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OCT 1987 TO SEPT 1988



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Monterey, CA 93943

Rear Admiral R.C. Austin
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DOCTOR
OF
PHILOSOPHY

ANALYSIS OF GRAIN REFINEMENT AND SUPERPLASTICITY IN ALUMINUM-MAGNESIUM ALLOYS

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Previous research had demonstrated superplastic behavior in aluminum-magnesium alloys of high magnesium content to result from deformation processing to an initially non-recrystallized condition. Analysis here of those data has demonstrated that such a result may be understood in terms of constitutive equations developed for fine-grained materials and that the constitutive equations are applicable to materials achieving grain boundary misorientations in the range of only 2^{o} to 7^{o} by a process of continuous recrystallization. The constitutive equations provide a basis for analysis of anomolous temperature dependence of the strength and of the activation energy for plastic deformation seen as well in this work. A study of the separate effects of processing variables has lead to a model for continuous recrystallization during deformation processing. This model considers recovery of dislocations to sub-boundaries to be the critical step in this process. Application of this model to development of advanced aluminum alloys for air frame structural applications will result in increased weight savings by such processing methods.

Doctor of Philosophy in
Mechanical Engineering
December 1987

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OPTIMUM SIGNAL PROCESSING IN DISTRIBUTED SENSOR SYSTEMS

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We consider the problem of detection of known signals in noise using quantized, discrete sensor observations. Optimal design of the quantizers at the sensor sites as well as the global fusion of the quantized observations is presented. Also the equivalence between a team of two sensors and their fusion centre and another team of a primary decision maker and a second opinion is shown. Since the fusion of information is a main pillar of the thesis, an early chapter is devoted to the optimum fusion policy. Extension of the results to the case of vector sensor observations is also considered.

We next consider the problem of minimum mean square estimation of a far away sensor observation from its quantized version and another sensor's observation. It is shown that the optimum quantizer for the sensor signal is the classical Lloyd-Max quantizer.

Examples are given to illustrate the trade off between performance and communications between the sensors. Our results match that of centralized processing at one extreme and that of decentralized processing at the other. The way is graded between extreme ends. Finally a faster algorithm is given to solve the system of nonlinear equations for the optimum system parameters.

Doctor of Philosophy in
Electrical Engineering
December 1987

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MULTICHANNEL 2-D POWER SPECTRAL ESTIMATION AND APPLICATIONS

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Spectral estimation for multiple 2-D signals by model-based methods is developed. The procedures compute the entire spectral matrix of autospectra and cross spectra for the set of 2-D signals. Spectral analysis by autoregressive (AR) modeling is studied extensively. Specific differences between AR models for this problem and those for lower dimensional problems are highlighted. An extension of the Jackson-Chien method for combining estimates with single quadrant support is proposed and a method is developed for estimating the model parameters directly from the data (i.e. without prior estimation of a correlation matrix). A measure of the similarity of two spectral estimates based on the statistical divergence is proposed and used to compare various spectral estimates. A comprehensive set of experimental studies are presented showing the performance of the methods in estimating the autospectra and magnitude and phase of the cross spectra. The Maximum Likelihood Method (MLM) of spectral estimation is extended to the multichannel 2-D case. The properties are compared experimentally with the autoregressive methods. The Improved Maximum Likelihood Method

(IMLM) is also developed for the multichannel case. Finally applications of multichannel 2-D spectral analysis models to image coding are presented.

Doctor of Philosophy
Electrical Engineering
December 1987

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THE ROLE OF VORTEX STRUCTURE IN TROPICAL CYCLONE MOTION

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B.S., Pennsylvania State University
M.S., Pennsylvania State University

The role of vortex structure in tropical cyclone motion is studied using a moving-grid, nondivergent barotropic model on a B plane in a no-flow environment. Initial condition sensitivity tests reveal that the northwestward "beta" drift of the vortex is controlled by the symmetric circulation in the r = 300 - 800 km "critical" annulus. Enhanced cyclonic or anticyclonic flow in this critical annulus leads to long-term cyclonic or anticyclonic turning motions. The dynamics of the motion process is examined in terms of the symmetric and asymmetric circulations. When the vortex is moving in a quasi-steady manner, the asymmetric flow appears as a pair of large-scale, counter-rotating gyres with a broad "ventilation" flow through the vortex center. A second much smaller pair of gyres is also found near the center. It is the interaction between these two sets of gyres and the symmetric flow that governs the motion process as revealed by a streamfunction tendency analysis and dynamical sensitivity tests in which the model equation is modified during the integration. Beta drift can be described as a balancing process between linear Rossby dispersion which generates the asymmetric gyres and nonlinear advection that moves the vortex to limit gyre development. Vortex structure is the key to this balance as it

determines both the linear generation of the asymmetric forcing and the nonlinear interaction between the symmetric and asymmetric circulations.

Doctor of Philosophy
Meteorology
December 1987

Advisor: R.L. Elsberry
Department of
Meteorology

A DATABASE APPROACH TO COMPUTER INTEGRATED MANUFACTURING

Dana E. Madison
Major, United States Army
B.S., State University College, Brockport, N.Y., 1972
M.A., State University College, Brockport, N.Y., 1975

This work presents a new approach to the integration of manufacturing environment has capitalized on the use of automation to evolve to a highly specialized state characterized by heteorogeneous systems providing computer support to the various activities. Conventional approaches to integration assume that these activities must continue to exist in their current relationships. We use a database approach to the integration problem which removes the traditional boundaries between activities. We develop a data model which captures more of the semantics of the manufacturing environment than existing models and allows us to take a data-oriented perspective of the activities it encompasses. We also show how the use of the data-oriented approach provides for integration of these activities and reduces the complexity of the manufacturing environment.

Doctor of Philosophy in
Computer Science
June 1988

Advisor: C.T. Wu
Department of
Computer Science

INTERACTIONS BETWEEN SYNOPTIC AND PLANETARY SCALES OF MOTION

Michael D. McAtee
Captain, United States Air Force
B.A., University of California, Berkeley, 1978
M.S., Naval Postgraduate School, 1984

The effects of synoptic waves on the dynamics of planetary waves are investigated using normal mode analysis. Initialized analyses of the Navy Operational Global Atmospheric Prediction System (NOGAPS) for 19 days between January and April 1986 are projected onto the normal modes of a linearized version of the model. For each analysis, the different terms (adiabatic nonlinear, linear and diabatic) which affect the time tendency of planetary-scale modes are determined by a one-time step integration of the NOGAPS model. The effect of synoptic scales on planetary scales is determined by computing the difference between the adiabatic nonlinear term computed from the NOGAPS analyses and analyses for the same period that have been spectrally filtered to remove most of the synoptic-scale waves. The energy tendency due to the nonlinear adiabatic term and the synoptic-scale contribution to this term are also computed. It is shown that the synoptic-scale contribution to the adiabatic nonlinear term and the time tendency of planetary-scale modes can be a very large percentage of these terms.

By eliminating momentum advections in the model and computing the adiabatic nonlinear term for the filtered and unfiltered analyses, the relative importance of interactions through mass field interactions or momentum field interactions are determined.

It is shown that synoptic-scale interactions which affect the planetary-scale barotropic modes are primarily through the momentum advections, while mass and momentum interactions are possible for the baroclinic modes. The importance of mass field interactions generally increases as the vertical scale of the wave decreases.

Because of the importance of synoptic waves to the dynamics and energetics of planetary waves, errors in the forecasts of planetary waves may in part be due to the synoptic-scale forecast errors.

Doctor of Philosophy in
Meteorology
December 1987

Advisor: R.T. Williams
Department of
Meteorology

OBSERVATIONAL/NUMERICAL STUDY OF THE UPPER OCEAN RESPONSE TO HURRICANES

Lynn K. Shay
B.S., Florida Institute of Technology, 1976
M.S., Naval Postgraduate School, 1983

The time evolution and the vertical structure of the ocean current is examined using moored current meter observations from hurricane Frederic in 1979 and data acquired by Airborne eXpendable Current Profilers (AXCP) in hurricane Norbert in 1984. Energetic near-inertial oscillations excited by the passage of these hurricanes have frequencies that are shifted by 1-20% above the local inertial frequency. These oscillations are evident in the upper 1000 m of the water column and are primarily due to the excitation of low-order vertical modes.

The first five free vertical modes are calculated from the Brunt-Vaisala frequency and the Sturm-Liouville problem. The horizontal velocity eigenfunctions for a flat bottom and sloping bottom are fit to the demodulated amplitudes observed in Frederic. In the wake of the hurricane, the time evolution of the depth-averaged component plus the first two baroclinic modes explain about 60% and 68% of the near-inertial current variance using the flat- and sloping-bottom models, respectively. Since the AXCP observations were acquired in the high wind regime, the near-inertial response for the 3-dimensional velocities is simulated by projecting a hurricane-like wind stress field onto the first five baroclinic modes. The divergence and curl of the wind stress are also convolved with the Green's function (J_o) for each baroclinic mode. In hurricane Norbert, the sum of the first

four near-inertial modes explains over 70% of the observed current variance on the right side of the storm track. Most of this current variability can be accounted for by the curl terms, although the divergent and Ekman terms do contribute to the observed current variance within 30-60 km of the storm center. The effect of the stress divergence and Ekman terms on the ocean current response rapidly diminishes after one inertial period.

The role of the depth-averaged velocity component is assessed using numerical simulations from a 17-level, primitive equation model with a free-surface boundary condition. The slope of the sea-surface induces a depth-averaged velocity that is comparable to that observed in Frederic. The simulated modal amplitudes for the first two baroclinic modes are within 10-15% of those derived from the Frederic data.

Doctor of Philosophy in
Physical Oceanography
December 1987

Advisor: R.L. Elsberry
Department of
Oceanography

PASSIVE MULTIPATH TARGET TRACKING IN AN INHOMOGENEOUS ACOUSTIC MEDIUM

Amnon Shefi
Commander, Israeli Navy
B.S., Technion, Haifa, Israel, 1971

Tracking a maneuvering acoustic source using multipath (MP) arrivals in an inhomogeneous (IH) ocean medium is investigated. Errors introduced by a horizontally stratified sound speed profile are quantitatively evaluated. A new method of converting MP time difference of arrivals to depth and range which accounts for the IH effect is developed and evaluated. A 3-D target tracker previously used in MP tracking is modified in order to remove estimation biases and improve computational efficiency. Tracking performance is demonstrated using extensive simulation and shown to be greatly improved.

Doctor of Philosophy in
Electrical Engineering
December 1987

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

WIND AND WAVE FORCING OF LONGSHORE CURRENTS ACROSS A BARRED BEACH

Dennis James Whitford
Commander, United States Navy
B.S., United States Naval Academy, 1972
M.S., Naval Postgraduate School, 1979

Previous investigations of lonshore currents have included various simplifying assumptions and restrictions including a planar beach, a steady and depth uniform flow, spatially-invariant bed shear stress and turbulent momentum exchange, and the exclusion of surface wind stress. These assumptions are quantitatively investigated by calculating the relative importance of each term in the longshore momentum balance with an emphasis on the relative importance of wind forcing across the barred nearshore. Wind and wave forcing of longshore currents across a barred beach are examined using both a numerical model and field measurements. A local momentum balance was measured at various locations across the surf zone during the SUPERDUCK experiment held at the U.S Army Corps of Engineers, CERC Field Research Facility, Duck, N.S., U.S.A. in October 1986. A moveable sled was instrumented with pressure, current, and wind sensors to measure the various terms in the longshore momentum equation. Stability-dependent atmospheric drag coefficients for the surf zone are determined from wind stress measurements acquired just beyond the surf zone and wind speed measurements acquired from an anemometer atop the 9 m sled mast. Breaking waves were visually identified and electronically marked on the data tapes. Mean current velocities at three levels were

measured across the barred surf zone to examine the effects of a bar on the vertical structure of the flow. A modified longshore current model is used to study the effects of barred topography. The predicted longshore current profiles are compared with field data and bed shear stress coefficients are determined from model-fitting. Significant spatial variability of longshore current [$O(1.0ms^{-1})$] is observed across the bar with depth uniform longshore flow. Wind force is found to be a first-order term along with wave force under certain wind and wave conditions. Spatially-dependent bed shear stress coefficients relative to the bar are determined from a local momentum balance. Mean bed shear stress coefficients were 0.004 ± 0.0010, 0.002 ± 0.0006, and 0.001 ± 0.0003 for offshore the bar, on top and immediately before the bar, and in the trough. Mean bed shear stress coefficients determined from model-fitting and from the momentum balance are in excellent agreement. Longshore current velocities are modeled within $\pm$ 20% of observed velocities across the barred beach at SUPERDUCK with a mean least square error 7-15%.

Doctor of Philosophy in
Physical Oceanography
June 1988

Advisor: E.B. Thornton
Department of
Oceanography

AERONAUTICAL ENGINEER

AERODYNAMIC PERFORMANCE OF WINGS OF ARBITRARY PLANFORM IN INVISCID, INCOMPRESSIBLE, IRROTATIONAL FLOW

Chris L. Holm
Lieutenant Commander, United States Navy
B.A., University of New Mexico, 1975

This thesis contains discussion, theory and program code for a computational fluid dynamics (CFD) model of a wing of arbitrary planform. The model assumes incompressible, inviscid, irrotational flow. The program computes forces acting on the wing by modeling the flow with a set of horse shoe vortex elements. It models the flow over an arbitrary wing using two solutions. One solution is the ideal life, associated with a cambered and twisted wing. The other solution is the additional lift associated with a flat wing. The program computes wing camber and twist using an elliptic loading distribution. The thesis includes the FORTRAN source code, a separable User's Manual for the VORTEX program, discussion of the theory applied in the model, and instructions for operating the program. It shows a sample wing planform with tabular and graphic results.

This thesis also discusses two other CFD models based on circulation (Γ) and pressure difference (ΔC_p). It presents some of the problems and solutions in grid generation.

Aeronautical Engineer
Master of Science in
Aeronautical Engineering
September 1988

Advisor: T. H. Gawain
Department of
Aeronautics and
Astronautics

EFFECT OF FIBER DIAMETER ON THE RELIABILITY OF COMPOSITES - AUTOMATED LASER DIFFRACTION IMPLEMENTATION

Jeffrey Scott Kunkel
Lieutenant, United States Navy
B.S., United States Naval Academy, 1980
M.S., Naval Postgraduate School, 1987

Composite failures are microscopically sequential and locally redundant. As a result, a composite structure reliability and its strength dependency on geometric size is intimately dependent on the statistics of fiber filament strength. A composite reliability model is needed to utilize such inherent materials redundancy in structural design. This investigation first establishes the important role of fiber diameter measurement in the characterization of fiber filament strength statistics and the composite reliability function, and second, implements the diameter measurement by laser diffraction. This method is automated and lends itself to industrial adoption for materials development, acceptance and quality control.

Aeronautical Engineer
December 1987

Advisor: E.M. Wu
Department of
Aeronautics and
Astronautics

A COMPUTER CODE (USPOTF2) FOR UNSTEADY INCOMPRESSIBLE FLOW PAST TWO AIRFOILS

Chung-Khiang Pang
Civilian, Singapore Ministry of Defence
B.S., University of Adelaide, South Australia, 1981

A numerical code, USPOTF2, has been formulated to solve for the potential flow for two airfoils executing unsteady motions in an inviscid incompressible flow medium. This code is an extension of an existing code U2DIIF, which does the same calculations for the single airfoil case. The technique uses the well known Panel Methods for steady flow and extends it to unsteady flow by introducing a wake model which creates a nonlinear problem due to the continuous shedding of vortices into the trailing wake. The presence of the second airfoil introduces a set of non-linear coupled equations for the Kutta condition. Numerous case-runs are presented to illustrate the capability of the code. The case of the step change in angle of attack is compared with Giesing's work. All other case-runs are illustrated together with the results for the single airfoil case.

Aeronautical Engineer
Master of Science in
Aeronautical Engineering
September 1988

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ELECTRICAL ENGINEER

PERFORMANCE ANALYSIS OF ALOHA NETWORKS UTILIZING MULTIPLE SIGNAL POWER LEVELS

Randy L. Borchardt
Captain, United States Army
B.S., Rensselaer Polytechnic Institute, 1978

This thesis develops the theory needed to determine the throughput and average packet transfer delay of both slotted and unslotted ALOHA networks utilizing multiple received signal power levels to create beneficial power capture effects in environments where near perfect capture does not occur. The throughput achievable can be greatly increased when two received power levels are utilized. Use of more than two equally spaced power levels provides no significant improvement in the throughput achievable when realistic capture thresholds are considered. The pseudo-Bayesian algorithm used to stabilize slotted ALOHA networks is theoretically adapted to systems employing two power levels.

Electrical Engineer
Master of Science in
Electrical Engineering
June 1988

Advisor: T.T. Ha
Department of
Electrical and
Computer Engineering

ESTIMATING FORCES ACTING ON AN UNDERWATER VEHICLE WITH G.P.S. AND KALMAN FILTERING

James K. Easton, Jr.
Lieutenant, United States Navy
B.S., University of Idaho, 1979

A discrete state space model is developed which describes an autonomous underwater vehicle and incorporates the effects of currents, sea state, and wind as it travels through the sea. Heading commands are calculated to overcome these effects by the design of an Extended Kalman Filter which estimates their combined velocity components. Simulations are done which test the filter's effectiveness in a range of different environments. Some potential uses for this system are discussed at the end.

Electrical Engineer
Master of Science in
Electrical Engineering
March 1988

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

ADAPTIVE CONTROL IN POSITIONING A RIGID-FLEXIBLE ROBOT ARM

Constantinos Mardas
Lieutenant, Hellenic Navy
B.S., Hellenic Navy Academy, 1979

The feasibility of controlling a rigid-flexible, two links planar robot arm with an adaptive computer simulation model is investigated. The velocity curve following method was used as the adaptive control scheme. The motors acting at each joint were driven by the adaptive model. The adaptive algorithm update the states and the gain parameter of the ideal motor used in the computer model. This adaptation procedure was accomplished using only the measured angular position of the arm. The mathematical model for the proposed manipulator was derived using the Langrangian dynamics approach. Simulation results were obtained with the manipulator performing under various conditions, by changing the load of the arm and the forces included in the environment.

Electrical Engineer
Master of Science in
Electrical Engineering
March 1988

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

MECHANICAL ENGINEER

THE DEVELOPMENT AND STRUCTURAL CHARACTERISTICS OF DEAN VORTICES IN A CURVED RECTANGULAR CHANNEL

Lawrence Richard Baun
Lieutenant, United States Navy
B.S., Auburn University, 1979

The development and structure of Dean vortices in a curved channel were measured and studied. A 40:1 aspect ratio channel with mild curvature was employed. Circulation of mean streamwise vorticity, and maxima of streamwise, spanwise and radial components of vorticity increase as the Dean number increases from 40 to 140. Mean vorticity components were determined from measurements of the three components of mean velocity using a miniature five hole pressure probe. Spectra obtained from a subminiature crossed-wire probe show principal and harmonic frequencies for Dean numbers greater than 165, when vortices are twisting. Spectral peaks at other Dean numbers provide evidence of oscillations also observed during flow visualization.

Mechanical Engineer
Master of Science in
Mechanical Engineering
September 1988

Advisor: P.M. Ligrani
Department of
Mechanical Engineering

A STUDY OF MODEL BASED MANEUVERING CONTROLS FOR AUTONOMOUS UNDERWATER VEHICLES

Richard J. Boncal
Lieutenant, United States Navy
B.S., Maine Maritime Academy, 1981

Autonomous Underwater Vehicles (AUV) are being considered by the U.S. Navy for a variety of missions. Requirements for autonomy reinforce the need for a robust maneuvering controller that can ensure accurate tracking of a planned path. Model reference controllers (MRC) have been employed in situations where accurate tracking is desired and where plant parameters change with operating conditions. Because underwater vehicles are highly non-linear, it is conjectured that an MRC will provide improved tracking performance for AUVs. This thesis presents the results of a simulation study in which the dynamics of a submersible are modeled using a modified version of the DTNSRDC 2510 equations of motion. A linearized version of these equations serves as the reference model and provides the basis for the design of feedforward and feedback elements of the controller. Results show that for dive plane maneuvers, accurate tracking of the planned path can be achieved for a moderately wide range of vehicle speeds.

Mechanical Engineer
Master of Science in
Mechanical Engineering
December 1987

Advisor: A.J. Healey
Department of
Mechanical
Engineering

EXPERIMENTAL VERIFICATION OF AUV PERFORMANCE

Glenn M. Brunner
Lieutenant, United States Navy
B.S., Purdue University, 1980

System identification for an Autonomous Underwater Vehicle model design is performed using Recursive Least Squares to provide a best fit discretized transfer function between dive plane command signals and vehicle response data. The data was provided by constructing a radio controlled vehicle model and performing vertical plane maneuvers in a water tank. The analog input and output signals were digitized and recorded. The vehicle design, sensor calibration, and resulting responses are discussed. Vertical plane equations of motion were derived and theoretical plant models formulated. Also, analog controller designs were performed based on the theoretical plant models. This study will lead to adaptive model controllers for the future.

Mechanical Engineer
Master of Science in
Mechanical Engineering
March 1988

Advisor: A.J. Healey
Department of
Mechanical
Engineering

SEPARATION IN TIME-DEPENDENT FLOW

William H. Butterworth, Jr.
Lieutenant, United States Navy
B.S., Villanova University, 1979

The angular motion of separation points on a smooth cylinder immersed in a sinusoidally oscillating flow has been determined experimentally through the use of a U-shaped water tunnel, a special differential pressure probe, and a data acquisition system. The results have been compared with those obtained previously by Grass and Kemp for a single amplitude of oscillation through the use of flow visualization. The results have shown that the separation points undergo large angular excursions during a given cycle, the degree of excursion depending on the Reynolds number and the Keulegan-Carpenter number. The separation data obtained in this exploratory investigation will form the basis of future numerical analysis of oscillating flow about cylinders.

Mechanical Engineer
Master of Science in
Mechanical Engineering
September 1988

Advisor: T. Sarpkaya
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Engineering

FEASIBILITY STUDY OF A MICROPROCESSOR CONTROLLED ACTUATOR TEST MECHANISM

Gregory L. Goode
Lieutenant, United States Navy
B.S., University of Texas, 1979

This thesis describes the investigation of the feasibility of using a commercially available microcomputer to control and test a missile fin actuator. Topics discussed include system modelling, automated data acquisition, system identification, simulation and controller design. Modularity, both functional and conceptual, is stressed in the design process as well as integration of modules during the modelling and simulation process. Verification of the computer simulation is used extensively as an interactive tool to modify the system model. The hybrid system under investigation contains analog and discrete components some of which are both non-linear and discontinuous. The use of digital systems, their limitations and advantages are highlighted in the modelling of these components and the development of a control system.

Mechanical Engineer
Master of Science in
Mechanical Engineering
March 1988

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Engineering

NUMERICAL SIMULATION OF THE FLUID FLOW THROUGH GAS TURBINE ENGINE EXHAUST DIFFUSER

Kent M. Griffin
Lieutenant, United States Navy
B.A., Vanderbilt University, 1978

The performance characteristics of a gas turbine engine exhaust diffuser can be expressed in terms of pressure recovery and in the flow distribution at the diffuser exit. Recent applications of waste heat recovery to gas turbine propulsion engines, such as waste heat boilers and recuperators, have focused attention on the quality of the flow at the diffuser exit.

A specific, proposed exhaust diffuser design was numerically modelled using the commercially available PHOENICS fluid flow computer program. In the initial phase of the study reported here, the numerical computer model simulated a scale model of a proposed exhaust diffuser system to be tested. After these tests are made, a direct comparison with the computer simulation can be made.

Mechanical Engineer
Master of Science in
Mechanical Engineering
June 1988

Advisor: P.F. Pucci
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Engineering

TWO-DIMENSIONAL AXISYMMETRIC AND THREE-DIMENSIONAL FINITE ELEMENT STRESS ANALYSIS OF THE LHA-1 CLASS SUPERHEATER HEADER

Doyle R. Kitchin
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1976

ADINA, a finite element program for automatic dynamic incremental nonlinear analysis, is used to conduct a stress analysis of the Tarawa class (LHA-1) superheater header. This investigation is sponsored by the Naval Sea Systems Command (NAVSEA) as a result of cracking in the superheater header tube attachment weld. A two-dimensional solid axisymmetric finite element model was developed using both a coarse and fine mesh. Both pressure and thermally induced stresses were studied. A three-dimensional solid finite element model was developed and a preliminary stress analysis conducted.

Mechanical Engineer
Master of Science in
Mechanical Engineering
March 1988

Advisor: G. Cantin
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Mechanical
Engineering

UNSTEADY FLOW ABOUT POROUS CAMBERED PLATES

Paul Jack Lindsey
Lieutenant, United States Navy
B.S., University of California, Berkeley, 1980

The investigation dealt with the numerical and experimental investigation of the effect of porosity on the vortex shedding from a cambered plate. The effect of porosity was incorporated into the analysis through use of the experimentally obtained pressure-drop data. The results have shown that the porosity of the existing materials used in parachute canopies is not sufficient to eliminate the negative pressure gradient. Canopies with nonuniform porosities will have to be designed to overcome the collapse phenomenon resulting from the unfavorable pressure gradients.

Mechancial Engineer
Master of Science in
Mechanical Engineering
June 1988

Advisor: T. Sarpkaya
Department of
Mechanical
Engineering

NATURAL CONVECTION IMMERSION COOLING OF AN ARRAY OF SIMULATED CHIPS IN AN ENCLOSURE FILLED WITH DIELECTRIC LIQUID

Turgay Pamuk
Lieutenant JG, Turkish Navy
B.S., Turkish Naval Academy, 1981

An experimental natural convection heat transfer study of a simulated electronic circuit board has been conducted. The board has an array of 9 simulated chips, each dissipating up to 2.5 Watts. The board is immersed in FC75, a fluorocarbon liquid, in an enclosure whose top and bottom surfaces are constant temperature heat sinks. The experimental data have been expressed in terms of relevant dimensionless heat transfer parameters such as Nusselt and Rayleigh numbers. The trend is that the chips located higher in the enclosure have lower heat transfer rates. Otherwise, the chips in the same row behave in a similar way which implies a quasi-two dimensionality.

Mechanical Engineer
Master of Science in
Mechanical Engineering
December 1987

Advisors: M.D. Kelleher
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Engineering

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

Janet K. Raycraft
Lieutenant, United States Navy
B.S., University of Minnesota, 1980

Most of the casualties incurred during a fire are due to the smoke generated. An understanding of the way smoke and fire spread during a fire would provide a valuable tool to save lives and minimize damage. The Naval Research Laboratory maintains a full scale test facility called Fire-1. The computer model developed in this thesis is based on the actual geometry of Fire-1 and uses field modeling. It is a three dimensional, finite difference model using primitive variables. The model includes local and global pressure corrections, surface radiation, turbulence, strong buoyancy, and conjugate boundary conditions. Given heat input data, the computer code produces pressure, temperature, density, and velocity fields. Experimental fire tests conducted in Fire-1 are used to validate the computer code. Reasonable agreement in the results has been found. Because of the model's ability to account for pressure, temperature and smoke buildup, its envisioned use is to predict fires aboard ships and submarines.

Mechanical Engineer
Master of Science in
Mechanical Engineering
December 1987

Advisors: M.D. Kelleher
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Department of
Mechanical
Engineering

MASTER OF SCIENCE
IN
AERONAUTICAL
ENGINEERING

HOT-WIRE MEASUREMENTS OF COMPRESSOR BLADE WAKES IN A CASCADE WIND TUNNEL

Adem Baydar
Lieutenant, Turkish Air Force
B.S., Academy of Air Force, 1983

A hot-wire system, with software designed for calibrating and taking data with single, double and triple hot-wire sensors separately, or three probes at once, was verified and used to make wake measurements downstream of a compressor stator blade in a cascade wind tunnel. Using a single hot-wire probe, velocity and turbulence data were obtained in the wake of the controlled-diffusion blade in order to verify LDV data taken in earlier studies. The tests were conducted at three inlet angles from near design incidence towards the expected stall condition at a Mach number of 0.25 and Reynolds number of about 700,000. Wake profiles were obtained from 0.08 to 0.2 chord lengths downstream of the blade. Good agreement was found with LDV measurements. Measurements at the highest incidence angle showed that the wake constituted one third of the flow and yet no separation occured before the trailing edge on the suction side of the blade.

Master of Science in
Aeronautical Engineering
March 1988

Advisor: R.P. Shreeve
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Aeronautics and
Astronautics

COMPOSITE MATERIALS AT HIGH TEMPERATURES

Charles Richard Bess
Lieutenant Commander, United States Navy
B.S., Fort Lewis College, 1971

An experimental investigation was made to determine the ultimate tensile strength and elastic modulus of IM6-3501-6 graphite epoxy laminated specimens exposed to temperatures from $70^{o}F$ to $600^{o}F$. Specimens were layered (0^{o}), (90^{o}, 0^{o}), (90^{o}, 0^{o}, 90^{o}). The coupons used are candidate materials for advanced tactical missile airframe design. A Material Testing System (MTS) testing machine with 100,000 lb. maximum load capacity was used to apply the programmed uniaxial tensile loading. A Research Incorporated quad elliptical heating chamber, together with temperature and power controller, were used for maintaining the elevated temperatures. A Measurements Group data acquisition system 4000 was used for data acquisition and data reduction.

The ultimate strength of the 12 plied composite specimen was determined at two temperatures, $70^{o}F$ and $138^{o}F$. The failure of the grips precluded the determination of the modulus at higher temperatures. The overall modulus was obtained for the same type of specimen at several temperatures up to $400^{o}F$.

Master of Science in
Aeronautical Engineering
September 1988

Advisor: R. Kolar
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Aeronautics and
Astronautics

FLOW VISUALIZATION OF THE AIRWAKE OF AN OSCILLATING GENERIC SHIP MODEL

John L. Biskaduros
Lieutenant, United States Navy
B.S., Marquette University, 1979

An experimental flow visualization study was done on an oscillating generic ship model in the Low Speed Wind Tunnel Facility at the Naval Postgraduate School in Monterey, California. The purpose was to visually analyze the flowfield around the model while simulating ship motion in rough seas, with a correspondingly modelled open-ocean atmospheric boundary layer.

The two flow visualization techniques utilized were neutral density helium bubbles and a liquid aerosol, each technique providing varying degrees of on-body and off-body analysis. Limited success was achieved with the aerosol, but the helium bubbles produced excellent photographic results and an accurate visualization of the oscillating model's flow field was achieved.

Master of Science in
Aeronautical Engineering
December 1987

Advisor: J.V. Healey
Department of
Aeronautics and
Astronautics

VISUALIZATION OF THE FLOW FIELD AROUND AN OSCILLATING MODEL OF THE USS ENTERPRISE (CVN-65) IN A SIMULATED ATMOSPHERIC BOUNDARY LAYER

Thomas A. Cahill
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1976

A flow visualization study of an oscillaating, 1:350 scale model of the USS Enterprise (CVN-65) was conducted in a low speed wind tunnel, modified to simulate an open ocean atmospheric boundary layer. The theories, equipment and techniques employed in this study are explained in detail and an analysis of the photographic results is included in this report. Both the helium bubble and fluorescent minituft methods of flow visualization yielded excellent results and recommendations for follow-on studies are suggested.

Master of Science in
Aeronautical Engineering
March 1988

Advisor: J.V. Healey
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Aeronautics and
Astronautics

FORTRAN PROGRAMS FOR AERODYNAMIC ANALYSES ON THE MICRO VAX/2000 CAD/CAE WORKSTATION

John A. Campbell, Jr.
Lieutenant, United States Coast Guard
B.S., Arizona State University, 1980

This thesis describes the conversion of four computer programs on the Naval Postgraduate School IBM 3033AP computer system and their implementation on the MicroVax/2000 CAD/CAE workstation. The existing 2-D airfoil analysis programs DUBLET and PANEL were extensively modified to improve the user interface. The 3-D wing analysis program VORLAT also received an updated interface. The JETFLAP source program no longer resided on the NPS mainframe and was reconstructed from an original source tape and program listing. This program was then converted from FORTRAN IV for the CDC 6000 series computers to FORTRAN 77 for use on the IBM mainframe and the MicroVAX/2000. An interactive data input program, JETFLAPIN, was developed to simplify data input, provide error checking and correction and thereby enhance the utilization of the JETFLAP program. The programs are intended for use by students in basic and advanced courses in aerodynamics at the Naval Postgraduate School, however they are also applicable to a course in computational aerodynamics.

Master of Science in
Aeronautical Engineering
September 1988

Advisor: J.V. Healey
Department of
Aeronautics and
Astronautics

FLOW VISUALIZATION BY LASER SHEET

Joseph S. Chlebanowski, Jr.
Lieutenant Commander, United States Navy
B.S., Lewis University, Lockport, Illinois, 1974

A flow visualization system using smoke and a laser sheet for illumination has been designed and developed for use in the Naval Postgraduate School 32- X 45-inch low speed wind tunnel. Major design features include a portable smoke rake designed for ease of installation and removal, the use of fiber optics to transport the laser energy in a safe and convenient manner, and a portable traversing mechanism to traverse and orient the laser light sheet. The capabilities of the flow visulization system have been demonstrated by producing qualitative photographic recordings of complex flow patterns past an airfoil model and a missile model.

Master of Science in
Aeronautical Engineering
March 1988

Advisor: S. Bodapati
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Astronautics

DYNAMIC STALL CALCULATIONS USING A ZONAL NAVIER-STOKES MODEL

Jack H. Conroyd, Jr.
Lieutenant, United States Navy Reserve
B.S., Bradley University, 1978

A zonal Navier-Stokes model, developed by J.C. Wu, 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 and integrated life, pitching moment, and drag coefficients versus angle of attack are compared to existing experimental data for four cases and existing computational data for one case. These cases involve deep dynamic stall and fully detached flow at and below a freestream Mach number of .184. The flow field about the oscillating airfoil is investigated through the study of pressure, vorticity, local velocity and stream function. Finally, the effects of pitch rate on dynamic stall are investigated.

Master of Science in
Aeronautical Engineering
March 1988

Advisors: M.F. Platzer
Department of
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Astronautics

L.W. Carr
Moffett Field, CA

HIGH REYNOLDS NUMBER, LOW MACH NUMBER, STEADY FLOW FIELD CALCULATIONS OVER A NACA 0012 AIRFOIL USING NAVIER-STOKES AND INTERACTIVE BOUNDARY LAYER THEORY

Lise J. Cowles
Naval Air Development Center
B.S., Pennsylvania State University, 1983
B.A., Lycoming College, 1982

A Navier-Stokes code, developed by N.L. Sankar, and an Interactive Boundary Layer code, developed by Tuncer Cebeci, are implemented for high Reynolds number, low Mach flows over a NACA 0012 airfoil. Upper surface pressure distributions, coefficients of lift, coefficients of friction, and velocity profiles obtained from the Navier-Stokes code are compared to results obtained from the Cebeci Interactive Boundary Layer code for steady flow. The steady state cases investigated are at .3 Mach and Reynolds numbers of 1 to 15 million, and at .12 Mach and a Reynolds number of 1.5 million.

Master of Science in
Aeronautical Engineering
December 1987

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FLOW VISUALIZATION OF THE AIRWAKE AROUND A MODEL OF A TARAWA CLASS LHA IN A SIMULATED ATMOSPHERIC BOUNDARY LAYER

William H. Daley, III
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1975

A qualitative analysis of the airwake of a TARAWA class LHA in a simulated atmospheric boundary layer was conducted using the environmental wind tunnel at the Naval Postgraduate School, Monterey, California. Helium bubble flow visualization techniques were employed and a photographic record made of the results. The study utilized a 1:205 scale wooden model of the LHA, suitably mounted to a motion simulator able to fix various combinations of pitch, roll and yaw. Helium bubble flow visualization produced excellent photographic results. Yaw angles of 0^{o} and 30^{o} starboard showed an generally smooth flow pattern with bow trailing vortices, while a yaw angle of 45^{o} port displayed areas of significant turbulence and recirculation zones.

Master of Science in
Aeronautical Engineering
June 1988

Advisor: J.V. Healey
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A MAPPING OF THE VISCOUS FLOW BEHAVIOR IN A CONTROLLED DIFFUSION COMPRESSOR CASCADE USING LASER DOPPLER VELOCIMETRY AND PRELIMINARY EVALUATION OF CODES FOR THE PREDICTION OF STALL

Yekutiel Elazar
Major, Israeli Air Force
B.S., Technion, Haifa, 1974
M.S., Technion, Haifa, 1983

Detailed measurements were made at M = 0.25 and Re_c = 700000 of the flow through a linear compressor cascade of controlled diffusion (CD) blading using a two-component argon-ion laser doppler velocimeter system. The measurements included mapping of the inviscid flow in the passage between two adjacent blades, boundary layer surveys, and wake surveys. Viscous flow phenomena such as a laminar separation region with reattachment on the suction surface, and laminar-to-turbulent transition on the pressure surface were resolved, and the viscous growth to the trailing edge was defined for three inlet angles from design incidence to near stall.

Numerical calculations to predict the flow were carried out using a fully developed boundary layer code, a strongly interactive viscous-inviscid code and a Navier-Stokes code. It was shown that the common weakness of numerical predictors was in the modelling of transition and turbulence. The documented data can be used generally to calibrate compressor cascade analysis codes and thus enable reliable predictions of stall.

Master of Science in
Aeronautical Engineering
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DATA ACQUISITION AND CONTROL FOR MULTIPLE COMPOSITE LIFE TESTS

James W. Emery, Jr.
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1975

Strength durability of composite materials has many current Navy applications including rocket motor cases, pressure vessel for submarine flasks, energy storage for space applications and for pilot ejection seats. The primary effect of composite aging can be characterized by the fiber filament life under constant stress (stress rupture). This thesis develops experimental facilities for parallel testing of fiber filaments in the form of a bundle. A fast data acquisition system records the filaments breakage during load application. The filaments within a bundle sample are maintained at a constant strain level which is automatically adjusted for creep by digital feedback signal from the load of a control sample. A slow speed data acquisition system records filament breakage during long elapse time (days to years). This work established a nationally unique capability at the Naval Postgraduate School to quantitatively characterize the reliability of composite material.

Master of Science in
Aeronautical Engineering
June 1988

Advisor: E.M. Wu
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Astronautics

THE AGE HARDENING RESPONSE OF THERMOMECHANICALLY PROCESSED AL-MG-LI ALLOYS

William F. Ferris
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1975

Four Al-Mg-Li alloys of compositions (weight percent) in the ranges 6-8% Mg, 0.5-2% Li, and 0.15-0.25% Zr were hot forged and warm rolled (thermo-mechanically processed) to achieve a microstructure suitable for superplasticity. They were then subjected to age-hardening studies at temperatures indicated by concurrent differential scanning calorimetry research. Optical and transmission electron microscopy techniques were used to relate microstructure to mechanical properties. Only the 6%Mg-2%Li alloy showed significant age hardening response, however, concurrent research demonstrated excellent superplastic response in the 6%Mg-1%Li and 8%Mg-1%Li alloys.

Master of Science in
Aeronautical Engineering
December 1987

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THE EFFECTS OF TORQUE RESPONSE AND TIME DELAY ON ROTORCRAFT VERTICAL AXIS HANDLING QUALITIES

Peter Allen Fyles
Lieutenant, United States Navy
B.S., United States Naval Academy, 1980

Research was conducted in support of updating the U.S. military handling qualities specification, MIL-H-8501A. The effects of torque response and time delay on rotorcraft vertical axis handling qualities were investigated with the use of a CH-47B variable stability helicopter and a fixed base simulator. The frequency response of displayed torque dynamics was found to be an important factor in vertical axis handling qualities. This finding has caused a revision to the update of the MIL-H-8501A.

Master of Science in
Aeronautical Engineering
December 1987

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Astronautics

UNSTEADY FLOW FIELD MEASUREMENTS USING LDV

Steven Dale Hedrick
Lieutenant, United States Navy
B.E., University of Mississippi, 1979

The primary goal of this thesis was the development of an experimental technique, and supporting software, for the acquisition and analysis of unsteady velocity data generated by an oscillating airfoil. This research was in support of a major investigation of the compressibility effects on dynamic stall.

The experimental procedure involved schlieren flow visualization for comparison of steady and unsteady flow fields, and for determination of parameters for further study. Laser Doppler velocimetry was employed for obtaining velocity data in the airfoil wake. For unsteady data, the airfoil was oscillated in pitch about its quarter chord.

The data analysis produced wake profile plots representing the flow field disturbed by the airfoil. Results were obtained for steady and unsteady conditions.

Master of Science in
Aeronautical Engineering
December 1987

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FLOW VISUALIZATION ON A SMALL SCALE

Roy Lester Hixson, III
Commander, United States Navy
B.S., Oregon State University, 1973
M.B.A., Chapman College, 1982

A quarter scale model of the planned renovated form of an existing flow visualization tunnel was designed and constructed to test the quality of flow and for small scale research and flow visualization demonstrations. Three flow visualization techniques were developed, including fog injection, helium bubbles, and smoke wire. In addition to velocity calibration and test section mapping of the tunnel, the latter two of these methods were used for visualizing flows around three different shaped bodies as demonstration that the tunnel's design objectives were realized. Both techniques produced excellent photographic results of flows around a block of rectangular cross section, a circular cylinder and an airfoil.

Master of Science in
Aeronautical Engineering
March 1988

Advisor: J.V. Healey
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Aeronautics and
Astronautics

FLOW VISUALIZATION OF THE AIRWAKE AROUND A MODEL OF A DD-963 CLASS DESTROYER IN A SIMULATED ATMOSPHERIC BOUNDARY LAYER

Michael K. Johns
Lieutenant Commander, United States Navy
B.A., Wichita State University, 1975

This study is part of a longer-term project to map the airwakes of model ships for scaling to full size and use in helicopter simulators to provide an alternative to at-sea dynamic interface testing utilizing the Naval Postgraduate School flow visualization tunnel modified to simulate the open ocean atmospheric boundary layer. A detailed study has been made of the airflow near the flight deck of the DD-963 in a stationary mode, using helium bubble, smoke, photographic and video equipment. The results show that the primary variable in the airwake is the yaw angle of the ship; pitch and roll having a lesser influence. Some highly complex flow patterns have been observed above the flight deck. For example, at zero degrees yaw, the airflow along the center line of the ship flows over the hangar and splits: the higher level of the flow continues aft and the lower level proceeds downwards towards the deck and turns back towards the hangar; this flow further splits, heading towards port and starboard, curls upward almost to the hangar "roof" level and finally flows downwind in two streams along paths close to both sides of the ship. This pattern becomes displaced to one side of the ship or other, depending on the yaw angle.

Master of Science in
Aeronautical Engineering
September 1988

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DEVELOPMENT OF NATOPS PERFORMANCE SOFTWARE
UH-1N HELICOPTER

Robert E. Joslin
Captain, United States Marine Corps
B.S., University of Florida, 1978

The performance data contained in the Naval Air Training and Operating Procedures Standardization (NATOPS) manuals for naval aircraft are presented primarily in graphical form derived from flight tests. Interpretation and interpolation of these multi-variable graphical charts is time consuming and susceptible to error.

This thesis generates modified helicopter aerodynamic equations for significant and frequently used NATOPS performance charts for the UH-1N Helicopter. These equations are developed into an interactive FORTRAN program that asks the user certain questions, such as temperature, altitude and gross weight, and then accurately and expeditiously calculates various NATOPS performance parameters for use both prior to and in-flight.

Master of Science in
Aeronautical Engineering
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THE EFFECTS OF FREESTREAM TURBULENCE ON AIRFOIL BOUNDARY LAYER BEHAVIOR AT LOW REYNOLDS NUMBERS

David W. Kindelspire
Lieutenant, United States Navy
B.S., Missouri State University, 1980

An experimental study was conducted to determine the effects of freestream turbulence on airfoil boundary layer behavior. Freestream turbulence intensity levels up to approximately 4% and length scales up to approximately two inches were generated using turbulence-generating grids. Data were collected using a single-wire hot-wire probe in conjunction with a three dimensional traversing system. Increased levels of freestream turbulence were found to cause correspondingly earlier transition to a turbulent boundary layer. Boundary layer growth was found to be unaffected by freestream turbulence levels up to 4% at length scales an order of magnitude greater than the boundary layer thickness. For length scales on the order of boundary layer thickness, a 12% increase in the turbulent boundary layer thickness was found with an increase in turbulence intensity from 0.23% to 0.5%.

Master of Science in
Aeronautical Engineering
September 1988

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CONCEPTUAL DESIGN OF A STAND-OFF WEAPON FOR MARITIME PATROL AIRCRAFT

John A. Koepke
Lieutenant, United States Navy
B.S., Southern Illinois University, 1980

A conceptual design of a stand-off weapon to be launched from maritime patrol aircraft for use against hostile surface combatants was performed at the request of the Naval Air Test Center. The purpose of this thesis was to study the feasibility of developing a low-cost, anti-ship missile for air ASW platforms.

A mission threat analysis was conducted to determine the lethality of probable targets and to determine required missile performance characteristics. Current design methods and techniques were used to calculate the necessary missile geometry to meet the derived performance characteristics.

An evaluation of navigation laws was conducted to determine the most appropriate flight profile for the missile. The control system was tailored to meet the specifications of the selected navigation law.

An investigation of passive and active homing devices was conducted. A low cost seeker to adequately locate and track targets of interest was examined.

A target engagement model was used to verify the missile's maneuverability. This model demonstrated that the missile could intercept highly maneuvering craft when launched from a desirable stand-off distance.

Master of Science in
Aeronautical Engineering
September 1988

Advisor: R.M. Howard
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Astronautics

THE IMPORTANCE OF AIRCRAFT PERFORMANCE AND SIGNATURE REDUCTION UPON COMBAT SURVIVABILITY

John Den Langford, Jr.
Lieutenant Commander, United States Navy
B.S., Kearney State College, 1971

An investigation was conducted to estimate the relative impact the six susceptibility reduction concepts of threat warning, tactics, signature reduction, noise jammers and deceivers, expendables, and threat suppression have on aircraft survivability, with particular emphasis given to tactics with increased aircraft performance and signature reduction. An essential elements analysis (EEA) was conducted for three representative scenarios, with and without threat warning available, to identify the essential events and elements in each scenario critical to aircraft survivability. The six concepts were assessed as to their relative impact on the essential events and an estimate of the aircraft's susceptibility and survivability was made. The results of the EEAs are presented in tabular format. The general conclusion is made that both increased aircraft performance, with threat warning available, and signature reduction, with and without threat warning available, play important roles in increasing aircraft survivability through a reduction in an aircraft's susceptibility.

Master of Science in
Aeronautical Engineering
September 1988

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A MICROPROCESSOR-BASED ENGINEERING WORKSTATION

John Rand Langmead
Lieutenant, United States Navy
B.S., United States Naval Academy, 1980

There is clearly a need to provide students with tools for numerical analysis that will prepare them for both the theoretical numerical simulations and experimental data analysis that they will encounter as working engineers. The microprocessor-based personal computer (PC) offers an affordable alternative to established mainframe computing facilities for conducting and presenting numerical approximations. The present effort identifies a baseline hardware configuration and software toolbox tailored to meet the needs of engineering students, and specifies the background necessary to utilize them with a minimal investment of time and money. The effort grew from the design, installation, operation, maintenance and documentation of a microcomputer laboratory facility. The results include demonstrations of applications in control system design, structural analysis, and computational fluid dynamics. The continuing goal is to make available tools in a medium in which the student can build new capabilities upon the existing algorithms.

Master of Science in
Aeronautical Engineering
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FINITE ELEMENT ANALYSIS OF LAMINATED COMPOSITE PLATES

Myung-Ha Lee
Major, Korea Air Force
B.S., Korea Air Force Academy, 1979

A bi-quadratic isoparametric plate/shell bending finite element is developed to study the behavior of isotropic and laminated composite plates. The element is based on Mindlin-Reissner's theory and the principle of virtual displacements. The element is implemented in a computer program. Results are presented and compared with analytical solutions to validate this element. Good agreement is observed for thin plates, while discrepancies are noted for thick plates. Effects of various integration schemes on the element performance are presented. Convergence studies for laminated composites for different fiber orientations are also discussed.

Master of Science in
Aeronautical Engineering
September 1988

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AN EXPERIMENTAL INVESTIGATION OF A FIGHTER AIRCRAFT MODEL AT HIGH ANGLES OF ATTACK

David H. Leedy
Lieutenant Commander, United States Navy
B.S., University of Cincinnati, 1974

A low speed wind tunnel investigation was conducted to examine the aerodynamic characteristics of the flowfield around a three percent scale YF-17 lightweight fighter prototype model at high angles of attack using flow visualization and force and moment measurements. Smoke filaments, injected into the wind tunnel test section, were illuminated by a laser sheet to highlight flow phenomena about the model. Force and moment measurements were made using a precision six-component strain gage balance. The investigation marked the first attempt at qualitative flow analysis using the laser sheet flow visualization system recently installed in the Naval Postgraduate School low speed wind tunnel facility. The investigation was undertaken to specifically identify flow phenomena and/or regions of interest that may have bearing on the design and performance of supermaneuverable aircraft. The data indicate a good correlation between the observed flow phenomena and force and moment measurements at various angles of attack, thus establishing the credibility of such experimental investigations for high angle of attack aerodynamic research.

Master of Science in
Aeronautical Engineering
September 1988

Advisor: S.K. Hebbar
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Astronautics

AN EXPERIMENTAL INVESTIGATION OF SOOTING CHARACTERISTICS OF A GAS TURBINE COMBUSTOR AND AUGMENTOR TUBE

Richard Howard Lindsay
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1975

An experimental investigation was conducted to examine the effects of fuel-air ratio, fuel additives, fuel composition and inlet air temperature on particle sizes in a gas turbine combustor and augmentor tube. Equipment improvements led to validation of two optical sizing techniques, three-wavelength light transmittance and three-angle forward light scattering. Generally, data obtained agreed well with results of earlier investigations.

Particle size variations within the combustor due to changing variables were documented. Effects of changing variables were dependent on inlet conditions and station. Fuel-air ratio had no effect on combustor or augmentor tube exhaust particle size. Raising inlet air temperature did not significantly alter particle size within the combustor. The smoke suppressant, ferrocene, did not affect particle size uniformly within the combustor but significantly reduced the augmentor exhaust particle size, especially when combined with an increase in inlet air temperature.

Master of Science in
Aeronautical Engineering
September 1988

Advisor: D.W. Netzer
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Astronautics

PROBABILISTIC ANISOTROPIC FAILURE CRITERIA FOR COMPOSITE MATERIALS

Kenneth John Nelson
Lientenant Commander, United States Navy
M.B.A., George Washington University, 1983

A most important structural design objective today is the reliable applications of composite materials. Reliability is associated with the probability of success or failure of a particular structure and/or composite material. For this study, the reliability associated with strength was investigated.

The objective was to develop a probabilistic anisotropic failure criterion and an analytical model which would account for the inherent strength scatter and enhance the structural reliability phase of composite design. This study analytically described the failure criterion and probabilistic failure states of an anisotropic composite in a combined stress state. Strength sensitivity and the failure mechanism within the domain of the combined stress space was based on a numerical simulation of a theoretical mathematical model. The numerical simulation was analogous to phisical testing of large composite sample sizes.

For the probabilistic and mechanistic independent case examined, the failure envelopes as defined by the failure criterion exhibited a mechanistic dependent phenomenological appearance. The size and shape of the resulting phenomenological failure envelopes were dependent on the intrinsic shape parameters and their combinations associated with the longitudinal strength and transverse strength. The probabilistic formulation of the failure criterion could reconcile the

difference between the phenomenologically coupled and the uncoupled failure criterion. In addition, the probabilistic failure criterion would provide analytical guidance for definitive experimental measurements. Finally, the probabilistic failure criterion would provide the analytical conditions for optimal design and feedback in composite material development and quality assurance.

