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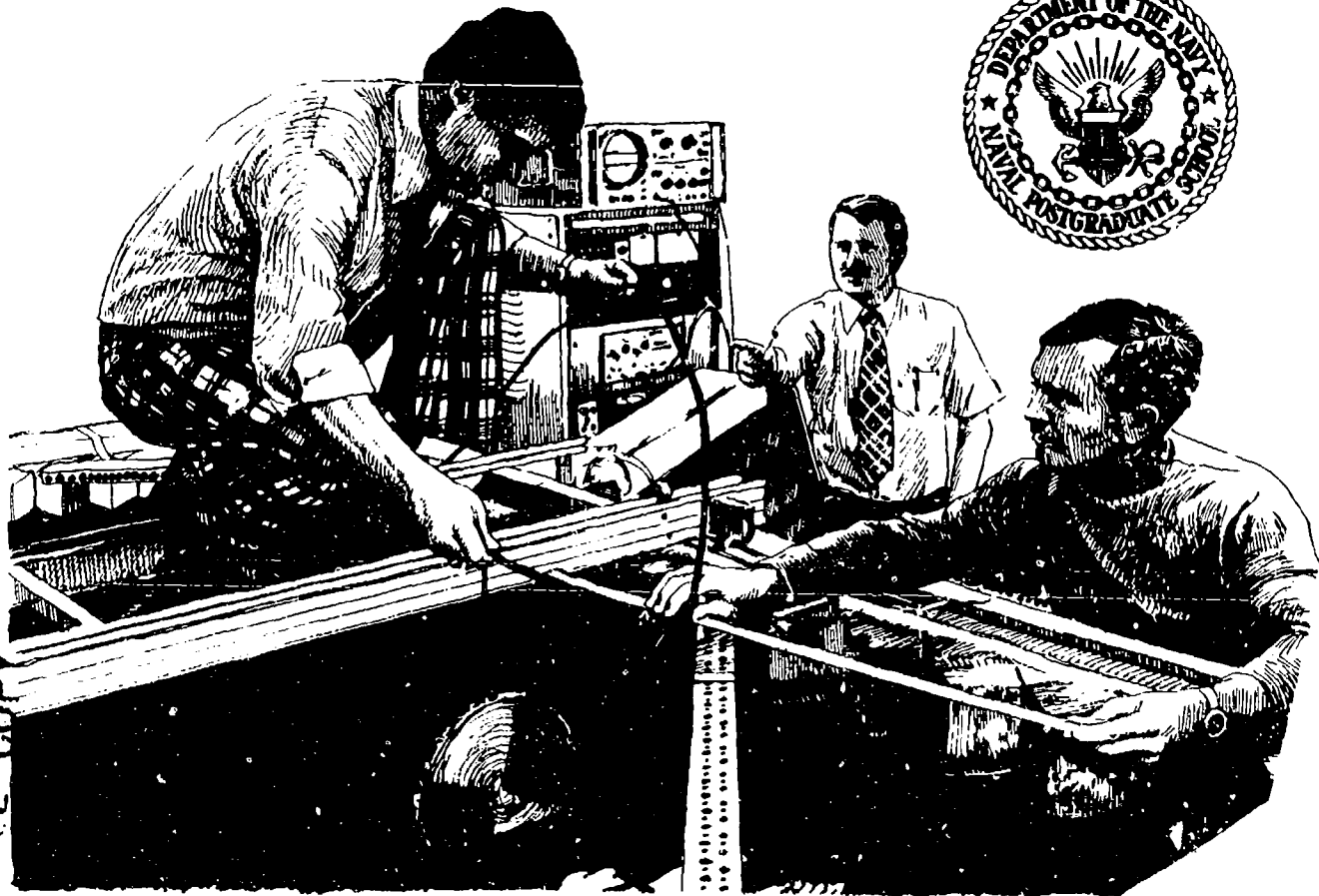
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COMPILATION OF ABSTRACTS OF THESES SUBMITTED BY CANDIDATES FOR DEGREES

REPORT FOR THE PERIOD
OCT 1983 TO SEPT 1984

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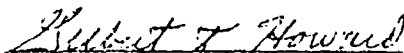Rear Admiral R. H. Shumaker   David A. Schrady
Superintendent   Provost

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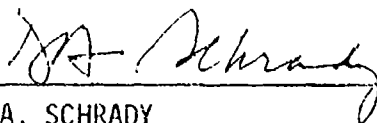Defense activities and federal government agencies.

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Prepared by:

Gilbert T. Howard

GILBERT T. HOWARD
Director of Research Administration

Released by:

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Provost

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NAVAL POSTGRADUATE SCHOOL
Monterey, California

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Monterey, California

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DOCTOR OF PHILOSOPHY

THE SPACE-TIME SCALES OF VARIABILITY IN OCEANIC THERMAL STRUCTURE OFF THE CENTRAL CALIFORNIA COAST

Laurence Coates Breaker
B.S.M.E., Bucknell University, 1961
M.S., University of Miami, 1969

The space-time scales of variability in ocean thermal structure are examined off the Central California coast. In the active coastal upwelling regime off Pt. Sur, there was an equatorward surface jet 15 to 40km offshore, and a weaker poleward undercurrent near the continental slope. Based on tendency analyses of a set of quasi-synoptic hydrographic surveys, both upwelling and mixing were important in lowering sea-surface temperature (SST). The coastal bathymetry influenced the in situ property distributions around Pt. Sur, and the satellite-derived SST patterns. Based on the satellite data, the upwelling frontal boundary meandered with space and time scales of about 80km (alongshore) and 30 to 40 days, respectively.

Over several months, the major upwelling frontal boundary gradually moves the order of 50km offshore. This movement often commences in May, a month or so following the spring transition to coastal upwelling; it may be caused by both cumulative offshore Ekman transport and Rossby wave dispersion. Consequently, the offshore region influenced by the coastal upwelling regime exceeds the Rossby radius of deformation.

The major abrupt decreases in coastal SST (of order 3C) in certain years were attributed to the spring transition to coastal upwelling. The four El Nino episodes of the past 12 years were evident in coastal SST. El Nino events may initiate, and apparently strengthen, the spring transitions.

3

Based on daily surface and subsurface temperature, correlation time scales ranged from several days (subsurface) to almost ten days (surface). The vertical temperature field was statistically homogeneous with correlation scales of at least 60m. Based on empirical orthogonal function analysis of vertical temperature profiles acquired on a meso-scale grid, the limiting horizontal and vertical scales were of the order of 20km and 40m, respectively. These scale estimates provide guidance for the design of observational studies and numerical models.

4

UTILIZATION OF NUMERICAL OPTIMIZATION TECHNIQUES IN THE DESIGN OF ROBUST MULTI-INPUT, MULTI-OUTPUT CONTROL SYSTEMS

Vernon C. Gordon
Commander, United States Navy
B.A.E., Auburn University, 1968
M.S.A.E., Naval Postgraduate School, 1970

A direct design method for solving the problem of robustness to cross-coupling perturbations in multivariable control systems is presented. The method uses numerical optimization procedures to manipulate the system feedback gains as direct design variables. The manipulation is accomplished in a manner that produces desired performance by pole placement and robustness by modification of the minimum singular values of the system return difference matrix.

Channels affected by cross-coupling perturbation may be recognized by the character of their transfer function plot. The mechanism used by the pole placement and robustness routine in obtaining a robust design is evident from the gain changes associated with the transfer function diagram and the zero shifts shown on pole-zero plots. The pole placement and robustness routine uses gain equalization and zero assignment to modify the characteristics of the system in the areas of low singular values, producing a robust design.

A modification of the pole placement and robustness routine that may be applied to the design of robust observers is also presented. Using feedback and filter gains as direct design variables, a practical design procedure for robustness recovery in observer based systems is obtained.

MEASUREMENT OF RANGE-RESOLVED WATER VAPOR CONCENTRATION
BY COHERENT CO_2 DIFFERENTIAL ABSORPTION LIDAR

Robert Michael Hardesty
NOAA/ERL Wave Propagation Laboratory
B.S., Virginia Polytechnic Institute and State University, 1971
M.S., University of Colorado, 1972

The feasibility of DIAL species concentration measurements using a coherent CO_2 lidar was examined. A computer simulation estimated errors in coherent and incoherent CO_2 DIAL measurements due to speckle, noise, turbulence, and atmospheric inhomogeneities. Results indicated that direct detection is the preferable mode at shorter ranges while heterodyne detection provides better sensitivity beyond a few km. The NOAA pulsed lidar was used to investigate statistical properties of the aerosol backscattered returns which are processed to obtain DIAL measurements. Fluctuations due to speckle and noise necessitate averaging of returns from multiple pulses for accurate concentration estimates. Other atmospheric effects can be minimized by judicious signal processing. The first reported range-resolved coherent DIAL water vapor measurements were made with the lidar to ranges beyond 10 km. Estimates compared reasonably with those from rawinsondes, although some tendency to overestimate relative to the sondes was observed. Wind velocity profiles were also obtained, demonstrating the feasibility of simultaneous concentration and wind velocity measurements.

OPTIMIZATION OF ARTIFICIAL DISPERSION
IN SALVO FIRING

Takasi Kisi
Gakushi, Osaka University, Japan, 1950

In salvo firing, the smallest ballistic dispersion is not always most desirable. Deliberate increase of the ballistic dispersion can improve the probability of destroying the target. Our concern in this dissertation is the optimization of such "artificial" dispersion in two-dimensional salvo models. In some cases no closed form solution is available, but we are able to offer efficient methods for the computation or approximation of the salvo kill probability. In other cases we are able to derive approximate formulae for the optimal ballistic dispersion.

AERONAUTICAL ENGINEER

ERROR CONTROL IN MODEL FOLLOWING CONTROL SYSTEMS USING CONSTANT ERROR MODEL FOLLOWING

Wayne C. Durham
Commander, United States Navy
B.S., U. S. Naval Academy, 1965

This thesis describes the development of a new method for controlling the error in model following control systems. The treatment is for first order, linear or nonlinear, time varying or time invariant systems with additive (linear) control. The errors controlled are assumed to have arisen from external disturbances or from differences in the initial conditions of the plant and the model.

The theory introduced is called constant error model following control. This paper describes the theory as an outgrowth of attempts to control a plant by feedback of an error between the plant and model with the error specified to be constant. From this, it is shown that a model may be followed with arbitrary error. The central result is that, given some error, one can find another model (control model) which, if followed with this arbitrary error, will guide the plant state trajectory back to that of the model.

APPLICATION OF MODERN GUIDANCE CONTROL THEORY TO A BANKTOTURN MISSILE

Bohyun Shin
Major, Republic of Korea Air Force
B.S., Republic of Korea Air Force Academy, 1973

In this work, the control laws of a banktoturn missile using an optimal estimator in the terminal guidance phase were designed, and the effect of increasing the number of measurement sensors in the missile to generate more information on the state was investigated. In the design of the control law, the modern optimal control theory with the quadratic performance index was used. Implementation of this control law required the use of a Kalman filter as the optimal estimator. The extended Kalman filter algorithm was utilized in the present study since the measurement states were nonlinear functions of the state vectors. In order to test the effects of the implementation of the increased measurement sensors, two-, four-, and six-measurement sensors were assumed to be implemented in the optimal estimator. By computer analysis, the designed guidance laws were evaluated and the effect of the implementation of increased measurement sensors was tested.

The results of the simulation revealed that the designed guidance law was successful within the specified scenarios, the effect of the implementation of the increased measurement sensors for the estimator was favorable only in that increased measurement sensors generated more information about the state vectors.

ELECTRICAL ENGINEER

IMAGE DATA COMPRESSION USING UNEVEN KNOTS SELECTION

Cesar Tadeu de Miranda
Captain, Brazilian Air Force
B.S., Instituto Technologico de Aeronautica, 1977

Application of B-spline functions over uneven knots in image processing is studied here. The subject is on compression of image signals. The algorithm for selecting uneven knots from the contours of the image is pursued. A specific closeness error constraint appropriate for 3-D data is used.

The image reconstruction problem is tackled in two distinct ways, namely triangulation method and thin plated spline method. Some procedures to evaluate the fidelity of the image reconstruction schemes are provided too. A set of experiments in a broad variety of aerophotograph images is performed in order to test and validate the overall algorithm.

15

APPLICATION OF A DISTRIBUTED ROUTING ALGORITHM
TO A PACKETSWITCHED COMMUNICATIONS NETWORK

Robert Reade Logan
Captain, United States Marine Corps
B.S., Washington State University, 1976

Two distributed routing procedures based upon the Yen shortest path algorithm are developed for application in a packet-switched communications network. The algorithm uses a unique method in calculating shortest paths based upon the time of arrival of update messages.

The first routing procedure uses a proposed "combination" link weight function having parameters involving both current link queue size and recent history of link utilization. Performance of this procedure is analyzed under a variety of network conditions using computer simulation. A comparison study is done with both a least hop routing protocol and a multiple path static routing protocol.

The second routing procedure has a hierarchical structure which offers substantial reductions in routing traffic and memory requirements over the first version when implemented in large networks.

The major conclusion is that these routing procedures exhibit robust operating characteristics which are almost optimal in simple situations.

MECHANICAL ENGINEER

DEVELOPMENT OF A MICROCOMPUTERBASED ENGINEERING DESIGN OPTIMIZATION SOFTWARE PACKAGE

Richard L. Booth
Lieutenant, United States Navy
B.S.M.E., University of New Mexico, 1977

A general purpose software package was developed to perform nonlinear constrained optimization of user-defined engineering design problems of significant complexity using desktop computers. The package, designated Microcomputer-based Desi;n Optimization Tool (MDOT), will accept nonlinear functions of up to ten variables, which may be bounded with as many as fifty constraints. It was implemented on a Hewlett-Packard Model 85 microcomputer with 32 Kbytes of random access memory.

MDOT employs the method of feasible directions for constrained optimization, and a variable metric method for unconstrained functions. It is interactive, provides for monitoring the optimization progress, and can be interrupted to restart from a new point in the design space. Typical applications of MDOT are in the design of machine components, composite laminates, and piping systems.

Mechanical Engineer and
Master of Science in
Mechanical Engineering
December 1983

Advisor: G. N. Vanoerplaats
Department of
Mechanical Engineering

19

FILMWISE CONDENSATION OF STEAM
ON LOW INTEGRAL-FINNED TUBES

Ioannis V. Georgiadis
Lieutenant, Hellenic Navy
B.S., Hellenic Naval Academy, 1975

Filmwise condensation heat-transfer measurements of steam were made on horizontal tubes under vacuum and near-atmospheric pressures. Data were taken for a smooth tube and for 21 tubes which contained rectangularly-shaped low integral fins. The fin geometry was systematically varied in order to investigate the dependence of the steam-side heat-transfer coefficient on fin spacing, thickness and height.

The condensation process was found to be most sensitive to fin spacing and to be weakly dependent on fin thickness. When the fin height was increased from 1.0 to 2.0 mm, the increase in the heat-transfer coefficient was about 20 percent, while the increase in condensing area was 51 percent.

The best performing finned tube had a fin spacing of 1.5 mm, a fin thickness of 1.0 mm and a fin height of 2.0 mm. It showed an enhancement over the smooth tube of between 4 to 5 under vacuum conditions, and around 6 at atmospheric conditions. Thus, the use of finned tubes may result in a significant reduction in the size and weight of present day steam condensers.

Mechanical Engineer and
Master of Science in
Mechanical Engineering
September 1984

Advisor: P. J. Marto
          Department of
          Mechanical Engineering

AN EVALUATION OF POLYMER COATINGS FOR THE PROMOTION OF DROPWISE CONDENSATION OF STEAM

Kenneth M. Holden, II
Lieutenant Commander, NOAA
B.S.M.E., University of Texas, Austin, 1970

Fifteen polymer coatings were evaluated for their ability to promote and sustain dropwise condensation of steam to enhance the heat transfer capability of steam condensers. Of the fifteen coatings, nine employed a fluoropolymer as a major constituent. Of the other six, four were hydrocarbons, one a chlorocarbon and one a silicone. Each coating was applied to four different metal substrates: brass, copper, naval brass, and titanium. While exposed to steam at atmospheric pressure, each coating was visually evaluated for its ability to promote dropwise condensation. Observations were conducted over a period of 4000 hours. Hardness and adhesion tests were performed on selected specimens both before and after exposure.

On the basis of sustained performance, six coatings were selected for heat-transfer performance evaluation. A separate apparatus was used in which coated copper tubes were mounted horizontally in a test section through which steam flowed vertically downward. Vapor-side heat-transfer coefficients were inferred from overall measurements. Test results indicate that the outside condensing coefficient can be increased by a factor of five to eight through the use of polymer coatings to promote dropwise condensation.

TWOD HEAT TRANSFER THROUGH POROUS MEDIA WITH HEAT GENERATION

Benjamin Martinez, Jr.
Lieutenant, United States Navy
B.A., Trinity University, 1974

This investigation develops an axisymmetric heat transfer-combustion model of a porous medium within a circular cylinder. System flow is governed by Darcy's law. Carbon and air properties are treated as variables of temperature. A combined continuity-Darcy equation, an oxygen mass balance equation, and energy balance equations (one each) for air and carbon, describe the conservation laws of the system. Transport mechanisms for oxygen mass transfer are molecular diffusion and convective transport, and an oxygen consumption term to account for combustion is included. Heat transfer mechanisms included in the model are conduction and convection. Radiation is accounted for at applicable boundaries only. Nonvolatile combustion is accounted for in the carbon energy and oxygen mass balance equations as a heat generation term of Arrhenius type. The numerical solution of four coupled, nonlinear, transient partial differential field equations is accomplished using the Galerkin formulation of the Finite Element Method. The effect of porosity on system behavior is examined.

Mechanical Engineer and
Master of Science in
Mechanical Engineering
June 1984

Advisor: D. Salinas
Department of
Mechanical Engineering

MASTER OF SCIENCE

IN

AERONAUTICAL ENGINEERING

PRELIMINARY HELICOPTER DESIGN DECISION MAKING
BASED ON FLIGHT PERFORMANCE FACTORS

Patrick V. Adamcik
Captain, United States Army
B.S., University of Texas at Austin, 1977

This thesis will assist those evaluating helicopter design to make preliminary judgments about the feasibility of new designs. By using the computer program developed in this thesis, a designer can produce estimates for power requirements, endurance velocity, rate of climb, range velocity, hover ceiling, and service ceiling versus main rotor radius. These estimates can also be examined for the effects of changes in main rotor radius, chord, and rotational velocity.

AN INVESTIGATION INTO THE CONTROL LIMITATIONS OF A BANK TO TURN MISSILE IN THE TERMINAL HOMING PHASE

Barton P. Anderson
Commander, United States Navy
B.S., Wheaton College, 1970

The purpose of this thesis was to examine guidance and control deficiencies in a bank to turn (BTT) cruise missile with limited roll authority in the terminal homing phase of its mission. A six degree of freedom simulation of a typical BTT missile was translated into FORTRAN H from the Continuous System Modeling Program (CSMP) simulation language and run on the IBM System 370 computer. Tests were conducted with the revised simulation program to examine the effects of electronic counter-measures (ECM) blinking and glint upon the missile's control system and accuracy against a simulated medium sized combatant's vessel traveling at 20 knots perpendicular to the missile's track over the earth. In addition to the standard attack profile involving a popout attack, several other attack profiles were tested including skid-to-turn (STT) control laws and a ballistic trajectory. Miss distances varied from 3.7 feet without ECM or glint to 85 feet with ECM operating. Susceptibility of the missile to ECM blinking varied with the blinking frequencies below 0.2 HZ and near 6.0 HZ.

Analysis of the data showed that errors at the low frequencies were primarily caused by the bank command loop of the autopilot. Those at the higher frequency were due to the roll rate command loop. Variation of the geometry of the missile's flight profile had no significant impact upon missile accuracy except that, without a popup maneuver, the roll rate channel demonstrated a marked decrease in effectiveness. Variation of the autopilot gain in the roll rate control loop changed the frequency at which degradation occurred but actually increased its effects.

Skid to turn control laws were tested. However the missile was unable to produce the necessary side force needed to track a passive target and produced undesirable coupling in the flight controls. An attempt to use the altitude command channel to fly a ballistic profile was unsuccessful due to instabilities created in the control system. It is recommended that a popup maneuver be included in the terminal guidance of a BTT cruise missile and that further tests be conducted to determine the extent to which autopilot modifications and gain adjustments can decrease the effectiveness of an ECM blinker against a BTT missile.

COMPUTER PROGRAMS FOR HELICOPTER DATA
DISPLAY AND CONCEPTUAL DESIGN

Gary M. Bishop
Captain, United States Army
B.S., United States Military Academy, 1975

This thesis allows a person with access to a computer that uses the FORTRAN language, and that is equipped with the DISSPLA software system, the ability to select and graphically portray for analysis the critical design parameters of actual helicopters.

It also allows a person with access to any computer that uses the FORTRAN language, the ability to do a complete conceptual design of a helicopter at one sitting in accordance with the procedures in the Helicopter Design Manual published as course notes for the AE 4306 Helicopter Design course at the Naval Postgraduate School.

Master of Science in
Aeronautical Engineering
December 1983

Advisor: D. M. Layton
Department of
Aeronautics

COMPUTER PROGRAM TO SIMULATE DIGITAL COMPUTER-BASED
LONGITUDINAL FLIGHT CONTROL LAWS IN A
HIGH PERFORMANCE AIRCRAFT

James Robert Carter
Lieutenant Commander, United States Navy
B. S., United States Naval Academy, 1973

The IBM Company's Continuous Systems Modeling Program was used to simulate the longitudinal flight control system of the F/A-18 aircraft. The model is intended for use in investigations of aircraft response to flight conditions which approach spin or stall and is restricted to the automatic flaps up (AFU) flight mode. Program outputs include stabilator deflection, leading and trailing edge flap positions, and cross-axis interconnect signals. Various stick forces, motion sensor inputs, and air pressure inputs were simulated to produce transient control surface responses. These computer generated responses exhibited characteristics corresponding to predicted aircraft control surface movements.

EDUCATIONAL AIDS IN AIRCRAFT COMBAT SURVIVABILITY

Patrick J. Cox
Lieutenant Commander, United States Navy
B.S., Kansas State University, 1969

This thesis presents four additions prepared for the textbook The
Fundamentals of Aircraft Combat Survivability Analysis and Design by
Professor Robert E. Ball. A set of homework problems with solutions was
developed for the textbook to provide the user with a means of measuring
student progress. An index, a lexicon of terminology, and a formulary
were also developed to enhance the usability of the textbook.

DEVELOPMENT OF A FIELD REPAIR TECHNIQUE FOR
"MINI-SANDWICH" KEVLAR/EPOXY AIRCRAFT SKIN

David Bruce Cripps
Captain, United States Army
B.S., United States Military Acedemy, 1978

An experimental analysis was performed on Kevlar/epoxy cloth "mini-sandwich" panels with cellular foam core. Three undamaged panels and twenty-three other panels with damage and repairs were subjected to static shear loading. Four parameters were varied in the types of repairs: hole size, hole plug filler material, patch material, and patch overlap distance. All twenty-six panels were tested to failure. A repair technique employing a cellular foam plug and fiberglass patches overlapping the original hole by 0.50 inches, symmetrically applied with structural adhesive was found to be suitable for repair of up to three inch diameter circular holes at field repair level. Additionally, postbuckling energy absorption was qualitatively examined for undamaged panels and for hole sizes ranging from 1.00 to 5.00 inches in diameter.

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DEVELOPMENT OF GRAPHICAL TIME RESPONSE
USING THE OPTSYSX PROGRAM

Harry A. Diel
Commander, United States Navy
B.S., University of Illinois, 1967

This thesis discusses the modification of and additions to an existing Optimal Systems Control FORTRAN Program (OPTSYS) originally obtained from Professor Arthur E. Bryson of Stanford University and subsequently redesigned to run interactively on the IBM 3033 VM/CMS by Lieutenant Commander John G. Hoden of the Naval Postgraduate School (NPS).

The modified FORTRAN program (OPTSYSX) and the additional FORTRAN programs (OPTCALC) and (OPTPLOT) are now designed to run interactively under VM/CMS on the IBM 3033, utilizing a library double precision numerical integration subroutine and high resolution precision plotting software, to provide the user with a highly accurate time response of a system which has been designed on the OPTSYSX Program. This series of programs permits the user to rapidly design, analyze and test all types of Optimal Systems Control problems. Examples of the various types of problems are worked through to illustrate all of the capabilities available.

Master of Science in
Aeronautical Engineering
September 1984

Advisor: D. J. Collins
Department of
Aeronautics

32

COMPUTER PROGRAM TO SIMULATE THE LATERAL-DIRECTIONAL
RESPONSE OF A HIGH PERFORMANCE AIRCRAFT DIGITAL
ELECTRONIC FLIGHT CONTROL SYSTEM

Scott Friedrich Graves
Lieutenant, United States Navy
B.S., University of Washington, 1975

The IBM Company's Continuous System Modeling Program was used to simulate the lateral and directional flight control systems of the F/A-18 aircraft. The model is designed for use in studies of high angle-of-attack maneuvering flight and is restricted to the Auto Flaps Up mode of operation. The model accepts simulated pilot stick and rudder inputs, air data information, and rate gyro, angle-of-attack, and acceleration feedback signals. Outputs are differential stabilator, differential leading-edge and trailing edge flap, aileron, and rudder deflections. Typical input values are used to validate the model, generating output control surface deflections which correspond to those expected for the F/A-18 aircraft.

DESIGN OF APPARATUS FOR THE DETERMINATION OF AERODYNAMIC DRAG COEFFICIENTS OF AUTOMOBILES

Brian R. Gritte
Lieutenant, United States Navy
B.S., University of Virginia, 1976

There are three major components of the total resistance to motion of road vehicles: aerodynamic drag, rolling resistance in the form of tire friction on road surfaces, and mechanical resistance in the form of bearing friction. Apparatus constructed at the Naval Postgraduate School, Monterey, California employs the measurement of total drag (aerodynamic drag + rolling resistance drag + mechanical drag) by means of coastdown testing and the measurement of rolling resistance and mechanical drag in an aerodynamic shielding trailer to determine the aerodynamic drag.

Data acquisition and reduction is carried out with a portable dedicated minicomputer system. The apparatus is designed to yield drag coefficients with an estimated uncertainty of about one percent.

AN ANALYSIS OF THREE APPROACHES TO THE HELICOPTER PRELIMINARY DESIGN PROBLEM

Allen C. Hansen
Lieutenant, United States Navy
B.A., University of Pennsylvania, 1976

Three methodologies from which to approach the problem of preliminary helicopter design are explored in this paper. The first is a sensitivity analysis of the basic helicopter performance equations. The purpose here is to ascertain where reasonable simplifications can be made that do not seriously degrade the accuracy of the results. The second is a graphical parametric design method, known as Carpet Plots. In this method a graphical solution is developed to meet the design criteria of the helicopter. In the third, an overview of Boeing Vertol's Helicopter Sizing and Performance Computer Program is given. The computer routines which enable a person to access HESCOMP on the Naval Postgraduate School mainframe IBM system are also provided.

DEVELOPMENT OF THE A-6E/A-6E TRAM/KA-6D
NATOPS CALCULATOR AIDED PERFORMANCE
PLANNING SYSTEM (NCAPPS)

Douglas Francis Hargrave
Lieutenant Commander, United States Navy
B.S., California State University, Northridge, 1970
M.B.A., Old Dominion University, 1980

The performance data contained in the Naval Air Training and Operating Procedures Standardization (NATOPS) manuals for Naval aircraft are presented primarily in graphic form. Interpretation of these graphic charts is time consuming and susceptible to error.

By using multiple regression analysis and other curve fitting techniques, the graphic charts can be modeled with closed-form analytical equations. These equations can then be used in computer programs, which perform the same functions as the original charts, but with greater accuracy, speed and simplicity.

This thesis conducts the above analysis on some of the more commonly used NATOPS performance data for the A-6 aircraft model. The result is the A-6E/A-6E TRAM/KA-6D NATOPS Calculator Aided Performance Planning System (NCAPPS), which is a library of A-6 performance software developed for the Hewlett-Packard HP-41CV hand-held programmable calculator. Procedures for developing the analytical models are described and a user's manual documenting the system is included.

Master of Science in
Aeronautical Engineering
December 1983

Advisor: D. M. Layton
Department of
Aeronautics

AN APPARATUS FOR SIZING PARTICULATE
MATTER IN SOLID ROCKET MOTORS

Robert Kelly Harris
B.S., Central Washington University, 1979

A light scattering apparatus to measure particle size (D_{32}) in a solid rocket motor was improved. Multiple consecutive scans of two photodiode arrays were accomplished with a pacing circuit and added memory. The device was calibrated using various suspended particle samples and found to make accurate measurements.

THE DEVELOPMENT OF A PERFORMANCE AND MISSION
PLANNING PROGRAM FOR THE A-7E AIRCRAFT

Roger Dale Hill
Commander, United States Navy
B.S., United States Naval Academy, 1970

In this thesis, drag and performance data from the A-7E Naval Air
Training and Operating Procedures Standardization Manual (NATOPS) were
reduced to a series of analytical expressions and implemented in a
mission planning program. The program was designed to be compatible
with desk-top calculators (64K memory) of the type used in aircraft
carrier Strike Operations Centers and to be interactive, so that air
wing and operations personnel may use it regularly for mission planning.

All or part of 15 NATOPS performance charts were reduced using
math modeling techniques, which included curve-fitting and cross-
plotting coefficients. Program implementation was demonstrated on an
IBM 3033 using a Waterloo BASIC compiler, and the program was checked
for accuracy and operational suitability by a sample group of Navy
attack pilots.

INTERACTIVE IMPLEMENTATION OF THE OPTIMAL SYSTEMS CONTROL
DESIGN PROGRAM (OPTSYSX) ON THE IBM/3033

John G. Hoden
Lieutenant Commander, United States Navy
B.A., University of Minnesota, Duluth, 1970

This thesis discusses the modification of an existing Optimal Systems Control FORTRAN Program (OPTSYS) originally obtained from Professor Arthur E. Bryson of Stanford University.

The modified FORTRAN program (OPTSYSX) is now designed to run completely interactively under VM/CMS on the IBM 3033 and is considered completely compatible with similar operating systems.

Program capabilities include: complete eigensystem analysis; the ability to perform computations on very large multivariable systems; controller, filter, regulator and compensator synthesis; transfer function analysis; steady-state gain determination; and modal analysis.

The program permits users to rapidly carry out simulation, analysis, and design of all classes of Optimal Systems Control problems in a totally interactive mode. Examples of various types of problems are worked out during individual terminal sessions.

SURVIVABILITY DESIGN GUIDELINES FOR FLY-BY-WIRE FLIGHT CONTROL SYSTEMS DEVELOPMENT

Daniel T. Hogan
Lieutenant Commander, United States Navy
B.S., U. S. Naval Academy, 1970
M.S.S.M., University of Southern California, 1979

Survivability of military combat aircraft has received increased emphasis by the U. S. Armed Services in recent years. The primary objective of the U. S. Military Survivability Policy is to ensure that effective survivability enhancement features are incorporated in current and all future U. S. combat aircraft.

Technological advances in Fly-By-Wire Flight Control Systems have significantly enhanced the performance capabilities of modern fighter/ attack aircraft. In consonance with the military services survivability policy, a series of survivability design guidelines for Fly-By-Wire Flight Control Systems have been developed and are herein presented. A recommendation for future survivability enhancement through the use of digital flight control technology, in a manner similar to artificial intelligence, is presented.

Master of Science in
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Advisor: R. E. Ball
Department of
Aeronautics

PROPOSAL AND DEVELOPMENT PLAN FOR AN AIRCRAFT SYSTEMS INTEGRATION LABORATORY

Robert W. Iler
Lieutenant Commander, United States Navy
B.S., University of Kansas, 1972
M.S., University of Southern California, 1978

This paper presents a proposal and a plan for the development of an Aircraft Systems Integration Laboratory (ASIL) in the Department of Aeronautics at the Naval Postgraduate School. The paper addresses the current and future benefits of, and requirements for, the laboratory in the areas of research and education; describes the capabilities of the proposed laboratory; presents a plan for its development; details the costs involved; and outlines the support required for construction and operation. The purpose of the laboratory will be to conduct research in the man-machine interface problems with aerospace systems and to facilitate the education of Naval aviation officers in the complexities of modern aircraft systems integration.

THE EFFECT OF COMPONENT REDUNDANCY UPON
AIRCRAFT COMBAT SURVIVABILITY

Angelo J. Kangalos
Lieutenant Commander, United States Navy
B.S., Youngstown State University, 1970

Aircraft combat survivability has developed into a discipline of its own. This thesis presents a brief overview of the two integral parts of survivability, susceptibility and vulnerability. It examines the probability of an aircraft being killed given a single shot fired by the enemy. It further examines the redundancy of critical components and the effect redundancy has on the probability of kill of the aircraft. Several numerical examples are given. The thesis also examines the Anti-aircraft Artillery Simulation Computer Program, and the modifications required in order to introduce component redundancy into it are developed.

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REPORT OF TESTS OF A COMPRESSOR
CONFIGURATION OF CD BLADING

Yuksel Koyuncu
First Lieutenant, Turkish Air Force
B.S.A.E., Turkish Air Force Academy, 1978

Results of 14 tests in a subsonic cascade are reported, in which the air inlet angle and Reynolds number were varied. The cascade contained 20 Controlled Diffusion (CD) blades with 5.01 inches chord, aspect ratio of 2.0 and solidity of 1.67. Pneumatic probe surveys and surface pressure measurements were used to obtain blade performance and flow quality data. There was no measurable influence of the Reynolds number on the blade losses in the range of Re. = 474000 to Re. = 690000. Fourteen tests, using seven different inlet air angles over a range of 24 to 46 degrees generated generally well behaved b ... performance parameters. The results were compared with previous results from a corresponding cascade of DCA blades.

DEVELOPMENT OF GRAPHICAL POLE-ZERO, ROOT-LOCUS, BODE, NYQUIST, AND NICHOLS RESPONSES USING THE OPTSYSX PROGRAM

Michael H. Laptos
Lieutenant, United States Navy
B.S., Purdue University, Lafayette, 1977

This thesis discusses the modification of and additions to an existing Optimal Systems Control FORTRAN Program (OPTSYS) originally obtained from Professor Arthur E. Bryson of Stanford University. This program has been subsequently redesigned to run interactively on the IBM 3033 VM/CMS by Lieutenant Commander John G. Hoden, and additions by Commander Harry A. Diel provide the user with a highly accurate graphic time response to a system designed using the OPTSYSX program.

The addition of the FORTRAN program OPTGRAPH gives the user the capability to obtain classical analysis (Pole-Zero Map, Root Locus, Bode, Nyquist, and Nichols) of transfer functions, calculated for a system designed with the OPTSYSX program. The OPTGRAPH program uses high resolution precision plotting software to provide the user with highly accurate frequency response plots.

This series of programs permits users to rapidly carry out simulation, analysis, and design of Optimal Systems Control problems in a totally interactive mode.

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HOLOGRAPHIC INVESTIGATION OF SOLID PROPELLANT COMBUSTION IN A TWO-DIMENSIONAL MOTOR

Yoonsang Lee
Major, Republic of Korea Air Force
B.S., Republic of Korea Air Force Academy, Seoul, 1976

This investigation continued the development of a method for obtaining high quality holograms of the combustion products from metallized solid rocket motor propellants burned in a two-dimensional motor to provide a cross-flow environment. The use of borosilicate side plates as a motor casing allowed good quality holograms to be obtained. With the present two-dimensional motor method there were upper limits of combustion pressure and weight percentage of aluminum where holograms could not be obtained because of excessive smoke opacity.

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AN INVESTIGATION INTO THE SOOT PRODUCTION PROCESSES IN A GAS TURBINE ENGINE

Alan L. Lohman
Lieutenant, United States Navy
B.S., United States Naval Academy, 1977

This thesis details an investigation into the nature of soot production in a gas turbine combustor. The goal was to obtain axial temperature profiles and soot size distributions inside an Allison T63-A-5A combustor. The present temperature probe and gas sampling apparatus were able to acquire data. Results from these initial tests suggested some preliminary conclusions. First of all, flatter temperature profiles were possibly indicative of fuels with lower aromatic content. Also, soot size along the centerline of the combustor did not appear to change appreciably. Soot itself seemed to be composed of 0.1 micron spherical particles prone to agglomeration. Relatively large, puff-like structures observed on sample collection filters were apparently artifacts of the sampling technique. Several methods of improving the apparatus were suggested.

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EASYPLOT: AN INTERACTIVE, USER-FRIENDLY
GRAPHICS PROGRAM

John C. Mainwaring
Captain, United States Army
B.S., United States Military Academy, 1974

This thesis is an interactive FORTRAN program called EASYPLOT, which allows a person to quickly access the NPS IBM 3033 graphics capabilities to produce a professional graph. No programming is required on the part of the user. EASYPLOT systematically asks the user questions, the responses to which are utilized by the DISSPLA software system to output two and three dimensional graphs. This program is available to any Naval Postrgraduate computer user.

Master of Science in   Advisor: R. E. Ball
Aeronautical Engineering   Department of
September 1984   Aeronautics

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HOLOGRAPHIC INVESTIGATION OF SOLID PROPELLANT COMBUSTION PARTICLES

Peter J. Mellin
Lieutenant Commander, United States Navy
B. S., United States Naval Academy, 1971

This investigation continued the development of a method for obtaining high quality holograms of the combustion products from aluminized solid rocket motor propellants burned in a two-dimensional motor to provide a cross-flow environment. The use of glass side plates as a motor casing provided both a convenient construction technique and allowed good quality holograms to be obtained. At combustion pressures above 500 psia and propellant slab thicknesses greater than 0.080 inches, the timing of the laser pulse during the burn was found to be critical, since an extremely short time interval existed between the establishment of steady state slab burning and the generation of too much smoke/combustion products to permit laser penetration. As desired operating pressures increase and aluminum powder particle sizes decrease, it will probably be necessary to use thinner propellant slabs.

IMPROVEMENT TO IBMPIP

Dale A. Milton
Lieutenant, United States Navy
B.M.E., Auburn University, 1971

Two batch air defense programs named P001 and MICE reside on the Naval Postgraduate School IBM 3033 computer. The programs compute the probability of kill of an aircraft by defensive weapons. Data is fed to the programs by an interactive preprocessing program named IBMPIP. Improvements to IBMPIP are proposed to enhance existing capabilities or provide new capabilities. Areas addressed are: introduction of user friendliness; enhancement of graphics capabilities; improvement in the accuracy of results; and a suggested philosophy for evolutionary improvements.

GROUND-UP-TO-SPACE (GUTS) LASER PROPAGATION
CODE DESCRIPTION AND MANUAL

Joel S. Morrow
Lieutenant, United States Navy
B.S., University of South Carolina, 1976

GUTSAVG is a high energy laser propagation computer program for
ground-to-space applications. Written by Dr. C. B. Hogge from the Air
Force Weapons Laboratory, Kirtland, AFB, it is one in a family of propa-
gation codes addressing this application. Specifically, GUTSAVG was
designed to compute irradiance at the target given a model atmosphere,
laser device parameters, and simple target engagement geometry. The
transmitter induced effects of beam quality and jitter are considered,
as are the linear atmospheric effects of scattering, absorption, and
turbulence. A thermal blooming model is also included. Adaptive optics
compensation can be applied with consideration given to isoplanatic
effects.

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TURBULENCE EFFECTS ON A GLOW DISCHARGE
AS DERIVED FROM CONTINUITY AND
ENERGY CONSIDERATIONS

William R. Oker
Lieutenant Commander, United States Navy
B.S., California State Polytechnic University, 1972

Effects of a turbulent gas flow on the stability of a glow discharge are investigated. While it is known that turbulence affects the stability of glow discharges, the mechanism is not clear. Primarily, the problem lies in the very long characteristic times of turbulence phenomena when compared to the glow discharge instability times.

A mathematical model is developed which is solved numerically for the ambipolar diffusion and an overall energy equation in an unsteady, cylindrical coordinate system. Strong perturbations of the electric field are introduced, which disturb an otherwise stable configuration and the effects of turbulence on the time evolution of the perturbation are observed.

It is shown that the modification of the ambipolar diffusion coefficient and the thermal conductivity is a reasonably sufficient model to introduce the turbulence effects. It is found that the charged particles density is effectively the sole source of heating in the gaseous environment of the discharge. It is then shown that turbulence acts to suppress the temperature instability introduced by the discharge streamer.

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Aeronautical Engineering
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Advisor: O. Biblarz
Department of
Aeronautics

AN EXPERIMENTAL INVESTIGATION OF COMBUSTION PRESSURE
OSCILLATIONS IN SOLID FUEL RAMJETS

Ted Michael Parafiorito
Lieutenant, United States Navy
B.S., New York Institute of Technology, 1971

An experimental investigation of the mechanisms involved in combustion pressure oscillations in solid fuel ramjets was conducted. Dynamic pressure measurements of the combustion chamber and air inlet were recorded, while a series of tests using Plexiglas as a fuel were performed. Combustion chamber geometric changes were systematically made in order to help isolate the causal mechanisms. The air inlet system resonant frequency coupling with reattachment zone flow was found to be the major source of pressure oscillations while bypass air injection was the major source of disturbance to the upstream reattachment region of flow.

The combustion efficiency of a vitiated air heater was also evaluated using a gas chromatograph to measure unburned fuel in the exhaust. Negligible unburned gaseous fuel existed for all fuel-air ratios and temperatures.

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Advisor: D. W. Netzer
Department of
Aeronautics

A THREE-DIMENSIONAL TRANSONIC, POTENTIAL
FLOW COMPUTER PROGRAM, ITS CONVERSION
TO IBM FORTRAN AND UTILIZATION

Jack Paschall, III
Commander, United States Navy
B.S., Oregon State University, 1965

This thesis describes the conversion of a computer program from FORTRAN IV for the NOS 1.2 operating system of the CYBER 175 or CDC 6600 computer to FORTRAN IV compatible with the Naval Postgraduate School IBM 3033 system. The converted program, called FLO27, calculates the inviscid, three-dimensional transonic potential flow over wings or wing-body combinations. The data input to FLO27 is extensive; therefore, an interactive program was developed to aid the user in building the required input data file.

DETERMINATION OF QUANTITATIVE RELATIONSHIPS BETWEEN
SELECTED CRITICAL HELICOPTER DESIGN PARAMETERS

Ronald S. Petricka
Captain, United States Army
B.S., United States Military Academy, 1973

This thesis determines the relationships of helicopter design parameters by first depicting graphically all possible pairings of selected design parameter values and then, secondly, depicting graphically respective curve fits for the data point plots which meet an acceptance criteria. In generating the curve plots, the specific constants of each curve equation are determined, thus allowing the designer the ability to derive quantitatively the values of many of the design parameters heretofore selected by trial and error methods.

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SENSITIVITY ANALYSIS OF PREDICTED REACTING FLOW
CHARACTERISTICS IN SOLID FUEL RAMJET COMBUSTORS

Anastasios S. Pilos
Captain, Hellenic Air Force
B.S., Naval Postgraduate School, 1982

This study was a sensitivity analysis of a computer code (based upon CHAMPION/2/E/FIX), used at the Naval Postgraduate School mainly to model the flow within Solid Fuel Ramjets. The purpose of the study was to make the code "simpler" and "more accurate" by reducing the required CPUs time and/or improving the accuracy of predictions.

ANALYSIS OF SYMMETRIC REINFORCEMENT OF QUASI-ISOTROPIC GRAPHITE-EPOXY PLATES WITH A CIRCULAR CUTOUT UNDER UNIAXIAL TENSILE LOADING

Patrick Sullivan
Commander, United States Navy
B.S., United States Naval Academy, 1969

David H. Pickett
Captain, United States Army
B.S., United States Military Academy, 1973

An experimental and computational analysis was made of the strain field around a reinforced circular hole in four HMF330/34 graphite/epoxy panels under uniaxial tensile loading. The basic panel was a 10.0 x 26.0 in. eight ply, quasi-isotropic 0/+ or $- 45/90_s$ cloth laminate. Each panel was reinforced during manufacturing by co-curing two circular plies of the same material to each side of the panel. A circular one inch hole was drilled concentrically through the laminate to provide a stress concentration. Four different reinforcement geometries were used: a combination of $[+ or - 45,...]_s$ or $[0,90,...]_s$ additional plies with the total reinforcement volume equalling 163 or 203% of the removed hole volume. A prior investigation of similar, but asymmetrically reinforced panels demonstrated only a 5 to 12% improvement in ultimate strength compared to an unreinforced panel. The symmetric reinforcement reported here provided an improvement of 29 to 40%. A finite element analysis was made and found to be in excellent agreement with the experimental results.

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A PARAMETRIC INVESTIGATION OF SOOT BEHAVIOR AND OTHER EMISSIONS IN A GAS TURBINE COMBUSTOR

Joseph D. Weller
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1973

An investigation was conducted to determine the effects of operating characteristics and fuel additives in a gas turbine combustor on particulates (soot) and other gaseous emissions (NOx, NO). The principles of Mie theory and three-wavelength light transmittance have been utilized in this investigation to determine particulate size and mass concentration. Using an Allison T63 turboshaft engine combustor, five experimental fuels of varying chemical composition were analyzed from an emissions standpoint. There was no apparent relationship between particulate size and either fuel composition or combustor exhaust temperature. Visible spectrum transmittance did indicate an inverse relation to increasing exhaust temperature. Though only two fuel additives were tested on one fuel, there was no manifestation of improved transmittance with their use.

HIGH ENERGY LASERS: A PRIMER ON DIRECTED
ENERGY WEAPONS FOR SPACE USE

Richard F. Ziska
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1971
M.S., University of West Florida, 1973

The rapid a..d inevitable commercialization and exploitation of space, which is now gaining increased momentum as the Space Shuttle program settles into a regular monthly schedule, is inescapably increasing our dependence on space-based systems of all kinds.   These systems have become vital national interests, the defense of which must be considered whenever realistic wartime scenarios are developed. Consequently, the introduction of weapons into the space environment is an important option, the potential of which must be thoroughly investigated so as not to unwittingly jeopardize critical national assets and ultimately national defense.

This thesis is intended to be a semi-technical "primer" on directed energy laser weapons for utilization in the space environment. The rationale for the selection of space-based laser weapon systems is examined.   Additionally, the basic concepts, components, and operations or three of the most promising methods for the generation of high-power laser energy in space are presented.

MASTER OF SCIENCE

IN

APPLIED SCIENCE

INFORMATION REQUIREMENTS ANALYSIS:
AN APPLICATION

Richard Bray Renner
Commander, Supply Corps, United States Navy
B.S., United States Naval Academy, 1957
M.S., Naval Postgraduate School, 1975

This research applied the methodology of Structured Systems Analysis to the information requirements of the Department of Administrative Sciences of the Naval Postgraduate School. It reviewed all flows of information to and from the Department and showed that even though, in the aggregate, the requirements seem amazingly complex, the analysis can be structured in a sensible, methodical system. The author also recommends several relational data bases and internal reports to support the Department's information requirements, as well as recommending that the analysis approach be adapted throughout the university.

MASTER OF SCIENCE

IN

COMPUTER SCIENCE

GENERAL DESIGN CONSIDERATIONS OF AN
AIR FORCE INFORMATION SYSTEM

Engin Aytacer, Jr.
First Lieutenant, Turkish Air Force
B.S., Turkish Air Force Academy, 1980

General design issues of an Air Force information system are considered in this thesis. Current structure of the system is presented with its requirements. Information storing, retrieving and updating procedures are presented and an example of a logical database is designed. Networking issues are expressed in an undetailed way. Finally, a set of high-end minicomputers are evaluated to present the approximate cost of a system and a general methodology for minicomputer selection process is presented.

