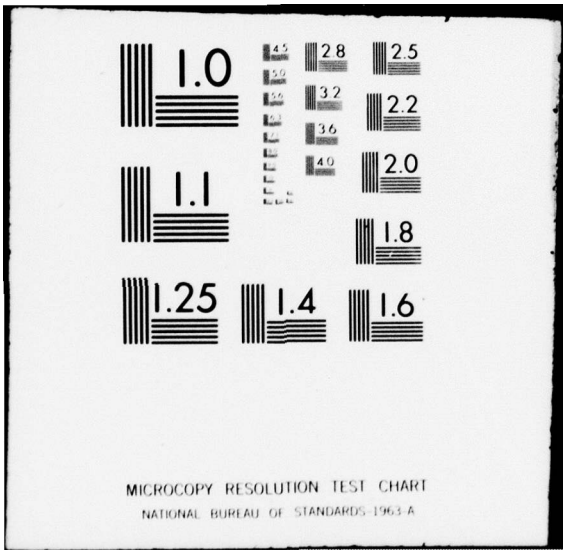
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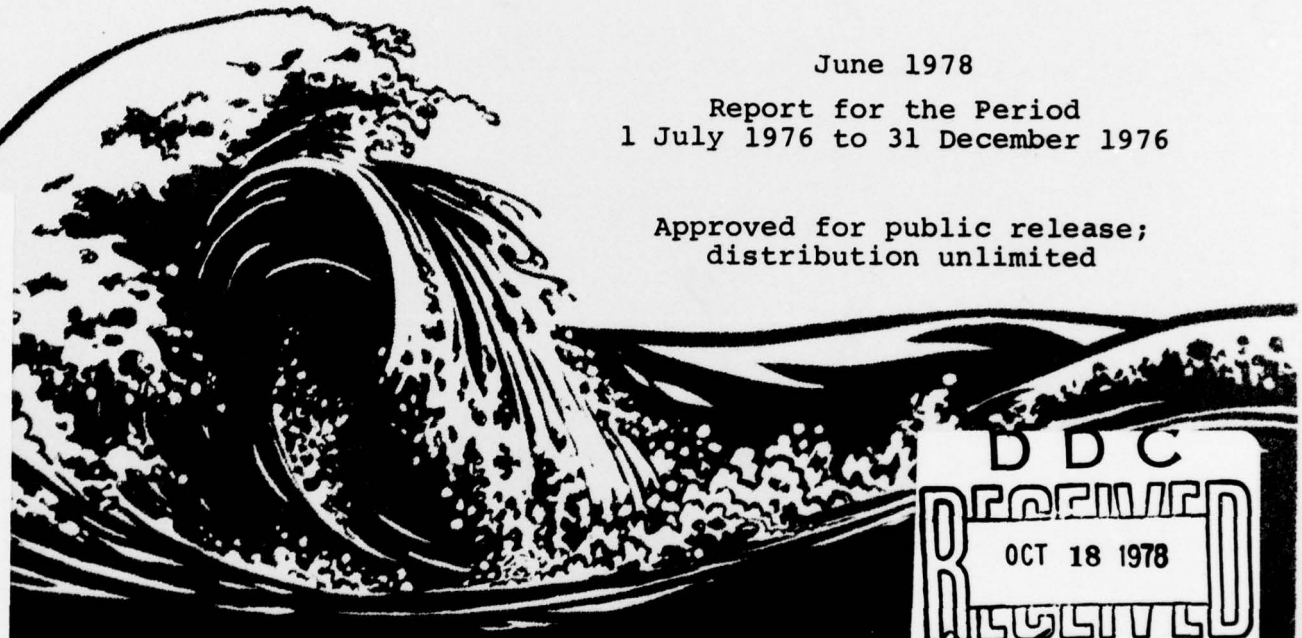
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A Simulator for Shipboard Radio Frequency Interference in Satellite Communications

Eduardo Siqueira Brick
Lieutenant, Brazilian Navy
M.S., Naval Postgraduate School, 1974

A simulator for shipboard radio frequency interference, intended to be used in the characterization of UHF satellite communications terminals such as the AN/WSC-3 and AN/SSR-1, has been developed. Analytical results for the performance of various types of communications systems in white gaussian noise is available in the open literature. Performance in other types of channels, such as between a satellite and ship, is not known yet due to unavailability of analytical models for the additive type of interference found in the ship's environment. A physical-statistical model for shipboard interference, based on Middleton's model for urban noise, is given. The model developed incorporates the relevant physical aspects of the various possible interferers and postulates a statistical framework in which these signals are inserted. A simulator based on the developed model was built to serve as a tool for study of the effects of the various inteferers upon shipboard satellite communications systems. The simulator is capable of generating 10 types of complex emitter and of providing linear and nonlinear processing of them. It is also capable of generating a PSK modulated test signal for performance measurements of UHF terminals. Results of performance measurements are presented. These results demonstrate the ability of the simulator to reproduce the shipboard electromagnetic environment.

Doctor of Philosophy
September 1976

Advisor: J.E. Ohlson
Electrical
Engineering
Department

The Role of Strong Atmospheric Forcing
Events in the Modification of the Upper Ocean
Thermal Structure During the Cooling Season

Norman Thomas Camp
Lieutenant Commander, United States Navy
B.Ed., Rhode Island College, 1962
M.S., Naval Postgraduate School, 1972

The role of strong atmospheric forcing events in determining the evolution of the upper ocean during the fall and early winter cooling season was investigated. The historical series of surface and near-surface marine observations at three mid-latitude ocean weather ships [PAPA (OWS P), NOVEMBER (OWS N), and VICTOR (OWS V)] support the hypothesis that the integrated effects of these events dominate this evolution. For example, periods when the mechanical forcing was greater than the long-term mean accounted for approximately 35% of the time in the record examined at the three stations. However 85%/68%/57% of the sea-surface temperature change at OWS N/OWS P/OWS V occurred during these periods.

Forty-nine data sets were examined and modeled during periods of intense fall and winter forcing. The significant thermal structure modifications observed during these strong events were simulated successfully using three modifications of the Kraus and Turner (1967) one-dimensional model. Evidence is presented which demonstrates that the amount of mechanically-generated turbulent kinetic energy available for entrainment decreases as the mixed-layer depth increases. Furthermore, in agreement with Gill and Turner (1976), these case studies suggest that only a small percentage of the convectively-generated turbulent kinetic energy is available for increasing the potential energy of the ocean by entrainment.

Doctor of Philosophy
December 1976

Advisor: Russell L. Elsberry
Meteorology Department

PASSIVE TARGET TRACKING USING NONLINEAR ESTIMATION THEORY

Marcilio Boavista da Cunha
Lieutenant Commander, Brazilian Navy
B.S., Pontificia Universidade Catolica RJ, 1969
M.S., Naval Postgraduate School

The problem of tracking submarine targets with passive sonobuoys is mathematically modelled. A comprehensive study is made of all the information available in the acoustic signals picked up by the sonobuoys and of the usefulness of this information in the estimation process. The presence of nonlinearities in the tracking model leads to the application of nonliear estimation theory. Bayes formulation concepts are applied to generate approximate solutions and filtering algorithms, and the well known extended Kalman filter equations and higher order filtering algorithms are obtained from this approach.

The concept of partitioning the measurements is presented and shown to bring advantages in computing efficiency and also, for nonlinear measurements, in tracking accuracy. A graphical interpretation of the action of Kalman filters is developed and provides insight into the importance of each variable in filtering process.

Extensive simulations, designed to test the performance of the algorithms developed, are presented in graphical form and analyzed.

Doctor of Philosophy
September 1976

Advisor: D.E. Kirk
Electrical Engineering
Department

Digital Encoding
for
Secure Data Communications

Eduardo Emilio Coquis Rondón
Lieutenant, Peruvian Navy
B.S., Naval Postgraduate School, 1974
M.S., Naval Postgraduate School, 1975

This thesis is concerned with the use of the digital computer to realize cryptography. Three cryptographic systems: simple substitution, pseudo-random cipher (polyalphabetic cipher), and data-keyed cipher, are designed, implemented through computer programming, and evaluated. A suitable cyclic error correcting code is designed to encode these systems for transmission. The code is tested by simulating a noisy channel.

Electrical Engineer
September 1976

Thesis Advisor: G. Marmont
Electrical Engineering
Department

Theory of Sampled Analog Recursive Comb Filters and Their Canceller Application

Arif Ejaz
Flight Lieutenant, Pakistan Air Force
B.S., P.A.F. College of Aeronautical Engg., 1968
M.S., United States Naval Postgraduate School, 1976

Sampled analog comb filter using a recursive filter implementation is studied. SAD-100 delay lines are used as the delay elements. The similarities and differences between sampled analog recursive filter and digital recursive filter are pointed out. Canceller type comb filters using the first order or the second order canonical circuits are studied. Experimental results of frequency response are presented to show their difference from that of digital filters. A theoretical analysis is presented based essentially on the digital filter theory but modified to take into account the differences described above. MTI-simulation was performed, and the ability of the CTD-filter to cancel clutter and pass doppler frequencies was demonstrated. The characteristic curves of the Fairchild CCD-321 have been obtained.

Electrical Engineer
December 1976

Advisor: T. F. Tao
Electrical
Engineering
Department

FINITE ELEMENT SOLUTION OF A THREE-DIMENSIONAL NONLINEAR REACTOR DYNAMICS PROBLEM WITH FEEDBACK

Eulogio Conception Bermudes
Lieutenant, United States Navy
B.S., United States Naval Academy, 1970

This work examines the three-dimensional dynamic response of a nonlinear fast reactor with temperature-dependent feedback and delayed neutrons when subjected to uniform and local disturbances. The finite element method was employed to reduce the partial differential reactor equation to a system of ordinary differential equations which can be numerically integrated. A program for the numerical solution of large sparse systems of stiff differential equations developed by Franke and based on Gear's method solved the reduced neutron dynamics equation. Although a study of convergence by refining element mesh sizes was not carried out, the crude finite element mesh utilized yielded the correct trend of neutron dynamic behavior.

Master of Science in
Mechanical Engineering and
Mechanical Engineer
December 1976

Advisor: Dong H. Nguyen
and
David Salinas
Department of
Mechanical Engineering

Forces on Roughened Cylinders
in
Harmonic Flow at High Reynolds Numbers

Steven R. Evans
Lieutenant, United States Navy
B.S., University of Mississippi, University, 1969

The in-line forces acting on sand-roughened circular cylinders immersed in an harmonically oscillating flow have been measured using a U-shaped water tunnel.

The drag and the inertia coefficients have been determined through the use of a Fourier analysis. These coefficients were found to depend on the Keulegan-Carpenter number, Reynolds number, and the relative roughness. The results have shown that roughness dramatically increases the transcritical drag coefficient.

It is recommended that the experiments be extended to the self-excited hydroelastic oscillations of cylinders in harmonic flows as well as to the problems related to wave slamming.

Master of Science in
Mechanical Engineering
and the degree of
Mechanical Engineer
September 1976

Advisor: T. Sarpkaya
Department of
Mechanical Engineering

Finite Element Solution of the Nonlinear Coupled Neutronic-Energy Equations for a Fast Reactor Fuel Cell

Roy Edward Kasdorf
Lieutenant, United States Navy
B.S.M.E, New Mexico State University, 1970

A transient overpower (TOP) accident in a Liquid Metal Fast Breeder Reactor (LMFBR) is considered. The analysis is formulated to model the dynamic response of the reactor fuel subassembly during the initial period of the postulated overpower transient. An equivalent cylindrical cell is used to model the fuel subassembly. The governing neutronic and heat transport equations for each region (fuel, clad, and coolant) of the equivalent cylindrical cell are developed. Nuclear Doppler broadening feedback is included in the dynamic model making the coupled equations non-linear. The resulting non-linear partial differential field equations are transformed into a system of ordinary differential equations by the finite element method. An isoparametric, quadratic, rectangular element is used for the discretization of the spatial domain. When using the finite element method, large system matrices may result. To facilitate solution of these large systems, an optimum compacting scheme is utilized. The implicit Gear's method is used for the solution of the system of ordinary differential equations. The results for a sample problem are presented.

Master of Science in Mechanical Engineering and Mechanical Engineer
December 1976

Advisors: D. Salinas and D. Nguyen
Dept. of Mechanical Engineering

The Potential Use of Reliability Growth Curves in Management of Weapon Systems

Ronald G. Anderson
General Engineer, Pt. Mugu, California
B.S., Northrup Institute of Technology, 1963

This paper explores the potential use of Reliability Growth Curves as a means by which the program manager can monitor and measure the reliability growth of a weapon system. The present reliability policies associated with weapon system acquisition are reviewed. Examination of three weapon system's Request for Proposals show how these policies are implemented. MIL-STD 785A, which provides the guidelines for reliability programs, is also reviewed and is followed by a discussion of the weaknesses of today's policies. This sets the stage for the presentation of the proposed method that will enable the program manager to control the reliability growth of new weapon systems.

Master of Science in Management
September 1976

Advisor: J. W. Creighton
Department of Operations Research and Administrative Sciences

ORGANIZATIONAL DESIGN CONSIDERATIONS FOR THE SUBHARPOON PROJECT

William Knowles Arnold, Jr.
Lieutenant Commander, United States Navy
B.A.E., University of Virginia, 1962

Ralph Khan Zia
Lieutenant, United States Navy
B.A. Finance, University of Illinois, 1969

This thesis explores, on behalf of the HARPOON Program Office (PMA-258) of the Naval Air Systems Command, various aspects of organizational and political-economic considerations applicable to the formation of a joint project staff charged with overseeing the modification of an operational missile for a foreign ally of the United States.

The joint endeavor is viewed from the three perspectives of foreign military sales, project management, and the psychosocial. Numerous findings unique to each of these areas are related via a systems model to provide specific recommendations and conclusions for the organization and management of the SUBHARPOON project.

Master of Science in Mangement
December 1976

Advisor: C.K. Eoyang
Administrative Sciences Department

A Study of the Effectiveness of Symposia
for
Transferring Technical Information to Applied End Use

by
Donald R. Bennett, P.E.
Pacific Missile Test Center, Point Mugu, California
B.A., LaVerne College

John L. Sweeney
Naval Aviation, Pacific, San Diego, California
B.S., University of California at Los Angeles

Kenneth L. Thornton
Pacific Missile Test Center, Point Mugu, California
B.S., Baylor University

A program is designed for the transfer of technology from the Navy's research effort to other potential users. This program uses the technical symposium as the basic mechanism for transfer, drawing on the technological resources of research organizations and the perceived needs of the user community. It is designed to communicate technological information, to develop a mutual appreciation of each other's problems and to establish communications among all participants in the technology utilization process.

A plan is developed for a technology transfer symposium in the field of Communications Electronics based on promising research efforts in this field performed at the Naval Postgraduate School (NPS). This symposium is proposed as the prototype vehicle for the Navy's Technology Transfer Symposium Program.

Lastly, a technique is developed for measuring the effectiveness of the symposium program, utilizing feedback from preceding symposia, so that the format of similar future programs might be optimized.

Master of Science in Management
September 1976

Advisors: J. W. Creighton
Administrative Sciences Department

J. A. Jolly
Administrative Sciences Department

The Use of Insight in Management Decisions

Sorrell Berman
Pacific Missile Test Center, Point, Mugu, California

This thesis hypothesizes that insight is the key element in effective decision-making. It approaches this position by developing a basic model of the environment in which a manager functions, showing the resources at his disposal. It then describes the contributions of the technologies which form the knowledge base for decision-making. Next, it distinguishes between intuition and insight, and demonstrates that it is insight which is the basis for the effective manager's art.

Master of Science in Management
September 1976

Advisors: J. W. Creighton
C. B. Derr
Department of Operations Research and Administrative Sciences

A Study of an Integrated Logistic Support Application
on a Surface Ship New Construction Program

Robert Alexander Bobulinski
Lieutenant, Supply Corps, United States Navy
B.S., Pennsylvania State University, 1969

This thesis contains a study of Integrated Logistic Support (ILS) Management on a surface ship new construction program. The author briefly outlines the concept of ILS based on Department of Defense ILS directives; explains the program's initial planning and organizational efforts; and then reconstructs a chronology of ILS related events that occurred during an actual program's acquisition cycle. The author sets up this historical account using past experience with various new construction programs, various directives, Navy and contractor program offices' historical and planning documents, library and industrial reference material, and interviews with ILS personnel.

The author compares the theoretical ILS concept with actual ILS occurrences, and then offers forth general conclusions. By using this method of presentation, he makes evident the complex nature of ILS, the need for a solid ILS information system and corporate memory, the need for the continued study of the ILS process, the need for more disciplined application and enforcement of the basic ILS principles, and the need for a better understanding and appreciation of matrix management, its problems and benefits.

Master of Science in
Management
December 1976

Advisor: E. A. Zabrycki
Department of Administrative Sciences

THE SYSTEMS APPROACH TO MANAGEMENT: A PARADIGM FOR THE TEST AND EVALUATION PROCESS

William Michael Branch
Naval Air Test Center, Patuxent River, Md.
B.S., North Carolina State University, 1965

This thesis addresses the Test and Evaluation process and demonstrates, through application of a dynamic systems model, that the Test and Evaluation process is a conglomerate of lower-order systems. Each system can be characteristically analyzed by focusing on objectives, inputs/outputs, interfaces, environmental, and effectiveness dimensions. Hence the systems approach to management is suggested as a paradigm for the Test and Evaluation process. This approach provides a systematic way of thinking about the job of management and emphasizes viewing the Test and Evaluation system as a whole instead of as segregated parts. The classic functions of management can be put in juxtaposition with the phases of Test and Evaluation to provide a better insight to management of scarce resources. Implementation of a strategy is perhaps the most important first step in practically using the systems approach and as such stimulates the manager to think in the proper perspective.

Master of Science in Management
September, 1976

Advisor: J. W. Creighton
Department of Administrative Sciences

Management by Objectives
and Governmental Productivity

David Ford Brumley
Pacific Missile Test Center, Point Mugu, California
B.S., University of Arkansas, 1959

This thesis examines some of the organizational characteristics that restrict productivity in government organizations. The beneficial impact of clearly established organizational objectives on productivity is stressed, and the theory and practice of Management by Objectives is reviewed. The purpose of the thesis was to determine if the techniques of MBO, appropriately utilized, could be expected to improve the productivity of government organizations, and to assist government managers in avoiding common pitfalls in MBO applications.

Master of Science in Management
September 1976

Advisor: J. W. Creighton
Department of
Administrative Sciences

A STUDY ON THE EFFECTIVENESS OF TRANSACTIONAL ANALYSIS FOR IMPROVING ORGANIZATIONAL PERFORMANCE

Daniel W. Buckner
Naval Air Test Center, Patuxent River, Md.
B.S.E.E., University of Maryland, 1965

This study investigates the effectiveness of Transactional Analysis used in personnel training by surveying two populations, one that had taken Transactional Analysis training, and one that had taken conventional training. Questionnaires were administered to the two populations. Responses were compared to determine if Transactional Analysis training resulted in greater awareness of basic human needs than did conventional training. Results indicate no significant difference between the two.

Master of Science in Management
September, 1976

Advisor: J. W. Creighton
Department of Administrative Sciences

The Recognition and Characteristics of Effective Executives

William Shortreed Burlem

A population was derived of individuals in positions of hierarchial importance from a variety of organizations whose effectiveness in their professional endeavors was apparent to their peers outside the organization. Characteristics of this select group were compared to those of populations of individuals not necessarily as particularly effective but occupying positions of similar hierarchial rank.

Significant differences were found between the select group and reference populations in the three broad categories examined: perception of management function, leadership style, and motivational needs. The select group interacted more with the environment external to their own organizations, and most significantly, are much more highly motivated by the need for power (and have a much lesser need for close interpersonal relationships) than the reference group.

The literature perceives the management function as directed either internally into the operation of an organization or externally into its operational environment, each to the exclusion of the other. It is suggested that both are necessary, and that the characteristics and skills requisite to the successful accomplishment of each are different.

Master of Science in Management
September 1976

Advisor: J. W. Creighton and C. B. Derr
Admin Science Dept.

Women (and Men) in the U. S. Army:

A Study in Optimal Utilization

Michael John Castle
Captain, Australian Army
B. Econ., Australian National University, 1975

Optimal utilization of all available resources is the ultimate goal of any nation's armed forces. This study examines the impact that the All Volunteer Force, the declining supply of 18 year-old males and legal and political pressures have had on the need for women in the U. S. Army. One major restriction to optimum utilization is the definition of combat. Numerical models employed to determine force structure consistent with the present restrictions and a current study to determine optimum unit female/male mix are discussed. The attitudes at all levels of command are the overwhelming influences on optimal utilization and these are examined along with the physiological and psychological nature of women and the effects of stereotyping. Discussions of current policies on career development, training, assignment and re-enlistment of personnel and conditions of employment are included. To provide a contrasting approach the study contains a brief discussion on the utilization of women in the armed forces of other nations. In conclusion four major areas (the need, the question of combat, specific management problems and the problem of attitudes) requiring command consideration and decision are identified.