Master of Science in
Aeronautical Engineering
December 1987

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DYNAMIC STALL ANALYSIS UTILIZING INTERACTIVE COMPUTER GRAPHICS

Eric L. Pagenkopf
Lieutenant, United States Navy
B.A., California State University, Northridge, 1980

A Navier-Stokes problem solver, developed by L.N. Sankar, is modified to provide dynamic, interactive graphical presentations of predicted flow field solutions about a NACA-0012 airfoil section, oscillating in pitch, in order to demonstrate the capabilities of dynamic graphics applications in the study of complex, unsteady flows. Flow field solutions in the form of pressure coefficient and stream function contour plots about an airfoil experiencing dynamic stall are plotted utilizing an IRIS 3000-series workstation and Graphical Animation System (GAS) software, developed by Sterling Software for NASA. These full cycle solutions, in conjunction with dynamic surface pressure distribution plots and integrated lift, pitching moment and drag coefficient data, are compared to existing experimental data in order to provide an indication of the validity of the code's far-field solution. Full procedural documentation is maintained in order to provide an efficient analysis tool for use in future oscillating airfoil studies planned by the NASA-Ames Fluid Mechanics Laboratory and the Naval Postgraduate School Department of Aeronautics and Astronautics.

Master of Science in
Aeronautics
March 1988

Advisors: M.F. Platzer
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THE DESIGN AND INITIAL CONSTRUCTION OF A COMPOSITE RPV FOR FLIGHT RESEARCH APPLICATIONS

H. Keith Parker
Lieutenant, United States Navy
B.S., Texas A&M University, 1980

A remotely piloted vehicle, similar to U.S. Navy's Pioneer RPV, was designed and initial construction implemented for the purpose of establishing an RPV flight research program at the Naval Postgraduate School. The RPV will be used to investigate the Wortmann FX63-137 airfoil for low Reynolds applications, testing airborne avionic devices, investigate new aerodynamic phenomena of interest to NAVAIR, and serve as a transition trainer for future RPVs. Constructed primarily of composite materials, the vehicle will provide the opportunity to conduct real time/in-flight composite structural analysis. Additionally, the opportunity of using an RPV in their research, will provide the students of the Naval Postgraduate School with a unique capability limited to very few universities throughout the country.

Master of Science in
Aeronautical Engineering
September 1988

Advisor: R.M. Howard
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HOLOGRAPHIC PARTICLE SIZING IN SOLID FUEL RAMJETS

Robert P. Paty
Lieutenant, United States Navy
B.S., Texas A&M University, 1979

An investigation was conducted to determine the suitability of a holographic technique as a diagnostic tool for metallized fuel combustion in a two-dimensional solid fule ramjet. The highly metallized fuels were burned under conditions similar to actual flight conditions. If found suitable, the objective was to produce a three-dimensional image of a volume in the boundary layer above the fuel surface, and to determine the particle size distribution in that volume. This distribution could be used to validate current models which must assume particle size, and could lead to better estimates of fuel regression rates and combustion efficiencies. Once the conditions for sustained combustion of the fuels were determined, the technique was successfully demonstrated, even in the presence of large amounts of smoke. Holograms were obtained at two different chamber pressures for each of the fuels. However, current resolution limits of the technique are not sufficient to reveal the vast majority of the particles in the combustor.

Master of Science in
Aeronautical Engineering
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COMPOSITE RELIABILITY: DETERMINATION OF FIBER STRENGTH VIA BUNDLE TESTING

Joseph A. Schmidt
Lieutenant, United States Navy
B.S., University of Maryland, 1980

Composite reliability is strongly dependent on the fiber strength distribution. Current methods of gathering statistics through single fiber failure methods are inefficient and costly. This thesis develops a testing method from which the fiber statistics in the form of Weibull parameters can be accurately extracted from bundle failure tests.

The values obtained from the bundle experiment as compared to known single fiber test bench mark parameters were practically indistinguishable. The confidence of the results stems from a thorough analysis of the bundle mechanisms and minimized contaminates which can disturb the strength distribution.

Master of Science in
Aeronautical Engineering
September 1988

Advisor: E.W. Wu
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CALIBRATION OF A TRIPLE WIRE PROBE FOR TURBULENCE MEASUREMENTS

Gary J. Selman
Lieutenant Commander, United States Navy
B.S., The Citadel, 1977

A method of calibration for a triple wire probe has been implemented for use in the flow visualization tunnel at the Naval Postgraduate School. The system was designed to allow flow measurements in highly turbulent flows and under conditions of relatively unknown flow directions. Preliminary evaluation of the method indicates that accuracies in the range of 1-4% can be expected. Although attainment of these levels of accuracy have not yet been achieved, it is felt that they can be realized.

Master of Science in
Aeronautical Engineering
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Advisor: J.V. Healey
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DEVELOPMENT OF A BOUNDARY LAYER CONTROL DEVICE FOR TIP CLEARANCE EXPERIMENTS IN AN AXIAL COMPRESSOR

Muliukur Tarigan
Major, Indonesian Air Force
B.S., Indonesian Air Force Academy, 1966

A boundary layer control device was designed to change significantly the case-wall boundary layer thickness entering a large-scale, multistage axial compressor. The device was intended to double the boundary layer thickness in order to evaluate the influence of the inlet boundary layer in controlled tip clearance experiments being conducted on the compressor. The boundary layer characteristics expected to be produced by the control device were predicted empirically and experimental verification was required. Kiel, cobra, and impact probes were used in the experiments and pressures were recorded manually using water manometers. The geometry of the boundary layer control device, an annular array of spires, was derived from shapes developed for simulating the atmospheric boundary layer in large rectangular section wind tunnels. A significantly thicker boundary layer was measured in the compressor than was intended. However, the results were interpreted and recommendations were made for geometry changes necessary to achieve the intended control for the tip clearance investigation.

Master of Science in
Aeronautical Engineering
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Advisor: R.P. Shreeve
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HUMAN FACTORS ASPECTS OF THE TRAFFIC ALERT AND COLLISION AVOIDANCE SYSTEM (TCAS II)

Robert Joseph Tuttell
Lieutenant Commander, United States Navy
B.S., Jacksonville University, 1976

The objective of this study is to investigate three areas of interaction between pilots and the TCAS II Collision Avoidance System in order to examine the following areas of concern: (1) Did pilots maneuver on traffic advisory (TA) information? (2) Did the pilots' use of the system increase the miss distance between conflicting aircraft? (3) Would an alternate design for the resolution advisory (RA) display be more effective than the current display? The first two questions were answered with data obtained from a NASA-Ames simulation using airline crews and a Boeing 727 flight simulator. Evaluation of these data reveal 14 incidents where pilots successfully maneuvered their aircraft using TA information. Forty scenarios where the TCAS II system directed evasive maneuvers were examined. These results show that the recommended aviodance maneuvers increased aircraft miss distance in 37 cases. Alternate designs for the resolution advisory display were evaluated using military and civilian pilots reacting to a computer display simulation. These results demonstrate that a "red and green" RA display is more effective than the current "red only" RA display.

Master of Science in
Aeronautical Engineering
March 1988

Advisor: LCDR C.A. Heard
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STEADY FLOW FIELD MEASUREMENTS USING LASER DOPPLER VELOCIMETRY

Ricky E. Wilson
Lieutenant, United States Navy
B.S., United States Naval Academy, 1980

A computer-integrated LDV system utilizing a Helium-Neon laser was designed, assembled and tested for use in the study of steady flow field quantities. All system elements were integrated to include a traverse mechanism, signal processing and conditioning, computer interface and display.

The system was initially calibrated utilizing a rotating wheel of known velocity. Experimental flow measurement tests of the system were conducted, across a conventional free jet flow and in the Naval Postgraduate School low speed wind tunnel. The flow field velocity measurements made in the wind tunnel were verified using an existing pressure data acquisition station and a standard pitot static probe.

The system was found to be adequate for advanced classroom instruction in LDV measurements. Upgrading to an Argon-Ion laser would be required to achieve the higher signal levels needed to measure turbulence quantities.

Master of Science in
Aeronautical Engineering
December 1987

Advisor: S. Bodapati
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Astronautics

APPLICATION OF LASER DIFFRACTION TECHNIQUES TO PARTICLE SIZING IN SOLID PROPELLANT ROCKET MOTORS

E.D. Youngborg
Lieutenant, United States Navy
B.S., United States Naval Academy, 1976

Measurements of forward scattered light were used to determine the particulate behavior in the combustor and across the exhaust nozzle of a small solid propellant rocket motor. A MALVERN 2600 was successful in measuring multimodal particle distributions, and a locally designed system was successfully applied to monomodal distributions. The propellant tested was a reduced smoke propellant containing one-percent zirconium carbide by weight. The results suggested that ZrC reacts to completion on or very near the propellant surface. Zirconium oxide (ZrO_2) agglomerates are believed to form on the surface. Surface agglomerate size decreased with increasing pressures to approximately 500 psig. Agglomerates broke up in the nozzle convergence to approximately 18 microns, independent of the pressure or nozzle entrance particle size. System limitations, sources of error and suggested improvements are discussed.

Master of Science in
Aeronautical Engineering
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AN INTERACTIVE COMPUTER CODE FOR PRELIMINARY DESIGN OF SOLID PROPELLANT ROCKET MOTORS

Chung-I. Yuan
Lieutenant Commander, Republic of China Navy
B.S., Chinese Naval Academy, Republic of China, 1976

An interactive computer code for the preliminary design of solid propellant rocket motors ("SPRMD") was successfully developed and its use was demonstrated through a design example. "SPRMD" was written in FORTRAN for use on an IBM PC/AT. It combined several existing codes ("MICROPEP, GRAINS, ROCKET," etc.) and used the performance loss estimation methods suggested by the AGARD Propulsion and Energetics Panel for aluminized propellants.

Master of Science in
Aeronautical Engineering
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Advisor: D.W. Netzer
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MASTER OF SCIENCE
IN
APPLIED MATHEMATICS

A DATA ANALYSIS SYSTEM FOR UNSTEADY TURBULENCE MEASUREMENTS

Donald K. Johnson
B.S., California State Polytechnic University, Pomona, 1977

A data analysis system has been developed to analyze unsteady turbulence measurements obtained in the boundary layer of an airfoil subjected to periodic turbulent pulse disturbances such as a propeller slipstream. Specific algorithms for analyzing the non-stationary data are identified, developed and implemented. Where alternate algorithms are developed, each is evaluated and the best method is recommmended based on specified criteria. The statistical parameters used to characterize the unsteady turbulent boundary layer include the non-stationary mean velocity, turbulence intensity, power spectral density and the autocorrelation and cross correlation functions. Since the data is periodic, both ensemble averaging and special non-stationary empirical model techniques are employed. Each of the algorithms has been implemented in the FORTRAN language and examples are presented using representative test case data.

Master of Science in
Applied Mathematics
September 1988

Advisors: P.N. Ilacqua
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MASTER OF SCIENCE
IN
COMPUTER SCIENCE

THREE-DIMENSIONAL VISUAL DISPLAY FOR A PROTOTYPE COMMAND AND CONTROL WORKSTATION

Milton D. Abner
Lieutenant, United States Navy
B.S., Grambling States University, 1980

The development of a real-time three-dimensional visual display for the Command and Control Workstation of the future (CCWF) is a means of rapidly interpreting large amounts of important information. In this study, we examine the realistic versus real-time trade-offs required to achieve such a display and the components effecting these tradeoffs, i.e., hidden surface technique, lighting and shading models, etc. We also present a unified data structure that is used in storing various properties that create the display.

Master of Science in
Computer Science
June 1988

Advisor: M.J. Zyda
Department of
Computer Science

DOCUMENT GENERATOR SOFTWARE DESIGN THAT SUPPORTS TURKISH ALPHABET

Metin Akinci
Lieutenant JG, Turkish Navy
B.S., Turkish Naval Academy, 1982

The objective of this study is to design and implement software for an automatic document generator supporting the Turkish alphabet. The implementation in this study is mainly based on IBM personal computers and dot matrix printers.

Master of Science in
Computer Science
June 1988

Advisor: D. Davis
Department of
Computer Science

DISTRIBUTED COMPUTER COMMUNICATIONS IN SUPPORT OF REAL-TIME VISUAL SIMULATIONS

Theodore H. Barrow
Major, United States Marine Corps
B.S., Stanford University, 1977

Complex visual simulations can strain the capability of a single workstation. A mix of different workstations is often more economical than the use of a large processor for such simulations. Methods of communicating between such workstations are needed that allow the developer to spend effort on the simulation and not on communications. Simple protocols are developed to support both broadcast and direct-connect communications between workstations using TCP/IP on an Ethernet. Comparisons are made between broadcast and direct connect protocols.

Master of Science in
Computer Science
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Advisor: M.J. Zyda
Department of
Computer Science

DESIGN, IMPLEMENTATION, AND EVALUATION OF AN ABSTRACT PROGRAMMING AND COMMUNICATION INTERFACE FOR A NETWORK OF TRANSPUTERS

Gregory R. Bryant
Lieutenant Commander, United States Navy
B.S., University of New Mexico, 1975

This thesis presents the design, implementation and evaluation of two abstracted programming and communication interfaces for developing distributed programs on a network of Transputers. One interface uses a shared memory model for interprocess communication and synchronization. The other interface uses a message passing model for communication and synchronization. The programming interfaces allow development of distributed programs that are independent of the physical configuration of a network. This thesis also presents an evaluation of Transputer performance with a particular emphasis on the interaction of computation and inter-Transputer communication.

Master of Science in
Computer Science
June 1988

Advisor: U.R. Kodres
Department of
Computer Science

AN INTELLIGENT COMPUTER-ASSISTED INSTRUCTION SYSTEM FOR CARDIOPULMONARY RESUSCITATION

Debra S. Campbell
Lieutenant Commander, United States Navy
B.A., University of Washington, 1976

This study discusses the design and implementation of an Intelligent Computer-Assisted Instruction system for cardiopulmonary resuscitation. Utilizing artificial-intelligence techniques, the system combines a learning-while-doing environment with effective guidance of tutorial interactions.

The user's knowledge of CPR procedures is tested at one of three experience levels, utilizing a randomly generated scenario. Using means-ends analysis, the recommended action is determined for each successive state in the scenario. This action is compared with the user's selection. If a difference exists, an hypothesis guides the tutoring module in the selection of a tutoring strategy.

An on-line review of CPR procedures is available, as is a help function to provide direction to the user if needed. At the end of a session, a summary of the user's actions is provided.

Master of Science in
Computer Science
June 1988

Advisor: N.C. Rowe
Department of
Computer Science

EVALUATION OF WORK DISTRIBUTION ALGORITHMS AND HARDWARE TOPOLOGIES IN A MULTI-TRANSPUTER NETWORK

William R. Cloughley
Lieutenant, United States Navy
B.S., United States Naval Academy, 1981

This thesis presents the evaluation of work distribution algorithms and hardware topologies in a multi-Transputer network. The primary emphasis concerns a work distribution algorithm known as "workfarm" that is effective on problems that are divisible into independent work packets.

All the programs and examples presented in this were implemented in the OCCAM programming language, using the Transputer Development System, D700C, Beta 2.0 March 1987 compiler version.

Master of Science in
Computer Science
June 1988

Advisor: R.A. Adams
Department of
Computer Science

NETWORK AND DATABASE DESIGN IN SUPPORT OF THE JOINT THEATER LEVEL SIMULATION

Charles Dunn, III*
Captain, United States Army
B.S., University of California, Berkeley, 1981

Stanley H. Evans, Jr.+
Captain, United States Army
B.S., Temple University, 1979

The purpose of this thesis is to determine the feasibility of incorporating a Sun Workstation into a Command and Control station to aid the players in the execution of their roles in the Joint Theater Level Simulation. This entailed reviewing the possibility of eliminating the Postprocessor from the analysis phase of the game play. The Joint Theater Level Simulation is a theater independent computer game that models two-sided air, ground and naval combat, utilized for warfare training, joint operational planning and doctrinal analysis. The products of this thesis will interface the Sun Workstation with the wargame's host computer, the VAX-11, to provide the players the capability to access and analyze game data to improve their decision making ability. To meet this end, several software products were produced which specifically interfaced with the VAX-11, Sun Workstation and Ethernet.

Master of Science in Computer Science* and Systems Technology (Command, Control and Communications)*+
September 1988* June 1988+

Advisor: J.S. Stewart
Department of Operations Research

DEVELOPMENT OF A PERSONNEL DATABASE SYSTEM FOR WATCH SCHEDULING ON HELLENIC NAVY SHIPS

Dimitrios A. Elefsiniotis
Lieutenant, Hellenic Navy
B.A., Hellenic Naval Academy, 1977

This thesis represents the development of a database system for personnel management and watch scheduling on the Hellenic Navy ships. DBase III plus is used as a "Database Management System" to implement the main task, duties assignment in the administration office of a war ship. The implementation is a collection of algorithms that provide intelligent decision support to users of the system about the assignment duties. It is designed to run on an IBM PC XT TURBO microcomputer.

The system is developed to support all the adminstrative tasks and activities and to provide real time decision information on the crew allocations.

Master of Science in
Computer Science
September 1988

Advisors: S.H. Parry
Department of
Operations Research

V.Y. Lum
Department of
Computer Science

A GRAPHICS FACILITY FOR INTEGRATION, EDITING, AND DISPLAY OF SLOPE, CURVATURE, AND CONTOURS FROM A DIGITAL TERRAIN ELEVATION DATABASE

Dennis G. Felhoelter
Major, United States Marine Corps
B.S., University of Louisville, 1972

The ability of man to scan terrain, compare it with a topological representation and make decisions based on his analysis is a unique and complex talent. Teaching a machine to make these same comparisons and analysis is a formidable task. However, the development of acceptable algorithms to permit the appropriate classifications of terrain will expand the capabilities of machines in a number of endeavors including route planning and movement across selected terrain.

Recent research in terrain classification has centered around using mathematical equations to represent small cells of land. This thesis attempts to improve the classification to terrain data by expanding the type of information available, and by enhancing the quality of the data through the use of a graphics tool (bicubic splines) to edit and smooth this raw elevation data for more accurate elevation representation.

Master of Science in
Computer Science
June 1988

Advisor: R.B. McGhee
Department of
Computer Science

A DATA ORIENTED APPROACH TO INTEGRATING MANUFACTURING FUNCTIONS IN FLEXIBLE MANUFACTURING SYSTEMS

David R. Fleischman
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1976

Computer Integrated Manufacturing (CIM) seeks to integrate computers into the manufacturing environment, with the end-result being a more efficient and productive factory. Current approaches to CIM generally fail to truly integrate the various manufacturing functions (design, scheduling, planning, manufacture, business, etc.) and instead result in self-sufficient, computer-served islands of automation. In these systems, data must be translated before it moves from one manufacturing function to another.

Wu and Madison have approached data modeling in a CIM environment from a new perspective. Their approach seeks to provide one data model that meets the needs of all manufacturing functions within a factory, negating the need for human or machine data translators.

In this thesis, we review the work done by Wu and Madison and apply their data model to a particular manufacturing function, the Flexible Manufacturing System (FMS).

Master of Science in
Computer Science
June 1988

Advisor: C.T. Wu
Department of
Computer Science

UNIX BASED PROGRAMMING TOOLS FOR LOCALLY DISTRIBUTED NETWORK APPLICATIONS

William C. Frank
Lieutenant, United States Navy
B.S., United States Naval Academy, 1981

The Graphics and Video Laboratory of the Department of Computer Science has a growing need for easy to use programming tools in support of distributed processing applications. Our most pressing need is for software on three UNIX-based workstations connections via Ethernet. The remote interprocess communication tools that UNIX provides for using Ethernet are effective but complicated to learn. This requires researchers to spend much of their time becoming proficient with them instead of concentrating on the distributed application at hand.

This work presents the design of implementation of several programming tools that allow programmers to establish and experiment with distributed programs in the graphics laboratory environment. The tools allow a higher level of abstraction for remote interprocess communications and establish a straightforward method for implementing distributed programs. Additionally, they support code reuseability with software templates and are modularized to be both understandable and changeable. Recommendations are made for future research and management efforts that have been highlighted by these new tools.

Master of Science in
Computer Science
December 1987

Advisor: M.J. Zyda
Department of
Computer Science

TERRAIN CLASSIFICATION FROM DIGITAL ELEVATION DATA USING SLOPE AND CURVATURE INFORMATION

Brenda K. Goodpasture
Lieutenant, United States Navy
B.S., Eastern Kentucky University, 1982

Over the past few decades man has concentrated considerable effort in deriving algorithms that can classify terrain in a manner similar to the human visual system. If an implementable algorithm were obtained, man could use this algorithm to add vision to autonomous land vehicles. The applications of autonomous land vehicles are numerous. Movement of large military equipment to previously inaccessible areas and the exploration of unknown areas are examples. The scope of this study is to develop a database from digital elevation data representative of terrain an autonomous land vehicle would traverse, and from this database use a two-dimensional algorithm to classify the terrain represented by the data.

Master of Science in
Computer Science
December 1987

Advisor: R.B. McGhee
Department of
Computer Science

TOWARDS A SOLUTION TO THE PROPER INTEGRATION OF A LOGIC PROGRAMMING SYSTEM AND A LARGE KNOWLEDGE BASED MANAGEMENT SYSTEM

John Patrick Gorman
Lieutenant Commander, United States Navy
B.S., Santa Clara University, 1975

In designing the interface between a database and a logic system with inference such as Prolog, efficiency is the major issue. Presented here are three of the methods that are considered most promising and in which much research is focused. The first method explores extending an inference machine to include a database manager; the second couples the inference mechanism with a database management system; and the third extends a database management mechanism to include inference.

Acknowledging up front that no method can be claimed best, the major emphasis of this study will be to determine the strengths and limitations of all three methods and thereby help to clarify many uncertain and sometimes conflicting issues caused by the parallel lines of development from the database and artificial intelligence communities.

Master of Science in
Computer Science
December 1987

Advisor: C.T. Wu
Department of
Computer Science

DATA STRUCTURES AND ALGORITHMS FOR SUPPORTING GLAD INTERFACES

Paul D. Grenseman
Captain, United States Marine Corps
B.S., United States Naval Academy, 1981

The relational database model has become the most popular and widespread database model. Most current database systems are based upon or related to the relational model. However, the relational model is beset with significant limitations, pitfalls and deficiencies. The relational model can be substantially improved with graphical interfaces. To this end, the Graphics Language for Accessing Database (GLAD) can provide easy to use and learn graphics interfaces for the relational model. Data structures and algorithms for GLAD will be presented to extend the relational model.

Master of Science in
Computer Science
June 1988

Advisor: C.T. Wu
Department of
Computer Science

PRELIMINARY WORK ON THE COMMAND AND CONTROL WORKSTATION OF THE FUTURE

Frank E. Harris
Lieutenant, United States Navy
B.S., University of Utah, 1980

The modern tactical commander has a flood of sensory and intelligence information at his disposal. A tool is required to sort that information, allowing the commander to choose the information that is most pertinent to the decisions he must make at that time. This study is the preliminary work on the command and control workstation of the future. The focus of this effort is in two areas. One is a user interface using multiple windows and a mouse controlled cursor. This interface allows the user to set up the display to give him the information he needs in a way that is easy for him to interpret. The second focus is preliminary work on a real-time display that presents the user with a three-dimensional picture of the situation. This initial display uses three resolutions to display large areas of Defense Mapping Agency Digital Terrain Elevation Data with near real time animation.

Master of Science in
Computer Science
June 1988

Advisor: M.J. Zyda
Department of
Computer Science

DESIGN, IMPLEMENTATION, AND EVALUATION OF A VIRTUAL SHARED MEMORY SYSTEM IN A MULTI-TRANSPUTER NETWORK

Simon J. Hart
Lieutenant Commander, Royal Australian Navy
B.S., University of New South Wales
B.S., University of New South Wales, 1977

This thesis presents the design, implementation, and evaluation of a virtual shared memory in a multi-Transputer network. The thesis explores the Transputer hardware implementation model and highlights the important details that programmers of such systems may need before being able to optimize such networks.

All the programs and examples presented in this thesis were implemented in the OCCAM programming language, using the Transputer Development System. *D700C, Beta 2.0 March 1987* compiler version.

Master of Science in
Computer Science
December 1987

Advisor: U.R. Kodres
Department of
Computer Science

A COMPUTER SIMULATION STUDY OF STATION KEEPING BY AN AUTONOMOUS SUBMERSIBLE USING BOTTOM-TRACKING SONAR

Chet A. Hartley
Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1979

For an Autonomous Underwater Vehicle to complete many operational missions, it must have the ability to maintain its position relative to the ocean floor. Maintaining station requires that the AUV be able to determine the direction and the distance displaced during a small time interval. Knowing the direction and distance traveled in a measured amount of time, the magnitude and direction of the ocean current can be calculated. Once this ocean current information is known, the AUV speed and direction can be properly adjusted to directly offset the ocean current forces.

This thesis will attempt to determine, by computer simulation, if the first problem of AUV station keeping, vehicle movement direction and distance detection can be performed using bottom-tracking sonar as the AUV's only sensor. Both the problems of performing and storing successive synthetic sonar images and of determining AUV motion using frame to frame correlation of these images are investigated.

Master of Science in
Computer Science
June 1988

Advisor: R.B. McGhee
Department of
Computer Science

DESIGN FOR A PROTOTYPE MARINE CORPS OFFICER STAFFING MODEL

Mark E. Hayes
Captain, United States Marine Corps
B.S., United States Naval Academy, 1980

This thesis is a design of an officer allocation model for the United States Marine Corps. It is a prototype software system that supports the modeling of various officer assignment policies. Officer allocation is the mapping of officer types to classes of billets. Assignment is the matching of a particular officer to a specific billet. This thesis examines the current officer allocation capability and proposes the design of a software system that will permit those making assignments the capability to define the type of allocation model that will best support their needs.

Master of Science in
Computer Science
December 1987

Advisor: G.H. Bradley
Department of
Computer Science

A PRACTICAL APPLICATION OF PETRI NETS IN THE SOFTWARE SAFETY ANALYSIS OF A REAL-TIME MILITARY SYSTEM

Duston L. Hayward
B.S., The Pennsylvania State University, 1982

This thesis evaluates the usefulness of Petri net modeling for software safety analysis of a real-time system. The system is a safety arming device for a guided missile. The features of basic Petri net modeling are discussed in relation to the kinds of components that are found in real-time systems. This thesis proposes a methodology for systematically constructing a Petri net model from system and software design information. Several techniques for analyzing the resulting Petri net model are illustrated and evaluated for appropriateness.

Master of Science in
Computer Science
December 1987

Advisor: D. Davis
Department of
Computer Science

TEMPORAL DATA, TEMPORAL DATA MODELS, TEMPORAL DATA LANGUAGES AND TEMPORAL DATABASE SYSTEMS

Donald D. Hom
Captain, United States Marine Corps
B.S., Rutgers University, 1982

The study of temporal database systems is relatively new in the field of computer science. Two developments have led to the present interest. The advances of the storage technology for large amounts of data and applications' requirements for time-dependent data have prompted our study of temporal databases. This thesis conducts a survey of the major research areas concerning temporal databases. Temporal data, taxonomies of temporal data models, temporal data languages, and temporal database systems are presented. It is argued here that future database systems should handle the temporal domain by an integrated temporal database system.

By understanding the present technology and the need of temporal database systems, our research in the area of real-time temporal database systems can begin. It is the purpose of this thesis to provide the bakcground information and research references of temporal database systems as a first step towards the real-time database system research. Real-time database systems are time-constrained and temporally constituted.

Solutions in temporal database systems can contribute to the design of real-time military applications using temporal database computers.

Master of Science in
Computer Science
June 1988

Advisor: D.K. Hsiao
Department of
Computer Science

SECURE ACCESS CONTROL WITH HIGH ACCESS PRECISION

Gregory H. Hoppenstand
Lieutenant, United States Navy
B.S., Purdue University

When classified data of different classifications are stored in a database, it is necessary for a contemporary database system to pass through other classified data to find the properly classified data. Although the user of the system may only see data classified at the user's level, the database system itself has breached the security by bringing the other classified data into the main memory from secondary storage. Additionally, the system is not as efficient as it could be because unnecessary material has been retrieved. This is a problem in access precision. This thesis proposes a solution to the access precision and pass-through problems using a database counterpart to the mathematical concept of equivalence relations. Each record of the database contains at least one security attribute (e.g., classification) and the database is divided into compartments of records. Compartments are disjoint sets, where each compartment of records has the same aggregate of security attributes. A suitable database model, the Attribute-Based Data Model, is selected, and an example of implementation is provided.

Master of Science in
Computer Science
March 1988

Advisor: D.K. Hsiao
Department of
Computer Science

A PROGRAM FOR SCHEDULING A PATROL AIR WING TRAINING PLAN

David V. Hutson
Lieutenant Commander, United States Navy
B.A., Harding University, 1972

This research examined the feasibility of a computerized scheduling system to assist the development of an annual training plan for a Patrol Air Wing. A prototype is proposed incorporating a modified A* search control structure to handle the combinatorial part of the problem. The system uses a pre-existing file for its database and is implemented on an ISI workstation using the Prolog computer language. Comparisons with a manual derivation of the training plan are made and analysis of the prototype results with the pruning variable at several levels is performed.

Master of Science in
Computer Science
June 1988

Advisor: N.C. Rowe
Department of
Computer Science

ADAPTABILITY AND FEASIBILITY ISSUES CONCERNING THE USE OF CD-ROM TECHNOLOGY FOR UNITED STATES NAVY APPLICATIONS

Jimmy S. Johnson
Lieutenant, United States Naval Reserve
M.S., Middle Tennessee State University, 1979

The development of CD-ROM technology has produced significant ramifications for mass storage applications. The CD-ROM's read-only nature and its ability to store over 500 megabytes of data on a single disc will eventually revolutionize the historical and archival database industries. The U.S. Navy is particularly interested in the space-saving and weight reduction capabilities of CD-ROM as compared to the current magnetic and paper media. Adaptability and feasibility are the primary issues to be faced when considering the integration of CD-ROM into U.S. Navy applications. This study addresses these issues and determines that CD-ROM will play a significant role in the Navy's efforts to create a "paperless ship" by 1990.

Master of Science in
Computer Science
March 1988

Advisor: B.A. Frew
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Computer Science

THE FORMAL SPECIFICATION OF COMPUTER SYSTEMS USING PETRI NETS

Klaus Karrasch
Lieutenant, Federal German Navy

With the introduction of formal specification of abstracted computer resources, both physical and logical, there is the possibility that a major step forward can be made toward developing a methodology for reducing the portability and reusability costs of computing system components. Still, the current methodology is only concerned with the static functional properties of resources and not their timing properties. This places limitations on the generality of the method. This study describes a way to formally specify the timing of computer systems by combining ideas of both semantic algebras and Petri Nets.

Master of Science in
Computer Science
December 1987

Advisor: D. Davis
Department of
Computer Science

A COMPUTER-AIDED INSTRUCTION PROGRAM FOR TEACHING THE TOPS20-MM FACILITY ON THE DDN

Tae Woo Kim
Captain, Republic of Korea Army
B.S., Korea Military Academy, 1984

We constructed an Intelligent Computer Assisted Instruction (ICAI) program to tutor the usage of the TOPS20-MM, an electronic mail facility available on the Defense Data Network (DDN). Learning by experience is one of the best ways to learn something. The main strategy of tutoring in this thesis was to provide an environment simulating the actual facility that guides the student while he/she tries to perform given tasks. Means-ends analysis, a classic technique for solving search problems in Artificial Intelligence, has been used to figure out the right command to perform a given task. Basic commands, e.g., a command for viewing a message number 7, will be taught first, then the tasks like "Send a message to the people mentioned in message number 3" will be issued.

Master of Science in
Computer Science
December 1987

Advisor: N.C. Rowe
Department of
Computer Science

THE PROBLEM OF UNDEFINEDNESS IN SPECIFICATIONS

Douglas Robert Lengenfelder
Captain, United States Air Force
B.S., United States Air Force Academy, 1979

Conventional approaches to the formal specifications of computing systems do not provide a facility for leaving elements undefined. The purpose of this thesis is to introduce a formalism for usch a facility and to examine its effect on the underlying semantics. These ideas are thus a modification of conventional formalism using algebraic semantics.

Master of Science in
Computer Science
June 1988

Advisor: D. Davis
Department of
Computer Science

AN ABSTRACT INTERACTIVE GRAPHICS INTERFACE FOR THE IBM/PC AND MACINTOSH

Ko-Hsin Liang
Lieutenant, Taiwan Navy
B.S., Chinese Naval Academy, 1984

Different computer systems have different programming environments in spite of their similar capabilities. GEM and Macintosh software system both provide an operating environment in which the users can utilize all kinds of functions and routines to produce a user-friendly application program. Unfortunately, the programmers have to repeat the learning procedure and recode the source works if for some reason the application program is needed to run on both IBM PC and Macintosh microcomputers. In this thesis, a common interface is provided for programmers to reduce duplicated efforts and hopefully to get the same effect in both operating environments.

Master of Science in
Computer Science
June 1988

Advisor: D. Davis
Department of
Computer Science

A COMPUTER SIMULATION STUDY OF RULE-BASED CONTROL OF AN AUTONOMOUS UNDERWATER VEHICLE

David L. MacPherson
Lieutenant, United States Navy
B.S., Rensselaer Polytechnic Institute, 1981

Man has an ever-increasing desire for machines to do his work for him. Unmanned vehicles that perform routine or hazardous tasks are receiving a great deal of attention. Vehicles for unmanned submersible applications are becoming more feasible as strides are made in very large scale integration of computer hardware. This work focuses on development of algorithms and ideas for the computer control of military Autonomous Underwater Vehicles (AUVs). Both a Lisp machine and a graphics workstation, communicating via an Ethernet network, were used in this thesis to develop AUV simulator software. The emphasis has been placed on developing a computer graphic simulation of the control panel of an AUV and on a family of programs that define AUV missions. An AUV missin is a complete software plan designed to control an AUV as it executes the steps to achieve some goal or objective. AUV missions are executed by this simulator in a fully autonomous mode once certain mission parameters are supplied by a human user.

Master of Science in
Computer Science
June 1988

Advisor: R.B. McGhee
Department of
Computer Science

DECISION SUPPORT DATABASE SYSTEM FOR HELLENIC NAVAL PERSONNAL MANAGEMENT

Antonios K. Makris
Lieutenant, Hellenic Navy
B.A., Hellenic Naval Academy, 1977

The Naval Officers Personnel Management System is a very complex system especially inside the Fleet Command. Managing the system manually is neither effective nor efficient in supporting the decision makers.

This thesis proposes a method to use a computer based information processing system to help decision makers in scheduling the assignment of officers to warships during the annual assignment process, as well as in other functions concerning personnel management. The thesis presents a decision support database system for the Naval Officers Management Staff.

Master of Science in
Computer Science
September 1988

Advisors: V.Y. Lum
J.B. Isett
Department of
Administrative
Sciences

EDITFONT: AN INTERACTIVE FONT EDITING SYSTEM

Hector Mariscal
Teniente Segundo Peruvian Navy
Peruvian Naval Academy, 1981

The major goal of this work has been the development and implementation of an interactive bit mapped font editor that enables the graphics programmer to create different fonts and icons for use in application programs. The font editor, called editfont, has been implemented on the Silicon Graphics, Inc, IRIS workstation. Editfont consists of approximately 3500 lines of code, including the program documentation. Fonts created by editfont can be retrieved from disk and high level routines implemented with the IRIS graphics library. One feature of the system is the capacity for font extraction from a picture. The steps for font generation via font extration are explained in detail. File format, data structures and routines used by the system are also described. Software and hardware limitations of the system are outlined, as well as possible future extensions.

Master of Science in
Computer Science
December 1987

Advisor: M.J. Zyda
Department of
Computer Science

INVESTIGATION INTO THE USE OF TEXTURING FOR REAL-TIME COMPUTER ANIMATION

Timothy W. Meier
Lieutenant, United States Navy
B.S., United States Naval Academy, 1981

We present in this study an investigation into the use of texturing on the Silicon Graphics, Inc. IRIS for real-time computer animation. Using a tool designed specifically for the IRIS for defining texture patterns, two approaches to the design and implementation of software functions to fill objects with multi-color texture patterns are discussed. The first approach makes use of the IRIS patterning hardware to fill objects with multi-color texture patterns. Realizing the limitations of the first approach, the second approach uses an algorithm to partition a polygon defined in three space into a number of smaller polygons, with each polygon representing a texture point.

Master of Science in
Computer Science
December 1987

Advisor: M.J. Zyda
Department of
Computer Science

DESIGN AND IMPLEMENTATION OF A PROGRAM FAMILY FOR TYPE EVALUATION

Timothy B. Nachtsheim
Lieutenant, United States Navy
B.S., University of Washington, 1982

One approach to designing reuseable software is to consider a program to be a member of a family of programs that are related through function, purpose, or lineage. Numerical evaluation of expressions is a function that links many programming environments together, such as programming languages, operations research models, and spreadsheet applications. In parallel, we may have type evaluation of expressions in these environments, a function usually performed by hand. By considering the need for type evaluation in these environments to constitute a problem domain from which a program family can be generated, a design for a type evaluator to support the family members is developed. Several examples of environment specific implementations are provided, and the degree of reuseability through the approach is discussed.

Master of Science in
Computer Science
December 1987

Advisor: G.H. Bradley
Department of
Computer Science

A PROTOTYPE SIMULATION SYSTEM FOR COMBAT VEHICLE COORDINATION AND MOTION VISUALIZATION

Andrew H. Nelson
Captain, United States Marine Corps
B.A., University of New Mexico, 1982

Corinne McConkle
Lieutenant, United States Navy
B.A., Whittier College, 1976

This thesis develops a prototype rule based command and control system for units of autonomous tactical vehicles. By applying artificial intelligence techniques, tactical coordination of multiple autonomous vehicles is also accomplished. This study identifies the requirements for such a system and provides a prototype system with a sophisticated computer graphics simulator as a testing facility for future follow on research.

This study was a joint research project. Andrew H. Nelson was responsible for the rule system modeling on the LISP machines and Corinne McConkle was responsible for the real-time graphics motion visualization on the IRIS workstation. The networking software was developed jointly.

Master of Science in
Computer Science
June 1988

Advisor: R.B. McGhee
Department of
Computer Science

INTERACTIVE NETWORKED MOVING PLATFORM SIMULATORS

Michael R. Oliver
Lieutenant Commander, United States Navy
B.S., Texas A&M University, 1972

David J. Stahl, Jr.
Lieutenant, United States Navy
B.S., United States Naval Academy, 1980

Previous research has produced a real-time FOG-M missile flight simulation using Defense Mapping Agency digital terrain elevation data and a Silicon Graphics, Inc. IRIS 3120 graphics workstation. This study is a continuation of that project with the goals of providing more realistic targets and allowing viewing the terrain from inside several different types of vehicles. In addition, the use of Ethernet network communications between two workstations taking part in the simulation is used to create a missile/target gaming environment.

Master of Science in
Computer Science
December 1987

Advisor: M.J. Zyda
Department of
Computer Science

IMPLEMENTATION OF A PARALLEL MULTILEVEL SECURE PROCESS

David R. Pratt
Lieutenant, United States Marine Corps
B.S, Duke University, 1983

This thesis demonstrates an implementation of a parallel multilevel secure process. This is done within the framework of an electronic mail system. Security is implemented by GEMSOS, the operating system of the Gemini Trusted Computer Base. A brief history of computer secrecy is followed by a discussion of security kernels. Eventcounts and sequences are used to provide concurrency control and are covered in detail. The specifications for the system are based upon the requirements for a Headquarters of a hypothetical Marine Battalion in garrison.

Master of Science in
Computer Science
June 1988

Advisor: J.S. Stewart
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Operations
Research

THE SUITABILITY OF AN OBJECT-ORIENTED LANGUAGE FOR PROTOTYPING AND ABSTRACT DATA TYPES

Michael O. Rowell
Captain, United States Marine Corps
B.S., Michigan State University, 1978

ACTOR, an object-oriented follow-on language to Smalltalk, is used in an implementation of a prototype video store management package and in the implementation of a tree abstract data type package. The language has high power, familiar syntax, portability, windowing and extensive development tools which make it an excellent choice for prototyping. The intuitive nature of the language and the close connection between modeling physical and logical entities are aptly demonstrated by detailed discussion of the design of the video management package. Implementation of binary search tree and AVL tree abstract data types demonstrate that coding of constructs which are procedural in nature does not exploit the strengths of an object-oriented language such as ACTOR.

Master of Science in
Computer Science
June 1988

Advisor: C.T. Wu
Department of
Computer Science

A TEXTURE ANALYSIS APPROACH TO COMPUTER VISION FOR IDENTIFICATION OF ROADS IN AERIAL PHOTOGRAPHS

Jean M. Sando
Lieutenant, United States Navy
B.S., University of Florida, 1979

The development of computer vision and the identification of objects in an image is important for many areas of scientific, medical, and commercial ventures. The available literature details many experiments and algorithms in these fields. In this study, the possibility of identifying road surfaces in aerial black and white photographs using texture analysis is examined. A system using texture that was successful in identifying road surfaces is presented as part of this research.

Master of Science in
Computer Science
December 1987

Advisor: R.B. McGhee
Department of
Computer Science

PROTOTYPING VISUAL DATABASE INTERFACE BY OBJECT-ORIENTED LANGUAGE

Robert J. Schuett
Major, United States Army
B.S., United States Military Academy, 1976

A graphics user interface called GLAD (Graphics LAnguage for Database) has been proposed as a unified interface method for interaction with a database. The GLAD interface is a graphic object-orient environment which provides a rich intuitive interaction for the user. The interface between GLAD and the user is accomplished through the use of an Object-oriented language (OOL). Predefined classes in a OOL provide a robust capacity for quick prototype implementation.

The thrust of this thesis is to describe the current status of the GLAD implementation and show how the use of an Object-oriented language is an effective tool for implementation of the GLAD interface.

Master of Science in
Computer Science
June 1988

Advisor: C.T. Wu
Department of
Computer Science

AN EXPERT SYSTEM FOR THE DIAGNOSIS OF VEHICLE MALFUNCTIONS

Mufit Can Selek
Lieutenant JG, Turkish Navy
B.S., Turkish Naval Academy, 1981

We examine the feasibility of an expert system to assist in the diagnosis of vehicle malfunctions. A passive expert planner is proposed that utilizes multiple domain-dependent knowledge bases. The system is implemented on a personal computer, and is based on general-purpose car repair manuals. An effort is made to quantify the amount of information processing necessary to adequately define the problem. The knowledge base and inference procedures for such a system are also presented.

Master of Science in
Computer Science
December 1987

Advisor: N.C. Rowe
Department of
Computer Science

SEMANTIC SHORTCOMINGS OF DATABASE MANAGEMENT SYSTEMS BASED ON A RELATIONAL MODEL

Jonathan S. Wall
Lieutenant, United States Navy
B.S., United States Naval Academy, 1981

To many critics and researchers, semantic meagerness is the main limitation of relational DBMS. The burden placed on users to remember attribute names and their domains is discussed and difficulties associated with the lack of set as a type for an attribute is examined. The paper explores the implications to high-level query languages necessitated by a set-type attribute. The allowance of semantically improper joins by DBMS is studied as is the lack of strong data type checking. The semantic shortcomings of system-chosen access paths is discussed. These problems are followed by recommended solutions.

Master of Science in
Computer Science
June 1988

Advisor: C.T. Wu
Department of
Computer Science

DESIGN AND IMPLEMENTATION OF A PRETTY PRINTER FOR THE FUNCTIONAL SPECIFICATION LANGUAGE SPEC

Jill Annette Weigand
Lieutenant, United States Navy
B.S., United States Naval Academy, 1981

The purpose of this thesis is to develop and implement a language dependent pretty printer for the SPEC language. SPEC is a formal language for writing black-box specifications for components of software systems which are developed in the functional specification stage of software development. The pretty printer is a software tool used to format specifications to make them easier to understand and read. A computer program was written implementing the pretty printer design criteria. The program uses Kodiyak and was written as an attribute grammar. Included is a listing of the grammar for the SPEC langauge, the pretty printer program source listing, a representative sample of input used to test the pretty printer program and resulting output. A significant result of this study is the conclusion that by abstracting this language dependent pretty printer it is feasible to use Kodiyak to create a language independent pretty printer generator.

Master of Science in
Computer Science
June 1988

Advisor: V. Berzins
Department of
Computer Science

THREE ALGORITHMS FOR PLANAR-PATCH TERRAIN MODELING

Seung Hee Yee
Captain, Korean Army
B.S., Korea Military Academy, 1982

Providing a simplified model of real terrain has applications to route planning for robotic vehicles and military maneuvers. In this thesis I explore planar-patch surface modeling to represent terrain in a simple and effective way. In planar-patch surface modeling the terrain is subdivided into a set of planar subregions. The homogeneity of the gradient within a planar subregion simplifies calculating the cost of traversing the region, thus simplifying route planning. I have explored three main strategies to model the surface: joint top-down and bottom-up, strict bottom-up, and presmoothing bottom-up approaches. Results of the algorithms are shown graphically by using the APL and Grafstat packages, verifying their correctness and accuracy.

Master of Science in
Computer Science
June 1988

Advisor: N.C. Rowe
Department of
Computer Science

ACCESSING HIERARCHICAL DATABASES VIA SQL TRANSACTIONS IN A MULTI-MODEL DATA-BASE SYSTEM

John A. Zawis
Lieutenant, United States Navy
B.S., Hawaii Pacific College, 1980

There has been a tremendous growth in recent years in the use of data base management systems (DBMS) throughout the world. This has lead to efforts to increase the effectiveness and efficiency of systems designed to create and maintain large databases. The traditional approach has been to select a data model and its associated model-based data language and implement a database system based on tha single model. The multi-lingual database system (MLDS) was designed to increase the functionality of data base systems by allowing the use of multiple data models and several model-based languages on a single system. With this approach, the system could support a heterogeneous collection of databases, each based on the data model most appropriate for the individual application requirements.

MLDS currently supports the use of relational, hierarchical, network, and functional databases. The goal of this thesis is to further increase the functionality of MLDS by permitting a user knowledgeable only in a relational-based data language (SQL) to access and manipulate information in a hierarchical database, while strictly maintaining the integrity of the hierarchical model. This extends the multi-lingual database system to a multi-model database system (MMDS). The emphasis in this thesis

is two-fold. First, to provide the design analysis necessary to accomplish the translation. More specifically, to develop a process for transforming a hierarchical database schema into an equivalent relational schema and to analyze the SQL requests that are used to access a database and provide a mehtodology for equivalent access a database and provide a methodology for equivalent access to a hierarchically-based database system. The second area of emphasis is in the implementation of the schema transformation process and language translation methodology within the current MLDS structure. The software engineering aspects of the implementation are detailed to provide a base for further expansion of similar systems.

Master of Science in
Computer Science
December 1987

Advisor: D.K. Hsiao
Department of
Computer Science

MASTER OF SCIENCE
IN
ELECTRICAL
ENGINEERING

DIRECT BIT DETECTION RECEIVER NOISE PERFORMANCE ANALYSIS FOR 32-PSK AND 64-PSK MODULATED SIGNALS

Iftikhar Ahmed
Lieutenant Commander, Pakistani Navy
B.S., University of Karachi, 1976

Simple two channel receivers for 32-PSK and 64-PSK modulated signals have been proposed which allow digital data (namely bits), to be recovered directly instead of the traditional approach of symbol detection followed by symbol to bit mappings. This allows for binary rather than M-ary receiver decisions, reduces the amount of signal processing operations and permits parallel recovery of the bits. The noise performance of these receivers quantified by the Bit Error Rate (BER) assuming an Additive White Gaussion Noise interference model is evaluated as a function of E_b/N_o, the signal to noise ratio, and transmitted phase angles of the signals. The performance results of the direct bit detection receivers (DBDR) when compared to that of conventional phase measurement receivers demonstrate that DBDR's are optimum in BER sense. The simplicity of the receiver implementations and the BER of the delivered data make DBDR's attractive for high speed, spectrally efficient digital communication systems.

Master of Science in
Electrical Engineering
December 1987

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

SCMOS SILICON COMPILER ORGANELLE DESIGN AND INSERTION

Joan Eichten Baumstarck
Lieutenant, United States Navy
B.S., University of Florida, 1981

Conversion of the MacPitts Silicon Compiler from NMOS to Scalable CMOS technology includes the custom design of SCMOS organelles, the incrementor, decrementor and subtractor, are designed using the Magic layout editor. Cell insertions are made to the MacPitts Silicon Compiler installed on ISI workstations.

Master of Science in
Electrical Engineering
December 1987

Advisors: D.E. Kirk
H.H. Loomis
Department of
Electrical and
Computer Engineering

COMPUTER SIMULATION STUDIES OF MULTIPLE BROADBAND TARGET LOCALIZATION VIA FREQUENCY DOMAIN ADAPTIVE BEAMFORMING FOR PLANAR ARRAYS

Charles D. Behrle
Lieutenant, United States Navy
B.S., United States Naval Academy, 1980

Computer simulation studies of a frequency domain adaptive beamforming algorithm are presented. These simulation studies were conducted to determine the multiple broadband target localization capability and the full angular coverage capability of the algorithm. The algorithm was evaluated at several signal-to-noise ratios with varying sampling rates. The number of iterations that the adaptive algorithm took to reach a minimum estimation error was determined. Results of the simulation studies indicate that the algorithm can localize multiple broadband targets and has full angular coverage capability.

Master of Science in
Electrical Engineering
March 1988

Advisor: L.J. Ziomek
Department of
Electrical and
Computer Engineering

DESIGN CONSIDERATIONS FOR THE ORION SATELLITE: STRUCTURE, PROPULSION AND ATTITUDE CONTROL SUBSYSTEMS FOR A SMALL, GENERAL PURPOSE SATELLITE

Austin W. Boyd
Lieutenant Commander, United States Navy
B.A., Rice University, 1978

A general purpose satellite (ORION) has been designed which will launch from the Space Shuttle using a NASA Get-Away-Special (GAS) canister. The design is based on the use of a new extended GAS canister and a low profile launch mechanism. The satellite is also configured to launch as a dedicated payload on SCOUT or commercial expendable launch vehicles. The satellite is cylindrical, measuring 19 inches in diameter and 35 inches long. The maximum spacecraft mass is 250 pounds, of which 32 pounds are nominally dedicated to user payloads. The remaining 218 pounds encompass the satellite structure and support elements, which include a hydrazine propulsion subsystem and a spin stabilized attitude control subsystem. The propulsion subsystem provides sufficient impulse to enable circular orbits as high as 835 nm or elliptic orbits with apogees at 2200 nm, leaving a nominal Shuttle orbit of 135 nm. Four stabilizing booms or active nutation control techniques are employed for spin stabilization about the longitudinal axis of the spacecraft. Attitude control accuracies on the order of 1^{o} are attainable for a total mission duration of 90 days to 3 years. Total satellite cost is $1.5 million.