DATABASE DESIGN FOR PERSONNEL MANAGEMENT
IN REPUBLIC OF KOREA ARMY

Kwang Soo Baek
Major, Republic of Korea Army
B.S., Republic of Korea Military Academy, 1972

The decision to implement a database is motivated by the need to
share data among a variety of diverse applications and to integrate data
for supporting more sophisticated applications. Both of these
requirements complicate the already difficult task of providing safe and
efficient access to computerized data. The designer should select an
appropriate database model among alternative database models. This
thesis analyses various aspects of personnel management in the Army and
determines relationships between policies and data item relationships.
Further, from the derived model, the data item relationships, database
design theories, and database relationships with these 3 components a
personnel management system is designed. In order to fully implement
these recommendations hardware must be chosen, and a significant volume
of data must be loaded.

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A LEARNING STRATEGY APPROACH FOR TEACHING
NOVICE COMPUTER PROGRAMMERS

Donald D. Begley
Captain, United States Marine Corps
B.S., Miami University, Ohio

The purpose of this thesis is to investigate various learning strategies and present some suggested applications for the teaching of computer programming to Marine Corps entry-level programmers. These learning strategies are used to develop a cognitively designed structure for the teaching of the software engineering process. This structure was designed so that programmers could have readily available in their thinking process, modern software engineering goals and principles that ultimately affect the quality of software.

Also suggested at a lower level of the overall structure is a syntax and semantics organizer. This particular framework serves as an advance organizer for which specific programming language features could be introduced. This structure can act as an organizing mechanism for the introduction of various, useful programming chunks that would start the novice programmer on his quest to becoming an expert.

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AN INTERACTIVE ENVIRONMENT FOR THE DEVELOPMENT
OF AN EXPERT SYSTEM IN ZOG

Dempsey Butler, III
Lieutenant, United States Navy
B.S., United States Naval Academy, 1977

ZOG is a rapid-response, large-network, menu-selection human-computer interface implemented on the PERQ microcomputer. This thesis develops a framework for and discusses issues relative to implementing the OPS7 expert system language as an interactive programming environment in ZOG. It begins by tracing the history of the ZOG system. The logical and physical aspects of ZOG's frame structure are explained. A discussion of the expert system language used in ZOG, OPS7, is presented to acquaint the reader with its character. The subnet schemas required to run an OPS7 style interpreter agent are developed and the user's perspective of the agent is presented. Finally, recommendations for future work in this area are made.

AN INPUT TRANSLATOR FOR A COMPUTER-AIDED DESIGN SYSTEM

Thomas H. Carson
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1971

The purpose of this thesis is to design and implement the input translator for the Computer System Design Environment, which is a computer-aided design system. The Computer System Design Environment is used to design real time controllers for a variety of purposes. The input translator will take an input, which has been developed in the prescribed language, CSDL, and with the aid of a partial syntax-directed editor, translate it into primitive list form. This form is used by the remainder of the system to select the best hardware and software components, described in a set of realization libraries, to build the proposed controller.

PERSONNEL MANAGEMENT DATABASE DESIGN FOR
THE REPUBLIC OF KOREA AIR FORCE

Sang Ho Cha
Lieutenant Colonel, The Republic of Korea Air Force
B.S., The Korean Air Force Academy, 1969

In this thesis we present a conceptual database for ROKAF's Personnel Management, based upon the relational data model. The objective of this thesis is to apply the computerized personnel information system to the area of military officer personnel management. A database design methodology which utilizes multiple levels of conceptual and logical database design structure is presented. We discuss the logical schema design in terms of a stepwise, interactive process of specification and refinement. We present operations to manipulate the relational data model for end-users database processing during the integration process.

The logical database is intended for use within a relational database system. This model has been tested using ORACLE, a relational database management (DBMS) running on the VMS operating system of a VAX 11/780 computer.

DESIGN AND ANALYSIS OF AN ACCESS CONTROL SYSTEM
FOR A MULTI-BACKEND DATABASE SYSTEM

Ali Ekici
Lieutenant Junior Grade, Turkish Navy
B.S., Turkish Naval Academy, 1978

This thesis describes the design and analysis of an access control mechanism for a multi-backend database system (MDBS). MDBS utilizes a minicomputer as the controller and a number of minicomputers and their disk systems as the backends. The database is distributed over the dedicated disk systems of the backends. The operations on the database are performed by the backends in parallel. Thus, the performance gain of the system is dependent on the number of backends in the system. Each backend performs its own access control operations using duplicated access control information.

Master of Science in
Computer Science
June 1984

Advisor: D. K. Hsiao
Department of
Computer Science

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PRELIMINARY DESIGN FOR HARPOON SHIPBOARD
COMMAND-LAUNCH CONTROL SET SIMULATION

Judd R. Eschliman
Lieutenant, United States Navy
B.S., University of Kansas, 1977

To realize the full performance capabilities of the Block 1C
version of the surface launched HARPOON cruise missile, modifications
have been directed on the HARPOON Ship Command-Launch Control Set
(HSCLCS), AN/SWG-1(V). The purpose of this thesis is to begin the
design of modules for a simulation model which meets the specification
requirements of the HSCLCS. These specifications are derived from
stated U. S. Navy requirements, some additional features proposed by the
author, and features proposed in a previous thesis. The simulation
model can then be used for testing and evaluating the proposed
modifications and for training purposes.

Master of Science in   Advisor: R. W. Modes
Computer Science   Department of
December 1983   Computer Science

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USING THE CONTROL SYSTEM DESIGN ENVIRONMENT IN
THE DESIGN OF A DATA LINK RECEIVER UNIT FOR
THE COAST GUARD HH-65A HELICOPTER

F. Sutter Fox
Lieutenant Commander, United States Coast Guard
B.S., United States Coast Guard Academy, 1971
M.B.A., Roosevelt University, 1977

This thesis is an attempt to prove the value of the Control System Design Environment by designing a ship-board or ground-based data link receiver to communicate with the data link installed in the Coast Guard HH-65A helicopter. The Control System Design Environment was intended to allow a designer to use a highlevel language to describe the required inputs and outputs of a system. This highlevel language, the Control System Design Lan age (CSDL) is translated into a list of primitives by a Pascal program, CSDL. S. The primitive list is then compiled into assembly language by a FORTRAN program, NEWCSDL.FOR. The final output includes the hardware and software lists to build a controller that meets the designer's specifications. This particular project includes a project design much more ambitio an any previously attempted in the Control System Design Environmer

PRINCIPLES OF SOFTWARE ENGINEERING
ENVIRONMENT DESIGN

John Richard Frost
Lieutenant Commander, United States Coast Guard
B.S., Florida State University, 1959

The history of programming languages, operating systems and computer hardware is briefly reviewed. Then the general methodology of established engineering disciplines is examined. Software "engineering" is then examined in light of its history and by analogy with the general engineering methodology. Here, a critical difference between software engineering methods and tnose of other disciplines is revealed. Software design is not separated from its implementation nor is there an effective means to communicate a software design from a designer to an implementor. It is shown that without an analog to the engineering blueprint, software engineering is not, and cannot become, a true engineering discipline. In following the engineering analogy, twenty-one principles of software engineering environment design are put forth. These touch on technical, management and ergonomic issues. Finally, it is concluded that work on software engineering environments holds much more promise for improved productivity than the traditional approach of programming language design.

Master of Science in
Computer Science
June 1984

Advisor: B. J. MacLennan
           Department of
           Computer Science

A GUIDE TO MACRO AND MICRO COMPUTER
PERFORMANCE EVALUATION

Gary Kenneth Gray
B.S., Saint Mary's College of Maryland, 1976

Guidelines and discussions are presented for computer performance evaluation at two levels. The first level, Computer Performance Management (CPM) or Macro Performance Evaluation, involves an overall computer performance management strategy concerning the use of computer resources. The role of CPM throughout the computer system life-cycle is also discussed.

The second level of computer performance involves Computer Performance Evaluation (CPE) or Micro Performance Evaluation. A brief discussion of CPE tools is given, as well as how to select a performance monitor. Some computer performance fallacies are revealed and a discussion of the determination of "critical sections" of software systems and program tuning practices for improving system performance is presented.

Limited discussion is devoted to performance issues in relatively new areas in the computer field such as networks, data base management systems and microcomputers.

A DESIGN ANALYSIS AND IMPLEMENTATION OF A
USER-FRIENDLY INTERFACE FOR THE
UNIX OPERATING SYSTEM

Frederick Earl Groenert, Jr.
Lieutenant Commander, United States Navy
B.S.E.E., University of Colorado, 1972

The user interface is a crucial, but often overlooked, part of the computer and software package. It is often the last thing designed. Short term memory aids and session pacing are two of the most important areas in which the machine can assist the user. Inclusion of a screen pointing device brings the computer closer to communicating on human terms. Basing the interface on a common metaphor, e.g. a desk top, can make it easy to learn and use.

In this thesis three facets of the interface are examined: communication from the machine; to the machine; and the dialog between user and machine. The Amiable interface designed for the UNIX operating system is described. Amiable is implemented on a SUN model 150 Workstation in the Naval Postgraduate School Computer Science Laboratory. Interface design is a hard problem, much remains to be done.

Master of Science in   Advisor: G. A. Rahe
Computer Science   Department of
June 1984   Computer Science

DOCUMENTATION FOR SOFTWARE MAINTENANCE

John F. Hall, II
Lieutenant, United States Navy
B.S.E.E., University of Washington, 1978

Documentation as an effective method of transferring information between individuals in order to reduce software maintenance costs is examined. Various categories of documentation are identified and evaluated as to their effectiveness toward easing the maintenance effort. The concept of minimal documentation is introduced as the solution to the problem of determining the correct amount of information required for a specific maintenance task. The idea of utilizing an explicit documentation hierarchy as the ideal method for storing explicit documentation is proposed. With the proper implementation of the documentation hierarchy, the minimal documentation concept can be realized, and the maintenance effort reduced.

MAN-MACHINE INTERACTION: OPERATOR

Susan K. Harding
Lieutenant, United States Navy
B.S., University of Southern Mississippi, 1979

More people than ever before are using computers. Some use only the home computer, while others use large mainframes or both. All computers have an interface with which the person must interact to operate the system correctly. This interface must be designed so that the operator can use the system without wasting time and money. This thesis describes some of the issues which should be considered when designing a man-machine interface, and defines some types of operators and their environments. The issues and their resolution are illustrated by a case study which describes the man-machine interface of an actual United States Navy system in use today.

DESIGN OF AN INTEGRATED SOFTWARE SYSTEM BASED ON THE RELATIONAL DATA BASE MODEL

Patrick John Harrison
Lieutenant, Royal Australian Navy
B.S., University of New South Wales, 1974

Gracie Lee Thompson
Lieutenant, United States Navy
B.A., University of South Florida, 1975

Integration of application programs into a single system has become increasingly important as the workstation environment moves toward uniformity for easier learning and use. This thesis proposes an Integrated Software System (ISS) based on the Relational Database model as a suitable basis for integrating five common applications found in a business office. Relations, or tables, are defined as the common data objects, and it is shown how they are used to support each logical application. Operations based on relational algebra are defined, which extend the functions of ISS beyond the aggregate of the five chosen applications. A simple graphical user interface is designed for the kernel of the system, and a design for a kernel prototype using a UNIX environment is presented.

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SYSTEMS ANALYSIS FOR LARGE ARMY FORMATIONS

Spyridon Kalyvas
Captain, Hellenic Army
B.S., Military Academy of Athens, 1972
B.S., Advanced School of Communication Electronics, 1978

The current functional doctrines of the Large Army Formation (Corp, Division, Brigade) Command Posts are, more or less, refined extensions of doctrinal concepts which were in use for three centuries. These functional doctrines have survived until today because they have been, in general, successful and effective. Today, however, we are entering a new era. New effective weapon systems, often with embedded computers, introduce the impersonal mass destruction of the enemy by long-range indirect and direct fire, requiring complete, precise and especially timely information on the battlefield status. Thus the traditional staff function will not be effective enough in modern warfare unless automated information processing means are studied, designed, developed and used.

This thesis analyzes the Large Army Formation (LAF) as an information system, identifies and defines the functional automation of the staff, and provides a preliminary and basic source study for future detailed investigation on the feasibility and utility of the automation in the Greek Large Army Formations.

Master of Science in
Computer Science
June 1984

Advisor: N. R. Lyons
Department of
Administrative Sciences

A PROPOSAL FOR THE KOREAN COMPUTER INDUSTRY

Kim, Hwa Soo
Lieutenant Commander, Republic of Korea Navy
B.S., Republic of Korea Naval Academy, 1976
B.S., Republic of Korea University, Seoul, 1981

The purpose of this thesis was to carry out a simple proposal for Korean computer industry and government. Furthermore, this thesis is a general proposal in terms of social and economic factors, as well as technological factors. This thesis includes a general proposal for the near future (i.e., "software houses" activation, development of a single market, and the shortage of software technical personnel), a general proposal for the distant future (i.e., social policy, computer research and development center's establishment, and semiconductor company establishment), and a general proposal for the Korean computer marketing field (i.e., consumer education, low cost and high performance strategies, diversification and differentiation strategies, and focal point strategy). A study of Korean computer companies and government is not completed and can not be.

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PERFORMANCE EVALUATION TOOLS FOR A MULTI-BACKEND DATABASE SYSTEM

Joseph G. Kovalchik
Lieutenant, United States Navy
B.S., United States Naval Academy, 1977

In this thesis, we discuss the development of the necessary tools for the performance evaluation of a multi-backend database system, known as MDBS. The basic motivation of the multi-backend database system (MDBS) is to develop an architecture which spreads the work of the database system among multiple backends. It is a major aim of this system to allow capacity growth by the use of additional disk drives and performance improvement by the use of additional backends. However, to verify the design and implementation, it is necessary to test the capability of MDBS in capacity growth and performance gain. Three tools for the performance and capacity tests are investigated. The first tool is the file generation package which creates test files for any artificial database. The second tool is the database load subsystem which loads the artificial database into MDBS. The third tool is the request generation package. This package creates test requests to query MDBS.

The following methodology is used to create an effective tool. First, the properties of an ideal tool are described. Then available existing programs are reviewed and evaluated to determine which program best meets the desired features. Lastly, the programs are upgraded to ensure that they are compatible with the current implementation, and meet the desired features. The main goal is to develop the necessary tools to generate tests in measuring the extensibility of MDBS, i.e., how does MDBS perform as more backends are added? Performance is expected to improve (maintain) as the number (size) of the backends (database) is increased.

Master of Science in
Computer Science
December 1983

Advisor: D. K. Hsiao
Department of
Computer Science

DESIGN AND ANALYSIS OF AN SQL INTERFACE
FOR A MULTI-BACKEND DATABASE SYSTEM

Griffin Newton Macy
Lieutenant, United States Navy
B.S.M.E., University of Kansas, 1978

Recent research in the area of database machines has been directed at achieving greater efficiency and increasing user-friendliness. This thesis is concerned with the second of these research directions, increasing user-friendliness. One development toward increased user-friendliness is the growing acceptance of the relational data model and relational query languages. Relational interfaces provide the user with an easy-to-understand data representation and language with which to manipulate the data.

This thesis presents the design and analysis of a relational query language interface, using the SQL relational query language, for the Multi-Backend Database System (MDBS), a database machine whcih uses the attribute-based model. The purpose is two-fold: first, to provide the user with an easier-to-understand language-to-machine interface, thereby, making MDBS available to the wider community of relational database users; second, to investigate how the attribute-based model may be used to support relational databases.

Master of Science in
Computer Science
March 1984

Advisor: D. K. Hsiao
Department of
Computer Science

83

THE ENHANCEMENT OF CONCURRENT PROCESSING THROUGH FUNCTIONAL PROGRAMMING LANGUAGES

Thomas R. McGrath
Lieutenant Commander, United States Navy
B.S., Cornell University, 1968
M.S.S.M., University of Southern California, 1981

The "von Neumann bottleneck" imposes severe limitations on programming languages. This thesis points out that although the hardware limitations imposed by this bottleneck are being overcome, its constraints will remain in programs as long as there are assignment statements in their code. We assert that functional programming languages allow us to harness the processing power of computers with hundreds or even thousands of processors, and also allow us to solve problems which are time/cost prohibitive on a uniprocessor.

We discuss a mechanical method for transforming imperative programs into functional programs. We feel that the mechanical transformation process is very inexpensive, and that it might be the best way to make imperative "library" programs into functional ones which are well suited to concurrent processing.

SOFTWARE LIBRARY - A REUSABLE SOFTWARE ISSUE

Sherman G. Metcalf
Lieutenant, United States Navy
B.S., Purdue University, 1978

This thesis presents a conceptual view of a reusable "Software Library." Issues concerning the "software crisis" and its subsequent impact on software development are reviewed. The traditional library is described for the purpose of comparison with the Software Library. A particular example of the Software Library, the Program Library, is described as a prototype of a reusable library. A hierarchical structure for a Program Library is discussed as an approach to making the library entities easily accessible and retrievable. The role of application generators in the Program Library is described. The special features of Ada that support programming libraries are described. Finally, non code products in the Software Library are discussed.

A PROGRAM MANAGER'S METHODOLOGY FOR DEVELOPING STRUCTURED DESIGN IN EMBEDDED WEAPONS SYSTEMS

Donald F. Moorehead, Jr.
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1975

James I. Ransbotham, Jr.
Lieutenant Commander, United States Navy
B.S., Georgia Institute of Technology, 1972

This thesis demonstrates a methodology to be used by a Program Manager to allow him to procedurally monitor the design development of an embedded weapons system. The methodology consists of a unique combination of several software engineering strategies integrated to form a powerful management tool. The primary objective of the methodology is to provide an algorithmic procedure which stresses simplicity at all levels of abstraction. Further, the system must be capable of generating good system specifications, good documentation, and fully understandable products. Sample products from the implementation of the methodology on the HARPOON Shipboard Command-Launch Control Set (HSCLCS) are provided for illustrative purposes.

DESIGN AND ANALYSIS OF ORDERING AND JOIN OPERATIONS
FOR A MULTI-BACKEND DATABASE SYSTEM

Serdar A. Aldur
Lieutenant Junior Grade, Turkish Navy
B.S., Turkish Naval Academy, 1978

This thesis proposes implementations of the sort and join in the
Multiple-Backend Database System. The idea of implementing these
operations is to provide better support for relational databases and
relational language interfaces. The key issue analyzed is the
distribution of functionality of the operation across the multiple
minicomputers of the MDBS architecture. The join analysis also examines
alternative join algorithms.

A DICTIONARY/DIRECTORY SYSTEM (DDS)
FOR THE SPLICE SYSTEM

Vassilios Panagiaris
Commander, Hellenic Navy
B.S., Hellenic Naval Academy, 1966

As a result of growing demands for Automated Data Processing at the Navy Stock Points and Inventory Control Points, long range plans are being developed around the Stock Point Logistics Interface Communications Environment (SPLICE) concept. Problems and opportunities are involved with designing and using distributed systems.

This thesis investigates the area of data dictionary/directory systems with special focus on distributed systems and attempts to outline the benefits for the SPLICE system from the use of a data dictionary/directory system. Interface considerations between data dictionary/directory system (DDS) and neighboring modules are also discussed.

Master of Science in
Computer Science
June 1984

Advisor: N. F. Schneidewind
Department of
Computer Science

MULTIPLEXING ETHERNET IN A MULTI-USER CP/M-86 SYSTEM

Izzet Percinler
Major, Turkish Army
B.S., Turkish Army Academy, 1967
M.S., Aitia Statistics, 1977

This thesis describes the Data Communications Software that demonstrates the viability of multiplexing Intel ISBC 86/12A Single Board Computers contained in a Multibus-based multi-user CP/M system. The NI3010 MULTIBUS-ETHERNET Communication Controller Board provides the interface between Multibus-based Microcomputers and an Ethernet Local Area Network. The Intel MDS (CP/M-86 based), for demonstration purposes within the context of this thesis, acts as a remote host. In future applications, it is envisioned that the remote host(s) will be either MDS-based systems or Digital Equipment Corporation's (DEC) VAX-11/780 (Unix Operating System) or the IBM 3033 mainframe.

Master of Science in
Computer Science
June 1984

Advisor: U. R. Kodres
Department of
Computer Science

THE DESIGN AND IMPLEMENTATION OF A SYNTAX DIRECTED EDITOR FOR A SPACE CONSTRAINED MICROCOMPUTER

Robert F. Richbourg
Captain, United States Army
B.S., Wake Forest University, 1976

Syntax directed editors (SDE) have been built to support popular languages or subsets or those languages. Typically, these implementations require large amounts of computing resources. This work describes the design and implementation of a SDE which requires less than 58 thousand bytes of main memory and supports the full C programming language. Several extant SDE models are examined in an effort to define a basic set of SDE facilities. Design principles are combined with machine constraints to produce a plan for the implementation of these facilities. A sample session with the resulting editor is provided.

The syntactic irregularities of the C programming language are examined. A discussion showing how language irregularities can hamper the implementation of a SDE follows. A grammatical definition of the C language is included.

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DESIGN AND ANALYSIS OF A COMPLETE RELATIONAL INTERFACE FOR A MULTI-BACKEND DATABASE SYSTEM

Richard Edward Rollins
Commander, United States Navy
B.S., United States Naval Academy, 1966

Organizations of all types are becoming increasingly dependent on the operation of database management systems based on one of the three generally known data models (i.e., network, hierarchical, or relational) for the centralized control of operational data. As an alternative to the development of separate, stand-alone systems for specific models, recent research has proposed a system designed to support multiple data models and model-based languages, as if the system is a heterogeneous collection of database systems. This proposal is based on the existence of a simple and powerful data model to which the three well-known models can be mapped. This model, the attribute-based data model, is the data model upon which the Multi-Backend Database System (MDBS), a software database machine, is based. This thesis concentrates on the language interface aspects of implementing MDBS as a kernel for the support of relational databases. In particular, this thesis provides the design and analysis of an interface between the relational query language (SQL) and the attribute-based data language (ABDL).

Master of Science in
Computer Science
June 1984

Advisor: D. K. Hsiao
Department of
Computer Science

91

ADAPTATION OF MCORTEX TO THE AEGIS
SIMULATION ENVIRONMENT

Willis Ralph Rowe
Lieutenant, United States Navy
B.S., University of Kansas, 1977

This thesis presents the adaptation of a multi-computer real-time executive, MCORTEX, to a target environment consisting of a set of INTEL 86/12A single board computers in a MULTIBUS back plane. CP/M-86 is brought under the control of MCORTEX, and mechanisms are implemented to provide access to the MCORTEX supervisor from Digital Research's PL/I-86 language system.

Initially CP/M-86 is operating the system of microcomputers in a multi-user mode. MCORTEX and user processes are loaded from CP/M-86 files. Use of all CP/M-86 functions is retained and MCORTEX can be used by PL/I-86 compiled applications programs to do multi-processing.

MULTIPLEXING THE ETHERNET INTERFACE AMONG VAX/VMS USERS

Antonios K. Sakellaropoulos
Major, Hellenic Air Force
B.S., Hellenic Air Force Academy, 1972

Ioannis K. Kidoniefs
Lieutenant, Hellenic Navy
B.S., Hellenic Naval Academy, 1975

This thesis focuses on the multiplexing of Ethernet interface among Vax-11/780 users. Since there is only one channel that connects VAX-11/780 system to Ethernet Local Area Network, multiplexing of the NI1010 Unibus Ethernet Communication Controller is necessary in order to service multiple VAX users concurrently via Ethernet.

Described herein is a Time Division Multiplexing of NI1010 controller, which can serve up to nine (9) separate VAX users. The developed software enables those users to communicate in any combination with one or more computer systems, which are connected to Ethernet as well. Two Microcomputer Development Systems (MDS) and VAX/VMS system were used for the implementation and texting of the project. The software is designed in such a way that those MDSs act very much like virtual VAX/VMS terminals.

A STANDARD OPERATING SYSTEM INTERFACE FOR
MICROCOMPUTER SOFTWARE DEVELOPMENT

Roger Stemp
Lieutenant, United States Navy
B.S., Auburn University, 1975

The majority of discussion directed at standardizing microcomputer operating systems has revolved primarily around establishment of a set of standardized primitives (a kernel) to be made available for use by programmers. To this end little progress has been made. Establishment of a universal kernel for microcomputer operating systems, or for mini or mainframes for that matter, is not only virtually impossible but also highly narrow in scope.

This thesis presents a possible solution to standardization efforts through implementation of a 'Dynamic Kernel' achieved by the establishment of a universal protocol between application programs and microcomputer operating systems via a standard interface structure. A high level design of the necessary interface structure and recommended primitives for initial inclusion in the 'Dynamic Kernel' are presented along with brief discussions of the inherent dangers and benefits that may be encountered.

Master of Science in   Advisor: D. L. Davis
Computer Science   Department of
March 1984   Computer Science

INTERNAL AND EXTERNAL PERFORMANCE MEASUREMENT
METHODOLOGIES FOR DATABASE SYSTEMS

Robert C. Tekampe
Captain, United States Marine Corps
B.S.E.E., University of Washington, 1975

Robert J. Watson
Captain, United States Marine Corps
B.S.E.E., University of Kansas, 1977

The scope of this thesis is two-fold. The first is to provide a methodology for the performance measurement of database systems. The second is the application of this methodology to a specific database system, in an attempt to verify the applicability of this methodology and the performance and capacity claims of the database system.

As a methodology, the thesis describes the strategies and locations for the placement of checkpoints, the kinds of performance data to be collected, the environment for the conduct of the performance measurement and the interpretation of the results. One of the most important contributions of this methodology is its capability to obtain actual measurement overhead making the presentation of truly accurate results possible. As an application of this methodology, we attempt to validate the performance and capacity claims of an experimental multi-backend database system known as MDBS. Surprisingly, these claims have been validated.

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INTERACTIVE DATA ANALYSIS: DEVELOPMENT OF AN INTERACTIVE DATA MANIPULATION SYSTEM

Nicholas G. Totos
Commander, Hellenic Navy
B.S., Hellenic Naval Academy, 1967

Large amounts of data collected during experiments or produced as outputs of programs that simulate systems, usually need further treatment in order to complete the research task. One step of the data analysis process is the manipulation of the data.

The data, even when stored in a computer, can be considered as inert if it cannot be manipulated. Manipulation may be considered any appropriate arrangement or transformation of a logical data matrix composed by the data.

The inert data matrix is activated and becomes an "Active Matrix" by the developed system IDAMAN (Interactive DAta MANager). It is expected that this system, based on the idea of Dr. Daniel Guinier, fulfills the demands for such manipulations. Compared to existing similar alternative systems, this system possesses two particular merits: no specific language is required; and the separation of data manipulation task from acquisition and future calculus grants to the system a higher power of expandability.

Master of Science in
Computer Science
June 1984

Advisor: R. H. Weissinger-Baylon
Department of
Administrative Sciences

IMPROVEMENTS TO SOFTWARE MAINTENANCE METHODS IN REAL TIME EMBEDDED AVIATION FLIGHT SYSTEMS

Robert Burton Upchurch
Lieutenant, United States Navy
B.A., Missouri University, 1976

Software maintenance costs in Naval Aviation Operational Flight Programs (OFP) are very high and are projected to climb higher in the future. Maintenance costs are high due to poor initial design, limited programmer and system resources, poor documentation, the conditions under which the OFP must operate and the difficulty involved in performing meaningful flight software tests. The primary factors which produce the stated maintenance phase of the software lifecycle model proposed for standard application software systems is contrasted with that for real time, embedded, aviation software systems. A limited set of software tools and methodologies which are currently available and would greatly aid the system engineers tasked with OFP maintenance is proposed. These tools and methodologies center on two areas of flight software maintenance: documentation and testing. The thesis concludes with recommendations for future aviation flight software systems.

Master of Science in
Computer Science
December 1983

Advisor: G. H. Bradley
Department of
Computer Science

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THE APPLICATION OF A GENERAL PURPOSE DATA BASE MANAGEMENT SYSTEM TO DESIGN AUTOMATION

Heather J. Walden
Lieutenant, United States Navy
B.S., Penn State University, 1977

This thesis describes the analysis of the Computer Systems Design Environment data base requirements, the design of a relational model to fulfill those requirements, and the implementation of that model on a general purpose data base management system.

DESIGN AND ANALYSIS OF A COMPLETE HIERARCHICAL
INTERFACE FOR A MULTI-BACKEND DATABASE SYSTEM

Doyle Joseph Weishar
Captain, United States Army
B.S., United States Military Academy, 1975

Typically, the design and implementation of a conventional database system begins with the choice of a data model, the specification of a model-based data language, and the design and implementation of a database system which controls and executes the transactions written in the data language. For example, we have the hierarchical model, the DL/I language and the IMS System. By using an unconventional approach to the design and implementation of a basic database system, we can design a system to support multiple data models and several model-based languages as if the system is a heterogeneous collection of database systems.

In this thesis we present a methodology for supporting hierarchical database management on an attribute-based database system. Specifically, we construct an interface which translates Data Language/One (DL/I) calls into attribute-based data language (ABDL) requests. We describe the data structures, the control structures, and the functions required to implement this interface.

AN INTERACTIVE ENVIRONMENT FOR A
COMPUTER-AIDED DESIGN SYSTEM

Duard Stephan Woffinden
Captain, United States Army
B.S.E.E., Utah State University, 1975

There has been increased interest in the design of human-computer
interfaces since personal computers have become popular. This thesis
examines several existing design methodologies for creating a human-
computer interface and then proposes a set of general design principles
to be followed. An initial implementation of a human-computer interface
for the computer-aided design system CSDE is presented.

Master of Science in
Computer Science
June 1984

Advisor: A. A. Ross
Department of
Computer Science

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MULTILEVEL SECURITY FOR THE INTEGRATED SOFTWARE SYSTEM MAIL APPLICATION

Robert W. Wyatt
United States Department of Defense
B.A., College of William and Mary, 1974
B.S., University College/University of Maryland, 1981

In order to avoid the development of the entire conceptual design of a multilevel secure electronic mail application, an approach is taken to develop the design through the integration of multilevel security features into an existing conceptual design. The conceptual design of the electronic mail application of the Integrated Software System (ISS) is used as the source of application specific functions. Thus the aim of the thesis is the conceptual design of those features which would make the ISS electronic mail application multilevel secure.

The first section of the thesis explores those issues and areas of work which impact on the design of the security features. The second section develops the conceptual design of the security features. During the design, the author establishes the attributes necessary to support multilevel secure access mediation, defines a modularization which supports and enhances security, and defines the user interface required by the modularization.

Master of Science in
Computer Science
March 1984

Advisor: D. Z. Badal
Department of
Computer Science

MASTER OF SCIENCE

IN

ELECTRICAL ENGINEERING

EQUILIBRIUM SOLUTIONS, STABILITIES AND DYNAMICS OF LANCHESTER'S EQUATIONS WITH OPTIMIZATION OF INITIAL FORCE COMMITMENTS

Ang Bing Ning
Captain, Republic of Singapore Navy
B.S., University of Singapore, 1979

Generalized Lanchester-type differential equations are used to study combat processes. This system of non-linear equations has multiple equilibrium solutions which can be determined by a numerical technique called the Continuation Method. Useful properties pertaining to neighborhood stability are derived by considering the lowest-dimensional (1*1) problem. A new set of parameters based on the system asymptotes is defined and used to characterize stability. System dynamics are investigated using phase trajectories, which are found to depend on the domains of attraction and stabilities of surrounding equilibria. The effect of varying initial force levels (X,Y) is studied by calculating an objective function which is the difference of the losses at the end of a multistage battle simulation. Based on the minimax theorem, a set of mixed strategies for (X,Y) can be found. For highly unstable warfare with large war resources, instability can be used to influence battle outcome.

PULSEWIDTH MODULATED SPEED CONTROL
OF BRUSHLESS DC MOTORS

Andrew A. Askinas
Lieutenant, United States Navy
B.S., Union College, 1979

Until recently, few alternatives existed for the use of hydraulic and pneumatic actuators in primary flight control applications. With the advent of the samarium-cobalt permanent magnet brushless dc motor, consideration must now be given to the utilization of an electro-mechanical actuator in missiles which require significant maneuvering capability and hence, greater torques. This thesis investigates the theory and techniques of pulse width modulated speed control of brushless dc motors. After describing basic pulse width modulation (PWM) concepts, two constant velocity control schemes are presented: current feedback and a limit cycle scheme. By calculating the motor form factor (a figure of merit for power losses in the switching transistors which comprise the PWM network), the relative worth of each scheme is then evaluated. An in depth study is conducted of the limit cycle approach, with an emphasis on the power loss reductions obtained through the reduction of the velocity limit settings.

COMPUTER AIDED ANTENNA DESIGN AND FREQUENCY
SELECTION FOR HF COMMUNICATIONS

Warren P. Averill
Captain, United States Marine Corps
B.S.E.E., Oklahoma University, 1978

Efficient and reliable high frequency skywave communication can be obtained only if wave propagation paths are carefully analyzed, and if an antenna which transmits and receives signals along the desired paths can be selected and designed. A micro-computer based program was developed to accomplish this task.

Master of Science in
Electrical Engineering
June 1984

Advisor: H. M. Lee
Department of
Electrical and Computer
Engineering

APPLICATION OF A SILICON COMPILER TO VLSI
DESIGN OF DIGITAL PIPELINED MULTIPLIERS

Dennis J. Carlson
Lieutenant Commander, United States Navy
B.S., Rensselaer Polytechnic Institute, 1969

The concept and application of silicon compilers is described.
The process of employing the MacPitts silicon compiler to design an 8-bit pipelined digital multiplier is presented and the resulting design
is evaluated. The process of installing and debugging the MacPitts
Compiler and the Caesar VLSI graphics editor on the VAX-11/780 computing
facilities at NPS is documented in appendices.

Master of Science in　　　　　　　　　Advisor:　D. E. Kirk
Electrical Engineering　　　　　　　　　　　　　Department of
June 1984　　　　　　　　　　　　　　　　　　　Electrical and Computer
　　　　　　　　　　　　　　　　　　　　　　　Engineering

IMPLEMENTATION OF AN INTEL 8086 MICROPROCESSOR-BASED
REALIZATION LIBRARY FOR THE CONTROL
SYSTEM DESIGN LANGUAGE

Alan Jeffrey Cetel
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1975

A library for use by the computer aided design system, known as the Control System Design Environment, made up of hardware and software primitives of the Intel 8086 microprocessor family, was written to extend the capabilities of the design system to more than two microprocessor families. Compatibility between this library and the U.Intel 8080 library was desired and achieved by use of designs originally realized with the 8080 library.

Master of Science in
Electrical Engineering
June 1984

Advisor: H. H. Loomis
Department of
Electrical and Computer
Engineering

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INVESTIGATION OF NON-LINEAR ESTIMATION
OF NATURAL RESONANCES IN
TARGET IDENTIFICATION

Choong Y. Chong
Lieutenant, Korean Navy
B.S., Seoul National University, 1980

This investigation considers a non-linear technique for extracting natural resonances from transient electromagnetic scattering responses of radar targets. These natural resonances represent the complex poles of the target's transfer function in the Laplace transform s-plane. The advantage of their use in identification is their dependence only upon the geometry and composition of the target and not upon the aspect and polarization of the incident signal.

Based on recent theoretical research, a new signal model has been developed for describing the form of the transient scattering response. This form precludes the optimal use of previous methods for natural resonance extraction based on Prony's algorithm. In this effort, a modified least-squares approach is taken which can accomodate the actual form of the transient signal. The algorithm is tested using simulated signals with various noise levels and conclusions are drawn concerning the viability of the method

Master of Science in   Advisor: M. A. Morgan
Electrical Engineering   Department of
December 1983   Electrical and Computer
                                             Engineering

A TRANSDUCTION PATH METHOD OF SOLID STATE
SENSOR ANALYSIS AND INVESTIGATION

Curtis L. Dubay
Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1979

This paper proposes a "transduction path" method of analysis for solid state sensors. It is based upon the idea that a sensor represents a transduction path from some input measurand to an electrical output. The transduction path may consist of one or more transduction or modification principles drawn from all fields of science. Also proposed is a "transduction path diagram" which provides a graphical representation of a transduction path. Background material concerning the development and description of solid state sensors is presented. Sensor measurands are identified and categorized by energy form. The known transduction and modification principles are presented as fundamental building blocks of the transduction path and cro.s-indexed by measurand. The transduction path diagram is introduced and examples or existing single and multistep tranducers are presented. Finally, the transduction path method is shown to be valuable as a systematic method of investigating sensor configurations.

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AN ANALYSIS OF COHERENT DIGITAL RECEIVERS
IN A JAMMING ENVIRONMENT

Faris T. Farwell, Jr.
Lieutenant, United States Navy
B.S., United States Naval Academy, 1978

The effect of various jammer waveforms on known optimum coherent digital receivers is analyzed and evaluated in terms of receiver performance. The optimum jammer waveform for the specified receiver is derived and several jamming strategies are studied and compared to the optimum case. These jammer waveforms strategies include deterministic models of tonal, weighted signals, frequency modulated, and additive white noise jammers. An M-ARY digital coherent receiver using orthogonal modulation (FSK), is subjected to various jammer waveforms and the receiver performance analyzed. Graphical results based on numerical analyses are presented to show the effects of jammer waveforms on receiver performance.

Master of Science in
Electrical Engineering
June 1984

Advisor: D. C. Bukofzer
Department of
Electrical and Computer
Engineering

OPTIMIZATION OF GUIDANCE AND CONTROL USING FUNCTION MINIMIZATION AND NAVSTAR/GPS

Vicente Chavez Garcia, Jr.
Lieutenant, United States Navy
B.S.E.E., New Mexico State University, 1978
M.S.E., University of Central Florida, 1982

A carefully designed controller, tuned to minimize a performance criterion based on representation of the added drag due to steering, can minimize propulsion losses. A computer simulation modeling the Sea-Land Mclean (SL-7) containership was coupled to a function minimization subroutine and a sea-state generator subroutine to accomplish the tuning. Storing these optimal controller parameters in a look up table as functions of ship state, sea state, and encounter angle, this technique can be used as an adaptive controller. Satellite platforms can give continuous environmental operating conditions which may be used to select proper controller parameters to provide continuous operation on a minimum of the cost function. The SL-7 containership computer model was tested in calm waters and in a seaway.

DEVELOPMENT OF REAL-TIME ERROR ELLIPSES AS AN INDICATOR OF KALMAN FILTER PERFORMANCE

Joseph Jaros
Commander, United States Navy
B.S., University of Texas, 1967

An error ellipse plotting routine was developed to provide real-time indication of Kalman filter performance. The study included an evaluation of the Hewlett-Packard HP-86 computer system's capability for providing real-time tracking information and an evaluation of the computer's possible use on the three-dimensional underwater tracking range at the Naval Underwater Weapons Engineering Station, Keyport, Washington. A series of tracking runs were used to demonstrate both linear and extended Kalman filtering. Information obtained from the error ellipses was used to modify filter parameters for improved filter performance. It was found that the error ellipse was useful as a tool for indicating filter performance and for making decisions regarding filter parameter modification. The HP-86 provided accurate, reliable results and it could be used for on-line graphics. However, the computing speed of the HP-86 computer as used in this study was too slow for on-line processing of the three-dimensional tracking problem.

Master of Science in
Electrical Engineering
March 1984

Advisor: A. Gerba
Department of
Electrical and Computer
Engineering

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MULTIPLE TARGET IDENTIFICATION AND DIRECTION FINDING
USING MATCHED FILTERING TECHNIQUES

James L. Johnston
Captain, United States Marine Corps
B.S.E.E., San Diego State University, 1975

This research investigates seismic signal processing techniques for battlefield target classification and acquisition. Multiple target classification is performed by discrete time domain matched filtering. Multiple target directions are determined using the responses of the matched filters and least mean squares polynomial curve fitting. The least mean squares polynomial curve fitting procedure is also used for direction finding for recoil/blast sources, using the unfiltered seismic signals.

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A DESIGN METHOD FOR A STATE FEEDBACK MICROCOMPUTER CONTROLLER OF A WIDE BANDWIDTH ANALOG PLANT

Ki Chul Kim
Lieutenant Commander, Republic of Korea Navy
B.S., Republic of Korea Naval Academy, 1976
B.S.E.E., Korea University, 1980

In the design of a microcomputer regulator, continuous or discrete method can be applied. The objective of this thesis is to provide a continuous controller design method that can be used to compensate for the effect of the microcomputer transport lag. The compensation over the frequency range of interest yields a regulator response approximately equivalent to a direct analog feedback controller. The technique uses state feedback method for development of the required phase compensation. The continuous system design is additionally compared to the discrete system design for the second order system numerical example. The method however is shown to be general enough to also apply to higher order system.

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NOISE CANCELLATION USING ADAPTIVE ARRAYS

Constantinos G. Manikas
Lieutenant, Hellenic Navy
Hellenic Naval Academy, 1974

All known adaptive beamformers utilize some form of automatic minimization of the mean square error. High adaptation rates though, exhibit a signal cancellation phenomenon leading to self-jamming by the adaptive antennas. This effect results from adaptive interaction between signal and interference (i.e., jammer) inputs simultaneously received by an adaptive antenna. This research investigates various existing ways of adaptive beamforming for noise cancelling, and signal enhancement from simple Adaptive Noise Cancellers to Hard Constraint Adaptive Beamformers.

INTEGRATION OF AN APPLE II PLUS COMPUTER INTO
AN EXISTING DUAL AXIS SUN TRACKER SYSTEM

Roger J. Morais
Lieutenant, United States Navy
B.S., University of Washington, 1977

This thesis describes the integration of an Apple II plus computer into an existing sun tracking system. The Apple Computer replaced an Intel 80/10A single board computer as the system controller. Software development and hardwiring were necessary to successfully integrate the new computer into the system. With the new computer installed, user interaction with the tracking system became possible. Additionally it was possible to replace hard to interpret assembly language code with higher level Basic code as the system controlling software.

Master of Science in
Electrical Engineering
June 1984

Advisor: H. A. Titus
Department of
Electrical and Computer
Engineering

UTILIZATION OF A BUBBLE MEMORY SYSTEM AS
A MICROCOMPUTER DISK RESOURCE

Gary A. Theis
Lieutenant Commander, United States Navy
B.S., University of Mississippi, 1972

Bubble memory is an emerging technology that is only beginning to realize its potential. The unique properties that this memory system possesses provides advantages in many situations. Bubble memory is non-volatile, solid state, and very durable. In addition this memory has a high density and a fast access time. These attributes are excellent for the non-ideal conditions found in industry and the military.

This thesis presents an implementation of an iSBC 254 Bubble Memory System as a disk resource in a standard microcomputer environment. An Intel 8086 microprocessor is used as the host executing under Digital Research's CP/M-86 operating system. This implementation is completely transparent to the user and requires no additional disk commands.

CSMP MODELLING OF BRUSHLESS DC MOTORS

Steven M. Thomas
Lieutenant, United States Navy
B.A., University of Delaware, 1976

Recent improvements in rare earth magnets have made it possible to construct strong, lightweight, high horsepower DC motors. This has occasioned a reassessment of electromechanical actuators as alternatives to comparable pneumatic and hydraulic systems for use in flight control actuators for tactical missiles. This thesis develops a low-order mathematical model for the simulation and analysis of brushless DC motor performance. The model is implemented in CSMP language. It is used to predict such motor performance curves as speed, current and power versus torque. Electronic commutation based on Hall effect sensor positional feedback is simulated. Steady state motor behavior is studied under both constant and variable air gap flux conditions. The variable flux takes two different forms. In the second case, the flux is varied as the sum of a sinusoid and one of its harmonics.

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INVESTIGATION OF USING THE WALSH TRANSFORM
FOR DE-INTERLEAVING SIMULATED
ESM RECEIVER OUTPUT

Larry Wayne Ward
Lieutenant Commander, United States Naval Reserve
B.S., North Carolina State University, 1975

The Walsh Transform is investigated for its usefulness in deinterleaving the interleaved pulse stream presented to a preprocessor by an ESM receiver. After background chapters on a typical ESM system and the theory and characteristics of the Walsh Functions, a number representation of the pulse stream is described. Fast Walsh Transforms and Power Spectral Densities of the pulse representations are computed and analyzed for features that could be used to recognize individual pulse trains in the interleaved representation.

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COMPUTER SIMULATED DEVELOPMENT OF A COMMAND TO LINE-OF-SIGHT MISSILE USING ON-OFF CONTROL

Je Young, Yeun
Lieutenant Colonel, Korean Air Force
B.S., Korean Air Force Academy, 1972

An on-off control provides a minimum time response for missile control. For application in missile control systems, it is wasteful of control effort (due to chatter) to use a ideal relay. Hence, it is necessary to modify the ideal relay into a saturating linear control. The result was almost the same to that of using the ideal relay.

Master of Science in
Electrical Engineering
December 1983

Advisor: H. A. Titus
Department of
Electrical and Computer
Engineering

MASTER OF SCIENCE

IN

ENGINEERING ACOUSTICS

THE ACOUSTIC PRESSURE IN A WEDGE-SHAPED WATER
LAYER OVERLYING A FAST FLUID BOTTOM

Chil Ki Baek
Lieutenant Commander, Republic of Korea Navy
B.S., R.O.K. Naval Academy, 1972

A simple equation and computer program for the pressure and phase distribution in a wedge-shaped medium overlying a fast absorbing bottom from a point source at infinite distance from the wedge apex was formulated by using the method of images. The computer program used for calculations was tested for perfectly reflecting boundaries. A sample case using a more realistic bottom is presented and discussed.

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A COMPARISON OF IMPEDANCE MEASUREMENT TECHNIQUES IN AIR

James Thomas Mason
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1970

The acoustic impedance of several Helmholtz resonators were measured using two different techniques. The first technique employed the conventional Standing Wave Tube method. The second was the Dual-Microphone Transfer Function method of J. Y. Chung and D. A. Blaser. The calculability of the frequency dependent Helmholtz resonator impedance allowed the methods to be compared for both absolute accuracy and relative precision. The average relative precision for the SWT technique was 4.2% while the average for the dual-microphone technique was 18.4%.

AMPLITUDE SHADING AND PHASE WEIGHTING OF A VERTICAL LINEAR ARRAY IN THE SOFAR CHANNEL BY THE LINEAR MINIMUM VARIANCE ESTIMATION TECHNIQUE

Daniel P. McVicar
Captain, Canadian Armed Forces
B.Eng., Nova Scotia Technical College, 1976

A single linear vertical passive array is used in the 'SOFAR' channel to determine the depth of a single underwater source at a constant range. The phase and amplitude weights applied to the array are determined by the linear minimum variance estimation technique. The resulting beam pattern is compared to the conventional time domain beamformer. It was found that the linear minimum variance estimation technique of amplitude shading and phase weighting was significantly superior to the conventional beamformer.

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FIBER OPTIC GRADIENT HYDROPHONE

Gary B. Mills
Lieutenant, United States Navy
B.S., University of Utah, 1975

A laboratory study has been made of the characteristics of an interferometric type optical fiber pressure gradient hydrophone. The optical system is configured as an all-fiber Mach-Zehnder interferometer excited by a single mode gallium arsenide diode laser. A pair of identical fiber coils, one in each arm of the interferometer, forms the sensing portion of the gradient hydrophone. Each coil consists of 10 meters of polyethylene jacketed, single mode fiber, wound in a doughnut shaped element of mean diameter 4 cm and thickness 3 mm. An acoustic calibrator, similar in design to the USRD type G40 shipboard calibrator used by the U. S. Navy, was constructed for use in obtaining single and dual (dipole) coil sensitivities. The acoustic sensitivity of each coil was determined separately and then the pair was aligned coaxially and separated by 10 cm to operate as a pressure gradient device. Details of the construction of the system, calibration procedure, lock-in demodulator, and hydrophone sensitivity data are presented. The system has demonstrated a 14 dB sensitivity advantage over the USRD type G63 standard (piezoelectric) pressure gradient hydrophone.

