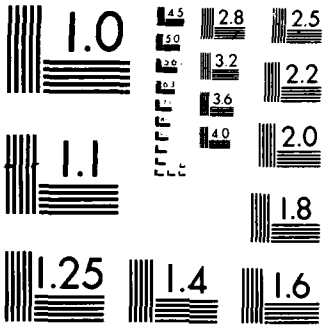
AD-A199 166 COMPILATION OF ABSTRACTS OF THESES SUBMITTED BY CANDIDATES FOR DEGREES(U) NAVAL POSTGRADUATE SCHOOL MONTEREY CA 30 AUG 88 NPS-012-88-001 1/9

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REPORT FOR THE PERIOD
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Monterey, CA 93943

Rear Admiral R.C. Austin
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K.T. Marshall
Acting Provost

The Work reported herein was supported by various Department of Defense activities and federal government agencies.

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SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION Unclassified	1b RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution is unlimited.
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S) NPS-012-88-001	5 MONITORING ORGANIZATION REPORT NUMBER(S) NPS-012-88-001
6a. NAME OF PERFORMING ORGANIZATION Naval Postgraduate School 6b OFFICE SYMBOL (If applicable) RAO	7a. NAME OF MONITORING ORGANIZATION
6c. ADDRESS (City, State, and ZIP Code) Monterey, CA 93943	7b. ADDRESS (City, State, and ZIP Code)
8a. NAME OF FUNDING/SPONSORING ORGANIZATION 8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c. ADDRESS (City, State, and ZIP Code)	10. SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO. / PROJECT NO. / TASK NO / WORK UNIT ACCESSION NO.

11. TITLE (Include Security Classification)

COMPILATION OF ABSTRACTS OF THESES SUBMITTED BY CANDIDATES FOR DEGREES

12. PERSONAL AUTHOR(S)
Students of the Naval Postgraduate School/Candidates for degrees.

13a. TYPE OF REPORT	13b TIME COVERED	14. DATE OF REPORT (Year, Month, Day)	15 PAGE COUNT
Summary	FROM 10/1/86 TO 9/30/87	88Aug 30	820

16. SUPPLEMENTARY NOTATION

17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	

19 ABSTRACT (Continue on reverse if necessary and identify by block number)

This publication contains the abstracts of theses submitted during the period 1 October 1986 - 30 September 1987 by candidates for Doctoral, Master's and Engineer's degrees at the Naval Postgraduate School, Monterey, CA 93943.

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT	21. ABSTRACT SECURITY CLASSIFICATION
☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT. ☐ DTIC USERS	UNCLASSIFIED

22a. NAME OF RESPONSIBLE INDIVIDUAL	22b. TELEPHONE (Include Area Code)	22c. OFFICE SYMBOL
Dr. G.T. Howard	(408) 646-2098	RAO/012

DD FORM 1473, 84 MAR 83 APR edition may be used until exhausted
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NAVAL POSTGRADUATE SCHOOL
Monterey, California

June 1988

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MASTER OF ARTS DEGREES

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DOCTOR OF PHILOSOPHY

1/2

IMPORTANCE OF ROTATIONAL SHEAR STRESS FOR ENTRAINMENT IN THE OCEAN MIXED LAYER

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M.S., University of Cincinnati, 1974
M.S., Oregon State University, 1978

The interaction of the northward component of planetary rotation and the east-west Reynolds stress affects the isotropy of the integral scale turbulence in the upper ocean by redistributing turbulent kinetic energy (TKE) among the components. This "rotation stress" mechanism is incorporated into a vertically integrated model of the ocean mixed layer. Simulations of Ocean Weather Stations P (50°N, 145°W) and N (30°N, 140°W) are used to compare this model with the Garwood (1977) model and with observations. The significant effect is the augmentation (for easterly winds) or reduction (for westerly winds) of the ratio of vertical to horizontal TKE. The rate of entrainment is affected by the change in the vertical convergence of TKE at the interface between the mixed layer and the pycnocline. Rotation stress significantly alters the mixing on diurnal to synoptic time scales during late winter and early spring. With rotation stress, retreat events occur more frequently, and the mixed layer depth change during retreat is 10-30% greater than without rotation stress. Typically, the ratio of vertical to total TKE is three times larger when rotation stress is included and the dissipation enhancement of Garwood (1977) is neglected. The resulting TKE distribution is more isotropic and in better agreement with laboratory results for neutrally stratified shear flows. This study demonstrates the need for measurements of the TKE budget in the upper ocean to confirm these findings and to further test the hypotheses of TKE models in oceanic applications.

Doctor of Philosophy
June 1987

Advisor: R.W. Garwood
Department of
Oceanography

A FIBER OPTIC INTERFEROMETRIC SEISMIC SENSOR WITH HYDROPHONE APPLICATIONS

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B.S., Florida Atlantic University, 1972
M.S., Florida Atlantic University, 1976

A fiber-optic interferometric seismic sensor which has applicability to hydrophones has been developed. It consists of a seismic mass supported in a case by two rubber mandrels, each wound with a single layer of single mode optical fiber 10-m long. One end of each fiber is cleaved to enhance reflection. The other ends are interconnected by a fiber-to-fiber 3-dB coupler, forming a Michelson interferometer. When the case of the sensor is displaced, force transmitted to the mass through the mandrels causes the fiber around one mandrel to extend in length while the other contracts. The resulting "push-pull" mechanical operation of the sensor allows both legs of the interferometer to be active, providing good common mode rejection of spurious effects, since a reference leg is not required. This, together with the fact that the light traverses each leg of a Michelson interferometer twice due to reflection, provides the sensor with four times the sensitivity of a conventionally constructed interferometric sensor. Sensitivities of 8500 radians of optical phase shift per micron of case displacement have been measured at frequencies above the mass-spring resonance, where the sensor operates as a seismometer. Below resonance the sensor operates as an accelerometer with a measured sensitivity of 10,500 radians/g, the highest reported for a fiber-optic accelerometer to date. Below resonance, the sensor has a detection threshold of 1 ng/ Hz, including both thermodynamic and demodulator noise sources (10 radians/ Hz). This is a 20 dB improvement over the best existing conventional low noise vibration sensors. When placed in a neutrally buoyant canister, the seismic sensor responds as a dipole hydrophone. A model of sensor performance as a hydrophone is presented and found to be in excellent agreement with experimental measurements in

both amplitude and phase. Improvements in sensitivity over previously designed fiber-optic and piezoelectric gradient hydrophone sensors range from 12 to 53 dB.

Doctor of Philosophy
September 1987

Advisor: S.L. Garrett
Department of
Physics

APPLICATIONS OF EIGENSTRUCTURE ASSIGNMENT TO DESIGN OF ROBUST MIMO DECOUPLING CONTROLLERS AND TO RECONFIGURATION ALGORITHMS FOR DAMAGED FLIGHT CONTROL SYSTEMS

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B.S., Southern Methodist University, 1970
M.S., Naval Postgraduate School, 1976

A matrix treatment of eigenstructure assignment theory as applied to the generalized linear time invariant system is presented. New geometrical interpretations of the constraints on selecting desired closed loop right and left eigenvectors as functions of the open loop system parameters are then shown to give qualitative measures on the computational complexity of selecting the vectors. Numerical optimization schemes are then presented which satisfy these geometric interpretations for subsequent encoding of an interactive eigenstructure synthesis program, EIGENS. Robust decoupling controllers are then synthesized via EIGENS. A new theoretical application of eigenstructure assignment to reconfiguring damaged digital flight controllers is then presented. The thesis concludes with reconfigured solution demonstrations as applied to the F/A-18 aircraft.

Doctor of Philosophy
December 1986

Advisors: D.J. Collins
R.H. Franke
Department of
Aeronautics and
Astronautics

SOLVING A CLASS OF SPATIAL REASONING PROBLEMS: MINIMAL-COST PATH PLANNING IN THE CARTESIAN PLANE

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M.S., Naval Postgraduate School, 1984

This work presents an algorithm to solve a two-dimensional weighted-region problem that requires finding the least-cost path between two points located on a map of homogeneous-cost regions. Such regions have a constant cost rate per unit distance accrued by paths passing through them. Conventional graph search applies standard search strategies to graphs whose links represent the only possible paths. We use Snell's law as a local-optimality criterion to create corresponding graphs for the weighted-region problem; the nodes in our graphs represent areal subdivisions of the physical environment. The performance of our Snell's-law-based algorithm is compared to that of a dynamic-programming, wavefront-propagation technique. Test results show average-case superiority of the Snell's-law-based algorithm, as measured by time, space and solution-path cost. We present a criterion to predict the time for the wavefront-propagation algorithm and the Snell's-law algorithm to solve problems; this allows the selection of the fastest algorithm. We also develop improvements to the wavefront-propagation algorithm that decrease its average-case time requirements and we prove properties of Snell's law when applied to the weighted-region problem.

Doctor of Philosophy
June 1987

Advisor: N.C. Rowe
Department of
Computer Science

SOLVING THE MULTICOMMODITY TRANSSHIPMENT PROBLEM

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M.S., Naval Postgraduate School, 1984

We examine two categories of solution algorithms for the large-scale multicommodity transshipment problem (MCTP): resource direction and price direction. In the former category we construct RDLB, a new algorithm which uses a simplified projection method in the subgradient capacity reallocations and conjugate subgradient directions with approximate line search to provide better termination conditions in the Lagrangean lower-bounding iteration. In the latter category, we develop DDC, a dual decomposition, and we introduce RSD(P) and RSD(A), new non-linear decomposition algorithms for the MCTP based on penalty transformations of the original problem and using restricted simplicial decomposition.

Computational results are presented for four- and ten-product versions of a problem with an underlying network of 3,300 nodes and 10,400 arcs. Results show RDLB stalls before reaching optimality, apparently a common problem in primal subgradient reallocations, while the RSD algorithms reach near-optimal solutions up to 10 times faster than a direct primal simplex-based solver, and display very favorable convergence rates compared to DDC. As a final test, RSD(A) and DDC are applied to a 100-product problem totaling 330,000 nodes and 1,040,000 arcs. RSD(A) reaches an acceptable solution within 4% of optimality in under 17 minutes, while DDC terminates after 68 minutes with a 12% gap remaining around the optimal solution.

Doctor of Philosophy
June 1987

Advisor: G.G. Brown
Department of
Operations Research

SUPERPOSITION EFFECTS IN RAPID CYCLOGENESIS

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M.S., Naval Postgraduate School, 1980

The effects of the zonal and meridional superposition of finite amplitude upper- and lower-level perturbations are investigated using a two-level analytical model and the Navy Operational Regional Atmospheric Prediction System (NORAPS). Superposition of a jet streak aloft and a finite amplitude low-level perturbation is also investigated using NORAPS. The initial along stream phase difference is crucial to the subsequent intensification of the low-level perturbation. A westward tilt with height of slightly less than a quarter wavelength is most favorable. The initial meridional superposition only modifies the growth rate that is established by the optimum zonal phase difference. The strength and location of low-level baroclinity and upper level shear vorticity, which depend on the structure of the mean flow, are important factors in determining the most favorable cross-track tilt. In the jet streak case with strong upper level forcing, the lower perturbation quickly moves to the most favored meridional position under the left front quadrant.

An east coast cyclogenesis event during 19-21 January 1986 is used to illustrate the effects of superposition. Despite strong upper-level forcing, rapid cyclogenesis at the surface did not occur, because the optimum superposition between the upper-level vorticity center and the surface cyclone was not achieved. Modifications to the initial conditions along the Atlantic Coast produce a simulation with a more favorable superposition, which results in more rapid intensification.

Doctor of Philosophy
March 1987

Advisor: R.L. Elsberry
Department of
Meteorology

AERONAUTICAL ENGINEER

11/12

A COMPUTER SIMULATION OF A SIMPLE ANTIRADIATION MISSILE WHICH USES INERTIAL GUIDANCE TO DERIVE TARGET LOCATION

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M.S., University of West Florida, 1974

This report addresses the possible use of inertial navigation by tactical, air-launched antiradiation missiles (ARMS) during attacks against stationary targets at unknown positions and elevations. A three degree-of-freedom simulation of a hypothetical medium-range ARM was conducted using an inertial navigation system and the missile's antiradar homing seeker to estimate the location of a target radar after launch and to navigate to that location if the missile seeker lost track on the radar during flight. Results indicate that the use of a simple algorithm for the estimation of radar position substantially improved missile accuracy when the radar signal was lost early in the missile's flight.

Aeronautical Engineer
Master of Science in
Aeronautical Engineering
March 1987

Advisor: M.F. Platzer
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Aeronautics and
Astronautics

SURVEY OF THE QH-50 DASH SYSTEM

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B.S., Wayne State University, 1975

The role of RPV's as platforms for tactical reconnaissance is steadily growing in importance, and their development is receiving attention by aerospace industries the world over. This thesis focuses on the superannuated QH-50 DASH system, which has the potential for being refurbished and returned to useful operational serviceability. Of fundamental import to this end is the need to perfect the launch and recovery control system of this aircraft. A survey is done of the system as it exists today, along with an investigation of its control system.

Aeronautical Engineer
Master of Science in
Aeronautical Engineering
June 1987

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

A THEORETICAL EXAMINATION OF A RE-ENTRY CAPSULE INCORPORATING AN AUTOROTATING ROTOR

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B.S., Massachusetts Institute of Technology, 1976
M.S., University of Southern California, 1984

A theoretical analysis was conducted to determine the aerodynamic and performance characteristics of a capsule incorporating an autorotating rotor for recovery from earth orbit. The potential advantages of this combination include the reduction of landing speeds to improve the chances of successful emergency landings on water, uneven terrain, or during inclement weather. Since others have concentrated on the approach and landing phases, the aim herein was to determine the range, deceleration, and heating effects during the entire re-entry. Rotor-to-capsule diameter and rotor deployment time were varied along with type of recovery, i.e., capsule lifting or nonlifting. The addition of a rotor was found to provide a significant increase in lateral range capability while changing maximum deceleration only slightly; however, excessive aerodynamic rotor heating requires either delayed deployment (reducing the performance gains) or substitution/development of structural materials having higher heat resistance than those studied.

Aeronautical Engineer
Master of Science in
Aeronautical Engineering
December 1986

Advisor: D.M. Layton
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Aeronautics and
Astronautics

A PILOTED SIMULATION INVESTIGATING HANDLING QUALITIES AND PERFORMANCE REQUIREMENTS OF A SINGLE-PILOT HELICOPTER IN AIR COMBAT EMPLOYING A HELMET-DRIVEN TURRETED GUN

Jeffrey N. Williams
Captain, United States Army
B.S., United States Military Academy

The development, inplementation, and results of a pilot-in-the-loop fixed-base simulation investigating yaw-axis handling qualities and vehicle maneuverability requirements for the task of single-pilot helicopter air combat at terrain-flight altitudes are presented. Experimental variables included yaw-axis natural frequency and damping. Weapon system type was also varied to include a full- and limited-traverse turret driven by a helmet-mounted sight and a fixed-forward gun. Results indicated that a high yaw natural frequency (ω_n = 1.5-2.0 rad/sec) and high yaw damping ($\zeta \sim 1.4$) were desirable for Level 1 handling qualities. Pilot ratings generally decreased and the effect of the yaw dynamic characteristics became more pronounced as the weapon system became more restrictive. Other analyses discussed are the vehicle maneuver envelope usage, turret envelope usage, tracking performance, and pilot commentary.

Aeronautical Engineer
Master of Science in
Aeronautical Engineering
September 1987

Advisor: D.M. Layton
Department of
Aeronautics and
Astronautics

ELECTRICAL ENGINEER

17/18

DESCRIPTION, ANALYSIS AND SIMULATION OF A NEW REALIZATION OF DIGITAL FILTERS

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M.S., Cairo University, 1976

This research considers a new realization of digital filters suitable for VLSI implementation. The method involves delta modulation which provides analog-to-digital (binary) conversion. The output of a linear system is the convolution of the input and the system impulse response. This new digital filter requires that both the input and the impulse response be first converted to bit streams using delta modulation. These bit streams are then convolved. The result is an analog voltage which approximates the convolution of the analog functions.

Direct convolution of the bit streams is difficult to realize with electrical circuits. A greatly simplified system with equivalent performance is a result of this research. This is called the reduced delta convolution (RDC) system (digital filter). The performance of the RDC system when used as a convolver and as a correlator is analyzed and verified by computer simulation. Analyses of the effects of self noise and external noise are included. Conclusions are that the RDC system has considerable potential as a digital filter when using integrated circuits. Realization requires considerably fewer components and simpler connections than other digital filters. A reason is that there are no multipliers required in the RDC system. The RDC system requires no synchronization, operates in real time and is easily programmed. Further, the RDC system has noise performance which is better than predicted by ordinary filter theory.

Electrical Engineer
Master of Science in
Electrical Engineering
September 1987

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Electrical and Computer
Engineering

HORIZONTAL ESTIMATION AND INFORMATION FUSION IN MULTITARGET MULTISENSOR ENVIRONMENT

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B.S., Military Technical College, Cairo, Egypt, 1968
M.S., Mansoura University, Egypt, 1981

In recent years, there has been a considerable increase in both the variety and number of sensors which needed to be tied together. A new distributed estimation architecture for Distributed Sensors Networks (DSN) is introduced. It is called Horizontal Estimation Architecture (HEA). The term horizontal is used to imply that the geographically dispersed nodes do not differ in rank and are peer-to-peer coupled. Each node is connected by a data link to its neighbors (where possible), thus providing a mesh network topology. The introduced HEA has four major components: the local estimator, the information fusion process (both together are called horizontal estimator), the network access protocol, and the controller-decisionmaker. The HEA techniques are applied to the solution of Multitarget Multisensor Tracking (MMT) problems in Track-While-Scan (TWS) systems with an emphasis towards track fusion. A mathematical framework which encompasses the components of the horizontal estimator is developed, with an emphasis towards the track fusion algorithm. An artificial intelligence approach using expert systems for track fusion has been presented. Through the HEA application its main features and practical usefulness are addressed.

Electrical Engineer
Master of Science in
Electrical Engineering
September 1987

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

A COMPUTER SIMULATION STUDY OF TRIPOD FOLLOW-THE-LEADER GAIT COORDINATION FOR A HEXAPOD WALKING MACHINE

Relle Lewis Lyman, Jr.
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B.S., United States Naval Academy, 1980

A new type of gait and steering algorithm for use by a six-legged walking machine is developed and presented in this study. The spatially oriented tripod follow-the-leader gait is an extension of previous studies of temporal follow-theleader gaits, and should prove useful for all-terrain walking vehicles, such as the Adaptive Suspension Vehicle. Tractor-trailer style steering is introduced as an effort to tailor steering control for this type of gait. Both gait and steering algorithms are implemented on a color graphics computer simulation for study and comparison with other walking algorithms.

Electrical Engineer
Master of Science in
Electrical Engineering
June 1987

Advisor: R.B. McGhee
Department of
Computer Science

FREQUENCY-SAMPLING DESIGN OF TWO-DIMENSIONAL FOR DIGITAL FILTERS WITH NONUNIFORM SAMPLES

William J. Rozwod
Lieutenant, United States Navy
B.S., Rensselaer Polytechnic Institute, 1981

Various approaches to the frequency-sampling design of two-dimensional FIR filters are analyzed. The IDFT approach requiring uniform sampling on a Cartesian grid is first described. A method which allows arbitrary placement of frequency samples but which does not satisfy the Haar condition is presented. Finally, a novel, computationally efficient method which allows nonuniform sampling and which always provides a unique design solution is presented. The new approach is compared with the other methods in terms of design flexibility, computational efficiency, and performance.

Electrical Engineer
Master of Science in
Electrical Engineering
September 1987

Advisor: C.W. Therrien
Department of
Electrical and Computer
Engineering

THE EFFECT OF MULTIPATH ON DIGITAL COMMUNICATIONS SYSTEMS: WITH APPLICATION TO SPACE STATION

William Joseph Toti
Lieutenant, United States Navy
B.S., United States Naval Academy, 1979

Analysis of the effect of multipath propagation on digital communications systems is conducted. A brief overview of the root causes of multipath propagation is included in this discussion. Probabilities of error are then derived for a generalized digital communications system experiencing Rician fading due to multipath propagation. Exact results are obtained for equiprobable M-ary Frequency Shift Keyed and M-ary Phase Shift Keyed modulation schemes used to transmit digital data. Furthermore, the probability of error is obtained for a generalized digital communications system experiencing single-bit Intersymbol Interference due to multipath propagation. Finally, the performance of digital communication links for NASA's Space Station operating in the presence of Intersymbol Interference is evaluated. Results obtained tend to show that severe communication system performance degradation may occur on those links under certain transmitter/receiver and Space Station geometries.

Electrical Engineer
Master of Science in
Electrical Engineering
December 1986

Advisor: D. Bukofzer
Department of
Electrical and Computer
Engineering

TARGET MOTION ANALYSIS USING EXTENDED KALMAN FILTERING TECHNIQUES

Frank Leonard Webb
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B.S., Louisiana Technical University, 1979

The modified polar coordinate formulation of the Extended Kalman Filter is investigated as a means of automated target tracking in the underwater Target Motion Analysis environment. A general purpose target model is also constructed. Target tracking performance in the passive, bearings only case is analyzed in detail. All target tracking simulations were performed on an MC68000 microprocessor based computer. Performance of the tracking filter is satisfactory given reasonable initial conditions and measurement noise.

Electrical Engineer
Master of Science in
Electrical Engineering
December 1986

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

MECHANICAL ENGINEER

25/26

INTERACTION OF A VORTEX PAIR WITH A FREE SURFACE

John Elnitsky, II
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B.S., United States Naval Academy, 1980

The trailing vortices generated by the control planes of submarines give rise to surface signatures in the form of scars and striations .

Two counter-rotating vortices were generated in a novel experimental system and their interaction with the free surface was investigated. In addition, the governing equations have been solved through the use of the boundary-element method for a representative Froude number. The results have been expressed in terms of the depth of submergence of the vortices, their mutual induction velocity, and the initial vortex separation. It has been shown that the free surface begins to deform when the vortices are at a distance of about one initial vortex separation from the free surface. The height of the maximum deformation is attained at a normalized time of about 0.1, when the vortices are at a distance of about 0.5 b_o from the free surface. The elevated part of the surface is bounded by two scars, whose motion is slaved to that of the vortices.

Mechanical Engineer
Master of Science in
Mechanical Engineering
September 1987

Advisor: T. Sarpkaya
Department of
Mechanical Engineering

INVESTIGATION AND DEVELOPMENT OF A MICROCOMPUTER-BASED ROBOTIC CONTROLLER

John Paul Harris
Lieutenant, United States Navy
B.A., University of California, Berkeley, 1978

In the field of robotics, there have been several different methods used to control the rigid multi-linked systems. Because of the degree of non-linearity inherent in the dynamic equations used to describe the motion of high performance robot systems, complex control schemes have been developed which require large mainframe computers.

This thesis shows that for the low performance rate associated with most robotic systems, equivalent linearization techniques provide a valuable modeling tool. Frequency response plots indicate that because of the relatively small velocities and accelerations involved, linearization of the system around set points provides adequate results.

With the increased speed of micro-computers and the simplified linear model, state space, optimal control (Linear Quadratic Regulator-LQR) was successfully demonstrated. The performance index of this optimal controller was based on a combination of the power consumed in making a move and the state errors generated. Different state weighting matrices were used on successive runs to investigate the net effect on power.

Mechanical Engineer
Master of Science in
Mechanical Engineering
June 1987

Advisor: D.L. Smith
Department of
Mechanical Engineering

EXPERIMENTAL INVESTIGATION OF THE EFFECT OF CURVATURE ON HEAT TRANSFER IN A CURVED RECTANGULAR CHANNEL OF HIGH ASPECT RATIO

John R. Hawk, III
Lieutenant, United States Navy
B.S., United States Naval Academy, 1978

An experimental investigation was conducted to study convective heat transfer in straight and curved rectangular channels of high aspect ratio that approximate plates of infinite extent. Experiments were performed at steady state in the turbulent flow regime with one wall held at a constant heat flux and the opposite wall essentially adiabatic. The effect of curvature induced secondary flow on heat transfer on the concave and convex walls was observed by comparing Nusselt numbers for four different configurations at several different Reynolds numbers. Significant heat transfer enhancement was observed on the concave wall. Correlations for Nusselt number as a function of Reynolds number were calculated for the cases studied.

Mechanical Engineer
Master of Science in
Mechanical Engineering
March 1987

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A MULTIBODY DYNAMIC ANALYSIS OF THE N-ROSS SATELLITE ROTATING FLEXIBLE REFLECTOR USING KANE'S METHOD

Natalie F. Heffernan
Lieutenant, United States Navy
B.S., Duke University, 1981

The Navy Remote Ocean Sensing System (N-ROSS) satellite is being developed to supply accurate data on ocean parameters for fleet operations. A Low Frequency Microwave Radiometer (LFMR), a large flexible reflector attached to an angled flexible boom, is a sea surface temperature sensor on this satellite which rotates at 15 RPM. The dynamic interaction between the reflector and the boom, and the effects of the reflector orientation and flexibility on the pointing error of the LFMR during a spin-up procedure are investigated by performing dynamic simulations. Dynamical equations of this flexible multibody system are formulated using Kane's method. Efficient computer simulations were achieved by developing a FORTRAN program and using Dynamic Simulation Language (DSL).

Mechanical Engineer
Master of Science in
Mechanical Engineering
June 1987

Advisors: Y.S. Shin
K.S. Kim
Department of
Mechanical Engineering

EXPERIMENTAL INVESTIGATION OF DAMPING CHARACTERISTICS OF BOLTED STRUCTURAL CONNECTIONS FOR PLATES AND SHELLS

Jonathan C. Iverson
Lieutenant, United States Navy
B.S., University of Miami, 1979

Reducing the contact force in bolted structural connections can reduce system vibration amplitudes by enhancing joint damping capacity. A test model consisting of two concentric circular cylindrical shells and four vanes connected by groups of bolts was tested and analyzed to investigate the relationship between the contact force and the system damping. A viscoelastic material was then introduced between the contacting surfaces and its effects on system damping were again investigated.

Experimental results show that resonant frequencies of modes whose mode shapes provided the most differential motion at the joint connection were shifted down in frequency and the damping increased. This damping increase and frequency shift continued as contact force was reduced until the structural joints moved into the total slip regime where the response becomes nonlinear. The maximum damping and maximum frequency shift were obtained just prior to this total slip.

The greatest increase in damping was achieved with the introduction of viscoelastic material between contact surfaces. This damping material also postponed the transition from microslip to macroslip.

Mechanical Engineer
Master of Science in
Mechanical Engineering
September 1987

Advisor: Y.S. Shin
Department of
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THE EFFECTS OF AN EMBEDDED VORTEX IN A FILM COOLED BOUNDARY LAYER

Stephen Leo Joseph
Lieutenant, United States Navy
B.S., University of Connecticut, 1977

This study was designed to model some of the secondary flow effects on endwalls, blades, and combustion chambers of gas turbine engines. Measurements were make in a turbulent boundary layer developing over a flat plate, using a single row of injection holes spaced three diameters apart inclined at 30 degrees with respect to horizontal. The hole diameter to boundary layer thickness ratio, non-dimensional injection temperatures, and blowing rates were the same as exist in turbine first stages. The injection system was designed to provide uniform injection temperatures for various blowing rates with discharge coefficients ranging from 0.58 to 0.73. The heat transfer surface was designed to provide constant heat flux with adjustable temperature range.

Experimental heat transfer results were obtained with a turbulent boundary layer only, with boundary layer and injection of film cooling, with boundary layer and embedded vortex, and finally with boundary layer, film cooling, and embedded vortex. Results with a turbulent boundary layer only show excellent agreement with correlations accounting for unheated starting length. Results with film cooling only show expected trends, and results with embedded vortex only show excellent agreement with data from the literature. The effects of the vortex on heat transfer in the film cooled boundary layer are significant and important: (1) On the downwash side of the vortex, heat transfer is augmented, effects of the film cooling are negated and local "hot-spots" will exist in engines. (2) Near the upwash side of the vortex coolant is pushed to the side of the vortex, appearing to augment the protection provided by film cooling.

Mechanical Engineer
Master of Science in
Mechanical Engineering
December 1986

Advisor: P. Ligrani
Department of
Mechanical Engineering

DYNAMIC ANALYSIS OF THE FLEXIBLE BOOM IN THE N-ROSS SATELLITE

Choong Soon Kang
Major, Republic of Korea Air Force
B.S., Korean Air Force Academy, 1978

Accurate ocean data is essential for successful fleet operation. The N-ROSS Satellite, which is being developed for this mission, will carry a Low Frequency Microwave Radiometer (LFMR). The LFMR consists of large flexible reflector and boom and spins at 15 r.p.m. The effects of the flexibility of the boom, the spin-up procedure and the structural damping on the pointing error of the LFMR are investigated by performing the dynamic simulation using the Dynamic Simulation Language. Two cases of boom material, Aluminum Alloy and the Graphite/Epoxy composite material, are analyzed and the results are compared. The simulation and analysis results are presented in graphical forms.

Mechanical Engineer
Master of Science in
Mechanical Engineering
March 1987

Advisors: Y.S. Shin
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Mechanical Engineering

AN INVESTIGATION OF THE HOT CORROSION PROTECTIVITY BEHAVIOR OF PLATINUM MODIFIED ALUMINIDE COATINGS ON NICKEL-BASED SUPERALLOYS

Rudolph E. Malush
Lieutenant, United States Navy
B.S., Pennsylvania State University, 1978

The adverse operating environments encountered by marine gas turbine components has necessitated the development of various protective coating systems. Diffusion aluminide coatings have been used successfully for many years to enhance the hot corrosion resistance of turbine blades and vanes. Recently, it has been found that by modifying these standard aluminide coatings with a thin platinum underlay, significant improvements in high temperature corrosion resistance can be achieved. Using a laboratory furnace specifically modified to reproduce hot corrosion attack morphologies, the effects of selected platinum-aluminide coating deposition variables were investigated on two nickel-base superalloy substrates (IN-100 and IN-738).

Mechanical Engineer
Master of Science in
Mechanical Engineering
March 1987

Advisor: D.H. Boone
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STABILITY OF THE VORTEX MOTION IN OSCILLATING FLOW

William T. McCoy
Lieutenant, United States Navy
B.S., Tulane University, 1979

Previous experimental investigations have shown that the characteristics of flow about a circular cylinder immersed in a time-dependent flow exhibit cycle-to-cycle variations. These variations have been attributed to the variations in the spanwise coherence, aspect ratio, nonuniformity of the flow, and random disturbances in the ambient flow. A theoretical investigation was undertaken to examine the stability of the flow characteristics in terms of the initial state of the vortices. An idealized model has been devised and the position of the vortex was varied systematically. The results have shown that finite-precision information about the characteristic of the flow does not lead to finite-precision information at a later stage. In fact, the advection of the vortices can give rise to chaotic behavior in the calculated lift and drag forces and in the velocity field. It is concluded that the *cycle-to-cycle variations are not entirely* due to lack of spanwise coherence and that they are mostly a consequence of the chaotic motion which can result from the advection of the vortices in a time-dependent flow.

Mechanical Engineer
Master of Science in
Mechanical Engineering
December 1986

Advisor: T. Sarpkaya
Department of
Mechanical Engineering

HEAT TRANSFER FROM AN ARRAY OF HEATED RECTANGULAR ELEMENTS ON AN ADIABATIC CHANNEL WALL

David W. Mears
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1975

This thesis describes an experimental study to determine the heat transfer characteristics of rectangular elements mounted on an adiabatic wall in a laminar air flow. The study involves forced convection and the determination of the heat transfer coefficients as influenced by the unheated elements. The study is timely in that major concern is the understanding of removal of the generated heat from electrical equipment and electronic devices which utilize microelectronic chips.

Mechanical Engineer
Master of Science in
Mechanical Engineering
December 1986

Advisor: A.D. Kraus
Department of
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NUMERICAL SIMULATION OF UNSTEADY SEPARATED FLOWS

Samir I.M. Mostafa
Colonel, Egyptian Air Force
B.S., Cairo University, 1970
M.S., Cairo University, 1981

Two unsteady flows dominated by the occurrence of separation are simulated through the use of the discrete vortex model. The first of those is a sinusoidally oscillating flow about a circular cylinder at a Keulegan-Carpenter number of K = 10. The vortex model has been combined with the boundary layer calculations and the positions of the separation and stagnation points, the evolution of the wake, the velocity and pressure distributions, and the instantaneous forces have been calculated and compared, whenever possible, with those obtained experimentally. The model has successfully simulated the occurrence of the transverse half Karman vortex street. The calculated positions of the vortices were found to be in good agreement with those obtained experimentally. The measured and calculated in-line forces and the differential pressure distributions showed reasonably good agreement.

The second simulation dealt with a rapidly decelerating flow about a two-dimensional sharp-edged camber. An extensive study of the velocity field in the vicinity of the singular points led to the development of a novel method for the introduction of vorticity at variable time intervals. The measured and calculated characteristics of the flow, such as the evolution of the wake and the forces acting on the camber, were found to be in excellent agreement. Furthermore, the simulation provided a plausible explanation for the cause of parachute collapse, a phenomenon which gave impetus to the numerical and physical experiments described herein.

Mechanical Engineer
June 1987

Advisor: T. Sarpkaya
Department of
Mechanical Engineering

UNSTEADY FLOW ABOUT CAMBERED PLATES

Paul Daniel Munz
Lieutenant Commander, United States Navy
B.S., Villanova University, 1977

The evolution of a two dimensional, incompressible, rapidly decelerating, time-dependent viscous flow about a sharp-edged camber is simulated through the use of the discrete vortex model. Vorticity is represented by a distribution of discrete point vortices. Each vortex is convected in the velocity field, calculated locally using the Biot-Savart law. The roll-up of the vortex sheets, the distribution of velocity and pressure on the camber, and the drag force are calculated at suitable time intervals for a prescribed time dependent-flow. Experiments are carried out in a vertical water tunnel partly to measure the drag force and partly to record on a video tape the evolution of the wake. The measured and calculated characteristics of the flow, such as the growth of the wake and the forces acting on the camber are found to be in good agreement. Furthermore, the numerical simulation provided a plausible explanation for the cause of parachute collapse, a phenomenon which gave impetus to the numerical and physical experiments described herein. The numerical model developed during the course of the investigation is applicable to any time-dependent flow about two-dimensional cambered plates (circular arcs).

Mechanical Engineer
Master of Science in
Mechanical Engineering
June 1987

Advisor: T. Sarpkaya
Department of
Mechanical Engineering

POOL BOILING OF R-114/OIL MIXTURES FROM SINGLE TUBES AND TUBE BUNDLES

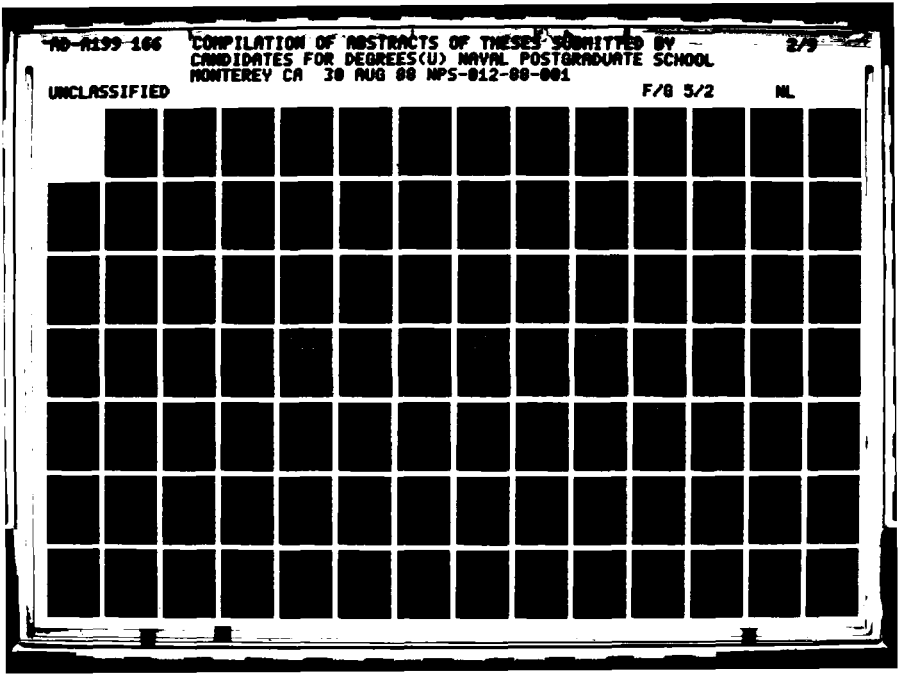
Thomas J. Murphy
Lieutenant Commander, United States Navy
B.S., Northwestern University, 1977

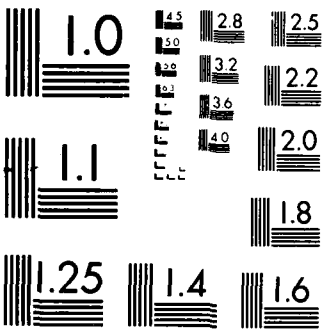
An apparatus was designed, fabricated and operated for the testing of horizontal tube bundles for boiling of R-114 with various concentrations of oil. Preliminary data were taken on the top tube in the bundle, with and without the other tubes in operation. Results showed up to a 37 percent increase in the boiling heat-transfer coefficient as a result of the favorable bundle effect.

In a separate single-tube apparatus, three enhanced tubes were tested at a saturation temperature of 2.2 ^{o}C with oil mass concentrations of 0, 1, 2, 3, 6 and 10 percent. The tubes were: (1) a finned tube with 1024 fins per meter (26 fpi), (2) a finned tube with 1575 fins per meter (40 fpi) and (3) a Turbo-B tube. These tubes resulted in enhancement ratios in pure refrigerant of 2.8, 3.8 and 5.7, respectively, at a practical heat flux of 30 kW/m^2. With 3 percent oil, these ratios were decreased to 2.6, 3.5 and 5, while with 10 percent oil, these ratios were further reduced to 2.6, 3.2 and 4.7, respectively. Based on these results, the use of Turbo-B tubes is expected to result in significant savings in weight and size of evaporators over the finned tubes presently in use on board some naval vessels.

Mechanical Engineer
Master of Science in
Mechanical Engineering
September 1987

Approved: [illegible]
Professor of
Mechanical Engineering


AD-A199 166
COMPILATION OF ABSTRACTS OF THESES SUBMITTED BY
CANDIDATES FOR DEGREES(U) NAVAL POSTGRADUATE SCHOOL
MONTEREY CA 30 AUG 88 NPS-012-88-001
2/9
UNCLASSIFIED
F/G 5/2
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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

NUMERICAL FIELD MODEL SIMULATION OF FULL SCALE FIRE TESTS IN A CLOSED VESSEL

Gerald F. Nies
Lieutenant, United States Navy
B.S., United States Naval Academy, 1980

A numerical finite difference field model was developed to simulate full scale fires in closed vessels. In particular the model was developed to simulate tests in the Fire 1 Test Facility at the Naval Research Laboratory in Washington, D.C. As a first step a rectangular 3-dimensional geometry was used to approximate the actual geometry in the computer model. Then a model with the actual spherical/cylindrical geometry was developed. The computer code produced pressure, temperature, density, and velocity fields from given heat input data for the fires. The most important feature of the model was that it accounts for the pressure buildup due to the fire in a pressure vessel such as Fire 1 or any other closed vessel such as a submarine. Other features include surface radiation exchange and heat losses through the wall. Model results were validated with experimental data from Fire 1. The envisioned use of the model is in simulating fires in Fire 1 and eventually in submarines.

Mechanical Engineer
Master of Science in
Mechanical Engineering
December 1986

Advisors: K.T. Yang
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THE THERMAL BEHAVIOR OF FILM COOLED TURBULENT BOUNDARY LAYERS AS AFFECTED BY LONGITUDINAL VORTICES

Alfredo Ortiz
Lieutenant, Colombian Navy
B.S., Escuela Naval "Almirante Padilla", 1983

Heat transfer effects of longitudinal vortices embedded within film cooled turbulent boundary layers on a flat plate were examined for freestream velocities of 10 m/s and 15 m/s for blowing ratios ranging from 0.47 to 1.26. Moderate strength vortices were employed having circulation to free stream velocity ratios of about 1.6 cm. Spatially resolved heat transfer measurements from a constant heat flux surface and mean temperature distributions in spanwise planes show that local heat transfer is significantly affected by spanwise vortex position, and blowing ratio. Of particular significance are boundary layer and vortex structural changes which occur at high blowing ratios.

Mechanical Engineer
Master of Science in
Mechanical Engineering
September 1987

Advisor: P. Ligrani
Department of
Mechanical Engineering

INVESTIGATION BY DIFFERENTIAL SCANNING CALORIMETRY OF MICROSTRUCTURE IN A SUPERPLASTIC AL-MG-ZR ALLOY

Donald L. Stewart, II
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1977

The three significant variables identified in thermo-mechanical processing of an Al-10Mg-0.1Zr alloy to obtain superplastic ductilities are reduction per pass, reheating time between passes, and total strain during warm rolling at 573K. The effect of adjusting these variables on elevated temperature mechanical properties has been evaluated and the microstructures characterized using transmission electron microscopy. Comparison of the differential scanning calorimetry results with mechanical property and microstructural data reveal that the endothermic energy absorbed by the material, which is related to microstructural stability, can be correlated with superplastic behavior.

Mechanical Engineer
Master of Science in
Mechanical Engineering
June 1987

Advisor: T.R. McNelley
Department of
Mechanical Engineering

SURFACE COMBATANT CALM WATER MANEUVERING PREDICTIONS IN FOUR DEGREES OF FREEDOM

David Diggs Norwood Vann
Lieutenant, United States Navy
B.S., United States Naval Academy, 1979

The equations of motion for a ship in four degrees of freedom were formed into a linear state-space representation and programmed using the IBM Digital Simulation Language. The simulation program allows for inclusion of nonlinear hydrodynamic coefficients. A method for predicting the required coefficients was developed and programmed for a baseline surface combatant. The resulting coefficients and simulated maneuvering output were compared to experimentally obtained coefficients and actual sea trial results for initial verification. A second test was conducted on a ship for which experimentally obtained coefficients were not available. Favorable agreement was found between the predicted ship motion and sea trial data.

Mechanical Engineer
Master of Science in
Mechanical Engineering
March 1987

Advisor: R.H. Nunn
Department of
Mechanical Engineering

CONDENSATION HEAT-TRANSFER MEASUREMENTS OF REFRIGERANTS ON EXTERNALLY ENHANCED TUBES

David Stephen Zebrowski
Lieutenant Commander, United States Navy
B.S.N.E., Purdue University, 1976

An apparatus was designed and fabricated for testing of a horizontal bundle of five tubes in a vertical row with R-114 as the working fluid.

Twenty-four tubes with rectangular-section fins and a smooth tube were tested in a single-tube apparatus using R-113 as the working fluid. An enhancement ratio (based on constant vapro-side temperature drop) of about 7.0 was obtained for the best-performing tube.

Among the tubes tested, the optimum fin spacing was found to be between 0.25 mm to 0.5 mm. The optimum fin thickness for tubes with a 1.0 mm fin height was found to be 0.5 mm. The vapor-side enhancement ratio increased with increasing fin height. However, the rate of increase in the vapor-side enhancement was found to be smaller with increasing fin height compared to the rate of area increase.

The indirect measurement of the local condensing heat-transfer coefficient around a finned tube showed a local value at the top of each of the two tubes tested that is approximately twice the average value for the entire tube.

Mechanical Engineer
Master of Science in
Mechanical Engineering
June 1987

Advisor: P.J. Marto
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Mechanical Engineering

MASTER OF SCIENCE

IN

AERONAUTICAL ENGINEERING

45/46

THE IMPLEMENTATION AND MODIFICATION OF BLUEMAX II: A FLIGHT PATH GENERATOR FOR USE AT THE NAVAL POSTGRADUATE SCHOOL

Robert William Baker
Lieutenant, United States Navy
B.S., University of Washington, 1979

BLUEMAX II is an aircraft flight path generator that has been accepted as a standard in the aircraft combat survivability assessment community. In this thesis, the program was converted from a CDC generated VAX format to the IBM 3033 FORTRAN IV. It was then incorporated with the existing graphics and output subroutines available in the flight path generator GRPIP. In an effort to make BLUEMAX II more user-friendly, several new subroutines and many modifications to the existing program were accomplished. In particular, the capability to restart at any intermediate point in a current flight path or to load an external file and resume constructing the flight path was added.

Master of Science in
Aeronautical Engineering
December 1986

Advisor: R.E. Ball
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Aeronautics and
Astronautics

A METHOD FOR DEVELOPING NATOPS PERFORMANCE SOFTWARE FOR THE SH-60B HELICOPTER

Garry M. Basilone
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1974

This thesis proposes a method of providing NATOPS aircraft performance criteria to the aircrew of SH-60B Helicopters through the use of interactive software for the hand-held SHARP PC-1500A Pocket Computer. Data from selected NATOPS performance charts is reduced to fourth order polynomials and developed into software for the PC-1500A. With the pocket computer, aircrew are able to expeditiously and with reduced risk of error, have on-line access to numerous NATOPS parameters.

Master of Science in
Aeronautical Engineering
June 1987

Advisor: D.M. Layton
Department of
Aeronautics and
Astronautics

A SIMULATION INVESTIGATION OF SCOUT/ATTACK HELICOPTER DIRECTIONAL CONTROL REQUIREMENTS FOR HOVER AND LOW-SPEED TASKS

Courtland C. Bivens
Aeroflightdynamics Directorate,
U.S. Army Aviation Research and Technology Activity,
Ames Research Center
B.S., United States Military Academy, 1973

A piloted simulator experiment was conducted to investigate directional axis handling qualities requirements for low-speed ($\leq$40 knots) and hover tasks performed by a Scout/Attack (SCAT) helicopter. Included in the investigation were the directional characteristics of various candidate light helicopter family configurations. Also, the experiment focused on conventional single main/tail rotor configurations of the OH-58 series aircraft, where the first-order yaw-axis dynamic effects that contributed to the loss of tail rotor control were modeled. Two types of yaw stability and control augmentation systems were implemented: one consisting of washed-out yaw rate feedback and shaped control input, the other a way rate command, heading-hold system. Five pilots flew 22 configurations under various wind conditions. Cooper-Harper handling quality ratings were used as the primary measure of merit of each configuration. Piloting performance measures were used as backup information only since it was observed during the experiment that each pilot displayed a remarkable ability to compensate for degraded handling qualities. The results of the experiment indicate that rotorcraft configurations with high-directional gust sensitivity require greater minimum yaw damping to maintain satisfactory handling qualities during Nap-of-the-Earth (NOE) flying tasks. It was also determined that both yaw damping and control response are critical handling qualities parameters in performing the air-to-air target acquisition and tracking task. The lack of substantial yaw damping and larger values of gust sensitivity increased the possibility of loss of directional control at low airspeeds for the single main tail rotor configurations. Task performance measures do have a predictive validity with reference to task success but such measures cannot be used as a substitute for pilot ratings in evaluating

vehicle handling qualities. The pilot tends to accommodate his output to a wide range of variations in control parameters without permitting degradation of vehicle performance. This accommodation is accomplished by a shift of effort and attention to the control task.

Master of Science in
Aeronautical Engineering
March 1987

Advisor: D.M. Layton
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VISUALIZATION OF THE FLOW FIELD AROUND A GENETIC DESTROYER MODEL IN A SIMULATED TURBULENT ATMOSPHERIC BOUNDARY LAYER

William Kelly Bolinger
Lieutenant Commander, United States Navy
B.S., University of Colorado, 1974
M.B.A., Chapman College, 1980

An experimental flow visualization study was performed on a rectangular block and other elements that could be assembled in the form of a generic destroyer ship model in the Low Speed Flow Visualization Facility at the Naval Postgraduate School, Monterey, California. The purpose of the study was to visually analyze the flow field around the model in a simulated open ocean atmospheric boundary layer. To ensure correct simulation of the atmospheric boundary layer, both velocity profile and longitudinal turbulence intensities were matched.

For the actual flow visualization studies, two techniques were used. During the on-body portion of the study, the ultraviolet lighting/fluorescent minituft technique was used. For the off-body portion, a helium bubble system with a neutral density centrifuge was utilized.

Both techniques produced excellent photographic results and allowed for direct comparison of the flow field using the two flow visualization techniques.

Master of Science in
Aeronautical Engineering
June 1987

Advisor: J.V. Healey
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Aeronautics and
Astronautics

TRANSONIC COMPRESSOR BLADE TIP FLOW VISUALIZATION ON A WATER TABLE

Alan K. Byrd
Lieutenant, United States Navy
B.S., Clemson University, 1979

The shock structure at the tip of a transonic compressor rotor was investigated on a water table. A four bladed cascade model was used and the wave pattern was examined at variable incidence, flow turning angles and back-pressures. Froude numbers, (equivalent to Mach numbers in the analogous two dimensional gas flow), in the range 1.6 to 1.74 resulted in an oblique shock between the blade passages starting from the leading edge pressure side of the blading. Qualitative agreement of the shock structure with earlier tests using the same blading in a transonic blow-down tunnel was observed, leading to the conclusion that the shock present in the compressor would be oblique and not normal as was previously assumed.

Master of Science in
Aeronautical Engineering
December 1986

Advisor: R.P. Shreeve
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MICROCOMPUTER SOFTWARE SUPPORT FOR CLASSES IN AIRCRAFT CONCEPTUAL DESIGN

Michael Lee Cramer
Lieutenant Commander, United States Navy
B.B.A., University of Notre Dame, 1975

The conceptual phase of aircraft design determines the general size and configuration of an aircraft. Many calculations are performed in assessing the optimum parameters. The calculations are often lengthy and iterative in nature and are thus highly appropriate for computer programming.

This thesis develops a computer program to enhance learning about design by performing calculations for aircraft conceptual design which follow hand calculation methods. It is intended to be used in the aircraft design course taught by the Department of Aeronautics at the Naval Postgraduate School, Monterey, California.

Master of Science in
Aeronautical Engineering
March 1987

Advisor: G.H. Lindsey
Department of
Aeronautics and
Astronautics

OPTIMIZING HF ANTENNA SYSTEMS ON THE DOLPHIN AND SEA HAWK HELICOPTERS

James B. Crawford
Lieutenant Commander, United States Coast Guard
B.S., United States Coast Guard Academy, 1974

Making an aircraft available and modifying it to test various antenna systems and configurations is extremely costly. The computer model is an excellent alternative means of analyzing antenna systems for optimum communication system performance. In this study electromagnetic "wire grid" computer models of two helicopters and eight HF antenna configurations are developed using Interactive Graphics Utility for Automated NEC Analysis (IGUANA). Numerical Electromagnetics Code (NEC) is used to obtain radiation patterns, and the Advanced Prophet program is used to develop the criteria for judging system effectiveness. These computer results compare favorably with test range data, showing great savings of cost. They provide the additional advantage of showing radiation patterns at an elevated angle for skywave propagation analysis (patterns which cannot be obtained on an antenna test range).

Master of Science in
Aeronautical Engineering
September 1987

Advisor: R.W. Adler
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Electrical and Computer
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AN AERODYNAMIC PERFORMANCE EVALUATION OF THE NASA/AMES RESEARCH CENTER ADVANCED CONCEPTS FLIGHT SIMULATOR

Paul F. Donohue
Major, United States Marine Corps
B.S., United States Naval Academy, 1972
M.B.A., Texas A&I University, 1981

The results of an aerodynamic performance evaluation of the National Aeronautics and Space Administration (NASA)/Ames Research Center Advanced Concepts Flight Simulator (ACFS), conducted in association with the Navy-NASA Joint Institute of Aeronautics, are presented. The ACFS is a full-mission flight simulator which provides an excellent platform for the critical evaluation of emerging flight systems and aircrew performance. The propulsion and flight dynamics models were evaluated using classical flight test techniques. The aerodynamic performance model of the ACFS was found to realistically represent that of current day, medium range transport aircraft. Recommendations are provided to enhance the capabilities of the ACFS to a level forecast for 1995 transport aircraft. The graphical and tabular results of this study will establish a performance section of the ACFS Operation's Manual.

Master of Science in
Aeronautical Engineering
June 1987

Advisor: C.A. Heard
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Aeronautics and
Astronautics

FLOW FIELD MEASUREMENTS USING HOTWIRE ANEMOMETRY

Gregory John Doremus
Lieutenant, United States Navy
B.S., State University of New York, Stony Brook, 1980

A computer controlled data acquisition system utilizing hotwire anemometry has been designed, built, and installed in the Naval Postgraduate School Low Speed Wind Tunnel Facility. All relevant wind tunnel data is obtained by the use of a computer guided Hewlett Packard data acquisition system and a Para-Scientific Pressure Computer. Two computer programs were written to coordinate hotwire system calibration with hotwire experimentation. An experiment, Wake Velocity Profile Analysis and Drag Coefficient Measurement of an Airfoil, was used as a vehicle to test the system. The final output of the data acquisition system, including graphical information, compared favorably with previous results from an older data acquisition system already in use. Drag coefficient output compared very favorably to data supplied by the National Advisory Committee on Aeronautics.

Master of Science in
Aeronautical Engineering
September 1987

Advisor: S. Bodapati
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Aeronautics and
Astronautics

A HOLOGRAPHIC INVESTIGATION OF PARTICULATES IN METALLIZED SOLID FUEL RAMJET COMBUSTION

Crawford A. Easterling
Lieutenant, United States Navy
B.S., United States Naval Academy

An investigation was conducted pursuant to the development of a holographic technique to be used in the study of particulates in metallized solid fuel ramjet combustion. Additionally, a technique for generating a time-space dependent temperature profile of a two-dimensional solid fuel ramjet fuel slab, was developed. A holocamera was designed and constructed for use with a two-dimensional solid fuel ramjet. Eleven micron resolution was obtained using diffuse illumination. Initial attempts to obtain holograms of metallized fuel combustion were unsuccessful. The fuels tested either would not sustain, or, produced copious amounts of smoke which precluded a sufficiently intense scene beam from reaching the holographic plate. Use of .005 inch diameter, Chromel-Alumel thermocouples, imbedded at measured depths in the fuel slab, provided subsurface temperature data as a function of time and location until exposed to free stream conditions.

Master of Science in
Aeronuatical Engineering
September 1987

Advisor: D.W. Netzer
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Aeronautics and
Astronautics

MEASUREMENTS OF GAS TURBINE COMBUSTOR AND ENGINE AUGMENTOR TUBE SOOTING CHARACTERISTICS

Thomas A. Grafton, III
Commander, United States Navy
B.S., Southern Illinois University, 1971

A methodical investigation was conducted to examine soot particle sizing techniques and data acquisition apparatus so as to better understand soot particle properties in and immediately aft of a typical gas turbine combustor. Three wavelength light transmittance and multiple angle forward light scattering particle sizing techniques were used. The original objectives of this thesis were (1) to modify the existing hardware to better simulate the flow behavior in an actual engine, (2) to obtain accurate particle sizing using a combination of transmittance and scattering measurements within the T-63 combustor, (3) to explore the effects that augmentor tube flow rate has on particle agglomeration and mass concentration, and (4) to re-examine the effects that varied fuel-air ratios have on the exhaust particle mean diameter. Mean particle sizes were found to be between .77 microns and .80 microns at the exit of the augmentor tube.

Master of Science in
Aeronautical Engineering
September 1987

Advisor: D.W. Netzer
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Astronautics

EXPERIMENTAL DESIGN OF A PILOTED HELICOPTER OFF-AXIS-TRACKING SIMULATION USING A HELMET MOUNTED DISPLAY

Gerald J. Hopkins
Captain, United States Army
B.S., United States Military Academy, 1980

The development of target tracking weaponry on the Army's Advanced Attach Helicopter (AAH) allows directional tracking with FLIR imagery at large angles from the longitudinal axis. A flight simulation using a helmet mounted display was conducted to quantify head tracking performance and to identify off-axis tracking limits for the aircraft's Pilot Night Vision Sensor. The experimental parameters included varying flight trajectories (hover, rectilinear, and curvilinear paths) and the target velocities and ranges. This paper details the design efforts in creating tracking scenarios in the simulator and the head tracking algorithms used to generate command profiles for perfect line of sight tracking performance. Confidence in the algorithms for tracking data calculations was essential to experimental conclusions on human tracking behavior and performance. The successful attempt to replicate the night vision system of the AAH is also discussed.

Master of Science in
Aeronautical Engineering
September 1987

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MATHEMATICAL MODELS FOR THE S.D.I.

Yoram Ilan-Lipowsky
Lieutenant Colonel, Israeli Air Force
B.S., Technion Israel, 1969

SDI technologies may affect the concepts of weapons systems and reshape the battlefields of the future. In this research a few of the SDI systems are analyzed and modeled mathematically. The different models were gathered in a software package that may be run on a personal computer. The intention is to produce a handy tool for preliminary studies and designs.

The following topics are covered: aerodynamic design of hypervelocity projectiles, flight simulation of hypervelocity projectiles, railgun simulation, ground track of orbits, guidance and homing.

A few case studies are analyzed to suggest and demonstrate potential use of these models.

Master of Science in
Aeronautical Engineering
June 1987

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M.F. Platzer
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FURTHER DEVELOPMENT OF A ONE-DIMENSIONAL UNSTEADY EULER CODE FOR WAVE ROTOR APPLICATIONS

David T. Johnston
Lieutenant, United States Navy
B.S., Cornell University, 1979

The EULER1 Fortran program for computing one-dimensional unsteady flow based on the QAZ1D method of Verhoff was extended to provide tracking and correcting of discontinuities, flow to right or left and open and closed end boundary conditions. The program was run on four shock tube test cases to verify accuracy and range of capability of the revised E1DV2 code. Further extensions and test verifications are recommended so that the code is suitable for wave rotor applications.

Master of Science in
Aeronautical Engineering
March 1987

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PARTICLE SIZING IN A SOLID PROPELLANT ROCKET MOTOR USING A LIGHT SCATTERING TECHNIQUE

Michael G. Keith
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1972
M.S., University of West Florida, 1974

Research was conducted to determine particle sizes across the nozzle of a small solid propellant rocket motor. Particle size was determined using light scattering techniques. The present optical components limit the lower measurable particle size to approximately three microns. During the investigation, spurious light was detected in the motor optical path. It was determined that transient pressure gradients in the motor during pressure rise resulted in deflection of the laser beam. Neutral burning propellant grains were shown to eliminate most of the observed difficulty. The use of a ring array in place of the linear array in the motor cavity measurement system is suggested for system improvement.

Master of Science in
Aeronautical Engineering
December 1986

Advisor: D.W. Netzer
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PROTOTYPE PARTICLE SIZE ANALYZER INCORPORATING VARIABLE FOCAL LENGTH OPTICS

Ludwig August Kern
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1974

A prototype particle size analyzer incorporating an innovative variable focal length optical system has been constructed. The device greatly minimizes some particle sizing errors inherent in current analyzers. It also has the advantage of being capable of measuring a wide range of particle diameters inexpensively and accurately.

An existing five lens optical train was modified to allow each lens to be adjusted in three planes and then mounted on a rigid twin rail base to alleviate alignment problems. A precision linear positioning motor was installed to drive a zoom lens that adjusts the system focal length from 1850mm to 5550mm. A photosensor section that measures the intensities of forward scattered light at two different angles was built and evaluated. An analog computer interface has been built into the system to provide the device with automatic and manual control.

During normal automatic operation the computer drives the zoom lens until an optimum intensity ratio is sensed. The system focal length is then determined which yields the corresponding particle size. Successful operation during initial testing has been achieved. Future refinements are suggested.

Master of Science in
Aeronautical Engineering
March 1987

Advisor: O. Biblarz
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Astronautics

ON ANALYSIS OF VISCOELASTIC STRUCTURE

Ju-Eon Kim
Captain, Republic of Korea Air Force
B.S., Korea Air Force Academy, Seoul, 1980
B.S., Seoul University, 1983

This study is to understand the effects of nonlinear behavior of structures using a finite element method.

The nonlinear behavior equations are derived from equations of motion and constitutive equations. The basic theory is the principle of virtual work.

The thesis begins with a comprehensive formulation of continuum-based finite element theory. The theoretical portion concludes with the details of both spatial and temporal discretization, including a discussion of nonlinearity.

In particular, large displacement problems and viscoelastic problems remain challenging engineering problems today. The viscoelastic problems depend on the relaxation function which is the source of material nonlinearities.

Master of Science in
Aeronautical Engineering
September 1987

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AIRCRAFT SURVIVABILITY: VULNERABILITY TO DIRECTED HIGH ENERGY WEAPONS

James Todd Knight
Lieutenant Commander, United States Navy
B.B.A., Sam Houston State University, 1974

The intent of this work is to introduce the aircraft designer, and those concerned with aircraft combat survivability, to the concepts and impact of the directed high energy weapons threat (laser, particle beam, high power microwave, and electromagnetic pulse). The impact of these weapons on the survivability of the individual aircraft components and the aircraft is discussed, and vulnerability reduction techniques for the four weapons are presented.

Master of Science in
Aeronautical Engineering
December 1986

Advisor: R.E. Ball
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Astronautics

REQUIREMENTS FOR AN INTERACTIVE COMPUTER PROGRAM FOR EVALUATING THE SURVIVABILITY OF HELICOPTER CONCEPTUAL DESIGNS (HISAP)

Steven Richard Laabs
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1975

This thesis provides the framework, logic skeleton and data requirements for the development of an interactive computer program for evaluating the survivability of a conceptual helicopter design. Generic models of helicopter designs, missions, and threat systems are also discussed. However, no attempt is made to program any of the results or develop the necessary data bases or mathematical models. Instead, it is limited to a conceptual investigation.

The Vought Interactive Survivability Assessment Program (VISAP) is used extensively as an example throughout this report. VISAP was developed at the Naval Postgraduate School as an interactive teaching tool to introduce students to the survivability decisions and design tradeoffs that confront the designers of conceptual fixed-wing aircraft.

Because of the similarities between these two applications, the proposed program is referred to as HISAP, or "Helicopter Interactive Survivability Assessement Program."

Master of Science in
Aeronautical Engineering
December 1986

Advisor: R.E. Ball
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Astronautics

STUDY OF ELECTROSTATIC MODULATION OF FUEL SPRAYS TO ENHANCE COMBUSTION PERFORMANCE IN AN AVIATION GAS TURBINE

Walter William Manning
Commander, United States Navy
B.S., United States Naval Academy, 1972

The influence of electrostatic and electrohydrodynamic charging on hydrocarbon fuel spray patterns and droplet atomization is investigated. Research was performed in a combustion environment with an Allison T-56 combustor liner and an unmodified pressure-jet atomizer fuel nozzle. High-voltage probes and a variable-geometry probe insertion device were developed to assess the effectiveness of probe type and location on fuel spray modification and modulation. Exhaust gas temperatures and temperature profiles were measured to determine changes in the combustor's thermal profile and combustion efficiency. JP-4, JET-A and Number-2 Diesel fuels were tested to analyze electrically-assisted atomization effectiveness relative to off-design fuel performance. Net temperature increases were recorded for all fuels, yielding combustion efficiency improvements of 1.18, 1.10 and 0.68 percent for DF-2, JET-A and JP-4 respectively. Observations indicate electrical charging effectiveness, in terms of thermal power output per unit of electrical power input, increases in the order of JP-4, JET-A and DF-2, suggesting a direct correlation with the surface tension of the fuels.

Master of Science in
Aeronautical Engineering
June 1987

Advisor: O. Biblarz
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Astronautics

THE USE OF A COMPUTER TO OBTAIN FLIGHT MANUAL DATA

Chang Whan Oh
Major, Republic of Korea Air Force
B.S., Korean Air Force Academy, Seoul, 1977

The one thing among many that must be prepared for every flight is the making of a flight plan. Pilots must use charts or graphs from the flight manual to compute the fuel flow that is essential to a flight plan. Since this requires many steps of interpolation to compute the specific conditions that cannot be read directly from a flight manual, it is time-consuming and increases the probability of making a mistake. This problem obstructs the execution of various mission changes and continuous sorties.

A computer program for a personal computer or a hand-held calculator is developed to compute the desired fuel flow by modifying the equations for an "IDEAL" airplane.

Master of Science in
Aeronautical Engineering
December 1986

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APPLICATION OF THE VISCOUS-INVISCID INTERACTION METHOD TO THE ANALYSIS OF AIRFOIL FLOWS AT LOW REYNOLDS NUMBERS

Seung Woock Paik
Captain, Republic of Korea Air Force
B.S., Korean Air Force Academy, Seoul, 1981

The purpose of this thesis is to show the capability of strong viscous/inviscid interaction methods to predict airfoil flows at low Reynolds numbers. Cebeci's interactive program was applied to the Wormann-Althaus FX 63-137 airfoil and the results were compared with the available experimental data. It was found that the boundary layer transition model has an important influence on the predictive capability of viscous/inviscid interaction methods.

Master of Science in
Aeronautical Engineering
December 1986

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COMPOSITE SERVICE LIFE PREDICTION VIA FIBER BUNDLE TESTING-EVALUATION OF TESTING EQUIPMENT AND DATA ACQUISITION SYSTEM

Dimitrios M. Petridis
Major, Hellenic Air Force
B.S., Hellenic Air Force Academy, 1974
B.S., University of Patras, Greece, 1982

The objective of this thesis is to investigate the problem of the safe service life prediction of graphite composite structures such as pressure vessels used in the pilot ejection seats, rocket motor cases and space shuttle energy storage compartments.

The basic data required for life prediction is the stress rupture life, i.e., the composite life under constant load and it has to be recognized that extensive testing over long periods of time is required to produce statistically meaningful data. The contribution of this investigation is focused on identifying the characterization methodology for efficient data generation (to minimize cost and time), the appropriate theoretical models for correlation of the data (to translate data to applications), and in evaluating the limitations of the available testing (lower bound response speed) and data acquisition equipment (upper bound recording rate), thereby enhancing future experimental planning and testing.

Master of Science in
Aeronautical Engineering
December 1986

Advisor: E.M. Wu
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A HEAT TRANSFER MODEL FOR A HEATED HELIUM AIRSHIP

Ray Maurice Rapert
Captain, United States Marine Corps
B.S., University of Arkansas, 1976

Basic heat transfer empirical and analytic equations are applied to a double envelope airship concept which uses heated Helium in the inner envelope to augment and/or control gross lift. The convective and conductive terms lead to a linear system of five equations for the concept airship, with the nonlinear radiation terms included by an iteritive solution process.

A FORTRAN program is used to perform the tedious calculations, and graphed results are obtained for the variables of interest. These indicate that a simple use of airship engine exhaust heat will give more than a 30% increase in gross airship lift. Possibly more than a 100% increase can be achieved if a "steam injection" heating system, with associated design problems, is used.

Master of Science in
Aeronautical Engineering
March 1987

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Astronautics

INVESTIGATION OF DYNAMIC STALL USING LDV: MEAN FLOW STUDIES

Richard Randolph Ryles
Major, United States Army
B.S., United States Military Academy, 1976

This thesis lays the foundation for the dynamic stall investigation being conducted at the Fluid Mechanics Laboratory at NASA-Ames Research Center. Using existing optical and electrical equipment, a new dedicated Micro-VAX computer and Labstar software, an indraft transonic wind tunnel and able technicians to make the proper interface hardware, the project came together in a new test facility at the Fluid Mechanics Laboratory. The goal of this thesis is to obtain both qualitative and quantitative information about the wake profiles of an airfoil in steady state operations at varying angles of attack and tunnel conditions. To accomplish this task, schlieren photography was used to obtain a qualitative picture of the flow field. With this information, a two component Laser Doppler Velocimeter was set up to accurately measure the velocity profiles that corresponds to the schlieren photographs. Once this preliminary work is completed, the same apparatus will be used to further investigate the unsteady dynamic stall phenomenon.

Master of Science in
Aeronautical Engineering
September 1987

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MEASUREMENT OF THE AERODYNAMIC FORCES GENERATED BY FLIGHT CREW HELMETS IN SUPERCRITICAL SUBSONIC FLOW

Timothy A. Sestak
Lieutenant Commander, United States Navy
B.A., University of Nebraska, Omaha, 1973

A general survey is made of the aerodynamic forces generated by aircrew flight helmets in subsonic, supercritical flow. The helmets tested were the Navy HGU-33/P and the Air Force HGU-53/P presently used by aircrews flying ejection seat aircraft in the U.S. military and a prototype helmet of significantly different shape and volume. The investigation measures the general magnitude and direction of forces generated by the helmets through a range of pitch and yaw angles. The study presents evidence that simple modifications to existing systems can significantly reduce and redirect the forces on aircrew helmets. It also demonstrates that helmet external geometry is a field of potentially significant improvement in aircrew survivability and that proper design of future helmets could contribute to the increased safety and survivability of aircrews in the ejection environment.

Master of Science in
Aeronautical Engineering
March 1987

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ICING ON THE LONGWIRE TRAILING ANTENNA

Stanley Haven Shoun
Lieutenant, United States Navy
B.S., East Tennessee State University, 1980

Concerns have been expressed about TACAMO's ability to deploy the long-wire-trailing-antenna in potential icing conditions. In light of TACAMO's strategic mission, such operations may be required, especially during the winter months. Standard operating practice, based on early operational experience with the antenna system, had been to cancel operations if there was visible moisture (i.e., clouds). In an effort to aid in the solutions to this problem, this paper encompasses two areas: First, it develops a theoretical description and modeling of ice accumulation on a .16 inch diameter wire, up to 20,000 ft. in length, deployed from a slow moving aircraft (EC-130). The objectives were to provide predictions on tension and ice build up for various weather conditions. The second objective of the paper is to make recommendations (i.e., operations, equipment, etc.) on the prevention of icing, as well as a survey of de-icing techniques.

Master of Science in
Aeronautical Engineering
March 1987

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VISCOUS/INVISCID INTERACTION ANALYSIS OF THE AERODYNAMIC PERFORMANCE OF THE NACA 65-213 AIRFOIL

Phutut H. Subroto
Captain, Indonesian Air Force
B.S., Indonesian Air Force Academy, 1975

Cebeci's viscous/inviscid interaction program was applied to the analysis of steady two dimensional incompressible flow past a NACA 65-213 airfoil at zero angle of attack at a Reynolds number of 240,000. Predicted boundary layer characteristics were found to be quite sensitive to the choice of boundary layer transition begin and length. Good agreement with the experimental results of Hoheisel et al could be obtained by proper choice of both transition begin and length.

Master of Science in
Aeronautical Engineering
March 1987

Advisor: M.F. Platzer
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COMPUTER AIDED DEFLECTION MEASUREMENT OF AN AIRCRAFT WING

Joseph Woods Sweeney, III
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1975

The purpose of this study is to update the existing P-2V Wing Torsion/Bending Structural Test to include computer-aided data acquisition and analysis. The system includes 20 displacement transducers, associated wiring and support framework, a dual DC voltage power supply, two Labmaster data acquisition expansion boards, an AT-compatible computer with 80286 processor and 80287 math co-processor, and ASYST software to perform all data processing.

This study produced a computer package capable of significantly enhancing the utility of the basic wing torsion/bending experiment through real-time data acquisition and analysis. Manual data acquisition required approximately ten minutes per static load, with additional time for data plotting and analysis. Computerized measurements are conducted in several seconds, and the data is automatically plotted on a dot-matrix printer. This improved system allows for expansion of the experiment to include testing a larger variety of static loading problems and the basic instrumentation to explore the wing's response to dynamic loading.

Master of Science in
Aeronautical Engineering
September 1987

Advisor: E.M. Wu
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THE DEVELOPMENT OF A COMPUTER CODE (U2DIIF) FOR THE NUMERICAL SOLUTION OF UNSTEADY, INVISCID AND INCOMPRESSIBLE FLOW OVER AN AIRFOIL

Ngai-Huat Teng
Ministry of Defense, Republic of Singapore
B.A., University of Oxford, United Kingdom, 1978

A numerical technique is formulated, in a computer program U2DIIF, for the solution of flow over an airfoil executing an arbitrary unsteady motion in an inviscid and incompressible medium. The technique extends the well known Panel Methods for steady flow into solving a non-linear unsteady flow problem arising from the continuous vortex shedding into the trailing wake due to the unsteady motion of the airfoil. Numerous case-runs are presented to verify U2DIIF computer code against other theoretical and/or numerical methods as well as in cases where limited experimental data are obtainable in literatures. These case-runs include airfoils undergoing a step change or a modified ramp change of angle-of-attack, airfoils executing harmonic oscillation in pitching and plunging motions, and airfoils penetrating a sharp edge gust.

Master of Science in
Aeronautical Engineering
June 1987

Advisor: M.F. Platzer
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A CASE STUDY OF A COMBAT HELICOPTER'S SINGLE HIT VULNERABILITY

James William Trueblood
Lieutenant, United States Navy
B.S.S.E., United States Naval Academy, 1980

This thesis presents the methodology for a detailed vulnerability assessment of a generic helicopter in the conceptual/preliminary design stage. The intent of this thesis is to provide a workable and understandable example of a vulnerability assessment. Towards that end, the single hit vulnerability of a helicopter to a 100 grain fragment is determined using the methodology presented in the textbook, The Fundamentals of Aircraft Combat Survivability Analysis and Design.

Master of Science in
Aeronautical Engineering
March 1987

Advisor: R.E. Ball
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DYNAMIC STALL CALCULATIONS USING A NAVIER-STOKES SOLVER

James F. Valdes
Lieutenant Commander, United States Navy
B.S., University of Idaho, 1973

A Navier-Stokes problem solver, developed by L.N. Sankar, is installed and verified on the NASA Ames Cray X/MP-48 computer and is used to calculate the flow field about a NACA 0012 airfoil oscillating in pitch. Surface pressure distributions and integrated lift, pitching moment, and drag coefficients versus angle of attack are compared to existing experimental data for two cases, involving deep dynamic stall and fully attached flow at and below a freestream Mach number of .3. The flow field about the oscillating airfoil is investigated through the study of contour plots of pressure, density, Mach number, and stream function. The effect of turbulence modeling is explored through use of the Baldwin-Lomax model and a modification designed to prevent underprediction of maximum lift. Finally, Reynolds number and compressibility effects are investigated by repeating the deep stall simulation at one-tenth the experimental Reynolds number and Mach numbers of .3 and .5. The latter conditions are intended for comparison with the results of wind tunnel experiments being planned at NASA Ames Fluid Mechanics Laboratory.

Master of Science in
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December 1986

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COMPUTER PROGRAM FOR CONCEPTUAL TANDEM ROTOR HELICOPTER DESIGN

Bruce A. Vandenbos
Lieutenant, United States Navy
B.S., Oregon State University, 1980

The conceptual phase of a helicopter design includes comparison of configurations which will meet the specified performance requirements. To perform this comparison, the designer must have the proper tools at hand. This thesis presents an interactive program for the conceptual design of tandem rotor helicopters. It is intended to complement the existing single rotor design program written for the Helicopter Design course, AE-4306, taught at the Naval Postgraduate School, Monterey, California.

This program manages the myriad of interrelated parameters by prompting for input, providing the opportunity for changes, and displaying the results. This relieves the designer of the tedious calculations and bookkeeping, thus allowing time for a more thorough analysis of the design.

Master of Science in
Aeronautical Engineering
September 1987

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AN INVESTIGATION INTO THE FEASIBILITY OF USING A DUAL-COMBUSTION MODE RAMJET IN A HIGH MACH NUMBER TACTICAL MISSILE

Clifford B. Vaught
Lieutenant, United States Navy
B.S., United States Naval Academy, 1980

An investigation into the feasibility of using a solid fuel, dual combustion mode ramjet in a high Mach number tactical missile was conducted to determine the regimes where this propulsion plant might be superior to a conventional solid fuel ramjet. The results of the study show that at Mach 6, 80,000 feet, with a temperature rise combustion efficiency of 90%, the DMRJ performance exceeded that of the SFRJ by 20% at near stoichiometric overall fuel-to-air ratios, neglecting mixing losses in the supersonic combustor. It also appears that $\eta_{\Delta T}$ must be greater than 70% in order for the DMRJ to outperform the conventional SFRJ.

Master of Science in
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September 1987

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HOLOGRAPHIC INVESTIGATION OF METALLIZED SOLID PROPELLANT COMBUSTION IN TWO-DIMENSIONAL AND THREE-DIMENSIONAL ROCKET MOTORS

J.D. Walker
Lieutenant, United States Navy
B.S., University of Missouri, 1980

This experimental investigation included the design and construction of a new, two-dimensional, rocket motor that could be used to obtain better holographic data than obtained in previous investigations using a small three-dimensional motor. The solid propellant used during this investigation was AP, HTPB, with 2%, 40 micron aluminum particles and 0.25% iron oxide.

Good quality holograms were obtained using the three-dimensional motor at operating pressures of 93 and 94 psia. Successful holographic recordings were also acquired using the new, two-dimensional motor at pressures of 45 and 183 psia.

System limitations and suggested improvements to the apparatus are discussed.

Master of Science in
Aeronautical Engineering
September 1987

Advisor: D.W. Netzer
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Astronautics

AN EXPERIMENTAL INVESTIGATION OF THE IGNITION AND FLAMMABILITY LIMITS OF VARIOUS HYDROCARBON FUELS IN A TWO-DIMENSIONAL SOLID FUEL RAMJET

Richard Clark Wooldridge
Lieutenant, United States Navy
B.S., United States Naval Academy, 1980

An experimental investigation was conducted to study the effects of inlet step height on ignition and flammability limits and recirculation zone and boundary layer combustion phenomena of various hydrocarbon fuels. A windowed two-dimensional solid fuel ramjet (SFRJ) was utilized. Hydrocarbon fuels were burned under conditions similar to the actual flight conditions proposed for the SFRJ. Effects of inlet step height changes were studied using a variable geometry inlet, an automatic data acquisition system, and high speed motion pictures of the interior of the combustion chamber at the recirculation zone and the boundary layer development region. Data was obtained at a mass flux of 0.2 lbm/in^2-sec at a nominal air inlet temperature of 1000 R with pressures ranging from 100 to 150 psia. The flammability limits were found to be approximately the same or slightly less than the ignition limits. Recirculation zone flame stability was dominant in determining flammability limits.

Master of Science in
Aeronautical Engineering
June 1987

Advisor: D.W. Netzer
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Astronautics

OPTICAL SIZING OF SOOT IN GAS TURBINE COMBUSTORS AND EXHAUST AUGMENTOR TUBES

Mark F. Young
Lieutenant, United States Navy
B.S., United States Naval Academy, 1979

An experimental investigation was conducted to examine optical sizing techniques in gas turbine combustors and exhaust augmentor tubes. The two primary objectives of this thesis are to improve the accuracy of optical particle sizing in the combustor and across the augmentor tube, and to verify the improved capabilities with a test series. Multiple wavelength light transmittance and light scattering techniques were used. Particle sizes were found to be .15 to .17 microns in the combustor, increasing in size to .35 to .45 microns in the aft can, and 1.5 to 1.6 microns at the exit of the augmentor tube. Also a MALVERN 2600 HSD particle sizer was used to verify the accuracy of the T-63 optical system. A number of recommendations for improving the system are discussed.

Master of Science in
Aeronautical Engineering
March 1987

Advisor: D.W. Netzer
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Astronautics

MASTER OF SCIENCE

IN

APPLIED MATHEMATICS

85/86

IMPLEMENTATION OF THE RUNGE-KUTTA-FEHLBERG METHOD FOR SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS ON A PARALLEL PROCESSOR

Colin F. Mayo
Captain, United States Marine Corps
A.B., College of the Holy Cross, 1977

A recent advance in computer architecture, the parallel processor computer, has made it theoretically feasible to reduce the time required to integrate a system of n ordinary differential equations by a factor of n. One established numerical technique, the Runge-Kutta-Fehlberg method, is adapted for parallel processing on an Intel Scientific Computer iPSC Concurrent Supercomputer. The algorithm is evaluated using a standardized collection of systems of equations. It is concluded that this type of parallel processor is not suited for the solution of this problem due to the communications overhead required. Short developments of ordinary differential equations and numerical integration methods are provided as background.

Master of Science in
Applied Mathematics
June 1987

Advisor: C.E. Roberts
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Mathematics

CROSS-CORRELATION OF UNIFORM CYCLIC DIFFERENCE SET SEQUENCES

David L. Rogers
Captain, United States Marine Corps
B.S., University of Alaska, Fairbanks, 1979

The incidence vector or characteristic function of a cyclic difference set can be viewed as a full period of a cyclic binary sequence. These cyclic difference set sequences possess certain desirable properties for applications in digital communications, radar ranging and some aspects of mathematical modeling. One particularly desirable property unique to cyclic difference set sequences is their two-level auto-correlation function.

In this thesis, the cross-correlation functions of a sample of uniform cyclic difference set sequences are investigated. The cross-correlations involve equivalent and inequivalent uniform cyclic difference set sequences. In addition, the span and cyclotomic cosets are determined for each sequence in the sample.

The number of values taken on by the cross-correlation function of two equivalent cyclic difference sets having a period of v is shown not to exceed the number of cyclotomic cosets modulo v. A conjecture is presented which states that the cross-correlation function of equivalent Hadamard quadratic residue sequences takes on three specified values. In partial support of the conjecture it is shown that the cross-correlation function of equivalent Hadamard quadratic residue sequences can not assume more than three values.

Master of Science in
Applied Mathematics
June 1987

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MASTER OF SCIENCE

IN

COMPUTER SCIENCE

89/90

AN IMPROVED USER INTERFACE FOR AN INTERACTIVE GRAPHICS FIGURE ILLUSTRATOR

Thomas John Beda
Lieutenant Commander, United States Navy
B.S., Purdue University, 1974

This study discusses briefly the history of technical figure illustration in the Computer Science Department of the Naval Postgraduate School. The single system experiencing the most usage is the fully automated interactive graphics figure illustrator--OZDRAW. During its short and active life, the need for perfective maintenance to include generalized documentation has been recognized. The result is a technical graphics figure illustrator with an improved user interface titled NPSDRAW and supporting documentation.