Master of Science in Management
December 1976

Advisor: Douglas Courtney
Administrative Sciences Department

An Application and Comparison of Static Marginal Analysis and Generalized Lagrange Multipliers in Generating a U.S. Navy Repair Materials Requirement List

Jan Dyhr Christensen
Captain, Royal Danish Air Force

An analysis is made of current Single Supply Support Control Point procedures for developing a Repair Material Requirements List. The objective is to minimize the expected cost of stockouts over all line items subject to a budget constraint. Static Marginal Analysis and Generalized Lagrange Multipliers are utilized in the generation of a revised Repair Material Requirements List. The revised and the present generation techniques are compared by the use of a simulation of a R3350 aircraft engine overhaul production facility. Both the Static Marginal Analysis and the Generalized Lagrange Multipliers techniques drastically reduced the number of stockouts and the number of subsequent orders. Given a choice between these techniques the Generalized Lagrange Multiplier approach appears preferable because it requires substantially less computer time to generate the list than did the Static Marginal Analysis.

Master of Science in Management
and
Master of Science in Operations Research
December 1976

Thesis Advisor: A.W. McMasters
Administrative Science Department

Implementing Replacement Cost Accounting

John Ross Clickener
Major, United States Marine Corps
B.A., University of Illinois, Urbana, 1964

This thesis examines the methods proposed and employed to recognize the effects of inflation in financial reporting. A brief discussion of the development of valuation theory is presented and the principal alternatives to the present historic cost based method are described. The development of specific inflation accounting proposals and methods is described. The proposals for general price-level adjusted financial statements by the accounting profession are identified, and emphasis is given to the description of the replacement cost methods adopted by the governments in the United States and England.

Specific methods of developing replacement costs in compliance with existing regulations are analyzed. The implementation and impact of replacement costing on a firm is described and possible alternatives to the specific method employed are explored. Conclusions are drawn as to the value of the replacement cost financial data, and opinions are offered concerning appropriate valuation methods.

Advisor: James M. Fremgen
Administrative
Sciences Department

Master of Science in
Management
December 1976

Schedule Adherence in a Naval Shipyard---

A Case Study

Eric Rockhill Eckstein
Lieutenant Commander, United States Navy
B. S., United States Naval Academy, 1964

In this research, the author documents the process of production management employed in a naval shipyard in seeking adherence to schedules during the non-nuclear portion of the overhaul of nuclear submarines. In addition to recording the process details for those who may learn from them in the future, the author also demonstrates some of the problems confronting managers in all naval shipyards. The author first profiles the history, mission, and organization of the activity chosen for the research, Mare Island Naval Shipyard, then develops the process constraints of estimated cost, schedule, personnel resources, and authorized work packages for an individual ship. The discussion then shifts to a detailed description of the management aids used to monitor and assess overhaul progress and of the techniques employed, using these aids, to seek schedule adherence on several ships simultaneously. The research concludes with a summary of the total process and suggestions for further research.

Master of Science in Management
September 1976

Advisor: Alan W. McMasters
Administrative Science Department

Development of Executive Success

Theodore E. Elsasser
Naval Aviation Propulsion Test Center
Trenton, New Jersey

Executive development and success are analyzed from two different vantage points. Executive effectiveness is considered first from the traditional view of management which is charged with the responsibility of ensuring the future of the organization by filling key positions with competent executives. Executive effectiveness then is reconsidered through the eyes of an individual who wants to rise through the hierarchy and attain executive success for himself.

This effort is an attempt to answer three fundamental questions. First, what does an executive do and what function does he perform? Second, what qualities represent the difference between a successful executive and a mediocre one? Finally, how can an individual use this knowledge to achieve personal executive success?

Executive development methods used in both public and private sectors are analyzed. A method for formulating a personal executive career strategy is presented.

Master of Science in Management
September 1976

Advisors: S. M. Dean
C. B. Derr
Department of Administrative Sciences

A Study of the Naval Postgraduate School Aeronautical Engineering/Systems Acquisition Management Dual Masters Program

Steven Lock Fahrenkrog
Lieutenant, United States Navy
B.A., Moorhead State College, 1969
M.S.A.E., Naval Postgraduate School, 1976

The concept of a Dual Masters Program that would provide Naval officers with a Masters Degree from both a technical curriculum and a management curriculum appeared at the Naval Postgraduate School (NPS) in late 1970. The history of the present NPS Dual Masters Program is presented and the curricula that participate in the program are described. Using the Naval aviation community and the Aeronautical Engineering/Systems Acquisition Management Dual Masters Program as a baseline, alternative programs are presented and evaluated. Conclusions and recommendations concerning the Naval aviation community's continued use of a Dual Masters Program are included.

Master of Science in Management
December 1976

Advisor: Melvin B. Kline
Administrative Sciences Department

Productivity Measurement and Enhancement
on U. S. Navy Ships

Richard Cox Felsinger
Lieutenant Commander, United States Navy
A.B., University of Delaware, 1966

The purpose of this research project is to examine the problem of how to measure and enhance productivity on U. S. Navy ships. Productivity measurement and enhancement is discussed in terms of analytic models, benefits and costs, factors affecting productivity, and output and input measures. A study was conducted with 26 U. S. Navy ships in which it was found that (1) the average number of men assigned was significantly more important than the amount of OPTAR consumed for repair parts in affecting the number of planned maintenance actions accomplished, (2) labor and material productivity ratios could be computed with PMS (maintenance), personnel, and OPTAR cost data, (3) ships with high labor productivity ratios tended to have high PMS accomplishment rates, and (4) four factors related to the level of productivity were adequacy of tools, adequacy of supplies, extent of teamwork, and adequacy of planning. A shipboard productivity improvement program including a ship efficiency questionnaire and a computer-based ship productivity report are presented.

Master of Science in Management
September 1976

Advisor: Richard A. McGonigal
Department of
Administrative Sciences

ORGANIZATION COMMITMENT AND PERSONNEL RETENTION IN THE MILITARY HEALTH CARE SYSTEM

Michael LeeRoy Feris
Lieutenant, Nurse Corps, United States Navy
B.S., University of Washington, 1969

Vernon Melvin Peters
Lieutenant, Medical Service Corps, United States Navy
B.S., George Washington University, 1975

The question of how sufficient numbers of military health care providers can be maintained to meet an increasing demand on their services in the face of the all-volunteer service provides the focus for study. This thesis addresses the personnel retention issue through a model of organization commitment developed from a synthesis of research findings in related areas of organization psychology. The model is tested upon an existing pool of survey data drawn from the three military medical services.

Discriminant analysis is employed to segregate the sample into degrees of commitment to determine the most successful predictors of retention and motivation. It was found that an individual's length of service and the perception of the command's concern for human resources were consistently more powerful predictors than the concern for salary, status, and educational opportunities.

Profiles of the four categories of commitment are developed which provide insight into which individuals can more likely be retained in service. The profiles suggest areas in which organizations can move to improve upon retention and motivation. It is concluded that the concept of organization commitment discloses a broader range of effective policy choices than models presently available.

Master of Science in Mangement
December 1976

Advisor: C.K. Eoyang
Administrative Science Department

A Survey of Industrial Research and Development Budgeting, Effort Selection and Evaluation

Howard C. Fish
National Parachute Test Range, El Centro, California
B.S.(M.E.), The University of Buffalo, 1950
M.S. (E.M.), Stanford University, 1951

and

Joseph W. Wilson
Pacific Missile Test Center, Point Mugu, California
B.S.E.E., University of California at Berkeley, 1958

A study was made of procedures used by industry for allocating research and development investments. Areas of inquiry included levels and trends of R&D effort criteria upon which to base budget decisions, personnel selection criteria, apportionment between basic and applied research and development, lead time to results, extension funding criteria, and worth evaluation.

Results show a wide range of criteria in use, with principal differences between industries and between companies of different sizes.

Recommendations are made for use of the study results, and for further study and eventual development of a comprehensive decision model.

Master of Science in Management
September 1976

Advisors: J. A. Jolly
J. W. Creighton
Administrative Sciences Department

UTILIZATION OF TECHNOLOGY TRANSFER CONCEPTS AS AN AID FOR ENGINEERING MANAGEMENT IN A TEST AND EVALUATION ORGANIZATION

Jack Allen Grubber
Naval Air Test Center, Patuxent River, Md.
B.E.S., Marshall College, 1953
B.S.E., University of Maryland, 1959

This thesis addresses Technology Transfer as it might be applied in a Test and Evaluation (T & E) activity for weapons systems and components within the Federal Government. Factors associated with the Technology Transfer process, aids and barriers to Technology Transfer, the innovative and creative processes, and managerial requirements for Technology Transfer are related to the job of an engineering manager in a T & E organization. From the relationships, a Paradigm for action for middle management engineers to improve technical capability by utilizing Technology Transfer concepts is formulated.

Master of Science in Management

September 1976

Advisors: J. W. Creighton
J. A. Jolly
Department of Adminstrative Sciences

Reliability Improvement Warranties:
Government Benefits, Contractor Risks

Roland Franz Habicht
Commander, United States Navy
M.S. Physics, Naval Postgraduate School, 1967

Reliability Improvement Warranties illustrate a new contractual technique for improving reliability by providing a strong monetary incentive to the contractor. This incentive, however, also places additional monetary risk on the contractor. Industry has expressed mounting concerns over this risk. This thesis contains an examination of the relationship between government benefits and contractor risk. Existing and proposed RIW contracts are evaluated in regard to the type of equipment under warranty, the use of exclusions, penalties for non-compliance, and RIW price. The results of the analysis illustrate how RIW is being used by the government.

Master of Science in Management
December 1976

Thesis Advisor: R. R. Judson
Administrative Sciences Department

The Logistic System Concept and Foreign Military Sales, U.S. Navy - Royal Norwegian Navy

Karsten Haukeli
Lieutenant Commander, Royal Norwegian Navy
Graduate from the Norwegian Naval Academy, 1969

A conceptual framework for a logistic system is developed. The functional activities within the logistic system, their relationship to each other, and how they should be managed is described.

The existing organization for Foreign Military Sales (FMS) in the Royal Norwegian Navy and the U.S. Navy is identified, including an example of a typical FMS transaction.

An evaluation of the FMS system is made, partly based on the conceptual model of a logistic system developed earlier. The evaluation is also based on gathered information and the author's personal experience with FMS.

It is concluded that there is a good fit between the existing FMS organization and the theoretical logistical model. Areas of special concern are identified to be order processing, communications, transportation and training of individuals in the customer's FMS organization.

Master of Science in Management
December 1976

Advisor: E. A. Zabrycki
Administrative Science Department

A Statistical Analysis of the Effectiveness of
Program Initial Conditions
as
Predictors of Weapon System Acquisition
Program Success

Douglas Davies Henry
Lieutenant, United States Navy
B.A., Duke University, 1970

This thesis examines the relationship between weapon system acquisition program's initial conditions (project) size, technical risk and program length) and program outcomes in the areas of cost, performance and schedule. The study employs a nonparametric correlation procedure and Mann-Whitney U Tests as the principal analytic tools of the examination process.

The results of the analysis indicate that a definite relationship between cost/schedule growth and program size exists. In a significant number of cases, large programs incurred greater absolute cost growth with less schedule slippage than did programs of smaller size. The variance in project technical performance is largely unexplained by the methodology, although there are indications that it is related inversely to program length.

Master of Science in
Applied Science
December 1976

Advisor: Carson K. Eoyang
Department of Operations
Research & Admin Sciences

Proposed Measure of Effectiveness for Human Resource Availability Periods and Their Impact Upon Unit Operational Readiness

Raymond Carl Highsmith
Lieutenant, United States Navy
B.S., Pennsylvania State University, 1967

The U.S. Navy Human Resource Management Support System (HRMSS) has been in operation in various forms throughout the naval establishment since 1971. To date approximately 50% of the Navy's operational commands have been exposed to HRMSS concepts and practices via the mechanism of a Human Resource Availability (HRAV). At this juncture, however, little has been done to evaluate the operational impact of the HRAV in those commands that have experienced the probess.

This study proposes a methodology with which the effectiveness of the HRAV process as currently used by HRMC/D's can be assessed. The study further proposes a methodology with which to determine the impact of the HRAV on improved unit performance and operational capability. Use of the methodology is anticipated to aid system managers at all levels to evaluate the product as well as to aid future policy and resource allocation decisions for the HRMSS.

Master of Science in Management
December 1976

Advisor: R. A. McGonigal
Administrative Sciences Department

Mini and Micro Computers in Communications

Victor E. Hipkiss
Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1968

Carl Robert Schramm
Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1971

Mini and micro computers represent the newest developments in the computer field. Their small size, low cost, and wide ranging versatility make them valuable devices for use in communications systems. They can be used to perform many of the message handling functions previously performed by the main computer, thus freeing it for its more important application tasks. The use of mini and micro computers as front end processors, data concentrators and terminal controllers is investigated, as well as general hardware and software features such small computers must have to perform communications functions. A cost comparison between minicomputers, microcomputers and hardwired devices is also presented.

Master of Science in Management
September, 1976

Advisor: N.F. Schneidewind
Administrative Sciences Department

A REGIONAL CENTER FOR UTILIZATION & TRANSFER OF TECHNOLOGY

Peter Scott Hughes
Naval Weapons Evaluation Facility, Albuquerque, NM
BSME, University of Cincinnati, 1964
MSME, University of Cincinnati, 1967

and

Milton Henry Olson
Naval Weapons Center, China Lake, CA
BSEE, University of Utah, 1958

The need for a regional center to bridge the gap between existing sources of technology and State and local government as users of technology is exposed.

A Regional Center for Utilization & Transfer of Technology is described and a demonstration project proposed.

In support of the parent objective, questionnaires were sent out and interviews were held with city managers throughout the State of California. From the results, three aspects of the concept were explored in depth: (1) a description of the market for technology transfer (TT) to local government; (2) organization for TT; (3) the measurement of effectiveness.

Other areas covered include: barriers to TT; a survey of existing TT organizations; models of the TT process; a synopsis of Department of Defense policy on TT; and high potential tasks for a Regional Center.

Master of Science in Management
September 1976

Advisors: J. W. Creighton, J. A. Jolly
Department of Administrative Sciences

Rate Stabilization at Navy Industrial Fund

Research and Development Activities

Joel David Kramar
Lieutenant Commander, United States Navy
B.A., Naval Postgraduate School, 1975

and

Ernest Arnold Solberg
B.S., North Dakota State University, 1951
M.P.A., University of Southern California, 1972

Recently the Assistant Secretary of Defense (Comptroller) directed that all DOD industrially funded activities bill their customers on the basis of stabilized rates. Industrially-funded R&D activities are included in the policy change.

The writers address the subject of stabilized rates at R&D activities. The writers (1) identify the policy change, (2) trace its emergence in the DOD organization and (3) assess potential impacts.

The writers conclude that stabilized rates are more appropriate for non-R&D activities than for R&D activities. However, stabilized rates are workable in the R&D environment as long as it is recognized that the R&D workload is essentially a level-of-effort concept, and as long as minimal adjustments to locally established rates are made at higher levels.

Sources of information included official correspondence and interviews at selected Navy Laboratories and other NIF activities.

Master of Science in Management
December 1976

Advisor: J. C. Tibbitts
Department of Administrative Sciences

An Iranian Language Interpretation of Financial and Managerial Accounting Terminology

Mehrdad Koohi
Lieutenant Commander, Imperial Iranian Navy
B.S., Accounting, Accounting College, Tehran, Iran, 1969

The purpose of this thesis is to introduce the major concepts and terminology of financial and managerial accounting in the Farsi (Iranian) language.

English accounting textbooks were screened and studied to develop a complete understanding of accounting terminology. Complicated terms were discussed with appropriate faculty members of the Naval Postgraduate School. The meanings of the key concepts and terms were then written in the Iranian language in such a way that future Iranian students can build a sound understanding of accounting principles.

Master of Science in Management
December 1976

Advisor: J. C. Tibbitts
Administrative Science Department

The U.S. Navy's Fitness Report System:
Review, Analysis, and Recommendations

Thomas Nelson Lawson
Lieutenant Commander, United States Navy
B.S., University of Pittsburgh, 1966

The quality of decisions arrived at by promotion boards, selection boards, detailers, and placement officers will reflect, in part, the accuracy and thoroughness of the information available in fitness reports. Although "perfect" fitness reports will not guarantee faultless results, anything less than optimal performance evaluations will certainly degrade the quality of decisions accordingly.

The purpose of this thesis is to provide reporting seniors and subordinate officers an insight into the Navy's fitness report system and propose relevant tools and techniques to officers preparing fitness reports to enable them to complete their task more objectively and in a manner fair to the officer being evaluated, yet providing the Navy with the information that it needs.

The philosophy and importance of officer performance evaluations are reviewed, their many uses enumerated, and the present system is analyzed with problem areas identified and recommended solutions provided that could be initiated without revising the present fitness report directives or format.

Master of Science in Management
December 1976

Advisor: Richard A. McGonigal
Administrative Sciences Department

An Evaluation of the Systems Acquisition Management Curriculum

James Joseph Lewis
Lieutenant Commander, United States Navy
B.A., William Jewell College, 1962
M.B.A., University of San Francisco, 1976

The Systems Acquisition Management Curriculum was initiated at the Naval Postgraduate School in 1971 and has undergone only minor change since that date. A major analysis of that curriculum is conducted in order to determine if the objectives of systems acquisition management education are being met. Various alternatives for restructuring the current curriculum are discussed and analyzed. A model Systems Acquisition Management Curriculum is developed which provides the basis for curriculum improvement.

Master of Science in Management
December 1976

Advisor: M. B. Kline
Department of Administrative Sciences

Planning, Programming and Budgeting For Resource Allocation In the United States Coast Guard

Richard John Losea
Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1969

Resource allocation is the process by which strategic decisions are made by an organization's management with regard to the question, "Who gets what, when and how?" It is during this process that management must tackle and find an answer to the problem, "How do I get the resources I need to do what must be done?"

The purpose of this thesis is to describe those individual subprocesses used by the United States Coast Guard to answer the above questions. Attention is focused on current Coast Guard procedures and practices, and those factors, both internal and external to the service, which influence the process of resource allocation in the Coast Guard.

Master of Science in Management
December 1976

Advisor: J. C. Tibbitts
Administrative Sciences Department

A Technique to Assess the Worth of Inventory Accounting Systems

by

Lee D. Mabee
Pacific Missile Test Center, Pt. Mugu, CA
B.S., University of Southern California, 1960

and

Urban J. Toucher
Pacific Missile Test Center, Pt. Mugu, CA
B.S., University of Wyoming, 1959

This thesis contains an assessment of inventory accounting systems in use by the Navy, Air Force, and the private sector. Based on review of eight attributes, the private sector system was judged near optimum, the Air Force system as barely meeting the criteria, while the Navy system was judged as not meeting the criteria. Changes for the Navy system to meet the criteria were recommended. Also, recommendations for further testing of the approach, and possible uses of it are made.

Master of Science in Management
September 1976

Advisors: Dr. J. W. Creighton
Dr. J. A. Jolly
Department of Administrative Sciences

A Proposal for Selection of Imperial Iranian Navy Officers for Management Education

Mokhtar Malek
Lieutenant Commander, Imperial Iranian Navy
B.S., Italian Naval Academy 1969

The present situation of the Imperial Iranian Navy and its implications for the organization's management manpower are described. The current procedure of selection of naval officers for postgraduate education in management is analyzed, and the areas in which it needs improvement are examined.

Two sets of criteria to use for increasing the effectiveness of selection are developed. One category concerns the personal characteristics for selection of officers for management education, and the other concerns procedural factors for increasing the over-all effectiveness of the selection process.

Finally, on the basis of these criteria and characteristics, a selection model, feasible for the Imperial Iranian Navy, is proposed.

Master of Science in Management
December 1976

Advisor: C. Brooklyn Derr
Administrative Science Department

CONSOLIDATION OF HELICOPTER PILOT TRAINING

John A. McAuley Jr.
Lieutenant Commander, United States Navy
B.A., Naval Postgraduate School, 1975

Bradley T. White
Lieutenant, United States Navy
B.S., United States Naval Academy, 1970

The Congress of the United States, in an attempt to reduce Department of Defense (DOD) spending, has recommended an interservice consolidation of Undergraduate Helicopter Pilot Training (UHPT). DOD, in the FY77 budget proposal, indicated its intention to consolidate UHPT at Fort Rucker, Alabama. The proposal bases its cost savings, to a large degree, on the elimination of the fixed-wing phase of Navy helicopter pilot training and the "release" of an unidentified Navy training base.

This thesis examines fixed-wing training as a part of helicopter pilot training and the implied savings attributed to consolidation as proposed. Alternatives to the DOD proposal are also discussed in light of their costs (both quantifiable and non-quantifiable), their importance, and their impact on the training of Navy and Marine Corps helicopter pilots.

The authors conclude, for a variety of reasons, that the DOD proposal considered is not cost-effective.