ABSOLUTE ELECTRO-ACOUSTIC MEASUREMENT OF TEMPERATURE OSCILLATIONS IN SUPERFLUID HELIUM BY THE RECIPROCITY METHOD

James Valdivia, Jr.
Lieutenant Commander, United States Navy
B.S.E.E., University of New Mexico, 1974

Bradley Ray Ogg
Lieutenant, United States Navy
B.S., University of Louisville, 1977

An experiment will be described which has verified for the first time an extension of the reciprocity calibration technique to reversible thermal transducers in superfluid helium. A plane-wave resonator of circular cross-section was capped at both ends by reversible teflon slit-electret diaphragms to generate or detect thermal waves. The resonator also incorporated a heater and a d.c.-biased carbon resistance thermometer to set independent upper and lower limits on the thermal excursions within the resonator. The temperature excursions measured by the reciprocity method fell between the upper and lower limits, which, for lower modes, were separated by only a few percent. For higher modes, the lower limit departed from the upper limit due to the thermal inertia of the resistance thermometer, but the reciprocity result remained only a few percent below the upper bound set by the thermophone over nearly a decade in frequency. The "slit-electret" transducers had sensitivities in excess of 100 V/oK, and temperature oscillations as small as 10-10 oK/(Hz1/2) were detected.

SUPPRESSION OF FINITE-AMPLITUDE EFFECTS IN SLOSHING MODES IN CYLINDRICAL CAVITIES

Si Hwan Yum
Lieutenant Commander, Republic of Korea Navy
B.S., Republic of Korea Naval Academy, 1973

A pertubation expansion is formulated for the three-dimensional, nonlinear, acoustic-wave equation with dissipative term describing the viscous and thermal energy losses encountered in a cylindrical cavity. The theoretical results show that nonlinear effects in sloshing modes are strongly suppressed.

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MASTER OF SCIENCE

IN

ENGINEERING SCIENCE

A COMPUTER PROGRAM TO CALCULATE THE SUPERSONIC
FLOW OVER A SOLID CONE IN AIR OR WATER

Patrick W. Hughes
Lieutenant, United States Navy
B.S., University of Washington, 1978

The computer program calculates the supersonic flow over a cone in air or water. The main objective is to calculate the cone semi-vertex angle given prescribed initial conditions. The program is written in structured FORTRAN and implements Busemann's graphical integration technique. Supersonic flow over a cone in water is useful as a good first approximation to the motion of the metal jet from an explosive shaped-charge fired underwater.

A typical result for supersonic flow over a cone in water is as follows: given an upstream temperature, 323.16 Kelvin; upstream pressure, 1 bar; shock angle, 20.0 degrees; and pressure behind the shock front, 5 kilobars, the cone semi-vertex angle is calculated to be 7.23 degrees.

Generally, pressures involved in water flow are much larger than for air flow, and the cone semi-vertex angles for water flow are smaller than for air flow.

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DESIGN AND ANALYSIS OF COORDINATED
BANK-TO-TURN (CBTT) AUTOPILOTS FOR
BANK-TO-TURN (BTT) MISSILES

Ioannis S. Lioulis
Lieutenant, Hellenic Navy
B.S.E.E., Naval Postgraduate School, 1983

This work addresses the design and anlysis of the Pitch, Yaw and Roll autopilot for application to the Bank-to-Turn (BTT) missiles. At first, the linear uncoupled channels were designed and analyzed according to the desired requirements. Utilizing the uncoupled channels, the linear coupled autopilots were designed, not including the inertial, kinematic and aerodynamic cross-coupling. Then, the nonlinear CBTT autopilots were designed and analyzed, using the linear CBTT (coordinated Bank-To-Turn) models, which now have coupled with kinematic, inertial and aerodynamic cross-coupling. The minimization of the above kinematic and inertial coupling and their effects were completed using feedbacks of angle-of-attack and rate of angle-of-attack in the Pitch autopilot.

DIGITAL COMPUTER APPLICATIONS OF KALMAN
FILTER IN TARGET TRACKING

Vasilios I. Martzoucos
Lieutenant, Hellenic Navy
B.S., Naval Academy of Greece, 1975

This paper analyzes the problem of tracking targets in noisy conditions.

First a basic background is provided. That includes general concepts from estimation theory and a specific description of the Kalman filter and its use for treating the various aspects of the target tracking problem.

Then progressively more difficult situations of target tracking examples are simulated and the results are analyzed and compared with the literature.

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REAL-TIME APPLICATIONS IN MULTIPROCESSOR SYSTEMS

M. Kadri Ozyurt
Lieutenant Junior Grade, Turkish Navy

This thesis builds a simulation model of a tactical fire control system in a real time environment, using a tightly connected multiprocessing system consisting of two single board computers. The additional hardware used in this project consists of an ADM-3A video terminal with a built-in retrographics feature, an MDS microprocessor development system, an analog-to-digital converter, and two sets of triplet potentiometers. The potentiometers are used to feed analog information about ownship, targetship, and gun position to the simulation model, which then evaluates and computes projected target positions and gun control parameters, and displays the results.

DISPERSION SENSITIVITY OF THE EIGHT INCH
ADVANCED RAMJET TECHNOLOGY PROJECTILE
DUE TO WIND AND MINOR THRUST ERRORS

Steven Ronald Poole
Major, Canadian Armed Forces
B.S., College Militaire Royale de Saint Jean, 1975

Advanced Ramjet Munitions Technology (ARMT) is an ongoing project within the Defense Advanced Research Projects Agency (DARPA) to research ramjet munitions. The ARMT eight inch projectile uses ramjet thrust for a boosted trajectory, but operates on a thrust drag balance concept to create a pseudo vacuum trajectory during powered flight. The trajectory was analyzed using an IBM 370 computer simulation for three and five degrees of freedom. Work was also done to adapt the Ballistics Research Laboratories six degrees of freedom program to the IBM system. Projectile aerodynamic and mass properties were obtained from the Norden Systems Wind Tunnel Data. Dispersion from the vacuum trajectory due to wind prior to ramjet burnout proved minor. Dispersion due to constant thrust errors under 5% was within a 600 foot radius at terminal guidance over a range of 33 miles.

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APPLICATION OF SENSITIVITY ANALYSIS TO AERODYNAMIC PARAMETERS OF A BANK-TO-TURN MISSILE

Tiago da Silva Ribeiro
Major, Brazilian Air Force
B.S., Instituto Tecnologico de Aeronautica, 1976

This thesis is an application of parameter sensitivity analysis to aerodynamic parameters of a Bank-to-Turn missile. In the development, a brief review of trajectory sensitivity theory is presented. A linear analysis is performed using an Uncoupled Pitch Channel Autopilot and a Coupled Roll-Yaw Channel Autopilot of the missile taken as model. Finally, a nonlinear analysis is given for the system. Comparisons between the linear and nonlinear cases are outlined.

THE EFFECT OF COLD WORK ON MARTENSITIC
TRANSFORMATIONS IN CU-ZN-AL
SHAPE MEMORY ALLOYS

Stephen Mark Sullivan
Lieutenant, United States Navy
B.A., Vanderbilt University, 1976

Samples of martensitic Cu-Zn-Al shape memory alloy were deformed by cold rolling below M_f (martensite finish temperature). The effect of cold work upon the reaction kinetics of parent to product and product to parent transformations was studied utilizing differential scanning calorimetry methods. Characterization of the microstructure of selectively deformed shape memory alloy samples was accomplished by optical and transmission electron microscopy techniques. Correlation of microstructure and substructural conditions with associated transformation trends provided an understanding of the effect of cold work, as characterized by stress induced morphology, upon shape memory behavior.

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CHARACTERIZATION OF SUBMERGED-ARC AND GAS-METAL-ARC
WELDMENTS IN HY-100 STEEL

Alfred E. Therrien
Lieutenant Commander, United States Navy
B.S. Eng., Maine Maritime Academy, 1971

Unsatisfactory weld toughness in submerged arc welded (SAW) HY-100 steel weldments precludes this process from large scale HY-100 shipbuilding production efforts. The gas metal arc welding (GMAW) process produces acceptable weldments in HY-100 steel. Optical, scanning electron and transmission electron microscopy were utilized to characterize and compare the microstructures in the last pass in each weldment for each process. The SAW weldment contains a coarse-upper bainitic microstructure and the GMAW weldment contains a martensitic structure. The cooling rate in the SAW was 42% slower than in the GMAW. The SAW contained 25% more weld metal inclusions than the GMAW. Microhardness traverses were conducted and the profiles relect significantly lower microhardness in the untempered last pass weld metal of SAW weldment, but the tempered weld metal microhardness in both weldments was measured at 250 HV. Charpy impact tests were conducted and impact transition curves were developed revealing that the SAW weldments ductile-to-brittle transition temperature was 50°C higher than the GMAW weldment.

Master of Science in
Engineering Science
December 1983

Advisor: K. D. Challenger
Department of
Mechanical Engineering

OPTIMAL DIGITAL CONTROL OF A
BANK-TO-TURN MISSILE

Carlos A. L. Velloso
Major, Brazilian Air Force
B.S., Instituto Tecnologico de Aeronautica, Brasil, 1976

This work addresses the application of digital optimum control theory to a bank-to-turn missile.

A optimal guidance law has been developed and tested in several scenarios, using a 2-D model. Effects of sample rate, pitch angle, gravity and approximations for small and large roll excursions are discussed.

MASTER OF SCIENCE

IN

HYDROGRAPHIC SCIENCES

STANDARDIZED GUIDANCE FOR THE ESTABLISHMENT
OF A NATIONAL HYDROGRAPHIC OFFICE
IN DEVELOPING NATIONS

Mark L. Faye
Physical Scientist, Defense Mapping Agency
B.A., State University of New York at Buffalo, 1975

A set of guidelines to be used in rendering advice and assistance to a nation attempting to establish a national hydrographic agency is warranted by various agencies of the U. S. Government. This thesis addresses the many aspects which need to be considered in setting up such an agency including the need for accurate nautical charts; a statement of mission, objectives and goals; organizational structure and function; training requirements; technical assistance available; and space, time, and cost estimates during the span of agency development.

The organization will be able to accomplish its objectives with a total of 23 employees divided into two organizational units. It is shown that a survey launch with six survey personnel is all that is necessary to achieve the identified near-term survey mission requirements. Time requirements will vary depending on whether survey operations can be conducted either on a year-round or seasonal basis--both scenarios have been identified.

AN ASSESSMENT OF THE POTENTIAL ROLE
OF MULTI-SPECTRAL IMAGERY IN
BATHYMETRIC CHARTING

Richard Thomas Joy
B.S., University of Maryland, 1976

Previous research has demonstrated the feasibility of deriving
water depth information from Landsat Multispectral Scanner (MSS) digital
data. However, previously published results, analyzed together with two
new case studies, show that the magnitude of errors (approximately 1-2
meters) in MSS single band depth estimates is too large for direct
production of bathymetric charts. Better accuracy is possible, though,
if MSS data are used to interpolate conventional soundings between
survey tracklines, especially if the survey vessels obtain concurrent
optical ground truth data. If depth accuracy standards can be met, the
MSS interpolation approach will be extremely cost effective. In addi-
tion, MSS imagery is shown to be a useful tool for planning and managing
conventional surveys. A recommended set of procedures is outlined for
incorporating MSS image data into an operational bathymetric mapping
program. A comprehensive program of development and operational demon-
stration surveys is recommended to convincingly establish the utility
and cost effectiveness of these procedures.

Master of Science in   Advisor: J. L. Mueller
Hydrographic Sciences   Department of
September 1984   Oceanography

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CRITERIA FOR THE CLASSIFICATION OF
HYDROGRAPHIC POSITIONING DATA

Nicholas E. Perugini
Lieutenant, National Oceanic and Atmospheric Administration
B.S., Pennsylvania State University, 1976

Two methods for evaluating the accuracy of hydrographic positioning data are presented. One method consists of classifying each position a survey based on the radius of the 90 percent confidence circle. The second method involves classification of positions based on the parameters of the 90 percent confidence ellipse. Both methods are based on geometric and statistical relationships between intersecting lines of position.

Range-range, azimuth-azimuth, and range-azimuth positioning data are classified using both criteria. For noncritical positions, the confidence circle method is found to be preferable due to its ease of interpretation. For positions of significant features, such as underwater hazards, the confidence ellipse provides a more useful representation of the shape and orientation of the true error distribution.

The concept of presurvey positioning design is also presented. With the aid of computer graphic displays, the hydrographer can predict the accuracy of offshore positioning data prior to data acquisition. By analyzing accuracy lobes generated about shore stations, a survey can be designed to meet given specifications.

REAL-TIME POSITION DETERMINATIONS USING
THE GPS TI4100/GEOSTAR RECEIVER

Peter J. Rakowsky
Cartographer. Defense Mapping Agency
B.S., University of Maryland, 1979

The NAVSTAR Global Positioning System is a worldwide, all-weather, satellite positioning system capable of high accuracy real-time position determination. The Applied Research Laboratories (ARL:UT), in conjunction with the Naval Surface Weapons Center (NSWC/DL) and other government agencies, conducted geodetic field tests of a government sponsored prototype receiver, the TI4100/GEOSTAR, in March 1984. Data were acquired from four satellites by three receivers, with antennas located at known stations, over approximately six-hour periods each day.

Based on the real-time solutions acquired on March 1, 8, and 9, 1984, absolute point position determinations have an average discrepancy of 7.5 meters with a one sigma repeatability of less than a meter. Relative positions were determined to an average relative accuracy of 1:9,700 for distances of 14 to 26 kilometers.

MASTER OF SCIENCE

IN

INFORMATION SYSTEMS

PROPOSED MANAGEMENT CONTROL REQUIREMENTS
OF THE U. S. COAST GUARD INFORMATION
RESOURCE MANAGEMENT ARCHITECTURE

William Robert Ashforth
Lieutenant Commander, United States Coast Guard
B.A., Northeastern University, 1972

This thesis places the Information Resource Management Architecture of the U. S. Coast Guard in the 'contagious growth' stage of Nolan's model of organizational computer growth. Control is the next stage predicted by the model. The financial accounting basis of EDP chargeback and control systems is examined as a precursor to developing five management control requirements of the IRM architecture. These include (1) aggregate financial accounting for information services, (2) an auditable user access/authorization scheme, (3) a user-oriented chargeback system, (4) pricing to establish an information marketplace, and (5) an information decision tool to assist in user tradeoff decisions between information services. Finally, an integrated system to satisfy these requirements at the Coast Guard District Office level of the IRM architecture is described, based on a Local Area Network system.

MANAGEMENT CONSIDERATIONS FOR
AN INFORMATION CENTER

John D. Auvil
Naval Air Test Center, Patuxent River, MD
B.S.E.E., West Virginia Institute of Technology, 1971

Recent studies have shown that the data processing industry has a very severe problem to solve. In the next few years there is going to be an extensive increase in millions of instructions per second (MIPS) available due to increases in hardware technology. It is imperative that the software development industry find ways to utilize this capability. Increased programmer productivity is the key.

This thesis introduces the Information Center concept that will allow management to better utilize existing data processing capability by providing users the tools required for increased software productivity. An actual government installation is used as an example of using a modern Systems Analysis approach in the installation of an Information Center. Industry trends are discussed and the debate of centralization versus decentralization presented.

OFFICE AUTOMATION AND THE NAVY
FINANCE CENTER

James Lawrence Barrett
Lieutenant Commander, United States Navy
B.S., New Mexico State University, 1975

The availability of computer technology and its continually declining costs has led to its application in the office environment. The use of computers and microelectronics in the office for the support of secretarial and managerial staff has been given a number of titles, the most common term being "office automation." The road to successful office automation is paved with stumbling blocks. User impatience to acquire office automation, the lack of understanding among senior executives, the proliferation of incompatible components, and unsuccessful pilot projects are some of the challenges that could confront the Navy Finance Center during the implementation of office automation. The purpose of this thesis is to define office automation and its components, recommend a plan to determine its feasibility at the Navy Finance Center, and recommend a methodology for implementation.

NARDAC OPERATIONS:
A CASE STUDY

Lawrence G. Beasley
Lieutenant Commander, United States Navy
B.A., California State University, Long Beach, 1974

This thesis presents an examination of operations within a typical Navy Regional Data Automation Command (NARDAC), specifically the Departments of Management Support and Data Processing Installation within NARDACs. The scope of this thesis will concern functional boundaries and changes to these boundaries as a result of a shift from mission funding to Navy Industrial Funding (NIF). The purpose of this examination is to discern not the propriety of the funding shift, but to critically examine operations as affected by the shift. In view of the changing environment in which NARDACs operate, some suggestions for organizational streamlining will be offered.

Master of Science in   Advisor: D. ". Gu.
Information Systems   Departme of
September 1984   Administrative Sciences

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THE CREATION OF A CENTRAL DATABASE
ON A MICROCOMPUTER NETWORK

John G. Boynton
Major, United States Army
B.S., United States Military Academy, 1972

Ronald G. Nichols
Lieutenant Commander, SC, United States Navy
B.S., Ohio State University, 1974

This thesis discusses the design and development of a central database on a network of microcomputers. It provides an overview of the methodology utilized in creating the system, along with the problems associated with a central database. The thesis includes the source listings for the creation of the system and a discussion of the difficulties of controlling contention within the networked database environment.

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DATA COMMUNICATIONS INFORMATION
RESOURCE MANAGEMENT AND NAVAL
DATA AUTOMATION COMMAND

James L. Branson
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1972

Thomas H. Yee
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1971

Data communications, as in emerging technologies, poses managerial problems for the Navy. The problems involve keeping knowledgable about new technologies, evaluating their application, and controlling usage to ensure compatiblity with organizational strategic goals. An IRM framework is utilized to examine the problems and to discuss the viewpoints of and decision problems faced by the user, as a buyer, and central management, as the provider of information based services. Alternative means of providing the service include outside consultants, NAVTELCOM, NAVDAC/NARDACs, or expanding an individual activities staff. Each of these is a viable option and each are analyzed. The authors recommend the formation of a steering committee, comprised of representatives from NAVDAC and NAVTELCOM, to provide strategic direction and policy and an Organizational Technology Team to provide targeted assistance as a significant step toward managing the implementation of this emerging data communications technology.

THE IMPLEMENTATION OF MICROCOMPUTER SYSTEMS
FOR THE REPUBLIC OF KOREA'S NAVAL SHIPS

Young Kyu Choe
Lieutenant Commander, Republic of Korea Navy
B.S., Republic of Korea Naval Academy, 1973

This thesis outlines an approach for the acquisition of microcomputer systems to support the Republic of Korea's Naval combatant ships. At present, most shipboard information handling operations are performed manually by crew members. These operations are labor intensive, drawing on the Republic of Korea Navy's manpower and operational readiness. To reduce this manpower drain, the development of a microcomputer system onboard ROKN ships is presented. Additionally, system design considerations, and how to choose microcomputer systems onboard ROKN ships are discussed at length.

MANAGEMENT CONTROLS FOR NAVY
COMPUTING CENTERS

Dewey R. Collier
Lieutenant Commander, United States Navy
B.S., Auburn University, 1971

Thomas L. Hoffman
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1971

The rapid growth of information systems technology has created new challenges for the information/computer center management. Major investments in computer hardware and software and expansion of the data processing roles in many organizations has had profound effects on the management of those organizations. A management control system must be used to 1) provide communication between the user and the data processing activity to act in the best interests of the organization, 2) encourage effective and efficient use of the information resource and 3) provide information relevant to future investment decisions. Each organization has specific organizational objectives that change over time and therefore requires a control system mechanism that must be sufficiently flexible to continue to meet those objectives.

This thesis provides a managerial guide by which a computing facility manager can implement a management control system or evaluate an existing system.

INFORMATION RESOURCE MANAGEMENT FOR NAVAL
SHORE ACTIVITIES: CONCEPTS AND
IMPLEMENTATION STRATEGY

Harold T. Cronauer
Lieutenant Commander, SC, United States Navy
B.S., United States Naval Academy, 1972

Dennis L. Worley
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1972

The authors provide a methodology for implementing IRM in Naval shore activities. The research stemmed from the authors' perception that hardware procurement was overshadowing the determination of actual information system requirements. The framework presented approaches an Information Resource Management implementation from the perspective of the activity's commanding officer. The emphasis is on the information needs of the commanding officer and the criticalness of identifying the information requirements prior to automating an information system for the activity. The evolution of Information Resource Management is discussed and precedes a presentation of an IRM infrastructure for the shore activity. The authors include a case for an IRM professional within the Navy. The thesis concludes with a detailed checklist to aid the commanding officer in the thought processes required to initiate the implementation of IRM for a Naval shore activity.

COMPARATIVE ANALYSIS OF GOVERNMENT AND
PRIVATE SECTOR ADP ACQUISITION

James M. DeLorenzo
Lieutenant Commander, SC, United States Navy
B.S., Quinnipiac College, 1973

Stephen L. LaRue
Lieutenant Commander, SC, United States Navy
B.S., United States Naval Academy, 1972

This thesis has identified the primary regulatory and administrative requirements related to the acquisition of major automated information systems (AIS). In addition, case analysis was performed on current ADP projects to evaluate the application of acquisition directives and to obtain pertinent cost data for model development. A baseline model was created from available data using the Interactive Financial Planning System (IFPS). This model delineates the cost elements germaine to the approval and acquisition phases of the life cycle management process. This concluded the initial phase of an effort towards a comparison of government and private sector acquisition processes. Further analysis of these acquisition processes is recommended for continued model refinement, including decision support system applications.

COPYRIGHT LAW, COMPUTER SOFTWARE,
AND GOVERNMENT ACQUISITION

Paul Raymond Dauphinais
Lieutenant, United States Navy
B.A., Bridgewater State College, 1977

This thesis examines copyright law as it relates to computer software and how this law affects the government acquisition of computer software.

Following a differentiation of copyright law, patent law, and trade secrets, a brief history of the evolution of copyright law is presented. Current government software acquisition practices are examined with respect to copyright statutes. The 1984 Betamax case is examined and related to software issues which concern the government as an entity. Finally, considerations which influence software procurement and copyrights are examined.

Master of Science in   Advisor: N. R. Lyons
Information Systems   Department of
September 1984   Administrative Sciences

AUTOMATION OF THE REPORTING AND TRACKING
REQUIREMENTS OF ARCHITECT-ENGINEERING
TYPE CONTRACTS

John T. Etheridge
Lieutenant Commander, United States Navy
B.S.M.E., Auburn University, 1975
M.B.A., Pepperdine University, 1982

The Naval Facilities Engineering Command utilizes several automated systems in carrying out its mission. These systems are presently geared toward the Headquarters and major command levels of management and not toward the field activities and smaller offices. This thesis examines an Architect-Engineer type contracting management procedure and proposes an automated alternative of the contract administration process using micro-computer technology for field activities. A brief examination is made of the NAVFAC automated systems and of the structure of the NAVFAC contracting organization prior to the presentation of a proposed A-E Management Information System. The closing chapters discuss integration of the proposed system, automated tools which make the system possible and the interface designs utilized to make the system user friendly.

Master of Science in   Advisor: W. R. Talutis
Information Systems   Department of
September 1984   Administrative Sciences

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A LOGICAL DESIGN OF A SESSION SERVICES CONTROL LAYER OF A DISTRIBUTED NETWORK ARCHITECTURE FOR SPLICE

Barry Albert Frew
Lieutenant, United States Navy
B.S.A.S., Miami University of Ohio, 1976

This thesis provides a logical design view of the session services control layer of a distributed network to be used in the SPLICE (Stock Point Logistics Integrated Communication Environment) project. It examines the functional requirements of session services, the data necessary to provide that functionality, and the interfaces required. These areas typically focus on the SPLICE application specifically, but apply to a generic session services as well.

The recommendations that are offered relate specifically to the SPLICE application and address the prospect of placing a fault tolerant capability in session services for SPLICE. Other recommendations are appropriate only to the SPLICE environment.

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SUGGESTIONS FOR DEVELOPMENT OF COM. _ RIZED
PRODUCTIVITY MEASUREMENT IN MILITARY
OUTPATIENT CLINICS

Michael Joseph Galdun
Lieutenant, NC, United States Navy
B.S., State University of New York at Buffalo, 1970
B.S. in Nursing, Emory University, 1976

A method to measure productivity in military outpatient clinics does not exist. Present methodologies are too broad in scope to assess these clinics successfully. A methodology is proposed to measure output by using an indicator based on six weighted components of output measure. These components were derived from the literature concerning productivity measurement, from existing methodologies, and from the author's personal experience.

ECONOMIC ANALYSIS OF ADP

Phillip J. Gardner
Lieutenant, United States Navy
B.S., University of Nebraska, 1978

Ronald S. Handrop
Lieutenant, United States Navy
B.S., University of West Florida, 1977

Christopher T. Nichols
Lieutenant, United States Navy
B.S., United States Naval Academy, 1978

This thesis was produced for the Naval Data Automation Command to help increase field analyst's capabilities to produce quality economic analyses. The field analyst is introduced to both concepts and methodology. It is tailored to the field analyst's background. Both economic analysis and budgeting are covered.

THE NAVTAG SYSTEM AND ITS MODIFICATION
TO INCLUDE THE SH-60B HELICOPTER

Francis R. Goodwin
Lieutenant, United States Navy
B.A., University of Louisville, 1978

The Naval Tactical Game (NAVTAG) Training Systems are to become
the standard war gaming computers in Fleet use to train Surface Warfare
Officers in tactical operations.   As modern weapons platforms are
developed, they need to be modeled into NAVTAG in order that they might
be included in applicable at-sea engagements.   In support of this
objective, the SH-60B (SEAHAWK) Anti-Submarine Warfare Helicopter, which
is currently not supported by NAVTAG, is incorporated into the NAVTAG
System.   The SH-60B is incorporated into the NAVTAG System with the full
range of functions that are enjoyed by other aircraft modeled in NAVTAG.
Using NAVTAG, the SH-60B is tested in an Anti-Submarine Warfare (ASW)
scenario developed to test its capabilities against a Soviet submarine.
For comparison and testing purposes, the SH-60B is also compared to the
SH-2F helicopter previously modeled in NAVTAG.   Both helicopters have
comparable mission objectives and tactics.

This is a research project to determine if NAVTAG can be modified
in a research environment, and with what degree of difficulty this may
be accomplished.   This in no way is meant to modify the Standard NAVTAG
Systems that have been distributed to fleet units, without the consent
of the Program Manager.

Master of Science in   Advisor: A. F. Andrus
Information Systems   Department of
September 1984   Operations Research

MANAGEMENT ASPECTS OF SOFTWARE MAINTENANCE

Brian J. Henderson
Lieutenant, United States Navy
B.A., University of Washington, 1979

Brenda J. Sullivan
Lieutenant, United States Navy
B.S., The American University, 1976

The Federal government depends upon software systems to fulfill its missions. These software systems must be maintained and improved to continue to meet the growing demands placed on them. The process of software maintenance and improvement may be called "software evolution." The software manager must be educated in the complex nature of software maintenance to be able to properly evaluate and manage the software maintenance effort. In this thesis, the authors explore software maintenance from a management perspective, highlighting topics of critical importance. These topics include forecasting software maintenance, estimating the resources required to perform software maintenance, managing maintenance personnel and effectively utilizing software tools. The synthesis of these topics forms a managerial paradigm for understanding the evolutionary nature of software maintenance.

A DECISION MODEL FOR SELECTION OF MICROCOMPUTERS
AND OPERATING SYSTEMS

Keith G. Highfill
Lieutenant, United States Navy
B.A., University of Rochester, 1977

A framework for the construction of an economic analysis model is suggested for the selection of microcomputer hardware and operating systems. The model is suggested in order to guide a prospective Navy microcomputer purchaser through the large number of available microcomputer systems. The model is designed such that common "spreadsheet" software programs can be utilized to manipulate the model and store data on available systems.

In addition, comparisons are made of current popular microcomputer systems and operating systems, in order to provide a frame of reference for the use of the model.

A FRAMEWORK FOR SOFTWARE DEVELOPMENT

Eric C. Hughlett
Lieutenant Commander, United States Navy
B.S.B.A., Appalachian State University, 1975

All sectors of society are confronted with what has been termed the "software crisis." As the world's largest single buyer of software, the Department of Defense has undertaken major software initiatives to ameliorate software-related problems associated with major computer systems acquisition. This thesis provides an overview of common problems in both embedded and administrative software development and acquisition. It defines quality software in terms of its characteristics, and provides the project manager/acquisition agency with a set of accepted controls to assure that quality is built in to software for improved maintainability. The difficulties and limitations of providing accurate estimates in software development are discussed in terms of software metrics. A number of DOD current and future standardization efforts are discussed, including the Army's development of a Military Computer Family (MCF), Ada, and the STARS initiative.

A PRELIMINARY DDS DESIGN FOR SPLICE
BASED UPON THE TANDEM DBMS

James R. Johnson
Captain, United States Marine Corps
B.A., Central Washington University, 1975
M.B.A., National University, 1981

David C. Ruff
Lieutenant, United States Navy
B.B.A., University of Mississippi, 1976

This thesis considers a Data Dictionary/Directory System (DDS) for the Stock Point Logistics Integrated Communications Environment (SPLICE) project using the TANDEM DBMS package. The thesis first gives a background on SPLICE, then describes the concept of Data Dictionary/ Directory Systems. In the coming age of information resource management, DDSs will increasingly become an important management tool of the database administrator. Highlights of the DDS facilities are mentioned as are design and distribution considerations.

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REUSABLE SOFTWARE

William C. Johnson
Lieutenant Commander, MSC, United States Navy
B.A., University of the South, 1973
M.S., Trinity University, 1976

This thesis reviews the topic of software reusability with special emphasis upon the reusability of products of the design phase of the software life cycle. The ideas of software reuse as a capital-intensive process and reuse of products of all phases of the software life cycle are also presented. The thesis presents a formal definition of the term software reusability, presents a hypothetical design scenario incorporating reuse, and compares the requirements of a reusable software design methodology with features of existing design methodologies. Other issues pertinent to software reuse in general, and reuse of design in particular, are reviewed.

Master of Science in
Information Systems
March 1984

Advisors: G. H. Bradley
Department of
Electrical and Computer
Engineering

N. R. Lyons
Department of
Administrative Sciences

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IMPLEMENTATION OF KOREAN AND CHINESE CHARACTERS THROUGH COMPUTER

Chong Hae Kim
Major, Republic of Korea Army
B.S., Korea Military Academy, 1976

Sung Woo Ko
Major, Republic of Korea Army
B.A., Korea Military Academy, 1976

Methods of representing Korean and Chinese characters are presented, using a limited number of keystrokes on a standard keyboard. Various attempts have been made to find the most efficient way to represent these characters such as enumeration methods, 16-bit coding for Korean character syllables, and the meaning and the sound method for Chinese characters. Details of these are explained with a brief introduction to some general properties of Korean and Chinese characters currently used in Korea.

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COMPUTER-MANAGED INSTRUCTION: THEORY, APPLICATION
AND SOME KEY IMPLEMENTATION ISSUES

Michael Korbak, Jr.
Lieutenant Commander, United States Naval Reserve
B.S., University of Pittsburgh, 1972

Use of computers in education has not materialized to the extent envisioned. In an attempt to better understand the use of computers in the educational arena, this thesis focuses on one viable application called Computer-Managed Instruction. It presents a capsulated examination of what Computer-Managed Instruction is, what it consists of, and what functions it performs. It examines some of the systems currently available to develop the flavor of actual system operation. Also, this thesis explores key student-teacher implementation issues of Computer-Managed Instruction, providing some insight into the slow acceptance and use of computers in education.

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APPLICATION OF THE COHEN, MARCH AND OLSEN "GARBAGE CAN"
DECISION PROCESS THEORY TO THE OPERATIONAL
BATTLE GROUP COMMANDER

William A. Lillard
Lieutenant Commander, United States Navy
B.S., North Carolina Methodist College, 1968

David M. Birdwell
Lieutenant, United States Navy
B.S., University of Texas at Arlington, 1975

The purpose of this thesis is to evaluate the usefulness of a decision support system utilizing the Cohen, March and Olsen "Garbage Can" decision theory in support of Battle Group Command operations. This thesis broadens the knowledge of decision support system application in an operational flag staff organization, with specific emphasis given to the usefulness of the Cohen, March and Olsen garbage can decision model in such an environment. It contains background history on the Composite Warfare Concept (CWC) and interfacing problems, a review of the topical area in study, and specifically addresses a methodology of data collection in an actual battle group situation for subsequent program implementation and validation. Included in this study is a brief statistical analysis of the program results. The main source of information for the thesis was interviews of senior U. S. Navy officers knowledgeable in the CWC concept and/or Command, Control, and Communications, and an exhaustive literature search of pertinent articles. The main source of program implementation data was the SEACON 84-1 wargaming exercise, conducted November 12 - 18, 1983 at the Naval War College, Newport, Rhode Island.

THE SIMULATION OF A MAJOR AUTOMATED INFORMATION
SYSTEM (AIS) ON A MICROCOMPUTER

Keith V. Lockett
Captain, United States Marine Corps
B.S., United States Naval Academy, 1977

Michael E. O'Neil
Captain, United States Marine Corps
B.S., Miami University, 1978

The objective of this thesis is to determine if a mainframe
computer Automated Information System (AIS) can be simulated on a
conventional microcomputer. To this end, the topical areas of software,
hardware, the simulation development lifecycle, and systems testing and
evaluation are explored in-depth. The purpose of this in-depth subject
area examination is to demonstrate the tradeoffs and decision points
encountered in the systems management lifecycle. Recommendations based
upon these tradeoffs and decisions are then presented. Lastly, the
conclusions address the attainment of the thesis objective.

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AN ANALYSIS OF DATA DICTIONARIES AND THEIR ROLE
IN INFORMATION RESOURCE MANAGEMENT

Ronald L. Owens
Lieutenant Commander, United States Navy
B.B.A., Hardin-Simmons University, 1971

Suzanne L. Landin
Lieutenant, United States Navy
B.A., University of Washington, 1973

The goal of efficient management of an organization's information resource can be accomplished through the implementation and use of a data dictionary. This thesis defines the structure and functions of a data dictionary and analyzes the attempt of the National Bureau of Standards to promulgate a standard software specification for use in the evaluation and selection of data dictionaries in the federal government. Criteria for the "ideal" data dictionary are developed based on the role a dictionary can play in information resource management and are then used to evaluate four commercial data dictionary packages. Finally, some ideas concerning possible applications for data dictionary technology are present.

LOGICAL DESIGN OF A DECISION SUPPORT SYSTEM
TO FORECAST TECHNOLOGY, PRICES AND COSTS
FOR THE NATIONAL COMMUNICATIONS SYSTEM

Edwin C. Partridge,III
Captain, United States Army
B.S., University of Southern Mississippi, 1974

Kent A. Williams
Lieutenant, United States Navy
B.S., United States Naval Academy, 1977

This work describes the logical design of a proposed decision
support system for use by the National Communications System in
forecasting technology, prices and costs. It is general in nature, and
only includes those forecasting models which are suitable for computer
implementation. Because it is a logical design, it can be coded and
applied in many different hardware and/or software configurations.

AN AUTOMATED INDIVIDUAL TRAINING RECORD MANAGEMENT
SYSTEM (PROTOTYPE), UNITED STATES MARINE CORPS

Ronald E. Pruiett
Lieutenant Colonel, United States Marine Corps
B.S., United States Naval Academy, 1967
M.S., University of Southern California, 1982

David P. Haeusler
Captain, United States Marine Corps
B.A., University of Colorado, 1977

This thesis examines the feasibility of implementing an existing manual system, the Individual Training Record Management System, on a microcomputer. To demonstrate conceptual feasibility, a prototype is designed and implemented utilizing a commercially available database management system (DBMS). The prototype is not intended to be a fully operational system. Rather it provides an opportunity to demonstrate functions that could be fully implemented in similarly designed systems utilizing the basic criteria of simplicity, utility and low cost.

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AN UPDATE OF THE FUNCTIONAL REQUIREMENTS OF THE NAVAL AVIATION LOGISTICS COMMAND MANAGEMENT INFORMATION SYSTEM (NALCOMIS)

James W. Puffer
Commander, United States Navy
B.A., University of Colorado, 1966

Efforts to improve naval aviation readiness have taken the form of automated aviation maintenance management information systems. The Naval Aviation Logistics Command Management Information System (NALCOMIS) is a large complex system that has been in development since the mid-1970s. An interim system of a smaller scale, Status Inventory Data Management System (SIDMS), has been operational on Atlantic Fleet aircraft carriers for over two years.

This thesis updates the functional requirements of NALCOMIS based on inputs from operational users of the interim system SIDMS. Data from questionnaires and structured personal interviews provide conclusions as to which functional requirements are most important/useful and which are least important/useful from a user point of view. The conclusions provide guidance for NALCOMIS implementation.

ASPECTS ON THE DEVELOPMENT OF THE NEW
COMP''TER TECHNOLOGY IN INDONESIA
.C A DEVELOPING COUNTRY

Benny Tjardono Reksoprodjo
Major, Indonesian Navy
B.S., Bogor Agriculture Institute, Indonesia, 1962

Srihartono Imam Subagyo
Captain, Indonesian Air Force
B.S., Gadjah Mada University, Indonesia, 1965
Drs. Degree, Gadjah Mada University, Indonesia, 1973

Indonesia is relatively new as an independent country. Indonesia
obtained its independence right after World War II at the same time that
the computer entered its developing stage. Meanwhile the development of
computer technology has been advancing faster than that of Indonesia as
a new nation. This fast advancement of computer technology resulted in
the realization today, that the acceptance of the computer is critical
to survival. Indonesia faces several problems that are sometimes
difficult to overcome due to cultural and economic factors that are
common to developing countries. This thesis will try to discuss the
problems that accompany the acceptance of the computer as a new tool in
Indonesia. A brief review of the historical, psychological and
sociological background of the Indonesian people, its society and its
way of life, in relation to the world outside is presented. An analysis
is made of the perceptions of Indonesian workers, directors and
managers, with recommendations as to how the usage of computers can be
accelerated with minimum friction to the organization.

Master of Science in   Advisor: R. A. McGonigal
Information Systems   Department of
September 1984   Administrative Sciences

SYSTEMS ANALYSIS FOR MICROCOMPUTER ACQUISITIONS

H. P. Rhoades
Lieutenant, United States Coast Guard
B.S., Bloomsburg State College, 1975

This thesis outlines the procedures for an analysis to be conducted to assist in the acquisition of a microcomputer. It provides a methodology to analyze present system operations, determine technical and economic feasibility of a microcomputer, and select hardware and software to meet organizational requirements. The intent of this thesis is to assist a Division Officer, Branch Chief, or small unit Commanding Officer who wants to increase productivity of specific outputs and feels a microcomputer may be the answer.

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CONTROL SYSTEM DESIGN LANGUAGE IMPLEMENTATION
OF A GAS TURBINE STARTING CONTROLLER

Richard Preston Riley
Lieutenant Commander, United States Navy
B.S., University of Oklahoma, 1972

This thesis investigates the feasibility and utility of the Computer System Design Language (CSDL) and its design environment. The primary purpose of this design system is to automatically design microprocessor based controller prototypes given a description of the controller's behavior. CSDL is used to create a highly structured behavioral description which is used by the design environment to create a software and hardware listing. A "generic" gas turbine engine start malfunction controller is developed using CSDL and tested on a Prolog development system.

Master of Science in   Advisor: A. A. Ross
Information Systems   Department of
June 1984   Computer Science

DATA DICTIONARY SYSTEMS AND THEIR ROLE IN
INFORMATION RESOURCE MANAGEMENT

Debra Lynne Robertson
Lieutenant, United States Navy
B.S., University of California, 1977

The explosive proliferation of computers has led to the increasing importance of developing and implementing various management concepts for effective and efficient operation and control. The complex data processing environment of today cannot be handled by hardware alone, but requires an information system composed of hardware, software, data, personnel and procedures. The vast storage capabilities of modern equipment has led to the development of databases for more effective and efficient use of memory capacity. The increasing importance of software, and the cost of developing and maintaining it, demands more and better management, giving rise to the software life cycle concept. With the automation of the functions of an organization, data and information become critical organizational resources. Information Resource Management provides effective and efficient management and control of these information resources. A key component in this management and control is the Data Dictionary System.

EVALUATION OF MANAGEMENT SYSTEMS PERFORMANCE AT NAVY REGIONAL DATA AUTOMATION CENTERS

Gloria Jean Cummings Scott
Lieutenant Commander, United States Navy
B.S., Southern University, 1968

The Navy Regional Data Automation Centers (NARDACs) became a Navy Industrial Fund (NIF) activity on 1 October 1983. This change requires that NARDACs bill customers for all data processing (DP) services provided. The impact of the change to NIF accounting on the evaluation of management performance is addressed within the context of the defined control structure. The purpose of this thesis is to present background information on the NIF concept, NARDACs, and operational audits, and to provide general recommendations for the design and application of operational auditing for a NARDAC. It is also to discuss benefits to be derived by managers of a NARDAC examined by an operational audit. A guide for performing an operational audit of a NARDAC is outlined.

IMPLEMENTATION OF A ZILOG Z-80 BASE REALIZATION LIBRARY FOR THE COMPUTER SYSTEMS DESIGN ENVIRONMENT

Theodore John Smith, Jr.
Major, United States Army
B.S., Loyola University, 1970

This thesis develops a Zilog-80 based realization library for use in the automated design of microprocessor based control systems. The library is designed around Standard Bus boards. This bus is supported by a number of manufacturers for use in breadboard construction, through a number of standard cards. The library of primitives developed implement the constructions used in Computer System Design Language (CSDL) for the Z-80 cpu. CSDL is a high level language that allows the specifications of tasks and procedures, and their time constraints. Use of the design system and this library can enable Z-80 based prototype controllers to be quickly designed and built.

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DATA DICTIONARY DESIGN AS A STEPPING-STONE TO DBMS
IMPLEMENTATION IN THE INDONESIAN ARMY DATA
COLLECTING AND PROCESSING SERVICE

Bambang Sutedjo
Captain, Indonesian Army
Armed Forces Military Academy, 1973

The organizational structure, tasks, and system configuration of
the Indonesian Army Data Collecting and Processing Service
(DISPULLAHTAD) are presented briefly in order to provide a background
for succeeding discussions. Features of available data dictionary
systems (DDS) and the initial design of a data dictionary for current
applications at DISPULLAHTAD are presented. Finally, based on that
initial design, a recommendation for database management system (DBMS)
implementation is discussed.

A DESIGN FOR AN INTERACTIVE VIDEODISC TRAINING PROGRAM FOR THE SUN WORKSTATION

David Lester Walts
Lieutenant Commander, United States Coast Guard
B.S., United States Coast Guard Academy, 1972

Roger Eric Kaplan
Lieutenant, United States Navy
B.S., United States Naval Academy, 1978

The demands on the military operational decision maker because of the ever-increasing tempo of developing crises, and the explosion of information available, require the development of decision aids. The availability of powerful microcomputers with sophisticated input and output devices and networking capabilities makes the development of a command and control workstation possible. However, such a system will be virtually useless if it is not easy to learn and simple to use. This thesis examines current videodisc and computer assisted instruction technology for their potential usefulness to the U. S. Navy. The videodisc, with 54,000 addressable frames, can provide help functions during operation which overlay computer response with the desired response. This will result in an effective system which is easy to learn, easy to use, and easily customized by the user. The study proposes a design by which the potential of interactive videodisc technology can be realized in the auto-instructional mode for the Sun Workstation.

MASTER OF SCIENCE

IN

MANAGEMENT

INSTALLATION OPTIONS FOR THE NAVSTAR GLOBAL
POSITIONING SYSTEM IN SURFACE SHIPS

Kevin S. Amos
Lieutenant, United States Navy
B.A., University of New Mexico, 1978

The NAVSTAR Global Positioning System (GPS) is a space based navigation system. This system is scheduled to be installed in a variety of military platforms. The receiver system for GPS will be installed in U. S. Navy surface ships between 1989 and 1996.

This thesis compares three alternative methods of completing this installation program: 1) installation during a ship's regularly scheduled overhaul, 2) installation by a special team of technicians, and 3) installation by the ship's assigned personnel. The strengths and weaknesses of each method are discussed. A recommendation of installation during regular overhaul is made.

AN EVALUATION OF THE APPLICATION OF A LOCK BOX
SYSTEM WITHIN THE DEPARTMENT OF THE NAVY

John J. Andrzejewski
Lieutenant Junior Grade, United States Coast Guard
B.S., United States Coast Guard Academy, 1979

The premise of numerous proposals for improving cash management is that the Federal Government can save millions of dollars of each year. Increasing attention is being given to cash management by the President, Congress, the Department of the Treasury and the federal agencies in the United States. A lock box system is one such cash management technique that provided a substantial savings through the reduction of float time. The Navy's Cash Management Action Plan stresses the use of this collection mechanism to increase efficiency of its existing collection systems. This study provides a lock box model that can be used in the evaluation of potential lock box applications. Using the Navy Regional Accounting and Finance Center, Washington, D. C., as a comparative example, the results of the analysis show that the establishment of a lock box in Atlanta would provide an estimated savings of over $260,000 to the Federal Government.

INSPECTION OF U. S. FLAG VESSELS IN FOREIGN COUNTRIES: AN APPLICATION OF COST EFFECTIVENESS ANALYSIS

Mark E. Ashley
Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1974

Allen L. Thompson, Jr.
Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1974

During the 1970's, the Coast Guard opened several overseas offices to carry out the increasing Commercial Vessel Safety activities occurring chiefly in Europe and the Far East. These offices were closed in April of 1982, to reduce operating expenses in response to political pressure and administrative initiatives to cut the federal budget. Overseas Commercial Vessel Safety activities are currently performed by U. S. based personnel travelling on temporary additional duty orders.

This thesis begins with a review of the Coast Guard's Commercial Vessel Safety program. Procedures involving cost effectiveness analysis are reviewed and applied in an analysis of whether or not the overseas offices should be reopened. The analysis is intended to provide information to internal program managers that is useful in the decision making process.

COST ESTIMATION OF NAVAL SHIP ACQUISITION

Baik, In Hwa
Lieutenant Commander, Republic of Korea Navy
B.S., Republic of Korea Naval Academy, 1973

The acquisition of major weapon systems is an extremely complex process involving interrelationships between a number of organizations. This thesis presents a general procedure and develops parametric cost estimates for Naval ship acquisition costs. Two different models are developed, one a 9-subsystem model, the other a single total cost model. The models were developed using the linear least squares regression technique with MINITAB statistical program on a data base of Destroyer type ships built in 1954-1966. A comparison of these two estimates with the existing RMC model's estimate was examined for Patrol Frigate construction data. The 9-subsystem estimate could be compared favorably with the RMC model cost estimate.

PROFESSIONAL, ORGANIZATIONAL AND TRAINING
WEAKNESSES IN SMALL PURCHASE WITHIN
THE DEPARTMENT OF THE NAVY

Randle D. Bales
Lieutenant Commander, SC, United States Navy
B.A., Stanford University, 1974

Kurt R. Huff
Lieutenant Commander, SC, United States Navy
B.S., United States Naval Academy, 1975
M.B.A., National University, 1980

This thesis examines the professional, organizational, and training weaknesses of intermediate level small purchase personnel. The intent of the study is to ascertain shortcomings in the above areas, to recommend an organizational and professional framework within which to conduct training, and finally to recommend the essential elements necessary for an effective intermediate level small purchase training program. A general format for a proposed training guide is suggested, and an example of the types of information that should be included is provided. An examination of costs and potential benefits is also provided in order to allow the reader to assess the financial aspects of a training program as recommended. This thesis also recommends areas for future study that may lead to increased productivity in small purchase. Specific conclusions and recommendations regarding the current state of small purchase are also made, as are recommendations for specific areas of management action to improve small purchase in the future.

Master of Science in
Management
June 1984

Advisor: D. V. Lamm
Department of
Administrative Sciences

A PRELIMINARY ANALYSIS OF THE COSTS AND BENEFITS OF OLDER AGE ACCESSIONS

Susan D. Barclay
Lieutenant, United States Navy
B.A., California State University, Fresno, 1973

This thesis examined differences based upon entry age for non-prior service entrants into the military during the All Volunteer Force period in an effort to establish certain costs and benefits which might be attributed to entry age. Entry age groups were defined as 17, 18-20, 21-24, and 25 years and older, and were further stratified by branch and sex. Data was supplied by the Defense Manpower Data Center, Monterey. Areas of study included entry age trends, accession quality, utilization, attrition, and marital status. Analysis of the data reveal significant differences among entry age groups, as well as differences between males and females, and each branch of service.