Master of Science in
Computer Science
June 1987

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Department of
Computer Science

A GENERAL PURPOSE GRAPHICS SUPPORT LIBRARY FOR THE ADA PROGRAMMING LANGUAGE HOSTED ON THE ZENITH H/Z-100 COMPUTER

Thomas R. Brown, Jr.
B.S., Eastern New Mexico University, 1981

This thesis explores the requirements necessary to develop a graphics support library for the Ada programming language hosted on the Zenith H/Z-100 microcomputer. A prototype graphics library is implemented in 8086 assembly language embedded in an Ada package. The library operates with JANUS/Ada under the CP/M-86 operating system.

Listings of library routines developed are provided as well as a user's guide and demonstration programs. Potential areas for further investigation and development are suggested.

It is concluded that an Ada graphics library for microcomputers is feasible and practical.

Master of Science in
Computer Science
December 1986

Advisor: U.R. Kodres
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A DATABASE MANAGEMENT SYSTEM TO MANIPULATE DATA COLLECTED AT THE NATIONAL TRAINING CENTER, FT. IRWIN, CA

Stephen D. Buck
Captain, United States Army
B.S., United States Military Academy, 1979

This thesis provides a step by step development of a database management program. Using a problem defined by the intended user, the thesis develops a model of the real world situation using Entity-Relationship Diagrams. This model is then refined into a Relational Model and implemented into a database management program. The theoretical principles used to validate the refinement process are presented in detail to substantiate the procedure. Included also, are a user specific program which facilitates data manipulation and a user's manual which describes the intricacies of the program.

Ft. Knox's Office of Combat Developments has sponsored this thesis in an attempt to provide a storage medium for data originating at the National Training Center (NTC). The NTC was established in the late 1970's to meet the need for a more dynamic training facility. The exercises conducted at the NTC have been acknowledged as extremely beneficial to the units involved. However, recent reports by the GAO show that the full potential of the training center is not being realized, as adequate data collection and analysis operations have not been instituted. This has caused units to continually relearn past mistakes and failed to allow units to build upon past performances. In an effort to reverse this trend, several institutions have begun analyzing the data originating at the NTC. This in turn, developed the need for a flexible and responsive data storage system.

Master of Science in
Computer Science
June 1987

Advisor: S.H. Parry
Department of
Operations Research

AN EXPERT SYSTEM TO ASSIST A NAVY DAMAGE CONTROL ASSISTANT WITH CHEMICAL, BIOLOGICAL, AND RADIOLOGICAL DEFENSE

Stephen J. Camacho
Lieutenant, United States Navy
B.S., United States Naval Academy, 1981

The goal of this study is to develop an aid for the Damage Control Assistant during a chemical, biological, or radiological attack on a naval ship. A prototype rule-based expert system is designed and implemented to serve as the aid. The rules are based on standard procedures found in (U.S.) "Naval Warfare Publication 62-1, Naval Ships' Technical Manual, Chapter 470," and other damage control texts. The expert system uses facts that describe the current situation and then searches the rule base for matching rules. The search method is hybrid forward-backward chaining; it searches through the rule base for rules that have matches to the facts, making conclusions new facts. The conclusions are displayed to the user along with the facts that matched.

Master of Science in
Computer Science
June 1987

Advisor: N.C. Rowe
Department of
Computer Science

AN EXPERT SYSTEM FOR LOGISTICS FORCE DEVELOPMENT

Robert Lawrence Chadwick
Captain, United States Army
B.S., United States Military Academy, 1978

The purpose of this research is to show the feasibility of an expert system to aid logistics planners in determining the types and numbers of logistics units needed to support corps contingency plans. The proposed system represents the domain knowledge of logistics planners as rules and uses backwards chaining to infer the types and numbers of logistics units needed. Next, a chain of command, represented as a tree diagram, is developed for the recommended units by aggregating individual units into battalions and groups. The system was implemented on a VAX 11/785 computer using the PROLOG programming language. Logistics plans for both a light corps and a heavy corps were used to test the system.

Master of Science in
Computer Science
June 1987

Advisor: N.C. Rowe
Department of
Computer Science

COMPARISON OF PASCAL AND THE DBASE III PLUS LANGUAGE IN PROGRAMMING AN INVENTORY MANAGEMENT SYSTEM

To Chang
Major, Republic of China Marine Corps
B.S., Republic of China Naval Academy, 1979

Before the widespread use of Database Management Systems (DBMS), programmers have had to rely on the third generation language such as COBOL, Pascal, and PL/I to implement their application programs. These programs are usually very hard to maintain and modify unless very disciplined structured programming techniques are used. However, with the DBMS, the ease of development, maintenance, and modification of data-managing application programs can be attained. In this thesis, we compare two versions of an inventory management program, one written in Apple Pascal and the other written in dBase III PLUS, in terms of their modifiability and maintainability.

Master of Science in
Computer Science
June 1987

Advisor: C.T. Wu
Department of
Computer Science

ACCESSING A FUNCTIONAL DATABASE VIA CODASYL-DML TRANSACTIONS

Harry Coker, Jr.
Lieutenant, United States Navy
B.S., United States Naval Academy, 1980

Conventional approaches to the design and implementation of database systems have been based upon the premise of a single data model with its model-based data language, thus restricting the database system to transactions based solely on a specific model and written in a specific data language. This traditional approach has drastically hindered the widespread interaction of database systems based on various data models and languages. As an alternative to this traditional and less effective approach to database systems, the multi-lingual database system (MLDS) has evolved. MLDS has allowed the user to access and interact with numerous databases in various data models via their corresponding data languages.

This thesis implements a methodology for accessing and manipulating databases stored in a particular data model via transactions of a separate data model; specifically, a functional database is accessed via CODASYL-DML transactions. This interface is the initial move toward extending MLDS to a thoroughly Multi-Model Database System (MMDS).

Master of Science in
Computer Science
June 1987

Advisor: D.K. Hsiao
Department of
Computer Science

IMPLEMENTATION OF A COMPILER FOR THE FUNCTIONAL PROGRAMMING LANGUAGE PHI - Φ

Eugene J. Cole
Major, United States Marine Corps
B.A., The Citadel, 1975

Joseph E. Connell, II
Captain, United States Marine Corps
B.S., University of Missouri, Rolla, 1974

This thesis describes the design of a prototype compiler for the functional programming language PHI. The design is highly modularized and the authors think this should facilitate the understanding of both concept and implementation. The front-end of the compiler implements machine independent lexical and syntactic analyzers; top-down parsing techniques are employed. The back-end implements a machine dependent one-pass semantic analyzer and code generator.

Since this implementation is a prototype, it does not possess all of the qualities desirable in a full implementation. The basic constructs of PHI: functions and data definitions are implemented, as well as the integer, natural number, and boolean types. However, the necessary hooks are present and the design is mature enough to allow expanding the prototype to a full implementation.

Master of Science in
Computer Science
June 1987

Advisor: D. Davis
Department of
Computer Science

THE STYLIST: A PASCAL PROGRAM FOR ANALYZING PROSE STYLE

Thomas C. Cool
Lieutenant, United States Navy
B.A., Pennsylvania State University, 1976

The Stylist is a Waterloo Pascal program that analyzes the style of English prose. A "style checker", The Stylist pertains to Computational Stylistics and Computer Assisted Composition Instruction (CACI)). The Stylist creates an effective model of the text based upon the following characteristics of its component words: etymology, tangibility, difficulty, emotional connotation and vigor. The Stylist then compares this model to the standards of fiction or nonfiction texts and reports results and recommendations to the user.

The Stylist also creates a concordance of the user's input text using a new data structure called a Concordance Search Tree (CST). A CST is a binary search tree with a linked list threaded through it recording the order of the use of each word. An inorder traversal of the tree, with a traversal of the linked list during each visit, creates a concordance.

This thesis also reviews related literature and programs.

Master of Science in
Computer Science
June 1987

Advisor: T. Wu
Department of
Computer Science

DESIGN, IMPLEMENTATION AND EVALUATION OF AN OPERATING SYSTEM FOR A NETWORK OF TRANSPUTERS

Mauricio de Menezes Cordeiro
Lieutenant, Brazilian Navy
B.S., Brazilian Naval Academy, 1976

This thesis presents the Design, Implementation and Evaluation of an Operating System for a Network of Transputers, with main focus on the Communication Subsystem. It also introduces the novice to the transputer Development System (TDS), and suggests a sequence for developing applications.

All the programs and examples presented in this thesis were implemented in the OCCAM1 Programming Language, and using the Transputer Development System (TDS-D600), running under the VAX/VMS Operating System at the Naval Postgraduate School (NPS).

Master of Science in
Computer Science
June 1987

Advisor: U.R. Kodres
Department of
Computer Science

AUTOMATED LOGISTICS PLANNING USING HISTORICAL ANALOGIES

Mark J. Davis
Captain, United States Army
B.S., United States Military Academy, 1980

The current method for creating tactical logistics estimates in the army inadequately incorporates historical data on the actual consumption of supplies. The automated-logistics-planning system described in this thesis addresses this deficiency. The program developed in this research produces general estimates for selected supply items by referencing equations and variables from current army planning documents and performing the necessary calculations. The program uses reasoning to identify previous operations which are analogous to the current operation. Separate criteria are used to identify the strongest analogies to the current operation for each of five categories of supply items. Information contained in the historical records of the three strongest analogies in each category is used to revise the general estimates. The revised estimates are hopefully more accurate in predicting actual supply requirements for the current operation than the estimates generated by formula alone.

Master of Science in
Computer Science
June 1987

Advisor: N.C. Rowe
Department of
Computer Science

AN ANALYSIS OF THE INGRES DATABASE MANAGEMENT SYSTEM APPLICATIONS PROGRAM DEVELOPMENT TOOLS AND PROGRAMMING ENVIRONMENT

James Frank De Stael
Lieutenant Commander, United States Navy
B.S.E., Purdue University, 1976

This study examines the database application programming environment presented by the Applications-By-Forms (ABF) subsystem of the INGRES database management system (DBMS). The development of a bibliographical search and report application program is discussed. The operation of the application program is described. Positive and negative aspects of the ABF programming environment are examined. The use of INGRES Query Language (QUEL) and Operation Specification Language (OSL) are also discussed.

Master of Science in
Computer Science
December 1986

Advisor: C.T. Wu
Department of
Computer Science

A SIMULATION STUDY OF A SPEED CONTROL SYSTEM FOR AUTONOMOUS ON-ROAD OPERATION OF AUTOMOTIVE VEHICLES

Michael J. Dolezal
Major, United States Marine Corps
B.S., St. John's University, 1970

The study of human driving of automotive vehicles is an important aid to the development of viable autonomous vehicle navigation and control techniques. Observation of human behavior during driving suggests that this activity involves two distinct levels, the conscious and the unconscious.

The behavior of a driver while stopping his vehicle at a stop sign may be conscious or unconscious, depending on the driver's skill level and the driving conditions. The driver's behavior involves a difficult process of estimating the distance to the stop sign and the velocity of the vehicle. Using these estimates, the driver then takes the necessary control actions to stop the vehicle. This research attempts to mimic the driver's conscious and unconscious behavior through mathematical modeling and computer simulation.

Master of Science in
Computer Science
June 1987

A DATA STRUCTURE FOR A MULTI-ILLUMINATION MODEL RENDERER

John Stephen Falby
Lieutenant Commander, United States Navy
B.A., The Citadel, 1975

The rendering of realistic computer images is important for many scientific, technical and commercial endeavors. Available literature provides the mathematical models to be utilized by a renderer. Lacking from the literature though are implementation details. In this study, we examine some of the existing illumination and shading models and present a data structure and initial design for a multi-illumination model renderer.

Master of Science in
Computer Science
December 1986

Advisor: M.J. Zyda
Department of
Computer Science

A PROTOTYPE VISUAL STRUCTURE EDITOR FOR PASCAL

Michael F. Farley
Lieutenant Commander, United States Navy
B.S., The University of Louisville, 1974

The development of programming tools for conventional, textual environments has dramatically increased the productivity of the individual programmer, but these environments have been developed to their logical extremes. Current research in the field of interactive programming environments has moved toward graphics-oriented systems to take advantage of the wider bandwidth of information transfer that is inherent in these systems. This paper describes the design and implementation of a prototype visual programming paradigm. Built around an interactive, user-friendly interface which uses a mouse, menus and windows, the system enables the user to construct Pascal programs through a combination of graphical object manipulations and textual entries.

Master of Science in
Computer Science
December 1986

Advisor: D.L. Davis
Department of
Computer Science

COMPUTER AIDED SOFTWARE ENGINEERING (CASE) ENVIRONMENT ISSUES

Wayne K. Frey
Lieutenant Commander, United States Navy
B.S., University of Minnesota, 1974

The rising percentage of system costs attributed to software development and maintenance has resulted in the research by industry and academia into ways of improving the productivity of software professionals in all phases of the software life-cycle. Computer Aided Software Engineering (CASE) environments are one solution being pursued. This thesis attempts to coalesce, from various efforts to date, some general principles for such environments in order to assist decisionmakers who must procure them. This work is in support of the Missile Software Branch, Naval Weapon Center, China Lake, California (MSB), and their investigation of CASE environments to improve productivity. Problems of CASE development and use are discussed in this context. A general problem solving approach through abstraction of resources is proposed with a focus on an individual programmer productivity subset of a CASE environment.

Advisor: D.L. Davis
Department of
Computer Science

A SOFTWARE SYSTEM IMPLEMENTATION GUIDE AND SYSTEM PROTOTYPING FACILITY FOR THE MCORTEX EXECUTIVE ON THE REAL TIME CLUSTER

Douglas R. Garrett
Lieutenant, United States Navy
B.S., The College of William and Mary, 1977

This thesis develops a prototyping facility to support accurate exploratory modeling of the temporal structure of real time, concurrent software systems on a parallel processor architecture. The hierarchical bus parallel processor architecture, called the Real Time Cluster Star (RTC*) is the hardware on which an executive operating system, the Extended Multi-COmputer Real Time EXecutive (E-MCORTEX), provides the capability for concurrent real time processing. The prototyping facility is a tool to aid the system designer to assess the tasking structure and the resulting temporal behavior of concurrent multiprocess systems. This facility allows an early modeling of a proposed real time system so that the system's design flaws can be discovered and corrected before the system is fully developed.

Master of Science in
Computer Science
December 1986

Advisor: U.R. Kodres
Department of
Computer Science

AN INTERACTIVE COMPUTER GRAPHICS NETWORK MONITOR FOR A TACTICAL COMMUNICATIONS NETWORK

Laurence W. Griggs
Major, United States Marine Corps
B.A., University of West Florida, 1980

In order to apply modern networking technology, either circuit-or packet-switched, to tactical communications networks, network designers must develop (1) robust link level protocols to handle broadcast media and node mobility and (2) distributed, adaptive routing protocols to handle the rapid reconfigurations required by node mobility and mortality. In addition, from the network manager's point of view, combat imposes electronic order of battle constraints that can affect network performance and limit the available network configurations. Optimizing message throughput under such design and operational constraints is extremely difficult.

Intended as an aid to both network designers and managers, this study describes a network monitor that used modern high-speed graphics hardware and a responsive multi-window user interface to depict, in real-time, the state of a packet- or circuit-switched tactical communications network. We model the network state as a set of overlays to an existing well-known tactical display format, namely that of Naval Tactical Data System (NTDS). In our implementation, tactical and network displays are decoupled in order to allow the network monitor's use with other graphical combat information systems.

Master of Science in
Computer Science
June 1987

Advisor: M.J. Zyda
Department of
Computer Science

AN EXPERT SYSTEM TO PROVIDE GUIDANCE ON THE OPERATION OF INSTALLED DAMAGE CONTROL SYSTEMS ABOARD NAVAL SHIPS IN EMERGENCY SITUATIONS

Bernard G. Gogel
Lieutenant Commander, United States Naval Reserve
B.S., Purdue University, 1972

We discuss the design and implementation of Emergency, a prototype expert damage-control-guidance system. It provides recommendations on emergency action procedures, and information on the location and use of the installed damage control systems aboard the ship to Damage Control Central personnel, who can transmit the information to the On-scene leader at the site of the emergency. This prototype system handles emergencies involving personnel injuries, fire, flooding, or fumes. A type of decision lattice control structure was used for the program. The program takes advantage of the similarities that occur during all emergencies with general procedures at the top of the lattice. At the bottom of the lattice, procedures handle the detailed requirements for the identified hazard and source. This structure allows for future additions to or revisions of the methods of combating emergencies. The program Emergency has laid some valuable groundwork for a prototype aboard a Naval ship.

Master of Science in
Computer Science
December 1986

Advisor: N.C. Rowe
Department of
Computer Science

A SURVEY OF OBJECT ORIENTED LANGUAGES IN PROGRAMMING ENVIRONMENTS

Harald Haakonsen
Lieutenant Commander, Norwegian Navy
Norwegian Naval Academy, 1977

This thesis addresses object oriented programming languages; and a restrictive definition of object oriented programming languages is presented and defended. Differences between programming languages are discussed and related to interactive integrated programming environments. Topics related to user friendly interface to the computer system and modern programming practice are discussed. The thesis especially addresses features in object oriented programming languages that are important when a user friendly interactive integrated programming environment is designed. Some future research areas are suggested.

Master of Science in
Computer Science
June 1987

Advisor: B.J. MacLennan
Department of
Computer Science

ADAMEASURE: AN IMPLEMENTATION OF THE HALSTEAD AND HENRY METRICS

Paul M. Herzig
Lieutenant Commander, United States Navy
B.S.E.E., University of New Mexico, 1976

A software metric is a tool that should be used in the development of quality software. The properties that define good software vary but encompass reliability, complexity, efficiency, portability, understandability, and modifiability. The Henry metric measures the complexity of data flow within a module and the complexity of inter-module communication. This thesis is an extension of a previous thesis entitled "AdaMeasure" that calculated the Halstead metric. The present design and implementation is a tool that computes the Halstead and Henry metrics for Ada programs.

Master of Science in
Computer Science
June 1987

INTELLIGENCE DECISION SUPPORT SYSTEM FOR THE REPUBLIC OF KOREA ARMY ENGINEER OPERATION

Chang Ki Jang
Major, Republic of Korea Army
B.S., Korea Military Academy

In the current circumstances of the Korean Army, the engineer units perform two major missions - river crossing and obstacle/denial operations - to support the combined arms team. To accomplish these missions, engineer units need various kinds of data and information during the planning phase of operations. This kind of data and information can be provided by the information processing system that is to be developed in this thesis.

This thesis is to apply a computer based information processing system to the planning phase of the military operations. The author presents an intelligent decision support system for the Army Engineer Operations, specifically the river crossing and obstacle/denial operations. The purpose of this system is to maintain and analyze the related information stored in the computer and to provide the resulting information to the commanders and their staffs to help them make their decisions more effectively. To accomplish this task, the author has used the structured system analysis and design methodology through the system development process, and has implemented the river crossing operation in a microcomputer with dBASE III Plus as an example.

Master of Science in
Computer Science
June 1987

Advisor: V.Y. Lum
Department of
Computer Science

AN INTERACTIVE ORGANIZATIONAL CHOICE PROCESSING SYSTEM TO SUPPORT DECISION MAKING BY USING A PRESCRIPTIVE GARBAGE CAN MODEL

Sun Mo Kang
Major, Korean Army
B.S., Korean Military Academy, 1979

This thesis discusses and implements an interactive decision support system using a Prescriptive Garbage Can Model. The fundamental presumption is that if the choice-outcome relationships in an organization can be observed and evaluated, it is possible to extract predictiveness from uncertain streams, and allow the organization to shift to a less random strategy. Solving organizational problems consists of selecting those choices that lead the organization in a direction towards the ideal state. Thus, it is convenient to model the organizational state transitions as a Markovian process with stationary properties. The purpose of a Prescriptive Garbage Can Model is to advise the participants of the choices available in a current situation, and to present choice policies leading the highest potential benefits. Also a method of interfacing the current system with an expert system for intelligent decision making is examined.

Master of Science in
Computer Science
June 1987

Advisor: T.R. Sivasankaran
Department of
Computer Science

BENCHMARKING PREPARATION FOR AND AGGREGATE AND SORTING RETRIEVALS IN THE MULTI-BACKEND DATABASE SYSTEM

Frank Edward Kelbe
Lieutenant, United States Navy
B.S.E.E., University of New Mexico, 1980

Dana Stephen Majors
Lieutenant, United States Navy
B.S., California State University, Sacramento, 1979

The scope of this thesis is twofold. The first is to provide a methodology for the performance evaluation of the Multi-Backend Database System, MBDS. The second is to describe the implementation and integration for two new database operations, the aggregate retrieval and the sorted retrieval.

The thesis provides the essential tools for the successful evaluation of MBDS. The performance evaluation of MBDS is necessary to validate the performance gains in terms of response-time reduction, and capacity growth in terms of response-time invariance. The implementation and integration of the aggregate retrieval and sorted retrieval provide two advanced data retrieval operations to MBDS. The aggregate retrieval operation allows the user to obtain extremely useful data not inherently available in the data itself. The sorted retrieval operation allows the user to retrieve data and have it presented in a more meaningful fashion.

Master of Science in
Computer Science
June 1987 - (Kelbe)
September 1987 - (Majors)

Advisor: D.K. Hsiao
Department of
Computer Science

TERM IO: AN ADA TERMINAL INTERFACE PACKAGE

Anthony James Keough
Lieutenant, United States Navy
B.S., University of Wisconsin, 1981

One difficulty in the use of the Ada language in interactive programming is the inability to specify serial CRT terminal screen functions when writing the user interface. This thesis presents a solution in the form of an Ada package for terminal IO that provides the programmer with Ada language function calls that perform many of the serial CRT screen control functions automatically available in other languages. A specification of the package TERM IO is presented. An implementation of the package for the VT-100 terminal and an example of the use of TERM IO are presented.

Master of Science in
Computer Science
June 1987

Advisor: D.L. Davis
Department of
Computer Science

A COLLISION-PREVENTION EXPERT SYSTEM FOR A NAVY OFFICER OF THE DECK

Terry W. Lewallen
Lieutenant, United States Navy
B.S.E., University of Central Arkansas, 1978

The goal of this thesis is to automate recommendations to the Officer of the Deck when decisions are made concerning situations that involve risk of collision. A rule-based expert system is designed and implemented as a solution to this task. The rules are based on regulations in the U.S. Coast Guard manual, Navigation Rules International-Inland. The expert system receives facts that describe the current situation, then searches the rule base for matching rules. The searching method is a hybrid form of forward chaining that searches cyclically through the rule base until all matches, intermediate and final, are located. The conclusions of the matching rules are displayed as a recommendation to the system user. The resulting system provides a valuable input to the Officer of the Deck, serving to increase the speed and reliability of the final decison by removing the necessity of manually looking up regulations or relying on memorization.

Master of Science in
Computer Science
March 1987

Advisor: N.C. Rowe
Department of
Computer Science

THE IMPLEMENTATION OF A FUNCTIONAL/DAPLEX INTERFACE FOR THE MULTI-LINGUAL DATABASE SYSTEM

Beng Hock Lim
Civilian, Ministry of Defense, Republic of Singapore
B.S., University of Singapore, 1977

Traditionally, the design and implementation of a conventional database system begins with the choice of a data model followed by the specification of a model-based data language. Thus, the database system is restricted to a single data model and a specific data language. An alternative to this traditional approach to database-system development is the multi-lingual database system (MLDS). This alternative approach enables the user to access and manage a large collection of databases via several data models and their corresponding data languages without the aforementioned restriction.

In this thesis we present the implementation of a functional/Daplex language interface for MLDS. Specifically, we present the implementation of an interface which translates Daplex language cells into attribute-based data language (ABDL) requests which, as the kernal language, support all other data language interfaces.

Master of Science in
Computer Science
December 1986

Advisor: D.K. Hsiao
Department of
Computer Science

A MULTIMEDIA COMPUTER CONFERENCING SYSTEM

James Edward Manley
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1976

The purpose of this study is to review the state of interworkstation computer communications, suggest ways in which these communications can be utilized for multimedia computer conferencing, and provide the details of a prototype system which demonstrates some of the capabilities that multimedia computer conferencing systems can have. The source code for the prototype system is provided in the appendices.

The results of this study are of interest to people designing command and control systems, integrated office automation systems, and personal and business communications systems. Additionally, the details of the multicomputer network information-sharing portion of the prototype can be useful to people who desire to distribute computational loads over a number of systems such as distributed graphics processing, scientific modeling and simulation, and engineering design and prototyping.

Master of Science in
Computer Science
December 1986

Advisor: M.J. Zyda
Department of
Computer Science

COMPUTER GRAPHICS INTERACTIVE WORKSHOP FOR TWO DIMENSIONAL FRACTALS

Lewis Gerhard Mason
Commander, United States Navy
B.S., United States Naval Academy, 1971

This study presents a background for fractals and describes an interactive computer graphics workshop for two-dimensional fractals. The workshop enables the user to learn about fractals through experimentation with the generation of Koch-like fractal curves. A variety of Koch-like fractal curves, Julia sets and the Mandelbrot set are presented as examples. Algorithms are presented for creating the Mandelbrot set and for creating Koch-like fractal curves.

Master of Science in
Computer Science
December 1986

Advisor: M.J. Zyda
Department of
Computer Science

ADAMEASURE: AN ADA SOFTWARE METRIC

Jeffrey L. Nieder
Lieutenant Commander, United States Navy
B.S.A.S., Miami University of Ohio, 1976

Karl S. Fairbanks, Jr.
Lieutenant, United States Navy
B.S., United States Naval Academy, 1981

Software engineers in general, and the Department of Defense in particular, are looking for good software metrics to aid in software development. Maurice Halstead developed the theory of Software Science which includes the relation between program complexity and program length. Halstead's length metric deals with the properties of an algorithm that can be measured, either directly or indirectly, statically or dynamically, and with the relationships among these properties. A system has been developed which implements Halstead's length metric. This system, which is written in Ada, takes Ada programs as input, and outputs the length metric complexity analysis. Finally, recommendations for future work in this area are made.

Master of Science in
Computer Science
March 1987

Advisor: D.L. Davis
Department of
Computer Science

A DECISION SUPPORT SYSTEM FOR THE DIAGNOSIS OF AIRCRAFT EMERGENCIES

Olen D. Porter
Captain, United States Marine Corps
B. S., LeTourneau College, 1976

The purpose of this research is to show the feasibility of an expert system that utilizes the existing sensors aboard an aircraft to aid the pilot in the diagnosis of single and compound emergencies. A passive expert planner is proposed that utilizes multiple and domain dependent knowledge-bases. The system is implemented on a personal computer, using the USMC AH-1T attack helicopter as a modeling platform. An effort is made to quantify the amount of information processing necessary to adequately define emergencies. Performance of the system was also evaluated.

Master of Science in
Computer Science
December 1986

Advisor: N.C. Rowe
Department of
Computer Science

THE DECOMPOSITION OF AN ARBITRARY THREE--DIMENSIONAL PLANAR POLYGON INTO A SET OF CONVEX POLYGONS

Jeffrey Hal Potts
Captain, United States Marine Corps
B.S., United States Naval Academy, 1977

We present in this study a three step algorithm for the decomposition of arbitrary, three-dimensional, planar polygons into convex polygons. Through a series of translations and rotations, an arbitrary polygon is mapped onto the x-y plane, then broken into a set of convex polygons, and finally mapped back to the polygon's original coordinate system for filling and display by special graphics hardware.

Master of Science in
Computer Science
December 1986

Advisor: M.J. Zyda
Department of
Computer Science

AN ADA MODEL OF THE AEGIS RADAR SCHEDULER

James H. Purdam
Lieutenant, United States Navy
B.S., Arkansas State University, 1979

This thesis presents a software implementation in JANUS/ADA of the Radar Scheduler process based on previous thesis work developed for the NPS AEGIS Modeling Project. The project is an emulation of the AEGIS AN/SPY-1A Radar Control Program for a multi-microprocessor system. This thesis is a first effort in implementing the NPS AEGIS project model in JANUS/ADA. Included are the results of the preliminary real-time testing and logical tests of the Radar Scheduler module.

Master of Science in
Computer Science
December 1986

Advisor: U.R. Kodres
Department of
Computer Science

A PROTOTYPE OF PILOT KNOWLEDGE EVALUATION BY AN INTELLIGENT CAI SYSTEM USING A BAYESIAN DIAGNOSTIC MODEL

Yodchai Rugsumruad
Commander, Royal Thai Navy
B.S., Royal Thai Naval Academy, 1972

This thesis describes the Testing system, a CAI system which monitors the progress of a student and automatically adjusts the lesson to suit his/her understanding of the material being presented. Each lesson is divided into three segments. The first segment consists of questions critical to the basic understanding of the lesson, the second questions complementary to the lesson, and the third questions supplementary. After the first segment, the student's performance is evaluated and a decision is made whether or not he/she should continue on to the complementary segment of the lesson or go on to the next lesson. Similarly, in the second segment, a decision whether to continue on to the supplementary segment or to the next lesson is made. Thus, a proficient student can progress through the material quickly, a slow learner slowly. The questions are grouped into types, and each of them is ranked as an easy or difficult concept to provide more precise guidance for the student's improvement. An example lesson is provided as an illustration.

Master of Science in
Computer Science in
June 1987

Advisor: N.C. Rowe
Department of
Computer Science

SOFTWARE TOOL SELECTION FOR A U.S. NAVY SOFTWARE MAINTENANCE ORGANIZATION

Joanne Sexton
Lieutenant, United States Navy
B.S., Rutgers University, 1978

Software tools have been in existence for a number of years. "Software environments," or how well software tools work together, has been a current topic in the literature. Unfortunately, those discussions have been limited to software production environments only. A greater need exists to define what is required in a software maintenance environment. Software maintenance environment requirements should drive the needs of production environments because of the greater permanence of maintenance and its more sizable effect on overall software life-cycle costs. As a step in that direction, this thesis examines one particular aspect of software maintenance-how to understand programs. With this particular focus, this thesis defines criteria to rate software maintenance tool selection, and offers alternative solutions for organizational aspects that are not currently automated by software tools.

Master of Science in
Computer Science
June 1987

Advisor: G.H. Bradley
Department of
Computer Science

AN INEXPENSIVE REAL-TIME INTERACTIVE THREE-DIMENSIONAL FLIGHT SIMULATION SYSTEM

Douglas Bernard Smith
Captain, United States Marine Corps
B.S., Duke University, 1981

Dale Gerard Streyle
Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1980

A prototype flight simulator for the Fiber-Optically Guided Missile (FOG-M) is presented. This prototype demonstrates the practicability and feasibility of using low-cost graphics hardware to produce acceptable simulation of flight over terrain generated from Defense Mapping Agency (DMA) digital elevation data. The flight simulator displays a dynamic, three-dimensional, out-the-window view of the terrain in real-time while responsing to operator control inputs. The total system cost (software and hardware) of the simulator is an order of magnitude less than most flight simulation systems in current use.

Master of Science in
Computer Science
June 1987

Advisor: M.J. Zyda
Department of
Computer Science

A PROTOTYPE RAY TRACER

Paul Gerard Smith
Captain, United States Marine Corps
B.A., The Citadel, 1978

The ability to make computer images more realistic is becoming more important as the hardware for producing such images is becoming less expensive and hence more available. The key to producing realistic images lies in the algorithms that can take full advantage of the hardware to produce them. In this study, we look at a prototype of a ray tracer, as presented in (Ref. 1). Ray tracing, in combination with a global illumination model, currently provides the most realistic images that can be generated on general purpose computing hardware. The prototype was successfully implemented on an IBM AT clone.

Master of Science in
Computer Science
June 1987

Advisor: M.J. Zyda
Department of
Computer Science

A SIMULATION STUDY OF AN AUTONOMOUS STEERING SYSTEM FOR ON-ROAD OPERATION OF AUTOMOTIVE VEHICLES

Chiam Huat Tan
Civilian, Ministry of Defense
Dip. Electrical, Singapore Polytechnic, 1977

The study of human driving of automotive vehicles is an important aid to the development of viable autonomous vehicle navigation techniques. Observation of human behavior during driving suggests that this activity involves two distinct levels, the conscious and the unconscious.

Conscious actions relate to the logical behavior of a driver such as stopping the vehicle when a traffic light is red, slowing down the vehicle when it turns a bend, etc. Such behavior can be described using natural human language. The unconscious actions of a driver are much less obvious. There are many such activities occurring while we are driving a vehicle to a particular destination. One of the important unconscious efforts involves the selection of successive points on the road to steer the vehicle towards in order to achieve the desired road-following behavior. This research work attempts to mimic this unconscious behavior through the use of a computer simulation model.

Master of Science in
Computer Science
December 1986

Advisor: R.B. McGhee
Department of
Computer Science

PARAMETRIC REPRESENTATION AND POLYGONAL DECOMPOSITION OF CURVED SURFACES

Gary Wayne Taylor
Captain, United States Marine Corps
B.S., Davis and Elkins College, 1980

We present in this study a design and implementation for a set of software functions useful for constructing solid-filled parametric bicubic surface patches. Such a capability is not generally provided for in currently available, high-performance graphics workstations. Our implementation of this functionality is on one such workstation, the Silicon Graphics, Inc. IRIS. The capability for producing such solid-filled surface patches has promoted their use in a variety of in-house applications at the Naval Postgraduate School.

Master of Science in
Computer Science
December 1986

Advisor: M.J. Zyda
Department of
Computer Science

EMYCIN-PROLOG EXPERT SYSTEM SHELL

Fikret Ulug
Lieutenant JG, Turkish Navy
B.S., Turkish Naval Academy, 1980

Building an expert system from scratch requires a long and tedious programming process. To make this easier, expert system shells are developed. We have implemented a shell in the language PROLOG. Our shell is modelled on a famous one, EMYCIN. We built two small-sized expert systems using our shell. The first one (CAR diagnosis system) diagnoses engine problems in a car, and the second one (FINANCE analysis system) gives financial advice. We also designed some explanation facilities for our shell. The choice of PROLOG facilitated our study considerably. PROLOG's built-in pattern-matching and backtracking facilities were two powerful features for the deduction process and EMYCIN's backward-chaining control structure. With our shell we were able to build an expert system quickly. Although they were left as a future study, implementation of the user interaction and explanation system modules can make our shell a usable product.

Report Number
December 1984

Advisor: R.C. Kowe
Department of
Computer Science

DESIGN AND IMPLEMENTATION OF A DEBUGGER FOR AN ABSTRACT MACHINE

Stanley Victrum
Lieutenant, United States Marine Corps
B.A., The Citadel, 1982

Conventional computer architectures do not allow us to unambiguously express our intent in a computer program. The combination of artificial data types and resource models force ambiguity and data structure overloading. For example, the semantics of a stack combine those of an array structure and a last-in-first-out queue, while the entire stack structure is implemented in computer memory as a group of fixed length cells. This and other machine-data type dependencies can markedly hamper software portability. To overcome these obstacles, a means of formally specifying a computing machine's physical resources in an implementation independent way has been proposed. Creating an abstraction of the computer's physical resources in this manner lets the implementor of the specifications clearly determine the intent of programs written for it. This abstraction has come to be known as the Abstract Machine or AM.

One implementation of these resource specifications has already been accomplished. Several programming tools, such as a programming language compiler and a visual display device, have also been created (in software) for use with this AM's implementation. At present, however, there are no means for interactively displaying and altering the storage resources of the Abstract Machine for debugging purposes. For the current AM implementation, the bulk of the automated debugging tools consist of assembler code tracing and listing options that can be chosen at run time. The goal of this thesis is to build an interactive debugger for the Abstract Machine near the assembler code level. This should expedite the process of producing relatively error-free, executable programs while using a smaller amount of time and effort. The debugger will serve as another building block in the creation of a complete

programming.environment for the Abstract Machine. This in turn will assist in the general study of minimizing the software portability problems that arise because of machine-software dependencies.

Master of Science in
Computer Science
June 1987

Advisor: D.L. Davis
Department of
Computer Science

AN IMPLEMENTATION OF THE AEGIS SPY 1A RADAR CONTROLLER IN ADA

Thomas Stanley Wetherald
Lieutenant, United States Navy
B.S., United States Naval Academy, 1979

This thesis presents a software implementation of the NPS SPY-1A Radar Controller model Track Processing module. The module is implemented in the JANUS/ADA programming language. This thesis is a follow on to the work done by Lieutenant Cech in 1982.

The goal of the NPS Radar Controller software design project now is to generate a SPY-1A Radar Controller program that can be installed and evaluated on both of the NPS AEGIS project's proposed parallel processing architectures. The two architectures under evaluation are a multi-microprocessor architecture based on 8086 Single board computers and a transputer network architecture. In addition, the goal is to evaluate the use of the ADA programming language for real time applications.

The specific goal of this thesis is to create a working implementation of the design presented in Lieutenant Cech's thesis using JANUS/ADA. Also to evaluate the data structures used in the design with respect to their efficiency in a JANUS/ADA program. This led to two complete implementations of the Track Processing module, one using access (pointer) types and the other using array types for most of the global data structures.

Master of Science in
Computer Science
June 1987

Advisor: U.R. Kodres
Department of
Computer Science

EXPERT DATABASE SUPPORT OF THE INTEGRATED MANUFACTURING PROCESS

Thomas George Wilbur, Jr.
Lieutenant, United States Navy
B.S., Jacksonville University, 1974

This effort explores the design requirements for an expert translator to be used as an interface between present Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM) systems. The translator's purpose is to perform certain standards checks on the design data and pass assembly information as well as material requirements from CAD to CAM. An example translator was implemented for a simple one room house construction problem using the artificial intelligence language Prolog. This research is part of an effort to design a generic Computer Integrated Manufacturing System in which the design through manufacturing process is totally automated.

Master of Science in
Computer Science
December 1986

Advisor: C.T. Wu
Department of
Computer Science

MASTER OF SCIENCE

IN

ELECTRICAL ENGINEERING

135/136

AN EXTENSION TO THE MULTILEVEL LOGIC SIMULATOR FOR MICROCOMPUTERS

Julio Cesar Lopes de Albuquerque
Lieutenant Commander, Brazilian Navy
B.S., Universidade de Sao Paulo, 1978

One of the most time consuming parts of the design process is the debugging of the project. This happens when simple modifications to a circuit require recompilation of the whole circuit.

In the CAD tool currently available for digital systems design, compilation is a bottle neck. The VOHL system has an extremely efficient simulator phase and a reasonable but slower compilation phase.

This thesis investigates a mechanism for eliminating the need to recompile the complete circuit when small changes are needed.

Master of Science in
Electrical Engineering
June 1987

Advisor: H.B. Rigas
Department of
Electrical and Computer
Engineering

OPTIMAL CONTROL OF THE TRIDENT II ELECTRONIC FEEDBACK AREA CONTROL SYSTEM

Walter Horst Augustin
Captain, United States Marine Corps
B.S., Illinois Institute of Technology, 1980

Optimal control methods are applied in the design of the Electronic Feedback Area Control (EFAC) pressure control system of the Trident II (D5) submarine launched ballistic missile. Physical operation restrictions are considered in the implementation of the optimal control system. Robustness characteristics are determined by applying the concepts of relative stability to multiple state feedback systems. A numerical algorithm is developed which estimates the solid propellant burn length from a knowledge of the operating pressure.

Master of Science in
Electrical and Computer
Engineering, 1982

Advisors: P.D. Stigum
D.E. Kirk
Department of
Electrical and Computer
Engineering

FACTORED-MATRIX REPRESENTATION OF DISTRIBUTED FAST TRANSFORMS

Richard Lee Bainbridge
Lieutenant, United States Navy
B.E.E., Auburn University, 1980

Parallel implementations of Fast Fourier Transforms (FFTs) and other fast transforms are represented using factored, partitioned matrices. The factored matrix description of a distributed FFT is introduced using a decimation-in-time (DIT) FFT algorithm suitable for implementation on a distributed signal processor.

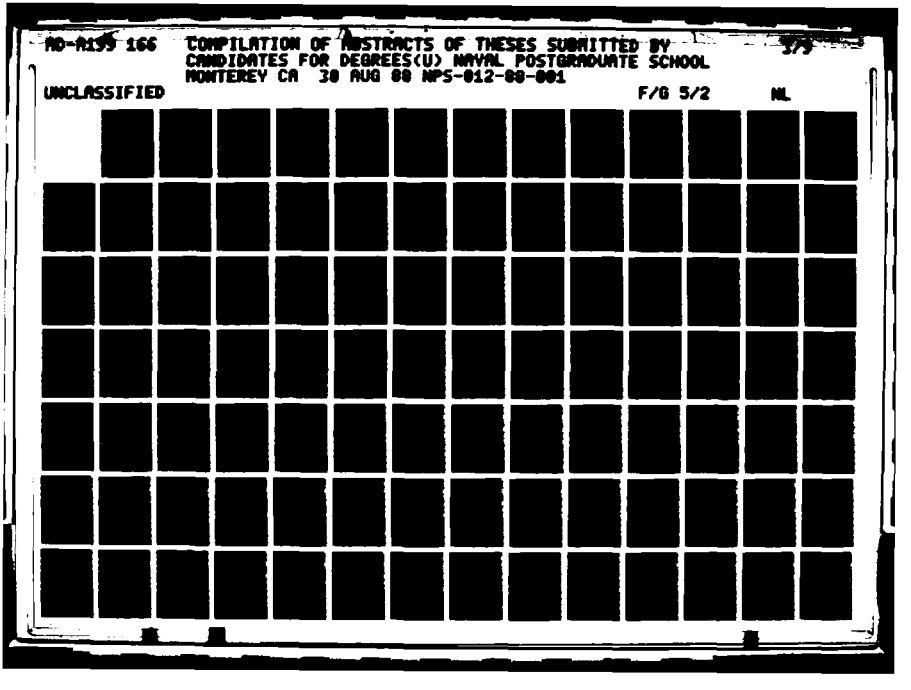
The heart of the matrix representation of distributed fast transforms is the use of permutations of an NxN identity matrix to describe the required inter-processor data transfers on the Butterfly Network. The properties of these "transfer matrices" and the resulting output ordering are discussed in detail. The factored-matrix representation is then used to show that the Fast Hartley Transform (FHT) and the Walsh-Hadamard Transform (WHT) are supported by the Butterfly Network.

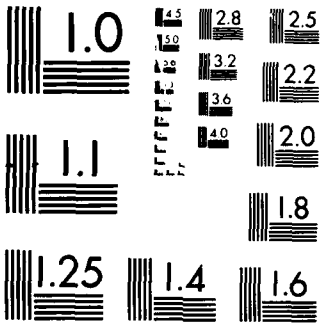
Master of Science in
Electrical Engineering
March 1987

Advisor: D.E. Kirk
Department of
Electrical and Computer
Engineering

AD-A199 166 COMPILATION OF ABSTRACTS OF THESES SUBMITTED BY CANDIDATES FOR DEGREES(U) NAVAL POSTGRADUATE SCHOOL MONTEREY CA 30 AUG 88 NPS-012-88-001 1/9

UNCLASSIFIED F/G 5/2 NL





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

RADIO FREQUENCY SWITCHING

Carter Price Bard
Lieutenant Commander, United States Navy
B.S., University of West Florida, 1980

An analysis of electromagnetic interference initiated internal to the Radio Frequency Switching System (RFSS) and the Radio Frequency Switching Matrix (RFSM) used by the Navy's High Frequency Direction Finding (HFDF) receiver sites is presented. A scanning spectrum analyzer and a digital 3-axis display are used to isolate and identify parasitic oscillations, intermodulation products, and other spurious noise sources.

Master of Science in
Electrical Engineering
December 1986

Advisor: S. Jauregui
Department of
Electrical and Computer
Engineering

MEASURED NOISE PERFORMANCE OF A DIRECT-SEQUENCE SPREAD SPECTRUM SYSTEM AND A COMPARISON OF SINGLE VICE DUAL-CHANNEL DELAY-LOCK LOOPS

Chris G. Bartone
Electronics Engineer, Naval Air Test Center
B.S., Pennsylvania State University, 1983

A direct-sequence (DS) spread spectrum system which could be used by a conventional amplitude modulated (AM) radio system was designed, built and tested. A delay-lock loop was used to provide code synchronization in the receiver. The noise performance of a single-channel delay-lock loop (SCDLL) was compared with a dual-channel delay-lock loop (DCDLL) with no data being transmitted. When data was transmitted a DCDLL was used and the noise performance (probability of bit error) of the DS spread spectrum system was measured. Test results indicate that the SCDLL performs as well as or better than the DCDLL. The measured noise performance of the DS spread spectrum system was within 5 dB of theoretical values for a spreading factor of 255. Conclusions are that apart from hardware simplicity, the SCDLL provides, in practice, a noise performance advantage relative to the DCDLL and that this DS spread spectrum system can be used to transmit low rate digital data reliably at values of SNR much less than unity. It is recommended that this DS spread spectrum system be considered by the Department of Defense to be implemented in AM radio systems to provide low data rate anti-jam/interference rejection capability.

Master of Science in
Electrical Engineering
September 1987

Advisor: G.A. Myers
Department of
Electrical and Computer
Engineering

A DYNAMIC SIMULATION AND FEEDBACK CONTROL SCHEME FOR THE U.S. MARINE CORPS' AIRBORNE REMOTELY OPERATED DEVICE (AROD)

William Glen Bassett
Captain, United States Marine Corps
B.S., Cornell University, 1980

The equations of motion for a ducted fan hovering device are developed and programmed in a computer simulation. Experimental aerodynamic data is integrated with the computer model. A feedback control scheme for the multiple-input, multiple-output system is determined using optimal control techniques. Time response results are obtained and analyzed.

As a separate issue, the body of the device is modelled for electromagnetic analysis and a basic antenna design is determined for UHF transmission.

Master of Science in
Electrical Engineering
September 1987

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

DESIGN OF SURVIVABLE SHIPBOARD HF MAST ANTENNA [illegible] THE NUMERICAL ELECTROMAGNETICS CODE

Il Yong Choi
Lieutenant, Republic of Korea Navy
B.S., Korean Naval Academy, 1981

Modern combat ships are crucially dependent on electromagnetic systems including numerous and varied types of antennas. There are many shipboard communication antenna parameters [illegible] type, and survivability of given antenna systems. [illegible] parameters can be varied to determine the overall optimal system. This thesis investigates computer numerical models to improve combat survivability for HF shipboard antenna systems. Future generation ships will have low profile combat survivable antennas. Possible improvements for present ships might be the elimination of "whip" antennas by exciting existing mast structures. Two mast configurations resembling an FFG-45 class ship are investigated for various feeding [illegible] a simplified rectangular column representing a forward [illegible] tapered column containing more details and closely resembling an after mast. The masts are modeled by using surface patches and wire grids. Six computer models of the given masts are developed by the Numerical Electromagnetics Code (NEC). Average power gain, front-to-[illegible] radiation patterns of driven antennas are presented and [illegible] between surface patch models and wire grid models are compared for frequencies from 2 MHz through 16 MHz. It is seen that good performance is possible, for several different feed methods, [illegible] structures for 2-16 MHz. Some feeding techniques [illegible] options that were tried were unsuccessful and [illegible] results.

Master of Science in
Electrical Engineering
September 1987

[illegible]

AN APPLICATION OF THE KALMAN FILTER TO THE DEVELOPMENT OF A BOOST PHASE TRACKING FILTER FOR A BALLISTIC MISSILE DEFENSE SYSTEM SIMULATION MODEL

Alfred W. Clark
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1976

This study investigates Kalman filtering theory and applies the theory to the implementation of a ballistic missile boost phase tracking filter. The task of tracking a ballistic missile during the boost phase of its flight using space based sensors is formulated as a state estimation problem. In this context, two filters are developed as candidates to accomplish the missile tracking. The first filter is an Adaptive Kalman Filter which is based on a third order linear approximation to the missile's motion. Noise Parameter Adaptation is incorporated in this filter in order to preclude filter divergence. The second filter is an Extended Kalman Filter which is based on the nonlinear dynamics of the missile's motion.

These filters along with a ballistic missile boost phase trajectory model are developed for incorporation into an existing computer simulation model designed to measure the effectiveness of large scale Ballistic Missile Defense Systems.

Master of Science in
Electrical Engineering
March 1987

Advisor: H.M. Fredricksen
Department of
Mathematics

INVESTIGATION OF CRYSTAL VIDEO RECEIVER PERFORMANCE USING OPERATIONAL SENSITIVITY METHODS

William D. Clingempeel
Captain (P), United States Army
B.S., United States Military Academy, 1976

Crystal Video Receivers with RF pre-amplification are analyzed in terms of operational sensitivity while operating in the presence of Additive White Gaussian Noise. Several theories exist concerning the acceptable method of obtaining the sensitivity of EW receivers. These include the Effective Bandwidth Method, the Gaussian Approximation Method, Classical square-law approach, the Integration Methods, Threshold levels also experience diversity in terms of definition. They include Minimum Discernible Signal (MOS), Targentral Signal (TSS) and Twice Noise Signal (TNS) as well as signal sensitivities required for automated thresholding in modern signal processing systems. Although each of these methods provides radar engineers with design criteria, a more meaningful method with respect to the "operational" parameters of the receiver is available for sensitivity analysis.

Crystal video receiver performance quantified by detector input signal-to-noise (SNR_D), probability of false alarm (*PFA*) and probability of detection (P_d), is obtained experimentally and graphically displayed. Operational Sensitivity is determined from plotted data and compared to theory as well as previous sensitivity methods. Results show that operational sensitivity methods appear to be the most relevant method of determining the performance of modern ESM systems.

Master of Science in
Electrical Engineering
June 1987

Advisor: J.B. Knorr
Department of
Electrical and Computer
Engineering

THREE-DIMENSIONAL IMAGE GENERATION FROM AN AERIAL PHOTOGRAPH

Leland G. Coleman
Lieutenant, United States Navy
B.S., University of Washington, 1980

This thesis concerns developing a program that takes an aerial photograph, and a set of Digital Terrain Elevation Data (DTED) that is defined over the area of the photograph, and generates a synthesized view that represents what a camera would see from a different location. The elevation data points are grouped into triangular panels that are projected to the reference image by three dimensional transformation equations. Shading for the synthesized image is determined from the reference image. The pixels of the reference image that fall within a triangular panel are collected and averaged. When a new observer location is selected, the panels are projected to the new synthesized image plane. A z-buffer approach and a polygon fill algorithm were used to remove hidden surfaces of the synthesized view.

This program is tested on both artificial and real data. Other characteristics and performance measurements of the program are also analyzed here. The quality of the synthesized image from real data was affected by the low resolution of the terrain elevation data, and yielded less desirable results than could be expected of a higher resolution terrain model.

Master of Science in
Electrical Engineering
September 1987

Advisor: C.-H. Lee
Department of
Electrical and Computer
Engineering

ANALYSIS OF AN ACOUSTO-OPTIC WIDEBAND CHANNELIZED RECEIVER

John Campbell Dentler
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1972

This thesis is an analysis of a prototype acousto-optic wideband channelized receiver. A mathematical model for the optical portion of the heterodyning receiver is developed as it applies to this prototype, as well as a systematic approach for optimum optical alignment. The receiver performance is measured with respect to amplitude response, phase response and the ability to perform narrow band frequency excision. The results of the performance tests lead to specific recommendations for improving the prototype as reconstructed at the Naval Postgraduate School and specific additional areas of research to be pursued for improving and analyzing the receiver.

Master of Science in
Electrical Engineering
June 1987

Advisor: J.P. Powers
Department of
Electrical and Computer
Engineering

THEORETICAL AND EXPERIMENTAL INVESTIGATION OF OPTICAL RESOLUTION OF TWO SOURCES OF UNEQUAL INTENSITY PARTIALLY COHERENT LIGHT

Donald K. Dunlap
Lieutenant Commander, United States Navy
B.S., University of Georgia, 1970

Resolution of two sources of light utilizing Rayleigh criteria has several applications in modern technology today. Whether one can distinguish between these two point sources of equal intensity has been the object of many case studies. This particular study examines the ability to resolve two point sources of coherent light (λ = 632.8 nm) using Rayleigh criteria (the peak of one intensity in the first null of the other), and the Sparrow criteria (two points are resolvable if the second derivative of their mutual summation at a point where the two intensity curves cross is less than or equal to zero) with a difference in intensity levels of up to 50db. The quantity L/L_R is the figure of interest and for a difference in intensity of 36db this value was observed to be 5.63, where L was the separation necessary for resolution and L_R was the Rayleigh distance for this experiment.

Master of Science in
Electrical Engineering
June 1987

Advisor: A.E. Fuhs
Space Systems
Academic Group

DESIGN OF THE DIGITAL SATELLITE LINK INTERFACE FOR A SYSTEM THAT DETECTS THE PRECURSORY ELECTROMAGNETIC EMISSIONS ASSOCIATED WITH EARTHQUAKES

Kevin Clifton Ebel
Lieutenant, United States Navy
B.S., University of Florida, 1977

The design, construction and implementation of a computer controlled radio frequency (RF) noise measurement and recording system in the 30.45 MHz and 150.75 MHz range and the interfacing of this system to a digital satellite link is presented. Earthquake prediction by the use of various physical precursors and the specific use of electromagnetic emissions in the RF range as a precursor to future earthquake activity is described.

Master of Science in
Electrical Engineering
December 1986

Advisor: R.W. Adler
Department of
Electrical and Computer
Engineering

IMPLEMENTATION OF THREE SPECKLE REDUCTION FILTERS FOR SOLID PROPELLANT COMBUSTION HOLOGRAMS

Thomas D. Edwards
Captain, United States Marine Corps
B.S., United States Naval Academy, 1977

Speckle noise appears when a diffuse light hologram of a particle field is reconstructed with a laser. The speckle must be reduced so that particles of interest may be counted and sized. This thesis describes speckle and a figure of merit known as the speckle index. Three speckle reduction filters suggested by work in the area of synthetic aperture radars were implemented, discussed and compared. An IBM AT personal computer with Itex/PC image processing software was used for the comparison. The geometric filter performed best overall, but may not be superior in every circumstance.

Master of Science in
Electrical Engineering
December 1986

Advisor: J.P. Powers
Department of
Electrical and Computer
Engineering

CODE DIVISION MULTIPLE ACCESS APPLIED TO FIBER OPTIC DATA TRANSMISSION

Tracey Alan Fischer
Lieutenant, United States Navy
B.S., United States Naval Academy, 1980

The potential for applying Code Division Multiple Access techniques to achieve simultaneous multichannel data transmission over a fiber optic data link is investigated. Initially, a slow speed data link at 1 kilobit per second is examined to verify the ability to perform data correlation on a two data stream system. Finally, a design for a high speed link operating at 166.7 kilobits per second is proposed.

Master of Science in
Electrical Engineering
September 1987

Advisor: J.P. Powers
Department of
Electrical and Computer
Engineering

ENHANCEMENT OF VIDEO IMAGES DEGRADED BY TURBID WATER

Jorge Alberto Franco
Lieutenant, Colombian Navy
B.S., Escuela Naval "Almirante Padilla", 1981

This thesis deals with the enhancement of video images degraded by turbid water viewing conditions. An algorithm by Peli and Lim has been used with some success for enhancement, but it was found to accentuate noise. The thesis examines a combination of the Peli and Lim algorithm with three approaches to enhancement.

First, a Short Space Spectral Subtraction algorithm which performs the restoration in the density domain, using an estimate for the power spectrum of the given data set. The degraded image is divided into many subimages and each subimage is restored separately and then combined.

Next, an algorithm for Image Enhancement and Noise Filtering by Use of Local Statistics, which uses the assumption that the sample mean and variance of a pixel is equal to the local mean and variance of all pixels within a fixed range surrounding it.

Finally, a median filter for noise reduction, where a given pixel of a degraded image is replaced by the median of the pixel values in a window surrounding it.

Combination of the algorithms are applied to degraded images, and the results are compared and discussed, in each case. It was found that noise smoothing can be achieved with the spectral subtraction algorithm, and that the local statistics technique yielded very good contrast enhancement.

Master of Science in
Electrical Engineering
December 1986

Advisor: C.W. Therrien
Department of
Electrical and Computer
Engineering

AN UNDERWATER SEAWATER BATTERY MONITOR AND TELEMETRY RECORDING SYSTEM

Elton Ray Gibson, Jr.
Lieutenant Commander, United States Navy
B.S, Auburn University, 1977

This thesis presents the design, test, and evaluation of the system to remotely monitor and record telemetry data from a one volt seawater battery. The monitoring system provides the ability to monitor the battery located one kilometer from a shore based data recorder. The system consists of a voltage-to-frequency converter which converts the voltage of the battery to a digital signal, the optical transmitter, the fiber optic receiver, a frequency-to-voltage converter which converts the digital signal to an output voltage and a programmable periodic data recording system. The system was deployed and successfully tested in a seawater environment.

Master of Science in
Electrical Engineering
December 1986

Advisor: J.P. Powers
Department of
Electrical and Computer
Engineering

RADIATION CHARACTERISTICS OF SELECTED LONG WIRE ANTENNAS AS A FUNCTION OF GEOMETRY USING COMPUTER MODELING TECHNIQUES

Robert J. Gillespie
Captain, United States Marine Corps
B.S., United States Naval Academy

This thesis, sponsored by the Marine Corps Development and Education Command, Quantico, VA, examines the far field patterns of five high frequency long wire antenna configurations through the use of the Numerical Electromagnetics Code (NEC). Lossy ground and the effects of variations made to these structures are considered. The resulting far field patterns are contained in the appendix.

The antenna configurations vary in length from 1.87 to 17.19 wavelengths and in their height above ground from 0.103 to 0.619 wavelengths. Variations to the antennas include: the use of a ground rod or radial screen attached to the transmitter, terminating the far end of the antenna, and varying the shape of the transmitter from a small box (radio sized) to a large (vehicle sized) configuration.

It is concluded that both the antenna height and length determine the far field geometry, and that the variation to the antenna also impact, though to a lesser degree, on the pattern. Tables of comparative results are provided.

Master of Science in
Electrical Engineering
December 1986

Advisor: R.W. Adler
Department of
Electrical and Computer
Engineering

DESIGN OF AN ADDRESSABLE MEMORY CONTROLLER

Byung Woon Ham
Lieutenant, Republic of Korea Navy
B.S., Korean Naval Academy, 1979
B.S., Seoul National University, 1982

The main memory is an essential subsystem in a Von Neumann type of stored program machine. Because of the speed gap existence between the processor and the main memory, there has been a constant need to improve the main memory to achieve a better throughput. One method is to use a CAM (Content Addressable Memory). It is known as a very powerful facility for searching a particular item from a data array rather than from conventional memory. Investigated in this thesis are the discussion of CAM characteristics, timing analysis, CAM controller design and simulation results. The main results obtained in this thesis are timing characteristics of the CAM system and design considerations of the CAM controller.

Master of Science in
Electrical Engineering
March 1987

Advisor: C-H. Lee
Department of
Electrical and Computer
Engineering

THE SIMULATION AND DESIGN OF A MULTIFREQUENCY QUADRATURE PHASE SHIFT KEYED ACOUSTIC TACTICAL DATA LINK (ATDL) TRANSMITTER

Gregg Thomas Hanold
Lieutenant, United States Navy
B.S., United States Naval Academy, 1979

This report discusses the simulation of an acoustic transmitter designed to transmit multifrequency quadrature phase shift keyed (MF-QPSK) square waves using discrete Fourier analysis. The effects of soft limiting the transmitted signal and undersampling the received signal have on receiver error performan e compared with a sinuisoidal signal. The MF-QPSK square wave signal results in a one to two dB degradation in receive error performance over the sinusoidal model and is suitable for use in the ATDL design. The simulation results are applied to the design of the modulation control and interface circuits necessary to transmit an acoustic message using the MF-QPSK square wave signal. Digital and analog methods of performing signal conditioning required to generate the composite signal are presented. A digital alternative to the multifrequency generation circuits using dedicated digital signal processing integrated circuits is examined to reduce the size and complexity of the ATDL transmitter. This effort represents a successful stage in the development of a prototype transmitter for use in laboratory and short range field testing of the modulation and coding concepts for a proposed acoustic tactical data link.

Master of Science in
Electrical Engineering
December 1986

Advisor: P. Moose
Department of
Electrical and Computer
Engineering

SPECTRAL ANALYSIS OF PSEUDONOISE SEQUENCES

Robert R. Horback
Captain, United States Army
B.S., United States Military Academy, 1976

Pseudorandom binary sequences are investigated in the frequency domain in efforts to identify properties of the sequence when only limited data is available. The purpose of this research is two-fold. The first objective is to determine the feasibility of using autoregressive (AR) spectral estimation techniques to identify periodicities in short segments of noise corrupted PN sequences. The method is found to be ineffective when less than a full period of the data is observed. However, when more than one period of the data is available, periodic behavior can be identified. These results are somewhat better than previous spectral techniques employing the discrete Fourier transform. The second objective is to investigate the relationship between PN sequence spectral characteristics and their underlying structural properties. A method of decimating sequences is presented which reveals structure in the spectral domain. By analyzing this spectral structure information is obtained concerning the underlying sequence.

Master of Science in
Electrical Engineering
December 1986

Advisor: H. Freedman
Department of
Mathematics

ANTI-SKYWAVE AM BROADCAST ANTENNA DESIGN

Sarfraz Hussain
Lieutenant, Pakistani Navy
B.S., N.E.D. Engineering University, Karachi, Pakistan, 1978

This thesis investigates the design of an anti-skywave (ASW) AM broadcast antenna. The parameters of a typical AM broadcast antenna are presented first. Then the design proposed by Richard L. Biby is studied by numerical modeling with the Numerical Electromagnetic Code (NEC). Biby's proposed design involves a ring of short radiators with a conventional monopole operating over finite ground. To analyze the behavior of Biby's proposed ASW antenna, a generic radiator study is conducted to test the ability of different sized radiators to launch the sky wave and the ground wave first as isolated elements and then as closely coupled radiators with cancelling phasing. Finally, some potential candidate structures are proposed for AM broadcast transmission which might achieve the desired characteristics of ground wave enhancement and sky wave suppression.

Master of Science in
Electrical Engineering
March 1987

Advisor: R.W. Adler
Department of
Electrical and Computer
Engineering

AN INVESTIGATION INTO THE POTENTIAL FOR DEVELOPING A SUCCESSFUL LOG-PERIODIC HALF SQUARE ANTENNA WITH DUAL FEED

John Richard Johnsen
Captain, United States Army
B.S., United States Military Academy, 1979

The investigation of a uniformly periodic half square array antenna with dual feed was conducted to provide more information about the potential of the structure as a log-periodic antenna for use by the military. Utilizing the Numerical Electromagnetics Code (NEC), an experimental investigation of the near field characteristics and the far field radiations patterns was conducted on a modeled version of the structure to identify the necessary performance characteristics of a successful log-periodic antenna. In the near field investigation, the Brillouin diagram was used extensively to analyzer performance characteristics generated by the k to β relationship where β was determined from the relative amplitude and phase of the near magnetic field created by the structure under various conditions. The far field radiation patterns were used to check the results of the Brillouin diagram and observe the presence of end and truncation effects.

The results of this study show that the potential of designing a successful log-periodic antenna with half square elements and a dual feed system exist, but further research is needed to establish optimum scaling and gain. The research did verify the dual polarization property, and the possibility of generating high and low angle propagation modes with the use of a dual feed system on the structure.

Master of Science in
Electrical Engineering
December 1986

Advisor: R.W. Adler
Department of
Electrical and Computer
Engineering

A PARALLEL STRUCTURE FOR ON LINE IDENTIFICATION AND ADAPTIVE CONTROL

Yong Hong Kim
Major, Republic of Korea Air Force
B.S., Korean Air Force Academy, Seoul, 1978

In this research study we investigate the possibility of employing parallel computing structures for adaptive identification and control. The identification algorithm is based on recursive least-squares with covariance resetting and block processing technique. It is shown how a parallel processing structure can be obtained by recursively applying Givens Rotation to the data matrix. Due to the regularity of its structure the approach presented is particularly attractive for VLSI implementation.

Master of Science in
Electrical Engineering
March 1987

Advisor: R. Cristi
Department of
Electrical and Computer
Engineering

PERFORMANCE OF DIGITAL COMMUNICATION RECEIVERS OPERATING IN THE PRESENCE OF WHITE GAUSSIAN NONSTATIONARY NOISE

Young Joo Kim
Major, Korean Army
B.S., Korean Military Academy, 1975

The problem of evaluating the performance of digital communication receivers operating in the presence of additive white Gaussian noise (AWGN) and nonstationary AWGN is addressed. A specific model for the nonstationary AWGN is proposed and the corresponding performance of conditional digital communication receivers is derived. Additionally, receivers that are optimum (in minimum probability of error sense) for detecting binary signals in the presence of noise and the nonstationary interference modeled is derived and its performance evaluated. Several examples involving Phase Reversal Keyed modulation and Frequency Shift keyed modulation for various forms of the nonstationary interference are worked out.

Master of Science in
Electrical Engineering
December 1986

Advisor: D.C. Bukofzer
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Engineering

RADIATION HAZARD EVALUATION FOR A HIGH POWER MOBILE ELECTROMAGNETIC RADIATION WEAPON USING THE NUMERICAL ELECTROMAGNETIC CODE

W.J. Koh
Ministry of Defense, Singapore
and
Manchester Institute of Science and Technology

It is well known that classical ECM techniques against an incoming active missile attack is effective only at distances where the jamming signal to missile return signal ratio is high. There is no guarantee that it will work well against all missiles. As the missiles get closer to the target, the effectiveness of classical ECM techniques is reduced [illegible] a short range ECM system that is effective at short range and increases its countermeasure capabilities as the range shrinks. The U.S. Army is considering a high power, mobile ECM system capable of delivering up to 5 GW of peak power at 10 GHz. The narrow beamwidth of this system creates a very high peak power density of the order of [illegible] at 10 Km distance. With this amount of concentration energy is capable of damaging or degrading the high [illegible] causing the missile to lose track of its target.

The purpose of this project is first, to evaluate the various [illegible] must meet a far field peak power density [illegible] on maximum aperture E-field strength. [illegible] and backlobe levels should not cause [illegible] the system. After an array design [illegible] structure is modeled and near field [illegible] the likely radiation hazard zone.

[illegible] of the Numerical Electromagnetic [illegible] the Ohio State University [illegible] to support the code. [illegible] reporting office of the Navy [illegible] and not the far field

requirement and maximum aperture E-field constraint. With the vehicular structure included, the system has a safety margin of more than 27 dB below the recommended radiation hazard limit near ground level.

Master of Science in
Electrical Engineering
March 1987

Advisor: R.W. Adler
Department of
Electrical and Computer
Engineering

GENERATION OF PROGRAMMABLE COMPOSITE OPERATIONAL AMPLIFIERS WITH A CMOS INTEGRATED CIRCUIT

Gary Steffen Kollmorgen
Lieutenant, United States Navy
B.S., United States Naval Academy, 1977

A general approach for extending the useful operating frequencies of linear active networks is the Composite Operational Amplifier. The Composite Operational Amplifier is generated by replacing single operational amplifiers with a network of N operational amplifiers (CNOA). This novel approach is extended to the integrated circuit. Three, 2 operational amplifier (C2OA), composite forms are integrated on to a single chip. Additionally, the resistor network of the composite is constructed to be digitally programmable making the composite operational amplifiers capable of different Q factors. The chip is constructed with 200 transistors, 4 capacitors, and 10 resistors as major components. The overall size of the chip is 136 by 185 mils and is packaged in a 24 pin dual in-line package (DIP).

Master of Science in
Electrical Engineering
December 1986

Advisor: S. Michael
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Engineering

DESIGN OF A SOLID STATE BUBBLE MEMORY RECORDER FOR SPACE APPLICATIONS AND A COMPARISON STUDY OF TWO EXISTING BUBBLE MEMORY DEVICES

Brian Paul Kosinski
Lieutenant, United States Navy
B.S., United States Naval Academy, 1980

Frank Dana Mazur
Captain, United States Marine Corps
B.S., State University of New York at Brockport, 1979

A solid state bubble memory recorder offers increased reliability over mechanical recorders presently used on board spacecraft. In the past, limiting factors of low data rate, high power consumption and low storage density for large bubble memory systems have precluded their use in space. This thesis discusses a prototype that has shown a high storage density, high data rate and low power consumption. Enhancements to the design for increased data rate and reliability are examined. Additionally, Intel and Hitachi bubble memory products are compared for their suitability in large capacity system applications. Obstacles to bubble memory, their solutions and future directions in bubble memory are presented.

Master of Science in
Electrical Engineering
September 1987

Advisor: R. Panholzer
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Electrical and Computer
Engineering

COMPARISON OF MODEL-BASED SEGMENTATION ALGORITHMS FOR COLOR IMAGES

Timur Kupeli
Lieutenant JG, Turkish Navy
B.S., Turkish Naval Academy, 1980

The objective of this thesis is to develop segmentation methods for multichannel and single channel images, and compare these methods. The segmentation algorithms are based on a linear model for the image textures and on inverse filtering to estimate the image textures and their regions. Two specific methods are compared: 1) A multichannel filtering algorithm that simultaneously models the three separate signals representing the intensity of red, green, and blue as a function of spatial position and 2) A single channel model applied to a combined image resulting from performing a Karhunen-Loeve transformation on the three signal components. Results of the multichannel image segmentation and the Karhunen-Loeve transformed one-channel image segmentation are presented and compared.

Master of Science in
Electrical Engineering
March 1987

Advisor: C.W. Therrien
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Electrical and Computer
Engineering

COORDINATED STEERING OF A SURFACE SHIP

Sang Sik Lee
Lieutenant Commander, Republic of Korea Navy
B.S., Korean Naval Academy, 1978
B.S., Seoul National University, 198

The conventional approach to ship steering is to regard the ... a single input, single output system without ... interaction between speed, yaw and roll. This approach ... successful application, particularly in conventional vessels ... amount of cross-coupling is normally slight. But, as a result of ... maneuvering, the modern warship suffers ... because of large control surfaces, high speed and ... Consequently, the adoption of a multivariable approach to ship ... would appear to be more suited for the design of a steering ... system.

This thesis describes the results of a simulation ... compensator design to suppress the undesirable cross-coupling ... between speed, yaw and roll.

Simulation studies using DSL and function minimization ... basis for accomplishing the design.

Simulation results presented indicate that the adoption of ... input, multi-output approach would result in a significant improvement ... the combined steering and stabilization problem of a warship.

... Science in
Electrical Engineering
September 1987

...
...
Engineering

AN AUTOPILOT DESIGN FOR THE UNITED STATES MARINE CORPS' AIRBORNE REMOTELY OPERATED DEVICE

Scot D. Lloyd
Captain, United States Marine Corps
B.S., United States Naval Academy, 1980

An autopilot for the U.S. Marine Corps' ducted fan hovercraft is designed using optimal control theory. Sincle input controllers are designed to govern the vehicles's roll rate and altitude rate. The gyroscopic coupling between the vehicles's pitch and yaw dynamics is examined and a multi-input controller is designed. A computer program called OPTCON is developed to generate optimal feedback control gains by solving the discrete matrix Riccati equation. This program is for use on portable or home IBM compatible computers. Graphic plotting of the time-varying gains and of the system time response is available for both monitor and hardcopy output.

Master of Science in
Electrical Engineering
September 1987

Advisor: H.A. Titus
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Electrical and Computer
Engineering

A TECHNIQUE FOR IMPROVING ACTIVE NETWORK PERFORMANCE IN A RADIATION ENVIRONMENT WITHOUT THE USE OF HARDENED DEVICES

David Michael Lohr
Major, United States Marine Corps
M.S., United States Naval Academy, 1968

This thesis examines and discusses the use of Composite Operational Amplifiers to reduce the sensitivity of active circuits to the degraded performance of individual devices after exposure to radiation damage. Composite operational amplifiers, known to provide enhanced stability, decreased sensitivity to circuit element variations and an extended operation frequency range, can be used to reduce circuit performance dependence on individual device parameter degradation under radiation without the use of radiation hardened devices. If radiation hardened devices are used in the composite operational amplifiers, it should be possible to achieve even higher levels of insensitivity to radiation. The composite operational amplifier is the only generalized method known to provide radiation damage protection in this manner for active linear networks.

Master of Science in
Electrical Engineering
March 1987

Advisor: S. Michael
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Electrical and Computer
Engineering

REPRESENTATION OF NONSTATIONARY NARROWBAND RANDOM PROCESSES AND THEIR APPLICATION AND EFFECTIVENESS AS JAMMING SIGNALS IN SPREAD SPECTRUM COMMUNICATIONS SYSTEMS

Kah Meng Low
Ministry of Defense, Singapore
Diplome d'Ingenieur, ESME, Paris, 1980

A representation of nonstationary narrowband random processes in terms of nonstationary quadrature components is proposed in a form analogous to that used to represent wide sense stationary narrowband random processes. The representation is then applied to a specific case in which the nonstationary narrowband random process is generated by the product of white noise and a deterministic periodic signal and then is processed by a narrowband filter. This representation is used in the modeling of a bi-level pulsed noise jammer which is assumed to be present in a communication channel. The effect of such a jammer on a direct sequence, binary phase shift keyed (DS-BPSK) spread spectrum communication receiver is evaluated and characterized in terms of the error rate performance of the receiver. Families of performance curves are plotted to demonstrate the effect of various parameters, namely signal-to-noise ratio, jammer power to signal power ratio, and processing gain, on the error rate of the complete spread spectrum receiver. The analysis carried out differentiates between two cases, namely fast and slow jammers. However, the analytical tools developed make it possible to consider either one of the two cases without resorting to [illegible] as has been done in the past.

[illegible] Science in Electrical Engineering

Advisor: D. Bukofzer
Department of Electrical and Computer Engineering

A STUDY OF LF TOP-LOADED MONOPOLE ANTENNAS USING NUMERICAL MODELING TECHNIQUES: COMPARISON TO SCALED TEST MODEL MEASUREMENTS

Riaz Mahmud
Lieutenant Commander, Pakistani Navy
B.E., University of Karachi, Pakistan, 1975

This thesis studies the electrical properties of a low frequency top-loaded monopole antenna. Several configurations of the antenna are developed using numerical modeling techniques. The electrical properties are calculated and compared with a set of measurements of a scaled test model. The results are presented in the form of design curves and comparison tables.

It is important for the U.S. Navy to have a reliable VLF and LF communication systems for worldwide coverage. A need exists to increase the power handling capacity and the bandwidth of the existing VLF-LF antenna systems. This study provides the validation of numerical modeling techniques for future simulation of VLF antennas with corona rings. This will permit the design of improvements in the power handling capability by extending the onset of corona.

Master of Science in
Electrical Engineering
March 1987

Advisor: R.W. Adler
Department of
Electrical and Computer
Engineering

TECHNOLOGY UPGRADE OF A SILICON COMPILER

Eva G. Malagon
Captain, United States Marine Corps
B.S., Illinois Institute of Technology, 1978

A 1.5 micron dual layer metal scaleable CMOS standard cell library is inserted into the NMOS based silicon compiler, MacPitts. The MacPitts data-path consisting of a collection of registers and arithmetic/logic units (organelles) and sequenced by a three phase clock was modified to accept two phase clocking and SCMOS organelles.

Master of Science in
Electrical Engineering
June 1987

Advisor: D. Kirk
Department of
Electrical and Computer
Engineering

ON THE RELATIVE OBSERVABILITY OF A LINEAR SYSTEM

Antonio Jose Gameiro Marques
Lieutenant, Portuguese Navy
B.S., Portuguese Naval Academy, 1981

The problem of identification of essential states is considered, leading to the definition of the concept of relative observability. Two analytical methods and two graphical methods to evaluate the relative degree of observability of a linear time-invariant system are presented and three algorithms are derived to rapidly evaluate the relative degree of observability for high order systems. Numerical examples are tested using a computer program. An approach for improving the degree of observability of a specific state variable is proposed for the single output regulator problem, multi-output servo and regulator problems. The improvement algorithm is tested on a single output regulator problem.

Master of Science in
Electrical Engineering
December 1986

Advisor: D.E. Kirk
Department of
Electrical and Computer
Engineering

AN APPLICATION OF A GRADIENT RELAXATION METHOD TO NOISY INFRARED IMAGES

James Chauncy McDougall
Captain, United States Army
B.S., University of Texas at El Paso, 1980

Image segmentation is an essential preliminary step in automatic pictorial pattern recognition and scene analysis problems. The objective of segmentation techniques is to partition an image into regions or components. The purpose of this thesis is to analyze a segmentation technique called gradient relaxation. The gradient relaxation method is a viable method in segmenting objects within an image. The gradient relaxation technique is applicable to images having unimodal distributions. This method is applied to noisy infrared images in an attempt to detect and classify the target. The method allows for an easy selection of a threshold value which may be required for other types of image processing on the image. The main issue is to examine the effectiveness of this technique applied to noisy infrared images from uncooled focal plane array sensor having unimodal distributions. The technique was able to extract the target in the image, producing a homogeneous and uniform region for most of the cases studied. A target which was fragmented into several parts because of the noise is not detectable. The technique could be implemented in hardware and applied to the inputs of a classification system for detectable objects in noisy infrared images.

Master of Science in
Electrical Engineering
June 1987

Advisor: C.-H. Lee
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Engineering

INVESTIGATION OF DOPPLER SHIFT ON HIGH FREQUENCY [illegible]
ORIGINATING FROM THE ARCTIC [illegible]

Monty A. McDowell
Lieutenant, United States Navy
B.S., University of Washington, 1974

During the period 9-23 April 1985, the Naval Ocean [illegible] San Diego conducted a High Frequency propagation Arctic Polar Experiment. An HF transmitter was placed on the Polar Cap and was programmed to periodically transmit at seven different HF frequencies. Three receiving sites monitored the signals and MPS analyzed [illegible] Doppler Shift and its cause. The Doppler Shift generally followed the magnetic indices, Kp, but other factors were involved.

Master of Science in
Electrical Engineering
December 1986

[illegible]

A TRANSFER FUNCTION APPROACH TO SCALAR WAVE PROPAGATION IN LOSSY AND LOSSLESS MEDIA

Timothy D. Merrill
Lieutenant, United States Navy
B.S., Florida Southern College, 1980

This thesis investigates the feasibility of microcomputer based simulation of scalar wave propagation in various media. Models for lossless media and media with a loss coefficient which is linear in frequency have been coded in FORTRAN and simulated successfully on a commercially available micro-computer, with simulation times less than thirty minutes. The spatial impulse responses for classical problems using square and circular-piston excitation are presented graphically, along with new, innovative, spatial excitation source shapes.

Master of Science in
Electrical Engineering
March 1987

Advisor: J.P. Powers
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Electrical and Computer
Engineering

EVALUATION OF EMI/RFI TECHNIQUES USED TO CORRECT ELECTROMAGNETIC INCOMPATIBILITY IN THE ENLARGER DIGITALLY CONTROLLED RF DISTRIBUTION SYSTEM

Paul Richard Montgomery
Lieutenant, United States Navy
B.S., Auburn University, 1978

Initial testing of the ENLARGER system revealed several problems regarding electromagnetic compatibility. Several modifications to remedy the problems were incorporated in the system prior to delivery. This thesis reports on post modification testing of the system and evaluates the electromagnetic interference/radio frequency interference reduction techniques employed and their impact on system performance.

Master of Science in
Electrical Engineering
June 1987

Advisor: S. Jauregui
Department of
Electrical and Computer
Engineering

CMOS CELL LIBRARY FOR A SILICON COMPILER

Anthony Joseph Mullarky
Lieutenant, United States Navy
B.S., University of Florida, 1980

A standard Complementary Metal Oxide Silicon (CMOS) library for use in Very Large Scale Integration (VLSI) circuits was developed. The development includes investigation of the various clocking strategies upon which the optimum clocking strategy, pseudo-two phase, was selected for all clocked cells in the library. The cells were then designed using the pseudo-two phase clocking strategy. A primary objective is to provide cells for use in converting the MACPITTS silicon compiler from n-channel Metal Oxide Silicon (NMOS) to CMOS technology. Cell layouts, timing data, schematics and logic tables for each cell are provided.

Master of Science in
Electrical Engineering
March 1987

Advisor: D.E. Kirk
Department of
Electrical and Computer
Engineering

AN ANALYSIS OF THE ENLARGER RF SWITCHING SYSTEM

Allan Ray Osborn
Captain, United States Army
B.S., United States Military Academy, 1976

Using a scanning spectrum analyzer and a 3-axis display the effects of internal electromagnetic interference in the RF Enlarger Switching System is presented and analyzed. The effects of this interference on the WARS Automatic SIGINT receiving system is analyzed, and the impact described quantitatively.

Master of Science in
Electrical Engineering
December 1986

Advisor: S. Jauregui
Department of
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Engineering

THE NEAR-MINIMUM TIME CONTROL OF A ROBOT ARM

Kemal Ozaslan
Lieutenant JG, Turkish Navy
B.S., Turkish Naval Academy, 1980

The feasibility of controlling a robot manipulator in minimum time with an adaptive computer simulation model is investigated. Updating of model parameters; position, velocity and motor gain constant are accomplished from motor position only thereby eliminating the requirement for a tachometer. The interactive nonlinear dynamics of the system such as Coriolis, centrifugal, Centripetal forces, Actuator dynamics and Gravity effects are incorporated. A two [illegible] robot manipulator is chosen as the simulation model.