Master of Science in Electrical Engineering
March 1988

Advisor: A.E. Fuhs
Space Systems Academic Group

TARGET LOCALIZATION IN AN INHOMOGENEOUS MEDIUM

Michael D. Budney
Lieutenant, United States Navy
B.S., United States Naval Academy, 1980

A computer algorithm was developed to determine if an acoustic transmitter can be localized based on estimates of local angles of acoustic signals incident upon a receive planar sonar array, knowledge of the deterministic effects of the ocean on sound propagation, and local sound-speed profiles of the ocean. The algorithm was designed to determine azimuthal and elevation/depression angles to the transmitter as well as computing the depth, range, cross range, and line-of-sight range separations between the transmitter and the receive array. The algorithm utilizes ray acoustics and model-based phase weights to determine the transmitter's location relative to the receive array's position. As written, the algorithm is capable of solving localization problems in which the transmitter and receiver are in the same gradient of the local sound-speed profile, provided that the range from transmitter to receiver is not so great that the acoustic signal passes through a turning point prior to reaching the receive array. The results indicate that the method proposed is viable for the class of problems for which it was designed, and accuracies on the order of 0.1 meters are obtained for line-of-sight ranges on the order of several

kilometers. The angles calculated by the algorithm are all accurate to within 0.005 degrees.

Master of Science in
Electrical Engineering
December 1987

Advisor: L.J. Ziomek
Department of
Electrical and
Computer Engineering

SEMICONDUCTOR LASER DIODES AND THE DESIGN OF A D.C. POWERED LASER DIODE DRIVE UNIT

Joseph C. Cappuccio, Jr.
Lieutenant, United States Navy
B.S., Jacksonville University, 1981

This thesis addresses the design, development and operational analysis of a D.C. powered semiconductor laser diode drive unit. A laser diode requires an extremely stable power supply since a picosecond spike of current or power supply switching transient could result in permanent damage. The design offers stability and various features for operational protection of the laser diode. The ability to intensity modulate (analog) and pulse modulate (digital) the laser diode output for data transmission was a major design consideration. Laser optical power is controlled via a closed loop system using a monitor photodiode. Laser diode temperature stabilization is accomplished with the use of a thermoelectric cooler. Laboratory and remote applications were considered in the design of this unit.

Master of Science in
Electrical Engineering
June 1988

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

PRELIMINARY DESIGN OF THE ORION ATTITUDE CONTROL SYSTEM

David C. Chappell
Lieutenant, United States Navy
B.S., University of Kansas, 1979

This thesis models the motion of the NPS satellite ORION using the three Euler rotation angles. The simulation program also models aerodynamic drag and gravity gradient torques. Simulations are performed to analyze the effect of changing the inertia ratio on satellite stability and performance. The active nutation control method was also simulated and an example of its operation given. The amount of time required to reduce nutation to an acceptable level was found to be dependent on the initial nutation angle, spin rate, and thruster size. The slower the spin rate, the greater the torque that could be used during a given firing arc resulting in faster nutation control.

Master of Science in
Electrical Engineering
December 1987

Advisor: G. Thaler
Department of
Electrical and
Computer Engineering

A NUMERICAL MODELING STUDY OF THE TRANSMISSION LINE ANTENNA FOR USE AS AN HF COMBAT SURVIVABLE SHIPBOARD ANTENNA

Seung Kyn Choi
Major, Republic of Korea Air Force
B.S., Korean Air Force Academy, 1977

This thesis investigates computer numerical models to improve combat survivability for HF shipboard antenna systems. The trend for the next generation of ships will be the elimination of tall and large structures to make antennas more survivable during combat. The use of a transmission line antenna on the bow and the stern of a ship seems to be a good candidate for solving these problems. The ship and antennas are modeled using wire grids. The computer models are developed by the Numerical Electromagnetics Code (NEC). Average power gain, input impedance, and radiation patterns of driven antennas are presented.

Master of Science in
Electrical Engineering
December 1987

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

FINITE ELEMENT ELECTROMAGNETIC SCATTERING: AN INTERACTIVE MICRO-COMPUTER ALGORITHM

Edward Michael Connolly
Lieutenant, United States Navy
B.S., United States Naval Academy, 1980

The goal of this thesis effort is to develop an interactive electromagnetic scattering algorithm for personal computer use in the analysis and computer aided design (CAD) of scattering structures. Extensive interactive computer aided design type features have been added to a previously developed finite element computer algorithm which considers scattering from inhomogeneous axisymmetric objects. These computer aided design features allow structures composed of multiple dielectric and/or magnetic materials to be graphically constructed or modified by the user by way of either a keyboard or mouse interface. Bistatic scattering patterns are graphically presented upon completion of the computation for a variety of user specified incident field orientations.

Master of Science in
Electrical Engineering
June 1988

Advisor: M. Morgan
Department of
Electrical and
Computer Engineering

SYSTEM IDENTIFICATION BY ARMA MODELING

Paul S. Dal Santo
Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1978

System identification concerns the mathematical modeling of a system based upon its input and output. It allows the development of a mathematical description when all that is available is the result of a process or the output of a system and not the process or system itself.

The purpose of this thesis is to develop algorithms for modeling systems as autoregressive-moving-average processes using the method of instrumental variables, a modification of the ordinary least-squares technique, and a multichannel method based upon processing the input and output data by separate infinite-impulse-response filters. The methods developed are tested by computer simulation using several second and third-order test cases and the results are presented.

Master of Science in
ELectrical Engineering
September 1988

Advisor: M. Tummala
Department of
Electrical and
Computer Engineering

LONG HAUL UNDERWATER FIBER OPTIC LINK

Frank A. DeNap
Lieutenant Commander, United States Navy
B.S., University of Illinois, 1973

This thesis presents the design, test and evaluation of a fiber optic remote monitoring system. Practical aspects of loss measurement, link analysis, receiver design, and controller implementation are examined. The fundamental operation of the system relies on conversion of the voltage data to a variable frequency TTL pulse train. The pulse train modulates a 1300 nm laser, which transmits the telemetry data via single mode fiber to the shore station. One of two test voltages can be selected by the shore-based controller, via the bidirectional link. Laboratory test results are included.

Master of Science in
Electrical Engineering
March 1988

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

A SPLIT LEVINSON APPROACH TO AUTOREGRESSIVE MODELING

William A. Dicken
Lieutenant Commander, United States Navy
B.S., University of Mississippi, 1977

The classical Levinson-Durbin linear prediction formulas for real valued input sequences are examined and compared to the recently proposed split-Levinson formulas. Both the autoregressive linear predictor model and the adaptive lattice model are used to formulate the new split-Levinson algorithms. A brief introduction to the theory of symmetric polynomials is presented to form the basis of the new algorithms. Computer simulations are used to test and compare the computational accuracy of the new algorithms for AR filter coefficient estimation, parameter estimation for a moving average process, and spectral estimation of sinusoids in white noise. Research results indicate that the new algorithms reduce the number of real multiplications required for a k^{th} order AR filter problem by one-half, and they are applicable to both the extended Prony method of spectral estimation and the estimation of moving average parameters.

Master of Science in
Electrical Engineering
June 1988

Advisor: M. Tummala
Department of
Electrical and
Computer Engineering

FAULT DIAGNOSIS IN DISTRIBUTED COMPUTER NETWORKS

Ibrahim Dincer
Captain, Turkish Army
B.S., War Academy, Ankara, Turkey, 1978

This thesis introduces the concept of a diagnosis algorithm in the context of the Preparata-Metze-Chien (PMC) model. It represents a Computer-Aided-Design (CAD) tool for use in analyzing such algorithms. That is, with this tool, the user can establish a multiprocessor system, a set of test outcomes and then analyze the properties of specified distributed diagnosis algorithm. Examples in this thesis include a system in which: 1) Correct diagnosis achieved in a small number of iterations. 2) Correct diagnosis is never achieved. 3) An oscillating situation exits in which, faulty processors become alternately enabled and disabled.

Master of Science in
Electrical Engineering
December 1987

Advisor: J.T. Butler
Department of
Electrical and
Computer Engineering

DIGITAL FILTER DESIGN TECHNIQUES

Janine V. England
Lieutenant, United States Navy
B.A.B.S., California State University, Fullerton, 1978

An overview and investigation of the more popular digital filter design techniques are presented, with the intent of providing the filter design engineer a complete and concise source of information. Advantages and disadvantages of the various techniques are discussed, and extensive design examples used to illustrate their application to specific design problems. Both IIR (Butterworth, Chebyshev and elliptic), and FIR (Fourier coefficient design, windows and frequency sampling) design methods are featured, as well as the Optimum FIR Filter Design Program of Parks and McClellan, and the Minimum p-Error IIR Filter Design Method of Deczky.

Master of Science in
Electrical Engineering
March 1988

Advisor: R.D. Strum
Department of
Electrical and
Computer Engineering

A COMPUTER MODEL INVESTIGATION OF A HALF SQUARE LOG-PERIODIC ARRAY

Mustafa Erdeviren
Captain, Turkish Army
B.S., Naval Postgraduate School, 1987

This thesis investigates the potential of a half square log-periodic array for use by the military over the frequency range of 2 to 30 MHz using a computer simulation technique by numerical methods. Using the Numerical Electromagnetics Code (NEC), a selected model was run in free space and over perfect ground to obtain data for radiation patterns and element currents of the array. After the evaluation of the NEC data, the results of the investigation show that half square log-periodic array with dual feed and switched transmission line has characteristics of a successful log-periodic structure with a unidirectional radiation pattern, over the design frequency range of 2 to 30 MHz, showing promise for military applications.

Master of Science in
Electrical Engineering
December 1987

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

2 FSK/QPSK TRANSMITTER AND RECEIVER: DESIGN AND PERFORMANCE

Nels A. Frostenson
Lieutenant, United States Navy
B.S., United States Naval Academy, 1980

Michael D. Sonnefeld
Lieutenant, United States Navy
B.S., United States Naval Academy, 1980

This research considers a particular form of M-ary signaling called 2 FSK/QPSK. It is a unique way of combining two modulation methods to produce an 8-ary signaling technique whose noise performance is shown to be significantly better than 8-PSK. A transmitter and receiver for 2 FSK/QPSK is designed, built, tested and analyzed. Theoretical and experimental results are compared using a plot of probability of bit error versus signal-to-noise ratio (SNR). Known theoretical performance of 8-PSK is used for comparison. Results show a 5 dB theoretical improvement in SNR and a 3 dB experimental improvement of 2 FSK/QPSK relative to 8-PSK.

Master of Science in
Electrical Engineering
December 1987

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

PASSIVE RANGE ESTIMATION USING OVER SEA MULTIPATH

Avner Gal
Lieutenant, Israeli Navy
B.S., Technion-Israel
Institute of Technology, Haifa, Israel, 1982

This thesis suggests an unconventional, unique method for passive range and height estimation of a cruising missile, or other microwave transmitter. Based on multipath propagation, the method uses five receiving antennas in a ladder configuration. Ratios of received signal powers are compared with values from lookup tables to determine the correct location of the transmitter. Computer simulation results are presented, to verify the suggested method.

Master of Science in
ELectrical Engineering
June 1988

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

LONG HAUL UNDERWATER FIBER-OPTIC COMMUNICATIONS

John Gregory Gallagher
Lieutenant, United States Navy
B.S.B., North Texas State University, 1979

The subject of this thesis is the design, construction and testing of a long haul fiber-optic communication system. This system would remotely monitor the voltage of a one volt, one ampere long-life saltwater battery at nominal depths of 1000 meters. It is the continuation of an ongoing project to monitor the battery in its deployed deepwater environment. The goal was to find methods to increase the transmission distance of the previous short haul (less than 10 kilometers) communication link to greater than 30 kilometers by utilizing a laser source instead of an LED and single mode fiber-optic cable instead of multimode cable. Additionally the capability to monitor various other environmental or system parameters by the use of a microprocessor.

Master of Science in
Electrical Engineering
December 1987

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

A COMPUTER SIMULATION STUDY OF AN EXPERT SYSTEM FOR WALKING MACHINE MOTION PLANNING

Richard P. Goodpasture
Lieutenant, United States Navy
B.S., Eastern Kentucky University, 1980

A basic algorithm for motion planning of an autonomous robotic vehicle is developed and presented in this study. The algorithm is implemented using simple rules in an expert system shell. This algorithm will allow autonomous vehicles with only rudimentary sensory abilities to navigate from point A to point B with no previous knowledge of the terrain. For this study, the algorithm is implemented with a KEE expert shell on a Texas Instrument Explorer Lisp machine and controls a color graphics computer simulation of the Ohio State University Adaptive Suspension Vehicle.

Master of Science in
Electrical Engineering
December 1987

Advisor: R.B. McGhee
Department of
Computer Science

PATH FOLLOWING ROBOT

Steven Gerald Goodway
Lieutenant, United States Navy
B.S., University of Washington, 1978

Given a desired path to be followed by a Robot, a set of commands must be given to the Robot joint servos so that the Robot Tip, or Endpoint, can follow that path. These commands must be synchronized in time and scaled so as to maintain accuracy in the presence of possible saturations in the servos. This thesis develops an algorithm to generate multiple simultaneous time varying commands to Robot joint positioning servos so that the Robot Tip will follow a desired path for the Cartesian Articulated Robots.

Master of Science in
Electrical Engineering
December 1987

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

SEGMENTATION OF NOISY IMAGES USING NONSTATIONARY MARKOV FIELDS

Kani Hacipasaoglu
Lieutenant, Turkish Army
B.S., Turkish Military Academy, 1980

The purpose of this thesis is to develop an algorithm for segmenting images corrupted by a high level of noise with different characteristics. In particular the images considered are composed of several regions describing different objects and background. The algorithm described is based on a Markov Random Field (MRF) model of the image and uses Kalman Filtering (KF) techniques and Dynamic Programming (DP) in order to smooth within the regions. The theoretical background for one dimensional and two dimensional data which have different characteristics and simulation results are presented, with examples of synthetic data and underwater images.

Master of Science in
Electrical Engineering
December 1987

Advisor: R. Cristi
Department of
Electrical and
Computer Engineering

AUTOMATED DESIGN OF A MICROPROGRAMMED CONTROLLER FOR A FINITE STATE MACHINE

James Edward Harmon
Lieutenant Commander, United States Navy
B.S., University of New Mexico, 1975

A Scalable Complementary Metal Oxide Semiconductor (SCMOS) microprogrammed controller for the Monterey Silicon Compiler (MSC) is implemented in the LISP programming language. The internal organization of MSC and the architecture of Very Large Integrated (VLSI) circuits generated by MSC are discussed.

Master of Science in
Electrical Engineering
June 1988

Advisors: H.H. Loomis
D.E. Kirk
Department of
Electrical and
Computer Engineering

MULTICHANNEL DATA TRANSMISSION THROUGH A FIBER OPTIC CABLE SYSTEM LINK

Fokion Hatzidakis
Lieutenant, Hellenic Navy
B.S., Hellenic Naval Academy, 1978

The objective of this thesis was to design and construct a system which transmits and receives data from different analog channels through a single fiber optic cable link. The system uses a microprocessor controlled multiplexer and a high speed analog-to-digital converter. Tests and measurements were performed to examine the restrictions, problems and different options on the various components of the system. Based on the above, a trade-off analysis was performed for the bandwidth and the number of channels.

Master of Science in
Electrical Engineering
December 1987

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

CONSTRUCTION OF GALLIUM ARSENIDE SOLAR CONCENTRATOR FOR SPACE USE

Chris L. Hudec
Major, United States Army
B.S., The Ohio State University, 1975

A Gallium Arsenide (GaAs) Solar Concentrator Array (SCA) was constructed using the recently developed fresnel lens technology. The parts used were a mixture of space qualified components and readily available off-the-shelf items. The objective of the test was to verify that the SCA would substantially increase the array's power output and reject the high thermal radiation it would encounter in space. It was found that the 3 by 3 GaAs SCA power output increased from 29.88 mW to 433.71 mW. The thermal analysis and the steady state cell operating temperature calculation showed that the SCA's thermal design would keep the GaAs solar cells at a steady state temperature of 50.7°C. However, because of the low intensity level of the light source available for use the cell operating temperature was only 27°C. This was considered to be inconclusive in determining the adequacy of the thermal design.

Master of Science in
Electrical Engineering
March 1988

Advisor: S. Michael
Department of
Electrical and
Computer Engineering

A COMPUTER PROGRAM PACKAGE FOR INTRODUCTORY ONE-DIMENSIONAL DIGITAL SIGNAL PROCESSING APPLICATIONS

Frank Edward Hudik
Lieutenant, United States Navy
B.S., United States Naval Academy, 1979

A need exists for a set of computer programs that can be used by students to solve elementary digital signal processing problems using a personal computer. This project involved the design and implementation of ten algorithms that solve such problems and an additional algorithm that creates plots of the various input and output sequences. The two primary goals of the programs were: 1) user friendliness and, 2) portability. With these goals in mind, the source code was written using Fortran-77 and compiled by a commercially available Fortran compiler specifically designed for personal computers. The plotting program uses a Fortran-compatible graphics package that is also commercially available. The programs, once compiled, can be distributed to users without the requirement to purchase either a Fortran compiler or a graphics package; however, access to a Fortran compiler enhances the utility of the programs.

Master of Science in
Electrical Engineering
March 1988

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

STRATEGIES IN THE TOPOLOGICAL APPROACH TO ELECTROMAGNETIC INTERFERENCE CONTROL

Vernon D. Ingram
Lieutenant, United States Navy
B.S., University of Washington, 1980

The ability of standard commercial equipment cabinets to be used to provide a barrier to electromagnetic interference is explored. The internal to external, and external to internal, electromagnetic isolation provided by various configurations of cabinet-penetrating conductors was measured at frequencies from 20 HZ to 20 MHZ. Excellent isolation was obtained over the entire frequency range when penetrating conductors (coaxial cables, grounds buses, power conductor green-wires, and power conductor black and white wires) were installed in accord with barrier principles. Little or no isolation was obtained with the direct penetration of the cabinet by conductors. These results were confirmed by laboratory and field measurements (at operating CDAA sites).

Master of Science in
Electrical Engineering
December 1987

Advisor: S. Jauregui
Department of
Electrical and
Computer Engineering

FREQUENCY HOPPING WITH ANALOG MESSAGES

Suwito Kardisan
Major, Indonesian Air Force
B.S., Indonesian Air Force Academy, 1968

All presently known frequency hopping (FH) systems transmit digital data. Consequently a clock is a typical part of the system. This research consists of a breadboard realization of an FH transmitter and receiver. Voice and/or music in analog form are transmitted using an FH carrier. Hopping is random in time and pseudo-random in frequency. The message which is recovered and heard using a speaker is of good quality.

Master of Science in
Electrical Engineering
March 1988

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

PC SOFTWARE FOR THE TEACHING OF DIGITAL SIGNAL PROCESSING

Yoel Katzir
Major, Israeli Air Force
B.S., Ben-Gurion University of the Negav, Israel, 1977

The Electrical and Computer Engineering Department at the Naval Postgraduate School has a need for additional software to be used in instructing students studying signal processing. This software will be used in a PC lab or at home.

This thesis provides a set of disks written in APL (A Programming Language) which allows the user to input arbitrary signals from a disk, to perform various signal processig operations, to plot the results, and to save them without the need for complicated programming.

The software is in the form of a digital signal processing "toolkit." The user can select functions which can operate on the signals and interactively apply them in any order. The user can also easily develop new functions and include them in the "toolkit."

The thesis includes brief discussions about the library workspaces, a user manual, function listings with examples of their use, and an application paper. The software is modular and can be expanded by adding additional sets of functions.

Master of Science in
Electrical Engineering
March 1988

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

PERFORMANCE STUDY OF A UNIPOLE ANTENNA WITH CONVENTIONAL AND ELEVATED RADIAL WIRE GROUND SCREENS

Dimitris A. Koutsouras
Lieutenant, Hellenic Navy
B.S., Hellenic Naval Academy, 1979

The advantages of using elevated radial wire ground screens with vertical monopole antennas for MF and HF broadcast have recently been reported. This study extends the concept to the folded unipole antenna and compares the performance of a folded unipole with elevated radials to that of monopoles operating with both elevated and conventional buried radial wire ground screens. The unipole's performance with 2,3 and 4 elevated radials, is within 2% of that for a standard monopole using 120 buried radial wires.

Master of Science in
Electrical Engineering
December 1987

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

SCATTERING IMPULSE RESPONSE SYNTHESIS USING RANDOM NOISE ILLUMINATION: INITIAL CONCEPT EVALUATION

Dong Il Lee
Major, Korean Army
B.S., Korean Military Academy, 1977

This thesis investigates the synthesis of smoothed impulse responses using sampled data of the input and output of random noise driven electromagnetic systems. Special interactive software was developed for NPS's time domain electromagnetic scattering laboratory. The system performs signal acquisition, synthesizes time and frequency domain scattering responses using broad band random noise and provides results as easily evaluated graphic displays. Attempted validations of the system are made by comparing synthesized impulse responses for microwave filters and transient scatterers to alternate experimental and computational data.

Master of Science in
ELectrical Engineering
March 1988

Advisor: M.A. Morgan
Department of
Electrical and
Computer Engineering

THE DE-EMBEDMENT OF NETWORK-ANALYZER MEASUREMENTS

Whan Su Lee
Major, Korean Air Force
B.S., Korean Air Force Academy, 1978

In the measurement of microwave circuits and devices, the data reduction of two-port measurement data obtained at the external terminals of microstrip-coupled devices, with correction for measurement error, can be obtained by de-embedment procedures with use of the HP 8409B vector network analyzer and a Fortran program.

Master of Science in
Electrical Engineering
March 1988

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

EFFECTS OF IRREGULAR SEA SURFACE AND EVAPORATION DUCT ON RADAR DETECTION PERFORMANCE

Moshe Marom
Commander, Israeli Navy
B.S., Technion-Israel
Institute of Technology, Haifa, Israel, 1979

The detection performance of microwave search radars operating in close proximity to the sea surface is evaluated. The effects of media characteristics on the propagation of electromagnetic waves have been incorporated. Specular and diffused scattering from a rough surface, and the effects of the curvature of the earth's surface have been included in the study. Additionally, surface ducting effects cuased by atmospheric anomalies are presented. Some design and operational considerations which can improve the detection performance of a surface search radar, are also presented.

Master of Science in
Electrical Engineering
June 1988

Advisor: R. Janaswamy
Department of
Electrical and
Computer Engineering

AN INEXPENSIVE REAL-TIME FLIGHT SIMULATOR FOR THE UNITED STATES MARINE CORPS' AIRBORNE REMOTELY OPERATED DEVICE

Steven Paul Martinson
Captain, United States Marine Corps
B.S., North Dakota State University, 1980

A flight simulator is developed for the Airborne Remotely Operated Device used by the United States Marine Corps. Real-time interactive simulation is performed on a high speed graphics workstation. Accurately modeled dynamics are incorporated to reflect actual vehicle flight. The resulting system gives an operator the on board impression of flying through three dimensional terrain. This will provide realistic flight training at a fraction of the cost of a commercial simulator.

Master of Science in
Electrical Engineering
June 1988

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

ADAPTIVE ARMA LATTICE FILTER BASED ON A GENERALIZED MULLIS-ROBERTS CRITERION

Donald W. Mennecke
Lieutenant, United States Navy
B.A., State University of New York, Buffalo, 1981

In this thesis, an adaptive lattice algorithm is derived for an ARMA digital lattice filter, whose parameters are estimated using a generalized Mullis-Roberts criterion for parameter estimation. Design of the ARMA lattice filter based on this generalized criterion is studied as is the accuracy of the parameter estimation algorithm used in its design. Application of the derived lattice algorithm to system identification modeling is demonstrated through computer simulation of various system identification problems.

Master of Science in
Electrical Engineering
June 1988

Advisor: M. Tummala
Department of
Electrical and
Computer Engineering

NUMERICAL ELECTROMAGNETIC MODELS OF CUBE-SHAPED BOXES-- AN INITIAL INVESTIGATION FOR NEAR-FIELD PREDICTION OF HF SHIPBOARD ENVIRONMENTS

Carlos R. Molina
Lieutenant Commander, Venezuelan Navy
B.S., Venezuelan Naval Academy, 1975

An investigation was performed to evaluate the accuracy of numerical modeling of Near-fields predictions for antennas on or near surfaces using the Numerical Electromagnetic Code (NEC). Average power gain and input impedance were calculated, for two models. The first, a dipole antenna located inside a cube-shaped wire-grid box of 1 meter sides was evaluated for a wide range of frequencies in free space. The second, a monopole antenna mounted of the top of two cube shaped boxes (a wire grid and a surface patch box) of .1 meter sides over a perfectly conducting ground was evaluated from 1 to 1.4 GHz. The monopole was positioned at the center, at an edge, and at the corner of the box top. For the dipole in the box, the average gain and input impedance are presented and evaluated. For the monopole on the box, calculated results are compared to measured admittance values. The NEC wire-grid model results compare closely to the measurements, but for surface-patch models, only one position of the monopole yielded satisfactory correlation to measurements. Recommendations for improved numerical modeling performance are made.

Master of Science in
Electrical Engineering
December 1987

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

THREE-DIMENSIONAL PERSPECTIVE IMAGE GENERATION FROM SONAR BATHYMETRY AND IMAGERY DATA

Robert John Myers
Lieutenant, United States Navy
B.S., United States Naval Academy, 1978

This thesis develops a program which will merge or overlay imagery and terrain elevation data and create a synthetic 3-D perspective view of the ocean bottom. The observer may position himself at various locations and see the terrain from different viewpoints. The elevation data is grouped into triangular panels and the color information is averaged from the imagery data file. The entire panel is assigned a single color equal to the average. These panels are then projected onto an image plane by using a 3D to 2D perspective transformation. Hidden surfaces are removed by a "painters" algorithm which relies on sorting the panels based on distance from the observer.

Master of Science in
Electrical Engineering
June 1988

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

AUTOMATIC DATA RETRIEVAL FROM ROCKET MOTOR HOLOGRAMS

Emin Sami Orguc
Lieutenant JG, Turkish Navy
B.S., Turkish Naval Academy, 1981

This thesis describes a technique of obtaining particle size information from holograms of combustion products. These data are needed to improve predictive capabilities of propellant performance, to provide input related to ammonium perclorate (AP) - aluminum interactions for steady-state combustion models and to provide in motor particle size distributions to allow more accurate predictions of damping in stabilite analysis and two phase flow and exhaust plume signature. This study describes the use of Itex/PC software for the filtering and processing of the hologram images to reduce speckle and also, improves a Fortran program which had been written before to extract the particle feature data from the modified image. The final step shows the statistical particle feature data exhibition by using the STATGRAPHICS (Statistical Graphics System) software.

Master of Science in
Electrical Engineering
December 1987

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

A MICROPROCESSOR-BASED, SOLAR CELL PARAMETER MEASUREMENT SYSTEM

Robert R. Oxborrow
Lieutenant, United States Navy
B.S., United States Naval Academy, 1980

The effects of the space environment on solar cells has, to date, been largely modeled and approximated in the design of solar arrays. Restrictions such as weight and cost have precluded direct analysis of the long term effect of radiation in space. At the Naval Postgraduate School (NPS), a simple circuit has been devised which facilitates in situ data collection and analysis of these effects. The circuit inlcudes an op-amp and a high beta transistor for cell voltage biasing. When coupled to a microprocessor-based controller system, this circuit has the capability to measure and store data pertaining to solar cell performance I-V curves. The complete system consists of an NSC 800 microprocessor, D/A and A/D components, analog multiplexers and demultiplexers, biasing transistors and op-amps. This design provides a compact, low power, accurate method for I-V measurement and data storage. Such a system may be used to observe and monitor an array of test cells and their performance/degradation in both the space environment and terrestrial applications.

Master of Science in
Electrical Engineering
March 1988

Advisor: S. Michael
Department of
Electrical and
Computer Engineering

ANALYSIS OF THE EFFECT OF FAULTY SPARES ON THE PERFORMANCE OF DIAGNOSTIC ALGORITHMS IN RELIABLE SYSTEMS

Mustafa Paktuna
Lieutenant, JG, Turkish Navy
B.S., Naval Academy, Istanbul, Turkey, 1981

Previous research of systems diagnosis algorithms have assumed that replacement processors are fault-free. In practical applications, however, faults can occur in spare processors. It is shown that faulty spare processors have a surprisingly large deleterious effect on the speed of diagnosis in the universal diagnosis Algorithm-1 analyzed by Smith [Ref. 13].

In this thesis we derive asymptotic approximation to the probability of repair when faulty spares are present. An exact value can be obtained from previously known results. Our asymptotoc approximations yield good estimates that can be calculated quickly. The analysis was performed by formulating the probability of repair calculations as a multiplication of matrices and by deriving approximations to the largest eigenvalues of these matrices. Also, faster calculations were achieved by an aggregation operation on the states of the system.

Master of Science in
Electrical Engineering
December 1987

Advisor: J.T. Butler
Department of
Electical and
Computer Engineering

EFFECTS OF REDUCED ORDER MODELING ON THE CONTROL OF A LARGE SPACE STRUCTURE

William J. Preston
Major, United States Marine Corps
B.S., Bradley University, 1975

The motion of a large space structure, such as a space station, is described by a large number of coupled, second order differential equations. To effectively control this structure, a mathematical model is required. Both the mathematical model developed directly from the physics of the structure, and the simplified model developed with modal analysis are of extremely high dimension. A reduced order model is therefore required in order to design a control system for the structure.

A straightforward approach to the control problem is taken by using linear quadratic optimal control techniques to determine the reduced order control solution for the truncated modal model. The effects of reduced order modeling on the control of the space station will be evaluated by observing the response of the closed loop system to several disturbances.

Master of Science in
Electrical Engineering
September 1988

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

AN EVALUATION OF INTERACTIVE LABORATORY SYSTEM SOFTWARE, ILS PC/DOS, A DIGITAL SIGNAL PROCESSING SOFTWARE PACKAGE

Thomas A. Quintero
Captain, United States Marine Corps
B.S., United States Naval Academy, 1981

An evaluation is presented of the Interactive Laboratory System's digital signal processing software. The capabilities of the software are outlined and several representative problems are solved. A comparison is made of this software package with existing signal processing tools at the Naval Postgraduate School.

Master of Science in
Electrical Engineering
December 1987

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

UNIDIRECTIONAL MANCHESTER ENCODED DATA TRANSFER VIA A FIBER OPTIC LINK

Robert G. Ragsdale, Jr.
Lieutenant Commander, United States Navy
B.S., Virginia Polytechnic Institute, 1972

The subject of this thesis is the application of Manchester encoding techniques to digital data transfer. Asynchronous receipt of digital data for decoding eliminates many of the technical implementation problems associated with synchronous transmission of data. The thesis goal was to construct the necessary hardware to allow Manchester encoded data transfer over a fiber optic data link. The scope of the project was limited to the transfer over a fiber optic data link. The scope of the project was limited to the transfer of byte size amounts of data from a microcomputer bus through the fiber link back to the computer bus. Successful coding, transmission, and decoding were accomplished as delineated in the hardware design section.

Master of Science in
Electrical Engineering
March 1988

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

A PAD ROUTER FOR THE MONTEREY SILICON COMPILER

Carlos F. Rexach
Lieutenant, United States Navy
B.S., University of Puerto Rico, 1980

A two layer pad router is developed for the Monterey Silicon Compiler. Features include an improved pad placement routine that extracts information from the internal layout to minimize chip area and wiring lengths, and a track allocation algorithm that minimizes the use of polysilicon during net layout. The router's performance was compared to that of the MacPitts Silicon Compiler with four distinct circuits. The Monterey pad router layouts were 5% to 25% faster, and 10% to 15% smaller than those produced by MacPitts.

Master of Science in
Electrical Engineering
March 1988

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

MICROPROCESSOR CONTROL OF A FAST ANALOG-TO-DIGITAL CONVERTER FOR AN UNDERWATER FIBER OPTIC DATA LINK

Gene L. Schlechte
Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1978

This thesis reports on the design and evaluation of a microprocessor-controlled, high-speed analog-to-digital converter. The processor supervises and manages the digital conversion, split-phase encoding (Manchester) and framing of the input signal. This converter is designed to be applied in an underwater package which will serially transmit sensor data over a fiber optic link to a shore station. This intelligent sensor will provide for ease of future system enhancements. An example would be the implementation of one package to multiplex several analog channels from a local sensor network over the single fiber optic link to the shore station.

Master of Science in
Electrical Engineering
March 1988

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

APPLICATIONS OF ORION TO NAVY UHF SATELLITE COMMUNICATIONS

Douglas Scott Schroeder
Lieutenant, United States Navy
B.S., Purdue University, 1982

This research was conducted to determine the usefulness of Orion as a proliferated, inexpensive, UHF communications satellite. The Navy presently depends on a few reliable, expensive satellites for UHF communications. Should these few be attacked by an adversary, communications could be crippled. As a wartime reinforcement, forty inexpensive satellites can be a deterrent by making such an attack economically futile. Doppler, jamming, and launch resources are the most significant problems. Doppler can be skirted by using a Manchester waveform and data buffers. The footprint of Orion is 16% of the FLTSATCOM footrint, hence, jamming opportunities are significantly reduced, and a suitable launch system has been devised to establish required orbits. The Orion constellation will be a survivable radio complement to restore partial capability to fleet users in time of conflict. The constellation could be launched on demand, but the best implementation is to launch prior to the onset of hostilities.

Master of Science in
Electrical Engineering
December 1987

Advisor: A.E. Fuhs
Space Systems
Academic Group

AN ELECTROMAGNETIC COMPATIBILITY ANALYSIS OF THE AN/URC-109 HF WIDEBAND COMMUNICATION SYSTEM AS INSTALLED ON THE LHD-1 AMPHIBIOUS ASSAULT SHIP

George A. Seaver, Jr.
Lieutenant Commander, United States Navy
B.E.E., Auburn University, 1979

The purpose of this study is to evaluate the performance of the AN/URC-109 HF Wideband Communication System as it is to be installed on the LHD-1 Amphibious Assualt Ship. The system is configured so that as many as twenty-two HF transmitter can be operated simultaneously. The COSAM II (DECAL/PECAL) WIDEBAND AND NARROWBAND RF ARCHITECTURE ANALYSIS PROGRAM was used in conducting the evaluation.

The program was first run in the necessary desired power mode to determine if any of the 506 possible RF coupling paths would have unsatisfactory interference levels and to determine the mean necessary desired power for each receiver. Then the program was run in the system performance score mode to evaluate the performance of each of the twenty-three receivers. Although two of the receivers had marginally unsatisfactory scores, the overall system performance was determined to be satisfactory, with an average performance score of 84%.

Master of Science in
Electrical Engineering
March 1988

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

DIRECT BIT DETECTION RECEIVER PERFORMANCE ANALYSES FOR 8-DPSK AND 16-DPSK MODULATED SIGNALS OPERATING WITH IMPROPER CARRIER PHASE SYNCHRONIZATION

Mehmet Sevki Sekerefeli
Lieutenant JG, Turkish Navy
B.S., Turkish Naval Academy, 1981

The application of Direct Bit Detection methods are analyzed and evaluated in digital communication systems employing Differential Phase Shift Keyed (DPSK) modulation. Assuming an additive white Gaussian noise interference model, and direct bit detection methods used in the receiver, 8-DPSK and 16-DPSK communication systems are considered and their performances evaluated in terms of the delivered bit error rate as a function of signal-to-noise ratio. The advantages and disadvantages of Direct Bit Detection Receiver (DBDR) systems used in conjunction with differential phase encoding are determined, with specific application to 8-DPSK and 16=-DPSK modulated signals. The effect of improper receiver carrier phase synchronization is considered in detail, and resulting performance degradations are evaluated. Numerical results show that for receiver phase errors of more than a few degrees, severe performance degradations result for both DPSK modulation schemes, unless a complete phase reversal (i.e., 180^{o}) takes place.

Master of Science in
Electrical Engineering
December 1987

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

DESIGN METHODOLOGY USING THE GENESIL SILICON COMPILER

Robert Howard Settle
Lieutenant Colonel, United States Marine Corps
B.S., United States Naval Academy, 1971

The applications of silicon compilers, and the design methodology of the Genesil Silicon Compiler are described. The performance of Genesil system library adders and multipliers are compared with comparable custom pipelined adder and multiplier circuits built on the Genesil Silicon Compiler. High performance pipeline methods are discussed. The appendix is a tutorial illustrating a Genesil system hierarchical top-down chip design, including simulation and timing analysis procedures.

Master of Science in
Electrical Engineering
September 1988

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

DESIGN INVESTIGATION FOR A MICROSTRIP PHASED ARRAY ANTENNA FOR THE ORION SATELLITE

Mark B. Smith
Lieutenent, United States Navy
B.S., University of Washington, 1980

Students at the Naval Postgraduate School are designing a general purpose mini-satellite that can be launched from a "Get-Away-Special" cannister located in the cargo bay of the Space Shuttle and will be compatible with expendable launch vehicles as well. This thesis defines preliminary antenna design parameters for the telemetry system of the ORION mini-satellite. These antenna design parameters may be used for investigations of various proposed antenna systems and the design parameters also allow for trade-off studies wiht the mission capabilities and subsystems of the satellite. An investigation is made into the feasibility of using conformal microstrip patch array antennas for the telemetry, tracking and command (TT&C) systems. It is necessary to have two separate microstrip patch array antennas for the telemetry system: one uplink and one downlink antenna. The microstrip patch array antenna can operate as either an omnidirectional antenna or a directional antenna by changing the phase of the individual patch feeds. This feature gives the microstrip patch array antenna more flexibility for meeting the needs of potential users.

Master of Science in
Electrical Engineering
June 1988

Advisor: M.A Morgan
Department of
Electrical and
Computer Engineering

COMPUTER ALGORITHMS FOR MEASUREMENT CONTROL AND SIGNAL PROCESSING OF TRANSIENT SCATTERING SIGNATURES

Soonpuen Somapee
Lieutenant, Royal Thai Navy
B.S., Royal Thai Naval Academy, 1983

This thesis describes the development of computer algorithms for experimental measurement control and subsequent signal processing of transient signatures to synthesize scattering impulse responses of scale model targets. The theories behind transient scattering are considered in order to construct the algorithms. Up-to-date hardware and software technology are selectively implemented to optimize the resultant signal to noise ratio. The detailed explanation of the hardware and software operation is provided. A noise model for the system is also discussed. Measurement and programming validations are described, where comparisons are made with numerical computations for transient scattering by selected canonical targets. Results are documented for further research in the transient scattering problem.

Master of Science in
Electrical Engineering
September 1988

Advisor: M.A. Morgan
Department of
Electrical and
Computer Engineering

TRANSISTOR SIZING IN THE DESIGN OF HIGH-SPEED CMOS SUPER BUFFERS

Gordon R. Steele
Captain, United States Marine Corps
B.S., Georgetown University, 1981

An algorithm for sizing transistors for static Complementary-symmetry Metal-Oxide-Semiconductor (CMOS) integrated circuit logic design using silicon gate enhancement mode Field-Effect Transistors (FET) is derived and implemented in software. The algorithm is applied to the mask level hardware design of a three micron minimum feature size p well high-speed buffer. A software representation of the super buffer can be used for the automated design of custom Very-large-Scale-Integrated (VLSI) circuits.

Master of Science in
ELectrical Engineering
March 1988

Advisors: D.E. Kirk
H.H. Loomis
Department of
Electrical and
Computer Engineering

USE OF A COHERENT SQUARE WAVE REFERENCE TO DEMODULATE BPSK CARRIERS AND A VISUAL INDICATOR OF THE QUALITY OF RECEIVED QPSK CARRIERS

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

This report consists of two parts. Part 1 compares the noise performance of a coherent phase demodulator when using as a carrier reference a square wave signal versus using a sinusoidal signal. Analyses for both signal references are included for the cases of allpass noise and bandpass noise at the demodulator input. The theory indicates the demodulator operating with either the square wave signal or the sinusoidal signal as a carrier will result in identical noise performance for the theoretical case of bandpass noise. However, experimental results demonstrate that the demodulator operating with the square wave signal reference has a 0.4 db. performance advantage for digital data transmission using binary phase shift keying, when compared under similar conditions to operations with the sinusoidal reference signal.

Part 2 investigates the features of a visual indicator (w-y oscilloscope display) depicting the quality of received quadrature phase shift keyed carriers. Such a display allows for visualization of the signal degrading effects due to noise, channel bandlimiting induced ISI, and multipath propagation. The observed pattern formed by the visual indicator allows an operator to determine these channel impairments. With

experience, an operator can assess the system probability of a bit error under a variety of operating conditions.

Master of Science in
Electrical Engineering
December 1987

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

COMPUTER AIDED DESIGN FOR LINEAR CONTROL STATE VARIABLE SYSTEMS (SVS)

Ismail Unlu
Lieutenant JG, Turkish Navy
B.S., Turkish Naval Academy, 1981

The theory, detailed outline of operating and algorithm procedures of a continuous time-invariant, linear control state variable systems design and analysis computer program is presented. The program, SVS, which is based on Melsa's LINCON, was modified to demonstrate Controllability, Observability, Bode Plot, Root locus plot, Nyquist plot, pole placement, Luenberger observer design, optimal control design, time response plot and some basic matrix manipulations. Worked examples with the program output are included. Some options give only numeric data output; others give both numeric data and high-resolution graphs. The software, which is fully interactive, menu driven and user-friendly is written in turbo Pascal to be run on the IBM-PC microcomputers. All options are presented via option menus and the user will be prompted for all input parameters.

Master of Science in
Electrical Engineering
December 1987

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

ANALYSIS OF AN IMAGE PROCESSING ALGORITHM FOR ITS IMPLEMENTATION IN REAL TIME

Roberto M. Ventura
Lieutenant, Colombian Navy
B.S., Escuela Naval "Almirante Padilla," 1983

This thesis deals with the implementation and analysis of an image processing algorithm in order to determine the feasibility of its operation in a real time environment at standard video frame rates.

A modification of the Peli and Lim algorithm has been put to work in processing images taken from a submerged camera operating in turbid water environments with uneven light distribution. The algorithm's performance was observed in detail to determine if it met the required specifications. Through analysis, the algorithm's intense computational requirements and large memory storage demands were resolved. It was determined that for the algorithm to operate in real time, a system with characteristics of a supercomputer would most likely be needed.

The algorithm was transported to an IBM AT equipped for image processing. Possible optimization techniques were discussed briefly, and other solutions for processing images with this type of equipment were suggested.

Master of Science in
Electrical Engineering
March 1988

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

A STUDY OF SECOND AND THIRD ORDER MODELS FOR THE TRACKING SUBSYSTEM OF A RADAR GUIDED MISSILE

John W. Williams
Captain, United States Marine Corps
B.S., United States Naval Academy, 1978

This thesis is a study of missile and target parameters used in second and third order modeling of the tracking subsystem used in radar guided missiles. Guidance methods are analyzed to determine which method is optimum in a search for an "ideal" missile. Target parameters which have an effect on the missile tracking system are analyzed and a target acceleration probability model is discussed. A two dimensional third order tracking model is simulated utilizing a Kalman filter for target parameter estimation and prediction. Linear second and third order tracking models are simulated and compared with the third order Kalman filter tracker. This thesis concludes that a proportional navigation guidance method, with a non linear third order tracking Kalman filter, is the better model. Benefits of using a non linear third order Kalman filter may not override the cost and complexity of implementation of the model.

Master of Science in
Electrical Engineering
June 1988

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

ADAPTIVE ALGORITHMS FOR TWO DIMENSIONAL FILTERING

Steven L. Wilstrup
Lieutenant Commander, United States Navy
M.B.A., University of West Florida, 1983

In this thesis, an adaptive two dimensional least mean squares (LMS) algorithm and a recursive least squares (RLS) algorithm are developed from the one dimensinal algorithms. Design of the two dimensional LMS and RLS algorithms are studied for accuracy based on the results of a two dimensional system identification model which was used in testing the algorithms. Application of the two algorithms is demonstrated through computer simulation in which the adaptive filters are employed in a noise canceler and an adaptive line enhancer and applied to an image processing problem.

Master of Science in
Electrical Engineering
September 1988

Advisor: M. Tummala
Department of
Electrical and
Computer Engineering

MASTER OF SCIENCE
IN
ENGINEERING
ACOUSTICS

COMPUTER-CONTROLLED MEASUREMENTS OF NONLINEAR STANDING WAVES

Hakan Basaran
Lieutenant JG, Turkish Navy
B.S., Turkish Naval Academy, 1981

A computer-controlled data collection system was designed and implemented to analyze finite amplitude acoustic standing waves in a rectangular air-filled cavity with linear and wedge-shaped boundary perturbations. The response of a nonlinear standing wave in perturbed and unperturbed cavities was studied. The experimental results showed that the computer-obtained by manual procedures. Quantitative comparisons could not be made because the properties of the cavity did not match those for which theoretical predictions are available.

Master of Science in
Engineering Acoustics
December 1987

Advisor: J.V. Sanders
Department of
Physics

RECIPROCITY CALIBRATION OF AN UNDERWATER TRANSDUCER BY THE DELTA-Z METHOD

Raynald Bedard
Major, Canadian Armed Forces
B.E., Royal Military College, 1980

A method for determining the free-field open-circuit voltage sensitivity of a reversible underwater electroacoustic transducer from the difference in its input electrical impedance when loaded by water and air was investigated theoretically and experimentally. A equation for the sensitivity was derived using reciprocal two-port network theory. The theory takes into account the diffraction due to the finite size of the transducer, its finite mechanical impedance, and its free-field radiation impedance in water. An experiment to test the predictions of the theory was performed using a 6" diameter, hollow, piezoelectric ceramic spherical transducer. The result of the experiment agreed within dB with a standard comparison calibration over the frequency range for which both the electrical impedance and comparison calibration data are considered reliable. The calibration method described, which has been termed the Delta-Z Method, may be useful for in-situ monitoring of transducer sensitivity in installations which can be flooded and purged.

Master of Science in
Engineering Acoustics
and Electrical Engineering
December 1987

Advisor: S.R. Baker
Department of
Physics

AN INVESTIGATION OF ACOUSTIC CAVITATION PRODUCED BY PULSED ULTRASOUND

Robert L. Bruce Jr.
Lieutenant Commander, United States Navy
B.A., University of Texas, 1975

Robert D. Middleton, Jr.
Lieutenant, United States Navy
B.S., Tulane University, 1980

Transient cavitation produced by pulsed ultrasound in the MHz range has been investigated. First, a theoretical background which develops bubble motion in general and focuses specifically on transient cavitation is presented. Second, the development of an apparatus which is designed specifically for studying this type of cavitation is discussed. Third, the use of the apparatus to make measurements of cavitation thresholds at various frequencies, pulse durations, and pulse repetition rates is discussed. Finally, results of the cavitation threshold measurements are interpreted using theories developed earlier.

Master of Science in
Engineering Acoustics
December 1987

Advisor: A.A. Atchley
Department of
Physics

TWO DEMODULATORS FOR HIGH SENSITIVITY FIBER OPTIC INTERFEROMETRIC SENSORS

Carol Mae Crooker
Lieutanant, United States Navy
B.S., United States Naval Academy, 1981

Fiber optic interferometric sensors with large optical leverage and consequently high sensitivity, have been demonstrated at the Naval Postgraduate School. Their development has motivated this investigation of electro-optic demodulators which can exploit the greater optical phase shifts brought about by the increased sensitivity to reduce the complexity and cost of the demodulators.

Two such schemes using a passive homodyne technique based on a 3X3 coupler are investigated in this thesis. The first is a fringe rate demodulator using inexpensive analog frequency-to-voltage conversion to convert fringe rate to voltage and discrete logic to resolve up/down ambiguity by discriminating the leading and lagging quadrature outputs from the 3X3 coupler. The second digitizes the coupler output which is manipulated numerically to perform a standard sine/cosine signal demodulation.

Due to the unavailability of 3X3 couplers at this time, both schemes were evaluated using simulation. The fringe rate demodulator used the output of a standard shaft encoder driven by a pendulum to simulate the interferometric sensor outputs. The digital scheme was simulated with a computer program to generate and demodulate the acoustic waveforms.

Master of Science in
Engineering Acoustics and
Electrical Engineering
December 1987

Advisor: S.L. Garrett
Department of
Physics

DEVELOPMENT OF A COMPACT APPARATUS FOR DETERMINING COMPLEX PARAMETERS OF FLUID-FILLED POROUS SOLIDS BY IMPEDANCE TECHNIQUES

Steven Douglas Grant
Lieutenant, United States Navy
B.S., United States Naval Academy, 1979

A method for determining the complex bulk modulus $\tilde{B}$ and the complex mass density $\tilde{\rho}$ of a fluid contained in a rigid porous solid is investigated. The fluid filled solid is contained within a small cylindrical cavity capped on each end by identical transducers. This method, suitable for an acoustically "soft" transducer, is based upon electroacoustic network theory. $\tilde{B}$ and $\tilde{\rho}$ are obtained from the input electrical impedance of each transducer when they are wired in parallel "in-phase" and "out-of-phase" respectively. A description of the apparatus and preliminary experimental results are presented.

Master of Science in
Engineering Acoustics and
Systems Technology
(Antisubmarine Warfare)
September 1988

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

SIGNAL ACQUISITION AND PROCESSING FOR AUTONOMOUS SPACE SHUTTLE CARGO BAY ACOUSTIC MEASUREMENTS (NASA G-313)

David P. Kuebler
Lieutenant, United States Navy
B.S., University of Texas, 1982

A narrowband trigonal acoustic transducer array and digital signal processing software are described in support of Space Shuttle Vibroacoustic experiment [NASA G-313]. The three co-planar, vibrationally isolated pressure-sensing microphones, the preamplifiers and the filters are designed to meet dynamic range and anti-aliasing requirements for the digitization and processing of recorded flight data with one Hertz resolution within the 30-780 Hz baseband acoustic spectrum. The experiment is designed to operate in environments up to 160 dB SPL and provides modal recognition and directional information to identify resonances and localize high intensity sound sources within the ambient launch environment of the Space Shuttle Cargo Bay. Also included is a model of the empty Cargo Bay resonances and modal density calculations based on an adiabatic perturbation of a rigid, right circular cylindrical enclosure.

Master of Science in
Engineering Acoustics
June 1988

Advisor: S.L. Garrett
Department of
Weapons
Engineering

DEVELOPMENT OF A TRANSIENT INBOARD WIRING TEST FOR THE AN/BQR-7 ARRAY

Ann Elizabeth Wilson
B.S., Tri-State University, 1982

The AN/BQR-7 hydrophone array installed on many SSBN submarines has a history of problems with wiring errors. These errors are caused by both improper installation of the array and mistakes made during array maintenance. The method used presently to detect these errors employs a sound source that is placed outboard the submarine. Although effective, the outboard procedure is time-consuming and can be unsafe or unworkable in foul weather.

An alternative to the outboard test is an inboard transient wiring test, the development and testing of which is described in this report. Using this type of test many of the problems associated with an outboard test can be eliminated. The inboard transient wiring test has the added advantage of being suitable for automation.

Shipboard testing of the automated inboard transient wiring test has been successful. Pending additional tests and some software modification the procedure will be made available for fleet use.

Master of Science in
Engineering Acoustics
December 1987

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

MASTER OF SCIENCE IN ENGINEERING SCIENCE

MEMORY EFFICIENT EVALUATION OF NONLINEAR STOCHASTIC EQUATIONS AND C3 APPLICATIONS

John C. Connell Jr.
Commander, United States Navy
B.S., University of Tennessee, 1969

The Statistical Mechanical Neural Computer (SMNC) developed in this thesis utilizes a Statistical Mechanical Nonlinear Algorithm (SMNA) to determine the longtime probability distribution of highly nonlinear stochastic systems. The use of the SMNA and a novel mesoscopic scaling technique help provide the SMNC with the capabilities of neural computers without the drawbacks of huge connection matrices and their attendent computational requirements.

In this thesis, the SMNC is initially used to verify the ability of the SMNA to duplicate relatively simple, single variable path integral solutions to nonlinear Fokker-Planck equations. After the fundamental algorithms are validated, the SMNC's ability to simulate a two-variable, multicellular problem by modeling a portion of the neocortex consisting of 10^5 neural units is discussed.