Master of Science in Management
December 1976

Advisor: J.D. Senger
Administrative Sciences Department

The Management Assessment Center: A Status Update and Proposed Application

Dennis Michael McGann
Lieutenant, Medical Service Corps, United States Navy
B.S., The George Washington University, 1975

Weaknesses in present and past systems for the selection of Medical Service Corps officers from among the ranks of the Hospital Corps are described. The writer then suggests the possible use of the Management Assessment Center concept in that selection process.

The assessment center concept is described. Literature describing uses of the Assessment Center concept for similar purposes is reviewed. Interviews conducted by the writer with persons prominent in Assessment Center techniques and applications are reported. Finally, suggestions for the use of the concept in the selection process are presented.

Master of Science
in Management
December 1976

Advisor: J. W. Creighton
Department of
Administrative Sciences

Premature Personnel Attrition in the
U. S. Marine Corps

Robert Alan Packard, Jr.
Captain, United States Marine Corps
B.S.M.E., Duke University, 1967

This study examined the problem of premature discharges of non-prior service male enlisted service members due to their failure to meet minimum behavioral or performance criteria. Based on records of all first-term male enlisted Marines discharged in FY '75 or '76, probabilities of successfully completing enlistment (avoidance of adverse discharge) are calculated for various subgroups of Marines based on demographic factors. The findings of previous studies are generally supported. In addition, geographic location of home of record in connection with education level was found to have a significant bearing on success rates. Possible uses of this information are pointed out in connection with establishment of accession policies and allocation of recruiting assets.

Master of Science in Management
December 1976

Advisors: J. K. Arima
R. A. Weitzman
Administrative Sciences Department

A STUDY OF RELIABILITY AND MAINTAINABILITY AS APPLIED TO THE PHALANX CLOSE-IN WEAPON SYSTEM ACQUISITION

James Smith Perry
Lieutenant, United States Navy
B.S., United States Naval Academy, 1970

Reliability and maintainability engineering should be included as an integral part of systems engineering throughout the acquisition process. This thesis examines reliability and maintainability as applied to the Phalanx Close-In Weapon System (CIWS) acquisition.

Factors external to the Phalanx program office which led to a unique, off-line Reliability, Maintainability, and Availability Upgrade Program are discussed, and lessons learned are offered for future weapon system acquisition managers.

Master of Science in Applied Science
December 1976

Advisor: M.B. Kline
Administrative Sciences Department

A Conceptual Logistic System for the I. I. N.

Mehdi Rahanjam
Lieutenant Commander, Imperial Iranian Navy
B.S., Imperial Iranian Military Academy, 1967

This project is a survey of the foreign military sales logistics system effectiveness between the Imperial Iranian Navy and the United States Navy.

The first part of the thesis describes the concept of logistics and identifies the fundamental logistics considerations, their characteristics for an effective and efficient logistics system.

The existing FMS logistic system is analyzed relative to the model to identify areas for improvement by further detail studies. A major conclusion involves the restructuring of the present decentralized procurement operations to a centralized function.

Master of Science in Management
December 1976

Advisor: E. A. Zabrycki
Department of Administrative Sciences

Women At Sea:
A Sinking Ship?

Paulette Reichert
Lieutenant, United States Navy
B.A., Marymount College of Kansas, 1971

Women represent the majority of the population in the United States today. Throughout many of the major institutions, including the Navy, acceptance of women's talents and contributions is limited -- they represent an underutilized resource. In four years, personnel shortages will be realized by U.S. military establishments. The manpower pool will no longer provide enough physically and mentally eligible men to accomplish its mission. With this in mind, this thesis examines three proposals concerning the utilization of womanpower: 1) continuing to utilize women in the traditional support roles of the past; 2) decreasing the participation of women; and 3) expanding women's roles to include sea/combat duty. Because of the continuing problems of recruiting, retention and reenlistment of men, it is concluded that women must be utilized in all aspects of the Navy and not restricted from sea/combat duty. Women serving as part of the total mission of the Navy is a new concept -- both to men and women. This thesis will highlight the barriers toward utilization of women at sea and discuss recommendations for future action and research.

Master of Science in Management
December 1976

Advisor: R. A. McGonigal
Department of
Administrative Sciences

Effects of Career Development Factors
on the Military Manager in the Support Activity

by

Joseph Gerald Rezin
Naval Air Station, San Diego, Ca.

In this study, a civilian member of middle management examines the internal and external forces that bear on the military officer during his management duty tours in the supporting Shore Establis hment, and influence his decision making behavior. It is found through a literature search that these motivational forces consist basically of: (1) the increasing complexity of career patterns, (2) promotion and attendant processes in an up or out situation, and (3) the policy of job rotation. By means of statistical analyses of data gathered by questionnaires, hypotheses are tested which lead to the finding that the most desirable military management billets perceived as springboards to promotion have average tour lengths significantly shorter than those of less desirable billets. It is concluded that the above situation could be rectified, and other problem areas resolved, through longer tour length assignments. The study applies, in general, to anyjoint military-civil service organization; however, primary interest is focused on Naval Air Systems Command activities.

Master of Science in Management
September 1976

Advisor: C. B. Derr
Department of
Administrative
Sciences

Executive Selection: A Method for Identifying The Potential Executive

by
Howard Wayne Rowe
Pacific Missile Test Center, Pt. Mugu, Ca.

James C. Rudeen
Naval Weapons Center, China Lake, Ca.

John M. Wenke
Naval Air Station, Patuxent River, Md.

This research effort continues the investigation started by Leshko and Vosseteig (1975) in the utilization of situational stimuli to identify and measure executive capacity. Expanded hypothesis testing relating to the executive capacity indicators isolated by Leshko and Vosseteig was conducted. The data base was comprised of sample populationsof executives from the private and public sectors, and middle managers from the public sector. These populations were compared with one another, then compared individually and collectively with the executive success criteria described in management literature. Analysis of the data showed that the private sector executives differed significantly from both executives and middle managers on all capacity indicators tested except health, job security, and family relationships. When the sample populations were compared with expected responses based on management literature, only health and family relationships indicators show a significant similarity with the answer expected.

Master of Science in Management
September 1976

Advisors: J. W. Creighton
J. A. Jolly
Department of
Administrative Sciences

THE NAVAL POSTGRADUATE SCHOOL ITS FUTURE: AN OPPORTUNITY

Frank Russo
Naval Air Systems Command, Washington, D. C.
B.S.M.E., University of New Mexico, 1958
M.S.S.M., University of Southern California, 1973

The steady decline in student enrollments at the Naval Postgraduate School during the past decade has led to review of its present mission, what its mission should be and actions necessary to ensure its future and effective growth. A new mission, as envisioned by the writer, was defined and recommendations identified to achieve that mission. Review of past study committee reports indicated the school had not done as well as it could have in marketing its services and capabilities or in providing all the services needed by its sponsors. But it has been far ahead of any other federal or non-federal institution of advanced learning in the development and presentation of unique educational experiences. One of the recommendations calls for establishing a marketing department or staff responsible for advertising and selling the schools programs and capabilities.

Master of Science in Management
September 1976

Advisor: J. W. Creighton
Department of Administrative Sciences

A MODEL FOR MEASURING EFFECTIVENESS IN A SECURITY ORGANIZATION

Ralph Woodrow Schneider
Naval Air Station, Point Mugu, Ca.
B.S., Illionois Institute of Technology, 1953
Professional Engineer, California Registration I665

This study effort validates the appropriateness of employing the Delphi technique to establish measures of effectiveness for support type functions.

The reason some processes are unmeasurable and the difficulties of measuring outputs are discussed. A model is developed for determining the effectiveness of a security organization and a step-by-step procedure is provided for instituting and effectiveness evaluation. The preparation of a Delphi questionnaire for establishing goals and for weighting the goals is presented, from which a panel of security experts in an iterative process assigns values to each goal to provide a medium for measuring effectiveness.

Master of Science in Management
September 1976

Advisor: B. H. DeWoolfson
Administrative Sciences Department

An Analysis and Proposal for Revision of the Coast Guard Enlisted Performance Evaluation System

John Frederic Stumpff
Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1969

Roger Douglas Chevalier
Lieutenant, United States Coast Guard
B.A., Saint John's University, 1969
M.A., Saint John's University, 1972

The Coast Guard enlisted performance evaluation system requires a semiannual evaluation of all enlisted personnel in the areas of proficiency, leadership, and conduct. The stated objective of the system is to differentiate between the performance of individuals. The performance evaluation marks assigned are intended for such administrative purposes as advancement in rate, assignment, and determination of the character of service. A Coast Guard-wide sample of performance evaluation marks for the period ending 31 December 1975 and of the records of personnel who participated in the March 1976 servicewide examination for advancement was analyzed. In an effort to improve upon the quality of enlisted performance evaluations, a format and methodology for development of a new performance evaluation system that will differentiate individual performance as well as aid in individual career development through counseling was designed.

Master of Science in Management
December 1976

Advisor: R. A. McGonigal
Administrative Science Department

DEMONSTRATION OF THE FEASIBILITY OF AUTOMATING THE INFORMATION SYSTEM OF A SMALL SERVICE ORGANIZATION USING A GENERALIZED COMPUTER SOFTWARE PACKAGE

Kenneth M. Suess
MSDO
San Diego, California

James F. Thaler
NAPTC
Trenton, New Jersey

The concept of using a generalized computer software package to satisfy the information processing requirements of a small service organization was introduced. The feasibility of this approach was demonstrated by applying the Statistical Package for the Social Sciences (SPSS) to the data processing requirements of a service organization. Using SPSS, an automated information system was developed and implemented in an operational environment for the Facility Engineering Support Office (FESO), a service organization at the Civil Engineering Laboratory (CEL).

The utilization of the SPSS at FESO conclusively demonstrated that a generalized computer software package is a cost-effective approach to satisfying the information processing requirements of a small service organization. The development process and operating procedures were documented to facilitate the adoption of this approach by other service organizations.

Master of Science
in Management
September, 1976

Advisors: J.W. Creighton
J. A. Jolly
Department of
Administrative
Sciences

Litton Crosses the River

Robert E. Wideman
B.A., Naval Postgraduate School, 1975

This paper examines the circumstances surrounding Litton's shipbuilding claims. It begins by discussing the business backgrounds of Charles B. Thornton and Roy L. Ash, the founding and development of Litton Industries, the founding and development of Ingalls Shipbuilding Company, and the acquisition of Ingalls Shipbuilding by Litton Industries. Areas explored include the concept of growth by acquisition versus internal growth, the economic problems faced by the shipbuilding industry, the United States' position in the world shipbuilding market, and the concept of total package procurement as it relates to the U. S. Navy's ship procurement process. Finally, this thesis looks closely at the financing of Litton's new automated shipyard, the award of the amphibious assault ship (LHA) and DD-963 class destroyer contracts to Litton Industries, the cost overrun on the LHA program, and the testimony of Gordon Rule before the subcommittee on Priorities and Economy in Government.

It is suggested that the reader familiarize himself with Appendix A before reading the main text.

Master of Science in Management
September 1976

Advisor: L. Darbyshire
Department of Administrative Science

Organizational Alternatives for the Plans and Workload Branch, Design and Fabrication Department Pacific Missile Test Center

William Harold Winner
Pacific Missile Test Center, Point Mugu, CA
B.S., Iowa State University, 1952
Professional Engineer, California Registration M16496

This study presents alternatives for optimizing the output of projects and tasks in the Navy's in-house facility for engineering design, manufacturing, maintenance, and repair at the Pacific Missile Test Center, Point Mugu, California. Key Departments are analyzed. Alternatives for management consideration are presented. Rationale for various alternatives is reported on. Finally, recommendations for action are made.

Master of Science in Management
September 1976

Advisor: John W. Creighton
Department of Administrative Sciences

Gasdynamic Effects on an Electric Discharge in Air

Jonney Lynn Barto
Lieutenant Commander, United States Navy
B. S., United States Naval Academy, 1965

The overall purpose of this work is to develop a subsonic, turbulent, diffuse electric discharge operating at near atmospheric pressure for use as the pumping mechanism in an Electric Discharge Convection Laser (EDCL). The work was done in two phases. The first consisted of a data collection phase during which the variation of discharge parameters was studied to determine their effects on the current-voltage characteristics of the multi-pin electrode arrangements used. The parameters studied included gap length, flow speed, turbulence intensity, electrode orientation, rate of voltage increase, and gas density through the addition of a diffuser. The second phase consisted of developing an interactive model which correctly reflects the dependences observed in phase one. A space-charge model resulted which correctly explains most major observed trends in gross discharge properties. Discharge stability is also discussed in terms of the model.

Master of Science in Aeronautical Engineering
September 1976

Advisor: Oscar Biblarz
Department of Aeronautics

Development of a Control Valve to Induce an Oscillating Blowing Coefficient in a Circulation Control Rotor

James Lawrence Bauman
Lieutenant, United States Navy
B.S., Iowa State University, 1970

The Circulation Control Rotor concept makes it possible to achieve large changes in lift coefficient, without changing angle of attack, by making only small changes in blowing coefficient. The concept has great potential in the area of rotary-wing aerodynamics, where implementation will require the generation of oscillating blowing coefficients. In order to examine the response of a circulation control airfoil to such an oscillating blowing coefficient, a simple control valve system was designed and built. The effectiveness of the control valve in oscillating the blowing coefficient at various frequencies and amplitudes was examined. An attempt to determine the effect of this oscillation on the instantaneous lift coefficient of the rotor was not successful.

Master of Science in Aeronautical Engineering
December, 1976

Advisor: James A. Miller
Department of Aeronautics

Analytical and Experimental Determination of
the Characteristics of a Transonic Axial Turbine

Billy Carrol Boatright
Lieutenant Commander, United States Navy
M.S., Naval Postgraduate School, 1976

An analysis and test rig measurements of the performance of a transonic axial turbine are reported. The purpose was to confirm the accuracy of measurements made in a test rig which was designed to separate the losses occurring in the stator from the losses occurring in the rotor blade rows. The analysis was programmed for the Hewlett-Packard 21-MX computer. Reasonable agreement between predicted and measured characteristics was obtained using experimentally determined losses in the computer program. Lack of agreement was noted using theoretical values. It was concluded that the rotor was not choked at the conditions in the tests, and that the test rig measurements were valid. A successful technique for smoothing the data obtained from the rig is also reported.

Master of Science in
Aeronautical Engineering
December 1976

Advisor: R.P. Shreeve
Department of
Aeronautics

Time Dependent Holographic Interferometry and
Finite-Element Analysis of
Heat Transfer within a Rectangular Enclosure

Gerald Paul Braun
Lieutenant, United States Navy
B.S.E.E., The University of Toledo, 1968

In this thesis, the finite-element method was developed to numerically analyze heat transfer by laminar natural convection within a rectangular cavity, a classical fluid flow problem. A second auxiliary case study involving Couette flow was included to test the flexibility of this analysis technique.

Analyzing heat flows experimentally was also explored utilizing holographic interferometry. Specific problems encountered during this phase of research are presented with appropriate comments.

Master of Science in
Aeronautical Engineering
September 1976

Advisor: D. J. Collins
Department of
Aeronautics

SOFTWARE DESIGN FOR A FATIGUE MONITORING DATA ACQUISITION SYSTEM

Charles Lynn Butler
Lieutenant, United States Navy
B.S., U.S. Naval Academy, 1969

The software for an aircraft fatigue monitoring data acquisition system was designed and implemented on a prototype instrument to evaluate the feasibility of employing such a system in the data collection process for the determination of fatigue effects in aircraft structures.

The operating software and the associated hardware are described herein; options for actual implementation in light of rapid technological developments are hypothesized and discussed. Separate software packages provide for the data collection and retrieval, including the pre-processing of data to a form which is suitable for computation. Results of test cases are presented where the software is proved by comparison of output to controlled input signals.

Master of Science in
Aeronautical Engineering
September 1976

Advisor: Prof G.H. Lindsey
Department of
Aeronautics

Man-Powered Flight

Lynn Carter II
Lieutenant, United States Navy
B.S., United States Naval Academy, 1968

An alternative to the conventional rigid wing was explored to see if any advantage might be obtained by utilizing slotted airfoil sails for wings and a complete shift in emphasis towards a lighter vehicle at the expense of drag penalties. Optimum combinations of size and structural parameters were sought through extensive computer analysis. Various tradeoff considerations for further improving aircraft performance were considered. Predictions of optimum structural parameters were obtained with aircraft power requirements and the optimum flight velocity.

Master of Science in
Aeronautical Engineering
September 1976

Advisor: M. U. Clauser
Department of
Aeronautics

PULSATING COMBUSTION DEVICE MINIATURIZATION

Robert Kenneth Crowe
Lieutenant, United States Navy
B. S., University of South Carolina

The phenomenon of pulsating combustion remains one of the least understood forms of combustion. In this thesis, combustion oscillations are classified into the categories of chamber oscillations, system oscillations, and intrinsic oscillations. Two pulsating devices, the pulsejet and the Reynst combustion pot, were studied in some detail. Experimentation was conducted to determine the miniaturization capabilities of the devices. Conclusions were drawn concerning the practicality of size reduction, and applications of the devices were suggested. Areas of possible future research are delineated that would further the development of the devices and their miniaturization.

Master of Science in
Aeronautics
December 1976

Advisor: M.F. Platzer
Aeronautics
Department

A KALMAN FILTER APPLICATION TO THE ADVANCED TACTICAL INERTIAL GUIDANCE SYSTEM OF THE AIR-LAUNCHED LOW VOLUME RAMJET CRUISE MISSILE

John A. Van Devender
Lieutenant, United States Navy
B.S., University of Southern Mississippi, 1968

A Montecarlo simulation is conducted to ascertain performance of the ATIGS system in a proposed air-launched cruise missile configuration. The simulation is conducted within a local-level inertial frame consisting of down-range, cross-range and up as primary reference vectors. Efforts are made to measure the relative effects associated with the intended pure position reset provided by a micrad sensor as compared with those effects which could be expected from a linear suboptimal Kalman filtering scheme used in conjunction with the MICRAD sensor.

Master of Science in
Aeronautical Engineering
December 1976

Advisor: H. A. Titus
Department of
Electrical
Engineering

METAL ATOM OXIDATION LASER

Richard C. Feierabend
Lieutenant, United States Navy
B.S.M.E., Cleveland State University, 1969

This work represents a continuation of research investigating the feasibility of a metal atom oxidation laser. The work was done on the Naval Postgraduate School's metal-atom oxidation laser set-up which was designed and constructed as part of previous thesis research. The series of experiments was conducted with ten rare earth elements in a pure oxygen environment.

A brief discussion of the toxicity and handling characteristics of the rare earth elements, the metal oxide laser system, and the possible metal deposition techniques is presented. The technique finally used in the metal deposition process and the difficulties incurred with the technique are also discussed.

Although no positive lasing action was noted, results from these experiments suggest further investigation is warranted.

Master of Science in
Aeronautical Engineering
September 1976

Advisor: Daniel J. Collins
Department of
Aeronautics

LOW ENERGY IMPACT LOADING OF GRAPHITE-EPOXY PLATES

Richard Lee Ferris
Lieutenant, United States Navy
B.S., United States Naval Academy, 1968

An experimental and theoretical analysis was performed on low energy impact loading of thin (.040 inches) graphite-epoxy plates. Six-inch square plates were subjected to dynamic impact (below the ballistic range) and static loading. The plate static strain energy and dynamic impact energy for failure were equal and constant. Theoretical analysis was performed using both exact and finite element methods. Small deflection theory was assumed and found to be inapplicable; the plates behaved in a manner indicating that a large deflection theoretical model would be more appropriate.

Master of Science in
Aeronautical Engineering
December 1976

Advisor: M.H. Bank
Aeronautics
Department

THE FINITE ELEMENT METHOD APPLIED TO FLOWS IN TURBOMACHINES

Valentin Francisco Gavito, Jr.
Lieutenant, United States Navy
B.S.M.E., Southern Methodist University, 1970

The finite element method is applied to the two-dimensional, inviscid, compressible radial equilibrium equation for axial compressors. Isoparametric elements are used along with three-point Gaussian integration for stiffness matrix evaluation. The radial equilibrium equation is put into quasi-harmonic form for stream function formulation and results are presented using an insentropic flow assumption. Axial velocity profiles at rotor and stator blade edges are compared with published performance data of the NASA Task-1 stage transonic compressor and with numerical finite element results of Hirsch and Warzee.

Master of Science in
Aeronautical Engineering
December 1976

Advisor: D.J. Collins
Department of
Aeronautics

Determination of the Blade-Element Performance of A Small Transonic Rotor

Wayne Randolph Hawkins
Lieutenant, United States Navy
M.S., Naval Postgraduate School, 1976

The blade-element performance of a small transonic compressor rotor operating at high subsonic speeds is reported. Measurements were made downstream using a small calibrated pneumatic probe, with simultaneous measurements of total pressure, velocity, turning angle, pitch angle, and temperature. In addition, a program is presented to calculate blade-element performance based on empirical data contained in NASA SP-36.