Master of Science in
Electrical Engineering
December 1986

Advisor: G.J. Thaler
Department of
Electrical and Computer
Engineering

A SWITCHED-CAPACITOR PHASE-LOCKED-LOOP

Enis Ozgunay
Lieutenant JG, Turkish Navy
B.S., Turkish Naval Academy, 1980

In this research the thesis objective was to replace the resistors of an RC network resulting in a sampled data equivalent network. The switched capacitor resistors are exactly equivalent to resistors by themselves; however, such an equivalence may not hold true when the realizations are used to replace resistors of an RC active network. During the research, firstly, the types of replacement methods and their properties were discussed. Furthermore, the main SC building blocks were presented and a second order switched-capacitor phase-locked loop was implemented in hardware.

Master of Science in
Electrical Engineering
March 1987

Advisor: S. Michael
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Electrical and Computer
Engineering

REQUIREMENTS ANALYSIS FOR THE OPERATION OF A REAL-TIME WARFARE SIMULATION OVER A PACKET SWITCHED COMPUTER NETWORK

Jeffrey Lloyd Paige
Lieutenant, United States Navy
B.S., Ohio State University, 1980

This thesis investigates the problems associated with operating a real-time warfare simulation system over an ARPANET-based packet switched network. The network throughput requirements of the simulation are determined from measurements taken over a local area network. The performance of the packet switched network is analyzed through the use of a switching node model, resulting in a graph of application throughput as a function of the internal network traffic. The throughput requirements are compared to this function, and maximum acceptable levels of internal traffic are determined. The effects of other aspects of packet switching are discussed including traffic dynamics, packet routing, and flow control. The results suggest that it may be possible to conduct a very restricted warfare simulation over this network. A better networking solution may be to use dedicated network resources instead of packet switching.

Master of Science in
Electrical Engineering
December 1986

Advisor: M.L. Cotton
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MULTIFREQUENCY UNIPOLE ANTENNA DESIGNS USING THE NUMERICAL ELECTROMAGNETICS CODE

Nicolaos Paleologos
Lieutenant, Hellenic Navy
B.S., Hellenic Naval Academy, 1977

The folded unipole antenna has recently appeared as a commercially available alternative to conventional insulated-base monopoles in standard broadcast applications. A folded unipole antenna has significant advantages over both series fed vertical and top-loaded antennas. This thesis investigates using a computer numerical model to obtain the input impedance of a 72 meter folded unipole antenna, with three fold wires. The design of a multi-frequency folded unipole antenna is demonstrated for 1.380 and 1.530 Mhz. Also presented are designs for 60^{o}, 90^{o}, 135^{o}, 180^{o}, 225^{o} folded unipole antennas for a frequency of 1 Mhz, with an input resistance of 50 ohms. Finally, designs are shown for 90^{o} monopole and 90^{o} unipole antennas at 1 Mhz.

Master of Science in
Electrical Engineering
December 1986

Advisor: R.W. Adler
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Engineering

AN ADAPTIVE LATTICE ALGORITHM FOR SPECTRAL LINE ESTIMATION

Ill Koo Park
Lieutenant Commander, Republic of Korea Navy
B.S., Republic of Korea Naval Academy, 1978
B.S., Republic of Korea Yonsei University, 1983

In this thesis we derive a lattice structure to realize linear phase transfer functions and develop an adaptive algorithm for continuously updating the lattice reflection coefficients. The lattice structure is considered because of its superior finite wordlength performance compared to transversal structures. The adaptive lattice algorithm developed in this thesis has been applied to estimate the sinusoidal frequencies as part of Prony's method. Results of computer simulation supporting the theory are reported.

Master of Science in
Electrical Engineering
June 1987

Advisor: M. Tummala
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RUDDER ROLL STABILIZATION

Pal Man Park
Lieutenant, Republic of Korea Navy
B.S., Republic of Korea Naval Academy, 1979

In recent years, the concept of using the rudder for roll stabilization of a ship in a seaway has been investigated with good results. Such designs have been used to solve the roll problem of a ship on steady course while compensating for yaw perturbations.

To complete a review of the possible design strategies to meet the specifications for this model, the effects of the feedback gains on rolling and yawing are studied in detail. Roll angle and roll rate feedback are used to control the rudder.

Roll stabilization with the rudder in various sinusoidal sea states is studied by simulation on the IBM digital computer. The model used is based on the data obtained from a typical naval ship. The Root Locus method is used to design the feedback gains. The computer simulation programs are written in Digital Simulation Language (DSL/VS), are plotted as data in DISSPLA and include the effects of rudder servo nonlinearities, which seriously restrict the ability of the rudder to reduce roll.

Master of Science in
Electrical Engineering
December 1986

Advisor: G.J. Thaler
Department of
Electrical and Computer
Engineering

INVESTIGATION OF DESIGN CONSIDERATIONS FOR TELEMETRY, TRACKING AND COMMAND (TT&C) ANTENNA SYSTEM ON NAVAL POSTGRADUATE SCHOOL ORION MINI-SATELLITE

David L. Peters
Captain, United States Army
B.S., United States Military Academy, 1980

This thesis investigates design requirements for the telemetry, tracking, and command (TT&C) antenna system on the proposed Naval Postgraduate School Orion mini-satellite. Initial design criteria were developed by examination of the satellite itself, including launch vehicles, orbital profiles, and ground interfaces. After consideration of these design constraints, a review of commercially available TT&C antennas was conducted to determine compatibility with Orion, culminating in recommendation of the conical log-spiral as the primary candidate for use on the spacecraft. The conical log-spiral is a low cost, space-qualified antenna capable of providing broadband omni-directional circularly polarized radiation from space, while fulfilling pattern coverage, space-ground link power margin, and transmitter-receiver isolation requirements for the Orion mini-satellite.

Master of Science in
Electrical Engineering
September 1987

Advisor: R.W. Adler
Department of
Electrical and Computer
Engineering

AUTONOMOUS SATELLITE NAVIGATION SYSTEM USING THE GLOBAL POSITIONING SYSTEM

Steven E. Petersen
Lieutenant, United States Navy
B.S., United States Naval Academy, 1978

Data collected from space resources is expected to increase at least three orders of magnitude by the year 2000. This increase will severely overload an already overworked ground based computer system. This paper presents a way to provide satellites with an autonomous stationkeeping/navigation capability to decrease the load on ground control computers. It is proposed that a Global Positioning System receiver implemented in VLSI technology be used for satellite position, velocity, and timing information. An onboard microprocesser will compare the actual position of the satellite with the desired position. If the satellite is outside a specified operational window, a minimum fuel transfer is calculated and automatically executed. A system such as this will give a satellite the ability to navigate autonomously. This capability will permit sensor data to be annotated with location and time prior to transmission to earth which will alleviate the current load on ground based computers and make the sensor data available more rapidly than possible today.

Master of Science in
Electrical Engineering
March 1987

Advisor: F.W. Terman
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Electrical and Computer
Engineering

EVALUATION OF DEVICE FIGURE OF MERIT IN MICROWAVE SWITCHING CIRCUIT DESIGN

Pitak Pibultip
Lieutenant, Royal Thai Navy
B.S., Royal Thai Naval Academy, 1978

In microwave switching circuit design, a switching-semiconductor figure of merit can be defined and used as the measure of device switching effectiveness. In this thesis research switching-semiconductor figures of merit were applied to general switching circuits. Computer-aided circuit analysis program (Touchstone), and a Fortran program were used for the computation of switching circuit performance.

Master of Science in
Electrical Engineering
June 1987

Advisor: H.A. Atwater
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Engineering

IMPLEMENTATION OF AN FIR [illegible]
USING A BIT-SLICE PROCESSOR

Darrel Wayne Purdy
Lieutenant, United States Navy
B.S., University of Oklahoma, 1980

A 13th order FIR filter for digital image processing is implemented in microcode using the Am29203 bit-slice [illegible] ADVANCED MICRO DEVICES. To meet this requirement, the filter is first implemented in Fortran. Then the results of both implementations are used for timing comparisons. Although non-optimal bit-slice devices are used on the evaluation board, a time of 11 microseconds is achieved, as compared to the 100 microseconds achieved in the Fortran implementation. Theoretical estimates of 2.65 microseconds and 0.78 microseconds are obtained for high speed Am2900 bit-slice devices and VITESSE [illegible] bit-slice devices respectively. It is shown [illegible] learning period for bit-slice devices is high, once learned a skilful bit-slice designer can implement a simple filter design in minimal time with significant results in time savings.

A brief discussion of bit-slice techniques is presented and an argument is proposed as to whether the bit-slice is a methodology or a device. The most recent commercial introduction of Gallium Arsenide devices is included in the discussion.

In addition to the implementation of the f[illegible] its characteristics as well as its equation representations are presented. A discussion about noise and quantization effects using this digital filter is also presented.

Finally, two appendices are included. The first appendix presents the use of the commercial software SMARTCOM II wit[illegible] the user terminal for the monitor system of the A[illegible]. The second appendix presents a detailed look at the [illegible] used to implement the filter.

Master of Science in
Electrical Engineering
June 1987

Advisor: C.-H. Lee
Department of
Electrical and Computer
Engineering

A SURVEY OF SHIPBOARD COMBAT SURVIVABLE VHF/UHF ANTENNAS

Henry Kevin Purvis
Lieutenant, United States Navy
B-EET, Southern Technical Institute, 1979

Antennas on modern ships protrude from the structure and are quite vulnerable to combat damage or inclement weather. Conformal antennas are needed to allow a ship to communicate after sustaining battle damage or heavy weather.

This thesis investigates three conformal antennas: a microstrip, a slot, and a combination monopole and slot. The principle of operation for each is discussed along with computer model results obtained from the Numerical Electromagnetics Code-Method of Moments and Basic Scattering Code.

Master of Science in
Electrical Engineering
September 1987

Advisor: R.W. Adler
Department of
Electrical and Computer
Engineering

A CONCEPTUAL DESIGN OF AN INERTIAL NAVIGATION SYSTEM FOR AN AUTONOMOUS SUBMERSIBLE TESTBED VEHICLE

Rex G. Putnam, Jr.
Lieutenant, United States Navy
B.S., United States Naval Academy, 1981

The autonomous submersile testbed vehicle is arguably the single most useful tool available to the submarine designer for designing modern technologically advanced submarines. The submarine's need for advancement and breakthrough capabilities has never been more critical than the present. The autonomous submersible testbed vehicle is designed to provide those advancements and breakthroughs to the United States Navy. A likely envisionment of the autonomous submersible vehicle is derived.

The design of the autonomous submarine depends heavily on the inertial navigation system that is used to control it. Indeed, it can be considered as the brain that forms the basis for operating the entire vehicle. Recent advancements in gyro technology and computer hardware have made a small, reliable, and inexpensive inertial navigation system possible. These new technologies are examined and an evaluation made as to their application to this type of vehicle. Industry's ability to manufacture these new gyros is surveyed, and actual data from manufacturers are examined.

Finally, a conceptual design of an inertial navigation system for the autonomous submersible is presented along with conclusions and recommendations as to the current effects of gyro technology on the inertial navigation design. The conclusions and recommendations are considered to have importance in other applications as well as the autonomous submersible vehicle design.

Master of Science in
Electrical Engineering
September 1987

Advisor: R. Cristi
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Electrical and Computer
Engineering

ESTIMATION AND MODELING OF SIGNAL-TO-NOISE PERFORMANCE IN A TELEMETRY RECEPTION SYSTEM

Michael J. Quinn
Lieutenant Commander, United States Navy
B.A., University of Rochester, 1974
M.S. Troy State University, 1981

This paper describes the results of one part of a Naval Postgraduate School research project to develop a method for selecting among or combining several high-data-rate digital signals received on geographically separated radio telemetry receivers. The system used at the Pacific Missile Test Center for reception of radio telemetry data from missiles and aircraft is examined with regard to real-time estimation of signal-to-noise ratio. A mathematical model and computer simulation of a subsystem used for demodulation of frequency modulated Pulse Code Modulation (PCM/FM) are presented. The characteristics of the power spectral density of the simulated video output of the demodulator are analyzed and are shown to be related to the Intermediate Frequency (IF) signal-to-noise ratio.

Master of Science in
Electrical Engineering
March 1987

Advisor: P.H. Moose
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Electrical and Computer
Engineering

IMAGE TEXTURE GENERATION USING AUTOREGRESSIVE INTEGRATED MOVING AVERAGE (ARIMA) MODELS

Steven Clifford Rathmanner
Lieutenant, United States Navy
B.S., Florida State University, 1979

This thesis involves investigation of linear filtering models as a means of generating texture in images. Various autoregressive filter models are used to generate various textures, and the results are analyzed to determine relationships between filter parameters and texture characteristics. A two-dimensional counterpart to the autoregressive integrated moving average (ARIMA) model from one-dimensional time series analysis theory is developed and tested for texture modeling applications. All these models are driven by white noise, and to the extent that real images can be reproduced this way, advantages in image texture transmission could be realized. Results of this work indicate that the purely autoregressive models work well for some types of image textures, but that for the textures studied the ARIMA model is not particularly suitable.

Master of Science in
Electrical Engineering
March 1987

Advisor: C.W. Therrien
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Electrical and Computer
Engineering

CORRECTION OF INERTIAL NAVIGATION SYSTEM DRIFT ERRORS FOR AN AUTONOMOUS LAND VEHICLE USING OPTICAL RADAR TERRAIN DATA

Mark Douglas Rickenbach
Lieutenant Commander, United States Navy
B.S., University of Idaho, 1974

[illegible] approach that some type of vision system capable of [illegible] an important attribute of a driverless [illegible] providing this capability is to use active [illegible] obtained by sonar or radar. This thesis is [illegible] simulation study of an approach to data [illegible] obtained from an optical radar system using a [illegible] The vehicle studied is modeled after the SRI [illegible] Vehicle Suspension Vehicle walking machine [illegible] University. Both the problem of registering [illegible] vehicle motion and of optimally [illegible] accurate terrain elevation data are [illegible]

[illegible]
[illegible]
[illegible]
[illegible]

PULSE WIDTH MODULATOR CONTROLLER DESIGN FOR A BRUSHLESS DC MOTOR POSITION SERVO

Vincent S. Rossitto
Lieutenant, United States Navy
B.S., United States Naval Academy, 1978

Recent interest in positioning cruise missile flight control surfaces using electromechanical actuation has prompted a detailed study of brushless dc motor performance in such an application. While the superior response characteristics of these electronically commutated motors are particularly well suited to unidirectional velocity drives, destructive electrical transients associated with rotational reversals of the motor limit its positioning performance. This thesis involves computer aided design of a functionally robust brushless dc motor position controller using pulse width modulation. Lumped parameter model simulation and phase plane analysis were performed to attain a preliminary parametric design of the controller. Comprehensive electrical and mechanical analyses were conducted using detailed model simulation to arrive at the final design by parametric optimization. FORTRAN source code listings for all simulations discussed in this thesis are appended and were run on a personal computer.

Master of Science in
Electrical Engineering
June 1987

Advisor: A. Gerba
Department of
Electrical and Computer
Engineering

DETECTION AND ANALYSIS OF DIRECT SEQUENCE SPREAD SPECTRUM SIGNALS

Charles L. Rowe, Jr.
Lieutenant Commander, United States Navy
B.S., Texas A & M University, 1972

The detection and analysis of BPSK direct sequence (DS) spread spectrum (SS) communication signals is investigated, with emphasis on the use of spectral correlation techniques for the detection and analysis task. The various types of SS communications are reviewed, with primary focus on direct sequence signals. Conventional methods for detection and analysis of DS SS communications are briefly discussed. The theory of spectral correlation is introduced, and the capabilities of software implementing this theory is studied. The deleterious effects of narrow band BPSK signals on spectral correlation processing is shown, as is the removal of these interfering signals by IIR digital notch filtering.

Master of Science in
Electrical Engineering
September 1987

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

IMAGE INTERPRETATION USING AN EXPERT SYSTEM

Diego L. Rueda
Lieutenant, Ecuadorean Navy
B.S., Escuela Superior Naval, Ecuador, 1976

The purpose of this thesis is to study and enhance an automatic image feature analysis system for aerial photographs in order to detect changes with respect to a model defined in a knowledge-base. The system interpretation must resemble some intelligent human interpretation and by its use should be able to reduce the manual effort in processing large volumes of data.

This computerized rule-based system is integrated by using Prolog and Image processing operators, which run in a multiprocess environment and communicate through a blackboard storage. The Prolog expert provides the model through a collection of certainty rules and facts, and uses its "inference engine" capability to combine different measurements. They are obtained as the evidence necessary to deduce a conclusion about the condition of a feature.

The system must be able to deal with uncertainties generated by noise in the images, variability of imaging conditions, and possible errors in the model. The main task is the formulation of interpretation rules so that the expert system can mimic the "reasoning" effectively from the domain principles and yield high confidence results.

A system that satisfies some of the stated specifications has already been developed by Professor Chin-Hwa Lee and Hsi-Jian Lee. This thesis as the continuation of the investigation process addresses the following objectives:

1. Analyze in depth all the Fortran programs in order to detect possible errors in the Image Processing operators (The main modules are: Shadow Processing, Model guided Split and Merge, Region Selection and Model Projection); additionally the documentation of all the programs should be generated.)
2. Expand the Rule Data base and Facts Data base to enhance the actual capabilities of the expert interpretation system.

3. Measure the CPU time for each of the subprocesses in order to determine the time consuming parts of the system. New approaches to improve those parts should be considered and developed.

4. Apply the system to different kinds of images to evaluate the system response to several illumination conditions of different image detail.

5. Develop and incorporate reflectance modeling capabilities to make the system more accurate.

Master of Science in
Electrical Engineering
December 1986

Advisor: C.-H. Lee
Department of
Electrical and Computer
Engineering

DESIGN AND IMPLEMENTATION OF A FIBER OPTIC RS232 LINK

James William Ryan
Lieutenant, United States Navy
B.S., Salem State College, 1981

This thesis investigates the feasibility of using a wideband fiber optic link to implement a RS232 data link. The [illegible] a fiber optic link is a viable replacement. It offers a bandwidth [illegible] MHz, 250 times that of a RS232 data link. This [illegible] implemented over a distance of [illegible] the present RS232 link. It also offers the benefits of [illegible] savings and is comparable to devices [illegible] substantial cost savings.

PASSIVE ADAPTIVE TRACKING USING MULTIPLE KALMAN FILTERS

Rigoberto Saez Ortiz
Lieutenant, United States Navy
B.S., United States Naval Academy, 1980

A method is presented for passive adaptive tracking using multiple Kalman filters. The filters are combined using a Bayesian weighting algorithm. The adaptive tracker is integrated in a passive multipath time-delay measurement algorithm assuming a homogeneous medium. A three dimensional maneuvering target estimator, in the cylindrical coordinate system is developed, and its performance evaluated.

Master of Science in
Electrical Engineering
March 1987

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

IMPLEMENTATION OF AN IBM-PC/AT AS A GPIB CONTROLLER

George H. Self, Jr.
Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1979

This thesis integrates an IBM-PC/AT microcomputer with five pieces of standard laboratory test equipment via a GPIB. A menu-driven program prompts the user to operate the test equipment from the keyboard on the PC. The user can perform a wide variety of tasks with this program and the program can be modified to perform other specific tasks desired by the user.

Two subroutines were developed to demonstrate the utility of this system and the use of the programming guidelines that were developed. A subroutine to collect waveform data from a digital oscilloscope and to plot the waveform with a plotter and a subroutine to generate a Bode plot of the transfer function for a two port network were developed.

Master of Science in
Electrical Engineering
December 1986

Advisor: J.P. Powers
Department of
Electrical and Computer
Engineering

SIGNAL-TO-NOISE RATIO AND BIT SHIFT ESTIMATES OF PSK TELEMETRY SIGNALS

John M. Senyard
Lieutenant JG, United States Coast Guard
B.S., United States Coast Guard Academy, 1983

The work described in this thesis is part of a continuing research project conducted at the Naval Postgraduate School for the Pacific Missile Test Center at Pt. Mugu, California. The demodulation of PSK telemetry signals, [illegible] such as that performed in the Microdyne model 1200-SRC telemetry receiver used by PMTC, has been modeled using FORTRAN on the mainframe computer at NPS. Using this model, a method for estimating intermediate frequency signal-to-noise ratio (SNR) at the input of the demodulator given from its output has been established.

In addition, work has been performed to better understand the [illegible] between two signals having the same bit rate and modulation but arriving via different [illegible] paths.

THE DESIGN AND TESTING OF AN ANALOG OPTICAL COMMUNICATION LINK CAPABLE OF THE SIMULTANEOUS TRANSMISSION OF FOUR FREQUENCY DIVISION MULTIPLEXED AUDIO SIGNALS

Michael Steven Silvers
Lieutenant, United States Naval Reserve
B.S., Auburn University, 1977

A Communication Link featuring the analog transmission of four simultaneous Frequency Division Multiplexed audio signals, via optical means, was designed, constructed, and experimentally tested. Low cost and common components were utilized throughout the system. Active filter techniques were employed and extended to uncommonly high frequencies. Fidelity of the recovered waveforms proved to be exceptionally high with crosstalk between channels of less than -50 dB.

Master of Science in
Electrical Engineering
June 1987

Advisor: J.P. Powers
Department of
Electrical and Computer
Engineering

REAL TIME PROGRAMMING OF A ROBOT

Paulo R. Souza
Captain, Brazilian Air Force
B.S., Instituto Tecnologico de Aeronautica, Brazil, 1979

Two difficulties that arise in controlling a robot arm (plant) are the changes in inertia and the lack of a velocity feedback. The inertia of the arm varies when the robot picks up or releases a load and the velocity would need a tachometer to be measured (expensive and not practical). One way to overcome those problems is to use an autoadaptive model to represent the plant. If the model "follows" the plant transfer function and both have the same input, the model can have velocity feedback and the effects will be reflected in the plant. The solution presented above was investigated and simulated in DSL by Kenneth R. Wilstrom, in his thesis from NPS in September of 1986. In the present research, a hardware and assembly software was designed and implemented based on the same structure mentioned in that thesis. The block diagram and autoadaptive algorithm were slightly modified and the plant was simulated in a dedicated analog computer. Two transfer functions were tested in the analog plant: a disk drive motor and a robot motor.

Master of Science in
Electrical Engineering
December 1986

Advisor: G.J. Thaler
Department of
Electrical and Computer
Engineering

FORWARD-BIASED CURRENT ANNEALING OF RADIATION DAMAGED GALLIUM ARSENIDE AND SILICON SOLAR CELLS

Richard L. Staats
Lieutenant, United States Navy
B.A., Metropolitan State College, 1979

Radiation damaged gallium arsenide and silicon solar cells were annealed using a combination of thermal and Foward-bias Current Annealing techniques. These cells were annealed under varying current densities from 0.125 A/cm^2 to 1.250 A/cm^2 and at temperatures from 90^{o}C to 140^{o}C. Gallium arsenide solar cells annealed at current densities from 0.250 A/cm^2 to 0.750 A/cm^2. Attempts to anneal silicon solar cells failed to produce positive results at all current densities. The primary application of this research is to determine the feasibility of on-orbit annealing of a satellite's solar array. At present, only silicon solar cells are deployed in space to provide electric power for satellites. When GaAs solar cells become space qualified, on-orbit Foward-bias Current Annealing of these solar cells become space qualified, on-orbit Foward-bias Current Annealing of these solar arrays may significantly increase the end of life of orbiting satellites.

Master of Science in
Electrical Engineering
September 1987

Advisor: S. Michael
Department of
Electrical and Computer
Engineering

THE USE OF COAXIAL TRANSMISSION LINE ELEMENTS IN LOG-PERIODIC DIPOLE ARRAYS

Robert E. Tarleton, Jr.
Electronic Engineer, Department of Defense
B.S., Arizona State University, 1980

This thesis examines the feasibility of designing a log-periodic dipole array (LPDA) with coaxial transmission line elements and comparing the resulting operational bandwidth with that of a conventional LPDA. Using the Numerical Electromagnetics Code (NEC), a coaxial dipole was modeled to optimize the bandwidth and then used as the element in a variety of uniform arrays. Different types of element connections were examined including switched series, switched parallel, and unswitched parallel. The results of NEC for each of the arrays are plotted as k-β diagrams to compare to the standard arrays.

The results of the investigation show that the Snyder dipole provides more operational bandwidth than a standard dipole, but when placed in a uniform array there is no more bandwidth than that of a conventional uniform array.

Master of Science in
Electrical Engineering
June 1987

Advisor: R.W. Adler
Department of
Electrical and Computer
Engineering

PERFORMANCE EVALUATION OF A HALF-WAVE RECTANGULAR SLOT ANTENNA OVER PERFECT GROUND USING MOM

Constantinos Theofanopoulos
Lieutenant, Hellenic Navy
B.S., Hellenic Naval Academy, 1978

Present and future trends in shipboard antenna [illegible] objective, antennas which are or will [illegible] environments, integrable in ship's superstructures, low in profile and compact.

This thesis investigates the performance [illegible] 0.2 meter slot antenna, which is cut into a [illegible] bulkhead being a section of the superstructure of [illegible] slot antenna was modeled using the Numerical Electromagnetic Code. Input impedances, radiation patterns and near field [illegible] presented. The reason for conducting this performance evaluation [illegible] determine if this approach to survivable antennas [illegible] be implemented in future ship designs.

Master of Science in
Electrical Engineering
March 1987

[illegible]

MEASURED PROBABILITY DENSITY FUNCTION OF A PHASE-LOCKED LOOP (PLL) OUTPUT

Mehmet Topcu
Lieutenant JG, Turkish Navy
B.S., Turkish Naval Academy, 1980

The behavior of the Phase-Locked Loop (PLL) is difficult to describe analytically, especially when noise is present at the input because the system is non-linear.

In this report, the noise behavior of the PLL is determined experimentally. Experimental results show that the probability density function of the PLL output for a variety of input signals which are each corrupted by additive Gaussian noise resembles the Gaussian density function.

Master of Science in
Electrical Engineering
March 1987

Advisor: G.A. Myers
Department of
Electrical and Computer
Engineering

THE DESIGN OF A REAL TIME OPERATING SYSTEM FOR A FAULT TOLERANT MICROCOMPUTER

Robert J. Voigt
Lieutenant, United States Navy
B.S., United States Naval Academy, 1979

The design and implementation of a real time operating system kernel for a fault tolerant microcomputer is presented. The operating system is designed for a real time imbedded system. The particular design is for a Motorola MC68000 microprocessor, however, the majority of the operating system is implemented using the C programming language for portability to other microprocessors. The C source for the kernel is presented. The source code is modular so that it may be used in part or as a whole operating system kernel. A heap implementation of a priority ready queue is used for task management. Performance measurements are included for parts of the ready queue.

Master of Science in
Electrical Engineering
December 1986

Advisor: L.W. Abbott
Department of
Electrical and Computer
Engineering

SHIPBOARD COMBAT SURVIVABLE HF ANTENNA DESIGNS

Ioannis G. Vorrias
Lieutenant, Hellenic Navy
B.S., Hellenic Naval Academy, 1977

This thesis investigates the feasibility of two shipboard combat survivable HF communication antenna designs. Both antennas are modeled as a rectangular volume, which in one case is excited by a square patch atop a monopole, placed at various spacings from the center of one of the volume's faces, and in the other case is excited by a wire which is connected between the center of a face that is created by a rectangular shaped notch and a perfect ground plane. Several computer models of the two configurations for either different spacings between the patch monopole and the rectangular volume, or different notch sizes, are modeled with the Numerical Electromagnetics Code (NEC) and compared. Input impedances and radiation patterns of the two survivable antennas are presented. Both antennas are evaluated against a 3:1 Standing Wave Ratio (SWR) criterion.

Master of Science in
Electrical Engineering
December 1986

Advisor: R.W. Adler
Department of
Electrical and Computer
Engineering

FIBER-OPTIC IMPLEMENTATION OF MIL STD-1553: A SERIAL BUS PROTOCOL

Robert Stanley Wester
Captain, United States Air Force
B.A., Park College, MO, 1976

This thesis explores the design and implementation of a fiber optic link for use in MIL STD-1553 environments. The discussion includes specific hardware and software designs to demonstrate a basic fiber-optic implementation of the standard. These designs are presented in sufficient detail to allow reconstruction with a minimum of effort. Results such as Built-In-Test performance and maximum data rates are included. The design and associated fiber optic link provide a good prototype to be used for further research involving fiber optic solutions for serial data link Local Area Networks.

Master of Science in
Electrical Engineering
March 1987

Advisor: J.P. Powers
Department of
Electrical and Computer
Engineering

DIGITALLY PROGRAMMABLE ACTIVE SWITCHED CAPACITOR FILTERS

Cengiz Yalkin
Lieutenant JG, Turkish Navy
B.S., Turkish Naval Academy, 1980

In this research, analog active circuits are analyzed and designed using periodic sampling techniques. Switched capacitor networks are the basis of these techniques. The use of switched capacitor network allows active filters to be implemented in IC form. As an application, a general purpose digitally controlled analog sampled data filter is presented. The results of this programmable filter are compared with the computer simulations for theoretical and practical verifications. The final goal of this research is to demonstrate a number of practical conclusions about switched capacitor networks.

Master of Science in
Electrical Engineering
March 1987

Advisor: S. Michael
Department of
Electrical and Computer
Engineering

DESIGN OF A VELOCITY AND POSITION CONTROL LABORATORY SERVO SYSTEM

Michael Alan Ziegler
Lieutenant, United States Navy
B.S., University of Wisconsin, Madison, 1979

In support of a course in automatic control theory, a velocity and position control laboratory servo system was designed for use in laboratory exercises. The system is constructed using a commercially available DC motor and power amplifier, which are interfaced to a student control panel. [illegible] system changes and measurements are conducted with the control panel. The system can be operated in open or closed loop, in a position or velocity control mode, and has several adjustable compensators incorporated in the signal paths. This thesis provides detailed construction, wiring and system testing steps, along with the required scale drawings, necessary to perform the hardware integration. A set of laboratory procedures, example laboratory reports, and advanced servo control problems are included for instructional purposes.

Master of Science in
Electrical Engineering
September 1987

Advisors: G. Thaler
Department of
Electrical and Computer
Engineering

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MASTER OF SCIENCE

IN

ENGINEERING ACOUSTICS

215/216

UNDERWATER ACOUSTIC BACKSCATTER FROM A MODEL OF ARCTIC ICE OPEN LEADS AND PRESSURE RIDGES

Michael Joseph Browne
Lieutenant, United States Navy
B.S., United States Naval Academy, 1980

The behavior of monostatic backscatter from Arctic open leads and pressure ridges has been studied by using scale models in the laboratory under controlled conditions. The experiments were performed in an anechoic tank using pulsed transmissions from underwater point sources to measure the backscatter from several different floating acrylic plate models. The physical properties of Arctic ice were modeled by the selection of the acrylic material, and the geometrical properties of the ice in features were accurately scaled in the laboratory by maintaining the appropriate dimension-to-wavelength ratios. The characteristic behavior of the backscatter was explained using both diffraction theory and mode-conversion concepts. It was generally observed that a significant amount of the incident acoustic energy resulted in solidborne vibrations and propagating waves within the floating plate. The ability of those vibrations to reradiate energy into the water resulted in greater backscatter than predicted from the trailing edge of an open lead and piston-like radiation from the pressure ridge models.

Master of Science in
Engineering Acoustics
June 1987

Advisor: H. Medwin
Department of
Physics

DEVELOPMENT, VALIDATION AND USE OF A COMPUTER-CONTROLLED SYSTEM FOR THE INVESTIGATION OF PHASE AND AMPLITUDE SHADED ACOUSTIC ARRAYS

John D. Butler
Lieutenant Commander, United States Navy
B.S., University of Texas at Austin, 1977

A computer-controlled system for automated measurement of phase and amplitude shaded acoustic dipole, tripole and quadrupole arrays beam patterns was developed and tested. Experimental data were collected with an anechoic chamber to simulate free field conditions and minimize interference effects.

Preliminary impedance, reactance and resistance matching of several speakers to ensure that equivalent acoustic characteristics was utilized for the arrays. A computer program was developed to control the stepper motor to rotate the arrays. Sample and control data were collected.

Various combinations of amplitude and phase shading were applied to the dipole, tripole, linear quadrupole and planar quadrupole arrays. The results were then compared to theoretical predictions and agreed to ± 2dB. This investigation successfully demonstrated the feasibility of deviations in the positioning of elements.

Master of Science in Engineering Acoustics
December 1978

DEVELOPMENT OF A NUMERICAL PROGRAM TO COMPUTE PROPAGATION LOSS USING NORMAL MODES WITH AN IMPEDANCE BOTTOM

Douglas Cantley
Captain, Canadian Armed Forces
B.A., University of Prince Edward Island, 1973

This thesis describes the development of a computer program that calculates the propagation loss for low frequencies in a shallow ocean given the depth of source and receiver, the sound speed profile of the water, the frequency of the source, and the impedance and sound speed in the bottom. The program does this by computing the sum of normal modes for a specified set of boundary conditions. At the surface, perfect pressure release is assumed, and the boundary condition at the bottom is one of impedance mismatch. An effort was made to develop a Fast Field Program, which would use an FFT to predict propagation loss at a variety of ranges by solving for a discrete set of wave numbers, but development was not completed.

Master of Science in
Engineering Acoustics
December 1986

Advisors: A.B. Coppens
Department of
Physics

T.B. Gabrielson
Naval Air Development
Center

UNDERWATER ACOUSTIC SCATTER FROM A MODEL OF THE ARCTIC ICE CANOPY

Patrick Leo Denny
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1973

Kevin Robert Johnson
Lieutenant, United States Navy
B.S., University of California, Riverside, 1976

When low frequency underwater sound interacts with the Arctic ice cover, not only will it be reflected from the plane and scattered in all directions from roughness elements, but it will also be diffracted at leads and reradiated from flexural waves in the ice. These phenomena have been studied in an anechoic tank by pulse transmission from an underwater point source to a series of large floating acrylic plate models, each representing a different type of ice cover. The flexural wave speed, the plate and lead dimensions and the acoustic roughness are accurately scaled, and the specific acoustic impedance contrast is approximately modeled by the selection of the acrylic material. The physical contributors to the gross reflection coefficient and backscattering strength are identified and compared for models of a plane ice layer, an Arctic ice pressure ridge, edges of leads, and a rubble field of ice.

Master of Science in
Engineering Acoustics
December 1986

Advisor: H. Medwin
Professor of
Physics

AUTOMATED IN-SERVICE SONAR ARRAY PERFORMANCE [illegible]

Gibson Brewer Kerr
Lieutenant, United States Navy
B.S., University of Rochestor, 1980

Patricia Mary O'Neill
Lieutenant, United States Navy
B.S., United States Naval Academy, 19[illegible]

The United States Submarine Force currently [illegible] and post-repair evaluations of hull mounted SONAR arrays that require extensive, highly specialized external equipment setups and facilities to perform. Due to recent advances in available test equipment and high-speed microprocessors, the capability of performing these array status evaluation tests rapidly and accurately with minimal ha[illegible] and personnel support is realizeable. This report presents [illegible] methods for performing two such tests on the BQR-7 submarine conformal array using modern, portable, computer controlled instrumentation: hydrophone wiring polarity checks and in-situ sensitivity measurements. In addition, some suggestions are made as to how these kinds of inboard testing methods can be extended to other SONAR arrays. Recommendations for the implementation of these methods on board U.S. Navy ships are presented.

Master of Science in
Engineering Acoustics
December 1986

Advisors: O.B. Wilson
S.R. Baker
Department of
Physics

A FINITE ELEMENT ANALYSIS OF THE VIOLIN

George Anthony Knott
Lieutenant, United States Navy
B.A., University of California, Berkeley, 1977

The MSC/NASTRAN finite element computer program and a Cray XMP computer were used to study the model characteristics of a violin with the Stradivari shape. The violin geometry was modeled using an arcs of circles scheme with PATRAN, a finite element graphics pre/postprocessor program. The violin was modeled in-vacu and with free boundary conditions. Belly, back, sound post, bassbar, neck, bridge, tail-piece, strings, rib linings, end and corner blocks are the components of the model. Mode shapes and frequencies were calculated for free top and back plates, the violin box, and the complete violin system, including the strings. The results obtained from the finite element technique were compared to experimental data from real violins collected by other investigators.

Master of Science in
Engineering Acoustics
March 1987

Advisor: Y.S. Shin
Department of
Mechanical Engineering

INVESTIGATION OF THERMOACOUSTIC HEAT TRANSPORT USING A THERMOACOUSTIC COUPLE

Michael Louis Muzzerall
Captain, Canadian Forces
B.S., Royal Military College of Canada, 1975

The results of measurements of thermoacoustically generated temperature gradients in short, thin plates located in a resonant tube are reported. The temperature gradient results from a heat flow generated by the acoustic field. Measurements, at both axial and transverse positions in the tube, are made for pressure amplitudes ranging from approximately 145 dB to 162 dB re 20 μ Pa (rms), in argon and helium, for single plates and stacks of up to five plates having separations from approximately 4 to 40 thermal penetration depths. The results are compared to predictions based upon a theory by Wheatley and others (J. Wheatley, et al., "Journal of the Acoustical Society of America," Vol. 74, pp. 153-170, 1983). For pressure amplitudes below 150 dB, the measurements agree well with theory. At higher pressure amplitudes, the agreement diminishes. It is concluded that non-thermal effects are responsible for the discrepancies.

Master of Science in Engineering Acoustics
September 1987

Advisor: A. Atchley
Department of Physics

APPLICATION OF A MODIFIED TIME DELAY SPECTROMETRY TECHNIQUE IN MODELING OF UNDERWATER ACOUSTIC PROPAGATION

Louis L. Prudhomme
Lieutenant, United States Navy
B.S., Tulane University, 1980

The analysis of sound propagating by multiple paths in an ocean at short ranges has been conducted using a Modified Time Delay Spectrometry (TDS) technique. In this version of TDS, a source driven by a linear FM slide and an HP3561A Dynamic Signal Analyzer are used to measure the amplitude as a function of frequency of signals traveling by different paths and having different arrival times. Two sets of data from the acoustic test ranges at the Naval Undersea Weapons Engineering Station were analyzed for different environmental conditions to determine the relative amplitudes of the directly propagating and surface reflected signals. Comparisons with simple rough surface scattering theory showed reasonable agreement. Results and control software are presented and discussed. Recommendations for future applications are made.

Master of Science in
Engineering Acoustics
March 1987

Advisor: O.B. Wilson
Department of
Physics

DEVELOPMENT OF A NEW METHOD OF MEASURING THE CHARACTERISTIC IMPEDANCE AND COMPLEX WAVE NUMBER OF A POROUS ACOUSTIC MATERIAL

Frederick Fay Schulz
Lieutenant, United States Navy
B.S., United States Naval Academy, 1980

The specific DC flow resistance, characteristic impedance and complex wave number of air-filled fiberglass have been extracted from measurements of the peak and half-power frequencies of the two lowest-frequency normal modes of a rectangular plexiglass cavity partially filled with fiberglass. Using Biot theory [Ref's. 8, 9 and 10] to describe the sound field within the fiberglass, a dispersion relation for the allowed modes in the cavity was derived, from which the above properties were extracted. The values determined by this new method compare favorably (within 25%) with the results of measurements using classical methods. The new method differs from the classical resonance tube method [Ref. 4] by 1) the use of a wave theory to describe the sound field within the fiberglass and 2) the use of a mode with particle velocity parallel to the air-fiberglass interface. These differences make it possible to extract the acoustic properties of bulk fiberglass using only a thin sample.

Master of Science in
Engineering Acoustics
June 1987

Advisor: S.R. Baker
Department of
Physics

THE TEMPORAL AND SPATIAL ACOUSTICAL RESPONSE OF A POINT-DRIVEN, FLUID-LOADED PLATE

James Gerard Stevens
Lieutenant, United States Navy
M.S., The Ohio State University, 1979

The radiated acoustic field from a point-driven, fluid-loaded plate [illegible] several years ago. However, current operational problems [illegible] in the light of certain acoustic anomalies.

The types of waves that propagate in a solid plate are reviewed for [illegible] Experimental models were constructed in an [illegible] in an attempt to model the aforementioned [illegible].

It is found that the effect of a plexiglass plate placed at the boundary of a half-space of water geometry is that of a phase delay only. The [illegible] conversion from compressional waves to flexural waves is thought to be insignificant.

A second experiment is described in which a plexiglass plate was driven with a small longitudinal vibrator. Experimental radiation patterns compared that of a piston. Plexiglass is an acoustically slow radiator, therefore the coincidence effect is not possible. Further, its [illegible] makes it a poor choice for experiments [illegible].

[illegible]

[illegible]
Adv. Coppens
Department of
Physics

IN-SERVICE SENSITIVITY MEASUREMENT OF THE MULLOKA SONAR TRANSDUCER

Simon Andrew Taylor
Lieutenant Commander, Royal Australian Navy
B.E., University of New South Wales, 1975

A method for the in-service monitoring of transducer performance in the Royal Australian Navy (RAN) Mulloka sonar system has been developed and tested. This method, termed the Modified Delta Z Method, uses the difference between the input electrical impedance of the transducer measured in air and in water to determine the sensitivity of the transducer. Also tested for its applicability to the Mulloka sonar was an in-situ, stave-to-stave sensitivity test developed at The Naval Postgraduate School (NPS) for the BQR-7 sonar hydrophones. Both methods use the same computer-controlled measurement equipment as other in-service sonar performance monitoring methods which have been developed at NPS.

Results indicate that, as presently implemented, the Modified Delta Z method does not provide an accurate absolute sensitivity calibration. It does, however, provide an accurate relative sensitivity calibration. Also, the stave-to-stave test gives an accurate indication of sensitivity degradation for an artificially degraded Mulloka stave.

Master of Science in
Engineering Acoustics
and Systems Technology
(Antisubmarine Warfare)
March 1987

Advisors: O.B. Wilson
S.R. Baker
Department of
Physics

APPLICATION OF AUTOMATED IN-SERVICE PERFORMANCE MONITORING TECHNIQUES TO THE AN/BQQ-5 SPHERICAL ARRAY TRANSDUCERS

Darrel Edwin Westbrook, III
Lieutenant, United States Navy
B.S., Texas A&M University, 1980

An automated complex admittance measurement system for monitoring the AN/BQQ-5 spherical array consisting of either TR-155 or TR-317 transducers has been developed and tested. Additionally, the in-situ stave-to-stave reciprocity and Modified Delta-Z techniques of measuring changes in transducer sensitivity, as developed at the Naval Postgraduate School, were applied to both the TR-155 and TR-317 transducers in the laboratory. All these measurements employ computer-controlled equipment for data acquisition, processing and output.

Comparisons of sensitivity changes caused by artificial degradation determined by these methods indicate that the in-situ element-to-element reciprocity technique provides an accurate determination of changes in sensitivity while the Modified Delta-Z technique is not as effective. However the latter method warrants further study.

Master of Science in
Engineering Acoustics
June 1987

Advisors: O.B. Wilson
S.R. Baker
Department of
Physics

MASTER OF SCIENCE

IN

ENGINEERING SCIENCE

229/230

A MISSILE FLYOUT MODEL FOR ISEAS

Dennis D. Antonio
Lieutenant, United States Navy
B S., United States Naval Academy, 1977

A computer model of the launch and flyout of a ship-[illegible] air missile toward an attacking aircraft or anti-ship [illegible] developed for the Interactive Simulation of Engagements [illegible] program. The model, written in the C language [illegible] Fortran program. The flyout model can be used to [illegible] performance against an air target. A complete description of the [illegible] model with flow charts and a C program listing is [illegible]

[illegible]
[illegible]
[illegible]

HOVER PERFORMANCE OF A REMOTELY PILOTED HELICOPTER

Randolph P. Cotten
Major, United States Marine Corps
B.S., University of Wyoming, 1970

This paper discusses the hover performance of a remotely piloted helicopter (RPH) and the suitability of the use of this RPH in the academic environment of the Naval Postgraduate School Department of Aeronautics and Astronautics. The methods used are those used in the Helicopter Performance Test Manual of the U.S. Navy Test Pilot School. When testing remotely piloted aircraft for use with the military, there is a necessity to test a product to specifications. These specifications may be similar to those of a full sized aircraft. The test methods used are adequate for the testing of RPH's for specification but the use of this equipment in an academic environment is not safe enough without major modification. The RPH has enough excess lift to carry a small test instrumentation package in forward flight. If the RPH is used only in a laboratory environment for the demonstration of hover performance; the gas engine can be replaced with an electric motor and a plexiglas shield can be used between the students and the RPH to satisfy necessary safety precautions.

Master of Science in
Engineering Science
December 1986

Advisor: D.M. Layton
Department of
Aeronautics and
Astronautics

THERMAL IMAGE MEASUREMENTS OF INFRARED SIGNATURES

George Dimitriadis
Lieutenant, Hellenic Navy
B.S., Hellenic Naval Academy, 1978

Thermal images of an instrumented ship target against a sea background have been recorded under varying environmental conditions, using an AGA Thermovision 780 radiometric imaging system with digital data recording. Data were obtained in the 8-14 μm spectral band at an angle of incidence of approximately 89° against the sea background. These pictures have been analyzed together with measured target emissivity and meteorological parameters to give the temperature and radiance distributions of the target. The influence of reflected sky radiation on the background radiance was observed under varying sea surface conditions. A predictive model of effective radiance temperature difference of the target versus sea background in terms of the environmental parameters using the LOWTRAN 6 Radiance/Transmittance computer code was developed. This effective temperature difference has been shown to vary both positively and negatively compared with the thermometric temperature difference depending on the wind speed and the air and sea surface temperatures.

Master of Science in
Engineering Science
December 1986

Advisor: A.W. Cooper
Department of
Physics

SURVIVABILITY CONSIDERATIONS FOR NAVAL AIRSHIPS

Alan Edward Haggerty
Lieutenant, United States Navy
B.S., Oregon State University, 1978

The need for the naval airship is discussed and the reasons for studying airship survivability are developed. A brief description of the science of survivability, and its two primary subdivisions, susceptibility and vulnerability, follows. The basics of aerostatics necessary for an investigation of airship survivability are discussed, and a generic airship is presented for further study. Specific applications of airship susceptibility and vulnerability reduction concepts and a discussion of possible specialized threats are presented. Areas for further research are identified. An appendix contains sample calculations.

Advisor: D.M. Layton
Department of
Aeronautics and
Astronautics

INVESTIGATION OF SILICON AND GALLIUM ARSENIDE SOLAR CELLS TO PULSED CO_2 LASER RADIATION

Scott Ellsworth Hoffman
Lieutenant, United States Navy
B.S., United States Naval Academy, 1978

The carbon dioxide laser represents one of the possible threats to an array of solar cells on a satellite. Recent improvements in semiconductor technology have produced advanced design AlGaAs solar cells that have improved radiation damage characteristics compared to conventional Silicon solar cells. An updated review of all possible laser induced damage mechanisms to solar cells is presented. Both cell designs were tested using the NPS CO_2 Laser Damage Facility to establish laser resistance and failure mode for each cell. The experiments conducted showed that the AlGaAs cells thermal/mechanically failed at irradiance of 0.30 MW/cm^2 and a fluence of 1.3 J/cm^2 in 4.45 usec. In contrast, the Silicon cells electrically failed at irradiance of 0.38 MW/cm^2 and a fluence of 1.7 J/cm^2 in 4.45 usec with ultimate thermal/mechanical failure at 0.42 MW/cm^2 (1.9 J/cm^2).

Master of Science in
Engineering Science
December 1986

Advisor: A.E. Fuhs
Department of
Aeronautics and
Astronautics

THE EFFECTS OF METALLIZED FUEL COMPOSITION ON THE COMBUSTION CHARACTERISTICS OF SOLID FUEL RAMJETS

Adonis Karadimitris
Lieutenant, Hellenic Navy
B.S., Hellenic Naval Academy, 1977

A series of experiments were conducted to investigate the effects of metallized fuel composition on the combustion characteristics of solid fuel ramjets (SFRJ). Metallized fuels were burned in a two dimensional SFRJ motor under conditions similar to the actual flight conditions proposed for solid fuel ramjets. Pressure, air inlet temperature and flowrate measurements were taken using an automatic data acquisition system. High speed motion pictures were taken of the interior of the combustor during the burning of the solid fuel through two viewing windows located in the recirculation zone and just prior to the aft mixing chamber where the boundary layer was more fully developed. Tests were conducted at mass fluxes of 0.2 and 0.5 lbm/in^2 sec, with pressures ranging from 57 to 200 psia and with a nominal inlet air temperature of 1100^oR.

The surface of most fuels had a characteristic shedding of small, unignited flakes. The flakes are thought to be binder material, and were more prevalent at lower pressures. Occassional shedding of large surface layers was observed, especially during motor shutdown. Metallic surface agglomerations appeared to interact strongly with these irregular surface layers. Large magnesium particles exhibited the expected bright ignition characteristics. Boron particles were not observed, apparently because they were smaller than the resolution limits of the motion pictures.

Master of Science in
Engineering Science
December 1986

Advisor: D.W. Netzer
Department of
Aeronautics and
Astronautics

DAMPING DEGRADATION IN SONOSTON AND INCRAMUTE DUE TO LOW TEMPERATURE STORAGE

Lewis William Leary
Lieutenant, United States Navy
B.S., Georgia State University, 1979

Two commercial manganese-copper based alloys, SONOSTON and INCRAMUTE, were evaluated for their ability to maintain optimum damping capacity with time when stored at room temperature and 100°C, which represents a temperature range within which marine equipment commonly operate. Damping measurements were obtained using the modified resonant dwell technique. Significant degradation occurs within 12 days in both alloys when stored at room temperature or 100°C, although SONOSTON stored at 100°C exhibited stable damping in the active strain range. Recovery treatments at 125° indicated that a recovery mechanism was operative in INCRAMUTE, but absent in SONOSTON. In fact a 125° recovery treatment actually appeared to degrade damping in the active strain range in SONOSTON. X-ray diffraction results indicated that the changing damping characteristics were unrelated to lattice changes detectable by that technique. Transmission electron microscopy revealed a unique contour "jumping" phenomena with electron beam heating, which is hypothesized to indicate a sensitive elastic transformation, with a low strain threshold, of the tweed microstructure. In addition, although not quantitatively evaluated, a modulus dicontinuity with time was observed upon initially vibrating cantilevers beam specimens, possibly related to the necessity to activate the damping mechanism of the tweed microstructure.

Master of Science in
Engineering Science
December 1986

Advisor: A.J. Perkins
Department of
Mechanical Engineering

COMPUTER SIMULATION OF AN ANTI-AIR OPERATION IN THE COMBAT INFORMATION CENTER

Jawad Mamou
Ensign, Royal Moroccan Navy
B.S., Ecole Royale Navale, 1984

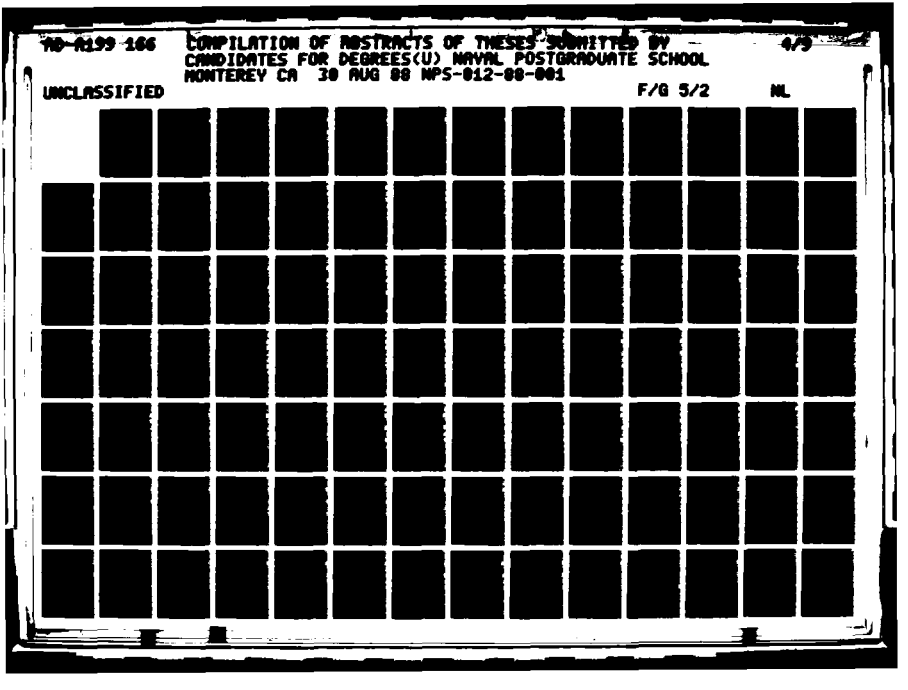
A computer program simulating an anti-air operation conducted from the C.I.C. of a ship was written in the C language to run on an MSDOS personal computer. This program simulates the main functions of a C.I.C. and incorporates into the NPS interactive simulation of an engagement at sea (ISEAS) with a radar module and a weapons module developed by others. The contribution of this thesis to ISEAS is weapons direction, decision-making, and graphics display of the tactical information in a useful form.

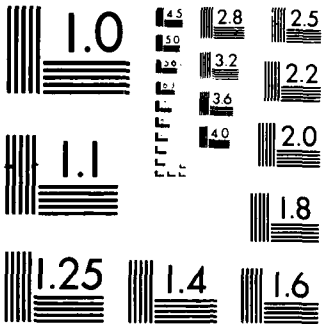
Master of Science in
Engineering Science
December 1986

Advisor: R.E. Ball
Department of
Aeronautics and
Astronautics

AD-A199 166 COMPILATION OF ABSTRACTS OF THESES SUBMITTED BY CANDIDATES FOR DEGREES(U) NAVAL POSTGRADUATE SCHOOL MONTEREY CA 30 AUG 88 NPS-012-88-001 4/9

UNCLASSIFIED F/G 5/2 NL





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

A RADAR MODEL FOR THE INTERACTIVE SIMULATION OF ENGAGEMENTS AT SEA (ISES)

Claudio Montero Arizaleta
Lieutenant JG, Venezuelan Navy
B.S., Escuela Naval de Venezuela, 1979

The Interactive Simulation of Engagements at Sea (ISES) is a PC based computer simulation of the air defense of a ship under development at the Naval Postgraduate School. This thesis describes the search radar computer model and the tracking [illegible] These programs are written in the C language.

Master of Science in Engineering Science
December 1985

[illegible]

VERIFICATION OF A MICRO-THRUSTING MODEL TO MAINTAIN SATELLITES IN LOW ORBIT

Christopher David Noble
Lieutenant, United States Navy
B.S., University of the State of New York, 1979

New concepts in aerospace travel have renewed interest in modeling and compensating for the effects of upper atmospheric drag. In particular, the SDI constellation requires strict orbital element maintenance. This thesis is a qualitative verification of a propellant longevity model for low-altitude earth orbit satellites doing intrack microthrusting to overcome atmospheric drag. The original model was developed at the Naval Surface Weapons Center. Pertinent orbital mechanics and atmospheric concepts are reviewed. The model and its computer program are described. The results of trend and sensitivity analysis reasonableness tests are presented. Finally suggestions for use are made. Many plots of mission life predictions are presented. The model computer program and sample input and output are also included.

Master of Science in
Engineering Science
June 1987

Advisors: M.D. Weir
Department of
Mathematics

R.D. Wood
Department of
Aeronautics and
Astronautics

CO2 PULSED LASER DAMAGE MECHANISMS AND ASSESSMENT OF PLASMA EFFECTS (UNFOCUSED BEAM)

John S. Olson
Commander, United States Navy
B.S., United States Naval Academy, 1970

A theoretical study and experimental investigation of the plasma-surface interactions and laser damage mechanisms associated with the irradiation of flat, cylindrical AISI SS 304 stainless steel targets was conducted. Two experiments were accomplished, one at normal atmospheric pressure and one in a high vacuum environment, using a Carbon Dioxide transversely excited atmospheric pressure (TEA), high energy, pulsed laser with an unfocused beam to ascertain the power density threshold requirements for plasma generation.

Irradiated target specimens were thoroughly examined for evidence of surface damage with a scanning electron microscope capable of clearly displaying damage features of micron size dimensions. Experimental results confirmed that surface damage was confined solely to unipolar arcing for targets irradiated with power densities near the plasma formation thresholds. These thresholds were determined to be 0.88 Megawatts per square centimeter $\pm$ 12% at atmospheric pressure and 0.43 Megawatts per square centimeter $\pm$ 12% in the high vacuum.

A sequential Unipolar Arcing Model, which incorporated the elaborate details of the refined Schwirzke Model, was developed, to thoroughly describe the complex series of interrelated events that constitute the unipolar arcing damage mechanism. The qualitative predictions of the theoretical model were confirmed by experimental results.

Master of Science in
Engineering Science
December 1986

Advisor: F. Schwirzke
Department of
Physics

A STUDY OF DIRECTIONAL AND FREQUENCY PROPERTIES OF SHADED AND PHASED SIMPLE ARRAYS

Young Soo Park
Major, Republic of Korea Air Force
B.S., Air Force Academy, CheongJu, 1978

Computer programs are designed to calculate and display beam patterns in both two and three dimensions. Graphical presentation and evaluation in three-dimensions are difficult and important problems.

Five computer models are presented and used in investigating the directional and frequency properties of shaded and phased doublet, triplet and quadruplet arrays. Comparisons assocated with parameters such as wavelength, inter-source distance, source strength, and phase difference are examined.

Master of Science in
Engineering Science
December 1986

Advisors: A.B. Coppens
G. Netzorg
Department of
Physics

CERENKOV RADIATION FIELD ANALYSIS DUE TO A PASSING ELECTRON BEAM

Byron K. Price
Lieutenant, United States Navy
B.S., University of Kentucky, 1980

This paper is a continuation of a preliminary study which investigated the magnetic field radiated from a charge bunch traveling over a finite path. One of the recommendations of the preliminary study was to investigate how the magnitude and shape of the radiated field depends on the location of the observer relative to certain time boundaries defined by relationships between the arrival times of different parts of a pulse. This recommendation was followed by studying the signals radiated from charge bunches with two different ratios of rise time to path length. Within the Cerenkov cone and near a time boundary, the observed pulses are shaped like spikes. The time boundaries were found to be hyperbolas in the plane defined by the direction of travel of the charge bunch and the direction of propagation of radiation.

Master of Science in
Engineering Science
June 1987

Advisor: J.R. Neighbours
Department of
Physics

MEASUREMENT OF PARTICLE SIZE DISTRIBUTION IN A SOLID PROPELLANT ROCKET MOTOR USING LIGHT SCATTERING

Ted E. Pruitt
Lieutenant Commander, United States Navy
B.E., Vanderbilt University, 1977

Research was conducted to determine the particle size distribution in the motor and exhaust of a small solid propellant rocket motor using light scattering techniques. A commercially produced MALVERN 2600 Particle Sizer was used in conjunction with a locally designed light scattering apparatus. The physical dimensions of the motor windows limited the minimum measurable particle size to roughly 3.5 microns. Motor data was repeatable and agreement between light scattering systems was within approximately 7%. A large particle bias was evident. The source of this bias was believed to be the RTV used for bonding and inhibiting. Design of a new slender two-dimensional motor was completed to permit smaller particle sizes to be measured within the combustor.

Master of Science in Engineering Science
June 1981

Advisor: D.W. Netzer
Department of Aeronautics and Astronautics

SOLAR CELL CONCENTRATOR SYSTEM

Nevsan Sengil
Lieutenant JG, Turkish Navy
B.S., Turkish Naval Academy

If solar cells are exposed to charged particle radiation, efficiency decreases. Also solar cell efficiency is increased by concentrated solar light. A solar cell [illegible] includes shielding against particle radiation and provides concentrated solar [illegible].

A solar cell concentrator system was constructed using a low solar cell. Using a heat pipe, heat was transferred to a radiator. Cell operating temperature was measured. At the operating temperature (77°C) and under concentrated solar light (Concentration Ratio ≅ 130) solar cell efficiency was measured. Observed efficiency was 18.18 ± 0.18 (%). These results were used to calculate the performance of an array, consisting of small concentrators. The performance of the concentrator array was compared with a conventional array, and demonstrated the higher efficiency advantages.

Master of Science in Engineering Science
December 1986

Advisors: A.J. Kuhs
Department of Aeronautics and Astronautics

TEST AND EVALUATION OF THE TRANSPUTER IN A MULTI-TRANSPUTER SYSTEM

Jose Vanni Filho
Lieutenant Commander, Brazilian Navy
B.S., Brazilian Naval Academy, 1975

The purpose of this thesis is to start the evaluation of the Transputer, a 32 bit microprocessor on a chip, and to verify its potentials and limitations for real time applications, in distributed systems.

The evaluation concentrates on the four physical communication links, and its advertised capability to operate in parallel with the main processor (CPU), each one of them at the rate of 10 mbit/sec in each direction. It also presents to the reader an introduction to the machine itself, to the Occam Programming Language, a description of the environment at the Naval Postgraudate School (NPS), and suggests to the novice a learning sequence.

The evaluation programs and other example programs presented in this thesis were implemented using the Occam Programming Language (Proto-Occam) in either the Occam Programming System (OPS) or the Transputer Development System (TDS), both resident on the VAX 11/780 computer under the VMS Operating System (VAX/VMS).

Master of Science in
Engineering Science
June 1987

Advisor: U.R. Kodres
Department of
Computer Science

CO_2 PULSED LASER DAMAGE MECHANISM AND PLASMA EFFECTS (FOCUSED BEAM)

Richard Lynn Weston
Lieutenant, United States Navy
B.S., University of Minnesota, 1979

An experiment was conducted with AISI SS 304 stainless steel targets, in a 10^{-6} Torr vacuum using a CO_2 TEA high energy, pulsed laser with a beam focused to 1 cm^2. An investigation of the laser damage mechanism was conducted. The power density required for onset of plasma formation and the start of surface damage were determined.

Targets were polished to 0.25 micron finish. Target specimens were examined using a scanning electron microscope to determine damage features of micron size dimensions. Experimental results confirmed that the surface damage was confined solely to unipolar arcing and thermal effects resulting from the arcing process. Several targets were cross-sectioned and chemically etched to determine changes in the microstructure of the stainless steel. At high power densities, the surface was heated sufficiently to cause a change in the stainless steel from Austenite to Austenite and Ferite. The localized change in the microstructure confirmed that the energy deposition from the plasma was confined to the arcing craters. The power density for onset of plasma formation and unipolar arcing was determined to be 0.41 MW/cm^2.

A Sequential Unipolar Arcing Model which incorporated the details of the refined Schwirzke Model was developed. The qualitative predictions of the model were confirmed by the experimental results.

Master of Science in
Engineering Science
December 1980

Advisor: F. Schwirzke
Department of
Physics

CONTROL OF A FLEXIBLE ONE-LINK MANIPULATOR

Ioannis Zouzias
Lieutenant JG, Hellenic Navy
B.S., Hellenic Naval Academy, 1979

The feasibility of controlling a flexible one-link manipulator with an adaptive computer simulation model, called a curve following system, is investigated. At the beginning a very flexible unloaded arm is used. Later the stiffness of the arm is increased, until we reach the case of a flexible arm that can be used in practice. Finally load is added to the arm and its behavior is studied.

Master of Science in
Engineering Science
June 1987

Advisor: G.J. Thaler
Department of
Electrical and Computer
Engineering

MASTER OF SCIENCE

IN

HYDROGRAPHIC SCIENCES

249/250

REMOTE SENSING OF OCEAN SEDIMENT VOLUME REVERBERATION

Chin-Wen Chang
Lieutenant, Republic of China Navy
B.S., Chung Cheng Institute of Technology, 1979

An experimental study was performed to establish a technique for measuring the volume reverberation from ocean sediments. Two types of sediments (aggregate and fine sand) were used in this study. The inhomogeneity within the sediment caused considerable sample-to-sample fluctuation in the scattered waveform. This fluctuation was removed by spatial averaging to obtain a mean value over the sampling area. An approximate model for volume reverberation from sediments was developed for an acoustic pulse with an exponential decay. The results are promising. Combining the model and the experimental results, the volume scattering coefficient obtained for the aggregate is $0.0624 \pm 0.007\ m^{-3}$ and for fine sand is $0.0413 \pm 0.007\ m^{-3}$. The latter result is close to the coefficient obtained from a cloud-of-small-spheres model for wavelengths much greater than the particle size.

Master of Science in
Hydrographic Sciences
December 1986

Advisors: J.V. Sanders
A.B. Coppens
Department of
Physics

DYNAMIC POSITIONING AT SEA USING THE GLOBAL POSITIONING SYSTEM

Augusto M. Ezequiel
Lieutenant Commander, Portuguese Navy
Portuguese Naval Academy, 1975

Dynamic positioning of a moving platform is analyzed using data from the Global Positioning System (GPS) acquired in Phase II of the Seafloor Benchmark Experiment on R/V Point Sur in August 1986. GPS position determinations are compared to simultaneous Mini-Ranger fixes.

The GPS positions computed using only broadcast ephermeris data were within 20 m from the Mini-Ranger fixes when data from four satellites were used and within 30 m when data from three satellites and a geoidal height constraint were used. It was found that the position accuracy is degraded when data from a satellite reaching culmination is used.

Master of Science in
Hydrographic Sciences
June 1987

Advisors: [illegible]

VOLUME REVERBERATION MEASUREMENTS OF SEDIMENTS IN THE LABORATORY

Joao F.F. Facada
Lieutenant, Portuguese Navy
B.S., Portuguese Naval Academy, 1977

The acoustic volume reverberation in sediments [illegible] sizes was determined in the laboratory. Three sediments, aquarium sand and aggregate, ranging in average grain size from [illegible] mm to 5.3 mm, were selected. An additional material, glass beads, with an average particle size of 1.7 mm, was also studied to investigate the influence of inhomogeneities in particle composition.

In the experiment ten sets of 50 scattered pulses of pulse duration 88 μs and 180 kHz carrier frequency were averaged, and the envelope of the decaying tail was fitted with a logarithmic curve. The decay constants for the various sediments showed a variation with [illegible] size expressed by $a = 10.3 - \eta/0.0035$ where a is the grain [illegible] in mm and η the decay constant in Np/μ s. The value of a can be estimated within ± 2.8 mm for a decay constant of 2.5×10^{-2} Np/μ s. This relation is limited to the specific equipment used in the experiment and to the frequency of 180 kHz.

Master of Science in
Hydrographic Sciences
June 1987

Advisors: J.A. Sande
A.B. Coppens
Department of
Physics

S.P. Tucker
Department of
Oceanography

ESTABLISHMENT OF SOFTWARE TO PROCESS GLOBAL POSITIONING SATELLITE DATA OBTAINED FROM TI 4100 GPS RECEIVERS

Marlene Mozgala
Lieutenant, NOAA Corps
B.S., Southampton College of Long Island University, 1976

The U.S. Naval Postgraduate School (NPS) conducted Seafloor Benchmark experiments in the summers of 1985 and 1986 which utilized the Global Positioning System (GPS) satellite system as the principal source of ship positioning. The data acquired in 1985 had to be processed elsewhere as NPS lacked the software required to process the data.

Software designed to process GPS satellite data was obtained from the U.S. National Oceanic and Atmospheric Administration/National Geodetic Survey (NOAA/NGS). The programs which compute point positions from broadcast ephemeris information (collected using the U.S. Government model of the TI 4100 GPS receiver) have been modified and tested, and are now fully operational at NPS on the IBM-3033 mainframe computer. The two programs to compute relative station positions have also been extensively modified for use on the IBM mainframe at NPS but still require further testing.

NPS now has the capability of computing point positions from data collected on TI 4100 GPS receivers using broadcast ephemeris information.

Master of Science in
Hydrographic Sciences
December 1986

Advisor: M. Kumar
Department of
Oceanography

DIFFERENTIAL POSITIONING OF A DYNAMIC PLATFORM WITH THE GLOBAL POSITIONING SYSTEM

Franklin Edward Ohlinger
Lieutenant, NOAA Corps
B.S., Auburn University, 1978

Positioning accuracy in a marine environment is enhanced by the application of differential correctors to Global Positioning System data collected during the Seafloor Benchmark Experiment with Texas Instrument TI-4100 receivers. These positions and their correctors are determined by implementing a Kalman filter computer algorithm.

The improvement in accuracy over single point positioning was in the range of 1 to 2 m for low geometric dilution of precision periods and 2 to 6 m for high GDOP periods. Precision was also enhanced. Reference positions were provided by a Motorola Mini-Ranger system with two shore stations.

Master of Science in
Hydrographic Sciences
September 1987

Advisors: N.K. Saxena
S.P. Tucker
Department of
Oceanography

GEODETIC POSITIONING OF SEAFLOOR TRANSPONDERS

Chih-Ping Wang
Lieutenant, Republic of China Navy
B.S., Chung Cheng Institute of Technology, 1979 (R.O.C.)

The purpose of the Seafloor Benchmark Experiment is to determine precisely the position of benchmarks on the ocean floor in a geodetic sense. An acoustic transponder on the bottom of a ship emits pulses which are returned to it after a known delay by transponders located on the sea floor. By using a least-squares method, the measured pulse transit times are converted into ship position fixes via slant distances. The main purpose of the experiment is to test the precision with which geodetic positions of transponders on the sea bottom may be determined, using either known ship positions obtained from a Mini-Ranger system or the Global Positioning System. Uncertainties in the positions of the transponders were found to be $\pm$ 13 meters.

Master of Science in
Hydrographic Sciences
September 1987

Advisors: S.P. Tucker
N.K. Saxena
Department of
Operations Research

ACOUSTIC BACKSCATTERING FROM BOTTOM SEDIMENT AT NORMAL INCIDENCE IN THE LABORATORY

Ta-Te Yu
Lieutenant Commander, Republic of China Navy
B.S., Chung-Cheng Institute of Technology, 1979

Normally incident sound pulses were used to investigate sediment types in the laboratory. Materials of five different grain sizes ranging in diameter from 0.16 to 5.30 mm were used to find acoustic volume reverberation at three frequencies. An acoustic volume reverberation model was used to test the experimental data and to determine the scattering coefficients for the individual sediments.

It was found that different sediments have different volume reverberations. From the slope of the trailing edge of the volume reverberation, the sediment type can be determined roughly. Different frequencies were used to find the relationship between volume reverberation and frequency, and the results showed that with increase in frequency the volume reverberation of the sediment decreases.

Master of Science in
Hydrographic Sciences
September 1987

Advisors: J.V. Sanders
A.B. Coppens
Department of
Physics

S.P. Tucker
Department of
Oceanography

MASTER OF SCIENCE

IN

INFORMATION SYSTEMS

259/260

THE ARCHIPELAGIAN APPROACH TO DSS PROTOTYPING: AN EMPIRICAL STUDY

Stephen George Albers
Lieutenant, United States Navy
B.G.S., University of Michigan, 1980

The Archipelagian Approach, a proposed methodology for designing and implementing Decision Support Systems (DSS), attempts to integrate modular design and adaptive design. The approach is based on decomposing the proposed system's tasks into structured and nonstructured modules, evaluating the difficulty of implementing each module, and utilizing the estimated difficulty and the priority of each module to determine the best development sequence. The feasibility of making reliable and accurate predictions of implementation difficulty, a key requisite, was previously not verified. This thesis presents a discussion of the Archipelagian Approach and an empirical study of factors that potentially could be used to predict implementation difficulty. The study concludes that five of the eight factors considered exhibit sufficient reliability and validity as predictors to confirm the viability of the approach.

Master of Science in
Information Systems
March 1987

Advisor: T.R. Sivasankaran
Department of
Administrative Sciences

SEARCH AND RESCUE AND ENFORCEMENT OF LAWS AND TREATIES INTELLIGENCE SYSTEM

Jon D. Allen
Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1979

Heidi R. Lang
Lieutenant, United States Navy
B.S., State University of New York, Buffalo, 1979

In recent years, the political climate surrounding drug interdiction has brought the focus of Coast Guard missions into emphasizing the prosecution of law enforcement cases. Many law enforcement cases are pursuant to a specific search and rescue case and traditionally, the Coast Guard has segregated its information regarding vessels into separate systems for each of these areas. The existence of separate repositories for vessel data has resulted in duplication of information, lack of consistency, and the inability to integrate information between systems. The purpose of this thesis is to propose, design, and implement a prototype law enforcement/search and rescue database system to provide a single repository for law enforcement and search and rescue vessel data. The prototype will be developed at Coast Guard Group Monterey.

Master of Science in
Information Systems
September 1987

Advisor: B.A. Frew
Department of
Administrative Sciences

COMPUTER-BASED TRAINING FOR STRATEGIC DECISION MAKING DEVELOPMENT OF THREE TUTORIALS

Sherrie S. Aly
Lieutenant Commander, United States Navy
M.A., University of Central Florida, 1985

The objective of this thesis is to cover the status and trends in Computer-Assisted Instruction (CAI) and Computer-Based Training (CBT) and to develop three tutorials which will provide computer-based training for managers. CBT for Strategic Decision Making is contrasted with conventional technically oriented training. This contrast is based primarily on the complexity of problem solving to be supported. A methodology for development of tutorials is presented and illustrated through three tutorial examples. The tutorials demonstrate the methodology utilizing three common personal computer-based application packages: (1) Lotus 1-2-3, (2) JAVELIN, and (3) IFPS/Personal. Appropriate uses for each application package are discussed.

Master of Science in
Information Systems
September 1987

Advisor: T.X. Bui
Department of
Administrative Sciences

COMPARISON OF P-3C ACOUSTIC PROCESSING CAPABILITY WITH ACOUSTIC OPERATOR CAPABILITY

Ronald R. Arnold, II
Lieutenant, United States Navy
B.S., Auburn University, 1980

The purpose of this study is to determine if the requirements for operation of the acoustic processing equipment now installed aboard P-3C aircraft is too complex for the acoustic operators, given their current amount of training. This was accomplished using a test scenario designed to test for all of the skills and knowledge required by the acoustic operator in the performance of his duties during the passive portion of the prosecution of a target. The results seem to suggest that the students that successfully complete the P-3C "AW" training pipeline are acquiring an acceptable level of operator capability. In addition, this study seems to suggest that fleet operators who are recognized in fleet squadrons as master journeyman, are operating their ASW acoustic processing equipment to its fullest capability and without apparent operator deficiencies.

Master of Science in
Information Systems
March 1987

Advisors: H.H. Smith
B.A. Frew
Department of
Administrative Sciences

A MODEL FOR THE DEVELOPMENT OF AN ORGANIZATION'S INFORMATION SYSTEM (IS) SECURITY SYSTEM

Joseph George Boyce
IS Auditor, United States Naval Audit Service
B.S., Widener University, 1974

This thesis addresses the development of a system to secure appropriately an organization from some discernible threats posed by the presence, power, and applications of its computers. It presents a conceptual definitional framework for an information system (IS) security system. This framework consists of the system's objectives environment; resources; components (tasks); and management. A generic development model is established to construct a security system within this framework. The model consists of planning, design, and implementation (installation, testing, and management) phases. Conclusions are drawn which present the continuing need for such a development process within an organization. The development model is considered sufficient enough to serve as a basis for the performance of security system developments within a broad range of organizations.

Master of Science in
Information Systems
December 1986

Advisors: J.M. Fremgen
M.P. Spencer
Department of
Administrative Sciences

IMPROVING INFORMATION MANAGEMENT AT MARE ISLAND NAVAL SHIPYARD

Kenneth R. Brattin
Lieutenant Commander, United States Navy
B.S., California State University, Long Beach, 1974

Eric M. Dahinden
Lieutenant Commander, United States Navy
B.A., California State University, Long Beach, 1973

This thesis discusses the problems of information management within a Naval Shipyard. The research was conducted at Mare Island Naval Shipyard in Vallejo, California; however, the findings may apply on a much larger scale to all NAVSEA industrial facilities. Discussion is focused on the Shipyard MIS installed by the Bureau of Ships (BUSHIPS) in the early sixties to aid shipyard managers in accomplishing a complex overhaul of a modern vessel. Present system problems resulting in inefficiencies and information degradation are described and possible actions to improve information flow without cognitive overload are explored.

Master of Science in
Information Systems
March 1987

Advisor: B.A. Frew
Department of
Administrative Sciences

SHOULD NEURAL NETWORKS BE STUDIED TO ASSIST THE DECISION FUNCTIONS OF TACTICAL ACTION OFFICERS?

Ronald W. Brinkley
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1977

The use of Artificial Intelligence (AI) such as expert systems and neural networks could be instrumental in providing multi-level, real-time decision support assistance to the Tactical Action Officer (TAO). This paper examines the TAO concept and discusses some of its problems. Expert systems and neural networks are addressed concerning what they are along with an elementary explanation of how they work. Synopses of their capabilities and limitations are discussed in relation to specific elements of the TAO milieu. The final portion of the paper proposes a logical structure for a Comprehensive TAO Assistance System which would employ the AI technologies discussed.

Master of Science in
Information Systems
September 1987

Advisor: C.R. Jones
Department of
Administrative Sciences

MICROCOMPUTER IMPLEMENTATION AND USE FOR THE AVIATION LOGISTIC SUPPORT FUNCTIONS OF THE THIRD MARINE AIRCRAFT WING: A CASE STUDY

Joseph F. Buranosky
Captain, United States Marine Corps
B.S., United States Naval Academy, 1976

Curtis W. Howes
Captain, United States Marine Corps
B.A., University of Washington, 978
M.S., University of Southern California, 1986

The proliferation of microcomputers is a reality. During this study, we researched the implementation and use of microcomputers for aviation logistics support in the 3rd Marine Aircraft Wing. In the course of our research, we interviewed Staff Officers and other personnel involved with automation and aviation logistics support. We saw first hand how these microcomputer systems were being employed. Based upon accepted theory and current ideas regarding the use of information technology, we analyzed the methods and effectiveness of microcomputer implementation and use across the Wing. We found a high degree of variability in the implementation methods and use of microcomputer systems. A great deal of work remains to be done. We think that much of what we discovered in the course of our study is applicable across organizational boundaries within the United States Marine Corps.

Master of Science in
Information Systems
March 1987

Advisors: C.K. Eoyang
K.J. Euske
Department of
Administrative Sciences

A REVIEW OF THE EVOLUTION OF NAVAL DATA AUTOMATION AND OPTICAL MEDIA MASS STORAGE ALTERNATIVES FOR NAVAL AVIATION TECHNICAL DATA [illegible]

Robert J. Clarey
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 19[illegible]

The increased sophistication and complexity of [illegible] have generated an exponential growth in the associated technical manual documentation. This data explosion [illegible] issues including: the exorbitant costs associated with the development and distribution of this required information; the weight, environmental and space considerations attributable to the storage of this data; and the complex task of publishing and distributing revisions to previously disseminated documentation.

This research serves as a preliminary feasibility study, [illegible] the optical media storage and presentation alternatives for Naval Aviation technical manual publications. The research includes a review of the [illegible] directives and programs aimed at [illegible] automation and distribution processes with particular emphasis on the logistical [illegible].

This thesis concludes with the recommendation for [illegible] investigation of the optical mass storage alternative. Additionally, this study recommends research emphasis in the areas of [illegible] standardization leads, technological [illegible], and the [illegible] advantages resulting from the [illegible] environmental and transportability [illegible].

Master of Science in
[illegible]
[illegible]

FUNDAMENTAL AUTOMATED SCHEDULING SYSTEM "FASS": A SECOND LOOK

John F. Cole
Lieutenant Commander, United States Navy
B.S., Purdue University, 1977

Peter MacDonald
Lieutenant Commander, United States Navy
B.A., State University of Buffalo, 1973

This research addresses the problems associated with integrating the Fundamental Automated Scheduling System (FASS), a PERT/CPM based overhaul scheduling device, into U.S. Naval Shipyards. Considered is the problem of how to effectively integrate FASS into all eight shipyards. The mission, organization, duties, and constraints of the Naval shipyards are first described, then the background concerning the requirements for the system is developed. The discussion then shifts to the implementation of the system in the Shipyards and how each shipyard is utilizing its version of FASS. Finally, a summary of recommended actions and suggestions for further research is provided.

Master of Science in
Information Systems
December 1986

Advisor: N.R. Lyons
Department of
Administrative Sciences

THE DEVELOPMENT OF A USER-FRIENDLY INTERFACE FOR THE BATTLE GROUP TACTICAL TRAINER: A PROTOTYPING APPROACH

Denise M. Copeland
Lieutenant, United States Navy
B.S., Arizona State University, 1974

A difficulty in the wargaming arena is the absence of user-friendly interfaces which players and/or operator personnel can learn quickly and use easily. The overall success of the wargaming experience could be enhanced through the implementation of user-friendly interfaces which are developed using human factors principles and state-of-the-art innovations. Additionally, user-friendly interfaces could significantly reduce overhead requirements. Given the man-machine interface of the Battle Group Tactical Trainer, the goal of this thesis is to apply design guidelines of user-friendly man-machine interfaces with established human factors principles to develop a primitive interface prototype which is characterized by a greater level of user-friendliness. The development of the interface prototype demonstrated the feasibility of improving and enhancing the user-friendliness of the current system.

Master of Science in
Information Systems
September 1987

Advisor: T.X. Bui
Department of
Information Systems

AN APPROACH TO VALIDATION AND VERIFICATION OF THE COMMUNICATIONS LOAD MODEL WITH SUPPORTING USER'S GUIDE

William Robert Cox
Lieutenant, United States Navy
B.S., San Diego State University, 1977

This thesis investigates the issues of validation and verification of the Communications Load Model (CLM) being used in the Battle Group Communications Simulation Facility at the Naval Air Development Center. The processes involved in creating user input files are explained and evaluated. A user's guide is included to assist the user in interpreting input into the proper data structure and format for use by the model. Structure and function of the model and its components are examined. Calculations of results predicted by scenario inputs are compared to actual program output. The analysis is used to determine appropriate methodology to be utilized in validation and verification of the CLM.