Master of Science in
Management
March 1984

Advisor: G. W. Thomas
Department of
Administrative Sciences

AN EVALUATION OF THE NAVY RESALE SYSTEM'S
OPERATING AND FINANCIAL STATEMENTS

Michael Stephen Barnett
Lieutenant Commander, SC, United States Navy
B.S., University of Kansas, 1973

This thesis contains an evaluation of the Navy Resale System financial and operating statements used to manage the sales activities from the headquarters, region, main, and branch levels. Navy Resale System (NRS) statements are compared to the National Retail Merchants Association's (NRMA) statements presented in the Retail Accounting Manual and to statements provided by major retailers.

From the results of the evaluation a number of conclusions are drawn. To summarize the Navy Resale System statements are essentially sound. However, change is needed in expense statement and leased sales presentation to communicate a better picture of how the Navy Resale System compares to other major retailers.

S-3A PILOT REDUCTION POLICY: A MORALE
AND EFFECTIVENESS STUDY

Mark Steven Bertsche
Lieutenant Commander, United States Navy
B.S.B.A., Marquette University, 1975

Since the introduction of the S-3A Viking aircraft into the U. S.
Navy in the early 1970's, the number of pilots within the S-3A community
has steadily decreased. Two policies were implemented to reduce the
number of S-3A pilots. The intent of these policies was to improve
morale and mission effectiveness. With the decrease of the number of S-
3A pilots, an increase in the utilization of the naval flight officer
was effected. The focus of this study is to measure the perceptions of
the impact of the pilot reduction policy and calculate relevant
correlations. The data used in this study is derived from the
perceptions of forty S-3A pilots and forty S-3A naval flight officers
from Naval Air Station Cecil Field, Florida, and Naval Air Station North
Island, California. Analysis of the survey data obtained from S-3A
pilots and naval flight officers indicates a perception that the
implementation of a pilot reduction policy favorably impacts morale and
mission effectiveness/performance. The results also support the use of
the naval flight officer in the S-3A copilot position.

Master of Science in   Advisor: R. A. Weitzman
Management   Department of
June 1984   Administrative Sciences

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WORKFORCE MOTIVATION IN 1983: A REVIEW
FOR DOD POLICY IMPLICATION

Dallas A. Bisignano
Lieutenant, MSC, United States Navy
B.S., Southern Illinois University, 1979

This thesis investigates the theories, strategies and techniques for productivity enhancement via increasing workforce motivation. It reviews previous research which explored the factors of employee morale and job satisfaction. Different perspectives of the concepts of motivation and productivity are offered. It considers contemporary employee motivation problems in management and suggests improvements for DOD consideration.

AN ANALYSIS AND CASE DEVELOPMENT OF THE ARMY
DEVELOPMENT AND EMPLOYMENT AGENCY

Nolen V. Bivens
Captain, United States Army
B.S., South Carolina State College, 1976

The purpose of this thesis is to analyze the Army Development and
Employment Agency (ADEA) and develop an indepth case study based on it.
The case study contains situations and issues which, when used by the
Organizational Effectiveness School, would require students to make an
integrated application of the curriculum's key concepts in Management,
Systems, and Behavioral Science. It would also require the student to
make application of the knowledge he or she gets from the curriculum
components of Probability and Statistics, Computer Literacy and How The
Army Runs. The aim of these conjoint cases is to allow the students to
develop solutions for a single organization's problems utilizing all of
the curriculum's content.

Master of Science in   Advisor: S. H. Parry
Management   Department of
June 1984   Operations Research

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FORECASTING BEEF PRICES FOR MILITARY SUBSISTENCE PROCUREMENT

Michael J. Borza
Lieutenant, United States Navy
B.S., Pennsylvania State University, 1977

Defense Subsistence Region Pacific (DSRPAC) is responsible for the acquisition of food products (meat, fresh fruit and vegetables, etc.) for military personnel located west of the Rocky Mountains. In the author's review of current DSRPAC operations, it was observed that capitalizing on price movements was not a consideration during acquisition of beef products. Using time-series analysis, it was shown that significant seasonal price movements occur for selected stock items. Supplemental information and the initial stages of a forecasting model were developed to support replenishment decision making. It is recommended that price movements be incorporated within the acquisition strategy of DSRPAC. The criterion of supply effectiveness should always be foremost, consistent with DSRPAC's purpose, but need not be degraded by the introduction of cost efficiencies associated with an acquisition strategy that considers price movements.

Master of Science in
Management
June 1984

Advisor: A. W. McMasters
Department of
Administrative Sciences

NON-CONSCIOUS SEX ROLE IDEOLOGY: THE IMPLICATIONS FOR OPTIMAL UTILIZATION OF U.S. SERVICEWOMEN

Johnnie M. Boynton
Lieutenant Commander, United States Navy
B.S., Xavier University of Louisiana, 1970

Numerous questions, discussions, concerns, and at times, resistances have accompanied the prospects and the realities of increasing roles for women in the traditionally male-dominated military services.

A consideration of the manifestations and implications of sex-role ideology in mainstream American Society, and its military microcosms is provided. It is reasoned that consideration is required by the planner or manager who desires to exercise insightful, responsive and constructive influence on dynamics of structural sex role re-definitions in the adapting military social structure.

A REVIEW OF MILITARY RECRUITING RESEARCH

Jerry J. Brown
Lieutenant Commander, United States Navy
B.S., Oklahoma Panhandle State College, 1970

The purpose of this thesis is to construct a comprehensive and systematic review of the existing research in the area of recruiting and recruiter productivity.

The objective is to identify areas where further investigation and research would be beneficial. The need for further study will be defined by either a paucity of related studies and/or the desirability of updating completed research projects to achieve currency.

The intent of this undertaking is not to provide a critical review of the studies investigated, but rather to simply identify holes in the research. The discovery of areas where little or no exploration has been attempted or where the research is no longer valid, in part or in whole, will identify the need to update the work.

Information such as is contained in this thesis will facilitate better planning and research design, assist in prioritization of projects, and improve allocation of research and development monies.

ACCOUNTING FOR VETERANS' EDUCATIONAL ASSISTANCE BENEFITS

Ned A. Broyles
Commander, United States Naval Reserve
B.S., Humboldt State University, 1968

The purpose of this study is to investigate accrual basis accounting as an alternative for accounting for the cost of GI Bill and VEAP veterans' educational assistance benefits. The history of veterans' educational assistance and current accounting methods are reviewed. The study suggests pension accounting techniques and inputs to a cost model as a basis to allocate the entitlements' cost.

Master of Science in
Management
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Advisor: K. J. Euske
Department of
Administrative Sciences

AN EVALUATION OF WHETHER THE NEW MANNING
SYSTEM SHOULD AND/OR COULD BE APPLIED
TO THE ADJUTANT GENERAL CORPS

David J. Buehler
Captain, United States Army
B.S., Jacksonville State University, 1973

Daniel E. Oliver
Captain, United States Army
B.B.A., University of Texas at El Paso, 1974

The Chief of Staff of the Army decided that the New Manning System could improve cohesion, teamwork, and combat effectiveness through the use of the unit replacement system, coupled with the regimental system, instead of the individual replacement system. Presently, the New Manning System is being applied exclusively to the combat arms branches. This research reviews the primary features of the New Manning System and the British Regimental system and the effects of cohesion. This research also d'scusses why it is not feasible to apply the principles of the New Manning System, in its present configuration, to the Adjutant General Corps. The New Manning System is then modified to provide the Adjutant General Corps with a branch regiment, functionally grouped battalions within this regiment, and geographical regions for the battalions.

THE NAVY'S CONSULTANT DEVELOPMENT AND QUALIFICATION
PROGRAM: ORIGIN AND ISSUES

Rita Jane Burch
Lieutenant, United States Navy
B.S., Hawaii Loa College, 1975

The Navy's Consultant Development and Qualification Program (CDQP)
can be considered to be at the midpoint of its own initial development.
It presently exists in the form of two instructions, one for the Pacific
System and one for the Atlantic System, with development of a Navy-wide
program scheduled for September of 1984. The program is designed to
describe desired performance capabilities for consultants in the Navy
and establish a system to develop and document those capabilities. The
program serves the needs of many people, from the individual consultant
to the Commanders of the Systems. The purpose of this thesis is to
document the origin of the Consultant Development and Qualification
Program in the Navy and to discuss areas of concern at this stage of its
evolution.

A COMPARISON: PROCUREMENT PRACTICES OF GOVERNMENT-ORIENTED AND COMMERCIAL-ORIENTED BUSINESSES

Charlie Elzner Burge
Lieutenant, SC, United States Navy
B.B.A., Texas Christian University, 1974

Mark Jeffrey Klingel
Lieutenant, SC, United States Navy
B.S., Florida State University, 1975

This thesis examines differences in the procurement practices of government-oriented businesses and commercial-oriented businesses.

A survey was conducted of various businesses within California, several questions were asked in the topic areas of long term contracting, subcontracting, source development and contract administration. The responses are stratified and compared in this baseline study.

While differences exist among the two groups, they share many similarities that are also presented in this study.

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DOCUMENTATION AND EVALUATION OF DEPOT MAINTENANCE
COST ACCUMULATION AND REPORTING AT THE NAVAL
AIR REWORK FACILITY, JACKSONVILLE, FLORIDA

Joseph Lawrence Burnett
Lieutenant Commander, United States Navy
B.S., Georgia Southern College, 1972
M.S., University of Southern California, 1979

The purpose of this research project was to examine the recording
and reporting of depot level maintenance costs to the Office of the
Assistant Secretary of Defense for Manpower, Installations and Logistics
(OASD, MI&L) .nd the interpretation of these costs in OASD report RCS
DD-M(A) 1397.

The analysis in this study is based on information obtained from
an on-site visit to the Naval Air Rework Facility, Jacksonville, Florida
and by analyzing five years of depot cost data obtained from OASD.
Particular emphasis was placed on the OASD reports for FY82 and FY83.

The results of the study indicate that if NARF Jacksonville can be
taken as representative of all NARFs, then the Department of the Navy
has a workable cost accumulation and reporting system with respect to
the rework of aircraft, their weapons systems and associated ground
support equipment, which is capable of providing the maintenance cost
data required by OASD. This study further reveals that the data in OASD
report RCS DD-M(A) 1397 is subject to misinterpretation and should be
revised.

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A VARIABLE INPUT-OUTPUT MODEL FOR INFLATION, GROWTH AND ENERGY FOR THE KOREAN ECONOMY

Sang Chul Chang
Major, Republic of Korea Army
B.S., Korean Military Academy, 1976

Yong Roo Hwang
Major, Republic of Korea Army
B.S., Korean Military Academy, 1973

Regional multipliers are a useful tool in the economic study of a region. However, conventional regional multipliers derived from a static input-output model fail to provide the time path of the impact over period. In many cases, the time restricts the impact within a year period. To alleviate the problem, this thesis introduces a regional dynamic multiplier model which spreads the impact out over time. In the absence of technical change, each period multiplier adds up to the static multiplier. Utilizing the Korean economy data, the thesis estimates the capital coefficients and the dynamic multipliers for the Korean economy. Finally, it provides a comparative simulation study in addition to the dynamic multipliers for various industries.

THE FORECASTING OF FUTURE INVENTORY AND THE
OPTIMIZATION OF TRAINING REQUIREMENTS
WITHIN THE AIRBORNE COMMUNITY

Donald B. Chung
Captain, United States Army
B.A., University of Hawaii, 1974

In an era of modernization, new weapons systems generate new manpower requirements for the airborne community within the United States Army. The problem of forecasting yearly requirements and inventories has become increasingly complex. This thesis formulates a methodology which applies the Markov Theory to manpower planning in order to forecast yearly inventories. It also discusses the strategy of dynamic programming in determining the optimal numbers of soldiers with certain skill levels and job types who should enter into each type of special training. Further, this methodology is applied to the Career Management Fields of 11 and 13 in forecasting inventories for fiscal years 1985 and 1986, and in determining the optimal numbers of soldiers to enter into each type of special training within the airborne community.

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MARINE CORPS COMBAT READINESS EVALUATIONS SYSTEM
(MCCRES): THREE CASE STUDIES FOR USE IN
PROVIDING FOR A MORE EFFECTIVE EVALUATOR

Larkin E. Conatser
Major, United States Marine Corps
B.S., Eastern Oregon State College, 1971
M.S., University Southern California, 1981

The Marine Corps Combat Readiness Evaluation System (MCCRES) was
designed to provide timely and accurate information concerning the
ability of active and reserve forces to perform assigned combat
missions. To provide this information, units are subjected to simulated
combat problems. Their performance is observed, evaluated, and reported
by evaluators from within the Marine Corps. These evaluators are key to
the collection of valid evaluation data. If the evaluator is not
effective, then the MCCRES, as an evaluation system, is ultimately
ineffective in determining a unit's "combat readiness."

The purpose of this thesis is to analyze the selection and use of
evaluators in the MCCRES. The current structure and process used for
management control in the selection and subsequent education of MCCRES
evaluators was investigated. MCCRES evaluators were interviewed and
their recommendations for improving evaluator effectiveness were
compared with the existing MCCRES models. The comparison resulted in a
set of recommendations to modify the current models.

Master of Science in   Advisors: K. J. Euske
Management   J. F. Mullane
December 1983   Department of
                                                   Administrative Sciences

SHIP READINESS AND PERSONNEL ATTRIBUTES IN (DD 963) SPRUANCE CLASS SHIPS

Jeffrey R. Crane
Lieutenant Commander, United States Navy
B.S., University of Utah, 1970

This analysis examines the relationship between shi; readiness and the personnel attributes of the personnel assigned to seventeen Spruance Class destroyers. Equipment history as defined in the Consolidated Casualty Reporting System is used as a proxy of ship history. Older, more experienced, and higher quality personnel assigned in the correct numbers are hypothesized to effect higher ship readiness (lower equipment casualties and lower associated equipment down time). Results from the analysis generally tend to support the hypothesis. However, as with previous analysis, the amount of variation attributable to personnel differences appears to be small when compared to the differences attributable to ship and command differences. Examining ship readiness with respect to the CASREP system does not produce strong enough personnel relationships in which to base future strategic planning, suggesting other avenues should be examined.

SYSTEM SAFETY AND THE COAST GUARD
LIGHTER-THAN-AIR SYSTEM PROJECT

Patrick Joseph Danaher
Lieutenant, United States Coast Guard
B.A., George Washington University, 1975

The Coast Guard is evaluating the potential of Lighter-Than-Air (LTA) vehicles for possible future Coast Guard utilization. Progress of the project is explored. Safety science is an emerging field particularly of value in the historically hazardous realm of aviation. The System Safety Concept as applicable to major project development is examined. One of the fundamental tasks of system safety management is to identify possible hazards early in the conceptual phase of product development. If the concept is not without historical precedence, part of this task is accomplished by examining historical safety records to identify potential hazards. To this end, records of Navy LTA mishaps are examined and comparisons are made to Coast Guard aircraft mishap records.

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Advisor: D. M. Layton
Department of
Aeronautics

A MODEL FOR SCHEDULING DELIVERIES OF REPAIR PARTS TO MULTIPLE PRODUCTION LINES AT A NARF

Terry H. Darton
Lieutenant Commander, United States Navy
B.S., University of Mississippi, 1972

A model has been developed describing the expected costs of delivery and delay per period when demand for a certain repair part comes from more than one production line at a NARF. This model extends the earlier work by McMasters and Davidson on a scheduled delivery model. The objective of the model development was the determination of the optimal number of periods between deliveries. This is that number N which minimizes the expected costs of delivery and delay per period. Unfortunately, no simple closed form expression for optimal N as a function of the other parameters could be obtained. As a consequence, parametric analyses of the cost function were conducted to determine optimal N and its behavior when other parameters were varied.

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AN EVALUATION OF THE PERCEIVED AND ACTUAL COST
COMPARISONS OF COMMISSARIES: FORT ORD CASE

Jeffery Lynn Dearing
Captain, United States Marine Corps
B.S.B.A., Southeastern University, 1976
M.S., Troy State University, 1982

There is a continuous effort by civilian lobbyists to induce
Congressional legislation that will require commissaries to contract
their management with private firms or either prohibit military retirees
from using the commissary or eliminate all commissaries within the
Continental United States (CONUS).

This thesis is concerned with the commissary as a privilege. It
highlights the tangible value currently available to the service family
in the Monterey, California area.

The data analyzed in this thesis is the result of an extensive
empirical study of shelf prices gathered from the Fort Ord Commissary,
California and is compared to the shelf prices of three commercial
"chain" supermarkets in close proximity to Fort Ord.

A questionnaire was distributed to potential patrons of the Fort
Ord Commissary to gather information on the perceptions of the
commissary as a military benefit. The questionnaire responses and price
data were then used to derive theoretical models which encompass the
direct and indirect costs of grocery shopping.

Master of Science in   Advisor: F. E. Royer
Management   Department of
September 1984   Administrative Sciences

AVIATION MAINTENANCE COMPUTERIZED
MANAGEMENT INFORMATION SYSTEMS:
PERSPECTIVE FOR THE FUTURE

Jerry Floyd Derrick
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1974

Theodore Aldred Miller
Lieutenant, United States Navy
B.S., University of Texas at Austin, 1979

The Naval Aviation Logistics Command Management Information System (NALCOMIS) is the next generation solution to the information assimilation gap faced by Naval Aviation maintenance managers. This thesis examines the scope of the problem at the Organizational and Intermediate levels of maintenance, and the intended effect of NALCOMIS and three peripheral information systems. The underlying concepts of the four systems investigated are used to explore Artificial Intelligence (AI) as the logical augmentation or follow-on to the NALCOMIS program. Recommendations regarding the implementation of AI and expert systems are made.

Master of Science in   Advisor: D. C. Boger
Management   Department of
June 1984   Administrative Sciences

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AN ANALYSIS OF THE MARINE CORPS LEVEL-OF-REPAIR MODEL (MCLOR) AND THE NAVY AVAILABILITY-CENTERED INVENTORY MODEL (ACIM) FROM AN OPERATIONAL AVAILABILITY STANDPOINT

Paul S. Dostal
Captain, United States Marine Corps
B.A., Golden Gate University, 1973

James M. McNeal
Captain, United States Marine Corps
B.A., Troy State University, 1974

This thesis is a study of the Marine Corps Level-of-Repair Model (MCLOR) and the Navy Availability-Centered Inventory Model (ACIM). The objective is to test the linkage of these models to obtain a specified operational availability (Ao) at minimum investment cost. An example equipment (AN/PRC-68) is utilized as the test problem to demonstrate the ability of the two models to be linked together to provide a desired Ao at least cost. This was done by submitting data from MCLOR outputs to the ACIM model. The ACIM data is subjected to sensitivity analysis by changing key system parameters (MTBF, MTTR, Repair Path). A side-by-side comparison of the results is provided.

A CONTEXTUAL ANALYSIS OF THE COMBINED SERVICE:
A SIGNIFICANT COMPONENT OF THE MILITARY
SEALIFT COMMAND'S BREAKBULK CAPABILITY

Margaret Randolph Earle
Lieutenant, United States Navy
B.A., Salem College, 1972

This thesis focuses on the Combined Service, a five ship scheduled breakbulk shipping operation, managed by the Military Sealift Command, Pacific. The object is to define the operation within the context of U. S. breakbulk requirements and worldwide breakbulk assets so as to provide a broader perspective to military decision makers. The research effort is directed at identifying major internal and external environmental factors impacting the Combined Service. Once these factors are addressed from a general perspective, their significance is specifically related to the Combined Service. The conclusion notes five trends observed throughout the analysis that should be considered when determining future utilization of limited U. S. breakbulk assets.

AN ANALYSIS OF THE FEEDBACK PROVIDED FROM THE MARINE CORPS COMBAT READINESS EVALUATION SYSTEM

Thomas P. Finnerty
Major, United States Marine Corps
B.S., Southern Illinois University, 1968

The purpose of this study was to determine the most appropriate and effective manner in which to provide feedback to the unit commander after a Marine Corps Combat Readiness Evaluation System (MCCRES). To this end research was conducted into the areas of management control and evaluation theory.

The approach of the study was multi-disciplinary with a detailed emphasis on the economic question of how better distribution could be made of the scarce resources of manpower, equipment, and training time based on the results of MCCRES. To answer the questions, a detailed field study was conducted in which interviews were completed with 37 Marine officers of rank from Captain to Colonel who had involvement with MCCRES as key billet holders.

The results of the study are displayed as an eight-step feedback model which is based on accepted theory in the fields of management control and evaluation theory. These results are communicated to the reader as a descriptive model.

The incorporation of this model as the Standard MCCRES Feedback Procedure will significantly enhance the value of the results to the evaluated unit and will improve the understanding of the resource allocation needs at all levels.

AN INTERNAL REVIEW AND OPERATIONAL TRIAL OF A HUMAN FACTORS ENGINEERING SELF-PACED COURSE IN ACCORDANCE WITH THE INSTRUCTIONAL SYSTEMS DEVELOPMENT PROCESS

Martha Marie Fleming
Lieutenant, United States Navy
B.S., Sam Houston State University, 1971

The Government Accounting Office (GAO) has stated that insufficient attention is given to Human Factors Engineering (HFE) in the design of systems during the Weapons Acquisition Cycle (WAC). According to GAO, these inadequacies have adversely impacted our military capabilities, and wasted lives and millions of dollars. A myriad of handbooks, manuals, and standards exist which provide detailed guidelines, criteria, and test plans for conducting HF T & E, which remain unused because the technological level is beyond the average user. The need for basic training in HFE has been clearly identified. A cost effective vehicle to bridge this gap in conceptual knowledge has been developed in the form of an HFE Self-Paced Course. As coordinated with the course's sponsor, an internal review and trial run were conducted, via this thesis, to assess its potential effectiveness. According to the results, this course has proven its capability to provide the stimuli necessary for the transfer of basic knowledge and skills in HF T & E. Additionally, the value of the job tasks identified in the course's terminal objectives were substantiated. The conclusions provided in this study are intended to encourage further course development through incorporation of the recommendations outlined. Ultimately, this would lead to its validation and implementation into the instructional system of the military. Implementation of such a basic course could be a major step toward increased integration of HF T & E during WAC.

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Advisor: R. A. McGonigal
Department of
Administrative Sciences

FROM CLASSROOM TO WARDROOM: INTERNALIZING, INTEGRATING,
AND REINFORCING LEADERSHIP AND MANAGEMENT, EDUCATION
AND TRAINING (LMET) SKILLS IN THE NAVY

Patricia G. Foley
Lieutenant Commander, United States Navy
B.A., George Washington University, 1970
M.A., University of Virginia, 1973

This report describes the current role of the Navy Leadership and Management, Education and Training Program (LMET), and analyzes the benefits and limitations of Navy-wide implementation. This methodology focused specifically on the incentives and constraints on utilization of LMET competencies. Interviews of a cross-section of 70 LMET graduates were conducted in an effort to determine key factors to promote competency use. Results indicate specific recommendations regarding the use of the Navy's Human Resource Management Support System to reinforce LMET training.

AN EVALUATION OF MARINE CORPS
EDUCATIONAL CREDENTIALS

David B. Franke
Major, United States Marine Corps
B.A., Southern Oregon State College, 1971
M.B.A., National University, 1981

The Marine Corps classifies civilian educational credentials into 16 categories. These categories are further divided into two groups-- high school graduates and non-high school graduates. This two-tier system is the structure currently used by Marine recruiters to determine an applicant's basic eligibility for enlistment. Applicants who are high school graduates are preferred over those who are non-high school graduates for a variety of reasons.

Difficulties arising from the two-tier system stem from the increasing types of educational credentials now available to prospective applicants and the varying definitions and treatment of educational credentials from Military Service to Service.

This thesis analyzes various personal and performance variables from a data base consisting of male, nonprior service recruits who entered the Marine Corps between October 1978 and April 1983. A recommendation is made for reclassifying the credentials that comprise the two-tier system. In addition, a three-tier system for categorizing educational credentials based on in-service performance variables is proposed.

The proposal and recommendation made in this thesis are "exploratory" in nature, and further research is encouraged.

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Advisor: M. J. Eitelberg
Department of
Administrative Sciences

COMMAND AND CONTROL OF CIVILIAN CONTRACT MANNED NAVY
FLEET SUPPORT AND MILITARY SEALIFT COMMAND SHIPS

Mary Louise Franzia
Commander, United States Navy
B.S., Sacramento State College, 1966

This study considers the decline of seagoing jobs in the U. S. maritime industry. A remedy for this decline proposed by the maritime unions is the civilian contract manning of Navy fleet support and Military Sealift Command (MSC) ships. Whether the Navy utilizes civilian contract manning will be influenced, in part, by how the Navy will be able to maintain command and control of ships that are crewed by contract mariners. Questionnaires were provided to maritime trade and labor organizations to determine how various command and control situations would be handled. The responses to the questionnaires form the basis for concluding that the implementation of civilian contract manning is still too general and uncertain for the Navy to accept. Recommendations are that the Navy should maintain its present manning policies of fleet support and MSC ships and continue to require that the specifics of the civilian contract manning proposal be addressed in full.

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Advisor: D. C. Boger
          Department of
          Administrative Sciences

FY83 PROMPT PAYMENT ACT PERFORMANCE

Randall William Freitas
Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1974

This thesis studies the problems of Coast Guard payment offices in making timely commercial invoice payments, and the accuracy of reports of interest penalties and early payments, required by the Prompt Payment Act and OMB Circular No. A-125.

The results of this study indicate errors in the collection of early payment and interest penalty data, and subjective interpretations as to the causes for such payments and penalties. A review of these reasons and other problems leads to the development of several models to estimate the magnitude of such payments and to evaluate the relative performance of payment offices. This review also indicates the desirability of automation, administrative measures to reduce early payments and interest penalties, and improved reporting.

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Advisor: S. S. Liao
           Department of
           Administrative Sciences

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ENLISTMENT STANDARDS AS APPLIED TO THE NAVY
SELECTION PROCESS WITH REFERENCE TO THE
SIGNALMAN AND RADIOMAN RATINGS

Brenda M. Gagner
Lieutenant Commander, United States Navy
B.A., University of Maine, 1973

Patricia A. Chmiel
Lieutenant, United States Navy
B.A., College of Our Lady of the Elms, 1973

The purpose of this thesis is to develop manpower selection models to improve the Navy's system of assigning personnel to the Signalman (SM) and Radioman (RM) ratings. Four multivariate models using "success" and "failure" as criterion variables were developed. The criterion was comprised of: months of total active federal military service (TAFMS1), achieved E-4 (ACHVDE4), and recommended for reenlistment (ELIGREUP). Predictor variables were derived from personal biographical and aptitude data available at enlistment.

Of the models developed, one was designed for application to the entire Signalman rating, another for the entire Radioman rating. The third model was for application to the white male segment of the Signalman rating; the fouth, to the white male segment of the Radioman rating.

Additionally, the study highlights the link with current selection procedures and characteristics and their possible effect on manpower modeling.

The cohort used in the study entered the Navy in 1976, 1977, and 1978. Results and recommendations for future research are also presented.

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Advisor: W. E. McGarvey
Department of
Administrative Sciences

DOCUMENTATION AND EVALUATION OF DEPOT LEVEL
MAINTENANCE COST ACCUMULATION AND REPORTING
AT THE AIR FORCE LOGISTICS COMMAND
SACRAMENTO, CALIFORNIA

Frederick David Gorris
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1972

The purpose of this research project is to examine the recording and reporting of depot level maintenance costs to the Office of the Assistant Secretary of Defense for Manpower, Installations, and Logistics (OASD, MISL) and the interpretation of the costs in the OASD report RCS DD-M(A) 1397.

The analysis in this study is based on information obtained from on-site visits to the AFLC Sacramento, California, and by analysis of five years of depot cost data obtained from OASD (of particular interest was the data from 1979-1983) report 1397.

The results of this study indicated that if Sacramento AFLC is representative of all AFLC's, the Air Force has a workable cost accumulation and reporting system which is capable and responsive in providing the maintenance cost data required by OASD. This study further revealed that in its present form report RCS DD-M(A) 1397 is subject to misinterpretation and should be revised or annotated.

A MICROCOMPUTER ABSTRACT REPRESENTATION OF THE MARINE
CORPS' SABRS FINANCIAL MANAGEMENT SYSTEM

Dennis H. Grimm
Major, United States Marine Corps
B.A., Norwich University, 1973

Richard H. Myers
Major, United States Marine Corps
B.S., Troy State University, 1969

Stanley G. Shumway
Captain, United States Marine Corps
B.S., The Citadel, 1977

The objective of this thesis is to provide financial managers in
the U. S. Marine Corps with a familiarization of the Prime Enhancement
Project (PEP) and to illustrate some of the potential for micro-
computers in the financial management field. Because of the systems'
constraints, the thesis is limited to an abstracted simulation of PEP
and an example abstracted from the budget formulation process using an
electronic spreadsheet. The objectives are met through the development
of an integrated system of a micro-computer, necessary software, and a
tutorial. The system described is the primary product of this thesis
and a concurrent thesis prepared by Captain K. V. Lockett and Captain M.
E. O'Neil of the Naval Postgraduate School. Simultaneous use of both
documents is essential to a thorough understanding of the project.

Master of Science in
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Advisor: J. R. Mullane
Department of
Administrative Sciences

EXCELLENCE IN THE SURFACE NAVY

Gregg G. Gullickson
Commander, United States Navy
B.S., United States Naval Academy, 1969

Richard D. Chenette
Lieutenant Commander, United States Navy
B.S.C.E., The Citadel, 1974

"Excellence in the Surface Navy" is examined, first by interviewing twenty-one senior naval officers, and then by going aboard six ships identified by the senior officers as being the embodiment of excellence. Chapters I through IV are a summary of the indicators of excellence on which the senior officers focused. Such topics as awards, ship cleanliness, and operational performance are discussed. Chapter V summarizes the views of these senior officers on the means used to achieve excellence. From the shipboard interviews, it is concluded that the excellent ships possess a common set of attributes that account for their excellence. The attributes are: good ships getting better; pride in evidence at all levels; teamwork, not just a concept but a way of life; the ship in automatic; high energy level/bias towards action; presence of a common vision and shared values; as the captain, so is the ship; sailors, our most important resource; and oh yes, task accomplishment. These attributes are discussed in chapters VI through XV. Recommendations are made for expanding analysis of excellence in the surface navy and other naval communities.

A PROPOSED LOGISTICS STRATEGY FOR THE DEFENSE OF REPUBLIC OF KOREA

Ha, Chul Soo
Major, Republic of Korea Army
B.S., Korean Military Academy, 1976

This thesis deals with concepts of strategy and logistics in the military and business fields. In particular, it is concerned with the relationships between military strategy and logistics. It recommends a logistics strategy for the defense of the Republic of Korea. Traditionally, logistics has been treated as secondary. But, in current situations, attention must be placed on logistics. Four steps are needed by the ROK military forces in the long-term point of view. First, the commanders or planners of the ROK military forces should understand the concepts and true meanings of logistics for defense policy. Second, the ROK military forces should have an organization which can deal with the logistics support of the U. S. or allied countries in case of threats or hostilities by North Korea. Third, life-cycle costing methods should be considered as an acquisition strategy. Fourth, the weapons procurement process needs some change, especially in the middleman agencies.

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Advisor: M. G. Sovereign
Department of
Operations Research

FINANCIAL PLANNING AND CONTROL
FOR THE MILITARY OFFICER

Fred R. Hahndorf
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1974

Joseph J. Riggio
Major, United States Marine Corps
B.S., Dowling College, 1977

The study is to provide the military officer with a single reference in personal financial planning and control. Pay, benefits, taxes, inflation, budgets, alternatives and various ideas to help the officer become more aware of the power of financial planning and control are discussed. The thesis focuses on the need for the officer to take control and responsibility for his personal finances. It provides a step by step guide to formulating a financial plan. The end objective is to provide the Navy and Marine Corr with more efficient and productive officers through improved confluence and awareness of money management. This additional knowledge will enable the officer to better assist his personnel in their financial matters.

DATA COLLECTION FOR CAPITAL EXPENDITURE
PROJECT PROPOSALS: A CASE STUDY

Terry R. Harding
Captain, United States Marine Corps
B.S.M.E., University of Kansas, 1975
M.A., Central Michigan University, 1978

Company investment procedures are frequently analyzed to ensure that there is no better way to meet established goals (Dean, 1954; Wellington, 1963). These goals are usually to maximize the return on asset investment or achieve a desired growth rate in earnings per share. Much has been written about these processes, but the analysis usually begins at the point where all pertinent information regarding the proposal has been gathered (Petty, 1975). This thesis investigates how this information is gathered. The research method was field research of three local organizations.

This thesis has four major conclusions. First, that vendor information is extensively used and in the case of the Corporate Farm, heavily relied on for cost data. Second, that historical information in the form of past contracts, sales receipts and rental agreements, are at a minimum used as a point of reference for cost data estimation in all cases. Third, that the industry provides cost data either in the form of written cost estimating guides (in the case of construction) and by direct exchanges of information between organizations (in all other cases). Finally, that there is a high variance of procedures of data collection among the companies interviewed.

Master of Science in   Advisor: K. J. Euske
Management   Department of
December 1983   Administrative Sciences

CRITERIA FOR COMBAT READINESS OF COMBAT PILOTS

Anestis Hatzipouflis
Captain, Hellenic Air Force
B.S., Hellenic Air Force Academy, 1973

Military aircraft missions are all multidimensional in nature. This means that every mission can be divided into usually one overall goal or purpose (i.e., destroy the target, deliver the supplies, rescue the survivors, etc.), with several subgoals (safety, minimize susceptibility, timeliness, etc.). Since missions are multidimensional, the operator effort in the form of mental and physical action (performance) becomes multidimensional. The multidimensional nature of skilled aircrew performance, in turn, requires that several criteria, all of which are relevant for a particular activity, be defined and used [Ref. 1]. The unique situation of an aircrew flying an aircraft for a specific mission, and the necessary determination of subcriteria for evaluating accomplishment of that mission, requires further research of an analytical and empirical nature. The relationship among altitude, airspeed, operator activity, and the hundreds of other system variables that comprise the total system must be compared to mission success in quantifiable terms. This study is an effort to improve acquisition of training performance information in affordable ways on behalf of the Hellenic Air Force (HAF). Thus, it is divided into: 1) the principles of human performance, 2) definition of the criteria and their measurement, 3) systematic definition of performance measure appropriate to combat-training needs, 4) definition of a cost effective measurement system usable in combat-crew training environments to acquire and process needed training information. The method that was used was a search of the available materials found in the NPS library. Most of the data found was based on USAF studies.

INTERMEDIATE TERM FORECASTING TECHNIQUES
FOR MANAGEMENT

David L. Herring
Lieutenant Commander, United States Navy
B.S., Louisiana State University, 1973

Autoregressive Integrated Moving Average (ARIMA) forecasts are made for the prices of a variety of commodities one year into the future in an attempt to determine if improved budget accuracy is possible for small businesses dependent upon commodities for the production of goods or services. An average forecast error of less than seven percent is obtained using commonly available ARIMA computer software employable on inexpensive microcomputers. It is concluded small businesses can affordably obtain more accurate commodity price budgets through the use of ARIMA forecasts.

SPECIFICATION OF VETERAN STATUS IN ESTIMATING
POST-SERVICE CIVILIAN EARNINGS

Roger J. Higgins
Lieutenant, United States Navy
B.A., San Diego State University, 1978

This thesis analyzes the earnings of veterans and non-veterans by race over a fourteen year period from 1966 to 1980, using the National Longitudinal Survey for Young Men aged 14 to 24 in 1966. The primary finding is that bonafide first term enlistees tend to have different returns to their veteran status than veterans as a whole and multi-term veterans in particular, and that these returns, on average, tend to be positive. This thesis also develops criteria for a single term of enlistment by length of service in a particular branch of the armed forces. In support of these findings, a working definition of full employment is also developed. The estimates of earnings equations for the fully employed subset of people are compared to the entire sample of the National Longitudinal Survey of Young Men.

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CONTRACTING INITIATIVES TO OBTAIN COMMERCIAL
AIR CARGO SERVICE ALTERNATIVES TO THE
NAVY QUICK TRANSPORTATION SYSTEM

Arthur D. Holden
Lieutenant Commander, SC, United States Navy
B.S., Arizona State University, 1974

Charles J. Weber
Lieutenant, SC, United States Navy
B.S.B.A., Old Dominion University, 1975

Since 1950 the Navy has moved its high-priority cargo through its Quick Transportation System (QUICKTRANS). This study examines the development of that system and the concurrent growth of the commercial air cargo industry. The authors selected Emery Worldwide as a representative of the commercial air cargo industry and compared its capabilities with the QUICKTRANS system requirements. The authors conclude that the commercial system represents an effective and cost efficient alternative to QUICKTRANS. Several preliminary objectives which must be satisfied in order to facilitate a shift to a commercial system alternative are identified and a contracting plan to meet those objectives is presented.

THE ENFORCER AIRCRAFT PROGRAM: A LOWER-
COST ALTERNATIVE WEAPON SYSTEM

Robert P. Holt
Commander, United States Navy
B.A., State College at Boston, 1967

Robert D. Dolan
Lieutenant Commander, United States Navy
B.S., Western Michigan University, 1970

This research concerns a close air support weapon system known as the Enforcer aircraft. This system was first introduced to the military services from outside the formal competitive channels addressed in the procurement regulations. Although there is no specific operational requirement for an Enforcer type aircraft, it remains under consideration as a lower-cost alternative close support system in the so-called high/low mix acquisition strategy. The research analyzes the progress, to date of the Enforcer as a system moving through the stages of the defense systems acquisition process. Emphasis is placed on the differing roles of the Enforcer's participants in that process. There is a detailed critical examination of an Air Force Enforcer cost effectiveness analysis and of the models used in that analysis. Conclusions and recommendations arising from the study are included, especially as they relate to the expected defense acquisition environment in the latter half of the eighties.

Master of Science in   Advisor: P. M. Carrick
Management   Department of
March 1984   Administrative Sciences

AN ANALYSIS OF THE EFFECTIVENESS OF THE
PROBLEM SOLVING SKILLS FOR MANAGERS:
TRAINING PROGRAM--USCG

Dennis J. Ihnat
Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1975

This thesis examines the "Problem Solving Skills for Managers" training package, piloted by the Coast Guard Leadership and Management School in April 1983. Four questionnaire instruments developed by the company which produced the training package were analyzed to determine the effectiveness of the training program. A quasi-experimental pre-test/post-test/control group research design was used by the Coast Guard Project Manager, and this thesis used a regression procedure to counteract any regression effect. The results of the analysis suggest that the training program was not effective as given, and suggests further study to determine why it was not effective.

INTERNAL ADMINISTRATIVE CONTROL: ITS APPLICABILITY TO THE MARINE CORPS

Christina F. Illig
Lieutenant Commander, United States Navy
B.A., Saint Bonaventure University, 1972

Harry G. Rudge
Major, United States Marine Corps
B.A., Slippery Rock State College, 1968
M.A., Western Michigan University, 1976

The thesis presnets a theoretical development of a definition of administrative control and its applicability to the Marine Corps. The authors conclude that: (1) administrative controls are those predetermined controls that give purpose, direction, and meaning to an organization; (2) administrative controls are reflected in three dimensions: first, as organization controls; second, as operating controls; and third, as information system controls; and (3) administrative controls are inseparable from management controls. The authors recommend: (1) expanding command/management input in the design of management information systems to improve their effectiveness; (2) increasing tour lengths for commanding officers to permit the effective implementation and operation of a management control program; (3) courses of instruction for all managers at all levels; and (4) procedures be developed to ensure the positive participation of senior management in creating a positive control environment.

AN EXAMINATION OF HIGH QUALITY ENLISTEES
ON A RECRUITING DISTRICT LEVEL.

Ross Edward Irlam
Lieutenant Commander, United States Navy
B.A., Western Illinois University, 1970

Two distinct analytical techniques were used to develop models to forecast the number of high quality nonprior service males enlisting monthly in the U. S. Navy on a recruiting district level. The Box-Jenkins methodology was applied to a monthly time series of enlistments for the period October 1978 to September 1983. A multiple regression causal model was developed based on the explanatory variables: numbers of unemployed, change in the rate of unemployment, and military/civilian pay ratio. A combined time series/causal model was developed by applying the Box-Jenkins technique to the residuals of the multiple regression. These models were compared for predictive validity. Recommendations for futher development of models containing explicit time series elements are presented.

Master of Science in
Management
June 1984

Advisor: G. W. Thomas
Department of
Administrative Sciences

A DESCRIPTION OF "PROFILE OF AMERICAN YOUTH" DATA FOR MILITARY MANPOWER AND PERSONNEL ANALYSIS

Thomas V. Johnson
Captain, United States Marine Corps
B.A., Chapman College, 1972

The success of any military organization in accomplishing its mission depends largely on the quality of the personnel who constitute the organization. The National Longitudinal Survey (NLS) and the "Profile of American Youth" (1980 Nationwide Administration of the Armed Services Vocational Aptitude Battery) offer a wealth of information on the behavior and characteristics of a nationally representative sample of young men and women. This thesis has developed a data base extract designed primarily for analysts seeking to obtain insights on the current and projected "quality" of military personnel. Instructions for using the data base extract are provided, along with a brief description of the survey and the computer program (SPSS) and a selected group of frequency distributions from the extract.

A COMPARATIVE STUDY OF MANAGEMENT SYSTEMS
BETWEEN THE U.S. AND KOREA

Myung Jin, Kim
Commander, Republic of Korea Navy
B.S., Korean Naval Academy, 1971

Yong Ho, Lee
Major, Republic of Korea Army
B.S., Korean Military Academy, 1973

Korea's rapid industrialization and its emergence on the world market amidst high competition within recent years are remarkable events in its economic history, and thus has begun to attract the interest of Western economists and public and private managers. Recently the Korean business firms have landed in the United States, and collaborated with their counterparts in the United States. A series of these events made two countries - Korea and the United States - eager to know each's management system for their joint venture. If businessmen are going to be able to deal effectively with their counterparts, it is essential that they understand each other's values, behavior, and their management system. This thesis first focuses on each management system between Korea and the United States, in terms of cultural background, then overviews their general characteristics. The survey was conducted for the Korean management system by utilizing Likert's model. Its data is compared with those of the American management system from the previous ICL Study. Finally it shows where and why their management systems differ and what they can learn from these differences by reviewing their merits and demerits.

A METHODOLOGY FOR COMPARING THE VARIABLE COSTS OF THE CONTINUOUS AND PERIODIC REVIEW MODELS

Christopher D. Knaggs
Lieutenant Commander, SC, United States Navy
B.B.A., University of Michigan, 1975

The optimal use of the continuous review model requires that an inventory system be examined after the receipt of every demand. Sometimes a delay can be encountered in the timing of these reviews due to several uncontrollable factors. As the length of these delays increases, a point is reached where it is better to switch the inventory system to a periodic review model. This thesis develops a methodology by which this point can be found for varying cost factors and demand levels. Using simulation, an example series of curves is presented that demonstrates the optimal point to switch inventory models for selected lead times. If delays are expected in the time between reviews, using the methodology offered in this paper will provide the manager an informational criterion for deciding what inventory model to use in a stocking system.

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AN ENLISTED PERFORMANCE PREDICTION MODEL
FOR HULL TECHNICIANS

Glen Leverette
Lieutenant Commander, United States Navy
B.A., Bethune-Cookman College, 1969

The purpose of this study is to determine if the Navy's system of assigning personnel to the Hull Maintenance Technician rating can be enhanced. The technique used is a multivariate model with subjectively defined categories of "success" and "failure" as criterion variables. Biographical data available at the time of enlistment are used as predictor variables. Two independent models were created using available data on personnel entering the Navy in 1976, 1977 and 1978. The models were validated on a random sample drawn from the 1976-1978 data base. Random sample data are not included in the model development.

These models predict the future fleet performance of HT personnel as measured by length of service, paygrade achieved, and recommendation for reenlistment. Other results and recommendations regarding implementation and future research are also discussed.

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Advisor: W. E. McGarvey
Department of
Administrative Sciences

AN EVALUATION OF THE UNITED STATES MARINE CORPS ENLISTED DINING FACILITY MANAGEMENT AND ACCOUNTING SYSTEM AT THE MARINE CORPS MOUNTAIN WARFARE TRAINING CENTER, BRIDGEPORT, CALIFORNIA

Leon S. Lusczynski
Major, United States Marine Corps
B.A., Eastern Connecticut State College, 1969

Bernard A. Siwicki
Captain, United States Marine Corps
B.S., Ferris State College, 1975

This thesis is an evaluation of the Marine Corps Dining Facility at the Mountain Warfare Training Center, Bridgeport, California. The objective is to determine why the dining facility has constantly exceeded the authorized inventory level and the Basic Daily Food Allowance. A management survey was conducted into the problem areas. A list of alternative solutions and recommendations are provided.

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COMPANY COMMANDER COMPETENCY ASSESSMENT
FOR THE UNITED STATES ARMY

Robert Lee Maginnis
Captain, United States Army
B.S., United States Military Academy, 1973

The Army cannot afford to develop company commanders who are marginally effective. A measure of a company commander's effectiveness can be ascertained by comparing his performance against a proven competency based model. This study develops a "success" oriented competency based model and provides a competency assessment and development (CAD) instrument which identifies possible command competency weaknesses for prospective company commanders.

The CAD provides a means of identifying "Where I Am" and then compares "My Competency Model" with that of "successful" company commanders in the field. The CAD also provid⸱ ª planning mechanism and appropriate references to assist the offiьer in the competency development process.

CONTROL SYSTEMS

James M. Martin
Lieutenant Commander, SC, United States Navy
B.S.B.A., John Carroll University, 1973

Managers are responsible for identifying the need for control and for designing control systems that are appropriate for each set of conditions. This thesis examines the nature of organizational control and discusses historical approaches to organizational control. Structural and behavioral control system theories are presented and analyzed. Four alternatives to control system design are documented and an approach to control system design is offered.

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Advisor: L. Darbyshire
Department of
Administrative Sciences

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AN ANALYSIS OF THE RELATIONSHIPS OF PERSONNEL
CHARACTERISTICS TO THE PERFORMANCE
OF DD 963 CLASS SHIPS

John D. May
Lieutenant Commander, United States Naval Reserve
B.A., Roanoke College, 1968

The purpose of this thesis was to analyze the relationship of fill ratios and personnel attributes to the performance of seventeen operational DD 963 class ships. Data sets were created from files provided by the Defense Manpower Data Center to determine the fill ratios and attributes. Descriptive aggregate data such as percentage of high school graduates, entry age, AFQT score and time in grade were selected to provide demographic information for the personnel involved. Summary CASREP data, provided by SPCC, were converted to nine variables to be used as the measures of ship performance. They included total downtime, downtime due to maintenance, total number of CASREPS, and two "readiness" indices. The relationships between these variables and personnel attributes were examined at the ship, departmental, and individual rating level. Separate effects of the individual UICs as well as overhaul quarters were accounted for. Personnel attributes and number of personnel vs personnel requirements had little relationship to readiness. In summary, the relationships between personnel attributes, personnel staffing levels and ship readiness measures remain to be proven.

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Management   Department of
December 1983   Administrative Sciences

FEDERAL LAND MANAGEMENT DECISIONS RELATED
TO EXECUTIVE ORDER 12348

N. Dawn McAnally
Lieutenant Commander, United States Navy
B.S., University of Texas, 1971

This thesis identifies issues surrounding Federal Land Management
decisions which relate to Executive Order (E.O.) 12348. It provides a
history of the Federal Land Management Program, discussing related
executive actions preceding E.O. 12348. The incentives and objectives
affecting individual decision makers are examined to determine effects
on land management actions. Public perceptions which influence
incentives of individual decision makers are revealed with'n the thesis.
Results of E.O. 12348 are analyzed to determine the necessity of
providing appropriate incentives to decision makers involved in future
land management actions.