Master of Science in
Aeronautical Engineering
December 1976

Advisor: R.P. Shreeve
Department of
Aeronautics

Measurement of Instantaneous Velocities From a Fluidically Controlled Nozzle Using A Laser Doppler Velocimeter

Michael Kenneth Hollis
Lieutenant, United States Navy
B.S., United States Naval Academy, 1969

A laser Doppler velocimeter was used to investigate the flow field produced by an oscillating jet. Velocity measurements were made with the fluidically controlled jet in both the oscillatory and non-oscillatory modes. Mean and instantaneous surveys were made to quantify the time dependent nature of the jet.

Master of Science in Aeronautical Engineering
September 1976

Advisor: D. J. Collins
Department of Aeronautics

An Investigation of Stress Determination for Aircraft Fatigue Life Estimation from In-Flight Strain Data

George Michael Horne
Lieutenant, United States Navy
B.S., Mississippi State University, 1968

A thorough knowledge of localized stresses due to geometric effects is necessary for accurate fatigue life estimation in aircraft structures. The Department of Aeronautics, Naval Postgraduate School, Monterey, California, has developed a strain monitoring system that provides data on nominal stresses experienced by aircraft structures, which can be applied to obtain local stresses at a stress concentration, provided a local stress vs. nominal strain relationship is available. A theory proposed by Neuber lends itself to development of a method by which local stress can be obtained with knowledge of nominal strain and material properties alone.

Neuber's theory was evaluated by comparison of experimental stress concentration factors with theoretical values for plates with central holes and was found to be a valid basis for obtaining local stress from nominal strain.

Stress relaxation behavior was obtained for two cyclic loading histories of plate specimens in an effort to extend the monotonic local stress vs. nominal strain relationships into practical use for fatigue life estimation of aircraft structures.

Master of Science in
Aeronautical Engineering
September 1976

Advisor: G. H. Lindsey
Department of
Aeronautics

THE IMPLEMENTATION OF A FINITE ELEMENT COMPUTER CODE AND ASSOCIATED PRE-AND POSTPROCESSOR INTO AE4101 AND AE4102 (FLIGHT VEHICLE STRUCTURAL ANALYSIS I AND II)

Dennis M. Losh
Lieutenant
B.S., United States Naval Academy, 1970

The objectives of the project described in this thesis were to : 1) provide the documentation that is needed for a Naval Postgraduate School student to use the general purpose finite element computer program called SAP IV, and 2) to make available, and prepare the users manual for, a pre-and postprocessor program called SUBROUTINE PSAP. This subroutine, which was developed at the NASA Langley Research Center, has been modified to specifically plot the finite element model geometry for SAP IV models and to postprocess displacement data for those models on the NPS Calcomp Model 765 Plotter. The input and output for SAP IV and SUBROUTINE PSAP are discussed in detail. The codes have been used successfully in AE 4102, Flight Vehicle Structural Analysis II.

Master of Science in
Aeronautical Engineering
December 1976

Advisor: Robert E. Ball
Department of
Aeronautics

Application of Holographic Interferometry To the Interior Ballistic Flow Field in the Barrel of a Twenty Millimeter Cannon

Richard Lewis Montgomery
Lieutenant, United States Navy
B.S.E.E., University of Miami, 1966

The technique of holographic interferometry was applied to the study of gas core characteristics in the barrel of a 20mm cannon. Using standard hydrodynamic equations theoretical predictions were calculated. Holographic interferograms were made of the associated flow field near the projectile during firing. Reconstruction of the wave-front provided the necessary means of comparing experimental results with the theoretical values obtained.

Master of Science in
Aeronautical Engineering
September 1976

Advisor: D. J. Collins
Department of
Aeronautics

Development of Measurement Techniques and Data Analysis
for a
Three-Stage Axial Flow Research Compressor

James Andrew Olson
Lieutenant, United States Navy
B.S., University of Connecticut, 1968

Preliminary measurements were made in a three-stage axial compressor using a calibrated pneumatic probe to determine the usefulness of the probe for investigating tip clearance effects. The probe was calibrated free of wall effect and an improved method of deriving velocity and pitch angle from probe pressure measurements was devised. It was shown that the effect of flow boundaries on the probe could be represented as simply a function of displacement in different flow passages of large cross section. The calibration and corrections were programmed and applied to the compressor measurements. It was concluded that the probe could provide accurate flow field measurements in the compressor at distances greater than 0.25 inches from the wall.

Master of Science in
Aeronautical Engineering
December 1976

Advisor: R. P. Shreeve
Department of
Aeronautics

An Experimental Determination of the Aerodynamic Drag Characteristics of Variable Geometry Rigid Bodies

Larry David Pfitzenmaier
Lieutenant Commander, United States Navy
B. S., Iowa State University, 1967

An investigation was made of the aerodynamic drag characteristics of two Variable Geometry Rigid Bodies (VGRB's). Results were obtained experimentally through the use of a low speed wind tunnel and an external wind-tunnel balance. Four wood models were tested representing two unique VGRB's in the full-volume and half-volume configurations. Results obtained with the smaller VGRB were compared to those obtained from an elongated body of revolution of equal length and volume.

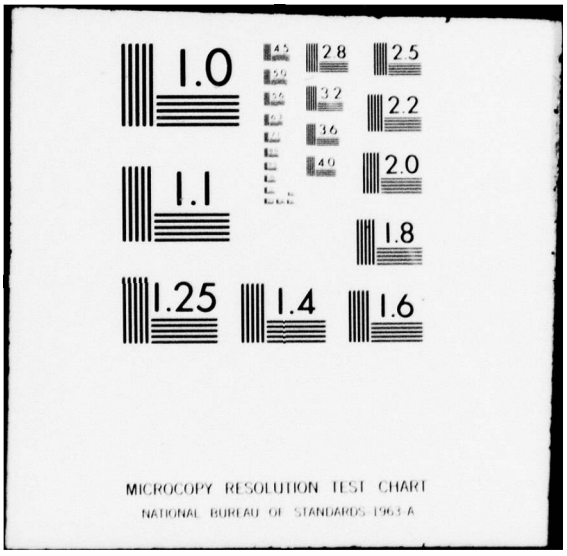
Master of Science in
Aeronautical Engineering
September 1976

Advisor: D. M. Layton
Aeronautics Department

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UNCLASSIFIED NPS-012-78-004PR NL

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A Microprogrammable Data Acquisition and Control System (MIDAS IIA) with Application to Mean Meteorological Data

John Russell Plunkett
Lieutenant-Commander, United States Navy
B.S., California State University at Long Beach, 1965

The construction and operation of a fully automated microprogrammable data acquisition and control system (MIDAS IIA) with application to the sampling and mean averaging of meteorological data is reported. MIDAS IIA is designed to automatically collect periodic samples of various meteorological data in digital and analog forms, compute mean averages over selectable time intervals, and produce a permanent output record of the time averaged data.

The system consists of a microprocessor based on the Intel Corp. 8008 CPU, a 16-channel multiplexed analog-to-digital converter, a digital clock, an incremental digital cassette tape recorder, numerous meterological data sensors, and a teletype for input/output. Details of system operation and programming are described.

Master of Science in Aeronautical Engineering
September 1976

Advisor: Prof. T.M. Houlihan
Mechanical Engineering Department

Sub-Ambient Controlled Turbulence Effects
on Discharge Stabilization for Laser Applications

Howard Allen Post
Lieutenant, United States Navy
B.S., Northrop Institute of Technology, 1967

This work deals with the effect of reduced pressure in a controlled turbulent flow on electric discharge stabilization. A converging-diverging nozzle was designed and fabricated to provide a device for investigating this phenomenon. Turbulence was generated by perforated plates designed with a geometry that had proven to be successful in previous controlled turbulent work. Turbulence and discharge data are presented along with photographs of the discharge for no flow, laminar flow and turbulent flow.

Master of Science in
Aeronautical Engineering
September 1976

Advisor: Oscar Biblarz
Department of
Aeronautics

A Microprocessor-Controlled Data Acquisition System for the Federal Scientific Model UA-500-1 Ubiquitous Spectrum Analyzer

Thomas Fredrick Sauntry
Lieutenant, United States Navy
B.S., United States Naval Academy, 1969

A microprocessor-controlled data acquisition system is described. The data acquisition system was developed to facilitate the acquisition and analysis of frequency data processed by a Federal Scientific Model UA-500-1 Ubiquitous Spectrum Analyzer. A control program in an Intellec 8 microprocessor is used to control the rate at which spectrum data are output from the spectrum analyzer. An interface circuit converts the data from serial to parallel format and then latches the data for input by the microprocessor. The microprocessor converts the data from binary format to binary-coded-decimal and then outputs the data on cassette magnetic tape. The spectrum data on cassette magnetic tape can subsequently be read back by the microprocessor and then punched on paper tape in a format suitable for input into the IBM-360 computer system.

Master of Science in Aeronautical Engineering
September 1976

Advisor: Thomas M. Houlihan
Mechanical Engineering Department

DEVELOPMENT OF A NON-DESTRUCTIVE INSPECTION TECHNIQUE FOR ADVANCED COMPOSITE MATERIALS USING CHOLESTERIC LIQUID CRYSTALS

Robert Troy Schaum
Lieutenant, United States Navy
B.A.E., Auburn University, 1969

A new, relatively simple and inexpensive non-destructive inspection technique for advanced composite materials is proposed and its feasibility is demonstrated. This technique uses encapsulated cholesteric liquid crystals to sense small temperature differences which result from nonuniform heat transfer through composites. Discontinuities in heat transfer evidenced by contrasting surface color patterns indicate material discontinuities, i.e. flaws.

Preliminary investigations into the thermal conductivity of a .041 in. thick graphite/epoxy laminated panel in the direction normal to the composite laminae and in the direction parallel to the laminae are described. The coefficients of conductivity in the two directions were found to differ by an order of magnitude. A qualitative test of the technique in locating embedded teflon triangles is reported, and a design for a testing device is proposed.

Master of Science in
Aeronautical Engineering
September 1976

Advisor: Prof. M. H. Bank
Department of
Aeronautics

Installation for Full-scale Wing Testing

Rumondor G. W. Senduk
Lieutenant Colonel, Indonesian Air Force
Dipl-Ing., Rh.-Wf. Technische Hochschule, Aachen

This work covers the first phase of the full-scale wing test simulator project being installed at the Aero Dept of the Naval Postgraduate School. A left wing section of the U-3 was made available as the test article. Loads were applied by double-acting, manually controlled hydraulic actuators from beneath the wing and reacted into the floor.

A matrix of influence coefficients has been obtained by recording the deflections corresponding to each load application, and compared to the output of a computer program SAP IV, using a simplified model of the wing structure. Furthermore, the elastic axis of the wing has been determined experimentally, and used to obtain an influence coefficients matrix as used in the solution of aero-elasticity problems.

Master of Science in
Aeronautical Engineering
September 1976

Advisor: M. H. Bank
Department of
Aeronautics

STATIC AND DYNAMIC BUCKLING OF SHALLOW SPHERICAL SHELLS SUBJECTED TO AXISYMMETRIC AND NEARLY AXISYMMETRIC STEP PRESSURE LOADS USING SATANS-IIA, A MODIFIED VERSION OF SATANS-II

Michael D. Shutt
Lieutenant
B.S., Oregon State University, 1970

A digital computer program for the geometrically nonlinear analysis of totally arbitrarily loaded shells of revolution (SATANS-II) was modified to more accurately account for the conditions at the pole of the shell. This program was used to determine the buckling load of shallow spherical shells of various sizes when subjected to static axisymmetric, dynamic axisymmetric, and dynamic nearly axisymmetric step-pressure loads of infinite duration. A comparison was made between the new buckling results and previous results obtained without the new pole routine. The comparison revealed a significant change in the buckling pressures, due solely to the change in the pole routine. The new static axisymmetric, dynamic axisymmetric, and even the dynamic asymmetric critical buckling pressure loads appear to be fairly reliable results for perfect, shallow shells.

Master of Science in
Aeronautical Engineering
December 1976

Advisor: Robert E. Ball
Department of
Aeronautics

A Three-Dimensional, Finite Element Lifting-Surface Computer Program, Its Utilization and Underlying Theory

Arne Paul Soderman
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1965

The computer program, A Theoretical Method for Calculating the Aerodynamic Characteristics of Arbitrary Jet-Flapped Wings, prepared by the Douglas Aircraft Company was examined with three objectives in mind: the investigation of an apparent instability or divergence of output characteristics, a revision of the User Manual, and the incorporation of a theoretical development of the underlying theory.

Master of Science in
Aeronautical Engineering
December 1976

Advisor: M. F. Platzer
Department of
Aeronautics

Digital Programmable Timing Device
for Fast Response Instrumentation
in Rotating Machines

James Clyde West, Jr.
Lieutenant, United States Navy
B.S., University of Oklahoma, 1970

The design, construction and test of an inexpensive computer peripheral device to control the acquisition of data from high response probes in periodic flows, is reported. The device (RPACE) was used with a Hewlett-Packard Model 21MX computer and 5610A A/D converter to obtain Kulite probe measurements in a transonic compressor by "synchronized sampling". A phased-locked-loop and counting circuits were used so that the moment of A/D conversion always corresponded to a programmable displacement of a stationary probe with respect to the moving rotor blades – independent of RPM. Also, the rotor speed was measured digitally in one revolution of the shaft. The results of a "survey" of a rotor blade passage at a blade passing frequency of 4500 per sec. are included.

Master of Science in
Aeronautical Engineering
December 1976

Thesis Advisor: R. P. Shreeve
Aeronautics Department

TWO-SENSOR INITIALIZATION OF A NONLINEAR KALMAN FILTER IN THE APPLICATION TO PASSIVE ACOUSTIC TARGET LOCATION AND TRACKING

Randall E. Wyatt
Lieutenant
B.S., U.S. Naval Academy, 1968

Methods of multi-sensor initialization are investigated to determine a useable technique for solving the Extended Kalman Filter initialization problem. A cross-correlation function is defined by the difference in time of reception of an acoustic signal at two different sensors, $\Delta\tau(k)$, and the ratio of the Doppler shifted frequencies, $M^*(k)$. The maximization of this cross-correlation function, coupled with the received frequency and arrival angle information, result in an accurate solution to the filter initialization scheme, as compared to using the incoherent frequency and bearing information.

Master of Science in Aeronautical Engineering
September 1976

Advisor: Harold A. Titus
Electrical Engineering Department

Microcomputer Based
Solid State Crash Data Recorder
For Military Aircraft

William Ramon Albertolli
Lieutenant, United States Navy
Bachelor of Architecture, University of Virginia, 1967

The design, breadboard implementation, and functional testing of a Crash Data Recorder for military aircraft is reported. A microcomputer is used to analyze the flight parameters, reduce redundant data, and record only significant information to be used in past-crash analysis. Non-volatile solid state memory is used as the recording medium. Functional tests indicate that the solid state recorder's reliability is higher than that of mechanical magnetic tape recorders while cost, weight, size, and required maintenance are greatly reduced.

The microcomputer provides an expansion capability for future applications of the flight recorder. Research and development, structural history, maintenance analysis, and training are areas where the Crash Data Recorder can also serve as an analytical tool.

Continued research in this subject is highly recommended.

Master of Science in
Aeronautical Engineering
December 1976

Advisor: Uno R. Kodres
Computer Science
Department

The Use of Microcomputers in DCS AUTODIN Tributaries

Gordon Ernest Anderson
Captain, United States Marine Corps
B. S., University of Washington, 1968

Present-day Mode I AUTODIN tributaries utilize large-scale computers such as the IBM 360 series, Burroughs 3500 series, and the Univac DCT 9000. The feasibility of using microcomputers (such as the Intel 8080) for such applications was investigated. It was demonstrated that microcomputers can function as Mode I AUTODIN tributaries at speeds greater than 2400 baud. This fact could result in the replacement of expensive leased equipment with subsequent cost savings and expanded use of AUTODIN in tactical and mobile situations. In addition, new methods of describing communication protocols were explored.

Master of Science in
Computer Science
December 1976

Advisor: V. Michael Powers
Computer Science
Department

Information Storage and Retrieval System
A Data Base Management System
For a Microcomputer

Ronald Bruce Dobie
Captain, United States Marine Corps
B.S., Miami University, 1968

This thesis develops a microcomputer based Information Storage and Retrieval (ISR) system. This systems is a stand alone data base management system which has the capability to add, update, delete, retrieve and display records from its local data base. The primary use for such a system would be among deployed military units which normally would not have access to larger non-mobile computers. The system would provide the military unit with a local data base. An added communications interface would allow this system to be used as part of a larger data base management network.

Master of Science in
Computer Science
December 1976

Advisor: L. V. Rich
Computer Science
Department

Verification and Feasibility Study of a Micro-Computer Based Ballistics Algorithm

John Thomas Ertlschweiger II
Lieutenant, United States Navy
B.A., University of Virginia, 1969

The radical cost reductions in computer hardware brought about by large scale integration (LSI) has motivated this feasibility study which explores the use of the INTEL 8080 as a ballistics computer in a distributed micro-computer based airborne tactical weapons system.

The results show that software floating point arithmetic using a sixteen bit mantissa is sufficiently accurate for solving the ballistics problem.

Experimental data failed to show that the mathematical model accurately predicts the weapon's behavior. Either the instrumentation to record the release data was inaccurate, or the ballistics tables do not accurately predict the actual behavior of falling weapons.

Master of Science in
Computer Science
December 1976

Advisor: U. R. Kodres
Computer Science
Department

A Microprocessor Implementation of Extended BASIC

Gordon Edwin Eubanks, Jr.
Lieutenant, United States Navy
B.S., Oklahoma State University, 1968

The design and implementation of an extension to the BASIC programming language for use on a microprocessor-based system has been described. The implementation is comprised of two subsystems, a compiler which generates code for a hypothetical zero-address machine and a run-time monitor which interprets this code. The design goals, solutions, and recommendations for further expansion of the system have been presented. The system was implemented in PL/M for use in a diskette-based environment.

Master of Science in
Computer Science
December 1976

Advisor: Gary A. Kildall
Computer Science
Department

A SHIPBOARD REPORT ORIGINATION SYSTEM UTILIZING A MICROCOMPUTER

Joseph Glade Holyoak
Lieutenant, United States Navy
B.S., College of Southern Utah, 1969

A Report Origination System (ROS) has been implemented, using an inexpensive microcomputer system, to help ease the administrative burden facing Navy shipboard managers. The system is an interactive line editing system, with optional prompting, which enables a person who is unfamiliar with the report format to respond to queries in order to edit a highly formatted report. Automatic error checking is performed using a previous edition of the report as a basis. The system allows creation of new formatted reports. The use of a general purpose microcomputer system makes the editing system affordable to a large number of users and also provides a general computing facility for other uses.

Master of Science in
Computer Science
December 1976

Advisor: U.R. Kodres
Computer Science
Department

PRELIMINARY DESIGN CONSIDERATIONS FOR A SHIPBOARD DAMAGE CONTROL MONITORING SYSTEM

James Abel Jordan, Jr.
Lieutenant, United States Navy
B. S., University of Louisville, 1970

At present ships are monitored for fire, flooding, and other casualties by watches such as the Sounding and Security Watch, but casualties still cause millions of dollars of damage each year. The need for a damage control monitoring system is discussed in detail and the design requirements for a system are identified. A number of alternatives for a monitoring system are examined, and one of these alternatives is recommended for implementation and prototype testing. The proposed system, which uses a network of fire and flooding detectors in individual compartments connected via a power line carrier to a central processor, can be developed at exceptionally low risk using existing technology and at a price that can be afforded. The system would provide comprehensive damage control monitoring, record keeping, and analysis functions.

Master of Science in
Applied Science
December 1976

Advisor: V. Michael Powers
Computer Science
Department

Redundant Ring Structures
for
Shipboard Distributed Computer Systems

Peter Burgess Snyder
Lieutenant Commander, United States Navy
B.S., Southern Connecticut State College, 1965

The potential constraints on a ring structured distributed computing system imposed by the shipboard environment were discussed. The feasibility of increasing distributed ring system availability to meet the requirements were investigated. It was shown that with a multiply linked ring structure, shipboard environmental effects would not severely degrade successful operation of a distributed system. This finding could result in the utilization of distributed ring computing systems with suitably redundant data path schemes as a highly reliable general purpose data processing system on shipboard platforms.

Master of Science in
Computer Science
December 1976

Advisor: V. Michael Powers
Computer Science
Department

THE DESIGN AND IMPLEMENTATION OF A GENERAL PURPOSE INTERACTIVE GRAPHICS SUBROUTINE LIBRARY

Barbara Jo Stankowski
Lieutenant, United States Navy
B.S., Pennsylvania State University, 1970

This thesis describes the design and implementation of a high level, general purpose, interactive graphics subroutine library for the Vector General Interactive Graphics Display System. The lower interface levels of the system and its effects on the development of this high level interface are discussed. The problems and various approaches associated with the development of a general purpose, high level applications subroutine library that is user oriented is outlined. The basic design goals, solutions and recommendations for further expansion of the system are presented. This graphics subroutine library is implemented within the conventions of the C-Programming language and the UNIX operating system as implemented on the PDP-11/50 in the Naval Postgraduate School Computer Laboratory.