Master of Science in
Information Systems
September 1987

Advisor: C.R. Jones
Department of
Administrative Sciences

A PACKET RADIO LOGISTIC NETWORK FOR A MARINE AMPHIBIOUS LANDING FORCE

Robert F. Cronin
Captain, United States Marine Corps
B.A., Boston College, 1977

The purpose of this thesis is to describe a deficiency in current Marine Corps logistic communication, investigate various technical solutions and select an appropriate design to eliminate this deficiency. The intention is not to answer all of the questions related to the topic, but to demonstrate that technology has advanced to a point where it is possible to provide an inexpensive solution to this particularly difficult problem. Although further research will be required, this thesis indicates that the technology is not only conceivable, practical and efficient, but well within reach. The thrust is to marry a relatively new, but proven technology, with a real world problem and to direct further attention to the effort, so that a practical solution can become a reality. As a result, the Marine Corps could possess a faster, more reliable logistic communication system while deployed and thus have an added advantage during a conflict.

Master of Science in
Information Systems
March 1987

Advisor: N.F. Schneidewind
Department of
Administrative Sciences

A DATABASE SYSTEM FOR MONITORING LABOR COSTS IN A PUBLIC WORKS ENVIRONMENT

David Paul Dinwiddie
Lieutenant, United States Navy
B.S., Rose-Hulman Institute of Technology, 1980

The Naval Postgraduate School Public Works Department must monitor labor hours charged by employees to assist in managing the payroll and executing the budget. Entering data into a local system, reconciling locally kept records with official records, and transferring data to official systems is too expensive. This thesis describes the design, analysis and implementation of a prototype system capable of providing year-to-date labor information with sufficient detail and accuracy to support the Public Works Officer in his budget execution endeavors. It also addresses the problem of integrating the prototype with larger systems which currently require manual input of the same data.

Master of Science in
Information Systems
September 1987

Advisor: N.R. Lyons
Department of
Administrative Sciences

AN EXPERT SYSTEMS APPROACH TO MILITARY DECISION SUPPORT IN AN AIR DEFENSE SCENARIO

Stephen P. Dodd
Captain, United States Marine Corps
B.S., Texas A&M University, 1977

Michael J. Molidor
Captain, United States Marine Corps
B.S., Texas A&M University, 1978

An expert system is a subspecialty of various artificial intelligence applications. This thesis is concerned with examining the feasibility of using an expert systems approach for solving problems in a stochastic non-repetitive environment. To ascertain this feasibility, the expert system prototype supporting an air defense scenario was developed. Additionally, the prototype was evaluated to see if it was possible to interface sources external and independent of the expert system to provide the required inputs for processing and analysis.

Master of Science in Information Systems - (Dodd)
Systems Technology (Command, Control and Communications) - (Molidor)
March 1981

Advisor: T.P. Sivasankaran
Department of Administrative Sciences

THE LOGICAL DESIGN OF A SHIPBOARD INTELLIGENCE SUPPORT SYSTEM (ISS) TO SUPPORT POWER PROJECTION OPERATIONS USING OPTICAL DIGITAL TECHNOLOGY

Thomas E. Dove
Lieutenant Commander, United States Navy
B.A., The Citadel, 1975

This thesis addresses the lack of an automated system to support threat analysis for Navy Power Projection Operations (Air Strike/Support, Counter-terrorism, Mine Warfare, Amphibious Warfare, Cruise Missile Operations, Evacuation, Special Warfare). A limited study of the current Power Projection threat analysis system was conducted to establish foundation for the new system design. Questionnaries and interviews were used to determine system user requirements. Based on the current system and user requirements for a new system, a data oriented high level logical system design was completed using the Yourdon methodology. In addition to the logical design, hardware recommendations are made, including the introduction of the use of optically-stored digital maps for system geographic displays. All design considerations relied on known technology and concentrated on commercially available hardware and minimizing system costs.

Master of Science in
Information Systems
September 1987

Advisor: N.R. Lyons
Department of
Administrative Sciences

[illegible]

[illegible]
Lieutenant United States Navy
[illegible] University of [illegible] Old Westbury, 1977

[illegible] publication is an iterative process that involves [illegible] by analysis, design and testing. The author must [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] important, an [illegible] [illegible] [illegible] audience for [illegible] document is written.

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EXCESS OUTFITTING MATERIALS IN SHIP CONSTRUCTION (SCN) SHIPBUILDING PROGRAMS: AN ANALYSIS OF THE INITIAL ALLOWANCE DEVELOPMENT PROCESS

Richard H. Feierabend
Lieutenant Commander, United States Navy
B.A., Hamline University, 1975

This thesis investigates the accumulation of excess outfitting material during a ship's initial supply support development process. The SCN allowance development process is discussed in general. The Integrated Stock Number Sequence Listing (ISNSL), the primary supporting sub-system for Ship Construction Navy (SCN) shipbuilding program allowance development, is reviewed. Analyses of ISNSL statistics from FFG-7 and SSBN-726 Class shipbuilding programs are conducted. The effects of configuration changes and adjustments to item management information, particularly the Best Replacement Factor (BRF) on excess outfitting materials is reviewed.

Master of Science in
Informations Systems
March 1987

Advisor: T.P. Moore
Department of
Administrative Sciences

INTEGRATED STRIKE PLANNING (ISPS)

Donald B. Fennessey
Lieutenant Commander, United States Navy
B.A., Dartmouth College, 1972

This thesis is a review of current work in automated computerized strike planning systems, particularly as they apply to Naval Battle Groups. Twelve systems are evaluated with reference to strike planning task criteria including route planning, knowledge base, and analysis capability using multi-attribute utility techniques. Their capabilities in each of the planning tasks are compared to those of a fully developed Integrated Strike Planning System (ISPS). Five combinations of those computer systems were selected for further analysis as possible alternatives to an ISPS. These combinations cover the range of capability from what is presently in the fleet to that of ISPS. Estimated costs were also compared and plotted versus the "capability scores" of those combinations. The results indicate that combined systems containing a version of the Air Force developed Force Level Automatic Planning System (FLAPS) as its central component provides far greater capability than those containing the Navy purchased Tactical Air Mission Planning System (TAMPS) at an estimated comparable cost. While none of the combined systems approach ISPS in capability, they may be considered as less costly and risky alternatives.

Master of Science in
Information Systems
March 1987

Advisor: C.R. Jones
Department of
Administrative Sciences

GROUP DSS
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COST ANALYSIS FOR AIRCRAFT SYSTEM TEST AND EVALUATION: EMPIRICAL SURVEY DATA STRUCTURING AND PARAMETRIC MODELING, VOLUMES I AND II

Robert W. Fonnesbeck
Lieutenant Commander, United States Navy
B.A., University of Utah, 1974

David J. Lee
Major, United States Marine Corps
B.S., United States Naval Academy, 1970

There is an increasing requirement from high levels within the government that the Navy's aircraft cost estimators and analysts provide explicit estimates for the sub-elements of Aircraft System Test and Evaluation (AST&E) efforts. The data required to produce more accurate and detailed estimates represent lower levels in the Aircraft Work Breakdown Structure (WBS) than previously available. This is a two volume thesis. Volume I examines the WBS and Contractor Cost Data Reporting (CCDR) system with a description of current reporting practices and implementation shortcomings. Recommended courses of action to improve reporting requirements and thereby improve data quality and cost estimates are proposed. Major cost drivers for AST&E, from both the perspective of Defense Contractors and Military Flight Test Centers, are discussed. Beginning in Volume II, a relational data base system is introduced to more easily evaluate AST&E cost elements and physical/performance characteristics. A Contractor Flight Test Cost estimating relationship (CER) is developed through step-wise multiple regression analysis of data gathered from Defense Contractors and Naval Air Systems Command (NAVAIR).

Master of Science in
Information Systems
March 1987

Advisor: T.X. Bui
Department of
Administrative Sciences

OPTICAL MEMORY CARDS: A COMPARISON WITH OTHER CURRENT TECHNOLOGIES AND POTENTIAL MILITARY APPLICATIONS

Stephen H. Frink
Lieutenant, United States Navy Reserve
B.A., University of South Florida, 1980

As the industrialized nations of the world move further into the Information Age, the storage and distribution of information becomes increasingly more critical to the success of our daily endeavors. Nowhere is this more apparent than in the military community. As the amount of information each military unit must have to function efficiently and effectively increases, so does the space required to store it. This situation has prompted at least one high-level Navy official to initiate a program to test the concept of a "paperless ship" by 1990. At the head of the list of systems to meet the mass storage requirements of the program are the optical memory technologies. Included under this heading are the optical memory cards. An optical memory card is the size of a standard 54mm x 86mm wallet card and, in one particular configuration, is capable of storing 800 pages of text alone or 200 pages of combined text and graphics. Employing optical memory card technology in the "paperless ship" will reduce the space required to store technical manuals and directives by a factor of over 200! Two applications: A Technical Document Publishing, Distributing and Update Program; and An Individual Personnel Record Storage and Update Program are discussed as potentially beneficial to the military community.

Master of Science in
Information Systems
September 1987

Advisor: R.A. Frost
Department of
Administrative Sciences

DEVELOPMENT OF A PROTOTYPE H-46 HELICOPTER DIAGNOSTIC EXPERT SYSTEM

Thomas J. Gadzala
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1975
M.S., University of Southern California, 1982

This study was undertaken to demonstrate the feasibility of applying expert system technology to the Navy's maintenance process. A microcomputer-based prototype known as a computer-aided dignostic system (CADS) was developed for this purpose. Given a helicopter electrical or hydraulic system discrepancy, the troubleshooter interacts with CADS to find the cause. The prototype CADS was developed utilizing the M.1 knowledge-based system development tool by Teknowledge, Inc.

The complexity of helicopter systems diagnosis, and inadequacies of the maintenance manuals, often result in unnecessary removal of system components. The prototype CADS is intended to demonstrate that a fully developed system, containing all the formal and heuristic knowledge of H-46 diagnostic information, could eliminate these problems. Also, such a diagnostic system could provide a comprehensive, stable diagnostic knowledge base, regardless of personnel turnover.

This study includes a description of current helicopter maintenance procedures, and how the integration of CADS could improve this process. Also included are descriptions of expert systems and the M.1 knowledge-based system development tool: how they work, and their applicability to structured selection problem-solving. The development and testing strategies used for CADS are discussed in detail. Results, conclusions, and recommendations for further study are provided.

Master of Science in
Information Systems
September 1987

Advisor: N.C. Roberts
Department of
Administrative Sciences

TACTICAL USE OF DIGITIZED MAPS

Steven James Gaffney
Major, United States Marine Corps
B.S., United States Naval Academy, 1975
M.S.B.A., Boston University, 1985

James Earl Daly
Captain, United States Marine Corps
B.S., University of Utah, 1981

The purpose of this study is to determine the problems and possibilities of developing a digitized mapping system for the ground tactical commander. The specific tactical units targeted are the Marine Infantry regiment and below. Particular emphasis is placed on the microcomputer as the implementation hardware. A review of the Defense Mapping Agency (DMA) databases was conducted and related Department of Defense programs were studied. To develop insights and provide a graphical tool for understanding the problems of a digitized mapping system, a Prototype was developed. It is determined that current microcomputer technology and DMA data bases provide the capability to develop and field an adequate, if not optimum, digitized mapping system.

Master of Science in
Information Systems
September 1987

Advisor: N.R. Lyons
Department of
Administrative Sciences

USING COMPUTER-AIDED SOFTWARE ENGINEERING (CASE) TOOLS TO DOCUMENT THE CURRENT LOGICAL MODEL OF A SYSTEM FOR DOD REQUIREMENTS SPECIFICATIONS

Donna A. Ganzer
Captain, United States Marine Corps
B.S., University of Texas, Austin, 1977

The Naval Postgraduate School's final exam scheduling system serves as a test case with which to compare two commercially available Computer-Aided Software Engineering (CASE) tools. The tools, Nastec Corporation's DesignAid (Release 3.55) and Index Technology's Excelerator (Release 1.7), are used to create Section 4.1 of two Abbreviated Systems Decision Papers to determine if their output can satisfy and should replace some of the Life Cycle Management documentation requirements of the Department of Defense for the procurement of Information Systems having a total cost of $100,000 or less.

Master of Science in
Information Systems
September 1987

Advisor: B.A. Frew
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Administrative Sciences

THE COMPLETED MANAGEMENT INFORMATION SYSTEM FOR THE MONTEREY NAVY FLYING CLUB

James M. Graham
Lieutenant Commander, United States Navy
B.S., University of Southern Mississippi, 1975

This thesis provides a completed Management Information System for the Monterey Navy Flying Club. The software package was designed to operate upon an IBM PC-XT or PC-AT or 100% compatible microcomputer which has 384K of main memory. Specific hardware requirements are discussed in chapter one. This software package supplies the necessary tools for the club manager to maintain all club records and generate required administrative and financial reports. Decision-making assistance is provided to the club manager and its Board of Directors by combining the system generated reports and the relational database capabilities of the R:Base 5000 language.

Master of Science in
Information Systems
March 1987

Advisor: B.A. Frew
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AN ANALYSIS OF ACQUISITION STRATEGY PLANNING FOR MAJOR NAVY INFORMATION SYSTEMS

John O. Haima
Lieutenant Commander, United States Navy
B.A., St. John's University, 1976

Information systems are an integral part of the United States Navy. The effectiveness of the Navy's administrative/logistic information systems is dependent on the Navy's ability to acquire, develop and maintain them.

This thesis will review current acquisition strategy guidelines, policies and the resulting acquisition strategy plans for major Navy administrative/logistic information systems. An attempt will be made to determine changes which can be made to improve the system and enable the Navy to keep pace with technology advances.

Master of Science in
Information Systems
March 1987

Advisor: N.F. Schneidewind
Department of
Administrative Sciences

SECURITY REQUIREMENTS AND INFORMAL SECURITY MODEL FOR THE COMBAT SERVICE SUPPORT CONTROL SYSTEM

Paul T. Hengst
Captain, United States Army
B.S., United States Military Academy, 1977

The Combat Service Support Control System (CSSCS) is a part of the Army Command and Control System (ACCS). The CSSCS will use modern information processing technology to control logistical, medical, and personnel data on the battlefield. Data stored and used by the system can be classified up to the secret level. Therefore, the CSSCS must contain a security system to protect the classified data. This thesis uses Department of Defense guidelines, information flow requirements, and CSSCS requirements to develop the security requirements for the CSSCS. From the consolidated security requirements, an informal security model is derived. Finally, implementation alternatives for the informal model are presented.

Master of Science in
Information Systems
March 1987

Advisor: N.R. Lyons
Department of
Administrative Sciences

ORGANIZATION ASSESSMENT OF THE DEPOT LEVEL ANALYSIS CENTER FOR THE LOCKHEED S-3 VIKING AIRCRAFT

Gregory Hightaian
Lieutenant, United States Navy
B.S., United States Naval Academy, 1980

Howard C. Keese
Lieutenant, United States Navy Reserve
B.S., Lamar University, 1979

An effective management information system is critical to the successful operation of any organization. In the large, complex organization of the Naval Air Rework Facility, the operation of such a system is a complex and demanding task.

The data analysis center for the Lockheed S-3 Viking aircraft is a key component in the management information system of NARF Alameda, California. For the center to be effective, its organizational design must facilitate its operation. This study examines the U.S. Navy directives governing the operation of such a center, organizational theory as it applies to the design of such an operation, and a comparative analysis of similar systems in operation.

Recommendations are provided for the structure of such an organization.

Master of Science in
Information Systems
September 1987

Advisors: N.C. Roberts
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Administrative Sciences

C.E. Lawler
Naval Aviation Depot
Alameda, California

A SYSTEM ANALYSIS AND DESIGN PROPOSAL FOR THE COMPTROLLER OF THE UNITED STATES NAVAL POSTGRADUATE SCHOOL

Donald H. Hildebrand, Jr.
Captain, United States Marine Corps
B.S., University of South Carolina, Columbia, 1978

Andrew Marafino, Jr.
Captain, United States Marine Corps
B.S., Bryant College, 1978
M.S., West Coast University, Los Angeles, 1981

A major problem experienced by the Naval Postgraduate School Comptroller concerns the methods presently used in the labor distribution budget process. These methods are primarily manual and very labor intensive. Developing and implementing an information management system for the comptroller will significantly reduce labor requirements and enhance the timeliness and accuracy of the information required to perform the budget process. A proposal for the analysis, design and implementation of such a system is the primary focus of this thesis.

Master of Science in
Information Systems
March 1987

Advisor: N.R. Lyons
Department of
Administrative Sciences

FACILITY DESIGN VALIDATION OF THE INFORMATION SYSTEMS LABORATORY

Timothy A. Holland
Lieutenant, United States Navy
B.S., United States Naval Academy, 1982

When installing a computer system there are many issues which the Information Systems manager must face. This thesis will identify and discuss some of those issues as they pertain to the installation of the Information Sciences Laboratory in Ingersoll Hall, Naval Postgraduate School. The laboratory will contain three local area networks and a number of specialized workstations. The recommendations made in this thesis are the floor plans showing a possible configuration for the laboratory.

Master of Science in
Information Systems
September 1987

Advisor: N.F. Schneidewind
Department of
Administrative Sciences

COMPUTER ASSISTED INSTRUCTION: TWO DECADES IN PERSPECTIVE

Thomas J. Hoskins, Jr.
Lieutenant Commander, United States Navy
B.S., University of West Florida, 1971

Janet D. Orrell
Lieutenant, United States Navy
B.S. McKendree College, 1981

This thesis examines the changes that have occurred in Computer Assisted Instruction (CAI) over the past 20 years. Numerous literature sources were reviewed and the information extracted was utilized to describe the history of CAI; provide a brief description of other types of computer-based education that are often grouped under the heading of CAI; examine the changes in hardware and software costs; describe the interaction of educators and software developers; reflect on the future of CAI; examine the development of computer-based instruction for Navy technical training, and make some comparisons between the public sector's use of computer-based instruction and the Navy's. Conclusions center on the benefits of CAI with regard to learning improvement; inadequate teacher training; failure to plan for implementation of hardware and software, and the less than optimal, but improving, interaction between educators and software developers.

Master of Science in
Information Systems
September 1987

Advisor: T.X. Bui
Department of
Administrative Sciences

PLANNING FOR ORGANIZATIONAL CHANGE: A CASE STUDY

Susan D. Iverson
Lieutenant, United States Navy
B.S., Stetson University, 1976
B.A., North Adams State College, 1979

The successful introduction of change to an organization is determined by how much planning is done before the change is implemented. This thesis addresses the assessment of an organization through organizational analysis, and examines the special aspects that must be considered when implementing a computer system to replace manual labor. Discussion includes identifying organizational information flows and their inefficiencies to define user requirements. The research consists of a review of current literature concerning organization theories and models used as a basis for the planning of organizational change. The theory and method included in this paper can be universally used by managers who are, or will be, involved in the transition from manual information processing to computerized processing.

Master of Science in
Information Systems
March 1987

Advisor: N. Lyons
Department of
Administrative Sciences

IMPLEMENTATION PROPOSAL OF COMPUTER-BASED OFFICE AUTOMATION FOR REPUBLIC OF KOREA ARMY INTELLIGENCE CORPS (ROKAIC)

Dae Joon Joo
Major, Republic of Korea Army
B.A., Korea University, Seoul, 1983

The availability of computer technology and its continually declining costs has led to its application in the office environment. The use of computer and micro electronics 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" (OA). OA is a working environment that brings together a useful combination of flexible and conveniently accessible, integrated, and compatible, computer-based service functions and facilities at the user's workplace. The purpose of this thesis is to provide an implementation strategy for an integrated office automation system in the Republic of Korea army intelligence corps (ROKAIC) computer system.

Master of Science in
Information Systems
March 1987

Advisor: N.R. Lyons
Department of
Administrative Sciences

THE IMPLEMENTATION OF A PLANT AND MINOR PROPERTY ACCOUNTING SYSTEM FOR THE NAVAL POSTGRADUATE SCHOOL

William Tigner Key
Commander, United States Navy
B.A., Georgia State University, 1972

Bruce Alan Whitehouse, II
Captain, United States Marine Corps
B.S., Lyndon State College, 1979

In October 1986, the Naval Postgraduate School was directed to centralize the accounting and control of minor property (approximately 60,000 items) and to locate that function in the Supply Department. The magnitude of this undertaking suggested that some sort of automated system be employed to assist in the task.

The objective of this study is to implement a prototype automated system to support the control and accounting of both plant and minor property at the Naval Postgraduate School. The effort was based on a Requirements Definition and System Specification set forth in a thesis by Ross and Smith in March 1987. The study includes a description of the implementation effort, prototype code written in dBase III Plus, and a User's Quick Reference. The basic structure of the code and data base design should be applicable throughout the U.S. Navy Supply system.

Master of Science in
Information Systems
September 1987

Advisor: D.R. Dolk
Department of
Administrative Sciences

APPLICATION OF A DATABASE SYSTEM FOR KOREAN MILITARY PERSONNEL MANAGEMENT

Sam Nam Kim
Major, Republic of Korea Army
B.S., Republic of Korea Military Academy, 1977

Jae Bock Park
Captain, Republic of Korea Air Force
B.S., Republic of Korea Air Force Academy, 1981

This thesis presents a database application, the Republic of Korea military personnel management system. In order to maximize the utilization of personnel resources a computerized personnel information system is needed.

An important consideration in database design is to assure that data can be used for a wide variety of applications and can be changed quickly and independently. For this purpose, we discuss normal forms including functional dependency concepts.

A simple data base using dBASE III+ is implemented on an IBM PC. It is designed for the user who does not have computer experience, and is based on the theoretical design problems.

Master of Science in
Information Systems
March 1987

Advisor: N.R. Lyons
Department of
Administrative Sciences

TRAINING REQUIREMENTS FOR MICROCOMPUTER USERS

Cynthia S. Lassnoff
Lieutenant, United States Navy
B.S., Pennsylvania State University, 1977

The use of microcomputers to increase productivity and aid decision making is growing steadily. Today, many individuals have little or no experience with computers. Adequate training is required so that personnel may operate them effectively.

This thesis discusses training requirements, the advantages and disadvantages of different types of training, and evaluation criteria. A case study of Naval Station Treasure Island is presented to illustrate a command that has recently implemented microcomputer technology.

Master of Science in
Information Systems
December 1986

Advisors: N.R. Lyons
E.V. Haag
Department of
Administrative Sciences

BATTLEFIELD MANAGEMENT SYSTEM: DATA REQUIREMENTS TO SUPPORT PASSAGE OF COMPANY LEVEL TACTICAL INFORMATION

Gary A. Lee
Captain, United States Army
B.S., Southwestern Oklahoma State University, 1977

Peter B. Polk
Captain, United States Army
B.A., Covenant College, 1976

One of the keys to survivability on the modern battlefield is command, control, and communications (C3). A way the U.S. Army can improve its C3 is to exploit its technological advantage in the area of communications. Computers and telecommunications are reshaping our whole society in ways which will inevitably extend to the battlefield. The interactive effect of automation and communications will fundamentally alter the way commanders approach their decision-making responsibilities. Our current technology can enhance the decision-makers ability to rapidly process and distribute critical battlefield information with reliability and accuracy. Until recently, there was little effort to infuse new technology into operations at the Battalion level and below. The concept of the Battlefield Management System (BMS) will provide the integrating tool which will automate this level of operations (the tactical level) on the battlefield.

The proposed design of BMS as an electronic information gathering, processing, and distribution system, capable of handling real-time information in a responsive manner, is one such application. The technology which makes this feasible exists today, however, no definition of the parameters required to support the passage of Company-level tactical information, and to focus this application, have been established. The objective of this thesis is to qualify a minimum acceptable bound on the data bit (i.e., memory size) and the data bit rate (i.e., the speed with which a microprocessor will need to transfer the information) for BMS by structuring the voice communications architecture of a sampled unit conducting tactical exercises at the National Training Center (NTC). Additional emphasis was placed on developing a methodology for the efficient use of the communications

tapes recorded at NTC in research and analytical efforts. Having derived the digital specifications from the maximum voice requirements, it was possible to quantify the positive impact BMS might have during a high intensity tactical situation.

The major conclusions reached in the thesis indicate that the application of digital equipment to solve battlefield reporting and information processing requirements is a realistic, obtainable goal, and should be pursued. Getting a digital system into the hands of its future users is essential to the ultimate realization of BMS by allowing users to incorporate a degree of this technology into current training. Finally, the information requirements as exhibited by the activity on a voice net do not pose an insurmountable challenge with regard to the capabilities of microprocessors currently available nor do the information requirements impose any undue architectural requirements in terms of the size of random access memory (RAM) required. The struggle to communicate digitally will be driven by the graphical requirements and not the voice requirements.

Master of Science in
Information Systems
March 1987

Advisor: N.R. Lyons
Department of
Administrative Sciences

APPLICATION OF A DATABASE SYSTEM FOR INVENTORY MANAGEMENT OF CLASSIFIED MATERIAL

Rolando Mateo Lim
Lieutenant, United States Navy
B.S., New Hampshire College, 1981

This thesis presents a database application in the area of inventory management of classified material. The system is designed for shipboard application. but can be used in the shore establishment as well.

A simple database using dBASE III PLUS is implemented on an IBM PC. It is designed for users who have very little computer experience.

Master of Science in
Information Systems
September 1987

Advisor: N.R. Lyons
Department of
Administrative Sciences

OPTICAL LASER TECHNOLOGY, SPECIFICALLY CD-ROM, AND ITS APPLICATION TO THE STORAGE AND RETRIEVAL OF INFORMATION

David J. Lind
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1972

One of the significant problems of this "information age" is the production of vast amounts of information in a form that is neither convenient nor cost effective. This information is most often produced and distributed on paper and the resultant effort in production, distribution and retrieval is herculean. A possible solution to this, is the new optical laser technology and its use in the storage and retrieval of large amounts of information. Through the use of this technology in the non-classified areas of the Department of Defense the effort in all three areas can be greatly reduced and the end user can become more efficient. In many areas of DoD, the greatest benefit would be the regained space and weight associated with the distribution of the manuals and other typically paper products on a Compact Disc - Read Only Memory (CD-ROM). One CD-ROM weighs less than an ounce and is capable of storing over 270,000 pages of text. The saved shipping and handling costs alone would be astronomically reduced not to mention the end user who would have a more effective and efficient product. The CD-ROM is designed to work as a peripheral device to a microcomputer and can therefore be made available to any user with an IBM compatible microcomputer. Tho application/demonstration portion of this thesis took over a million database records, from the Transaction Ledger On Disc (TLOD), at the Naval Supply Center (NSC) in Oakland and pressed them to a single CD-ROM. The menu driven retrieval software with indexing on 3 criteria was also provided . It is evident that optical laser discs, principally in the form of CD-ROM, are more than just an innovative technology, indeed, they have an important part in the future of the U.S.

Navy, of the Department of Defense, and all of our nation. The storage and retrieval of information is to be dramatically effected by this technology.

Master of Science in
Information Systems
June 1987

Advisor: B. Frew
Department of
Administrative Sciences

A PROTOTYPE DATABASE MANAGEMENT SYSTEM FOR PATROL WING OPERATIONS ANALYSIS

Peter L. Lindberg
Lieutenant Commander, United States Navy
B.S., Metropolitan State College, 1974

This thesis investigates the feasibility of using current DBMS software on available personal computers to manage mission summary and operational data within the Patrol community of the U.S. Navy. Patrol community is defined to mean Type Commander, Wing Commander and Squadron organization levels. This paper focuses on an application at the Wing Commander level but is adequately generalized so as to be readily customized for use by squadrons or Type Commanders. This project seeks to apply currently available DBMS technology to a body of information that is currently being managed with manual or spreadsheet methods in order to improve analysis capabilities, accuracy and efficiency. A database has been modeled based on actual data with certain elements deleted or generalized for security classification reasons. This model is easily modified for use by the target organization. This model data structure is then implemented in a prototype program on MS-DOS-DBMS application software and an evaluation made of user friendliness, performance and capabilities.

Master of Science in
Information Systems
September 1987

Advisor: T.X. Bui
Department of
Administrative Sciences

SNAP II: TRAINING ADMINISTRATIVE ENHANCEMENTS

Stanley M. Liss
Lieutenant Commander, United States Navy
B.S., Oregon State University, 1975

Shawn T. O'Rourke
Lieutenant Commander, United States Navy
B.A., Central College, 1975

This thesis presents methods for reducing the administrative burden that U.S. Navy personnel experiences, in managing shipboard training programs, through enhancements to the SNAP-II (Shipboard Non-Tactical Automated Data Process) Administrative Subsystem. Major areas addressed are Chief of Naval Operations, Fleet and Type Commanders (Atlantic and Pacific) instructions pertaining to the requirements and conduct of shipboard training programs, fleet personnel and inspecting activities views on training programs effectiveness and support, and SNAP-II capabilities supporting these requirements. A description of proposed system functions and enhancements, in the form of a calendar generator application, training requirements and accomplished documentation, is presented which provides the foundation for automating shipboard training programs throughout the Atlantic and Pacific fleets.

Master of Science in
Information Systems
September 1987

Advisor: B.A. Frew
Department of
Administrative Sciences

A FEASIBILITY STUDY USING CHINESE SPEECH AS A COMMAND/CONTROL TOOL FOR COMPUTER SYSTEMS

I Kang Liu
Commander, Republic of China Navy
B.S., Chinese Naval Academy, 1975

This thesis examines whether American English speech recognition technology can be used by Chinese speakers, in their native tongue, to achieve a reasonable degree of recognition accuracy. Three experiments were completed. The first showed that 88.25% of 4305 trials of Chinese phoneme recognition was correctly recognized. The second showed that 74.67% of 900 trials of simulated speaker independent mode Chinese utterance recognition was correctly recognized. The third showed that 12.44% of 900 trials of speaker dependent mode Chinese utterance recognition was incorrectly recognized on the first attempt. Only 16 utterances required a retraining to eventually obtain a correct recognition.

Master of Science in
Information Systems
March 1987

Advisor: G.K. Poock
Department of
Operations Research

A STUDY OF THE U.S. COAST GUARD STANDARD TERMINAL ACQUISITION PROCESS

James D. Maes
Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1980

This thesis is a study of the regulations and directives that apply to the acquisition of Automated Data Processing systems for the United States Coast Guard. The original standard terminal acquisition for the Coast Guard in 1981 was intended to provide the Coast Guard with state of the art microcomputer capabilities. It was also an attempt at standardization to avoid a proliferation of noncompatible computer systems. A comparison of the original standard terminal acquisition process with the current applicable guidelines and regulations will provide a number of 'lessons learned' as well as a basic framework for similar acquisitions in the future.

Master of Science in
Information Systems
March 1987

Advisors: R.W. Smith
N.R. Lyons
Department of
Administrative Sciences

THE IMPACT OF INDUSTRIAL FUNDING ON NARDAC OPERATIONS: A MARKETING PERSPECTIVE

Kenneth Thomas Marion
Commander, United States Navy
B.A., Villanova University, 1971

Duane Harwood Douglas
Lieutenant, United States Navy
B.S.S., University of Kansas, 1981

This thesis examines in detail the management strategies employed at three different NARDACs-San Diego, San Francisco, and Washington, D.C. Specific emphasis is given to the marketing of ADP services since October 1983, when NARDACs became Navy Industrial Fund activities. A detailed marketing audit of each organization is presented, and the strength and weaknesses of marketing strategies employed at each NARDAC are assessed. The pros and cons of the different approaches are examined, recommendations are made, and a baseline for the development of an effective approach to marketing ADP services in the Navy is established. Central to the entire analysis is the understanding that NIF demands that NARDACs be operated as businesses. The authors conclude that managers at every echelon must fully come to grips with what operating as a business implies if NARDAC operations in the NIF environment are to reach their full potential.

Master of Science in
Information Systems
March 1987

Supervisor: K. Euske
Department of
Administrative Sciences

MICROCOMPUTER PROGRAM DESIGN CONSIDERATIONS FOR THE NOVICE USER

David C. Moore
Lieutenant Commander, United States Navy
B.S., Ohio State University, 1976

The purpose of this thesis is to present the issues and considerations related to the development and implementation of a user interface for a microcomputer-based application program. The interface design goal is to enable a novice user to fully utilize all application program functions without prior training or reference to a user's manual.

The results of the empirical evaluation of the user interface are presented together with an analysis in support of the effectiveness of a proposed interface design methodology and interface design considerations.

Master of Science in
Information Systems
March 1987

Advisor: N.R. Lyons
Department of
Administrative Sciences

ANALYSIS OF THE P-3C CP-901 MODERNIZATION PROGRAM

Leo Francis Murphy
Lieutenant Commander, United States Navy
B.A., Holy Cross College, 1974

The CP-901 (AN/ASQ-114 or Univac 1830A) is a general purpose digital computer used in the P-3C Orion aircraft. Operated by the U.S. Navy during the last 18 years with the barest minimum of improvements, progressive increases in processing workloads have resulted in a significant degradation in the CP-901's ability to meet minimum acceptable performance, extensibility and expandability requirements. This thesis provides a synoptic description of the CP-901 modernization program initiated by the Naval Air Systems Command and cogent points from numerous civilian and military studies of alternative methods of upgrading the P-3C computer system are evaluated. The thesis concludes by providing recommendations for further areas of investigation and consideration.

Master of Science in
Information Systems
March 1987

Advisor: N.F. Schneidewind
Department of
Administrative Sciences

AN ON-LINE TUTORIAL FOR THE ADMINISTRATIVE SCIENCES PERSONAL COMPUTER LABORATORY

Karen M. Overall
Lieutenant, United States Navy
B.S., Eastern New Mexico University, 1979

This thesis describes the development of an on-line, self-paced tutorial that shows novice computer users how to use the IBM PCs and network in the Administrative Sciences Department PC Laboratory. The tutorial is designed in a modular fashion so the user can easily exit the software at a number of logical stopping points. The topics that are covered are: 1) the IBM PC in general, 2) IBM PC-DOS, 3) the network, 4) a list of the software available on the network, and 5) sources available for further details. A copy of the tutorial on a floppy diskette may be obtained by contacting the NPS Administrative Sciences PC Laboratory.

Master of Science in
Information Systems
September 1987

Advisor: B.A. Frew
Department of
Administrative Sciences

EVALUATION OF THE MAN-MACHINE INTERFACE FOR THE INTEGRATED TACTICAL DECISION AID (ITDA)

Linda F. Parker
Lieutenant Commander, United States Navy
B.A., Gustavus Adolphus College, 1974

This evaluation of the man-machine interface for the Integrated Tactical Decision Aid (ITDA) covers managerial decision making, the role of a Decision Support System (DSS), and the basic components of generic decision support systems. It then concentrates on criteria for the dialog subsystem of a decision support system, and evaluation of the ITDA against these criteria.

The primary question considered is: Does the man-machine interface for the ITDA suit the system's role as a decision aid. Secondary questions considered are: What is the role of a decision aid? What criteria should the dialog subsystem of a DSS be expected to meet? How does the ITDA fare against these criteria?

Finally, the report discusses what can be done to improve the man-machine interface of the ITDA.

Master of Science in
Information Systems
March 1987

Advisor: T.M. Mitchell
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Operations Research

NAVY STOCK POINT LOCAL UNIQUE COMPUTER PROGRAMS; AN ANALYSIS FOR TRANSITION AND MANAGEMENT UNDER THE STOCK POINT ADP REPLACEMENT (SPAR) PROJECT

James Andrew Pearson
Lieutenant Commander, United States Navy
B.S., San Diego State University, 1977

Computer Systems at Navy Stock Points are planned to be, in the near future, replaced with new systems being procured by the Stock Point ADP Replacement Project (SPAR). An important issue of the replacement will be the converson of existing computer software to allow transition from the current hardware environment to the replacement hardware. Centrally developed and managed Uniform Automated Data Processing System for Stock Points (UADPS-SP) software will be the main thrust of the conversion of thousands of field activity developed application software programs referred to as "local uniques".

This thesis documents the scope of the local unique program situation by documenting numbers and characteristics of those local programs. It further provides an analysis of the SPAR conversion strategy and methodology in terms of conversion support and programming tools being procured to accomplish current local unique program workload. Local unique program management is analyzed and observations are made concerning program management adequacy.

Master of Science in
Information Systems
March 1987

Advisor: R.A. Frew
Department of
Administrative Sciences

A SOCIO-TECHNICAL ANALYSIS OF COMPUTER APPLICATION WITHIN THE FOURTH MARINE AIRCRAFT WING

Daniel F. Piermarini
Major, United States Marine Corps
B.S., Fitchburg State College, 1975

R. Paul Ortiz
Captain, United States Marine Corps
B.S., John Jay College of New York, 1975

The acquisition of microcomputers within the Fourth Marine Aircraft Wing (4TH MAW) has placed a major emphasis on the computerization of the already existing information systems. The Information Systems Management Office within the 4th MAW has been restructured and is presently forcing key personnel to re-think and analyze the role of information processing. This thesis addresses the sociotechnical approach to the technology transfer and office automation processes within the 4th MAW. The role of the Zenith 150 microcomputer is examined for its effectiveness and ability to improve the units' responsiveness to operational tasks. The Zenith 150 microcomputer is an effective tool which can assist management in planning, problem solving, communication and decision making.

The authors' research findings indicate that the implementation process currently being used is not sufficient to meet all the needs of 4th MAW units. This study identifies alternatives necessary to meet user needs. A socio-technical framework is applied to discuss the use of integrating mechanisms such as local area networks (LAN's), modems, data base programs, and quality training schedules. The authors' process, which implements these devices, will provide better unit communication and enhance operational efficiency.

Master of Science in
Information Systems
March 1987

Advisors: R. McGonigal
B. Roberts
Department of
Administrative Sciences

A SYSTEMS ANALYSIS AND DESIGN PROPOSAL FOR THE SUPPLY DEPARTMENT'S PLANT AND MINOR PROPERTY PROCESS AT THE NAVAL POSTGRADUATE SCHOOL

Michael L. Ross
Captain, United States Marine Corps
B.S., George Mason, 1978

Ralph Q. Smith
Lieutenant, United States Navy
B.S., Georgia Institute of Technology, 1980

The current system used to administer Plant Account equipment for departments at the Naval Postgraduate School involves over 4500 items. The current Minor Property System is decentralized and encompasses approximately 60,000 items. A recent Naval directive called for the centralization of Minor Property systems. This thesis was undertaken to assist the Command in compliance with this directive and to improve Command property management. Implementation of a management information system (MIS) to support property management functions would achieve these two objectives, as well as eliminate redundant data handling and improve property management administrative effectiveness. To aid in meeting the above objectives the following deliverables are presented in this paper: detailed system specifications for database application, data dictionary, file structures, and hardware specifications.

Master of Science in
Information Systems
March 1987

Advisor:

A PROPERTY MANAGEMENT SYSTEM FOR THE ADMINISTRATIVE SCIENCES DEPARTMENT

Timothy M. Sexton
Lieutenant, United States Navy
B.A., State University of New York, Stonybrook, 1976

The Administrative Sciences Department (ASDEPT) of NPS maintains a considerable amount of computing and office equipment [illegible] to support its students, staff, office, and management personnel. This thesis provides a relational database application - The Property Management System (PMS) to support the management and accountability of the AS DEPT property. The systems analysis and design methodology of a relational database is outlined. The implementation is undertaken on a microcomputer using dBase III plus. A data dictionary, program listings, and User's Manual are included.

Master of Science in
Information Systems
September 1987

Advisor: T.X. Bui
Department of
Administrative Sciences

SHIPBOARD AMMUNITION MANAGEMENT SYSTEM: A DATABASE APPROACH

Steven L. Smith
Lieutenant, United States Navy
B.S., Washington State University, 1979

This thesis concerns the analysis, design, and partial implementation of a software package to automate the present manual system of conventional ammunition management onboard most ships of the U.S. Navy. Structured analysis and design techniques are utilized in the development and approximately one quarter of the application programs have been implemented.

The system is designed for stand alone operation on an IBM compatible microcomputer using the relational database package dBase III Plus by Ashton-Tate.

Follow-on work would consist of completing the application programs, select a pilot vessel and install the system, collect user comments, and modify the system as necessary.

Master of Science in
Information Systems
September 1987

Advisors: N.R. Lyons
Y. Mortagy
Department of
Administrative Sciences

A DATABASE DESIGN FOR A UNIT STATUS REPORTING SYSTEM

Ann Jacoby Stebbins
Captain, United States Army
B.S., Indiana University of Pennsylvania, 1978

This thesis advances the hypothesis that utilization of a database management system (DBMS) will lead to improved accuracy, and decrease the amount of time spent on the preparation of the U.S Army's Unit Status Report: (USR). This study developed data flow diagrams of the proposed USR system, along with a supporting passive data dictionary. A Semantic Database Model (SDM) schema for the proposed USR system is also presented. This thesis concludes that the proposed database design for the USR system be implemented using a standard (Army-wide) DBMS.

Master of Science in
Information Systems
March 1987

Advisor: Y.K. Mortagy
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THE APPLICATION OF CURRENT USER INTERFACE TECHNOLOGY TO INTERACTIVE WARGAMING SYSTEMS

Nora Gaye Stevens
Lieutenant, United States Naval Reserve
B.A., Wofford College, 1979

A major problem in the military wargaming arena is the difficulty in understanding and utilizing currently available user interfaces. Users span a broad range in terms of rank, background, technical skill, perspective, and computer literacy. Military workloads and complexity of computer and wargaming systems preclude familiarity with system interfaces. New users are inundated with a variety of obstacles, including unfamiliar hardware and cryptic command structures, as well as widely varying wargaming software systems. In most cases, in-depth training is required before a wargaming session can commence, thus consuming valuable time, resources, and money.

This thesis pursues the specific application of the "visual" interface and windowing to the user interface of wargaming systems for the purpose of improving the utility and usability of these systems to their users and sponsors.

Master of Science in
Information Systems
September 1987

Advisor: T.X. Bui
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Administrative Sciences

SOFTWARE REQUIREMENTS FOR A PUBLICATION LIFECYCLE MANAGEMENT SYSTEM

Karen K. Struble
Lieutenant, United States Navy Reserve
B.S., Indiana University of Pennsylvania, 1979

This thesis defines software requirements for a NWP/NATOPS Publication Lifecycle Management System. Functional requirements are identified and analyzed through the use of structured analysis. Specifications for the proposed system are developed. Possible architectures of the system are identified.

Master of Science in
Information Systems
September 1987

Advisor: N.R. Lyons
Department of
Administrative Sciences

PREVENTING INTERNAL COMPUTER ABUSE

Randal Gerald Tart
Major, United States Army
B.S., United States Military Academy, 1972

American businesses lose millions of dollars every year through computer crime perpetrated by company employees. Most of these losses are the direct result of inadequate corporate security programs. They could be eliminated fairly easily if organizations would employ common sense and relatively inexpensive remedial actions that range from the mostly broad-based and non-technical efforts of top management to the very specific and technical measures inherent to lower management levels. This paper deals specifically with the steps that should be taken at the top management level. It proposes that top management must first develop a better understanding of the nature of the criminal threat and effect an ethical business environment that will detect/deter/prevent abusive inclinations. Top management must then ensure that a sound overall security program is in place as a framework within which specialized security controls can and must function. Finally, top management must initiate specific security controls and ensure that subordinate levels of managers follow suit.

Master of Science in
Information Systems
December 1986

Advisor: N.R. Lyons
Department of
Administrative Sciences

A COMPARATIVE STUDY OF GDSS USE: EMPIRICAL EVIDENCE AND MODEL DESIGN

Daniel H. Webb
Lieutenant Commander, United States Navy
B.S., Florida State University, 1976

Amy L. Hughes
Lieutenant, United States Navy
B.A., Moravian College, 1979

Although the technology is in its infancy, Group Decision Support Systems (GDSS) have attracted attention as a possible means of improving the effectiveness and efficiency of the ever-increasing number of group decisions that are made in modern organizations. We have conducted an empirical study in which groups of three were tested in two different settings. One setting involved unaided face-to-face problem solving and the other involved GDSS-aided face-to-face problem solving. Our study expanded the research of Fijol and Woodbury and thus, we replicated the conditions of their experiment. In support of a major premise of our model, we found that the case used was too simple to be efficiently solved using a GDSS. Further research is necessary to define precisely which characteristics and settings are best used to support each problem type and to make GDSS a useful management tool.

Research has suggested that a wide range of options may be included in a GDSS and that there are several possible settings for its use. Not all settings and options, however, are feasible for all problem types. In addition to our study, we have developed a model, based on problem type, that recommends optimal settings and characteristics for GDSS use with a particular problem type.

Master of Science in
Information Systems
September 1987

Advisor: T.X. Bui
Department of
Administrative Sciences

DSS DEVELOPMENT EFFORTS AT THE MARE ISLAND NAVAL SHIPYARD

Richard N. Woodman
Captain, United States Marine Corps
B.A., St. Lawrence University, 1977

Michael F. Rall
Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1981

The mandate of a cost conscious Congress and American people caused NAVSEASYSCOM to commission a study to identify areas for improvement within U.S. Naval Shipyards. Budget development and control was one area identified. The focus of this thesis is centered on a single shipyard, the Mare Island facility, detailing the budgeting operations of one of its departments. The objective is to develop an initial pilot project, a prototype Decision Support System (DSS), that will address the concerns of budget preparation, control and variance analysis. Additionally, this project assesses the feasibility of larger DSS efforts within the shipyard. The methodology of the development was a blend of structured and typical DSS approaches, providing flexibility with rigorous documentation. Further effort toward integrating the findings of this thesis with the present accounting system is recommended to expand the use of decision support within the shipyard.

Master of Science in
Information Systems
March 1987

Advisor: N.R. Lyons
Department of
Administrative Sciences

TOUCHSTONE: A CRITERIA DEVELOPMENT PROGRAM FOR GROUP DECISION SUPPORT SYSTEMS

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B.S., University of Virginia, 1969
M.A., Webster College, 1979
B.S., National University, 1985

Michael E. Neeley
Lieutenant, United States Navy
B.S., University of Southern Illinois, 1979

Group decision making utilizing the Delphi method can be a time-consuming and difficult procedure, especially when the required group membership is separated by great distances. This study designs and implements an automated group decision support system which may be employed by a single computer or a networking system.

This particular model is text-based as opposed to mathematical-based, a radical departure from the GDSS models currently in vogue. This program, TouchStone, successfully translates the Delphi method of criteria development to the computer. It is implemented in Turbo Pascal for the IBM-PC.

Master of Science in
Information Systems
March 1987

Advisor: T.X. Bui
Department of
Administrative Sciences

JANUS/ADA SOFTWARE IMPLEMENTATION OF A STAR CLUSTER LOCAL AREA NETWORK OF PERSONAL COMPUTERS

Thomas Victor Works
Lieutenant, United States Navy
B.A., University of Rochester, 1979

This thesis describes the detailed design and implementation of a star cluster local area network among multiple Zenith Z-100 microcomputers. The Z-100s are linked together by the Concentrator, a server system consisting of a power supply, an iSBC 86/12A single board computer, and three BLC 8538 eight channel I/O expansion boards, through RS232c USART ports.

The local area network software consists of a server program resident in the Concentrator which provides the communication links between the Z-100s and the utility programs resident in each microcomputer. These utilities include file and message transfer (both point to point and broadcast), directory listing transfer, and online user identification. The program and utilities are written in JANUS/Ada, with assembly language subroutines for machine specific functions, and are designed to run with the CP/M-86 operating system.

Master of Science in Information Systems
December 1986

Advisor: U.R. Kodres
Department of Computer Science

MASTER OF SCIENCE

IN

MANAGEMENT

327/328

A STUDY OF THE EFFECTS THAT IMPLEMENTATION OF BIENNIAL BUDGETING HAS ON THE DEPARTMENT OF THE NAVY'S POM DEVELOPMENT AND BUDGET FORMULATION PROCESSES

Thomas J. Anderson
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1974

A trend towards biennial budgeting at the Federal level may be developing. In 1982, expanded multiyear procurement procedures in the acquisition of major weapons systems were made available to DoD by the Congress and Major Milestone Funding is under discussion. In 1986, DoD became the first Federal agency to submit a biennial budget (for FY 1988 & FY 1989). The purpose of this thesis is to study the effects that these changes are causing on the POM development and budget formulation within the Department of the Navy. The potential benefits that a biennial budget offers to those formulating and executing the budget vary considerably depending upon the specific form that the biennial budget takes. Favorable characteristics from DoD's perspective are identified.

Master of Science in Management
June 1987

Advisor: J.L. McCaffery
Department of Administrative Sciences

DETERMINANTS OF QUIT BEHAVIOR AMONG MANAGERIAL AND PROFESSIONAL WOMEN

Jacquelyn M.Y. Arrowood
Lieutenant Commander, United States Navy
B.A., California State University, San Diego, 1976

This thesis examines the effects of personal, human capital and job related characteristics on the quit decision of managerial or professional level women. In addition, perceptual or equity factors, such as crowding within grade level and functional area, relative time to promotion and pay compared to others in the firm, were modeled. The micro-data are from the personnel files of a large manufacturing firm. Three types of analysis were conducted. The first was a logit analysis of a cross-sectional sample of the managerial/professional women in this firm. The second was a logit analysis of a pooled cohort sample of these women, during their second full year after hire. The third examination of the data used a proportional hazard analysis, compensating for the selection bias, due to censored data, inherent in quit studies. The relative advantages and disadvantages of the three techniques are discussed. Empirical results of the proportional hazards model show that such job related factors as recent promotion, salary, grade level and favorable performance ratings significantly reduce quits, with promotion having the strongest effect. Personal factors such as marriage and children also reduce the managerial/professional woman's propensity to quit.

Master of Science in Management
December 1986

Advisor: L.M. Solnick
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Administrative Sciences

AN ANALYSIS OF P-3 AIRCRAFT SERVICE PERIOD ADJUSTMENT CRITERIA

William E. Ash
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B.S., University of Houston, 1978

Logisticians at NARF's (Naval Air Rework Facilities) presently rely on the qualitative judgement of skilled P&E's (Planners and Estimators) to determine when depot level maintenance is required on P-3 aircraft. This study focuses on quantifying the management problem of deciding which P-3's to recommend for rework delays under the Navy's ASPA (Aircraft Service Period Adjustment) program. Inspection consistency, precise managerial auditing, and computer-based trend analysis are prospective attributes of a properly tested and instituted quantitative ASPA evaluation. The engineering basis and the economic realities of the P&E's decision are addressed. By exploring current management science methodologies, a practical model patterned after ASPA evaluation methods being tested at NARF Norfolk and at Army Helicopter Depot Corpus Christi is recommended to assist NARF management with this decision.

Master of Science in Management
December 1986

Advisor: A.W. McMasters
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Administrative Sciences

AN ANALYSIS OF THE FACTORS AFFECTING THE CAREER ORIENTATION OF JUNIOR URL NAVAL OFFICERS

Raymond J. Ashcraft
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1974

This thesis constructs and tests a model of the career orientation of junior unrestricted line naval officers. Specifically, the influence of biodemographic characteristics, length of service, family financial situation, intrinsic and extrinsic job satisfaction, and perception of external job opportunities are investigated. Results indicate that variables which assess the individual's total amount of sea duty, probability of finding a good civilian job, and satisfaction with the extrinsic aspects of the military job are most important in predicting the career orientation of junior naval officers with between eighteen months and seven-and-one-half years of active service. Knowledge of the variables in the model, and their relative influence on the career intentions of junior naval officers can provide manpower planners with information valuable for managing the retention of these officers.

Master of Science in Management
June 1987

Advisor: G.W. Thomas
Department of Administrative Sciences

COST ANALYSIS OF FIRST TOUR PATROL SQUADRON PILOTS AND NAVAL FLIGHT OFFICERS WHO DO NOT COMPLETE THEIR INITIAL FLEET TOURS

Larry D. Ayers
Lieutenant, United States Navy
B.S., Auburn University, 1974

This study was conducted to determine the training costs associated with thirty two first tour P-3 pilots and naval flight officers removed from flight status between 1984 and 1986. The thesis is designed to provide basic training cost information that may aid decision makers in determining the effectiveness of training programs in place. Costs determined within this report include precommissioning and flight training costs through fleet readiness squadrons. The total training costs related to the thirty two officers examined amounts to more than $6,700,000.

Master of Science in Management
June 1987

Advisor: S.S. Liao
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PRACTICAL COMPTROLLERSHIP TEXTBOOK

John Robert Backus
Lieutenant Commander, United States Navy
B.A., SUNY College at Plattsburgh, 1975

Legal and regulatory changes have made the 1981 edition of the Practical Comptrollership Course (PCC) Textbook obsolete. A new PCC Textbook was drafted under the hypothesis that it could be rewritten to improve the future performance of the military comptroller better than the 1981 edition. The hypothesis was tested by having a comptroller, a senior officer, an accounting professional, and several auditors compare the new PCC Textbook with the 1981 version, and their paradigms for comptrollership to determine if the new PCC Textbook might prepare comptrollers better. Research revealed that some characteristics of the new PCC Textbook were more likely to improve future comptrollership. Further, the research revealed differences in expectations between the accounting professional and the senior officer. Suggestions for improved research methods and salient topics for further research are offered. The new PCC Textbook is appended to the thesis.

Master of Science in
Management
March 1987

Advisors: R. Evered
J. Duke
Department of
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MODELS FOR OPTIMIZING THE MIX OF AIR-LAUNCHED MISSILES FOR REPAIR PROCESSING

Charles Francis Bednash
Lieutenant Commander, United States Navy
B.A., University of South Florida, 1973

Randal H. Taylor
Pacific Missile Test Center, Point Mugu, California
B.S., Iowa State University, 1982

This thesis proposes three linear programming models for the Naval Air Systems Command to use in planning the repair of air-launched missiles through the Naval Weapons Stations. Specific emphasis is placed on the development of three models to aid the workload planner in determining the optimal mix of air-launched missiles to induct for repair each quarter at intermediate level maintenance facilities.

Master of Science in Management
March 1987

Advisor: T.P. Moore
Department of Administrative Sciences

ANALYSIS OF OVERPRICING OF MAINTENANCE SERVICE CONTRACTS AWARDED VIA THE 8(A) PROGRAM AND BY FORMAL ADVERTISING

Eric John Benson
Lieutenant Commander, United States Navy
B.S., University of Nebraska, Omaha, 1975

Section 8(a) of the Small Business Act, as amended, authorizes the Small Business Administration (SBA) to enter into contracts with other government procuring agencies for goods and services. The SBA subcontracts the work on a sole source basis to small businesses that are owned and controlled by socially and economically disadvantaged individuals. Overpricing of 8(a) contracts occurs when an award is made above the current fair market value and the SBA does not provide business development expense funds for the price differential. Both General Accounting Office and United States Army Audit Agency audits cite cases of overpricing. This thesis examines overpricing from a total change order rate perspective for 8(a) and formally advertised maintenance service. From the data accumulated for this study, it was determined that the change order rates were comparable.

Master of Science in Management
December 1986

Advisor: S.S. Liao
Department of Administrative Sciences

DOUBLE-STACK UNIT TRAIN CONTAINER SERVICE: ITS COMMERCIAL IMPACT AND VALUE TO THE MILITARY SHIPPER

Karl-Heinz Bernhardt
Lieutenant Commander, United States Navy
B.B.A., University of Toledo, 1977

Double-stack container train service was successfully introduced in 1984 and has expanded rapidly since. The newly designed five-platform articulated well railroad car serves as the vehicle. Space-age computer-assisted design has helped to engineer a radical departure from conventional railcar configuration and produce significant weight and rolling resistance reductions. Commensurate with introduction of this new generation of equipment, the ocean carriers and railroads have developed new cooperative train scheduling procedures and container/railcar handling methods. Additionally, the higher volume of containers per stack train has forced a redesign of railyards and marine terminals. Opportunities for unique military application of stack train technology and possible container rate reductions await the military transporter. The expedient maturation of stack train technology has provided an early opportunity for a thorough review of its development, the impact upon the containerized freight industry, and the stack trains' potential value to the military.

Master of Science in Management
December 1986

Advisor: D.C. Boger
Department of Administrative Sciences

QUANTIFICATION OF THE S-3 VIKING AIRCRAFT SERVICE PERIOD ADJUSTMENT (ASPA) PROGRAM

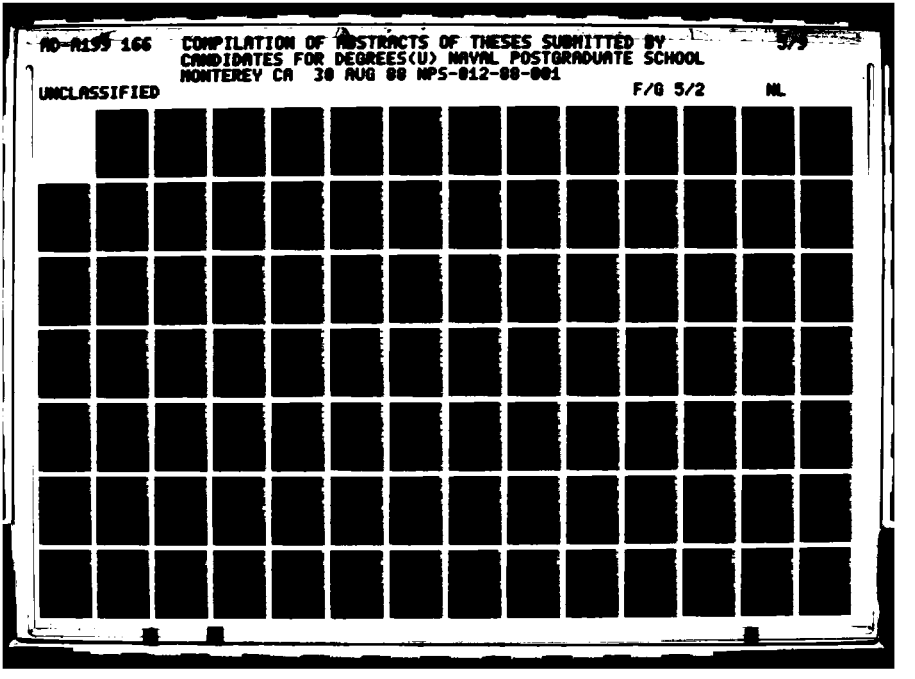
Wayne Peter Borchers
Lieutenant, United States Navy
B.S., United States Naval Academy, 1980

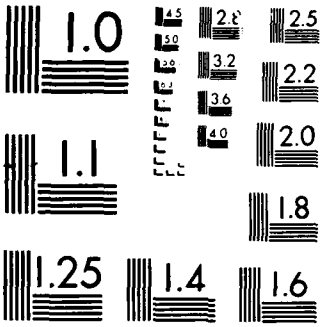
Richard Michael Rowan
Lieutenant, United States Navy
B.S., University of Arizona, 1979

The Aircraft Service Period Adjustment (ASPA) inspection/evaluation process for the Navy's S-3A Viking aircraft is presently a subjective assessment of the aircraft's general material condition. The purpose of this thesis is to quantify the ASPA inspection/evaluation process. The methodology used to quantify this process utilizes the Analytic Hierarchy Process (AHP) model. The AHP model is based upon three principles of logical analysis: (1) the principle of constructing hierarchies, (2) the principle of establishing priorities, and (3) the principle of logical consistency. This study presents a more efficient method of determining the aircraft induction decision than the current subjective ASPA procedures. Although the principle of logical consistency caused great concern amongst the authors, a methodology has been developed for quantifying the S-3A ASPA process that will assist NARF Alameda management in the control and documentation phase of the S-3A ASPA program.

Master of Science in Management
December 1986 (Borchers)
March 1987 (Rowan)

Advisor: A.W. McMasters
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Administrative Sciences


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COMPILATION OF ABSTRACTS OF THESES SUBMITTED BY
CANDIDATES FOR DEGREES(U) NAVAL POSTGRADUATE SCHOOL
MONTEREY CA 30 AUG 88 NPS-012-88-001
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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963-A

IMPLEMENTATION OF IMPROVED MANAGEMENT CONTROL OF AVIATION DEPOT LEVEL REPAIRABLE FUNDS

Stanley D. Bozin
Lieutenant Commander, United States Navy
B.S., Rutgers Universtiy, 1974

The purpose of this study is to evaluate the implementation process of the conversion of Aviation Depot Level Repairable (AV-DLR) funding to the Navy Stock Fund. On April 1, 1985 this conversion was implemented to obtain the following objectives: (1) to improve the supply system discipline; (2) to improve financial flexibility; (3) to improve budget forecasting; (4) to improve material support responsiveness. This thesis examines the implementation process and presents specific recommendations for improving the management control of AV-DLRs in the area of budgeting, feedback, and accountability.

Master of Science in Management
December 1986

Advisor: O.D. Moses
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Administrative Sciences

U.S. ARMY OFFICER GRADUATE EDUCATION: NEW METHODOLOGY FOR ESTABLISHING REQUIREMENTS AND UTILIZING ASSETS

Danny W. Braudrick
Lieutenant Colonel, United States Army
B.A., University of Arizona, 1974

The purpose of this thesis is to review the Department of Defense (DoD) and the Army policies regarding graduate education at civilian institutions. Particular attention is paid to Congressional, General Accounting Office (GAO), Office of the Secretary of Defense (OSD) and Army reviews of DoD and Army policies and program execution. Issues investigated are: (1) The identification of graduate education requirements via an annual position-by-position validation process; (2) Whether or not this process identifies the Army's total requirements, functionally and cognitively; (3) Whether DoD and Army utilization policies regarding assignment of officers with graduate education to specific validated positions are appropriate; (4) Whether a better methodology to validate requirements and utilize officers with graduate degrees exists which will satisfy both the professional development needs of the officer corps and the Army.

Master of Science in Management
December 1986

Advisors: B.J. Roberts
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AN ANALYSIS OF CLAIMS AND CLAIMS AVOIDANCE TECHNIQUES IN THE SHIP REPAIR AND OVERHAUL INDUSTRY

Carl Thomas Bright
Lieutenant Commander, United States Navy
B.S., Alcorn State University, 1975

Claims settlement and claims avoidance in the current ship repair and overhaul industry are extremely difficult. The intense competition and depressed economic status of the industry has forced several industry contractors to adopt contract buy-in and the submission of zero profit margin bids as a business strategy. The lack of commercial repair and overhaul work leaves the Navy as the dominant industry customer. Navy contracts accounted for 90 percent of the entire industry workload in 1986. This research examines the current claims avoidance techniques employed by the Navy and their effectiveness for future claims avoidance. It also recommends management techniques and procedures for the improving claims avoidance. This research has conducted a literature search, supplemented by interviews with government and industry officials.

Master of Science in Management
June 1987

Advisor: D.V. Lamm
Department of Administrative Sciences

A COST-BENEFIT ANALYSIS OF PERSONNEL POLICIES CAUSING OVERPAYMENT AT SEPARATION

William V. Budd
Lieutenant Commander, United States Navy
B.S., University of Washington, 1975

This thesis reviews the out-of-service debt with emphasis on the personnel policies driving the debt. Using criteria developed in the thesis, elimination of all debt categories, except reenlistment bonuses was accomplished. A review of the policies governing the Selected Reenlistment Bonus Program was conducted, followed by a cost-benefit analysis of the Program. The results indicate a net cost from this Program of $23 million for the Navy.

The requirements of the Debt Collection Act are then reviewed, and compared to implementation of the Act's provisions by NFC. The impacts on debt collection methods, provided by the Act, are reviewed. The collections under each provision of the Act are identified, with those provisions controlled by the Government providing higher returns than those controlled by civilian organizations.

Master of Science in Management
June 1987

Advisor: D. Scoggin
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IMPROVING THE QUALITY OF THE NAVY'S MATERIAL HANDLING EQUIPMENT (MHE) FLEET WITH SPECIAL EMPHASIS ON FORKLIFTS AT NAVAL SUPPLY CENTERS

Robert J. Bump
Lieutenant Commander, United States Navy
B.S., University of Louisville, 1976

Reliable and readily available MHE is vital to all large scale military supply, maintenance and transportation operations. Therefore, the need to improve the quality of the Navy's MHE fleet cannot be over-emphasized. The current MHE inventory quality is poor and methods for improving this quality are essential. This thesis considers the Navy's forklift trucks because they comprise a large majority of the MHE fleet. A review of current MHE management policies, maintenance concept and plan, and replacement methodology is provided. Next, the current status of Navy forklifts at the eight Naval Supply Centers is analyzed to determine the average age and over-age of MHE, the compliance with DoD MHE replacement criteria, utilization rates and the extent of economically obsolete MHE. The results of this analysis show that a significant percentage of these trucks are over-aged and economically obsolete. The DoD criteria need to be replaced by the private sector approach for determining the economic life of MHE.

Master of Science in Management
December 1986

Advisor: A.W. McMasters
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ANALYSIS OF EXCESS MATERIALS ASSOCIATED WITH AIRCRAFT CARRIER OVERHAULS

LaDean W. Bunkers
Lieutenant Commander, United States Navy
B.S., Bemidji State University, 1976

Larry R. Heyen
Lieutenant, United States Navy
B.S., University of Nebraska, 1977

This thesis examines the effects of current material management practices related to aircraft carrier overhauls on the Excess and Unassigned Direct Material accounts at the Norfolk Naval Shipyard. Research was conducted on all material management procedures from the initial planning process through the post-overhaul process of excessing material. Emphasis was placed on evaluation of efficiency of the present excessing and reutilization processes with appropriate recommendations for improvements. Results indicate that improvements can be implemented to decrease the quantity of material being ordered and excessed without adversely effecting the scheduled completion of aircraft carrier overhauls. These improvements will generate more efficient use of Navy assets while reducing the cost of future overhauls.

Master of Science in Management
December 1986

Advisor: D.G. Matthews
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EARLY DELIVERY OF PURCHASED MATERIAL: A DOD PROBLEM

Gerald A. Burleigh
Lieutenant, United States Navy
B.A., University of Maine, Orono, 1972

The issue of early deliveries and their consequences for the Navy are new concepts which depart rather significantly from customary government thinking, where late delivery is the primary concern. The government normally accepts supplies when they are delivered, even if earlier than required. This thesis investigates whether or not early deliveries do in fact occur, and if so, whether they are a significant problem for the government.

The objective of the research effort, once it was established that early deliveries do in fact occur, is to explore those factors and costs associated with receipt of material prior to the required delivery date. Emphasis is placed on the factors of holding costs and production lead time as they relate to the costs and consequences of early deliveries.

In summary, early deliveries do occur. There are no shelf-life problems associated with the early receipt of material. There are opportunity costs incurred in the holding and paying for material delivered early.

Master of Science in Management
December 1986

Advisor: T.P. Moore
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AN ASSESSMENT OF THE PIERSIDE PROCUREMENT INITIATIVE

Glenn Canigiani
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B.S., United States Naval Academy, 1975

The research focuses on the background, implementation, and operation of Pierside Procurement sites throughout the United States and overseas. The research was conducted by a review of directives and policy guidance, field interviews, and visits with key individuals involved in the Pierside Procurement initiative. The intent of the study is to analyze the Pierside Procurement initiative, ascertain shortcomings, and make recommendations that offer viable solutions to these problems. This study also recommends areas for future study that may provide insight into improving the Pierside Procurement process.

Master of Science in Management
June 1987

Advisor: D.V. Lamm
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Administrative Sciences

THE EFFECT OF FORMAL TRAINING ON CONTRACT-CONSTRUCTION COST GROWTH

Mark D. Claussen
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B.S., United States Naval Academy, 1977

Navy junior officer contract-construction administrators work with civilian contractors who are experienced professionals in a competitive industry where the favored tool is a bulldozer. Increased construction cost resulting from on-the-job "learning" experiences with these contractors is a luxury the Navy can no longer afford. This study examines the results of a survey questionnaire that was distributed to all junior officers currently serving as contract-construction administrators to determine their attitudes and beliefs regarding formal training and to solicit training suggestions. The study concludes that (1) The Naval Facilities Engineering Command does not have a formal training policy for contract administrators; (2) Less than 50% of all construction offices have a training program; (3) Formal training is a controllable variable that significantly reduces contract cost growth. Recommendations include: (1) NAVFAC expand the basic Contract Construction Administration and Management course; (2) NAVFAC issue a policy statement regarding mandatory completion of the contract modifications course; (3) Shift the funding responsibility for training to the Engineering Field Divisions; (4) Develop a Personal Qualification Standard similar to that established for the Contract Authority Warranting Program.

Master of Science in Management
March 1987

Advisor: R.A. Weitzman
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NON-LOGISTICS BAR CODE USES FOR THE DEPARTMENT OF DEFENSE: ILLUSTRATIVE APPLICATIONS FOR THE NAVAL POSTGRADUATE SCHOOL

Jerry J. Coady
Lieutenant Commander, United States Navy
B.S., Cameron College, 1971

This thesis examines the use of existing bar code technology as a means of increasing efficiency and accuracy in the performance of administrative tasks within Department of Defense agencies. Motivated by increasing labor costs, both the private and public sectors have implemented bar code based control systems in a myriad of applications. While the public sector has concentrated on the logistics applications of bar coding through LOGMARS, the private sector has expanded their use of bar code based data entry and management control systems. The focus of this study is directed toward a comparative analysis of the non-logistics bar code applications prevalent in the private sector as potential applications within the DoD. Two specific areas at the Naval Postgraduate School are analyzed as potential bar code test applications for reducing manhours and increasing accuracy in the performance of administrative tasks; namely the NPS Attendance Monitoring System and the NPS Bachelor Quarters Inventory Management System. Major recommendations for future research deal with computer support, funding and cost/benefit analysis.

Master of Science in Management
March 1987

Advisor: P.R. Eversed
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AN ANALYSIS OF THE FINANCIAL IMPLICATIONS OF HIGH-IMPACT VERSUS LOW IMPACT COMMUNICATIONS IN THE UNITED STATES NAVY

Robert J. Colucci
Commander, United States Navy
B.S., Miami University, Oxford, Ohio 1970

This study investigates and analyzes the financial implications associated with the use of high-impact versus low-impact communications in the United States Navy. The study examines the general merit and overall cost effectiveness of employing a high-impact communication style, such as that supported in the Navy Correspondence Manual, rather than a low-impact, bureaucratic writing style often found in public and private sector correspondence.

The study uses input data from survey forms returned by nearly 400 Naval Officers and Enlisted respondents stationed in operational and staff billets.

The study arrives at several statistically significant conclusions on the benefits to be realized by adopting the high-impact writing style Navy-wide. Specifically, the study finds that the high-impact writing style:

(a) was quicker to read than the low-impact style
(b) produced a perception of greater comprehension in readers and because of its stylistic characteristics,
(c) was actually responsible for greater comprehension

The study develops these findings to demonstrate analytically that the Navy could reduce communications costs by millions of dollars annually by more forcefully adopting a Navywide policy of high-impact communications.

This is the first study to investigate and identify the specific costs associated with various writing styles. Therefore, it should serve as the bedrock for follow-on study efforts.

Master of Science in Management
June 1987

Advisor: J.E. Suchan
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Administrative Sciences

STANDARDIZATION OF HULL, MECHANICAL, AND ELECTRICAL EQUIPMENT (H,M&E) INVENTORY

John Charles Corbett
Lieutenant Commander, United States Navy
B.S., Miami University, 1974
M.B.A., George Washington University, 1985

Inventory standardization can increase parts availability while reducing operating costs. Although DoD and Navy policies and guidance support standardization, Navy programs have not been successful in minimizing nonstandard parts in weapon designs. This thesis attempts to identify the supply support problems caused by a lack of inventory standardization and to determine the extent of these problems. A model was developed to estimate the costs resulting from non-standardization of inventory. The model demonstrates that through inventory standardization the Navy could annually save millions of dollars. The savings achieved by reducing nonstandard parts and consolidating items with similar form, fit, and function can be re-invested in inventory to improve depth. Finally, standards offices can make a substantial contribution to the reduction of nonstandard parts if given more authority in the acquisition approval process.

Master of Science in Management
September 1987

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GRAMM-RUDMAN, PROPOSITION 13, AND CUTBACK MANAGEMENT

James Crawford Cox, Jr.
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1974

The Gramm-Rudman Act mandated the sequestration of over 11 billion previously approved FY-1986 budget dollars. DoD financial managers then found themselves faced with tough decisions in order to fulfill missions with less resources than expected. The fiscal environment facing DoD organizations resembled that faced by local governments in California following the passage of Proposition 13 in 1978. A survey of DoD financial managers was conducted to determine how these managers were reacting to their reduced budgets. Responses were compared to actions taken by California managers subsequent to Proposition 13 to gauge the potential of the strategies now being employed to cope with Gramm-Rudman. This study indicates that DoD managers have begun cutting back, but have not yet made the fundamental shift from maintaining their previous organization to embracing a new, leaner one which can function with significantly fewer resources.

Master of Science in Management
December 1986

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Administrative Sciences

THE SOCIAL WELFARE LOSSES OF CONSCRIPTION: AN EVALUATION FOR THE 1980S

Michael S. Crouch
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1973

This thesis estimates the social welfare losses that would result from a hypothetical draft in the United States in the 1980s. A previously developed mathematical model is used to estimate: (1) expenditures on draft avoidance, (2) the excess economic cost which results when a degree of randomness is introduced into the selection process, and (3) the conscription tax - the tax imposed on individuals who either reluctantly volunteer to serve or are inducted into the military. These first two estimates represent social welfare losses. The conscription tax is estimated in order to evaluate the relative efficiency of conscription as a means of taxation.

My finding is that when conscription is used to procure military manpower, the social welfare losses that result are significant ($1 billion to $5 billion). I also found conscription to be a very inefficient form of taxation.

Master of Science in Management
December 1986

Advisor: D.R. Henderson
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Administrative Sceinces

REVIEW AND EVALUATION OF THE NAVY'S IMPLEMENTATION OF THE FEDERAL MANAGER'S FINANCIAL INTEGRITY ACT

Matthew D. Culbertson
Lieutenant Commander, United States Navy
B.S., University of South Carolina, 1977

This thesis provides a review and evaluation of the Navy's implementation of the Federal Managers' Financial Integrity Act. Topics considered include: internal control in the Federal Government; overview of the internal control evaluation system; the Department of the Navy's internal control program including Navy implementation problems; and Navy solutions and shortcomings to the implementation problems. The research consists of interviews with Naval activities on implementation problems and solutions and a review of relevant General Accounting Office audits and other relevant instructions and studies.

The conclusion was reached that the Navy has made fair progress in implementing the Act but further action is required. Recommended actions include increasing Navy efforts to incorporate the internal control process into the overall management process, reducing the paperwork burden and gaining line manager support of the process in order to evolve the Navy's system into a more effective program.

Master of Science in Management
June 1987

Advisor: J.G. San Miguel
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Administrative Sciences

PREDICTING SHIPBOARD READINESS UTILIZING INFORMATION AND PROXIES CURRENTLY AVAILABLE: REPORTS, EXERCISES AND STATISTICS

Thomas Bernard Davilli
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1975

William Paul Schenzel
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1975

A readiness model for surface combatants was developed to illustrate the relative impact of classical readiness determinants. Training, personnel, equipment and supply data for 44 U.S. Atlantic Fleet units were collected from various existing sources and analyzed utilizing multivariate regression techniques. Identified in the resulting final model are the specific relationships among significant determinants and operational readiness. Recommendations for further analysis are offered with respect to the areas investigated and other probable determinants.

Master of Science in Management
December 1986

Advisor: L.M. Solnick
Department of Administrative Sciences

UNIT DEPLOYMENT PORT OPERATIONS: AN ANALYSIS OF THE CRITICAL ELEMENTS OF PORT THROUGHPUT IN SUPPORT OF WARTIME CONTINGENCIES

Frank A. DeLost
Lieutenant Commander, United States Navy
B.S., Oral Roberts University, 1973

This thesis focuses on the key factors involved in unit deployment seaport operations during wartime contingencies from the perspective of the military port operator. A general overview of the planning and coordination responsibilities of the military port operator is addressed. In addition, the thesis includes a model designed to estimate unit equipment port throughput capacity against throughput requirements. The model can be used to assist in the identification of capability shortfalls and required corrective action. An application of the model for a potential deployment scenario involving the 7th Infantry Division (Light) demonstrates the model's usefulness as a management planning tool for military port operators assigned to commercial seaports during defense-related emergencies.

Master of Science in Management
December 1986

Advisor: D.C. Boger
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APPLICATION OF WARRANTIES IN THE PROCUREMENT OF SPARE PARTS AT THE NAVY FIELD CONTRACTING SYSTEM LEVEL

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Lieutenant Commander, United States Navy
B.A., Montclair State College, 1976

The objectives of this research are to identify and discuss the background of current warranty policy and its application to the acquisition of spare parts within the Navy Field Contracting System, specifically the Navy Aviation Supply Office and the Navy Ships Parts Control Center.

As a result of this research, the conclusions are as follows: 1) Navy policies on warranty development and implementation must be definitized, 2) Spare parts warranty form development should utilize the same decision process as used for weapon system warranties, 3) Weapon systems warranties ultimately drive the type of warranty coverage for spare parts, and 4) Pending a formalized administration and centralized data collection system, spare parts warranties should specify coverage for Materials and Workmanship defects, unless a more complex warranty is dictated by the weapon system program office.

Master of Science in Management
June 1987

Advisor: D.V. Lamm
Department of Administrative Sciences

DETERMINING THE OPTIMAL PRESCRIBED LOAD FOR THE U.S. MARINE CORPS DIRECT SUPPORT ARTILLERY BATTERY USING LINEAR PROGRAMMING

Jeffrey L. DeWeese
Captain, United States Marine Corps
B.S., Ohio State University, 1977

In future conflicts, the projected expenditure rates of artillery ammunition greatly exceed the ability of the Marine direct support artillery battery's ammunition transportation assets. It is therefore vital that the artillery battery commander be able to select the most effective mix of ammunition to carry on his organic transportation in a given tactical situation. Linear programming is a tool which the battery commander can use to help solve this important problem. This thesis provides a linear program to assist him in this solution. In addition, with slight modification, this linear program can be of use to commanders at all levels of the Marine artillery organization.

Master of Science in
Management
June 1987

Advisors: P.M. Carrick
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Administrative Sciences

AN ANALYSIS OF COST ANALYSIS METHODS USED DURING CONTRACT EVALUATION AND SOURCE SELECTION IN GOVERNMENT CONTRACTING

Morgan Leslie Donaldson
Lieutenant, United States Navy
B.A., State University of New York, Stony Brook, 1973

The Federal Acquisition Regulations prescribe certain analytical tools and procedures to be used and followed by the government contracting officer in his determination of a fair and reasonable price that the government should pay for required goods and services. This determination is made during the contract evaluation and source selection phase of the acquisition process.

However, during recent years additional tools and methods have been prescribed for use. One must ask, in light of recent trends in prescribing new analytical tools and methods, whether our basic tools are adequate for the task, or has the procurement environment become sufficiently complex to warrant the use of additional tools and methods.

This thesis examines this question through an analysis of current tools and methods used during contract evaluation and source selection. It also offers an alternative approach to contract evaluation and source selection based upon a marginal analysis of a contractor's cost of direct resources.

Master of Science in Management
December 1986

Advisor: D.V. Lamm
Department of Administrative Sciences

ACHIEVING QUALITY IN THE NAVY FIELD CONTRACTING SYSTEM

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B.S., University of South Carolina, 1976

The Navy Field Contracting System (NFCS) recently began a program of funding its activities based upon the productive units completed. Due to this emphasis on quantity of output, there was concern that the quality of the product would suffer. This research studies the effect of Productive Unit Resourcing (PUR) on the quality of contracts produced by the Navy Field Contracting System. In doing so it examines the current quality practices in the NFCS, as well as some past and present practices within the Air Force. These findings are presented along with some of the current ideas found in the commercial sector concerning achieving quality. A program for achieving quality in the NFCS is also proposed.

Master of Science in Management
December 1986

Advisor: J.F. McClain
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Administrative Sciences

AN ANALYSIS OF THE ACCOUNTING SYSTEM USED FOR RESEARCH FUNDING AT THE NAVAL POSTGRADUATE SCHOOL

Margaret A. Dunne
Lieutenant, United States Navy
B.A., University of North Carolina, Chapel Hill, 1980

Research has long been funded on a reimbursable basis at NAVPGSCOL. Commencing in FY 1988, DoN research will be funded directly. Non-DoN research will be conducted at a budgeted reimbursable level. Altering the funding method requires that changes be made in research cost accounting. This thesis examines the way in which Federal activities receive and account for funds. It then describes the current system used to account for research funds at NAVPGSCOL. The budgetary and accounting implications of direct funding are discussed. An analysis of the research accounting information needs of users is conducted. Lastly, recommendations are made concerning the way in which research funds should be accounted for under direct funding at NAVPGSCOL.

Master of Science in
Management
March 1987

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Administrative Sciences

MATERIAL LOGISTIC SUPPORT OF THE HOSPITAL SHIPS

Thomas A. Ebert
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Donald W. Hess
Lieutenant Commander, United States Navy
B.S., Mankato State University, 1970

The USNS Mercy will shortly be accepted by the U.S. Navy. While the conversion of an oil tanker into a first class floating hospital has received the appropriate attention, the logistical support of the Mercy has not. This thesis looks at the provisioning and resupply of the Mercy with the objective of identifying a method of stratifying medical stores by an Essentiality Index. What is presented is a logical and reliable means to rank medical consumables by the degree of cure provided to a projected patient stream.

This thesis recommends that an Essentiality Index be calculated for all medical consumables projected by the Combat Zone Assessment Requirements and Sets, Kits and Outfits models. Utilization of this Essentiality Index will positively impact the provisioning of the USNS Mercy, improve the range and depth of medical consumables listed in the Fleet Issue Load List, and in general provide a tool to better manage medical consumables throughout the supply system.