MASTER CHIEF PETTY OFFICER OF THE COMMAND PROGRAM: AN ORGANIZATIONAL EFFECTIVENESS SECOND LOOK

Louis L. McGinty
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1973

The primary purpose of this project is to provide a critical analysis of the Master Chief Petty Officer of the Command program. It is the author's belief that sufficient consideration has yet to be given to the possible negative ramifications of the program. The study evaluates the program using various current leadership theories, and from the perspective of structure, human resource, symbolic, and political frames of the organization. While current policy states that the Master Chief Petty Officer of the Command program works within the framework of the traditional chain of command, the author attempts to demonstrate that this may not be the case, and provides recommendations to alter the program so as to maintain much of the value while reducing the risk of the perceived pitfalls.

The study focuses upon the effects of the Master Chief Petty Officer of the Command program as it is presently implemented in the Surface Forces of the U. S. Atlantic Fleet (SURFLANT).

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Advisor: R. T. Harris
Department of
Administrative Sciences

AN ANALYSIS OF TIME DISTRIBUTION AND WORK LOAD IN
THE AREA OF INDIVIDUAL TACTICAL DEVELOPMENT

James O. McGranahan
Lieutenant, United States Navy
B.A., University of California, Santa Barbara, 1976

The U. S. Navy is a group of people organized to meet a common purpose. One of the Navy's purposes (missions) is combat warfare to protect and defend the United States of America. Therefore, it is vital that Naval officers in operational billets assigned to ships, submarines, aircraft squadrons, and afloat staffs maintain the highest degree of readiness and tactical expertise. Analysis of survey data obtained from air warfare officers indicates that time distribution and work load can have an important impact in the area of individual tactical development. The results showed, in particular, that officers perceived there was insufficient availability of time to develop individual tactical competency.

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Advisors: A. Weitzman
W. R. Bishop
Department of
Administrative Sciences

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ATTITUDES OF MALE UNRESTRICTED LINE (URL) OFFICERS
TOWARDS INTEGRATION OF WOMEN INTO THEIR
DESIGNATORS AND TOWARDS WOMEN IN COMBAT

Colleen J. McKenzie
Lieutenant Commander, United States Navy
B.A., University of California, Riverside, 1973

Using Rand survey data, this thesis examines the attitudes of male
Unrestricted Line (URL) officers towards allowing women into their
designators and the training and use of women in combat situations. The
history of women in the Navy and a general look at the question of women
in combat provide a framework for the analysis of the survey results.
The possible implications of those attitudes, and the impact they could
have on women officers' careers, are also examined.

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ARE NAVY MEMBERS WITH INTEGRATED BEHAVIORAL STYLES CONSIDERED TO BE MORE EFFECTIVE?

Christine M. McMahon
Lieutenant, United States Navy
B.A., University of Delaware, 1977

This study examines the relationship between influence behaviors and an individual's effectiveness in a work team. The influence behaviors of individuals in 17 Navy decision-making groups from both shore and operational commands are tested in order to determine which behaviors are valued and considered to be most predictive of perceived effectiveness and influence. In addition, individuals' preferences to control or to be controlled are compared with their influence behaviors and perceived effectiveness. The results indicate that individuals who exhibit both behaviors that are aimed at asserting their own ideas or 'selves', defined as agentic behaviors, and behaviors that allow others to express their ideas or 'selves', defined as communal behaviors, are considered most effective by other group members at influencing group outcomes.

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AN ANALYSIS OF THE RELATIVE IMPORTANCE OF THE COMPTROLLER BILLET ACROSS NAVY ACTIVITIES

Russell P. McPadden
Lieutenant Commander, SC, United States Navy
B.A., University of Connecticut, 1974

This study examines the level of correlation between the billet requirements for Navy comptrollers and the organizational importance of their respective commands within the Navy hierarchy. Data were collected on the comptroller billets at 148 Navy shore activities which have military comptrollers. Each comptroller billet was ranked on paygrade, required education and experience. Commands were ranked according to overall command characteristics. Pairwise correlations were made of comptroller billet rankings with command rankings.

The correlations obtained were not strong. The Navy has not standardized comptroller functions and responsibilities, allowing comptroller positions to evolve separately throughout the Navy. An ongoing trend is for commands to upgrade their requirements for comptroller talent. The lack of standardized billets prevents adequate forecasting of manpower needs.

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Advisor: W. J. Haga
Department of
Administrative Sciences

MARINE CORPS PERFORMANCE UNDER
THE PROMPT PAYMENT ACT

Robert Joseph Meckel
Captain, United States Marine Corps
B.S., University of Southern California, 1972

The prompt Payment Act (P.L. 97-177) went into effect on 1 October 1982. This act required federal agencies to automatically pay an interest penalty to vendors on all late payments. This thesis is an examination of the Marine Corps bill paying performance under the provisions of the Prompt Payment Act from 1 October 1982 through 31 March 1984. Only those invoices that are subject to the Prompt Payment Act will be examined, with special attention paid to early and late payments. From the data accumulated by this study, it was determined that early payments by Marine Corps payment centers have been significantly reduced, while the problem of late payments due to invoice documentation delays still exists.

STUDENT-FACULTY EVALUATION:
WHAT PLACE IN ACADEME?

Vivian G. Melidosian
Lieutenant, United States Navy
B.S., Northern Illinois University, 1978

Carol A. White
Lieutenant, United States Navy
B.S., University of Maryland, 1975

Questions regarding the usefulness of the Naval Postgraduate School's Student Opinion Form (SOF) as a device to measure teaching effectiveness have prompted this research. The possibility that the SOF may weigh heavily in pay, promotion, and tenure decisions is cause for research into its validity and reliability as an evaluation instrument. The first of three separate studies described here consists of an analysis of a questionnaire distributed to all teaching professors in the NPS Administrative Sciences Department. The second study concerns a questionnaire completed by 258 Administrative Sciences students, and the third study considers the responses of 560 students to four supplementary items added to the SOF. The results indicate that neither students nor faculty members feel strongly that SOFs actually measure or improve teaching effectiveness, that a large part of the variation in SOF ratings is attributable to factors other than a professor's teaching quality, and finally, that a student's anticipated course grade or cumulative grade point average has little correlation with the SOF ratings given the professor.

FACTORS AFFECTING THE ORGANIZATIONAL COMMITMENT OF MILITARY PHYSICIANS

James T. Menifee
Lieutenant Commander, MSC, United States Navy
B.S., George Washington University, 1978

This study examines the 1978 DOD Survey of Officers and Enlisted Personnel for the determinants of organizational commitment for military physicians. The physicians studied were not in the initial period of obligation. Organizational commitment is measured in terms of the physician's intended years of service beyond his obligated service, XSRV. Different variables appear to be important in explaining the organizational commitment of physicians depending on whether or not they are serving in their initial period of obligation. The Uniformed Services Health Professionals Special Pay Act of 1980 substantially amended the special pay entitlements of physicians in the armed forces. The study supports the argument for the amendments. Frequency analysis, multivariate regression, and discriminant analysis are utilized to examine potential factors involved in making career decisions. The civilian versus military job comparison variables are found to be important factors affecting military physicians career decisions.

NAVAL AVIATION IMA REPAIR CAPABILITY:
A READINESS TO RESOURCES APPROACH

Dean R. Merrill
Commander, United States Navy
B.A., Kenyon College, 1968

This thesis studies intermediate repair planning at the Naval Air
Systems Command (NAVAIR) level. Maintenance information system
initiatives (Naval Aviation Logistics Command Management Information
System (NALCOMIS)/Naval Aviation Logistics Data Analysis (NALDA)/AIMD
Performance Management System (APMS)) and an analytical "systems" model
(Analytical Hierarchy Process (AHP)) are examined. The study concludes
that information system initiatives provide the performance measurement
orientation and information processing base required in support of
NAVAIR "tactical" planning. It further concludes that complex logistics
problems can be "modeled" through the AHP. AHP is a promising technique
for integrating performance information and expert opinion into a
hierarchical, multiple objective planning structure. It provides a
method for determining resource requirement priorities in support of
readiness goals. The study recommends that research be expanded to
include development of a NAVAIR decision support framework utilizing the
AHP.

NAVAL AVIATION SUPPORT EQUIPMENT ACQUISITION
POLICIES AND PROCEDURES IN THE 1980S

Terry Lynn Merritt
Lieutenant, United States Navy
B.S.B.A., University of Delaware, 1977
B.A.A.S., University of Delaware, 1977

Thomas Michael Vandenberg
Lieutenant, United States Navy
B.S., Eastern Illinois University, 1977

As weapon systems become increasingly complex and costly, the variety of support equipment needed to maintain them has increased dramatically. One result of this proliferation of support equipment is the recognition of the need for an effective and efficient management and acquisition process. The objective of this research effort is to examine the procedures which have been established for the management of support equipment at the Naval Air Systems Command (NAVAIR), to identify the problems which have been encountered, and to discuss what impact recent changes in acquisition policy mandating competition have had on this process.

SETTING TIME STANDARDS AT NISTARS

Raymond L. Miller
Lieutenant Commander, SC, United States Navy
B.B.A., Wichita State University, 1971

The Naval Integrated Storage and Retrieval System (NISTARS) is currently in the process of being installed at four Naval Supply Centers in the United States. These systems will automatically track, record, and direct movement of materiel from the receiving dock through storage to the final point of issue. Despite technological advances, accurate standards of anticipated materiel throughput for developing labor requirements have not yet been set at NISTARS.

Therefore, this thesis investigates the applicability of setting time standards at NISTARS activities. Various methods of determining standard times are reviewed. Governmental sources of standard times information are examined. The steps for developing standard times are provided. An example standard time for the rackables manned storage and retrieval machine is presented. It is concluded that standard times can and should be implemented at NISTARS to facilitate more accurate labor scheduling and to increase warehousing productivity.

OMB CIRCULAR NO. A-76: EFFICIENCY REVIEW AND PERFORMANCE
MEASUREMENT OF THE DEPARTMENT OF DEFENSE
HEALTH CARE DELIVERY SYSTEM

Raymond L. Moran
Lieutenant Commander, United States Navy
B.S., The Consortium of California State University & Colleges, 1979

John A. Hetsko
Lieutenant, United States Navy
B.A., George Washington University, 1979

Each year the Department of Defense (DOD) is exposed to great pressure from the public sector and Federal Government to save money and to be efficient. The Productivity Program Office of Assistant Secretary of Defense (Manpower, Reserve Affairs and Logistics) brings together approaches for cost containment and organizational efficiency. The Military Health Services System (MHSS) has been notorious for its assumed inefficiency. This apparent "waste" gets attention when health costs go up as productivity trends downward when measured by the Composite Work Unit (CWU). This thesis examines the CWU and a proposed Health Care Unit (HCU). Both measures were discussed and analyzed in an attempt to determine the reliability of each. The Commercial Activities Program and the Efficiency Review Program are presented together with some limited analysis. A proposed performance indicator is presented offering potential for productivity measurement of the MHSS. Conclusions are drawn to summarize the foregoing topics and recommendations are made regarding the Efficiency Review Program, the proposed MHSS productivity measure, and incentives are presented offering potential for efficiency improvement for military health care delivery.

A COMPARISON OF THE NAVY'S "DO-IT-YOURSELF" MOVE PROGRAM WITH OTHER DOD AND COAST GUARD ACTIVITIES

Russell John Myers, Jr.
Lieutenant Commander, SC, United States Navy
B.A., Drake University, 1971

John Arthur Williams, Jr.
Lieutenant Commander, SC, United States Navy
B.B.A., Texas A & I University, 1974

This study is a comparison of the "Do-it-Yourself" (DITY) Household Goods moving program, including both administrative and payment procedures, as presently used by the U. S. Army, U. S. Air Force, U. S. Marine Corps, U. S. Coast Guard and the U. S. Navy. The two purposes of this comparison are, firstly, to determine if fraud, waste and abuse exists within the Navy system to a significant degree and, secondly, to provide recommendations for beneficial modification of the Navy program. This study was supported through personal interviews at the various service headquarters and supporting staffs, personal observations of member counseling sessions, and interviews with major civilian contractors involved in this program. Additionally, the historical development of the DITY program, in general, with specific applications to the U. S. Navy is explored. Conclusions are drawn based upon personal observations and interviews with planning and operational staffs while taking into consideration manning types and levels, political limitations and realities, fiscal responsibilities, and most importantly, the possibility of degradation of service to the member.

THE ANALYSIS OF SOCIAL INSURANCE BENEFITS PROVIDED FOR THE INDONESIAN MILITARY PERSONNEL

Eddy Noegroho
Commander, Indonesian Navy
B.S., Gajah Mada University, 1963

Social insurance is a compulsory insurance program, which is now commonly applied throughout the world. Indonesia has also adopted social insurance programs, which for the military personnel is managed by a government insurance company called PERUM ASABRI. This thesis analyzes the social insurance benefits provided for the Indonesian military personnel, particularly the benefits from the savings aspect of the insurance program. The present value method is applied to calculate the contributions made by a hypothetical military officer and the benefits he would be entitled. Based on this analysis, recommendations are suggested for a better and fairer benefit scheme, while not threatening the continuity of the company's operation.

REVIEW AND EVALUATION OF INTERNAL CONTROL
IN THE DEPARTMENT OF THE NAVY

Angela M. Oppé
Lieutenant Commander, United States Navy
B.A., University of Washington, 1972

This thesis will provide a review and evaluation of the internal control program in the Department of the Navy.

Topics considered include: the evolution of the term internal control both in the private and public sectors; the theoretical background of R. N. Anthony's planning and control system and his management control process; the establishment and review of internal control systems within both sectors; and illustrative cases which demonstrate the inadequacy of focusing on the narrow interpretation of internal accounting control. It is the author's belief that management control—measures employed by management to reach its objectives—is the only meaningful framework within which the subsets of administrative and accounting controls must be combined for the effective and efficient accomplishment of the organization's objectives, whether of the public or private sector.

The research consisted primarily of a detailed search and evaluation of the literature in the area of internal control and management control.

THE DEVELOPMENT OF AN ENLISTMENT STANDARDS
MODEL FOR THE NAVY AVIATION MACHINIST'S
MATE (AD) RATING

Dwayne A. Oslund
Lieutenant Commander, United States Navy
B.S., Oregon State University, 1971

J. S. A. Clark
Captain, Australian Army, RAE
B.E. (Civil), University of New South Wales, 1976

The purpose of this study is to present analytic techniques for developing enlistment standards models which attempt to improve upon existing methods. Alternative criteria for measuring successful operational performance, and a means of measuring utility are also provided. Another purpose of this study is to discover if the Navy's system of selecting personnel for the Aviation Machinist's Mate (AD) rating may be improved.

Two criteria were utilized in developing these models: length of service; and a composite measure of success that considers length of service, highest paygrade achieved, and reenlistment eligibility. Measures on individuals at the time of enlistment are used as predictor and discriminating variables. Six models are developed and analyzed using regression and discriminant techniques. Utility analysis is conducted on each of these models as a means for measuring their usefulness in monetary terms. Recommendations for future research are also presented.

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ANALYSIS OF SELECTION PROCESS FOR MANAGEMENT
EDUCATION: KOREAN MILITARY CASE

Durk Kwan, Park
Major, Republic of Korea Army
B.A., Korean Military Academy, 1974
B.A., Seoul National University, 1978

The current selection system of Korean military officers for
postgraduate education in management is described and analyzed. The
method of validation analysis is used to analyze the current selection
system.

Three factors to use for increasing the effectiveness of the
current selection system are developed. The first factor concerns the
priority of the predictors based on the validation analysis. The second
concerns personal characteristics for consideration in the selection of
officers for management education. The third concerns procedural
considerations for increasing the overall effectiveness of the selection
process.

Finally, on the basis of the three factors developed, a new
selection model, applicable to selecting Korean military officers for
postgraduate education is management, is proposed.

EVALUATION OF GRADUATE EDUCATION OF THE MILITARY
PROFESSIONALS AND ASSESSMENT OF THEIR NEEDS

Park, Soon-Heon
Major, Republic of Korea Army
B.S., Korean Military Academy, 1974

The military services have been aware of the importance of advanced, formal education since the Korean War (1950-1953). During the past three decades, however, with the philosophy of (1) the fortification of self-defense power, (2) the modernization of the military equipment and (3) the development of the defense industry, there has been a great increase in the need for officers with education at the baccalaureate level and graduate level to prepare them for an extreme variety of roles beyond the traditional professional officer's combat mold.

In this regard, this thesis is concerned with (1) whether or not the needs for graduate education were inflated; (2) whether officers so educated were used adequately in positions identified as requiring graduate education; and (3) how we measure the value of graduate education in military officers.

THE HUMAN RESOURCE MANAGEMENT SURVEY:
ANALYSIS OF THE SUBSTANCE-ABUSE
QUESTIONS, QUESTIONS 75
THROUGH 82 INCLUSIVE

Richard Paul Peck
Lieutenant Commander, United States Navy
B.S., State University of New York Maritime College, 1973

The substance-abuse questions of the Navy's Human Resource Manage-
ment (HRM) survey were analyzed to determine if they are giving
commanding officers valid information on substance-abuse problems in
their commands. The responses to the questions concerning substance-
abuse, questions 75 through 82 of the revised HRM survey, are contained
in a data base maintained and updated by the Naval Personnel Research
and Development Center (NPRDC) in San Diego, California. Nine thousand
one hundred nine (9,109) responses were analyzed using the Statistical
Package for the Social Sciences (SPSS). It was concluded that questions
75 through 79, which concern the use of illegal drugs in the command or
in the workgroup, have little or no useful information for a commanding
officer. To these questions respondents either did not reply or replied
that illegal use existed "to a very little extent." Analysis of ques-
tions 80 through 82, which concern alcohol use, revealed that the Navy's
programs to discourage the use of alcohol are not regarded as effective
by the majority of the personnel in the lower enlisted (E1 - E6) and
officer (O1 - O3) paygrades.

AN ORGANIZATION DEVELOPMENT APPROACH
TO THE COMMERCIAL ACTIVITIES PROGRAM

Norma J. Powers
B.S., Loyola University of Chicago, 1976

Linda Donnelly Schmitt
B.A., Rosemont College, 1969

This thesis examines the Commercial Activities Program (CAP) as implemented at a depot specialized for major overhaul and repair of ships. Empirical data was collected to determine the effects of CAP on depot employees and managers. Three groups of employees were surveyed and several managers were interviewed. The results of the data analysis are mixed, indicating a variety of attitudes and reactions toward the Commercial Activities Program.

The researchers propose the Organization Development approach as a way to manage the change imposed by CAP. An open-systems model is presented to illustrate the system-wide perspective and provide a method for achieving organization health. Assistance from the Navy's Organization Effectiveness Centers is recommended as an important resource for organizations such as a depot to draw on to manage change and achieve organization health.

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Department of
Administrative Sciences

THE MILITARILY USEFUL CLEAN PRODUCT TANKER: SEALIFT COMPONENT OF THE DOD PETROLEUM DISTRIBUTION SYSTEM

Suzanne Roberts
Lieutenant, United States Navy
B.S., Louisiana State University, 1972

The Department of Defense petroleum distribution system utilizes Military Sealift Command controlled clean product tankers as its primary element of sealift transport. Relying upon the commercial tanker fleet for the majority of its fleet requirements, MSC is presently facing the decline of that industry due to strong economic and political factors. The reaction and behavior of both DOD and MSC to this changing resource scenario has generated considerable attention and debate. This thesis attempts to depict the overall structure of the DOD petroleum distribution system, MSC's product tanker role in that system, and potential alternative behaviors with regard to the apparent inevitable decline of the product tanker industry.

AN ANALYSIS OF BUDGETING IN FOUR INDUSTRIES

Michael S. Roesner
Lieutenant, SC, United States Navy
B.S., Northern Michigan University, 1974

This research tested some aspects of the contingency model of management, specifically whether firms in the apparel, wood, chemical and areospace industries adapted their budgetary processes to the nature of their respective environments. The hypotheses were that there are no differences in the budgetary processes of companies operating in different industries, and that there are no differences in the budgetary processes of high and low-performing companies within the same industry.

A profile describing the overall organizational and budgetary characteristics of each industry was constructed using data acquired from interviews with corporate executives. Profit-center or major divisional executives also provided data through surveys on the behavioral aspects of the budgetary process in each industry.

Discriminant and variance analysis techniques showed that there were differences across the industries, and between the high and low-performers within an industry.

THE DEVELOPMENT OF SCHEDULED MAINTENANCE
PROGRAMS FOR NAVAL AIRCRAFT

Charles Vincent Rose
B.S., San Diego State College, 1965
M.S.A.E., San Diego State College, 1969

This thesis presents a synopsis of the overall system that determines scheduled maintenance requirements for Navy aircraft. The history of the development of the logic process now used to determine scheduled maintenance requirements is reviewed to show what changes have occurred, and why the changes were necessary.

Current processes for determining maintenance requirements are reviewed in some detail to promote understanding of how the logic system works, and how it interacts with the design process.

Major system acquisition and logistic support analysis processes are briefly summarized to highlight the location of the maintenance requirements determination procedures within the total system.

Comparisons are made and differences are noted between the U. S. Air Force procedures for maintenance program development and those of the Navy.

Potential problems with the new system of statistical sampling based depot maintenance are noted, and possible future developments in the field are discussed.

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ANALYSIS OF LOW BIDDING AND CHANGE ORDER RATES
FOR NAVY FACILITIES CONSTRUCTION CONTRACTS

James R. Rosmond
Lieutenant Commander, United States Navy
B.S., University of Washington, 1974

One of the principal concerns of Government contract adminis-
tration is the proper control of change orders.   They are useful in
resolving problems that would otherwise inhibit the satisfactory comple-
tion of contracts, but their overuse is an unnecessary drain on public
funds.   The purpose of this thesis is to evaluate what effects bidders
of fixed-price Government construction contracts have on contract prices
when the level of competition intensity increases.   It is suggested that
in a climate of intense competition, the winners of bid awards are
usually not only willing to assume the risk of losing profits, but also
are willing to improve their financial positions through excessive use
of contract change orders.   This premise is tested against a sample of
actual construction contract data from the Western Division, U. S. Naval
Facilities Engineering Command.   Several conventional measures of the
level of competition intensity are applied in regression and variance
analyses.

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AN ANALYSIS OF DEPARTMENT OF DEFENSE FINANCIAL
AND ACQUISITION POLICIES IN SUPPORT OF
MILITARY CONTINGENCY REQUIREMENTS

Robert Edinburgh Sanders
Lieutenant Commander, SC, United States Navy
B.S., Tuskegee Institute, 1972

John Stephen Proctor
Lieutenant, SC, United States Navy
B.A., The George Washington University, 1974

The purpose of this study is to evaluate the viability of the financial and acquisition policies of DOD in support of military contingency requirements. This study explores the historical perspectives, as well as the current contingency authorities, policies, and legislation. This same perspective is also applied in evaluating the salient features of industrial preparedness, economic and social impacts of government defense expenditures, war reserves, strategic stockpiles, and the complexities of funding these policies. This research indicates existing policies viably support the projected requirements of any military contingency short of a war. However, this viability is seriously challenged by: (1) the age and relevance of many statutes, (2) their lack of consolidation, (3) the necessary diversion of funds from needed programs, (4) the reliance upon supplemental appropriations, and (5) the integrity of the defense industrial base. The researchers propose several wide-ranging programs to strengthen military capabilities and readiness.

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THE INDUSTRIAL MODERNIZATION INCENTIVES PROGRAM

William J. Sargent
Lieutenant Commander, SC, United States Navy
B.S., Edinboro University, 1974

David J. Fajer
Lieutenant, SC, United States Navy
B.S., Portland State University, 1975

Decreases in the manufacturing productivity growth rate, rising weapon systems costs, and the decline of the defense industrial base are major interrelated problems currently facing the Department of Defense (DOD). The Industrial Modernization Incentives Program (IMIP) is a DOD capital investment incentive plan designed to help alleviate these problems. The objective of this research is to trace the historical elements of the IMIP, provide an analysis of the IMIP and the actions that have been taken to implement it, and to advance recommendations regarding the IMIP for consideration during the Program test period.

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LEVERAGED LEASING IN THE FEDERAL SECTOR

Michael K. Schmitt
Commander, United States Navy
B.A., Villanova University, 1969

Henry E. Crump, Jr.
Lieutenant, United States Navy
B.S., University of North Carolina, 1976

The Department of the Navy recently acquired eighteen auxiliary ships, five T-5 tankers and thirteen TAKX cargo carriers. The financing of these ships was not carried out via the standard purchase appropriation, but rather through a complex transaction known as a leveraged lease. The tax benefits contained in the Economic Recovery Tax Act (ERTA) of 1981 permit either public or private entities to share tax benefits with the owner of an asset. Leveraged leasing is based on this principle. The tax benefits received by a public tax exempt entity is a loss to the Federal Treasury, and Congress has reacted with legislation to control it. This study examines leveraged leasing in the private and public sector with special emphasis on the lease by the Navy of the thirteen Maritime Prepositioning Ships (TAKX). The complex sequence of cash and tax flows are discussed, as well as the impact on the federal budgeting process and Congressional efforts to control the effects on the Treasury.

DECISION THEORY: INDIVIDUAL BIASES AND THEIR EFFECT ON FORECASTING IN AN ORGANIZATION

David Alan Schwiering
Lieutenant Commander, United States Navy
B.A., Waynesburg College, 1971

John Timothy Shannon
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1970

There has been a great deal written about how individual cognitive biases effect decision making. However, there is little empirical evidence to show how such heuristic patterns effect decision making within organizations. This thesis reviews the literature concerning heuristics and behavioral decision theory and then examines budgetary forecasting decisions within two large organizations to see if these biases can be observed in forecasts produced within organizations.

THE ENGINEERS WHO HAVE LEFT DCA: THEIR MOTIVATIONS AND ASPIRATIONS

Colleen M. Sherman
B.S., Boston University, 1970

This research attempts to answer two questions: what are the reasons behind turnover among engineers at the Defense Communications Agency (DCA); and what attracts and motivates DCA's engineers. Interviews with engineers who left DCA between January 1981 and February, 1984 showed that they are overall individuals who: have a strong, primary need to do professional, challenging technical work that is also important work; and to perform the work in a professional environment where appreciation of their work is communicated to them by competent management. They are drawn to a particular job largely by the nature of the work it offers. The opportunity to have a positive personal impact is another attractor variable, as is the opportunity to grow professionally and technically. The motivation to seek a new job can come from the perception that one is dead-ended professionally or has no more opportunity to grow technically. For the majority, salary is at most a secondary consideration in deciding to leave a job. Engineers may also be induced to leave a challenging, significant job if matters external to the work process itself become intolerable or highly frustrating, and a position of equal or greater merit is available elsewhere.

A COMBINED REGRESSION AND BOX-JENKINS PREDICTION MODEL FOR REENLISTMENT IN SELECTED NAVY RATINGS

Kevin J. Sherry
Lieutenant Commander, United States Navy
B.S., Fordham University, 1971

This thesis examines five Navy ratings using two distinct modeling techniques in an effort to predict first term reenlistments. The techniques utilized are Box-Jenkins time series analysis and linear regression. A combined model utilizing both techniques is also developed. The ability of the models to predict is considered adequate for three of the five ratings and not adequate for two of the ratings. The regression models utilizing 20 - 24 year old unemployment as the only independent variable yielded surprisingly good predictions, once the time series patterns in the data were modeled.

NAVY CAREERS AND ADULT DEVELOPMENT

Robert C. Siverling
Commander, United States Navy
A.B., Franklin and Marshall College, 1966

There are a number of theories based on the idea that adults go through predictable stages of development during their lives. The complex interactions among the adult development cycle, the career cycle, and the family cycle have implications for the design and administration of organizations. This paper summarizes several of these theories and examines the interactions of the career pattern of Navy surface warfare officers with their life and family cycles. Interviews of Naval officers confirm a series of propositions about this interaction and lead to a set of policy recommendations to make the career cycle more compatible with the development cycle.

CONTRACT AUDIT FOLLOWUP: ITS IMPACT
ON DEFENSE CONTRACTING

David V. Smith
Lieutenant, United States Navy
B.S., University of North Carolina at Greensboro, 1975

Department of Defense Directive 7640.2 (previously 5000.42),
"Policy for the Followup of Contract Audit Reports," has created contro-
versy both within DOD and the defense industry. Critics have claimed
that the policy causes a fundamental shift in the relationship between
the contracting officer and contract auditor, strengthening the
auditor's role while eroding the independence and authority of the
contracting officer. The available literature on the policy is highly
subjective and consists primarily of the assertions of management, both
in government and industry, either supporting or denouncing the policy.

The primary purpose of this study was to objectively investigate
the specific claims of critics and to explore the overall impact of the
followup policy on defense procurement. The thesis is based on an
analysis of data collected from interviews of procurement managers,
contracting officers, and auditors within the state of California and
telephone discussions with procurement professionals nationwide.

The results of the research indicate that the contract audit
followup policy: (1) adversely affects the independent role of the
contracting officer; (2) attracts unnecessary attention to the
contracting officerauditor relationship; (3) imposes uneconomical goals
on defense procurement; and (4) fails to improve effective use of the
government's audit resources. The results provide useful insight into
the opinions and feelings of contracting practitioners and should assist
decision makers in testing their opinions and theories about the effects
of the policy on defense procurement.

NATURE AND EXTENT OF SUBCONTRACT COMPETITION
CONDUCTED BY PRIME CONTRACTORS
AND SUBCONTRACTORS

Stephen Everett Smith
Lieutenant, SC, United States Navy
B.S., University of Hartford, 1973

The purpose of this study was to investigate the nature and extent of subcontract competition at the prime contractor and subcontractor levels. This area has received increased attention recently due to the emphasis to increase competition in Government procurement. Information was gathered by: interviews with personnel of two prime contractors; review of these prime contractors' subcontract files; and questionnaires sent to subcontractors of these prime contractors.

This study found the Government's definition of competition was widely acceptable and could be used as a common definition, that both prime contractors and subcontractors were extremely motivated to compete when consistent with their corporate goals and that they generally achieved a large amount of subcontract competition. Finally, there are specific actions the Government can take to increase the amount of subcontract competition.

MULTIPLE MODEL ELECTRONIC EQUIPMENT MANAGEMENT
BY THE UNITED STATES NAVY

Daniel R. Smoak
Lieutenant, SC, United States Navy
B.S., University of North Carolina, 1976

Electronic equipment which has multiple models in service creates special logistics support problems for the Navy. This thesis concentrates on the management of multiple model electronic equipment at the Naval Electronic Systems Command (NAVELEX). The causes of multiple models include changes in operational requirements, initial design deficiencies, nonsupportability of the equipment and incomplete technical data for procurement specifications. Parts support difficulties and the weak information interface between NAVELEX and the Ships Parts Control Center Mechanicsburg (SPCC) are discussed. Recommendations for improving this information flow, reducing the number of models of equipment and for providing required procurement technical data are made.

Master of Science in
Management
December 1983

Advisor: A. W. McMasters
Department of
Administrative Sciences

AN ANALYSIS OF NAVAL AVIATION CONFIGURATION
STATUS ACCOUNTING

Thomas F. Snyder
Lieutenant Commander, United States Navy
B.A., California State College, 1969

Marlene A. Snyder
Lieutenant, United States Navy
B.A., Wellesley College, 1973

Naval Aviation configuration status accounting and its interface with the present and future prescribed and locally developed information systems is reviewed. It was determined that the lack of coordination, integration and standardization resulting from the proliferation of locally developed systems decreases logistic support and maintenance management effectiveness. It is recommended that the prescribed Naval Aviation configuration status accounting system and the proliferation of local systems be consolidated into a single integrated system. NALCOMIS, a program currently under development, has the potential to meet all user requirements with minor expansion to its current design.

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Management
December 1983

Advisor: W. R. Talutis
Department of
Administrative Sciences

AN ANALYSIS OF PROPOSED AND CURRENT REGULATIONS CONCERNING LOBBYING COSTS IN DEPARTMENT OF DEFENSE CONTRACTS

Rhys Sueur
Lieutenant Commander, SC, United States Navy
B.A., Wake Forest University, 1973

The purpose of this study is to analyze the Department of Defense (DOD) attempts to regulate lobbying costs in Government contracts. The study reviews all DOD efforts in the lobbying area since 1977, and discusses policy changes, critical responses, and the rationale behind the approach.

The results of this research indicate that: (1) politics have overshadowed the merits of the lobbying issue in many instances; (2) no one has a quantitative figure of the amount of lobbying costs charged to Government contracts; and (3) there is no solid consensus on what activities constitute lobbying and how they should be regulated. The researcher proposes continued evaluation of the DOD lobbying costs regulations to obtain better data and ascertain the magnitude of the costs involved in lobbying in DOD contracts, and the DOD regulatory approach.

Master of Science in
Management
June 1984

Advisor: D. C. Guyer
Department of
Administrative Sciences

PLANNING FOR FOLLOW-ON SPARE PART SUPPORT
BY THE NAVAL ELECTRONIC SYSTEMS COMMAND

Michael Francis Sule
Commander, SC, United States Navy
B.S., University of Vermont, 1970

This thesis addresses the problem of follow-on spare part support and how the Navy Electronic Systems Command (NAVELEX) plans for this support. Current NAVELEX policies, procedures, and practices which impact on follow-on spare part support are analyzed and evaluated. NAVELEX has recently changed its policy from, in effect, not planning for follow-on support to an aggressive program to pursue competitive reprocurement for repair parts whenever possible. Specific recommendations are made to improve NAVELEX's policy and planning for follow-on support. These recommendations may be applicable to other DOD activities.

A COMPARATIVE EXAMINATION OF MINORITY PARTICIPATION WITHIN THE UNITED STATES NAVY OFFICER CORPS

Edward Lawrence Sullivan
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1971

Patricia Ann Miller
Lieutenant, United States Navy
B.S., Southern Connecticut State College, 1972

This thesis examines minority participation in the Navy officer corps, 1973 to 1983. Some comparisons of the experiences of white officers, and of the officer corps of other services, are introduced as yardsticks for the Navy minority experience. A brief history of minority military participation prior to the inception of the All-Volunteer Force (AVF) is presented. Demographic trends observable within the American population are presented and compared with planned manpower requirements for the next ten years. A brief description of minority experience in the Navy Officer Corps during the AVF era is presented.

A comparison of sources of entry of minority officers into the military, and how the Navy differs from the other services, as well as the significance of such a difference, are presented. An examination of perceptions and career intentions of minority officers in the Navy and how they differ from those of minorities in other branches of the service are presented.

Master of Science in
Management
December 1983

Advisor: G. W. Thomas
Department of
Administrative Sciences

A LOOK AT THE NAVY'S MANPOWER PERSONNEL
TRAINING ANALYST BILLETS

Daniel Bush Summerall
Lieutenant Commander, United States Navy
B.B.A., Texas Tech University, 1972

This study brings together into one document all information pertinent to the Navy's Manpower, Personnel, Training and Analysis (MPTA) billets which a graduate of the Naval Postgraduate School would logically fill in subsequent tours of duty. Each XX33P and XX33Q coded billet is separately listed indicating the subspecialty, designator and rank requirements, activity to which the billet is assigned, office phone number, immediate senior in the chain of command, geographical location and a billet description. Billets are categorized according to major areas of interest such as Recruitment, Compensaion, Requirements Determination, etc. The researcher lists these in order of importance according to the current billet description as updated through personal interviews. Recommendations to course and curricula content are offered as a result of the study.

STRATEGIC PLANNING IMPLEMENTATION IN
INDONESIA'S TRANSMIGRATION PLAN

Joewono Swandojo
Lieutenant Commander, Indonesian Navy
B.S., Indonesian Naval Academy, 1968
Drs., Institute of Public Administration (STIA-LAN), 1982

Currently, strategic planning, if it has been implemented properly, is apparently the only way to obtain a successful effort for each institution (both government and private sectors) in accomplishing given goals.

This thesis attempts to study the implementation of strategic planning in Indonesia's Transmigration Plan. For that purpose, some additional analysis for similar efforts in other countries is also included in order to give more comprehensive perspectives.

Some conclusions and recommendations are generated to improve the strategic planning and implementation in the future.

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DOCUMENTATION AND EVALUATION OF DEPOT MAINTENANCE COST ACCUMULATION AND REPORTING AT THE SACRAMENTO ARMY DEPOT, SACRAMENTO, CALIFORNIA

Kevin James Tackett
Lieutenant Commander, United States Navy
B.S., University of South Carolina, 1971

The purpose of this research project is to examine the recording and reporting of depot level maintenance cost to the Office of the Assistant Secretary of Defense for Manpower, Installation and Logistics (OASD) and the interpretation of these costs in OASD report RCS-DD M(A) 1397.

The analysis in this study is based on information obtained from personal visits to the Sacramento Army Depot and by analyzing four years of depot cost data obtained from OASD. Of particular interest was OASD report RCS-DD M(A) 1397 for FY 82, which is a compilation of all service component maintenance costs.

The results of this study indicate that if Sacramento Army Depot is representative of all Army Depots, then the Department of the Army has a workable cost accumulation and reporting system which is capable of providing the maintenance cost data required by OASD. This study further revealed that in its present form information in OASD report RCS-DD M(A) 1397 is subject to misinterpretation and should be revised.

FORECASTING U.S. ARMY MAJOR COMMAND READINESS BASED ON ENLISTED PERSONNEL STRENGTH

Carter S. Thomas
Captain, United States Army
B.S., United States Military Academy, 1974

A model using linear programming optimization and Markov Chain forecasting techniques is presented to forecast future Major Command (MACOM) readiness based on the personnel criteria of Army Regulation (AR) 220-1. The model is composed of four modules. First, the Recruitment Module forecasts accessions based on total numbers recruited and historical attrition rates. Second, the Distribution Module optimally assigns all new accessions and permanent change of station moves to the MACOMs. Next, the Forecasting Module ages the MACOMs using the theory of Markov Chains. Finally, the Readiness Indicator Module computes and assigns a readiness rating to the MACOMs based on the personnel criteria specified in AR 220-1. The results obtained from this methodology can aid DCSPERS, MILPERCEN, and other decision makers in the formulation of future manpower policies concerning recruitment, promotion, expiration term of sevice (ETS) and permanent change of station (PCS).

Master of Science in
Management
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Advisors: P. R. Milch
G. T. Howard
Department of
Operations Research

LINKING STRATEGIC PLANNING AND MANAGEMENT CONTROL

Diane R. Traugh
Lieutenant Commander, United States Navy
B.A., University of Minnesota, 1973
M.A., Catholic University of America, 1980

The purpose of this research is to review and integrate the literature describing the relationship between the strategic planning process and the management control process. The assumption made is that neither the strategic planning process nor the management control process are achieved in isolation from each other. Elements or dimensions of each process must exist on a common ground and serve as integrating mechanisms between the two processes. The focus of the thesis is to identify the common elements or dimensions.

The tool for implementing strategic planning decisions is the management control system. The management control system will be effective if expectations are clearly communicated, managers are motivated toward the organization's goals, and the system effectively monitors how appropriate the strategies continue to be. Essentially, good management produces an integrated planning-controlling system in an organization. The literature suggests that those managers who understand how to integrate the planning and controlling processes produce better performance.

AN ECONOMIC MODEL FOR THE REPLACEMENT
AND MANAGEMENT OF NAVY VEHICLES

Dale M. W. Walker
Lieutenant Commander, CEC, United States Navy
B. Architecture, University of C lorado, 1972

Brian R. Silas
Lieutenant, CEC, United States Naval Reserve
B. Building Construction, University of Florida, 1973

The Naval Facilities Engineering Command (NAVFACENGCOM) Command Management Guidance for FY-84 identified the need for an alternative to the twenty year old DOD-specified vehicle replacement criteria (age and mileage). This thesis identifies a model which structures the replacement decision as an examination of the economic balance between average annual costs of ownership and operation. The model is suggested for dynamic application in determining the optimal service lives of various vehicle types for fleet-wide replacement programming. It is also recommended as a tool for activity level transportation managers, since it provides a means to examine and compare the economic consequences of management policies and practices. Its practicality for this application is enhanced by the possibility that if implemented via the computer medium, it could be integrated with the electronic record keeping capability for public works transportation management currently being provided by NAVFACENGCOM's Project BEST.

AN ASSESSMENT OF THE REVISED MANPOWER POLICIES
IN THE NORWEGIAN ARMED FORCES

Stein Wilhelm Weber
Captain, The Royal Norwegian Air Force
Norwegian Naval Academy, 1978

Revised manpower policies will be implemented 1 November 1984 in the Norwegian Armed Forces. The basis for promotion and rotation of officers, and the structure of the military education are to be changed service-wide. The thesis evaluates the possible consequences of introducing self-determination with regard to when and where military officers are assigned to duty stations and positions.

The introduction of a standard level of promotion for all career officers is addressed. It may seem to be a desirable personnel policy, but such an advancement system is partly a consequence of a direct link between the services' rank and pay structures. The consequences in the long run may turn out to be further inflation in the military ranks and thereby increased problems for the services. Possible criteria for promotion are analyzed and the benefits and disadvantages of the notion of real competency are discussed.

The thesis suggests that the revision may contribute to changes in the adaptation of the career officer to the military organization, if a major portion of the officers takes the opportunity early in their career to select a permanent residency and becomes less mobile. The new regulations will probably relieve much of the dissatisfaction among career officers, provided that the services do not have to use excessive temporary duty assignments in order to get important billets filled. As a result of the study, several areas of concern with regard to the implementation of the revised policies are identified and subsequent policy actions are recommended.

Master of Science in
Management
December 1983

Advisor: R. D. Evered
Department of
Administrative Sciences

A PERFORMANCE BASED MANAGEMENT SYSTEM
FOR THE UNITED STATES NAVY

George M. Yacus
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1974

This thesis discusses _performance based management_, a system that manages and compensates on the basis of both leadership and technical performance. Present military manpower systems attempt to combine these two dimensions into a one-dimensional system, but this approach has met with increased dissatisfaction by lawmakers. The U. S. Army has originated a concept paper describing performance based management issues, and has also developed a computer model that reflects changes in costs and force structure when a performance based system is compared with the current system. The author discusses the concept of performance based management, the computer model, significant issues, and the possible implementation of a performance based management system for the United States Navy.

THE DECISION FOR THE OPTIMAL PRICE IN COMPETITIVE BIDDING: THE CASE OF A KOREAN CONSTRUCTION COMPANY

Cha Young Yoon
Major, Republic of Korea Air Force
B.S., Republic of Korea Air Force Academy, 1975

During recent years, there has been a surprisingly large amount of bidding for overseas projects, especially in the middle east area. This boom has contributed to the economic development of Korea.

But unfortunately, the theoretical and practical studies of these fields are still unsatisfactorily developed. Also the recognition of the scientific factors in the pricing problem by the decision makers is not complete. So, to be successful in this field, management must concentrate their efforts on improving the management system.

The purposes of this thesis are: first, to provide a method of determining an optimal competitive bid by a scientific approach; and second, bidding to provide a total system including effectiveness, competitiveness and efficiency. The model presented here can certainly be a powerful and effective tool for competitiveness.

MASTER OF SCIENCE

IN

MECHANICAL ENGINEERING

AN EXPERIMENTAL TECHNIQUE FOR THE STUDY
OF VELOCITY PROFILES IN A LAMINAR JET
USING A PULSED NITROGEN LASER

David T. Armstrong
Lieutenant Commander, United States Navy
B.S.E.E., Purdue University, 1975

A nonintrusive technique for flow visualization of momentum jets has been investigated. A flow system containing a fluid photosensitive to ultraviolet radiation (a solution of mineral spirits and photochromic dye) has been constructed for generating a momentum jet in a test chamber. An ultraviolet beam (337.1 nm) from a pulsed nitrogen gas laser was fired through the test chamber producing opaque traces in the jet and ambient fluid. Movement of the fluid deformed these traces and produced a record of fluid flow. Velocity distributions have been obtained in laminar jets.

Master of Science in
Mechanical Engineering
September 1984

Advisor: W. G. Culbreth
Department of
Mechanical Engineering

AN ANALYTICAL EVALUATION OF SPALL SUPPRESSION OF
IMPULSIVELY LOADED ALUMINUM PANELS BASED ON A
ONE DIMENSIONAL STRESS WAVE PROPAGATION MODEL

Michael K. Asada
Captain, United States Army
B.S., United States Military Academy, 1976

The response of materials to intense impulsive loading is quite complex. For this reason, an approximate analytical method is used based upon a one dimensional elastic shock approach to analyze the effects of a shaped charge against aluminum panels. This method allows concentration on one aspect of spalling by introducing simplifying assumptions into the governing equations of continuum physics. Then with this information, means to suppress the spall can be developed in order to design or modify an armored vehicle configuration to withstand the catastrophic effects of spallation against its crew members. This work provides a broad overview of stress wave effects in aluminum panels that are caused by rapidly applied loading conditions, together with fundamental results involving elastic shock waves. Results are presented that are useful in obtaining a quantitative appreciation of the behavior of the aluminum under short duration loading. These results may serve as precursors to more complete analyses such as predicting the amount of deformation or spall a specified target experiences when attacked by a certain type of shaped charge.

Master of Science in
Mechanical Engineering
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Advisor: Y. S. Shin
Department of
Mechanical Engineering

SUPERPLASTICITY IN THERMOMECHANICALLY PROCESSED HIGH MAGNESIUM ALUMINUM-MAGNESIUM ALLOYS

John J. Becker
Lieutenant Commander, United States Navy
B.S., University of North Dakota, 1971

The elevated temperature deformation characteristics of two thermomechanically processed high magnesium, aluminum-magnesium alloys were investigated. The thermomechanical processing itself included warm rolling at 300°C to 94% reduction. Subsequent treatments included annealing after rolling for either one-half hour or ten hours at 300°C, or one half hour at 440°C. These annealing treatments resulted in varying degrees of recrystallization and grain growth and facilitated examination of the effect of grain size on the superplastic deformation characteristics of these alloys. Tension testing was conducted at strain rates ranging from 5.3×10^{-5} to 5.3×10^{-2} S-1 and temperatures varying from ambient to 300°C. Materials in the warm rolled condition exhibited the highest strength at ambient temperature and were generally most superplastic at elevated temperature. An Al-10%Mg-0.5%Mn alloy exhibited elongation of approximately 400% at 300°C.

THE HEAT TREATMENT RESPONSE OF THERMOMECHANICALLY
PROCESSED M-50 STEEL

Elizabeth Vaughan Bres
Lieutenant, United States Navy
B.S., Vanderbilt University, 1977

The heat treatment response of M-50 steel, thermomechanically processed warm rolling, was compared to that of the same material in a conventional, spheroidize-annealed condition. Warm rolling of M-50 produces markedly finer microstructures than does conventional processing, and may result in enhanced fracture resistance in such a steel. This work examined the effect of austenitizing time and temperature on warm rolled material, comparing its response to that of a conventional, spheroidized starting condition. Warm rolled samples demonstrated significantly higher hardness and retained their finer microstructures after short austenitizing times or treatment at low austenitizing temperatures. The hardness difference is attributed to faster dissolution of finer carbides. Using warm rolled M-50, a given hardness is achieved using shorter austenitizing times or lower austenitizing temperatures than for conventional M-50.

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MARINE STEAM CONDENSER DESIGN OPTIMIZATION

Thomas M. Buckingham
Lieutenant, United States Navy
B.A., College of the Holy Cross, 1977

A surface-condenser analysis code was coupled with a constrained function minimization code to produce an automated marine condenser design and optimization package. The program, CONDIP, was based on the principles developed in ORCON1, a sophisticated computer code produced by the Oak Ridge National Laboratory. CONMIN, the optimization program, was developed at the Ames Research Center.

CONDIP is an extremely versatile design tool, incorporating a detailed analysis of the complex steam-side thermodynamic processes occurring at each row in the condenser. The additional capability of tube enhancement is also included. However, in coupling CONDIP with CONMIN numerous problems had to be overcome in order to make CONDIP capable of completing an analysis even when thermodynamic conditions in the condenser became infeasible. This had to be accomplished while ensuring continuity in all constraint and objective function evaluations. A series of test cases were conducted to evaluate and compare the importance of various objective functions and design criteria.