Master of Science in
Computer Science
September 1976

Advisor: G.M. Raetz
Computer Science
Department

An Evaluation of a Raster Scan Display for Signal Processing and Analysis

William R. Teetz
Lieutenant, United States Navy
B.S., University of New Mexico, 1968

The purpose of this study was to evaluate the Hughes CONOGRAPHIC-12 graphics display terminal as a signal processing and analysis tool. Utilization of computer controlled graphics terminals is part of an effort to provide necessary data to the signal analyst in a more usable form than is presently available. The work described herein was part of a continuing program at the Naval Postgraduate School to support acoustic signal analysis. The direction presently being taken in this program is to evaluate newer, smaller, more modern and less expensive hardware in this environment.

The CONOGRAPHIC-12 display terminal is a viable option to be considered in this application. However, several features that are commonly available on the Hughes CONOGRAPHIC-12 terminal were not considered useful in this study and therefore were not utilized or evaluated.

Master of Science in Computer Science
December 1976

Advisor: George A. Rahe
Computer Science
Department

The Design of an Inter-Processor Support System for an Interactive Graphics Package

Dominick W. Visco
Lieutenant, United States Navy
B.S., United States Naval Academy, 1970

The hardware and software limitations of a processor supporting a general purpose multiprogramming operating system were discussed in relation to services provided to tasks with real-time requirements. In order to provide adequate service to all user programs, a hardware and software alternative based on a multiple processor configuration was recommended. The hardware configuration and required software support were discussed.

The new support level software routines were conceived to be subdivided between two processors. The dedicated host contained the device driver, interrupt handler, and responsibility for handling all real-time requirements. The main processor supported the multiprogramming environment which retained the responsibility of memory management, user interface routines, display list generation, and manipulation code.

Master of Science in
Computer Science
December 1976

Advisor: Gary M. Raetz
Computer Science
Department

Software Engineering: Tools of the Profession

Arrena Sue Williams
Lieutenant, United States Navy
B. A., Southwest Texas State University, 1969

Software engineering is presented as a new branch of the engineering disciplines. The tools and techniques of the profession are examined in an attempt to resolve definitional ambiguities and describe the concepts or attitudes generally associated with three specific programming methodologies. Language properties supportive of the methodologies are investigated. The professional tools and language characteristics are evaluated in terms of their effect on DOD software.

Master of Science in
Computer Science
September 1976

Adviser: G. L. Barksdale
Computer Science
Department

A 35 GHz Gunn Effect Oscillator

Ferit Atalay
Lieutenant, Turkish Navy
B.S.E.E., Naval Postgraduate School, 1975

The Gunn effect and theoretical studies on waveguide-mounting of packaged Gunn diodes are discussed. An oscillator designed by mounting a packaged diode into a reduced height waveguide is described. Experimental results are compared with those predicted by an equivalent circuit response of the oscillator. Operation of an IMPATT diode tested in the same cavity is also described.

Master of Science in
Electrical Engineering
December 1976

Advisor: Jeffrey B. Knorr
Electrical Engineering
Department

The Design, Construction, and Implementation of a Simulated Pilot's Task to be Used in the Study of the Effects of EEG Biofeedback

Douglas Pierce Ayers
Lieutenant, United States Navy
B.S., United States Naval Academy, 1969

A brief history of the EEG and a physiological explanation of the possible causes of EEG waveforms is given. A highly reliable simulated pilot's tasking system is designed and explained in detail. An analog circuit to produce a voltage equal to the square root of the sum of two input voltages squared is designed to be used as a measure of effectiveness of EEG biofeedback. A discussion of present and future data analysis programs is presented.

Master of Science in
Electrical Engineering
September 1976

Thesis Advisor: G. Marmont
Electrical Engineering
Department

FEASIBILITY OF A DIRECTION FINDING CAPABILITY FOR THE NATIONAL VHF-FM DISTRESS SYSTEM

James Leander Barth, Jr.
Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1967

This thesis investigates and explains various direction finding systems compatible for VHF-FM use. The system will be shore-based with the antenna mounted on existing structures. Basic DF principles are covered for background information. Specific techniques explained are relative amplitude(loop), time of arrival(interferometer) and doppler methods. Also included are propagation characteristics with line-of-sight determination and free space loss of existing VHF-FM antennas.

Conclusions are that the proposed system will probably not be acceptable without additional DF equipment aboard surface craft.

Master of Science in
Electrical Engineering
September 1976

Advisor: G. D. Ewing
Department of
Elect Eng

AN APPLICATION OF KALMAN FILTERING TO UNDERWATER TRACKING

Eric James Benson
Lieutenant, United States Navy
B.S., United States Naval Academy, 1971

A program was developed to improve the on-line measurement capability of the three-dimensional, underwater tracking ranges at the Naval Torpedo Station, Keyport, Washington. The program utilizes a Kalman filter routine to minimize the effects of measurement noise in determining the true target position. The gain schedule used by the filter is calculated off-line and may be varied based on tracking requirements. Listings of both of the Fortran programs are included.

Simulated exercises were run utilizing a variety of gain schedules. Results of these simulations will assist NTS engineers in the implementation and operation of the program using the NTS computer facility. Details of the simulation procedure and a listing of the track generator program are included.

Master of Science in
Applied Science
December 1976

Advisor: Harold A. Titus
Electrical Eng.
Department

CHARGE AND CURRENT DENSITY DISTRIBUTIONS ON MODERATELY THICK TRANSMITTING CROSSED-MONOPOLE ANTENNAS

William Edward Beyatte
Lieutenant, United States Navy
B.E.E.E. Vanderbilt University, 1970

Charge and current density distributions in the vicinity of the cross junction of several configurations of electrically long, moderately thick, crossed-monopole antennas with an intersecting angle of 45 degrees were measured. The recorded data was compared with a monopole antenna with the same dimensions as the vertical segment of the crossed-monopole. Junction conditions such that there would be a maximum current/minimum charge and minimum current/maximum charge on the vertical monopole were investigated.

Master of Science in Electrical Engineering
December 1976

Advisor: Robert W. Burton
Department of
Electrical Engineering

Time Optimal Control of Linear Systems: A High Order Application

Sergio Bidart Jimenez
LTJG, Chilean Navy
B.S.E.E., Naval Postgraduate School, 1975

This thesis describes and proves the method used to determine the optimal sequence of control pulses, which when applied to a linear system will make it fulfill deadbeat response.

In particular, a computer program is presented which determines the width and magnitude of optimal control signals for a fourth order system.

To prove the validity of the method, the system is simulated and the response to a step input and to the optimal control signals are compared. Also width and magnitude of control signals are varied slightly and responses are compared to prove that the signals so determined are optimal.

Master of Science in Electrical Engineering
December 1976

Advisor: O. M. Baycura
Electrical Engineering Department

THE EFFECTS OF VISUAL BIOFEEDBACK UPON CORRELATED MOTOR CORTEX ACTIVITY OF A SUBJECT ENGAGED IN A SIMULATED PILOT'S TASK

Allen Ray Boutz
Lieutenant, United States Navy
B. S., United States Naval Academy, 1970

Electroencephalograms of a subject engaged in a simulated pilot's task were analyzed using synchronous detection techniques. The effect of visual biofeedback upon correlated activity of certain motor cortex areas associated with coordinated hand and wrist movements of the subject's right hand was determined. Significantly increased correlation of activity was noted during mental processing involved with the pilot's task when the subject was given feedback. The largest portion of data was collected in the 70- 95 HZ frequency band.

Master of Science in Applied Science
December 1976

Advisor: G. Marmont
Department of
Electrical Engineering

An Application of Phase Coherence to the VP ASW Problem

Franklin Jeffrey Burns
Lieutenant Commander, United States Navy
B.S., Purdue University, 1966
M.B.A., University of West Florida, 1971

The use of phase coherence between two sonobuoys to increase target detection for the VP ASW problem is investigated using a model to simulate the spectral characteristics of a moving target. Phase coherence, coherent processing, and a digital technique which includes doppler shift and time delay is discussed. A computer simulation and coherence calculation program is explained. Five examples are evaluated. Three-dimensional plots of the magnitude squared coherence as a function of time delay and doppler shift are presented. Results suggest that calculation of coherence at a Tactical Support Center could enhance target detection.

Master of Science in Oceanography
September 1976

Thesis Advisor: H. A. Titus
Electrical Engineering Department

A Sensitivity Study of the Chirp-Z Transform and the Prime Transform as Sampled Analog DFT Algorithms

James G. Campbell
Lieutenant Commander, United States Navy
B.A., Rice University, 1966

Two different sampled analog Discrete Fourier Transform (DFT) algorithms, the Chirp-Z Transform (CZT) and the Prime Transform, are examined in a computer simulation to evaluate their sensitivity to implementation errors of various kinds. Methods of sensitivity study in analog and digital signal processing are summarized to provide a framework for the sampled analog study. The CZT and the Prime Transform are compared with one another and with the digital Fast Fourier Transform, and relative accuracies and design tradeoffs are noted.

Master of Science in Electrical Engineering
December 1976

Advisor: T.F. Tao
Electrical Engineering Department

An Experimental Analysis of Log-Periodic Antennas

Clemente Orejuela B
Lieutenant Commander, Peruvian Navy
B.S., Naval Postgraduate School, 1975

Antenna structures for which the input impedance and radiation pattern vary periodically with the logarithm of the frequency are described.

The antennas provide linearly polarized unidirectional, and omnidirectional patterns as well as circularly polarized unidirectional patterns.

Experimental results of pattern and impedance measurements are presented over the frequency range of 90 to 900 Mhz.

Master of Science in
Electrical Engineering
December 1976

Advisor: Robert W. Burton
Electrical Engineering
Department

A Study of Noise in Charge Coupled Devices

GLENN RUSSELL DEACON
Lieutenant, United States Navy
B.S.E.E., University of New Mexico, 1971

Integrated focal plane arrays for thermal imaging are being developed using infrared charge coupled device (IRCCD) technology. A study of noise in charge coupled devices was conducted to determine device compatibility with thermal imaging requirements for detector noise limited operation. Specifically, a FAIRCHILD-321 CCD was studied to determine its usefulness as a preamplifier or readout processor. Device transfer characteristics and frequency response for operation in a gain mode were studied. The noise characteristics of the device were studied.

Master of Science in
Electrical Engineering
December 1976

Advisor: Tien F. Tao
Department of
Electrical Engineering

EXTENDED KALMAN FILTERING APPLIED TO THE POSITION LOCATING AND REPORTING SYSTEM (PLRS)

Bernard M. de Mahy, Jr.
Captain, United States Marine Corps
B.S., University of Southwestern Louisiana, 1969

The Marine Corps and Army are developing a Position Locating Reporting System to aid the battlefield commander in locating his assets during battle.

This study has applied Extended Kalman Filtering techniques tc that problem, evolving from a simple Extended Kalman Filter Observer to three moving observers, whose position is uncertain, estimating the position of another unit.

Master of Science in
Electrical Engineering
December 1976

Advisor: H. A. Titus
Electrical Engineering
Department

A DIGITAL COMPUTER ANALYSIS OF THE WULLENWEBER ANTENNA: HIGH BAND NARROW SECTOR PATTERN

William York Frentzel,II
Lieutenant, United States Navy
B.S.E.E. United States Naval Academy 1969

A digital electromagnetic antenna analysis program is used to model the Wullenweber Circularly Disposed High Band Antenna Array, narrow sector pattern. The computed patterns are compared to existing measured patterns, and various environmental and physical parameters are varied to determine their effect on antenna performance.

Master of Science in
Electrical Engineering
December 1976

Advisor: Stephen Jauregui
Department of
Electrical Engineering

A SURVEY OF MONOLITHIC LINEAR INTEGRATED CIRCUITS

Michael Joseph Gazarek
Lieutenant Commander, United States Navy
BCS, Seattle University, 1965

A survey has been made of monolithic linear integrated circuits based on manufacturers specifications. The survey considers operational amplifiers, converters, communication devices, analog switches, and special circuits currently available, analyzing device parameters to derive a uniform set of descriptors. Based on this survey, sufficient monolithic linear IC building blocks are readily available. Application potential is limited only by current technological expertise.

Master of Science in Applied Science
December 1976

Advisor: Rudolf Panholzer
Electrical Engineering Department

Emulation of the AN/UYK-7 Tactical Data Computer on the Burrough's D-Machine

by

Jerry Michael Haggerty
Lieutenant, United States Navy
B.S., United States Naval Academy, 1970

John Michael Hartling
Lieutenant, United States Navy
B.S., Miami University, Oxford, Ohio, 1969

A workable design is presented for emulating the AN/UYK-7 multiprocessing computer system on the Burrough's Interpreter Based System, the D-Machine. The program developed provides for exact execution of the AN/UYK-7 instruction repertoire with the exception of Floating Point, hardware interrupts and IOC Instructions. The design allows for future expansion to incorporate these functions. Input/Output is limited to a card reader, line printer and single disk. Various aspects of Emulation, the D-Machine, and the AN/UYK-7 are discussed and a detailed User's Manual is provided along with recommendations for modifying the design into a full emulation.

Master of Science in Computer Science
December 1976

Advisor: S.Jauregui
Electrical Engineering Department

THE APPLICATION OF A MICROCOMPUTER TO MONITORING SHIP SECURITY

Robert Charles Johnston
Lieutenant-Commander, Canadian Forces
B.Sc., Royal Military College Of Canada, 1964
B.S.E.E., Naval Postgraduate School, 1975

A system, based on a MOS TECHNOLOGY KIM-1 Microcomputer, is developed to monitor security on board a ship. Two levels of priority are provided. The highest level monitors fire, smoke, and vapour sensors at up to sixty-four locations. Triggering a sensor at one or more of these locations activates alarms and displays the location of the sensor.

The low priority level monitors up to thirty-two sensors and displays the location of the sensor(s) upon activation.

System operation is indicated by display of the time on the Microcomputer's 7-segment LED's.

Master of Science in
Electrical Engineering
December 1976

Advisor: R. Panholzer
Electrical Engineering
Department

History of the AN/UYK-20(V) Data Processing System Acquisition and its Impact on Tactical Systems Development

Robert Richardson Joyce
Lieutenant Commander, United States Navy
B.S., University of California, 1965

In 1972 the Chief of Naval Material perceived a proliferation of small computer types in the Navy inventory. To stem that proliferation a standard minicomputer was procured, to be used in all current and future tactical systems requiring a small digital processor. That standard was designated the AN/UYK-20(V) Data Processing System. Lack of dedicated support forced the Chief of Naval Material to tax the users of the system to obtain the necessary development and operational support funds. Premature delivery of the system to meet user schedules resulted in highly unreliable equipment being used in development efforts. A significant adverse impact on user project costs and schedules resulted. Examination of the standard minicomputer acquisition fosters a number of recommendations for future tactical digital processor acquisitions.

Master of Science in Electrical Engineering September 1976	Co-advisor:	Stephen Jauregui Elect. Engineering Department
Master of Science in Management September 1976	Co-advisor:	Edward A. Zabrycki Admin. Sciences Department

The Kalman Filter Applied to Process Range Data of

the Cubic Model 40 Autotape System

Benjamin E. Julian
Lieutenant Commander, United States Navy
B.S., University of Washington, 1966

The Kalman Filter is implemented to process range data output from the Cubic Model 40 Autotape system, a surface position locating system currently employed on the underwater tracking ranges at Dabob Bay and Nanoose. Results are presented for different measurement noise and forcing function noise statistics.

Master of Science in
Electrical Engineering
December 1976

Advisor: Harold A. Titus
Electrical Engineering
Department

Interval Modulation (IM) of a Sinusoidal Carrier

Edgar Leslie Kilborn, Jr.
Lieutenant, United States Navy Reserve
B.S.E.E. , Northeastern University, 1971

Interval Modulation (IM) of a sinusoidal carrier is a modulation technique unlike AM, FM, or PM. IM conveys the information of a message waveform by modulating an interval between bursts of a sinusoidal carrier. IM is accomplished by sampling the message waveform, producing a delay proportional to the amplitude of the sampled message waveform and, upon the completion of the delay, initiating a burst of a fixed number of full cycles of a sinusoidal carrier. With the completion of the burst, another sample of the message waveform is taken and the sequence of events repeats. Because the length of a burst is fixed and because the delay between bursts is dependent upon the sampled value of the message waveform, the IM signal is non-periodic. An analysis is made of the IM signal modulated by a constant voltage modulating waveform and by general modulating waveforms. Descriptions are given for the circuits used in generation and detection of the IM signal. IM signal parameters are also considered for use with message waveforms in the audio frequency range.

Master of Science in Electrical Engineering
December 1976

Thesis Advisor: G. A. Myers
Electrical Engineering Department

Biofeedback Related to
Enhancement of Preferred Frequencies
in the Electroencephalogram

James Lenus McClane
Lieutenant, United States Navy
B.S., United States Naval Academy, 1970

A physiological basis for the term "preferred frequency" is presented. Computer modeling schemes are shown to be useful in the conceptualization of neural circuits. The Bioengineering Laboratory effort in EEG work at the Naval Postgraduate School is described. A method is developed for the investigation and analysis of "preferred frequency" patterns resulting from a pseudo-random tasked activity. Data are presented supporting the concept of a task related "preferred frequency" pattern for the experimental tasked activity.

Master of Science in
Electrical Engineering
December 1976

Thesis Advisor: G. Marmont
Electrical Engineering
Department

ITU Registrations And Navy UHF SATCOM

Timothy Deming Barron Meno
Lieutenant Commander, United States Navy
B.A. Ed., University of Michigan, 1962

This thesis examines international frequency management as applied to the 225-400 and 500-890 MHz UHF bands. 40,647 registrations from the 1975 International Frequency List are analyzed in terms of four characteristics: frequency, location, power level, and maximum hours of operation. A relationship between registrations and national interest is suggested, and ten countries are identified that account for 84.3 percent of registrations in the 225-400 MHz band. Ten countries are also identified that account for 96.4 percent of registrations in the 500-890 MHz band. Seventy percent of transmitters registered in the 225-400 MHz band have power levels of 100 watts or greater, while in the 500-890 MHz band, only 35 percent operate at this level. Intermittent operation dominates the 225-400 MHz band; registrations indicating 24 hour continuous operation dominate the 500-890 MHz band. These findings have implications in terms of potential interference between terrestrial users and current and future Navy SATCOM operations.

Master of Science in Management
September 1976

Advisor: John E. Ohlson
Electrical Engineering Department

Hydrofoil Performance in a

Sinusoidal Sea

Constantine D. Mitakos
Lieutenant Commander, Hellenic Navy
B.S.E.E., Naval Postgraduate School, 1975

The performance of a Hydrofoil in various sinusoidal seas is studied by simulation on the digital computer system IBM 360/67.

The model used is based on data obtained from the USS HIGH POINT, PC(H)-1.

The computer simulation program is written in Digital Simulation Language (DSL/360).

Master of Science in
Electrical Engineering
September 1976

Advisor: G. J. Thaler
Department of
Electrical Engineering

AUTOMATIC DEPTH AND PITCH CONTROL SYSTEMS FOR SUBMARINES

Volkmar Nitsche
Lieutenant Commander, Federal German Navy

Klaus J.C. Luessow
Lieutenant Commander, Federal German Navy

Steady-state and total decoupling schemes for multivariable systems are used to develop two automatic control systems for the vertical motion of a fictitious submarine. A linearized mathematical model is derived from a non-linear model in six degrees of freedom. Both designs are simulated and evaluated with respect to performance, simplicity of design procedure, and grade of complexity. The controller, designed via the steady-state decoupling method, is implemented in the non-linear model and tested under various operating conditions.

Master of Science in
Applied Science
December 1976

Advisor: G.J. Thaler
Electrical Engineering
Department

Deck Boxes for UHF SATCOM Radio Frequency Interference Study

Gary Brent Parker

Lieutenant, United States Navy
B.S., University of Washington, 1969

This report concerns itself with the design, construction, and utilization of a remotely controlled deck box assembly. This deck box assembly was used in conjunction with other specialized equipments for the study of radio frequency interference. This study, "Shipboard RFI in UHF SATCOM," was sponsored by the Naval Electronics System Command and concerns itself with the electromagnetic spectrum and potential RFI in the 240 to 400 MHz band. These deck boxes incorporate fixed and tunable bandpass filters, tunable notch filters, remotely controlled coaxial switches, an amplifier, attenuator, and noise diode in an RF protected enclosure. Details include design criteria, component selection, circuit construction, physical layout, control circuitry and technical support for the deck box assembly.

Master of Science in
Electrical Engineering
June 1976

Advisor: John E. Ohlson
Electrical
Engineering Dept.