There are many important applications of the SMNC and its SMNA to C^3 systems including radar, sonar and electronic signals processing, missile guidance systems and an integrated battle management system. Such C^3 systems will benefit from the SMNC's

potential to efficiently filter large amounts of data, recognize patterns and anticipate, with some degree of uncertainty, the future state of highly nonlinear stochastic systems.

Master of Science in
Engineering Science
December 1987

Advisor: L. Ingber
Department of
Physics

INTERFACE CHARACTERIZATION OF CU-CU AND CU-AG-CU LOW TEMPERATURE SOLID STATE BONDS

Robert Z. Dalbey
Naval Weapons Center, China Lake, CA
B.S., University of Nevada, Reno

In this study, Auger Electron Spectroscopy (AES), Scanning Electron Microscopy (SEM) and Energy Dispersive X-ray (EDX) analysis have been used to characterize the interface regions of copper to silver and copper to copper bond samples in an effort to identify those parameters which most affect the bond characteristics. Longitudinal and transverse cross sections of the bond joint are examined. Auger electron sputter depth profiling was used to examine the interface properties and composition across the bond interface. Depth profiles indicate carbon and oxygen diffuse away from the interface during bonding facilitating adhesion. Tensile tests on bonded samples indicate that bond pressure has a more significant effect on bond strength than temperature. A temperature threshold for bonding is observed which is related to the ability of the bond materials to scavenge their oxides. The difference in bond strength/toughness for Cu-Cu bonds versus Cu-Ag-Cu bonds may qualitatively indicate the magnitude of the chemical energy term associated with joining these two dissimilar metals.

Master of Science in
Engineering Science
December 1987

Advisor: K.D. Challenger
Department of
Mechanical
Engineering

DESIGN, IMPLEMENTATION, BUILDING AND EVALUATION OF A TORUS DOUBLE TRANSITIVE CLOSURE NETWORK OF TRANSPUTERS

Jose Ignacio Frazao Sosa
Lieutenant Commander, Venezuelan Navy
B.S., Venezuelan Naval Academy, 1974

Currently the design of highly parallel "supercomputers" is one of the most challenging problems in engineering. The purpose of this thesis is to describe how the problem was approached in the design, implementation and building of a Torus Double Transitive Closure Network of Microprocessors, using the T414 Transputer device as the basic Unit of Computation. Also compares the performance of the evolved model, from one Transputer to the final stage of sixteen Transputers running in parallel. All the programs and examples presented in this thesis were implemented in the OCCAM2 Programming Language, using the Transputer Development System, D700c, Beta 2.0 release March 1987 compiler version.

Master of Science in
Engineering Science
June 1988

Advisor: U.R. Kodres
Department of
Computer Science

ADA FLOW: THE AUTOMATION OF SOFTWARE ANALYSIS USING PETRI NETS

Albert J. Grecco
Lieutenant, United States Navy
B.S., United States Naval Academy, 1982

There is considerable interest in the development of Ada-based, automated software tools to aid in the development and testing of embedded, real-time software. The Naval Postgraduate School has already implemented automated Ada metric tools at the request of the Naval Weapons Center, China Lake. This thesis is the preliminary work for a new automated software analysis tool entitled "AdaFlow." This tool, which is written in Ada, takes Ada programs as input, and translates the source code to a Petri net model. This Petri net model provides the user with the capability to perform automated, interactive analysis of Ada programs for properties such as safety and deadlocks. Recommendatios for future work in this area are included.

Master of Science in
Engineering Science
June 1988

Advisor: D.L. Davis
Department of
Computer Science

THE ANALYSIS OF THERMAL RESIDUAL STRESS FOR METAL MATRIX COMPOSITE WITH AL/SIC PARTICLES

Soon Hae Hur
Lieutenant Colonel, Republic of Korea Army
B.S., Republic of Korea Military Academy, 1975

When a metal matrix composite is cooled down to room temperature from the fabrication or annealing temperature, residual stresses are induced in the composite due to the mismatch of the thermal expansion coefficients between the matrix and fiber. A method can be derived for calculating the internal stresses appearing in Metal Matrix composites of Al matrix with SiC particles due to differences in thermal expansion coefficients. Special attention is paid to creep deformation in the matrix phase. The analysis shows that considerable internal stresses and creep deformation appear in the composites when subjected to cooling.

Master of Science in
Engineering Science
June 1988

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

A COMPUTER STUDY OF AIR DEFENSE GUN EFFECTIVENESS

Hyun Dae Jung
Lieutenant Commander, Republic of Korea Navy
B.S., Korean Naval Academy, 1976

This study describes the continuing development of a computer model for the simulation of burst kill probabilities for air defense gun systems firing projectiles at maneuvering aircraft. The computer simulation developed by Keeling is modified by adding a high explosive proximity and contact fuzed round to the simulation. The objective of this thesis is to develop and analyze the shipboard anti-air defense problem in order to choose the best air defense gun system. The air defense gun system studied consists of a 40 mm gun, firing fragmenting proximity and contact fuzed projectiles, an early warning radar system, and a fire control system. The aircraft vulnerability and the gun data used in this thesis are entirely synthetic to avoid security classification problems.

Master of Science in
Engineering Science
December 1987

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

AUTOMATIC CONTROL OF ROBOT MOTION

George P. Kalogiros
Lieutenant, Hellenic Navy
B.S., Hellenic Naval Academy, 1979

The feasibility of controlling the three link rectangular and revolute robots with an adaptive computer simulation model, using a curve following technique, is investigated.

Both configurations are tested for different load conditions, for rejection of random disturbances and for robustness in the case of servo motor parameter variations.

The interactive nonlinear dynamics of the revolute robot, such as coupling inertia, actuator dynamics, centripetal and coriolis forces, are also investigated. First a gravity-free environment is assumed and then the robot arms are tested under gravitational torques.

Master of Science in
Engineering Science
December 1987

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

THE USE OF SEAPLANES AS AN ADVANCED WEAPON SYSTEM

Algeu Kreniski
Lieutenant Colonel, Brazilian Air Force
B.S., Fund. Tecnico Educ. Souza Marques, Brazil, 1974

In this thesis the military potential of giant seaplanes as carriers of fighter/attack aircraft is considered. After a survey of past seaplane developments possible scenarios to demonstrate the utility of seaplane carriers are discussed. This is followed by preliminary seaplane sizing, design, and operational considerations. It is concluded that a fleet of Boeing 747-size amphibian planes carrying one or two F-5-size fighter/attack planes offers new and attractive military possibilities that merit further evaluation.

Master of Science in
Engineering Science
September 1988

Advisor: M.F. Platzer
Department of
Aeronautics and
Astronautics

THE INFLUENCE OF WARM ROLLING PARAMETERS (TEMPERATURE AND REHEATING TIME BETWEEN PASSES) ON THE SUPERPLASTIC RESPONSE OF AL-MG ALLOYS

George J. Kuhnert, Jr.
Lieutenant, United States Navy
B.B.A., Belmont College, 1980

The effects of rolling temperature and reheating interval between consecutive rolling passes on the superplastic response of two Al-Mg alloys were investigated. The alloys were Al-8%Mg-0.1%Zr and Al-10%Mg-0.1%Zr (wt. pct.). The effects of varying the process parameters were observed on resultant superplastic ductility during testing at 300°C. The data support a model for microstructure evolution during processing by a mechanism of continuous recrystallization (CRX). The model for CRX assumes that dislocations recover to sub boundaries which are stabilized by precipitates, of size on the order of one micron, located at nodes of the substructure. Continued recovery results in formation of boundaries of moderate misorientation, in the absence of the migration of a high angle boundary. The dependence of CRX on reheating time and rolling temperature was investigated and a strong dependence of subsequent superplastic response on these two processing parameters was observed. The influence of grain size on resultant superplasticity was also noted, indicating that the extent of grain refinement is limited to the spacing of particles.

Master of Science in
Engineering Science
June 1988

Advisor: T.R. McNelley
Department of
Mechanical
Engineering

PETRI NET MODELING AND SOFTWARE SAFETY ANALYSIS: METHODOLOGY FOR AN EMBEDDED MILITARY APPLICATION

Alan D. Lewis
Lieutenant, United States Navy
B.S., United States Naval Academy, 1980

This thesis investigates the feasibility of software safety analysis using Petri net modeling and an automated suite of Petri Net Utilities (P-NUT) developed at UC Irvine. We briefly introduce software safety concepts, Petri nets, reachability theory, and the use of P-NUT. We then develop a methodology to combine these ideas for efficient and effective preliminary safety analysis of a real-time, embedded software, military system.

Master of Science in
Engineering Science
June 1988

Advisor: D.L. Davis
Department of
Computer Science

A PRELIMINARY FEASIBILITY STUDY FOR THE UTILIZATION OF A TILT-ROTOR AIRCRAFT (MV-22) FOR LOGISTICAL SUPPORT TO THE MILITARY OUTPOST ALONG THE VENEZUELAN JUNGLE AREA BORDERING COLOMBIA

Victor Manuel Ponte
Lieutenant Commander, Venezuelan Navy
B.S., Venezuelan Naval Academy, 1974

Resupply to remote jungle outposts/villages along the Venezuelan frontier is conducted via river boats along the Arauca and Meta Rivers, which define the border with Colombia. The lack of usable airstrip/landing sites in this area, precludes the use of conventional STOL aircraft, while the remote location restricts the use of helicopter due to range limitations. This is aggravated by a harsh rain forest climate that makes visual air navigation difficult. Additionally, frequent guerilla attacks on boats operating along this lifeline waterway makes its use less than desirable. This thesis examines the feasibility of a tilt-rotor aircraft, to include site preparation, navigation/approach procedures to provide the necessary logistical link to this region.

Master of Science in
Engineering Science
June 1988

Advisor: R.D. Wood
Department of
Aeronautics and
Astronautics

TURBULENCE EFFECTS ON THE HIGH ANGLE OF ATTACK AERODYNAMICS OF A VERTICALLY LAUNCHED MISSILE

M. Peter Rabang
Lieutenant, United States Navy
B.S., University of South Carolina, 1981

A subsonic wind tunnel investigation was conducted at the Naval Postgraduate School Wind Tunnel Test Facility to examine the effects of grid generated turbulence on the high angle of attack aerodynamics of a vertically launched missile. Four turbulence generating grids produced turbulence with length scale to missile model diameter ratios of 1.05, 0.89, 0.62, and 0.15 with respective turbulence intensities of 3.31%, 2.78%, 1.88%, and 0.47%. The test model is representative of current cruciform wing missiles with low aspect ratio wings and long root chords. The tangent ogive nose has a nose fineness ratio of 2.29. Three separate body configurations were tested with and without the turbulence generating grids. One configuration was a body in isolation and the other two were wing and tail configurations at 0^{o} and 45^{o} roll angles. All test runs were conducted at Re_{d} $1.1x10^{5}$ over an angle of attack range of -5^{o} to 95^{o}. Results indicate that as turbulence length scales approach body diameter size, the angle of attack for the onset of asymmetric vortices was delayed and the side force magnitude was reduced. The vortices generated by the nose of the missile continue to

dominate the afterbody vortices for body configurations with and without wings regardless of the turbulence conditions.

Master of Science in
Engineering Science
June 1988

Advisor: R.M. Howard
Department of
Aeronautics and
Astronautics

SOFTWARE REUSABILITY: A DECISION TREE MODEL

William D. Randall, Jr.
Lieutenant Commander, United States Navy
BCHE, Auburn University, 1975

There are numerous claims in the software engineering literature that reusable software will solve many of the problems extant in the software industry, but here are few articles examining the economic factors inherent in the reusability issues. This thesis proposes a decision tree as a model of the reuse decision and suggests applications for its use.

Master of Science in
Engineering Science
June 1988

Advisor: G.H. Bradley
Department of
Computer Science

THE EFFECT OF A TURBULENT AIRSTREAM ON A VERTICALLY-LAUNCHED MISSILE AT HIGH ANGLES OF ATTACK

Donald P. Roane, Jr.
Lieutenant, United States Navy
B.S., United States Naval Academy, 1981

The purpose of this thesis is to initiate an investigation of the response of a shipboard surface-to-air missile launched vertically into a region of turbulence at high angles of attack. A review was conducted on the effects of asymmetric vortices, turbulent flowfields, and the marine atmospheric environment on a slender body of revolution. Turbulence mapping of a wind tunnel with installed turbulence-generating grids was conducted using hot-wire anemometry. The resultant turbulence intensities and length scales were analyzed as a function of the downstream distance and the grid mesh-width/bar-diameter ratio. Turbulence intensity was found to decrease, while the length scale increased, with increasing distance from the generating grid. Both the turbulence intensity and length scale increased with an increase in the grid bar diameter. A generic, vertically-launched surface-to-air missile (VLSAM) model was developed and constructed for further wind tunnel testing, to include force, moment, pressure and flow visualization studies.

Master of Science in
Engineering Science
December 1987

Advisor: R.W. Howard
Department of
Aeronautics and
Astronautics

ADAPTIVE IDENTIFICATION BY SYSTOLIC ARRAYS

Paul A. Willis
Lieutenant, United States Navy
B.S., Purdue University, 1978

This thesis is concerned with the implementation of an adaptive identification algorithm using parallel processing and systolic arrays. In particular, discrete samples of input and output data of a system with uncertain characteristics are used to determine the parameters of its model. The idenfitication algorithm is based on recursive least squares, QR decomposition, and block processing techniques with covariance resetting. Along similar lines as previous approaches, the identification process is based on the use of Givens rotations. This approach uses the Cordic technique for improved numerical efficiency in performing the rotations. Additionally, floating point and fixed point arithmetic implementations are compared.

Master of Science in
Engineering Science
December 1987

Advisor: R. Cristi
Department of
Electrical and
Computer Engineering

BACKGROUND GAS PRESSURE DEPENDENCE OF UNIPOLAR ARCING ON SODA LIME GLASS AND PLASTIC INDUCED BY CO2 PULSED LASER

Adam Randall Wojtowich
Captain, United States Army
B.S., DePaul University, 1979

An experiment was conducted to determine the background gas pressure dependence of laser-induced unipolar arcing (UA) on soda lime glass and polystyrene (plastic). A CO_2 pulsed laser was used to produce a power density of 5.25×10^6 W/cm^2, and the background pressure was varied from 1.0 atmosphere (atm) to 10^{-8} atm (10^{-6} torr).

For glass at 1.0 atm, the UA crater density at the damaged area's center was maximum and between 1.0 and 0.1 atm, it decreased linearly as the pressure dropped. UA did not occur outside of the heavily damaged area. Between 0.1 and 0.001 atm, UA occurred outside the heavily damaged area and both the center and perimeter crater density remained constant. A wave-like ring burn pattern was observed showing the influence of plasma dynamics on the laser beam propagation. Below 0.0001 atm, the UA increased at the perimeter, and target center, and peaked at approximately 0.0005 atm. The crater density remained constant for lower pressures. A proposed model for this interaction is outlined.

Damage at the plastic target's center was too intense for analysis, but UA outside the intensely damaged area occurred at

0.15 atm and increased to a maximum at 0.0005 atm. UA remained constant below 0.0005 atm.

Master of Science in
Engineering Science
June 1988

Advisor: F Schwirzke
Department of
Physics

A VIRTUAL STATISTICAL MECHANICAL NEURAL COMPUTER

Charles P. Yost
Lieutenant Commander, United States Navy
B.S., Miami University, 1975
M.B.A., University of West Florida, 1982

This study applies recently developed statistical algorithms and an innovative large system scaling technique to the problem of implementing a virtual neural computer. Once the techniques are shown to faithfully model highly nonlinear, nonequilibrium probability distributions, they are applied to the brain.

The statistical mechanical neural computer (SMNC) developed in this thesis makes use of scaling to effectively filter the information flow and to model its contents. The implications for command and control are the SMNC's ability to recognize patterns of previously stored information detecting similarities between new and old data. The purpose of the SMNC is to serve as a decision aid that will contain high quality information about specific nonlinear relationships related to system variables, through the aggregation of information into coarse-grained data at a mesoscopic level. This should give the user, be it battlefield commander or Wall Street analyst, the ability to more accurately forecast the most likely course of events a given scenario would follow based on its recent history.

The SMNC is well suited for the study of stochastic processes. Its methods for the aggregation and scaling of data make it an

effective tool for the study of both short and long term behavior in nonlinear nonequilbrium systems.

Master of Science in
Engineering Science
December 1987

Advisor: L. Ingber
Department of
Physics

MASTER OF SCIENCE
IN
HYDROGRAPHIC
SCIENCES

AN ANALYSIS OF A NUMERICAL TIDAL MODEL APPLIED TO THE COLUMBIA RIVER

Richard Bruce Koehler
Lieutenant, National Oceanic and Atmospheric Administration
B.S., University of Arizona, 1978
M.S., University of Arizona, 1986

An implicit finite difference model for predicting flood routing is applied to the lower Columbia River, where tidal forcing causes flow reversals interacting with upstream dam flow during small river flow periods. The model is one-dimensional, unsteady, including lateral inflow and variable bed friction for different channel sections. A comparison of stages at six stations was made for a sensitivity analysis. The analysis used a total of 2209 hours of simulated river stages.

Downstream boundary changes of 0.5 feet and 2.0 feet were made to the Astoria tide stages. Model simulations showed that 70% of the tide difference appears at Vancouver and Portland, 80% at St. Helens, 85% at Longview, 93% at Wauna and 95% at Skamokawa. Varying the upstream boundary condition (Bonneville Dam discharges) by 10% and 25% were markedly different from the downstream boundary changes. Upstream, where the tide influence is weakest, the tidal cycle is more likely to be "washed out" by the higher flows of the Columbia. Also these changes fluctuated with the tide cycle. Downstream stations did not show such differences because of the larger cross section areas of the Columbia River nearer the mouth and the proximity to the downstream boundary condition.

The river system was calibrated in a downstream to upstream direction and used a total of 606 hours of observed river stages. Three periods with distinct river flow conditions were used in the calibration. Regression analyses of the computed residual values for each of the stations gave correlation coefficients (r^2) less than 0.360. However, cross correlations between residual and computed stages showed that the two series were highly sinusoidally correlated for all stations. A spectral estimation of the residuals exhibited very strong peaks at frequencies of 0.081 hr^{-1} (12.3 hrs), 0.042hr^{-1} (24.0 hrs) and subsequent harmonics of these frequencies. The residual components are strongly associated with the tidal cycle.

Master of Science in
Hydrographic Sciences
September 1988

Advisors: E.B. Thornton
C.-S Wu
Department of
Oceanography

LOCAL GEOID DETERMINATION USING THE GLOBAL POSITIONING SYSTEM

Wei-Ming Ma
Lieutenant, Republic of China Navy
B.S., Chinese Naval Academy, 1981

A local geoid model to predict the geoid heights in the vicinity of Monterey Bay, California was developed to use Global Positioning System (GPS) differential positions and known Mean Sea Level (MSL) with the method of collocation. The local geoid models were based on Rapp's 360 degree x 360 order global geoid model determined from gravity measurements. Control data were adjusted by least squares to solve for the parameters in the local geoid model. Also studied were factors that affected the GPS-measured ellipsoid height differences. These included (1) comparing GPS differencing solutions, (2) standard error of GPS observations, (3) corrections for surface meteorological values, and (4) observation durations for GPS.

The data used in this research were taken from GPS measurements on the campus of the Naval Postgraduate School (NPS), an area about 100 m x 630 m and in an area approximately 15 km x 33 km near Monterey, California. The time period was from February 5, 1988, to May 12, 1988.

The accuracy of the predicted geoid heights is $\pm$ 2 cm if a six-parameter model is used for the large area, and $\pm$2 to 10 mm if a five-parameter model is used for the NPS campus.

Master of Science in
Hydrographic Sciences
September 1988

Advisors: K. Jeyapalan
S.P. Tucker
Department of
Oceanography

MASTER OF SCIENCE
IN
INFORMATION SYSTEMS

NALCOMIS/OMA: FUNCTIONAL CONSIDERATIONS FOR AUTOMATING ORGANIZATIONAL MAINTENANCE ACTIVITIES

Ronald T. Allen
Lieutenant, United States Navy
B.S., Augusta College, 1979

This thesis shows that current plans for Naval Aviation Logistics Command Management Information System for Organizational Maintenance Activities (NALCOMIS/OMA) exclude several important data collection, processing, and reporting activities which currently take place at squadron maintenance activities. The importance of these local activities is demonstrated through interviews with NALCOMIS Phase II users and squadron maintenance managers. It is also shown that, although local in nature, these activities are vital to the achievement of the stated objectives of NALCOMIS.

Master of Science in
Information Systems
March 1988

Advisor: T.P. Moore
Department of
Administrative
Sciences

THE P-3 SCHEDULING SUPPORT SYSTEM (P-3 S^3)

William B. Anderson
Lieutenant Commander, United States Navy
B.S., Iowa State University

A P-3 Scheduling Support System (P-3 S^3) is a Management Information System (MIS) that was designed using structured techniques. Structured analysis was used to determine the functionality and data requirements. Computer Assisted Systems Engineering (CASE) tools were used to document the analysis and design. The system was designed to be implemented in dBase III Plus, a data base management tool developed by Ashton Tate. P-3 S^3 is designed to run on a microcomputer with the MS-DOS operating system. It provides real-time access to historical data and provides suggested personnel assignments to the user. The design provides for faster flight schedule generation and prevention of conflicting schedule events.

Master of Science in
Information Systems
March 1988

Advisor: B.A. Frew
Department of
Administrative
Sciences

A MICRO-COMPUTER BASED EMPLOYEE SCHEDULING SYSTEM FOR THE PALO ALTO VETERANS ADMINISTRATION MEDICAL CENTER

James Michael Buyske
Lieutenant Commander, United States Navy
B.S., University of Idaho, 1976

Steven Verdell Call
Lieutenant, United States Navy
B.S., State University of New York, 1981

This thesis provides the Palo Alto Veterans Administration Dietetics Division with micro-computer based employee scheduling system. It includes a discussion of the system analysis and design, program development and system implementation. The use of a prototyping development methodology and its implications is a central discussion point.

Master of Science in
Information Systems
September 1988

Advisor: T. Abdel-Hamid
Department of
Administrative
Sciences

COMPUTERIZED SUPPORT OF THE PRETRIAL CONFINEMENT DECISION-MAKING PROCESS IN THE MARINE CORPS

Charles William Campbell
Major, United States Marine Corps
B.S., Brigham Young University, 1974

This thesis explores the feasibility of developing an expert system to assist Marine Commanding Officers in making accurate pretrial confinement decisions. The predictive value of a number of factors was investigated, based on interviews with those who make or review pretrial confinement decisions regularly and on a preliminary study of eight battalions at Camp Pendleton, California. The study revealed eight factors with predictive value. Rank, prior unauthorized absence, years of service, age, receipt of unit awards and positive page 11 entries manifested the types of association expected, based on the interviews. Seriousness of the charges showed a surprising inverse association with unauthorized absence, while GCT schore suggested that those of average intelligence were less inclined to flee than those of either above average or below average intelligence. Findings were incorporated into a first-version prototype of the Pretrial Confinement Advisor (PCA) expert system using the M.1 Knowledge System Software Tool. Procedures for refinement and field testing of the prototype were recommended.

Master of Science in
Information Systems
March 1988

Advisor: D.R. Henderson
Department of
Administrative
Sciences

NAVAL COMPUTER-BASED INSTRUCTION: COST, IMPLEMENTATION AND EFFECTIVENESS ISSUES

David W. Colemen
Lieutenant Commander, United States Naval Reserve
B.A., Oregon State University, 1975

Thesis examines Computer-Based Instruction (CBI) in the Navy, with reference to other military usage. Many literature sources were examined. Numerous military and civilian personnel working on current CBI projects were interviewed; in person, by electronic mail and by phone. Main points covered include: basic definitions of types of instruction; advantages and disadvantages of instruction relating to computers; a short history of Naval CBI; CBI costs; factors in CBI cost-effectiveness; simulators and computers; CBI use for on site training; implementation aand usage problems; methods to improve CBI implementation and usage in the Navy; what makes an effective course; improving CBI and conventional instruction effectiveness. Conclusions focus on: improving instructional quality; standardizing CBI course materials; using a standard computer for CBI; improving computer literacy Navy wide; automating CBI writing materials; putting good CBI courses on ships in the fleet.

Master of Science in
Information Systems
March 1988

Advisor: B.A. Frew
Department of
Administrative
Sciences

COMPUTER AIDED INSTRUCTIONAL COURSE AUTHORING: AN EXAMINATION OF THE PRE-RELEASE VERSION OF MAESTRO IN DEVELOPING A COURSE IN NAUTICAL RULES OF THE ROAD

Clark W. Crabbe
Lieutenant Commander, United States Navy
B.S., Oregon State University

This thesis examines computer aided instructional course authoring using the Maestro system. A test course was written using International Rules of the Road as the course content; some comparisons are made with M.1 as a system; recommendations for continued study using Video Disk equipment as a storage medium are made.

Master of Science in
Information Systems
December 1987

Advisor: T.R. Sivasankaran
Department of
Administrative
Sciences

PROJECT ORION MICROCOMPUTER MANAGEMENT SYSTEM

Richard Boyd Darden
Lieutenant Commander, United States Navy
B.S., University of Mississippi, 1976

This thesis describes the development of a microcomputer project management system for the Space Systems Academic Group (SSAG) at the Naval Postgraduate School. The focus of the paper is on system requirements and implementation to manage Project ORION.

Project ORION is a high-technology mini-satellite venture under direction of the SSAG. It involves the design, procurement, fabrication and testing of the satellite in the planning, scheduling and controlling phases of project management.

Conclusions define key factors important in the implementation process such as organizational responsibilities, quantification of planning detail, personnel training and operating procedures.

Master of Science in
Information Systems
September 1988

Advisor: G.L. Pauler
Department of
Operations
Research

AN EMPIRICAL EXPERIMENT EVALUATING THE EFFECTIVENESS OF GROUP DECISION SUPPORT SYSTEMS (GDSS)

James Patrick Driscoll
Lieutenant, United States Navy
B.S., United States Naval Academy, 1981

Jeffrey Ayres King
Lieutenant, United States Navy
B.S., Texas A & M University, 1980

An increasing reliance on group decision making and advances in computer technology have combined to spur research in an area of decision support known as group decision support systems (GDSS). Proponents of GDSS claim its unique features enable groups to make decisions faster, better, and with greater confidence and satisfaction than non-GDSS groups.

This study is an empirical experiment evaluating the effectiveness of a GDSS. A complex scenario covertly resembling the Cuban missile crisis was passed out to seven groups of four graduate students. Four groups were instructed to recommend a solution to the crisis scenario with the aid of a GDSS. The other three groups were instructed to do the same, but without computer aided support.

The analysis of the data indicated that there was not an appreciable difference in decision quality, speed, or satisfaction between the GDSS groups and the non-GDSS groups.

Master of Science in Information Systems
September 1988

Advisor: J.E. Suchan
Department of Administrative Sciences

DATA ADMINISTRATION FOR THE RAPID ACQUISITION OF MANUFACTURED PARTS

Catherine T. Eads
Lieutenant, United States Navy
B.A., Southern Illinois University, 1978

Pamela A. Smith
Lieutenant, United States Naval Reserve
B.S., Park College, 1981

Procurement of spare parts is both time consuming and costly for the Navy. The Rapid Acquisition of Manufactured Parts (RAMP) is a Navy program designed to reduce the lead time required to procure small mechanical parts by up to 90%. RAMP is a flexible manufacturing system (FMS) which will use computer controlled equipment to produce 15,000 parts per year with an average lot size of four parts. A distributed system consisting of heterogeneous hardware, software and data, the RAMP environment presents many database administration difficulties.

This thesis presents an overview of the RAMP Manufacturing System, discusses the data administration issues found in distributed computing environments and flexible manufacturing systems, and suggests an expanded information resource dictionary system to manage and control RAMP's shared data. The problem of maintaining consistency among multiple databases in the event of a failure is examined.

Master of Science in
Information Systems
September 1988

Advisor: D.R. Dolk
Department of
Administrative
Sciences

MANAGEMENT REQUIREMENTS OF THE 3COM ETHERNET LOCAL AREA NETWORK

Bradley K. Geiger
Captain, United States Marine Corps
B.A., Franklin and Marshall College, 1978

The Marine Corps has installed 3COM ethernet local area networks (LANs) at various sites upon implementation of the Recruit Services Management Information System. With the introduction of new technology comes the requirement to administer the network.

This paper describes LAN services available on the network, management philosophies for the LAN services, and areas of LAN administration considered important to the successful operation and maintenance of a LAN. LAN administration problems identified by users are also addressed.

Master of Science in
Information Systems
September 1988

Advisor: N.F. Schneidewind
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Sciences

HEMOS: AN EXPERT SUPPORT SYSTEM PROTOTYPE FOR FORECASTING BLOOD REQUIREMENTS FOR MARINE CORPS MEDICAL SUPPORT

Michael A. Greenauer
Lieutenant, United States Navy
B.S., State University of New York, Brockport
M.P.A., State University of New York, Brockport

Research was conducted to demonstrate the applicability of artificial intelligence techniques to the problem of estimating blood resupply requirements in Navy units supporting Marine Corps commands engaged in combat operations. Prototyping methodology was used to develop an expert support system named HEMOS (Hemotologic Expert Support System for Marine Corps Operational Support). The prototype system was tested and compared with state-of-the-art manual techniques, and was found to be notably more accurate in forecasting blood resupply requirements.

Master of Science in
Information Systems
March 1988

Advisor: T.R. Sivasankaran
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AUTOMATED GOVERNMENT CONTRACT MANAGEMENT AS A PARADIGM FOR STANDARD PROGRAMS VS. STANDARD FORMS

Walter William Harsch, II
Lieutenant, United States Navy
B.S., Metropolitan State College, 1976

This thesis identifies a potential weakness in the Federal Government's policy in the area of Contract Administration relating to computer prepared forms and documents, in particular, the preparation of Contract Progress Payment Requests (Standard Form 1443). It is the author's thesis that the government, which gave us the "Standard Form," should take a leadership role in developing the "Standard Program," and that these programs be distributed to contractors free of charge in an effort to: 1. Establish and maintain program standards concerning content and documentation, and 2. Eliminate, to the maximum extent possible, mistakes in form preparation caused by math or logic errors.

Master of Science in
Information Systems
March 1988

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ANALYSIS AND DESIGN OF A MICROCOMPUTER-BASED DECISION SUPPORT SYSTEM FOR THE U.S. NAVY'S SHIPBOARD TACTICAL ACTION OFFICER

John H. Hart
Lieutenant, United States Navy
B.S., United States Naval Academy, 1981

This thesis examines whether a Decision Support System (DSS) could be of practical assistance to the U.S. Navy's shipboard Tactical Action Officer (TAO). The environment of the TAO is one of tension and information overload as he monitors the data coming in from sensors and other watchstanders and attempts to determine the tactical situation from these clues. The thesis begins with the assumption that in order to help the TAO perform his duties and reach a correct analysis of the developing tactical picture, a knowledge-based DSS could be developed to assist him by figuring out the identify of, and associated threat presented by each contract and to help him remember what the identity so far has been. Through a series of interviews of qualified TAOs, a set of requirements for such a system was developed. The results were analyzed and the subsequent design made to include analytic capabilities. Rules of Engagement recommendations, and a trackball interface featuring pull-down menus and familiar symbology.

Master of Science in
Information Systems
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DESIGN AND DEVELOPMENT OF A USER INTERFACE FOR THE DYNAMICA MODEL OF SOFTWARE PROJECT MANAGEMENT

Carson E. Haury
Captain, United States Marine Corps
B.A., State University of New York, Plattsburgh, 1975

Managing large software development projects and delivering them on time and within budget has proven to be a difficult task. The Dynamica Model of Software Project Management, has been designed to support the management of the software development process. The current interface to the model, however, is not suited to the inexperienced user.

The objective of this thesis is to enhance the usability and acceptance of the Dynamica Model of Software Project Management. The design of the user interface accomplished in this thesis is an attempt to provide the maximum benefit of the model to the user by simplifying the process of using, viewing, and storing results from the model. This allows the user to focus his or her attention on design considerations and interpreting model experiments.

Specifically, the accomplishments of this thesis include the development of a menu system which provides a logical format for accessing the Dynamica model and the creation of a Dynex model interface to aid in variable manipulation.

Master of Science in
Information Systems
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ANALYSIS AND DESIGN OF A LOCAL AREA NETWORK INFORMATION SUPPORT SYSTEM FOR THE MARINE CORPS AIR STATION, YUMA ARIZONA

Samuel L. Jordan
Captain, United States Marine Corps
B.B.A., University of New Mexico, 1982

This thesis provides an analysis of the organizational information system of the Marine Corps Air Station, Yuma, Arizona. A discussion of academic theory concerning structured systems analysis and design, local area network communications standards, and the characteristics of a local area network provide the theoretical foundation for the analysis and design of a local area network information support system for the Air Station. A survey was conducted to identify the problems and the functional requirements. Based upon this analysis, a local area network information support system is presented as a technologically viable alternative to the current information system. Implementation issues are presented as well as an implementation strategy which can be used to manage the change process. A cost-benefit analysis is presented to demonstrate the economic feasibility of the proposed local area network information support system. Finally, recommendations are presented for the Air Station's Local Area Network committee.

Master of Science in
Information Systems
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Sciences

TASK-ORIENTED, NATURALLY ELICITED SPEECH (TONE) DATABASE FOR THE FORCE REQUIREMENTS EXPERT SYSTEM, HAWAII (FRESH)

Victoria M. Larson
Lieutenant, United States Navy
B.S., University of Arizona, 1977

The Defense Advanced Research Projects Agency (DARPA) Strategic Computing has a goal of developing a large-vocabulary, speaker-independent voice-recognition system for battle management and fleet readiness assessment. One of the primary testbeds for the recognition system will be the command and control operation of the classified database for the Force Requirements Expert System, Hawaii (FRESH).

The Naval Ocean Systems Center (NOSC) has designed an unclassified database called Task-Oriented, Naturally Elicited Speech (TONE) which simulates the characteristics of FRESH on a smaller scale. This study assisted NOSC in developing a voice-recognition, man-machine interface that could be used with TONE and upgraded at a later date for FRESH. The study identified more than 600 words that are associated with command and control and provided NOSC with the three most common forms of syntax used by the participants in the study.

Master of Science in
Information Systems
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Research

THE PROPOSED NAVAL POSTGRADUATE SCHOOL CAMPUS NETWORK: COMPUTER COMMUNICATIONS FOR THE 1990S

Kevin M. Leahy
Captain, United States Marine Corps
B.A., Saint Joseph's University, 1977
M.B.A., National University, 1986

Computer data communication at the Naval Postgraduate School is about to be revolutionized. No longer will departmental computer users be limited to the resources available to them at their site. The NPS Connectivity and Networking Committee has proposed an innovative, high-speed Campus Network which promises to provide connectivity to virtually all NPS computing resources, regardless of building location or controlling department.

This paper describes the composition of the Connectivity and Networking Committee and explains the network proposal that its members made. Certain aspects of this proposal are elaborated upon, including fiber optics as a transmission medium and the Committee's recommendations for internetworking protocols.

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Advisor: N.F. Schneidewind
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COMPUTER-BASED TRAINING APPLIED TO THE U.S. NAVY MAINTENANCE TRAINING IMPROVEMENT PROGRAM

Galen Jay Ledeboer
Lieutenant Commander, United States Navy
A.B., Dordt College, 1973

In the military, there has been much interest in combining instructional methodologies with computer technology to facilitate training. The potential for life cycle cost reduction while improving the effectiveness of training is very attractive. Thus, Computer-Based Training (CBT) has been embraced by the U.S. Navy. Initially, CBT was used primarily to manage training programs and has more recently also been used to provide instruction directly. However, CBT has not adequately kept pace with the formidable record-keeping and data requirements of a typical Navy training program. Proposals are introduced here to improve data processing and management for CBT. Also, concepts are described to promote better decision-making so that more efficient use can be made of CBT resources, both now and in the future. Methods to facilitate actual training with CBT are discussed. These initiatives are applied specifically to the Navy Maintenance Training Improvement Program (MTIP).

Master of Science in
Information Systems
September 1988

Advisor: J.B. Isett
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Sciences

A PROPOSAL FOR THE TRANSFER OF A LARGE FORCE MANAGEMENT EXPERT SYSTEM (FRESH) FROM THE CINCPACFLT COMMAND CENTER TO THE CINCLANTFLT COMMAND CENTER

Craig Blaine Luigart
Lieutenant Commander, United States Navy
B.A., University of Louisville, 1976

The thesis investigates the transferability of an existing large expert system, FRESH from it's current arena of employment, the Fleet Command Center of the Commander-in-Chief Pacific Fleet, to the Fleet Command Center of the Commander-in-Chief Atlantic Fleet. The research is limited to the rules, heuristics and encoded knowledge used by the FRESH system and does not cover interface issues. A literary review of expert system theory begins the thesis and analysis of the two fleets follows in succeeding chapters. System documentation is used to obtain a high level view of FRESH system rules, heuristics and encoded knowledge and these are then compared to Atlantic fleet manual procedures gained by the use of classical knowledge engineering techniques. The environmental differences developed by these comparisons between the two fleets are cited and their possible implications on the systems transferability to the Atlantic fleet explored. The thesis concludes with a suggested method of transfer to the Atlantic fleet in light of their lack of experience with automated scheduling systems and modifications to the existing system which will be required to allow it's use in the Atlantic.

Master of Science in
Information Systems
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INTERCONNECTING DIFFERENT TYPES OF LOCAL AREA COMPUTER NETWORKS

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Major, United States Army
B.A., State University of New York, Buffalo, 1975
M.A., Boston University, 1980

When interconnecting local area computer networks of various types, there are many issues which the Information Systems manager must consider. This thesis will identify some of these issues as they pertain to the interconnection of four local area computer networks of the Administrative Sciences Department in Ingersoll Hall, Naval Postgraduate School. Relevant information which results from this thesis will be used to enhance this internetting.

Master of Science in
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Sciences

AN EVALUATION OF THE QUALITY OF TRAINING AND USABILITY OF THE FLEET MANAGEMENT SYSTEM-REAL TIME (FMS-RT)

Michael Gerard Mansfield
Lieutenant, United States Navy
B.S., State University of New York Maritime College, 1983

This thesis recommends ways to improve the content of the training curriculum and software usability of the Fleet Management System-Real Time (FMS-RT). The premise of this thesis is that the Navy should increase its performance during major overhauls and availabilities. According to experts, the current FMS-RT training program could be improved with the addition of three curriculum areas: project management training, advanced project management estimating techniques, and the more specific assignment of responsibilities in the implementation of the program. In addition, many problems and possible enhancements to the FMS-RT software were identified by our usability survey. Incorporating these changes to the training curriculum and software should allow the Navy to increase ships force performance during overhauls.

Master of Science in
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DEVELOPMENT OF AN INSTRUMENT FOR MEASURING AND ANALYZING CLIENT SATISFACTION FOR NAVY REGIONAL DATA AUTOMATION CENTERS

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B.A., University of Hawaii, 1972

Robert Jack Birdwell
Lieutenant, United States Navy
B.A., University of Texas, Austin, 1980

Client satisfaction was considered to be a critical indicator of the effectiveness of the services provided by the Navy Regional Data Automation Centers (NARDACs). The purpose of this thesis is to develop the means to measure this indicator.

Interviews of twenty-eight middle management clients served by NARDACs in four geographical regions within CONUS were conducted. Forty-four items that influence satisfaction were identified belonging to eight factor dimensions of the client satisfaction domain. The Likert Scale methodology was employed in the construction of the measurement instrument. The instrument was reviewed for completeness of items and logical soundness of operations by three independent groups of experts, thus achieving content validity. A client satisfaction index is formulated from data obtained with the measurement instrument.

The instrument was piloted to a NARDAC site consisting of fifty-two client organizations using self-administered mail surveys. Evaluation of the instrument was performed on the scored results of twenty-six pilot respondents. The pilot results were subjected to empirical tests for construct validity and reliability. The results indicated that the instrument could

be used to measure client satisfaction after further piloting on a larger (at least two hundred twenty) sample size.

Master of Science in
Information Systems
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A SURVEY OF AUTOMATIC CODE GENERATING SOFTWARE

Sherman L. O'Brien
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B.S., Iowa State University, 1974

The advances made in computer hardware development have long outdistanced the computer software needed to make that hardware perform useful work for the user. This has precipitated a software crisis in the industry and spawned many potential solutions for alleviating the crisis. Among the various solutions are software systems that will automatically write program code.

This thesis examines four such software systems currently available to a system developer giving a brief discription of the product, principles behind its operation and possible applications. Additionally, it provides the reader background information on computer programming languages, reasons for the software crisis, the software development life cycle, and a method of classification and taxonomy of software development tools. The thesis concludes that these tools, properly applied, can be useful in relieving the software crisis in an organization but will not eliminate the crisis or the need for programmers.

Master of Science in
Information Systems
September 1988

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THE DESIGN AND IMPLEMENTATION OF A VISUAL USER INTERFACE FOR A STRUCTURED MODEL MANAGEMENT SYSTEM

David D. O'Dell
Major, United States Marine Corps
B.S., Kent State University, 1970

In the scheme of an integrated decision support system, model management holds a position comparable with data management. Unfortunately, the development and formalizing of model management techniques historically have lagged far behind data management concepts, although the increased interest in spreadsheets has rekindled an interest in models as productivity enhancing tools. Model management systems offer one way of integrating models into the overall structure of an organizational information resource library. This thesis proposes the design and implementation of a visual interface to one such model management system, based on A.M. Geoffrion's structured modeling paradigm. Our goal is to provide the user with a natural, easy-to-use interface that is, at the same time, powerful enough to extract the full potential from a model management system.

Master of Science in
Information Systems
March 1988

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Sciences

AN INTERROGATIVE MODEL OF COMPUTER-AIDED ADAPTIVE TESTING: SOME EXPERIMENTAL EVIDENCE

Patrick A. O'Donnell
Lieutenant, United States Navy
B.S., United States Naval Academy, 1982

This thesis proposes and validates an interrogative diagnostic model of computer-aided, adaptive testing. The model uses an algorithm based on Bayesian techniques to determine both the number and the difficulty level of questions to present. The power of the model lies in its ability to automatically adapt a testing session to the individual's level of knowledge by choosing the domain, type and number of questions. The model was implemented as a computer program and was tested in a experiment with 34 military officers who were masters degree students. Analysis of the results indicated that the IDM can evaluate student knowledge as effectively as traditional written examinations but with a significantly less number of questions and shorter test duration.

Master of Science in
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Sciences

A PROPOSAL FOR A MICROCOMPUTER BASED SYSTEM TO AUTOMATE THE MARINE CORPS CRIME STATISTICS REPORTING PROGRAM

Paul Emile Paquette
Captain, United States Marine Corps
B.A., University of Maine, 1979

This thesis investigates the possibility of implementing a Database Management System to support information processing needs within the Military Police Section of the Plans, Policies and Operations Department of Headquarters Marine Corps. An overview of the structured analysis and design methodologies with emphasis on the Life Cycle approach to software engineering was conducted. The numerous tools provided by the structured analysis and design methodologies were utilized in the development of the Database Management System. This implementation emphasized documentation and maintenance to ensure that the system will meet the current and future needs of the Military Police Section.

Master of Science in
Information Systems
March 1988

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A DUES MANAGEMENT EXPERT SYSTEM FOR INVENTORY MANAGERS AT RETAIL STOCK POINTS

Albert F. Potwin
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B.S., Seattle Pacific University, 1982

The job of the retail inventory manager at Navy Stock Points is complex and labor intensive. The inventory manager deals with a vast array of information in the form of reports from the Uniform Automated Data Processing - Stock Point (UADPS-SP) system. Because the responsiveness of the Navy Supply System depends upon the effectiveness of inventory managers, Navy Stock Points must find a way to process their ever increasing information workloads more efficiently than before. Improvements in productivity and training are feasible through the application of "expert systems" technology. This thesis presents the continuation of the design and development process of an expert system for the task of Delinquent Dues Processing. The area of retail inventory management dealing with System Cancellations Processing was also implemented to establish a more complete Dues Management System. The resulting revised prototype presents a system with more problem solving capabilities and a more natural "user friendly" interface.

Master of Science in
Information Systems
March 1988

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ARCHITECTURE AND ALLOCATION CONSIDERATIONS FOR GROUP EXPERT SYSTEMS

Michael Bernard Rattigan
Lieutenant, United States Naval Reserve
B.S., University of North Carolina, Greensboro, 1977

This thesis investigates the design, communication, and allocation considerations for implementing a distributed group expert system on a Local Area Network. A model system called GESP (Group Expert System Prototype) was implemented in Prolog on a microcomputer LAN to be used as a working platform. From observations of the model, conclusions have been drawn concerning: (1) the architecture of the expert system software required to support an interactive group expert system; (2) implications of expert system to expert system communication; and (3) the optimum allocation strategy of expert systems to nodes. Due to the lack of a distributed operating environment in which to implement the model, efficiency has been sacrificed for operability. Although GESP is not a fully practical implementation of a group expert system, it should as a minimum provide a functional framework for understanding, analyzing, and designing interactive group expert systems.

Master of Science in
Information Systems
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DECISION SUPPORT SYSTEMS FOR MOBILE SUBSCRIBER EQUIPMENT COMMUNICATIONS MANAGERS

James R. Ralph, III
Captain, United States Army
B.B.A., North Georgia College, 1981

The United States Army is fielding a new area common-user tactical communications system, Mobile Subscriber Equipment (MSE), that is designed to keep pace with the AirLand Battle. MSE will dramatically change the structure and responsibilities of signal corps units. The network is under centralized control, and many of the planning and management functions are automated at the signal brigade. This thesis looks well below the brigade level. The intermediate commands are no longer as involved in communications planning, and the nodal platoon leader must now be expected to verify data, assimilate large amounts of information, analyze situations, and make decisions without the buffer of the battalion staff.

This paper proposes a Decision Support System to aid the node center, the hub of the system, in performing these functions. The decisions and planning functions of the nodal platoon leader are analyzed, and the DSS capabilities and requirements are presented by developing the three main components of the system-data, dialogue, and models. The proposed DSS is intended to increase the platoon leader's effectiveness in order to provide timely, reliable, and flexible tactical communications on the battlefield.

Master of Science in
Information Systems
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ANALYSIS AND DESIGN OF A DECISION SUPPORT SYSTEM FOR SILAS B. HAYS ARMY COMMUNITY HOSPITAL

Timothy John Reeves
Captain, United States Marine Corps
B.S., Miami University, 1981

Upper-level managers at Silas B. Hays Army Community Hospital (SBHACH), Fort Ord, CA, are tasked with the administrative operation of a Medical Treatment Facility providing various health-care services to the surrounding military community. This broad mission requires hospital administrators to analyze large amounts of data when commonly tasked with solving ill-structured problems resulting from managing such a large hospital. The thesis research presents the use of a Decision Support System (DSS) to support upper-level managers faced with ill-structured problems and discusses the use of structured interviews in deriving the resource manager's critical information needs. These Critical Success Factors (CSFs) are presented in detail and proposed measures that a DSS should possess to satisfy these critical information needs are identified. The design of the first iteration of the Resource Management DSS using structured software design tools provides the necessary documentation from which the system may be implemented.

Master of Science in
Information Systems
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Sciences

A SYSTEM COSTS PLANNING DECISION SUPPORT SYSTEM

Craig L. Riddle
Lieutenant, United States Navy
B.S., United States Naval Academy, 1981

This study undertakes the task of analysis and design to create a prototype microcomputer-based decision support system for cost planning. System acquisition cost planning is a complex process in which a variety of ill-defined, often conflicting variables influence the decision to be made. Multi-Attribute Utility Theory (MAUT) offers a Multicriterion decision method to incorporate and quantify these variables in the search for an optimal solution. A decision is defined by the options among which one must choose, the possible outcomes, or consequences. Typically, there exists a measurable preference among various choices when making a decision. This preference is called "utility." Microeconomic marginal analysis applied to utility curves generated from MAUT data derivation reveals insights to decision risk assessment and cost planning limitations. In a decision with preferences spread among several goals, the utilities may be assigned different weights to determine overall utility value. This theory of weighted utility is the basis for this prototype. This study envelopes user-oriented analysis and design of a prototype. The microcomputer code is developed for in-house use by decision makers, thus facilitating the management decision process more cost effectively and in less time.

Master of Science
Information Systems
September 1988

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AN EXPERT SYSTEM APPLICATION FOR SERMIS

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B.A., Northwestern University, 1976

The Support Equipment Resources Management Information System (SERMIS) is an extensive program that controls the Navy's aviation support equipment assets. Deficient support equipment allowances for maintenance activities are being generated under this system due to the retirement of a cadre of experts who have acquired years of direct experience with these activities. These direct experiences contribute to mastering the types of knowledge SERMIS requires as input data to this allowance process. Interviews were conducted with an acknowledged expert to identify the types of information that comprised this prerequisite body of knowledge. A prototype expert system application was then constructed using a commercial development tool. The prototype demonstrated the feasibility of capturing this knowledge and using it as a front-end application to gain a more effective and efficient use of SERMIS.

Master of Science in
Information Systems
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AN EXPERT SYSTEM FOR CREDIT RECORD ANALYSIS

Gary M.F. Salazar
Lieutenant Commander, United States Navy
B.S., University of Colorado, 1975

Finance has been the prime motivation in many recent espionage cases. This thesis expanded the prototype Manpower Financial Tracking Expert System (MFTES) that analyzes individual financial profiles in order to detect the potential of an employee to engage is espionage activities. The architecture of MFTES has modules that capture Control Strategy, Taxonomy of Concepts, Expert Rules, and Numerical Processing. During evaluation, it successfully followed the documentary trail for 75 employee credit reports and made inferences about their potential risks.

Master of Science in
Information Systems
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SYSTEM INPUT/OUTPUT CHANGES REQUIRED TO EXPORT THE FORCE REQUIREMENTS EXPERT SYSTEM (FRESH) TO THE COMMANDER IN CHIEF ATLANTIC FLEET

Nicholas L. Sherwood
Lieutenant Commander, United States Navy
B.S., State University of New York, Fredonia, 1976

The intent of this research has been to identify system input and output changes that will be needed to transport FRESH (an employment scheduling expert system) from CINCPACFLT to CINCLANTFLT. A general discussion of expert system theory is presented tying this theory to FRESH wherever possible. Specific uses of FRESH at CINCPACFLT are discussed as well as the present Pacific FRESH input and output requirements. CINCLANTFLT's existing manual method of scheduling is discussed. Finally CINCLANTFLT's proposed changes to the Pacific FRESH inputs and outputs are analyzed. Conclusions identify what FRESH inputs and outputs must be changed prior to FRESH transference to CINCLANTFLT.

Master of Science in
Information Systems
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THE RAND STRATEGY ASSESSMENT SYSTEM: A NEW PERSPECTIVE ON DECISION SUPPORT SYSTEMS

Philip Kemble Siddons
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B.S., Florida State University, 1977

On-line strategic analysis and wargaming are experiencing increased growth within the national government, particularly the Department of Defense (DOD). A renewed emphasis on improved methods for net assessment has resulted in the advent of the Rand Strategy Assessment System (RSAS), a new strategic analysis tool which brings automated analysis and wargaming to the forefront of long-range strategic planning.

The ability of the RSAS to go beyond net assessment into the areas of decision support systems (DSS), group decision support systems (GDSS), and crisis management decision support systems (CMDSS) is the subject of this thesis. These areas are explored to provide recommendations for system modifications, upgrades, large-scale implementation, and proper utilization within the context of strategic planning and decision-making.