UNDERWATER SHOCK-INDUCED RESPONSES OF
SUBMERGED CYLINDRICAL STRUCTURES

Francois G. Daube
Civilian, French Ministry of Foreign Affairs
Ingenieur E.N.S.T.A., Paris, France, 1981
M.S., Massachusetts Institute of Technology, 1982

The non-linear elasto-plastic responses of a submerged cylindrical shell to an underwater shock wave have been investigated. Using the EPSA (Elasto-Plastic Shell Analysis) code, the gross responses of homogeneous and ring-stiffened shells were evaluated. The relevant parameters have been displayed and evaluated using PATRAN-G color graphics system. An interface module was developed between EPSA and PATRAN-G. The deformations and von Mises stresses throughout the shell have been qualitatively evaluated.

Master of Science in
Mechanical Engineering
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Advisor: Y. S. Shin
Department of
Mechanical Engineering

AN ANALYTICAL MODEL OF GAS TURBINE
ENGINE INSTALLATIONS

Stephen M. Ezzell
Lieutenant Commander, United States Navy
B.S., North Carolina State University, 1971

An interactive computer simulation of marine gas turbine installations including intake and exhaust ducting for the engine and module cooling has been developed. A one-dimensional analysis was used in determining the pressure losses of the ducting. The pressure losses along with the ambient conditions and desired power setting define a unique operating point for the system. The computer model predicts operating parameters for this point by an interactive matching technique.

REPRESENTATION OF POTENTIAL FLOW ABOUT AXISYMMETRIC BODIES WITH DISCRETE SINGULARITIES

Linda Crockett Janikowsky
Lieutenant, United States Navy
B.S., George Peabody College for Teachers, 1977

A rational methodology has been developed whereby three-dimensional sources and sinks may be placed along the major axis of a class of ovary ellipsoids so as to minimize normal velocity and to calculate as exactly as possible the tangential velocity, pressure distribution, and the body shape. For this purpose the strength and position of the singularities and the position and number of the control points were optimized through the use of the method of least squares and the Automated Design Synthesis optimization technique. The results have shown that the previous methods are far from satisfactory and the use of two types of optimization in the determination of the strength and position of the singularities yields the desired body shape and flow characteristics with excellent accuracy. A comprehensive computer code has been developed to enable one to calculate most of the practically significant body shapes.

Master of Science in
Mechanical Engineering
March 1984

Advisor: T. Sarpkaya
Department of
Mechanical Engineering

AN INVESTIGATION OF ELEVATED TEMPERATURE FATIGUE CRACK INITIATION IN 2 1/4 CR-1 MO LOW ALLOY STEEL

Orion P. Keifer
Lieutenant Commander, United States Navy
B.S.M.E., United States Naval Academy, 1973

Environmental effects in elevated temperature fatigue have been extensively studied and reported in the literature for 2 1/4 Cr-1 Mo steel. The results of cycles to failure (lumped initiation and propagation life) versus strain range have shown drastic reductions in fatigue life with a dwell period at compressive strains in each loading cycle. This thesis has separately examined the crack initiation and propagation stages for several specimens tested in air at $538^{\circ}C$ without dwell and a single specimen with a five minute compressive dwell. With dwell, the crack initiation stage was severely reduced (by a factor greater than eleven) relative to testing without dwell. The results clearly indicate that oxide cracking is a precursor to crack initiation in the substrate. It is concluded that the fatigue life of this alloy must be estimated based on the crack propagation characteristics alone, since crack initiation can be expected very early (i.e., first few cycles) for any practical environment.

Master of Science in
Mechanical Engineering
June 1984

Advisor: K. D. Challenger
Department of
Mechanical Engineering

FLOW VISUALIZATION STUDY OF NATURAL CONVECTION
FROM A HEATED PROTRUSION IN A LIQUID
FILLED RECTANGULAR ENCLOSURE

Rick Herman Knock
Lieutenant Commander, United States Navy
B.A., Albion College, 1972

The flow visualization study of natural convection in a liquid filled rectangular enclosure with a small heater protruding into it from one vertical wall was conducted. The top and bottom horizontal surfaces of the enclosure were heat exchangers whose temperatures could be varied independently. The fluid in the enclosure was water. The Baker electrochemical technique which utilizes a pH indicator was used for flow visualization. Photographs were taken of the two dimensional flow for three different locations of the heater on the vertical wall. Nusselt numbers for each heater location and for a range of Rayleigh numbers were also determined. Visual results indicate the presence of a dual-cell configuration within the enclosure. There is a buoyancy driven upper cell and a shear driven lower cell. The flow of the upper cell follows the geometry of the enclosure. Though the uncertainty inherent in the experiment was high, data calculations suggest a trend that as the heater is raised within the enclosure the Nusselt number decreases.

Master of Science in
Mechanical Engineering
December 1983

Advisor: M. D. Kelleher
Department of
Mechanical Engineering

EFFECT OF BOUNDARY CONDITIONS ON THE DAMPING
CHARACTERISTICS OF A RANDOMLY EXCITED
CAST NICKEL-ALUMINUM BRONZE SPECIMEN
AT LOW STRESS LEVELS

Stephen T. Knouse
Lieutenant, United States Navy
B.S.M.E., University of Nebraska, 1976

This research examines how various specimen support arrangements affect a material's damping characteristics. The 74 lb. sample studied is cast nickel-aluminum bronze and measures 19.8 x 13.65 x 1 inches. Using previously documented Naval Postgraduate School research, desired random vibration analysis has been verified by impulse hammer techniques. Input excitation is provided by a combination piezoelectric-electromagnetic vibration generator system and response is recorded through the use of piezoelectric accelerometers. The frequency range studied varies from 100 Hertz to 12,500 Hertz. The vibration generator is threaded into the specimen and the accelerometers are attached to the machined surface of the sample with a cyanoacrylate adhesive. Boundary support conditions include various: foam, bolted and shock-chord configurations.

NON-LINEAR TRANSIENT RESPONSE OF FLAT PLATE TO AIR SHOCK WAVE

Lee, Jae-Nam
Major, Republic of Korea Army
B.S., Korean Military Academy, 1974

The non-linear elasto-plastic response of a clamped flat plate to a typical air shock wave was investigated. The nonlinear effects to the plate responses due to the material and geometric nonlinearity were studied.

In this study, (1) the necessity of the modification of old armored vehicles was reviewed and (2) the NASTRAN code was employed in this investigation, (3) the theoretical background of the nonlinear transient analysis was described, (4) a step by step procedure of analyzing the dynamic load problem by shock wave using the NASTRAN code was developed, and (5) sensitivity analyses were performed and also difficulties associated with the nonlinear analysis were described.

DESIGN AND CONSTRUCTION OF A COMPUTER CONTROLLED MICROTHERMOCOUPLE PROBE FOR THE STUDY OF BUOYANT JETS

Ronald John Matoushek
Lieutenant Commander, United States Navy
B.S.E.E., Purdue University, 1974

A computer-aided data acquisition system was developed and a microthermocouple probe constructed to obtain thermal distributions in turbulent buoyant jets exposed to a cross-flowing ambient fluid. The system performed high speed temperature measurements as a microthermocouple probe was automatically traversed through a sequence of preprogrammed positions under the control of a microcomputer. Operability of the apparatus was demonstrated by measuring temperature distributions in planes perpendicular to the streamwise axis jets from which contour plots of temperature were generated. Using temperature distributions along with velocity distributions allow buoyant jet characteristics to be computed, including the entrainment rate of ambient fluid, jet trajectory, and heat transfer to the ambient. The experimental technique is discussed and temperature contour plots for a jet at various planes are presented.

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A GENERAL SIMULATION PROGRAM FOR ROBOT MANIPULATOR ARM DYNAMICS

Gene Richard McGalliard
Lieutenant Commander, United States Navy
B.S., Stevens Institute of Technology, 1971

A computer program is presented which implements a recursive Lagrange formulation of open-loop kinematic chain equations of motion for the purpose of providing a generalized dynamic model of robot manipulator arms. The dynamic model was verified against results known for a PUMA arm, obtaining joint accelerations given current positions, velocities, and torques. The FORTRAN program was executed on an IBM 3033 digital computer and can accommodate most physical robotic configurations. Additionally, an attempt has been made to simulate manipulator motion using the verfied model and previously published integration methods. Comparison of simulation results against known results provides evidence that additional work must be accomplished in the area of solution iteration.

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SUPERPLASTICITY IN A THERMO-MECHANICALLY PROCESSED ALUMINUM-10.2%MG-0.52MN ALLOY

Max E. Mills
Lieutenant Commander, United States Navy
B.S.CH.E., University of Idaho, 1976

This research extended the previous work performed by Becker on the elevated temperature deformation characteristics of an aluminum-10.2% magnesium-0.52% manganese alloy. The alloy was warm rolled at 300 C to 94% reduction. Stress-strain testing was utilized to collect data for stress vs strain rate and ductility vs strain rate, as well as stress exponents and activation energies. Tensile testing was performed at strain rates from $1.39 \times 10^{-4} s^{-1}$ to $1.39 \times 10^{-4} s^{-1}$ and temperatures from 20 C to 425 C. Ductility ranged from 400% at 300 C and 600% at 325 C to 700% at 425 C. The data clearly establishes that the warm rolled alloy is superplastic at temperatures as low as 275 C and may exhibit superplastic elongations (greater than 400%) at strain rates as high as $10^{-2} s^{-1}$ at 325 C. Scanning electron microscope observations indicated little or no void formation at or below 300 C. The high ductilities observed at temperatures above the solvus are the result of grain boundary sliding.

ON THE USE OF LIQUID CRYSTAL THERMOGRAPHY
AS A TECHNIQUE OF FLOW VISUALIZATION

Gregory A. Morrison
Captain, United States Marine Corps
B.S.M.E., United States Naval Academy, 1977

An airfoil, resistively heated with a uniform constant heat flux, is covered with mylar sheet impregnated with temperature sensitive cholesteric liquid crystals. When the foil is convectively cooled by air flow, the liquid crystals exhibit color patterns which are found to depend on angle of attack and flow velocity. By comparing these color patterns with smoke flow visualization, it is found that the color patterns clearly indicate laminar to turbulent transition, and boundary layer separation from the surface, demonstrating the positive contribution of this technique to the field of flow visualization.

HEAT TRANSFER MEASUREMENTS OF INTERNALLY FINNED ROTATING HEAT PIPES

Adnan Nefesoçlu
Lieutenant Junior Grade, Turkish Navy

A rotating cylindrical heat pipe was tested using various internally finned condensers and was compared with a smooth-wall cylinder. Each condenser was tested at rotational speeds of 700, 1400 and 2800 rpm with film condensation. Distilled water was used as the working fluid.

The heat transfer rate of each condenser was plotted versus the driving temperature difference between the vapor saturation temperature and the cooling water inlet temperature. The objective of this investigation was to study the performance with various fin configurations and to find an optimum fin geometry.

As expected, in all cases, performance was improved with increasing rpm. The performance of internally finned condensers was found to be as much as 230 percent greater than that of the smooth condenser.

HEAT TRANSFER TO VERTICAL FLAT PLATES
IN A RECTANGULAR GAS-FLUIDIZED BED

David Carter Neily
Lieutenant, United States Navy
B.S., University of Colorado, 1975

This experimental study was conducted at the Naval Postgraduate
School to investigate the heat transfer characteristics of flat vertical
plates in a rectangular gas-fluidized bed. The primary objective was to
determine what effect variations in the bed width-to-height ratio had on
heat transfer to the vertical flat plates forming the container walls.
The experiment was conducted using a specially heated and instrumented
fluidized bed equipped with a movable side wall which permitted modifi-
cation of the bed geometry. As the width of the bed was adjusted, the
settled bed height was maintained at a constant level by the addition or
removal of bed material.

A secondary objective of the study was to determine the effect of
variations in the fluidization gas flow rate on heat transfer to the bed
walls. Flow rates ranging from fixed bed fluidization to pneumatic
conveying were studied.

Pressure drop measurements as well as visual observations were
used to determine minimum fluidization flow rates for each configur-
ation. Heat transfer coefficients were calculated for each flow rate
and bed geometry, using temperature data obtained from a computer
controlled thermocouple network. In addition, a study was made of
variations in wall temperature with changes in vertical position.

Master of Science in
Mechanical Engineering
June 1984

Advisor: P. F. Pucci
Department of
Mechanical Engineering

COMPUTER AIDED DATA ACQUISITION AND CONTROL
OF AN INTERNAL COMBUSTION ENGINE

Bryan R. Oakes
Lieutenant, United States Navy
B.A., Linfield College, Oregon, 1975

Two microcomputers, a Digital Equipment Corporation VT-103 and an Octagon Systems Corporation SYS-1, were interfaced with a General Motors Model 1-53X3 single cylinder diesel engine to provide automated data acquisition and data reduction and engine control while running class-room experiments. Engine inlet and exhaust temperatures and pressures, RPM, torque and fuel flow, along with additional engine parameters, can be measured with the aid of a computer. Values for parameters such as specific fuel consumption, air-to-fuel ratio, and thermal efficiency can then be computed, and both measured and computed values can be displayed and recorded. The Digital Equipment Corporation computer is the parent computer and is used interactively for data acquisition and data reduction and for feedback control through the Octagon computer to which it is linked. The Octagon computer is used exclusively for control of the engine speed and load.

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FILMWISE CONDENSATION OF STEAM
ON EXTERNALLY-FINNED
HORIZONTAL TUBES

William M. Poole
Lieutenant, United States Navy
B.S.M.E., United States Naval Academy, 1978

The film-condensation characteristics of a smooth tube and six externally-finned tubes having fins 1 mm high and 1 mm thick, and pitches of 1.5, 2.0, 2.5, 3.0, 5.0, and 10.0 mm, were experimentally tested.

A smooth copper tube with an active length of 133.5 mm, an outside diameter of 19.05 mm, and an inside diameter of 12.7 mm was first tested to correlate the inside heat-transfer coefficient using the Sieder-Tate equation. The leading coefficient for this equation was found to be 0.034 +/- 0.001, and was used to derive the external condensing coefficient for all of the tubes by subtracting the inside and wall resistances from the measured overall resistance. The condensing coefficient was measured, both at atmospheric pressure and vacuum (84 mm Hg), with the heat flux as a variable.

Condensation data taken for the smooth tube were compared with data in the literature to check the reliability of the apparatus and the data-reduction procedures. The data for the finned tubes showed an optimum pitch of 2.5 mm.

Master of Science in
Mechanical Engineering
December 1983

Advisor: P. J. Marto
Department of
Mechanical Engineering

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COMPRESSIVE STRENGTH OF EPOXY RESIN CHOCKS
SUBJECTED TO ELEVATED TEMPERATURES

Richard P. Prince
Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1975

Epoxy resin chock specimens were molded from Philadelphia Resins Corporation's product CHOCKFAST ORANGE. The 2" x 2" x 1 1/4" chocks were divided into seven groups of 12 specimens each and subjected to the temperature environments of 21.5°C, 40°C, 80°C, 100°C, 120°C, 160°C, and 200°C respectively. A single furnace was used to create the proper environment for each elevated temperature group and equal amounts of specimens were removed at regular intervals up to a 120 hour maximum exposure. The specimens were allowed to cool to ambient conditions and then were placed under compressive loading. Stress versus strain plots revealed increased ultimate compressive strengths but decreased moduli of elasticity for each elevated temperature group.

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NUCLEATE POOL BOILING CHARACTERISTICS OF
GEWA-T FINNED SURFACES IN FREON-113

Ricardo J. Pulido O.
Lieutenant, Columbian Navy
B.S., Escuela Naval Almirante Padilla, 1979

Pool boiling heat-transfer measurements were made using seven Gewa-T copper tubes in R-113. The first tube (19 mm OD $\times$ 0.75 fins/mm $\times$ 0.25 mm gap) was tested under three conditions: (a) plain; (b) with four shrouds; and (c) with up to 5 wires (0.13 mm diameter) wrapped in the inter-fin trough area. Verifying prior data, the shroud with longitudinal openings of 60° at the top and 8.5^o at the bottom gave the best performance among the four shrouds tested. This shroud increased the boiling heat-transfer coefficient by 253% (over the smooth-tube case) at a heat flux of 10,000 W/m^2, while it showed only a 18% increase at 100,000 W/m^2. When wire wraps were provided, in all cases, the heat transfer coefficient was improved at all heat fluxes. The use of three wires gave the best performance with 341% increase in heat-transfer coefficient at 10,000 W/m^2 and a 130% increase at 100,000 W/m^2.

The next three Gewa-T tubes had dimensions of 25mm OD $\times$ 0.75 fins/mm with fin-tip gaps of 0.15, 0.25, and 0.35 mm, respectively. The last three Gewa-T tubes had the same dimensions except that the fin density was 1.02 fins/mm. For each of these fin densities, the 0.25 mm fin-tip gap produced the best boiling performance at all heat fluxes. Also, for a given fin-tip gap, the boiling performance increased with increase in fin density. For a fin-tip gap of 0.25 mm, the lower fin-density tube produced an 80% increase, while the higher fin density tube produced a 103% increase in the boiling heat-transfer coefficient.

AN EXPERIMENTAL INVESTIGATION INTO THE DYNAMIC RESPONSE OF A STIFFENED FLAT PLATE LOADED IMPULSIVELY BY AN UNDERWATER SHOCKWAVE

Thomas R. Rentz
Lieutenant, United States Navy
B.S., United States Naval Academy, 1978

The experiment conducted is in support of a broad-based study of underwater shock wave phenomena and the effects they have on ship's hull lethality. An air-backed flat plate with externally machined rectangular stiffeners and a clamped boundary condition was subjected to a shock wave loading generated by an eight pound TNT charge detonated underwater. The plate was instrumented to measure transient strains. The test structure acceleration and free field pressures were also measured. Preshot and postshot calculations were performed using the finite element/finite central difference computer code, EPSA (Elasto Plastic Shell Analysis). This code was modified to predict the nonlinear elastoplastic shell response for the plate. The EPSA/PATRAN-G interface program developed at NPS was utilized to produce color graphics which aided greatly in the analysis.

IMPLEMENTATION OF A GENERAL FINITE ELEMENT CODE
ON AN IBM PC COMPATIBLE MICROCOMPUTER

Rehe E. Ruesch
Lieutenant Commander, United States Navy
B.S., Purdue University, 1976

The practicality of using microcomputers to solve systems of equations of several hundred unknowns has been demonstrated. However, machine and software limitations of eight bit processors made the construction of useful finite element programs very difficult, and severely limited the size of problems which could be solved in a reasonable amount of time. The introduction of the sixteen bit micro-processor has completely revolutionized the microcomputer industry, and many of the limitations of the eight bit systems have been eliminated. The new microcomputers have made mainframe-like computing power available to everyone, at a very reasonable cost. For many reasons, however, there are few general finite element programs available for the microcomputer today. A general finite element program of moderate complexity called MEF ("Methode des Elements Finis") is adapted for implementation on the IBM PC-XT and the COLUMBIA MPC microcomputers. The resulting implementation is verified and results are compared with other finite element systems.

Master of Science in
Mechanical Engineering
September 1984

Advisor: G. Cantin
Department of
Mechanical Engineering

OPERATIONAL PERFORMANCE CHARACTERISTICS OF A MULTIPLE-SHROUDED, ANGLED-DIFFUSER STACK GAS EDUCTOR IN TURBULENT CROSSFLOW

Ralph Eugene Staples, Jr.
Lieutenant Commander, United States Navy
B.S., Maine Maritime Academy, 1971

Performance characteristics of two multiple-ring diffuser eductors were determined from collected data. The performance characteristics of a five ring diffuser model were compared with a geometrically similar model tested in cold flow. Model similarity for comparison was maintained through the mach number.

Both models were tested in a turbulent crossflow simulating a 29.5 knot relative wind. Minor improvement in the pumping coefficient was seen to occur when crossflow was introduced.

External surface temperature measurements along the model assembly were recorded by two methods for comparative analysis. The effect of crossflow is seen in a significant surface temperature reduction in the shroud assembly, while apparent degradation of film cooling effectiveness at the diffuser rings resulted in minimal temperature changes.

COOLING OF HIGH POWER GENERATORS AND
MOTORS FOR ELECTRIC PROPULSION

James L. Szatkowski
Lieutenant, United States Navy
B.S.E.E., University of Utah, 1976

This study reviews the history and development of marine electric propulsion drives, the types of electric propulsion, and the inherent losses which occur within the synchronous AC machines typically used for high-power propulsion systems.

A thorough review of the literature pertaining to heat transfer in electrical machinery is made. In particular, the use of liquid cooling in various flow configurations including buoyancy-driven thermosyphons and two-phase thermosyphons is analyzed.

Forced-liquid cooling is feasible but the required rotating seals are a problem in reliability. Closed-loop thermosyphon cooling appears feasible at high rotational speeds, although a secondary heat exchange through the shaft is required. Closed, two-phase thermosyphons and heat pipes are also feasible, but require forced-air circulation for heat rejection to the ambient. Since all of these concepts deserve additional attention, areas for further research and development are recommended.

ELASTIC-PLASTIC FRACTURE TOUGHNESS TESTING METHODS

Wayne Kurt Tritchler
Lieutenant Commander, United States Navy
B.S.E.Sci., Iowa State University, 1975

An interactive computerized experimental procedure is presented for obtaining the elastic-plastic fracture toughness (J_{Ic}) for a material. The process employs a bend type, single specimen approach by using the measured unloading crack opening displacement (COD) compliance to obtain the crack length. Data are taken, manipulated and plotted during the test to provide the operator with the necessary information to control the testing machine. The program automatically plots the J versus crack extension curve and determines J_{Ic} upon completion of the test. A second program is presented to assist the operator in fatigue precracking the specimen. A third program is used to recall, list and plot the data that were stored on diskette during the test.

NUMERICAL ANALYSIS OF THE ELASTIC SHOCK RESPONSE
OF SUBMARINE INSTALLED EQUIPMENT

Mark Steven Welch
Lieutenant, United States Navy
B.S., University of Michigan, 1978

Motivated by a lack of explosive test data on nuclear submarines, the Navy has sought other means to qualify installed equipment in submarine shock environments. The currently used method for non-shock testable items is the Dynamic Design Analysis Method (DDAM) developed by the Naval Research Laboratory in the early 1960's. With the advent of large-scale computing power, newer numerical methods have become available to predict equipment responses. This investigation is a comparative study of DDAM and ELSHOK; a new generation numerical shock response code. The limitations and strong points of both methods are examined using illustrative examples.

EFFECT OF MASS FLOW ON STACK
EDUCTOR PERFORMANCE

Richard W. White
Lieutenant, United States Navy
B.S., United States Naval Academy, 1977

A computer aided data acquisition system was utilized in the study of the effect of mass flow on exhaust stack eductor performance. Pressure and temperature data was acquired via a Hewlett Packard data scanner and a scanivalve was utilized to aid in pressure data acquisition. Verification runs were conducted on a previously tested model with known performance characteristics with favorable results.

Model diffuser ring geometry was altered to enhance film cooling and avoid local hot spots noticed in previous research. Uptake Mach numbers were varied between 0.06 and 0.024. The eductor pumping coefficient was found to increase from 0.6 to 0.69 respectively. Shroud and diffuser ring temperatures varied slightly with Mach number, however, temperatures noticed were lower than those reported earlier due to the increased performance of the eductor.

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EXPERIMENTAL STUDY OF THE EFFECT OF MOIST
ENVIRONMENTS ON EPOXY PESIN CHOCKS

George F. Wright
Lieutenant Commander, United States Coast Guard
B.S., United States Coast Guard Academy, 1973

The widespread use of epoxy resin chocks to support alignment critical machinery on Naval ships has been hampered by the lack of a material specification, installation procedures, and maintenance information. Experiments were conducted to determine the effect of moist, shipboard environments on the compressive strength of the chocks, both during and after the curing process. Various techniques to accelerate exposure effects were investigated. Results indicated precautions are necessary for curing in low temperature/high humidity environments. Elevated temperature immersions and humidity chamber exposure proved to be useful methods to accelerate the studied effects.

MASTER OF SCIENCE

IN

METEOROLOGY

EVALUATION OF AN AEROSOL PREDICTION MODEL FOR COASTAL REGIONS USING MARINE AEROSOL GENERATION AND TRANSPORT DATA

David J. Saunders
Captain, United States Air Force
B.S., University of West Florida, 1973

A mixed layer dynamic model for the structure and evolution of aerosols in a marine regime is presented. The aerosol spectrum is divided into continental and marine components, with a constant vertical continental profile assumed; both in and above the mixed layer. The aerosol spectrum is transformed into a reference relative humidity of 80%. The temporal evolution of the aerosol spectrum is predicted from rate equations which require a specification of the surface production rate, the entrainment rate (W_e), and the mixed layer depth (h). The model was tested against the data set obtained in the Monterey Bay during the MAGAT 80 experiment. The model was initialized with both observed MAGAT data and an equilibrium initial value gathered from the JASIN Experiment. The model was run for radii equal to 0.8, 2.0, 5.0 and 10.0 microns. The significance between the observed initial values and the JASIN data is that the MAGAT data were observed from the same air mass as the initial atmospheric data and verification aerosol data. The JASIN initial aerosol data are based on an equilibrium state as a function of only wind speed and reference relative humidity. The model continuously generated a correct gain or loss of aerosol concentrations as defined by the observed MAGAT data, and in most cases the model output is within one order of magnitude of the observed values.

Master of Science in
Meteorology
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Advisor: K. L. Davidson
Department of
Meteorology

THE VISIBILITY CLIMATOLOGY OF MCMURDO SOUND/
WILLIAMS FIELD, ANTARCTICA

Cheryl G. Souders
Captain, United States Air Force
B.A., Coe College, 1976
B.S., University of Utah, 1977

Accurate forecasting of visibility at McMurdo/Williams Field, Antarctica is essential for the air operations involving the resupply of United States bases and the conduct of research on the Antarctic continent. McMurdo, located at 77° 51' S 166° 41' E, receives all supplies destined for use by the United States Antarctic Research Program scientists. The Williams Field runway is 4.5 mi southeast of McMurdo. Weather observations are taken at both locations. The visibility climatology, August through March, for McMurdo (1956-1983) and Williams Field (1968-1983) was prepared using four operational visibility categories, as well as the seven important weather parameters which reduce visibility, namely, blowing snow, light snow, moderate to heavy snow, the three types of fog and ice crystals. A wind speed/direction climatology was also prepared becuase of its relation to both blowing snow and fog.

PREDICTABILITY OF INVERSIONS AT
VANDENBERG (VBG) AFB, CA

Richard B. Wilkerson
Captain, United States Air Force
B.S., University of Utah, 1979

Accurate prediction of variations in the height of atmospheric inversions are required for optimum utilization of modern weaponry. A marine atmospheric boundary layer model was used to explore the influence of land on predictions of the inversion heights. Data for this evaluation were obtained from rawinsonde observations taken at Vandenberg AFB, California for each season. Vertical velocities for these data were obtained by vertical integration of the moisture budget equation (Q-method). Results of the model output were compared graphically and by use of RMS error statistics. These results were very poor and revealed that strong land influences on diurnal variations yield inversion height fluctuations which the model cannot reproduce. Further development of the model is necessary to overcome problems caused by the land influence.

THE INCLUSION OF SURFACE DATA INTO
THE SPADS CLOUD ANALYSIS MODEL

Neil R. Wyse
Captain, United States Air Force
B.S., California State University, Fresno, 1978
B.S., Pennsylvania State University, 1979

Conventional data were added to an existing satellite cloud analysis model to produce an improved analysis for use on minicomputer systems. An effective merge of satellite and surface report data produced outputs of cloud amount, cloud type, cloud top heights, cloud base heights, precipitation occurrence, and hazardous/restricted weather (IFR). A qualitative evaluation against the previous model is included.

The model was compared with a manual cloud analysis from a previous evaluation and indicated an acceptable correlation. Problems were encountered when comparing the model results with the Air Force 3DNEPH.

This research demonstrates the value of secondary data sources in the automated analysis of cloud and weather parameters. Each data source has its individual advantages and deficiencies. The successful combination of these two data types produced a synergistic improvement to the overall results.

MASTER OF SCIENCE

IN

METEOROLOGY
AND
OCEANOGRAPHY

A COMPARISON OF TWO ACOUSTIC PARABOLIC EQUATION TRANSMISSION LOSS MODELS FOR COMPATIBILITY WITH THE WAVENUMBER TECHNIQUE IN THE DETERMINATION OF SOURCE DEPTH

Joe Lane Blanchard,II
Lieutenant, United States Navy
B.S., University of North Carolina at Charlotte, 1974

The Brock version of the Split-Step Fast Fourier Transform (SSFFT) and the Jeager version of the Implicit Finite Difference (IFD) acoustic parabolic equation models are compared with a Lloyd mirror interference pattern in the range domain. The SSFFT displays the inability to place the transmission loss nulls at the correct ranges. It is also unable to utilize bottom loss information correctly. The IFD produced nulls at the correct ranges; however, it inserted an unacceptable amount of noise except when small (1 m) vertical grid steps were used and the pressure release bottom was placed at extended depths. In shallow water cases, the IFD is able to properly represent the pressure information. Each model is explored in the wavenumber domain by use of a "Wavenumber Technique" (WT) model with emphasis on source depth determination. The source depth may be determined by measuring the distance between the equally spaced nulls in the wavenumber representation. Neither acoustic model was able to provide accurate source depth information when the null spacings were compared to a known source-depth determination curve. Since the null spacings were not uniformly spaced, this was to be expected. Some specific problem areas in the models were identified by the use of the WT.

ESTIMATIONS OF DIABATIC HEATING FOR AN EXPLOSIVELY-DEVELOPING MARITIME CYCLONE

Thomas E. Bosse
Lieutenant, United States Navy
B.S., United States Naval Academy, 1976

The Navy Operational Global Atmospheric Prediction System (NOGAPS) boundary layer and cloud parameterizations are evaluated for a case of explosive cyclogenesis in the western North Pacific Ocean. Storm-region diabatic heating estimates are obtained from the application of quasi-Lagrangian diagnostics to a thermodynamic energy budget calculation, and from the NOGAPS diagnoses.

The model-diagnosed sensible heating appears to be correctly positioned, while the diagnoses of convective, large-scale and open-cell cumulus condensation heating produce cloud features which generally reflect the distribution of the clouds in the satellite imagery.

NOGAPS provides a better estimate of the diabatic heating over the open ocean than does the thermodynamic energy budget calculation. The contribution of diabatic heating in this case study is determined to be as significant as that of thermal advection. This diabatic energy input is an order of magnitude greater than that determined from studies of continental cyclogenesis.

Master of Science in
Meteorology and Oceanography
June 1984

Advisor: C. H. Wash
Department of
Meteorology

THE EFFECT OF STOCHASTIC SURFACE HEAT FLUXES ON
THE CLIMATOLOGY OF THE SEASONAL THERMOCLINE

David C. Copley
Lieutenant, United States Navy
B.S., University of Washington, 1973

The stochastic forcing theory of Frankignoul and Hasselmann, 1977 is modified to include a mixed layer model. This enables the examination of the interaction between stochastic heat flux or wind stress components and the annual period surface heat flux. The presence of the stochastic heat flux component causes the average sea surface temperature to be 0.75 C higher than it would be with only the annual period component. It also delays the time of Maximum surface temperature, and it causes the average mixed layer depth to be ten meters shallower. A stochastic wind stress component applied to an annual heat flux cycle produces a smaller sea surface temperature variance, but it results in a more rapidly deepening and deeper mixed layer than achieved with an annual cycle and constant wind stress. The stochastic forcing model shows that the climatology of the seasonal thermocline is dependent on nonlinear interactions between the annual cycle and stochastic forcing.

AN EVALUATION OF DISCRETIZED CONDITIONAL PROBABILITY AND LINEAR REGRESSION THRESHOLD TECHNIQUES IN MODEL OUTPUT STATISTICS FORECASTING OF VISIBILITY OVER THE NORTH ATLANTIC OCEAN

Mark Diunizio
Lieutenant, United States Navy
B.S., United States Naval Academy, 1977

This report describes the application and evaluation of four primary statistical models in the forecasting of horizontal marine visibility over selected physically homogeneous areas of the North Atlantic Ocean. The main focus of this study is to propose an optimal model output statistics (MOS) approach to operationally forecast visibility at the 00hour model initialization time and the 24hour and 48hour model forecast projections. The technique utilized involves the manipulation of observed visibility and Navy Operational Global Atmospheric Prediction System (NOGAPS) model output parameters. The models employ the statistical methodologies of maximum conditional probability, natural regression and minimum probable error linear regression threshold techniques. Additionally, an evaluation of the 1983 predictive arrays/equations using 1984 NOGAPS data fields and a maximum-likelihood-of-detection threshold model were accomplished. Results show that two statistical approaches, namely a maximum conditional probability strategy utilizing linear regression equation predictors and the minimum probable error threshold models, produce the best results achieved in this study.

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THE EFFECT OF INTERIOR MOTION ON
SEASONAL THERMOCLINE EVOLUTION

Janice P. Garner
Lieutenant, United States Navy
B.A., Montclair State College, 1972
M.A., Indiana University, 1974

The response of the seasonal thermocline formation and mixing to prescribed vertical interior motion is examined. For the annual and shorter period interior motion cases studied, the response was strongest for the annual period. For an oscillatory vertical motion having a 15 m amplitude at a 75 m depth, warm sea surface temperature anomalies of up to 2.16 C and cold anomalies of up to 2.04 C are found, depending on the phase difference between the interior motion and the annual heat cycle. The net phaseaveraged effect on the mixed layer for annual period interior motion is a reduction in vertical mixing. Higher frequency motion produces a net enhancement of the mixing.

OBSERVATIONS OF THE CALIFORNIA
COUNTERCURRENT

Robert L. Harrod
Lieutenant Commander, United States Navy
B.S., Oregon State University, 1975

Results from moored current meters, 150 - 350 m, are discussed for a region over the continental slope off Cape San Martin, California from January 1979 to April 1980.

Current vector time series were constructed from the data and compared to a local upwelling index. Progressive vector diagrams of the data were also constructed, and spectrum analysis was performed for alongshore and crossslope currents.

The California Countercurrent was found to be present in the study are iring the entire period. Seasonally, the countercurrent was substantially stronger during the spring. Frequent current reversals and oscillations occurred between equatorward and poleward flow, less often at the nearshore station. Preferred low frequency energy peaks were found at periods of about 10 days. The intensity of the countercurrent increased with increasing coastal upwelling index, and the crossslope flow also appeared to be related to the local coastal upwelling index.

A STUDY OF ANTARCTIC REMOTE SITE AUTOMATIC
WEATHER STATION DATA (1980-81) FROM
THE ROSS ICE SHELF AREA

Suzanne Plott Hervey
Lieutenant, United States Navy
B.A., Ripon College, 1975

The third generation of the Antarctic remote-site Automatic
Weather Stations (AWS2B) was installed at various locations during
Austral summer 1979/80. The quality and quantity of surface pressure,
wind (speed and direction) and temperature data show a marked improve-
ment over that of the earlier AWS platforms (1976-80) examined by
personnel at the Naval Postgraduate School, Monterey, California.
Statistical processing of data from February 1980 to December 1981 was
done in order to contribute to a base climatology for AWS sites and to
investigate possible operational applications of the data to the United
States Antarctic mission. Comparisons were made between synoptic
reports collected at McMurdo, Antarctica and the data obtained from the
surrounding AWS2B stations.

SENSITIVITY ANALYSIS OF A COUPLED ATMOSPHERIC-OCEANIC BOUNDARY LAYER MODEL

Rex Vernon Hervey
Lieutenant Commander, United States Navy
B.S., Wichita State University, 1973

A coupled, atmospheric-oceanic boundary layer model which provides a single station assessment and prediction capability has been developed from independently formulated one-dimensional oceanic and atmospheric bulk boundary layer models. Sensitivity analyses are conducted to determine major differences in the response of the coupled model compared to those of the separate oceanic and atmospheric models. The general behavior of the coupled model is not significantly different from that of the atmospheric model alone over short term simulations (12 to 24 hours). However, under a certain set of limited conditions where winds are light and the lifting condensation level is close to the height of the inversion, large differences may occur. Major differences between the predicted evolution of the ocean boundary layer by the ocean model and coupled model are more common, and the short term predictive ability of the ocean model in coupled form is enhanced.

EXPERIMENTS IN FORECASTING ATMOSPHERIC
MARINE HORIZONTAL VISIBILITY USING
MODEL OUTPUT STATISTICS WITH
CONDITIONAL PROBABILITIES OF
DISCRETIZED PARAMETERS

Michael L. Karl
Lieutenant Commander, United States Navy
B.S., University of Washington, 1975

This report describes the development and application of a program
to forecast important air/ocean parameters using the method(s) of model
output statistics. The focus of this operationally oriented study is to
forecast atmospheric marine horizontal visibility using a discrete
analysis of observed visibility and the Navy's Operational Global
Atmospheric Prediction System (NOGAPS) model output parameters. Three
strategies (two based on maximum-probability and one based on natural-
regression) are compared to two multiple linear regression methods. The
primary data set is from a North Atlantic Ocean area bounded
approximately by the North American coast from Norfolk, VA to St. Johns,
Newfoundland, and then eastward to about $37.5^{\circ}W$. Both the dependent and
independent data were derived from the same basic set. New or
unfamiliar concepts, in addition to the primary methodology, include the
statistical division of the North Atlantic Ocean into physically
homogeneous areas, two new threshold models for the application of
linear regression equations, linear regression based upon a 'decision-
tree' concept, functional dependence of predictors and class errors.
Results show that the methodology proposed by Preisendorfer does out-
perform multiple linear regression.

THE IMPLICIT FINITE-DIFFERENCE (IFD) ACOUSTIC
MODEL IN A SHALLOW WATER ENVIRONMENT

SPATIAL STRUCTURES OF OPTICAL PARAMETERS IN THE CALIFORNIA CURRENT AS MEASURED WITH THE NIMBUS-7 COASTAL ZONE COLOR SCANNER

John T. McMurtrie, Jr.
Lieutenant, United States Navy
B.S., University of South Carolina, 1977

Optical variability across the continental slope and shelf off Central California was studied using Nimbus-7 Coastal Zone Color Scanner (CZCS) data. CZCS estimates of $k(490)$, the irradiance attenuation coefficient at 490 km, were expressed as optical depth $1/k(490)$. A modified atmospheric correction algorithm was used to account for water radiance at 670 nm. Time sequence of $1/k(490)$ were assembled and partitioned into four zonal transects at different latitudes, spanning May through November in 1979, 1980 and 1982. Empirical Orthogonal Functions (EOFs) were calculated for each partition. The first EOFs are cominated by scales of order 180 km, with in all cases, a band of low optical depth water in the first 100 km adjacent to the coast. Scales decrease in successive EOFs, to about 40 km in the fifth EOF. The feasibility of joining EOFs from different partitions was demonstrated as a precursor for future applications to piecewise analysis of oceanic satellite data.

Master of Science in
Meteorology and Oceanography
March 1984

Advisor: J. L. Mueller
Department of
Oceanography

AN EVALUATION OF THE SPADS AUTOMATED
CLOUD ANALYSIS PROGRAM

Christopher A. Moren
Lieutenant, United States Navy
B.S., University of Utah, 1977

An evaluation of the SPADS automated cloud and precipitation intensity analysis program is presented. The program uses the Geostationary Observational Environmental Satellite (GOES) visual and infrared imagery to produce contoured digital displays of cloud-top height and precipitation intensity for an approximate 1024 x 1024 n mi area centered at $35^{\circ}N$ $80^{\circ}W$. Verification consists of correlating surface and upper-air observations, pilot reports, automated radar summaries and a manual analysis of the satellite imagery to the contoured digital display from the automated cloud analysis program for five cases during the summer 1983.

The test results indicate considerable skill, paticularly for cloud amount, cloud-top temperature and cloud-top height. The cloud type and precipitation intensity results were generally consistent, but further testing is required to refine the thresholds and the standard deviation values for discrimination of particular cloud types.

A STUDY OF PRECIPITATION OCCURRENCE USING
VISUAL AND INFRARED SATELLITE DATA

Linda Sue Paul
Lieutenant, United States Navy
B.S., University of Minnesota, 1973

Bi-spectral satellite thresholds for precipitation specification are explored with visual and infrared satellite data collocated with Service-A hourly observations for 137 surface stations in the southeastern United States. The data span the month of August 1979 and total 70,623 observations, including 538 daylight precipitation observations.

The distributional and statistical differences of four satellite resolution sizes ranging from 484 to 2025 nmi^2 are explored and determined to be significant in the representation of weather conditions. Precipitation and no-precipitation data can be statistically differentiated with the visual and infrared mean and standard deviation values.

For overcast ceiling reports, a simple linear bi-spectral threshold based on a 50% probability of precipitation is defined as extending from albedo 1.00 to 0.60 with associated cloud top temperatures 290K and 210K, respectively. For overcast and broken ceiling reports, an albedo greater than 0.80 specifies a 50% probability of precipitation.

RESPONSE OF AN ATMOSPHERIC PREDICTION MODEL TO
TIME-DEPENDENT SEA-SURFACE TEMPERATURES

Peter Henry Ranelli
Lieutenant Commander, United States Navy
B.S., Rensselaer Polytechnic Institute, 1975

The purpose of this research is to explore the need for time-dependent sea-surface temperatures in atmospheric model predictions up to 10 days. The Navy Operational Global Atmospheric Prediction System is used in this study. First, a control run is made in which the sea-surface temperature (SST) is fixed in time. In the test case, the observed SST analyzed each 12 hours by the Fleet Numerical Oceanography Center are used to force the system. The 10-day predictions are compared to determine if a coupled atmosphere-ocean model would improve or deteriorate the atmospheric predictions. The case analyzed occurred after the oceanic spring transition so that only small increases in SST occurred. Use of time-dependent SST resulted in only small changes in latent, sensible and total heat fluxes, and in storm tracks and intensities. Thus, further case studies of the atmospheric response are necessary to indicate whether coupled atmosphere-ocean models are required on 10-day time scales.

SIMULATION OF A SYNCHRONOUSLY COUPLED
ATMOSPHERE-OCEAN PREDICTION MODEL

Peter Joshua Rovero
Lieutenant, United States Navy
B.S., University of Michigan, 1977

The purpose of this research is to explore the need for time-dependent sea-surface temperatures in atmospheric model predictions to 10 days. Six and nine-layer versions of the Navy Operational Global Prediction System (NOGAPS) are used in this study. Control forecasts were made in which the sea-surface temperature (SS).T) is fixed in time. Test hindcasts were made in which the SST was updated at each time step of the atmospheric model using interpolations of 12-hourly SST analyses. The 10-day predictions are compared to determine any improvement or degradation due to the time-dependent SST. Two cases are analyzed, one during November 1983 and another during April 1984. Use of the time-dependent SST's resulted in significant changes in the forecast fields of surface heat fluxes and precipitation which were physically consistent with the SST trend. Analysis of 15 storm forecasts revealed significant changes of storm track, duration or cyclogenesis in only 4 cases. Three of these cases were forecast by the nine-layer version of NOGAPS during the April period and one case was forecast by the six-layer NOGAPS during the November period.

SPECTRAL DECOMPOSITION AND VERIFICATION OF NOGAPS 500MB MEDIUM-RANGE FORECASTS

Robert C. Showalter
Lieutenant Commander, United States Navy
B.S., Purdue University, 1973

Twelve NOGAPS 500mb 5-day forecasts were spectrally decomposed into wavenumber groupings for verification purposes. Four forecasts were from the NOGAPS 2.0 (six-level) version and eight from the NOGAPS 2.1 (nine-level) version. Wavenumber components of the forecasts and observed waves were grouped into planetary (wavenumbers 1-3), long (wavenumbers 4-7) and medium (wavenumbers 8-12) to facilitate model comparison. Hovmoller (time-longitude) diagrams were used to analyze the observed and forecast fields.

Two systematic errors emerged; amplitude smoothing of wave and trough features, and consistent positive error at high latitudes. NOGAPS 2.1 demonstrated modest improvement (over NOGAPS 2.0) as error magnitudes were reduced and initiation of error occurred later in the forecast. Both NOGAPS 2.0 and NOGAPS 2.1 showed positive error growth near the poles and no improvement was noted in the newer model version.

ONE-DIMENSIONAL MODEL HINDCASTS OF COLD
ANOMALIES IN THE NORTH PACIFIC OCEAN

Gary L. Stringer
Lieutenant Commander, United States Navy
B.S., University of Washington, 1975

Two cases of pronounced, long-term cold anomalies from the North
Pacific Ocean Experiment TRANSPAC monthly analyses during 1976-79 are
studied. The first case developed after October 1977 and persisted to
June 1978. Two periods of amplification of the anomaly are identified.
The second anomaly was the most extreme cold anomaly in the four-year
sample. The relationships between local atmospheric forcing, and the
development, existence and decay of the anomalies are examined with the
Garwood ocean mixed layer model. In the first case, the fall deepening
period was hindcast very well. However, the period of spring transition
and seasonal warming were not well predicted. It is deduced that the
most likely cause of errors is inaccurate atmospheric forcing. In the
second case, the model predictions are very sensitive to the surface
heat flux. This anomaly cannot be satisfactorily simulated with the
Garwood model. This appears to be due to large uncertainties in the
surface heat flux fields in the summer.

DEVELOPMENT OF A MICROCOMPUTER COUPLED ATMOSPHERIC AND OCEANIC BOUNDARY LAYER PREDICTION MODEL

Gary Lee Tarbet
Lieutenant Commander, United States Navy
B.S., University of Utah, 1975

A coupled Marine Atmospheric Boundary Layer (MABL) and Oceanic Boundary Layer (OBL) model is developed using the Naval Postgraduate School and Garwood models respectively. All coding is done on the Hewlett-Packard 9845 microcomputer with emphasis on ease of use. The model is used to explore cases when feedback between the boundary layers significantly influences model forecasts. The sensitivity of the model to slight input variations is explored. Light wind situations where stratus or fog formation is extremely difficult to predict is investigated. Cases covered include variations in mixed layer depth and wind speed which produces significantly different forecasts from the initial input.

Master of Science in   Advisor: K. Davidson
Meteorology and Oceanography   Department of
December 1983   Meteorology

MASTER OF SCIENCE

IN

OCEANOGRAPHY

A CRITICAL ANALYSIS OF OCEAN THERMAL
ANALYSIS MODELS IN OPERATION AT FNOC

Brian J. Brady
Lieutenant Commander, Royal Navy
B.S., Salford University, 1971

Horizontal and vertical thermal structures were examined in a region of the Northeastern Pacific Ocean off Northern California. The observations were acquired on three cruises as part of the ONR-sponsored Ocean Prediction Through Observation, Modeling and Analysis (OPTOMA) research program, centered in a region of the California Current System, ca. 37 to $39^{O}N$, 124 to $126^{O}W$, during June and July, 1983.

The horizontal temperature correlation scale was between 30 and 50 km, which was a significant factor when comparisons were made between measured horizontal thermal structures and those retrieved from Fleet Numerical Oceanography Center's (FNOC) analyses, which had grid spacing of 320km (TEOTS) and 40km (EOTS).

Operational (modeled) analysis fields were not in agreement with the observed fields. The major discrepancies occurred in the magnitude of the mixed layer depth and the shape of the horizontal temperature fields (maps).

The operational significance of differences between modeled and observed thermal structures was assessed in terms of their effect on low-frequency; i.e., less than 1Khz, acoustic propagation utilizing the FACT9H and PE Transmission Loss models.

Mixed layer depth differences produced significant disagreement between direct ranges computed from model and observed temperature profiles. The effect was most pronounced at higher frequencies and when both source and receiver were shallow; i.e., both at 20m.

A comparison was made between average depth/temperature profiles from July 1982/July 1983, and FNOC climatology to obtain a measure of the effect of interannual variability in the domain. This comparison showed that a significant temperature anomaly existed in the upper 400m in 1983 compared to 1982 due to El Nino and that this anomaly was not represented by the FNOC climatology.

The differences between modeled and measured thermal structures are believed to be related to thermal structure model resolution, model sensitivity to input data, short scales of spatial variability and non-representative climatology for the domain.