Master of Science in
Management
December 1986

Advisor: T.P. Moore
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Administrative Sciences

MULTI-CREWING USCG CUTTERS--HOW AND WHY

Robert Clifford Eccles
Lieutenant, United States Coast Guard
B.B.A., University of Texas, Arlington, 1975

The historical research conducted for this paper found operational and economic advantages, ranging from slight to significant, in favor of multi-crewed vessels when compared to similar single-crewed vessels. In spite of these findings, nearly all USCG multi-crewing efforts have ultimately been abandoned. A survey of upper echelon officers in a position to most directly impact on the administration of multi-crewed vessels was conducted, and it was determined that most respondents had erroneous, negative perceptions about the levels of efficiency, productivity, maintenance, and morale that could be expected aboard such units. Interviews with crewmembers from dual-crewed vessels revealed an organizational approach to implementation of the concept that was vague and inconsistent. The research concludes by declaring that multi-crewed organizations have not yet had the opportunity to display their full performance potential due to organizational, leadership, and communications shortcomings. Organization Development oriented recommendations are offered to help alleviate these problems.

Master of Science in
Management
December 1986

Advisors: E.V. Haag
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Administrative Sciences

IMPACT OF THE FUTURE MERCHANT FLEET ON MILITARY OPERATING AND SUPPORT PROGRAMS

Ruth Carole Edwards
Lieutenant, United States Navy
B.A., Mississippi University for Women, 1976

This study deals with the impact of ocean shipping trends on the merchant fleet's ability to adequately fulfill its mission of providing a military auxiliary that is substantial enough to meet its role in the defense of the nation. After a brief history of the U.S. merchant fleet, trends in merchant ship technology, size and type are identified. Using these trends, a profile of future merchant ship type and manpower availability is presented. The manpower and ship types which the military would require of the merchant fleet in time of conflict are identified. Program action options to meet manning and shipping requirements are presented. The study concludes that the future U.S. merchant fleet will be unable to totally fulfill its military support requirements for manning or shipping.

Master of Science in Management
December 1986

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Department of
Administrative Sciences

AN INVESTIGATION INTO THE ADMINISTRATION OF INTERSERVICE SUPPORT AGREEMENTS AT EIGHT U.S. NAVY SHORE INSTALLATIONS

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This thesis focuses on the administration of Interservice Support Agreements (ISSAs) at eight U.S. Navy shore installations. Three issues are addressed: (1) the types of problems being faced by individuals responsible for administrating ISSAs; (2) the incidence and resolution of disputes between host and tenant activities; and (3) the determination of cost savings which result from having an ISSA. The thesis concludes that difficulties being experienced may be classified into five categories and are not severe overall; disputes occur infrequently and are resolved in a professional manner; and significant variation exists in the ways cost savings are determined. Recommendations for improving ISSA administration are offered.

Master of Science in Management
December 1986

Advisor: J.R. Duke
Department of Administrative Sciences

A SURVEY OF COMMERCIAL LOCAL DELIVERY SECURITY METHODS AND THEIR POTENTIAL FOR APPLICATION AT NSC SAN DIEGO, CALIFORNIA

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In the light of recent emphasis on material accountability in the Navy's supply system, Naval Supply Centers (NSCs) need a method for evaluating commercial security practices and adapting them for use in the military environment. Local delivery is an especially vulnerable stage in the physical distribution process for both commercial and military activities. This study surveys three commercial local delivery operations. Private sector local delivery systems studied are described and security measures used are discussed in the context of their total system. Their effectiveness at providing shipment integrity and minimal delivery delay is compared with similar measures of effectiveness calculated using Naval Supply Center, San Diego delivery statistics. Where greater comparative effectiveness is observed in commercial operations, recommendations for adapting commercial procedures to the Navy's system are offered.

Master of Science in Management
December 1986

Advisor: D.C. Boger
Department of Administrative Sciences

DEFENSE SPENDING AND REGIONAL GROWTH: AN EXAMINATION OF AN EXPORT-BASE MODEL AND AN ECONOMETRIC MODEL

Brian G. Finch
Lieutenant, United States Navy Reserve
B.S., Auburn University, 1979

This thesis concerns the relationship between defense expenditures and the states' economic growth since 1975. The chief emphasis is on an analysis of both an export-base model and an econometric analysis of the relationship between defense spending and personal income. Also considered are the effects of manufacturing wage rates, state tax rates, population, and elements of state and federal expenditures on personal income.

Master of Science in Management
June 1987

Advisors: L.M. Solnick
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A COMPARISON OF THE BASKET METHOD AND STRATIFIED RANDOM SAMPLING FOR CONTRACT CHANGE ORDER NEGOTIATIONS

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B.A., University of South Dakota, 1975
M.A., University of South Dakota, 1976

This study compares two methods of statistical sampling for application in a contracting context. The methods are compared with the intent of demonstrating the superiority of one method over the other in assisting price analysts and contract negotiators in expediting processing of proposals for change orders while maintaining acceptable levels of risk. The Basket Method and Stratified Random Sampling techniques are examined to determine which method allows a more accurate estimate of a proposal population to be made. The several populations used in the simulation have errors planted to represent both random "honest" mistakes and weighted "dishonest" mistakes. The author concludes that the Basket Method has a more desirable accuracy pattern than the Stratified Random Sampling Technique.

Master of Science in Management
June 1987

Advisor: S. Liao
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MANAGEMENT CONTROL IN MORALE, WELFARE, AND RECREATION ACTIVITIES

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This study examines the management control procedures used by Navy club and recreation programs. It discusses management control theory available in literature and uses Anthony and Young's model of programming, budgeting, operations and measurement, evaluation, and reporting as a basis for the ensuing discussion. NMPC policies in the area of management control are described with particular emphasis being given to Project "Smart Compass". A summary of interviews with managers at three levels in the chain of command documents actual practice in use at sample commands. Particular strengths and weaknesses of control systems are discussed in an analysis of theory, policy, and practice. Though the study was done of Navy club and recreation programs, the conclusions and recommendations are applicable to club and recreation programs of all four armed service branches.

Master of Science in Management
December 1986

Advisor: J.M. Fremgen
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Administrative Sciences

EVALUATING THE MAINTENANCE CONCEPT FOR THE MK VIII AND MK IX SEAL DELIVERY VEHICLES

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Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1976

This thesis explores the current maintenance concept for the SEAL Delivery Vehicle (SDV), and recommends improvements in certain integrated logistics support elements in order to improve reliability, availability, and maintainability. Diving system certification, overhaul, organizational, intermediate and depot level maintenance, and configuration control are discussed as they relate to the maintenance concept. The "Mobile Logistics Support Van" concept is described. A statistical analysis of SDV subsystem failure rates, repair times, and failure distributions is developed, with the goal of identifying the subsystems and components which most degrade the reliability and maintainability of the SDV.

Master of Science in Management
June 1987

Advisor: T.C. Moore
Department of Administrative Sciences

IMPACT OF LIFE-CYCLE COSTING ON NAVY FAMILY HOUSING ACQUISITION

Jeffrey Edward Friar
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The goal of this thesis is to identify ways to improve the selection process for family housing project alternatives. The thesis concentrates on the economic analysis of the current program that allows the government to lease housing from the private sector (i.e., the Section 801 program).

In particular, the role of energy costs is examined. A cost benefit analysis demonstrates the merit of life-cycle costing for the 801 program. The inclusion of all life-cycle costs in an 801 program contract should result in a lower total cost to the government. The recommendation, therefore, is that the award of an 801 program contract for Navy family housing should be based on lowest total life-cycle cost.

Master of Science in Management
December 1986

Advisor: R.D. Evered
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THE EFFECTIVENESS OF UNITED STATES COAST GUARD PARTICIPATION IN THE DEPARTMENT OF TRANSPORTATION 8(A) PILOT PROGRAM

Joel Dennis Fujiwara
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B.S., United States Coast Guard Academy, 1976

Section 8(a) of the Small Business Act authorizes the Small Business Administration (SBA) to engage in procurement contracts with federal agencies for the purpose of subcontracting to small business firms on a non-competitive basis. This authority exists to assist socially and economically disadvantaged small businesses in establishing a competitive position within the financial marketplace.

From 1983 to 1985, the Department of Transportation (DOT) participated in an experimental 8(a) program known as the 8(a) pilot program. This program attempted to develop procurement opportunities for 8(a) firms in new areas which involved high-technology or large dollar values (over $1 million).

This thesis attempts to evaluate the effectiveness of U.S. Coast Guard participation in the DOT 8(a) pilot program. Specifically, it evaluates to what degree Coast Guard procurements within the 8(a) pilot program achieved overall program objectives.

Master of Science in Management
June 1987

Advisor: R.W. Smith
Department of
Administrative Sciences

A SURVEY OF THE NAVY OFFICE OF LEGISLATIVE AFFAIRS PROGRAM: OLA PROCUREMENT WORKSHOPS

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A.B., Eastern Kentucky University, 1974
MBA, National University, 1982

This research was undertaken to evaluate the effectiveness of the Navy Office of Legislative Affairs procurement workshops in strengthening the defense industrial base and increasing competition.

The researcher found, through a literature review, that there is a need for the procurement workshops. The defense industrial base has shrunk over the last few decades to where there is concern over whether or not the U.S. would be able to fight a prolonged war. Additionally, competition has become the watchword in Navy procurement.

Through the use of a questionnaire to survey attendees at workshops over the last three years, starting with 1984, the researcher determined that the workshops have been effective in attaining both objectives.

Master of Science in Management
December 1986

Advisor: R.W. Smith
Department of
Administrative Sciences

PROFILE OF THE SUCCESSFUL RECRUITER

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University of Texas, Austin, 1978

This thesis develops and analyzes a model to identify attributes of a successful recruiter. Expert Systems software is used to elicit from twenty U.S. Army recruiters and instructors, who are experts in the field, characteristics associated with recruiter success. An interactive computer program based on Quasi-Artificial Intelligence (QAI) captured the expert's intuition, knowledge, experience, and judgments to create expert systems that can be used to select U.S. Army recruiters before they attend recruiting school. This study found that personal characteristics such as Integrity and Commitment, and skills such as Persuading and Listening are substantially more important than the types of attributes generally used to predict recruiter success.

Master of Science in Management
June 1987

Advisor: G.W. Thomas
Department of
Administrative Sciences

A COST ANALYSIS OF MH-53E AVIONICS MAINTENANCE SUPPORT ALTERNATIVES FOR REMOTE DEPLOYMENT

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B.S., South Dakota State University, 1976

The United States Navy is in the process of considering the use of Mobile Maintenance Facilities to provide an intermediate level maintenance capability to MH-53E helicopter minesweeping and countermeasure squadrons of four and seven aircraft while on deployment to remote locations. This thesis considers two alternatives: (1) no intermediate maintenance capability and, (2) full capability. Because of limited data only the repair of avionics components are considered. The alternative corresponding to no maintenance capability provides the increased inventory required to meet expected failures. The second alternative involves all of the elements of intermediate maintenance at a remote site as well as the needed supply support. Present value analyses of the life cycle costs are utilized to determine the least cost alternative. The results suggest that intermediate maintenance activities are the least cost alternative for avionics support for a seven-aircraft detachment and the most costly alternative for the four-aircraft detachment.

Master of Science in Management
September 1987

Advisor: A.W. McMasters
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ANALYSIS OF CONSTRUCTION DESIGN ESTIMATION PRACTICES AT PUBLIC WORKS CENTER, GREAT LAKES

Stephen L. George
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B.A., University of Oklahoma, 1978

The purpose of this study is to develop a statistically validated predictive model for construction design man-hours to aid in the decision-making process for assigning projects to PWS engineers and Architect-Engineer firms. This study was performed at PWC, Great Lakes and consisted of personnel interviews and the compilation of a database from internal reports. Although a predictive model was not developed, it was discovered that the design man-hours estimation procedure is inaccurate and causes PWS to hold customer funds that could be used for other purposes. A decision-making model was developed to assist in assigning projects to in-house design resources or to Architect-Engineer firms. In addition, significant cost savings are already being realized through the use of the Computer Aided Design and Drafting System, with greater savings projected when the system is fully installed.

Master of Science in Management
March 1987

Advisor: J.M. Fremgen
Department of Administrative Sciences

COMMERCIAL/INDUSTRIAL ACTIVITIES PROGRAM: THE EFFECT OF PROGRAM IMPLEMENTATION AT THE COMMAND LEVEL

Brian J. Gerling
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B.S., Kansas State University, 1979

Concerns exist among field level commercial activities (CA) program managers. This poses a threat to proper implementation of the CA program. The concerns are manifested in a poorly managed command CA program. This study examines the allegations of bias in CA program policy structure towards the elimination of federal employees from Department of Defense commercial activities. The feasibility of a federal incentive system to improve overall program efficiency and management is discussed. Other areas of interest addressed are individual role perceptions and responsibilities; OPNAV relationships; and the mechanics of program operations. The study concludes that the Navy's CA policy needs to provide a greater degree of equity in its treatment of both the federal managers and the affected civilian employees in CA activities.

Master of Science in Management
December 1986

Advisor: P.M. Carrick
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Administrative Sciences

MANAGEMENT OF MIFASS, A MARINE CORPS C^2 SYSTEM

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Captain, United States Marine Corps

The purpose of this research is to investigate the problems surrounding the Marine Integrated Fire and Air Support System (MIFASS) Program, managed by the United States Marine Corps. This investigation involves the following:

1) Defining what MIFASS was and the program management structure supporting the program, and
2) Analyzing the problems of a flawed acquisition strategy, flawed requirements definition, and a flawed program management structure.

As a result of this analysis this paper concludes the need for establishing a "Marine Corps Systems Command" out of which C^2 programs may be supported, and the opening of a program management office for the acquisition of complex C^2 systems.

Master of Science in
Management
September 1987

Advisors: T. Hampton
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COST BENEFIT ANALYSIS OF INSTALLING A RECOVERY EXERCISE MODULE (REM) IN A CRUISE MISSILE FOR AN OPERATIONAL TEST LAUNCH

Howard Elliott Glassman
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B.S., Pennsylvania State University, 1977

This thesis provides a cost benefit analysis of installing a Recovery Exercise Module (REM) in a Cruise Missile for an Operational Test Launch.

Topics considered include: Should the Cruise Missile Project Office (CMPO) continue development of a new redesigned REM; should all test missiles be intentionally destroyed or should the REM be utilized; can the NonTactical Instrumentation Kit (NTIK) being developed for the Air Force be a cost effective test procedure for the Sea Launched Cruise Missile?

The conclusion is that the CMPO should maintain use of the current REM model and cancel plans to redesign the REM. Additionally, REM production and test missile refurbishment should be competed, between several contractors.

Master of Science in Management
June 1987

Advisor: D.C. Boger
Department of Administrative Sciences

SUPPORT EQUIPMENT MANAGEMENT IN THE F/A-18 PROGRAM

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Since the early 1960s, the Navy has witnessed the introduction of aircraft of increasing technical complexity. While possessing superior tactical abilities as an outgrowth of this technical complexity, these aircraft have displayed an increasing need for specialized repair capabilities. As a result, the number and types of support equipment (SE) required to maintain them have risen dramatically. This thesis examines the policies and methods for support equipment acquisition and management as established by the Naval Air Systems Command. The primary focus is on the integration of these procedures with the program management structure of specific aircraft programs. The research examines in-depth several innovations to the support equipment planning and management process instituted with the F/A-18 program and evaluates them for effectiveness.

Master of Science in Management
December 1986

Advisor: J.F. McClain
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INFLUENCES OF HIGH QUALITY ARMY ENLISTMENTS

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This thesis investigates the relationship between the quality of soldiers and influences on their enlistment decision. Influences analyzed include economic benefits of enlisting, military advertising, and Army recruiters. Data were from the 1985 New Recruit Survey of active duty Army recruits. The analysis attempts to determine what differences, if any, there are in the influences on the enlistment decision of soldiers who score above the expected population mean on the Armed Forces Qualification Test (AFQT) portion of the Armed Services Vocational Aptitude Battery (ASVAB), and the influences on those who score in the lower half of the AFQT. The results of principal components and discriminant analysis indicate that educational benefits such as the New GI Bill strongly influence high quality soldiers. Advertising and recruiters are also important influences on the enlistment decision.

Master of Science in Management
March 1987

Advisor: G. Thomas
Department of
Administrative Sciences

MODELS FOR CONDUCTING ECONOMIC ANALYSIS OF ALTERNATIVE FUEL VEHICLES

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B.S., Radford College, 1977

The present status of alternative fuel vehicles, specifically electric-powered and compressed natural gas-powered vehicles is summarized. Specific advantages and disadvantages of each vehicle type, in comparison to the gasoline-powered vehicle, are reviewed. A life cycle cost model is formulated for each vehicle type. An integer linear program is derived and explained as a means of determining the optimal mix of vehicles for a command's transportation fleet. The models are tested by running several test cases using data from the Naval Postgraduate School transportation office.

Master of Science in Management
June 1987

Advisor: D.C. Boger
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AN EVALUATION OF THE SELECTED RESERVE EDUCATIONAL ASSISTANCE PROGRAM (SREAP) AS IT RELATES TO THE SELECTED MARINE CORPS RESERVE (SMCR)

John D. Gumbel
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B.A., University of California, Los Angeles, 1977

The Selected Reserve Educational Assistance Program, which became effective on 1 July 1985, is the first educational assistance program to provide specifically for members of the Selected Reserve. This thesis reviews previous veterans' educational assistance programs and evaluates the impact of the Selected Reserve Educational Assistance Program, through its first twenty-two months of existence (1 July 85 - 30 April 87), on Selected Marine Corps Reserve attrition. For several samples program participants are found to have significantly lower attrition rates. These lower attrition rates are translated into a financial analysis that demonstrates the program to be highly cost effective in its successful attainment of its stated goal of increased retention in the Selected Reserves.

Master of Science in Management
September 1987

Advisor: L. Solnick
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THE RELATIONSHIP BETWEEN REENLISTMENT INTENTIONS AND RESERVE PARTICIPATION WITHIN THE ARMED FORCES

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B.S., Bedriftsoekonomisk Institut, 1967

This thesis investigates the military affiliation intentions of enlisted personnel in all four branches of service in their first or second term with less than a year remaining of their present active duty obligation. The investigation is done in two sequences:

1) reenlist/does not reenlist ("stayers vs. leavers"), and for those who plan to leave
2) join the reserves/do not join the reserves ("reservists" vs. "civilians"),

using the demographic, tenure, cognitive/affective, economic, and employment alternative variables as explaining factors. The analysis is done by using the Probit probability model which calculates the probabilities of each individual to reenlist/join the reserves, given specific characteristics. The results show that the explanatory effect using the groups of variables mentioned above, is higher for the reenlistment decisions than for the reserves decisions.

Master of Science in Management
December 1986

Advisor: G.W. Thomas
Department of Administrative Sciences

ANALYSIS OF NAVAL SURFACE FORCES, PACIFIC AFLOAT INTERMEDIATE MAINTENANCE ACTIVITY "REPAIR OF OTHER VESSEL" COST ESTIMATION PROCEDURES

Gary Michael Hall
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1972

This study analyzes the Repair of Other Vessel (ROV) estimation procedures used by Commander, Naval Surface Forces U.S. Pacific Fleet (COMNAVSURFPAC) afloat Intermediate Maintenance Activities (IMA). Data were gathered through archival research and interviews of fleet and staff personnel. The objective of the thesis is to investigate if a model based upon archival data could be developed which would improve the IMA ROV estimates to a level of 80% accuracy. Such a model was not found. However, the elimination of one IMA report and additional research of the function of the IMA ROV estimates and SUADPS reports are recommended.

Master of Science in Management
December1986

Advisor: K. Euske
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WHOLESALE REPLENISHMENT MODELS: MODEL EVALUATION

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B.A., University of North Carolina, 1974

This thesis analyzes a new wholesale level repairables replenishment model proposed for implementation by the U.S. Navy. The new model uses the total investment level as its measure of effectiveness with a mean supply response time (MSRT) goal as a constraint. In addition, the new model requires that procurement and repair order quantities be specified as input parameters. The importance of the model is that it relates resources to readiness, an area of primary concern to Congress and the Department of Defense. Tests with actual data were conducted between the current Navy repairables model and the new model. The results of these tests indicate that the new model would consistently outperform the current model for investment levels and system material availability (SMA).

Master of Science in Management
June 1987

Advisor: A.W. McMasters
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INTEGRATION OF RCM ANALYSIS INTO THE S-3A MAINTENANCE PROGRAM

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In recent years, it has been discovered that it may not be wise to do extensive preventive maintenance on a system. The system may actually tend to fail more often than if such maintenance were eliminated. The Reliability Centered Maintenance (RCM) program identifies only those preventive maintenance tasks which will provide increased reliability, while at the same time, reducing expenditures. The S-3A is a shipboard based anti-submarine warfare aircraft and was built by Lockheed Aircraft Corporation for the United States Navy. The S-3A entered service in the mid 1970's, well before the current refinements to the RCM program had been developed. As a consequence, its maintenance plan did not embody all of the changes that today's RCM program includes. A complete RCM analysis has never been performed on the S-3A aircraft because excessive amounts of resources would be required. This thesis shows where RCM can be selectively applied to the existing S-3A maintenance program.

Master of Science in Management
December 1986

Advisor: A.W. McMasters
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AN EMPIRICAL ANALYSIS OF THE INFLUENCE OF CORPORATE MERGERS ON ORGANIZATIONAL SLACK

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B.A., University of Minnesota, 1975

This thesis analyzes the effects of corporate mergers on organizational slack. It is hypothesized that organizational slack will be reduced in the acquiring firms following the merger. Further, it is hypothesized that the type of merger will affect the resultant change in slack. A multidimensional financial model is used to measure change in slack between pre- and post-merger time frames for 50 mergers that occurred in 1977 and 1978. Similar measures are calculated for a control group of 43 nonmerging firms. It is found that the merged firms undergo significantly greater reductions in slack than their nonmerging counterparts. Among the merged firms, horizontal mergers show the largest decrease in slack, followed by vertical mergers, and finally conglomerates.

Master of Science in Management
June 1987

Advisor: K.J. Euske
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AN ASSESSMENT OF KOREAN MILITARY COMPENSATION POLICIES PROJECTED FOR THE 21ST CENTURY

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Major, Korean Air Force
B.S., Korean Air Force Academy, 1977
B.A., Korean Yeon Sei University, 1983

The Korean military organization has been organized and largely sustained by the loyalty and patriotism of its members. However, improvements in the economy may create future military manpower problems.

The implementation of high technology improvements in weaponry and tactics also will impact on these emerging problems, as the military services will need to recruit and retain even-higher quality personnel. To assure that these requirements are met, and to compete with pay increases in the private sector, constructive changes in Korean military compensation policies may be required.

To address this issue, this research examines the current compensation policies in the context of military-civilian comparisons and obtains the views of Korean officer students at the Naval Postgraduate School. The results of these efforts provide the basis for identifying and recommending the most appropriate compensation policies for the Korean military to meet the personnel retention problems of the 21st Century.

Master of Science in Management
December 1986

Advisor: K.J. Coffey
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ROLES, STRATEGIES, AND PROGRAM BUDGETING WITHIN THE OPERATIONS AND MAINTENANCE, NAVY APPROPRIATION ACCOUNT

Jack B. Housley
Lieutenant, United States Navy
B.S., University of Arizona, 1981

This thesis is an analysis of the budgetary roles and strategies used in the Department of the Navy by Major Claimants, Office of the Comptroller of the Navy (NAVCOMPT), Office of the Secretary of Defense, and Office of Management and Budget. The database is a report generated by NAVCOMPT, "Department of the Navy; Operations and Maintenance, Navy (O&MN); Review of the FY 1987 Budget."

The analysis of the data supplied by NAVCOMPT suggests a plethora of findings on DoN budgetary behavior. These include: claimants which request more funds receive more funds; changes in a claimants budget request by NAVCOMPT are not final; NAVCOMPT frequently restores funds it has cut; NAVCOMPT is just as likely to add to a budget request as to subtract from the request; the OSD/OMB review has a definite cutting bias; the best predictor of a claimant's budget this year is last year's budget and claimants do not maintain their proportional share of incremental budget changes.

Master of Science in Management
December 1986

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Administrative Sciences

THE APPLICATION OF COST-BENEFIT ANALYSIS IN RAISING THE NONCOMPETITIVE SMALL PURCHASE THRESHOLD

Robert Leo Howard, III
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B.S., University of Mississippi, 1977

The purpose of this thesis is to determine the economic impact of a proposed acquisition policy change. As an interim measure, a class deviation to the Federal Acquisition Regulation was issued 4 June 1987. The change increases the small purchase noncompetitive threshold from $1,000 to $2,500 for a test period of one year. This deviation was issued after the research commenced but before this report was issued. The primary reason for this change is to reduce the administrative cost associated with obtaining competition. Consequently, the government should be prepared to make a trade-off between the administrative cost of competing and any savings realized from competition.

Using the data collected from two field activities, NAS Point Mugu and NWC China Lake, an analysis was conducted to determine the costs and benefits associated with increasing this threshold. This research focuses on administrative order costs, shortage costs, procurement administrative lead time, and productivity of acquisition personnel.

This thesis concludes with observations about the noncompetitive threshold and makes recommendations concerning a policy change.

Master of Science in Management
September 1987

Advisor: P.M. Carrick
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Administrative Sciences

ASSESSMENT OF FATIGUE IN AVIATION CREWS

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This study investigates the relationship of Schonpflug's model of regulatory behavior and a questionnaire which was designed to assess behavioral change due to fatigue in aviation crew members. Data was gathered from three patrol aviation squadrons. Rotated factor analysis was used to determine designation of factors and their related questions. A paired sample t-test was utilized for the determination of change due to a one month period of flight operations. The two statistical tests were graphically combined and compared to Schonpflug's model of regulatory behavior. The psychological costs to benefits economics of Schonpflug's regulatory model were confirmed. Schonpflug's model was found to be an excellent evaluative tool when coupled with the questionnaire's statistical tests in determining non resolution of problems brought about by fatigue.

Master of Science in
Management
June 1987

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Operational Research

ALCOHOLISM IN THE NAVY: AN UPDATED COST STUDY

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B.B.A., Eastern Kentucky University, 1974

A study to determine the costs incurred by alcohol abuse in the Navy was conducted at four residential alcohol rehabilitation facilities. This study determined cost in six areas: (1) damage to Navy property, (2) loss of work due to drinking patterns, (3) legal and administrative expenses, (4) cost of sick call visits, (5) loss of work due to associated medical problems and (6) cost of residential rehabilitation treatment. Cost of operating the rehabilitation facilities was determined by examining budgets of each facility. All other costs studied were determined by interviewing patients at these facilities. Costs incurred by the Navy because of an individual member's alcohol abuse, savings gained by rehabilitating a Navy member as well as loss incurred by not rehabilitating an individual were also determined. This study indicates that it is more cost effective to rehabilitate an individual than to let his abuse of alcohol continue and to use his or her talents rather than to separate early from active duty.

Master of Science in Management
September 1987

Advisor: R.A. McGonigal
Department of Administrative Sciences

THE CONSTRUCTION CONTRACTOR PERFORMANCE EVALUATION AS A CONTROL MECHANISM

Steven Richard Iselin
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B.S., University of Notre Dame, 1980

This study examines the Naval Facilities Engineering Command's current use of construction contractor performance evaluations (SF 1420) from the viewpoint of accepted control and measurement theory. Surveys of field contract administrators, supervisory civil engineers, field contract specialists, and construction contractors were completed to assess their use of and views about the evaluations.

The study concludes that: (1) NAVFAC lacks standards of performance to describe the distinction between satisfactory, outstanding, and unsatisfactory performances; (2) Contractors are not generally aware of the evaluation process; (3) Evaluations are not used to provide contractors feedback; (4) Evaluators are not well trained; (5) Evaluations are not fully utilized; (6) The data base of evaluation information is inadequate.

The study recommends that: (1) NAVFAC issue a policy statement to contractors to clarify the evaluations uses, standards, and performance elements; (2) interim evaluations be issued to provide contractors feedback; (3) contractors receive copies of all their evaluations; (4) evaluators receive uniform training on completion of evaluations; (5) SF 1420 be modified to allow for a more specific evaluation.

Master of Science in Management
December 1986

Advisors: D. Moses
R.W. Smith
Department of Administrative Sciences

A STUDY OF THE PUBLIC ACCOUNTING PROFESSION'S PROGRAM FOR AUDIT QUALITY AND ITS APPLICABILITY TO THE NAVAL AUDIT SERVICE

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B.M., Western Michigan University, 1977
M.S.L., Western Michigan University, 1979

The fundamental purpose of this thesis is to identify ways to enhance the quality of audit work performed by the Naval Audit Service. To this end, an in-depth examination is made of the public accounting profession's self-regulation initiatives, focusing on those quality elements that are also applicable to the Navy's internal auditing function. These include certification requirements of the American Institute of Certified Public Accountants, the nine elements of quality control outlined in Statements on Quality Control Standards No. 1, and the Peer Review Program. Finally, specific recommendations for the Naval Audit Service's quality program are presented, based on the application of appropriate private sector practices.

[illegible]

[illegible]
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PRICING STRATEGY, PRICING STABILITY AND FINANCIAL CONDITION IN THE DEFENSE AEROSPACE INDUSTRY

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B.S., United States Naval Academy, 1980

Patrick Daniel Keavney
Lieutenant, United States Navy
B.S., United States Naval Academy, 1980

The purpose of this research is to determine if pricing strategy and pricing stability for products in the defense aerospace industry can be predicted based on a firm's financial condition. The sample for this research includes 17 contractors and 52 missile and aircraft programs.

Two separate issues are addressed. The first issue concerns the relationship between financial condition and contractor pricing strategy. The second concerns the relationship between organizational slack and pricing stability.

The overall findings are:

1. A limited amount of variation in pricing strategy can be explained through the use of a linear regression model using financial ratios.
2. No apparent relationship exists between organizational slack and pricing stability.

Master of Science in Management
June 1987

Advisor: O.D. Moses
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Administrative Sciences

COST-EFFECTIVENESS ANALYSIS OF SYSTEM SAFETY

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The Department of Defense (DoD) Instruction 5000.36, "System Safety Engineering and Management," directs the Department of the Navy to establish formalized system safety programs throughout the procurement and life cycle of all systems, subsystems and equipment, and modifications thereto, acquired by DoD. Ideally, the application of system safety engineering and management techniques improves the mission net cost-effectiveness of any DoD weapon system by the prevention of accidental deaths and injuries, and by minimizing material losses and damage to operational systems. Even though DoD has directed significant attention to the incorporation of system safety in current and future weapon systems, the system safety program has been criticized for its poor marginal contribution. In the past, Naval system safety programs have struggled for survival and recognition. With this in mind, the scope of this thesis is to evaluate the cost-effectiveness of system safety.

Master of Science in Management
March 1987

Advisor: P.M. Carrick
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Administrative Sciences

A CLUSTER ANALYSIS OF MANPOWER SUPPLY TO ARMY RESERVE CENTERS

Alvin R. Jones
Civilian, U.S. Army Test and Evaluation Command
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This thesis applies cluster analysis to the problem of grouping Army Reserve Center markets based on measurable economic characteristics of local labor markets and characteristics of individual Reserve Centers. Three applications with potential uses in manpower planning are demonstrated. Predicting models for Reserve accessions are developed for the clustered Reserve Centers.

Master of Science in Management
June 1987

Advisors: G.W. Thomas
S.L. Mehay
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NAVAL FACILITIES CONDITION: THE ANNUAL INSPECTION SUMMARY REPORT AND THE SHORE BASE READINESS REPORT

James A. Jones
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This thesis examines the consistency of information contained in the Annual Inspection Summary Report and the Shore Base Readiness Report. The objective is to determine if the facilities deficiencies reported in the Annual Inspection Summary support the readiness ratings on facility condition reported in the Shore Base Readiness Report. The mean percentage deferrable, nondeferrable, and total facilities deficiencies per current plant value of a mission category is calculated and analyzed by analysis of variance tests to determine if there is a significant difference in the mean percentage deficiencies per current plant value among different readiness ratings. The analysis indicates there is no significant difference of the mean percentage deficiencies per current plant value.

The study concludes that the facilities deficiencies reported in the Annual Inspection Summary do not support the readiness ratings on facility condition reported in the Shore Base Readiness Report.

Master of Science in Management
December 1986

Advisor: S. Liao
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AN ASSESSMENT OF THE COST ACCOUNT ROLL-UP SYSTEM (CARU)

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The Cost Account Roll-up (CARU) System was designed to provide accurate, real-time labor distribution data to managers at Naval Supply Systems Command (NAVSUP) field activities in a format consistent with the way in which they are budgeted. The system also provides productivity information in conjunction with the labor distribution data. This study was undertaken to assess the effectiveness of CARU as an information system in support of NAVSUP's latest budgeting strategy, the Productive Unit Resourcing System.

The results of the study indicate that CARU is an effective information system. It does an excellent job of supporting the Productive Unit Resourcing System. CARU has the potential to excel as a decision making tool for managers in matters of employee performance and financial accountability.

Master of Science in
Management
December 1986

MAJOR NEW ISSUES CURRENTLY AFFECTING GOVERNMENT ACQUISITION

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The purpose of this thesis is to review and synopsize the major new issues currently affecting Government acquisition. The individual topics discussed are: (1) the Federal acquisition process, (2) the Packard Commission's recommendations and their effect on Government acquisition, (3) the role of competition in Government contracting, (4) the new requirements for weapon systems warranties, (5) the role source selection plays in the acquisition process, (6) how delays in contractor performance affect the Government, (7) the role of the Armed Services Board of Contract Appeals (ASBCA) in Government acquisition, (8) the recent changes in the Weighted Guidelines (WGLs) for profit, (9) the impact of the Defense Financial and Investment Review (DFAIR) Study on investment, progress payments and profit, and (10) the role Integrated Logistics Support (ILS) plays in major weapon systems acquisitions. This thesis will serve to update the Manual of Acquisition Topics, a single desk reference guide for acquisition managers.

Master of Science in Management
June 1987

Advisor: D.V. Lamm
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AN EXAMINATION OF THE FACTORS THAT AFFECT STUDENT PERFORMANCE IN THE FIRST GRADUATE ACCOUNTING COURSE TAKEN AT THE NAVAL POSTGRADUATE SCHOOL

Thomas S. Kennedy
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1976

The purpose of this study is to examine various factors in a student's background and investigate how they affect the student's performance in the first accounting courses taken at the Naval Postgraduate School (NPS). An understanding of these factors could enable future students to perform better academically. This understanding could also prove useful in the screening process used to select Naval Officers for study in Administrative Sciences at the Naval Postgraduate School. The findings indicate that undergraduate grade-point average, prior accounting course work, and prior financial management work experience are the most important influences on success in accounting courses at NPS.

Master of Science in Management
June 1987

Advisor: O.D. Moses
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EXPERIMENTAL DESIGN OF MULTI-CREWING IN THE R.O.K. NAVY

In San Kim
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The ROKN is engaged in anti-infiltration operations which call for unlimited time of ships underway. The operations will continue until our political situation improves to the level of the two Germanies. Korean military forces have a primary mission which is obviously military readiness and our vulnerability to North Korean special forces infiltrations places a high priority on anti-infiltration operations. This situation generates high pressure on the ROK military forces. Therefore, the purpose of this study is to develop an optimum organizational structure which will give flexibility in dealing with those two conflicting missions.

Primary research data exists in the experiences of the other Navies which gives basic impetus to this study. Fortunately, the USCG has partially implemented a multi-crew system. The mission and constraints of the USCG share of the USCG share similarities with the ROKN and the ROKCG. Those two Korean services try to achieve organizational effectiveness through optimization of given resources. For the additional mission, increasing time of the ships underway is a primary concern which can be accomplished by redesigning the organizational structure.

In this thesis, comparisons between various manning models are studied. Secondly, barriers in implementing change in other services are identified, especially the ROKN. Thirdly, appropriate approaches to overcome the common barriers are proposed.

Ultimately, a structural design is selected which best matches the organizational environment of the Korean Navy as a fast patrol force.

Master of Science in Management
December 1986

Advisor: C.K. Foyang
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A PROPOSAL FOR IMPLEMENTATION OF COMMERCIAL ACTIVITY PROGRAM IN THE REPUBLIC OF KOREA: ARMY MAINTENANCE DEPOT

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B.A., Korea Military Academy, Seoul, 1977

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Major, Republic of Korea Army
B.A., Korea Military Academy, Seoul, 1976

This thesis examines the possibility of implementation of a Commercial Activity (CA) program in the Republic of Korea (ROK) military. For more than three decades in the U.S., a CA program has been executed to improve Government efficiency. The Office of Management and Budget (OMB) Circular No. A-76 is the bible for that issue. Commercial Activity is defined as certain activities which are performed by public organizations that have enough well-developed civilian competitors. ROK Army depot maintenance is presented as a typical example of CA applied by in-house management and workers. The new Defense Resource Management System in the ROK military could provide the practical basis for CA concept inplementation even though there are some barriers to use of cost data for the cost comparison.

The authors believe that the implementation of a CA program in the ROK Army will improve defense budget efficiency (reduce budget requirements) and also generate additional positive effects such as improving combat supportability, increasing total combat power, contributing to national growth, and promoting civil-military relationships. Some limitations and recommendations toward implementing a CA are discussed.

Master of Science in Management
December 1986

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INCOME, EDUCATION, AND ABILITY: THE UTILITY OF ALTERNATIVE MEASURES OF ABILITY

Edwin James Knowles Jr.
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B.S., Kent State University, 1977

This thesis analyzes the effect of innate ability on earnings differentials by using a standard human capital earnings function. The data used is the 1984 panel (Round 6) of the National Longitudinal Survey for Youth aged 14 to 21 in 1979. AFQT and Coding Speed (the Armed Services Vocational Aptitude Battery (ASVAB) Form 8A subtest) are examined and compared for the utility of each as a valid ability measure. The primary finding is that, although Coding Speed demonstrated utility as an ability proxy, AFQT functions much more effectively. While the effect of innate ability by itself on earnings is found to be relatively small, the inclusion of measures of ability in human capital earnings equations substantially reduced the estimates of the returns from education.

Master of Science in Management
December 1986

Advisor: G.W. Thomas
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AN ANALYSIS OF REENLISTMENT AND RESERVE INTENTIONS OF FIRST-TERM ENLISTED PERSONNEL

Mark W. Lamboni
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B.S., United States Naval Academy, 1975

This thesis investigates military affiliation intentions of first-term enlisted servicemen in all four branches of service who have less than a year remaining on their initial enlistment contract. The investigation is accomplished in two sequences:

1. The study of servicemen most likely to reenlist, and those most likely to separate; and
2. Of those servicemen who are classified as not likely to reenlist, the likelihood of their joining the reserves.

The two decisions are analyzed using demographic, tenure, cognitive/affective, economic, and employment alternative variables as explanatory factors. The analysis is completed by using a probit non-linear estimation technique which calculates the likelihood of a serviceman choosing to continue, or discontinue, military service given his set of specific characteristics. The results indicate potential policy variables that may be targeted by manpower policy planners to increase the likelihood of continued military affiliation either by reenlistment or reserve force participation.

Master of Science in Management
June 1987

Advisors: G.W. Thomas
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AN INTEGRATED LOGISTIC SUPPORT MODEL FOR MAJOR WEAPON SYSTEMS OF THE PAKISTAN NAVY

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B.S., Pakistan Naval Academy, 1970

Previous acquisitions of major weapon systems by the Pakistan Navy have lacked adequate logistic support planning. During most weapon system acquisitions, emphasis has traditionally been placed on getting the hardware in place with the least possible cost. Other elements affecting operational use, and specifically, sustained readiness, have clearly been secondary. Accordingly, after systems have been introduced into the Navy, additional costly expenditures have been necessary to operate and maintain these systems effectively. As a solution to this problem, this thesis offers a simplified version of the Integrated Logistic Support (ILS) used by the United States Navy and other components of the U.S. Department of Defense for the life cycle support management of weapon systems from "womb-to-tomb". By following the road map provided in this thesis, the Pakistan Navy should be in a better position to develop a streamlined life cycle support management plan for weapon systems during future acquisitions.

Master of Science in Management
June 1987

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A MODEL FOR EFFECTIVE PERFORMANCE IN THE INDONESIAN NAVY

Isnak Tatuconsina
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B.S., Indonesian Naval Academy, 1971

This thesis describes a process of designing a management competency development model for the Indonesian Navy. Competency is used here as skill, knowledge, characteristic or attitude which differentiate effective from [illegible] managers. In the process of building the model two main steps are taken. First, a literature study of the empirical analysis of management competencies was conducted to identify management competencies in the United States in general and the U.S. Navy in particular. Second, a pilot study was conducted using ECHO, a projective survey technique to identify the "cultural-bound" management competencies in the Indonesian military environment. The sample used in this pilot study was thirteen Indonesian Officers who study at the Naval Postgraduate School in Monterey, California. Combining the findings from the two studies, a conceptual model of management competency for the Indonesian Navy was developed.

[illegible] possibilities, process or procedure in the hope that it can be used as a guide line in developing a training program for management [illegible] in the Indonesian Navy.

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U.S. FMS AND ROK ECONOMIC ACQUISITION OF WEAPON SYSTEMS

Seung Joo Lee
Major, Republic of Korea Army
B.S., Korea Military Academy, 1977

Since the Korean war, the military balance on the peninsula has continually favored North Korea. The North continues to pose an imminent danger to the peace and stability of the South. North Korea's recent swing toward the Soviet Union and the transfer of new technology further increases the threat. The importance of the peninsula to the East-Asia regional security has been emphasized. In FY 86, the U.S. Congress did not appropriate FMS funds for the Republic of Korea. This has resulted in increased defense expenditures that force the Republic of Korea into finding a more efficient means of acquisition. It is clear that FMS pricing, contract and financing are critical areas to ROK's efficient acquisition of arms. Instead of a high-level political solution to the problem, negotiation and price analysis are found to be the most important areas at the operational level to be improved upon in the ROK's FMS procurement. It is concluded that good price analysis and skilled negotiation will insure adequate requirement definition and efficiency in ROK procurements.

Master of Science in Management
June 1987

Advisor: E.J. Laurance
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OPERATING HOURS BASED INVENTORY MANAGEMENT

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Inventory management models based on operating hours are examined and discussed. Traditional demand based models incorporating risk and shortage costs are developed. The two major components of an operating hours model, operating hours and procurement lead-time are reviewed and discussed. Data for both operating hours and procurement lead-time for the LM-2500 Gas Turbine Engine, and operating hours for the U.S. Air Force are reviewed and tested to determine accuracy. Some time series models are tested to determine if operating hours forecasting can be improved. The role of the item manager in an operating hours based model is discussed.

Master of Science in
Management
December 1986

Advisors: W.R. Greer
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AN EVALUATION OF THE DEPARTMENT OF DEFENSE DRUG TESTING PROGRAM

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B.A., San Diego State University, 1980

This thesis investigates the approaches taken by the Department of Defense (DoD) and specific Military Services with regard to testing military and civilian personnel for drug abuse. Costs and results of programs are compared. Conclusions and recommendations concerning drug testing are provided.

Master of Science in Management
December 1986

Advisor: [illegible]
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AN ANALYSIS OF THE PROCUREMENT ADMINISTRATIVE LEAD TIME (PALT) FOR THE PROCUREMENT PROCESS AT THE NAVAL POSTGRADUATE SCHOOL

Terry C. Lodge
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B.A., Chapman College, 1976

This study examines the environment within the Naval Postgraduate School's Small Purchase Branch. The intent of the study is to analyze the procurement process, ascertain the factors which contribute to the overall Procurement Administrative Lead Time (PALT), and make recommendations that offer alternate solutions to problems associated with PALT. The primary areas studied include the legislative environment, work environment, training, staffing, management, and automation. The thrust of the study is to improve the efficiency and effectiveness of the Purchase Branch. Specific conclusions regarding the current state of the NPS Small Purchase Branch are made, along with recommendations that management may use to improve the branch in the future. This study also recommends areas for future study that may lead to increased productivity in any small purchase activity.

Master of Science in Management
December 1986

Advisors: K.J. Euske
D.C. Boger
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ARE U.S. NAVAL HOSPITALS OPERATED EFFICIENTLY?: A STUDY USING DIAGNOSIS RELATED GROUPS

Albert Benjamin Long
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B.S.B.A., Appalachian State University, 1975
M.H.H.C.A., Saint Louis University, 1977

Howard Thomas Osment
Lieutenant, United States Navy
B.S., University of New Hampshire, 1982

In an effort to control rampant hospital-cost inflation, Congress passed the Tax Equity and Fiscal Responsibility Act of 1982 and the Social Security Amendments of 1983. The result of these two initiatives is the implementation of a prospective payment system (PPS) that uses diagnosis related groups (DRGs) in classifying patients and reimbursing hospitals for Medicare patients. Using the Health Care Financing Administration's (HCFA) methods (i.e., rates, weights and ICD-9-CM DRGs) for determining reimbursable amounts, this analysis examines the postulation that the typical U.S. naval hospital-- if reimbursed for actual inpatient workload--would have received more than its incurred expenses. Data for three naval hospitals over a two-year period (FY83 and FY84) are used. Findings of this analysis suggest that on the average the typical naval hospital would have been reimbursed 32 percent more than actual inpatient expenses had it been reimbursed under Medicare.

Master of Science in Management
December 1986

Advisor: D.R. Whipple, Jr.
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EXPENDITURE DISTRIBUTION TRENDS WITH REGARD TO THE AVAILABILITY OF FUNDS IN THE DOA AND DOAF BUDGETS

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B.A., University of Pittsburgh, 1980

This thesis examines the factors that affected Army and Air Force spending for fiscal years 1955-1984. The four major appropriation categories were analyzed using budget shares, growth rates, and percentages of the respective services' budget totals. The data was then compared to DON and DOD spending trends to determine if consistent budget behavior exists within DOD. The result was that DOA and DOAF budgeting appears to be incremental in nature, with programmatic influences on new and controversial issues. Availability of DoD funds influenced the categorical spending for each of the services but in different ways. While DON followed the DOD pattern closely, DOA and DOAF budget emphasis reflected the nature of the individual service, which explains why Military Personnel received the largest DOA share, while Procurement received the highest percentage of the DOAF budget.

Master of Science in Management
June 1987

Advisor: J.L. McCaffery
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A PRAGMATIC ASSIZEMENT OF DEFENSE CONTRACTOR RISK, PROFITABILITY, AND DEBT: 1976 - 1984

David Joseph Louk
Lieutenant Commander, United States Navy
B.S., Virginia Commonwealth University, 1973

This thesis is an investigation into the measurement and analysis of the relationship between defense contractor risk and profit levels as compared to commercially oriented firms' risk and profit levels. Past studies that have attempted to quantify the interrelationship of risk and profit are examined. Hurdle's leverage, risk, market structure, and profitability model is used as a basis for the current model of risk and profitability. Empirical analyses of defense contractor risk and profit relationships are performed using least squares regression analysis, Chow tests, and three stage simultaneous regression analysis.

Master of Science in Management
June 1987

Advisor: D.C. Boger
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AN ANALYSIS OF SPARE PARTS FORECASTING METHODS UTILIZED IN THE UNITED STATES MARINE CORPS

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Byron F. Stebbins
Captain, United States Marine Corps
B.B.A., Texas A&M University, 1978

The main thrust of this study is centered around the United States Marine Corps' initial provisioning of spare parts. The research focuses on two integral components for the establishment of stockage levels. The first component considers an analysis of the peacetime replacement rate and the production leadtime data provided by contractors. The second component evaluates the current Marine Corps inventory model as compared to the Navy's inventory model and the Initial Spares Optimization Model (ISOM). This study is primarily concerned with initial issue provisioning stockage levels maintained by the Marine Corps Logistics Base, Albany, Georgia.

During the course of the study it was found that:

(1) Difficulties exist in documenting contractor provided engineering estimates maintained in the Marine Corps Provisioning Files.

(2) The current inventory is inadequate and state-of-the-art methods and models should be implemented by the Marine Corps.

(3) Contractor provided engineering estimates tend to be skewed. Provisioners have no formal method for validating contractor data.

One major contribution of this study is the development of an initial manual of standard factors that can be used by provisioners to validate data and as a baseline from which pertinent questions could be raised.

Master of Science in Management
June 1987

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A STUDY OF CARRIER BASED AIRCRAFT READINESS SUSTAINABILITY IN THE EVENT OF EXTERNAL AIR LOGISTIC SUPPORT DEPRIVATION

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B.S., University of Maine, Portland-Gorham, 1974

This thesis investigates the feasibility of constructing a quantitative model of the Navy's aircraft carrier aviation logistic support system. The emphasis is on predicting the effect that an interruption of COD/VOD material would have on the sustainability of aircraft readiness. Two forecasting models were constructed; one for forecasting full mission capable rates (FMC) and one for forecasting mission capable rates (MC). The conclusion was that aircraft readiness is very sensitive to a prolonged interruption in the external air logistic support pipeline. Recommendations are made to conduct specific carrier operations to extend the range of actual data observations.

Non-linear, multiple regression and Box-Jenkins statistical techniques were utilized. A substantial data base consisting of various measures of the logistic support system over a three year period is included.

Master of Science in Management
June 1987

Advisor: S.S. Liao
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RANDOM SAMPLING FOR EXTRAPOLATED DEDUCTIONS IN NAVY MAINTENANCE SERVICE CONTRACTS

Robert Anthony Maholchic
Lieutenant, United States Navy
B.S., University of California at Los Angeles, 1981

This thesis examines the use of random sampling as a basis for taking extrapolated deductions in the payment of Navy maintenance service contracts. Motivated by increasing inspection requirements, NAVFAC has authorized limited use of this quality assurance tool. The experience of two activities which implemented extrapolated deductions in their family housing maintenance contracts is the focus of this study. Methods employed are evaluated along with an analysis of payment history, contractor performance and inspection requirements. The statistical basis used in the field tests along with an alternate proposal is analyzed. Various issues are identified which should be addressed before general guidance is promulgated. Major recommendations deal with sample adjustment, computer support, inspection methods and the need for oversight.

Master of Science in Management
December 1986

Advisor: D. Moses
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THE FEASIBILITY OF USING ALTERNATIVE MODELS FOR DETERMINING RESERVE NAVAL MOBILE CONSTRUCTION FORCE MATERIAL READINESS

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Lieutenant Commander, United States Navy
B.A., Boston College, 1974

This thesis explores the feasibility of using alternative models for determining the material readiness of Reserve Naval Construction Force units. There is no system currently in place to measure and determine either the readiness contribution of the equipment and supplies on hand for these forces, or the material condition of the essential combat and major end items that will be used to carry out the wartime mission. Alternative models are explored to enable an accurate assessment of the individual unit's readiness posture and to portray this in appropriate format to the Joint Chiefs of Staff via the UNITREP system.

Master of Science in Management
December 1986

Advisors: T.P. Moore
O.D. Moses
Department of Administrative Sciences

AN ANALYSIS OF GOVERNMENT FURNISHED MATERIAL (GFM) IN NEW CONSTRUCTION SHIPS

Paul John Masters
Lieutenant Commander, United States Navy
B.S., York College of Pennsylvania, 1976

This thesis discusses the supply support process for new construction ships, the feasibility, cost and impact of maximizing the use of the Navy supply system for repair parts and equipage, and provides regression models for use in program budget formulation and execution. The discussion includes the criteria for determining contractor versus government furnished equipment and material. The report also presents the results of a test case involving the transfer of parts procurement responsibility from the contractor to the government.

Master of Science in Management
December 1986

Advisor: D.C. Boger
Department of Administrative Sciences

ARCHITECT/ENGINEER LIABILITY IN CONSTRUCTION CONTRACTING

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

This thesis investigates possible relationships between the amount of Architect/Engineer firm (A/E) liability and A/E costs and/or construction costs. A/E's provide plans and specifications for government construction projects. Any changes which occur during the course of construction can lead to A/E liability when the corrective work includes unproductive costs. The data for this thesis includes the A/E design costs, construction costs, and the amount of A/E liability for each project. The projects were classified as not complex, complex, and very complex based on the construction characteristics of each project. Regression analysis was used in the search for a predictive mathematical equation. The best equation explained only 29.0% of the variation in A/E liability. Consequently, this study does not establish any significant relationship between the amount of A/E liability and A/E costs and/or construction costs. The background research did indicate that the A/E should have a much greater involvement in a project during construction. It is recommended that the project A/E be required to make site visits at least weekly.

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Advisor: J.M. Fremgen
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Administrative Sciences

THE NAVY'S CARGO TRANSPORTATION SYSTEM

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Lieutenant Commander, United States Navy
B.S., University of Idaho, 1976

The purpose of this thesis is to determine if the Navy is receiving sufficient services to support the cost and manner in which the QUICKTRANS contract is managed. It reviews the current contract and analyzes its efficiency. Additionally, it reviews a proposed revision to the established manner of contracting transportation services, which was presented in 1983. Finally, it reviews potential future improvements to QUICKTRANS and the entire Navy Integrated Transportation System.

Master of Science in Management
December 1986

Advisor: D.C. Boger
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INVESTIGATION OF INITIATIVES TO IMPROVE PROCUREMENT SUPPORT AT U.S. NAVAL SHIPYARDS

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Lieutenant Commander, United States Navy
B.A., University of Washington, 1977

This thesis examines current recommendations and initiatives to streamline the Navy Field Contracting System and improve procurement support for naval shipyards. Specific recommendations from the Coopers & Lybrand shipyard study and Department of Defense and Navy initiatives which will have a positive and significant impact on shipyard procurement support are examined. Additionally, current shipyard requisition processing procedures are reviewed, which highlight the complexity of the system and factors involved in the requisitioning, ordering and receipt of material. Finally, this report explores personnel quality enhancement tools and automated procurement systems designed to improve the acquisition process.

Master of Science in
Management
June 1987

Advisors: R.W. Smith
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A STUDY OF THE CHINESE SHIPYARD MANAGEMENT CONTROL SYSTEM

David Michael McDonald
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This paper traces the evolution of the Chinese shipyard management control system. It starts with a presentation of the current control system in use in Chinese shipyards. Next an explanation of how this control system evolved is offered using the institutional and resource dependency perspectives. From 1947 until 1980 when China produced ships for domestic use only, a resource dependency perspective provided a good explanation of the shaping of the control system. When China shifted to export production in 1981, however, it was necessary to shift to an institutional perspective to present the most accurate portrayal of the control system's evolution. Finally, the paper points out that the shipbuilding organization's goals have again changed, and proposes that a resource dependency perspective best explains recent control system changes. The paper also predicts this perspective to hold for future control system development.

Master of Science in Management
September 1987

Advisors: K.J. Euske
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ACQUISITION STREAMLINING EFFORTS WITHIN THE SPACE AND NAVAL WARFARE SYSTEMS COMMAND

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B.A., Mary Washington College, 1979

In 1986, Deputy Secretary of Defense W.H. Taft IV, established an "Acquisition Streamlining Initiative" (ASI) which addresses and attempts to "streamline" the acquisition process and mandated requirements. This research reviews efforts of one Hardware Systems Command--The Space and Naval Warfare Systems Command (SPAWAR)--to implement ASI. In reviewing the five major programs streamlined thus far at SPAWAR, it was found that monetary savings have been achieved. The various manner and methods in which the savings were achieved, however, is the primary focus of this study.

Master of Science in Management
June 1987

Advisor: P. Carrick
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COST ISSUES OF THE NAVAL AIRSHIP PROGAM

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Desiree Ellen Melnychenko
Lieutenant, United States Navy
B.S., Towson State University, 1979

This study evaluates the ongoing acquisition process for the Naval Airship Program (NASP). It presents a general background to the Lighter-Than-Air (LTA) concept, describes the Department of Defense (DoD) acquisition process, and describes how the NASP acquisition process has differed from the prescribed norm. It also examines the stated mission need for the NASP, and the manner in which the NASP program office has dealt with other alternatives to that mission need. Finally, this study examines whether the Department of the Navy (DoN) has justified the NASP from an economic basis. The conclusions reached are that the NASP has not been properly justified in a classic cost-benefit manner against its competing alternatives, and that although the DoN has authorized hardware development to continue, significant cost issues remain unresolved.

Master of Science in Management
June 1987

Advisor: P.M. Carrick
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Administrative Sciences

AN ANALYSIS OF THE PROCUREMENT ADMINISTRATIVE LEADTIME (PALT) AT THE NAVY AVIATION SUPPLY OFFICE (ASO)

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B.A., Chapman College, 1974

The purpose of this thesis is to determine if there are contracting techniques that can be employed to reduce procurement administrative leadtime (PALT) for the procurement of spare parts at the Navy Aviation Supply Office (ASO). Findings were that implementation of the initiatives in the Competition in Contracting Act (CICA) of 1984 and Section 908 of the FY87 DoD Authorization Act has resulted in increased PALT. Reasons for this increase in PALT include the establishment of a Competition Advocate; processing of justifications and authorizations (J&As); increased synopsis time in the Commerce Business Daily (CBD); a reduced threshold for contractors' certified cost or pricing data; and missed requirements dates due to prospective pricing of BOA orders. The major conclusion is that ASO is using the appropriate contracting techniques for spares procurement. A spirited application of those techniques to streamline the procurement process may reduce PALT.

Master of Science in Management
June 1987

Advisor: R.W. Smith
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Administrative Sciences

SHOULD THE NAVY ESTABLISH A CENTRALIZED OFFICE FOR THE MANAGEMENT OF GOVERNMENT-FURNISHED PROPERTY?

George K. Mitchell, Jr.
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B.A., Western Kentucky University, 1970

The issue of providing government-furnished property (GFP) to major defense contractors, for use in production of Navy hardware, has received considerable attention since 1981 when the House Subcommittee on Legislation and National Security of the Committee on Government Operations held the first of, what was to become, several hearings in regard to DoD's perceived mismanagement of property administration. While Congress made several recommendations over the course of the intervening years, one recurring recommendation was made at the conclusion of each hearing. Congress desired that DoD or the Military Departments establish a central office to coordinate all actions planned and underway for improving management and accountability of GFP.

In this study, the researcher provides a brief history of GFP and the events which have led to criticism of DoD management. Policy for furnishing GFP is reviewed along with the pro's and con's of its usage. The responsibilities of the government, the contractor, and the government's property administrator are discussed. Organizations already existing in the Air Force, Army, Defense Logistics Agency, and the Navy practicing some degree of centralized property management were reviewed as to their organization and methods for providing guidance and assistance to their property administrators. Interviews with twenty seven Navy property administrators concerning issues such as the sufficiency of guidance they receive from higher headquarters and their views of centralization round out the research. The study concludes that the Navy would benefit by establishing a central office to provide policy and technical guidance to Navy property administrators.

Master of Science in Management
December 1986

Advisor: R.W. Smith
Department of
Administrative Sciences

THE RECONCILIATION PROVISION OF THE 1974 CONGRESSIONAL BUDGET ACT: PROCESS AND OUTCOMES

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Lieutenant, United States Navy
B.A., Muskingum College, 1980

In the 1950's, Congress created a set of budgeting norms which established that the House of Representatives controlled the power of the purse. Those norms eroded and were replaced by a free spending Congress which was unable to control its spending decisions. In 1973, the Congress reformed its budgeting process in an attempt to correct the problems of the past decade. The 1974 Congressional Budget and Impoundment Control Act provided for the reconciliation of the second budget resolution. The reconciliation provision was designed to provide Congress with the ability to finalize the spending decisions made in the two budget resolutions. In 1980, Congress changed the designed intent of the reconciliation provision. Reconciliation became a tool for the Budget Committees to use in an attempt to control budget growth. This thesis examines whether reconciliation has restored the power of the purse to Congress.

Master of Science in Management
June 1987

Advisor: J.L McCaffery
Department of Administrative Sciences

THE GUARANTEED TRAFFIC PROGRAM FOR LESS-THAN-TRUCKLOAD SHIPMENTS AT NAVAL SUPPLY CENTER, OAKLAND

Bernard E. O'Neil
Captain, United States Marine Corps
B.A., Westfield State College, 1978

This thesis examines the less-than-truckload Guaranteed Traffic Program (GTP) for continental U.S. (CONUS) shipments as it is currently being used at NSC Oakland and NSC Norfolk. A description of the major CONUS Navy Material Transportation Office (NAVMTO) transportation programs is presented. A detailed description is given of the Guaranteed Traffic Program, including award procedures and the agreement (tender). Reduction in manning in conjunction with implementation of the GTP, as well as other benefits of guaranteed traffic are studied. Transportation costs and transit times are analyzed to determine the effect that guaranteed traffic has had on these factors.

Master of Science in Management
December 1986

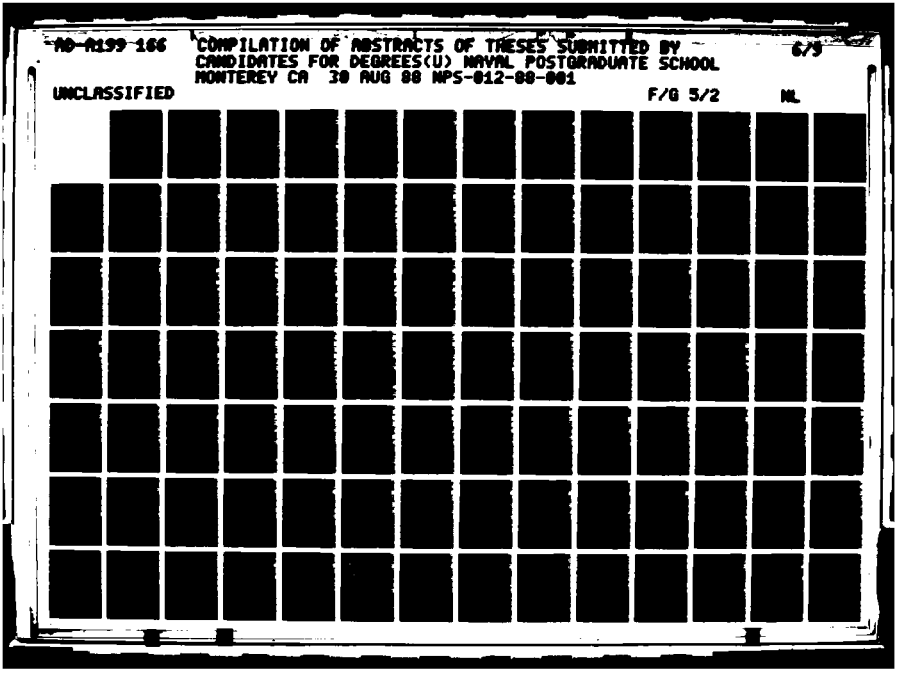
Advisors: D.C. Boger
T.P. Moore
Department of Administrative Sciences

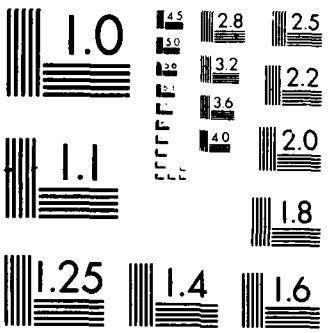
PERFORMANCE WORK STATEMENTS: [illegible]
PREPARATION [illegible]

Christopher D. Paddock
Lieutenant, United States Navy
B.A., University of [illegible]

Office of Management and Budget (OMB) Circular [illegible] Federal policy concerning the performance of commercial activities [illegible]. The provisions of Circular [illegible] cost comparison to determine if a CA is more [illegible] the government or private sector. The Performance Work Statement (PWS) provides the baseline for solicitation [illegible]. The research of this study focuses on identifying [illegible] preparation of the PWS. Research included review of [illegible] and interviews of government and industry personnel [illegible] solicitation at the Naval Postgraduate School. [illegible] concludes that PWS preparation is [illegible] standardization contributes to a [illegible] inhibits full competition.

Master of Science in [illegible]
Management
June 1987


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COMPILATION OF ABSTRACTS OF THESES SUBMITTED BY CANDIDATES FOR DEGREES(U) NAVAL POSTGRADUATE SCHOOL MONTEREY CA 30 AUG 88 NPS-012-88-001
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MICROCOPY RESOLUTION TEST CHART
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AN EFFECTIVE INFORMATION SYSTEMS STRUCTURE FOR THE KOREAN AIR FORCE LOGISTICS ORGANIZATION: A PRELIMINARY INVESTIGATION

Byung Kil Park
Major, Korean Air Force
B.S., Korean Air Force Academy, 1978

Aviation logistics is a complex and multi-faceted activity, and is one in which management information systems (MIS) play a crucial role. This thesis examines the Korean Air Force Logistics MIS and proposes an alternative structure for the MIS function that should improve both efficiency and effectiveness. Specifically, we will focus on the centralization and decentralization of the MIS structure.

The thesis reviews the current information system structure for the Korean Air Force Logistics organization, and identifies some problem areas. An analysis of the advantages and disadvantages of centralization and decentralization is then provided based on literature findings. Following this analysis, a structured methodology is employed to investigate the appropriate centralization and decentralization structure for the Korean Air Force Logistics organization. The benefits of the proposed structure are discussed. Finally, suggestions for future research in this area are provided.

Master of Science in Management
June 1987

Advisor: T.K. Abdel-Hamid
Department of Administrative Sciences

THE POSSIBILITY OF A CONTRACTING SCIENCE

Steven A. Park
Lieutenant Commander, United States Navy
B.A., The Citadel, 1975

This thesis investigates the possibility of the contracting field of study becoming a contracting science.

The paper begins with background material concerning the different problems and difficulties currently encountered in contracting research. A case is made that a more systematic and rigorous (or scientific) approach is needed for gaining insight into contracting phenomena. An examination of the nature, the characteristics, and the requirements of "science" is conducted. Through this examination, the major requirements of: the possession of a distinct subject matter, the description and classification of the distinct subject matter, the identification of underlying uniformities and regularities of the phenomena, and the use of the scientific method are identified. The field of contracting is then evaluated against these requirements. The writer concludes that the field of contracting can and will evolve into a science; however, a change in beliefs and attitudes must first occur.

Master of Science in Management
December 1986

Advisor: D.V. Lamm
Department of Administrative Sciences

ARMED SERVICES BOARD OF CONTRACT APPEALS: ANALYSIS OF SUSTAINED DECISIONS ON DOD SUPPLY CONTRACT DISPUTES

Robert Douglas Parsons
Lieutenant Commander, United States Navy
B.S.A.S., Ohio University, 1978

The purpose of this thesis is to identify deficiencies in the Federal Government's acquisition process through an analysis of ASBCA decisions for the period 1981 through 1985. The study focuses upon Department of Defense contract cases involving the default conversion to terminations for the convenience of the government resulting from Board decisions. The essence of the study is to determine if meaningful conclusions could be drawn from the Board decisions that would be used to improve the acquisition process. Using research methodology several deficiencies are revealed in the actions taken by the acquisition team that waived the right to successfully pursue a default termination. Lack of contract knowledge, inadequate training, [illegible] of the substantial compliance aspects [illegible] first article units. Additional research [illegible] study concludes that analysis of [illegible] is a [illegible] technique for making improvements in the [illegible] process.

Faculty [illegible]
Department [illegible]
[illegible]

[illegible]
[illegible] of
[illegible] Sciences

ANALYSIS OF A PROPOSED WHOLESALE REPAIRABLES REPLENISHMENT MODEL

Gregory H. Pearsall
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1974

This thesis analyzes a proposed new Navy wholesale level repairables replenishment model with specific focus on procurement log size (Q) because of its direct relationship to inventory control point workload. The model is also tested with real-world data.

Results emphasize the trade-offs between wholesale investment levels and order quantities and mean supply response time goals.

Master of Science in Management
December 1986

Advisor: A.W. McMasters
Department of Administrative Sciences

AN EVALUATION OF THE MANPOWER STAFFING SYSTEM FOR THE NAVAL FACILITIES ENGINEERING COMMAND'S FACILITIES ACQUISITION MISSION

Kenneth L. Rado
Lieutenant, United States Navy
B.S.C.E., University of Delaware, 1978

This thesis describes and evaluates the manpower demand forecasting system used by the Naval Facilities Engineering Command (NAVFAC) both to obtain manpower resources for its facilities acquisition mission during the Planning, Programming and Budgeting process and to allocate these resources among its Engineering Field Divisions (EFDs). The method by which NAVFAC developed its manpower demand forecasting is assessed as being valid. This thesis shows that the accuracy of this model, developed in 1980 using FY 79 data, can be enhanced by using more recent data over a period of several fiscal years. This is done in this thesis using FY 85 and FY 86 data. Thesis research showed that this same model can be used as a baseline with a high degree of accuracy to allocate resources among the EFDs; however, an expanded data base is crucial to improved accuracy. Other manpower staffing factors, not quantified in NAVFAC's staffing model, are described and their effects on staffing requirements appraised. The means by which EFDs internally allocate these resources among Divisions is evaluated, and recommendations for improvements are made.

Master of Science in Management
March 1987

Advisor: R.A. Weitzman
Department of
Administrative Sciences

THE EFFECTS OF COMBINING NAVY SUBSPECIALTIES ON GRADUATE EDUCATION QUOTAS, AND QUOTA MODEL ENHANCEMENTS

Mary Louise Rainey
Lieutenant, United States Navy
B.A., Nazareth College of Rochester, 1975

This thesis examines the effects of a simplification of the U.S. Navy Subspecialty System on determining graduate education quotas. A set of "matching" criteria is introduced by which Navy fully-funded graduate education curricula are rated for fraction commonality. Subspecialty fields, represented by their supporting curricula, are then aggregated based on various levels of curriculum commonality, and the effect on quotas quantified. Results indicate that reducing the number of subspecialty fields does not significantly alter the number of inputs required to maintain the system. The thesis also advances a model by which U.S. Navy Unrestricted Line graduate education quotas may be allocated by primary designators. This model may be used to enhance the capabilities of current models of quota determination.

Master of Science in Management
June 1987

Advisor: K.T. Marshall
Dean of Information and Policy Sciences

RESERVE MANNING OF FF-1052 AND FFG-7 CLASS FRIGATES: A CRITIQUE OF THE ACCURACY AND COMPLETENESS OF EXISTING COSTING STUDIES

Patrick Robert Rearden
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1976
M.A., Pepperdine University, 1979

The purposes for this research have included:

1. To evaluate studies that have attempted to make a cost analysis of either Regular Navy or Naval Reserve Force ships.
2. To collect and analyze data related to the costs of operating selected Regular Navy and NRF ships during Fiscal Year 1986.

The focal points of this work were the costs observed by eight selected Pacific Fleet frigates. Of the eight, four each belonged to the Regular Navy and the NRF. Of these, two ships were of the FF-1052 class, while the other two belonged to the FFG-7 class.

Operating costs were divided into three families: manpower, equipment and supplies, and variable costs of operation. Data was obtained in most cases from original documents and ship's manning records.

The thesis observes that the actual costs of operating an FF-1052 class in the NRF was higher than to do so in the Regular Navy. By contrast, FFG-7s prove to be more economical when associated with the Naval Reserve Force.

Master of Science in Management
March 1987

Advisor: K.J. Coffey
Department of Administrative Sciences

AN ANALYSIS OF UNPRICED ACTIONS UNDER BASIC ORDERING AGREEMENTS ESTABLISHED BY THE AVIATION SUPPLY OFFICE

Douglas Scott Roark
Lieutenant, United States Navy
B.S., Old Dominion University, 1977

This study was undertaken to define the problems associated with the issuance and management of unpriced orders (UPOs) under Basic Ordering Agreements (BOAs) [illegible] Aviation Supply Office (ASO). The researcher attempts to determine solutions to these problems and develop a model or thought process for acquisition managers to use in the issuance and management of UPOs.

The researcher found that the issuance of UPOs were interrelated with the requirement to obligate funds in maintaining adequate inventory levels and the enhanced competition goals resulted from the Competition in Contracting Act of 1984. Driving forces behind the overaged backlog of UPOs were an inadequate support force, insufficient automated data processing equipment and the inability to enforce the Federal Acquisition Regulation (FAR) [illegible] requirements. These requirements relate to [illegible] issuance [illegible] of UPOs.

The inability to [illegible] problem was brought to the attention of [illegible] instituted [illegible] reductions in UPO [illegible] proposals in advance [illegible] clauses which allow [illegible] contractors who fail [illegible]

ASO has developed [illegible] control of UPOs [illegible] obligation/invoice [illegible] the Navy instituted [illegible].

The researcher has studied the ASO [illegible] process and has reached [illegible] make UPO decisions [illegible]

acquisition environment. Most importantly, the researcher believes that the decision making process should be decentralized to the acquisition manager and that he should be free to make decisions affecting UPO activity levels and given adequate resources, but at the same time his performance ratings should be predicated on his ability to meet the current definitization timeframes promulgated in the FAR.

Master of Science in Management
December 1986

Advisor: R.W. Smith
Department of
Administrative Sciences

ENHANCING THE PROFESSIONALISM OF PURCHASING AGENTS (GS 1105S) WITHIN THE DEPARTMENT OF THE ARMY

Paul Francis Rock
Captain, United States Army
B.S., University of Florida, 1976

This thesis reviews current efforts to enhance the professionalism of U.S. Army purchasing agents (GS 1105s) assigned in the Forces Command (FORSCOM), Training and Doctrine Command (TRADOC) and the Aviation Systems Command (AVSCOM). Objectives of this study are to characterize these efforts and to provide recommendations, as appropriate, on how to improve this workforce in view of their purchasing transactions and contracting procedures used to affect such procurements. In summary, recent efforts to promote the status of purchasing agents have been substantive; however, further development of the series is still needed. Recommendations include redesignating current AVSCOM GS 1105 positions to contract specialist (GS 1102) positions and implementing the researcher's "Proposed Career Plan for U.S. Army GS 1105s" for FORSCOM and TRADOC purchasing agents. This career plan both promotes the use of career bridging by GS 1105s to occupationally progress into the GS 1102 series and recommends that GS 1105s be required to attain an associate degree in order to remain in their current series.

Master of Science in Management
September 1987

Advisor: R.W. Smith
Department of
Administrative Sciences

COMPARISON OF COSTS FOR THE PERFORMANCE OF SECURITY FUNCTIONS AT MILITARY INSTALLATIONS BETWEEN SERVICES PROVIDED BY CIVILIANS AND MILITARY PERSONNEL

Geronimo Rodriguez
Lieutenant, United States Navy
[illegible] of the Republic of the Philippines, 1978

This study examines the various issues which evolve from types of [illegible] between civilian and military security [illegible] manpower costs.

The main thrust of the study focuses around manpower costs. To [illegible] manpower costs of two naval installations, one [illegible] and the other a security [illegible] personnel, is made and presented. Their [illegible] and personnel salaries are [illegible] manpower costs. In addition, a survey of the [illegible] allowed for individual physical [illegible] that the conclusions of this [illegible] on matters and decisions [illegible] Naval installations.

[illegible]
Department of
[illegible] Postgraduate Schools

A STUDY OF THE DEPARTMENT OF DEFENSE CONFIGURATION MANAGEMENT POLICIES AND PROCEDURES AS APPLIED TO THE FA-18 STRIKE/FIGHTER PROGRAM

Christopher John Roum
Lieutenant Commander, United States Navy
B.S., Metropolitan State College, Denver, 1976

This thesis appraises the costs and benefits of the Department of Defense (DoD) and the Department of the Navy (DoN) Configuration Management (CM) program but only so far as to identify the present costs and benefits and their relationship. The FA-18 program is utilized as the research vehicle and is examined in terms of configuration management and control policies and procedures. The focus is on post-production-baseline configuration control. An overview of critical CM issues in the government/contractor relationship is presented and their impact on the FA-18 program is analyzed. It is determined that current policies and procedures cannot insure control of the product baseline in highly sophisticated and broadly integrated weapon systems. Responsibility for CM is too fragmented and the system too cumbersome to allow effective and efficient information flow. In most cases, CM inefficiencies identified in the FA-18 program were previously addressed by program management and extraordinary work arounds implemented to ensure future FA-18 supportability. Recommendations for improvement of Configuration Management and Control for future programs are made.

Master of Science in Management
June 1987

Advisor: P.M. Carrick
Department of
Administrative Sciences

JOB SATISFACTION, ORGANIZATION, COMMITMENT AND RETENTION IN THE NOAA CORPS

Patrick J. Rutten
Lieutenant, NOAA Corps
B.S., California Polytechnic State University
San Luis Obispo, California, 1975

Job satisfaction, commitment, and retention are assessed utilizing survey responses from 319 of 375 NOAA Corps officers. Job satisfaction is analyzed using need-satisfaction theory. Commitment and retention are analyzed using discriminant analysis.

Low job satisfaction and poor retention are found in grades O-1 and O-2. Moderate job satisfaction is indicated by mid-grade officers. Officers in grades O-3 (40%) and O-4 (34%) plan to retire with 20 years of service.

The majority of officers expressed low satisfaction in the areas of communication and feedback. Promotions are a major concern for officers in the grades of O-1 through O-5. The majority of officers enjoy their work, despite problematic areas, and plan to make a career in the Corps. Recommendations to improve job satisfaction, motivation, commitment, and retention are presented.

Master of Science in Management
December 1986

Advisor: C.K. Eoyang
Department of
Administrative Sciences

A REVIEW OF NAVY STOCK FUND ACCOUNTING PRACTICES FOR PROCUREMENTS FROM COMMERCIAL SOURCES

Ralph O. Scherini
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1976

The Navy Stock Fund (NSF) is a revolving fund used to purchase supply inventories and hold them until needed by customers. The accounting system employed to monitor and control the NSF is a complex system dispersed throughout a maze of different activities, ADP systems and reporting systems. The various NSF management levels use different accounting systems to serve their specific purposes and thus account for the NSF resources at differing levels of detail.

This thesis focuses on accounting systems the NSF uses for the procurement of wholesale inventory from commercial contractors. It attempts to determine if these systems can be improved through the application of accounting procedures currently in use by a major private sector firm. Specifically, the thesis attempts to identify major problems caused by the required levels of detail used within the NSF accounting system and determine if private sector financial inventory accounting practices can be directly employed by the Navy to resolve or improve these problems.

Master of Science in Management
June 1987

Advisor: D.G. Matthews
Department of
Administrative Sciences

AN EXPERT SYSTEM FOR INVENTORY MANAGERS AT RETAIL STOCK POINTS

William D. Schill
Lieutenant, United States Navy
B.A., University of South Carolina, 1977

The responsiveness of the Navy supply system depends upon the effectiveness of its inventory managers. It is difficult to achieve and maintain the high skill levels required of inventory managers to perform their jobs. Improvement in the effectiveness and productivity of existing personnel is possible through the application of "expert systems" technology. This thesis presents the design and development of expert system prototypes for two tasks performed by Navy stock point inventory managers: Delinquent Dues and Variable Ranking Lists processing. A review is provided of the acquired knowledge factors and the steps taken in the construction of the systems. The prototypes were evaluated by inventory managers and found to be extremely functional. The inventory managers were enthusiastic about the effectiveness and future use of these systems.

Master of Science in Management
March 1987

Advisors: A.W. McMasters
T.R. Sivasankaran
Department of Administrative Sciences

A DETERMINATION OF THE EXTENT OF AGREEMENT BETWEEN THE SHORE FACILITIES PLANNING DOCUMENTS AND THE SHORE BASE READINESS REPORT

Joseph P. Sebunia
Commander, United States Navy
B.S., Rensselaer Polytechnic Institute, 1969

This thesis investigates the extent of agreement between the Shore Facilities Planning Documents and the Shore Base Readiness Report. The objective is to determine if the Facility Planning Documents support the facility quantity readiness ratings reported in the BASEREP. The mean total deficiencies and the mean percentage deficiencies per facility requirement of a mission category are calculated and analyzed by analysis of variance tests to determine if there is a significant difference in the means among the assigned readiness ratings. The analysis indicates there is no significant difference in the mean deficiencies or the mean percentage deficiencies per facility requirement. The study concludes that the facilities deficiencies reported in the Facilities Planning Documents do not support the readiness ratings reported in the Shore Base Readiness Report.

Master of Science in Management
June 1987

Advisor: S.L. Mehay
Department of Administrative Sciences

ESTIMATED EFFECTS OF RETIREMENT REVISION ON RETENTION OF NAVY TACTICAL PILOTS

John H. Singley
Lieutenant, United States Navy
B.S., University of South Carolina, 1974

Recent changes in military retirement will reduce benefits to members entering service after July 31, 1986. These changes may have effects on Navy tactical pilot retention. This thesis seeks to measure retention effects resulting from retirement revision. A binary-response logistic-regression model was applied to cross-sectional data obtained from randomly selected Navy tactical aviators to evaluate possible determinants of their retention choice behavior. This data analysis suggests that the Military Retirement Act 1986 will contribute to a decrease in retention rates. Job security, tastes for military life, airline hiring rates, spouse employment, and pay were also found to be significantly (1%) correlated with retention.

Master of Science in Management
December 1986

Advisor: R.A. Weitzman
Department of
Administrative Sciences

INSTITUTIONALIZING THE BUY OUR SPARE PARTS (BOSS) INITIATIVES WITHIN THE NAVY FIELD CONTRACTING SYSTEM (NFCS)

Ronald J. Stearns
Lieutenant, United States Navy
B.S., University of Iowa, 1972

This study examines the Buy Our Spares Smart (BOSS) Program which was established as a result of Defense Department spare parts pricing problems experienced in 1983-1984. The study focuses on how BOSS initiatives might be institutionalized in the Navy Field Contracting System (NFCS).

The study reviews the BOSS organization, initiatives, and the current status of the program. The study examines methods which would facilitate effective incorporation of the BOSS initiatives within the NFCS and analyzes problems and issues related to these methods.