Master of Science in
Information Systems
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A USER-FRIENDLY DESIGN OF AN INTERACTIVE PROTOTYPE FOR THE MAINTENANCE AND MONITORING OF CIVILIAN TRAINING RECORDS

Sharon Elizabeth Slominski
Lieutenant Commander, United States Navy
B.A., Radford College, 1975

Ivon Ralph Young
Lieutenant, United States Navy
B.S., University of Maryland, 1980

The objectives of this thesis are to identify through research and user involvement the issues relating to user satisfaction concerning the man-computer interface and then prototype an interactive design based upon those identified issues.

The Civilian Personnel Office, Naval Postgraduate School, was chosen for the area of evaluation and application, since it has on-line computer capabilities that are idle because of the difficulty of use.

The thesis process developed a working prototype using guidelines identified through research and user involvement of user-friendly software. An important conclusion of this study is the observation that while interactive system development should commence with independent designs of both the functional application and the user interface, recognition of the interrelationships that might ve created by the implementation environment can have a significant impact on the quality of system performance and must be thoroughly investigated before final system design.

Master of Science in
Information Systems
September 1988

Advisor: T.R. Sivasankaran
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Sciences

ANALYSIS OF T-AH HOSPITAL SHIP INFORMATION REQUIREMENTS WITH LOGICAL MODEL AND RECOMMENDATION FOR TRANSITION MANAGEMENT

Rickie L. Sosh
Lieutenant, United States Navy
B.S., Murray State University, 1975
B.S., Coleman College, 1981

This thesis deals with logical model and information requirements of the new Mercy Class Hospital Ship's Medical Treatment Facility. It compares the currently planned information systems with the logical model. Several alternative methods for satisfying deficiencies are proposed. These alternatives are readily available items and/or enhancements to the currently planned systems. Methods for the development of information system implementation and transition plans are presented.

Recommendations include further study on information system support requirements for patient evacuation, and also further study and training with fleet operational units to test transition and management plans.

Master of Science in
Information Systems
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Advisor: J.B. Isett
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Sciences

ANALYSIS AND DEVELOPMENT OF MANAGEMENT INFORMATION SYSTEMS FOR PRIVATE MESSES AFLOAT

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B.S., University of South Florida

Michael T. Madden
Lieutenant, United States Navy
B.A., The Citadel

This thesis examines the design and development of an automated information system to support the records keeping and reporting functions for private messes afloat. A system life cycle methodology was used to develop the program, Private Mess Accounting System (PMAS). This program was then demonstrated for potential users and statistical information was gathered and analyzed on the program's potential impact.

Master of Science in
Information Systems
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Advisor: T.R. Sivasankaran
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Administrative
Sciences

AN INVESTIGATION OF DIFFERENCES IN MOTIVATORS OF INFORMATION SYSTEMS AND NON-INFORMATION SYSTEMS PERSONNEL AND IN THE MOTIVATING POTENTIAL OF JOBS IN THE INFORMATION SYSTEMS AND NON-INFORMATION SYSTEMS FIELDS

Janice M. Veneri
Lieutenant, United States Navy
B.A., Indiana University of Pennsylvania, 1972

A survey was conducted to investigate motivational differences between IS and non-IS personnel. The motivational factors of growth need strength (GNS), group interaction strength (GIS), advanced technology strength (ATS), and change acceptance strength (CAS), were tested as well as differences in the motivating potential of jobs. Control for occupational level differences was achieved by classifying the respondents into one of three job categories: professional/technical, managerial, and clerical/operations. With the exception of higher ATS for the IS professionals, no significant differences were found. Additional analysis explored other factors, such as occupational level, age, sex, and educational level, that might account for some of the variation in the scores. The implications of the findings were discussed and recommendations made for further research.

Master of Science in
Information Systems
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Advisor: T.R. Sivasankaran
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Sciences

DESIGN AND IMPLEMENTATION OF A PROTOTYPE GRAPHICAL USER INTERFACE FOR A MODEL MANAGEMENT SYSTEM

Marvin Abram Wyant, Jr.
Lieutenant, United States Navy
B.S., Texas A&M University, 1982

The purpose of this thesis is to design and implement a prototype graphical user interface for a structured model management system. The program is written for an IBM PC using Lattice-C, the Halo graphics package, and the ORACLE DBMS. Design and Implementation issues are discussed and evaluated. Future enhancements to the program and a recommendation as to the disposition of the prototype are also included.

A brief explanation of the structured modeling is presented. An example problem is used to illustrate the various model representation provided by structured modeling. The program re-creates the graphical representations of structured modeling from a database representation.

The results of this thesis show that the prototype design methodology is an excellent supplement to the traditional life-cycle design methodology. The implications of this observation are discussed in relationship to the graphical user interface program.

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Advisor: D.R. Dolk
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Sciences

MASTER OF SCIENCE
IN
MANAGEMENT

JOB SATISFACTION FOR MALE AND FEMALE U.S. AIR FORCE OFFICERS

Espen Amundsen
Captain, Royal Norwegian Air Force
The Royal Norwegian Naval Academy, 1979

This thesis investigated the relationship between job satisfaction and gender by examining factors considered to be determinants of job satisfaction among junior U.S. Air Force officers. The data used in this research were from the 1985 DoD Survey of Officers and Enlisted Personnel. Bivariate analysis, factor analysis and regression analysis were performed to determine the effect of gender on those factors considered to be determinants of job satisfaction. No difference in level of job satisfaction was found between male and female officers, but differences were found in the variables that explained job satisfaction for male and female officers. An understanding of job satisfaction and the relationship of gender to the factors that determine officers' job satisfaction may give military policymakers and leaders greater opportunities to affect job satisfaction and thereby affect job performance and career intention.

Master of Science in Management
December 1987

Advisors: G.W. Thomas
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CD-ROM: LIBRARY OF THE FUTURE

Hagop Avedis Avedissian
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B.M.E., City University of New York, 1977

Kenneth Patrick Butrym
Lieutenant, United States Navy
B.S., Marquette University, 1979

This thesis examines the feasibility of using the compact disc-read only memory (CD-ROM) as the storage medium for the Department of Defense (DOD) construction contracting. Specifically, the DOD sponsored program, headed by the Naval Facilities Engineering Command (NAVFAC), called Construction Criteria Base (CCB) is evaluated. The program is composed of a compact disc containing government construction criteria including Army, Navy and NASA standards. The test platform used is the specification branch of NAVFAC and its Engineering Field Divisions. The CD-ROM used in conjunction with a microcomputer is compared to the standards libraries of the present which are comprised of paper, microfilm and microfiche storage media. The conclusion reached is that the use of the CD-ROM disc in the DOD construction arena is advisible.

Master of Science in Management
June 1988

Advisor: P.M. Carrick
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HOW MINIATURE/MICROMINIATURE (2M) REPAIR CAPABILITIES CAN REDUCE THE IMPACT OF NO EVIDENCE OF FAILURE (NEOF) AMONG REPAIRABLES ON THE NAVY'S OPERATIONS AND MAINTENANCE ACCOUNT

Robert C. Barr
Lieutenant, United States Navy
B.S., Southeastern University, 1978

Today, with technical advances and cost reductions in electronics, it has become possible to recategorize many FLRS and DLRS as progressive repairables. This thesis covers the growing problem of No Evidence of Failure (NEOF) among these progressive repairables and how Miniature-Microminiature (2M) repair capability can be used to correct this problem. The major objective is to demonstrate how 2M repair capability can save O&MN funding and decrease the Repair Turnaround Time (RTAT) for repairables. Two NSNs were chosen from the Support and Test Equipment Engineering Program (STEEP) tests performed by SIMA San Diego during 1987. A statistical analysis and a Level of Repair Analysis (LORA) were run on both. Research was also conducted on possible changes and uses for shipboard 3-M documentation. The main conclusion of this thesis is that with proper training and implementation, 2M repair capability can save O&MN funding, decrease RTAT for both FLRs and DLRs, and enhance fleet Operational Availability (Ao).

Master of Science in Management
June 1988

Advisor: D.C. Boger
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AN ANALYSIS OF ESTIMATED VERSUS ACTUAL DEVELOPMENT COSTS FOR AN ELECTRONICS STATE-OF-THE-ART (SOA) EXTENSION

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Lieutenant, United States Navy
B.A., Boston College, 1978

This thesis is a case study that compares actual costs to estimated costs for a State-of-the-Art (SOA) extension. The Advanced Nuclear Gamma-Ray Spectrometer (ANGAS) program initiated by the Defense Advanced Research Project Office (DARPA) in conjunction with the Research and Development Division of Lockheed Missiles and Space Company (LMSC), Inc. is the subject of this case study.

This thesis identifies: the original description of the technology extension; the methods used at Lockheed to develop SOA extension cost estimates; specific factors that helped and hindered accurate cost estimating and significant variances in cost and technological progress.

Master of Science in Management
December 1987

Advisor: W.R. Greer
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FISCAL CONSTRAINTS AND THE P-3 FLIGHT HOUR BUDGET

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After seven years of exceptional growth in the 1980s, the Department of Defense (DoD) budget is confronted with Congressional budget reduction and deficit control measures. A revised Gramm-Rudman-Hollings Act was passed in September 1987 setting annual deficit targets for fiscal years 1988 to 1993. If the legislation is implemented, DoD organizations face an extended period of financial constraint and budgetary uncertainty. This thesis examines the flight hour program of Commander, Patrol Wings Pacific in developing methods to prepare for an era of budget constraints. The thesis discusses the Gramm-Rudman Act and general organizational reaction to fiscal stress. It then analyzes management control of nonprofit organizations, productivity measurement, and alternative accounting and financial management information systems as means for coping with budget reduction. Decision-makers at all levels of the military must understand these methods in order to manage effectively in an era of financial constraint.

Master of Science in Management
June 1988

Advisor: L.R. Jones
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A LITERATURE SURVEY OF PRIVATE SECTOR METHODS OF DETERMINING PERSONAL FINANCIAL RESPONSIBILITY

Martin Bradley Bodzin
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B.S., Arizona State University, 1974

Credit grantors and employers have two clearly established methods--judgmental and empirically derived--of determining personal financial responsibility that can be used as a basis for accepting or rejecting credit or job applicants. This thesis is a literature survey and analysis of those methods. The foundations of the two methods are examined and models of the empirically derived method are discussed.

The paper builds upon the cost considerations and governmental constraints of the value-maximizing organization. Operational costs associated with personal financial responsibility determination methods include administrative expense, forgone revenue, and asset depletion due to decision making errors. Governmental constraints include information gathering restrictions for equal opportunity and privacy purposes. Applicability of the private sector methods to the public sector is also discussed.

The judgmental and empirical methods are each effective. Their utilization is based upon their respective abilities to minimize cost while achieving the organization's objectives.

Master of Science in Management
September 1988

Advisor: K.J. Euske
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AN INVESTIGATION INTO THE FEASIBILITY OF A SPECIALIZED ALLOWANCE OF CRITICAL SPARE PARTS FOR GAS-TURBINE CLASS SHIPS

Karl W. Bogott
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B.S., University of Colorado, 1972

The possibility of developing a 'suite' of critical engineering parts to be carried by one of a group of Gas-turbine ships when deployed together has been raised. Such ships are sufficiently uniform in their engineering plants to make such a 'suite' feasible. The end purpose would be to lessen the possibility of a 'loss of mission' engineering failure by having low demand parts in theater. The inherent question is that of the performance of both current allowance computation models and the operating procedures which support those models. To answer the questions, a test of the current COSAL model is compared with a similar test of a model more attuned to high levels of protection. Allowance computation procedures are explored, as are those of the related essentially measuring systems. The author presents the results of this test, conclusions drawn therefrom, suggestions for possible action and recommendations for improvements in current reporting procedures.

Master of Science in Management
December 1987

Advisor: D.R. Whipple
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ANALYSIS OF THE PRODUCTION PLANNING AND INVENTORY CONTROL SYSTEM USED BY NADEP, NORTH ISLAND FOR THE REPAIR OF THE T-64 SERIES ENGINE

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Lieutenant, United States Navy
B.S., Juniata College, 1979

This thesis is an analysis of the current production planning and inventory control system used by NADEP, North Island for the repair of the T-64 series engine. The system is described and analyzed for its effect on repair time and work-in-process inventory. Recommendations are made to improve repair time and reduce work-in-process inventory levels. A simulation and queueing theory are used to compare the queue of awaiting maintenance engines under the current system versus the queue when a specified monthly repair rate is maintained.

Master of Science in Management
June 1988

Advisor: D. Trietsch
Department of Administrative Sciences

A STATISTICAL ANALYSIS OF SURFACE ESCORT COST ESTIMATION

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B.S., The Citadel, 1976

This study investigates the relationship of the component weights of U.S. Navy Surface Escort Ships and their corresponding costs of construction. The procedures of various U.S. Navy agencies who conduct Surface Ship Costing are described, with emphasis upon the method followed by COMNAVSEASYSCOM, Washington, D.C. A statistical analysis is provided which focuses upon multiple linear regression techniques applied to the weight/cost relationship. Additionally, the research includes the investigation of non-weight explanatory variable contribution to the various regression models. The analysis concludes that linear relationships do exist between the variables. The statistical evidence provided suggests that linear regression provides equivalent results to non-linear logarithmic transformation of the dependent cost variable. Further, the analysis indicates that the inclusion of non-weight dummy variables, such as contract type for vessel construction, enhance models with strictly weight explanatory variables. The models developed herein lack the precision demanded of budgetary cost estimating. However, the equations will generate point estimates that may add credence to existing methods, especially within concept formulation or tradeoff studies.

Master of Science in Management
June 1988

Advisor: W.R. Greer
Department of Administrative Sciences

MANAGEMENT CONTROL OF LEASED INTERIM FACILITIES: A CASE STUDY

Gary Wallace Bradley
Captain, United States Marine Corps
B.S., Western Baptist College, 1973
Th.B., Western Baptist College, 1975

Rising costs and decreasing resources have resulted in an increased emphasis upon management controls in military command. This thesis focuses on an analysis of the management control structure and process of the trailer leasing program at the Marine Corps Base, Camp Pendleton, California. The purpose of the trailer leasing program is to meet temporary facility space requirements for various organizational and tenant units at Camp Pendleton. Data were obtained by interviewing key personnel involved in the trailer leasing process and examining archival material. The study follows the trailer leasing process through the operations of the three major program participants and provides recommendations focused on improving the effective management of the program.

Master of Science in Management
December 1987

Advisor: K.J. Euske
Department of Administrative Sciences

AN ANALYSIS OF THE ADVANCED TRACEABILITY AND CONTROL SYSTEM GOALS

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B.B., Western Illinois University, 1978

Thomas W. Honeycutt
Lieutenant, United States Navy
B.S., Northern Illinois University, 1978

The purpose of this thesis is to analyze the efficiency and effectiveness of the Advanced Traceability and Control System (ATAC). Prior to the implementation of ATAC, end users of depot level repairables sent retrograde carcasses to various organic and commercial facilities for repair and overhaul. Due to many factors, the depot level carcass tracking system was unable to prevent the loss of delay of many retrograde carcass's through the transportation pipeline. These problems resulted in erroneous charges to the type commander's operating funds, unnecessary investment in inventory levels to meet demand, and a possible lessened fleet readiness due to shortages for critical repair items. The Navy's solution to this problem is ATAC. The ATAC program simplifies the retrograde turn-in process while providing improved traceability and accountability throughout the return pipeline.

Master of Science in Management
December 1987

Advisor: D.C. Boger
Department of Administrative Sciences

REGIONAL EMPLOYMENT GROWTH AND DEFENSE SPENDING

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B.S., Tennessee Technological University, 1982

The purpose of this thesis is to study how a state's growth or decline in employment is related to Department of Defense expenditures in that state. This analysis looks not only at the impact of total DoD expenditures on employment, but explores the effect of various categories of defense outlays such as military and civilian pay. Prime contract awards for procurement, services, research and development, and construction were included as well. The scope of the thesis was also broadened by considering the impact of defense spending on employment in various industries (i.e., manufacturing, services, and wholesale and retail trade) as well as on total employment. The analysis was conducted by regressing an econometric model using as input cross-sectional data (from the 48 contiguous states). The results indicated that defense spending is an important part of regional growth.

Master of Science in Management
December 1987

Advisors: L.M. Solnick
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Department of Administrative Sciences

A STUDY OF THE ADEQUACY OF THE NAVY INDUSTRIAL FUND ACCOUNTING SYSTEM FOR USE WITH THE RAMP SMP FACILITY

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B.B.A., University of Georgia, 1976

Using modern automated manufacturing techniques changes the behavior of traditional manufacturing costs incurred in labor intensive processes. The Navy RAMP SMP facility is an automated manufacturing facility which is envisioned to operate within the Navy Industrial Fund (NIF) system. The traditional NIF accounting system may be inadequate to deal with the changes in costs that will result. The purpose of this thesis is to determine the adequacy of the NIF accounting system to properly account for costs incurred in the RAMP SMP facility.

This thesis describes the RAMP SMP facility, discusses the accounting issues which arise when automated manufacturing techniques are introduced, provides an overview of the NIF accounting system, and analyzes the NIF accounting system's adequacy for use with the RAMP facility. The author concludes that some elements of the NIF accounting system are inadequate in their present state for use with the RAMP SMP facility.

Master of Science in Management
June 1988

Advisors: K.J. Euske
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CONSTRAINTS PLACED ON MARINE CORPS AMMUNITION REQUIREMENTS BY THE PPBS

Donald Michael Burlingham
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B.S., United States Naval Academy, 1980

To determine whether the products of the Planning, Programming and Budgeting System (PPBS) are worthwhile, they must be measured against some form of output. The Prepositioned War Reserve (PWR) of the Marine Corps is a measure of sustainability: a desired output of the PPBS. This thesis investigated the PPBS, the Marine Corps programming methodology and ammunition requirement generation to determine whether these processes artificially constrain ammunition purchases.

This thesis suggests that the constraints placed on ammunition requirements are related to the lack of long-range strategic goals, inadequate planning in the PPBS and the inherent weaknesses of program budgeting.

Master of Science in Management
June 1988

Advisor: J.L. McCaffery
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ANALYSIS OF THE AIRCRAFT FLYING HOUR PROGRAM AT THE PACIFIC MISSILE TEST CENTER

Vanessa J. Byrne
Lieutenant, United States Navy
B.A., Ohio Wesleyan University, 1974

This thesis is an analysis of the flight hour cost program at the Pacific Missile Test Center (PMTC). The method by which PMTC computes aircraft flight hour rates is compared to the techniques used by the Naval Air Test Center and the Naval Weapons Center. A new approach to computing aircraft rates is proposed in this report. Using historical cost data, regression analysis is used to derive a rate per hour flown for fuel consumption. Based upon these data, no correlation exists between aircraft flight hours and aircraft parts costs. A decision support system (DSS) is also proposed herein to assist in the calculation of the flight hour rates. This DSS can also be used as a budget and as a vehicle to track program cost and schedule variances. It is recommended that a follow-on analysis be conducted to ascertain whether or not a true correlation exists between flight hour and aircraft parts costs. Under the current budget system, funds for parts are requested per hour in the Navy and Marine Corp flying hour program.

Master of Science in Management
December 1987

Advisor: S. Liao
Department of Administrative Sciences

EXPLOITING NAVY OFFICER END-OF-ACTIVE-OBLIGATED-SERVICE (EAOS) DATE IN FORECASTING LOSSES

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B.S., University of La Verne, 1981

The key to effective military personnel planning is accurate loss forecasting. Accurate estimates of future losses enable personnel managers to determine the number of individuals to recruit and promote, as well as the size and cost of future personnel inventories.

The thesis describes the generation and analysis of several simple loss rate forecasting models. The models are divided into two classes, those that incorporate eligibility data and those that do not.

Aviation officers, particularly pilots, were narrowed down to Lieutenants with four to nine years of commissioned service. They were divided into three communities (jet, prop, and helo).

Two methods of loss forecasting were used, BI which is somewhat akin to OP-01s technique and the method I wish to exploit, EAOS.

EAOS techniques appear to contribute more to officer loss forecasting than the BI technique. However, BI techniques are still significant but to a lesser degree. The findings are discussed within the context of the study.

Master of Science in Management
December 1987

Advisors: S.L. Mehay
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IMPROVEMENT OF MANAGERIAL EDUCATION OF JUNIOR OFFICERS IN THE VENEZUELAN NAVY

Igor A. Campos
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B.S., Venezuelan Naval Academy, 1985

The Venezuelan Navy depends on its personnel, equipment, and facilities to successfully accomplish the Navy's mission. Therefore, Naval operations rely on the ability of the officers to plan, organize, lead, and control the organization.

Naval officers, whether senior or junior, hold positions as managers. For this reason a study was made of the educational background of officer candidates to determine the amount of management education they have received at the Naval Academy.

From this study it was learned that although naval officers are generally well educated and trained, they are weak in the management area. In this thesis an attempt is made to show the basic elements necessary to improve such managerial education. Conclusions are drawn and recommendations are made to help the managerial development of Venezuela's naval officers.

Master of Science in Management
March 1988

Advisor: R.A. Weitzman
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UNITED STATES MARINE CORPS PROVISIONING MEASURES OF EFFECTIVENESS

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B.A., West Chester State College, 1979

This thesis investigates measures of effectiveness (MOE) and defines the data elements for an automated USMC repair parts initial provisioning evaluation system. Twenty-three specific MOEs, applicable to any new weapon system, are proposed from five general criteria categories: weapon system readiness, supply support, cost, essentiality and range/depth. Then, each MOE is examined for practical implementation potential by identifying and/or modifying data elements resident in USMC automated files. To assist in the database programming of MOEs, Appendices B through E define and cross-reference the MOEs, automated files and data elements.

Master of Science in Management
December 1987

Advisor: D.R. Dolk
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TERMINATION OF U.S. NAVY PROCUREMENT CONTRACTS FOR SECONDARY ITEMS IN LONG SUPPLY

Gary Jon Chapman
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B.S.B.A., San Jose State University, 1976

This thesis discusses the U.S. Navy's current situation with regard to secondary items in long supply. This study concentrated solely on the area of acquisition of secondary items for wholesale inventory requirements. A brief history follows of how th U.S. Navy makes its requirements determinations and how the Navy has ended up in a long supply position on many items. The proposed Naval Supply Systems Command's termination model is examined in detail. Recommendations are given for potential improvements in this model which should result in more accurate determinations of the actual costs involved in a termination decision. An alternative decision model is proposed which, if implemented in the Navy, will assist both item managers and buyers in making the best business decisions on whether to terminate a contract for items in long supply or allow it to continue to completion.

Master of Science in Management
June 1988

Advisor: D.V. Lamm
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THE IMPACT OF AGENCY AUDITS ON THE BUY OUR SPARES SMART (BOSS) PROGRAM

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B.S., Oregon State University, 1978

This study examines the effects of audits on the Navy's Buy Our Spares Smart (BOSS) Program. The BOSS program was established in 1983 in response to the Department of Defense's efforts to resolve the spare parts pricing problem. The study focused on the impact of Government (U.S. General Accounting Office, Department of Defense Inspector General, and Naval Audit Service) auditing on the development and progress of the BOSS program.

This study examined all (20) completed audits as listed in the BOSS annual reports and compared them against changes that have occured since inception of the BOSS program.

The researcher found no significant impact of Government auditing on the BOSS program. The BOSS program had demonstrated unusual stability from the beginning implying that the program was extremely well thought out and executed. Audit findings and recommendations readily support this supposition.

Master of Science in Management
June 1988

Advisor: E.N. Hart
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STANDARDIZING CONSTRUCTION BETWEEN INDUSTRY AND GOVERNMENT

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B.S., University of Southern California, 1980

The study set out to determine how standards in construction are developed and whether economic analysis based on life cycle costing is considered during their development. It explains how several organizations in the federal government and in the commercial sector develop standards for construction. It was determined that economic analysis is not used during the development of the vast majority of these standards. Although not used, it is believed that the standards writers could perform economic analysis if they were so inclined. The National Bureau of Standards has actually developed a step by step guide for performing life cycle cost analysis of building codes. It is recommended that the military also develop a similar technique for evaluating changes made to their technical and design related manuals. As a final point, it was concluded that the military is actively involved in coordinating its military specifications with voluntary standards writing organizations in an attempt to eliminate duplication between their standards and is thereby complying with the directive of OMB Circular A-119.

Master of Science in Management
December 1987

Advisor: P.M. Carrick
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STANDARDIZATION: USING COMPARATIVE MAINTENANCE COSTS IN AN ECONOMIC ANALYSIS

Roger Nelson Clark
Lieutenant Commander, United States Navy
B.S., Idaho State University, 1975

This thesis investigates the use of comparative maintenance costs of functionally interchangeable equipments in similar U.S. Navy shipboard applications in an economic analysis of standardization. The economics of standardization, life-cycle costing, and the Navy 3-M System are discussed in general. An analysis of 3-M System maintenance costs for a selected equipment, diesel engines, is conducted. The potential use of comparative maintenance costs in determining an equipment standard and equipment reprocurement is reviewed.

Master of Science in Management
December 1987

Advisor: P.M. Carrick
Department of Administrative Sciences

THE POST-AWARD COSTS OF CONTRACTING OUT: THE U.S. NAVY'S IMPLEMENTATION OF OMB CIRCULAR A-76

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B.A., State University of New York, 1974

Charles Pegram, Jr.
Lieutenant, United States Navy
B.S., University of North Carolina, 1974

The Commercial Activities program as delineated by OMB Circular A-76 has been controversial since its inception. One area of continuing controversy is the accuracy of pre-award cost estimates for estimating post-award program savings in operations that are contracted out. This thesis examines the post-award results of contracting out and identifies those costs that are either underestimated or not accounted for in the cost comparison process. Research was conducted on 14 West Coast activities that contracted out a food service operation, storage and warehousing operation, or both under a multi-function contract. The issues identified by the study include: the need for post-award guidance and policy, the need for increased claimant guidance at the field level, the absence of an adequate cost accounting system and post-award program controls, the need for increased contract administration staffing, a problem with budget flexibility at activities that have contracted out and continuing problems with performance definition.

Master of Science in Management
June 1988

Advisor: P.M. Carrick
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REENLISTMENT BEHAVIOR OF NUCLEAR-TRAINED ENLISTED MEN

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B.S., University of Michigan, 1981

This thesis investigates reenlistment behavior of a particular occupational sector of the U.S. Navy. The data set consists of enlisted members with nuclear NECs and 4 to 9 years of service during the 1977-1987 time frame. Specific pay and employment data from the civilian nuclear industry is used for comparison to military pay. Two econometric modelling techniques ar employed: logit analysis for individual level data, and time-series cross-sectional analysis for pooled data. The effect on reenlistment probability of changes in relative military and civilian salaries is determined. The results demonstrate the importance of pay to the reenlistment decisions of these men, but indicate that the supply elasticity is relatively low. It is argued that this low responsiveness of retention to pay changes is due not only to the arduous conditions of the work environment, but to the fact that military to civilian pay ratios were uniformly low during the period of observation. Previous research concerning the relationship of retention to pay has aggregated occupational categories and found higher elasticities. This paper shows that retention behavior can be better understood using information about compensation in disaggregated military occupational sectors and specific civilian aternatives.

Master of Science in Management
June 1988

Advisor: L.M. Solnick
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REVIEW OF THE INCREASED PARTICIPATION OF THE COMMANDERS-IN-CHIEF (CINCS) IN THE PLANNING, PROGRAMMING, AND BUDGETING SYSTEM (PPBS)

Cynthia Ann Craig
Captain, United States Army
B.S., Northeastern University, 1977

This thesis provides an analysis of the causal factors leading to the increased influence and authority of the Commanders in Chief (CINCs) in the defense resource decision and allocation process. A discussion is provided on the various Joint Chief of Staff (JCS) reforms which led to the enhancement of the CINCs role in the Planning, Programming, and Budgeting System (PPBS). Major issues, constraints, control, and implementation problems currently confronting the CINCs are explored. A brief summary of the initiatives begun by Deputy Secretary of Defense (DEPSECDEF) Taft to increase the involvement of the CINCs in the defense programming process also is provided. The policy issues related to implementation of the Goldwater-Nichols Department of Defense (DoD) Reorganization Act of 1986 are reviewed along with some of the positive and negative aspects of the increased demand for CINC participation in PPBS. Conclusions and recommendations for further study are furnished.

Master of Science in Management
June 1988

Advisor: L.R. Jones
Department of Administrative Sciences

COST ANALYSIS OF TRAINING OUT OF COMMUNITY NAVAL AVIATORS FOR THE RESERVE PATROL AVIATION FORCE

Leo Dennis Cullen
Lieutenant Commander, United States Naval Reserve
B.A., Mansfield State College, 1976

This study was conducted to determine the cost of training out of community Naval Aviators (Pilots and Naval Flight Officers) into the P-3 Reserve Force. It was designed to assess the cost of training the average Pilot or Naval Flight Officer whose original fleet experience was in an aircraft other than the P-3, and to provide to decision makers information regarding which communities contribute most efficiently to the P-3 Reserve Force. Additionally, the use of these out of community aviators was measured in order to examine manning problems at the P-3 Reserve drilling sites.

Master of Science in Management
March 1988

Advisor: S.S. Liao
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NATIONAL SERVICE: CAN WE AFFORD IT?

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B.S., United States Naval Academy, 1981

This thesis estimates the costs, implicit as well as explicit, of three National Service proposals. The three proposals examined were: (1) a completely voluntary system as presented by Donald Eberly, the Director of the National Service Secretariat; (2) a "coercive-voluntary" model developed by Richard Danzig and Peter Szanton in their book "National Service: What Would it Mean?"; and (3) a mandatory system similar to the military draft of the Vietnam War era. Costs included were: wages, medical benefits/coverage, GI Bill benefits, administrative costs, basic and specialized training costs, operational costs and recruiting/advertising costs. Additionally, implicit (i.e., opportunity) costs were included in Models Two and Three. Estimates were made only of the costs of the programs. The assessment of potential benefits from an untested program is even more problematic than the attempt to estimate economic costs and is beyond the scope of this thesis.

This research indicates that previous estimates of the costs of National Service programs may be underestimated by several billion dollars. In all probability, these estimates were low due to the unintentional exclusion of certain relevant costs, such as training and implicit costs. However, it is also possible that conservative assumptions were used in many previous estimates to make national service more politically appealing.

It was found that the voluntary model of Eberly is the least costly, but is also unrealistic. Greater expenditures in wages and benefits would be necessary to provide enough incentives to enlist sufficient volunteers. This thesis suggests a program that provides better incentives for volunteers and presents a more realistic cost of a voluntary system.

It is found that the term "National Service," as used in this context, more accurately describes a job creation program for lower income youth than a service program designed to attract youth from a cross-section of American society.

Master of Science in Management
December 1987

Advisor: D.R. Henderson
Department of Administrative Sciences

WHAT EFFECT HAS CONTRACTING-OUT FOR COMMERCIAL ACTIVITIES HAD ON NAVAL PROPERTY ADMINISTRATION?

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B.A., Rutgers University, 1977

The issue of providing Government-furnished property to contractors for use on production contracts has received a great deal of attention since the late 1960's. Now with more emphasis being placed on contracting-out for commercial activities, agencies are providing contractors property to use while performing service contracts on military installations. This thesis reports the findings of a survey of 30 property administrators involved with commercial activities (services) contracts. The study concludes that property administration gets little attention in the services contracts area. This situation will not be corrected until guidance and direction comes down from higher authority that is clear and concise.

Master of Science in Management
December 1987

Advisor: P.M. Carrick
Department of Administrative Sciences

A LONGITUDINAL ANALYSIS OF INTENTIONS TO ENLIST: IMPACT ON SUBSEQUENT ENLISTMENTS AND PERFORMANCE OF U.S. MARINES

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B.S., The Citadel, 1978

This study examines the relationship between the surveyed intentions of young men to join the military and their actual enlistment behavior. Of specific concern, is how knowledge of this relationship might benefit the United States Marine Corps in achieving cost-effective management of recruiting resources. A review of selected literature examines the use of an intentions variable in manpower forecasting models as well as some of the major research efforts involving surveyed intentions. The analysis uses a longitudinal data base, created by merging responses from the 1976-83 Young Attitude Tracking Study (YATS) with Defense Manpower Data Center (DMDC) cohort files, to examine the connection between an individual's self-stated propensity to enlist and his subsequent behavior.

The analysis also attempts to describe selected characteristics of individuals who joined the military--including demographic variables, quality indicators, and measures of performance - on the basis of their YATS responses. There was no conclusive evidence of major differences in the characteristics of enlistees who were initially positive or negative toward joining the military. However, the results of the study do

suggest that different combinations of intentions and demographic characteristics may lead to different patterns of enlistment behavior.

Master of Science in
Management
June 1988

Advisor: M.J. Eitelberg
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A TEMPLATE FOR THE SELECTION AND ARRAY OF INVENTORY AS AN AID IN THE DEVELOPMENT OF EVACUATION PLANS

James Lawrence Dietz
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B.A., Point Park College, 1973

A program is developed using the FOCUS interactive query language to aid in the selection of aviation-related inventory to be withdrawn from a forward-deployed stock point in the event of an evacuation. The program allows the input of critical parameters, and produces a scorecard which can be used to analyze withdrawl alternatives. Several possible selection objectives and measures of effectiveness are discussed.

Master of Science in Management
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Advisor: F.C. Horton
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STATE ECONOMIC ENTERPRISES AND TURKISH ECONOMY

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In Turkey, the state had a stake in economic affairs, either in terms of orientation of economic life or in terms of state managed enterprises, both before and after the Republic. In the early years of the Republic, the state, instead of developing the productive potential of the state-owned enterprises, and reorganizing them to increase their effectiveness, continued to operate them as they were.

After the 1930s, a considerable number of State Economic Enterprises (SEEs) were established with different legal structures. The attempts at reforming and reorganizing the administration of these enterprises increased in frequency. Since 1960, the scope of SEEs' economic activities has been further extended, in spite of their continued operation at low levels of productivity under inefficient management. The need for the State Economic Enterprises to improve their efficiency so as to provide savings, their transformation is a vital aspect of Turkey's modernization.

Master of Science in Management
December 1987

Advisor: F. Horton
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DEREGULATION'S EFFECT ON LABOR IN THE TRUCKING INDUSTRY

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Lieutenant, United States Navy
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After forty-five years of considerable government regulation in the trucking industry, Congress passed the Motor Carrier Act of 1980. The Motor Carrier Act was a major step toward deregulation of the trucking industry. Provisions in the act allowed for greater competition and exposure to market forces. From its beginning, the Motor Carrier Act has been extremely controversial. Opponents of the act have claimed that deregulation has placed considerable strains on labor in the industry. This thesis will examine if deregulation has had an effect on employment and wages in the trucking industry.

Master of Science in Management
December 1987

Advisor: R.A. Weitzman
Department of Administrative Sciences

THE CREDIBILITY OF THE SUPPLY DEPARTMENT IN THE MAINTENANCE ENVIRONMENT

David Neal Doyle
Lieutenant Commander, United States Navy
B.A., Ouachita Baptist University, 1974

This thesis examines the credibility of the supply department within the maintenance environment. Data for the analysis was obtained by surveying commanding officers and Supply Corps officers of 312 maintenance-related Navy activities. The surveys were distributed under report control number OPNAV-4400-4(OT). Each population was analyzed independent of the other. The conclusion of this research is based on a comparison of that independent analysis and shows that the supply department within the maintenance environment has a significant credibility gap.

Master of Science in Management
December 1987

Advisor: R.D. Evered
Department of Administrative Sciences

THE IMPACT OF INDEPENDENT RESEARCH AND DEVELOPMENT REGULATIONS ON COMPANIES NOT REQUIRED TO NEGOTIATE ADVANCED INDEPENDENT RESEARCH AND DEVELOPMENT AGREEMENTS

Craig C. Drew
Lieutenant, United States Navy
B.B.A., University of New Mexico, 1978

The purpose of this study is to determine the impact of Independent Research and Development (IR&D) regulations on companies not required to negotiate advanced IR&D agreements. The study used data gathered from a survey questionnaire. The questionnaire addressed the contract characteristics of these companies and the impact of the regulations in the areas of (1) cost allowability and allocability, (2) the IR&D ceiling formula and (3) the nature of IR&D costs and their incurrence.

The responses to the survey showed that approximately 30% of the companies doing business with the Government were not involved in any significant IR&D efforts. A significant number of companies engaged in IR&D efforts expressed some dissatisfaction with the IR&D regulations. In general, however, most companies indicated the present system was acceptable.

Master of Science in Management
December 1987

Advisor: J. Fremgen
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SHORT-TERM PLANNIN . AND FORECASTING FOR PETROLEUM

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B.A., Central Washington State College, 1975

The Defense Fuel Supply Center (DFSC) has, in recent past, been unable to adequately forecast for short-term petroleum requirements. This has resulted in inaccurate replenishment quantities and required short notice corrections which interrupted planned resupply methods. The relationship between the annual CINCLANTFLT DFM budget and sales from the Norfolk Defense Fuel Support Point (DFSP) is developed and the past sales data from the Norfolk DFSP is used to construct seasonality indices. Finally, the budget/sales relationship is combined with the seasonality indices to provide a new forecasting model. This model is then compared with the current one for FY-88 monthly forecasts. The comparison suggests that the new model can provide accurate, timely requirements data and improve resupply of the Norfolk Defense Fuel Support Point.

Master of Science in Management
June 1988

Advisor: A.W. McMasters
Department of Administrative Sciences

AN ANALYSIS OF THE NAVAL SUPPLY SYSTEMS COMMAND'S ENGINEERING THE WORKPLACE (EWP) PROJECT

Patrick Alan Elliott
Lieutenant Commander, United States Navy
B.A., San Jose State University, 1971

The purpose of this thesis isto evaluate the current Naval Supply Systems Command stock point productivity enhancement project known as Engineering the Workplace (EWP). It was found that EWP produced significant efficiencies in physical distribution work methods, employee performance, and material organization and flow. It was also found that EWP is an effective tool for training employees in efficient work methods, monitoring employee performance on a continuing basis, and providing managers with a quantitative decision making control mechanism that is based on objective performance measurement indices. The major conclusion is that EWP is an appropriate methodology to use in other functional areas of a stock point. An aggressively managed application of EWP throughout other segments of the NAVSUP community may significantly improve productivity.

Master of Science in Management
June 1988

Advisors: T.P. Moore
R.W. Smith
Department of Administrative Sciences

COST BENEFIT ANALYSIS FOR THE TURKISH NAVY

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B.A., Turkish Naval Academy, 1981

National security depends upon many factors, like the morale of a country's soldiers, the character and skill of its political and military leaders, its geographic position relative to other countries, etc.

But national security also depends upon economic factors, which are variously interpreted and defined. Most writers who stress the importance of economic factors are referring to the economic strength of the nation, as contrasted with its military forces.

When a country like Turkey, which has one of the most important strategic locations in the Middle East, is trying to accomplish its defense objectives as a NATO allied country with limited resources, it must use these resources as effectively as possible in order to select defense systems. The aim of this paper is to select the best force structure by using cost-benefit analysis. Each candidate force structure includes a different type of new frigate for the Turkish Destrcyer Fleet.

Master of Science in Management
December 1987

Advisor: F. Horton
Department of Administrative Sciences

THE NAVY'S SURFACE OPPORTUNE LIFT PROGRAM

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M.B.A., University of Puget Sound, 1982

The Navy's Surface Opportune Lift (OPLIFT) program is a Navy Material Transportation Office--managed cost reduction program. The program makes use of deploying and returning U.S. Navy ships to move fleet and shore material. The transportation cost avoided or saved would otherwise be billed to Servicewide Transportation funds.

This thesis is an analysis of the OPLIFT program with an emphasis on the cost savings achieved over the past five years. In order to determine if maximum cost savings are being achieved an examination of top management emphasis on OPLIFT utilization, fleet implementation of the Program and the existing cost savings reporting system is conducted. In addition, trends and patterns in OPLIFT utilization are identified and a multiple regression model to predict monthly cost savings is developed. An attempt is made to identify measures which can be taken to upgrade and improve the program and enable the Navy to maximize cost savings.

Master of Science in Management
December 1987

Advisor: F.C. Horton
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CONTRACTING PRINCIPLES: A CONCEPTUAL FRAMEWORK FOR THEIR IDENTIFICATION AND VALIDATION

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B.A., The University of Lousisville, 1975

This thesis addresses the process by which scientific principles of contracting can be identified and validated. This process is developed within a conceptual framework which considers: the morphology and functionality of laws and principles; the conduct of inquiry in the context of a generally-accepted scientific approach; and a number of fruitful research design methodologies having the capacity to expose and facilitate analysis of elemental aspects of law-like propositions. The validation process, once developed, is demonstrated to be applicable to testing hypotheses dealing with contracting phenomena. The writer concludes that contracting principles can be articulated and scientifically validated. Research in this area will support establishing contracting as a science.

Master of Science in Management
December 1987

Advisor: D.V. Lamm
Department of Administrative Sciences

AN ANALYSIS OF RETENTION OF FIRST-TERM ENLISTED PERSONNEL IN THE SELECTED RESERVES

Donald D. Fithian, Jr.
GS-13, United States Army
B.S., Old Dominion University, 1976

This thesis analyzes retention decisions of male, first-term enlisted Selected Army Reservists. The likehood of retention is analyzed with the conditional logistic regression (logit) model using a dichotomous choice of intentions (stay/leave) for various Reserve sub-populations: non-prior and prior active service groups for National Guard and Army Reserve components. The relative importance of various demographic, military experience and cognitive/perceptual factors to the retention decision is assessed. The results highlight potential policy variables which can be impacted by manpower policy planners to manage Reserve force retention.

Master of Science in Management
June 1988

Advisors: G.S. Thomas
S.L. Mehay
Department of Administrative Sciences

STREAMLINING INVITATION FOR BIDS

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M.S.B.A., Boston University, 1984

The U.S. Government issues a solicitation document known as the Invitation for Bid (IFB). This is the first step in a process known as Sealed Bidding. The IFB package consists not only of the description of the needed deliverable or service, but also statutes, regulations and assorted legal clauses. The IFB then becomes a voluminous bureaucratic document that is difficult to comprehend by even the most experienced of contractors. This study presented the problems of the IFB from the contractor's and Government's viewpoints with an eye towards streamlining the IFB package to make it more understandable and usable. Suggestions are made towards this end.

Master of Science in Management
December 1987

Advisor: D.V. Lamm
Department of Administrative Sciences

DEVELOPMENT OF A PROCUREMENT TASK CLASSIFICATION SCHEME

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This thesis is an initial attempt to develop a procurement task classification scheme.

The paper begins with a theoretical framework highlighting current taxonomic issues and practices. The development of the 169 Federal Acquisition Institute/Acquisition Enhancement Study (ACE II) Program procurement task statements used in this paper is then reviewed. From the objectives of this study and the nature of the procurement task statements, criteria are developed to select an existing task classification scheme. The Berliner, Angell, and Shearer classification scheme was selected. An objective procedure was developed by the researcher to classify the behaviors of the procurement task statements in accordance with the Berliner classification scheme. The procedure, through use was found to be almost entirely subjective. Due to the potential benefits of the procurement task classifiction scheme and activity hierarchy, the researcher concludes that it is in the best interests of procurement personnel and the procurement process to continue taxonomic research to validate the procurement task classification scheme and activity hierarchy.

Master of Science in Management
December 1987

Advisor: D.V. Lamm
Department of Administrative Sciences

A TURNOVER ANALYSIS FOR DEPARTMENT OF DEFENSE PHYSICIANS

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This thesis analyzes the career orientation of military physicians. Career orientation is analyzed using a logistic regression (logit) model with a dichotomous dependent variable career intention (short-term/long-term). The model is used to analyze the career intentions of four cohorts: all physicians, single physicians, married physicians, and couples (married physicians plus their spouses). The relative importance of various demographic and cognitive/perceptual factors to the career orientation decision is assessed. The results highlight potential policy variables which can be impacted by manpower policy planners to manage the career orientation of military physicians.

Master of Science in Management
June 1988

Advisor: G.W. Thomas
Department of Administrative Sciences

AN ANALYSIS OF THE NAVAL POSTGRADUATE SCHOOL'S COMMISSIONED OFFICERS' AND FACULTY CLUB ACCOUNTING SYSTEM

Linda Marie Gandee
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B.S., United States Naval Academy, 1982

This thesis assesses the current accounting system functioning at the Naval Postgraduate School's Commissioned Officer's and Faculty Club. The primary purpose is to determine if the existing system, the Recreation and Mess central Accounting System (RAMCAS), provides enough information/controls to present all aspects of operations and to be adequately used in management's decision-making processes. The study reveals that RAMCAS does not provide enough detail to managers. Suggestions are made to enhance the club's accounting system and cost controls. These suggestions include use of subsidiary accounts, food revenue statistics, and a data collection system for cost controls. Implementation of these suggestions will amplify the club's accounting system and provide detailed information that will meet the needs of the organization.

Master of Science in Management
June 1988

Advisor: W.R. Greer
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IMPACTS OF END-USER COMPUTING ON THE STRUCTURES OF CONTEMPORARY ADMINISTRATIVE ORGANIZATIONS

Paul Bernard Gashler
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End-user computing (EUC) places information processing power in the hands of people at all levels of organization. With information now widely accepted as a corporate resource, the impact of distributed EUC on organizations is potentially very significant. This thesis examines, via case studies, EUC impact on the structure of contemporary administrative organizations, emphasizing three structural variables - information processing, differentiation of organizational groups and communications networks. EUC has been shown both to instigate and facilitate structural change in the organizations studied. The impacts noted in the cases are listed by structural variable. Interpretations of the case study results are also provided.

Master of Science in Management
June 1988

Advisor: T.K. Abdel-Hamid
Department of Administrative Sciences

AN ANALYSIS OF SPARROW MISSILE MAINTENANCE

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B.S.B.A., The Citadel, 1976

It is anticipated that the Air-Launched Missile maintenance budget will not increase sufficiently enough to keep pace with maintenance requirements. One option of cutting costs is to decrease overhead by combining facilities. This thesis studies the proposal to combine depot and intermediate level maintenance for Sparrow Missiles. The missile maintenance organization, cycle, performance, and costs are outlined. Factors influencing delays in the maintenance cycle are discussed. A method of determining the impact on total missile inventory costs for one day of maintenance is developed.

Master of Science in Management
December 1987

Advisor: P. Carrick
Department of Administrative Sciences

LIFE CYCLE COSTING IN SPARE PARTS: PROCUREMENT A DECISION MODEL

Ruth Graham
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B.S., State University of New York, Stony Brook, 1979

Life cycle costing methods can be applied to the procurement of some, but not all, spare parts. As a result, a decision model is needed to determine which spare parts should be considered for life cycle costing. This thesis discusses a decision model for determining the applicability of life cycle costing to spare parts procurement. The thesis briefly reviews the application of the life cycle costing concept to the acquisition of major systems and associated spare parts. It then reviews current spare parts acquisition techniques and identifies critical criteria to be considered during the acquisition of spare parts using life cycle costing techniques. Finally, the thesis uses the identified characteristics to develop the decision model.

Master of Science in Management
June 1988

Advisor: D.V. Lamm
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THE EFFECTS OF ECONOMIC CONDITIONS ON OVERALL AIR FORCE OFFICER ATTRITION

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Air Force planners need to accurately predict officer losses in order to effectively control: the overall force size, promotion rates, augmentation and recruiting needs. Officer losses are influenced by a variety of behavioral and economic factors. This research identified the overall civilian unemployment rate as the major economic factor affecting Air Force officer losses.

However, including the unemployment rate with the "in system" data (number of separation/retirement applications already accepted) failed to increase the accuracy of the model currently used by the Air Force.

Recommendations are to further explore the cause of the serial correlation found in the time series data and to model the causal relationships that cause officers to leave the Air Force.

Master of Science in Management
December 1987

Advisors: L. Solnick
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USING COST REALISM TO IMPROVE THE SOURCE SELECTION PROCESS

William E. Hall
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The source selection decision in a competitively negotiated acquisition is very difficult. Cost realism is one evaluation factor that may be used to assist in making the source selection decision. In this study the concept of cost realism and feasible methodologies for achieving it are investigated. The role of cost realism in the source selection plan and the source selection process is identified and defined. Specific cost realism issues are reviewed and discussed. Cost realism utilization in the Department of the Navy is investigated. The study concludes that cost realism provides useful assistance in making the source selection decision.

Master of Science in Management
December 1987

Advisor: D.C. Guyer
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THE APPLICATION OF A MICRO-COMPUTER AND DATABASE MANAGEMENT SOFTWARE TO IMPROVE SQUADRON OPERATIONS DEPARTMENT READINESS AND ADMINISTRATIVE MANAGEMENT DECISIONS

Stanley M. Hanna
Lieutenant, United States Navy Reserve
B.S., University of West Florida, 1980

Michael W. Morris
Lieutenant, United States Navy Reserve
B.A, University of Colorado, 1980

This study presents the design and implementation of a microcomputer decision support system (DSS) that 1) tracks crewmember qualifications (quals) to calculate a Patrol (VP) Squadron's Actual Crew Readiness (ACR), 2) provides information on optimal crew scheduling, and 3) enables the Operations Officer to perform "what-if analysis" on aircrew data. Lotus 1-2-3 is used as a "Model Base Management Software," dBase III Plus as a "Data Base Management Software" and Wordstar as a "Report Writer" in a logical integration of these off-the-shelf commercial software products.

This integrated decision support system is developed as a prototype designed to provide real time management decision information on crew readiness and demonstrates that a Readiness report based on the data for 15 separate aircrews can be compiled within 20 minutes.

Master of Science in Management
December 1987

Advisor: R.D. Evered
Department of Administrative Sciences

A FEASIBILITY STUDY OF RELATING SURFACE SHIP OPTAR OBLIGATION PATTERNS TO THEIR OPERATING SCHEDULES

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B.S., Iowa State University of Science and Technology, 1982

Kevin L. Kukar
Lieutenant, United States Navy
B.S., Iowa State University of Science & Technology, 1982

U.S. Navy surface 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 funding necessary to execute its annual budget. At present the type commander's budget office essentially uses a base plus incremental change budget process to allocate OPTAR. No attempt is made to allocate the OPTAR on the basis of when the funds are likely to be most needed.

This thesis studies OPTAR spending patterns for two classes of Navy ships in the Pacific Fleet and attempts to quantify the relationship between employment and obligation. Regression analysis was used to generate a forecasting model. Based on the results of this analysis, a forecasting model was created that could accurately predict the spending requirements for these two classes of ships. The regression equations and comparison results are presented.

Master of Science in Management
June 1988

Advisor: S.S. Liao
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COST ACCOUNTING IN THE AUTOMATED MANUFACTURING ENVIRONMENT

John T. Hastings
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Cost accounting and product costing techniques are used by firms to measure the amount of resources consumed in the production of goods. Writings in the current literature [Johnson, 1987; Kaplan, 1987; Howell, 1987] have argued that traditional cost accounting should be modified in an automated manufacturing environment. The purpose of this thesis is to determine whether traditional cost accounting techniques should be modified in the automated manufacturing environment. Data for this thesis were obtained from archival research of the current literature relating to cost accounting in the automated manufacturing environment. The conclusion of this thesis is based on a comprehensive analysis of that literature. The author concludes that traditional cost accounting techniques should be modified in the automated manufacturing environment.