Master of Science in
Oceanography
September 1984

Advisor: C. N. K. Mooers
          Department of
          Oceanography

ESTABLISHMENT OF HYDROGRAPHIC SHORE CONTROL
BY DOPPLER SATELLITE TECHNIQUES

David Henry Minkel
Lieutenant, National Oceanic and Atmospheric Administration
B.S., Arizona State University, 1972

The methods of Doppler Satellite surveying, as applied to establishing hydrographic shore control, are presented and evaluated. Both methods, point and relative positioning, are defined procedurally with the advantages and disadvantages of each included. The field operations of two Doppler surveys (Monterey and Lake Superior) are reviewed with regard to requirements and procedures. A cost breakdown of the Lake Superior survey illustrates the high cost effectiveness of satellite techniques. The results of four Doppler data reduction programs (DOPPLR, MAGNET, GEODOP V, and MX 1502 translocation) are included and compared. Results of a special survey are included to demonstrate the high accuracy attainable by relative positioning methods. Selected data sets from both Doppler surveys were reduced using GEODOP V and are used to illustrate survey design and planning considerations. An accuracy standard for Doppler established shore control, compatible with both IHO and NOS accuracy standards, is proposed. A method for determining station elevation differences is also presented.

REAL-TIME ENHANCEMENT OF A CLIMATOLOGY
OR FORECAST OF OCEAN THERMAL STRUCTURE
USING OBSERVED OCEAN TEMPERATURES

Kenneth D. Pollak
B.S., Humboldt State University, 1976

Vertical temperature profiles observed in the eastern North Pacific were used to examine the feasibility of extrapolating an observation from one location to another. The technique, referred to as simple enhancement, is a special case of the Gandin (1963) optimum interpolation methodology. Application to Navy ASW operations is considered. The technique requires the use of a trial value and a local observation. Trial values are obtained from a climatology and a synoptic analysis/forecast system provided by the Fleet Numerical Oceanography Center. An enhanced temperature profile is calculated by adding an observed anomaly (i.e., observation minus trial value) to the trial value at the desired location.

Calculations of mean and RMS errors indicate that simple enhancement can provide a closer estimate to actual conditions than unenhanced climatology. The mixed layer depth cannot be extrapolated accurately to new locations presumably due to mesoscale eddies, fronts, internal waves and small scale fluctuations at the base of the mixed layer. Also, the choice of the trial value used is not critical. Experiments at different locations and seasons would be required for a complete assessment of the application to ASW operations.

OBSERVATIONS OF INERTIO-GRAVITY WAVES
IN THE WAKE OF HURRICANE FREDERIC

Lynn K. Shay
Department of Meteorology, Naval Postgraduate School
B.S., Florida Institute of Technology, 1976

Inertial waves excited in the mixed layer by hurricane Frederic, had horizontal scales of approximately 1 to 2 times the baroclinic Rossby radius of deformation (50 km) of the first mode near the DeSoto Canyon. Initially, energy propagated vertically at 1.25 km/d and horizontally at 80 km/d. These waves spun down over e-folding scales of four inertial periods as energy propagated vertically at 270 m/d and horizontally at 30 km/d. Inertio-gravity waves in the deep thermocline had horizontal scales of 25 to 50 km and vertical scales approximately equal to the water depth. The energy of these waves was dominated by the barotropic mode with some contributions from modes 1 and 2. These waves were not admitted to the shelf region because the bottom slope was greater than the internal wave characteristics.

The mean flow followed the isobaths at all levels, but it was in the opposite direction in the bottom layer. The mean flow initially decreased along the eastern boundary of the canyon as the forcing readjusted the flow. Near bottom temperature variations of $4^{\circ}C$ were associated with the storm surge and advection in the along-track direction, particularly along the northern rim of the canyon.

MASTER OF SCIENCE

IN

OPERATIONS RESEARCH

AN APPLICATION OF THE RAYLEIGH DISTRIBUTION TO CONTRACT COST DATA

Thomas S. Abernethy
Lieutenant, United States Navy
B.S., United States Naval Academy, 1978

Accurate cost models are essential to the proper monitoring of contract cost data. The greater the accuracy of the model, the earlier contract cost overruns can be recognized and their cause(s) ascertained. The availability of a variety of cost models allows flexibility in choosing the correct model for the particular circumstances and increases the chances of being able to select a model that can provide reliable forecasts about future costs.

This thesis investigates the possibility of adapting the Rayleigh distribution to cost modelling and develops an APL algorithm which summarizes the results of the application of the Rayleigh model to historical contract cost data.

The Rayleigh model was found to be applicable to cost modelling and exhibited some predictive capability in the 21 Navy contracts examined.

AIR-LAND BATTLE INTERDICTION MODEL
CORPS COMMUNICATIONS MODULE

Daniel R. Alexander
Captain, United States Army
B.S., United States Military Academy, 1975

This thesis provides the detailed concepts and methodology required to simulate the Corps Communications Module (CM) portion of the Air-Land Interdiction Model.

The Communications Module is a closed architecture with rule-based decision making, network design, threat play, and net congestion that closely simulates the environment that U. S. Army communication systems face in supporting Corps and selected Theater level units in Europe. The common decision making thread is a Communications Generalized Value System (CGVS) which determines current assets value based on past, present, and potential usage. The CGVS provides a basis for quantitative and qualitative decision making that can be studied for cause and effect relationships by means of audit trails.

The Communications Module analyzes Corps communications in high resolution detail while dealing with the problems of friendly net congestion compounded by enemy interdiction. When operational, the Communications Module will give U. S. Army communicators a realistic training and architectural planning tool.

Master of Science in
Operations Research
June 1984

Advisor: A. L. Schoenstadt
Department of
Operations Research

AN EVALUATION OF THE AIR-TO-AIR ENGAGEMENT MODELS IN THE NAVAL WARFARE GAMING SYSTEM

Nicholas I. Ardan III
Lieutenant Commander, United States Navy
B.S., St. Lawrence University, 1971

This thesis is an examination of the Air-to-Air engagement models in the Naval Warfare Gaming System installed at the Center for War Gaming, Naval War College, Newport, Rhode Island. Descriptive narrative and flow charts derived directly from the computer code are included. Qualitative evaluation of the models and their documentation is provided from both an operational and analytical point of view. Problem areas and discrepancies are identified and specific recommendations for model improvement are discussed. The intent is to provide a course of action for the Center for War Gaming to use in modifying the existing Air-to-Air engagement routines in order to produce reasonable and more realistic outputs for war gaming. General recommendations concerning future development for additional modeling levels of detail are also discussed.

ROUTING A USCG BUOYTENDER TO SERVICE AIDS TO NAVIGATION:
A CASE OF THE TRAVELING SALESMAN PROBLEM

Jon M. Bechtle
Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1978

A problem of routing a United States Coast Guard buoytender to service aids to navigation is formulated as a symmetric traveling sales-man problem. A heuristic algorithm is developed which seeks the minimum distance tour which can be taken by the buoytender to visit the aids to navigation. A user's guide is provided.

The algorithm is programmed in Convergent Technologies FORTRAN for use on the Coast Guard Standard Terminal. Several problems are solved by the algorithm producing solutions that are optimal or nearly optimal.

A MODEL FOR NARF SUPPLY SUPPORT WHICH INCLUDES BOTH ON-SITE SPARES AND SCHEDULED DELIVERY

Vance D. Berry, Jr.
Lieutenant, United States Navy
B.S., United States Naval Academy, 1978

Supply support of a Naval Air Rework Facility (NARF) should consider both on-site inventories of spare repair parts as well as back-up resupply from the local Naval Supply Center (NSC). This thesis presents a model for such a system for a limited time horizon. The decision variables are the number of units of an item to stock on-site and the length of time between deliveries once the on-site inventory is depleted. The determination of the optimal values of these variables required evaluation of the total expected variable costs for each given set of parameters. After identification of optimal values of both decision variables, a comparison between the minimum total expected costs of this model and an earlier model without on-site spares was conducted. The results suggest that the on-site spares model is preferable to one without spares. However, because the outcome of such a comparison is strongly dependent on the cost values assumed, additional analyses are needed before a general statement can be made.

THE EFFECT OF STRUCTURE ON THE SOLUTION TIMES
OF MINIMUM COST TRANSPORTATION AND MULTI-
ECHELON NETWORK FLOW PROBLEMS

Willard R. Bonwit, Jr.
Lieutenant, United States Navy
B.S., United States Naval Academy, 1978

Researchers require benchmark test problems to evaluate the speed of computer codes designed to solve minimum cost network flow problems. To date, the only universally available test problems developed for that purpose are randomly generated. In practice, however, real-world network problems solve faster than random network problems. This thesis examines the effect on solution time resulting from applying structure, produced through simulation of real-world phenomena, to test networks. An efficient computer code, VSGEN, is developed which generates structured transportation and multi-echelon networks. Various types of structure, including unit flow cost, network topology and arc capacity, reduced the time required to solve the test networks an average of 26%, when using a primal network simplex solver, GNET.

The parameter Big M used in primal simplex algorithms may affect solution times differently in structured versus unstructured networks. VSGEN is used to investigate this possibility. A bound on the minimum Big M is first developed for bipartite networks. This bound is sharper than the default bound used in GNET, but it does not reduce solution times in either structured or unstructured problems. Even the best possible bound reduces solution times by only 10%, on average.

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FACTORS AFFECTING THE ORGANIZATIONAL COMMITMENT
OF JUNIOR OFFICERS IN THE U. S. AIR FORCE

Alfonso Calero Espinosa
Lieutenant Commander, Colombian Navy
B.S., Escuela Naval, Almirante Padilla, Cartagena, Col.

This thesis attempts to explain the organizational commitment of the junior officer in the Air Force. The data set was divided in two groups: officers with more than four but less than or equal to five years of active service; and officers with more than seven but less than or equal to ten years of active duty. The effects of satisfaction with military life on turnover were analyzed using linear regression; satisfaction with military life was initially included in a set of selected candidate variables which were regressed with intended years of service beyond obligation as the dependent variable. Then, discriminant analysis was undertaken to investigate the influence of measures of Military versus Civilian comparative job satisfaction on the long-term career decision and the short-term turnover decision. A final regression model was tested using satisfaction with military life as the dependent variable and the set of variables representing the perception of alternative job opportunities in the civilian sector as candidate explanatory variables. Knowledge of the relative influence of the several variables analyzed in this study will provide manpower planners with useful information to evaluate the extent to which personnel policies may be successful in managing the problem of junior officer retention.

SOME APPLICATIONS OF FUZZY SETS AND THE ANALYTICAL HIERARCHY PROCESS TO DECISION MAKING

Alberto Castro Rosas
Commander, Mexican Navy
B.S., Mexican Naval Academy, 1969

This thesis examines the use of fuzzy set theory and the analytic hierarchy process in decision making. It begins by reviewing the insight of psychologists, social scientists and computer scientists to the decision making process. The Operations Research-Systems Analysis approach is discussed, followed by a presentation of the basis of fuzzy set theory and the analytic hierarchy process.

Two applications of these methods are presented. The first uses fuzzy sets and a little of the analytic hierarchy process to solve an hypothetical decision problem for the commanding officer of a naval task force. The second applies the latter technique and estimated data to the problem of choosing the best alternative to provide quality air service to Mexico City.

COMBAT ATTRITION ANALYSIS
USING RENEWAL PROCESS

Joong Kun, Cho
Major, Republic of Korea Army
B.A., Korean Military Academy, 1974

This thesis uses renewal theory to investigate the Lanchester-type combat attrition process. The attrition process is analyzed in detail and modelled as a so-called renewal process in which times between casualties are considered to be independently and identically distributed random variables. Other random variables that can be considered in the renewal process are examined, and the distributions of these random variables are determined in order to study the behavior of attrition process. Examples with specific distribution functions are given for better understanding. Computer simulation is generated and compared with the attrition model developed. The total casualty occurrence by total force is also discussed, through pooling of the single renewal processes. The t   : casualty occurrence is shown to be a Poisson process and time   tween casualties to be approximately exponentially distributed fo   ge numbers of combatants.

LEXICON: A STRUCTURED MODELING SYSTEM
FOR OPTIMIZATION

Robert D. Clemence,Jr.
Captain, United States Army
B.S., Lehigh University, 1973

Linear Programming (LP) is used infrequently for routine decision-making. Even in situations where LP is an extremely attractive tool, there is too much cost, frustration, delay and risk incurred in conversion of a mathematical hypothesis into a valid LP solution. This report outlines an entirely new approach to specifying and generating LPs which departs fundamentally from classical methods in an ambitious attempt to mitigate their most onerous disadvantages. These ideas are implemented and tested in a new modeling language and software system called LEXICON. Using LEXICON, a model is conceived, formulated, specified, expressed, internally documented, verified and directly executed in a single form. The LEXICON language is derived from a modeling form proposed by Geoffrion. The software engineering of the LEXICON system admits expansion of the language, portability, and linkage with contemporary real-time LP solvers.

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MARINE OFFICER ATTRITION MODEL

William John Esmann
Major, United States Marine Corps
B.S., United States Military Academy, 1970

Predicting officer attrition is a major difficulty in the Planning, Programming and Budgeting Process. The Marine Corps until recently used an averaging method of determining out-year attrition. The purpose of this paper is to apply econometric techniques to the problem of predicting attrition. This paper develops a simple model which enables the unskilled user to accurately predict attrition.

AN INTELLIGENCE COLLECTION MANAGEMENT MODEL

Thomas A. Gandy
Captain, United States Army
B.S., United States Military Academy, 1974

This thesis examines the structure and functions of a generalized tactical intelligence collection system. Included are its position in the intelligence system structure, relationship with other activities in the intelligence system, and the organization and control of its components. A mathematical optimization model of a simplified intelligence collection system is developed to explore several issues related to intelligence collection. An interactive multi-attribute decision aid useful in the prioritization of numerous intelligence collection requirements is demonstrated.

A PRELIMINARY ANALYSIS OF C-12 AIRCRAFT USAGE
BY THE NAVY AIR LOGISTICS SYSTEM

Robert Louis Gilson
Lieutenant Commander, SC, United States Navy
B.S., University of Idaho, 1974

Exploratory data analysis techniques are utilized in an attempt to understand the operation of the Navy Air Logistics System as a prerequisite to determining potential locations for additional C-12 aircraft already in the pipeline. Graphical analyses of flight data from Fiscal Year 1983 are combined with interviews of commands responsible for scheduling the aircraft to determine a measure of relative efficiency between the 23 bases currently supporting the aircraft. Glenview and Jacksonville are the recommended sites for the first two new C-12s. Several opportunities for further study and analysis are suggested.

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SOLUTION TECHNIQUES FOR WHOLESALE PROVISIONING OF REPLACEMENT PARTS

William A. Goulding
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1973

The purpose of this thesis is to present solution techniques for provisioning problems arising in the Navy's wholesale purchase of replacement parts. The objective is to minimize the Mean Supply Response Time (MSRT) subject to a budget constraint. The problem can be formulated as a Dynamic Program (DP), however, it is too large and complex for a standard recursive dynamic approach. Consequently, a variation of the normal DP approach was developed that significantly reduces the required computations. An existing DP computer program was modified to implement this DP variation. The result is a usable approach considering speed and ease of manipulation.

Master of Science in
Operations Research
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Advisor: G. T. Howard
Department of
Operations Research

METHODOLOGY FOR BENEFIT ANALYSIS
OF CAD/CAM IN USN SHIPYARDS

Richard B. Grahlman
Lieutenant Commander, United States Navy
B.S., Oregon State University, 1976

This thesis expands the concept of Computer-Aided Design/Computer-Aided Manufacturing (CAD/CAM) in naval shipbuilding to include maintenance. This inclusion is coupled with the integration of the design and manufacturing processes in the acronym CIDMM, which stands for Computer-Integrated Design, Manufacture and Maintenance.

A methodology is proposed to identify and measure the tangible and intangible benefits derived from CAD/CAM in naval shipbuilding. The methodology is flexible enough to be applied to future CIDMM systems. A decision-aid for assessing the intangible benefits and a structure for computing the time benefits are proposed in the methodology.

SHAPE WITH AND WITHOUT REDUNDANT COLOR AS CODING MECHANISM FOR SIMULATED RADAR DISPLAYS IN A TIME-EXTENDED SIMPLE VIGILANCE TASK

Urs Hessling
Lieutenant Commander, Federal German Navy

A simple monitoring task was extended to eight hours to achieve a higher realism in testing human vigilance. An extremely low stimulus frequency, the confinement of the subjects during the test run, and the scheduling of the experiment from 10 p.m. to 6 a.m. were further tools to create a more operational environment. Subjects were treated in one of two conditions, simulating a shipborne tactical radar display with precoded information, to test a currently operational shape coding mechanism (control condition) for positive effects due to the addition of redundant color codes (experimental condition).

The results did not support the hypothesis of positive effects in the experimental condition. In fact, the number of missed signals was significantly higher in that condition. Longer reaction times in both conditions were found to be correlated to higher signal and display densities.

The following recommendations were made for further research: (1) In the area of monochromatic displays, the effects of different, non-white colors and changes in light characteristics, e.g. luminance and saturation, should be compared against those of standard CRT color and light parameters. (2) For multichromatic displays, experiments involving secondary tasks or artificial stimuli should be conducted to gain further evidence about the possibility of operator's 'target fixation' during monitoring due to certain colors or color combinations. The importance of further research in the area of 'underload' situations is emphasized.

A MODEL OF THE TACTICAL COMMAND CONTROL PROCESS
FOR U. S. ARMY MANEUVER BRIGADES

Jerome A. Jacobs
Major, United States Army
B.S., United States Military Academy, 1972

Eduardo Cardenas
Captain, United States Army
B.S., United States Military Academy, 1976

This thesis examines current decision and control theory and U. S. Army doctrine to develop a systemic model of the U. S. Army tactical command control process. The model is investigated in a simulated brigade delay operation using First Battle. The data obtained from the simulation is used to demonstrate specific analytic tools which have potential for application within the command control process. These quantitative tools are proposed as a supplement to the qualitative analysis performed by the force commander and his staff during combat operations. Prospects for employment of these techniques are enhanced by the current development of automated components within the U. S. Army tactical command control system and by training of personnel in quantitative analysis at the U. S. Army schools and centers.

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DRAFTSMAN DISPLAYS, A GRAPHICAL TECHNIQUE
FOR EXPLORATORY DATA ANALYSIS

Malcolm D. Johnson Jr.
Captain, United States Army
B.S., United States Military Academy, 1976

This thesis develops and explores the graphical analysis of multi-variate data sets through the use of a Draftsman technique of scatter plot displays. These plot displays are useful for determining associations and relationships between variables in order to promote an understanding of the characteristics of the data in exploratory and descriptive applications. General graphical enhancement techniques such as jittering and transformations are discussed and incorporated in the development of a computer program which produces Draftsman displays. A technical description of the Draftsman computer program is presented, and user implementation procedures discussed. An analysis is conducted on two varied sets of data to demonstrate the versatility and utility of the Draftsman display technique for exploring data structures.

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NUMERICAL OPTIMIZATION ALGORITHM FOR ENGINEERING PROBLEMS USING MICROCOMPUTER

Dong Soo, Kim
Major, Republic of Korea Army
B.S., Korea Military Academy, 1976
B.E., Seoul National University, 1980

A general purpose computer program is developed to perform non-linear constrained optimization of engineering design problems. The program is developed especially for use on microcomputers and is called Microcomputer Software for Constrained Optimization Problems (MSCOP). It will accept a nonlinear objective function and up to 50 inequality constraint functions and up to 20 bounded design variables.

MSCOP employs the method of feasible directions. Although developed for microcomputers, for speed of development, the MSCOP was implemented on an IBM 3033 using standard basic language, Waterloo BASIC Version 2.0. It is directly transportable to a variety of microcomputers.

Typical applications of MSCOP program are in the design of machine components and simple beam and truss structures. Solutions to three sample problems are given.

MANPOWER MODELING IN THE AIRBORNE COMMUNITY
OF THE UNITED STATES ARMY

Dimitrios Theoharis Koutianoudis
Captain, Hellenic Army
B.A., Hellenic Military Academy, 1973
B.A., University of Athens, 1980

With the evolution of new sophisticated technology, military manpower planning problems involving specialized training have become increasingly important. This problem has become especially urgent for the airborne community of the U. S. Army because this community has a variety of special training requirements which make the problem especially complex when other dimensions such as grade level and military occupation specialty are also taken into account.

This thesis formulates a methodology which applies Markov chain theory to forecast future inventories and uses marginal analysis to determine the optimal numbers of soldiers with certain skill levels and job types who should enter special training. The goal of the optimization model is the minimization of the maximum percentage shortage of personnel relative to authorization. The methodology is used with FY 1984 data to determine the optimal numbers of soldiers to enter special training during fiscal years 1984 and 1985 to minimize the maximum percent shortage.

APL TUTOR: AN ON-LINE INSTRUCTIONAL FACILITY

Katherine S. Lanes
Lieutenant, United States Navy
B.A., New Mexico State University, 1974

This thesis describes a set of APL programs which enable a student to learn A Programming Language (APL) by using it. The student needs to know only how to log on to the computer and enter a few simple commands to begin the course.

The basic unit of the TUTOR workspace is the text variable which describes the use of one of seventy-five built-in APL functions. This description is accessible by a HELP function without going through an entire lesson. Other functions conduct interactive question-and-answer drills. A MENU function lists the units for student selection of a lesson or information on a symbol. The student can also go through a sequence of lessons in a computer-driven course.

These programs were written on and for the IBM 3033 installation at Naval Postgraduate School, using APL version 4.0 for VM/CMS with IBM 3278 terminals.

THE INTRODUCTION OF UNCERTAINTY TECHNIQUES
TO THE PRODUCTIVITY INVESTMENT FUND

Edward A. Lenio
Lieutenant Commander, United States Navy
B.A., The Citadel, 1974

Each year the Defense Productivity Program Office (DPPO) disburses funds for Productivity Investment Projects (PIFs). The purpose of these projects is to increase productivity within the Department of Defense (DoD). To enhance these efforts, DPPO requested a study to be conducted to determine if methods of risk or uncertainty will affect the results obtained by the current procedure. This study applies various principles of uncertainty to this procedure and examines their impact on the project rankings. A background of DPPO and PIFs is presented together with discussion of risk and uncertainty techniques, as well as the economic indicators used in ranking projects. A model is then explained which will introduce uncertainty into the present procedure. Results of the initial comparison and sensitivity analysis is revealed. Conclusions are drawn based on these results and recommendations concerning alternate procedures and possible further research are presented.

A PRELIMINARY ANALYSIS OF COURSE
LOADING PREDICTION ERRORS

Craig C. Madsen
Lieutenant, United States Navy
B.S., Iowa State University. 1978

The course loading forecasts for the Operations Research Depart-
ment published by the Naval Postgraduate School Programming Office are
investigated for measures of predictive accuracy by course and
curricula. Both course and curricula forecasts are categorized as
problem causing, reasonably accurate, or undefined due to limited infor-
mation. The paucity of the data precludes the use of sophisticated
statistical techniques to identify any permanence in effects thereby
limiting results to indications of predictive performance. A management
aid is developed consisting of a data base and manipulative APL programs
for the purposes of updating and displaying current information while
identifying possible synergistic interactions between data
subcategories. Appendix A contains the User's Guide for this management
aid. These results can be applied to the current forecast to aid the
department chairman in creating the faculty teaching schedule.

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ALTERNATIVE MODELS FOR CALCULATION OF ELEVATION
ANGLES AND RAY TRANSIT TIMES FOR RAY TRACING
OF HYDROPHONIC TRACKING DATA

Carl D. Main
Lieutenant Commander, United States Coast Guard
B.A., University of California at Santa Barbara, 1969
M.A., University of Washington, 1978

This thesis treats the problem of determining the elevation angle
needed to initialize an underwater sound ray tracing algorithm used to
locate the position of a target vehicle. At regularly spaced time
intervals the vehicle pings a syncrhonized sound signal which is
received by a (short base line) sonar array containing four hydrophones
positioned at four of the corners of a cube. The wavefront direction
angles are determined from the arrival times at the four hydrophones.

Current methods for using such time data to produce an apparent
position suitable for ray tracing are reviewed. Then four new methods
are developed and documented mathematically. All methods are compared
under a simulated environment of a sound speed profile which is linear
with depth. One of the new methods is judged to be an improvement over
current methods in this idealized environment. Finally the improved
method is used to estimate the variability in the time data from a real
hydrophonic tracking problem.

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AN ANALYSIS OF GUNNER SHOT SELECTIONS AND
PERFORMANCE AGAINST A SIMULATED
MOVING TARGET

Ephraim Martin, IV
Captain, United States Army
B.S., United States Military Academy, 1975

This analysis presents a methodology for examining a target's motion history to investigate those characteristics of target motion which a trained gunner keys on when selecting shots. Using this methodology a target motion history is examined and the criteria which two trained gunners use to pick shots are described and compared. The hit performance of each gunner is then modeled establishing a relationship between the target's motion and hit performance for these two gunners.

LAMPS MK III PACK-UP KIT SPARES SELECTION AS DEPICTED BY THE AVAILABILITY CENTERED INVENTORY MODEL (ACIM)

James A. McDonell
Lieutenant, United States Navy
B.S., State University of New York at Binghamtom, 1977

This thesis presents an overview of the Availability Centered Inventory Model (ACIM). Information and analyses are provided for the system and support hierarchies, rudimentary assumptions, and the maximum availability calculation envisioned by ACIM. A discussion on the procedures used to develop a LAMPS MK III helicopter availability-centered allowance list is presented. This allowance list is then used as a basis for selection of Lamps MK III Pack-up Kits (PUKs). These PUKs are analyzed via the statistics provided by ACIM in its Statistical Summary Report. The objective of this analysis is to provide an understanding of some of the strengths and weaknesses of ACIM when it's used as a decision aid or analysis tool.

AN EVALUATION OF THE UNITED STATES ARMY 'SESAME' AND SWEDISH 'OPUS VII' SPARES PROVISIONING MODELS

Carl F. Menyhert
Captain, United States Army
B.S., United States Military Academy, 1976

Two existing provisioning models using operational availability as the key operational characteristic for measuring system effectiveness are compared. The two models are the U. S. Army Selective Stockage for Availability Multi-Echelon Method (SESAME) and the Swedish OPUS VII.

The SESAME and OPUS VII models and their problem-solving methods are described. Mathematical overviews of each model are examined. Differences between the models, their advantages and limitations are discussed. Each model is evaluated in terms of input parameters, required structure of systems, types of outputs, and model shortcomings.

LOCALLY WEIGHTED REGRESSION SCATTERPLOT SMOOTHING (LOWESS): A GRAPHICAL EXPLORATORY DATA ANALYSIS TECHNIQUE

Gary W. Moran
Commander, United States Navy
B.S., United States Naval Academy, 1969

Statisticians have long used moving average type smoothing and classical regression analysis techniques to reduce the variability in data sets and enhance the visual information presented by scatterplots. This thesis examines the effectiveness of Robust Locally Weighted Regression Scatterplot Smoothing (LOWESS), a procedure that differs from other techniques because it smooths all of the points and works on unequally as well as equally spaced data. The LOWESS procedure is evaluated by comparing it to previously validated uniform and cosine weighted moving average and least squares regression programs. Interactive APL and FORTRAN programs and detailed user instructions are included for use by interested readers.

AN OPERATIONAL ANALYSIS OF SYSTEM CALIBRATION

Hasan Basri Mutlu
Lieutenant Junior Grade, Turkish Navy
B.S., Turkish Naval Academy, 1978

Mathematical models and a computer simulation program written in APL are proposed for studying ways of dealing with mis-calibration. Methodology for assessing the system effectiveness and an approach for optimizing the effectiveness of a calibration program are examined. The application of the theory is discussed and the results of the simulation program are presented.

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SOLVING SET COVERING PROBLEMS USING
HEURISTICS WITH BRANCH AND BOUND

Nam, Kook Jin
Major, Republic of Korea Army
B.S., Korea Military Academy, 1975

An algorithm based on simple heuristics is presented for an important class of all-binary integer linear programs known as the set covering problem. In spite of its very special form, the set covering problem has many practical applications. Optimal solutions to problems derived from these applications are difficult to obtain using known methods. Various solution techniques are investigated based on heuristic algorithms that obtain upper and lower bounds on the optimal solution value together with branch and bound enumeration. These solution techniques are effective on some problems. Computational results are reported for several large-scale real-world problems and several artificial problems.

GRAPHIC SIMULATION OF A MACHINE-REPAIRMAN MODEL

Rex Ernest Nelsen
Major, United States Marine Corps
B.S., University of Idaho, 1973

A discrete-event simulation of a stochastic process, a machine-repairman model, has been programmed on the IBM Personal Computer. The model consists of three helicopters, of which two are in service and one is in cold standby, with an option of one or two repairmen.

The program output is a graphics display containing a system state-versus-time graph, a table of statistics, and animated figures that illustrate the current state of the system. The program user can directly observe the dynamics of the model as the fixed-increment, simulation clock advances. The user has the option of changing the following model parameters: helicopter failure rate, repairman service rate, and the number of repairmen to employ.

AN INVESTIGATION OF THE MCDEC RESEARCH AND DEVELOPMENT PROGRAM PRIORITIZATION PROCESS

Laurence H. Nelson
Captain, United States Marine Corps
B.S., University of Idaho, 1978

A research and development program prioritization process proposed by the Marine Corps Development and Education Command is investigated. Relevant literature is reviewed and the process classified with the majority of accepted industrial program selection models. Linear programming formulations of the process illustrate resource allocation improvements suggested by the literature. Two linear programming approaches are demonstrated with available process test data. The subjective research and development program values proposed by the original process are discussed in terms of measurement scale properties, and further research is suggested in the areas of alternative model forms, subjective program evaluations, and model implementation cost-benefit analysis.

EVALUATIONS OF APPROXIMATIONS FOR SHORTAGE COSTS FROM MAJOR CUSTOMERS FOR A SINGLE PERIOD INVENTORY MODEL

Wilhelm F. Noeggerath
Captain, German Air Force
Diplom-Betriebswirt, Fachhochschule des Heeres I, 1974

A single period inventory model is considered for supporting an overhaul depot. Demand for any stocked item is assumed to come from several repair lines, each of which has a different demand distribution and unit shortage cost. An approximation for the expected shortage costs was proposed by McMasters. This thesis evaluates the accuracy of that approximation as well as two additional ones proposed by the author. For the case of independent Poisson distributions two of the approximations are shown to give the exact expected shortage costs. Simulations were needed to evaluate the accuracy of the approximation formulas for binomially and normally distributed customer demands. By imposing restrictions on the range of certain parameters, acceptable levels of accuracy can be achieved for the two approximations. The imposed restrictions leave sufficient freedom to then determine the optimal quantity to stock for a given item.

A SIMULATION STUDY OF MODELS FOR COMBINATIONS OF RANDOM LOADS

Noh, Jang Kab
Major, Korea Air Force
B.S., Korea Air Force Academy, 1974

This thesis describes a model for a combination of random loads acting upon a physical structure, such as a building or ship. The various loads represented in the model might be winds, tidal effects, or even earthquakes or snow loading. Asymptotic results are given for the first-passage time for the load combination process to exceed a given stress level exceeding structural strength. The accuracy of using the asymptotic results to approximate the first-passage time, or time to structural failure, distribution is assessed by simulation.

DESIGN OF AN EVALUATION SYSTEM TO MEASURE
PERFORMANCE DEGRADATION DUE TO
CONTINUOUS OPERATIONS

Michael G. O'Donnell
Captain, United States Army
B.S., United States Military Academy, 1976

This paper establishes guidelines for an evaluation system designed to measure performance degradation due to continuous operations for battalion-sized units of the United States Army. It serves to initiate direction for the evaluation system, provides the framework on how to accomplish the necessary data measurements for such an evaluation and enumerates the performance indicators to be measured. Techniques to analyze different types of data are provided, along with examples of the use of those techniques. A discussion of the uses of the analysis results is also presented.

NORMAL APPROXIMATION FOR RESPONSE TIME IN A
PROCESSOR-SHARED COMPUTER SYSTEM MODEL

Suriya Pornsuriya
Ensign, Royal Thai Navy

In a time-shared computer system, the processor allocates its processing time equally to all jobs submitted for service from a fixed number of terminals. Under Markov assumptions, i.e. independent identically distributed exponential terminal think times and job requested service times, the distribution of response time of a tagged job theoretically can be determined by solving a system of differential equations derived for each initial system state. However, explicit closed form solutions to these equations are quite complex. The Central Limit Theorem and heavy traffic arguments suggest normal approximations to the distribution of the response time. Simulation of the response time is used to study the accuracy of these normal approximations to the response time distribution via moments and quantiles. Finally, the analysis is extended to a model for a system with two types of terminals.

'SHIPSHOR' - AN AMPHIBIOUS
SHIP-TO-SHORE SIMULATION
FOR USE ON AN IBM PC

Steven M. Ritacco
Major, United States Marine Corps
B.S., United States Naval Academy, 1973

This thesis completed implementation of an amphibious ship-to-shore simulation (called SHIPSHOR) for use on an IBM Personal Computer. The investigation included a description of the physical system being modelled, an explanation of the logic used by the model, a validation section, sensitivity analysis, and a thorough documentation section.

The model is functioning and producing credible output as exhibited in the validation chapter. It is capable of operating under a variety of conditions to produce results which illustrate the build-up ashore of personnel and firepower versus time. Its main application, as suggested within, is for use as a decision aid to the commander in operational planning and to the staff officer in procurement planning.

To be effective, SHIPSHOR needs continuous validation and modification. Model building is an evolutionary process which should not cease until the usefulness of the model has expired.

Master of Science in
Operations Research
September 1984

Advisor: J. L. Wayman
Department of
Mathematics

THE OPTIMAL LOCATION OF COAST GUARD RECRUITING OFFICES

Timothy W. Rolston
Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1978
M.B.A., National University, 1982

The optimal location of Coast Guard Recruiting Offices and their recruited allocation is investigated. Since quantity of recruits is not a problem with the Coast Guard, a reward model is developed to rate the quality potential of a recruiting area. This multiplicative model assumes that Navy recruiting performance can be used to predict Coast Guard recruiting potential. Integer dynamic programming is applied to determine the optimal allocation of recruiters using the reward model. A non-integer dynamic programming algorithm is also presented as a decision aid that can be used for recruiter allocation, quota assignment, boundary definition, recruiter performance evaluation, and recruiter time allocation. Paucity and possible errors in the Coast Guard data precluded strong conclusions about the reward model and subsequent results.

AN ANALYSIS OF THE ATLANTIC FLEET
AFS PHASED MAINTENANCE PROGRAM

Steven Charles Rowland
Lieutenant, United States Navy
B.A., University of Rochester, 1978

The Combat Stores Ship (AFS) Phased Maintenance Program was authorized in 1979 as a five year test effort to stabilize deployment patterns for Atlantic Fleet AFSs and to test a progressive maintenance policy similar to the one used by the Military Sealift Command.

This study analyzes the costs and benefits of the AFS Phased Maintenance Program (AFSPMP) relative to the conventional maintenance policy that was in use prior to the AFSPMP. The depot and intermediate level maintenance manday and dollar costs are estimated for four alternative maintenance policies to aid in determining how well the AFSPMP is performing with regard to costs. The benefit analysis presents several quantitative and qualitative aspects of the AFSPMP and conclusions are drawn concerning the cost-effectiveness of the AFSPMP as compared to the conventional policy. Conclusions concerning the expansion of this program to other classes of ships are also presented, along with recommendations for further research in this area.

Master of Science in
Operations Research
March 1984

Advisor: D. C. Boger
Department of
Administrative Research

A COMPARISON OF THREE MAGNETIC ANOMALY DETECTION (MAD) MODELS

Daniel Carl Schluckebier
Lieutenant, United States Navy
B.S., University of Nebraska, 1973

This thesis presents a comparison of three Magnetic Anomaly Detection (MAD) models: a cross-correlation detection model, a square law detection model, and a model referred to as the OPTEVFOR detection model. FORTRAN and BASIC programs for the three detection models are included in this thesis. The programs yield detection probabilities for straight line encounters. Magnetic signal values for the straight line encounters are an additional output. Plots of lateral range curves and magnetic signal values are presented. A discussion of the required parameters is included in the thesis to facilitate the use of the programs. The parameters that were considered in the comparison of the three detection models are: magnetic noise, aircraft and submarine headings, submarine displacement, and the vertical separation between submarine and aircraft.

A MATHEMATICAL MODEL FOR CALCULATING DETECTION PROBABILITY OF A DIFFUSION TARGET

Mucahit Sislioglu
Lieutenant Junior Grade, Turkish Navy
B.S., Turkish Naval Academy, 1978

The primary objective of this study is to derive a mathematical model to predict the detection probability of a target which moves randomly, according to a two-dimensional diffusion model. This model assumes that there is a stationary searcher which has a "cookie-cutter" sensor with radius R. In order to construct this model, a Monte Carlo simulation program is used to generate detection probabilities. It is demonstrated that this model can be used asymptotically to predict an upper bound detection probability of an "equivalent" random tour target.

Master of Science in
Operations Research
September 1984

Advisor: J. N. Eagle
Department of
Operations Research

DESIGN AND SOLUTION OF AN AMMUNITION DISTRIBUTION
MODEL BY A RESOURCE-DIRECTIVE MULTICOMMODITY
NETWORK FLOW ALGORITHM

Cyrus James Staniec
Captain, United States Army
B.S., Syracuse University, 1971

Planning distribution of multiple commodities in a capacitated network is a problem frequently encountered in civilian and military logistic systems. However, application of optimization to large-scale problems has been limited. Specialized solution techniques for the multicommodity transhipment problem (MCTP) have emerged in recent years which improve solution efficiency, but have been used only on relatively small models. This effort documents the use of a resource-directive network optimization algorithm, MNET, to solve a large-scale MCTP. An ammunition distribution system is modelled with up to 100 commodities, over 300,000 constraints, and 1,000,000 variables. A feasible solution of excellent quality is produced in minutes by MNET. MNET is designed to solve completely general MCTP and may be applied directly to other problems of this broad class.

Master of Science in
Operations Research
September 1984

Advisor: G. G. Brown
            Department of
            Operations Research

SENSITIVITY OF CONDITIONS FOR LUMPING
FINITE MARKOV CHAINS

Moon Taek, Suh
Major, Republic of Korea Army
B.S., Korean Military Academy, 1975

Markov chains with large transition probability matrices occur in many applications such as manpowere models. Under certain conditions the state space of a stationary discrete parameter finite Markov chain may be partitioned into subsets, each of which may be treated as a single state of a smaller chain that retains the Markov property. Such a chain is said to be "lumpable" and the resulting lumped chain is a special case of more general functions of Markov chains.

There are several reasons why one might wish to lump. First, there may be analytical benefits, including relative simplicity of the reduced model and development of a new model which inherits known or assumed strong properties of the original model (the Markov property). Second, there may be statistical benefits, such as increased robustness of the smaller chain as well as improved estimates of transition probabilities. Finally, the identification of lumps may provide new insights about the process under investigation.

However, a problem that arises in connection with practical applications of Markov chain models is to determine whether the chain is lumpable. This is especially difficult when the matrix $P = (P_{ij})$ of transition probabilities is estimated from transition data. In this case, it is desirable to find bounds on cn Δ, the largest error, $\hat{P}_{ij} - P_{ij}$, in estimating P_{ij}, for all i and j.

This thesis examines the sensitivity of the lumping conditions based on $\hat{P}$, the estimate of P. In general, it is found that the classical lumping conditions are extremely sensitive to the estimation error which can be expected to occur even with large data sets. Thus, these conditions may be of limited value in many actual applications.

Master of Science in
Operations Research
September 1984

Advisor: D. R. Barr
Department of
Operations Research

AN ANALYSIS OF THREE AVCAL INVENTORY MODELS
USING THE TIGER SIMULATION MODEL

Mark David Sullivan
Lieutenant Commander, United States Navy
B.S., University of Louisville, 1974

This thesis investigates the effectiveness of three Aviation Consolidated Allowance List (AVCAL) inventory models in achieving aircraft system operational availability. The three models studied are the Aviation Supply Office (ASO) Model, the Repairables Integrated Model for Aviation (RIM-AIR), and the Availability Centered Inventory Model (ACIM). TIGER, a simulation model developed by Naval Seas Systems Command, is amended to accomodate simulation of multiple aircraft sorties with a realistic parts pipeline operation. AVCAL model inventory levels are compared over a ninety day period utilizing availability statistics computed by TIGER.

ATTRITION IN THE UNITED STATES ARMY:
AN EXPLORATORY DATA
ANALYSIS APPROACH

David Alan Thomas
Captain, United States Army
B.S., United States Military Academy, 1975

Exploratory data analysis techniques were utilized to demonstrate
the effectiveness of such techniques in identifying factors associated
with attrition from the United States Army. Multivariate graphical data
analysis was performed utilizing the "Draftsman" program recently added
to the NPS GRAFSTAT package, as well as other exploratory techniques.
Empirical survivor curves which take into account and explicitly display
the discrete probabilities of departure of enlistees at 36 or 48 months
are provided. Tables are provided depicting probabilities of attrition
and reenlistment for selected personal characteristics of enlistees.

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MASTER OF SCIENCE

IN

PHYSICS

COHERENCE STUDY OF GEOMAGNETIC FLUCTUATIONS
IN FREQUENCY RANGE .04 - 0.6 HZ
BETWEEN REMOTE LAND SITES

Stephen John Anthony
Lieutenant, United States Navy
B.S., University of Minnesota, 1973

Fluctuations in the geomagnetic field were measured by three orthogonally mounted coil sensors at two land sites separated by 40 km. Computer generated voltage vs time and magnetic field vs time plots failed to reveal the presence of dominant micropulsations. A coherence study between the two sites revealed coherence values of 0.6 - 0.8 in the frequency range 0.04 - 0.6 Hz. This is compared to a coherence study completed at the Naval Air Development Center, Warminster, Pennsylvania, between land sites 24.8 km apart. The NADC Coherence values are lower (0.3 - 0.6).

TIME-RESOLVED REFLECTIVITY MEASUREMENT OF EXTRINSIC SILICON DURING PULSED LASER IRRADIATION

Emory Leie Chenoweth
Lieutenant, United States Navy
B.S., United States Naval Academy, 1976

Geoffrey Davis Johnson
Lieutenant, United States Navy
B.S., North Carolina State University, 1977

Time-resolved reflectivity (TRR) of crystalline silicon has been measured with nanosecond resolution during and immediately after pulsed neodymium:glass laser irradiation (1.06 um, full width at half maximum pulse duration of 20 ns) over a range of pulsed laser energy densities. The TRR information was used to determine energy density thresholds for melting and damaging the polished surface of extrinsic silicon wafers. Reflectivity initially increased under laser irradiation and then returned to its original value for energy densities between 0.46 J/cm^2 and 1.05 J/cm^2. For energy densities greater than 1.05 J/cm^2, the final value of reflectivity was less than the original value due to permanent target damage. The damage threshold was substantiated with optical photomicrographs. A qualitative examination was undertaken to determine the change in specular and diffuse reflection from the target surface as a function of the degree of laser-induced damage.

Master of Science in
Physics
June 1984

Advisor: A. W. Cooper
Department of
Physics

THE CONSTRUCTION OF A Nd:YAG LASER
AND OBSERVATION OF THE OUTPUT

Ki Hyun Chung
Major, Republic of Korea Army
B.S., Korean Military Academy, 1976

An experimental Neodymium YAG laser system has been constructed using a cylindrical pumping reflector containing three CW tungsten-halide lamps. Maximum laser output of 2.05 watts has been obtained with slope efficiency 0.19 percent at 3300 watts input power. Slope efficiency increased with increasing input power and output power decreased with increasing resonator length.

Master of Science in
Physics
December 1983

Advisor: A. W. Cooper
Department of
Physics

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SUPERSONIC MISSILE SEEKER LENS SYSTEM
USING GRADIENT INDEX MATERIAL
FOR FIRST ELEMENT LENS

David S. Davidson
Captain, Canadian Forces
B.Eng., Royal Military College, 1976

The design of a supersonic missile seeker lens system using an aerodynamically efficient lens, a scanning mirror and detector was accomplished through the use of ray-tracing routines. The design of the first element lens uses a gradient in refractive index to overcome the severe handicap that the pointed shape imposes. This problem has been previously solved for positive orientations of the center of symmetry of the Gradient Refractive Index (GRIN) material with respect to the lens. In this study the negative orientations are resolved and the lens studies for a range of orientations and strengths of gradient. The best lens is then used in conjunction with the mirror and detector in a ray-tracing scheme. Such a system was found to be feasible and worthy of further study.

MEASUREMENTS OF DIRECT PATH AND FOLDED PATH OPTICAL SCINTILLATION USING A CORNER CUBE REFLECTOR

Leon M. Henry
Lieutenant, United States Navy
A.B., College of the Holy Cross, 1977

A theoretical prediction of path weighting for optical scintillation strength was made by Dr. Avihu Ze'evi. As part of a continuing effort at NPS to verify the prediction, a sixty-one meter enclosed tunnel was constructed, allowing the position of a turbulence source to be varied. This experiment tested the Ze'evi hypothesis using a corner cube reflector. The results confirm patterns found in previous experiments, and the general form of the predicted path weighting. However, questions concerning the nature of the turbulence present in the tunnel do not allow strong conclusions to be formed.

COMPUTER SIMULATION STUDIES OF SPUTTERING
AND MULTIMER FORMATION FROM CLEAN
AND OXYGEN REACTED SURFACES OF
TITANIUM, VANADIUM AND NIOBIUM

Michael G. Mathis
Lieutenant Commander, United States Navy
B.S., Seattle University, 1970

The NPS computer simulation model was used to investigate the sputtering by 1.0 keV argon bombardment of clean and oxygen reacted monocrystalline titanium, vanadium and niobium. Variations in yield, energy and angular distributions and in particular, multimer formation, were studied as a function of oxygen density and location. Simulation results show a significant decline in substrate yield as the oxygen coverage is increased, regardless of location. Further, there is a marked preference for multimer formation by lattice fragmentation, rather than by recombination, for all three metals. The percentages of multimers formed by fragmentation were found to increase with increasing oxygen density for all three metals. Previous results on face-centered cubic crystals concerning the yield per layer and the effects of channeling were confirmed for body-centered cubic and hexagonal closed-packed crystals. For comparison, simulation runs were repeated at ion energies of 0.5 and 2.0 keV for titanium with oxygen atoms located in three-fold sites with a C(2x2) density.

Master of Science in
Physics
December 1983

Advisor: D. E. Harrison
          Department of
          Physics

COMPUTER SIMULATION STUDIES OF SPUTTERING FROM CLEAN TUNGSTEN AND NITROGEN REACTED TUNGSTEN AND MOLYBDENUM SURFACES

Dirk Meyerhoff
Kapitanleutnant, Federal German Navy

The Naval Postgraduate School computer simulation model QRAD was used to study sputtering from clean and nitrogen reacted tungsten, and from nitrogen reacted molybdenum, for (001) surfaces bombarded by normal incidence argon ions in the energy range from 0.5 keV to 3.0 keV. The simulation results are compared to experimental data obtained by Winters, who concludes, that the difference in the cross sections for the sputtering of nitrogen from W(001) and Mo(001) is dominated by the adsorbate-substrate mass difference since the other important parameters are similar. The simulation however shows little dependence on the substrate mass, but a strong dependence of the sputtering cross sections on the distance of the adatoms above the substrate. The nitrogen position is required to be higher on tungsten than on molybdenum.

CERENKOV RADIATION GENERATED BY PERIODIC
ELECTRON BUNCHES IN A FINITE AIR PATH

Lawrence A. Newton
Lieutenant, United States Navy
B.A., University of California, San Diego, 1974
M.B.A., San Diego State University, 1978

Microwave Cerenkov radiation is measured for the case of bunched electron beams which exceed the velocity of light in a finite air path. The theoretical equation for prediction of the form of the power for Cerenkov radiation is tested experimentally for this case. Initial verification of the theory is observed.