The researcher found two alternative methods of integrating the BOSS initiatives. The first is use of the Productive Unit Resourcing System (PURS) to incorporate continued BOSS Program funding. The second is to fold the maturing BOSS Program into the Competition Advocate General Priority Objectives. Recommendations concerning these two alternatives as well as modifications to current regulations and the breakout process are presented.

Master of Science in Management
June 1987

Advisor: D.V. Lamm
Department of Administrative Sciences

SOCIOECONOMIC FACTORS AND PERSONAL CHARACTERISTICS AFFECTING THE RETENTION OF OFFICERS IN THE UNITED STATES ARMY AND UNITED STATES MARINE CORPS

Jay D. Steele
Lieutenant, United States Naval Reserve
B.A., California State University, Hayward, 1976

This thesis addresses the question of which factors most highly influence the career decision of officers in the U.S. Army and Marine Corps who are between their fourth-year and twelfth-year of service. This was accomplished using data from the 1985 DoD Survey of Officer and Enlisted Personnel in a logistic regression model.

Several conclusions were drawn from this study. Intrinsic factors appear to contribute more to the career decision than extrinsic factors. Specifically, promotion probability and satisfaction with current job have the most influence. Extrinsic factors are still significant but to a lesser degree. Personal factors, especially length of service and sex, are also important. The impact of individual factors, however, is generally quite small; so an effective retention program must include a combination of factors. Finally, the Army as a whole, Marine Corps as a whole, and Army medical specialists are not homogeneous and so must be considered separately when determining policy changes intended to increase retention.

Master of Science in Management
June 1987

Advisor: [illegible]
Department of Administrative Sciences

A COMPARISON OF THE EFFECTIVENESS OF TRADITIONAL NAVY ENLISTED DETAILING WITH THAT OF PERMANENT ASSIGNMENTS

Ann F. Stencil
Lieutenant, United States Navy
B.S., United States Naval Academy, 1980

This study examines the idea of reorganizing traditional Navy enlisted detailing, by commiting personnel to one homeport and to a permanent assignment on one ship for the extent of their careers. Normal shore rotations would still occur, but the same homeporting would generally be observed for assignments. The results of this study suggest methods by which existing enlisted detailing methods may be modified so that the Navy realizes overall cost savings in areas such as PCS moves, retention, training and administration.

Master of Science in Management
December 1986

Advisor: D.R. Henderson
Department of
Administrative Sciences

A STUDY OF THE IMPACT OF THE LACK OF A COST ACCOUNTING STANDARDS BOARD

James F. Sumner, III
Lieutenant, United States Navy
B.S., University of Wisconsin, 1978

This thesis has two purposes. First, it attempts to determine whether the absence of the Cost Accounting Standards Board (CASB) has given rise to any areas of contention between contractors and defense agencies and what those areas might be. Second it evaluates several issues by reference to data reflecting the opinions and experiences of industry representatives and Government contract administrators. Data were gathered by the use of two questionnaires.

Results show that there have been some conflicts that may be attributable to the disappearance of the CASB, although the financial effects of these matters on contract prices do not appear to be substantial. Recommendations are presented to alleviate the conflicts identified.

Master of Science in Management
June 1987

Advisor: J.M. Fremgen
Department of
Administrative Sciences

BALANCED FORCE STRUCTURE

Alton Kasper Terkhorn
Lieutenant, United States Navy
B.S., Indiana University, 1978

The Fleet Expansion Program is designed to rebuild the Navy and to regain maritime superiority. It has two main objectives. The first and most important objective is to build a balanced force structure consisting of 529 specially selected ships. The second objective is politically oriented and calls for a 600 ship count by the end of the decade.

Within five years after the Program was promulgated, the Navy's emphasis appeared to shift from building a well balanced fleet to sustaining a 600-Ship Navy. This thesis traces the history of the shipbuilding programs to determine the current status of the Fleet Expansion Program. It concludes that the original objectives are still being pursued, however, there is an indication that the emphasis will shift in the future.

Master of Science in
Management
December 1983

Advisor: J. McCaffery
Department of
Administrative Sciences

A COMPARISON OF THE BASKET METHOD AND DOLLAR UNIT SAMPLING FOR CONTRACT CHANGE ORDER NEGOTIATIONS

James P. Tortorelli
Lieutenant, United States Navy
B.A., University of Illinois, 1979

The Basket Method and Dollar Unit Sampling techniques are examined to determine which of them draws a sample which allows a more accurate estimate of a population to be made. The several populations used in the simulation have errors planted to represent both random "honest" mistakes and weighted "dishonest" mistakes. The author concludes that the Basket Method has a more desirable accuracy pattern than the Dollar Unit Sampling Technique.

Master of Science in Management
December 1986

Advisor: S. Liao
Department of Administrative Sciences

STRATEGIC SEALIFT: GOAL AND REALITY

Margaret Ann K. Ulrich
Lieutenant Commander, United States Navy
A.B., Immaculata College, 1970

Strategic mobility is divided into three basic elements: airlift, sealift, and the prepositioning of supplies and equipment. The Military Sealift Command (MSC) is responsible for sealift and plays a major role in prepositioning ships and equipment. Through its programs, MSC provides flexibility and increased readiness to strategic mobility. This thesis discusses many interrelated sealift problems: labor and market vagaries, changing ship types and containerization, the changing nature of ports, deregulation and A-76 legislation, the decreasing U.S. merchant fleet, and the struggling shipbuilding industry. MSC's new tactics for strategic sealift, prepositioned ships and fast sealift support, better approach the intent of the national strategy to have surge capability and sustainability in fighting a war.

Master of Science in Management
December 1986

Advisor: D.C. Boger
Department of Administrative Sciences

A COMPARATIVE ANALYSIS BETWEEN THE PORTUGUESE AIR FORCE AND THE UNITED STATES AIR FORCE BUDGETING PROCESSES

Flarimundo F. Vale de Gato
Major, Portuguese Air Force
Portuguese Military Academy, 1970
Licentiate, University of Lisbon, 1979

The purpose of this thesis is to find meaningful ways to improve the budgeting processes followed by the Portuguese Air Force and the United States Air Force. Although applied differently in several aspects, PPBS makes up the theoretical framework of both Air Force's budgeting systems, making them comparable to a great extent.

The thesis describes, analyzes, and evaluates the major phases, steps and procedures of both Air Forces' budgeting processes, especially within their organizational structure and with emphasis at field level. From a systematic comparison between the two budgeting processes, the most relevant similarities and differences are outlined and important problem areas are identified. Concrete solutions are recommended for the improvement of such areas, relative to both Air Forces.

Master of Science in
Management
December 1986

Advisors: J.R. Duke
R.A. McGonigal
Department of
Administrative Sciences

AN INTERACTIVE COMPUTER FORECASTING MODEL TO DETERMINE THE EFFECTS OF POLICY CHANGES ON THE VALUATION OF THE MILITARY RETIREMENT SYSTEM

Peter G. Valko
Lieutenant Commander, United States Navy
B.S., Aero-Space Institute, 1971

In the past thirty years, as military retirement costs have climbed from 1% of the defense budget to their current 8% level, the military retirement system (and, in particular, the non-disability retirement component) has come under increasing criticism and scrutiny by the Congress, the public, and the news media. Recommendations from previous studies of the military retirement system have proposed various modifications to the system to alleviate alleged inequities and inefficiencies, and to reduce costs. A BASIC-language computer model (ENTRYAGE) was developed in 1983 as part of a thesis to perform a sensitivity analysis on entry-age normal retirement costs methods to evaluate some of these recommendations. At the request of the Office of the Assistant Secretary of Defense, an effort was initiated to revise the program to produce results that replicate those of the Military Retirement System Projection and Actuarial Valuation Program (GORGO) developed by the DoD Actuary. This study has determined that the level of sophistication of the GORGO program far exceeds that of the ENTRYAGE model, and the major re-programming effort required was beyond the scope of this study. However, the ENTRYAGE model was not user-friendly, required single-line data input, and would "crash" when the operator made an erroneous data entry. Therefore, the ENTRYAGE model was extensively revised to incorporate menus, prevent program crashes, present results in page format, and, in general, make it more user-freindly as an analytical tool.

Master of Science in Management
December 1986

Advisor: K.J. Euske
Department of Administrative Sciences

ARES: A SYSTEM FOR REAL-TIME OPERATIONAL AND TACTICAL DECISION SUPPORT

Antonios L. Vassiliou
Major, Hellenic Army
B.S., Military Academy of Greece, 1974

We introduce a real-time decision support system which uses optimization methods, simulation, and judgement of the decision maker for operational assignment of military units to tasks and for tactical allocation of unit resources to task requirements.

The system, named ARES for the Greek god of war, accomodates a high degree of detail in the logistics of unit movements and operations, yet separates the assignment and allocation activities in a fashion which naturally accommodates human intervention and judgement.

ARES is designed to assist the decision maker, not to replace him. ARES is demonstrated with a hypothetical scenario constructed for Engineering Battalion of the Hellenic Army which are to be assigned 20 tasks employing 25 resource types in repairing major damage to public works following a large earthquake*.

ARES is designed for use in real time, and quick data preparation is aided by the provision of standard task icons from published sources.

*This hypothetical data was prepared prior to the earthquake in Kalamata near Athens on 13 September, 1986, and exhibits uncanny, by coincidental resemblance to that real situation.

Master of Science in Management
December 1986

Advisor: G.G. Brown
Department of Operations Research

AN ASSESSMENT OF DEPARTMENT OF DEFENSE QUALIFIED PRODUCTS LISTS

Robert Dale Vint
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1974

This thesis surveys the Qualified Products Lists (QPL) program. It provides an introduction to standardization and specification by giving their definitions and explaining their role in the government acquisition process. The Defense Standardization and Specification Program is briefly outlined to provide a framework of understanding of the context in which the QPL process works. The intended application of the prequalification process is covered along with a history of the QPL program. Summaries of two prior studies on the effectiveness of the QPL program are discussed. Included also is testimony from the Hearings before the Senate Committee on small business in 1984 concerning competition for parts procurement.

Interview comments obtained from vendors and contractors dealing in the electronic business sector are compiled with their suggestions pertaining to the QPL process. The last chapter contains analyses of the previous studies contrasted to research conducted, recommendations for program improvement and conclusions.

Master of Science in Management
March 1987

Advisor: P. Carrick
Department of
Administrative Sciences

THE ECONOMIC BENEFITS OF THE FOREIGN MILITARY SALES PROGRAM TO THE U.S. DEPARTMENT OF DEFENSE

Paul William Viscovich, Jr.
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1975

This study demonstrates that the Foreign Military Sales program generates direct and measurable economic benefits for the U.S. Department of Defense. These benefits occur primarily in the form of cost savings and recoupments on dual-production acquisition contracts. The study focuses first on aggregate FMS savings reported in recent Army and Navy studies, and evaluates their average impact on procurement budgets during the years in question. Following this, nine dual-production Navy contract cases are examined to illustrate how FMS cost savings can be measured at the contract level. Two of the contract cases are examined for the effect of recouped nonrecurring costs, and all nine contract cases are subjected to a tailored learning curve analysis to evaluate the effect of FMS orders on the unit price paid by the U.S. Navy for those systems.

The study includes a detailed presentation on FMS program policies and procedures, and the regulatory environment in which the program exists.

The issue of costs associated with FMS is discussed, but the impact of these costs is not examined.

Master of Science in Management
June 1987

Advisor: L. Zambo
Department of Administrative Sciences

SUGGESTIONS FOR ENHANCING THE PROCUREMENT CAREER MANAGEMENT PROGRAM IN THE UNITED STATES COAST GUARD

Lawrence C. Vose
Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1977

This thesis examines the Procurement Career Management System in the United States Coast Guard. The intent of this study is to focus on the Contracting Series Personnel (GS-1102 and Military equivalent) training and education requirements. In the course of this study, the contracting "body of knowledge", the resources available to provide this required knowledge and skills, and the many ways that various Federal Agencies utilize these resources are addressed. An examination of the elements that constitute a Procurement Career Management System is provided along with an analysis of how these elements are implemented in the Coast Guard and other Federal Agencies. The study recommends the establishment of a Coast Guard Procurement Career Manager/Training Coordinator and the formation of a Procurement Career Management Board. Additional specific recommendations include the development of an acquisition personnel MIS, the use of Individual Development Plans and an entry level core curriculum. Specific conclusions and recommendations about the current state of the Coast Guard Procurement Training effort are also made.

Master of Science in Management
June 1987

Advisor: R.W. Smith
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Administrative Sciences

ACQUISITION STREAMLINING

Maryelizabeth Walsh
Captain, United States Army
B.A., Auburn University, 1976

Acquisition streamlining involves taking action to preclude or eliminate non-cost-effective requirements in design, development and production. It is based on the concept that by applying pertinent contract requirements and allowing early industry involvement in recommending the most cost-effective solutions, the Department of Defense can reduce the cost and/or time of system acquisition and life cycle cost without degrading system effectiveness. This thesis focuses on the Streamlining Initiative, its background and composition, where and how it has been utilized, and when and how it can be applied to achieve the least cost acquisition. The study looks to two of the military services, the Army and the Navy, and how they each have approached streamlining. Specifically, the thesis looks at the Army Streamlined Acquisition Program (ASAP) and the Navy T-45 Training System as current management initiatives and procedures to reduce the cost and improve the quality of equipment and systems procured by the Department of Defense.

Master of Science in
Management
December 1986

Advisor: P.M. Carrick
Department of
Administrative Sciences

THE IMPACT OF THE COMPETITION IN CONTRACTING ACT OF 1984 ON THE CONTRACT AWARD PROTEST PROCESS

Michael J. Walsh
B.S.E.E., University of Virginia, 1971

The observed effects of the Competition in Contracting Act of 1984 have been: a marginally increased number of protests; dramatically improved decision times due to shortened agency response deadlines and GAO dismissal of spurious protests; and stays of award and termination of contract performance. There is no evidence that the increase in protests is related to increased complaints about restrictive sole source contracting. The legislative impact has been minimal at the field activity level where there is a widespread perception that protests are increasing for unjustified reasons. While personal experience may not support this complaint, it has a legal merit since the burden of proof has shifted entirely to the Government. Unintended results of the statute may include: 1) improved solicitation review to avoid situations vulnerable to protest, and 2) added scrutiny, with concomitant delay, in the source selection process to assess the defensibility of the tentative source selection decision.

Master of Science in Management
June 1987

Advisor: D.V. Lamm
Department of Administrative Sciences

INTEGRATED LOGISTICS SUPPORT
[illegible]

undertaking.
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acq[illegible]
an acquisition [illegible]
to achieve [illegible]
associated with [illegible]
conception [illegible]
cost and fly-before-[illegible]
tasking. [illegible]
life-cycle [illegible]
programs.

[illegible]
[illegible]

HAS THE NAVY'S OPERATIONAL TEST AND EVALUATION FORCE BECOME ANTIQUATED?

Lennart Wendel Jr.
Lieutenant Commander, United States Navy
B.S., Michigan Technological University, 1975

The main thrust of this paper centers around the issue of whether the Navy should restructure the Operational Test and Evaluation Force (OPTEVOR) along the lines of the Army's and Air Force's independent test agencies. The paper begins with an overview of the weapon system acquisition process. It then proceeds to demonstrate how test and evaluation (T&E) fits into the acquisition process. Finally, a description and evaluation of each of the service's independent test agancies is presented.

The researcher suggests that the perceived problems are not caused by OPTEVFOR's present structural arrangement, but are the result of OPTEVFOR's philosophy. The final conclusion is that OPTEVFOR should not change its existing structure, instead it needs to expand upon its current emphasis on increased communication.

Master of Science in Management
December 1986

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KNOWLEDGE ACQUISITION FOR AN EXPERT SYSTEM AT RETAIL STOCK POINTS

Gary W. Westfall
Lieutenant Commander, United States Navy
B.A., Wittenberg University, 1974

The job of the retail inventory manager at NAVSUP stock points is laborious and complex. The expertise required to perform the job normally takes years to obtain. Improvements in productivity and training are possible through the application of so-called "expert systems" programming. This thesis presents the decision-making methodology of experts as they perform two common time consuming tasks of a Navy stock point inventory manager--Delinquent Dues and Variable Ranking List processing. Delinquent Dues Listings alert the inventory manager to potential problem requisitions which are well past their estimated delivery date. Variable Ranking Lists highlight a number of situations requiring inventory manager review, the most common being National Stock Numbers (NSNs) with an excessive amount on order. A narrative, flowcharts, and a summary of inventory manager decision rules for these two functions are provided. Building on the recording of these knowledge factors, the potential for an expert system prototype is suggested.

Master of Science in Management
December 1988

Advisors: A.W. McMasters
I.R. Sivasankaran
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Administrative Sciences

AN ANALYSIS OF FACTORS AFFECTING THE RETENTION OF MEDICAL OFFICERS IN THE UNITED STATES NAVY

William P. Whalen
Lieutenant Commander, United States Navy
B.B.A., University of Michigan, 1974
M.H.H.A., Xavier University, 1976

This thesis examines factors influencing a Navy physician's decision to stay or leave the service in FY85. Data contained in the Navy Medical Officer File, END FY85 were analyzed using the LOGIT nonlinear estimation technique. The sample was restricted to officers who were not obligated to remain in the service.

Several logistic regression models indicate that a physician's specialty and source of entry were significant in this career decision. Specifically, executive medicine officers, surgeons, pediatricians, OTHER physician specialists, and internists were found less likely to leave than hospital-based or general medical officers. Similarly, physicians entering the Navy via the Armed Forces Health Professions Scholarship Program were more likely to leave than volunteers or medical officers who entered the Navy through earlier commissioning programs. In addition, physicians were less likely to leave the service if they received an increase in military pay, were augmented into the regular Navy, had received aviation medicine training, were a foreign medical graduate, were older, were more senior in grade, were aliens or naturalized citizens, had longer length-of-service, or were not eligible to retire.

Master of Science in Management
December 1986

Advisor: S.L Mehay
Department of
Administrative Sciences

ISSUES IN NAVY MANAGEMENT OF MAJOR WEAPON SYSTEMS WARRANTIES

Kevin L. White
Lieutenant, United States Navy
B.A., Grove City College, 1976

The purpose of this research is to investigate problems in management of Navy warranty contract clauses, as the result of recent legislation mandating cost effective warranty coverage for major weapon systems. This investigation involves the following: 1) Identification of warranty benefits and recent warranty legislation, 2) Review and comparison of Services and Navy Systems Command implementation procedures, and 3) Analysis of five warranty contract clauses. The methodology for this research involves current literature and interviews with government and industry officials involved with warranty issues.

As a result of this analysis, the conclusions are as follows: 1) Actual costs and estimating techniques need definition and refinement, 2) Navy implementation procedures must be integrated and coordinated, and 3) Early on planning in weapon system development is required to avoid potential problems. This study recommends that a single warranty management information system be established. Management procedures and reporting formats should be standardized as much as possible.

Master of Science in Management
December 1986

Advisor: D.V. Lamm
Department of
Administrative Sciences

CNET PROGRAM AUTOMATED TRACKING SYSTEM (CPATS): A COMPREHENSTVE STUDY

Mary Edith Williams
Lieutenant, United States Navy
B.S., Appalachian State University, 1978

The purpose of this thesis is to conduct a comprehensive analysis of the Chief of Naval Education and Training Program Automated Tracking System (CPATS) and its impact at the operational level. The methodology used involves reviews of the history, implementation and applications of the system and its benefits and costs in terms of information and funding. The results indicate that CPATS has the potential for improving the quality and timeliness of important management information. Much of this potential has already been realized at CNET headquarters and in liaison with training sponsors. The full potential has not yet been realized at the field level, and recommendations toward that end are made herein. The study also indicates that the initial costs of implementing CPATS will be recovered with less than a full year's operating cost savings.

Master of Science in
Management
June 1987

Advisors: J.M. Brennan
Department of
Administrative Sciences

INFLUENCES ON DEFENSE PROCUREMENT EXPENDITURES IN CALIFORNIA DURING THE REAGAN PRESIDENCY

Nerissa Williams
Lieutenant, United States Navy
B.A., University of California, San Diego, 1979

The purpose of this thesis is to examine the trends in defense procurement during the Reagan presidency, with the emphasis on California. In addition, those factors which make up the general area of study termed the politics of defense procurement will be examined to determine what role they played in the award of defense dollars in California.

Master of Science in Management
June 1987

Advisor: J.L. McCaffery
Department of
Administrative Sciences

AN ANALYSIS OF SELECTED SURFACE SHIP OPTAR OBLIGATION PATTERNS AND THEIR DEPENDENCY ON OPERATING SCHEDULES AND OTHER FACTORS

Thomas [illegible] Williams, IV
Lieutenant Commander, United States Navy
B.S.B.A., The Citadel, 1975
M.B.A., Bryant College of Business Administration, 1982

U.S. Navy ships receive their annual operating funds from their type commander in the form of an OPTAR (Operating Target). The ship's OPTAR can be viewed as the [illegible] essary to execute its annual budget. At present, [illegible]'s budget office essentially divides each ship's annual OPTAR [illegible]ation into fourths and allocates to the [illegible] equal [illegible] for each quarter. [illegible]apt is [illegible] to allocate the OPTAR on the basis of [illegible] likely to be most needed.

[illegible] corresponding pat[illegible] of Navy ships [illegible] attempt to [illegible] conclusions as to the [illegible] affecting [illegible] factors on the OPTAR obligation [illegible]. [illegible]ic and non parametric statistical [illegible] to study [illegible] relationships between [illegible] or the [illegible] and [illegible] the [illegible] explain [illegible] Possible explanations [illegible].

Master's thesis
Management
June 1985

REPAIRABLE ITEM INVENTORY MANAGEMENT FOR THE KOREAN AIR FORCE

Young Hong Yoo
Major, Republic of Korea Air Force
B.S., Korean Air Force Academy, Seoul, 1976
B.A., Yonsei University, Seoul, 1982

Kim Il Suk
Captain, Republic of Korea Air Force
B.S., Korean Air Force Academy, Seoul, 1982

The Korean Air Force has determined that repairables management is one of the areas to which attention could be expected to lead to substantial improvement in the efficient management of defense resources and in maintaining adequate level of force effectiveness. This thesis reviews various inventory models for the management of repairable items. It discusses the characteristics of each model, and identifies and explains the differences in each model with respect to assumptions, objectives, constraints, and optimization methods. Each model was compared to the existing system for managing repairables for the Korean Air Force to determine the most appropriate models.

Master of Science in Management
December 1986

Advisor: F.R. Richards
Department of Administrative Sciences

PROFILE OF THE SUCCESSFUL RECRUITER

Joyce Elaine Zellweger
Lieutenant Commander, United States Navy
B.A., Wells College, 1977

This thesis develops and analyzes a model to identify personal attributes of a successful recruiter. Expert Systems software is used to elicit from five U. S. Army recruiting experts characteristics associated with recruiter success. Experts include current and former Active Guard and Reserve (AGR) recruiters from various levels of the U. S. Army Recruiting Command. An interactive computer program based on Quasi-Artificial Intelligence (QAI) captured the experts' knowledge, experience, judgments, and intuition to create expert systems that can be used to make recruiter selection decisions. The study finds that personal characteristics such as Integrity and Motivation, and skills such as Listening and Informing are substantially more important than the types of attributes generally used to predict recruiter success.

Master of Science in
Management
December 1986

Advisor: G.W. Thomas
Department of
Administrative Sciences

MASTER OF SCIENCE

IN

MECHANICAL ENGINEERING

479/480

CORROSION PERFORMANCE OF HIGH DAMPING ALLOYS IN 3.5% SODIUM CHLORIDE SOLUTION

Saleem Akhtar
Lieutenant Commander, Pakistani Navy
B.S., University of Karachi, 1978

The electrochemical nature of corrosion provides a means of determining an almost instantaneous corrosion rate. Corrosion rate and the nature of corrosive attack were investigated for several high damping alloys based on the Cu-Mn, Fe-Cr-Al, Fe-Cr-Mo, Ti-Ni and Cu-Zn-Al systems in 3.5 Nacl solution. The results of potentiodynamic polarization and polarization resistance measurements were compared with the results of actual sea exposures. A zero resistance ammeter technique was used to measure the galvanic currents between galvanically coupled metals. The magnitude of the galvanic current provide an indication of the severity of galvanic corrosion which occurs in 3.5% Nacl environment. Scanning electron microscope (SEM) was used to determine the nature of corrosive attack and the extent of film formation on the surface of each corroding alloy.

Master of Science in
Mechanical Engineering
September 1987

Advisor: A.J. Perkins
Department of
Mechanical Engineering

COMPOSITE RELIABILITY ENHANCEMENT VIA PRELOADING

David Keith Bell
Lieutenant, United States Navy
B.S., University of Kansas, 1979

Many Navy applications of composites, including ships' superstructures, submarine air flasks, and missile rocket motor casings, require high strength and reliable materials. Composite strength reliability is dictated by individual fiber breaks at low loads (lower tail) and the accumulation of the fiber failure sites.

This study examines the effects of applying a preload to a graphite-epoxy composite tow prior to complete polymerization of the matrix. The objective is to break the (inevitable) weak fibers and minimize the effects of the associated stress concentrations, subsequently limiting the clustering of fiber failures. By eliminating the lower tail, the shape of the Weibull distribution is reduced, thereby increasing composite reliability.

Advisor: E.M. Wu
Department of
Aeronautics and
Astronautics

FILMWISE CONDENSATION OF STEAM ON LOW INTEGRAL-FINNED TUBES WITH DRAINAGE STRIPS

Oguz Cakan
Lieutenant JG, Turkish Navy
B.S., Turkish Naval Academy, 1980

Heat-transfer measurements were made for filmwise condensation of steam under low pressure and at near-atmospheric pressure on horizontal finned tubes attached with bronze porous and solid drainage strips. The effects of drainage strip type, height and thickness were investigated. A total of sixteen drainage strips were manufactured and tested on two finned tubes each with a fin thickness and height of 1.0 mm and with a fin spacing of 0.5 mm and 1.0 mm.

The heat-transfer performance generally increased with increasing porous strip height up to a possible optimum value between 11 and 15 mm. Of the pore diameters tested (0.05-0.013 mm, 0.025-0.05 mm and 0.0025-0.013 mm), the strip with an average pore diameter of 0.025-0.05 mm gave the best heat-transfer performance. This optimum strip type showed an optimum strip thickness of 5.2 mm. The solid strips showed an optimum strip thickness of 1.5 mm. The optimum porous strip gave a 9% and 17% greater steam-side enhancement than the optimum solid strip for low and atmospheric pressures, respectively. For the finned tube with a fin spacing of 0.5 mm, a maximum enhancement of about 1.6 was found when it was attached with 5.2-mm-thick and 8-mm-high porous strip having a pore diameter of 0.025-0.05 mm.

Master of Science in
Mechanical Engineering
December 1986

Advisors: P.J. Marto
A.S. Wanniarachchi
Department of
Mechanical Engineering

A COMPARISON OF HIGH DAMPING SHAPE MEMORY ALLOYS WITH CU-MN-BASED AND FE-CR-BASED ALLOYS

Joseph T. Cronauer
Lieutenant, United States Navy
B.S., United States Naval Academy, 1981

The strain dependence and temperature dependence of damping in the thermoelastic martensitic (shape memory) alloys titanium-nickel and copper-zinc-aluminum was compared to pre-determined optimum damping behavior in the "quiet" alloys copper-manganese-aluminum and iron-chromium-molybdenum. Damping measurements were taken using a modified resonant dwell technique, in which cantilever beams were evaluated for damping at their first three resonant modes at temperatures between ambient and 110°C. Differential scanning calorimetry was used to correlate microstructural changes with damping capacity. All alloys that were conditioned for high damping showed a trend of low damping at low strains, a strain threshold, and increased damping with strains above the threshold. Damping was directly related to the progress of martensitic transformation in the Ti-Ni alloy. The Cu-Zn-Al alloy was examined in a condition which did not develop high damping. Damping in the Fe-Cr-Mo alloy was insensitive to temperature change. The damping of the Fe-Cr-Mo alloy was sensitive to temperature and time at temperature.

Master of Science in
Mechanical Engineering
June 1987

Advisor: A.J. Perkins
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CHARACTERIZATION OF THE CORROSION BEHAVIOR OF HIGH DAMPING ALLOYS IN SEAWATER

William David Escue
Lieutenant Commander, United States Navy
B.S., Georgia Institute of Technology, 1977

Corrosion rates and the nature of corrosive attack were investigated for several high damping alloys, including alloys based on the Cu-Mn, Fe-Cr-Al, Fe-Cr-Mo, Ti-Ni, and Cu-Zn-Al systems. Rates and modes of attack were determined for exposure of samples in synthetic and natural seawater. The results of potentiodynamic polarization and polarization resistance measurements made in the laboratory were compared with the results of actual sea exposures at the LaQue Center for Corrosion Technology, Wrightsville Beach, North Carolina. These results were used to make tentative recommendations for in-service application of high damping alloys used singly or in combination with common aluminum alloys and steels in a marine environment. Overlays of independently determined potentiodynamic polarization plots for selected pairs of alloys were used to project theoretical corrosion rates in galvanic couples. A Galvanic Series for high damping and conventional alloys in quiescent synthetic seawater was developed. Results from laboratory and actual sea exposures showed that the Fe-Cr-Al and Fe-Cr-Mo high damping alloys experienced severe localized corrosion and pitting, the Ti-Ni alloy demonstrated a very slight corrosion rate, and the Cu-Mn-Al-based alloys were characterized by low to moderate corrosion rates.

Master of Science in
Mechanical Engineering
June 1987

Advisor: J. Perkins
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STUDY OF VORTICES EMBEDDED IN BOUNDARY LAYERS WITH FILM COOLING

David L. Evans
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1974

Measurements are presented of boundary layers with embedded vortices and with film cooling for freestream velocities of 15, and 11 m/s. Measurements of a boundary layer with embedded vortex and no film cooling, and of a boundary layer with film cooling but no vortex are presented for freestream velocity of 15 m/s. Plots of total velocity, V, streamwise velocity, V_x, secondary flow vectors, total pressure, P_o, and streamwise vorticity are presented for many of these test conditions.

The results show that the embedded vortices completely dominate the flow field in boundary layers with film cooling. This is indicated from the plots of V, V_x, and P_o which show the effects of film cooling to be completely decimated in the vicinity of the vortex.

In order to conduct this study, a five-hole pressure probe was calibrated for pitch and yaw. The probe was then used to measure five pressures associated with the flow. From these pressures, total velocity and the x, y, and z components of velocity were determined.

A boundary layer profile was conducted to verify the calibration of the pressure probe, measurement procedures, and velocity computations. The results show expected boundary layer behavior with a small V_y and V_z component.

Master of Science in
Mechanical Engineering
March 1987

Advisor: P.M. Ligrani
Department of
Mechanical Engineering

MICROCOMPUTER CONTROL OF A RELIABLE [illegible]

Mark P. Finch
Lieutenant, United States [illegible]
U.S. Pennsylvania State [illegible]

The Navy uses electrohydraulic [illegible] in the control of vehicles, weapons, and platforms. [illegible] of how these systems work will lead to [illegible] performance, safety, and reliability. [illegible] combining or voting inputs and [illegible] assure that these systems [illegible] [illegible] has been made to develop a [illegible] system to be used to study the effects of [illegible] cross-strapped electrohydraulic control systems. [illegible]

DESCRIBING FUNCTION ANALYSIS OF AN ICEBREAKER PROPULSION CONTROL SYSTEM

Richard J. Formisano
Lieutenant Commander, United States Coast Guard
B.S., United States Coast Guard Academy, 1974

The propulsion control system of a U.S. Coast Guard Polar Class Icebreaker having reversible pitch propellers was analyzed using a describing function technique. The present system, which uses open loop pitch control, was redesigned to evaluate the addition of closed loop pitch control. A previously developed computer simulation of the Icebreaker was installed on the NPS Main Frame and used in an evaluation of the controlled system.

Master of Science in
Mechanical Engineering
September 1987

Advisor: D.L. Smith
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MODELING AND EXPERIMENTAL VALIDATION OF A SINGLE-LINK FLEXIBLE MANIPULATOR

Kevin P. Gannon
Lieutenant, United States Navy
B.S., Tulane University, 1979

Structural flexibility effects on robot mechanisms is a very important consideration in the move toward lighter, faster, and more accurate robot systems. This thesis presents the computer simulation and experimental validation of a dynamic model of an experimental single-link flexible manipulator, using the Equivalent Rigid Link System with an enhanced natural-mode discretization. The experimental arm is driven by a hydraulic actuator and moves in a vertical plane. Hydraulic actuator dynamics and the effects of gravity are included in the equations of motion. Computer simulation for the experimental arm is performed by the Dynamic Simulation Language (DSL). The validation of the dynamic model includes the comparison between the actual tip position and the predicted arm tip position.

Master of Science in
Mechanical Engineering
December 1986

Advisor: L.-W. Chang
Department of
Mechanical Engineering

MICROCOMPUTER CONTROL OF A HYDRAULICALLY ACTUATED PISTON

Ian Grunther
Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1980

This thesis is a study of a computer comtrolled hydraulically actuated piston. The system uses a Hewlett Packard HP85B microcomputer as a controller. Included in this research is a detailed computer simulation of the system with laboratory validation. This effort supports the overall goal of complete study of microcomputer control of electrohydraulic power systems by the establishment and simulation modeling of a baseline system. Special emphasis is placed on modeling the effects of the computer on overall system performance. It was found that sample period is one of the most important factors influencing the ability to control a hydraulic power element using a microcomputer. Proper selection of the sampling period alone is not always sufficient to insure the ability to control the plant. Other factors such as non-linearities in the plant may influence the ability to use a digital controller.

Master of Science in
Mechanical Engineering
June 1987

Advisor: R.H. Nunn
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THE EFFECT OF TEMPERATURE ON THE TENSILE PROPERTIES OF HSLA-100 STEEL

James Evan Hamilton
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B.S., University of Colorado, 1979

High Strength Low Alloy (HSLA) steels have been shown to possess high strength and toughness. Additionally, these steels can be welded without the normal preheating required by comparable HY-series steels. HSLA-100, 100 Ksi yield strength, contains increased amounts of copper, manganese and nickel over the currently certified HSLA - 80. However, prior to use in Naval ship construction knowledge of the steels toughness behavior is necessary. Existing fracture mechanics models are not applicable to HSLA - 100 steel because HSLA-100 has only 0.04% carbon and these models use carbides as the nucleation site for cleavage fracture. This research is part of a program to investigate and model the micromechanics of deformation and fracture of HSLA-100.

Tensile testing of hourglass shaped specimens was conducted at quasi-static strain rates. Individual tensile test temperatures ranged from 24 C to -196 C. True stress, corrected for necking, and true plastic strain were monitored throughout the tests. This allowed a comparison to be made between the plastic strain behavior of HSLA-100 steel and a traditional constitutive equation used to describe the stress-strain behavior of metals.

Master of Science in
Mechanical Engineering
June 1987

Advisor: K. Challenger
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STRESS ANALYSIS OF THE LHA-1 CLASS SUPERHEATER HEADER BY FINITE ELEMENT METHOD

Jon W. Kaufmann
Lieutenant, United States Navy
B.S., State University of New York Maritime College, 1981

Numerous cracks and leaks in the superheater header tube attachment welds in the LHA-1 class of amphibious assault ships have prompted an investigation by the Naval Sea Systems Command (NAVSEA). This thesis describes the stress analysis of the superheater header tube attachment region using a three dimensional axisymmetric Finite Element model. The SAP 80 structural analysis program was utilized to conduct the analysis. Both pre and post processors were employed to obtain graphical representations of the model as well as the results of the stress analysis. This thesis focuses primarily on thermally induced stresses produced in the header. Some results obtained for a nominal 100 Degree F temperature drop across the thickness of the superheater header wall yielded a maximum hoop stress of 19.01 (Ksi) and a maximum in plane stress of 1.58 (Ksi).

Master of Science in
Mechanical Engineering
June 1987

Advisors: G. Cantin
E.L. Wilson
Department of
Mechanical Engineering

COMPUTER SIMULATION OF A ROTATIONAL SINGLE-ELEMENT FLEXIBLE SPACECRAFT BOOM

Robert S. Laufenberg
Lieutenant, United States Navy
B.S., Iowa State University of Science and Technology, 1978

The requirement to develop a space based remote ocean sensing platform exists within the Department of the Navy. This project models a satellite subsystem with structural flexibility utilizing the Equivalent Rigid Link System (ERLS). Dynamic analysis with computer simulation is presented for a simple flexible boom rotating in three dimensions with and without a point mass at the boom tip.

Master of Science in
Mechanical Engineering
March 1987

Advisor: L.-W. Chang
Department of
Mechanical Engineering

ROBOT FIREFIGHTER DRILLING LOADS

Daniel Arthur Lawrence
Lieutenant, United States Navy
B.S., Auburn University, 1979

Aircraft carrier deck fires are tragic and costly events whether in peace or in war. Ordnance detonation presents an additional hazard to close approach by firefighting personnel. In order to meet this hazard firefighting robots are being investigated. One concept employs a newly developed device for penetrating an aircraft fuselage and injecting a fire extinguishing agent (Halon). A study of the associated manipulator arm was conducted to measure loads during operation of the penetrator. Experiments were designed to identify worst-case loads and a test apparatus was utilized to mimic real drilling. Test data were collected on the effects of drilling through sheet aluminum alloy. Forces and moments were measured by strain gages during actual drilling [illegible]

Master of Science in
Mechanical Engineering
June 1987

INDIRECT MEASUREMENT OF LOCAL CONDENSING HEAT-TRANSFER COEFFICIENT AROUND HORIZONTAL FINNED TUBES

Donald J. Lester, Jr.
Lieutenant, United States Navy
B.S., University of Oklahoma, 1980

Heat-transfer measurements were made for condensation of steam on three finned tubes with rectangular-section fins. These tubes have a fin thickness and fin height of 1.0 mm and fin spacings of 0.5, 1.0 and 1.5 mm. Data were taken by insulating both the inner and outer surfaces over up to 5 or 6 angular portions, including 0, 30, 60, 90, 150, 210 degrees, of the top portion of each tube. The measured average heat-transfer coefficients for the unblanked portion of the tube were processed to yield both the local and average heat-transfer performance as a function of the angle measured from the top of the tube using a third-order polynomial.

The results show that the average enhancement for the fin spacings of 0.5, 1.0 and 1.5 mm were 2.5, 3.0 and 3.1 respectively, for the atmospheric-pressure condition. And they were 1.8, 2.3 and 2.4 for the low-pressure condition. The local enhancements at the top of tubes were 5.2 and 3.8 for s = 0.5 mm, 6.6 and 4.8 for s = 1.0 mm, and 6.6 and 5.5 for s = 1.5 mm at atmospheric and low pressures, respectively.

Master of Science in
Mechanical Engineering
September 1987

Advisor: P.J. Marto
Department of
Mechanical Engineering

MICROSTRUCTUREAL CHARACTERIZATION OF HLSA-100 GMA-WELDMENTS

Kenneth D. Mickelberry
Lieutenant, United States Navy
B.S., University of Houston, 1978

A high strength low alloy steel, HSLA-100, is under development by the U.S. Navy. Instead of developing a new weld filler metal for this alloy it is desirable to use the already certified filler metals that are used for welding HY-100 steel. The research presented in this thesis evaluated the effect of cooling rate on the HY-100 welding consumable when used to weld HSLA-100 plate. The 800°C to 500°C cooling rate after gas metal arc welding was varied from 22°C/sec to 42°C/sec by using different plate thickness, different preheat and interpass temperatures as well as different heat inputs. Mechanical property data is reported elsewhere but summarized in this thesis.

All welds met required strength and toughness. However, for all but the fastest cooling rate, the tensile test transverse to the weld failed in the weld metal rather than in the base metal as would be expected with HY-100 steel. This indicates that the weld metal strength is less than the base metal, an undesirable situation.

The weld metal microstructure was characterized by optical metallography, scanning and transmission electron microscopy. These microstructures were correlated with microhardness and the mechanical properties. All welds have a predominately acicular ferrite microstructure. Occasional regions of side plate ferrite and MAC (martensite, austenite and carbide combinations) were observed but not believed to have any significant effect on the mechanical behavior. Retained austenite was often observed between the ferrite laths when examined by transmission electron microscopy. This austenite is

believed to be very stable and may be responsible for the excellent resistance to brittle fracture exhibited by these welds.

Master of Science in
Mechanical Engineering
September 1987

Advisor: K.D. Challenger
Department of
Mechanical Engineering

VORTEX MOTION IN A STRATIFIED MEDIUM

Brian L. Miller
Lieutenant, United States Navy
B.S., Purdue University, 1980

A comprehensive computer code has been developed through the use of the governing equations of motion and the Boussinesq hypothesis and the rise of a vortex pair in a linearly density-stratified medium has been calculated through the use of the Biot-Savart law and a finite difference scheme. The results have shown that the code is capable of predicting the behavior of the vortices and the propagation of the internal waves resulting from the vortex motion. The reasons for the finite rise of the vortices in a stratified medium is clearly explained in terms of the counter-rotating vortices induced by the stratification.

Master of Science in
Mechanical Engineering
December 1986

Advisor: T. Sarpkaya
Department of
Mechanical Engineering

A COMPARISON OF TRIPPING BEHAVIOR OF WIDE AND NARROW FLANGED "T" AND "Z" STIFFENED PANELS

Robert Bruce Miller
Lieutenant, United States Navy
B.S., Florida Institute of Technology, 1978

An experimental investigation was conducted to study the dynamic instability and tripping characteristics of a specific stiffened rectangular flat plate design due to hydrostatic and impulsive loading. The air backed test panels were constructed of 6061-T6 aluminum with externally machined longitudinally, wide flanged "T" or "Z" stiffeners and were tested under clamped boundary conditions. Test panel loading was provided by a manual hydropump for static testing and by the underwater detonation of an eight pound, cylindrical TNT charge for the dynamic test. The static test panel was instrumented to measure pressure, strain and plate deflection. The dynamic test panel was instrumented to measure transient strains and free-field pressure. The data obtained from these tests were qualitatively analyzed and compared to the results of geometrically similar narrow flanged "T" stiffened panel results currently available in the literature.

Master of Science in
Mechanical Engineering
March 1987

Advisor: Y.S. Shin
Department of
Mechanical Engineering

MARINE GAS TURBINE MODELING FOR OPTIMAL CONTROL

Robert L. Miller
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1974

The United States Navy is making extensive use of marine gas turbine engines in its ships. These engines have a very complex set of multiple, interacting inputs. Modern control theory can be used to exploit these complex interactions to optimize the performance of these engines. To date the control systems employed do not use modern control techniques. Through the formulation of a linear state-space model of the gas turbine plant a Linear Quadratic Regulator (LQR) can be designed. Using the state-space model developed, the feasibility of using an LQR control technique will be examined for a small low power gas turbine engine.

Master
Smith
Department of
Electrical Engineering

NON-SINGULAR MODELING OF RIGID MANIPULATORS

Khayyam Mohammed
Lieutenant, United States Navy
B.A., Queens College, 1977

A problem arises when conventional kinematic equations that minimize computational time are used to model a rigid revolute robot arm. Mathematical singularities result when successive link axes "line up" such that their angles are 0 or 180 degrees. This may result in erratic and uncontrollable motion of the arm until it moves away from the point of singularity. One solution is to spend a minimum amount of time at the singular position or to avoid this position altogether. Another solution is to use other sets of equations, instead of the regular resolved-rate equations, to model the robot arm. This thesis shows how using equations based on Newton's Second Principle of dynamics for a three link, two degree of freedom manipulator, the problem of singularity is avoided. The equations are demonstrated in a simulation program.

Master of Science in
Mechanical Engineering
December 1986

Advisor: D.L. Smith
Department of
Mechanical Engineering

[illegible] METHODS FOR LOW [illegible] TEMPERATURE [illegible] BONDING

Paul A. Muffler
Lieutenant, United States Navy
[illegible] Carolina University, 1978

[illegible] for low temperature diffusion bonding of dissimilar [illegible] Fourteen [illegible] bonding temperature [illegible] [illegible] of stainless [illegible] [illegible] in order to verify the design [illegible] [illegible] procedures. The Scanning Electron [illegible] [illegible] substrate the [illegible] temperature [illegible] [illegible] produced. The results [illegible] [illegible] possible at all three [illegible] [illegible] growth in the silver [illegible] [illegible] entire section was [illegible] at 400°C after 30 [illegible] [illegible] successfully [illegible] [illegible] development

STRUCTURAL CHARACTERISTICS OF DEAN VORTICES IN A CURVED CHANNEL

Randal D. Niver
Lieutenant, United States Navy
B.S., Arizona State University, 1978

Dean vortices in a curved channel were studied using flow visualization and a miniature Kiel probe to record total pressure. The channel is 1.27 cm high by 50.8 cm wide (0.5 in. x 20.0 in.), aspect ratio of 40 to 1, with a radius of curvature of 60.96 cm (24.0 in.) for the concave surface. Mean velocities within the curve channel were maintained at Dean numbers which ranged from 0 to 250.

Smoke injected into the mouth of the channel at Dean numbers from 42 to 218 and locations from 65^{o} to 145^{o} revealed different types of flow behavior, including numerous pairs of Dean vortices extending from the convex to the concave wall. Different types of flow structures have been categorized as to unsteadiness, height, and symmetry. For each category a map has been constructed which depicts the flow structure observed as a function of Dean number and angular location. These maps and the photographs give an understanding of the flow behavior in the curved channel over a significant range of experimental conditions.

Total pressure measurements at a Dean number of 110 and one location (118^{o}) were taken. The preliminary results are presented on a contour plot which shows some repeatability across a 2 in. portion of the channel span. These contour plot results are consistent with photographs for the same experimental conditions.

Master of Science in
Mechanical Engineering
June 1987

Advisor: P.M. Ligrani
Department of
Mechanical Engineering

APPLICATION OF NUMERICAL OPTIMIZATION IN MODERN CONTROL

Thomas F. Olson
Lieutenant Commander, United States Navy
B.S., Bradley University, 1973

The theory of optimal control presents a powerful method of controller design. The basis of the method is selection of a "performance index" which compares the actual to desired controller performance for such items as output response and energy consumption. In most previous work, the design process has radically simplified the performance index for analytic feasibility and practical utility. In order to provide a more accurate and versatile method, state of the art numerical optimization methods, using the Automated Design Synthesis Program, are applied to numerical modeling of multivariable controllers, using the Dynamic Simulation Language. The resulting optimum values stemming from the analysis are the controller gains which minimize the desired performance index for a specified set of system constraints.

Master of Science in
Mechanical Engineering
December 1986

Advisor: R.H. Nunn
Department of
Mechanical Engineering

CONTROL SYSTEM SIMULATION FOR A SINGLE-LINK FLEXIBLE ARM

Ki Soon Park
Major, Republic of Korea Air Force
B.S., Korean Air Force Academy, 1978
M.B.A., Chungnam University of Korea, 1984

To control a lightweight manipulator, a validated dynamic model based on the Equivalent Rigid Link System (ERLS), is used to formulate a control algorithm. The required torque to drive the manipulator to a desired angle is calculated. Since the control system includes an electrohydraulic actuator, the required current is also calculated by the inverse dynamics of the hydraulic servo. A computer simulation is performed with various loading conditions, gain values, and desired angles.

Master of Science in
Mechanical Engineering
September 1987

Advisor: L.-W. Chang
Department of
Mechanical Engineering

INVESTIGATION OF TWO FERROMAGNETIC DAMPING MATERIALS IN CONJUNCTION WITH INITIAL DEVELOPMENT OF A SIGNAL ANALYZER INTERFACE PROGRAM

Gregory Richard Patch
Commander, United States Navy
B.S., United States Naval Academy, 1970

A promising method for the attenuation of shipboard vibration and noise utilizes constituent materials whose composition and microstructure combine to absorb energy readily and dissipate it. However, the alloy design of damping materials which possess both significant energy-absorption capacities and adequate structural strength levels is difficult. Presently, there are several problems associated with designing a material with high damping characteristics. One of these involves the development of efficient, reliable and reproducible methods for measurement of material damping capacities. Initially, the primary area of interest concerned the development of microcomputer analysis techniques to study the vibration damping characteristics of Iron-Chromium (Fe-Cr)-based alloys. The present research utilized a Zenith Z-100 series Z-150 microcomputer to examine programming techniques which store and analyzes the damping data produced by various ferromagnetic alloy specimens. The computer program developed for this study enables an interface of the Zenith Z-150 microcomputer and a Scientific Atlanta SD380 Signal Analyzer. The program utilizes the spectrum analyzer screen display to (a) provide graphic representation of damping measurements, (b) provide a means to evaluate damping characteristics, (d) calculate damping coefficients for specimens tested with commercially available hardware systems, and (e) provide a convenient tool for subsequent research in the area of vibration damping technique.

Master of Science in
Mechanical Engineering
September 1987

PROCESSING AND SUPERPLASTICITY IN LITHIUM-CONTAINING AL-MG ALLOYS

Benjamin W. Sanchez
Lieutenant, United States Navy
B.E., SUNY Maritime, 1979

The refined microstructures and superplastic properties resulting from controlled thermomechanical processing of an Al-8Mg-0.5Li-0.2Zr alloy were evaluated. The processing involved warm rolling at 573K (300°C) separately to true strains of 1.9 and 2.6. Increasing the rolling strain enhanced the superplastic ductility of the alloy at 573K in the strain rate regime of 10^{-2}-$10^{-3}s^{-1}$. Elongations in excess of 500pct., without cavitation, and a corresponding strain rate sensitivity coefficient of approximately 0.5, were obtained. TEM investigations of the microstructural characteristics responsible for the mechanical behavior revealed that a more uniformly refined grain structure (2-5 μm) evolved by continuous recrystallization in material experiencing the larger rolling strain. It was also concluded that the increase in rolling strain enhances grain refinement both preceding and concurrent with superplastic deformation.

Master of Science in
Mechanical Engineering
March 1987

Advisor: T.R. McNelley
Department of
Mechanical Engineering

DATA ACQUISITION, REDUCTION AND ANALYSIS OF SHOCK AND VIBRATION TESTING USING A SUPER MICROCOMPUTER

Robert A. Shafer
Lieutenant, United States Navy
B.S., United States Naval Academy, 1981

The advent of small, portable super microcomputers has enabled the rapid analysis of mechanical signals. In addition to the microcomputer's reduction in cost, their capabilities have expended to allow real time analysis of the frequency characteristics of vibrating structures. Data acquisition modules allow the addition of powerful components to a microcomputer. Modules consisting of the necessary Analog to Digital converters, Digital to Analog converters, and the hardware necessary to support sixteen channels of input data can easily fit inside desk top microcomputers. Fast 32 bit processors, small high volume hard disk drives and large RAM capacities complete the package, enabling a microcomputer to perform complex dynamic signal analysis. One application of the super microcomputer is in the field of underwater explosion shock testing. The combination of the acquisition and analysis capabilities in the same device eliminates the requirement to record the data to an intermediate device prior to analysis. Thus the data can be analyzed within minutes of the completion of an experiment, giving immediate results at the testing site instead of an analysis facility. Another application of the data acquisition equipped microcomputer is in the analysis of the frequency response characteristics of structures. Programming the microcomputer to acquire the data from a vibrating structure in order to determine the dynamic signature is easily done. The Hilbert transform, identified previously as a means of detecting non-linearities in the frequency response, can also be included in the data analysis portion of the same program. Thus a complete package of signal analysis routines, including frequency response, power spectra, and system linearity, can be programmed into the microcomputer. Discussed in

this study is the method utilized to validate a data acquisition equipped microcomputer for such applications.

Master of Science in
Mechanical Engineering
June 1987

Advisor: Y.S. Shin
Department of
Mechanical Engineering

A FLOW VISUALIZATION STUDY OF LAMINAR/TURBULENT TRANSITION IN A CURVED CHANNEL

Marc A. Siedband
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1975

Laminar/turbulent transition was studied as it occurs in a newly constructed curved channel of rectangular cross section. The channel is 1.27 centimeters high by 50.8 centimeters wide (0.5 in. x 20 in.), aspect ratio of 40 to 1, with a concave surface radius of curvature of 60.96 centimeters (24 in.). Mean velocities for air in the channel range from 1.40 to 3.89 m/sec, which corresponds to Dean number and hydraulic Reynolds number ranges of 167 to 461 and 2,231 to 6,173, respectively.

Flow visualization from a smoke wire shows changes in the behavior and appearance of a smoke trace illuminated in the radial plane with varying Dean number and varying channel location. In some cases, these smoke trace patterns show distortion similar to what would be expected if pairs of counter-rotating vortices are present. A map of vortex stability as channel location and Dean number were varied and constructed from analysis of smoke trace photographs.

Master of Science in
Mechanical Engineering
March 1987

Advisor: P.M. Ligrani
Department of
Mechanical Engineering

THE EFFECT OF PROCESSING AND SUPERPLASTIC DEFORMATION ON AMBIENT DUCTILITY OF AL-10%Mg-0.1%ZR

Dimosthenis K. Solomos
Commander, Hellenic Navy
B.S., Greek Naval Academy, 1968

In previous work, the room temperature mechanical properties of an Al-10Mg-0.1Zr alloy were evaluated after simulated, superplastic forming at a temperature of 300°C (573K). A variation of ductility from 1 to 14% elongation was observed in the room temperature test data. To examine the cause of this variability, the processing schedule was changed to one incorporating more severe reductions during rolling. This resulted in a lesser range of variability in room temperature ductility, but the material no longer behaved superplastically. Elongations at 300°C of only 161% at a maximum were recorded although the small grain size required for good superplasticity apparently was developed. SEM and optical microscopy was then done to investigate the cause of this loss of superplastic behavior.

Master of Science in
Mechanical Engineering
March 1987

Advisor: T.R. McNelley
Department of
Mechanical Engineering

GAS TURBINE PROPULSION ENGINE PERFORMANCE PREDICTION

Gregory B. Todd
Lieutenant Commander, United States Navy
B.S., Francis Marion College, 1974

The installation of a gas turbine as the propulsive engine for naval surface ships involves a system of inlet, engine and exhaust subsystems. These subsystems are interdependent requiring a matching of characteristics.

The project entailed the modification and improvement of an existing computer simulation program for marine propulsion gas turbine installations. The intake and exhaust subsystems for engine and module cooling to predict the pressure losses throughout the ductwork were included. The program additionally computes the operating characteristics of the propulsion engine based on those predicted losses.

Department of
Mechanical Engineering

THE INFLUENCE OF TOTAL STRAIN, STRAIN RATE AND REHEATING TIME DURING WARM ROLLING ON THE SUPERPLASTIC DUCTILITY OF AN AL-MG-ZR ALLOY

James E. Wise, II
Lieutenant, United States Navy
B.S., United States Naval Academy, 1979

The effect of varying three processing variables on the superplastic ductility of an Al-10Mg-0.1Zr alloy was studied. The three variables investigated were: (1) time at temperature during warm rolling; (2) strain rate during rolling (by varying reduction per pass); and (3) total strain. After the material was warm rolled, samples were tension tested at 300°C and at strain rates varying from $6.67 \times 10^{-5} s^{-1}$ to $1.67 \times 10^{-1} s^{-1}$. The greatest superplastic ductilities were achieved in material experiencing the largest total strain, lowest strain rate and most prolonged reheating time during warm rolling. The results are consistent with a model for structure development based on continuous recrystallization.

Master of Science in
Mechanical Engineering
March 1987

Advisor: T.R. McNelley
Department of
Mechanical Engineering

515/516

MASTER OF SCIENCE

IN

METEOROLOGY

517/518

AUTOMATED SATELLITE CLOUD ANALYSIS: A PRELIMINARY APPROACH TO THE PROBLEM OF SNOW/CLOUD DISCRIMINATION

Robert C. Allen, Jr.
Captain, United States Air Force
B.A., Eastern Illinois University

An algorithm is developed and evaluated for the discrimination of clouds, snow cover and clear land. The method uses visible daytime images of AVHRR channels 1 (0.63 μm), 2 (0.83 μm) and 3 (3.74 μm). Reflectance is derived for channel 3 by using the emission temperature to estimate and remove the thermal component of emission. Separation of clouds from snow and land is based on this derived channel 3 reflectance. Mean values of channel 3 reflectance in channel 3 to 2 to 4 percent for snow and land, 2 to 27 percent for the clouds and 8 to 32 percent for the cirrus clouds. These values overlap for thin clouds and snow. The method then attempts analysis of these based on the ratio of reflectance properties between channels 1 and 3. Surface and total cloud cover was verified by comparison with surface observations using the standard Lambert conformal and Mercator projections. The method was applied to [illegible] with an overall efficiency of 93 percent. [illegible]

NUMERICAL INVESTIGATION OF OROGRAPHICALLY ENHANCED INSTABILITY

Gerald T. Byrne
Captain, United States Air Force
B.S., Drexel University, 1974

The NEPRF spectral baroclinic primitive equation with six layers was numerically integrated over time to examine the effects that vertical wind profiles have on the development of lee cyclogenesis. In addition, the model was run in both linear and nonlinear modes to isolate their effects on the tests. The objective was to simulate a cold front moving over a high mountain ridge, similar to the Alps or Rockies, by implementing a wind reversal profile to determine if this was conducive to lee cyclogenesis. It was found that the wind reversal profile produced favorable cyclonic growth, particularly when the model was in a linear mode. A nonlinear wind reversal test also produced positive results but only for a relatively short time; thereafter nonlinear interactions dampened cyclonic growth considerably. In addition, two tests were run that allowed the mountain to grow in a very short time to isolate inertial gravity wave interactions. The gravity waves did produce considerable oscillations in the two tests, but after 15 hours or so these two tests showed similar cyclonic growth to the previous tests.

Master of Science in
Meteorology
September 1987

Advisor: R.T. Williams
Department of
Meteorology

INVESTIGATION OF ANOMALOUS CLOUD FEATURES IN 3.7 MICROMETER SATELLITE IMAGERY

John M. Rogers
Captain, United States Air Force
B.S., Metropolitan State College

When band 3 (3.7 micrometers) daylight AVHRR imagery are examined, unique effects not present in the other four bands are observed. These effects include a higher radiance from cloud tops than from the sea-surface, unique ship exhaust tracks and the highlighting of areas of thin clouds, continental aerosol intrusion into marine air and ice clouds. These effects are due to the addition of various amounts of reflected solar radiance and thermal emitted radiance. In this thesis, three cases illustrating these effects are examined.

The apparent temperature reversals result from clouds reflecting more solar radiation than the sea surface. Ship tracks and continental aerosol effects are due to altered size distributions caused by added ship exhaust pollutants or aerosols. The absorptivity of ice clouds is higher than water clouds, thus the sensed radiance from ice clouds is essentially only emitted, not reflected. Therefore, ice clouds appear colder than liquid water clouds in band 3.

Master of Science in
Meteorology
March 1987

Advisor: P. Durkee
Department of
Meteorology

TROPICAL CYCLONE INTENSITY PREDICTION BASED ON EMPIRICAL ORTHOGONAL FUNCTION REPRESENTATION OF WIND AND SHEAR FIELDS

Edward L. Weniger
Captain, United States Air Force
B.S., Villanova University, 1978

An objective technique for predicting 24, 48 and 72 h tropical cyclone intensity is investigated using 1216 cases in the western North Pacific from 1979 to 1983. Potential predictors include conventional storm-related parameters, such as date, intensity, motion and position. Additional potential predictors include empirical orthogonal function (EOF) coefficients of the zonal and meridional components of the environmental wind (250, 400 and 700 mb) and vertical wind-shear (250-400, 400-700, and 250-700 mb) fields. These coefficients represent the synoptic forcing in the vicinity of the storm. The intensity change information is filtered to eliminate data for storms affected by landfall from the sample. The regression equations are verified against a homogeneous sample of Joint Typhoon Warning Center (JTWC) official forecasts, which are also demonstrated to be significantly better (95% confidence) than persistence at all forecast intervals. Regression equations developed using EOF coefficient predictors along with conventional predictors are comparable to the JTWC official forecast, even at 48 and 72 h. The regression equations based on the complete set of predictors have slightly more skill than those based only on conventional predictors. If the regression equations are derived from a smaller sample to allow for an independent test, the results appear to be better in the dependent set, but are degraded in the independent sample. Nevertheless, these independent sample results are comparable in skill to the JTWC forecasts at all intervals. Regression equations generated from

three subsets stratified by 12 h old intensity are significantly better than the 48 and 72 h JTWC official forecast.

Master of Science in Meteorology
June 1987

Advisor: R.L. Elsberry
Department of Meteorology

MASTER OF SCIENCE

IN

METEOROLOGY AND OCEANOGRAPHY

525/526

ANALYSIS OF WATER COLUMN STABILITY USING SHIPBOARD AND SUBMARINE DENSITY AND SHEAR MEASUREMENTS

Edward G. Beale, Jr.
Lieutenant, United States Navy
B.S., University of California, Riverside, 1977

Analysis of water column stability was performed using shipboard and submarine shear and density profile data acquired by U.S.S. DOLPHIN AND R/V ACANTA in October, 1984 in the vicinity of Monterey, California. Data was acquired utilizing CTD and acoustic Doppler profiler (ADVP) instruments. The upper ocean thermohaline structure and water column stability, over a 10km square domain, was determined from repeated measurements of the conductivity, temperature and velocity to a depth of 115m. The temporal and spatial variation in the analyzed fields of temperature, salinity, density and velocity are compared with the constructed profiles of the static stability parameter (E) and gradient Richardson number. The analyzed fields were in turn compared with the larger scale forcing factors of coastal upwelling, current and eddy, bottom topography, and internal waves. The stability of the water column was found to be both statically and dynamically stable with the exception of thin patches of instability which were determined to be the result of double diffusive processes.

Master of Science in
Oceanography and Meteorology
December 1985

AN EVALUATION OF THE IMPACT OF VARIABLE TEMPORAL AND SPATIAL DATA RESOLUTION UPON IREPS

Michael E. Dotson
Lieutenant, United States Navy
B.S., United States Naval Academy, 1981

Atmospheric refractive index gradients significantly modify the path of electromagnetic (EM) waves as they propagate through the atmosphere. Accordingly, the performance of U.S. Navy (EM) systems can be either degraded or enhanced due to atmospheric conditions which affect atmospheric refractive index profiles. The Integrated Refractive Effects Prediction System (IREPS) version 2.2 is the latest software developed by Naval Ocean Systems Center (NOSC) to predict atmospheric refraction and its resulting effect on EM systems. Specific environmental parameters are used as input data to produce various output products to be used by the tactician in planning the optimum use of naval assets. As with any model, the quality and accuracy of the resulting output is directly related to the quality and timeliness of the input data. This thesis study shows the importance of timely, high resolution data, for input into the IREPS version 2.2 program, in order to obtain realistic atmospheric refractive and corresponding EM system performance predictions. A continentally derived data set is used to compare the results of using high resolution versus low resolution data as input into IREPS, and to qualitatively show how quickly the refractive structure of the atmosphere can vary with time. A second data set from an over ocean experiment attacks the horizontally homogeneous atmosphere assumption which appears to be frequently incorrectly applied. Finally, a statistical comparison is performed to evaluate the extent to which the natural variability of the atmosphere can result in significant variations of atmospheric refractivity that could affect naval EM systems.

Master of Science in
Meteorology and Oceanography
June 1987

Advisors: W.J. Shaw
Department of
Meteorology

PREDICTABILITY OF ICE CONCENTRATION IN THE HIGH-LATITUDE NORTH ATLANTIC FROM STATISTICAL ANALYSIS OF SST AND ICE CONCENTRATION DATA

Gordon H. Fleming
Lieutenant Commander, Canadian Armed Forces
B.S., Royal Roads Military College, Victoria, B.C., 1978

A statistical analysis of 27 years of monthly averaged sea surface temperature (SST) and ice concentration data was conducted for 17 locations along the annual mean position of the marginal ice zone spanning the North Atlantic. Anomalies (differences from monthly means) of both variables were observed to have spatial scales of 100s to 1000s of kms, temporal scales of 6 months to several years, and a strong regional dependence. Sea surface temperature autocorrelation values were in general higher than ice concentration autocorrelation values. Cross-correlations between the two variables were found to be highly significant in some regions and poor in others. The various correlation features appeared plausible with respect to understood physical processes in each region. For example, the data for the northern Barents and Iceland Seas showed strong cross-correlations at lags extending to over nine months. The steady-state cold water temperatures and relatively weak currents in these regions enhanced persistence of both SST and ice concentration, allowing them to interact. By contrast, the Davis Strait area, a region of strong confluent currents of different temperatures and limited ice persistence, showed weak cross-correlation values. Statistical analyses of large, homogeneous data sets as conducted in this study appear to be superior to current thermodynamic models in their potential for long-range forecasts of ice concentration.

Master of Science in
Meteorology and Oceanography
September 1987

Advisor: J.E. Walsh
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Department of
Oceanography

ESTIMATION OF EXTINCTION COEFFICIENTS AT 3.75 AND 11.00 μM FROM SATELLITE MEASUREMENTS AT 0.63 AND 0.86 μM

Margarita Garcia de Quevedo
Lieutenant, United States Navy
B.S., Texas A & M University, 1975
M.Ed., Texas A & M University, 1979

A method for estimating extinction coefficients in the near-infrared and infrared wavelengths from satellite measurements in the visible was developed. Five tests were devised to examine the limits and sensitivity of the model. The first test studied the error inherent in the retrieval of the parameters which are needed to describe the distribution of atmospheric particles and are direct inputs for the calculation of extinction at 3.75 and 11.00 μm. Also studied were errors associated with uncertainties in the extinction values, uncertainties in relative humidity values, deviations of particle size distribution from the model and effects of high winds on the aerosol distribution. Results indicate that the biggest error results when wind generated aerosols change the particle size distribution especially at radii larger than 2 μm. The error reaches 82% for prediction at 11.00 μm at 60% relative humidity. The smallest error, less than 7% for all variations, is associated with the retrieval technique itself. Errors up to 25% in the measured satellite extinction coefficients lead to errors of up to 25% in the estimated values for both the marine and rural models. Results indicate that the rural model at high values of relative humidity is affected the most with an error of 31% at an RH of 95% at 11.00 μm. Negative deviations in the marine particle size distribution give rise to large errors for $\lambda = 11.00$ μm. For 20% deviation, the error can be as high as 41%. The error decreases accordingly as the percent deviation is reduced.

Master of Science in
Meteorology and Oceanography
March 1987

Advisor: P.A. Durkee
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Meteorology

EFFECTS OF RAINFALL ON THE SEASONAL THERMOCLINE

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Ecuadorian Naval Academy, 1981

An oceanic planetary boundary layer model is used to determine the effects of fresh water flux on the seasonal pycnocline and mixed layer at Ocean Station "P" (50°N, 145°W). First sensitivity of the model was tested by constant forcing with a range of values of precipitation minus evaporation. Then realistic forcing with daily monthly average precipitation values, observed winds and heat fluxes were applied to the model for a simulation of the year 1967.

The sensitivity study revealed that precipitation and evaporation have a significant impact on the seasonal evolution of mixed layer depth and temperature, even though the surface heat flux is not changed. The use of realistic forcing indicates the importance of having realistic initial salinity profiles in such models. This is especially true in the autumn and winter seasons when rainfall reduces seasonal mixed layer deepening by as much as 25 meters, representing a 20% change. For the simulation of the year 1967, the model-predicted values of salinity very closely follows climatology for the first half of the year. During the late summer and fall, predicted salinity is greater than suggested by the climatology and may be due to unrealistically steady values of precipitation.

Master of Science in
Meteorology and Oceanography
June 1987

Advisor: R.W. Garwood
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Oceanography

PROPERTIES OF THE ATMOSPHERIC BOUNDARY LAYER ABOVE A SUBTROPICAL OCEANIC FRONT

John P. Higgins
Lieutenant, United States Navy
B.S., Northeastern University, 1976

The marine atmospheric boundary layer (MABL) and synoptic-scale situation is described using rawinsonde and sea-surface temperature (SST) data collected during the 1986 Frontal Air-Sea Interaction Experiment (FASINEX). The data obtained from 14 February to 9 March 1986 are divided into eight consecutive three-day periods and analyzed. Significant changes in synoptic-scale features and flow patterns occurred during each three-day period due to movement of low pressure systems. MABL changes noted were due primarily to large scale convergence. Thirteen pairs of rawinsonde launches, seven from opposite sides of an oceanic front and six from the same side (five warm, one cold) are compared. The time difference between soundings in each pair did not exceed sixty minutes. Boundary layer height, mixed layer potential temperature and specific humidity differences between paired rawinsonde launches were larger when launches were from opposite sides of the oceanic front. A combination of both shipboard and aircraft data will be necessary to further describe the conditions of the MABL and synoptic-scale situation.

Master of Science in
Meteorology and Oceanography
June 1987

Advisor: K.L. Davidson
Department of
Meteorology

COMPARISON OF WESTERN NORTH PACIFIC TROPICAL CYCLONE AIDS USING STORM-RELATED AND SYNOPTIC PARAMETERS

Henry Jones
Lieutenant, United States Navy
B.S., United States Naval Academy, 1979

The performance of four western North Pacific Ocean objective aids (One-way influence Tropical Cyclone Model-OTCM; Recurver analog-REC; Total analog-TOTL; and 50% no steering -CY50) is evaluated using mean forecast errors, systematic errors, cross-track (CT) and along-track (AT) statistics. Stratification of these errors by storm-related (latitude, longitude, motion, 12-h intensity change and size) and synoptic parameters through empirical orthogonal functions (700 mb easterlies/250 mb trough, 700 mb westerlies/250 mb trough, 700 mb easterlies/250 mb ridge, 700 mb westerlies/250 mb ridge) distinguishes between different conditions associated with tropical cyclone motion. The systematic and CT/AT error results reveal distinct biases for each objective aid: 1) OTCM (short-range rightward/slow and long-range leftward/fast); 2) REC (rightward/fast); TOTL (leftward/fast; and 4) CY50 (rightward/slow). The OTCM has the best performance as a result of a small systematic bias. The REC analog has large forecast errors on left-turning and straight-moving cases due to the selection of only recurving analogs. The selection of analogs from the total sample (TOTL) results in errors due to missed recurvature cases. Finally, the CY50 has the worst long-range skill because of the lack of the physics of OTCM and climatology for cases of [illegible]

ESTIMATION OF MARINE BOUNDARY LAYER DEPTH AND RELATIVE HUMIDITY WITH MULTISPECTRAL SATELLITE MEASUREMENTS

Richard J. Kren
Lieutenant, United States Navy
B.S., Parks College of St. Louis University, 1980

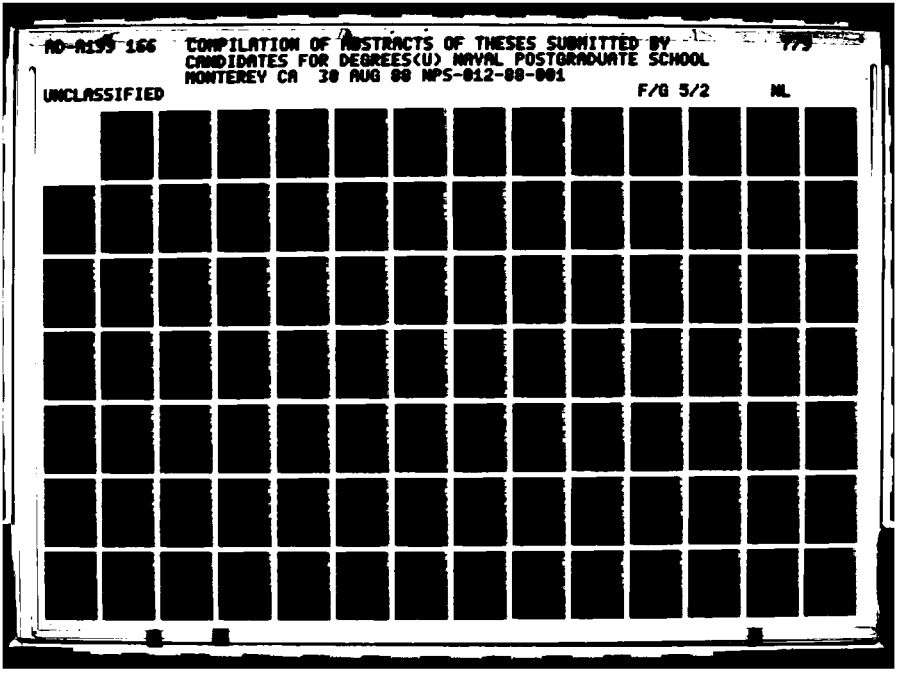
This study presents a technique for estimating marine boundary layer depth and relative humidity structure from satellite inferred measurements of aerosol optical depth, total water vapor and sea-surface temperature. The data originate from radiance measurements by channels 1, 4 and 5 of NOAA's AVHRR instrument. The technique assumes that the atmospheric optical depth and total water vapor are primarily confined within the boundary layer, and that the layer is well-mixed. These inputs are combined through the relative humidity dependent variables of extinction and vapor density. Relative humidity is parameterized as an increasing linear function with height, resulting in an equation for the near-surface relative humidity. This equation is solved, enabling estimation of boundary layer depth and humidity structure. The technique is iterative in nature, requiring 5 to 10 iterations for convergence.

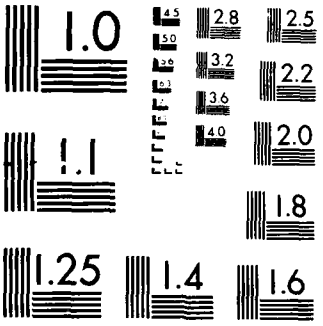
Master of Science in
Meteorology and Oceanography
June 1987

Advisor: P.A. Durkee
Department of
Meteorology

AD-A195 166 COMPILATION OF ABSTRACTS OF THESES SUBMITTED BY CANDIDATES FOR DEGREES(U) NAVAL POSTGRADUATE SCHOOL MONTEREY CA 30 AUG 88 NPS-012-88-001 1/3

UNCLASSIFIED F/G 5/2 NL





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

[illegible] FROM [illegible]

Gary C. [illegible]
Lieutenant Commander, United States Navy
[illegible] University of Washington, 1975

[illegible] vectors are obtained for an area 100 to 300 [illegible] from the central California coast south of [illegible] specified Spring [illegible] with 4 hour spacing between [illegible] of the complex flow vectors. The [illegible] qualified agreement with geostrophic [illegible] Good agreement when [illegible] resolvable features are [illegible] The technique is only able to identify [illegible] for identifying weak [illegible] spurious eddies and [illegible] resolved by [illegible] and orientation [illegible] technique on a [illegible] with an [illegible] technique can be a [illegible] data.

[illegible]
[illegible]

CHARACTERISTICS OF MESOSCALE ISLAND BARRIER CLOUD PHENOMENA OBSERVED IN SATELLITE AND SPACE SHUTTLE IMAGERY

David R. Markley, Jr.
Lieutenant Commander, United States Navy
B.S., Muskingum College, 1974

Mesoscale island barrier effects occur in the lee of islands and are observed in satellite imagery and in photographs from manned spaceflight missions. These phenomena arise when, in the presence of a low-level inversion, the boundary layer flow is disturbed by a barrier. Five types of island barrier effects are examined: a) von Karman vortices, b) single plumes, c) transitions from vortices to plumes, d) calm sea streaks and e) ship wake-like cloud patterns.

Results from 23 cases indicate a strong relationship between inversion height and type of barrier effect phenomena. A low, strong inversion was found for von Karman vortices cases while a higher, weaker inversion was present in the transition and plume cases. An inversion above the barrier occurred with wake phenomena. Wind shear structure appears important in the development of the calm sea streaks and the ship wake patterns.

Master of Science in
Meteorology and Oceanography
December 1986

Advisor: C.H. Wash
Department of
Meteorology

VERTICAL WIND SHEAR AS A PREDICTOR OF TROPICAL CYCLONE MOTION

Denis H. Meanor
Lieutenant Commander, United States Navy
B.A., Miami University, 1976

The effects of vertical wind shear in the environment on tropical cyclone motion are investigated for 1357 western North Pacific Ocean cases. An empirical orthogonal function analysis is used to represent the vertical shear of the zonal and meridional components between the 700, 400 and 250 mb levels. Composite wind-shear fields are developed for five past-motion storm categories and analyzed to determine their statistical differences. The significant differences between these categories represents differing synoptic forcing by the wind shear that affects storm motion. Within the category of storms moving northwest, significant differences occur between right- and left-turning cyclones. This demonstrates that the vertical shears derived from operationally analyzed wind fields contain synoptic forcing information that is revelant to tropical cyclone motion. A regression analysis is used to identify potential predictors from among the wind-shear EOF coefficients. These predictors are included in regression equations to post-process the 24-, 48- and 72-h OTCM forecasts for 1982-1983. The modified OTCM tracks utilizing this scheme have an average error of 419 km at 72 h, which is an improvement of 174 and 212 km over the unmodified OTCM and official JTWC 72-h forecast errors, respectively. Wind-shear EOF coefficients included in a decision tree to select the best objective forecast aid only nominally increase the accuracy of the "optimum" forecasts.

Master of Science in
Meteorology and Oceanography
March 1987

Advisor: R.L. Elsberry
Department of
Meteorology

VARIATION OF THE WIND STRESS
PASSAGES DURING FASTEX

Lieutenant Commander, United
U.S. Naval

The variations of
passages of atmospheric
during the 1986 Frontal
frontal passages
Endeavor) in the
March 1986. Wind
using velocity variances
method, using mean wind
coefficient. The
enhanced by a factor
frontal zone
during individual
peaks occurring
front. The
wind and sea
part through a
wind waves by
of swell waves

Master
Naval
September

CHARACTERISTIC SPECTRAL SIGNATURES OF ARCTIC NOISE-GENERATING MECHANISMS

Virginia Therese Oard
Lieutenant, United States Navy
B.A., DePaul University, 1976

The specific spectral characteristics of ten primary Arctic ambient noise-generating mechanisms are identified. These mechanisms are thermal cracking, wind-induced turbulence, snow-pelting, ice/snow interactions, plate/crystal interactions, low-stress ice/ice interactions, lead formation, rafting, pressure ridging and seismic events. The analysis consisted of 28 U.S./Canadian and 11 Soviet data sets which contained spectra specifically attributed to one of these processes. Variability in emitted sound pressure levels was statistically examined using the U.S./Canadian data. A generic spectrum was developed for each noise-generating mechanism by visually averaging the composite shapes of the spectra attributed to each noise-generating mechanism.

Master of Science in
Meteorology and Oceanography
June 1987

Advisor: R.H. Bourke
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A.B. Coppens
Department of
Physics

A COMPARISON OF SATELLITE-DERIVED OCEAN VELOCITIES WITH OBSERVATIONS IN THE CALIFORNIA COASTAL REGION

John F. O'Hara
Lieutenant, United States Navy
B.S., United States Naval Academy, 1980

Satellite-derived ocean surface velocity vectors in the California Current System (CCS) are compared with in situ hydrographic and Doppler data. The in situ data were acquired during the April 1981 phase of the Coastal Ocean Dynamics Experiment (CODE) experiment. In general, the satellite-derived velocities agreed with the in situ data. Due to the baroclinic nature of the study region, the satellite vectors were found to be representative of the subsurface geostrophic flow. Although the number and concentration of the satellite vectors was small, these vectors were capable of resolving the mesoscale features located in the study region. Comparison of co-located data revealed that the in situ Doppler velocity measurements were approximately 1.5 times larger than the satellite-derived velocity vectors. These results agree with a similar study in March of 1985 which was conducted in an adjacent region.

Master of Science in
Meteorology and Oceanography
March 1987

NUMERICAL SIMULATIONS OF THE CALIFORNIA CURRENT: FILAMENT FORMATION AS RELATED TO BAROCLINIC INSTABILITY

David A. Olivier
Lieutenant, United States Navy
B.S., University of Virginia, 1980

Offshore jets or filaments are a well observed phenomenon in the California Current System. Their surface and subsurface structures as well as their spatial and temporal variability are well documented. The methods by which these filaments are formed is not as well understood as their structural form. The most common generation theories are: (1) variations in wind stress coupled with topographic irregularities, (2) dynamic instability and (3) geostrophic turbulence. In this study an attempt is made to identify the factor(s) responsible for filament formation south of Cape Mendocino by numerically simulating the California Current System using a two-layer, non-linear, primitive equation model. It is shown that baroclinic instability is the primary method by which filaments are formed in this region and that other factors such as barotropic instability, friction and non-linearities can alter the characteristics of the fastest growing baroclinically unstable wave.

Master of Science in
Meteorology and Oceanography
September 1987

Advisor: D.C. Smith
Department of
Oceanography

A SYNOPTIC INVESTIGATION OF MARITIME CYCLOGENESIS DURING GALE

William E. Pertle
Lieutenant Commander, United States Navy
M.S., Naval Postgraduate School, 1982
B.S., Chapman College, 1976

A synoptic diagnosis of two intensive observation periods (IOP 1 and 9) of the Genesis of Atlantic Lows Experiment (GALE) is conducted. Operationally available data and some preliminary GALE data were used to describe key synoptic and subsynoptic features that are important to the coastal and ocean cyclogenesis, and explain the evolution of these features. Adequacy of the operational and GALE enhanced data sets to explore these features is addressed. A verification of the Navy Operational Regional Analysis and Prediction System (NORAPS) forecasts of these systems is conducted. In both cases mesoscale structure was important in understanding the cyclogenesis event. Cyclogenesis of both IOP 1 and 9 represent more complex interactions and processes than the simplified cyclogenesis suggested by the quasi-geostrophic theory.