Master of Science in Management
June 1988

Advisor: K.J. Euske
Depattment of Administrative Sciences

AN ANALYSIS OF THE RELATIONSHIP AMONG ABILITY MEASURES, EDUCATION AND EARNINGS

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B.A., University of Michigan, 1983

This thesis analyzes the interrelationship of measures of ability and education on earnings differentials by using a standard human capital earnings function. The data used are from the 1983 and 1984 panels of the National Longitudinal Survey of Youth aged 14 to 21 in 1979. The Armed Forces Qualifying Test (AFQT) and Coding Speed (a subtest of the Armed Services Vocational Aptitude Battery (ASVAB) Form 8A) were examined and compared for their relative utilities in measuring ability. The results showed that both AFQT and Coding Speed performed as measures of ability by refining the estimated returns to education. Their relative utilities varied according to an individual's occupation and level of education.

Master of Science in Management
December 1987

Advisors: G.W. Thomas
L.M. Solnick
Administrative Sciences

A HANDBOOK FOR THE JUNIOR FINANCIAL MANAGEMENT SUBSPECIALIST-IN-TRAINING

Patricia S. Hine
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B.A., California State University, Sacramento, 1979

There is an ample body of directives, manuals and informative literature pertaining to Navy financial management, with the preponderance designed for the technician or mid-grade and senior officer. The officer assigned to a Navy financial management training billet, subspecialty coded 0031T or 0031S, by virtue of her or his inexperience, generally cannot comprehend such material and is ineligible and, in all likelihood, unprepared for advanced training. This research is aimed at determining the information needs of the junior financial management subspecialist-in-training through feedback from the financial management subspecialty community at large, educators of Navy financial managers, and the Chief of Naval Operations (CNO) financial management subspecialty sponsor, OP-92. Based on the research, this effort then focuses on the production of a reference handbook designed to meet the informational needs of the junior Navy financial management subspecialist-in-training.

Master of Science in Management
December 1987

Advisor: J.R. Duke
Department of Administrative Sciences

POST SERVICE EARNINGS GROWTH RATES OF MILITARY VETERANS IN THE ERA OF THE ALL VOLUNTEER FORCE

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B.S., Southern Illinois University, 1982

This thesis analyzes the effect of military training, veteran status, and military experience on the post-service earnings growth rates of veterans. The National Longitudinal Survey of Young Men, years 1971 to 1981, was used as the source of data. Two similar earnings growth rate models were estimated: The first used veteran status as an explanatory variable, and the second equation substituted changes in military experience for veteran status. Veterans were found to have higher earnings growth rates compared with their non-veteran cohorts. Results of the effects on earnings growth rates from both increases in military experience and general types of transferable military training were insignificant and thus were inconclusive. Blacks suffered economic disadvantages, as their earnings growth rates were less than their non black cohorts. Analysis of a disaggregated sample consisting only of blacks indicated that black veterans no longer receive significant economic advantages over black non-veterans. The earnings growth differences between black veterans and black non-veterans were not significant.

Master of Science in Management
June 1988

Advisor: S.L. Mehay
Department of Administrative Sciences

AN ANALYSIS OF THE ACQUISITION OF THE PENGUIN MISSILE

David E. Hough
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B.S., Azusa Pacific College

Program Managers within the Department of Defense are under increasing pressure to conform to Congressional Mandates and Department of Defense Directives to ensure standardization of weapons with the NATO allies. There are many unique problems to be considered prior to making a decision.

This thesis will review the Penguin Missile acquisition, the problems encountered and how they were handled and the alternatives available to the Program Manager to handle these problems.

Master of Science in Management
December 1987

Advisor: LCDR R.W. Smith
Department of Administrative Sciences

PROFILING MARKET POTENTIAL FOR NAVY RECRUITING AT THE LOCAL GEOGRAPHICAL LEVEL

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Lieutenant, United States Navy
B.A., State University of New York College, Buffalo, 19

This thesis investigates several alternative methods for estimating intentions to join the United States Navy. The Youth Attitude Tracking Study (YATS) is used to obtain the intentions of young male respondents to join the military, and specifically the Navy. Intention propensity indexes are calculated for Navy recruiting areas and districts.

The main conclusions of the study are:

A. intention propensity can be forecasted at the Navy recruiting district level;

B. a propensity index could be used to allocate the number of recruiters and recruiter goals at the Navy recruiting area and district level;

C. probit and logit regression models should be tested by predicting enlistment intentions for 1985-1987, then comparing the prediction against observed out-of-sample years.

Master of Science in Management
June 1988

Advisor: S.L. Mehay
Department of Administrative Sciences

QUIT BEHAVIOR OF FIRST-TERM ENLISTED MARINE CORPS PERSONNEL

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B.A., University of Southern California, 1982

This thesis examines the effects of personal, human capital, and job-specific characteristics on the quit decision of first-term enlisted Marine Corps personnel. Additionally, factors for census region the Marine enlisted from, the granting of a waiver to enlist, and number of promotions were modeled. The data provided are from the Defense Manpower Data Center Cohort Files and include those who enlisted from September 1980 through September 1981 on a four year contract. A model of utility maximization was used to determine the quit decision. Probit analyses were conducted for the general population and selected groups based on marital status, race, education, and AFQT group. Empirical results of the model indicated, for personal factors, being married and from a minority group significantly reduced quits. The results on census region were generally inconclusive but those from the Pacific and New England areas had a higher propensity to quit. The human capital factors supported evidence from previous literature that high school graduates are the 'best bet" and less likely to quit. Finally, the job-specific factors for MOS indicate that the two areas with the greatest likelihood of quits were infantrymen and electronic equipment repairman; it

was in the overcrowded field of administrative support that the quit rate was large, negative and significant.

Master of Science in
Management
December 1987

Advisor: L.M. Solnick
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DEPARTMENT OF DEFENSE EXPENDITURE IMPACT ON STATE ECONOMIC GROWTH

Craig E. James
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B.S., Rose-Hulman Institute of Technology, 1981

Utilizing pooled cross-sectional and time series data an econometric model is used to estimate the impact defense expenditures had on state economic growth between 1976 and 1985. Defense contracts for procurement, research and development, services, and construction were found to have a significant positive effect on state growth during this period. However, defense expenditures for civilian payrolls were found to have had a significant adverse effect on growth and expenditures on military payrolls were found to be insignificantly related to state growth.

Master of Science in Management
December 1987

Advisors: S. Mehay
L. Solnick
Department of Administrative Sciences

AN ANALYSIS OF EFFECTIVENESS MEASUREMENT IN THE MARINE CORPS MILITARY PAY SYSTEM

Danny Allan Jenkins
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B.A., Ohio University, 1975

This thesis is an analysis of the methods used by top-level Marine Corps financial management to measure the effectiveness of the active duty military pay system. Specific characteristics of measurement quality, usefulness, and motivational capability are discussed. Current measures used to monitor effectiveness are described, including those of the Marine Corps Disbursing On-Site Examination Teams and the Disbursing Performance Standards Program. These measures are then analyzed in relation to the specific measurement characteristics. The thesis concludes that the current measurement process does not appear to provide adequate information to monitor pay system effectiveness appropriately. Recommendations to improve the measurement system include reporting more information on the accuracy and timeliness of the pay system as a whole (as opposed to that of individual commands), placing more emphasis on measuring and reporting pay-related administrative performance, and reporting more information relevant to the effectiveness of the automated portion of the system (the computer).

Master of Science in Management
December 1987

Advisor: J.M. Fremgen
Department of Administrative Sciences

TURNOVER OF JUNIOR ARMY OFFICERS: A TEST OF THE MOBLEY, GRIFFETH, HAND AND MEGLINO MODEL OF PERSONNEL, TURNOVER, USING STRUCTURAL EQUATION TECHNIQUES

Ian Johnston
Major, Australian Army
B.A., University of Adelaide, 1974
B.S., University of Western Australia, 1980

This thesis attempted a test of the Mobley, Griffeth, Hand and Meglino model of personnel turnover, using structural equation techniques, on a sample of junior Army officers. Procedural, data and, possibly, model specification problems, resulted in the failure of the initial model. Following simplification, the model was run on the whole sample, Academy, OCS/OTE, ROTC(S), and ROTC(R) method of entry groups, married and single groups, a short term turnover group, and a group unconstrained by initial service obligations. Differences in causal relationships were found for the separate groups, suggesting that specific models of turnover may be appropriate for individual groups. Intended remaining service was found to be more strongly related to turnover in the short term than the long term. Initial obligations were found to have a confounding effect on the model and should be controlled for in future studies. Recommendations for further tests of the Mobley, Griffeth, Hand and Meglino model, using more appropriate analytic procedures and a more suitable sample, were made.

Master of Science in Management
June 1988

Advisors: G.W. Thomas
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ANALYSIS OF THE KOREAN NAVY SELECTION PROCESS FOR THE NAVAL POSTGRADUATE SCHOOL

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B.S., Korean Naval Academy, 1981

The purpose of this thesis is to identify and analyze problems in the selection process of Korean Navy students to attend NPS, as well as to suggest a selection model that allows for channeling of high-potential Korean Navy officers into NPS in a way which is least expensive to the Navy and most appropriate for officer professional development.

Master of Science in Management
June 1988

Advisor: R.A. Weitzman
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A MANPOWER MODEL FOR DETERMINING "C" SCHOOL REQUIREMENTS

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This thesis proposes an alternative to the Navy's current procedures for granting quotas for advanced formal training or "C" school. The amount of specialized skill training taught in "C" schools and the costs associated with it have greatly increased over the past years. This thesis proposes an effective method for ensuring that a cost efficient number of personnel are trained in "C" schools. A Markov Chain model is developed utilizing data from the Enlisted Master Record to predict a force inventory of "C" school graduates. The inventory projection shows how "C" school graduates will be distributed among paygrade and use of subspecialty. "C" school planners can use the model to predict changes in the inventory due to changes in "C" school assignments.

Master of Science in Management
December 1987

Advisor: D.R. Whipple
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SHOULD INTEREST EXPENSE BE AN ALLOWABLE COST ON GOVERNMENT CONTRACTS?

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Interest expense is not an allowable cost in government contracts. Interest expense is not reimbursed on cost-type contracts nor is it allowed to be considered when negotiating fixed-price contracts. This has been the government's policy for over 40 years. Contractor interest expense has become the largest unallowable cost. This research examines how contractors view interest expense. Additionally, the reactions of contractors if interest expense were to be allowed is discussed. Interest theory, financial structure, and the history of the government's policies on interest expense are reviewed. The research was conducted through the use of literature search and personal interviews. As a result of the research, it was concluded that interest expense should remain unallowable and the current policy had no direct deleterious impact.

Master of Science in Management
December 1987

Advisor: D.V. Lamm
Department of Administrative Sciences

MILITARY COMPENSATION ALTERNATIVES FOR RETENTION OF OFFICERS IN THE REPUBLIC OF KOREA ARMY

Chang Hwan Kim
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B.S., Korea Military Academy, 1978

This research examines the current compensation policies of the Republic of Korea Army with a view toward identifying and recommending the most appropriate compensation policies for recruitment and retention of high quality officers.

The Republic of Korea Army is sustained largely by the loyalty and patriotism of its members. However, several changes in the economic encironment have tended to make military service a less attractive career alternative for young men. Today, the ROK Army faces several problems that are relative to inefficient manpower management.

Two separate surveys were utilized in an attempt to determine the attitudes of ROK Army officers relative to compensation policies. The most significant finding of both surveys is that certain changes in the compensation policies could have a positive influence on the recruitment and retention of high quality officers. Specific policy changes that are suggested by the surveys are improvement of pay compensation, focusing on increasing initial pay of junior officers and a special allowance for typical military job conditions, and improvement of current promotion and retirement systems for enhancing job security.

Master of Science in Management
June 1988

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DATABASE APPROACH FOR RESOURCE MANAGEMENT AT ROK ARMY DIVISION LEVEL

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Major, Republic of Korea Army
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This thesis is designed to propose the need for database establishment at the Army division level to improve the efficiency and effectiveness of the defense resource management system (DRMS). Since the DRMS requires complex and multi-faceted activities which includes financial, material, and facility data, the application of accurate and timely data is a crucial component. A limitation of the current resource management system is that it does not effectively satisfy the user's information requirements. A relational database system can facilitate to solve these problems by the report generator capability or ad hoc queries in a simple SQL query operation. Considering the current situation of the ROK Army division equipped with the computer mainframe, the initiation of this study can provide the ROK Army authorities or the computer experts with a motivation to develop the database system as the primary means of reinforcing the DRMS.

Master of Science in Management
December 1987

Advisors: D.R. Dolk
S.S. Liao
Department of Administrative Sciences

EXCELLENCE IN PUBLIC WORKS CENTERS IN THE UNITED STATES NAVY

Mark Edward Kistner
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B.S., Purdue University, 1982

The purpose of this study was to identify the specific characteristics and qualities of the "Excellent" Public Works Centers (PWCs) in the United States Navy. The specific areas of interest were management style, staff, skills, strategy, structure, systems and the shared values of the excellent PWCs.

The study was conducted in two parts. The first part involved identifying, through interviews, what the perceptions of excellence were at the senior PWC command level (Naval Facilities Engineering Command/NAVFAC). NAVFAC provided input for four possible centers to study. The second part of the study involved analyzing the four PWCs identified. The analysis was performed via site visits to the four centers. The purpose of the site visits was to interview the key PWC organization personnel at each center.

This study is a summary of the indicators of excellence that were found at the PWCs studied.

Master of Science in Management
December 1987

Advisor: B.J. Roberts
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AN ANALYSIS OF THE OPERATIONAL LEVEL IN THE COMBINED INTERMEDIATE AND DEPOT LEVEL MAINTENANCE CONCEPT FOR AIRBORNE MISSILE SYSTEMS

Eugene Klimson
Lieutenant, United States Navy
B.S., California State University, Los Angeles, 1976

The purpose of this research effort is to determine what changes (if any) should be made to the organizational maintenance level for air-launched missiles if the Naval Air Systems Command adopts the omnibus maintenance concept. The omnibus maintenance concept would combine the intermediate and depot maintenance levels.

The conclusion drawn from this policy analysis is that no changes should be made to the organizational level. Any changes that might be considered for the organizational level would not fulfill the goal of increasing productivity for maintaining equipment and systems as specified in the Secretary of the Navy's Action '88.

Master of Science in Management
December 1987

Advisor: F.C. Horton
Department of Administrative Sciences

PRODUCTIVITY MEASUREMENT AND ANALYSIS OF AIRBORNE WEAPONS MAINTENANCE PLANS PERFORMED BY THE WEAPONS SUPPORT DIRECTORATE, PACIFIC MISSILE TEST CENTER, PT. MUGU

Jacqueline L. Knudson
Lieutenant, United States Navy
B.S., University of Washington, 1983

The President's Productivity Improvement Program for the Federal Government, Executive Order 12552 of February 25, 1986, places a requirement that DOD show a 20% increase in productivity over a five year period, ending in 1992. Productivity is difficult to measure, especially when trying to measure the productivity of a service. This thesis develops a measure of productivity for one specific service. The service measured is revising Airborne Weapons Maintenance Plans performed by the Weapons Support Directorate, Pacific Missile Test Center, Pt. Mugu, California.

Master of Science in Management
December 1987

Advisor: D.R. Whipple
Department of Administrative Sciences

MANAGING THE F-14 FLIGHT HOUR BUDGET IN AN ENVIRONMENT OF DECREASING FINANCIAL RESOURCES

Jeff C. Kuhnreich
Lieutenant Commander, United States Navy
B.A., Duke University, 1977

This thesis examines the Flight Hour Program of the Commander, Naval Air Forces Pacific Fleet (CNAP) in order to help develop alternate methods for tactical jet squadrons to prepare for the budgetary constraints imposed due to the passage of the Gramm-Rudman-Hollings Act. An overview of the program as it now functions is provided. Comments and perceptions of the future of the program gathered from interviews of individuals working with and under the program are also presented. The thesis examines methods of evaluating the program and discusses the program's effect on safety. Recommendations and suggestions for future study or examination are presented.

Master of Science in Management
September 1988

Advisor: K.J. Euske
Department of Administrative Sciences

PROCEDURES FOR AND ANALYSIS OF LOST AND DAMAGED CARGO WITHIN THE DEPARTMENT OF DEFENSE

Joseph T. Lapp
Lieutenant, United States Navy
B.A., Fairfield University, 1973

DOD moves a tremendous amount of cargo each year via commercial carriers - rail, water, truck, and air. In the process, a portion of the cargo is lost or damaged. This thesis examines the legal basis for transportation claims, and the DOD system used to report and account for transportation claims. The thesis contains a statistical analysis of the number and dollar value of DOD claims submitted by each service. The analysis consisted of an interservice comparison and a comparison with commercial carriers. The results showed there is a significant difference among the services in how lost and damaged cargo is managed. Additional research is required to fully explain these differences, especially in the area of ocean carrier transportation.

Master of Science in Management
December 1987

Advisor: D.C. Boger
Department of Administrative Sciences

THE AGGREGATION OF POPULATION GROUPS TO IMPROVE THE PREDICTABILITY OF MARINE CORPS OFFICER ATTRITION ESTIMATION

Randall W. Larsen
Captain, United States Marine Corps
B.S., Iowa State University, 1976

This thesis presents an algorithm for the aggregation of low inventory categories (small cells) which characterize the population of Marine Corps, unrestricted, active duty officers. The basis for aggregating these small cells is the degree of homogeneity of historical attrition rates. The techniques of hierarchical cluster analysis are applied to the small cell problem in lieu of existing functional and organizational structures.

This research demonstrates the adaptability of cluster analysis to loss rate aggregation and provides a shell for more refined model applications. Further, statistical stability and attrition rate homogeneity have been introduced to allow for subsequent application of shrinkage type parameter estimation methods associated with the development of an officer attrition rate generator.

Master of Science in Management
December 1987

Advisor: R.R. Read
Department of Operations Research

AN ANALYSIS OF THE UNITED STATES NAVAL RESERVE BUDGET GROWTH

Guy B. Leary
Lieutenant Commander, United States Navy Reserve
B.S., Clemson University, 1970

This thesis analyzes the Naval Reserve budget during the period FYs 1970-1987 and compares the Naval Reserve budget growth to the active Navy budget growth during the same period. By performing descriptive data analysis on the total budget authority of both the active and reserve Navy during the period under study, the data indicates that the Naval Reserve has received its fair share of the active Navy budget during the majority of the years of the study. The Naval Reserve's share of the active Navy budget is justified due to the tremendous growth of personnel and missions in the Naval Reserve during the period. The growth of the Naval Reserve budget appears to have been effected more by the defense buildup of the Reagan administration than by the formulation of the Total Force concept in 1970 for the Guard and Reserves. The yearly changes of the Naval Reserve budget are primarily incremental, which indicates the Naval Reserve is an agency with an established budgetary base.

Master of Science in Management
December 1987

Advisor: J.R. Duke
Department of Administrative Sciences

DUAL NAVY COUPLES: THEIR ASSIGNMENT AND RETENTION

Sara Ann Leeds
Lieutenant Commander, United States Navy
B.A., University of California, 1976

Naval officers and enlisted personnel, married to other Navy members were compared to naval members married to civilians. Data from the 1985 DoD Survey of Officer and Enlisted Personnel were used to compare dual Navy couples on the basis of several variables to measure the efficiency and fairness of the assignemnt process. In general, naval policy was found to be working well. There were two areas of concern: (1) enlisted Navy couples had less sea duty, and (2) Navy couples had fewer PCS moves. Both problems have potential morale implications. Further study is recommended and suggested changes to policy are made, the most important being the increased moves for Navy couples to promote fairness.

Master of Science in Management
June 1988

Advisor: M.J. Eitelberg
Department of Administrative Sciences

AN ANALYSIS OF THE EDUCATIONAL OBJECTIVES IN THE AREA OF INVENTORY MANAGEMENT FOR SUPPLY CORPS OFFICERS ATTENDING THE NAVAL POSTGRADUATE SCHOOL

Robert Louis Logue, Jr.
Lieutenant Commander, United States Navy
B.A., University of Tennessee, 1975

Bruce Preston Gearey
Lieutenant, United States Navy
B.S., United States Naval Academy, 1978

A Supply Corps officers' knowledge of inventory management principles serves as the keystone of his professional career development. This thesis is an analysis of the Naval Postgraduate School (NPS) course titled Inventory Management (MN3377) that is required to be taken by the majority of Supply Corps officers who attend NPS. The thesis traces the development of the text for the course, (Naval Supply Systems Command (NAVSUP) Publication 553, Inventory Management) and of the course itself. This thesis evaluates whether the text and course are presently meeting the needs of the Navy. Based on this evaluation, a recommendation is made to revise the emphasis and content of the course. A revised course outline and learning objectives are presented. Additionally, chapter 1 of NAVSUP Publication 553, entitled "Supply Systems Overview and Basic Inventory Management Concepts," was revised and expanded, and is included as a part of this thesis.

Master of Science in Management
June 1988

Advisors: A.W. McMasters
T.P. Moore
Department of Administrative Sciences

AN EXAMINATION OF THE ADMINISTRATION OF THE PROCUREMENT TECHNICAL ASSISTANCE COOPERATIVE AGREEMENT PROGRAM

Jeffrey Browning Matens
Lieutenant Commander, United States Navy
B.S., Louisiana State University, 1977

The Procurement Technical Assistance Cooperative Agreement Program is designed to provide Federal matching funds to state, local, and non-profit organizations established to provide technical procurement assistance to businesses desiring to contract with the Federal Government. This study examines the effectiveness of the Defense Contract Administration Service Regions' (DCASRs') administration of the PTA Program, and the state of the Program in general. Recommendations are offered for improvements in the Program's administration, as well as recommendations for improving the PTA Program overall.

Master of Science in Management
June 1988

Advisor: R. Smith
Department of Administrative Sciences

NAVY/MARINE CORPS MILITARY COMPENSATION 1967-1987: GROWTH OR DECLINE?

Jimmy Darrell McCord
Major, United States Marine Corps
B.B.A., Western Michigan University, 1970

There is, among military personnel and their dependents, a perception that benefits provided to them by the Government and their respective services have been victims of a steady erosion in value. The purpose of this thesis is to determine if the four major areas of benefits (retirement, housing, medical and commissary/exchange) have decreased, increased, or remained constant from base year 1967 to 1987. The conclusion reached in this thesis is that retirement and medical benefits have, in fact, seriously eroded over the past 20 years; commissary benefits have been slightly improved, exchange benefits have remained constant, and housing benefits have increased as to the number of government quarters available, but decreased in the quality of those quarters, and service members forced to live off base have suffered erosion in the purchasing power of the housing allowance.

Master of Science in Management
December 1987

Advisor: R.A. Weitzman
Department of Administrative Sciences

THE OUTPORTING SHIP PROGRAM IMPLEMENTED IN RESPONSE TO THE PROGRAM GROWTH OF THE READY RESERVE FORCE

Joan M. McFarland
Lieutenant, United States Navy
B.S., University of Kentucky, 1975

This thesis is a discussion of the actions the government has taken in response to the decline of the civilian merchant marine fleet. Early sealift capability, a vital component of the U.S. defense strategy has deteriorated. Progressively more expansive measures have been adapted in governmental efforts to build up a strong arsenal of assets capable of responding rapidly in the event of a contingency. This thesis looks at the components of the strategic sealift program, the National Defense Reserve Fleet, the Ready Reserve Force and, the newest measure, the ship Outporting Program. This program was implemented to alleviate congestion at the fleet anchorages, thereby reducing the ship activation and loadout times, ensuring rapid delivery of U.S. fighting force equipment overseas. This study culminates with the presentation of data that may be used to develop a model that will appraise the effectiveness of outporting a Ready Reserve Force ship.

Master of Science in Management
June 1988

Advisor: A.R. Andrus
Department of Operations Research

NON-DEVELOPMENTAL ITEMS (NDI) POLICY: THE EFFECT ON HM&E STANDARDIZATION

Richard Bruce McKenna
Lieutenant Commander, United States Navy
B.S., University of Rhode Island, 1976

This thesis describes the effects of the NDI policy on HM&E equipment procurement. It describes and examines the scope of the current non-standardization/APL proliferation problem in the HM&E area and the impact that NDI policy has had in this area. The thesis examines current standardization programs including the increased emphasis on using non-government standards (a form of NDI) to curb proliferation, cut acquisition costs, and reduce reliance on government generated standards. The results of the research indicated that HM&E procurement outcomes will not be eseentially affected by the new NDI policy. NDI has been an elemental consideration in past HM&E procurements and a significant factor in the current APL proliferation problem. The incorporation of more non-government standards to define equipment requirements, though highly desirable to cut development costs, is not always feasible. Current efforts to convert government standards to non-government may be overly optimistic due to the limited capabilities of the voluntary standards organizations.

Master of Science in Management
June 1988

Advisor: P.M. Carrick
Department of Administrative Sciences

NAVY CONSTRUCTION CONTRACT REGULATIONS VS. THE BOARD OF CONTRACT APPEALS

Thomas David McMurray
Lieutenant Commander, United States Navy
B.S., University of South Carolina, 1975

This thesis addresses construction contracting in the United States Navy. It compares the Government construction contract regulations with decisions by the Boards of Contract Appeals.

Nine topics are researched including submittal reviews, profit, change orders and changes, notice to proceed, acceleration beneficial occupancy, weather delays, and extended overhead.

The Boards' decisions are used to understand the topics and to identify weaknesses in the regulations. Recommendations are made to improve the Naval Facilities Engineering Command Contracting Manual (P-68).

Master of Science in Management
December 1987

Advisor: R. Evered
Department of Administrative Sciences

CONGRESSIONAL CONTROL OF NAVY BUDGET EXECUTION: ACQUISITION OF THE A-6F AIRCRAFT

Gary Wayne Miller
Lieutenant Commander, United States Navy
B.A., San Jose State University, 1972

This thesis explores Navy responses to Congressional control as illustrated by the acquisition of the A-6F aircraft. Congress exercises control through the procedures of authorization, appropriation and oversight activities.

Navy responds to control by program design, justification, financial manipulation and actions to influence Congressional deliberations. A policy implementation model extrapolated from the work of Bardach is developed for application to the A-6F acquisition.

Findings that relate to Congressional controls are the dissipation of energy in attempting to control budget implementation decisions and the opportunism and fragmentation in Congressional decision making. Findings that apply to Navy responses to control are the inclusion of technical and political elements in program construction, the combination of factors to terminate programs and the distortion in measuring program success.

Master of Science in Management
June 1988

Advisor: L.R. Jones
Department of Administrative Sciences

THE ENLISTED BILLET COST MODEL

Melody F. Mock
Lieutenant, United States Naval Reserve
B.A., University of Oregon, 1979

The purpose of this thesis is to present an enlisted manpower costing model for use in budget planning. The Enlisted Billet Cost Model is intended for use by program sponsors to both budget for personnel costs of each billet as well as to budget personnel costs for special programs. This model reflects the costs of individual enlisted personnel or groups of enlisted personnel based on areas of specialization and qualification. The Enlisted Billet Cost Model apportions costs, when possible, of enlisted personnel by pay grade and by area of specialty. Cost elements of the Military Personnel, Navy (MPN) account that cannot be assigned to individual groups of enlisted personnel are incorporated in a basic cost model. Cost elements of the MPN account that can be assigned by particular billet, special qualification, specific duty location, or critical specialty are incorporated into individual submodels.

Master of Science in
Management
June 1988

Advisors: K.J. Euske
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Sciences

AN ANALYSIS OF THE PROCUREMENT ADMINISTRATIVE LEAD TIME AT THE NAVAL REGIONAL CONTRACTING CENTER PHILADELPHIA

John E. Mooney
Lieutanant Commander, United States Navy
B.A., University of West Florida, 1977

The purpose of this thesis is to identify and discuss the components of large purchase Procurement Administrative Lead Time (PALT) at the Naval Regional Contracting Center (NRCC) Philadelphia and techniques which may be employed by NRCC personnel to reduce PALT given the current acquisition environment at the NRCC. Findings were that implementation of the initiatives in the Competition in Contracting Act (CICA) of 1984 and the Productive Unit Resourcing System (PURS) have resulted in increased PALT. The major conclusion is that NRCC Philadelphia is employing the correct techniques for control and management of PALT. Recommendations include initiation of a customer education and training program, early synopsis of appropriate requirements, revising the PURS unit weighting system, and development of a MIS to reduce PALT.

Master of Science in Management
December 1987

Advisor: R.W. Smith
Department of Administrative Sciences

THE IMPACT OF ONBOARD MAINTENANCE TRAINING ON SURFACE SHIP READINESS

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Lieutenant Commander, United States Navy
B.S., The Citadel, 1976

Analysis of shipboard equipment failure rates generated by merging Navy casuality report and Unified Industries Onboard Maintenance Training (OMT) data bases demonstrate a measurable positive effect on reliability in those ships which participated in the program. When comparing equipment failure rates of these trained ships before and up to three years after the training event, over 70 percent of the time there was definite net positive effect. This positive effect was not found to be statistically significant at normally recognized levels ($\alpha \leq .1$), but the effect is readily apparent. Eleven OMT courses, comprising 1176 shipboard training events over six years were examined. Equipment failure rates for trained units are compared before training with those for the three years following training. While the analytical results of this thesis present quantitative evidence of the positive effect of OMT on equipment readiness, this study also discusses the significant economic efficiency of the program as an alternative to contracted equipment repair.

Master of Science in Management
December 1987

Advisor: D.R. Whipple
Department of Administrative Sciences

COST ESTIMATING METHODS ASSOCIATED WITH A STATE-OF-THE-ART EXTENSION AT LOCKHEED MISSILE AND SPACE COMPANY, INC.

John I. Morris
Lieutenant, United States Navy
B.S., San Diego State University, 1978

The present Department of the Navy Budget process does not appear to include a completely satisfactory method by which to estimate the costs associated with programs requiring advancement of technology beyond the current state-of-the-art (SOA). Navy budget analysts could benefit from an understanding of how cost estimating is accomplished in the defense industry. With these insights, Navy estimating methods might be enhanced by allowing for the validation of the various estimating methods and inclusion within the Navy estimation process as appropriate. This research examines the methods used by a major defense contractor in estimating the development costs associated with a specific state-of-the-art extension project. The study, conducted through the use of personal interviews and examination of project cost data and information, determined that a combination of techniques was utilized within a formalized contractor-specific estimation process. These techniques included engineering estimates, reference to similar projects previously accomplished, and parametric modeling.

Master of Science in Management
December 1987

Advisor: W.R. Greer
Department of Administrative Sciences

TRADE OFFSETS IN FOREIGN MILITARY SALES-- THE F/A-18 PROGRAM: A CASE STUDY

Robert Leslie Moses
Lieutenant Commander, United States Navy
B.B.A., University of Mississippi, 1977

This case study is intended to provide an overview of trade offsets and how these arrangements affect the domestic F/A-18 Strike Fighter program. The study defines trade offsets and interprets the existing Department of Defense (DoD) policy concerning these arrangements. Using the F/A-18 as a case study the researcher considered the impact of these offsets in a management analysis manner relative to the Program Manager.

Master of Science in Management
December 1987

Advisor: R.W. Smith
Department of Administrative Sciences

DIAGNOSIS RELATED GROUPS FOR DOD: BACKGROUND OF A COMPETITIVE STRATEGY

Mark Roger Munson
Lieutenant, United States Navy
B.S., Consortium of California State Universities and Colleges, 1980

Public Law 99-661 requires that the Department of Defense (DOD) use Diagnosis Related Groups (DRG) for resource allocation. DRGs are an attempt to identify outputs of a hospital's inpatient care system that consume similar amounts of resources. These outputs are clinically significant in that they are composed of similar discharge diagnoses.

Rates of reimbursement for DRGs, are predicated on the isoresource consumption nature of DRGs. The Federal government has established DRGs as the basis of a prospective reimbursement rate structure. Several state administered programs have also adopted this reimbursement policy. By establishing an expected rate of reimbursement, the paying agency has effectively provided hospitals an incentive to control costs.

This study delves into the factors surrounding the development and use of DRGs. Considered are the political and legislative environment and its effects on the healthcare industry, the history and applications of case-mix management approaches and factors that will determine the success of transference of case-mix management to DOD.

Master of Science in Management
December 1987

Advisor: D.R. Whipple
Department of Administrative Sciences

FEMALE ENLISTMENT IN THE UNITED STATES ARMY RESERVE: MEMBERSHIP AND MOTIVATIONS

Spencer J. Murray
Captain, United States Army
B.S. Tennessee Technological University, 1977

This thesis examines socioeconomic profiles for the enlisted membership of the United States Army Reserve based upon personal and military background variables in an effort to identify market segments within the general population that provide potentially large sources of high quality, military manpower. Increased participation by females and older age accessions were examined as alternative means for expanding tha manpower supply both quantitatively and qualitatively. The USAR membership was stratified by census regions and personal background variables including gender, racial-ethnic groups, entry age, and prior service status to examine their net effect upon the demographic composition of the force.

Having analyzed the socioeconomic profiles of the membership, the motivations of accessions were examined upon entry into the reserve component to identify variables influencing their decision to enlist. Five categories of influencers were analyzed: economic rewards, military advertising, intrinsic rewards, information from Army recruiters and guidance counselors, and characteristics unique to the reserves.

The analyses of the data revealed significant differences in the educational attainment and aptitude test scores between men and women and among different entry age groups. In addition, the factors influencing men and women to enlist were noticeably

different: older enlistees were influenced more by economic incentives than were younger enlistees; and women were influenced more by self-development opportunities and the equality of treatment by gender than were male enlistees.

Master of Science in Management
December 1987

Advisor: G.W. Thomas
Department of Administrative Sciences

MANAGEMENT CONTROL OF FACILITY WARRANTIES IN NAVFAC CONSTRUCTION CONTRACTS

Thomas William Nielsen
Lieutenant Commander, United States Navy
B.S., Clarkson College of Technology, 1975

This thesis investigates Naval Facilities Engineering Command policies and procedures with respect to construction contract warranties and the extent to which Navy construction contract warranties are enforced in the field. Throughout contract development and administration NAVFAC warranty policy is found to be well stated and consistent with Federal policies. Procedures used to comply with NAVFAC contracting policy are well defined and they are followed by contracting field activities. However, uniform warranty management controls are not used by nor readily available to activities that must manage warranties after construction has been completed. There is a potential for high cost facility deficiencies under warranty to be corrected at Government expense. Recommendations to correct this situation are proposed and discussed.

Master of Science in Management
December 1987

Advisor: J.M. Fremgen
Department of Administrative Sciences

THE PRINCIPLES OF THE CONTRACTING DISCIPLINE: AN ANALYSIS

Stephen Courtney Ober
Lieutenant Commander, United States Navy
B.A., The College of the Holy Cross, 1977

This thesis analyzes five candidate contracting principles for their validity and utility to the contracting discipline. The effort is an important cornerstone to the establishment of contracting as a scientific discipline.

The paper begins with a brief review of the preceeding and complimentary efforts to date, and presents a general hierarchy of science within which future contracting principles would exist. The model adopted for this validation process is fully described and one of the candidate principles is rigorously validated by the researcher against that model. The research effort goes on to present the results of a survey conducted among a group of the contracting discipline's most respected professionals. Each was asked to conduct an independent validation of the candidate principle in terms of the model. Results of this survey are tabulated and analyzed. While no overwhelming consensus as to the candidate principle's validity was obtained, this effort was able to refine and redefine the candidate principles to the extent which they should be much more highly susceptible to validation. The writer concludes that principle validation is much closer to realization.

Master of Science in Management
June 1988

Advisor: D.V. Lamm
Department of Administrative Sciences

A REVIEW FOR A BETTER BREAKOUT CANDIDATE PREDICTOR THAN ANNUAL BUY VALUE

Stephen J. Olson
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B.A., University of Nebraska, Lincoln, 1978

The purpose of the Navy's breakout program is "to improve the acquisition status of replenishment spare parts through either, (1) identification of the actual manufacturer of an item, or (2) the competitive procurement of a part that was previously purchased noncompetitively." [Ref. 1:p. S6-103.6] The program, as established by the Department of Defense (DoD) in 1983, had the annual buy value (ABV) as its determinator of candidate items. Since 1983 considerable sophistication has evolved in the breakout determination process. In particular, three models have been developed by various services to replace the ABV approach. This thesis develops a similar model for Navy use. Since such models depend on technical data, the procuring of such data is also considered. The obvious conclusion is that technical data should be obtained during the initial provisioning process.

Master of Science in Management
December 1987

Advisor: A.W. McMasters
Department of Administrative Sciences

THE READY RESERVE FORCE: IS IT CAPABLE OF PERFORMING ITS MISSION?

Mary Margeret Orban
Lieutenant, United States Navy
B.S., Bowling Green State University, 1970

Everett John Parvin
Lieutenant, United States Navy
B.A., Chapman College, 1979

This thesis examines the Ready Reserve Force (RRF) from a personnel manning and supply and logistic support perspective. The history of the RRF and a discussion of its current status are included. Specifically examined is the decline in the number of merchant mariners and in the number of available billets for the mariners. Three merchant marine manning studies are evaluated and five alternatives for guaranteeing manning are discussed. In the area of supply and logistic support, the onboard shore and ship spare part inventories are evaluated for fulfillment of RRF requirements. Recommendations concerning manning include taking measures to increase the size of the U.S. flag fleet, manning Naval Auxiliary ships with merchant mariners, and establishing a civilian Merchant Marine Reserve program. Recommendations concerning supply and logistic support are made to expedite the receipt of needed supplies and ways of cutting costs.

Master of Science in Management
December 1987

Advisor: D.C. Boger
Department of Administrative Sciences

AN ANALYSIS OF ACQUISITION STRATEGIES FOR THE TURKISH ARMED FORCES

Erdal Ozturk
Lieutenant, Turkish Army
B.S., Turkish Army Academy, 1980

This research undertaken to perform analysis for alternative acquisition strategies for the Turkish Armed Forces. The main purposes were to determine advantages and disadvantages of each acquisition strategy and to find out the most promising acquisition strategy for the Turkish Armed Forces.

Four acquisition strategies were discussed in the thesis with the emphasis on life cycle support. While each acquisition strategy has its own advantages and disadvantages, coproduction is shown to be the most promising acquisition strategy for Turkey. However, it is further shown that the advantages and disaavantages of each acquisition strategy strongly depends on the conditions of bidder proposals and specialities of the system to be selected.

The thesis concluded by presenting recommendations and a rating matrix for evaluation of the alternative acquisition strategies.

Master of Science in Management
December 1987

Advisor: J.F. McClain
Department of Administrative Sciences

THE OFFICER BILLET COST METHOD

Cynthia A. Padgett
Lieutenant, United States Navy
B.A., Michigan State University, 1979

The purpose of this thesis is to present a military manpower costing model which is appropriation oriented to be used for budget planning purposes. The purpose of the model is to arrive at a more refined cost estimate for individual officers or groups of officers based on their area of specialization and qualifications. This model is intended for use by program sponsors in the planning and budgeting of billets for their programs and personnel for the billets. The Officer Billet Cost Model is constructed showing variation in officer costs by paygrade. Pay components of the Military Personnel, Navy (MPN) account that could not be assigned to individual groups of officers were incorporated in a basic cost model. Pay components of the MPN account that could be assigned by designator were incorporated into individual submodels.

Master of Science in
Management
March 1988

Advisors: K.J. Euske
D.G. Matthews
Department of
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Sciences

A RELATIONAL DATABASE MANAGEMENT SYSTEM FOR AN ROK ARMY INFANTRY DIVISION WITH PROBABILISTIC INVENTORY CONTROL MODEL

Taeyong Park
Major, Republic of Korea Army
B.S., Korea Military Academy, 1978

The purpose of this thesis is to provide an inventory database management system for an ROK Army infantry division.

Since 1973, the ROK Army has significantly improved its capability in logistics management by using computer systems. However, the operational level of command (the division) has some difficulties in meeting higher command requirements because of the unavailability of computer hardware and software. As of last year, the computer hardware was installed at the division level. User friendly software development has become another requirement for effective use of this computer hardware. To help meet this objective, this thesis provides a database management system for the manager who works at the diviision logistics section, and for the Quartermaster battalion which is the major unit to handle material within the division.

To meet the objective, the author of this thesis concentrated on writing user friendly interface programs within the current logistics management system.

By applying the proposed system, the Army can improve one of its logistics objectives, i.e., automatic data processing. This can contribute to the logistics management system implementation

by allowing the division to generate more accurate reports in less time, and to improve inventory management by shortening the administrative process.

Master of Science in Management
December 1987

Advisor: Y.K. Mortagy
Department of Administrative Sciences

REVIEW AND EVALUATION OF THE ACCOUNTING AND REPORTING PROCEDURES FOR BP-23 NAVY STOCK FUNDS AT NSC SAN DIEGO AND NSY LONG BEACH

Kevin L. Petersen
Lieutenant, United States Navy
B.S., University of Minnesota, 1979

This thesis discusses one sub-category of the Navy Stock Fund, Budget Project-23, which is used to finance the procurement of long lead-time material at Naval Shipyards. An investigation was made of the accounting practices at one location, NSY Long Beach, along with its supporting Authorization Accounting Activity, NSC San Diego. Three specific research questions are addressed; what factors cause an apparent difference in the obligations recorded at the Shipyard and those reported out of the Supply Center, what is causing the large balances in the Accounts Payable account, and what is causing the large balances in the Material-in-Transit account. The findings include an unexplained cause of Supply System billings not posted, problems with processing computer tapes, data entry errors, personnel not previously reconciling the Accounts Payable account and a lack of written guidance on the subject.

Master of Science in Management
June 1988

Advisor: J.M. Fremgen
Department of Administrative Sciences

CONTRACTING ISSUES ASSOCIATED WITH REDUCTION OF REPAIR TURNAROUND TIME WITHIN THE CONTRACT DEPOT MAINTENANCE (CDM) PROGRAM

Roger Ellsworth Petty
Lieutenant Commander, United States Navy
B.S., Miami University, 1977

This thesis examines the key contracting issues that have caused Repair Turnaround Time (RTAT) of Depot Level Repairables (DLR's) under the Contractor Depot Maintenance (CDM) program to be excessive. Many of the DLR's repaired by commercial depots under this program exceed the Naval Supply System Command's goal of 60 days for items managed by the Navy Ships Part Control Center (SPCC) and 45 days for items managed by the Aviation Supply Office (ASO). SPCC, ASO and four commercial depots were visited to gather RTAT data on DLR's and identify potential improvements in the CDM program that would reduce RTAT. An analysis of the policies and procedures used by SPCC and ASO in requirements determination as well as the effects of the repair workload forecast on the CDM process was also conducted. Recommendations are made to reduce RTAT through the contractual vehicle utilized and enhanced demand forecasting.

Master of Science in Management
December 1987

Advisors: R.W. Smith
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IMPLICATIONS OF THE BUDGETING PROCESS ON STATE-OF-THE-ART (SOA) EXTENSIONS

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Lieutenant, United States Navy
B.S., Saint John Fisher College, 1979

This thesis is a case study which compares the estimated and actual costs of a weapon system which experienced a state-of-the-art (SOA) extension. The subject of this case study is the primary electromagnetic warfare support measures system on 637 class submarines. The system is produced by GTE Government Systems Corporation. This study analyzes the corporation's budgeting process and two production contracts to determine whether either contributed to the costs associated with SOA advance. The budgeting process did not appear to have any significant effect and the variance analysis of the contracts indicated that cost estimating uncertainty increases in SOA advance situations, particularly in the development and initial production phases. It appears cost estimating accuracy improves as a program matures into production.

Master of Science in Management
December 1987

Advisor: W.R. Greer
Department of Administrative Sciences

LEADERSHIP AND MANAGEMENT EDUCATION AND TRAINING (LMET): ITS RELATIONSHIP TO SHIPBOARD EFFECTIVENESS AND READINESS

David P. Polley
Lieutenant Commander, United States Navy
B.S., Miami University, 1975

Teresa C. Cissell
Lieutenant, United States Navy
B.A., University of Alabama, Huntsville, 1978

A macro-level correlation analysis was conducted to discover whether the Leadership and Management Education and Training (LMET) of supervisory personnel on Navy ships is systematically related to measures of effectiveness (MOEs) such as exercise and inspection scores, Unit Status and Identity Report (UNITREP) combat readiness ratings, and personnel retention. The results showed few significant relationships between the majority of MOE and LMET variables. In fact, correlations which appeared significant were not present in both fleets. Many of the significant correlations were counterintuitive. Several suggestions for improved research in the area of LMET evaluation and fleet measures of effectiveness are offered.

Master of Science in Management
December 1987

Advisor: C.K. Eoyang
Department of Administrative Sciences

A FRAMEWORK FOR THE ANALYSIS OF THE RESERVE OFFICER AUGMENTATION PROCESS IN THE UNITED STATES MARINE CORPS

Curtis John Powell
Captain, United States Marine Corps
B.S., St. John Fisher College, 1980

This study examines the major components and issues involved in the Reserve officer augmentation process in the United States Marine Corps. A complete description of the legal background, quota determination process and selection method is presented. In addition, a framework for analysis of the augmentation process is outlined as a guide to future research. An analysis using the 1985/1986 Officer Exit Surveys, demographic data, and fitness report performance was done to study the differences between Regular and Reserve officers. This analysis attempts to assess the type of officer the Marine Corps is losing and how augmentaiton plays a role in this attrition. The results were inconclusive as to performance differences between the two groups, however, Reserve and Regular officers had marked differences in their reasons for leaving the Marine Corps. This study does not conclude whether or not augmentation is a problem, but rather provides a logical, objective research methodology in which to undertake analysis of the issue.

Master of Science in Management
December 1987

Advisor: D. E. Bonsper
Defense Advanced Research Management Education Center

MANAGING BACKLOG OF MAINTENANCE AND REPAIR (BMAR) IN THE MARINE CORPS

Lynn A. Price
Captain, United States Marine Corps
B.S., East Tennessee State University, 1977

This thesis assesses the ability of the Marine Corps to effectively manage backlog of maintenance and repair (BMAR) and predict future maintenance and repair requirements. The current Marine Corps real property maintenance program is evaluated along with the BMAR model used by Headquarters, Marine Corps. In addition, the methods and models used by the Department of the Navy, Department of the Air Force, and Department of the Army for predicting maintenance and repair requirements are examined. The thesis includes the results of a field questionnaire which focuses on the actual operations at Marine Corps activities. It also identifies the factors which cause BMAR to increase and alternatives to using BMAR as an indicator of real property conditions.

Master of Science in Management
December 1987

Advisor: J.M. Fremgen
Department of Administrative Sciences

DEFENSE TRANSPORTATION ISSUES: MSC - BREAKBULK SHIPPING; MAC - CIVIL RESERVE AIR FLEET (CRAF) PROGRAM; AND MTMC - DEFENSE FREIGHT RAILWAY INTERCHANGE FLEET (DFRIF)

B.J. Putnam
Lieutenant, United States Navy
B.S., Georgia State University, 1979

This thesis examines various Department of Defense (DOD) transportation issues relating to the Military Sealift Command (MSC), Military Airlift Command (MAC), and the Military Traffic Management Command (MTMC). Specifically, a history of the MSC, the demise of breakbulk shipping, and its impact on strategic sealift requirements are discussed; a history of the MAC, its reliance on the civil airline industry for augmentation of organic airlift resources (Civil Reserve Air Fleet (CRAF) program), and the status of the CRAF are reviewed; and a history of the MTMC, its rationale for owning rail assets, and the feasibility of a CRAF-type program for rail are examined. Additionally, a brief overview of the newly organized United States Transportation Command (USTRANSCOM) and its impact on the Transportation Operating Agencies (TOAs) (MSC, MAC, and MTMC) is provided.

Master of Science in Management
December 1987

Advisor: D.C. Boger
Department of Administrative Sciences

A MODEL ETHICS PROGRAM FRAMEWORK FOR THE NAVY FIELD CONTRACTING SYSTEM WORK FORCE

Mary E.B. Quatroche
Lieutenant, United States Navy
B.S., United States Naval Academy, 1981

The issue of ethics in government contracting is currently of great concern to the American public. The norms for ethical behavior for Navy contracting personnel are established in statute and regulation and prescribed by DoD instruction 5500.7, "Standards of Conduct." The research and data analysis in this paper examines the characteristics of programs which can effectively implement these ethics requirements. A model ethics program framework is then developed to assist managers of Navy Field Contracting Systems activities in the effective development and implementation of Standards of Conduct programs.

Master of Science in Management
December 1987

Advisor: J.F. McClain
Department of Administrative Sciences

AN ANALYSIS OF THE STRUCTURAL ORGANIZATION OF THE VENEZUELAN NAVAL AVIATION

Omar de la Cruz Quintero Torres
Captain, Venezuelan Navy
B.S., Venezuelan Naval Academy, 1969

The Venezuelan Naval Aviation Organization created in 1962 has experienced a continual evolution in accordance with changes in the environment surrounding it. From a tiny Aviation Office, it has evolved into an Operational Command within the Venezuelan Navy. However, during the last 7 years the Naval Aviation Command has experimented with several structural reorganizations in an attempt to find a suitable structure for its organizational requirements. This thesis assesses the purpose, environment, and formal organization of the Venezuelan Naval Aviation Organization to identify the structural deficiencies that could be improved upon. After analyzing three possible structures, the one considered the best fit for current organizational requirements was recommended as a possible solution to the structural deficiencies encountered.

Master of Science in Management
December 1987

Advisor: N. Roberts
Department of Administrative Sciences

COMPETITIVE PROCUREMENT OF ELECTRIC POWER

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Lieutenant Commander, United States Navy
B.S., New Mexico State University, 1980

This thesis set out to determine if it was possible or required for the Department of Defense to competitvely procure electrical utility services (power). The research was conducted by archival research of legal rulings, industry and governmental publications, federal regulations, federal statutes, and federal policies. This was followed with field research and interviews with key individuals involved in utility management and utility procurement. It was determined that competitive procurement of electrical utility services is not only possible, it is required. The thesis presents an overview of the electric utility industry, a review of competitive procurement guidance and policies, and an analysis of several considerations and strategies for competive procurement, and it provides conclusions and recommendations for actions and further study.

Master of Science in
Management
December 1987

Advisors: R.W. Smith
J.G. San Miguel
Department of
Administrative
Sciences

EFFECTS OF CHANGES IN CONGRESSIONAL COMMITTEE/ SUBCOMMITTEE STRUCTURE ON FEDERAL EXPENDITURES

Paul R. Recker
Lieutenant Commander, United States Navy
B.A., Calvin College, Grand Rapids, Michigan, 1972

This thesis examines the role of the legislative structure in explaining the growth of federal government spending. The legislative structure of Congress is defined in terms of the size, number, and partisanship of congressional committees and subcommittees. An economic model is used to correlate and assess archival data from the years 1961 through 1984. Archival data is broken down by functional expenditure area (dependent variable), by committees and subcommittees which addressed specific functional areas, by the numbers of senators or representatives sitting on the respective committees and subcommittees, and by the averaged Democratic proportion of the membership on the committees and subcommittees in the corresponding functional area. The model estimates the effect of structural and other, non-structural, variables (e.g. percentage change in unemployment and real national income) on the percentage change in functional expenditures over time. This thesis concludes that legislative structure plays a statistically insignificant role in explaining the growth of federal spending.

Master of Science in Management
December 1987

Advisors: D.R. Henderson
S.L. Mehay
Department of Administrative Sciences

THE ARMY'S OUTPUT ORIENTED RESOURCE MANAGEMENT SYSTEM (OORMS): THE IMPACT ON MANPOWER MANAGEMENT

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Civilian, United States Army Test & Evaluation Command
B.A., Western Maryland College

This thesis analyzes the Army's Output Oriented Resource Management System (OORMS) to evaluate its effect on manpower management. OORMS was developed in response to a need for a systematic feedback loop in the Army's Planning, Programming, Budgeting, and Execution System (PPBES) process. The system is designed to provide feedback on execution in terms of outputs achieved for inputs assigned in the PPBES. This research focuses on the impact of OORMS on manpower management in terms of the quality and usefulness of the information provided and the workload required to support the system. The study supports the conclusion that OORMS, as currently developed, does not support manpower management. Recommended actions to improve the usefulness of OORMS are provided.