Master of Science in   Advisor: F. R. Buskirk
Physics   Department of
December 1983   Physics

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A SPATIALLY INCOHERENT AND TEMPORALLY COHERENT SOURCE

John S. Peterson
Lieutenant, United States Navy
B.S., United States Naval Academy, 1978

The ability to create a spatially incoherent and temporally coherent source is a major military concern when considering atmospheric turbulence effects on laser beam propagation. Young's double slit experiment is used to measure the degree of spatial coherence of the source when various diffusive materials are placed between the laser and double slit. A photo-multiplier tube is used for detection of an argon-ion laser signal. Experimental results show that the spatial coherence of the source is affected significantly by the location of the diffusive material and the size of the laser beam. For this particular experimental geometry, opal glass placed 17 cm from the double slit degrades the spatial coherence of the source by 99.5%. By expanding the beam diameter 2 1/2 times the original size, the spatial coherence of a diffused beam is decreased by an average of 95% over a 10 cm region. In addition to experimental observations, the applicable sections of partial coherence theory are discussed.

MASTER OF SCIENCE

IN

SYSTEMS TECHNOLOGY
ANTISUBMARINE WARFARE
(ASW)

AN ANALYST'S AND USER'S GUIDE TO THE PASSIVE
SONAR MODEL IN THE NAVAL WARFARE
INTERACTIVE SIMULATION SYSTEM

Albert A. Tobin, Jr.
Lieutenant, United States Navy
B.S., United States Naval Academy, 1977

This user's guide examines the passive sonar model used by the Naval Warfare Interactive Simulation System (NWISS). The processes by which passive sonar detections are made are discussed. The thesis includes an explanation of how to affect those processes in order to control the interaction and results of an NWISS ASW scenario. A method for determining a sonar system's figure of merit and estimating ranges of detection is presented for the benefit of the operator who prepares the scenario, as well as for the user. This method is primarily intended for use with NWISS in its tactical training role.

MASTER OF SCIENCE

IN

SYSTEMS TECHNOLOGY COMMAND, CONTROL AND COMMUNICATIONS (C3)

COMPUTER GRAPHICS ENHANCEMENT FOR COMEL

Martin R. Conrad, Jr.
Captain, United States Army
B.S., United States Military Academy, 1975

COMEL is a communications-oriented war game developed by the Joint Telecommunications Staff Officer's Course at Keesler AFB. The war game was automated by previous thesis students to run on a VAX/VMS computer. This thesis further modified COMEL to eliminate the manual gameboard and totally automate the game using Ramtek graphic display devices.

The game has two portions, an Acquisition Phase and an Operations Phase. In the Acquisition Phase, players budget for research and development, manufacturing, purchase, and operations and maintenance of communications and electronic equipment for a Joint Task Force (JTF). In the Operations Phase, players allocate the available communications and electronic equipment to units, physical locations, or special missions and then direct the employment of the units and equipment in a war game.

The programs are written in structured FORTRAN-77, with extensive comments and external documentation. The graphics routines were written using the DI-3000 graphics system.

A TUTORIAL FOR THE RAMTEK 9460 RASTER GRAPHICS SYSTEM AND THE DI-3000 GRAPHICS PACKAGE

Ronald H. Elmlinger
Lieutenant, United States Navy
B.S.; Colorado University, 1977

This document is a tutorial for programming with the DI-3000 graphics software package, RAMTEK 9460 graphics hardware, and VAX 11/780 computer located in the Naval Postgraduate School's Wargaming Analysis and Research Laboratory.

For first time users, an introductory level explanation of the functions and terminology associated with the graphics package is presented. This document can also serve as a departure point for programmers who wish to make more extensive use of available capabilities.

REPRESENTATION OF SMALL-ARMS EFFECTS IN
AGGREGATED FORCE-ON-FORCE COMBAT MODELS

Lawrence B. Lane
Captain, United States Marine Corps
B.S., Rensselaer Polytechnic Institute, 1977

This thesis explores the problem of determining the relative worth
of small-arms in a combined arms scenario by using aggregated models.
The documentation of current operational models is reviewed to see how
the effects of small-arms have been represented in general, and in
large-scale aggregated-force models in particular. After investigation
of the main uses of small-arms, an inference is drawn that the contribu-
tion of small-arms is only implied in current models.

Master of Science in
Systems Technology
(Command, Control and Communications)
March 1984

Advisor: J. G. Taylor
Department of
Operations Research

USING CONTINUOUS VOICE RECOGNITION TECHNOLOGY AS AN INPUT MEDIUM TO THE NAVAL WARFARE INTERACTIVE SIMULATION SYSTEM (NWISS)

John Philip Lombardo
National Security Agency
B.S., Loyola College, Baltimore, 1968
M.B.A., Loyola College, Baltimore, 1979

A great deal of research has been conducted in the past 20 years concerning the use of voice recognition equipment with computers. The goal of this research has been to improve the man-machine interface. With the breakthrough from discrete to continuous voice recognition technology in the 1970's, a large step toward that goal was taken.

This thesis attempts to show that continuous voice recognition technology can be effectively applied in a highly interactive, computer-aided wargaming environment. Through analysis of the strictly-formatted command syntax of the Naval Warfare Interactive Simulation System (NWISS) and use of commercially available, innovative, continuous speech hardware and software, a new input medium was created for the users of that wargame. The true effectiveness of this application of voice recognition technology must still be tested. Plans for such testing are being made and, to that extent, the thesis objectives are partly met.

Master of Science in
Systems Technology
(Command, Control and Communications)
June 1984

Advisor: G. K. Poock
Department of
Operations Research

AN APPROACH TO INTERFACING
DATA BASES IN WWMCCS ADP

Sheila K. McCoy
Lieutenant Commander, United States Navy
B.A., University of Rhode Island, 1970

Evolving requirements including the development of the Joint Operation Planning and Execution System (JOPES) are forcing the WWMCCS ADP community toward the development of a distributed data base approach to information management. In this thesis the Electronic Data Interchange (EDI) concept is examined as a proposed system for realizing a distributed data approach. Using the EDI concept, any command which could translate to and from the EDI standard data set could exchange data with any other participating command. Implementation of this sort of system would facilitate interfaces among commands while not limiting participating commands to specific hardware, software, or data base management systems. The thesis proposes the EDI concept as a step toward realization of better data distribution and management in WWMCCS ADP.

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AN EXPERIMENT IN THE VALUE OF
MILITARY INTELLIGENCE

Kenneth Michael O'Bryant
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1971

Robert George Risney
Captain, United States Army
B.S., University of Nebraska, 1977

This thesis is an investigation into the value of intelligence on enemy position and strength during a simulated battle experience. An experiment was conducted to determine if there was an amount of intelligence which could statistically be shown to be optimal, with more or less intelligence resulting in a degradation in performance by the decision maker. A variation of chess was utilized as the basic war gaming model. Subjects were provided different levels of intelligence on the enemy's strength and position. A computerized chess game calculated all enemy moves. All aspects of the experiment, including filtering of intelligence, communications between display terminals, and data collection were under software control.

The analysis of the data obtained from the experiment suggests that the amount of intelligence provided did correlate with player performance, and that there exists a level of information such that additional information leads to decreased performance.

AN INVESTIGATION OF THE IMPACT OF HEADQUARTERS STRUCTURES ON THE MILITARY COMMAND ENVIRONMENT

James D. Owens
Major, United States Army
B.S., Ohio State University, 1970

Garland B. Brown
Captain, United States Air Force
B.S., California State Polytechnic University, 1979

This thesis describes an experiment conducted by the Defense Communication Ag ..y (DCA), Defense Systems, Inc. (DSI), and the Naval Postgraduate School (NPS) during the period 31 October 1983 through 23 November 1983. Specifically, the experiment investigates how a headquarters' structure influences its effectiveness which ultimately impacts upon the speed and correctness of headquarters decision. This was accomplished by using the Naval Warfare Interactive Simulation System (NWISS) as a transmission vehicle to pose military problems to military students using a standard scenario set and simulated headquarters networks. Although the results are not conclusive, they do tend to support a relation between different headquarters structures and the speed and correctness of decisions made by a headquarters.

PROJMNG FORTRAN: AN INTERACTIVE COMPUTER PROGRAM
FOR USE WITH THE DEFENSE MANAGEMENT
SIMULATION EXERCISE

George W. Schultz
Lieutenant Commander, United States Navy
B.S.E.E., University of New Mexico, 1971

Contract Negotiation Package (CNP), the supporting computer program for the Defense Management Simulation (DMS), is revised and embedded into a program which makes it user-friendly, and which provides sensitivity analysis capability to it. The program includes a plotting function for the sensitivity analysis. Exercise records are established for review of contracting team performance. Database files are generated which permit teams to submit reports, which provide a baseline for subsequent game sessions, and which permit monitor evaluation of team progress.

The text provides a description for the operation of both CNP and PROJMNG. It documents the new program, PROJMNG.

Appendices include the Fortran code, and Conversational Monitor System (CMS) executive machine language programs for the new programs' operation. It contains instruction manuals which depict operation for both programs.

CHART AND SKETCH: AN INTERACTIVE COMPUTER GRAPHICS PROGRAM

James J. Tschudy,II
Captain, United States Air Force
B.S., Utah State University, 1978

Chart and Sketch is a highly interactive, color, computer graphics program. It is implemented in Fortran 77 and interfaced to the Precision Visual's DI-3000 software package which drives the RAMTEK RM-9460 Graphic Display System. DI-3000 is an integrated system of device independent, graphics software tools that may be called as subroutines in fortran programs.

The Sketch option provides for the interactive creation of multi-colored, empty and color-filled graphic objects such as circles, diamonds, squares, polygons, lines, arcs, sectors and text. Created objects may be selectively scaled, translated, copied, erased, displayed, and written to or read from selected graphics files. Created objects may be combined to form graphics segments. The program provides for within-segment modelling, zooming, and panning.

The Chart option allows the creation and display of charts from a chart database. Sketch may be used to add graphic objects to the displayed chart, which may in turn be written to a graphics file for later retrieval and display.

The program is written in structured Fortran 77, internally documented, so that it can be read, understood, modified, and expanded with a minimum of effort.

BATTLE GROUP ASSET MANAGEMENT
DECISION SUPPORT SYSTEM

Charles S. Vogan, Jr.
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1972

A battle group commander's successful employment of the assets in his battle group heavily relies on his conceptualization of the pragmatic capabilities of each of these assets. This thesis comprises an interactive decision support system (DSS), which utilizes database management and high resolution computer graphics, to assist the commander in meeting this challenge. The DSS incorporates data on specific systems installed on each unit as the basis for user developed capability effectiveness/system coverage displays. The system is designed to be operated through discrete speech voice recognition equipment.

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MASTER OF SCIENCE

IN

SYSTEMS TECHNOLOGY
ELECTRONIC WARFARE (EW)

STATISTICAL/TREND ANALYSIS OF THE MARINE
ATMOSPHERIC BOUNDARY LAYER MODEL

Robert D. Bisking
Lieutenant, United States Navy
B.S., University of Texas, 1979

Transmission and reception of electromagnetic (EM) energy by communications, weapons, and active/passive sensor systems is known as ducting, caused by refractive layers in the atmosphere of marine environments. The Naval Postgraduate School (NPS) has developed a Marine Atmospheric Boundary Layer (MABL) model which can be used to predict, over a 24 hour period, the refractive profile of the lower atmosphere. This thesis examines the model from the statistical/trend analysis approach to examine whether the model can be used as a valid predictor of refractive/ducting conditions.

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METEOROLOGICAL CONDITIONS AFFECTING ELECTROMAGNETIC PROPAGATION ON THE ARABIAN PENINSULA

Wayne Frederick Petersen
Captain, United States Army
B.S., Florida Institute of Technology, 1973

Modern U. S. military radars and communication equipment performance will be strongly influenced by the environment it will be operating in. One of the most important atmospheric effects is ducting of electromagnetic energy by refractive layers in the atmosphere. To assess the effects of ducting on electromagnetic emissions around Dhahran, Saudi Arabia, a geometric optics model of wave propagation developed by Raymond P. Wasky was modified and utilized. This thesis also attempted to show the correlation of wind direction and wind speed to the establishment, location and heights of ducts. Finally this thesis attempted to determine if there was any correlation between the occurrence of land-sea breezes and ducting.

AN ASSESSMENT OF ATMOSPHERIC REFRACTIVITY
IN THE NORTHERN MARGINAL ICE ZONE

Charles T. Sutherlin
Lieutenant Commander, United States Navy
B.S., North Carolina State University, 1970

This thesis presents an analysis of atmospheric refractivity conditions in the Arctic Marginal Ice Zone. The fundamental principles of atmospheric effects on electromagnetic wave propagation are presented along with methods to assess these effects. Using these principles, a determination of the occurrence of atmospheric ducts is made from meteorological data gathered during the Arctic Marginal Ice Zone Exercise, 1983 (MIZEX-83). The optimum coupling height, thickness and intensity for all ducts are calculated and statistically analyzed. Duct occurrence is related to area meteorological conditions. Based on area refractivity, the potential for enhanced area electronic warfare operations is evaluated.

MASTER OF SCIENCE

IN

SYSTEMS TECHNOLOGY
(SPACE SYSTEMS OPERATIONS)

DEVELOPMENT OF A COMPUTER SIMULATION TO DETERMINE THE OPPORTUNITIES FOR DETECTION OF MOVING TERRESTRIAL TARGETS BY A MULTI-SATELLITE CONSTELLATION

James Richard Sowers
Lieutenant Commander, United States Navy
B.S.A.E., West Virginia University, 1970

This thesis develops a computer program which simulates up to 24 earth-orbiting satellites and 3 moving terrestrial targets covering a period of 10 hours. Although written to support the simulation programs of the Advanced Wide Area Missile (AWAM) Project, this computer program has the flexibility to be expanded for further studies in space systems operations. The graphical output of the simulation shows opportunities for detection of each target by each satellite for each minute of the simulation. The Naval Space Surveillance System's orbit prediction model "SHOWHOW" is used as the model of satellite motion in the simulation. A brief introduction to orbital mechanics is also included.

MASTER OF SCIENCE

IN

TELECOMMUNICATIONS SYSTEMS MANAGEMENT

ANALYSIS OF MODERN ANALOG AND DIGITAL
COMMUNICATION CHANNELS FROM A
MANAGER'S PERSPECTIVE

John A. Brouse, Jr.
Lieutenant Commander, United States Navy
B.S., University of Utah, 1974

This thesis presents the fundamental communication transmission principles which define the performance characteristics of the transmission channel. The subject matter is divided into three categories (1) antennas, (2) transmission lines, and (3) waveguides. The scope of presentation is results oriented rather than the traditional theorem and proof approach. While the results are quantitative in nature, consideration of the underlying principles as well as the advantages and disadvantages associated with each transmission channel are presented. Although technical factors are often the basis upon which decisions regarding communication systems are made, it is evident that the telecommunication systems manager must understand the fundamental principles of the transmission channel in order to effect viable solutions to telecommunications management problems.

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THE TELECOMMUNICATIONS INDUSTRY IN TRANSITION: IMPACT OF DIVESTITURE

Dennis Joseph Dezelan
Captain, United States Army
B.A., Cleveland State University, 1971

On 1 January 1984 the final act of a long anti-trust suit between the Department of Justice and the American Telephone and Telegraph Company unfolded. AT&T divested itself of its twenty-two operating companies and simultaneously shed its long coveted position as a regulated monopoly. Military and civilian telecommunication managers at policy or operational levels must consider telecommunications as an industry in transition and act accordingly to maximize opportunities of competition and minimize the hazards and frustrations of an industry reaching out in all directions at once.

Presented in this thesis is a brief historical review of the telecommunication industry and events leading to deregulation. Management challenges and opportunities are examined on the basis of the changing technology advancing the telecommunications industry. Strategies for telecommunication managers are examined in view of the opportunities and problems encountered.

SPECIALIZED COMMON CARRIERS: LONG DISTANCE
ALTERNATIVES FOR MILITARY INSTALLATIONS

Scott L. Klingler
Captain, United States Air Force
B.S., Brigham Young University, 1979

Specialized Common Carriers, communications carriers which came
into existence offering private line microwave service, are now
significant competitors in the long distance telecommunications
industry. This thesis provides military installation telecommunications
managers with a basic knowledge of how Specialized Common Carriers
entered the telecommunications market, what services Specialized Common
Carriers offer, and how to obtain these services for a military instal-
lation. It includes a case study evaluation of the potential use of
long distance services of two of these competing common carriers at
Naval Air Station, Moffett Field, California. A computer program used
to calculate the costs of using these two alternative long distance
carriers is included as part of the case study.

Master of Science in   Advisor: D. C. Boger
Telecommunications   Department of
Systems Management   Administrative Sciences
March 1984

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MULTILEVEL SECURITY IN A LOCAL AREA NETWORK

Debra Ann Straub
Lieutenant, United States Navy
B.S., Indiana State University, 1975

This thesis examines the design of a local area network that is able to simultaneously handle users at a variety of security levels, while providing full multilevel protection of the data. A major feature of the design is the use of trusted software in the network interfaces to provide security for data entering or leaving the network. This secure design was initiated to investigate options for local area network technology that could be incorporated into the planned near-term upgrade for the WWMCCS Information System ADP support.

Master of Science in
Telecommunications
Systems Management
March 1984

Advisor: N. R. Lyons
Department of
Administrative Sciences

MASTER OF ARTS

IN

NATIONAL
SECURITY
AFFAIRS

PROTEST MOVEMENTS AND THE SECURITY POLICY OF THE
FEDERAL REPUBLIC OF GERMANY SINCE 1950

Arthur Neil Black
Captain, United States Air Force
B.A., California State University, Sacramento, 1979

This thesis presents an analysis of selected West German protest
movements from the founding of the Federal Republic of Germany in 1949
to the present. The purpose is to test the hypothesis that public
opposition to security policies of the Federal Republic of Germany, as a
continuing process, has enjoyed an increasing amount of success in
affecting national decision-making, and may play a key role in shaping
West Germany's future in the NATO alliance. Social problems related to
the effects of radical countercultures are discussed, as well as specu-
lation about Soviet involvement in West German protest movements. The
recent success of the Greens/Alternative Party in several local elec-
tions in West Germany raises the possibility that public attitudes may
become less hospitable to the U. S. military presence in West Germany.
This trend could have serious implications for NATO and for U. S.
interests in Western Europe as a whole.

Master of Arts in   Advisor: D. S. Yost
National Security Affairs   Department of
December 1983   National Security
                                                    Affairs

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THE INFLUENCE OF SOVIET AND AMERICAN POLITICAL CULTURE
ON NEGOTIATING POSITIONS: THE INTERMEDIATE-
RANGE NUCLEAR FORCE CASE

William Rockwell Blackburn
Commander, United States Navy
B.A., Northwestern University, 1968

This thesis explores the influence of the underlying political
culture of the Soviet Union and the United States on the positions of
those governments at the Intermediate-Range Nuclear Force Negotiations.
It defines the term political culture as the conceptual framework within
which politics operates. The thesis then discusses the historical
evolution and primary characteristics of the elite political cultures of
both nations. In the process of this a cultural model, or stereotype of
the political elite of each nation is postulated. This model is then
utilized to evaluate the negotiating positions of each country from a
cultural standpoint. Finally, the thesis concludes that political
culture probably does influence the positions of governments and may be
a useful method of evaluating those positions and predicting future
actions. In addition, the thesis sees a possibility of utilizing
political culture as one method of determining the importance of those
positions to the governments involved.

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THE ECONOMY OF ROMANIA: HOW IT COMPARES TO OTHER
CENTRALLY-PLANNED ECONOMIES IN EASTERN EUROPE

Grace Marie Charney
Captain, United States Air Force
B.S., Slippery Rock State College, 1971

This paper is an examination of the Romanian economy. It begins
with a basic description of socialist economies, outlining character-
istics and procedures common to many socialist economies. For purpose
of comparison, the next section cites recent economic information on
Eastern Europe socialist countries other than Romania.

The section on Romania compares its economy to the socialist
model; describes its formal structure, composition, and distribution;
and identifies trade relations. It traces the development of the
economy through the seven five-year plans from 1951-1985. It then
highlights economic events that reflect dissent in Romania and economic
reform programs.

Useful definitions, tabular examples of Romanian trade, graphic
displays of economic features, and the text of the 1975 Helsinki Agree-
ment which galvanized East European dissent movements are included in
the appendices.

UNITED STATES POLICY IN INDIA: BALANCING GLOBAL
AND REGIONAL PERSPECTIVES

Carl A. Cockrum
Captain, United States Army
B.A., Gonzaga University, 1975

This paper explores the legacy of past United States involvement
in South Asia and the policies of the current administration under
President Reagan. The generally positive attitude that the Soviet Union
has adopted towards Indian strategic goals is contrasted with American
policies that have tended to oppose Indian objectives. The military
capability, economic growth and self-sufficiency, and the increasing
diplomatic strength of India, are reviewed with the conclusion that the
emerging national power of India precludes a South Asian policy that is
driven solely by East-West issues. Current Indian policies including
the import/export policy, the Mid-East, arms transfers, and policy
towards Pakistan and China are probed to determine areas of current or
potential agreement or disagreement with the United States. The policy
recommendation formulated from the above factors includes specific mea-
sures for recognizing India's growing power status, support of Indian
nonalignment, and support of a responsible Indian de facto regional
dominance balanced with a limited support for Pakistan.

KOREAN UNIFICATION: A GAME THEORETICAL
AND BARGAINING ANALYSIS

David L. Cook
Major, United States Army
B.A., Wichita State University, 1972

Since 1948 a stalemate has existed between North and South Korea on the issue of unification. Although discussions were held on the subject in 1972 and 1979, no substantive changes have occurred in the situation for 35 years. Thus, new approaches that could increase the possibility of agreement between North and South Korea must be developed. This thesis uses a game theoretical model based on the Prisoner's Dilemma to analyze the situation and provide strategy recommendations that can help alter the status quo. This theoretical model will provide policy-makers with an insight into the problems involved in moving towards unification. The role that the U. S., Japan, USSR, and the PRC have in the unification process is also analyzed using the game theoretical model. It concludes that: the time to act is now, the initiative for unification must come from inside Korea, and that a substantive increase in communication and cooperation are crucial if unification is to occur.

THE END OF THE BREZHNEV ERA: STASIS AND SUCCESSION

Charles Joseph Duch
Captain, United States Air Force
B.A., Southern Connecticut State University, 1974

In the absence of constitutional guidelines for political succession in the USSR, the Brezhnev succession proceded on an ad hoc basis. The election of Yuri Andropov as General Secretary in November 1982 followed an intense period of political coalition building, which ensued after the death of Party Secretary Mikhail Suslov in January 1982 and Brezhnev's serious illness in March of the same year. Andropov's victory over his chief rival, Party Secretary Konstantin Chernenko, indicated that a coalition with foreign policy interests was able to control the succession and defeat a coalition of economic managers. The equipoise in the Politburo after Andropov's election indicates that key domestic and foreign policy issues were not completely resolved with Andropov's election and future changes in the leadership may indicate a corresponding policy evolution.

THE POLISH ARMED FORCES: WARSAW PACT
RELIAB'LITY IN QUESTION

Michael Edward Duffy
Lieutenant Commander, United States Navy
B.A., College of the Holy Cross, 1971

The December 1981 imposition of martial law in Poland and its
lifting in 1983 have been indicative of the turmoil that has existed in
Poland over the last few years. As the largest member geographically
and demographically of the Warsaw Pact, the domestic unrest has placed
the reliability of the Polish armed forces as Warsaw Pact members in
question.

This thesis concludes that the Polish armed forces can be
considered reliable members of the Warsaw Pact in foreseeable
circumstances, despite some qualifications. This conclusion is reached
through a review of the postwar history of the Polish armed forces and
an analysis of other pertinent factors, including the burden of
governing and the economy's effect on the armed forces. Various other
issues favoring and opposing reliability are also analyzed.

Master of Arts in
National Security Affairs
December 1983

Advisor: R. E. Looney
          Department of
          National Security
          Affairs

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RUSSIAN CULTURE AND SOVIET SCIENCE

Beulah Clare Galvin
Lieutenant, United States Navy
B.A., Indiana University, 1978

This thesis analyzes the effect of Russian culture and Soviet
ideology on Soviet science. Russian culture is shown to inhibit the
ability of Soviet scientists to achieve major breakthroughs or develop
radically new theories. Culture does, however, enhance the Soviet
ability to thoroughly exploit and innovatively apply proven scientific
theories and technologies. The Soviet inability to achieve break-
throughs compels their reliance on Western technology. Their
proficiency in exploiting proven technologies enables the Soviets to
compete effectively with Western military systems. Thomas Kuhn's
description of the scientific process is utilized as a framework in this
analysis.

CHANGE IN NIGERIA: CHALLENGE OF THE 80'S

George H. Gilkes
Captain, United States Army
B.A., Florida State University, 1974

Nigeria, a country of great importance to U. S. interests, faces many challenges in the 1980's. The survival of this strategically important nation may be dependent upon its ability to manage and control the forces currently at work trying to dismember the growing unity of its people. Three potential forces for change - Islam, ethnicity, and the economy - are discussed, and the most likely vehicle for peaceful, progressive change, is analyzed.

While facing its many challenges the emergence of a constitutional government, steadily gaining in strength, may provide Nigeria's best hope for peaceful evolution and significant development in the 1980's.

Master of Arts in
National Security Affairs
December 1983

Advisor: M. W. Clough
Department of
National Security
Affairs

MOBILIZATION: AN INSTRUMENT OF UNITED
STATES STRATEGIC POLICY

William Allen Hancock
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1972

Mobilization represents an instrument of significant importance in U. S. strategic policy. Inherent in the mobilization process and a viable, secure mobilization base is the capacity for maximizing potential national strength to achieve essential national security goals. The relative decline of U. S. international influence, the current condition of superpower nuclear parity and U. S. conventional inferiority to the Soviet Union, and the increasing potential for the occurrence of protracted warfare at various levels of conflict have increased the importance of maintaining a credible mobilization capability. The current U. S. deterrent posture and warfighting capability and the viability of its mobilization base are weakened, however, by U. S. vulnerability to disruptions of supplies of strategic and critical minerals from foreign sources, the degraded condition of the American defense industrial base, and the lack of both an effective, centralized national mobilization authority and a comprehensive, integrated mobilization plan.

THE LIMITS OF INTERVENTION: SOVIET NAVAL POWER
PROJECTION CAPABILITIES AND THE
DECISION TO INTERVENE

Guy D. Holliday
Lieutenant, United States Navy
A.B., Bowdoin College, 1977

This thesis considers the factors that influence a Soviet decision
to use naval power for intervention in third world countries beyond
their borders. A qualitative cost-benefit analysis is described for
general application and several case studies are developed using
"decision points" that follow from the analysis. Operational defini-
tions of the physical assets available for use in an overseas power
projection are then offered and compared against the requirements for
levels of escalation suggested by decision points that can be reasonably
projected to occur.

SAUDI ARABIA AND THE UNITED STATES
PERCEPTIONS AND GULF SECURITY

Donald S. Inbody
Lieutenant, United States Navy
B.M.E., Wichita State University, 1973
M.M.E., Wichita State University, 1977

The relationship of Saudi Arabia and the United States is examined, particularly in the framework of Gulf Security. A brief analysis is conducted of internal authority within Saudi Arabia followed by a look at security problems in the Gulf region as seen from the Saudi perspective. How the Saudis perceive the role of the United States in Gulf Security is then studied, with an emphasis on the cultural clash and the problems which are wont to arise. With an assumption that Saudi-U. S. relations are likely to continue in the foreseeable future, and that such relations are in the best interests of the United States, a conclusion is reached which offers several suggestions for strengthening these ties, reassuring the Saudis of American resolve, and encouraging the maintenance of stability in the Gulf region.

JAPAN AND THE SOVIET THREAT:
PERCEPTIONS AND REACTIONS

Curtis A. Kemp
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1972

Japan and the USSR occupy neighboring positions geographically, yet stand vastly separated due to historical and cultural reasons. A cloud of distrust permeates bilateral relations. Since 1978, greatly expanded Soviet military forces in Northeast Asia have been added to this unstable foundation. With such military power so close, one might think Japan would be acutely concerned. This paper examines the security perceptions of various Japanese groups, the Japan-USSR economic linkages to the security issue, and the extent which Japan's ongoing defense programs represent a direct response to the Soviet "threat." The U. S. government would like to believe that Japan shares a similar security outlook of the USSR. This study demonstrates that marked differences currently exist, but suggests that Japanese perceptions of (and responses to) the Soviet "threat" are in a state of flux.

SECURITY ASSISTANCE RATIONALES:
THE SOVIET UNION AND
EASTERN EUROPE

Richard V. Kikla
Lieutenant, United States Navy
B.A., Pennsylvania State University, 1977

This thesis analyzes Soviet arms transfer policies within the
Warsaw Treaty Organization relative to three perspectives: political
and diplomatic, strategic and military, and economic. The political and
diplomatic perspective emphasizes political control and maximization of
Soviet influence as a primary rationale for Soviet arms transfers. The
strategic and military perspective emphasizes military power and the
maximization of the Warsaw Treaty Organization's military potential as
an alliance. The economic perspective focuses on the Soviet military-
industrial complex and internal decision-making as a factor in arms
transfers.

The inter-relationship of these three perspectives defines the
objectives and limitations of Soviet arms transfers within the Warsaw
Treaty Organization. The thesis concludes that the quality of Soviet
arms transferred to the WTO will always be at least a generation behind
those equipping Soviet forces and that East European license production
will only be of equipment that is relatively obsolete by Soviet
standards.

Master of Arts in   Advisor: E. J. Laurance
National Security Affairs   Department of
December 1983   National Security
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NORWEGIAN SECURITY DETERMINANTS:
DETERRENCE AND REASSURANCE

John J. Linnehan
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1971

This research provides an analysis of Norway's security policy from World War II to the present. The growth of Soviet military power and the Norwegian response in the evolution of its security policy are discussed in order to discern the strength of NATO's northern flank. The adequacy of Norway's policy of detente and reassurance has been questioned with respect to the premise of warning time and reinforcement. Norway's policy has been successful, but with increasing national disunity regarding NATO's nuclear policy, the questionable "guarantee of reinforcement," and the need for political courage and decisiveness in a crisis. Given Norwegian disunity, the Soviet Union may be able to achieve limited goals in the North without resorting to force.

FOREIGN POLICY DIMENSIONS OF ARGENTINA
AND BRAZIL: EMERGING MIDDLE POWERS
MARCHING TO THEIR OWN DRUMS

Terry Jean Lovvorn
Lieutenant Commander, United States Navy
B.A., Westmont College, 1971

This paper focuses on and compares dimensions of Argentine and Brazilian foreign policy in the international system, coupled with changes in their domestic and regional politics. Both countries have adopted independent foreign policy strategies aimed toward regional and global interdependence. Their pursuit of independent action has tended to ignore United States influence unless it coincided with perceptions of their national interests. These strategies have resulted in marked diversification of contacts with other nations, both developing and developed. Additionally, these traditional rivals acknowledge the benefits to be gained politically and economically by cooperating. In final, assessment of their bids for independence and self-sufficiency have only highlighted Argentine and Brazilian interdependence on the Latin American region and the international system.

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THE CHANGING ROLE AND CAPABILITIES
OF THE ITALIAN NAVY

Daniel Doyle Lucas
Lieutenant Commander, United States Navy
B.S., California Maritime Academy, 1973

The Italian Navy is presently undergoing an extensive moderni-
zation and reconstruction program. The ultimate goal of this study is
to provide an assessment of the potential impact of Italy's evolving
force improvements on NATO's maritime capabilities in the Mediterranean.
To accomplish this goal, four potential factors that may have governed
the process leading to the Navy's recent improvement efforts are
investigated.

The influence of historical forces, NATO commitments, domestic
economy and politics, and commercial interests are the key elements
considered. A brief review of the three services and their present
force structure deployment and missions is necessary to attain a proper
perspective on the Navy's role, objectives and associated problems. All
of the above factors have had some influence on the changing role and
capabilities of the Italian Navy. Under current conditions, the Navy is
capable of adequately accomplishing its assigned mission. Any added
burden placed upon it by a change in NATO's strategy (a decrease in
regional forces) or a sudden down-turn of the economy, would probably
degrade its capabilities considerably.

THE EVOLUTION OF UNITED STATES AND NATO TACTICAL NUCLEAR DOCTRINE AND LIMITED NUCLEAR WAR OPTIONS, 1949-1984

Alan Gary Maiorano
Lieutenant, United States Navy
B.A., Wake Forest University, 1977

The debate over nuclear weapons in Europe and their utility as part of NATO's forward defense strategy has persisted since the mid-1950s. Existing tactical nuclear employment doctrine and strategies are based on obsolete criteria and defense concepts established when the U. S. possessed superiority in nearly all nuclear categories. NATO has allowed its tactical nuclear doctrine and arsenal of battlefield nuclear weapons to deteriorate, choosing instead to rely on the American strategic nuclear umbrella for all but the most localized of conflicts.

This thesis examines the development, stagnation and decline of NATO tactical nuclear doctrine and strategy from 1949 to 1984. It analyzes four tactical nuclear postures, drawing from each to recommend a viable tactical nuclear strategy for NATO today. The presence and potential employment of tactical nuclear weapons make it imperative that NATO devise an effective limited nuclear war strategy.

SOVIET PERSPECTIVES ON CURRENT
SINO-SOVIET RELATIONS

Douglas Conrad Meister
Lieutenant, United States Navy
B.S., United States Naval Academy, 1977

The Sino-Soviet dispute affected a fundamental realignment of the
world power structure. It has been suggested that improving Sino-Soviet
relations presage yet another such change. This will not be the case.
The USSR is by any measure the more powerful and decisive actor in the
dispute. It considers the existence of the dispute and the position of
the PRC an affront to its dignity and a threat to its interests. The
dispute should be resolved but only on Soviet terms. Compromise would
risk ideological and strategic stability. At the same time PRC leaders
face analogous constraints that prevent compromise on their part. The
Soviets' only other solution, military force, can only be applied at
greater risk than compromise would entail. Continuing the relationship
on terms of peaceful coexistence, while operating diplomatically and
internationally to contain the PRC, is the only alternative left.

THE CULTURAL ANTECEDENTS OF U. S.
MILITARY PLANNING

Jeanne Marlene Miller
Lieutenant Commander, United States Navy
B.A., Phillips University, 1973
M.P.A., Golden Gate University, 1978

The American military planning system is examined to determine what concepts, habits, skills, arts, instruments, and institutions of the U. S. national culture are relevant to the development of military plans and policy. A supporting line of inquiry examines the juxtaposition of the history of military planning with the American value system, and explores the evolution of the American planning system through the years. A review of recent styles of strategic thought from over-reliance on quantitative methods to a more balnaced approach is conducted.

POLITICAL CHANGE IN MOROCCO: ITS EFFECT
ON THE TRADITIONAL MONARCHY

Charles Frank Odom
Captain, United States Army
B.S. Ed., Midwestern University, 1973

This thesis examines the effect of pressures for political change on the stability of monarchial rule in Morocco. Part One traces the origins of monarchial rule and outlines its guiding principles and dominant institutions. Part Two examines the present day monarchy with emphasis given to several incidents that occurred after 1940 that created pressures for political change in the country. The effects of modernization, nationalism, and decolonization on the stability of the monarchy will be analyzed. The nature of the post-independence Moroccan political system and the relationship of the monarchy to other political forces that developed as a result of the Nationalist movement will also be discussed. The final part of this study focuses on the nature of current political pressures on the monarch of Morocco. The author's conclusion is that despite the changes that led to the emergence of other political forces in Morocco, the prospects for significant future change in the system is slim and the monarchy will remain the dominant political force in the country.

THE ROYAL NAVY AND BRITISH SECURITY POLICY

James Edmond Oldham
Lieutenant, United States Navy
B.S., United States Naval Academy, 1978

This thesis examines the roles of the Royal Navy in British security policy. Since World War Two, Britain's role in the international system has changed, and so has its security policy. Today Britain plays a part in the nuclear balance of power; is a major contributor to NATO and West European collective security; and has diminished but still significant interests beyond Europe. The Royal Navy contributes to each of these dimensions of Britain's defense policy. It operates Britain's strategic nuclear deterrent. Its conventional forces contribute to Britain's European commitment, though the Navy's role is currently considered less significant than that of the British Army and the RAF. Finally, the Royal Navy plays a role in protecting Britain's residual global interests such as the Falklands. The future of the Navy is ultimately dependent upon the constraints which limit defense resources. In the future the Royal Navy will continue to operate the strategic nuclear deterrent; will contribute to Britain's European role with diminished capability; and slowly but inevitably further reduce its commitments beyond Europe.

SOUTH AFRICAN DEFENSE POLICY

Carl T. Orbann
Lieutenant Commander, United States Navy
B.A., University of South Florida, 1971

The Republic of South Africa is the preeminent regional military and economic power in southern Africa. It is also a country that has earned near universal condemnation over the practice of apartheid. South Afri a's strength as opposed to its neighbors' weakness, and the fact that South Africa practices internal policies which are condemned by its neighbors and the international community, provide the basis for conflict in southern Africa. Further, as South African military capabilities grow, and the ability cf outside actors to influence the actions of the Republic is lessened, a better understanding of the defense policies of South Africa becomes even more important to the West.

This paper examines South African defense policy as it is today, and as it has developed historically from 1910. Historical development of the South African Defense Force and South African defense policies are examined in Chapter I. Chapter II is devoted to the Total Onslaught/Total National Strategy concept developed and instituted by Prime Minister P. W. Botha. The Total Onslaught is important as it provides the basis for current South African threat assessments. Likewise, the Total National Strategy provides the framework within which defense policies are defined.

Finally, Chapter III is devoted to an examination of current South African defense policies. This chapter examines South Africa's threat perceptions, constraints placed upon South Africa, and the country's assets. Lastly, it examines the defense strategies which have developed in response to these factors.

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National Security Affairs
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Advisor: M. W. Clough
          Department of
          National Security
          Affairs

AMBER WAVES OF GRAIN: AMERICAN AGRICULTURE
AS A STRATEGIC RESOURCE IN A CROWDED WORLD

Gary Parson
Lieutenant, United States Navy
A.B., Indiana University, 1976

This thesis deals optimistically with the topic of feeding the
increasing world population. It first briefly reviews the literature,
favorable and unfavorable, from early thoughts on the subject, past
landmark books such as Robert Malthus' On Population and Dennis Meadows'
The Limits to Growth to The Global 2000 Report to the President.

In its analysis of the present situation, the paper reviews
historical data and current trends. In the area of population, the
imaginative, if radical, policies being pursued in China are carefully
examined. In agriculture, several developments in the United States are
brought out.

Finally, it analyzes the predomi⸱⸱   position of the United States
in the area of agriculture, relative   oth the world in general⸱ and
the Soviet Union in particular. Wea⸱⸱ ⸱s are noted and discussed; but
the conclusion is drawn that be⸱ nd tra⸱ alone American agricultural
superiority continues to offer ⸱ ⸱⸱⸱⸱ benefits and opportunities and,
if handled carefully, may ⸱⸱ ⸱a ⸱ ategic implications.

THE CARIBBEAN: U. S. ECONOMIC AND
MILITARY INTERESTS

Rick L. Russell
Lieutenant, United States Navy
B.S., Miami University, 1978

This thesis deals with the reasons the Caribbean is of interest economically and militarily to the United States. It examines factors affecting foreign policy formulation; essential materials, supplies, and trade routes; Soviet and Cuban activities in the region; and political, economic, and military recommendations based on these aspects to ensure the continued existence of the Caribbean as a free area, secure from Soviet and Cuban involvement and interference. In so doing, it examines why the region is important to United States security and economic prosperity.

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THE FOREIGN POLICY OF ANGOLA
UNDER AGOSTINHO NETO

Gregory M. Saunders
Captain, United States Army
B.S., United States Military Academy, 1976

This thesis analyzes the foreign policy of Angola under its first President, Agostinho Neto. Part one examines the evolution of the Popular Movement for the Liberation of Angola's (MPLA) relations with Angola's northern neighbor Zaire from the movement's inception in 1956, through the liberation struggle, post-independent conflicts in Zaire's Shaba Province and finally rapprochement. The author traces the effect of changes in Zairian policy on the MPLA's perceptions of responses to its regional and international environment before and after independence. Part two outlines the evolution of MPLA policies toward the problems in southern Angola growing out of the complex forces generated by the interplay between ethnic and political conflicts in the region and Namibia involving the MPLA, the SouthWest Africa People's Organization (SWAPO), the Union for the Total Independence of Angola (UNITA), and South Africa. A central focus of this thesis is the impact of factional divisions within the MPLA on Angolan foreign policy.

U. S. POLICY TOWARD THE ISRAELI-EGYPTIAN CONFLICT
SEPTEMBER 1970 - FEBRUARY 1972:   THE ANALYSIS
OF A FAILURE OF AMERICAN DIPLOMACY

Joseph Thomas Stanik
Lieutenant, United States Navy
B.S., United States Naval Academy, 1978

Between September 1970 and February 1972, a unique opportunity existed in the Middle East for the conclusion of an interim settlement in the dispute between Egypt and Israel.   Egyptian President Anwar el-Sadat declared his willingness to enter into a peace agreement with Israel and demonstrated his sincerity by renewing the Rogers cease-fire plan, proposing an interim Suez Canal agreement with Israel, and opening a dialogue with the United States.   Unfortunately, the American foreign policy establishment failed to take full advantage of the positive political developments in the Middle East, and a rare opportunity to move this troubled region closer to peace was lost.   This failure of American diplomacy can be traced to the uncoordinated and ineffective Middle East policy pursued in the three years separating the Jordanian civil war of 1970 and the October 1973 Arab-Israeli war.   During this crucial period, U. S. Middle East policy was formulated without an accurate understanding of regional developments, was not impartial, was preoccupied with the global ramifications of the Arab-Israeli conflict, was not effectively conducted, was not coordinated between the White House and the State Department, and most important, did not enjoy the full support and complete commitment of the President of the United States.

A MULTIVARIATE ANALYSIS OF SELECTED SOCIO-ECONOMIC
INDICATORS IN THE MIDDLE EAST

Michael W. Trahan
Captain, United States Army
B.A., Texas A&M University, 1975

The main objective of this study is to construct socio-economic indices for twenty-one Middle East countries and use these indices to rank and scale the countries according to their socio-economic development levels. This study involves multivariate analysis of socio-economic data which would reflect the complex reality of the development levels and process; and give a more comparative picture of the development potential of the countries of the Middle East.

INTERMEDIATE-RANGE NUCLEAR FORCE MODERNIZATION
AND SOVIET-WEST GERMAN RELATIONS

Luanne Aline Turrentine
Lioutenant Commander, United States Navy
B.S., University of Minnesota, 1971

NATO's decision to modernize its intermediate-range nuclear forces (INF) by deploying 108 Pershing II's and 464 cruise missiles has created friction between the Soviet Union and the Federal Republic of Germany. Following the NATO decision of 12 December 1979, the Soviet Union staged a monumental propaganda effort in West Germany against the moderniza- tion, with special attention to the Pershing II's which are to be sta- tioned solely on West German soil. This effort, however, was not suffi- cient to cause the Federal Republic of Germany to reject the deployment, although there were heated Bundestag debates and massive public demon- strations against the deployment.

Since the deployment began in November 1983, no dire consequences have come to pass for the Federal Republic of Germany. The Soviet Union, in fact, needs to retain positive relations with the Federal Republic because of its need for hard currency and Western technology, and the FRG is the USSR's most valuable Western trade partner. Retalitory measures taken by the Soviets against the Pershing II's have only amounted to modernization measures already in progress during the negotiations.

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THE WARSAW PACT BALTIC FLEET

Kim W. Veitch
Lieutenant Commander, United States Navy
B.S., University of Arizona, 1972

This thesis provides an examination of the threat posed to NATO by the Warsaw Pact Baltic Fleet and its capability to accomplish its maritime missions. The history of the Soviet Baltic Fleet is discussed in order to demonstrate previous Russian actions and interests in the Baltic region. The missions of the Warsaw Pact are delineated and supported by evidence from Warsaw Pact exercises. The constraints caused by political and natural geography, oceanographic factors, and climate are reviewed. The character and types of operations necessitated by these constraints are proposed. The force structures of the Warsaw Pact nations (East Germany, Poland, and the Soviet Union) which make up the Warsaw Pact Baltic Fleet are examined. Trends in modernization and capabilities are discussed in particular depth. The navies of the NATO opposition (Denmark and West Germany) are presented in the same manner. The ability of the Warsaw Pact Baltic Fleet to accomplish its missions in the face of the constraints and opposition is analyzed.

THE DOMESTIC STRATEGIC PLANNING ENVIRONMENT

Stephen Joseph Walsh
Lieutenant, United States Navy
B.Music, West Virginia University, 1976

This thesis examines the American environment for strategic planning and policymaking on the premise that participants in those processes should be aware of the constraints inherent in the structure of American government which work against coherence and efficiency. Against an historical background of Soviet-American competition and conflict it explores the structural and sociological constraints in American politics and their effects on foreign policy. It then investigates the concept of the national interest as a force in foreign and domestic politics. It concludes that planning undertaken in ignorance of these structural and sociological factors will have little hope of successful implementation.

THE IMPACT OF SOVIET ETHNICITY AND DEMOGRAPHIC
CHANGES ON SOVIET FOREIGN POLICY

Patricia Weathers Wyatt
Civilian, United States Department of Defense
B.A., College of William and Mary, 1975

This thesis examines Soviet ethnic and national problems resulting from the gradual demographic shifts presently underway. It considers the impact of the shift from a Russian dominated socity, to the Russians becoming only one large minority group among many. The tensions that will increasingly strain the Soviet system as a result of the demographic changes and the complex problems with which the new Kremlin leadership must deal are discussed in relation to Soviet foreign policy. A major problem of the coming decades will be how the leadership attempts to resolve these changes. The nationality problems of the Soviet Union may not intrinsically be momentous, but are crucial for their potentially exacerbating effects on Soviet foreign policy.

STRATEGIC IMAGINATION: THE LOST DIMENSION
OF STRATEGIC STUDIES

Earle Swisher Yerger III
Lieutenant, United States Navy
B.B.A., University of North Florida

A survey of the range of methodologies from the purely quanti-
tative methods such as systems analysis, operations analysis, and opera-
tions research toward methods which incorporate other information, such
as trend extrapolation, economic analysis (as it pertains to defense)
and the Delphi Technique. A brief introduction to the utility of
scenario construction precedes an examination of the wargame; both
useful in many ways to the military planner. This is an attempt to
illustrate the quality and worth of the quantitative methods, as well as
point out the need for the open mind when considering defense matters.
Proven methodologies, the scientific method, and alternative courses must
all be utilized in the technological war.

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USICA
Attn: John Madigan
1717 H. Street, N.W. Rm. 730
Washington, DC   20547

Air Force Aero Propulsion Laboratory   1
Wright-Pattersonb Air Force Base, OH   45433

Air Force Materials Laboratory   1
Wright-Patterson Air Force Base, OH 45433

Air Force Rocket Propulsion Laboratory   1
Edwards AFB, CA 93523

Air Force Weapons Laboratory   1
Kirtland Air Force Base
Albuquerque, NM 87117

U. S. Army Ballistic Research Laboratory   1
U. S. Army Armanent
Research and Development Command
Aberdeen Proving Ground, MD 21005

Director, U.S. Army   1
Night Vision and Electro-Optics Laboratory
Attn: Code DEL NV-VI
Fort Belvoir, VA 22060

Civil Engineering Laboratory   1
Port Hueneme, CA 94043

Harry Diamond Laboratory   1
Adelphi, MD 29783

Naval Research Laboratory   1
Washington, DC 20375

Naval Weapons Laboratory   1
Dahlgren, VA 22448

Mr. Daniel S. Appleton   1
850 Coast View Drive
Laguna Beach, CA 92651

J. R. Auston   1
Applied Physics Laboratory
Johns Hopkins University
Johns Hopkins Road
Laurel, MD 20810