Master of Science in
Meteorology and Oceanography
March 1987

Advisor: C.H. Wash
Department of
Meteorology

DEVELOPING A PHYSICAL BASIS FOR AN AEROSOL CLIMATOLOGY OF THE PACIFIC OCEAN

Frederick R. Pfeil
Lieutenant Commander, United States Navy
B.S., Pennsylvania State University, 1976

NOAA-7 AVHRR data from April 1982 are used to demonstrate a method for building an aerosol climatology for the North and South Pacific Ocean. Sunglint is removed by deleting an area determined from visual inspection of many images. Red-visible (0.63 μm), near-infrared (0.86 μm) and infrared (11 μm) channels, and the ratio of visible albedo to near-infrared albedo are used to eliminate areas of cloudiness. The ratio values are also used to indicate whether small (continental) or large (marine) aerosol particles predominate. Once a "clean" image of radiances due primarily to scattering by aerosols is obtained, satellite pixel values are averaged over one degree boxes from 50°N to 50°S, 110°E to 70°W. The mean visible and near-infrared albedos, mean ratio and standard deviations are computed and displayed as contoured fields over the North and South Pacific Ocean. These charts and individual examples are used to estimate spatial and temporal changes in aerosol concentration.

Master of Science in
Meteorology and Oceanography
December 1986

Advisor: P.A. Durkee
Department of
Meteorology

EVALUATION OF SATELLITE-DERIVED PRECIPITATION ALONG THE WEST COAST OF THE UNITED STATES

Michael D. Pind
Lieutenant Commander, United States Navy
B.S., University of Southern Mississippi, 1983

Four satellite estimation techniques were applied to twelve cases during the winter/spring (1986-87) along the west coast of the United States. These estimates were then compared with observed precipitation patterns from radar and surface observations to evaluate their skill.

Results proved the National Environmental Satellite, Data and Information Service (NESDIS) subjective technique superior. Other methods were IR threshold, color bispectral and the Naval Postgraduate School (NPS) bispectral minicomputer program. All techniques overestimated observed precipitation, but the NESDIS method substantially reduced the amount of over-estimation. All techniques showed excellent alignment and were more successful representing the western edge rather than the eastern edge of precipitation. Only the NESDIS and NPS bispectral approach showed skill in depicting precipitation intensity.

Master of Science in
Meteorology and Oceanography
June 1987

Advisor: C.H. Wash
Department of
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WIND FORCING EXPERIMENTS IN THE CALIFORNIA CURRENT SYSTEM

Philip G. Renaud
Lieutenant, United States Navy
B.S., United States Naval Academy, 1979

A high-resolution, multi-level, primitive equation ocean model is used to examine the response of an idealized, flat-bottom, oceanic regime off northern California to steady, equatorward, local wind-forcing during the upwelling season. The model has open boundaries on all but the eastern coastal boundary on which either free-slip or zero-slip boundary conditions are imposed. Time-invariant winds, either with or without a component of wind stress curl, are used as model forcing to spin-up a classical two-dimensional, upwelling-induced coastal jet and undercurrent. Since no eddies are generated, a stability analysis of the mean flow is conducted which explores both the necessary conditions of mixed (barotropic and baroclinic) instability, through calculations of potential vorticity, and the sufficient conditions for baroclinic instability, through an application of a simple two-layer stability model. Comparisons of model results with observations of the coastal jet in the California Current System indicate that the location and the horizontal and vertical current shear associated with the model coastal jet compare favorably with observations; however the modeled jet is stronger, deeper and wider than the observed jet. Finally, the inclusion of wind stress curl and the zero-slip boundary condition are demonstrated to be important elements in model simulations of the coastal jet.

Master of Science in
Meteorology and Oceanography
December 1986

Advisors: M.L. Batteen
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Oceanography

REAL-TIME AIRBORNE OCEAN SAMPLING AND APPLICATIONS TO NAVAL OPERATIONS

John J. Rendine
Lieutenant, United States Navy
B.S., United States Naval Academy, 1979

The Airborne Digital Data Acquisition System (ADDAS) was developed by the joint Naval Postgraduate School/Harvard University research project, called the Ocean Prediction Through Observation, Modeling, and Analysis (OPTOMA) Program, for the real-time synoptic mapping of oceanic features.

Given the capabilities of such a system, an aerial sampling strategy was developed based on the spatial scales of oceanic variables and the aircraft and ADDAS limitations. The strategy was applied to "simulated" AXBT survey flights on "synthetic" fields. The simulated AXBT observations were objectively analyzed and compared to the synthetic field. By varying the simulated AXBT spacing and the objective analysis parameters, an "optimum" AXBT spacing to adequately represent the synthetic structure of the domain was deduced.

To further develop such a system for both airborne and shipboard use, a proposed Ship/Aircraft Data Acquisition, Display, and Analysis System (SADADAS) was presented. The following synoptic mappings produced could provide a possible tactical decision aid for antisubmarine warfare (ASW) operations: 1) Sea surface temperature; 2) Temperature/Sound speed at selected depths; 3) Maps of mixed layer depth; 4) Subsurface ducts/sound channels; and 5) Vertical sections of temperature/sound speed.

Master of Science in
Meteorology and Oceanography
December 1986

Advisors: C.N.K. Mooers
G.W. Groves
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Oceanography

MESOSCALE APPLICATIONS OF HIGH RESOLUTION IMAGERY

Randy J. Scanlon
Lieutenant, United States Navy
B.S., United States Naval Academy, 1979

Analysis of two mesoscale phenomena, a dry slot in stratocumulus over the eastern North Pacific (June 1985) and an enhanced-V cloud formation over the Gulf of Mexico (April 1984) is performed using very-high resolution photographs taken from the Space Transportation System (STS) 41-C and 51-G missions. Collocated meteorological satellite imagery (GOES, NOAA AVHRR, DMSP) and conventional meteorological data are utilized with the shuttle photography to better understand the microscale and mesoscale features of these two events.

Master of Science in
Meteorology and Oceanography
September 1987

Advisor: C.H. Wash
Department of
Meteorology

DIAGNOSTIC STUDY OF A GENESIS OF ATLANTIC LOWS EXPERIMENT (GALE) CYCLOGENESIS EVENT

Daniel J. Soper
Lieutenant, United States Navy
B.S., University of Massachusetts, 1976

The Navy Operational Regional Atmospheric Prediction System (NORAPS) analyses and forecasts, with 80 km resolution, are used to investigate an explosive cyclogenesis event that occurred in Intensive Period (IOP) 2 during 26-28 January 1986. A synoptic investigation and quasi-Lagrangian diagnostic evaluation of the primary cyclone mass, vorticity, heat and moisture budgets are discussed.

Explosive development occurs with the superposition of an upper-level jet streak over a shallow surface system associated with a well-developed coastal front. The advection of shear vorticity aloft in combination with warm advection induces strong low-level convergence and spin-up of the low-level vortex. Significant surface sensible and latent heat fluxes and latent heating maxima are closely correlated with the period of rapid development from 00-12 GMT 27 January 1986.

Master of Science in
Meteorology and Oceanography
March 1987

Advisors: R.L. Elsberry
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MESOSCALE VARIABILITY IN THE WEST SPITSBERGEN CURRENT AND ADJACENT WATERS IN FRAM STRAIT

Alan M. Weigel
Lieutenant, United States Navy
B.S., United States Naval Academy, 1979

A dense network of conductivity-temperature-depth (CTD) measurements was carried out between 76_oN and 81_oN in order to define the distribution of temperature and salinity in Fram Strait. Although weakly baroclinic, the WSC flow was found to be strongly influenced by the 2000 m deep Kipnovich Ridge which separated the flow into several streams. In addition, filaments of warm Atlantic Water (AW) were found to spread out over the top of the Greenland Gyre. The WSC branches near 80_oN. Approximately 20% of the baroclonic transport enters the Arctic Ocean north of Spitsbergen as the eastern branch. The other branch (80% of the baroclinic transport) turns westward, apparently under the influence of the Yermak Plateau, and joins with the southward flowing East Greenland Current (EGC). The entire turning takes place south of 81_oN near the ice edge with baroclinic speeds of up to 0.03 m/s. The structure of the East Greenland Polar Front (EGPF) and associated mesoscale features were also examined. The EGPF was found to leave the Greenland continental slope north of 79_oN and turn northeastward across the Yermak Plateau and into the Arctic basin. A cold core mesoscale eddy having a length scale of approximately 60 km and a closed baroclinic circulation up to 0.15 m/s was found associated with the front. Also associated with the front was extensive temperature and salinity finestructure which occurred near the maximum temperature in the water column. This finestructure was often associated with strong double diffusive activity.

Master of Science in
Meteorology and Oceanography
March 1987

Advisor: R.H. Bourke
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A TECHNIQUE TO REANALYZE SURFACE WINDS OVER THE TROPICAL PACIFIC USING SATELLITE CLOUD DRIFT WINDS

Robert K. Weinheimer
Lieutenant, United States Navy
B.A., Roger Williams College, 1977

A procedure of using satellite low-level cloud winds to improve the monthly-mean surface marine wind analysis over the tropical Pacific was tested for April 1984. The satellite winds were projected to the sea surface using the 850 mb-surface wind shear determined from operational numerical analysis products of FNOC. Bias corrections were applied based on collocations of projected satellite data and marine data and by subdividing the Pacific into 1) four quadrants and 2) 36 subdivisions. The quadrant method was further tested by successively removing known data and applying the bias corrections calculated for the quadrant to the previously removed data. The averaged errors of the projected satellite data was estimated to be about 3 m/s in the western Pacific and 4.3 m/s in the eastern Pacific. After the bias corrections, these errors were reduced to about 2 m/s and 2.5 m/s, respectively.

Master of Science in
Meteorology and Oceanography
September 1987

Advisors: C.-P. Chang
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MASTER OF SCIENCE

IN

OCEANOGRAPHY

551/552

TOPOGRAPHIC INFLUENCES IN THE CALIFORNIA CURRENT SYSTEM

Ching-Yin Chen
Lieutenant Commander, Republic of China Navy
B.S., Chinese Naval Academy, 1976

A ten-level primitive equation numerical model is used to study the influences of the bottom topography in the California Current System. Five different numerical experiments were integrated for 40 days after being initialized with a baroclinic alongshore coastal jet representative of the observed coastal jet. By comparison with a flat bottom case, in Experiments 1 and 3, in which the topographic slopes face westward or northward, the topography appears to have stabilizing influences on the mean flow. In Experiments 2 and 4, in which the topographic slopes face southward, the topographic β-effect appears to be strong enough so that these two cases have already reached a quasi-steady state by 40 days. This is because in Experiments 2 and 4 the long, non-dispersive topographic Rossby waves are effective at transporting the eddy energy away from the source region near the coast. The resulting new mean flow appears to be stable.

Master of Science in Oceanography
December 1986

Advisor: R.L. Haney
Department of Meteorology

SEA SURFACE CURRENT ESTIMATES OFF CENTRAL CALIFORNIA AS DERIVED FROM ENHANCED AVHRR INFRARED IMAGES

Chung-Ming Fang
Lieutenant Commander, Taiwan R.O.C. Navy
B.S., Cheng-Chung Institute of Technology, 1979

A technique is presented which uses an interactive computer program to estimate sea surface current velocities from the displacement of sea surface temperature (SST) patterns apparent in enhanced sequential Infrared (IR) images obtained from the NOAA-6 Advanced Very High Resolution Radiometer (AVHRR). This technique was applied to the surface currents of the California Current System using IR image data from 27 and 28 April 1981. This technique, which uses enhanced pseudocolor gradient imagery, produced more current vectors than an earlier technique developed by O'Hara (1987) which used unenhanced gray scale imagery. The resultant surface vectors agree well in direction but underestimate velocities obtained from Doppler Acoustic Log (DAL) measurements taken during the same period. The two methods produced closest agreement for current velocities of less than 40 cm/sec and with satellite-derived velocities obtained with sequential 12 hour images rather than sequential 24 hour images. Satellite-derived velocities in the rapid flow area (larger than 40 cm/sec) showed poor correspondence to DAL-measured velocities. The strong current shear in these areas may distort the surface SST patterns making identification of features between two images more difficult. The satellite derived surface velocities are assumed to be representative of the velocities of the upper mixed layer, which is usually 10 to 30 m deep in the study region.

Master of Science in
Oceanography
September 1987

Advisors: S.R. Ramp
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Oceanography

COUPLED ACOUSTIC AND OCEAN THERMODYNAMIC MODEL

Jacques M. Fourniol
Capitaine de Corvette, French Navy

An acoustic ray tracing algorithm is developed to be coupled with a thermodynamic upper ocean mixed layer model. For a test case, the coupled mixed layer-acoustic model is applied to a specific area in the western Mediterranean Sea. Climatological atmospheric forcing is used to provide boundary conditions for the mixed layer for short periods of time during different seasons. The response of the acoustic model to the predicted changes in the sound-speed profile is analyzed to show dependence of acoustic propagation upon the surface atmospheric forcing and the season. The atmospheric factors such as wind, rain, and solar irradiation have almost no effect on the propagation of rays emanating from a deep transmitter. In the case of a shallow source, the wind is the most dominating factor which influences the acoustic propagation. The effect of heavy rain with light wind is also examined.

Master of Science in
Oceanography and
Engineering Science
June 1987

Advisors: R.W. Garwood
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Engineering

555 1556

DEPARTMENT

OF

OPERATIONS RESEARCH

557/558

A GOAL PROGRAMMING R&D PROJECT FUNDING MODEL OF THE U.S. ARMY STRATEGIC DEFENSE COMMAND USING THE ANALYTIC HIERARCHY PROCESS

Steven M. Anderson
Captain, United States Army
B.S., United States Military Academy, 1978

At present the U.S. Army Strategic Defense Command (USASDC) relies on subjective judgments from key management personnel to make project funding decisions. In this thesis the Analytic Hierarchy Process (AHP) is used to convert subjective pairwise comparisons of thirty-five major USASDC projects, based on eleven key factors, into ratio-scaled numerical weights. The AHP coefficients are then used in a linear Goal Program (GP) in order to optimize the funding level for each project in Fiscal Year (FY) 1988 at several different USASDC total budget levels. An optimal priority list of projects is also determined. The model results are compared with the proposed funding levels and the present priority list, and a detailed examination of the impact of changes of the model parameters is conducted. This analysis of the model results and model sensitivity stimulates six funding recommendations for USASDC decision makers.

Master of Science in
Operations Research
September 1987

Advisor: D.C. Boger
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Operations Research

A CASUALTY STRATIFICATION MODEL

Steven J. Antosh
Major, United States Marine Corps
B.S., Villanova University, 1975

This Naval Postgraduate School thesis develops an algorithm and model for stratifying battle casualties. The algorithm was constructed in response to a need by Headquarters Marine Corps for casualty estimates stratified by military occupational specialty and rank. The model focuses on three factors which are considered to be fundamental to an individual's survival on the battlefield: location on the battlefield, the firing rates of the enemy's weapons, and an individual's vulnerability to the enemy's weapons. A brief outline of how the model can be enhanced for added realism and usefulness is also provided.

Master of Science in
Operations Research
September 1987

Advisor: G.F. Lindsay
Department of
Operations Research

A PROPOSED COMPUTER-ASSISTED DECISION MAKING SYSTEM FOR THE HELLENIC NAVY DECISION MAKERS

Haralabos Athanasopoulos
Lieutenant Commander, Hellenic Navy
B.S., Hellenic Naval Academy, 1969

The Hellenic Navy currently avoids the use of computers in all functional areas except for routine bookkeeping. Some individual, societal, cultural and institutional military factors that influence this attitude are explored. To correct this situation, it is proposed that a staff Information Systems Officer specialty be established, capable of creating the interface between the decision maker and modern computer systems. A computer-assisted decision making system is proposed that can be used by the Hellenic Navy decision maker. Finally, three representative problems are proposed and solved using such a system, to demonstrate the power of modern computer-assisted decision making.

Master of Science in
Operations Research
March 1987

Advisors: D.E. Neil
M.L. Mitchell
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A PERSONNEL FLOW MODEL FOR PREDICTING THE COAST GUARD ENLISTED FORCE STRUCTURE

Lance L. Bardo
Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1981

The U.S. Coast Guard is a military service with a hierarchical organization. CG manpower planning requires a forecast of the number of accessions needed as well as the resulting force structure for each month of the upcoming year. In this thesis, we present a modified Markov transition model that integrates the pertinent personnel flows to forecast the monthly accessions and force structure for the enlisted CG. Personnel flows are estimated using standard statistical techniques such as linear regression analysis and point estimation. An algorithm is presented to solve for end of month stocks while meeting a man year consumption constraint--Full Time Equivalent (FTE) when attrition rates and the beginning and end of year stocks are given. Finally, the pertinent personnel flow estimates, the FTE algorithm and the modified Markov model are integrated into a comprehensive Military Employment Capability Plan which is programmed on a micro-computer spreadsheet.

Master of Science in
Operations Research
September 1987

Advisor: P. Milch
Department of
Operations Research

THE ANTI-VEHICULAR MINEFIELD EVALUATION SYSTEM (AMES) MODEL

Charles W. Barker, III
Major, United States Army
B.S., United States Military Academy, 1974

The Anti-vehicular Minefield Evaluation Simulation (AMES) Model is a FORTRAN based computer model designed as a tool to evaluate the effectiveness of minefields against realistic breaching target arrays. The AMES Model allows the construction of vehicular formations in a variety of types and configurations. It also permits deliberate breaching operations to be conducted by target formations at angles other than normal to the face of the minefield. The results may be used to evaluate the effectiveness of mine dispensing systems, mine/fuze combinations, and countermine methodology, as stand alone analyses or as inputs to high resolution tactical simulation models.

Master of Science in
Operations Research
September 1987

Advisor: M.L. Mitchell
Department of
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EVALUATION OF OPERATION PLANS USING THE NAVAL WARFARE GAMING SYSTEM

Glenn James Barrowman
Commander, United States Navy
B.S., United States Navy Academy, 1971

This thesis evaluates the Naval Warfare Gaming System (NWGS) or the Enhanced NWGS (ENWGS) as a tool for analyzing and improving operations plans and concept plans. As the United States Navy's designated vehicle for global, theater, fleet, and force war games, NWGS/ENWGS has been installed at the United States Naval War College, the Tactical Training Groups, and is remotely connected to the headquarters of each Fleet Commander in Chief. The Joint Operation Planning System and NWGS are described in some detail and NWGS, as well as its follow-on ENWGS, is examined to determine its limitations as well as its capabilities in this capacity.

Master of Science in
Operations Research
March 1987

Advisor: M.G. Sovereign
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CRITICAL ITEM IDENTIFICATION

June A. Bishop
Lieutenant Commander, United States Navy
B.A., Florida State University, 1972

The Joint Chiefs of Staff are concerned about the military's ability to deter enemy action and counter enemy forces. In an effort to assess capabilities and have a basis for apportioning necessary items, the Unified Commands were asked to identify critical items. This paper looks at the various methods the Navy uses to determine critical items with the objective of finding a consistent method for critical item determination. Based on the results of research, the validity of existing programs used in critical item identification could improve if there was more communication between the Fleet Commander in Chief and his Type Commanders and Navy Supply Systems Command. Better communication would also make model results available to all for use in planning.

Master of Science in
Operations Research
September 1987

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Operations Research

THE EFFECTS OF BEARING ERROR AND SONOBUOY POSITION UNCERTAINTY ON AN EXTENDED KALMAN FILTER BEARINGS-ONLY TARGET TRACKER

Donald F. Brock
Lieutenant Commander, United States Navy
B.S., University of Central Florida, 1974

The PTA (Passive Tracking Algorithm) utilizes an Extended Kalman Filter and is currently being incorporated into the onboard computer software (OP Programs) of several air antisubmarine warfare (ASW) platforms. This thesis develops a generic Extended Kalman Filter and examines the sensitivity of this target tracker to errors which occur in the air ASW problem; specifically, sonobuoy position error and bearing error.

Master of Science in
Operations Research
December 1986

Advisor: J.N. Eagle
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Operations Research

APPLICATION OF THE ANALYSIS PHASE OF THE INSTRUCTIONAL SYSTEM DEVELOPMENT TO THE MK-105 MAGNETIC MINESWEEPING MISSION OF THE MH-53E HELICOPTER

David S. Broughton
Lieutenant, United States Navy
B.S., University of Minnesota, 1980

With the introduction of the MH-53E helicopter as a platform for airborne mine countermeasures, a new cockpit flight simulator has been proposed. This simulator, device 2F141, will provide the U.S. Navy with the capability to simulate the flight environment of an airborne mine countermeasures mission. The methodology of the Instructional System Development (ISD) model was applied as a framework for development of a training program. This study concentrates on the analysis phase of the ISD process. Through the application of a task analysis and quantification methodology of the Mission Operability Assessment Technique, a rank ordering of subtasks and major flight segments for the ship-based MK-105 magnetic minesweeping mission was determined. This study finds that the major flight segments of landing, takeoff and prepare for tow, and transit to the minefield requires the most improvement to increase the mission operability and effectiveness score. Therefore, a training program should be designed and developed that will effect these improvements by utilizing the cockpit flight simulator.

Master of Science In
Operations Research
September 1987

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THE APPLICATION OF SINGLE-SOURCE SHORTEST PATH ALGORITHMS TO AN OJCS CONTINGENCY PLANNING MODEL AND A VEHICLE ROUTING MODEL

Jerome W. Brown, Jr.
Captain, United States Marine Corps
B.S., Miami University, 1980
M.S., University of Southern California, 1983

This thesis investigates the use of single-source shortest path algorithms in two unrelated contexts. In the first application, the label setting and label correcting algorithms are examined for applicability to and implementation within a J-8, Organization of the Joint Chiefs of Staff contingency planning model. This model has encountered problems of slow execution directly related to shortest path computations, which can be resolved by the methods proposed. Additionally, these two shortest path algorithms are examined for use within the model for identification and presentation of alternate optima when they exist.

The second application involves the development of a new algorithm, called reference node aggregation, which is designed to efficiently produce a subset of the all-pairs shortest path solution for large scale networks. The anticipated use of this algorithm is in connection with vehicle routing models. The motivation for producing a subset of the full solution is that only a very small subset of all possible pairs of nodes will ever be considered for consecutive visitation by a vehicle; hence, most of the information in an all-pairs solution is irrelevant. For those pairs whose exact shortest paths are not computed, a single-step approximation is devised which does not require access to peripheral storage. The new algorithm has three user-specified engineering parameters which effectively control the tradeoff between the accuracy of the subset solution and the effort required to compute it.

Master of Science in
Operations Research
March 1987

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AN ANALYTICAL STUDY OF THE OLIVER HAZARD PERRY CLASS (FFG-7) GUIDED MISSILE FRIGATE AS AN ANTIAIR WARFARE (AAW) AREA DEFENSE ESCORT

Edward L. Brownlee
Lieutenant, United States Navy
B.S., United States Naval Academy, 1981

The Oliver Hazard Perry Class (FFG-7) Guided Missile Frigate is a relatively low capability multi-purpose warship. It is designed with adequate capabilities for two major considerations; a convoy escort for low threat environments and for support of NATO's wartime reinforcement mission. This analytical study evaluates the effectiveness and predicts the performance of the FFG-7 as an AAW area defense escort.

This thesis develops a mathematical model using engagement time against the target to measure and assess the ship's effectiveness. The model provides insight into the interrelationship between AAW effectiveness and escort positioning range from the protected ship. The results demonstrate that positioning range from the protected ship can have significant affect on AAW effectiveness and performance.

Master of Science in
Operations Research
September 1987

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MILITARY EFFECTIVENESS ANALYSIS OF COAST GUARD CANDIDATE WPB CRAFT

Wayne R. Buchanan
Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1976

This thesis describes an analysis of the military effectiveness of five candidate craft being considered to replace the Coast Guard's aging fleet of coastal patrol boats (WPB's). The candidates represent various advanced technology designs offering a variety of speed characteristics and seakeeping abilities. The Defense Operations missions of the next generation WPB are examined and potential threats identified. An experiment is conducted using the Naval Warfare Interactive Simulation System (NWISS) to model a barrier patrol scenario. In this scenario, a WPB engages an enemy patrol boat using cruise missiles and naval ordnance. Various WPB speeds and sea conditions are examined in sixty-three replications of the simulation. Analysis of Variance and Contingency Table techniques are employed. Conclusions are drawn about the effect of WPB speed characteristics on military effectiveness.

Master of Science in
Operations Research
March 1987

Advisor: J.S. Stewart
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INVESTIGATION AND IMPLEMENTATION OF AN ALGORITHM FOR COMPUTING OPTIMAL SEARCH PATHS

James F. Caldwell, Jr.
Lieutenant, United States Navy
B.S., United States Naval Academy, 1981

A moving target is detected at long range with an initial position given by a probability distribution of a grid of N cells. Also located on the grid is a searcher, constrained by speed, who must find an optimal search path in order to minimize the probability of target survival by time T. A branch-and-bound algorithm designed by Professors Eagle and Yee of the Naval Postgraudate School in Monterey, California, is successfully implemented in order to solve this problem. Within the algorithm, the problem is set up as a nonlinear optimization of a convex objective function subject to the flow constraints of an acyclic N x T network. Lower bounds are obtained via the Frank-Wolfe method of solution specialized for acyclic networks. This technique relies on linearization of the objective function to yield a shortest path problem that is solvable by dynamic programming. For each iteration, the lower bound can be found by use of a Taylor first order approximation. Implementation of this algorithm is accomplished by the use of a Fortran program which is run for several test cases. The characteristics of the solution procedure as well as program results are discussed in detail. Finally, some real world applications along with several questions requiring further research are proposed.

Master of Science in
Operations Research
September 1987

Advisor: J.N. Eagle
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COURSE SCHEDULING AND OFFICER ASSIGNMENTS IN THE UNITED STATES MARINE CORPS: A HEURISTIC MODEL

Keng-Seng Chng
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B.A., University of Leeds, 1982

A heuristic model is proposed to solve the officer course scheduling and assignment problem in the United States Marine Corps. This model divides the problem into two sub-problems, namely course scheduling and officer assignments. Each sub-problem is solved through a separate model formulation.

The course scheduling model uses a FORTRAN-77 implementation of a new heuristic. The officer assignment model is a linear program that is formulated and solved using the GAMS Modeling system. Both models run on an IBM 3033AP mainframe and on personal computers using the DOS operating system.

The models were tested using FY 88 planning data supplied by Headquarters Marine Corps (HQMC). Results from test runs, each carrying a different assumption about HQMC's policy on officer assignments, indicate a clear improvement in course waiting time over past years. Using the model, the average waiting time for an officer ranges from 1.1 to 2.3 weeks, depending on the assumptions made. In the past, average waiting time has been greater than five weeks.

Master of Science in
Operations Research
September 1987

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DETERMINATION OF NETWORK ATTRIBUTES FROM A HIGH RESOLUTION TERRAIN DATA BASE

Seok Cheol Choi
Major, Republic of Korea Army
B.A., Korea Military Academy, 1979

The purpose of this research is to develop algorithms for mapping terrain characteristics from a 100 meter grid representation to arcs and nodes of a transportation network. The algorithms capture elevation and trafficability parameters as they relate to both the arc itself and to the off-arc characteristics. These network parameters are directly usable in appropriate optimization algorithms to determine minimum travel time path and minimum distance path through the network for a variety of maneuver unit types and missions.

Master of Science in
Operations Research
September 1987

Advisor: S.H. Parry
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A MODEL FOR EVALUATING THE EFFECTIVENESS OF A SYSTEMATIC SEARCH FOR A MOVING TARGET

Umit Colak
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B.S., Turkish Naval Academy, 1980

The primary objective of this project is to estimate the effectiveness of a systematic search conducted against a randomly moving target and to generate target density curves in the search area after the search.

In this problem, searcher course and speed are fixed known values. The target course is also fixed, but is randomly selected. The measure of effectiveness (MOE) is the total equivalent area searched.

The approach to the problem in this project is a modification of the methods of B.O. Koopman in Search and Screening. The method first calculates the target location density ρ at each point in a specified area A, and then integrates $(-\rho)$ over A. The result is a measure of how effectively area A was searched.

Master of Science in
Operations Research
March 1987

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DEPLOYMENT PLANNING: A LINEAR PROGRAMMING MODEL WITH VARIABLE REDUCTION

K. Steven Collier
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B.S., United States Military Academy, 1977

The United States Armed Forces must be capable of deploying to areas of operations anywhere in the world. Planning for these deployments is the responsibility of the Joint Deployment Agency, MacDill Air Force Base, Tampa, Florida. Deployment plans are large and complex. A straightforward linear programming model of a deployment plan could easily exceed 700 million decision variables.

This study outlines the development of a system used to assist planners in determining deployment plan feasibility and in selecting modes of transportation. The system consists of a data input array, an algorithm to eliminate all unusable variables, and a linear programming model.

The largest scenario considered in this study is a 90-day deployment plan with 90 movement requirements, 9 types of lift assets, traveling between 22 ports. This corresponds to a linear programming model with 35 million decision variables. The variable reduction algorithm reduced the number of decision variables to 11,100, and an optimal solution was found in a total computation time (input, reduction, optimization, output) time of 6.5 minutes.

Master of Science in
Operations Research
September 1987

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AN INDEPENDENT EVALUATION OF THE CH-46 SAFETY RELIABILITY AND MAINTAINABILITY PROGRAM (SR&M)

Michael J. Conklin
Captain, United States Marine Corps
B.S., United States Naval Academy, 1978

This thesis is an independent partial evaluation of the Safety Reliability and Maintainability Program (SR&M). The two measures of effectiveness which were used to see if the goals of this program were realized in the areas of maintainability and reliability are the maintenance manhours per flight hour and the mean flight hours between failures. Standard statistical analysis was performed utilizing the software packages GRAFSTAT and MINITAB.

Master of Science in
Operations Research
September 1987

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DISCRETE RELIABILITY GROWTH MODELS USING FAILURE DISCOUNTING

James E. Drake
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B.S., United States Military Academy, 1978

Three discrete reliability growth models using fractional failure reduction, referred to as failure discounting, are developed to estimate changing system reliability. Each of the models is designed for use when testing is performed until a fixed number of failures have been observed and attribute data, success or failure, is available for each trial. The first reliability growth model applies failure discounting to the maximum likelihood estimate for a proportion. The second and third models use a modification of an exponential reliability estimate employing linear regression and a weighted average technique respectively along with failure discounting to track changing reliability. Two failure discounting methods were used with each reliability growth model. The first method reduces past failures by a fixed fraction at a fixed interval. The second method uses the upper confidence bound for the reoccurrence of each failure cause as the discounted failure value. The performance of the reliability growth models with varying reliability growth patterns is evaluated with a Monte-Carlo simulation.

Master of Science in
Operations Research
September 1987

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A PROTOTYPE DECISION SUPPORT SYSTEM FOR MARINE CORPS OFFICER ALLOCATION POLICY ANALYSIS

Philip J. Exner
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B.S., United States Naval Academy, 1976

This thesis presents the prototype for a decision support system which permits repeated formulation and solution of the Marine Corps staffing allocation problem under various user-controlled policy scenarios. The system allows the decision maker to vary the eligibility criteria used to determine who may be transferred as well as to adjust the relative priorities of two objectives: minimize relocation costs and maximize "fit" as defined by the Marine Corps. The user may also set a minimum acceptable "aspiration level" for the total fill of all billets. Based on the eligibility requirements which are input by the user, the system extracts data on individual Marines and the jobs that need to be filled, and matches people to billets using a set of matching rules developed by the Marine Corps. The resulting matches are then transformed into a capacitated transshipment network for solution in a special commercial optimization software package. The network formulation models a multiobjective allocation problem using optimization techniques to permit adjustment of some of the objective priorities. After the solution is presented to the decision maker, he may change the relative priorities of the relocation cost and fit objectives, set an aspiration level for the total fill, or change the rules used to determine who may be transferred. The user then has the option of reformulating and re-solving the problem with the new objective priorities or aspirations, or re-starting the entire problem based on the new eligibility rules. Testing of the system on all Marine Corps aviation officers, who constitute about 35 percent of the total personnel, suggests that the concept is feasible to implement for the

entire Marine Corps, provided that certain enhancements recommended in the thesis are implemented.

Master of Science in
Operations Research
September 1987

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THREE SMALL UNIT SHORT TERM FORCE ON FORCE ATTRITION MODELS WITH LOGISTICS CONSIDERATIONS

Dean E. Fish
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B.S., United States Naval Academy, 1981

Three related simulation models based on modified Lanchester theory are examined. The models allow consideration of various aspects of logistics to be incorporated into a battle scenario. The first model allows for an overall general logistics percentage factor that must remain the same for each input throughout a hypothetical engagement. The second model has the additional capability to allow for varying logistics percentages. The last model includes the advantages of the second model plus two intermediary steps and also allows for resupply. The two intermediary steps discuss aspects of two additional models that will not be fully developed in this thesis. They show the procedure used in the development of the resupply considerations in the last model. These models are general in application, and they are designed for small unit short term scenarios. This thesis is demonstrative in nature, and its purpose is to demonstrate a basis of techniques and computer programs for incorporating logistics considerations into a hypothetical combat environment that can be later modified and structured for user specific needs.

Master of Science in
Operations Research
March 1987

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ENEMY THREAT MODULE TO THE NAVAL POSTGRADUATE SCHOOL LOGISTICS WAR GAME

John W. Goodwin
Lieutenant Commander, United States Navy
B.S., University of South Carolina, 1975

The Naval Postgraduate School Logistics War Game is a computerized, aircraft carrier task force level war game designed to sensitize U.S. Navy officers to the logistics capabilities necessary to sustain extended combat operations. The game explicitly models the expenditure of fuel and ordnance as the task force maneuvers off the coast of a hypothetical third world power. The objective of the game is to accrue points for conducting air strikes and achieving target damage while maintaining optimal logistic levels.

The previous version of the game allowed safe operation near hostile territory and no opposition strikes. In order to add realism to the game while forcing the player to maneuver and incur attritions, this thesis models multiple threats from this hypothetical third world country. Aircraft, small patrol craft, and diesel submarines are modeled with a combination of stochastic and deterministic techniques. The inclusion of this threat module forces the player to make real world decisions when allocating limited resources between offensive and defensive operations.

Master of Science in
Operations Research
March 1987

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PRACTICAL APPLICABILITY OF EXACT AND APPROXIMATE FORMS OF THE RANDOMIZATION TEST FOR TWO INDEPENDENT SAMPLES

Derek H. Hesse
Lieutenant, United States Navy
B.S., United States Naval Academy, 1980

The practical applicability of randomization tests is discussed. The randomization test for two independent samples is the specific test examined in both hypothesis and significance testing contexts. This test has optimum theoretical properties as a nonparametric procedure for comparing the means of two populations. However, the calculations that are required to actually use the test in practice can be extremely time consuming. Using the randomization test for two independent samples to conduct a significance test is shown to be a #P-complete enumeration problem. This implies that a computationally efficient way to perform an exact version of the procedure is not likely to exist. Two approximate ways to perform the randomization test are studied with the aid of a simulation. One method uses a normal distribution to approximate the actual randomization distribution and the other method is the usual two sample t-test. The t-test is found to yield results very close to those that are obtained from the exact randomization test under the conditions studied.

Master of Science in
Operations Research
September 1987

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COST ESTIMATING RELATIONSHIPS FOR FIGHTER AIRCRAFT

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B.S., Korean Air Force Academy, 1977

This thesis presents Cost Estimating Relationships (CERS) for fighter aircraft. Since the fighter aircraft is one of the most important tactical weapon systems, it is very useful to establish CERs solely for fighter aircraft. Using the public data on U.S. fighter aircraft, Ordinary Least Squares (OLS) is used as the primary statistical method of establishing CERs. The data collection techniques and adjustments used are discussed, and simple and multiple linear regressions are performed on various combinations of the explanatory variables. This thesis then shows that CERs based on new fighter aircraft data are more reliable than those based on new and old fighter aircraft data.

Master of Science in
Operations Research
March 1987

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POWER ALGORITHMS FOR SEVERAL COMMON TESTS

Seong Pil Hur
Lieutenant, Republic of Korea Navy
B.S., Republic of Korea Naval Academy, 1980
B.S., Korea University, 1983

Power algorithms for several common statistical tests are presented. In experimental design of operational tests and evaluations the selection of design parameters so as to attain an experiment with desired power is a difficult and important problem.

An interactive computer program is presented which uses the power algorithms for several tests and creates graphical presentations which can be used to assist decision makers in statistical design. Several common tests and associated parameters (such as sample size, types and levels of treatments, and alpha-level) are examined.

Master of Science in
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SENSITIVITY OF ALIVENESS ADJUSTMENTS

Theodore J. Janosko
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B.S., Ohio State University, 1975

Aliveness analysis is a computational technique which attempts to estimate the expected number of losses had real ordnance been used during a force-on-force experiment. This thesis carefully follows the development and motivation for the aliveness concept. Examples of aliveness computations are presented, with special emphasis on the SGT York Follow-on-Evaluation (FOE). A simple aliveness computer program was used to examine the sensitivity of aliveness adjustments to changes in such parameters as probability of kill and target selection method.

Master of Science in
Operations Research
June 1987

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FAULT TREE RELIABILITY ANALYSIS OF THE NAVAL POSTGRADUATE SCHOOL MINI-SATELLITE (ORION)

Trenton G. Keeble
Major, United States Army
B.S., United States Military Academy, 1975

Fault tree analysis, which has proved to be a useful analytical tool for the reliability and safety analysis of complex systems, is applied to the Naval Postgraduate School Mini-Satellite (ORION). A general background to reliability analysis, fault tree analysis, and fault tree construction is given. Impact of a phased mission is included in the analysis. A fault tree for ORION is constructed and used to identify minimal cut sets and minimal path sets. The cuts sets and path sets are, in turn, used to calculate an estimate of ORION's reliability to perform a three year mission. The reliability model was constructed in a Lotus 1-2-3 spreadsheet to enable the designers to do "what-if" analysis.

Master of Science in
Operations Research
September 1987

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A SIMULATION STUDY OF ESTIMATES OF A FIRST PASSAGE TIME DISTRIBUTION FOR A SEMI-MARKOV PROCESS

Seung Woong Kim
Major, Korean Army
B.S., Korean Military Academy, 1977

This thesis reports on a simulation study of parametric and nonparametric procedures for obtaining confidence intervals for the logarithm of the probability a semi-markov process enters a particular state before a fixed time t. Three estimators and confidence interval procedures are proposed and compared. The different estimators use different amounts of information about the process. The maximum likelihood estimator and its normal confidence interval procedure uses the most; the estimator based on the empirical distribution function of the observed first passage times uses the least. An estimator based on an exponential approximation to the survivor function of the first passage time uses an intermediate amount of information; confidence intervals for the last estimator are obtained using jackknife and bootstrap procedures. The maximum likelihood procedure is the most efficient if the underlying model is correct. If the model is not correct the empirical survivor function estimator appears to be best for small times and the estimator based on the exponential approximation best for large times.

Master of Science in
Operations Research
March 1987

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AN EVALUATION OF A JOINT REPLENISHMENT INVENTORY MODEL WITH RANDOM DEMANDS

Won Bong Kim
Lieutenant Commander, Republic of Korea Navy
B.S., Republic of Korea Naval Academy, 1975

This paper considers a joint replenishment inventory problem with a continuous-review (S,c,s) policy for the backorder case with Poisson demands and constant procurement lead times.

Whenever item i's inventory level hits s_i: (reorder point) or lower it triggers an order so as to raise item i's level to S_i (order up point). At the same time any other item j with inventory level at-or-below its can-order point c_j is included in the replenishment.

A Poisson demand model with a queueing description of the system's operation is analyzed, and comparisons are conducted for joint versus individual orders in the case of multi-item problems, where joint replenishment of several items may reduce setup costs.

Master of Science in
Operations Research
March 1987

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BAYESIAN SOLUTIONS TO A 2 X 2 DECISION MATRIX USING INTERVAL SCALED PAYOFFS WITH AN APPLICATION TO FOREIGN POLICY DECISIONS

Alan R. King
Lieutenant, United States Navy
B.A., University of Hawaii, 1979

Statistical Decision Theory is applied to assessing objectively the uncertainty involved in foreign policy decisions. In an international conflict of interest situation, a protagonist is presented with the problem of estimating what course of action an antagonist is going to pursue. This problem is addressed by taking observations of the antagonist's behavior. These observations are interpreted as being associated with a specific course of action. Bayes formula is then used to update a conjectured a priori probability function to estimate the course of action being pursued by the antagonist. This updated (a posteriori) conditional probability function is then used to develop a decision rule to select an appropriate response. The decision rule is based on an ordering of possible outcomes, the values assigned to those outcomes, and greatest expected value of return.

Master of Science in
Operations Research
September 1987

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TRACKING PROCEDURE FOR NON-NORMALLY DISTRIBUTED MEASUREMENT ERRORS

Alexander Kukliansky
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B.S., Hebrew University of Jerusalem, 1976

The Kalman Filter is a widely used procedure in tracking algorithms. When normality assumptions are violated, the Kalman Filter performance tends to degrade. In this thesis a new procedure is introduced for accomodating non-normal properties of measurement error distributions. The procedure is developed for the multi-observer situation. Simulation experiment results are presented and numerical comparisons are made between the Kalman Filter performance and that of the new procedure.

Master of Science in
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September 1987

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STRATEGIC ALLOCATION OF SEALIFT: A GAMS-BASED INTEGER PROGRAMMING APPROACH

Michael J. Lally
Captain, United States Army
B.S., United States Military Academy, 1978

This study develops a prototype model which can be used to allocate strategic sealift resources in crisis deployments. The first part of the model is a GAMS-Based Integer Program that extends a classic network flow optimization model developed by Dantzig and Fulkerson. The second part uses a Fortran program to convert the GAMS output into ship schedules. Using intelligent reduction methods, the formulation reduces the number of constraints by 60-70% and the number of variables and nonzero elements in the matrix by 90-99%. Results of this study indicate integer programming with these reduction methods is a viable alternative to modeling sealift as continuous flow variables.

Master of Science in
Operations Research
September 1987

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AN EXAMINATION OF THE INFLUENCE OF ENVIRONMENTAL FACTORS ON RECRUITING CATEGORY I-IIIA MALES

James M. Lewis
Captain, United States Army
B.S., United States Military Academy, 1978

This thesis studies the influence of environmental factors on recruiting Category I-IIIA males for the United States Army. Econometric modeling using regression analysis is used to estimate the determinants of the supply of recruits. Four models are developed from the cross-sectional time-series data and comparisons of the elasticities of the independent variables are given. The four models are Ordinary Least Squares, Instrumental Variable Estimation, Instrumental Variable Estimation with AR(1), and Fixed Effects. Following a discussion on how the data was collected over a four year period on a monthly basis for each of the Army's fifty-five recruiting battalions (except Puerto Rico), each model is specified and the possible violations of the basic assumptions of linear regression discussed. Results of each model are presented and interpreted in terms of resource allocation and policy implementation. Finally, fixed effects regional models for each recruiting brigade are run and geographical variation examined.

Master of Science in
Operations Research
September 1987

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OPERATIONAL AVAILABILITY MEASURES IN NAVAL WEAPONS SYSTEM TEST AND EVALUATION

John M. Lillard
Lieutenant, United States Navy
B.A., Virginia Military Institute, 1980

This thesis examines the problem of estimation of operational availability (A_o) during operational test and evaluation (OT&E) of naval weapons systems. The difficulties in accurate estimation of A_o of on-demand systems are emphasized. Methods currently used by the organizations involved in OT&E are analyzed through the use of a Monte Carlo simulation of an on-demand system and by statistical analysis of its failure and repair data.

New procedures for A_o estimation based on assumptions of exponential time to fail while both on and off are suggested, as well as a method for confidence interval calculation.

Master of Science in
Operations Research
September 1987

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FACTORS AFFECTING THE RECRUITMENT AND RETENTION OF LINGUISTS IN THE U.S. ARMY

James R. Lucas, Jr.
Major, United States Army
B.S., Henderson State University, 1975

This study examines influences on the enlistment and reenlistment decisions for linguists in the U.S. Army. Some of the potential factors considered are: previous language experience, ethnicity, age, gender, and education level of the respondent. Data were obtained from enlisted Army students enrolled in training at the Defense Language Institute (DLI) in Monterey, California during the period April-May 1987. The analysis attempts to determine the differences, if any, that existed between the linguists surveyed and appropriate control groups. Results indicate that the three most prominent reasons given for enlisting were: a chance to better one's self, to earn money for college, and to receive training in a skill. Results further indicate that monetary benefits such as the Army's new linguist specialty pay and increased reenlistment bonuses strongly influence the soldier's reenlistment decision. Significant differences are noted for many of the demographic and background variables when comparisons are made with the 1985 ARI *New Recruit Survey* and USAREC's 1986 report, The Measurement of Student Attitudes Toward Enlistment Incentives and Career Opportunities.

Master of Science in
Operations Research
September 1987

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METHODS FOR DETERMINING MEASURES OF EFFECTIVENESS FOR THE MARINE CORPS FINANCE CENTER

Douglas C. Lynn
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B.A., University of Washington, 1976

This analysis systematically reviews the established organizational goals of the Marine Corps Finance Center in order to determine the objectives or decision criteria for the unit. Specific production output data sets, which can be used to measure how well the objectives are accomplished, are then analyzed. Graphical, parametric, and nonparametric procedures are used to determine distributions, trends, correlation, and significance of the data. A comparison of the weighted-linear and weighted-product methods for aggregating multiple measures of effectiveness is then presented and the results are examined with respect to the specific organizational goal of developing an overall measure of effectiveness.

Master of Science in
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June 1987

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ENGAGEMENT MODULE FOR THE NAVAL POSTGRADUATE SCHOOL LOGISTICS WAR GAME

Michael T. Maliniak
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B.S., United States Naval Academy, 1980

The Naval Postgraduate School Logistics War Game is a single player, interactive, educational war game designed to teach naval officers the importance of logistical support for a force operating in hostile waters for an extended period of time. The game models the force's weapons and fuel consumption as it operates continuously off the coast of a fictional hostile nation. The objective of the game is to accumulate points by conducting air strikes and damaging targets while maintaining adequate logistic levels.

Formerly, the game did not possess any capability for the force to defend itself or engage enemy forces. In order to sensitize the player to the logistical impacts associated with defending a force while conducting offensive operations, combat engagements are modeled to create more realistic fuel and weapon depletion rates, requiring more challenging logistic planning.

Master of Science in
Operations Research
September 1987

Advisor: M.L. Mitchell
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EFFECTS OF UNIFORM TARGET DENSITY ON RANDOM SEARCH

Michael J. McNish
Lieutenant, United States Navy
B.S., United States Naval Academy, 1978

This thesis was motivated by a study performed by COMSUBPAC of detection rates for a random search model. COMSUBPAC's study concluded that the probability of nondetection to time t, PND (t) was not of the form exp (-[illegible]). The motion model used for that study was a new and interesting model, therefore this investigation began by analyzing that model. This investigation discovered that the density of targets for COMSUBPAC's motion model was not uniform over the search area, which might lead to a nonexponential form for PND (t). To lend support to the hypothesis that a uniform distribution of target position can lead to an exponential form of PND (t), the target motion was altered to achieve a uniform target density. The same basic target motion was used because of its inherent advantages over other target motion models. Three different types of boundary reflection patterns were analyzed for their ability to create a uniform target density. Two of those patterns were successful, but only one was suitable for further analysis. Support for the hypothesis was achieved when the PND (t) using this new uniform density target motion model was found to be of exponential form. It was also discovered that the exponential detection rates for this new simulation model were very close to the detection rates predicted by B.O. Koopman's random search formula.

Master of Science in
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September 1987

Advisor: [illegible] Eagle
Department of
Operations Research

A STATISTICAL ANALYSIS DETERMINING EFFECTIVE AND EFFICIENT METHODS OF SHIPBOARD TRAINING

Kirk A. Michealson
Lieutenant, United States Navy
B.S., United States Naval Academy, 1979

A significant factor affecting the operational readiness of the surface Navy is the training of personnel to operate and maintain shipboard system and equipment. Even though the importance of training is not disputed, factors such as effectiveness and efficiency must still be considered before selecting a specific method of instructional delivery. This study compares the most common training methods in the surface Navy using one-way analysis of variance (ANOVA), individual degree of freedom ANOVA, and two sample testing techniques to determine which methods are the most effective and efficient. The methods compared are live lectures, video presentations, silent reading, and audio presentations at three different speeds. The analyses show that audio presentations at normal speed and at 1.25 times normal speed are the most effective and efficient, while the two most common methods of instructional delivery (live lectures and video presentations) are significantly less effective in the majority of the comparisons.

Master of Science in
Operations Research
March 1987

Advisor: D.E. Neil
Department of
Operations Research

THE CURVE FITTING OF PORTABLE WEAR METAL ANALYSIS

Byung H. Min
Major, Korean Army
B.S., Korea Military Academy, 1976
B.S., Seoul National University, 1980

This thesis describes the curve fitting algorithm that the Portable Wear Metal Analyzer used for calculating concentrations in ppm and compares this with some alternative algorithms. Each algorithm considered fits a curve to the three standards used, which were 20%, 50% and 100% of the full scale for all nine wear metals. APL was used for all programs.

Master of Science in
Operations Research
March 1987

Advisor: H.J. Larson
Department of
Operations Research

COMPARATIVE ANALYSIS OF ATTRITION GENERATION METHODOLOGIES UTILIZED IN AGGREGATE COMBAT MODELS

Kevin L. Murphy
Major, United States Army
B.S., United States Military Academy, 1973

This thesis investigates methodologies used for attrition coefficient generation in aggregate combat models and the effect of these specific approaches on acceptable portrayal of combat dynamics and weapon system weighting in subsequent output interpretations. Particular attention is given to the subjective firepower scores, analytical firepower scores and the Bonder equation approaches for generation of attrition coefficients. Combat was simulated in both Lanchester Square Law and Potential-Antipotential aggregated models, using a common scenario for each technique. The output was compared for various individual weapons systems and overall force ratio computations. Sensitivity analysis was applied to a single system to determine reaction to various input changes and the impact on the output interpretation.

Master of Science in
Operations Research
September 1987

Advisor: S.H. Parry
Department of
Operations Research

DETERMINING THE MOST APPROPRIATE CRITERIA FOR SELECTION TO BRIGIDIER GENERAL

James Craig Naudain
Captain (P), United States Army
B.S., United States Military Academy, 1977

The United States Army Military Personnel Center is currently implementing the Selection Board Support System (SBSS), which is an executive decision support system designed to assist selection board members with difficult selection decisions. Previous study groups have determined the criteria by which board members will evaluate candidates, through the grade of O-6, under SBSS. This thesis determines the most appropriate criteria for the selection to Brigidier General.

The criteria were determined by analyzing the expert opinion data of 327 Brigadier and Major Generals. Univariate and multivariate statistical techniques were used to analyze questionnaire data and to suggest selection criteria. The final selection criteria determination was based on results from principle component analysis, variable cluster analysis, and a subjective analysis of the General Officers' comments.

Master of Science in
Operations Research
September 1987

Advisors: F.R. Richards
D.R. Whipple
Department of
Operations Research

TECHNIQUES FOR ORGANIZING AND IMPLEMENTING A NAVAL BASE PRODUCTIVITY IMPROVEMENT

Chris G. Nicolaou
Lieutenant Commander, Hellenic Navy
B.S., Hellenic Naval Academy, 1971

During recent years the concept of increasing productivity has generated a great deal of discussion in business and economic circles especially in the Armed Forces of each nation. This interest has motivated research into the area of productivity measurement. The purpose of this study is to develop a model for measuring productivity and to present techniques for organizing and implementing a workshop of a Naval base productivity.

The results of this research serve a wide variety of needs such as:

* Human resource allocation and effective control over a Navy workshop maintenance facility.
* Personnel performance improvement.
* A set of methods for measuring productivity.

Products of this study are the following:

* Development of a general productivity measurement model at a firm level which can be modified and applied to the operations of a workshop in a Naval Base.
* Identification of critical factors that are required in an effective productivity measurement system.

Finally, it must be noted that a successful productivity measurement is the representative indicator for the future treatment and success of every organization.

Bachelor of Science in
Operations Research
March 1987

Advisor: D.E. Neil
Department of
Operations Research

A STUDY OF PILOT SELECTION FOR THE KOREAN AIR FORCE

Jang Kyong Park
Captain, Republic of Korea Air Force
B.S., Korea Air Force Academy, Seoul, 1981

The Operation with Economic Efficiency (OEE) Program in the Republic of Korea Air Force (ROKAF) was designed to reduce the cost and improve the efficiency of all ROKAF operations. The ROKAF is now faced with the problem of developing a more efficient pilot candidate selection and training program which will improve pilot quality and reduce attrition rates and the number of aircraft accidents. The present research provides a starting point for the development of a more efficient pilot selection and training program. If successful, this program should result in the selection of pilot candidates exhibiting a significantly higher probability of completing the pilot training program. This thesis also provides a summary of aviation selection. test batteries presently in use by the U.S. Air Force and U.S. Navy and applies the principles of decision theory in determining whether a change in the ROKAF's present pilot selection system is feasible.

Master of Science in
Operations Research
September 1987

Advisors: D.E. Neil
T.M. Mitchell
Department of
Operations Research

OPTIMAL TARGETING FOR THE TOMAHAWK-D CRUISE MISSILE

Thomas J. Phalon
Lieutenant, United States Navy
B.S., Tulane University of Louisiana, 1980

The 'D' version of the Tomahawk Land Attack Missile (TLAM) enables the weaponeer to place under attack multiple 'soft' targets with a single missile. Targets are attacked by the dispensing of the submunition payload at up to 12 target sites. This study develops probabilities of kill for a range of values involving the missile accuracy, bomblet dispersion and number of bomblets dispersed. These kill probabilities are then examined in a attempt to develop an optimal strategy concerning the number of submunition packs to be dropped at each target site to maximize expected number of kills. These data points are of potential assistance in making wise targeting decisions. Under the missile error and bomblet dispersion assumptions made here, it is optimal to dispense bomblets on as many targets as available, however operational constraints may argue for other tactics.

Master of Science in
Operations Research
March 1987

Advisor:

THE EFFECTS OF FLIGHT HOURS AND SORTIES ON FAILURE RATES

Steven J. Phillips
Lieutenant, United States Navy
B.A., Millersville State College, 1978

This thesis focuses on the modeling of F-14A component failure rates. Current methodology employs the Exponential distribution to model component failures and the associated Poisson distribution to determine expected demand. Three other failure rate distributions are explored as alternatives: a Weibull flight hour model, a Geometric sortie-dependent model, and a Mixed sortie-flight hour model. The expected number of component failures is calculated for each model and a comparison is made between the current model and these alternatives. The specific results pertain to aircraft of this type but the concepts employed can be applied to other aircraft as well.

The Geometric model provided a better fit for components which were not operated continuously, and the Weibull performed better when the components were operated continuously. Overall, the Exponential was the least effective model for the nine components studied.

Master of Science in
Operations Research
March 1987

Advisor: M.L. Mitchell
Department of
Operations Research

ENHANCED BATTLE DYNAMICS FOR THE FORCE EVALUATION MODEL

Wallace A. Price
Captain (P), United States Army
B.S., United States Military Academy, 1977

The Combat Sample Generator Model (COSAGE) is being replaced by the Vector-In-Command model (VIC) as the feeder model to the Force Evaluation Model (FORCEM) at the U.S. Army Concepts Analysis Agency (CAA). This thesis presents and analyzes the two general methodologies in use today for estimating the attrition coefficients in a high resolution model: the self contained model and parameter fit model. It offers the analyst a framework for taking the output reports generated by the VIC model and incorporating these into FORCEM, much as COSAGE's outputs are now currently inputted into FORCEM via the Attrition Calibration Model (ATCAL). This thesis focuses on the ability of VIC to enhance FORCEM. This includes VIC being able to compute non-conventional warfare results and carry these results through ATCAL into FORCEM. VIC also enhances the capability of FORCEM via ATCAL to predict battle results and is able to extract information about the dynamics of the battle in smaller than the present 12 hour time steps.

Master of Science in
Operations Research
September 1987

Advisor: S. Parry
Department of
Operations Research

A METHODOLOGY FOR MODELING URBAN COMBAT IN ALARM

Christopher S. Pritchett
Captain, United States Army
B.S., United States Military Academy

This thesis extends the development of the Advanced Airland Research Model (ALARM), a research effort at the Naval Postgraduate School (NPS), in the areas of urban terrain representation and urban mission planning. The growing proportion of dismounted infantry forces in the U.S. Army and the increased urbanization of Europe requires having a means at hand for studying the use of dismounted infantry in urban combat. The feasibility of using networks to model urban terrain and sequence the activities comprising an urban mission are demonstrated. A division scenario is developed that links brigade and battalion terrain networks. A template for an urban defense mission is developed and demonstrates the use of networks for simulating mission planning in built-up areas. An outline is provided for linking multi-level terrain and mission networks into one planning model.

Master of Science in
Operations Research
September 1987

Advisor: S.H. Parry
Department of
Operations Research

DESIGN AND IMPLEMENTATION OF A NETWORK OPTIMIZER FOR OFFICER ASSIGNMENT DURING MOBILIZATION

Stephen H. Rapp
Captain, United States Marine Corps
B.S., United States Naval Academy, 1982

This thesis describes the design and implementation of a large-scale network optimization model for assigning United States Marine Corps officers to billets during mobilization.

The new model has been tested at Headquarters, USMC, and is slated for installation in Fall 1988 as a permanent replacement for an existing procedure that has been in use since 1978. The new model improves the turnaround time from days to minutes, reduces computation costs by substantial amounts yearly, and, in tests on FY87 data, resulted in significantly better allocations of the officer pool, according to several measures of effectiveness.

The network model treats officers with similar attributes as supply nodes and billets with similar attributes as demand nodes. Arcs of the network represent potential assignments between supplies and demands.

Highly detailed information obtained from current USMC databases is used to specify the attributes of the nodes. These attributes are used to decide which officer/billet arcs are allowed in the network. These attributes also govern the arc cost function, which incorporates a hierarchy of objectives: unit fill, billet fit, relocation cost and unit turbulence.

The model is trebly decomposed with the most time-critical billets optimized first and the least critical last. The three optimizations with appropriate intervening data revisions are conducted in a single model run.

Master of Science in
Operations Research
September 1987

Advisor: R.E. Rosenthal
Department of
Operations Research

A COMPARISON OF PROJECTION METHODS IN THE FORECASTING OF OVERHEAD COSTS FOR SEVEN GOVERNMENT AEROSPACE CONTRACTORS

Christopher P. Schnedar
Lieutenant Commander, United States Navy
B.B.A.S., University of New Mexico, 1977

This thesis compares three types of models developed to predict overhead costs for seven government aerospace contractors. The methodologies utilized to develop the models include generalized least squares, univariate Box-Jenkins, and multivariate Box-Jenkins procedures. The results of those models are compared using three measures of effectiveness: correlation coefficient between actual and predicted values, root mean squared error divided by the mean of the actuals, and mean absolute percentage error (in percent). As was expected, the univariate Box-Jenkins method produced short term forecasts which were superior to those of the least squares regression models. However, the regression forecasts were highly accurate and were considerably less expensive to obtain. Only one multivariate Box-Jenkins model could be developed. The results of this model were marginally superior to the related regression model and significantly inferior to the univariate Box-Jenkins model for the same contractor.

Master of Science in
Operations Research
September 1987

Advisor: D.C. Boger
Department of
Operations Research

[illegible] SIMULATION OF AN AIR DEFENSE SCENARIO

Klaus Schuster
[illegible] Federal Republic of Germany Air Force
[illegible] Informatik (FH) der Elektrotechnik
[illegible] Schule der Bundeswehr, Munich, 1978

This paper presents the development of an animated graphical [illegible] simulation of an air defense scenario. In particular, the air [illegible] consists of a variable number of attackers, pictured as airplanes and a variable number of defenders, pictured as air defense artillery units. The simulation allows choosing between two different [illegible] algorithms. Protocol 1 simulates a random target assignment, where every defender selects a target at random to shot at. Protocol 2 simulates a controlled target assignment, where the defenders are assigned to a target and continue to track the target until a fire is made. The simulation is written in BASICA, uses an IBM [illegible] graphics display and requires a color monitor and a color [illegible]

[illegible]

[illegible] Department of
Operations Research

DIVER ACTIVE THERMAL PROTECTION SYSTEM

Steven B. Seigel
Lieutenant, United States Navy
B.S., Old Dominion University, 1978

Engineering and physiological concepts were combined to design a closed circuit liquid transport heat distribution system controlled by the Naval Special Warfare (NSW) combat swimmer. The Diver Active Thermal Protection System (DATPS) is designed to be a non-tethered diving suit which supplements the diver's heat loss in 32° F water temperature for up to six hours. A computer program serves as a controller to examine specific temperature parameters and perform calculations to keep the diver comfortable. A proof-of-concept design and physiological model are presented. These are used to verify and predict thermoregulatory heat transfer for NSW divers in extreme cold water environments for extended durations.

Master of Science in
Operations Research
March 1987

Advisor: D.E. Neil
Department of
Operations Research

EVALUATION OF MULTI-LEVEL SUPPORT STRUCTURE REQUIREMENTS FOR NEW WEAPON SYSTEMS

Rainer Seth
Captain, Federal Republic of Germany, Army
M.S., Fachhochschule des Heeres, Darmstadt, 1975

This thesis presents a computer program, CAESAR, for IBM XT/AT or compatible computers to compute the logistics demand of a new system in terms of manpower and supply.

CAESAR, (Computer Aided Evaluation of Supply and support on All Repair levels), uses inputs such as weapon system distribution, system characteristic data and major unit data to provide conclusions about the logistics behavior of failing weapon systems.

The modelling of system behavior with CAESAR has several advantages over the empirical approach. It can be utilized at any major unit level, and it can be used to simulate repair part consumption of weapon systems prior to their introduction into the Armed Forces.

CAESAR is not an optimizer. Instead it is an evaluator to be used to assist decision making. It facilitates the examination of various logistics tradeoffs. Thus, it can be a valuable tool for managers responsible for introducing new equipment and for defining the accompanying support network.

Master of Science in
Operations Research
September 1987

Advisor: F.R. Richards
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Operations Research

A PILOT STUDY ON THE APPLICABILITY OF VARIANCE REDUCTION TECHNIQUES TO THE SIMULATION OF A STOCHASTIC COMBAT MODEL

Curtis Smith
Captain, United States Army
B.S., United States Military Academy, 1978

This thesis investigates the applicability of VRTs to the simulation of stochastic combat models. Ways of measuring the efficiency of a VRT are explored. Antithetic variates and stratified sampling are applied to the simulation of a trivariate Markovian combat model. Means of programming the antithetic variates and stratified sampling to reduce the inherent variability of uncertainty in the output data of the model are illustrated. Response surface regression models are used to characterize the performance of the antithetic variates and stratified sampling in the Markovian combat model.

Master of Science in
Operations Research
September 1987

Advisor: D.P. Gaver
Department of
Operations Research

AN INVESTIGATION OF THE COMMANDER'S INDEPENDENT THERMAL VIEWER PERFORMANCE USING GLIMPSE DETECTION MODELING

Myron A. Spears, Jr.
Major, United States Army
B.S., United States Military Academy, 1976

This thesis studies the performance of the Commander's Independent Thermal Viewer (CITV) using glimpse detection modeling. A glimpse model simulates the current tank detection capability and is compared to detection data from the Antiarmor Systems Detectability Study, Phase II. Following a discussion of the effects of increased fields of view on detection probability and glimpse time, a CITV model is developed that adds a second sight to the current configuration simulation. The CITV model is studied with 1000 and 1500 meter targets under day conditions and 1000 meter targets under night conditions using two employment techniques (split and aligned). The issue of what benefit the addition of the CITV to current and production tanks gives the tank crew in terms of detection and its interface to direct fire engagement is investigated. Additionally, field of view as a design criteria, and tactical employment techniques are addressed.

Master of Science in
Operations Research
September 1987

Advisor: J. Esary
Department of
Operations Research

A COMPARISON OF THE AN/GMD-1 RAWINSONDE WITH THE AN/TPQ-37 RADAR (WINDFINDER) AS THEY AFFECT BALLISTIC ARTILLERY

Gary L. Stipe
Major, United States Army
B.S., Montana State University, 1975

This thesis is an examination of using a fielded doppler shift radar, specifically the AN/TPQ-37 (FIREFINDER), to gather wind signature data for use in ballistic artillery calculations. Stale rawinsonde data and current radar gathered data are compared to current rawinsonde data as they affect the artillery probability of kill P(k) against a point target. Graphical results as well as parametric and non-parametric tests are used to determine any statistical differences in the results of the tests. Final recommendations include continued research, as well as a physical test firing to compare the accuracy of the two systems.

Master of Science in
Operations Research
March 1987

Advisor: E.B. Rockower
Department of
Operations Research

A MODEL OF F-14 OPERATIONS FOR THE NAVAL POSTGRADUATE SCHOOL LOGISTICS WAR GAME

Jeffrey B. Taub
Lieutenant, United States Navy
B.S., Cornell University, 1980

This thesis is a continuation of the development of the Naval Postgraduate School Logistics War Game (PROLOG) in the area of readiness and availability of aircraft on a deployed aircraft carrier (CV). F-14 flight operations and maintenance actions are modeled so as to continuously provide the player with a realistic number of ready and available fighter aircraft. The models have been coded into FORTRAN 77.

Master of Science in
Operations Research
September 1987

Advisor: M.L. Mitchell
Department of
Operations Research

not necessarily increase with increasing number of observers. All of the above results assume that the Variance-Covariance properties of the observers are known.

Master of Science in
Operations Research
September 1987

Advisors: D.P. Gaver
P.A. Jacobs
Department of
Operations Research

ENHANCING AND EVALUATING SONAR DETECTION PERFORMANCE THROUGH SIGNAL INJECTION ABOARD FLEET BALLISTIC MISSILE SUBMARINES: A PILOT PROGRAM

Ross D. Telson
Lieutenant, United States Navy
B.S., Auburn University, 1979

The feasibility and potential value of a program seeking to enhance and evaluate performance of U.S. Fleet Ballistic (FBM) Submarine Sonar Operators is investigated. Implications of related literature and programs with similar goals are summarized. A Pilot Synthetic Target Signal Injection (STSI) program is designed, implemented, and evaluated aboard eight FBMs. Empirical data, participant observations and their assessments are analyzed and summarized. Two primary conclusions are drawn.

First, STSI is feasible. An STSI program can be implemented aboard AN/BQR-T4 trainer-equipped submarines without modifying current equipment, altering standard operating practices, hazarding ships, or overburdening crews.

Secondly, the potential benefits outweigh the costs of implementing an STSI program. Current laboratory research and theory strongly suggest that signal injection will markedly improve operator performance. Many of the participants surveyed reported improvements in performance although most noted no noticeable change and some claimed a slight reduction. Empirical data analysis showed marked detection performance variations between target signal injections, but could not clearly attribute those variations to a particular treatment such as operator, time of day, ship, etc. In the absence of baseline data, empirical analysis from this pilot study could not be used to support observations that signal injection improved sonar operator performance, nor could an independent analysis of two of the ships by the SSBN Sonar and Command and Control System Evaluation Program.

Master of Science in
Operations Research
September 1987

Advisors: J.N. Eagle
D.P. Gaver
Department of
Operations Research

THE NAVAL WARFARE GAMING SYSTEM AND PASSIVE SONAR DETECTION MODELS

Thomas J. Thomas, Jr.
Lieutenant, United States Navy
B.S., Villanova University, 1980

This thesis provides descriptions of the passive sonar detection models of the Naval Warfare Gaming System (NWGS) and a proposed Enhanced Naval Warfare Gaming System (NWGS). The Encounter Definite Range Law model in the proposed ENWGS is a "cookie cutter" passive sonar detection model with a random detection range which accounts for the effect of signal excess fluctuations. Three passive sonar detection models are presented that provide alternative ways to account for signal excess fluctuations.

Master of Science in
Operations Research
September 1987

Advisor: R.N. Forrest
Department of
Operations Research

ANALYSIS OF THE FEASIBILITY AND DESIRABILITY OF A SINGLE-PILOT LIGHT HELICOPTER, EXPERIMENTAL, (LHX)

John M. Tomkovich, Jr.
Captain, United States Army
B.S., United States Military Academy, 1978

The United States Army will need to replace its fleet of aging and technologically obsolete helicopters in the near future. Current plans call for the UH-1 utility, the OH-58 Observation/Scout, and the AH-1 Attack helicopters to be replaced by a light family of helicopters (LHX) with a shared basic frame and drivetrain. The mission equipment would be varied to create a Scout and Attack (SCAT) version and a utility version. In order to conserve resources it is planned that the LHX will have only one crewstation--the pilot's. This paper analyzes the feasibility and the desirability of the single-pilot proposal. The analysis is limited, however, by a lack of empirical data, so that the conclusions are opinionated.

Master of Science in
Operations Research
September 1987

Advisor: D. Neil
Department of
Operations Research

A STATISTICAL MECHANICS MODEL OF [illegible]

Stephen C. Upton
Captain, United States Marine Corps
B.S., University of Idaho, 1978

The purpose of this thesis is to model a [illegible] modern methods of nonlinear nonequilibrium [illegible] initial development of methods [illegible] decision aid to the commander in force planning [illegible] budgeting decisions, doctrinal evaluations, and [illegible] general method is developed and [illegible] scenario using the combat variable [illegible] to a functional form (a Lagrangian) [illegible] probability distribution [illegible] likelihood fit is obtained [illegible] algorithm. The [illegible] associated with [illegible] described [illegible] distributions [illegible] integrals.

AN APL WORKSPACE FOR CONDUCTING NONPARAMETRIC STATISTICAL INFERENCE

Wayne Franz Vagts
Lieutenant Commander, United States Navy
B.S., University of Notre Dame, 1975

This thesis oontains programs written in APL and documentation for performing certain nonparametric tests and computing nonparametric confidence intervals. These methods of inference are particularly useful in dealing with Department of Defense related problems as illustrated in the several military examples worked in Appendix C. The following nonparametric tests are considered: Sign Test, Wilcoxon Signed-rank Test, Mann-Whitney Test, Kruskal-Wallis Test, Kendall's B, Spearman's R, and Nonparametric Linear Regression. The tests are based on the exact distributions of the respective test statistics unless a large sample approximation is determined to provide at least a three decimal place accuracy. The software consists of two APL workspaces; one, which is designed for microcomputers (IBM PCs or compatibles) and is menudriven, and the other, without menus, is designed for the mainframe computer (IBM 3033) at the Naval Postgraduate School.

Master of Science in
Operations Research
June 1987

Advisor: T. Jayachandran
Department of
Mathematics

A TANK DISTRIBUTION MODEL FOR THE UNITED STATES ARMY

John A. Van Grouw
Captain, United States Army
B.S., United States Military Academy, 1980

The U.S. Army must plan for the future distribution of the worldwide tank fleet, as well as react to requirements which dictate changes to the current fielding plan.

Determination of the distribution for a given production level in a single time period is modeled as an integer program. The optimization approach is to maximize the worldwide effectiveness of the fleet, subject to applicable subjective and objective fielding constraints. The application of the single-period model to solve the multi-period distribution problem is also developed.

A FORTRAN 77 computer program implements the integer formulation, using the X-System as a solver on the IBM 3033AP. The General Algebraic Modeling System (GAMS) software package is used to implement the same formulation on both the IBM PC and the IBM 3033AP mainframe computer.

Master of Science in
Operations Research
March 1987

Advisor: R.E. Rosenthal
Department of
Operations Research

ANALYSIS OF INTELLIGENCE AND ACADEMIC SCORES AS A PREDICTOR OF PROMOTION RATE FOR U.S. ARMY NONCOMMISSIONED OFFICERS

Jerry B. Warner
Captain, United States Army
B.S., United States Military Academy, 1976

This thesis systematically and comprehensively analyzes available personnel data to determine if a significant relationship exists between measures of intelligence and academic performance, and career promotion rate for Noncommissioned Officers. Forty thousand Noncommissioned Officer (NCO) records are analyzed to determine this, using three approaches.

The first approach is a sequential procedure which progresses from analysis of individual variables through multivariate regression models. The second approach focuses on analysis of NCO's who scored in the top three percent of promotion rate. The third approach uses more advanced statistical techniques, including the use of principal components and factor analysis, to better identify the most influential explanatory variables.

During the analysis, eight measures of intelligence and academic ability are used as explanatory variables. Four control variables are included in the analysis to discriminate between subgroups of NCO's. They are: sex, career field, race, and paygrade.

Throughout the analysis considerations [illegible] accession policy is included. [illegible] elimination of some special groups which [illegible] significantly different [illegible] example of this was [illegible] duty.

This study finds that [illegible] show that an increasing [illegible] score and prior [illegible] higher promotion rate[illegible] performance testing [illegible]

However, there is significant variance associated with the explanatory relationship. As a result, a useful predictive model could not be designed using regression methods. Although the model could predict promotion averages for major population subcategories, it is unreliable when used solely with the AFQT variable.

The findings of this study suggest two policy recommendations. The first recommendation is a confirmation of the constraints placed on AFQT category and high school diploma status by the 1984 Defense Authorizations Act. The second recommendation is to require promotion boards to consider NCO schooling level and performance test scores in their proceedings, but to avoid directly tying either score to promotion, in terms of a minimum quota or scaled promotion point scale.

Finally, a suggestion is given for further research to investigate the underlying reasons for different attrition patterns observed among racial and ethnic groups.

Master of Science in
Operations Research
June 1987

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

THE IMPACT OF DEPLOYMENT RATES ON THE EFFECTIVENESS OF STRATEGIC DEFENSES

Frederick W. Weber, Jr.
Captain, United States Army
B.S., United States Military Academy, 1977

The effectiveness of a Ballistic Missile Defense layer of Space-Based Kinetic Kill Vehicles is examined relative to a threat with increasing numbers of Fast-Burn Boosters over the years 1994-2004. A methodology for evaluating Ballistic Missile Defense layer effectiveness and required deployment rates over time is developed.

Master of Science in
Operations Research
September 1987

Advisor: E.B. Rockower
Department of
Operations Research

RANDOMIZATION AND ALTERNATIVE TESTS

Christopher C. Whitehead
Lieutenant, United States Navy
B.S., University of Texas, 1978

General randomization test procedures and their applicability as practical tests of significance are discussed. Specific procedures are detailed for the two sample comparison of means and the one-way analysis of variance. Three [illegible] studied. The robustness and power of these specific randomization tests are examined and compared against parametric, nonparametric and approximate randomization test alternatives. Selected test conditions include various sample sizes, continuous and discrete sampling distributions, and various approximate randomization test sample sizes. Results of the simulation indicate that randomization and approximate randomization tests are as robust and powerful as parametric tests and more robust and powerful than comparable nonparametric tests. Furthermore, the results imply that parametric and approximate randomization tests may provide excellent alternatives to randomization tests when exact randomization tests may be infeasible.

Master's Thesis
Operations Research
December 1982

Department of
Operations Research

REGRESSION MODELS OF QUARTERLY INDIRECT LABOR HOURS FOR NARF ALAMEDA

Michael R. Woodward
Lieutenant Commander, United States Navy
B.S., California State College, Stanislaus, 1976

Since overhead costs for indirect labor account for a large percentage of the Naval Air Rework Facility's (NARF) total budget, it is essential that management be able to predict these costs accurately. The research performed in this thesis uses data from the major cost centers which comprise NARF Alameda. Regression models of their indirect labor to be used for forecasting purposes are developed. Quarterly data are used in the analysis, requiring transformation of the data to eliminate the effects of autocorrelation. The Durbin-Watson test is used to check for the effects of first-order autocorrelation and Wallis' test is used for fourth-order autocorrelation. Once the effects of autocorrelation are eliminated, excellent structural results are obtained for twelve of the thirteen cost centers of interest. Predictive analysis performed using withheld data show the final models can be expected to yield reliable forecasts.

Master of Science in
Operations Research
September 1987

Advisor: D.C. Boger
Department of
Administrative Sciences

[illegible] POSSIBLE EXPRESSION TO [illegible]
[illegible] APPLICATION DATE

[illegible] Yesin
Lieutenant JG, Turkish Navy
[illegible] British Naval Academy, 1980

[illegible] approaches, factors and applications to [illegible] regression techniques pointed to the estimation of officer [illegible] [illegible] [illegible] that the result [illegible] [illegible] into aspects of the linear [illegible] [illegible] tenable. This does the direction [illegible] [illegible] be approximated and [illegible] [illegible] optimum' quantities.

1632

MASTER OF SCIENCE

IN

PHYSICS

633/634

SOURCE REGION EMP FROM SURFACE BURSTS

David B. Barrett
Lieutenant Commander, United States Navy
B.A., Texas Tech University, 1975

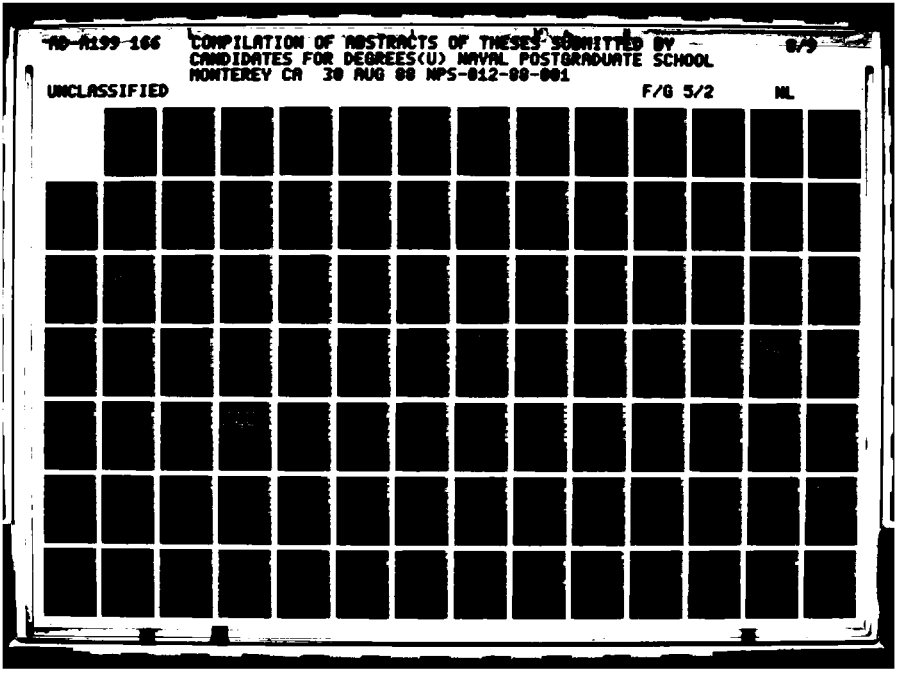
A BASIC program is developed for the IBM PC computer to aid in the analysis of source region EMP from surface nuclear detonations. The program allows input of critical parameters, and produces graphical displays of the time histories of the prompt gamma source pulse, the Compton current, the air conductivity, the radial E field, and the azimuthal B field.

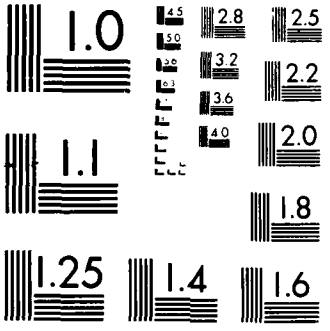
Master of Science in
Physics
June 1987

Advisor: K.E. Woehler
Department of
Physics

AD-A199 166 COMPILATION OF ABSTRACTS OF THESES SUBMITTED BY CANDIDATES FOR DEGREES(U) NAVAL POSTGRADUATE SCHOOL MONTEREY CA 30 AUG 88 NPS-012-88-001 8/9

UNCLASSIFIED F/G 5/2 NL





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

LASER REFLECTANCE AS A FUNCTION OF ROUGH WATER GLITTER PROFILE

Carlton M. Bourne
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1975

A new remote sensing technique was developed for predicting the expected mean laser radar return from a rough water surface. This technique involved measuring the standard deviations of the upwind and crosswind profiles of the elliptical glitter patterns occurring for illumination of the water surface with a point source near the laser radar system. A pencil beam laser radar from a companion project simultaneously measured the reflected signals from the water surface. The glitter pattern images were recorded with a video camera and recorder. The images for each run were later digitized along their major and minor elliptic axes and averaged over 256 images to produce smooth intensity curves from which the standard deviations were measured. The radar return fluctuated over a large range because of the rapid variation of individual water surface facets, and so was recorded and time-averaged over the same interval as the video images. Data sufficient for empirical prediction of the mean laser return signal were obtained. This is necessary to permit evaluation of the performance of a given laser radar design. The data obtained also approximated the predictions of a new model proposed in this work.

Master of Science in
Physics
March 1987

Approved: _____

A REPORT ON THE EFFECTS OF NEUTRON IRRADIATION OF GAAS SEMICONDUCTORS

John K. Callahan
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1973

The effects of neutron irradiation in GaAs MMICs and small signal FETs were investigated. Carrier concentration and mobility were measured as a function of fluence, doping, and channel depth. The individual components of the MMICs were also measured. Device degradation was determined to be the result of a combination of decreases in carrier concentration and mobility in the FETs. Radiation hardness levels based on 20% degradation in gain and drain current were determined.

Master of Science in
Physics
June 1987

Advisors: J.R. Neighbours
W.T. Anderson
Department of
Physics

DIFFRACTION RADIATION FROM RELATIVISTIC ELECTRON BUNCHES

Michael James Gallet
Lieutenant, United States Navy
B.S., United States Naval Academy, 1981

Diffraction radiation is that electromagnetic energy which is caused by a relativistic charged particle passing through an aperture in an opaque material. Ter-Mikaelian solved for the diffraction radiation from a point charge. This paper discusses the phenomena resulting from finite, relativistic charge bunches.