Master of Science in Management
December 1987

Advisor: D.R. Whipple
Department of Administrative Sciences

DEFENSE CONTRACTOR'S COST ESTIMATING METHODS FOR STATE-OF-THE-ART EXTENSIONS

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

The Navy's various weapons project officers routinely decide whether to use existing weapons technology or to extend into as yet undeveloped technology. For state-of-the-art (SOA) extensions, initial estimates of development cost frequently are inaccurate. This study first examines the background of methods utilized for SOA extension measurement. This study also reviews the cost estimating methods used by Litton Applied Technology, Inc. to estimate the development costs of the AN/ALR-67 Radar Warning Receiver, a specific SOA extension project. The principal findings are that regression analysis and geometric surface analysis are used to quantify SOA extensions, but only in theoretical applications. Litton Applied Technology uses the bottoms-up approach to estimate development costs. The future trends in defense cost estimating are also forecasted.

Master of Science in Management
December 1987

Advisor: W.R. Greer
Department of Administrative Sciences

AN EVALUATION AND ANALYSIS OF THE UNITED STATES NAVY'S SUPPLY SUPPORT FOR AIR-LAUNCHED MISSILES AND SUPPLY SUPPORT ALTERNATIVE FOR THE NAVAL AIR SYSTEM'S COMMAND OMNIBUS PROGRAM

John Gregory Ripperton
Lieutenant Commander, United States Navy
B.A., University of Redlands, 1975

This thesis provides an assessment of the existing supply support system for intermediate and depot air-launched missile maintenance. Through examination of the supply support structure, the research effort is directed at determining the quality of supply support being provided to air-launched missile maintenance facilities. The thesis provides conclusions on the performance of the existing supply support system and provides recommendations for improvements in the system. In addition, this thesis develops possible alternatives for supply support of the Naval Air Systems Command's proposed Omnibus project which proposes the combining of intermediate and depot levels of maintenance for air-launched missiles. Applicable measures of effectiveness which may be used in analyzing the various alternatives are also identified and discussed. Recommendations are made concerning which measures of effectiveness the Naval Air Systems Command should use in selecting an alternative for the Omnibus concept.

Master of Science in Management
December 1987

Advisor: T.P. Moore
Department of Administrative Sciences

UNITED STATES NAVAL HOSPITAL SHIP PROGRAM: HISTORY, EVOLUTION, AND CONFIGURATION MANAGEMENT

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Lieutenant, United States Navy
A.A., Atlantic Community College, 1977
B.S., Jacksonville University, 1979
M.B.A., Augusta College, School of Business, 1981

This thesis presents an analysis of past and present American and International hospital ships with the goal of categorizing Technical, Political and Cultural (TPC) influences. The theoretical framework for such an effort is the TPC Theory advocated by Noel M. Tichy. Configuration Management (CM) is offered to the reader as a unique managerial and integrative mechanism for controlling, coordinating and implementing TPC influences in a Department of Defense system such as the 1980's hospital ship project. The author concludes that a successful merging of TPC Theory and Configuration Management is a possible and desired result. Recommendations include utilizing the TPC/CM ideas in future Naval Medical Command systems and specific recommendations for managing TPC influences in future hospital ship projects.

Master of Science in Management
December 1987

Advisor: D.R. Whipple
Department of Administrative Sciences

A DICTIONARY OF ACQUISITION AND CONTRACTING TERMS

Daniel Frederick Ryan
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1977

This thesis presents a procedure fo establishing a basis for defining words and terms used in the field of contracting. It offers a sample of published definitions presently used in government contracting. A synthesis of different published definitions was produced and the results sent to recognized professionals in the contracting discipline for their opinion. Their feedback was used to arrive at an acceptable definition of the words and terms offered. Follow-on work needs to be done to define other words and terms in the contracting field using the procedure established by this effort. Appendix E of the thesis presents the 28 contracting terms for which consensual definitions were established.

Master of Science in Management
September 1988

Advisor: D.V. Lamm
Department of Administrative Sciences

ARMS PRODUCTION IN VENEZUELA

Alonso Sader Castellanos
Commander, Venezuelan Navy
Venezuelan Naval Academy, 1971

This thesis examines the Venezuelan military expenditures pattern, the arms production experiences in Latin America and its possible causes, and the Venezuelan economic, military and production capabilities.

The suggestion is made that Venezuela should expand its arms industries development programs in order to reduce imports, contribute to the economic growth, and increase its political and economic independence.

Master of Science in
Management
December 1987

Advisor: R.E. Looney
Department of
National Security
Affairs

AN ANALYSIS OF THE REASONS WHY NONFERROUS FOUNDRY SUBCONTRACTORS REFUSE TO PARTICIPATE IN DOD BUSINESS

Jon Arthur Schauber
Lieutenant, United States Navy
B.A., University of Rochester, 1979

This study attempted to identify the extent to which nonferrous foundry subcontractors have taken the position of refusing to participate in Department of Defense business and the principal reasons for this refusal. A survey questionnaire was sent to 1,326 domestic nonferrous foundries to obtain data on their attitudes concerning participation in DOD business. An analysis of subcontractor responses indicates that approximately 20% of the surveyed firms refuse, or intend to refuse, to participate in DOD business. The principal reasons for this refusal include inflexible Government procurement methods/policies, burdensome paperwork requirements and more attractive commercial s les to non-DOD prime contractors. The study analyzes each of these reasons as well as 20 additional problem areas. The differences between foundry subcontractors that intend to get out of DOD business and those subcontractors who are already out and intend to stay out are examined.

Master of Science in Management
June 1988

Advisor: D.V. Lamm
Department of Administrative Sciences

AN EXAMINATION OF THE MANPOWER AND BILLET CHARACTERISTICS OF THE ACQUISITION/ CONTRACT MANAGEMENT COMMUNITY OF THE U.S. NAVY SUPPLY CORPS

Todd Richard Schonenberg
Lieutenant Commander, United States Navy
B.A., Gettysburg College, 1973

This thesis examines the manpower and billet characteristics of the Acquisition/Contract Management community in the U.S. Navy Supply Corps. Emphasis is placed on the subset of officers holding Masters Degrees and those billets requiring a Master's Degree. Low manning in year groups prior to 1972, and the large number of accessions in year group 1977 are major factors in projecting future manpower profiles. Billet characteristics require careful career planning by officers to enhance opportunities for promotion.

Master of Science in Management
June 1988

Advisor: R.W. Smith
Department of Administrative Sciences

A "FAIR SHARE" ANALYSIS OF THE U.S. COAST GUARD BUDGET

John C. Simpson
Lieutenant Commander, United States Coast Guard
B.S., United States Coast Guard Academy, 1975

This thesis is an analysis of the U.S. Coast Guard budget to determine if the Coast Guard receives its "Fair Share: of the Federal Budget. The Coast Guard's share of the budget is compared to the budgets for the Department of Transportation, the Department of Defense, and the flexible portion of the Federal Budget. The fiscal years 1976-1986 comprise the time frame for the study.

The incremental differences in the annual budgets are converted to percentage terms for comparison. The budgets are analyzed in annual fiscal year dollars and converted to constant FY-82 dollars for further analysis and comparison. Both Budget Authority and Budget Outlays are considered.

Statistical and subjective analysis of the data concludes that the Coast Guard does receive its "Fair Share" of the budget over time.

Master of Science in Management
December 1987

Advisor: J.L. McCaffery
Department of Administrative Sciences

A FINANCIAL MANAGEMENT REVIEW OF THE NAVAL RESERVE MANPOWER ALLOWANCE AND TRAINING REQUIREMENTS

Terry L. Simpson
Commander, United States Naval Reserve
B.S., Wichita State University, 1971

Brenda D. Ingle
Lieutenant, United States Naval Reserve
B.A., National University, 1983

The purpose of this thesis is to describe the budget formulation and allocation process for the Naval Surface Reserve manpower and training program. The thesis describes how manpower and training requirements are used by the Department of Defense Planning, Programming and Budgeting System (PPBS), and the Navy's Program Objective Memoranda (POM) in development of budget estimates. The existing system, key players, major roles, chronology of events and organizational inter-relationships are described as they currently function.

Master of Science in Management
December 1987

Advisor: D.G. Matthews
Department of Administrative Sciences

FINANCIAL PLANNING FOR THE NAVAL OFFICER

Alvin R. Smith
Lieutenant, United States Navy
B.S., United States Naval Academy, 1979

This study was undertaken to assist the interested Naval Officer understand and navigate through the maze of personal finance. Specifically, it examines how Naval Officers can plan, save and budget their limited financial resources. The ultimate goal of this study is to encourage the Naval Officer to take control of his/her finances through the steps provided herein. It is believed that the Naval Officer who masters his/her own finanical situation is better prepared to counsel his/her subordinates concerning finances. Further, they will be better prepared financially to deal with anxieties unique to the Naval Service.

Master of Science in Management
June 1988

Advisor: L. Darbyshire
Department of Administrative Sciences

THE IMPACT OF OMB CIRCULAR A-76 ON THE COST, OPERATIONAL READINESS AND MAINTENANCE OF SPECIAL MISSION SHIPS IN THE MSC NUCLEUS FLEET

Denise M.B. Smith
Lieutenant, United States Navy
B.A., Queens College of the City University of New York, 1978

This thesis examines the effects of the procedures mandated by Office of Management and Budget (OMB) Circular A-76 on the cost, operation, and maintenance of MSC Nucleus Fleet, Special Mission ships. It attempts to answer certain questions about the policy that governs commercial activities including performance work statement control for service functions needed by the government. The findings suggest that cost savings were realized as a result of large scale manning reduction, and that MSC is making significant progress towards full implementation of A-76 procedures.

Master of Science in Management
June 1988

Advisor: D.C. Boger
Department of Administrative Sciences

LOGISTIC SUPPORT FOR THE NAVY ONE-MAN ONE ATMOSPHERE DIVING SYSTEM (NOMOADS)

Michael Powell Smith
Lieutenant, United States Navy
B.A., B.S., Plymouth State College, 1979

This thesis examines the logistic support requirements of the Navy One-Man One-Atmosphere Diving System (NOMOADS). The introductory chapter provides a system description as well as the objectives and methods of the study. Next, a background chapter describes the acquisition and contracting aspects of NOMOADS. The main concern of the thesis is brought forth in the logistic chapter, which considers the concepts of reliability, maintainability, availability, spare parts requirements, and life cycle cost. The final chapter provides conclusions and recommendations. A Draft Integrated Logistics Support Plan (ILSP) is presented in Appendix A.

Master of Science in Management
December 1987

Advisors: T.P. Moore
R.W. Smith
Department of Administrative Sciences

EXCELLENCE IN FLEET COMBAT REPLACEMENT SQUADRONS: PREDICTING CARRIER QUALIFICATION SUCCESSES

Martin P. Smith
Lieutenant, United States Navy
B.S., Miami University, 1975

This thesis presents a two-part analysis of excellence criteria for fleet combat replacement squadrons. Part one focuses on the qualitative issues and management techniques identified in outstanding fleet combat replacement squadrons.

Part two develops and presents a regression model for predicting a fleet replacement squadron pilot's carrier qualification grade. The model was derived using standard linear regression techniques and the SPSSx software package of the Naval Postgraduate School. CNO (OP-59) sponsored the quantitative portion of the analysis. Approximately 1,300 student aviator training records from fiscal 1986 through 1987 were surveyed to generate the data base for the study. Eleven independent variables were used to predict expected student carrier qualification scores. Two additional models for predicting fleet combat replacement carrier qualification grades and advanced jet training command carrier qualification grades are presented. Functions of the model for a directed detailing capacity were given and additional research topics were recommended.

Master of Science in Management
March 1988

Advisors: M.J. Eitelberg
H. Smith
Department of Administrative Sciences

EVALUATION OF INVENTORY MANAGEMENT POLICIES AT NAVAL SHIPYARDS

Rory L. Souther
Lieutenant, United States Navy
B.S., Miami University, 1979

Although the overall shipyard workload has decreased, material inventories at naval shipyards have grown significantly in recent years. Inventories at the eight naval shipyards increased 63 percent (adjusted for inflation) between 1979 and 1983, and 24 percent between 1984 and 1987. Little action has been taken to reverse this trend although the problem has been the subject of numerous studies since 1978.

This thesis examines existing inventory management policies at naval shipyards. An evaluation of the efficiency of existing policies for obtaining and excessing materials was emphasized, and recommendations for improvement were provided. Results indicate that changes can be implemented that would decrease the quantity of material ordered and excessed without creating overhaul and repair delays. Such action would reduce the overall investment in shipyard inventories.

Master of Science in Management
June 1988

Advisor: J.G. San Miguel
Department of Administrative Sciences

POST-SERVICE EARNINGS OF VIETNAM-ERA VETERANS

Erdinc Soyak
Lieutenant, Turkish Army
B.S., Turkish Army Academy, 1979

This thesis analyzes the effect of military service and military training on post service earnings using the National Longitudinal Survey of young men (14 to 24 years of age in 1966). When data were dissaggregated by race and veteran status, some differences appeared between the earnings of veterans and non-veterans. A Chow test indicated that the data could not be pooled for blacks and non-blacks. An analysis of earnings revealed that the effect of veteran status on post-service earnings is inconclusive. Further analysis of wage equations and annual income equations of veterans showed that veteran status does not have significant returns from either military training or time spent in the service.

Master of Science in Management
December 1987

Advisor: S.L. Mehay
Department of Administrative Science

THE IMPLEMENTATION AND EXECUTION OF AN INTERNAL CONTROL PROGRAM IN A NAVAL SHIPYARD

John M. Stanovich
Lieutenant Commander, United States Navy
B.S., University of Southern Mississippi, 1976

This thesis reviews the evolution of an internal control program from the Federal Manager's Financial Integrity Act through implementation by local line managers. Using interviews and a case study analysis of one shipyard's internal control program, a current picture of how the program is working provides evidence that the use of internal controls can make a difference when promoted throughout the entire chain of command. This thesis also reviews the elements of internal control and its history in the government and in the Navy.

Master of Science in Management
June 1988

Advisor: J.M. Fremgen
Department of Administrative Sciences

THE EFFECTS OF THE GOLDWATER-NICHOLS DEPARTMENT OF DEFENSE REORGANIZATION ACT ON SURFACE WARFARE OFFICER CAREER PATHS

Thomas F. Steward
Lieutenant Commander, United States Navy
B.S., Southern Methodist University, 1972

This thesis reviews the joint officer management policies mandated by the Goldwater Nichols Department of Defense Reorganization Act and analyzes their effect on Surface Warfare Officer (SWO) career paths. The focus of this thesis is the balance between joint education and experience on the one hand, and service specific education and experience on the other hand. The analysis is conducted using the SWOPATH model of SWO career paths developed in an earlier Naval Postgraduate School thesis. The results show grade creep in the Commander command billets of SWO career paths resulting from a shift in emphasis toward joint experience.

Master of Science in Management
December 1987

Advisor: P.R. Milch
Department of Administrative Sciences

MARKET RESEARCH FOR EFFECTIVE COMPETITION IN THE FEDERAL PROCUREMENT PROCESS

Richard Leon Stewart
Lieutenant Commander, United States Navy
B.A., West Virginia State College, 1974

The Competition in Contracting Act of 1984 (CICA) created a new requirement for the Federal procurement process. This requirement is to conduct market research in planning for procurements of goods and services. The nature of this requirement is not clear. The prevalent views of the requirment can be classified as the 'narrow view' and the 'broad view'. The 'narrow view' holds that the purpose of market research is merely to identify potential sources of supply. The 'broad view' is that the requirement involves understanding the marketplace and conducting the methodical research that is oftentimes necessary to develop that understanding. This thesis argues that the broad view is the more appropriate for the Federal procurement process. A definition of market research is offered as well as the five principal elements of an effective program and four possible approaches to organizing to conduct market research. A model is developed to guide the manager of in the execution of a market research program. An organizational approach for market research at a Navy Inventory Control Point is recommended.

Master of Science in Management
December 1987

Advisor: R.D Evered
Department of Administrative Sciences

FLAGS OF CONVENIENCE AND THEIR EFFECT ON NATO MERCHANT MARINE MANNING

Dorothy Lou Tate
Lieutenant, United States Navy
B.A., Old Dominion University, 1978

This paper is a study of Flags of Convenience and how their use has affected the number of British and Norwegian merchant mariners available for crewing NATO ships. A trend and regression analysis is presented to describe the relationship between the decline in ship registration and the decline in merchant marine officers in the United Kingdom and Norway.

Master of Science in Management
December 1987

Advisor: R.A. Weitzman
Department of Administrative Sciences

A STUDY OF COMPUTER CENTER MANAGEMENT

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B.S., Chung Cheng Institute of Technology, 1976

The computer field is changing rapidly and technical innovations are being introduced. Managerial techniques are proposed to deal with the technology changes. However, these techniques are developed in the United States and the rest of the western world and do not take into consideration the various economic and culture factors in developing countries. This thesis seeks to present a number of new techniques in managing computer centers with some modifications so that they can be successfully implemented in developing countries.

Master of Science in Management
June 1988

Advisor: Y.B. Mortagy
Department of Administrative Sciences

A PRELIMINARY STUDY OF AN OMNIBUS MAINTENANCE CONCEPT FOR AIR LAUNCHED MISSILES

Arthur Robert Terrell
Lieutenant Commander, United States Navy
B.S., San Jose State University, 1976

Kevin Bruce Call
Lieutenant, United States Navy
B.S., James Madison University, 1978

By the year 2000, the U.S. Navy's inventory of air launched missiles is expected to triple. With the current impetus to reduce Department of Defense spending, NAVAIR (Code 418) has focused attention upon the logistics requirements for air launched missiles and is currently seeking a more efficient, cost-cutting maintenance strategy. Presently in the conceptual stage, a Request for Information (RFI) has been drafted by NAVAIR to be distributed to interested contractors in an effort to determine the feasibility of an omnibus maintenance site. This thesis explores those issues relevant to the RFI and attempts to provide a non-biased structure from which the responses to the RFI may be evaluated.

Master of Science in Management
December 1987

Advisor: A.W. McMasters
Department of Administrative Sciences

CONTRACTING: A SYSTEMATIC BODY OF KNOWLEDGE

Connie L. Thornton
Lieutenant Commander, United States Navy
B.A., Chadron State College, 1976

This thesis attempts to develop a systematic body of knowledge for the acquisition contracting discipline. A general definition as well as five critical attributes considered necessary for the formulation of a body of knowledge are identified and discussed. These are then applied to the contracting discipline in order to compile a body of knowledge for this specific field.

The thesis effort concludes that the contracting discipline possesses rudimentary elements of the requisite attributes to support a specific body of knowledge. The present acquisition contracting body of knowledge however, is not well organized and is deficient in many respects. Recommendations and areas for further research complete the research effort.

Master of Science in Management
December 1987

Advisor: D.V. Lamm
Department of Administrative Sciences

AN EXAMINATION OF FORWARD PRICING RATE AGREEMENTS (FPRA'S) AT DCASPRO'S AND NAVPRO'S

James S. Town
Lieutenant Commander, United States Navy
B.S., University of Florida, 1976

The purpose of this thesis is to determine the extent to which Forward Pricing Rate Agreements (FPRA's) have been established at Defense Contract Administration Services Plant Representative Offices (DCASPRO's) and Naval Plant Representative Offices (NAVPRO's). The research is also intended to identify the reasons why FPRA's are not established and determine what actions can be taken to increase the number of this type of agreement. The major conclusion is that Forward Pricing Rate Agreements covering the main categories of labor and overhead rates have not been established to the maximum extent possible at DCASPRO's and NAVPRO's. The primary recommendation is to eliminate the requirement to use the Joint Logistics Commanders' (JLC) uniform rates of change when determining forward pricing rates for executive compensation, salaries, wages and employee benefits.

Master of Science in Management
June 1988

Advisor: R.W. Smith
Department of Administrative Sciences

THE GRADUATE RECORD EXAMINATION (GRE) AS A PREDICTOR OF SUCCESS AT THE NAVAL POSTGRADUATE SCHOOL

Barbara T. Transki
Lieutenant Commander, United States Navy
B.A., University of Oklahoma, 1977

The Naval Postgraduate School is conducting a three-year study to determine whether or not to use the Graduate Record Examination as a selection tool/admissions standard. Students are currently selected based on their professional military performance and their undergraduate grades, math and science exposure. This thesis examines a sample of 198 students who took the Graduate Record Examination after arrival at the school and who have completed six quarters of study. The results indicate that the Graduate Record Examination is a much stronger predictor than the currently used undergraduate measures (Academic Profile Code). When the Graduate Record Examination scores are combined with undergraduate grade point average and the officer's age, an excellent predictor is developed. The thesis contains, in addition to descriptive information and regression results, a prediction equation which may be used by Navy selection committees in determining whether or not an officer will succeed at the Naval Postgraduate School.

Master of Science in Management
June 1988

Advisor: R.D. Evered
Department of Administrative Sciences

THE PACKARD COMMISSION, A FINANCIAL CRITIQUE

Patrick Tryon
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1977

This thesis evaluates the Packard Commission recommendation to use commercial integrated circuits in military application from an economic perspective. The research indicates that while the procurement cost of Qualified Products List (QPL) devices is higher than commercially procured devices, the reliability of QPL devices is significantly better vis-a-vis the commercial integrated circuit. The primary contributing factor in the high procurement cost appears to be a result of having to manufacture QPL integrated circuits in the continental United States, not because of excessive documentation as claimed by the semiconductor industry in general. Furthermore, utilization of the QPL process does not have a negative impact on the availability of integrated circuits. Rather, the availability of such circuits is increased.

Master of Science in Management
December 1987

Advisor: P.M. Carrick
Department of Administrative Sciences

AN ASSESSMENT OF PURCHASING PRODUCTIVITY MEASUREMENT SYSTEMS

Curtis Heigh Tucker
Lieutenant Commander, United States Navy
B.A., Wake Forest University, 1971

Productivity has become one of the most important and misunderstood concepts of the 1970s and 1980s. There is a need for concise definitions and terminology regarding the subject. This study addresses the area of purchasing productivity measurement. The study surveyed private industry and Navy Field Contracting Activities in order to document what systems are currently used to measure purchasing productivity and to attempt to find optimal measurement factors for improvements to existing models. The research also discusses the impact that automation has had on purchasing productivity. This research was conducted through the use of a survey, a literature search and by interviews with Navy Field Contracting and private industry officials.

Master of Science in Management
June 1988

Advisor: R.W. Smith
Department of Administrative Sciences

SUBSTITUTION, PERMANENT CHANGE OF STATION AND TRAINING COST COMPARISON IN MARINE CORPS OFFICER ASSIGNMENTS: A PROTOTYPE STUDY

Ahmet Turkmen
Lieutenant JG, Turkish Navy
B.S., Turkish Naval Academy, 1982

This is a cost analysis study that attempts to show how comparisons may be made among Permanent Change of Station (PCS) cost, training cost and substitution cost. A cost formulation method is introduced in this study that helps to make comparisons among these three costs. The comparison is carried out for a segment of the Marine Corps that includes only Armor and Artillery officers and billets coded for them.

Master of Science in Management
December 1987

Advisor: P.R. Milch
Department of Administrative Sciences

GOVERNMENT ORIENTED AND COMMERCIALLY ORIENTED BUSINESS SEGMENTS OF CORPORATIONS: DATA AND ANALYSIS

Susan Valerie Viscovich
Lieutenant, United States Navy
B.A., University of Delaware, 1978

This thesis investigates the relationship between Department of Defense oriented corporations and commercially oriented corporations, along with the government and commercially oriented business segments of these same corporations. The data elements of backlog, net sales, operating profits, and identifiable assets are examined, and the methodology for deriving these data elements from the SEC 10K reports in their total and segmented forms is explained. The analyses of variance on the unsegmented data elements determined no difference between corporation groups, however analyses of segmented data elements resulted in significant variations. Segmented data appears to be necessary to explain the variations due to either type of corporation for time period.

Master of Science in Management
December 1987

Advisor: D.C. Boger
Department of Administrative Sciences

FINANCIAL STRENGTH AS A PREDICTOR OF PRICING STRATEGY

Paul Bruce Webb
Lieutenant, United States Navy
B.A., Ottawa University, 1978

The purpose of this research is to determine if the pricing strategy used by defense aerospace contractors can be explained using information readily available from the financial statements of the corporation and from compilations of industry financial data. The sample includes seventeen defense contractors within the aerospace industry and fifty-two aircraft and missile programs. Twenty-one financial ratios were developed from corporate financial data and compared with the industry average for the same ratio. The resulting values were correlated with the slope of the price reduction curve for the programs. A seven variable linear regression model was developed which is significant in explaining pricing strategy.

Master of Science in Management
December 1987

Advisor: O.D. Moses
Department of Administrative Sciences

SUITABILITY OF FIXED PRICE AWARD FEE CONTRACTS FOR THE NAVY COMMERCIAL ACTIVITIES PROGRAM

Christopher William Webster
Lieutenant, United States Navy
B.A., St. Leo College, 1975
M.B.A., Troy State University, 1977

Office of Management and Budget (OMB) Circular A-76 established Federal policy concerning the performance of commercial activities (CA). The Circular establishes criteria for conducting cost comparison to determine whether a CA is more economically performed by the Government or by the private sector. Performance by the privae sector is accomplished through the formation of contracts. The research of this study focused on the suitability of fixed price award fee (FPAF) contracts for private sector performance of commercial activities. Research included a review of existing guidelines, interviews with managers and policy makers, and examination of four specific cases where FPAF contracts were employed on an experimental basis to determine their benefits and detriments. The study concludes that FPAF contracts may be suitable, but that more fundamental changes in the commercial activities program are necessary and should precede wide use of FPAF contracts.

Master of Science in Management
June 1988

Advisor: P.M. Carrick
Department of Administrative Sciences

ANALYSIS OF RECEIPT TAKE-UP TIMES FOR NAVY SHIPS

Dwight Samuel Weirich
Lieutenant, United States Navy
B.A., Virginia Military Institute, 1978

The purpose of this thesis is to determine if Navy Ships are processing materiel receipts in accordance with the Uniform Material Movement and Issue Priority System. Capable of isolating weaknesses within the Supply and Logistics Support Systems, it discusses the various segments of the requisition cycle and how these segments are utilized. Finally, it analyzes the Receipt Take-Up Time portion of the requisition cycle for Navy Ships utilizing the Navy's Requisition Response Time Management Information System.

Master of Science in Management
December 1987

Advisor: F.C. Horton
Department of Administrative Sciences

AN ANALYSIS OF THE COST/SCHEDULE CONTROL SYSTEM IMPLEMENTED AT MARE ISLAND NAVAL SHIPYARD

Donald J. Wurzel
Lieutenant Commander, United States Navy
B.A., University of Virginia, 1975

Janet S. Rustchak
Lieutenant, United States Navy
B.S., Mobile College, 1973

This thesis analyzes the Cost/Schedule Control System implemented at Mare Island Naval Shipyard. Each shipyard has the perogative to implement the system as desired, so each implementation will differ somewhat. The analysis of the underlying problems with Mare Island's system, however, may be applicable to all eight Naval Shipyards. Recommendations for possible actions to improve the Cost/Schedule Control System at Mare Island Shipyard are provided.

Master of Science in Management
June 1988

Advisor: J.G. San Miguel
Department of Administrative Sciences

A STUDY OF THE U.S. FOREIGN MILITARY SALES AND THE ROC PROCUREMENT SYSTEM

An-Sheng Yeh
Lieutenant Colonel, Republic of China Army
B.S., Chinese Military Academy, 1976

The ending of diplomatic relationships with the United with the United States Government in 1979, resulted in a very ambiguous political environment between the ROC and the U.S., and severely affected ROC's procurement system. It is clear that to find a more efficient means of acquisition of arms has currently become a critical lesson in the Republic of China.

This thesis concerns the concepts, methods and procedures of the United States foreign military sales. It also evaluates the Republic of China's current procurement system.

It concludes that a good understanding of the process of the United States Foreign Military Sales Program will improve the effectiveness and efficiency in the ROC's procurement of arms.

Master of Science in Management
September 1988

Advisor: F.C. Horton
Department of Administrative Sciences

AN EMPIRICAL ANALYSIS OF THE NAVY JUNIOR RESERVE OFFICER TRAINING CORPS (NJROTC)

Henry Alan Zwartz
Lieutenant, United States Navy
B.S., Chapman College, 1980

This thesis examined the Navy Junior Reserve Officer Training Corps program. Data from Defense Manpower Data Center accession and separation files were used to build a profile of this program. Statistical analysis performed provided information which is useful in measuring the performance of the Navy Junior Reserve Officer Training Corps program in relation to similar programs operated by the other military branches. Results of this analysis indicate the areas where the Navy Junior Reserve Officer Training Corps can become more efficient. An accurate means of tracking military accessions was also produced.

Master of Science in Management
December 1987

Advisor: R.A. Weitzman
Department of Administrative Sciences

MASTER OF SCIENCE
IN
MATERIALS SCIENCE

AN ELECTRON MICROSCOPY STUDY OF TWEED MICROSTRUCTURES AND PREMARTENSITIC EFFECTS IN HIGH DAMPING 53CU45MN2A1 ALLOY

Larry Leroy Mayes
Commander, United States Navy
B.S., University of Utah, 1972

The evolution of tweed microstructure upon aging a 53Cu45Mn2A1 alloy was studied in the transmission electron microscope (TEM). Characteristic (110) tweed contrast develops after the alloy is aged for 4 hours or longer at 400 C, which apparently is just within the miscibility gap, and is then cooled to room temperature. The microstructure evolved is proposed to consist of a small proportion of Mn-rich regions in a Cu-rich matrix. As the phase separation proceeds, the Neel temperature and the FCC-to-FCT transition temperature both rise within these Mn-rich domains, and as a result they begin to display incipient lattice instabilities when observed at room temperature. This takes the form of a "flickering" effect in the TEM image. The flickering consists of consistent and repetitive contrast variations at specific locations in the microstructure. The significance of these microstructural features to damping is discussed.

Master of Science in
Materials Science
March 1988

Advisor: A.J. Perkins
Department of
Mechanical
Engineering

MASTER OF SCIENCE IN MECHANICAL ENGINEERING

A THREE DIMENSIONAL NON-SINGULAR MODELING OF RIGID MANIPULATORS

Sadrettin Altinok
Lieutenant, Turkish Army
B.S., Turkish Army Academy, 1981

There are several common approaches used to obtain the kinematic and dynamic equations which describe the motion of robot manipulators. However, a problem arises when these conventional body oriented robot arm kinematic equations are used to simulate the manipulator motion. In this case, the jacobian matrix which relates the end effector motion to joint angle variations becomes singular when two successive arm links align. When the robot arm passes through these singular points, the jacobian matrix is not invertible, and a result of this, the motion cannot be simulated. This thesis investigates how this situation can be avoided by using a Newton Euler approach to variable definition, and using the equations interpreted in a fixed reference frame.

Master of Science in
Mechanical Engineering
December 1987

Advisor: D.L. Smith
Department of
Mechanical
Engineering

AN ADVANCED STUDY OF NATURAL CONVECTION IMMERSION COOLING OF A 3 X 3 ARRAY OF SIMULATED COMPONENTS IN AN ENCLOSURE FILLED WITH DIELECTRIC LIQUID

Terry J. Benedict
Lieutenant, United States Navy
B.S., United States Naval Academy, 1982

An experimental study has been conducted to examine the three-dimensional natural convection heat transfer from an array of simulated electronic components immersed in a chamber filled with Fluorinert FC-75, a commercially available dielectric liquid. The top and bottom walls of the chamber were maintained at uniform temperature while all other surfaces were insulated. The simulated components were in the form of a 3 x 3 array of discrete protruding aluminum blocks, each with geometrical dimensions of a 20 Pin Dual-inline-Package. The components were electrically powered resulting in a range of energy dissipation levels from 0.1 to 3.1 watts. Flow visualization in steady state was accomplished using Magnesium particles illuminated by a Helium Neon laser plane. Component surface temperature measurements allowed determination of the heat transfer characteristics. Timewise fluctuations of temperature at several locations were measured with increasing power levels.

Master of Science in
Mechanical Engineering
June 1988

Advisors: M.D. Kelleher
Y. Joshi
Department of
Mechanical
Engineering

DEVELOPMENT OF A CONSTITUITIVE EQUATION FOR HSLA-100 AT CRYOGENIC TEMPERATURES

David M. Bissot
Lieutenant, United States Navy
B.S., United States Naval Academy, 1980

HSLA-100 is a 100ksi nominal yield strength steel being developed by the Navy for Naval shipbuilding applications. To assist in ductile and brittle failure modelling of this low carbon steel, tensile tests were conducted at temperatures ranging from 37°C to liquid nitrogen (-196°C) to determine a constituitive equation for this alloy at low temperatures.

The Hollomon Power Equation ($\sigma = K\varepsilon^{n}$) and the Voce Equation ($\sigma = \sigma_{\infty} - [\sigma_{\infty} - \sigma_{o}] \exp [-\varepsilon / A]$) are used to describe the true stress/true strain behavior to failure of individual tests. The Bridgeman correction is applied to the true stress to compensate for the triaxial stress state that exists at and beyond the necking (maximum load) point. The Power and Voce equations are then fit to the Bridgeman corrected true stress versus true plastic strain. Relative comparisons are made between the two equations resulting in the conclusion that the Voce equation describes the stress-strain characteristics of this alloy better than the Hollomon equation.

The temperature dependence of the material constants, σ_{o}, and A, in the Voce equation were determined producing a constituitive equation for the tensile behavior of HSLA-100 as a function of strain and temperature, at a strain rate of about 1 x 10^{-3} in/in-sec. The Bridgeman correction factor was investigated in detail, mapping its change as a function of strain past the

necking point. The Bridgeman correction produced a discontinuity in the stress-strain curve at strains in the vicinity of the necking strain. This is not believed to be the true material behavior and thus, indicates that the Bridgeman correction methodology is suspect.

Master of Science in
Engineering Science
December 1987

Advisor: K.D. Challenger
Department of
Mechanical
Engineering

THE DESIGN OF AN INTELLIGENT MULTIDISK CONTROL MODULE FOR VME BUS BASED SYSTEMS

Steven L. Brooks
Lieutenant Commander, United States Navy
B.S., University of Utah, 1978

The design of an intelligent multidisk control module for VME bus based systems is presented. The control module is designed to support concurrent disk operations on up to four flexible disk drives with multiple VME bus MASTERS. The design is presented for a UNIX compatible operating system but the operating system interface is kept simple enough that the multidisk control module can be used with most modern operating systems with minimal changes required.

Master of Science in
Mechanical Engineering
December 1987

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

EFFECT OF FRICTION AND CONTROL PARAMETERS ON THE TRACKING ACCURACY OF A TARGET SEEKER

Joseph K. Chan
Naval Weapons Center, China Lake, California
B.S., University of South Alabama, 1981

The tracking accuracy of a missile target seeker depends on many variables. For a target seeker using a gimbaled platform, an important variable is the friction induced by the preloaded bearings, and by the short wires which connect the target detector with the rest of seeker's electronics. This friction force is nonlinear and sufficiently large enough such that accurate position tracking of a target, whether stationary or moving, is difficult. Conventional control methods such as P.D. (proportional plus derivative) or P.I.D. (proportional plus derivative plus integral) control action can not satisfactorily meet the error criteria. To overcome the deficiency of these two methods, a model-reference method has been synthesized, relying on idealized predictor corrector control to improve the tracking accuracy of the missile seeker. Computer simulations using the Dynamic Simulation Language have demonstrated the superior performance expected from this method.

Master of Science in
Mechanical Engineering
December 1987

Advisor: A.J. Healey
Department of
Mechanical
Engineering

THE EFFECT OF HEAT TREATMENT AND CYCLIC STRAIN AMPLITUDE ON THE DAMPING PROPERTIES OF IRON-CHROMIUM BASED ALLOYS

James L. Childs, Jr.
Lieutenant, United States Navy
B.S., M.I.T., 1982

Fe-Cr-Al and Fe-Cr-Mo alloys are being studied for their high damping characteristics and possible utility to the Navy in the noise reduction and vibration control of shipboard machinery systems. This research studied the dependence of damping in these alloys on heat treatment and cyclic strain amplitude. Tensile specimens annealed at 900^{o}C and 1100^{o}C were subjected to cyclic axial loading at low strain levels on an MTS mechanical testing system, generating load-displacement hysteresis loops at various frequencies. These hysteresis loops were analyzed to determine the damping response at various levels of loading. Damping capacity is found to be dependent on both strain amplitude and frequency. A comparison is made between these results and previous work which evaluated the strain dependence of damping in these alloys using more conventional experimental methods.

Master of Science in
Mechanical Engineering
June 1988

Advisor: J. Perkins
Department of
Mechanical
Engineering

PRELIMINARY DESIGN AND CYCLE VERIFICATION OF A DIGITAL AUTOPILOT FOR AUTONOMOUS UNDER-WATER VEHICLES

Stephen W. Delaplane
Commander, United States Navy
B.S., Old Dominion University, 1978

Autonomous Underwater Vehicles (AUV's) are being considered for a diversity of U.S. Navy missions. They portend the advantages of cost effective fleet multiplication, minimal detectability, and reduced risk to personnel and high-value fleet assets. In response to the Department of the Navy and DARPA interests, AUV research and development by a number of public and private sector organizations has intensified in recent years. The Naval Postgraduate School has now built the first of a series of AUV models which will be used as "test-beds" for evolving automated control technologies. This thesis documents the results of initial efforts to install an on-site facility to support the design and development of a model-based digital autopilot for control of the NPS test vehicle. Using an IBM PC/AT and analog-digital interacing, the development methodology has been implemented and verified by a simplified model reference control program for AUV dive plane commands.

Master of Science in
Mechanical Engineering
March 1988

Advisor: A.J. Healey
Department of
Mechanical
Engineering

HEAT TRANSFER MODELING OF JET VANE THRUST VECTOR CONTROL (TVC) SYSTEMS

Michael F. Dulke
Lieutenant Commander, United States Navy
B.S., United States Merchant Marine Academy, 1977

The research presented herein, analyzes two models of a jetvane Thrust Vector Control (TVC) System. Computational modeling was accomplished using the latest version of the PHOENICS computer code, designated PHOENICS-84. The vane configurations studied, consisted of a simple wedge and a blunt bodied vane, with a leading edge radius of 1.016 mm. (1/25 in). These models were examined in a two dimensional, subsonic and supersonic, cold flow field, for both laminar and turbulent flow cases.

Results consist of a numerical solution and a graphical representation of surface shear stress coefficient, Stanton number and convective heat transfer coefficient.

Master of Science
Mechanical Engineering
December 1987

Advisors: D. Salinas
M.D. Kelleher
Department of
Mechanical
Engineering

EXPERIMENTAL INVESTIGATION OF THE EFFECTS OF UNDERWATER EXPOSURE ON THE DAMPING CHARACTERISTICS OF BOLTED STRUCTURAL CONNECTIONS FOR PLATES AND SHELLS

Richard W. Durham
Lieutenant, United States Navy
B.S., University of Kansas, 1979

Recent studies have indicated that use of the bolted structural connection and the introduction of a viscoelastic material at the joint build-up can reduce the vibration response of a structure. Many potential applications utilizing this type of vibration reduction must operate in an underwater environment. A test structure consisting of two concentric circular shells connected by four vanes and assembled with bolts was tested to determine the effects of underwater exposure on the damping properties of a bolted structure. The effects of underwater exposure on system damping were examined for various structural bolt torques and for the application of a viscoelastic layer at the joint interfaces.

With increasing underwater exposure time, the modal frequencies shifted forward and the frequency response amplitudes decreased. Modal damping was also noted to increase with underwater exposure time. After a finite period of underwater exposure time the system frequency responses stabilized and modal frequencies, damping and response amplitudes remained constant. The changes in the frequency response of the structure with underwater exposure resulted from the effects of viscous fluid layer damping at the joint interfaces. As water replaced the air

at the joint interfaces, with continued underwater exposure, the effects of viscous fluid layer damping increased.

The introduction of water into the joint interfaces of a bolted joint increased the stiffness of the structure and resulted in increased structural damping. This effect was noted for the simple bolted case and to a smaller degree for the case with viscoelastic material at the joint interfaces.

Master of Science in
Mechanical Engineering
March 1988

Advisor: Y.S. Shin
Department of
Mechanical
Engineering

SOME EXPERIMENTS WITH UNDERWATER ACOUSTIC RETURNS FROM CYLINDERS RELATIVE TO OBJECT IDENTIFICATION FOR AUV OPERATIONS

Maureen A. Farren
Lieutenant, United States Navy
B.S., University of Southern California, 1980

Object identification and avoidance by an autonomous underwater vehicle requires that a knowledge-based, intelligent control system have some way to quantify sonar returns from an object for comparison with stored data on simple shapes. One measurement of an insonified object is its target strength, which is dependent on geometrical shape and surface properties. This thesis examines various aspects of target strength for two geometrically similar, open-ended cylinders with different expected surface properties. Experimental data was obtained in an anechoic underwater chamber using two acoustic transducers where position of the cylindrical object was varied relative to the transducer's locations. Target strength estimates, as well as propagation time delay of the insonifying signal, were studied. The experimental results were compared to the calculated values of a fully insonified, finite cylinder.

Master of Science in
Mechanical Engineering
March 1988

Advisor: A.J Healey
Department of
Mechanical
Engineering

CHARACTERIZATION OF HIGH DAMPING FE-CR-MO AND FE-CR-AL ALLOYS FOR NAVAL SHIPS APPLICATION

David B. Ferguson
Lieutenant Commander, United States Navy
B.S., Vanderbilt University, 1977

The metallurgical basis for high damping in Fe-Cr-based alloys was investigated. Two alloys similar to VACROSIL-010 were studied, with compositions of 84.7 Fe-11.44 Cr-2.91 Al and 84.8 Fe-11.65 Cr-2.92 Mo. The strain dependence of specific damping capacity (SDC) was evaluated using a modified version of the resonant dwell technique. Heat treatment variations were introduced by annealing in argon gas at temperatures between 950°C and 1100°C and then furnace cooling. Cantilever beam specimens were evaluated for SDC at their first three resonant modes (0-1,000 Hz) at room temperature. Changes in damping capacity were correlated with the results of tensile hysteresis testing and dilatometry.

Master of Science in
Mechanical Engineering
March 1988

Advisor: J. Perkins
Department of
Mechanical Engineering

PROCESSING OF ALUMINUM ALLOY 2090 FOR SUPERPLASTICITY

Gary E. Groh
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1974

Existing superplastic forming techniques for Al alloys rely on deformation at temperatures of 500°C to achieve the desired ductilities. The Al alloy 2090 (Al-Li-Cu-Zr) has been successfully fabricated by such techniques, but at temperatures where cavitation during forming may significantly reduce the mechanical properties of the final product. It has been previously shown that cavitation can be effectively suppressed by forming at lower temperatures. The purpose of this research is to investigate the applicability of thermomechanical processing methods (developed at NPS for Al-Mg-X alloys) to produce a refined microstructure capable of supporting superplasticity at lower temperatures in Al 2090.

Master of Science in
Mechanical Engineering
September 1988

Advisors: T.R. McNelley
S.R. Hales
Department of
Mechanical
Engineering

SINGLE PHASE LIQUID IMMERSION COOLING OF DISCRETE HEAT SOURCES IN A VERTICAL CHANNEL

Sherrill John Hazard, III
Lieutenant, United States Navy
B.S., University of Maine, Orono, 1980

Natural convection liquid cooling of simulated electronic components was investigated. A single column of eight protruding components was constructed using foil heaters mounted on the back of stainless steel rectangular blocks. These components were attached to a vertical plexiglas wall to simulate a column of 20 pin DIP's. A channel was formed by placing a smooth movable shrouding wall parallel to the test surface. The test surface and the shrouding wall were placed in a water immersion bath. Flow visualization was accomplished using a laser generated plane of light to illuminate suspended particles. Photographs were taken of the flow at the test surface mid-plane for four different power settings at each of three different channel widths. A nondimensional temperature and a modified Grashof number for each heated protrusion at each input power setting and channel width were determined. Visual results indicate two distinct flow reigons. Far away from the components, a natural convection boundary layer flow was observed. Near the components, the flow was modified by the protrusions. As the component heat input increased, more pronounced three dimensional effects were noticed. Temperature measurements indicate that as the modified Grashof numbers increased, the nondimensional

temperatures decreased for each component. Also, the difference in the nondimensional temperatures for various components decreased with increasing modified Grashof numbers.

Master of Science in
Mechanical Engineering
December 1987

Advisor: Y. Joshi
Department of
Mechanical
Engineering

DAMPING AND MICROSTRUCTURES IN AGED CU-MN BASED ALLOYS

Joseph Patrick Heil
Lieutenant, United States Navy
B.S., United States Naval Academy, 1980

An aged high damping alloy 53Cu-45Mn-2A1 was studied both microstructurally by transmission electron microscopy (TEM) and macrostructurally with two different damping measurement methods. In-situ heating and cooling observations were made with TEM in order to define the recently discovered "flickering" phenomenon associated with its "tweed" microstructure. TEM studies were also made of an aged 53.6Cu-46.4Mn binary alloy. Damping measurements were obtained by a normalized bandwidth method applied to data from a resonant bar. This was used to determine (i) the aging condition for optimum damping, (ii) the subsequent trend of damping at room temperature for each aging condition, and (iii) the effect of an 8 HR storage at 100^{o}C on damping capacity. Damping measurements utilizing a free decay technique to determine log decrement were also used and compared to results from the normalized bandwidth method.

Master of Science in
Mechanical Engineering
June 1988

Advisor: A.J. Perkins
Department of
Mechanical
Engineering

THE MODELING OF VISCOELASTIC CIRCULAR PLATES FOR USE AS WAVEGUIDE ABSORBERS

Charles Dean Hettema
Lieutenant Commander, United States Navy
B.S., Tulane University, 1976

A long standing concern of the Navy has been the need to reduce structural vibrations in plates, such as ship's hulls. Recently, it was proposed to use waveguide absorbers as a means to reduce structural vibrations. A waveguide absorber is a device which is made from damping material but mounted to the structure at a point rather than the full surface. A waveguide absorber removes and then dissipates vibrational energy from the structure through traveling waves. The performance of a waveguide absorber is determined from the driving point impedance, the ratio of force to velocity at the attachment point. This study has determined the theoretical driving point impedance for viscoelastic circular plates.

The constitutive relations for viscoelastic material were evaluated and it was proven that a complex Young's modulus and shear modulus can be used to represent the viscoelastic material. Mindlin's theory for elastic isotropic plates, with complex moduli, was used to solve for the driving point impedance. The solutions are in terms of Bessel functions. Poisson's boundary conditions were used at the free edge of the circular plate, and clamped boundary conditions were used at the attachment point, which is at the center of the plate. A non-numeric language, REDUCE, was used to solve for the driving point impedance given the appropriate equations of motion and boundary conditions. The

complex Bessel functions, needed for the results of the REDUCE program, were generated by a FORTRAN program. To validate the results of this study, elastic and viscoelastic plates were tested to determine their driving point impedance. A comparison of the theoretical results and the experimental results shows that there is agreement for all cases studied.

Master of Science in
Mechanical Engineering
September 1988

Advisor: Y.S. Shin
Department of
Mechanical
Engineering

PASSIVE VIBRATION CONTROL USING VISCOELASTIC AND CONSTRAINED LAYER BEAM WAVEGUIDE ABSORBERS

Charles T. Horne, III
Lieutenant, United States Navy
B.S., Auburn University, 1981

Reduction of noise and vibrations within structural systems has been a long standing problem. Recent studies have indicated that waveguide absorbers have been effective in the reduction of noise and vibrations over a broad frequency range. A waveguide absorber is a structure along which vibrational waves can travel. If the waveguide absorber is treated with an energy dissipation scheme, the amplitudes of the waves will decrease as they travel along the waveguide absorber.

The test structure consisted of a rectangular aluminum plate with clamped boundary conditions. A finite element analysis approach theoretically predicted the test structure's mode shapes and modal strain energies. An experimental modal survey was conducted to compare with the theoretically predicted mode shapes and natural frequencies. The mode shapes and modal strain energies determined the optimum locations of the waveguide absorbers and their orientation on the test structure. The frequency range of interest and mode shapes determined the required number of waveguide absorbers.

Experiments were conducted using viscoelastic and constrained layer beam waveguide absorbers over a 2000 Hertz frequency range. Significant reduction of the test structure's frequency response

was demonstrated through the effective use of multiple beam waveguide absorbers.

Master of Science in
Mechanical Engineering
September 1988

Advisor: Y.S. Shin
Department of
Mechanical
Engineering

NUMERICAL FIELD MODEL SIMULATION OF FULL-SCALE FIRE TESTS IN A CLOSED SPHERICAL/CYLINDRICAL VESSEL WITH INTERNAL VENTILATION

Richard Reid Houck
Lieutenant Commander, United States Coast Guard
M.B.A., Pepperdine University, 1979

Shipboard fires have plagued mariners for centuries; they still cause significant damage and casualties each year. Improved fire prevention and control require a sound knowledge of the phenomena of fire. At the same time, a study of fires in enclosed pressure vessels has been undertaken by the Navy using FIRE-1, a large pressure vessel, to conduct full-scale experimental fires. A computer model is being developed to simulate the FIRE-1 tests. This three-dimensional finite difference model uses a cylindrical/spherical coordinate system and includes the effects of turbulence, surface and flame radiation, internal ventilation, global and local pressure corrections, strong buoyancy, and conjugate boundary conditions. Given a heat release rate, the model computes temperature, pressure, density and velocity fields for the entire vessel. This thesis presents the internal ventilation feature of the model and compares the numerical results to a nonventilated case. Additional features such as combustion and gaseous radiation are being incorporated to more accurately model real fires. When validated, this model will become a useful tool for evaluating fire prevention and control procedures and equipment.

Master of Science in
Mechanical Engineering
September 1988

Advisors: M.D. Kelleher
K.T. Yang
Department of
Mechanical
Engineering

COMPOSITE RELIABILITY ENHANCEMENT VIA PRELOADING

Mark Christopher Jones
Lieutenant, United States Navy
B.S., University of Michigan, 1980

Composite strength is an inverse function of the size of the composite. As the use of composites expands into larger applications, such as airplane wings, missile components, and ship superstructures, the ability to accurately predict composite performance for large applications has become more important. The composite failure process is sequential and initiates with early breaking of the weak fibers. Concentration of breakage sites accumulates and leads to ultimately catastrophic failure. Prestressing fibers prior to solidification of the matrix has been demonstrated to increase the reliability of the composite by minimizing the spatial concentration of the breakage sights.

This study concentrates on quantifying the level of preload and gauge length to optimize the prestress effect. Computer simulations of graphite bundle tests were used to validate the data analysis methodologies applied to actual AS-4 graphite bundle tests. The actual experimental results are consistent with computer-simulated behaviors.

Master of Science in
Mechanical Engineering
September 1988

Advisor: E.M. Wu
Department of
Aeronautics and
Astronautics

IMPLEMENTATION OF DYNAMIC CONTROL OF A SINGLE-LINK FLEXIBLE ARM USING A GENERAL MICRO-COMPUTER

Michael Kirkland
Lieutenant, United States Navy
B.S., University of Missouri, 1980

Today's demand for a high speed, low weight and large load capable manipulator has spurred the research on flexible manipulators. This thesis centers on an implementation of dynamic control on a single-link flexible arm utilizing a general purpose micro-computer. This research also studies the dynamic behavior of the control system with a brief comparison of the derived flexible-body-model controller to a rigid-body-model controller.