THEORY AND APPLICATIONS OF CTD RECURSIVE COMB FILTERS

Frank Piazza
Lieutenant, United States Navy Reserve
A.A.S., Hudson Valley Community College, 1966
B.S.E.E., Rochester Institute of Technology, 1969

Both integrator and canceller types of sampled analog comb filters implemented by a canonical second order recursive circuit have been studied experimentally and theoretically. Two 96 stage CTD (charge transfer device) delay lines are used in the experimental study. Theoretically, an analysis based on a modification of the digital recursive filter theory was developed and accounted for the major features of the experimental results.

Three comb filter applications have been demonstrated. The first two used the integrator type comb filter for the improvement of the signal-to-noise ratio of a periodic signal contaminated by noise and for the sorting of a periodic signal of selected PRF from other periodic signals. The third application used a canceller type comb filter to eliminate a sinusoidal interference from a desirable signal.

Master of Science in
Electrical Engineering
December 1976

Advisor: T.F. Tao
Electrical Engineering
Department

An Improved Communications System
For Free Swimming Divers

Peter Stewart Pierpont
Lieutenant Commander, United States Navy
B.A., University of Vermont, 1967

In a continuing effort to produce an efficient, reliable communications system for free swimming divers, a second-generation, frequency modulated underwater communications system was designed, analyzed and tested. This system is given the acronym DUCS-II (DIVER UNDERWATER COMMUNICATIONS SYSTEM), and incorporates many features of a prototype (DUCS I) previously designed at the Naval Postgraduate School. Improvements or alternative methods concerning electronic circuitry, underwater enclosures and supporting equipment are accomplished and evaluated. Recommendations for improvements with respect to hardware and test and evaluation procedures are included in anticipation of ultimate use in U. S. Navy SCUBA operations.

Master of Science in
Electrical Engineering
December 1976

Advisor: George Marmont
Department of Electrical
Engineering

A USER'S GUIDE FOR THE DATA GENERAL NOVA^{R} 800 MINICOMPUTER

Grant Douglas Ralph
Major, Canadian Forces
Bachelor of Engineering
Charleton University
Ottawa, Ontario, 1969

This thesis is a comprehensive summary of the Data General NOVA^{R} 800 minicomputer system used in the Electrical Engineering laboratory at the United States Naval Postgraduate School. The system hardware is discussed briefly. The major emphasis is placed on programming concepts which are presented in a modular form to encourage employment as a user's guide and instructional aid. Programming exercises are designed to consolidate the concepts introduced and demonstrate the advancement in sophistication each new technique provides. Minimal discussion of the basic required instructions precedes each exercise to allow early and frequent personal operating experience on the equipment.

Master of Science in
Applied Science
December 1976

Advisor: D.E. Kirk
Electrical Engineering
Department

Conversion of Electromagnetic
to Acoustic Energy

Antonio Manuel Machado Dos Santos Reto
Lieutenant, Portuguese Navy

The conversion of electromagnetic to acoustic energy is a broad and complicated subject. Some topics can be found in the literature but its thorough treatment is rather complex.

Engineering approaches to the problem are however possible through useful simplified models. Simplified treatments of the three major mechanisms leading to the production of mechanical forces on materials supporting an electromagnetic field are to be presented. These mechanisms are referred to as radiation pressure, transient surface heating and stimulated Brillouin scattering.

A discussion of the experimental apparatus and procedures used in an attempt to experimentally verify some of the results given in the theoretical formulation, is also made.

Master of Science in
Electrical Engineering
December 1976

Thesis Advisor: O.M. Baycura
Electrical Engineering
Department

POWER OPTIMIZATION OF THE CAPTURED AIR BUBBLE SURFACE EFFECTS SHIP

Frederick Kenneth Richardson
Lieutenant, United States Navy
B.S., Purdue University, 1968

Through the use of simulation studies of the Surface Effects Ship (SES) XR-3, it is shown that power optimization can be achieved by controlling the air bubble plenum pressure and the pitch angle of the craft. Studies indicate a savings of up to forty percent in total power required for cruising speeds in the range of fifteen to thirty knots.

Master of Science in
Electrical Engineering
December 1976

Advisor: G. J. Thaler
Electrical Eng.
Department

HIGH FREQUENCY IONOSPHERIC PROPAGATION PHENOMENA

Richard Robert Rowe
Lieutenant, United States Navy
B.S. Ed., Eastern Montana College, 1968

PROJECT BRIGHAM was a Department of Defense data collection effort wherein 890 kHz wide samples of the HF spectrum were acquired using a 25 Hz sampling rate with 2.8 kHz resolution for a period of up to 2.4 minutes. The main thrust of this paper has been the visual examination of the data on a graphics display with the idea of identifying drastic and unexpected changes in either individual signals or the entire wavefront; those changes being due, at least in part, to signal transformation resulting from various ionospheric phenomena. In addition, an in-depth statistical study was conducted on several of the specific signals with the hope of aiding in the formulation of an algorithm to efficiently automate the receiving system's sensitivity settings.

Master of Science in
Electrical Engineering
December 1976

Advisor: S. Jauregui, Jr.
Department of
Electrical Engineering

IMPEDANCE MEASUREMENT OF THE CROSSED-MONOPOLE WIRE STRUCTURES

David G. Rundall
Lieutenant, United States Navy
B.S. (E.E.) University of Colorado, 1970

This investigation experimentally determines the input impedance characteristics of various cylindrical crossed-monopole antennas at 2-12 GHz frequencies and compares the results to the well known characteristics of the cylindrical monopole antenna. The analysis includes a physical reasoning for the loading effect of the arms on the cross-monopole antenna and resonance effects contributed by various members. The experimental results are also compared to the results obtained using numerical analysis.

Master of Science in
Electrical Engineering
December 1976

Advisor: Robert W. Burton
Department of
Electrical Engineering

PREDICTION OF THE FAR-FIELD BEAM PATTERN OF A RANDOM NOISE SOURCE FROM MEASUREMENTS MADE IN THE NEAR-FIELD

Jorge Trelles Sanchez
Lieutenant, Peruvian Navy

A theory is presented for computing far field beam patterns from distributed random noise sources. The theoretical model utilizes the Green's Function for the wave equation and the space-time autocorrelation function for determining the radiation from a randomly vibrating area. The actual far field beam pattern of a horn speaker in an anechoic chamber was obtained, and also near field measurements were taken to obtain the correlation distance and the mean square of the particle velocity using the autocorrelation function. Finally a computer program was written to evaluate the integral wave equation by numerical methods. It was found that the critical parameters in the mathematical model were the correlation distance and the frequency limits of integration. Small variations in the correlation distance modified greatly the width of the predicted beam pattern, while changes in the limits of integration had a moderate effect. The Frequency Spectrum was obtained in the anechoic chamber and it was used to determine the limits of integration of the integral solution for the intensity field.

The predicted beam patterns were in satisfactory agreement with the measured far field beam patterns. The differences between them are probably due to inaccuracies in determining the limits of integration and the correlation distance.

Master of Science in
Engineering Acoustics
December 1976

Advisor: G.L. Sackman
Electrical Engineering
Department

Sensitivity Study of Sampled Analog
Tapped Delay Line Transversal Filters

George Sarantis Sklivanos
Lieutenant, Hellenic Navy
B.S., Naval Postgraduate School, 1975

This thesis consists of two parts, one theoretical and one experimental. Theoretically, sensitivity of the transversal filter using a sampled analog tapped delay line is studied. Low pass filters of different delay stages, cut off frequencies and transition bands are designed by the Parks-McClellan procedure (which minimizes the maximum error). Tapping errors are involved by uniformly distributed random variables. The effects of these errors on the filter's performance are analyzed by a computer simulation program. It was found that although longer TDL filters yield better performance, under certain conditions they have poorer sensitivity. In the second part a new 32 TADs sampled analog Bucket Brigade Device (BBD) tapped delay line is experimentally evaluated to characterize its errors.

Master of Science in
Electrical Engineering
September 1976

Thesis Advisor: T.F. Tao
Electrical Engineering
Department

SOURCES AND BIOLOGICAL EFFECTS OF
NONIONIZING ELECTROMAGNETIC RADIATION

Andrew Peter Sosnicky
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1966

This thesis is designed to provide an insight into the potential biological effects on humans resulting from exposure to nonionizing electromagnetic radiation emitted by communications and radar equipment. The spectrum considered extends from the extremely low frequency band, which may be employed for communicating with submerged submarines, through the microwave band, which is utilized for satellite communications and radars. The different views of the Soviet bloc and the Western nations are presented. A near term safety measure, the use of protective garments, is recommended while debate continues. The underlying intent of this thesis is to provide a compact document which can be used to introduce telecommunications managers and other interested personnel to the uses, characterisitics, and possible hazards of this valuable portion of the electromagnetic spectrum.

Master of Science in Management
September 1976

Advisor: O.M. Baycura
Electrical Engineering Department

AM Modulation of a
Carbon-Dioxide Laser Beam
Using Acousto-Optical Interaction

Ismet Tanes
Lieutenant, Turkish Navy
B.S.E.E., Naval Postgraduate School, 1975

Amplitude and frequency modulation techniques of a CW CO_2 laser beam by acousto-optical interaction are discussed. The theory of a photovoltaic detector and its experimental evaluation is presented. The communication possibilities of the amplitude modulated system is verified. Operation of this system is discussed. Range capabilities of the system is demonstrated.

Master of Science in
Electrical Engineering
December 1976

Thesis Advisor: J. P. Powers
Electrical Engineering
Department

The Role of Commercial Communications

in National Emergency Preparedness

Thomas Lee Taylor
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1963

This thesis is a descriptive analysis of the current role played by commercial communications in the Federal Government's emergency preparedness effort. This role is defined by an examination of three principal facets of the government/communications industry interface: Specifically, the evolution of legislative authority by which the government exercises regulatory authority over communications assets, the emergency preparedness planning machinery of government, and the current governmental reliance on these assets to effect routine as well as emergency communications. The basic conclusion is that regulatory legislation and emergency preparedness planning organization has not kept pace with the rapid growth of the commercial communications industry and the increasing governmental dependency on the services and equipment provided by this industry. Recommendations for improvements are offered.

Master of Science in Management
September 1976

Advisor: O. M. Baycura
Department of Electrical Engineering

DETECTION OF A LOW LEVEL SIGNAL IN NOISE BY TEGULOMETRIC METHODS

Kiefer Ault Tobin
Lieutenant Commander
B.S., Oregon State University, 1960

A novel and sensitive method is described for the analysis and detection of weak signals generated by many sources and highly contaminated by noise. This process yields a spectral display whose elements are related to the probability of occurrence of a frequency rather than to the power spectral density of conventional schemes. Thus, a weak signal and stronger signals may show equally if they appear over the same percentage of the analysis period.

This process, called tegulometric analysis, is tested and improved in sensitivity for detection of very weak signals hidden in gaussian noise. The investigation shows that this method can be optimized to produce low level signal detections based upon short observational periods. The frequency resolution capability of the method is shown to be marked.

Master of Science in Engineering Acoustics
December 1976

Advisor: Prof. George Marmont
Elect. Eng.

Depth and Pitch Control System for a Near Surface Submarine

Panos E. Vassiliadis
Lieutenant Commander, Hellenic Navy
B.S., Naval Postgraduate School, 1975

The problem of the near surface submarine depth and pitch controller is studied. Optimal unbounded automatic depth and pitch controllers are designed (a) for a submarine with stern plane only control and (b) for a submarine with stern and fair-water plane control. The two controllers are combined by a variable parameter function for use under a seaway. Submarine motion is simulated using an existing program, modified for the special cases. Step and pulse forces are applied to the submarine and operation of the combined controller is tested for various values of the parameter. Further analysis and evaluation of the controller is also included.

Master of Science in
Electrical Engineering
September 1976

Advisor: G. J. Thaler
Electrical Engineering
Department

On the Setting-up of an Underwater Acoustic Calibration Facility

Carlos A. Wilkens A.
Lieutenant Junior Grade
Chilean Navy

Concepts of the principle of the acoustic reciprocity theorem are introduced and applied in the derivation of the analog electrical network of transducers.

The selection of possible test sites and desirable environmental characteristics are discussed.

Some of the most common calibration methods are explained in conjunction with the minimum test instruments required to carry out the measurements.

Master of Science in Engineering Acoustics
December 1976

Advisor: D. A. Stentz
Electrical Engineering Department

A MODERNIZATION PLAN FOR THE TECHNICAL DATA DEPARTMENT OF THE NAVAL SHIPS WEAPON SYSTEMS ENGINEERING STATION

Billie Wayne Wieland
Lieutenant-Commander, United States Navy
B.S., United States Naval Academy, 1965

John William Pounds Jr.
Lieutenant, United States Navy
E.S.E.E., University of New Mexico, 1970
M.S.E.E., Naval Postgraduate School, 1975

A methodology is presented which utilizes an intraorganizational structure to coordinate a modernization that requires the acquisition of facilities involving high technology. This methodology is then applied to a proposed modernization of the Technical Data Department of the Naval Ships Weapon Systems Engineering Station, Port Hueneme, California. The results of this application are initial recommendations for an acquisition coordinating structure to reduce technical and organizational risks.

Master of Science in Management
September 1976

Advisor: Peter C. C. Wang
Mathematics Department

A Test Facility to Measure Heat Transfer Performance of Advanced Condenser Tubes

Andrew Conrad Beck II
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1966

An experimental test facility capable of investigating plain and enhanced condenser tube heat transfer characteristics was designed and built. The completed facility, including a stainless steel test condenser, has the capability of testing tubes under simulated marine conditions utilizing variable steam flowrate and orientation, cooling water flowrate and temperature, vacuum pressure, non-condensable gas concentration, and condensate inundation effects.

The test condenser has the capability of being tested with a wide variety of tubing configurations and has glass windows on both sides to view the condensation process over nearly its entire length. Initial tests will be performed using 5/8 inch tubes.

Data will be automatically gathered and processed to yield the overall, internal and external heat transfer coefficients of corrugated or internally finned tubes operating with filmwise or dropwise condensation.

Master of Science in Mechanical Engineering
December 1976

Thesis Advisor: P. J. Marto
Mechanical Engineering Department

AN INVESTIGATION OF THE MECHANICAL PROPERTIES OF WARM ROLLED ALUMINUM-17.5 WEIGHT PERCENT COPPER ALLOY

Alfred Louis Cipriani
Lieutenant, United States Navy
B. S., United States Naval Academy, 1969

An aluminum-17.5 weight percent copper alloy was warm rolled to achieve refinement of the microstructure. This refined microstructure consisted of finely dispersed intermetallic Al_2Cu particles with an average size of 1.2 microns in an aluminum matrix. This led to improved room temperature properties as well as the onset of superplasticity at elevated temperatures. Ductility and toughness were increased almost six-fold, despite slightly decreased yield strength and maximum compressive strength. It would appear that warm working can be used to enhance both room temperature properties and superplasticity, and that further research could maximize this improvement.

Master of Science in Mechanical Engineering
December, 1976

Advisor: Terry R. McNelley
Mechanical Engineering Department

Microstructural Comparison of Positive Float and Trickle Discharge Operations on the Positive Electrodes of Submarine Storage Batteries with Lead-Calcium Alloy Grids

Michael Thomas Coyle
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1965

Lead-calcium alloy grid batteries are utilized as the backup emergency power supply on non-diesel-electric submarines. Sudden and premature capacity losses have been experienced when these batteries are operated in a float mode while in standby conditions, hence a continuous drain, or trickle discharge, is maintained in lieu of float. This requires periodic battery charges to restore full capacity. The microstructural effects of float and trickle discharge operation on positive plates from small cells, manufactured from full size submarine battery plates, are studied using a scanning electron microscope. This is complemented with light microscopy observations and x-ray diffraction analysis. A patterned dendritic network of spiny crystals was discovered to be prevalent in the trickle-discharged plates. This network was seen on the grid surface corrosion layer and on a dense layer found in the internal active material. It is postulated that this network may be related to lead-sulfate dissolution upon recharge.

Master of Science in Mechanical Engineering
September 1976

Thesis Advisor: J. Perkins
Mechanical Engineering Department

TRANSMISSION ELECTRON MICROSCOPY STUDY OF SUBGRAIN STRENGTHENING OF CARTRIDGE BRASS

Thomas Benton Fulton
Lieutenant, United States Navy
B. S. United States Naval Academy, 1976

The development of substructure in cartridge brass, subjected tc cold rolling followed by warm annealing, is characterized as a function of annealing temperature and true strain. Substructure develops and becomes refined as annealing temperature is increased to the point of recrystallization. Dislocation cell structure is also refined as true strain is increased. The variation of hardness with annealing temperature correlates well with substructure development and refinement.

Master of Science in Mechanical Engineering
December, 1976

Advisor: Jeff Perkins
Mechanical Engineering Department

Microscopic Investigation of Interface Corrosion of Steel-Aluminum Explosively Bonded Material Exposed to Periodic Sea Water Spray

Michael Richard Keelean
Lieutenant, United States Navy
B.S., Central Michigan University, 1968

An explosively bonded triclad consisting of 5456 aluminum, 1100 aluminum, and ASTM A516, Grade 55 steel is currently in use as a transition joint between steel hulls and aluminum superstructures on several military marine vehicles. This study examines some of the corrosion processes and product formations that take place when this joint is exposed to the marine atmosphere. Accelerated sea spray testing was performed in the laboratory to simulate in-service conditions with joint specimens receiving exposures of varying durations. A corrosion model is hypothesized and photomicrographs of the various exposed specimens are presented and discussed.

Master of Science in
Mechanical Engineering
September 1976

Advisor: A. J. Perkins
Department of
Mechanical Engineering

Design Improvements on a Rotating Heat Pipe Apparatus

James Lewis Loynes
Lieutenant, United States Navy
B.M.E., University of Louisville, 1970

Design improvements were made to a rotating heat pipe apparatus to eliminate problems of maintaining a vacuum, heater coil failure due to overheating, and uneven temperature profile along the condenser wall. The apparatus was manufactured, installed and tested with a working fluid of water at 700, 1400, and 2800 RPM. The rotating heat pipe operated efficiently through all phases of testing. The condenser temperature profile was compared to Tucker's [1] profile, and it was found that the improved cooling system did flatten the temperature profile over a 4-inch region of the condenser wall.

The heat transfer rates were compared to Tucker's [1] heat transfer rates and found to be somewhat less but in general were very close to those obtained by Tucker [1]. Recommendations for future improvements are contained herein.

Master of Science in Mechanical Engineering
September 1976

Advisor: P. J. Marto
Department of Mechanical Engineering

Oscillatory Flow Past a Circular Cylinder

Michael Dale May
Lieutenant, United States Navy
B.S., United States Naval Academy, 1970

A circular cylinder, immersed in fluid and oscillated perpendicular to its axis, is acted upon by a fluid dynamic force. This force is generally considered to be composed of two components, a drag and inertial. The magnitudes of these two components vary with the frequency and amplitude of oscillation of the cylinder.

It was the purpose of this study to experimentally determine these two components of the force as a function of displacement amplitude to cylinder diameter and as a function of Reynolds number based on maximum velocity during oscillation for the case of both a rough and smooth cylinder.

Master of Science in
Mechanical Engineering
September, 1976

Advisor: Clarence J. Garrison
Mechanical Engineering
Department

HIGH STRENGTH TO WEIGHT ALUMINUM-18 WEIGHT PERCENT MAGNESIUM ALLOY THROUGH THERMAL MECHANICAL PROCESSING

Frank G. Ness Jr.
Lieutenant, United States Navy
Bachelor of Science University of Utah, 1968

An Aluminum-18 weight percent Magnesium alloy was prepared by casting and then warm rolling at 425 C to 94% true strain. This alloy was compression tested at six strain rates from 0.00664 per minute to 0.332 per minute and at eight temperatures ranging from 25 C to 425 C. The most significant result is that a warm rolled Aluminum-18 weight percent Magnesium alloy can exhibit compressive strengths in excess of 95 ksi, in a material of 10% lower density than commercial high strength Aluminum alloys. Furthermore, one can envision a thermal mechanical process involving warm working followed by cold working at room temperature whereby one can attain an ultimate tensile strength greater than 90 ksi. Additionally, superplastic behavior at elevated temperatures was manifest in the relatively high value of strain rate sensitivity and by the value of the activation energy for deformation.

Master of Science in Applied Science
December, 1976

Advisor: Terry R. McNelley
Mechanical Engineering Department

Study of the Cyclic Performance of Submarine Type Lead-Acid Storage Batteries by Examination of the Positive Plate Structures

John Louis Pokorny Jr.
Lieutenant, United States Navy
B.S.E.E., Marquette University, 1969

The microstructures of the active material of the positive plate of submarine type storage batteries were studied, using scanning electron microscopy, as the batteries were cycled on a deep cycle routine. It is seen that capacity loss of these batteries can be directly related to the formation of a coralloid structure within the active material of the positive plate in both lead-antimony and lead-calcium grid batteries. It is proposed that this coralloid structure also leads to active material shedding which is observed at the end of the battery life. The ability of thick plate lead-calcium grid batteries to be successfully operated on a deep cycle routine is related to a reserve of active material retained within the positive plate as lead-sulfate, which is eventually transformed into PbO_2 to maintain the capacity of the battery.