Using the Huygens-Fresnel principle, diffraction patterns from spherical and cylindrical charge distributions are found and plotted. For charge bunch sizes less than the radiation wavelength, the results are almost identical to those for point charges.

The radiation pattern is composed of two regions. The "transition region" is characterized by a strong peak at $\theta = \gamma^{-1}$, the Lorentz factor. The "diffraction region" consists of a series of peaks and nulls in field strength typical of the standard plane wave diffraction pattern.

Master of Science in
Physics
December 1986

Advisor: F.R. Buskirk
Department of
Physics

OPTICAL CHARACTERIZATION OF LITHIUM PLASMA PRODUCED BY LASER IRRADIATION

Bruce A. Roselton
Lieutenant, United States Navy
B.S., University of Nebraska, 1979

Solid lithium deposited on stainless steel (SS) was irradiated by a CO_2 laser at 10.6 μm and by a dye laser tuned to 666.4 nm and to the first resonance line of lithium, 670.8 nm. Type 316 SS surfaces were irradiated by a dye laser at 670.8 nm. Power densities ranged from <0.1-9.4 MW/cm^2. Optical information from the lithium plasma produced was evaluated using Stark broadening analysis to determine the plasma density, which varied from $2 \times 10^{16}/cm^3$ to over $10^{17}/cm^3$. Lithium and SS surfaces were observed by an SEM before and after irradiation, and evidence of ripplar structures found on both surface types.

[illegible]

[illegible] E.R. Schwinzke
Department of
Physics

G.C. Tisone
Sandia National
Laboratories

SPUTTERING OF CHEMISORBED NITROGEN FROM THE (100) PLANES OF TUNGSTEN AND MOLYBDENUM: A COMPARISON OF COMPUTER SIMULATION AND EXPERIMENTAL RESULTS

Philip Jay Mattson
Captain, United States Army
B.S., Oregon State University, 1977

The Naval Postgraduate School simulation model, QDYN86, was used to examine sputtering of nitrogen from the (100) faces of single crystals of molybdenum and tungsten. The nitrogen placement was varied, and analyses were conducted on the sputtering cross sections of the nitrogen. The cases where the adatom was directly hit by the incident ion, or if it was sputtered due to the collision cascade process, were analyzed separately. The simulations were conducted to compare the results with Winters' recent work, and to build upon the efforts of earlier studies completed at the Naval Postgraduate School. It was found that placement of nitrogen at 0.245 A from the surface of molybdenum resulted in cross sections similar to those found by Winters. The effect of the mass of the substrate was verified, in that a substrate of greater mass results in a higher sputtering cross section. This agreed with Winters' findings, and conflicted with earlier conclusions of past theses. The adatoms apparently reduce the momentum available to create collision cascades, reducing the sputter yield ratio of the substrate when the ions directly hit the adatoms.

Master of Science in
Physics
December 1986

Advisor: D.E. Harrison
Department of
Physics

SURFACE POLARITON RESONANCES AND REFLECTANCE ON A BIGRATING

John Gary Melendez
Lieutenant, United States Navy
B.S., University of Alabama, Birmingham, 1978

A first order perturbation theory for treatment of the diffraction of light with surface polariton resonances on a bigrating has previously been developed and implemented. A modification has since been developed to include simultaneous resonant coupling to four surface polaritons. This work implements the modification and compares the results against exact theory.

Results for reflectance versus angle of incidence were obtained for a sinusoidal bigrating of silver with a period of 615.47 nm and an incident wavelength of 633.00 nm. The perturbation theory is found to be valid at off-normal incidence for grating height to period ratios of 0.024 and less. For the geometry investigated, second order effects strongly influence the reflectance versus incidence angle near normal incidence, and the perturbation theory thus has only limited usefulness. Results for reflectance versus incident frequency at normal incidence, however, are reliably predicted by the perturbation theory.

Master of Science in
Physics
June 1987

Advisor: N.E. Glass
Department of
Physics

A MOLECULAR DYNAMICS SIMULATION STUDY OF SMALL SCALE SURFACE DEFECTS UPON ATOM EJECTION PROCESSES

Gregory Miller
Lieutenant, United States Navy
B.S., Carnegie-Mellon University, 1976

A molecular dynamics simulation has been used to investigate the sensitivity of sputtering processes, from a single-crystal target, to surface roughness (in the form of single and multiple surface vacancies and clusters). A Cu(111)/Ar+ system was examined for normally incident beams of energy 100 eV and 1 keV, using a modified Moliere/Morse two-body potential function. Comparisons are made between the effects of vacancies and clusters on sputtering yields, ejection times, layer yield curves, and ejected atom energy and angular distributions. Clean surface results are compared to those of a Born-Mayer/Morse potential [illegible]. It is found that the effects of vacancies [illegible] surface vacancy concentration density of 0.015% vacancies/A² [illegible] 300 eV [illegible] yield. The choice of the potential [illegible] properties to the same degree as the [illegible] could on quantitative results [illegible].

[illegible]
[illegible]

[illegible] Dr. Harrison
Department of
[illegible]

DETERMINATION OF THE ORIGIN OF SELF-PUMPED PHASE CONJUNCTION IN BARRIUM TITANATE

Thomas R. Moore
Captain, United States Army
B.S., Stetson University, 1978

When a beam of extraordinarily polarized light is directed through a poled, single crystal of $BaTiO_3$, it fans in the direction of the optic axis. This thesis research investigates the origin of this fanning, or asymmetric self-defocusing, in barium titanate. Experimental observations and theoretical simulation suggest that this phenomenon is due to near forward stimulated photorefractive scattering. Additionally, observations of unique variegated beam patterns during phase conjugation are reported, including internally pumped rings and motion invariant patterns.

Master of Science in
Physics
June 1987

Advisor: D.L. Walters
Department of
Physics

PHOTOCURRENT GENERATION FROM BASIC METALS, UTILIZING A SHORT PULSED ARF EXCIMER LASER

Thomas Jay Ringler
Lieutenant Commander, United States Navy
B.S., North Carolina State University, 1974

An excimer laser used to produce "cold" photoelectrons from common metal surfaces offers an improvement over a standard heated (thermionic) cathode electron source. Photoelectrons accelerated across an anode cathode gap were observed under both space charge limited and emission limited conditions. Temporal characteristics of the resulting electron beam showed fast rise times of 3-5 nano seconds (ns) for space charge limited and 8-12ns (full width half maximum) for emission limited cases. Spatial characteristics of the output pulse shape revealed a classic clipped peak amplitude in the space charge pulse but identical characteristics in the emission limited pulse output. Both types of emission produced large current densities up to 91 amps/cm^2. Varying the cathode metal used for the photocathode indicates Zinc (Zn) produced the largest current density, and therefore, the highest quantum efficiency in both space charge and emission limited cases.

Master of Science in
Physics
September 1987

Advisor: F.R. Buskirk
Department of
Physics

EMISSION ANGLES FOR SOFT X-RAY COHERENT TRANSITION RADIATION

Robert Michael Robinson
Lieutenant, United States Navy
B.S., United States Naval Academy, 1980

Emission angles for both coherent and incoherent transition radiation in the soft x-ray region were measured. The results clearly show that coherent transition radiation produces larger emission angles at high beam energies than does incoherent radiation. These results allow the possibility of using coherent transition radiation to measure higher electron beam energies than are possible using incoherent radiation approximations. The measured emission angle magnitudes are compared to theoretical values obtained using computer simulation. Differences are noted and possible sources of error are cited.

Master of Science in Physics
September 1987

Advisor: J.R. Neighbours
Department of Physics

SIMPLE LASER-DRIVEN, METAL PHOTOCATHODES AS COLD, HIGH CURRENT ELECTRON SOURCES

Jimmy Dale Saunders
Lieutenant Commander, United States Navy
B.S., University of Mississippi, 1976

Recent developments in excimer laser design have made near ultraviolet light intensities of several megawatts per square centimeter possible in unfocused beams. These advances and recent experiments indicate that high-current, simple-metal photoemissive electron guns are now feasible. Such guns should produce greater than 50 Amps per square centimeter of illuminated cathode surface. Additionally, these guns could operate at vacuums of 10^{-6} torr with no complicated system components inside the vacuum enclosure. The electron beam produced by such photoemission guns would have a very low emittance and high brightness. This beam would also follow closely the temporal characteristics of the laser pulse, making fast risetime, ultra-short electron beam pulses possible.

Master of Science in Physics
December 1986

Advisors: F.R. Buskirk
D.C. Moir
Department of Physics

DEVELOPMENT OF AN ACOUSTIC ECHOSOUNDER FOR DETECTION OF LOWER LEVEL ATMOSPHERIC TURBULENCE

Frank Joseph Weingartner
Lieutenant, United States Navy
B A., Northwestern University, 1981

Atmospheric density fluctuations induce phase perturbations that degrade the spatial coherence of a laser beam propagating through the atmosphere. These degradations spread the laser beam and alter the centroid and intensity profile stochastically. Turbulent conditions arising from various environmental situations and meteorological phenomena are found at virtually all levels of the atmosphere. A substantial fraction of the optical turbulence along a vertical path arises from the surface heat flux within the first 100-200 meters above the ground.

This thesis seeks to measure and analyze these turbulent layers. A high frequency acoustic echosounder was developed to analyze atmospheric turbulence within the first 100-200 meters above the ground with extremely high accuracy. The echosounder design incorporated a 25 element, square, planar array housed within a lead and foam insulated, acoustic shroud. This acoustic echosounder was employed to collect real-time, low level atmospheric data at two sites. This data should prove useful in determining whether the performance of laser and electro-optical systems could be increased by raising sensors and transmitters well above the local turbulent layer through the use of towers or other such structures.

Master of Science in
Physics
June 1987

Advisor: D.I. Walters
Department of
Physics

ENERGY DISTRIBUTION OF CERENKOV RADIATION FOR FINITE FREQUENCY INTERVALS

Thomas M. Wilbur
Lieutenant, United States Navy
B.S., Pennsylvania State University, 1978

The equation defining the energy radiated per unit solid angle due to Cerenkov radiation is analyzed in detail, including the effects of all equation variables for a hypothetical electron accelerator experiment. Specifically, various finite frequency intervals are used in an effort to determine the optimum means of determining the details of a charge bunch in a high energy electron accelerator. In particular, it is shown how narrowband measurements as a function of angle may yield information on both the beam path length and the bunch charge parameters. As an aid to the analysis, an interactive Fortran program is presented that allows for any specific experimental parameters, with options for various output types as desired.

Master of Science in Physics
June 1987

Advisor: J.P. Neighbours
Department of Physics

DEVELOPMENT OF A DATA ANALYSIS SYSTEM FOR THE DETECTION OF LOWER LEVEL ATMOSPHERIC TURBULENCE WITH AN ACOUSTIC SOUNDER

Michael Raymond Wroblewski
Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1980

Atmospheric density fluctuations induce phase perturbations that degrade the spatial coherence of a laser beam propagating through the atmosphere. These degradations spread the laser beam and alter the centroid and intensity profile stochastically. Turbulent conditions are found at virtually all levels of the atmosphere. A substantial fraction of the optical turbulence along a vertical path arises from the heat flux between the atmosphere and the earth's surface. This type of turbulence is typically within the first 100 to 200 meters above the surface.

During this thesis research, a high frequency acoustic sounder was developed to analyze this turbulent layer. The primary focus was the development of the command and control software required to coordinate the data collection and reduction.

The system was used at two sites and should prove useful in quantifying the effects of optical turbulence within the surface boundary layer on laser and optical system performance.

Master of Science in Physics
June 1987

Advisor: D.L. Walters
Department of Physics

ANGULAR DISTRIBUTION OF TRANSITION RADIATION IN THE SOFT X-RAY SPECTRUM

Chang-Ho Yim
Major, Republic of Korea Army
B.S., Republic of Korea Military Academy, 1975

The angular distribution of transition radiation has been investigated theoretically and experimentally. The theoretical prediction and the computer graphic analysis are presented in families of plots which illustrate the dependence of the intensity on the emission angle. Although the experimental method used had limited resolution, the optimum cone angles of the x-ray radiation were in agreement with the theoretical values. Problems encountered during the experiment are discussed for continuing work. This work may have several important applications in electron beam diagnostics. These include monitoring of the beam emittance and energy.

Master of Science in
Physics
December 1986

Advisor: J.R. Neighbours
Department of
Physics

FREQUENCY SPECTRUM OF SOFT X-RAY EMISSION FROM TRANSITION RADIATION

Seog Koo Yoon
Major, Republic of Korea Army
B.S., Korean Military Academy, 1978

The absolute differential production efficiencies from foil stack materials for an electron-beam energy of 65 MeV were measured. The spectra shapes and the absolute differential production efficiencies for each of the four foil stacks are well matched by the calculated values. The transition radiation cone was measured using a motor-driven detector. The measured apex angle is in agreement with the optimum radiation cone angle. Aluminum bandwidth narrowing associated with K-edge absorption was observed. The production intensity was compared with the theoretical prediction and interpreted in terms of absorption and coherence.

Master of Science in Physics
December 1986

Advisor: J.R. Neighbours
Department of Physics

653 1654

MASTER OF SCIENCE

IN

SYSTEMS TECHNOLOGY
ANTISUBMARINE WARFARE
(ASW)

655/656

APPLICATION OF AUDIO SIGNAL PROCESSING TO IMPROVE SONAR OPERATOR PERFORMANCE THROUGH AURAL SENSORY INPUT

David John Alexander
Commander, United States Navy
B.S., United States Naval Academy, 1969

An experiment was conducted to determine the potential effectiveness of some audio signal processing techniques on improving sonar operator performance through aural sensory input. Analysis of the experimental data provides insight into the benefit of aural enhancement in a surface ship environment.

A review was conducted of the characteristics of the human auditory system to determine which sensitivities are most compatible with audio signal processing techniques. Recommendations are provided for specific signal processing techniques which may complement the human auditory system.

Master of Science in
Systems Technology
(Antisubmarine Warfare)
March 1987

Advisors: D.E. Neil
R.N. Forrest
Department of
Operations Research

A HORIZONTAL SPATIAL REQUIREMENT STUDY OF THE GULF STREAM AS MODELLED BY THE IFDPE ACOUSTIC MODEL

Katherine Leann Cease
Lieutenant, United States Navy
B.A., University of Louisville, 1981

The sampling increment in horizontal spacing for a range-dependent environment was studied with respect to accurate prediction of propagation loss through a frontal system. A transmission loss model was verified by comparing its predictions with experimental data when the sampling increment was very small. A study of the effect of altering the sampling increment produced a maximum increment which retained a reasonable agreement with the prediction for very small incrementation. Sensitivity studies were performed at three source depths to determine depth dependency.

Master of Science In
Systems Technology
(Antisubmarine Warfare)
March 1987

STRESSORS AND THEIR EFFECT ON SONAR OPERATOR PERFORMANCE

Douglas Steven Dillner
Lieutenant, United States Navy
B.S., University of California, Davis, 1975

This report was motivated by a report by the Essex Corporation, Goleta, CA., for the Applied Psychology Unit, Admiralty Research Establishment, Teddington, Middlesex, U.K. The Essex Report is based on a survey of 212 royal Navy SONAR operators, in which the operators were asked to rate the relative severity of 19 stressors on their ability to function as operators. The survey results showed that several stressors were more severe overall. In this report, U.S. Navy SONAR operators are surveyed using the same methodology. Only stressors rated more severe in the Essex report were used. The survey results suggest the relative impact of the "severe" stressors on USN SONAR operators. In particular, of those "severe" stressors, all operators, regardless of platform type, chose fatigue as having the greatest impact on their performance. The survey results also include operators' comments which indicate the source of the stressor. Finally, recommendations to alleviate the stressors are offered.

Master of Science in
Systems Technology
(Antisubmarine Warfare)
September 1987

Advisor: D. Neil
Department of
Operations Research

AN ACOUSTIC BUBBLE DENSITY MEASUREMENT TECHNIQUE FOR SURFACE SHIP WAKES

Stephen Wallace Hampton
Lieutenant, United States Navy
B.S., United States Naval Academy, 1981

The Dual Frequency Pump Method of acoustically determining point by point bubble cloud densities was studied to determine the practicality of using this acoustic technique to determine bubble densities in surface ship wakes. The dual-frequency technique sound field to insonify the target bubbles. The bubbles themselves then radiate sound at the sidebands of the higher frequency. The frequency of the return sound is proportional to the bubble sizes present. The Dual Frequency Pump Method of bubble detection can differentiate and count many different-sized bubbles and is, therefore, well suited for determining ship wake bubble density distributions. The theory, considerations, experimental results, and recommendations of this thesis support the application of the dual-frequency acoustic technique to the ship wake problem.

Master of Science in
Systems Technology
(Antisubmarine Warfare)
September 1987

Advisor: A.A. Atchley
Department of
Physics

A STUDY OF THE FEASIBILITY OF USING A BURIED SONAR TRANSDUCER TO ECHO-LOCATE OBJECTS BURIED IN SEDIMENT

Roy Dale Malmberg
Lieutenant, United States Navy
B.S., University of Oklahoma, 1980

An analysis is conducted to determine the feasibility of using a buried sonar transducer to echo-locate [illegible] imbedded in sediment. The active sonar equation is examined and representative values for each term are developed which are appropriate for the sediment on the acoustic test ranges at the Naval Undersea Weapons Engineering Station, Keyport, Washington. It is found that transmission loss through the sediment limits the useful range of the proposed 10 kHz active sonar system to approximately 10 meters, thus rendering it impractical as a localization tool. Three alternative systems are proposed for further consideration.

Master of Science in
Systems Technology
(Anti-Submarine Warfare)
September 1981

Advisor: S. Baker
Department of
Physics

METHODS OF REMOTE OPTICAL ANGLE MEASUREMENT WITH COMPASS APPLICATIONS

Jeffrey Thomas Newmaster
Lieutenant, United States Navy
B.S., United States Naval Academy, 1979

Three fiber optic sensor systems designed to remotely determine angular position are described. Two of the systems use a sheet polarizer affixed to a "codewheel" and the third system uses a two-channel digital shaft encoder style "codewheel".

The first polarization scheme uses four optical channels, two of which are analog and two digital. The ratio of the two analog channel intensities yields $\tan^2 \theta$. The four-fold quadrant ambiguity is resolved by the two digital channels which are transected by two semicircular masks on the polarizer codewheel [Ref. U.S. Patent #4,577,414, 25 Mar 1986]. The second polarization scheme again uses quadrant ambiguity masks but only one analog channel which simulates a polarization vector which oscillates through 90°. The oscillating vector is produced by superimposing two sine wave modulated beams at the polarizer codewheel. The modulations of the two beams have a phase difference which is created by time delaying one of the beams in a fiber delay loop. The phase difference between the generated composite signal and electronic reference signal then determines the angle of the codewheel. It was demonstrated experimentally that this type of split analog/digital scheme has a resolution equivalent to a 10-bit digital system (i.e. $\pm 0.35^{\circ}$).

The digital shaft encoder scheme uses only two digital channels and a codewheel which has two concentric masks with 48 equally spaced windows offset with respect to each other by one-half window width. At 0° there is a unique mask which initializes an up/down decoder chip [Hewlett-Packard HCTL-2000]. This system has a resolution better than 7 bits. A magnetic heading sensor based on this third system was constructed and tested.

[illegible] applications of fiber optic systems to radiation sources, fibers, sensors, splices, couplers, WDMs, polarizers, detectors, and signal [illegible] are compared.

ANALYSIS OF ACOUSTIC REVERBERATION ON THE UNDERWATER WEAPONS TEST RANGES AT THE NAVAL UNDERSEA WARFARE ENGINEERING STATION, KEYPORT, WASHINGTON

Orlin H. Nieman
Lieutenant, United States Navy
B.S., United States Naval Academy, 1981

The purpose of this work is to examine the feasibility of applying room acoustic reverberation measurement techniques to the study of reverberation in the underwater ranges operated by NUWES. This report explains the limitations and discusses the difficulties encountered in applying the ASTM technique underwater. No acoustic reverberation was discernable at the Nanoose Range which may have resulted from insufficient signal excess due to ambient noise. Reverberation at Dabob Bay was readily discernable and measureable. Reverberation decay rates are listed for illustration and reference. This demonstrates that with modifications for use in water, ASTM room acoustic reverberation techniques may be applied to certain bodies of water.

Master of Science in
Systems Technology
(Antisubmarine Technology)
March 1987

Advisors: O.B. Wilson
H.A. Dahl
Department of
Physics

MASTER OF SCIENCE

IN

SYSTEMS TECHNOLOGY COMMAND, CONTROL AND COMMUNICATIONS (C3)

665/666

A SOFTWARE ARCHITECTURE FOR A COMMANDER'S DISPLAY SYSTEM

Rodney M. Adams
Lieutenant, United States Navy
B.S., United States Naval Academy, 1981

One of the main tasks of a command and control system is to present commanders with a basis for completing his tactical situation. A system that transforms a large volume of data into a comprehensive picture that can then be used for situations assessment can aid the commander's decision making process. A system capable of performing this task has, until recently, required the dedication of vast amounts of computer resources.

This report suggests a structure for a commander's display system that relies on recent advances in computational power in the form of a small, high-powered, dedicated graphics system. A prototype system is included as part of the research effort.

Master of Science in
Systems Technology
(Command, Control and
Communications)
March 1987

Advisor: M.J. Zyda
Department of
Computer Science

APPLICABILITY OF ARMY AUTOMATION SECURITY GUIDANCE TO LOCAL AREA COMPUTER NETWORK SECURITY

Jeffrey D. Ayes
Captain, United States Air Force
B.B.A., University of Wisconsin, Eau Claire, 1979

The U.S. Army Combat Developments Experimentation Center (USACDEC) Directorate of Information Management (DIM), Fort Ord, is currently involved with several network implementations, all at various stages of development, and wants adequate network security at an affordable price. During early stages of development they found almost no existing local area network (LAN) security guidance. This thesis does not look for a set or perfect LAN guidance solution, but develops a background for security considerations during the development of a network based on existing automated data processing security guidance. All Army guidance reviewed was supplied by USACDEC/DIM; all other (DoD, etc.) guidance was selected for review by USACDEC/DIM, but obtained elsewhere.

Master of Science in
Systems Technology
(Command, Control and
Communications)
March 1987

Advisor: [illegible]

THE ANALYSIS OF SOCIETAL WARFARE

Kevin G. Briggs
Captain, United States Air Force
B.S., United States Air Force Academy, 1979

This thesis develops an adaptive structure for analyzing problems involving sociotechnical systems in the context of societal warfare. The structure, called the Modular Analysis Process (MAP), has been designed to help solve problems that require policy and/or systems analysis approaches to evaluate. The MAP can be used to analyze the impact of alternative designs on a complex system's architecture, (say, to its doctrines, machines, procedures, organizational structure, etc.), in relationship to a scenario and mission. The MAP helps the analyst to efficiently develop cost-effective solutions to problems.

Most of the examples in this thesis pertain either to the area of command and control (C2) above the theater command level or to strategic C2.

Master of Science in
Systems Technology
(Command, Control and
Communications)
March 1987

Advisor: J.G. Taylor
Department of
Operations Research

EXAMINING THE RELIABILITY OF A HAND GEOMETRY IDENTITY VERIFICATION DEVICE FOR USE IN ACCESS CONTROL

Daryl C. Bright
Captain, United States Air Force
B.A., University of Minnesota, Morris, 1970

Controlling the access to secure government facilities has become increasingly important as these systems are entrusted with more sensitive applications. Unauthorized access could be very detrimental to our nation's security. The use of biometric measures, one of which is hand geometry, may represent a possible solution. This thesis looks at one hand geometry identification device, and determines its effectiveness as a function of the rejection threshold setting, a time lapse in use, and the construction of the reference templates. Rejection thresholds of 40, 60, 80, 100, 120, and 140; three weeks of inactivity by the test subjects; and construction of the reference templates from 1, 2, 4, 5, 6, 8, and 10 individual hand readings are examined. The application of hand geometry identification technology for protecting Command, Control, and Communications (C3) facilities is then discussed. This study uses the ID-3D Hand Geometry Identifier built by Recognition Systems, Inc. of San Jose, California. This device was very effective in producing low Type I and Type II error rates during 6300 trials covering all situations examined. This technology has great potential for protecting C3 facilities and systems.

Master of Science in
Systems Technology
(Command, Control and
Communications)
March 1987

Advisor: D.E. Neil
Department of
Operations Research

A DATABASE DESIGN FOR A MULTIMEDIA C2 WORKSTATION IN SUPPORT OF RESA

Michael F. Carroll
Captain, United States Air Force
B.A., Rutgers University, 1979

This thesis supports the Naval Postgraduate School's program to develop a multimedia (text, voice, graphics) command and control (C2) workstation as a Decision Support System to aid players of the Research, Evaluation, and Systems Analysis (RESA) facility. RESA is a Naval wargame that focuses on the battle group/force level operations and command and control decision-making. NPS will interface this workstation with the wargame to provide players the capability to access and analyze game data in order to improve their decision-making ability. The objective of this thesis is to design a data base for the C2 workstation using data extracted from the game blackboard. The design will consist of a Semantic Data Model for the logical representation of the data and a relational data base design implemented on the ORACLE Data Base Management System (DBMS). This design provides a detailed specification of the data base structure and is intended to be used during implementation of the DBMS on the workstation.

Master of Science in
Systems Technology
(Command, Control and
Communications)
March 1987

Advisor: J.S. Stewart
Joint C3 Academic Group

INVESTIGATING THE EFFECTS OF COMMAND, CONTROL, AND COMMUNICATIONS COUNTERMEASURES, (C3CM) ON THE INTELLIGENCE SUPPORT TO A CARRIER BATTLE GROUP FORCE

Lewis J. Ciochetto
Lieutenant, United States Navy
B.A., Texas A&M University, 1978

Timely, accurate, and complete intelligence information is considered a major element in the command and control of battle forces. A largely unexamined threat to the flow of this intelligence information from a national or theater level sensor to the battle commander comes from command, control, and communications countermeasures, (C^3CM), which may be used to deny a commander an accurate picture of the battlefield by using various hostile electronic and deceptive means. This thesis examines the beginnings for the development of a computer assisted war game to measure the effect of such degraded intelligence information upon the performance of a carrier battle group commander. A manual war game was developed and tested at the Naval Postgraduate School Wargaming Analysis and Research (WAR) Laboratory and used to examine whether war gaming can be considered an appropriate tool for investigating this command and control element. Analysis of the preliminary game results are provided along with recommendations for a more sophisticated computer assisted game.

Master of Science in
Systems Technology
(Command, Control and
Communications)
March 1987

Advisor: J.S. Stewart
Joint C3 Academic Group

SOVIET NAVAL COMMAND AND CONTROL - A PRIMER

Michal Ann Cox
Lieutenant, United States Navy
B.A., University of Kentucky, 1980

Wilfred Purisima Quintong
Lieutenant, United States Navy
B.S., United States Naval Academy, 1979

This thesis is designed to serve as a primer for Soviet Naval Command and Control (C2). The following topics are discussed: (1) Soviet military thought, along with the theory of the Soviet Navy; (2) Soviet political and military organization and structure; (3) structure of the five Soviet military services, with emphasis on the Soviet Navy; (4) Soviet concept of troop control; (5) Soviet military theater concepts; and (6) Soviet Naval Command and Control Structure. Additionally, appendices provide a brief overview of the following areas: (1) Warsaw Pact military structure; (2) Soviet military ranks and grades (3) Soviet Naval educational institutions; and (4) current Soviet heads of office.

Master of Science in
Systems Technology
(Command, Control and
Communications)
March 1987

Advisor: J.G. Taylor
Department of
Operations Research

BRIDGING THE GAP BETWEEN SOVIET AND AMERICAN LANGUAGES AND CULTURES: A BASIC INTRODUCTION TO TROOP CONTROL FOR THE RUSSIAN LANGUAGE TRANSLATOR

Mona Guilfoil
B.A., Smith College, 1980

This thesis discusses the nature and sources of problems facing the foreign language translator in the U.S. intelligence community--in particular, the Russian language translator--and develops the idea of CONTEXT as a solution. CONTEXT is defined as knowledge of a particular subject area from both sides of the language and cultural barrier. It attempts to integrate the vocabulary and conceptual framework of a given subject area in a foreign language and culture (such as Soviet TROOP CONTROL) with the vocabulary and conceptual framework of the subject area in a translator's native language and culture (such as American COMMAND AND CONTROL)--maintaining important differences where they exist and pointing out similarities. This integrated, dynamic body of knowledge known as CONTEXT should be applied by a translator in analyzing foreign language data. This thesis develops a very basic CONTEXT for TROOP CONTROL and COMMAND AND CONTROL (1) to demonstrate the elements and method of building CONTEXT, and (2) to provide a basic introduction for the language analyst who is new to both subject areas.

Master of Science in
Systems Technology
(Command, Control and
Communications)
March 1987

Advisor: J.G. Taylor
Department of
Operations Research

ATTRIBUTES OF A TACTICAL AIRBORNE RECONNAISSANCE COLLECTION MODEL FOR THE AIRLAND RESEARCH MODEL (ALARM)

Raymond D. Harris, Jr.
Captain, United States Air Force
B.A., Alabama State University, 1982

The objective of this thesis is to determine the form of inputs to a reconnaissance information collection module and to state attributes of a perception database generated by the resulting information-seeking activities. This will include descriptive characteristics of collection platforms involved and the subsequent intelligence information flow. Results of this thesis are intended to contribute to the ongoing determination of design specifications for the Airland Research Model (ALARM).

Master of Science in
Systems Technology
(Command, Control and
Communications)
March 1987

Advisor: S.H. Parry
Joint C3 Academic Group

AN EXAMINIATION OF THE ADVANCED COMMUNICATIONS TECHNOLOGY SATELLITE (ACTS) AND ITS APPLICATION TO THE DEFENSE DATA NETWORK (DDN)

Stephen Clark Horner
Captain, United States Army
B.S., United States Military Academy, 1976

This thesis examines NASA's Advanced Communications Technology Satellite (ACTS) with emphasis on its potential applicability to the Defense Data Network (DDN). The ACTS program is a joint NASA industry program to develop the next generation of communications satellites, thus assuring the U.S.'s continued pre-eminence in this area. The ACTS will essentially operate as a "switchboard in the sky." The thrust of the thesis is to take a broad-brush look at the system and discuss its applicability to the DoD's packet switching data network, the DDN. This thesis is written so that a technical background is not required by the reader. Applicable background information is provided where necessary. The emphasis is on the concepts involved and a discussion of the interoperability of the two systems.

Master of Science in
Systems Technology
Command, Control and
Communications)
June 1987

Advisor: D.C. Boger
Department of
Administrative Sciences

APPLICATION OF THE MODULAR COMMAND AND CONTROL EVALUATION STRUCTURE TO A STRATEGIC DEFENSE INITIATIVE COMMAND AND CONTROL SYSTEM

Gail K. Kramer
Captain, United States Air Force
B.S., United States Air Force Academy, 1982

This thesis focuses on relating a generic evaluation structure, the Modular Command and Control Evaluation Structure (MCES) to the battle management (BM) and command, control and communication (C3) issues of the Strategic Defense Initiative (SDI). To do this, the area of SDI battle management, command and control (C2), and communications is reviewed and explained as well as the MCES. This provides useful descriptive analysis required for identifying and measuring proposed BM/C3 architectures.

Master of Science in
Systems Technology
(Command, Control and
Communications)
March 1987

Advisor: M.G. Sovereign
Joint C3 Academic Group

AN INTRODUCTION TO PROBLEMS IN UNDERSTANDING AND PREDICTING SOVIET BEHAVIOR--A PSYCHOLOGICAL AND CULTURAL APPROACH

Steven G. Lauren
Lieutenant, United States Navy
B.S., George Mason University, 1977

A variety of psychological and cultural mechanisms influence the American perception of the Soviet Union. This thesis is an introduction to the underlying mechanisms of the American interpretation of Soviet behavior. It discusses the psychological mechanisms of forming impressions, beliefs and making judgments as the basis for the American tendency to misinterpret Soviet behavior. The evolution of Soviet political culture is discussed in order to further the understanding of Soviet motivations and behavior. The Soviet concept of "reflexive control," and examples of Soviet deception and disinformation, are included in the discussion of the potential implications of this misunderstanding in arms control, nuclear and chemical warfighting, and space program development.

Master of Science in
Systems Technology
(Command, Control and
Communications)
March 1987

Advisor: N.K. Green
Department of
National Security
Affairs

APPLICATION AND EXPANSION OF THE MODULAR COMMAND AND CONTROL EVALUATION STRUCTURE (MCES) AS A FRAMEWORK FOR IMPROVING INTEROPERABILITY MANAGEMENT

Shelton Lee, Jr.
Captain, United States Marine Corps
B.S., United States Naval Academy, 1977

This thesis introduces the Modular Command and Control Evaluation Structure (MCES) as a tool which the author recommends for command and control (C2) planners to use when addressing interoperability management problems. The framework of MCES is used to identify the inadequacies of the Marine Corps Technical Interface Concepts (TIC) as an interoperability management tool and provides some insight into how to better define interoperability requirements in terms of message exchange occurrences (MEOs). MEOs are the building block of interoperability, and they can be stored along with their elements of decomposition in an integrated interoperability database (IIDB) for use by C2 planners.

Master of Science in
Systems Technology
(Command, Control and
Communications)
June 1987

Advisor: M.G. Sovereign
Joint C3 Academic Group

SPEECH RECOGNITION IN A COMMAND AND CONTROL WORKSTATION ENVIRONMENT

Michael A. LeFever
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1976

This thesis investigates speech recognition in a command and control workstation environment. It discusses the Navy's need for a command and control workstation (CCWS) and the importance of the human interface design. In particular, it evaluates the performance of Stanford Research Institute International (SRI's) 1000 word discrete speech recognizer. The speech board is intended to be used in the Command and Control Multi-Media workstation being developed by SRI. Additionally, it investigates a VOTAN continuous recognizer (currently in use by research and commercial vendors) in an interactive warfare simulation game. The results indicate that speech recognition systems could increase the capability of the commander to input and access information, provide more rapid response to information desired or displayed, and enhance human interaction in the man-machine interface. Past, current, and future speech applications are discussed.

Master of Science in
Systems Technology
(Command, Control and
Communications)
March 1987

Advisor: G.K. Poock
Joint C3 Academic Group

EXAMINING THE RELIABILITY OF A RETINAL RECOGNITION DEVICE AS DATABASE SIZE AND THE NUMBER OF ENROLLMENT SCANS ARE VARIED FOR APPLICATIONS IN COMMAND, CONTROL AND COMMUNICATIONS (C3)

Anthony M. Leigh, Jr.
Lieutenant, United States Navy
B.S., University of Maryland, 1980

As the amount of sensitive information stored in databases increases due to the current trend to automate Command, Control and Communication (C3) systems, the impact of unauthorized access could be very detrimental to our nation's security. Access control hardware that uses retinal blood vessel pattern recognition may be the solution to the problem. This thesis looks at one retinal pattern recognition device and attempts to determine it's reliability as a function of the data base size stored in memory and the number of enrollment scans averaged together to form the reference template. The database sizes used consisted of 300, 600 or 1200 templates, and the reference templates tested were comprised of 3, 5 or 7 enrollment scans. The applicability of this technology for protecting C3 systems is discussed. This study employed the Eye Dentify 7.5 system developed by Eye Dentify Inc. of Beaverton, Oregon, which performed extremely well by producing a low TYPE I error rate and no TYPE II errors in over 1000 trials. This technology has potential for the protection of C3 systems.

Master of Science in
Systems Technology
(Command, Control and
Communications)
December 1986

Advisor: G.K. Poock
Joint C3 Academic Group

COMMAND AND CONTROL VULNERABILITY ASSESSMENT SURVEY GUIDE

Anthony E. Lorusso
Captain, United States Air Force
B.S., United States Air Force Academy, 1981

This thesis addresses that portion of Command, Control, Communications Countermeasures (C3CM) that deals with protecting friendly C2 capabilities from degradation by enemy Counter C3 actions. Specifically, this study establishes baseline understandings of command and control and C3CM, and then establishes guidelines to assist commanders in obtaining a complete assessment of their C2 vulnerabilities. Additionally, the developed guidelines will be employed to assess the C2 vulnerabilities of the Allied Tactical Operation Center (ATOC) at Sembach Air Base, Germany which is a NATO command and control center for offensive air operations.

Master of Science in
Systems Technology
(Command, Control and
Communications)
March 1987

Advisor: J.M. Bouldry
Joint C3 Academic Group

THE DEVELOPMENT OF VISUAL INTERFACE ENHANCEMENTS FOR PLAYER INPUT TO THE JTLS WARGAME

Stephen L. Lower
Captain, United States Air Force
B.A., Missouri Western State College, 1973

This thesis examines the design and development of a desktop prototype of a computer wargame. The prototype specifically deals with the ability to format the Joint Theater-Level Simulation's Model Interface Program (MIP) into the visual interface format of computer graphics known as window management. In this case, the Apple Macintosh microcomputer, a desktop computer, was used as the operating system for implementation of this prototype. The development of the prototype is examined with respect to the current version of the MIP. The prototype development is based on software design applications which include design models, correlation of programming languages to operating systems, and a breakdown of the design into a modular format. The thesis concludes with recommendations for changes which can enhance the use of the prototype from both a technical and managerial standpoint.

Master of Science in
Systems Technology
(Command, Control and
Communications)
March 1987

Advisor: J.S. Stewart
Joint C3 Academic Group

AN ANALYSIS OF THE MODULAR COMMAND AND CONTROL EVALUATION STRUCTURE (MCES) APPLICATION TO THE IDENTIFICATION FRIEND, FOE OR NEUTRAL (IFFN) JOINT TESTBED

Larry W. Moss
Captain, United States Army
B.S., University of Houston, 1976

This thesis presents an analysis of the application of the Modular Command and Control Evaluation Structure (MCES) to the Identification Friend, Foe, or Neutral (IFFN) Joint Testbed. The MCES and IFFN Testbed evaluation approaches are also compared. MCES is a structured approach to evaluate Command and Control (C2) systems which uses standard and evolving operational research tools. The MCES approach provided the IFFN Joint Testbed with an air defense C2 system architecture which became a descriptive tool for C2 analysts to define and evaluate measures to determine the effectiveness of competing air defense C2 systems. This IFFN application served as an evaluation and refinement of MCES as well as a tool for assisting the IFFN Joint Test Force in evaluating U.S. air defense C2 systems in the NATO area.

Master of Science in
Systems Technology
(Command, Control and
Communications)
March 1987

Advisor: J.T. Malokas
Joint C3 Academic Group

THE APPLICABILITY OF STRUCTURED MODELING TO DISCRETE EVENT SIMULATION SYSTEMS

David James Patrick
Captain, United States Air Force
B.S., Radford College, 1979

Organizations involved in the development, maintenance and use of combat simulation models have a need for computer-aided model management tools. Structured modeling (SM), a new modeling paradigm developed by Professor Geoffrion of UCLA, was designed to provide such tools in support of mathematical programming models. This thesis examines the effectiveness of structured modeling when applied to discrete event simulation by attempting to represent an existing combat simulation model using SM. There are three main products of this work.

First, a demonstration of the benefits which accrue from representing a simulation model using SM. Second, a review of the limitations of the structured modeling methodology for discrete event simulation. Third, recommendations for overcoming these problems.

Master of Science in
Systems Technology
(Command, Control and
Communications)
March 1987

Advisor: D.R. Dolk
Joint C3 Academic Group

A DEMONSTRATION OF A TRUSTED COMPUTER INTERFACE BETWEEN A MULTILEVEL SECURE COMMAND AND CONTROL SYSTEM AND UNTRUSTED TACTICAL DATA SYSTEMS

George E. Rector, Jr.
Captain, United States Marine Corps
B.S., United States Naval Acadmey, 1976

The task of this research is to demonstrate a multilevel secure interface between a system operating at multiple security levels and other untrusted systems operating at a single security level. Without a trusted interface device, these systems cannot be electronically connected. All communications between the systems must be done manually with all information transfer being reviewed by a security officer. Only releasable information is printed or stored in a removable medium and hand carried to the other system. In contrast, a trusted, multilevel secure guard can connect untrusted systems electronically and control the release of sensitive information. This task will demonstrate the ability of a multilevel trusted system to interface with untrusted systems operating at different levels of security.

Master of Science in
Systems Technology
(Command, Control and
Communications)
March 1987

Advisor: T.J. Brown
Joint C3 Academic Group

SOVIET TROOP CONTROL AND THE POWER DISTRIBUTION

Stanley K. Snyder
Lieutenant, United States Navy
B.S., Portland State University, 1979

This thesis explores the purpose of Soviet troop control and how it relates to their national policy and tactics for war. While their command decision making body is highly centralized, decision making is executed at the local level through a system of staff representatives to control the reserves.

Master of Science in
Systems Technology
(Command, Control and
Communications)
March 1987

Advisor: J.T. Malokas
Joint C3 Academic Group

AN ANALYSIS OF FLIGHT DATA ACQUISITION IN THE CONTINENTAL UNITED STATES OVER-THE-HORIZON BACKSCATTER RADAR SYSTEM

Richard J. Toohey
Captain, United States Air Force
B.S., University of Massachusetts, 1971
M.B.A., University of Utah, 1975

The Continental United States (CONUS) Over-the-Horizon Backscatter (OTH-B) radar is intended to be the cornerstone of a revitalized atmospheric warning and defense system. This unusual new type of radar can detect air breathing targets at any altitude out to a range of 1800 nautical miles. However, the strategic warning function also requires a detected target be classified by comparing its observed parameters against a data base of flight data on known aircraft movements. The data base must be comprehensive to keep the number of targets classified as Unknown relatively small. Otherwise, proposed strategic warning algorithms using the OTH-B reported Unknowns as inputs will either generate too many false alarms or may fail to detect an attack against North America. This thesis analyzes the flight data acquisition system established for the first OTH-B radar and suggests additional flight data sources. Further, operational procedures to make the most efficient use of collected flight data are suggested. Prior to that, however, the history of North American strategic atmospheric warning and air defense is explained and the OTH-B radar's operating principles and capabilities are examined. Proposed strategic warning algorithms are also briefly examined and improvements are suggested.

Master of Science in
Systems Technology
(Command, Control and
Communications)
March 1987

Advisor: J.T. Malokas
Joint C3 Academic Group

A COMPARATIVE ANALYSIS OF GENERALIZED LANCHESTER EQUATION MODEL AND A STOCHASTIC COMPUTER SIMULATION MODEL

Terry A. West
Captain, United States Army
B.S., University of Nebraska, 1979

This thesis involves a numerical experiment to compare a deterministic Generalized Lanchester Equation model, referred to as the M/W model, and a stochastic computer simulation model, referred to as the C/S model. A discussion of the historical background of Lanchester's equations precedes the presentation of the two models and the experimental design. The results are presented graphically and show that the M/W force level trajectory is a good approximation for the C/S force level trajectory. It is also shown that the two model's trajectories behaved similarly. These results indicate that deterministic attrition models may often be good approximations for the mean of stochastic attrition models. Command and control applications of a model like the M/W model are presented and a list of suggested follow-on research is provided to stimulate further work in this area.

Master of Science in
Systems Technology
(Command, Control and
Communications)
March 1987

Advisor: D.E. Harrison
Department of
Physics

DEVELOPMENT OF A PROTOTYPE MULTICHANNEL COMMUNICATION NETWORK MAINTENANCE EXPERT SYSTEM

Joseph S. Yavorsky
Captain, United States Army
B.S., United States Military Academy, 1978

This thesis involves the development of a small prototype microcomputer-based expert system to aid the Battalion Maintenance Officer (or staff) of a division signal battalion allocate resources when a communications node fails. This decision aid is designed to "fill the gap" between those automated systems designed to reroute circuits and those designed to diagnose equipment failures.

The system models a multichannel network as employed by a division signal battalion. It is limited to only the multichannel equipment itself and not any other network components (patch panels, switchboards, etc.). The assumption is that troubleshooting has taken place and the system failure is due to multichannel equipment failure in an AN/TRC 145 Radio Terminal.

This system is conceived as part of an integrated automated management system to aid the controlling node in managing the battlefield communications network more effectively. It is called the Computer Aided Communication System Maintenance Manager (CACSMAM). CACSMAM consists of approximately 185 production rules, written using the M.1 Knowledge System Development Tool (version 2.0) by Teknowledge, Inc and requires 338K bytes of RAM on an IBM PC compatible computer running PC DOS 2.1 or higher.

Master of Science in
Systems Technology
(Command, Control and
Communications)
March 1987

Advisor: C.R. Jones
Department of
Administrative Sciences

MASTER OF SCIENCE

IN

SYSTEMS TECHNOLOGY
ELECTRONIC WARFARE (EW)

691/692

A DIGITAL COMPUTER ANALYSIS OF THE FISHBONE ANTENNA

Sherman L. Curtis
Lieutenant, United States Navy
B.S., United States Naval Academy, 1979

This thesis investigates the electromagnetic response of the traveling-wave antenna designated as Fishbone. The Fishbone antenna is modeled using the Numerical Electromagnetics Code (NEC) in order to derive antenna electrical characteristics including directive gain, main beam elevation angle, and main beam 3dB beamwidth. Additionally, computer modeling of one, two, and five Fishbone antenna structures in tandem are evaluated in the frequency band of 2 - 30 MHz in order to ascertain the effects of wave setting on adjacent antenna electric feedpoints on radiation patterns.

Master of Science in
Systems Management
(Electronic Warfare)
December 1981

R.W. Adler
Department of
Electrical and Computer
Engineering

AN APPLICATION OF MULTIDIMENSIONAL SCALING TO ELECTRONIC WARFARE OPERATOR PROFICIENCY ASSESSMENT

Michael W. Gainok
Lieutenant, United States Navy
B.S., Purdue University, 1978

This thesis applies the techniques of Multidimensional Scaling (MDS) to analyze the performance of shipboard electronic warfare (EW) operators. EW watchstanding was separated into ten distinct areas of performance for purposes of this analysis. The problem of developing a model for EW measures of effectiveness (MOEs) was approached from two independent directions.

A paired comparison task was performed by a panel of EW experts to provide input to a Multidimensional Scaling algorithm. The result of this analysis provided a two dimensional spatial representation of the ten performance areas along with a dimensional interpretation. The two dimensions were interpreted as time criticality (speed) and advance preparation. These dimensions were found to be the major components in EW watchstanding. A hypothetical grouping of the performance areas was also conducted to provide a direct comparison of the MDS model with the intuitive modeling by the subjects.

The comparison of the MDS model and the hypothetical grouping was used to gain insight into the underlying factors of EW watchstanding to determine the MOEs of speed and advance preparation for EW training and for EW in general.

Master of Science in
Systems Engineering
(Electronic Warfare)
December 1986

Advisor: E.B. Rockower
Department of
Operations Research

AIRBORNE PASSIVE TARGET MOTION ANALYSIS

Jay A. Gutzler
Lieutenant, United States Navy
B.S., United States Naval Academy, 1980

Kalman filtering techniques are applied to a two sensor bearings only passive target motion analysis problem. An algorithm is developed to simulate tracking long range maneuvering airborne targets. The target tracking performance of the filter is evaluated using computer generated noisy bearing measurements. The performance of the filter is satisfactory given reasonable initial conditions and measurement noise.

Master of Science in
Systems Engineering
(Electronic Warfare)
September 1987

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

COMPUTER SIMULATION OF THE AN/TRQ-32(V) AND EVALUATION OF DF ANTENNA ARRAY PERFORMANCE BY NUMERICAL ELECTROMAGNETIC CODE (NEC)

John P. Kimmel
Captain, United States Army
B.S., United States Military Academy, 1978

The increased mobility and sophistication of tactical units has brought about an increased dependence on radio communications for command and control. Exploitation of signals in the High Frequency and Very High Frequency bands may provide some of the timeliest information available to a Commander. This paper provides a thin-wire computer model of the Army's AN/TRQ-32(V) Radio Receiving Set, using the Numerical Electromagnetic Code (NEC). The computer model is used to postulate line-of-bearing (LOB) errors for the system's four element "Adcock" direction finding (DF) array for signals arriving from various elevation angles and for multicomponent wavefields.

Master of Science in
Systems Engineering
(Electronic Warfare)
September 1987

Advisor: R.W. Adler
Department of
Electrical and Computer
Engineering

MASTER OF SCIENCE

IN

SYSTEMS TECHNOLOGY SPACE SYSTEMS OPERATIONS (SSO)

697/698

AN INITIAL SPACE-RELATED PERSONNEL PLAN FOR THE U.S. ARMY MILITARY INTELLIGENCE CORPS

Edward James Apgar
Captain, United States Army
B.S., United States Military Academy, 1981

This thesis outlines an approach for space-related intelligence/electronic warfare (IEW) operations to the commander of the U.S. Army Intelligence Center and School. First, it articulates Army space-related IEW tasks. Second, it determines the graduate degrees which will assist military intelligence officers in conducting these space-related IEW tasks. Third, it suggests assignments and selection criteria for the initial cohort of military intelligence officers who will conduct space-related IEW tasks.

Master of Science in
Systems Technology
(Space Systems Operations)
September 1987

Advisor: J.G. Taylor
Department of
Operations Research

F-LAYER POLAR CAP ARCS

Denise Dillon Fite
Lieutenant, United States Navy
B.A., Hunter College, 1975

Two types of ionospheric anomalies have been discovered recently in the polar cap: patches and arcs. Polar cap arcs are the focus of this study, which seeks correlation between arcs and total electron content (TEC) enhancements and amplitude scintillation effects. Simultaneous optical and radio frequency measurements were taken at Thule AFB and Qanaaq, Greenland, using an All-Sky Imaging Photometer (ASIP) and a specifically equipped Global Positioning System (GPS) receiver. Arcs were discovered to produce significant, rapidly varying TEC increases, and small but measurable amplitude scintillation.

Master of Science in
Systems Technology
(Space Systems Operations)
September 1987

PROJECT SKYLITE: A DESIGN EXPLORATION

Mark F. Landers
Lieutenant, United States Navy
B.S., United States Naval Academy, 1981

William J. Welch
Lieutenant, United States Navy
B.S., United States Naval Academy, 1979

This thesis proposes a design for the project SKYLITE satellite. Project SKYLITE is an experiment which will assess compensating techniques designed to reduce laser wave front distortion caused by the atmosphere. The satellite will measure and downlink the propagated beam irradiance of the Mid-IR Advance Chemical Laser (MIRACL), based at the White Sands Missile Range (WSMR), New Mexico. The spacecraft will be designed to measure beam quality and power of both high and low power laser experiments. The irradiance and power values will vary as different compensating methods are employed. The spacecraft, which is gravity gradient stabilized, provides an array of IR sensors in the 3.6 to 4.2 micron window to measure laser irradiance. The use of several retroreflectors appended to the satellite will provide for precision pointing and turbulence correction measurements using a ground based Alexandrite laser. Due to the high energy involved during the lasing experiment, highly reflective, radiation shielding of both sensitive equipment and the solar array will be required to allow for survivability throughout its three year life without thermal or structural degradation. To minimize cost, Project SKYLITE will utilize the STS (Space Shuttle) standard canister for small self-contained payloads known as the Extended Get Away Special (GAS) can. The satellite has been designed to use the Orion bus currently being designed by NPS. The use of off-the-shelf technology for both economy and rapid procurement processes has been a prime consideration throughout the design to meet the Initial Operational Capability deadline of first quarter FY-89. The satellite expense, estimated with the Air Force Unmanned Spacecraft Cost Model, is

approximately 3.9 MS for recurring costs and 14.8MS for nonrecurring costs.

Master of Science in
Systems Technology
(Space Systems Operations)
September 1987

Advisor: R.A. Olsen
Space Systems
Academic Group

RELATING SERVICE DOCTRINE TO SPACE SYSTEM REQUIREMENTS

Thomas W. Light
Captain, United States Army
B.S., Georgia Institute of Technology, 1977

The objective of this thesis is to demonstrate a method of relating doctrine to requirements when considering space concepts. Service members must evaluate solicited and unsolicited proposals from contractors, consider the advantages of space, and then relate the advantages of space to the overall context of the proposed space system working within current and future military organizations. To perform these tradeoffs requires a strong foundation in how the services plan to operate in the next conflict; the AirLand Battle and Maritime Strategy provide this strong foundation and are examined. The Army's Concept Based Requirements System (CBRS) relates doctrine to requirements; it is described as a recommended method for determining joint requirements. To illustrate how CBRS will operate when considering joint space requirements, the concept of a space-based laser designator is explored.

Master of Science in
Systems Technology
(Space Systems Operations)
June 1987

Advisors: A.E. Fuhs
C.R. Jones
Space Systems Academic
Group

AN APPLICATION OF THE MCES TO THE POLITICAL ASPECTS OF SDI

Colleen McFadden
Lieutenant, United States Navy
B.S., United States Naval Academy, 1981

This study examines the political effectiveness of the Strategic Defense Initiative (SDI) as a policy making tool, by applying the Modular Command and Control Evaluation Structure (MCES) to develop political measures of effectiveness.

Master of Science in
Systems Technology
(Space Systems Operations)
September 1987

Advisor: M.G. Sovereign
Space Systems
Academic Group

THE EVOLUTION OF NAVAL WARFARE TECHNOLOGY AND THE IMPACT OF SPACE SYSTEMS

Patrick James Sharrett
Lieutenant Commander, United States Navy
B.S., Southern Illinois University, 1974

This thesis traces the history of naval warfare technology from antiquity to modern times. By analyzing various technological innovations, including their development, assimilation, and employment by navies in battle, five basic naval warfare trends are identified to which technological changes have contributed. These trends are:

(a) increasing the size of area which a force can control.

(b) increasing force endurance.

(c) reduction of reaction and weapon delivery times.

(d) reduction of exposure and risk to a force.

(e) increasing the probability of kill per weapon.

Citing these trends, the author discusses some of the current contributions of space systems to naval warfare operations. Although most changes have been evolutionary in nature, space systems have the potential to be revolutionary because of their contribution to all five trends. Consequently, increased emphasis on and support of space system development by the U.S. Navy is recommended.

Master of Science in
Systems Technology
(Space Systems Operations)
September 1987

Advisor: C. Jones
Department of
Administrative Sciences

NROSS: A FORCE MULTIPLIER

Cheryl Lynn Spohnholtz
Lieutenant, United States Navy
B.S., United States Naval Academy, 1980

This thesis examines the Navy Remote Ocean Sensing System (NROSS) as a force multiplier and shows why the Navy needs an oceanographic satellite. A history of oceanographic remote sensors provides background and is followed by a review of current and planned environmental satellites. The capabilities of these satellites are compared to Navy tactical requirements and deficiencies are noted. Finally, NROSS is discussed, and a look to the future shows why, more than ever, the Navy needs NROSS.

Advisor: L.K. Crumback
Space Systems
Academic Group

VULNERABILITY REDUCTION: GUIDELINES FOR THE DESIGN OF SPACECRAFT

John Steven Walls
Lieutenant, United States Navy
B.S., University of Maine, 1978

This work applies the vulnerability concepts and methodologies of the aircraft combat survivability discipline to the design of spacecraft. It provides guidelines that will enable a designer to improve the survivability of a spacecraft by decreasing spacecraft vulnerability. Vulnerability fundamentals are introduced, various aspects of natural and man-made threats are discussed, and procedures for the identification of spacecraft critical components and for a vulnerability assessment are presented. The six vulnerability reduction concepts are discussed, and a generic satellite design is given as a working example of the various concepts, techniques, and methodologies.

Master of Science in
Systems Technology
(Space Systems Operations)
September 1987

Advisor: R.E. Ball
Department of
Aeronautics and
Astronautics

707 /708

MASTER OF SCIENCE

IN

TELECOMMUNICATIONS SYSTEMS MANAGEMENT

709/710

SHIP-SHORE PACKET SWITCHED COMMUNICATIONS SYSTEM AND AN APPLICATION INTO THE HELLENIC NAVY

Evagelos S. Agapiou
Commander, Hellenic Navy
B.S., Hellenic Naval Academy, 1971

Computer to computer communications have advanced rapidly in the last years. High frequency (HF) communications systems have not kept pace with these advances and have generally not been considered suitable for high speed data communications.

This thesis presents an architecture for ship-shore sea service communications. It starts with the problems that make sea service communications different from conventional systems (Local Area Networks, LANs). Then, these problems are integrated into a complete system by using the ISO reference model. The first three layers of the ISO reference model, physical, data link, and network layers are examined in reference to these problems.

An examination concludes that a ship-shore packet switching communications system is applicable in Hellas and its Navy.

Master of Science in
Telecommunications Systems
Management
September 1987

Advisor: T.J. Brown
Department of
Electrical and Computer
Engineering

THE MANAGEMENT OF SPREAD SPECTRUM COMMUNICATIONS IN A COSITE AND INTERSITE ENVIRONMENT

Peter R. Burke
Lieutenant, United States Navy
B.A., State University of New York, Buffalo, 1981

This thesis examines the management of spread spectrum systems in cosite and intersite environments. The theory behind two spread spectrum techniques, frequency hopping and direct sequence, is provided. Current methods of managing communications are examined for their applicability to spread spectrum techniques. Finally, some methods of controlling spread spectrum systems to avoid self-jamming are explored.

Master of Science in
Telecommunications Systems
Management
March 1987

Advisor: R.D. Evered
Department of
Administrative Sciences

REDUCTION IN BANDWIDTH AND BUFFER SIZE BY USING THE MODIFIED HUFFMAN CODING AFTER DROPPING THE LESS FREQUENT SOURCE SYMBOLS

Ahmet Corapcioglu
Lieutenant JG, Turkish Navy
B.S., Turkish Naval Academy, 1979

This research employs the modified Huffman coding technique after dropping the selected source symbols, with respect to their usage frequencies. The expected results are a decrease in average length as well as in variance. The ultimate purpose is to reduce the required bandwidth and buffer size in a communications system.

Master of Science in
Telecommunications Systems
Management
March 1987

Advisor: R.W. Hamming
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Administrative Sciences

AN INFORMATION ANALYSIS AND SOFTWARE DESIGN FOR A PERSONAL COMPUTER-BASED MESSAGE MANAGEMENT SYSTEM

Michael C. Dahlmeier
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B.S.B., University of Minnesota, 1978

Recent improvements in Naval Communications electronic and the automation of a significant portion of message processing has done much to reduce the problem of writer-to-reader delay. Most delays that still remain are the time-consuming manual message preparation procedures that are concentrated at the message drafter and transmission center level phase. This thesis analyzes the outgoing message preparation process from message creation to electronic transmission with respect to speed and accuracy. System and User requirements are translated into a preliminary software design for personal computer based Message Management system. The design methodology used is a combination of Structured Design Technique and Hierarchical Input Process Output Charts to show system relationships and documentation of modules and the

Master of Science in
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THE EFFECTS OF SHIFTWORK ON THE PERFORMANCE OF WATCHSTANDERS AT COAST GUARD COMMUNICATION STATIONS

David Clark Ely
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B.S., U.S. Coast Guard Academy, 1982

An analysis of a Coast Guard watch system is presented. Current theory and research on shiftwork is documented and discussed to provide background for the analysis. An examination is made to evaluate personnel performance as a function of location within the existing watch schedule. A survey is conducted among watchstanding personnel to examine their opinions and motivations towards the existing watch schedule and relevant factors. Results indicate that there are minor differences between performance during day watches and performance during night watches. Similarly, the study indicates that performance within a given watch declines as time on watch increases for day watches only; this pattern does not hold for night watches.

Master of Science in
Telecommunications Systems
Management
June 1987

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METHODOLOGY FOR EVALUATING THE EFFECTIVENESS OF THE ADMINISTRATIVE (ZYB) MESSAGE PRIORITY SCHEME AS A QUEUE CONTROL MECHANISM

David T. Glenn
Lieutenant, United States Coast Guard
B.S., U.S. Coast Guard Academy, 1977

The increasing incidents of channel overloads on the multichannel fleet broadcast caused the Chief of Naval Operations (CNO), in 1985, to authorize implementation of special administrative (ZYB) message processing procedures for periods of heavy congestion. This thesis outlines a method for evaluating this ZYB priority scheme. It uses an analytical approach to describe and model NAVCOMPARS and the multichannel broadcast. Based on the M/M/1 queueing model chosen, performance attributes are identified and defined. A performance analysis using multiattribute utility analysis is outlined that evaluates the effectiveness of the ZYB message priority scheme as a traffic management tool during periods of extreme message traffic loading. This study also provides a means for evaluating and refining threshold values to implement ZYB processing at a specific location.

Master of Science in
Telecommunications Systems
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June 1987

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METEOR-BURST COMMUNICATIONS: IS THIS WHAT THE NAVY NEEDS?

Gretchen Ann Helweg
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B.A., Texas A&M University, 1977

This thesis evaluates the limitations of meteor-burst communications for Navy requirements. The author examines the basic physics of the meteor-burst concept and the history of meteor-burst systems to determine inherent or persistent shortcomings. These findings are then compared to ongoing research and Navy applications for this communications medium. Limitations of meteor-burst communications are discussed with respect to potential Navy applications. Recommendations of possible applications of this technology are provided.

Master of Science in
Telecommunications Systems
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June 1987

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APPLICATION AND EXPANSION OF THE MODULAR COMMAND AND CONTROL EVALUATION STRUCTURE (MCES) AS A FRAMEWORK FOR ACQUISITION MANAGEMENT

Nicholas J. Hoffer
Major, United States Marine Corps
B.S., Ohio State University, 1973

This thesis provides a description of a collection of "tools" which may be used by acquisition program managers. The Modular Command and Control Evaluation Structure (MCES) provides the framework for management of the process. The Marine Corps Technical Interface Concepts (TIC) and interoperability database (IDB) are discussed as standards for filling four of the seven MCES modules. Finally, generic measures of communications system performance are described and used in conjunction with System Effectiveness Analysis (SEA) to define the analytical process of measuring effectiveness.

Master of Science in
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COST-EFFECTIVENESS METHODOLOGY FOR EVALUATING KOREAN INTERNATIONAL COMMUNICATION SYSTEM ALTERNATIVES

Hwang Tae Kyun
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B.S., Korea Military Academy, Seoul, 1976

Cost and Effectiveness models are developed by using of cost-effectiveness technique for fiber optic cable and satellite communication media. The models are applied to the Korean international communication problem. Alternative selection is required since the two medias differ in cost and effectiveness. The major difficulties encountered were data gathering and measuring the effectiveness of the Korean international network. The research recommends the use of a cost-effectiveness methodology and suggestions are provided for future Korean communications.

Master of Science in
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Administrative Sciences

THE OFFICER IN TACTICAL COMMAND AND TACTICAL DATA INFORMATION EXCHANGE SYSTEMS (OTCIXS/TADIXS) AND THE TRANSITION TO THE MILITARY STRATEGIC AND TACTICAL RELAY SYSTEM (MILSTAR)

Richard Banks Landolt
Lieutenant, United States Navy
[illegible] University of Florida, 1991

The purpose of this thesis is to explore possible difficulties and their solutions in transitioning the OTCIXS/TADIXS subsystems from the [illegible] to the Satellite System in the DWASPF MILSTAR [illegible] provide a description of the mission and operational concept involved with the OTCIXS and TADIXS subsystems as well as the objectives that MILSTAR will possess and function as a [illegible] system.

[illegible] OTCIXS and TADIXS, and the capabilities MILSTAR will [illegible] these subsystems. Finally, the capabilities OTCIXS and TADIXS [illegible] MILSTAR will provide recommendations on [illegible]

[illegible]

[illegible]
Department of
[illegible]

APPLICATION OF MOBILE SUBSCRIBER EQUIPMENT (MSE) TO A MARINE AIR-GROUND TASK FORCE (MAGTF)

Timothy James Moriarty, Jr
Captain, United States Marine Corps
B.A., Virginia Military Institute, 1978

This thesis summarizes the evolution of the U.S. Army's MSE program and describes the system's major elements and components. It outlines basic technical characteristics and the organizational structure that the Army's communications units have adopted to perform their missions using MSE. After reviewing the structure, organization for combat, and command, control, communications, and intelligence (C^3I) requirements of a Marine Amphibious Force (MAF)-sized MAGTF, a model MAF C^3I system using MSE is developed. Equipment allowances and personnel requirements are determined and a cost comparison of the MSE system with equivalent programmed U.S. Marine Corps communications equipment is made. Selected Measures of Performance (MOP's) for MSE are listed for future comparison with equivalent Marine Corps equipment. MSE components warranting Marine Corps consideration are identified and an overall recommendation presented.

Master of Science in
Telecommunications Systems
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COMMAND, CONTROL AND COMMUNICATIONS REQUIREMENTS FOR COAST GUARD COMMAND CENTERS

George W. Wood, III
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B.S., United States Coast Guard Academy, 1977

The purpose of this study is to identify the command, control and communications (C3) requirements for each of the Coast Guard missions as they would apply to command centers providing support to field resources performing them. The various Coast Guard mission areas are reviewed with an emphasis on C3. An analysis of the decisions made and information processing events accomplished in a command center, based on mission, are presented. This analysis includes a review of the information required to accomplish these decisions and events, where it comes from and by what transmission means. It also includes a review of the information generated by these decisions and events, where it goes, and by what transmission means. Additionally, connectivity with other Coast Guard, Department of Defense and federal agencies is discussed.

Master of Science in
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Management
June 1987

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MASTER OF ARTS

IN

NATIONAL SECURITY AFFAIRS

725/726

THE POLITICAL IMPLICATIONS OF EAST-WEST TRADE AND TECHNOLOGY TRANSFER

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Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1975
M.A., Webster University, 1982

This study is a review of the political and economic issues that are involved in East-West trade and technology transfer in the 1980's. Using unclassified sources, specific instances of technology transfer are evaluated and assessments as to its impact are made. The analysis provides evidence that the Soviet Union and their allies derive relative advantage from East-West trade--one which not only provides greater net economic benefits to the East, but also is creating serious security concerns in the West.

The main conclusion of the research undertaken is that the nature and severity of the problem have been greatly underestimated by both academics and government officials.

Advisor: R.E. Looney
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National Security Affairs

NAVAL SHIP UTILITY: THE SOVIET PERSPECTIVE

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Lieutenant, United States Navy
B.A., University of Washington, 1973
B.S., University of Washington, 1976

This thesis critically reviews twenty-two articles from the Soviet Naval Digest, "Morskoy Sbornik", dealing with a wide spectrum of measures of effectiveness such as individual time efficiency, ASW search effectiveness, command decision efficiency, effectiveness of ASW training, measures of force control, and others. These Soviet measures of effectiveness are categorized by level of combat action. Although there is some question about the specific Soviet meaning of the translations, this thesis uses the translator's rendering of the basic units of Soviet Naval organization; individual, subunit (podrazdeleniye), unit (chast'), and force (soyedineniye). The levels of combat action above force (generally agreed to be named front (front), and TVD (Teatr Voyennykh Deystviy), are not included in this study. The articles illustrate the Soviet tendency to organize their operations research along the same lines as the units of naval organization and indicate that the most basic measure of naval ship utility is combat effectiveness.

Master of Arts in
National Security Affairs
December 1986

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THE CUBAN INTERVENTIONARY FORCES: THE GROWING STRATEGIC AND REGIONAL THREAT TO THE UNITED STATES AND NATO

Timothy J. Doorey
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B.A., Temple University, 1979

Over the past twenty-seven years, Cuba has transformed its military forces from an ill-equipped, untrained band of guerrillas into the second most powerful military in the Caribbean Basin. Today, the Cuban armed forces are equipped with numerous modern fighter-bomber aircraft, warships (including attack submarines), tanks, and other lethal weaponry. Unlike other recipients of Soviet arms, Cuba has proven its capability and willingness to maintain and operate this sophisticated military equipment around the world, even in combat environments. This has been demonstrated in Angola, Ethiopia and Nicaragua.

Havana has also developed an extensive intelligence and propaganda apparatus capable of performing tasks ranging from espionage and disinformation to assassination and arms smuggling.

Cuba's growing military, paramilitary, and intelligence presence in the Caribbean Basin, combined with the expanding military power of the Soviet Union and Soviet-backed Nicaragua in the same region, pose a serious and growing threat to U.S. security interests in the Caribbean and elsewhere in the Third World.

This thesis examines specifically Cuba's capability and intent to jeopardize the United States' security interests by analyzing the motives, resources, and tactics of the Cuban interventionary forces.

Master of Arts in
National Security Affairs
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THE DEFENSE OF JAPAN: THE U.S.-JAPAN SECURITY RELATIONSHIP

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B.A., University of California, Los Angeles, 1978

This thesis examines Japan's minimalist defense policy within the larger context of a U.S. global security system. Throughout the post-World War II period, Japan's foreign policy has been centered on its economic and security relationship with the United States. This is a complementary relationship in which both countries have a significantly different security worldview: Japan maintains an essentially regional perspective in contrast to the global perspective of the United States. It also considers the effects of increasing awareness of enormous Soviet military capabilities in the U.S. and the USSR. The most important focus of the security relationship is the defense of the Japanese homeland, because of the political and economic importance of the U.S.-Japan trade relationship. The main question in the U.S.-Japan security relationship is, "What is an optimum security role for Japan?"

Master of Arts in
National Security Affairs
June 1986

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National Security Affairs

NUCLEAR WINTER AND NUCLEAR POLICY: IMPLICATIONS FOR U.S. AND SOVIET DETERRENCE STRATEGIES

Gail Alane Griffin
Lieutenant, United States Navy
A.B., University of Illinois, 1972

Nuclear weapons were rapidly incorporated into the strategies for maintaining the national security objectives of both the Soviet Union and the United States--in spite of poorly understood nuclear weapons effects.

The nuclear winter hypothesis, the basis of which was first proposed in 1982, directed scientific research into the consequences of massive amounts of dust and smoke, from nuclear detonations, on the earth's climate and subsequently on the ecology of the earth. This thesis presents the evolution of the nuclear winter hypothesis in order to elucidate its unique aspects for global devastation and the consensus of plausibility which the hypothesis holds in the scientific community.

The hypothesis has aroused a flurry of political activity for nuclear policy. With the historical aspects of the nuclear era as a backdrop, the question of incorporating new scientific information on the consequences of nuclear war into policy is discussed.

The observed responses of the U.S. and Soviet Union and the implications for future actions in response to the nuclear winter hypothesis are examined--leading to the conclusion that the hypothesis has little or no impact on U.S. and Soviet nuclear policy.

Master of Arts in
National Security Affairs
September 1987

ON TERRORISM: AN ANALYSIS OF TERRORISM AS A FORM OF WARFARE

Donald J. Hanle
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B.A., University of South Carolina, 1975

This thesis examines the proposition that terrorism is a form of war. To do this, this paper first analyzes warfare in terms of what it is and how it functions. This is done by surveying classical military thinkers such as Thucydides, Sun Tzu, Machiavelli, von Clausewitz, and Liddell Hart, to name just a few. This provides an understanding not only of the nature and purpose of war, but of the basic immutable principles under which it operates. These offer a means to construct a paradigm with which terrorism can be tested to determine whether or not it is a form of war. Once the constant elements of war are analyzed and understood, the variable factors are then examined. Here, the study focuses upon the evolution of war, highlighting what changes and why. From this, it is possible to understand not only why terrorism came into being but the environment in which it operates as well.

The second part of this study begins with an analysis of the terroristic method of force employment, followed by an examination of seven major types of terrorism to determine which, if any, qualify as a form of war. These include: psychotic, criminal, mystical, revolutionary, repression, military and state sponsored terrorism. Of these, three are found to qualify as a form of war--military, revolutionary, and state sponsored.

These three types of terrorism are then analyzed as forms of warfare in terms of how they employ force, as well as to what end that force is used. What becomes apparent is that not only does this terroristic force operate in the same basic manner as that employed in traditional warfare, it has the same basic capabilities and weaknesses of classical military force. This is significant because it suggests that countervailing strategies must be based upon classical principles of war and combat. These general countervailing strategic guidelines are presented in the final part of this work.

The significance of this study, then, is that it determines that terrorism, or certain types of terrorism, are indeed a form of war. Moreover, these not only have the same end but operate in essentially the same manner as the more classical or traditional forms of warfare. Consequently, the only proper means of neutralizing these forms of terrorism is to treat them as a form of war and apply military force against them in accordance with the principles of war and combat.

Master of Arts in
National Security Affairs
September 1987

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National Security Affairs

ECONOMIC SANCTIONS AND THE U.S. NATIONAL INTEREST

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[illegible] Pennsylvania State University, 1974

Economic sanctions appear to be gaining wider usage by the United States. To date however, policymakers have often imposed sanctions with little information as to their likely impact on the target country. Do successful sanctions have an element of commonality so that policymakers can gain guidance as to the situations in which sanctions are likely to meet their stated goals? Using a recently compiled data base on past sanctions, it is demonstrated that no clear pattern can be found differentiating successful from unsuccessful sanctions. Because of the inability of predicting whether a new sanction will be successful or unsuccessful, their use in future is seriously questioned.

THE ORIGIN AND EVOLUTION OF U.S. NAVAL STRATEGIC NUCLEAR POLICY TO 1960

Harold C. Kreitlein
Lieutenant, United States Navy
B.A., Brigham Young University, 1976

This thesis treats the impact of the atomic bomb on traditional naval strategy as that strategy had developed under the influence of Captain Alfred T. Mahan, how traditional naval strategy was modified by the development of naval aviation, the lessons of World War II, and the leadership of James Forrestal, and how the adoption of atomic weapons into naval strategic planning was integrally tied to naval aviation.

The growth of the Soviet Union as a threat to world peace, and interservice rivalry over roles and missions are compared as factors that influenced the development of post-World War II naval strategic thinking. The Navy's reaction to the adoption of massive retaliation as the foundation of the national strategic nuclear policy is discussed and analyzed.

Master of Arts in
National Security Affairs
December 1986

THE MARITIME STRATEGY AND SOVIET SUBMARINE-LAUNCHED CRUISE-MISSILES: IMPLICATIONS FOR THE U.S. NAVY

Edward John Majewski Jr.
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B.E., N.Y.S. Maritime College, 1980

The current Maritime Strategy envisions forward flanking operations for the U.S. Navy in a future conflict. Soviet development and future deployment of submarine-launched cruise-missiles (SLCMs) in a strategic mode, specifically their SS-NX-21's and SS-NX-24's, pose different problems to our present maritime plans which envision our fleets and forces engaged away from home waters. Soviet strategic, land-attack (SLA) SLCMs, if deployed in platforms off our allied coasts, will impact upon deployment, development and engagement planning as guided by the Maritime Strategy. Their effect on Western SLOCs, port facilities, bases and threat to interior continental strategic forces can be met by an extended Maritime Strategy which promotes a measure of coastal defense. Aspects for U.S. Naval interaction are the current Maritime Defense Zones (MDZ) program, and the newer Air Defense Initiative (ADI). This investigation examines the Soviet SLA-SLCM threat, a broader Maritime Strategy, and the U.S. Navy's role in the MDZ and ADI programs.

Master of Arts in
National Security Affairs
September 1987

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THE STRAITS OF MALACCA AND SINGAPORE: THE NEGLECTED CHOKE POINT

Catherine Howes Osman
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S.B., Massachusetts Institute of Technology, 1979

This thesis considers the Straits of Malacca and Singapore and the abilities of the littoral states to control the use of this navigational choke point during a crisis situation. Malaysia, Singapore and Indonesia have drastically improved the capabilities of their militaries in the past ten years. Together, they can deny the use of this key naval transit corridor to other navies. The region is considered from a historical and current perspective and the force build-up and capabilities are examined. The U.S. and Soviet interest in the region is also considered. Conclusions are reached concerning the strategic value of the region and future U.S. considerations.

Master of Arts in
National Security Affairs
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COUNTERFORCE TARGETING: IMPLICATIONS FOR DETERRENCE

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M.L.S., University of Pittsburgh, 1976

Since the beginning of the nuclear era, American strategic thought has stressed the imperative of deterring nuclear war. Over the years, there has been much discussion and debate concerning the utility of nuclear weapons in deterring, versus fighting a world war.

Of the strategic targeting concepts receiving serious attention during this debate, that of counterforce has been foremost. As recent U.S. declaratory policy has outlined counterforce as the preferred targeting strategy, the debate flourishes.

This thesis presents an exploration of the questions and problems that have evolved throughout the nuclear age concerning deterrence and warfighting with regard to counterforce targeting issues. The counterforce option is viewed as a rational and logical argument, and the conclusion of this thesis supports the warfighting view that the development of improved counterforce capabilities, both nuclear and conventional, is the more logical and responsible approach to achieving an effective and credible deterrent posture.

Master of Arts in
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EVOLVING ARMS TRANSFER RATIONALES: THE CASE OF ITALY

Charles K. Pickar
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Ph.D., University of Maryland, 1979

The conventional wisdom about European arms suppliers holds that these nations are motivated primarily by financial considerations when [illegible] This paper argues that the economic rationale is [illegible] important in the Italian case. The evidence suggests that as Italy moves into the next decade, the political rationale will become more important. Italy is using arms transfers for reasons of [illegible] There are three reasons for this change. First, the Italian government has recently instituted a number of changes in the arms transfer mechanism designed to increase control over the export process. Second, the new and still developing defense policy steps Italy an opportunity to use arms sales to increase Italy's power in the Mediterranean. Finally, the Italian nation, long the object of pity from their northern European neighbors, is gaining a sense of [illegible] Italy's gross national product [illegible] Great Britain. They are now a member of the influential [illegible] and Italian technology is becoming increasingly in demand. [illegible] Italy being treated as a serious [illegible] and is reflected in the arms transfer area.

Submitted to [illegible]
[illegible]
June 15th

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National Security Affairs

THE ORIGIN OF THE UNITED STATES SECURITY COMMITMENT TO THE REPUBLIC OF KOREA

Gary Joseph Porfert
Captain, United States Army
B.S., Massachusetts Institute of Technology, 1977

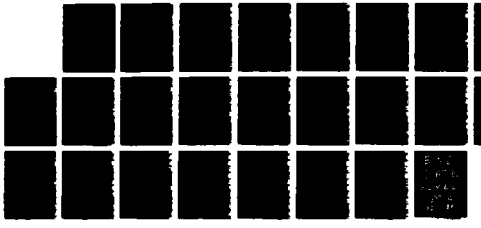
This thesis illuminates the nature of the United States' security commitment to the Republic of Korea by analyzing its origin. It is concluded that the commitment is a function of the American approach to foreign policy, and especially U.S.-Soviet relations, more than of any intrinsically vital U.S. interests in Korea. Korean policy from 1945 to 1953 is analyzed in terms of a debate between proponents of differing approaches to commitment. The seeming inconsistency between the 1949 troop withdrawal and the U.S. intervention in 1950 is seen as the result of a shift in overall foreign policy rather than a reassessment of Korea's geostrategic importance to the United States.

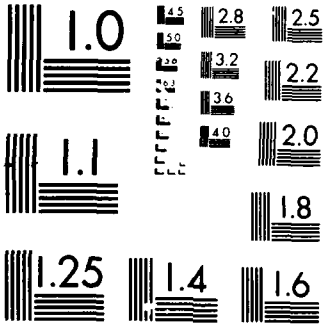
Master of Arts in
National Security Affairs
June 1987

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AD-A199 166 COMPILATION OF ABSTRACTS OF THESES SUBMITTED BY CANDIDATES FOR DEGREES(U) NAVAL POSTGRADUATE SCHOOL MONTEREY CA 30 AUG 88 NPS-012-88-001 1/3

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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

ARMS TRANSFERS TO THE IRISH REPUBLICAN ARMY

Laurence Noel Schuetz
Captain, United States Navy
B.B.A., University of Texas, 1960
M.A.I.R., University of Southern California, 1974

This paper describes the arms transfer relationships of a non-governmental organization, the Irish Republican Army (IRA). Open source information is used to develop models of munitions, financial and training relationships. These models are then explained in terms of (1) systemic influences, (2) supplier rationales, objectives and interests, and (3) recipient demand factors. Finally, the implications of these relationships are briefly addressed in the summary and conclusions. The closing section also includes suggestions for future research, based upon an assessment of (1) possible sources of detailed arms transfer data, and (2) methodological challenges.

Master of Arts in
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June 1987

Advisor: E.J. Laurance
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SOVIET FOREIGN POLICY IN THE [illegible]:
INTERNAL AND EXTERNAL DETERMINANTS

John J. Gordon
Captain, United States Air Force
B.A., Middlebury College, 1978

This study presents a framework for the [illegible] of Soviet Middle Eastern policy from 1967 to the present. The volatility of the current Middle Eastern situation and the inherent risk of superpower involvement lends a sense of urgency to the task of correctly interpreting Soviet interests, objectives and commitment to the Middle East. This paper uses past Soviet policy behavior to [illegible] for the understanding of current and future Soviet activity by examining the impact of internal and external inputs to the decision process. The field of study is limited to two countries, Egypt and Syria, chosen for their leading roles in the development of Soviet policy in the Middle East.

Master of Arts in
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Advisor: [illegible]
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THREAT AND OPPORTUNITY: THE SOVIET VIEW OF THE STRATEGIC DEFENSE INITIATIVE

Karl W. Uchrinscko
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B.A., Kent State University, 1975

The Soviet response to the Strategic Defense Initiative (SDI) during the period March 1983 through November 1985 provided indications of their view of the program both as a threat and as an opportunity to weaken NATO. The SDI is seen not only as a threat to the physical security of the Soviet Union but as part of an effort by the United States to seize the strategic initiative by neutralizing the military component of Soviet strategy. A major objective of that strategy is the political separation of Western Europe from the United States which the Soviets sought to facilitate by aggravating allied concern over the SDI's potential implications for European security and economic interests.

Master of Arts in
National Security Affairs
December 1986

Advisor: K.L. Herbig
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National Security Affairs

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