Master of Science in Mechanical Engineering and Mechanical Engineer
September 1976

Advisor: A. J. Perkins
Department of Mechanical Engineering

A Comparison of Integration Methods for the Solution of Nonlinear Reactor Dynamics Problems Through the Use of Finite Elements

Ralph Carroll Sheldrick
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1967

A comparison of numerical methods utilized by the finite element technique for solving a nonlinear nuclear reactor dynamics problem was conducted. Using the Crank-Nicolson, DVOGER (Gear) and Implicit Gear methods, the results showed the Implicit to be the superior method investigated. This is based on the fact that all three methods yielded the same steady state solutions; but, the Implicit Gear method used significantly less CPU time and comparable storage to Crank-Nicolson. This was particularly apparent as the degrees of freedom were increased. In addition, the transient solution in all cases was better than that obtained in Crank-Nicolson and compared favorably to that of Gear's method.

The other noteworthy result was in the effect of the error criterion on solution. It was shown that for a range of error from 10^{-4} to 1.0, the steady state solution value remained the same. This results in a significant reduction in computer processing time since the time required decreases substantially as the error conditions imposed are relaxed.

Master of Science in
Mechanical Engineering
December 1976

Advisor: David Salinas
Mechanical Engineering
Department

Nucleate Boiling of Freon 113 in Thin Liquid Films

Soehana
Lieutenant Commander, Indonesian Navy
B.S., Naval Postgraduate School, 1976

Experimental results are presented for distilled Freon 113 at atmospheric pressure with liquid levels ranging from pool depths near 10mm down to thin films near 0.2mm.

Temperature measurements with thermocouples and liquid crystals show that liquid level has little effect on heat transfer coefficient above a level of 5mm, and a slight decrease occurs as the liquid level is reduced to 2mm. Below 2mm, the heat transfer coefficient increases sharply as the level is further reduced.

In addition, the heat transfer coefficient increases with increased surface roughness.

In thin films, the incipient boiling point occurs at a lower heat flux and a lower superheat than in pool boiling.

Master of Science in Mechanical Engineering
December 1976

Thesis Advisor: P. J. Marto
Mechanical Engineering Department

Heat Transfer Performance of Various Rotating Heat Pipes

Lawrence Lee Wagenseil
Lieutenant Commander, United States Navy
A.B., University of North Carolina, 1966

A rotating heat pipe was tested using various copper condenser configurations including two smooth-wall cylinders, an internally finned cylinder and a truncated cone. All condensers were tested with film condensation, and the truncated cone was also tested for dropwise condensation. Each condenser was tested at rotational speeds of 700, 1400 and 2800 RPM with distilled water as the working fluid.

The heat transfer rate of each condenser was plotted against the saturation temperature of the vapor. The main objective was to compare the heat transfer rates obtained with the various condensers in order to identify an optimum configuration for future testing.

In all cases, performance improved with increasing RPM. Dropwise condensation showed substantial improvement in performance relative to film condensation in the same condenser. Similarly, the performance of the internally finned cylindrical condenser was remarkably superior to that of the smooth-wall cylindrical condenser.

Master of Science in
Mechanical Engineering
December 1976

Advisor: P. J. Marto
Department of
Mechanical Engineering

A Scanning Electron Microscope Study
of the Corrosion of Sacrificial Hull
Anodes under Simulated Ship Service Conditions

Peter Warren Wright
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1966

The behavior of ship hull sacrificial anode zinc was studied under simulated shipboard exposure conditions. The adherence and passivating tendencies of anodic corrosion products are discussed in relation to time and corrosion product layer thickness. The effects of velocity and time of dynamic exposure on zinc anode specimens pre-exposed statically are presented. The behavior of zinc corrosion products is related to laminar and turbulent regimes of electrolyte flow as well as ionic diffusion. The depassivating tendencies of zinc anode corrosion products are presented. The corrosion of an aluminum sacrificial anode is characterized, and the observed widespread pitting corrosion is hypothesized to be anti-intergranular in nature.

Master of Science in
Mechanical Engineering
December 1976

Advisor: A. J. Perkins
Mechanical Engineering
Department

THE INFLUENCE OF DRILLED CAVITIES ON NATURAL CONVECTION AND SATURATED POOL BOILING HEAT TRANSFER FROM A HORIZONTAL SURFACE

George Richard Yount
Lieutenant, United States Navy
B.S., Industrial Education, 1968

The objective of this research project was to study the effect of small artificial cavities on both natural convection and the incipience of saturated pool boiling from a horizontal test surface. All tests were run with distilled Freon 113. Data for the heat flux as a function of the superheat and the convection heat transfer coefficient as a function of the heat flux were carefully obtained and plotted. Experimental results are presented for the heat transfer from horizontal circular disks, with and without artificial cavities.

Increases in both natural convection and boiling heat transfer were observed with the addition of artificial cavities. The magnitude of heat transfer augmentation was found to be strongly dependent upon the artificial cavity density.

Master of Science in
Mechanical Engineering
December 1976

Advisor: Matthew Kelleher
Department of
Mechanical Engineering

An Examination of Turbulent Dissipation

in the Marine Boundary Layer

George William Karch
Lieutenant, United States Navy
B.S., United States Naval Academy, 1970

Shipboard measurements of temperature and velocity fluctuations were performed to determine optical propagation properties of the marine boundary layer. Empirical expressions describing the temperature structure parameter, C_T^2, in terms of the Richardson number, Ri, overland were used to evaluate data obtained for open ocean conditions. Profiles of the dissipation of turbulent kinetic energy, ε, with respect to height, Z, and with respect to a stability parameter, Z/L, were examined for open ocean conditions.

In general, there was little correlation between the measured C_T^2 and the stability parameter. However, the distribution of ε with height for both the stable and unstable cases showed little deviation from that expected for near neutral conditions.

Master of Science in
Meteorology and Oceanography
December 1976

Advisor: Kenneth L. Davidson
Department of
Meteorology

A Finite Element Prediction Model

with Variable Element Sizes

Richard Gordon Kelley, Jr.
Lieutenant, United States Navy
B.S., Pennsylvania State University, 1970

There are a variety of meteorological forecast problems which require high spatial resolution in only a limited area. An important example of this type of problem is the prediction of tropical cyclones. This study tests a simple finite element prediction model with a variable element size. The shallow water equations are used and the motion is confined in a periodic channel on a f-plane. The Galerkin technique is applied to linear basis functions on triangular elements. The model uses leapfrog time differencing and periodic restarts. The model is tested with a wave imbedded in a mean flow and also with an isolated vortex. The experiments with a uniform element size show excellent phase propagation, but some small scale noise is generated. The introduction of momentum diffusion terms helps to control the noise. The model is also tested with elements which decrease abruptly in scale along a line and with elements which decrease smoothly. Both of these cases generate more noise than with uniform elements.

Master of Science in *Meteorology*
September 1976

Advisor: Roger T. Williams
Department of Meteorology

Some Observations of Ocean Thermal

Response to Typhoon Passage

Benjamin Lewis Holt, Jr.
Lieutenant, United States Navy
B.S., United States Naval Academy, 1970

The fact that typhoons cause a cooling of the upper oceanic layers during their passage is well documented. This case study establishes the magnitude of this cooling for 17 western Pacific super-typhoons during the period 1968 to 1972. Digitized bathythermograph (BT) records for the typhoons were screened to acquire points before and after typhoon passage that met selection criteria. The selected BT records were then assigned a weight that reflected the number of hours before or after the typhoon passed its closest point of approach (CPA). The resulting data file for the 17 typhoons was analyzed using several techniques. It was found that there is a positive correlation between the magnitude of mixed-layer cooling and the distance from the typhoon path, as well as with wind velocity at the BT site. Mean mixed-layer cooling near the storm path ranged from .70° to 2.0°C with a maximum cooling of 4.8°C. At the outer reaches of the storm's influence (300 nmi) the mean mixed-layer cooling range was -.09°C to .36°C. The results of the analysis compare favorably with single storm analyses in the Atlantic and a 14 storm analysis in the Pacific. Mixed-layer depth information was subjected to the same analysis as the mixed-layer cooling but the results were inconclusive.

Master of Science in
Meteorology and Oceanography
December 1976

Advisor: Russell L. Elsberry
Department of Meteorology

Study of Monsoon Circulation
with
Steady and Fluctuating Heating

Richard Joseph Pentimonti
Lieutenant, United States Navy
B.S., Gonzaga University, 1967

In a study of the planetary-scale vorticity budget of the northern summer monsoon, Holton and Colton (1972) found that a strong vorticity sink is needed to balance the generation by horizontal divergence at 200 mb. In this work we use numerical experiments to examine the hypothesis that the fluctuation of the divergence forcing as observed by several studies serves as this sink. A 3-level numerical model is used with the thermal forcing specified by the horizontal divergence distribution observed by Krishnamurti (1971). Two experiments are carried out, one with heating steady in time and the other fluctuating in time with a period of 10 days. The time-mean fields of the quasi-steady state solution in both experiments show a significant westward phase shift of the Tibetan high, thus the fluctuation of heating cannot be a sufficient sink. On the other hand, the positions of the simulated tropical upper tropospheric troughs agree quite well with those observed. This suggests that damping due to cumulus transport is more likely to account for the vorticity sink. Transient wave activities are also found at the upper level in both experiments. They appear to be drawing energy from the planetary-scale flow and could serve as a vorticity sink. These waves are most active in the fluctuating heating case, suggesting that local barotropic instability at upper levels may be more important than that implied by the time-mean wind.

Master of Science in
Meteorology and Oceanography
December 1976

Advisor: Chih-Pei Chang
Department of Meteorology

An Investigation of Small Scale Humidity Fluctuations in the Marine Boundary Layer

William Leroy Shutt
Lieutenant, United States Navy
B.S., United States Naval Academy, 1971

Humidity spectra have been measured with the Lyman-alpha humidiometer, together with mean profiles of virtual potential temperature, wind, and humidity in the open ocean environment. Empirically derived expressions describing the temperature structure parameter, C_T^2, were extended by similarity arguments to the humidity-structure parameter, C_q^2, and C_q^2 was related to the stability parameter Ri. Using the above measured parameters, vertical humidity flux was computed in two different manners, and a comparison was made. In general, there was little correlation between the spectrally analyzed C_q^2 values and Ri. Results for C_q^2 can essentially be regarded as a function of z and humidity gradient. Non-dimensional C_q^2 results were generally an order of magnitude smaller than expected. No correlation between the two methods of calculation of humidity flux was found.

Master of Science in Meteorology and Oceanography
December 1976

Advisor: K. L. Davidson
Meteorology Department

Marine Fog Development Along the West Coast During 1973 Using Transient Ship and Coastal Station Observations

George Stephen Evermann
Lieutenant, United States Navy
B.S., University of Nevada, 1969

Using transient ship observations, a hypothetical five phase Marine Fog Development (MFD) Model was applied to four actual cases of summer marine fog during 1973 along the central California coast. The MFD Model incorporates a phase zero or synoptic phase and a proposed Coastal Conference Zone (CCZ) concept into previous West Coast fog models. Phase zero describes the synoptic conditions that establish the marine layer over the coastal regions and explains the presence of low stratus overcast which normally exists prior to fog development cases. The CCZ concept defines a transition zone in which warm dry continental air converges with cool moist marine air and denotes the seaward extent of coastal influence. The location of the transitory CCZ is dependent upon the strength of offshore flow of continental air from the coastal region. The location where this flow meets the prevailing northwesterlies becomes the most likely site of marine fog formation.

Selected synoptic scale meteorological parameters were examined and incorporated with transient ship and coastal station observations. This appeared to be an effective technique for tracking the CCZ and identifying fog phase development.

Master of Science in Oceanography
September 1976

Advisor: Dale F. Leipper
Department of Oceanography

An Evaluation of a Computer Simulation Model of Plankton Dynamics in Monterey Bay

David Edward Henrickson
Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1971

A computer simulation model of the phosphate, phytoplankton and zooplankton dynamics in Monterey Bay was examined and modified. The model is driven by four forcing functions expressed as annual cycles of upwelling velocity, incident solar radiation, mixed layer depth, and mixed layer temperature. An alternate upwelling index was developed based on the local wind field. A revised radiation index is employed based on the generation of both advective fog and low stratus cloud cover common during upwelling on the California coast. Analysis of the model's response to sinking and advection of phytoplankton was examined. The importance of seasonal increases in predators was introduced as a controlling factor in the seasonal growth of zooplankton. The model is able to predict the seasonal trends of phosphate, phytoplankton, and zooplankton throughout the year.

Master of Science in Oceanography
September 1976

Advisor: E. D. Traganza
Department of Oceanography

A Photographic Reconnaissance of the Microrelief in the Monterey and Carmel Submarine Canyons, California

John Alexander Jensen
Lieutenant, United States Navy
B.S., United States Naval Academy, 1971

Over 500 underwater photographs were taken in the Monterey and Carmel submarine canyons for the purpose of studying their microrelief. The pictures indicated that a variety of biological and physical differences exist not only within each canyon but also between the two nearby canyons.

In Monterey Canyon are to be found fine grain sediments which have been very actively churned by benthic organisms. Few rock outcrops were noted, and definitive evidence of current activity in the form of ripple marks was observed in only one region. Carmel Canyon included generally coarser grain material than Monterey Canyon and showed a marked absence of active burrowing. A large number of rock outcrops was observed and there appeared to be extensive current activity throughout most of the canyon.

Master of Science in Oceanography
December 1976

Advisor: R. S. Andrews

Design and Wind Tunnel Testing of

a Size Sampling in-situ Net System
(SSISNET)

Robert Paul Mitchke
Lieutenant, United States Navy
B.S., University of Houston, 1967

A number of plankton sampling devices have been designed and tested and their physical properties (filtration, efficiency, filtration pressure drop, net filtration ratio and mesh approach speed) have been calculated and compared. The data necessary to make these calculations were collected by mounting 1/4 scale sampler models in a wind tunnel, the wind speed having been adjusted to that corresponding to a water speed of 40 m/min; wind speeds were measured at the samplers' mouths by a remote controlled hot-wire anemometer. Photographs were taken of the flow patterns through the use of a flow visualization system comprised of a liquid aerosol generator and tunnel injection system. A study of the photographs and the reduced data resulted in the discovery of an optimum design for a plankton collection system that is composed of a mouth reduction nose cone and two nets in series housed in a cylindrical casing.

Master of Science in Oceanography
September 1976

Advisor: Eugene D. Traganza
Department of
Oceanography

Optical
Transmissometer-Nephelometer
for Deep Ocean Use

David Michael Mosey
Lieutenant, United States Navy
B.S.E.E., Purdue University, 1971

A submersible light transmissometer-nephelometer was designed and constructed for the purpose of measuring the beam attenuation and relative volume scattering coefficients at two fixed angles and at depths to 1000 meters.

Flexibility, a major design criterion, makes it possible for the unit to be operated in a number of configurations. Addition of an internal battery supply, a filter wheel, light stops, a photomultiplier tube and amplifiers is possible. The NPS light transmissometer-nephelometer is not a single purpose instrument but has the capability to be utilized as a submersible optical bench, useful in the development of underwater optical instrumentation.

Master of Science in
Oceanography
September 1976

Advisor: Stevens P. Tucker
Department of
Oceanography

Evidence of Subarctic Water Mass Intrusions
at Ocean Weather Station NOVEMBER

John Francis Pfeiffer
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1967

A divergent heat budget equation which included the effects of surface heat flux, horizontal and vertical advection, and horizontal divergence on the near-surface heat content was used to examine the role of thermal advection in the upper 250m of the water column at Ocean Weather Station NOVEMBER. This station is located on the southern boundary of the transition zone separating the Subarctic water mass from the Subtropic water mass. Values for horizontal thermal advection changes were computed over the period 1968-1970. Pulse-like periods of cool advection were associated with periods of reduced salinities suggesting these were intrusions of Subarctic water. Over the nine-year period of analysis, these intrusions had a periodicity of 7 to 8 months with a duration of 3 to 4.5 months. It is suggested these wave-like intrusions along the Subtropic front are the result of the passage of non-dispersive baroclinic Rossby waves.

Master of Science in
Oceanography
September 1976

Advisor: R. H. Bourke
Oceanography
Department

Breaking Wave Criterion on a Sloping Beach

Richard Markley Smith
Lieutenant, United States Navy
B.S., United States Naval Academy, 1971

The various wave theories, theoretical breaking criteria and derived breaking criteria are reviewed for shallow water waves. To account for the non-linear hydrodynamics present in a shallow water wave breaking on a beach with a sloping bottom, the perturbation technique of Iwagaki and Sakai is used to derive a second order expression for the horizontal water particle velocity for long waves. The kinematic breaking criterion is applied to the derived $c^{(2)}$ and $u^{(2)}$ values to establish breaking. The results indicate that the ratios of η_b/L_o and h_b/H_o provide reliable breaking criteria. Each of the parameters is dependent only upon beach slope and H_o/L_o. Theoretically derived values for h_b/H_o compare favorably with field measurements and offer significant improvement over previous theory. Predicted breaking depths are less than those present in experimental data, suggesting extension to higher orders may be warranted.

Master of Science in Oceanography
September 1976

Advisor: Edward B. Thornton
Department of Oceanography

Numerical Investigation of
the
Dynamics of Sea of Marmara

Huseyin Yuce
Lieutenant, Turkish Navy
Turkish Navy Academy, 1970

Dynamics of the circulation in the Sea of Marmara are investigated with a time dependent, three dimensional numerical model. The empirically inferred hydrologic regimes of the sea and connective straits are discussed.

A baroclinic model based on the primitive equations is solved by direct integration of an initial value problem. The circulation in the sea is driven by surface forces that simulate wind stress and horizontal pressure gradient forces related to internal stratification.

The predicted density field, in sigma-t units, is compared with data. Detailed three dimensional horizontal velocity patterns and vertical velocity patterns in horizontal planes are given.

Bottom friction, irregular bottom topography, non-linear terms in the momentum equation and vertical mean part of the horizontal velocity have been omitted. For simplicity density is predicted in place of temperature and salinity.

Master of Science in
Oceanography
September 1976

Advisor: J. B. Wickham
Department of
Oceanography

Analysis of a Long-Range
Environmental Forecasting Model

Everett Alvarez, Jr.
Commander, United States Navy
B.S., University of Santa Clara, 1960

This thesis describes long-range forecasting models that were developed for the Middle East, Latin America, and Africa to cope with the problem of projecting important economic, political, military, and social variables over a five to twenty year range.

On the basis of imperfect data that is available for these regions, this study examines the innovations introduced to handle the unstable situations found in developing areas of the world. Limited to the Middle East region, this effort undertakes a restructuring of the data base, introduces new scaling techniques for social and political concepts, and imposes a rigorous statistical analysis through different econometric techniques.

Utilizing new estimated regression coefficients, a forecast simulation for several Middle East countries follows along with concluding analyses and a discussion of inherent problems present in the model.

Master of Science in
Operations Research
December 1976

Thesis Advisor: M.G. Sovereign
Operations Research
Department

CONGESTION PROBLEMS IN FIELD ARTILLERY OPERATIONS

Paul James Bross
Captain, United States Army
B.S., Virginia Military Institute, 1969

As a result of the 1973 Mideast war, the current emphasis on properly portraying combat interactions and analyzing the appropriate Measures of Effectiveness has become increasingly important, especially in regard to fire support operations. This thesis will examine some of the reasons for the increased emphasis on fire support problems and how this particular battlefield activity is currently modeled by the military analysis community. Following this, a simplified analytical procedure (taken from general queueing theory) for measuring the amount of randomness actually played by stochastic models, such as DYNTACS and others, will be presented, along with the implications this poses for current military planners and decision makers. In addition to these basic conclusions, a validation procedure for selected distributions of particular interest to fire support modelers is presented, that can be implemented under current operational procedures at no additional cost to the United States government.

Master of Science in
Operations Research
September 1976

Advisor: J. G. Taylor
Operations Research
Department

Analysis of U.S. Navy Aircraft Accident Rates in Major Aviation Commands

Lawrence Charles Bucher
Lieutenant Commander, United States Navy
B.S.E.E., Purdue University, 1966

Time dependent variable measures were obtained for all major aircraft accidents between July 1971 and July 1974. Using these time dependent variables and functional forms of these variables, a regression analysis was performed for each of eight major aviation commands. By using these functional forms of the variables, a relatively high amount of variance in aircraft accident rate was accounted for at a high confidence level in some commands. When reviewing the results of the eight major commands considered, it was particularly noted that the variables most instrumental in explaining the variance in aircraft accident rate were not all pilot oriented but were variables interpreted as being related either to pilot experience level, pilot proficiency or aircraft condition.

Master of Science in Operations Research
September 1976

Advisor: G. K. Poock
Department of Operations Research

A DYNAMIC MODEL FOR NAVY PETTY OFFICER PROMOTION

George Robert Cathcart
Lieutenant, United States Navy
B.S., Miami University, 1970

This thesis develops a linear model which provides a strategy of promotion for the Navy's Enlisted Personnel system to reduce the deviation from authorized strength over a five year period.

The enlisted structure is discussed along with the importance of vacancies with respect to promotions. Then the current state of the art is reviewed for ideas and assistance in developing the new model. The promotion equations which use future information to minimize the amount of deviation from authorized strength are then derived for a typical rating.

The feasibility of the model has been demonstrated by writing a FORTRAN computer program to solve the promotion equations. Two ratings, one over authorization and one under authorization, were selected as examples. The input data and the resulting strategy of promotion was used to validate the model.

Master of Science in
Operations Research
September 1976

Advisor: R.W. Butterworth
Operations Research
Department

A Practical Computation Method for Steady State Solution of $M/E_k/c$ Queue

Mehmet Celayir
Lieutenant, Turkish Navy
Turkish Naval Academy, 1970

Numerical tables available for $M/E_k/c$ queueing systems are discussed. A new approximation method for steady-state information and waiting time distribution of this queueing system was developed. Validity of approximation was established directly for the large waiting times and by simulation for the smaller values. The developed method enables one to find delay probability, expected number in the queue and in the system, expected time to be spent in the queue and in the system, and probability of waiting for more than a specified time t.

Master of Science in
Operations Research
September 1976

Advisor: R. R. Read
Department of
Operations Research

Measuring The Effectiveness Of Scatterable Mines In The Armor Combat Environment

Terry Winslow Curl
Captain, United States Army
B.S., California State Polytechnic College, 1966
M.S., North Dakota State University, 1971

Scatterable mines are currently being evaluated in the material acquisition process. This new concept of landmines will be examined by an analysis of field experiment data provided by the Combat Developments Experimentation Command (CDEC), Fort Ord, California. An experimental design and analysis plan is presented to measure the effectiveness of scatterable mines. The experimental design considered two models. A "normal" model is designed without considering CDEC's instrumentation, equipment, and personnel, and a "modified" model which takes into consideration CDEC's limitations. The experimental design, analysis methodology, and a hypothetical example are presented to indicate implementation of the "modified" model. Finally, a comparison of the "modified" model is made with CDEC's "Tactical Effectiveness of Mines in the Armor Weapons System" model design. Dynamic measures of effectiveness are used to discriminate between levels of five factors (e.g., location of minefield, type of minefield, threat tactic, minefield density, defensive force mix) and to determine if there is a synergistic effect with employment of scatterable mines.

Master of Science in
Operations Research
September 1976

Advisor: Samuel H. Parry
Department of
Operations Research

Some Methods of Investigating the Stochastic Properties of Crime Trends

Crisogono Rebaño Francisco
Major, Philippine Constabulary
B.S., Philippine Military Academy, 1968
M.B.A., University of the Philippines, 1972

Three quantitative methods of investigating and analyzing the stochastic properties of crime trends are suggested. The careful use of control charts may assist Law Enforcement Agencies in determining with varying degrees of accuracy, whether the actual incidence of crime is under control or not. Exponential smoothing is recommended for forecasting crime trends due to its unique capacity to place more weight on the most recent observations. Finally, the investigation of the interrelationships and the determination of the probable sources of variability among different felonies are presented using the analysis of variance. Felonies with the same sociological as well as statistical characteristics may be aggregated.

These methodologies, taken together, may possibly assist in determining the efficiency or inefficiency of law enforcement programs and, possibly, a more effective utilization of resources.

Master of Science in Operations Research
September 1976

Advisor: G. F. Lindsay
Operations Research
Department

ACCURACY ANALYSIS FOR A LOWER CONFIDENCE LIMIT PROCEDURE FOR SYSTEM RELIABILITY

Thomas Robert Gatliffe
Lieutenant-Commander, United States Navy
B.S., United States Naval Academy, 1965

This thesis examines a proposed empirical method for determining the the $100(1-\alpha)\%$ lower confidence limit for the reliability of a system composed of a mixture of series and parallel connected components for which only component level test data is available. The method is an extension of the Log-gamma prccedure originally proposed for series connected systems only. The accuracy of the method is assessed for some representative system reliability constructs using a computer simulation procedure. The simulation results are examined with a view toward identification of accuracy indication parameters which may be estimated prior to the component tests.

Master of Science in
Operations Research
September 1976

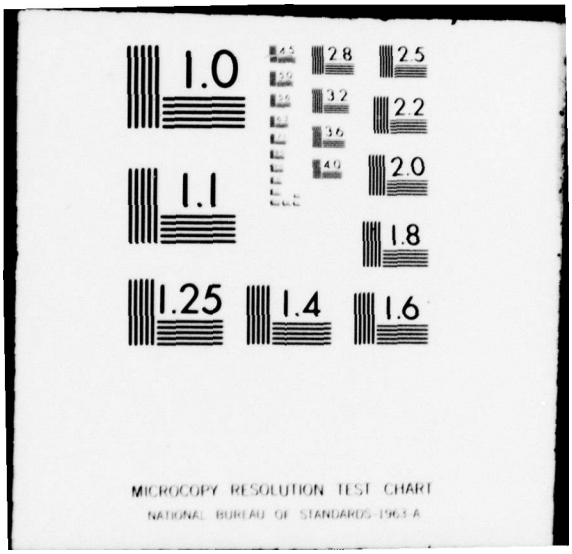
Advisor: W. M. Woods
Dean of
Educational
Development

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Composition of Material Price Indices for Operation and Maintenance, Navy Budgetary Account

Paul Richard Gorman
Lieutenant, United States Navy
B.S., Ohio State University, 1968

A price index for the Operations and Maintenance, Navy budgetary account is developed for the period 1965 to 1975. Component price indices are presented for four object classifications of the account. These indices are compared with price indices used by the Congressional Budget Office in their "Five Year Budget Projections" for current services. Pending further research into the construction of an improved O&M,N index, it is shown that those indices used by the Congressional Budget Office have substantially underestimated the effects of inflation upon the O&M,N account. It is recommended that the developed indices be used for the Congressional Budget Office analysis of the Operations and Maintenance, Navy account.

Master of Science in
Operations Research
September 1976

Thesis Advisor: M.G. Sovereign
Operations Research
Department

AN ALGORITHM FOR SOLVING A RANGE CONSTRAINED TRAVELING SALESMAN PROBLEM

John William Harms
Captain, United States Army
B.S., United States Military Academy

A problem of routing earth resource survey aircraft, proposed by NASA, is formulated as a traveling salesman problem, in which the salesman (aircraft) has a range constraint. A heuristic algorithm is presented, which seeks a minimal length set of subtours through n cities. The aircraft begins a subtour at the base location, visits a subset of the n cities and returns when the range constraint prevents a visit to another city. Additional subtours are created until all cities are visited.

The algorithm is programmed in FORTRAN for use on digital computers. The IBM 360/67 computer at the Naval Postgraduate School was used to find solutions to three operational problems of size seven, eighteen and twenty-five cities. Computation times for each problem was under 20 seconds and the solutions were significiantly better than feasible solutions calculated without the use of the algorithm.

Master of Science in
Operations Research
December 1976

Advisor: Gilbert T. Howard
Operations Research
Department

A Normative View of the Pre-Overhaul Planning Process

Michael Edward House
Lieutenant, United States Navy
B.A., University of Montana, 1968

This paper derives from the author's understanding and appreciation of the importance of the various events in the Pre-Overhaul Planning Phase. This thesis describes the Pre-Overhaul Planning Process for a destroyer type ship scheduled for overhaul at a naval shipyard. The Pre-Overhaul Planning Process is then examined from a normative viewpoint which concurrently provides a basic framework for the decision maker to utilize in the detailed analysis of each component of the overhaul repair work package. In conducting this detailed analysis, numerous tradeoffs are required between the overhaul objective, the constraints and the resources available to accomplish the overhaul repairs. The environment the decision-maker encounters in the Pre-Overhaul Planning Process is also described. By presenting how the Pre-Overhaul Planning System works, how it should work and the environment that must be contended with, this thesis will lead to an increased awareness of the requirements and the importance of Pre-Overhaul Planning.

Master of Science in Management
September 1976

Advisor: M. D. Sovereign
Department of Operations Research

APL Histogram, Density Estimation and Probability Plotting Routines

Dennis Roy Hutchinson
Captain, United States Army
B.S., United States Military Academy, 1969

This paper introduces several data analysis routines that were designed for interactive use with APL (A Programming Language) and placed in the APL user library at the Naval Postgraduate School. Specifically, histograms, density estimation and probability plotting routines are both explained in detail and demonstrated with actual data. In addition, applications and limitations on each of the routines are explored. And, the combined routines give the general user an extensive tool to analyze either discrete or continuous data.

Master of Science in Operations Research
December 1976

Advisor: Peter A. W. Lewis
Department of Operations Research

ANALYSIS OF U. S. NAVY MAJOR AIRCRAFT ACCIDENT RATES BY AIRCRAFT TYPE

Gary Fredric Johnson
Lieutenant, United States Navy
B. A., Bemidji State College, 1968

An analysis of U. S. Navy major aircraft accidents during the period Fiscal Year 1972 - 1974 was conducted. Forward (stepwise) Multiple Regression techniques were employed on a group of ten basic variables considered time dependent. The multiple regression techniques were employed to develop predictive equations for the dependent variable, Accident Rate with a view to determining which of the basic variable measures were significant in accident rate studies and if the variables are unique to a specific aircraft community or generally applicable to all aircraft.

Aircraft considered independently were A-4, A-6, A-7, and F-4, additionally composites of Attack aircraft (A-3, A-4, A-5, A-6, A-7), Fighter aircraft (F-4 and F-8), Propeller aircraft (E-1, E-2, C-1, C-2, S-2, P-3, C-117, C-118, and C-130) and Helicopters (H-1, H-2, H-3, H-46, and H-53) were considered.

Master of Science in
Operations Research
September 1976

Advisor: Gary K. Poock
Operations Research
Department

Methodologies of Officer Billet Classification

Juergen Lemke
Major, Federal German Air Force
Ing. Grad., Technische Akademie der Luftwaffe Neubigerg, 1968

Four potentially valuable methods to classify officer billets into subgroups on the basis of multivariate observations about the billets are presented. The methods aiming to reduce the dimensionality and to identify homogeneous subgroups are Principal Component Analysis, Multidimensional Scaling, Hierarchical Cluster Analysis (Hiclust) and Cluster Analysis Optimizing an Objective Function (K-Means). They are applied to a data set obtained from an outside source and comprising 96 Navy officer billets. Thirteen quantitative variables measuring the relative amount of time spent for managerial responsibilities and resources have been entered into the analysis. On the basis of the entered variables, the presence of eight billet clusters have been determined. The evolved groups are described by their centroids and within-group standard deviations.

Master of Science in
Operations Research
September 1976

Advisor: R. R. Read
Operations Research
Department

An Exploratory Input-Output Model For Support Cost Estimation

Clemente Pionilla Mariano
Lieutenant Colonel, Philippine Army
B.S., Philippine Military Academy, 1964

A cost model to estimate support costs in the Philippine Army is developed. Leontief's input-put technique is appraised for applicability in the cost model. A role for input-output cost models is related with cost analysis. In discussing the data aspects of the cost model, the use of proxy variables and their validation are presented. Correlation analysis is suggested as a tool for choosing a valid proxy variable. The matter of fixed costs is discussed also, and its treatment in the cost model is suggested. Using hypothetical data, an example on the use of the model in a Philippine Army setting is presented. Support units, tactical forces, and budgetary programs comprise the major elements of the system in the cost model.

Master of Science in
Operating Research
September 1976

Advisor: John A. Larson
Department of
Administrative
Sciences

An Heuristic Scheduling Algorithm for Resource-Constrained Project Networks

Stewart Iden Marsh, Jr.
Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1971

An algorithm is proposed for scheduling project networks having a single constraining resource and a constant level of available resources. The algorithm seeks to generate a minimum length schedule indirectly by maximizing the average resource utilization over the two time intervals represented by the current decision point and its successor. An attempt is made to schedule all of the activities whose predecessors have been completed, failing this all feasible subsets are considered. Where possible, the algorithm considers only those subsets which introduce new activities at the subsequent decision point.

Master of Science in
Operations Research
December 1976

Advisor: A. W. McMasters
Operations Research
Department

DESIGN CONSIDERATIONS FOR LANCHESTER-TYPE MODELS OF WARFARE (LATMW)

Herbert-Hans Mauerer
Captain Federal German Army
Betriebswirt (graduiert), 1971, Technical Military Academy, West-Germany

This thesis discusses design considerations for Lanchester-Type Models of Warfare (LATMW). It establishes a framework for setting minimum design standards for such combat models. We formalize these considerations in a Minimum Evaluation Framework (MEF) for combat models. The state-of-the-art for models is briefly reviewed and major pitfalls in modelling combat are sketched. We show how to avoid such shortcomings by following our MEF specifications. Modern combined arms forces are abstracted as coherent systems of complementary and supplementary components. We derive a method to refine Lanchester Attrition-Rate Coefficients (LAEC) as system capability measures by additionally considering reliability and availability weightings. Examples are given to demonstrate the implementation of these refined LARC quantifications in LATMW.

Master of Science in Operations Research
September 1976

Advisor: James G. Taylor
Operations Research Department

AN EXAMPLE OF PHASED MISSION RELIABILITY ANALYSIS FOR A HYPOTHETICAL NAVAL WEAPONS SYSTEM

Steven E. Pilnick
Lieutenant, United States Navy
B.E., State University of New York at Stony Brook, 1970

In a phased mission, the functional organization of the system changes during consecutive time periods, which introduces analysis complexities not present with just a single phase. This occurs since the performance of a particular component in one phase of the mission is not independent of its performance in another phase. In this paper, an example is analyzed, largely with graphical techniques and diagrams, so as to avoid the complicated mathematics which characterize much of the existing methodology.

Master of Science in
Operations Research
December 1976

Advisor: James D. Esary
Operations Research
Department

Optimization of Scenario-Bound Tactical
Nuclear Force Requirements
(A Proposed Methodology)

Earl Wayne Renner
Captain, United States Army
B.S., United States Military Academy, 1969

No methodology currently exists for determining an optimal number of tactical nuclear weapons to be stockpiled from the numerous results obtained from scenarios simulated by tactical nuclear wargame models. This thesis is an attempt to provide the US Army Concepts Analysis Agency with such a methodology. Utilizing resources of both the USACAA and the Naval Postgraduate School, research was accomplished to establish the usefulness of decision theory concepts to compare the scenario-bound results of the simulations, solve for a strategy mix, and apply that strategy mix to the scenario dependent expenditures. The resulting stockpile, together with the results for each scenario, could provide the decision maker with more flexibility in dealing with the uncertainty of enemy intentions.

Master of Science in
Operations Research
December 1976

Advisor: Donald R. Bouchoux
Department of
Operations Research

An Investigation
of
User Generated Cockpit Discrepancies
in Naval Aircraft

Frederick George Schobert, Jr.
Lieutenant, United States Navy
B.S., United States Naval Academy, 1970

This thesis analyzes problems in current Naval aircraft as reported by fleet aviators attending the U. S. Naval Aviation Safety School. A method is developed which facilitates the collection and processing of the reported information. A collective sample of 286 incidents is stratified into a design discrepancy outline which illuminates 31 specific problem areas. Various recommendations are made concerning concept expansion to a fleet-wide level.

Master of Science in
Operations Research
September 1976

Advisors: Douglas E. Neil
L. E. Waldeisen
Department of Operations
Research

Development of a Concentric Piston Transducer For Tracking Underwater Vehicles

Vilnis Uldis Auns
Lieutenant Commander, Canadian Forces
B.S.E.E. Royal Military College of Canada, 1965

The use of amplitude and phase shading on a pair of concentric piston radiators has been employed as a means of controlling the acoustic radiation patterns for a small flush face transducer which is intended for use as a 75 kHz sound source in the underwater tracking of vehicles. A description is given of the design, construction and tests of several models of the composite piezoelectric ceramic transducer. Results indicate that this appears to be a feasible method for achieving a principal design goal of a broad beamwidth radiation pattern with a pronounced reduction in source level along the transducer axis. Some additional development is needed for achieving a configuration which might be optimum for production.

Master of Science in
Engineering Acoustics
December 1976

Advisor: O. B. Wilson
Physics and Chemistry
Department

A PRELIMINARY INVESTIGATION OF ACOUSTIC ENERGY TRANSMISSION FROM A TAPERED FLUID LAYER INTO A FAST BOTTOM

James Nathaniel Edwards, Jr.
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1965

The transmission of acoustic energy from a tapered fluid layer into an underlying layer of fluid was investigated. Pulsed transmissions at frequencies of 75.85 kHz and 107.5 kHz were used to insonify the upper layer while a small probe transducer was used to measure signal amplitude variation with depth in the lower layer. The experimental data collected indicate that a directional transmission of acoustical energy into the lower layer occurs over regions corresponding to the individual cutoff depths for normal modes in the upper layer. A simple method for estimating the position of these regions is discussed and the effects of frequency and upper layer slope variations are reported.

Master of Science in
Engineering Acoustics
December 1976

Advisor: A.B. Coppens
Physics and
Chemistry
Department

AN EXPERIMENT USING REFRACTIVE PROPERTIES OF AN ENCAPSULANT TO ALTER THE SOUND RADIATION PATTERN IN WATER OF A SMALL, FLUSH-FACE TRANSDUCER

Alexander L. Ford, III
Lieutenant, United States Navy
B.S., United States Naval Academy

A preliminary experiment is described in which a compound of high index of refraction is used to obtain a broad beam width sound radiation pattern in water from a small transducer element, resonant at 75 kHz, located in a flush-face mounting in a plane baffle. It is demonstrated that the resultant radiation pattern is significantly broader than that typical of current production transducers using identical transducer elements but with a different encapsulant. Due to the limited number of experimental test configurations, it is not possible to determine with certainty the significance of the index of refraction of the encapsulant.

Master of Science in
Engineering Acoustics
December 1976

Advisor: O.B. Wison, Jr.
Physics and Chemistry
Department

Frequency-Time Correlation of Surface Scattered Underwater Sound

Michael Francis Loomis
Lieutenant Commander, United States Navy
B.S., St. Procopius College, 1959

The wind driven surface of a large anechoic tank was used to study forward scattered underwater sound. A 10 kHz sawtooth signal was used to drive an omnidirectional source to insonify the rough surface. Direct and reflected path sound signals to a point hydrophone were separated by appropriate gating and the reflected path signal was analyzed for up to 2 minutes at 10 and 20 msec. intervals, using digital FFT spectral analysis. Graphs of sound pressure level vs. time for every 10 kHz from 30 kHz to 120 kHz (surface roughnesses between 1.1 and 10.5) are shown. Correlation of the scattered sound pressure with frequency was analyzed. Evidence is presented to support the hypothesis that, for large roughnesses, the instantaneous scattered sound amplitudes are harmonic functions of sound frequency; that is, there is a consistent frequency separation between instantaneous amplitude maxima at one frequency and minima at another frequency.

Master of Science in Engineering Acoustics
December 1976

Advisor: H. Medwin
Department of Physics and Chemistry

Hydroacoustic Validity of Inside-Out Towed Array Modeling

Michael R. Scherr
Lieutenant, United States Navy
B.S., United States Naval Academy, 1971

and

Thomas F. Musso
Lieutenant, United States Navy
B.S., United States Naval Academy, 1971

In order to investigate the validity of inside-out towed array modeling, hydrodynamic and acoustic tests were performed using a 0.37 in. (0.94 cm.) inside diameter pipe. Flow rate measurements were performed to compare the flow inside the test pipe to that outside a towed array. Sound measurements were made at various points in a reverberant environment to test if the amount of acoustic energy produced per unit length of test pipe was dependent on the flow condition.

From the results of this investigation, it appears that the flow noise generated by turbulent pipe flow increases with the onset of fully developed flow. In this case, inside-out towed array modeling becomes less valid.

Master of Science in Engineering Acoustics
December 1976

Advisor: Alan B. Coppens
Physics and Chemistry Department

DEVELOPMENT OF A FLEXURAL DISK TRANSDUCER
FOR ACOUSTIC TRACKING OF UNDERWATER VEHICLES

Omer Sevdik
Lieutenant, Turkish Navy
B.S.E.A., Naval Postgraduate School, 1976

A high frequency, broad-band transducer which has a broad radiation pattern in a half space is required for acoustic tracking of underwater vehicles. Two models of a flexural disk transducer, were built and tested. It was found that the radiation loading in water completely damps the resonances due to standing flexural waves and the radiation appears to be due entirely to flexural waves propagating in the disk. Broad-band radiation patterns and broad bandwidth (60-80 kHz) were obtained. The discrepancies between theory and experiment are attributed in part to violation of the thin plate assumptions and to lack of knowledge of the actual velocity distributions. This approach offers promise for achieving the desired broad beam widths. However, additional development work is needed to obtain a transducer which has the curved face necessary for smooth hydrodynamic flow.

Master of Science in
Engineering Acoustics
December 1976

Advisor: O.B. Wilson
Physics and Chemistry
Department

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