Master of Science in
Mechanical Engineering
September 1988

Advisor: L.W. Chang
Department of
Mechanical
Engineering

NATURAL CONVECTION LIQUID IMMERSION COOLING OF A COLUMN OF DISCRETE HEAT SOURCES IN A VERTICAL CHANNEL

Daniel L. Knight
Lieutenant, United States Navy
B.S., The Citadel, 1979

Natural convection from a single column of eight in-line, rectangular, flush heat sources was examined. A vertical channel was formed by placing a movable shroud parallel to the test surface. The experimental program consisted of temperature measurements and flow visualizations. For a range of component power levels and channel spacings, surface temperatures of each heat source were measured at five locations using embedded thermocouples. The resulting steady state data was compared with corresponding measurements for an identical geometric arrangement of protruding heat sources. The flow visualization was carried out using a laser generated plane of light.

Master of Science in
Mechanical Engineering
September 1988

Advisor: Y. Joshi
Department of
Mechanical
Engineering

ANALYTICAL AND EXPERIMENTAL STUDIES OF BEAM WAVEGUIDE ABSORBERS FOR STRUCTURAL DAMPING

Gi Gon Lee
Lieutenant, Korean Navy
B.S., Naval Academy of Korea, 1982

The reduction of structural vibrations in ships and submarines is a long standing concern of the Navy. Waveguide absorbers are very effective devices which can be applied to this problem. This study evaluates the increase in vibration damping of a plate structure across a broad frequency range using light weight beam waveguide absorbers. Viscoelastic and constrained layer beam waveguide absorbers were studied both theoretically and experimentally. Impedances of the waveguide absorbers at the attachment point were predicted using both Bernoulli-Euler and Timoshenko beam theory for the viscoelastic beam and using sixth order beam theory for the constrained layer beam. The theoretically predicted impedances were compared with the experimental measurements. Results from random vibration tests of a plate structure showed significant increases in damping over a broad frequency range (100 Hz - 2 KHz) when the waveguide absorbers were attached on the plate.

Master of Science in
Mechanical Engineering
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VIBRATION RESPONSE OF CONSTRAINED VISCOELASTICALLY DAMPED PLATES: ANALYSES AND EXPERIMENTS

Gerald J. Maurer
Lieutenant, United States Navy
B.S., University of Minnesota, 1981

The frequency response analysis of several constrained viscoelastically damped plates were performed with modifications to account for the frequency dependent properties of viscoelastic materials (loss factors and shear modulus) using MSC/NASTRAN. A modal strain energy approximation method was also applied to each plate. Comparisons of the frequency response analysis to the modal strain energy method were made for each plate structure. The experiments were performed on the plates to establish the base line data for the comparisons.

The modal strain energy method frequency response plots showed good agreement with the frequency response analysis method plots for all plate structures analyzed. Plate structures with fewer natural frequencies in the frequency range investigated showed better agreement between the two prediction methods than the structures with more natural frequencies. The experimental data for the plate analyzed indicate less damping than calculated by either of the finite element prediction methods. The experimentally determined natural frequency modes were well approximated by both of the finite element prediction methods.

Master of Science in
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COMPUTER MODEL OF AN AVIATION GAS TURBINE TEST FACILITY

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B.A., University of North Florida, 1977

A computer model of an aviation gas turbine test facility was developed and analyzed to compare computer generated gas pressures, temperatures, and velocities to those of an actual, operational test facility. The computer model simulated the Royal Danish Air Force Test Facility at the Skrydstrup Air Force Base, Denmark. The Parabolic, Hyperbolic, or Elliptic Numerical Integration Code Series (PHOENICS) was used. The Computer Model output compared well with actual data obtained from the Denmark test facility. Tabular Data and Figures are presented.

Master of Science in
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OPTIMIZING SUPERPLASTIC RESPONSE IN LITHIUM CONTAINING ALUMINUM-MAGNESIUM ALLOYS

Ian G. Munro
Captain, Canadian Armed Forces
B.Eng., Royal Military College of Canada, 1978

Four lithium containing Al-Mg-Zr alloys, containing 6-8 wt. pct. Mg, 0.5-2 wt. pct. Li, and 0.15-0.25 wt. pct. Zr, were studied with a view to maximizing superplastic ductilities. Differential scanning calorimetry was employed to assist in the characterization of the microstructures and to determine the solvi of the constituent second phases. These data were used to aid in the choice of thermomechanical processing parameters previously applied to Al-Mg alloys containing 10 wt. pct. magnesium. The superplastic response of the alloys was evaluated over a range of temperatures (275°C to 350°C) and a range of strain rates (10^{-5} to 10^{-1} sec^{-1}). Elongations in excess of 1000% at 300°C and 1.7 x 10^{-2} sec^{-1} strain rate were obtained in a Al-8Mg-1Li-0.15Zr (wt. pct.) alloy. Transmission electron microscope investigations of the microstructure before and after superplastic deformation revealed that the volume fraction of second phase was predominantly responsible for structural stability.

Master of Science in
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ANALYTICAL AND EXPERIMENTAL INVESTIGATION OF CONSTRAINED VISCOELASTIC LAYER DAMPING FOR A PLATE AND SHELL MODEL

James Robert Nault
Lieutenant, United States Navy
B.S., United States Naval Academy, 1981

The use of constrained viscoelastic layer damping treatments has recently been found to be effective in reducing unwanted resonant vibrations in structures. The proper design of such damping treatments has been difficult, however, since closed form equations to describe system behavior can only be used for simple beams and plates. In addition, finite element analysis has been difficult since the material properties of viscoelastic materials show a marked dependence on frequency and temperature, resulting in the need to run an excessive number of finite element analyses for each design. Two recently developed design tools are used in this paper to design a proper constrained viscoelastic layer damping treatment for a test structure consisting of two concentric cylinders connected by four vanes. The first design tool is subsystem analysis, where a portion of the test structure is approximated by appropriate closed form equations to determine system behavior with different applied damping treatments. The second design tool is a finite element technique called the Modal Strain Energy method.

After application of the constrained viscoelastic layer damping treatment to the outer shell of the test structure, vibration response amplitudes were found to drop significantly for all frequencies except in the lowest fifth of the frequency range. This was due to the low shear modulus of the viscoelastic

material at these low frequencies, which made the viscoelastic material unable to provide good shear resistance. Structural damping also increased. Further application of damping treatments to the vanes of the structure produced only slightly more damping and response amplitude reduction.

The ModalStrain Energy method did not show good agreement with the experimental results. In general, the Modal Strain Energy method was a conservative design tool in that it predicted higher responses and less damping for the test structure than was obtained experimentally. Errors in the Modal Strain Energy analysis were due to coarseness of the finite element model and inaccuracy in the modeling of the bolted joints of the structure.

Master of Science in
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AEROTHERMODYNAMICS OF A JET ENGINE TEST CELL FACILITY

Eric A. Nicolaus
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B.S., United States Merchant Marine Academy, 1978

This thesis consists of a three-dimensional numerical analysis of the Jet Aircraft Hush House located at Naval Air Station, Florida. Utilizing the PHOENICS Code allows for the determination of the aerothermal characteristics including velocity, pressure, enthalpy, turbulent kinetic energy and the dissipation rate of turbulent kinetic energy in the facility during testing of the U.S. Navy's F-4 (Phantom II) J-79-GE-8 gas turbine engine with afterburner. How and by what method PHOENICS arrives at this solution is discussed. Of greatest importance is the resulting "behavior" of the aerothermal system.

Problems encountered using the PHOENICS Code, resulting numerical solutions to the particular facility, comparison to actual test data and recommendations for further applications of the PHOENICS Code are presented.

Master of Science in
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DETERMINATION OF TAFEL CONSTANTS IN NONLINEAR POLARIZATION CURVES

Thomas Edward O'Loughlin
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B.B.A., University of Notre Dame, 1981

The presence of non-linear behavior in potentiodynamic polarization plots has resulted in difficulty in determining the Tafel constants from such plots. A FORTRAN based program involving numerical differential techniques using a graphical display was used to determine the existence of the Tafel regions.

Various alloys polarized in synthetic seawater and a 3.5% NaCl solution were analyzed. Although severe concentration polarization often dominated the cathodic branches, the techniques employed did allow for the selection of regions which approached linear behavior. The effects of concentration polarization in hindering the determination of Tafel constants were exemplified by the uncovering of a cathodic branch containing a small region where only activation polarization dominated followed by the onset and total domination of concentration polarization.

A method of determining where the anodic and cathodic currents begin to dominate the potentiodynamic polarization curve is introduced.

Master of Science in
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THE INTERACTION OF A FLUID INTERFACE WITH A VORTEX PAIR

Mark D. Petersen-Overton
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A detailed parametric study of the variables critical to a numerical model of the interaction of a free surface with an ascending vortex pair has been carried out. The model is based on a discrete vortex representation of the free surface and the use of the appropriate boundary conditions. A study was performed to minimize the numerical Helmholtz instabilities inherent in the numerical model for lower Foude numbers. A method of free-surface re-discretization was developed and implemented. Additionally, an investigation of the motion of a vortex pair approaching and passing through a sharp salt/freshwater density interface was conducted. Experiments were performed in a large basin and the vortices were generated with two counter-rotating plates. The rise and intrusion of the Kelvin oval into the upper layer of lower density fluid was recorded on a video tape and then analyzed through the use of a Motion Analysis system.

Master of Science in
Mechanical Engineering
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MICROSTRUCTURAL CHARACTERIZATION OF THE HEAT AFFECTED ZONE OF HSLA-100 STEEL GMA-WELDMENT

Gary P. Potkay
Lieutenant, United States Navy
B.S., Purdue University, 1980

A high strength low alloy steel, HSLA-100 is under development by the U.S. Navy. The research presented in this thesis evaluates the effect of cooling rate on the heat affected zone (HAZ) of Gas Metal Arc Weldments (GMAW). The cooling rate at 540^{o}C gas metal arc welding was varied from 22^{o}C/second to 42^{o}C/second 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. No failures occurred in the HAZ which indicates that the strength of the HAZ is not a strength limiting factor.

The HAZ microstructure was characterized by optical metallography, scanning and transmission electron microscopy. These microstructures were correlated with microhardness and the mechanical properties. Microconstituents of the coarse grain HAZ for all the weldments were predominately a mixture of low carbon, higher bainite and martensite. The microstructure is characterized by parallel laths and regions of high dislocation

density and considerable amounts of retained austenite. The microstructure of the HAZ adjacent to the base metal was in general, an overaged region of polygonal ferrite grains with coarse copper precipitates.

Transmission electron microscopic (TEM) examination of the HAZ revealed a second phase between the bainitic laths, especially in the coarse grained HAZ. Dark field TEM and electron diffraction studies confirmed that this second phase was retained austenite. This austenite would have formed at temperatures where substitutional solid diffusion could occur and thus, austenite stabilizing elements (and impurity elements) probably have partitioned into the austenite. This would make the austenite very stable and thus explain the reported excellent resistance to hydrogen assisted cracking exhibited by the HAZ of these welds.

Master of Science in
Mechanical Engineering
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PROCESSING OF 2090 ALUMINUM ALLOY FOR SUPERPLASTICITY

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The applicability of a thermomechanical process, involving warm rolling to facilitate continuous recrystallization (CRX), to aluminum alloy 2090 was considered. The thermomechanical process has been shown to result in 2-5 mm grains and superplasticity at 300^{o}C in Al-Mg and Al-Mg-Li alloys. In this study, the warm rolling temperature and the reheating time between consecutive rolling passes were varied. Superplastic ductility of 320 percent was obtained during tension testing at 350^{o}C. Microstructural analysis of the structures produced during warm rolling indicates inadequate interaction between precipitating phases and dislocation structures. Thus, improved warm-temperature superplastic ductility may be obtained by initial precipitation treatments followed by warm rolling.

Master of Science in
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A FEASIBILITY STUDY IN PATH PLANNING APPLICATIONS USING OPTIMIZATION TECHNIQUES

David W. Sanders
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B.S., United States Naval Academy, 1977

Path Planning is an intricate part of the navigation function of any vehicle traveling between two points in space. In an autonomous underwater vehicle, a trajectory may be planned between two points using the optimization techniques of ADS (Advanced Design Synthesis) coupled to a motion analysis routine, DSL (Dynamic Simulation Language). The problem is posed as a two-point-boundary-value problem with initial states and desired final states known, as well as a final time specified. The objective function is minimized in the form of a quadratic regulator for the purpose of conserving the vehicles energy supply. An obstacle in the dive plane (X-Z plane) is introduced and successfully avoided using the constrained optimization technique. The use of optimization is proven as a feasible method for successfully planning the trajectories of underwater vehicles.

Master of Science in
Mechanical Engineering
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CONTROL OF EMBEDDED VORTICES USING WALL JETS

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Lieutenant Commander, United States Navy
A.B., University of California, Berkeley, 1975
M.S., Crummer Graduate School of Business,
Rollins College, Winter Park, Florida, 1982

A wall jet inclined at 30^{o} to horizontal was used to alter the structural characteristics of streamwise vortices embedded in a turbulent boundary layer developing in a zero pressure gradient. The vortices were created using a half-delta wind attached to the floor of a wind tunnel. With the jet opposing the vortex downwash and blowing ratio increasing from 0 to 4.8, streamwise vorticity decreased from ~750 to 150 s^{-1}, while circulation decreased from ~0.15 to ~0.05 m^2/s. The average vortex core radius increased from ~0.9 to ~ 2.4 cm, while the vortex moved ~ 3 cm spanwise toward the jet. With the jet at the vortex upwash and blowing ratio increasing from 0 to 6.7, streamwise vorticity decreased from ~ 860 to ~ 570 s^{-1} while circulation decreased from 0.17 to 0.15 m^2/s. With a vortex having greater circulation (produced by a larger vortex generator), the jet opposing the vortex downwash, and blowing ratio increasing from 0 to 3.0, streamwise vorticity decreased from ~ 1000 to ~ 700 s^{-1} while circulation decreased from ~ 0.34 to ~ 0.27 m^2/s. At high blowing ratios (>2.0) wall heat transfer rates were not altered significantly compared to a boundary layer with an embedded vortex and no injection on a heated wall. It is thus apparent

that a wall jet with high momentum lifts off the wall, causing little alteration of the near-wall region of the boundary layer already disturbed by an embedded vortex.

Master of Science in
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ANALYSIS OF GAS TURBINE TEST CELL #1 LEMOORE NAVAL AIR STATION, CALIFORNIA

Kevin D. Smith
Lieutenant, United States Navy
B.S., United States Naval Academy, 1982

This thesis is a three-dimensional numerical analysis of Gas Turbine Test Cell #1 at Lemoore Naval Air Station, California. The Parabolic, Hyperbolic, or Elliptic Numerical Integration Code (PHOENICS) is used to determine the steady-state aerothermal characteristics within the test cell during the full power run-up of a GE F404 gas turbine engine (afterburner in operation). The method in which PHOENICS arrives at a solution is discussed as well as how the code was applied to this problem.

The solution of the problem is presented in tabular form and the results are discussed. Recommendations for the future application of PHOENICS to this project are given.

Master of Science in
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LOCAL PATH PLANNING USING OPTIMAL CONTROL TECHNIQUES

Winston Smith
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B.S., University of Mississippi, 1980

The ability of an autonomous vehicle control system to plan a safe, collision-free local path from one vehicle position to another is one of the most important functions. In this thesis, it is shown how a safe obstacle-free local path can be planned using optimal control theory and optimization techniques. The problem is posed as a two point boundary value problem with various problem constraints which control the vehicle behavior in transversing from one point to another. The objective function being minimized is a control performance index which includes vehicle energy saving parameters. Numerous fixed and moving obstacles in the dive plane are introduced and successfully avoided using this technique. Three dimensional path planning is also successfully demonstrated on a 12 state linear model of an underwater vehicle. This technique is shown to be a feasible method of local path planning applications.

Master of Science in
Mechanical Engineering
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THERMOMECHANICAL PROCESSING OF AL ALLOY 2090 FOR GRAIN REFINEMENT AND SUPERPLASTICITY

Procopios T. Spiropoulos
Captain, Hellenic Air Force
B.S., Hellenic Air Force Academy, 1977
B.S., University of Patras, 1981

An Al-Cu-Li-Zr alloy, recently registered as 2090, with 7 percent lower density and 10 percent higher elastic modulus, has been introduced as a replacement for the 7075-T6 alloy. The purpose of this research is to investigate the applicability of thermomechanical processing methods developed at NPS for materials including Al-Mg and Al-Mg-Li alloys, to the 2090 alloy. The material is hot worked, cold worked, aged and warm rolled to a total true strain of about 2.4. Tensile tests were conducted at different temperatures and strain rates allowing a determination of the effect of the processing on microstructural evolution and the superplastic behavior of this material.

Master of Science in
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MACHINERY DIAGNOSTICS VIA MECHANICAL VIBRATION ANALYSIS USING SPECTRAL ANALYSIS TECHNIQUES

James A. Stamm
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B.S., United States Merchant Marine Academy

Mechanical vibration analysis affords a reliable means to selectively identify specific machinery faults. As such, it plays a key role in diagnostic work on individual units and in progressive maintenance monitoring programs where substantial diagnostic and prognostic capabilities are considered essential. A physical machinery diagnostics model was developed that was designed to incorporate some of the more common machinery faults found in rotating machinery relating to shaft, bearing, gear, and alignment defects. The results of spectral analysis techniques used to detect these simulated faults are displayed and discussed, with special emphasis on gear train diagnostics. Also included are a description of one of the current U.S. Navy machinery vibration monitoring programs, and an initial study regarding a proposed technique for providing a graphic display of gear faults.

Master of Science in
Mechanical Engineering
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COMPARATIVE CONTROLLER DESIGN FOR A MARINE GAS TURBINE PROPULSION PLANT

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B.S., United States Naval Academy, 1981

Improved control of gas turbine propulsion plants could offer the Navy increased economic, maintenance, and tactical benefits. This thesis provides methods of steady state and dynamic computer modelling, as well as two non-proprietary control design methods. The classical proportional integral (PI) regulator design method and the modern linear quadratic regulator (LQR) controller design method are used to demonstrate a base for Navy redesign of existing gas turbine propulsion plant control systems. A comparison of the PI and LQR designs is conducted. In addition, a real or near-real time dynamic computer simulation is presented that has immediate application in the areas of model-based control and plant health monitoring.

Master of Science in
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A CONCEPTUAL DESIGN STUDY OF A HOVERING SYSTEM CONTROLLER FOR AN AUTONOMOUS UNDERWATER VEHICLE

Chris A. Thompson
Lieutenant Commander, United States Navy
B.S., University of Utah, 1974

An Autonomous Underwater Vehicle (AUV) will have many operational scenarios that will include a transition from cruise to hover over a fixed position in the ocean. While hovering, the AUV must be able to balance the current induced forces - a difficult task to accomplish automatically. The magnitude of these forces induced on an example AUV have been estimated for currents from 4 m/s to 1 m/s with the incident current varying from 0^{o} to 360^{o}. Using the estimated forces, different configurations of thrusters were investigated and the power required for different thruster configurations compared. Three thrusters (two longitudinal, one lateral) can balance the forces exactly and a unique solution was evaluated. With redundant thrusters, more economical schemes can be developed using force allocation logic with "minimum norm" solutions. System horsepower requirements have been estimated and a conceptual model based controller methodology has been proposed. The force allocation logic proposed will now allow for a smooth transition from cruise to hover mode positions.

Master of Science in
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A THREE-DIMENSIONAL NONSINGULAR SIMULATION OF RIGID MANIPULATORS

Robert M. Verbos
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B.E., Villanova University, 1981

Robot manipulators have been studied, using various approaches to obtain the kinematic and dynamic equations which describe their motion. Conventional body-oriented robot arm kinematic equations have the disadvantage that a singular condition occurs when two successive links of the manipulator are aligned. When this occurs, the jacobian matrix which relates the end effector motion to the joint angle variations becomes singular and is not invertible, resulting in motion that can not be simulated. This thesis extends the previous work done in the investigation of a nonsingular Newton Euler approach to forward dynamic equations interpreted in a global (inertia) fixed reference frame. Specifically, the previous results are extended into validation of the approach for three-dimensional motion, including gravitational effects. In addition, the comparison and verification of the motion of an actual robotic manipulator to the simulation is investigated.

Master of Science in
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September 1988

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TWO-DIMENSIONAL COMPUTATION OF HEAT TRANSFER IN FUSION WELDING

Lambert Roger Walker, III
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1975

A two-dimensional finite difference model was developed to calculate the temperature distribution during the fusion welding process. The model is based upon the enthalpy formulation for phase change processes. Changes in thermal properties during the process have been accounted for. Temperature variations with respect to time have been calculated for specific locations in the cross-section of the work piece away from the edges for specified boundary conditions. These computations allow the estimation of cooling rates and the extent of the fusion zone. The model could be used in real-time monitoring of the welding process.

Master of Science in
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TRANSIENT THREE-DIMENSIONAL HEAT CONDUCTION COMPUTATIONS USING BRIAN'S TECHNIQUE

John A. Watson
Lieutenant Commander, United States Navy
B.S., New Jersey Institute of Technology, 1975

A transient three-dimensional heat conduction code was developed using finite differences. A stabilit· restriction on the time step was avoided using a technique proposed by Brian. Computations from the code were validated using both the explicit technique and an available closed-form solution for small times. The maximum error was found to be within 0.019 percent for an 11 x 11 x 11 grid and time step of 17.117 seconds. The total CPU time to carry out the computations up to 3,600 seconds using Brian's technique was six times that required for the explicit technique with the same time step of 17.117 seconds. However, as the time step was increased without altering the geometry, the CPU time using Brian's technique decreased and was less than that used in the explicit technique for time steps larger than 110 seconds. The validated code was also used in the analysis of the transient thermal response of a component on an orbiting spacecraft.

Master of Science in
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EFFECTS OF AN EMBEDDED VORTEX ON A SINGLE FILM-COOLING JET IN A TURBULENT BOUNDARY LAYER

Warren Williams
Lieutenant Commander, United States Navy
B.A., The Citadel, 1976

Effects of embedded longitudinal vortices on heat transfer in a turbulent boundary layer film cooled from a single injection hole are discussed. Film coolant was injected at blowing ratios 0.50 to 1.50 at a freestream velocity of 10 m/s. A single longitudinal vortex was induced upstream of the film-cooling holes. Heat transfer measurements were made downstream of injection. Flow visualization tests were conducted after the injectant was contaminated with smoke. Surveys of mean velocity and mean temperature were also made in different spanwise normal planes. For all blowing ratios examined, the embedded vortices cause significant alterations to wall heat transfer and to film-cooling distributions.

Measurement of mean temperature and mean velocities in spanwise planes show that injectant is pushed to the upwash side of the vortex when the injection hole is located beneath the vortex core or vortex downwash. Evidence of injection is seen only for $x/d \leq 7.4$. For other injection locations with respect to the vortex core, evidence of injectant appears for x/d up to 96, and the injectant is not swept into the vortex upwash by secondary flows.

Also measured are secondary heat transfer peaks which appear for blowing ratios of 1.0 and 1.5.

Master of Science in
Mechanical Engineering
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A STUDY OF NATURAL CONVECTION COOLING OF MULTIPLE DISCRETE HEAT SOURCES IN A VERTICAL CHANNEL

Thomas D. Willson
Lieutenant Commander, United States Navy
B.S., Pennsylvania State University, 1975

Natural convection liquid cooling of simulated electronic components in a vertical channel was investigated. The test surface contained a single column of eight rectangular, protruding heated elements, each simulating a 20-pin dual-in-line package. Temperature measurements and flow visualization were performed for a number of power dissipation levels and channel widths. Collectively, this information was used in interpreting the flow and transport characteristics. A correlation to predict the heat transfer rates was developed based on the component surface temperatures. Optimum channel widths were determined from these surface temperature measurements for the range of power levels investigated. Temperature distributions in the fluid were measured using a traversing thermocouple probe.

Master of Science in
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MASTER OF SCIENCE
IN
METEOROLOGY

A STUDY OF A RAPID CYCLOGENESIS EVENT DURING GALE

Jeffrey L. Carson
Captain, United States Air Force
B.S., Pennsylvania State University, 1982

An explosive cyclone that developed during intensive observation period (IOP) 9 of the Genesis of Atlantic Lows Experiment (GALE) is studied. Detailed surface analysis is conducted based on operationally available data, late reporting ship observations and special observations acquired by GALE scientists to determine the surface storm track and deepening rate. GALE dropsonde and rawinsonde data are used to supplement the normal upper-level data base, and are analyzed by the Navy Operational Regional Analysis and Prediction (NORAPS) using optimal interpolation objective analysis. These analyses are discussed with special emphasis given to possible factors contributing to the explosive cyclogenesis. Factors that influenced the cyclone's rapid development include upper-level postive vorticity advection, low-level warm temperature advection and low-level instability. Vertical soundings and cross-sections utilizing the dropsonde and rawinsonde data are used to study the environment in which the rapidly deepening cyclone initially developed.

Master of Science in
Meteorology
June 1988

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THREE-DIMENSIONAL ANALYSIS OF SYNOPTIC SATELLITE AND CONVENTIONAL METEOROLOGICAL OBSERVATIONS

Douglas David Owen
Captain, United States Air Force
B.S., North Carolina State University, 1981

This thesis presents applications for three-dimensinal displays of clouds and conventional meteorological observations. Several views of a well developed squall line over the gulf of Mexico on 9 April 1984 are presented to demonstrate the effectiveness of an improved three-dimensional display process. The squall line is analyzed using enhanced GOES infrared imagery, space shuttle photography, and three-dimensional software to highlight the vertical structure of clouds. Also, a procedure to incorporate displays of atmospheric thermodynamic variables into the three-dimensional cloud displays has been developed. The surfaces added to the cloud displays include: constant height levels, constant pressure levels, and levels of constant potential temperature. These surfaces illustrate the usefulness of the display technique for analyzing the three-dimensional structure of the atmosphere. Additionally, a technique has been developed to use lifting condensation levels as a "first guess" for the base heights of the clouds. Cloud bases determined from lifting condensation levels represent a more realistic approach of determining cloud base topography than the previous method of using a single "flat base" for all the clouds in the three-

dimensional display. Detailed appendices are included to demonstate the software used and developed in this thesis.

Master of Science in
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March 1988

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STUDIES OF BAROTROPIC FLOW OVER TOPOGRAPHY USING A GALERKIN FINITE ELEMENT MODEL

Thomas I. Petroliagis
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B.S., Hellenic Air Force Academy, 1980
B.S., University of Thessaloniki, Greece, 1986

A finite element shallow-water model is tested with two types of surface topography. The model uses rectantular subdivisions in a vorticity-divergence formulation, and a semi-implicit time discretization. In the first experiment an east-west ridge or valley is placed in a channel with east-west periodic conditions. Linear quasi-geostrophic solutions are derived with the rigid lid assumption. The Rossby waves are successfully simulated in the model with linear solutions as the initial conditions. The model phase speeds are very close to the analytic values when the latter are properly corrected. In the second experiment a ridge is placed across the channel and the Coriolis parameter is set to zero. The initial conditions consist of a uniform flow through the channel and constant free-surface height. The numerical simulations agree with hydraulic jump theory. In the jump cases the model predicts increasing wind speeds and decreasing free surface heights. Higher spatial resolution would be required to properly simulate the details of the hydraulic jump formulation.

Master of Science in
Meteorology
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AN INVESTIGATION OF FINITE DIFFERENCE AND FINITE ELEMENT VERTICAL SCHEMES FOR THE BAROCLINIC PREDICTION EQUATIONS

Donn E. Sloniker
Captain, United States Air Force
B.S., Brigham Young University, 1978

The vertical discretization in a linearized baroclinic prediciton model was analyzed by comparing various finite element and finite difference solutions following Jordan (1985) and Shapiro (1987). The baroclinic instability experiments of Shapiro (1987) were augmented to include the unstaggered vertical scheme from Jordan (1985). Two basic wind profiles were used and the experiments were run with different resolution models and horizontal wavelengths. For a given wind profile and vertical resolution, different models performed better. The finite element models for the staggered vertical grids did not perform up to their possibilities due to the boundary elements. However, for the unstaggered vertical grid, the finite element model did better than the finite difference model in most cases.

Master of Science in
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MASTER OF SCIENCE
IN
METEOROLOGY
AND
OCEANOGRAPHY

THE PHYSICAL OCEANOGRAPHY OF THE NORTHERN BAFFIN BAY-NARES STRAIT REGION

Victor G. Addison, Jr.
Lieutenant, United States Navy
B.S., State University of New York, Stony Brook, 1979

A dense network of conductivity-temperature-depth (CTD) measurements was conducted from Baffin Bay northward to 82 09 N at the entrance to the Lincoln Sea, in the most comprehensive physical oceanographic survey ever performed in the northern Baffin Bay-Nares Strait (NBB-NS) region. These data indicate Nares Strait Atlantic Intermediate Water (NSAIW) and Arctic Basin Polar Water (ABPW) to be derived from Arctic Basin waters via the Canadian Archipelago, whereas the West Greenland Current (WGC) is the source of the comparatively dilute West Greenland Current Atlantic Intermediate Water (WGCAIW) and West Greenland Current Polar Water (WGGCPW) fractions. Baffin Bay Surface Water (BBSW) is found seasonally throughout northern Baffin Bay. Recurvature of component branches of the WGC, which attains a maximum baroclinic transport of 0.7 Sv, occurs primarily in Melville Bay (0.2 Sv), south of the Carey Islands (0.1 Sv) and ultimately in Smith Sound (0.2 Sv). The Baffin Current originates as an ice-edge jet in Smith Sound and is augmented by net outflow from Smith, Jones, and Lancaster Sounds at rates of 0.3 Sv, 0.3 Sv and 1.1 Sv, respectively. Circulation in Smith, Jones and Lancaster Sounds can be described in terms of the Geostrophic Estuarine

Circulation Model (GEC). The North Water is caused by the combined influences of near-surface layer enthalpy and mechanical ice removal.

Master of Science in
Meteorology and Oceanography
December 1987

Advisor: R.H. Bourke
Department of
Oceanography

THE EFFECTS OF TIME-DEPENDENT WINDS AND OCEAN EDDIES ON ICE MOTION IN A MARGINAL ICE ZONE

Jeffrey L. Barker
Lieutenant Commander, United States Navy
B.S., Georgia Institute of Technology, 1976

Observations made during the MIZEX program indicate the presence of mesoscale eddies in the ocean front at the marginal ice edge in the East Greenland Current. The eddies ranged in scale from 5 to 80 km. Barotropic and baroclinic instability may be the physical mechanisms responsible for the existance of such eddies. The observations also indicate transient wind reversals (3-10 m/s) with a frequency of several days. Here the effect of time-dependent winds and ocean eddies on ice motion in a marginal ice zone is studied. Results are obtained with a two-layer, nonlinear, primitive equation ocean model and a coupled free-drift ice model. The results indicate that ocean eddy signature in the ice edge is sensitive to cross-ice-edge motion induced by the winds and is shown to be dependent on magnitude, direction, and duration of the wind.

Master of Science in
Meteorology and Oceanography
December 1987

Advisor: D.C. Smith
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AN OBJECTIVE TECHNIQUE FOR ARCTIC CLOUD ANALYSIS USING MULTISPECTRAL AVHRR SATELLITE IMAGERY

John P. Barron
Lieutenant, United States Navy
B.S., United States Naval Academy, 1981

An established cloud analysis routine has been modified for use in the Arctic. The separation of clouds from the snow and sea ice backgrounds is accomplished through a multispectral technique which utilizes AVHRR channel 2 (visible), channel 3 (near infrared) and channel 4 (infrared) data. The primary means of cloud identification is based on a derived channel 3 reflectance image. At this wavelength, a significant contrast exists between liquid clouds and the arctic backgrounds, unlike in the standard visible and infrared images. The channel 3 reflectance is obtained by first using the channel 4 emission temperature to estimate the thermal component of the total channel 3 radiance. This thermal emission component is subsequently removed from the total radiance, leaving only the solar reflectance component available for analysis. Since many ice clouds do not exhibit a substantially greater reflectance in channel 3, the routine exploits differences in transmissive characteristics between channels 3 and 4 for identification. The routine was applied to six case studies which had been analyzed by three independent experts to establish 'ground truth'. Verification of the cloud analysis results, through a comparison to the subjective analyses, yielded impressive statistics. A success rate of 77.9% was obtained with an arguably small data base of 131 undisputed scenes. However, problems did arise with

the identification of ice clouds and the classification of ocean scenes covered by optically thin clouds.

Master of Science in
Meteorology and Oceanography
March 1988

Advisors: P.A. Durkee
C.H. Wash
Department of
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AN ANALYSIS OF RESULTS OF A HIGH-RESOLUTION WORLD OCEAN CIRCULATION MODEL

Wesley A. Barton
Lieutenant Commander, United States Naval Reserve
B.S., Rensselaer Polytechnic Institute, 1977

The results of a highly vectorized and multitasked model of the world ocean circulation have been analyzed. This model employs realistic physics, geometry, and forcing on a high-resolution grid. The model was run on the NCAR Cray X-MP/48 using a robust-diagnostic strategy. Twenty years of model integration using one-half degree horizontal resolution and 20 levels of vertical resolution were accomplished after 200 wall-clock hours at a maximum FORTRAN performance speed of 450 megaflops. Seven key regions of the world ocean were analyzed using an ocean model processor. A representation of the global ocean circulation emerged that compared well with observations and that included strong advective features, fronts, and subtropical meanders. A diagnostic analysis program was developed to analyze meridional heat and volume transports. The results in all basins appear to be reasonable when compared to the results of other studies. For example, an anomalous northward heat transport of 3.8×10^{14} W at 30°S in the South Atlantic compares favorably with the estimate of 4.2×10^{14} W at 32°S by Bennett (1978) using hydrographic data. The results of the simulations conducted in this study can be compared and

contrasted against the results of future eddy-resolving simulations.

Master of Science in
Meteorology and Oceanography
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Advisor: A.J. Semtner
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CHANGES IN THE CALIFORNIA CURRENT SYSTEM OBSERVED OFF NORTHERN CALIFORNIA DURING JULY-AUGUST 1986

Michael E. Beasley
Lieutenant, United States Navy
B.S., Auburn University, 1979

Changes in the flow pattern of the California Current System (CCS) in a relatively short time period (~ one week) are investigated. The offshore flow pattern changed orientation from southwestward to southward and a cool filament seen previously was no longer discernible. The nearshore flow pattern changed from a predominantly southward to a northward flow. The changes occurred between two OPTOMA cruises conducted in the summer of 1986. Two possible causes are investigated for these changes: 1) a change in the poleward undercurrent of the CCS, and 2) a change in the coastal winds. Analysis of cross-sections of the poleward undercurrent indicate that it remained subsurface throughout the cruises. Analysis of wind data indicate that southward winds were the dominant wind pattern throughout the first cruise. Wind data from a moored buoy off Point Arena indicate northward winds (i.e., wind reversals) following the first cruise, which could be associated with the changes in the flow patterns of the CCS.

Master of Science in
Meteorology and Oceanography
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Advisor: M.L. Batteen
Department of
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ATMOSPHERIC ANGULAR MOMENTUM AND LENGTH OF DAY

William L. Benedict
Commander, United States Navy
B.A., University of Michigan, 1971

Changes in the globally integrated absolute angular momentum of the atmosphere were computed from the Fleet Numerical Oceanography Center NOGAPS wind analyses and compared to astronomically measured changes in length of day (LOD) obtained from the U.S. Naval Observatory, Washington, D.C. The two time series were subjected to both time and frequency domain analysis. In the time domain, digital filters were used to isolate seasonal and subseasonal components. In the frequency domain, energy density, coherence and phase were computed over periods from 2 days to 1000 days. Over 90% of the total variance in astronomically determined LOD can be explained by meteorological phenomena. Fluctuations in LOD are coherent and in phase with fluctuations in the globally integrated angular momentum of the earth's shell (crust, mantle and oceans: liquid core is excluded) at almost all periods less than 365 days. Annual fluctuations in LOD appear to originate in the midlatitudes and propagate equatorward. Subseasonal fluctuations (30 to 100 day periods) appear to be a tropical phenomena.

Master of Science in
Meteorology and Oceanography
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Advisor: R.L. Haney
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OPTIMIZED OBSERVATION PERIODS REQUIRED TO ACHIEVE GEODETIC ACCURACIES USING THE GLOBAL POSITIONING SYSTEM

Richard H. Bouchard
Lieutenant, United States Navy
B.S., Lyndon State College, 1979

Measurements of a 1230-km baseline were made during an eight-week period in the fall of 1987 using Trimble 4000SX single-frequency, five channel Global Positioning System (GPS) receivers. Twenty-eight days of carrier phase data were processed using correlated triple differences with fixed satellite orbits, the broadcast ephemerides, a modified Hopfield tropospheric model, and without ionospheric correction to determine the accuracies and precisions of the slope distance to determine the optimized observation periods required to achieve various orders of geodetic accuracies.

The accuracies of the slope distances were better than 10 ppm for any observing period. The day-to-day repeatabilities of the slope distance measurements were better than 1.0 ppm (2σ) after 20 minutes of observations. Accuracies and repeatabilities (2σ) of the baseline components were better than 10.0 ppm after 20 minutes of observations. The correlated triple difference results were on the order of previous GPS surveys that used higher resolution differencing or external timing aids. Discussions include the effects of ephemeris, tropospheric and ionospheric errors, and dilution of precision.

Observation periods and mean slope distance errors were reduced when observations started close to and included the

infinite peak of the Position Dilution of Precision (PDOP). The smallest variances were associated with observations about the infinite PDOP peak.

Master of Science in
Meteorology and Oceanography
March 1988

Advisors: S.P. Tucker
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A NUMERICAL STUDY OF BAROCLINIC CIRCULATION IN MONTEREY BAY

Barry L. Bruner
Lieutenant, United States Navy
B.S., Arizona State University, 1980

The circulation of Monterey Bay is both variable and complex, and is likely to be significantly influenced by circulation in the adjacent California current. To study this circulation a two-layer, numerical model was used. The model was forced by inflow and outflow at an open boundary that connected the Pacific Ocean with the bay. Topography representing Monterey Canyon was included in the lower layer of the model. The effects of wind and tidal forcing were not considered. Results indicate that surface circulation is strongly constrained by topography when the lower layer flow is 5 cm/sec or larger and that the flows within the bay are consistent with geostrophic, vorticity-conserving flow over bottom topography. The sensitivity of the model to the distribution and strength of inflow and outflow forcing location was investigated. The model was found to be sensitive to the location of inflow and outflow forcing and also to the inflow and outflow vertical structure.

Master of Science in
Meteorology and Oceanography
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Advisor: D.C. Smith
Department of
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A NUMERICAL STUDY OF EDDY INTERACTIONS WITH A BAROTROPIC OCEANIC JET

George Preston Davis, Jr.
Lieutenant, United States Navy
B.S., United States Naval Academy, 1981

Mesoscale vortices generated by western boundary currents are well observed and documented, particularly in the case of the Gulf Stream System. The movement of these rings in the region of the Gulf Stream is well studied and has been ascribed to the following physical mechanisms: (1) the beta effect on an isolated ring, (2) advection of a ring in a recirculation regime, (3) downstream advection of a ring in contact with a jet, and (4) vorticity advection associated with the jet and eddy interaction.

Utilizing a two layer, nonlinear primitive equation model, an examination of eddy movement, is conducted, with focus on eddy/jet interaction. A series of numerical experiments is performed in which the initial separation distance between eddy and jet is varied. The model demonstrates that vortex movement is strongly related to the proximity of the vortex to the jet. It also is demonstrated that observed movement is not solely dependent on the beta effect nor on advection due to recirculation.

Master of Science in
Meteorology and Oceanography
June 1988

Advisor: D.C. Smith, IV
Department of
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PARAMETERIZATION OF HORIZONTAL WIND VELOCITY VARIABILITY

Timothy Joseph Dowding
Lieutenant, United States Navy
B.S., United States Naval Academy, 1978

Longitudinal and transverse horizontal wind velocity variability is parameterized based on data collected for the Bureau of Land Management (BLM) between 1980 and 1982. The BLM data sets were used to derive horizontal wind velocity components and standard deviations of these components in the longitudinal (downwind; u, σ_u) and transverse (crosswind; v, σ_v) directions for various time averages. The standard deviations were plotted versus wind speed so that trends in the change of values could be determined. A methodology was used to develop a theoretical algorithm to account for turbulence production mechanisms due to shear, buoyancy and mesoscale processes. Empirical fits were determined for both the u and v wind directions over four different time averages. The results were related to puff growth in the x, y directions and form the basis for improving a puff dispersion model for near-coast overwater regions.

Master of Science in
Meteorology and Oceanography
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Advisor: G.E. Schacher
Dean of Science
and Engineering

THE SEA BREEZE CIRCULATION DURING THE LAND/SEA BREEZE EXPERIMENT (LASBEX) IN CENTRAL CALIFORNIA

Michael Fagan
Lieutenant, United States Navy
B.S., United States Naval Academy, 1981

The sea breeze circulation was investigated using a combination of acoustic doppler sodar, lidar and conventional observations in central California on the coast of Monterey Bay in September 1987. The study was called LASBEX (Land Sea Breeze EXperiment) and used the combined effort and resources of the Naval Postgraduate School (NPS), NOAA Wave Propagation Lab (WPL) and Naval Environmental Prediction Research Facility (NEPRF).

A monostatic three-axis phased-array doppler sodar was able to detect the various features of the sea breeze front, which has many of the characteristics of a gravity head current produced in laboratory experiments, such as the longitudinal vortex, lobe and cleft structure, and strong regions of turbulence and convergence. Profiles of the wind field and its component variances were generated every five minutes. Vertical velocities up to 1.0 m/s were detected in the updraft region at the front. Vertical velocity fields were used to derive the horizontal divergence associated with the sea breeze and values of convergence in the range of $4 \times 10^{-3} s^{-1}$ and greater were calculated. These are believed to be more accurate values than any found in previous sea breeze studies.

Doppler lidar radial velocity information was useful in mapping the various layers and wind structure of the sea breeze.

The wind field of the sea breeze seen by the lidar was compared with the sodar. Th results of this comparison showed that the sodar was well suited to investigate features under 600 meters in height, such as the updraft region behind the front and the variance of the wind, whereas the lidar was better at describing the larger scale flow, such as the return flow of the sea breeze, the convergence zone along the sea breeze front and prevailing synoptic winds. Together, these instruments gave a comprehensive and complete description of the sea breeze frontal structure, evolution and movement.

Master of Science in
Meteorology and Oceanography
September 1988

Advisor: W.J. Shaw
Department of
Meteorology

THE TEMPORAL AND SPATIAL VARIABILITY OF THE MARINE ATMOSPHERIC BOUNDARY LAYER AND ITS EFFECT ON ELECTROMAGNETIC PROPAGATION IN AND AROUND THE GREENLAND SEA MARGINAL ICE ZONE

Douglas J. Groters
Lieutenant, United States Navy
B.S., United States Naval Academy, 1982

The variability of the marine atmospheric boundary layer (MABL) and its effect on the electromagnetic (EM) refractive structure around the Greenland Sea marginal ice zone were examined. Rawinsonde profiles and surface observations collected from three ships during MIZEX-87 (20 March-11 April) served as the data set for the examination. A program was developed to calculate the refractivity at each vertical level of the rawinsonde profiles. The program also identified the levels at which trapping, superrefraction and subrefraction occurred.

Temporal studies showed that a higher incidence of anomalous refractive layers occurred during periods when the region was under the influence of high pressure. More than 50% of the time, trapping and super-refractive layers were attributed to the development of a capping inversion just above the MABL during these periods.

Spatial studies showed that the refractive structure varied relative to distance from the ice edge as did the depth of the MABL. An upward slope in refractive layer heights was observed from the ice toward the open water. Significant spatial inhomogeneity was observed over horizontal ranges of less than 100 km. This was attributed both to the large-scale synoptic

forcing affecting the region and to variations in the surface fluxes of heat and moisture over the ice and over the water. A range-dependent ray trace model developed at the Naval Ocean Systems Center was used to show how the ray paths of EM waves vary with a changing refractive structure.

Master of Science in
Meteorology and Oceanography
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Advisor: W.J. Shaw
Department of
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A PROTOTYPE EXPERT SYSTEM TO FORECAST TYPHOON CONDITIONS AT CUBI POINT, PHILIPPINES

Bruce M. Hagaman
Lieutenant, United States Navy
B.S., United States Naval Academy, 1981

A prototype expert system is designed to forecast the tropical cyclone related winds that may be used to set Conditions of Readiness (COR) at Cubi Point, Philippines. One set of rules modifies the storm position and strength forecasts to account for terrain interactions while crossing the Philippines. A second set estimates the local winds given the modified storm position and intensity.

Tests using an independent storm set indicate the terrain-modified positions are comparable in accuracy to current Joint Typhoon Warning Center forecasts. However, the reduction of storm intensity due to terrain is underestimated and the westward translation of the storm is reduced too much. Finally, the conservative strategy of using worst-case wind gust estimates also contributes to an overprediction of the local winds and thus the COR. COR estimates are only 32% accurate, with a 95% capture rate for winds over 35 kt but a 70% false alarm rate due to overforecast of winds under 35 kt. More dynamic/statistical study appears to be required to refine the terrain-modification algorithm. Empirical rules from expert forecasters should be included in future systems.

Master of Science in
Meteorology and Oceanography
September 1988

Advisor: R.L. Elsberry
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ENVIRONMENTAL INFLUENCES ON THE PRODUCTION OF ARCTIC HALOCLINE AND DEEP WATER

James A. Hill
Lieutenant, United States Navy
B.S., San Houston State University, 1979

Pease (1987) related the effects of atmospheric forcing, mainly temperature and wind fields, to the size of coastal polynas. Using Pease's formulation and Killworth's (1977) plume model as applied by Melling and Lewis (1982), the effects of atmospheric forcing on brine injection into the Arctic pycnocline are investigated. This paper will discuss the likelihood of coastal polynas as a source for denser abyssal waters.

A standard case was developed for the model with initial conditions taken from Melling and Lewis (1982) and Pease (1987) for comparison with individual sensitivity experiments. Ten environmental parameters were individually examined for their influence on the plume depth after 90 days. The standard case resulted in a 90-day plume depth of 436 meters. A submarine canyon case was simulated, resulting in plume penetration to over 1300 meters in 90 days. Further experiments used actual T-S soundings from Aagaard et al. (1981) and Ostlund et al. (1987). Finally, a 20 kilometer wide plume is shown to penetrate to almost 600 meters in 90 days.

Master of Science in
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Advisor: A.J. Semtner
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NUMERICAL OCEAN PREDICTION IN THE CALIFORNIA COASTAL REGION USING A HIGH-RESOLUTION PRIMITIVE EQUATION MODEL

Clifford D. Johnson
Lieutenant Commander, United States Navy
B.S., University of Washington, 1977

A high resolution, multi-level, primitive equation (PE) model of the California coastal region is initialized with a temperature field analyzed from real data collected during the OPTOMA II cruises of June and July, 1984, for the purpose of forecasting the movement of thermal features in the region. The results are compared to the observations and to the forecast experiments of Rienecker et al. (1987), since they initialized their quasi-geostrophic (QG) model with the same OPTOMA II temperature data. Key prediction features include an anticyclone and cyclone pair, and an offshore "jet" that was formed between the pair with velocities on the order of 60 cm/sec in the upper ocean region (<225m). The temperature front associated with this "jet" is traced at the 85 m level, in a time series from day 0 to day 14, as is the perturbation pressure field. Translational velocities of this frontal feature are on the order of 5-10 cm/sec in a southward direction, which is consistent with those observed. Some quantitative differences between the PE model prediction and the QG model are found. Based on these results, it s feasible that frontal movement in the California coastal region can be forecast by a multi-level, high resolution PE

model, given synoptic data for initialization. However, many more studies are needed to understand the dynamics and robustness of the present model predictions.

Master of Science in
Meteorology and Oceanography
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DISCRETE PRECIPITATION EFFECTS ON SEASONAL MIXED LAYER DYNAMICS IN THE NORTH PACIFIC OCEAN

Mendal S. Livezey
Lieutenant, United States Navy
B.S., Indiana University, 1981

This study was conducted to examine the effects of discrete precipitation events on the short-term and seasonal evolution of ocean mixed layer temperature and salinity structure. This study was located at Ocean Station "P" (50^{o}N, 145^{o}W) in the Northeast Pacific Ocean. Two numerical modeling experiments were performed. The first was to simulate the response of the mixed layer to hypothetical discrete (isolated) precipitation events. This experiment showed that the effect of a single discrete rain event can vary with season, with the mixed layer depth (MLD) at onset of the rain event, and with the strength of wind stress forcing. A single rain event can have lasting effects on mixed layer depth and temperature for up to 55 days after the event, depending upon the season.

The second experiment simulated quasi-realistic "complex" precipitation forcing, with a realistic distribution of synoptic events over a 13-month period. For this experiment, four different precipitation "intensities" were tested. The values of temperature, salinity, and MLD predicted by the model were compared with observed Conductivity Temperature Depth measurements and with the values predicted using constant precipitation forcing. In all experiments, the modelled MLD's approximated the observed MLD and temperature cycle. MLD's for all cases were too deep while temperature was estimated well in

winter and was too cool in summer. Predicted salinity provided the greatest discrepancy between the modelled and the observed cycle. The 96 cm/400-day quasi-realistic precipitation forced case best approximated the salinity observations though predicted salinity was fresher than observed in winter and saltier than observed in summer. Model results suggest that the amount of precipitation observed at Ocean Station "P" was too low to explain the observed and simulated ocean salinity and temperature structure for the year.

Master of Science in
Meteorology and Oceanography
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Advisors: R.W. Garwood
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MULTISPECTRAL SATELLITE ANALYSIS OF MARINE STRATOCUMULUS CLOUD MICROPHYSICS

Gary M. Mineart
Lieutenant, United States Navy
B.S., Iowa State University, 1980

Variations in marine stratocumulus cloud microphysics during FIRE IFO 1987 are observed and analyzed through the use of NOAA-9/10 AVHRR satellite data and aircraft in-cloud measurements. The relationships between channel 3 reflectances and cloud microphysical properties are examined through model reflectances based on Mie theory and the delta-Eddington approximation, and reveal a channel 3 reflectance dependence on cloud droplet size distribution. The satellite observations show significant regions of continental influence over the ocean through higher channel 3 reflectances resulting from the injection of continental aerosols and the associated modification of cloud droplet characteristics. Additionally, channel 3 reflectance gradients across individual could elements correspond to radially varying cloud droplet size distributions within the elements. Various mesoscale and microscale features such as ship stack effluent tracks and pollution sources are observed in the data. Correlations between reflectance values and aircraft measurements illustrate the potential of estimating cloud droplet size distribution and marine atmospheric boundary layer aerosol composition and concentration through the use of satellite data. Such an estimation technique may prove useful in determining the climatic implications of cloud reflectance changes due to the

influence of natural and man-made aerosol sources, and provide a means to assess the performance of boundary layer electro-optic systems.

Master of Science in
Meteorology and Oceanography
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Advisor: P.A. Durkee
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Meteorology

SHIP TRACK CLOUD ANALYSIS FOR THE NORTH PACIFIC AREA

Steven Emory Morehead
Lieutenant, United States Navy
B.S., UCLA, 1980

Anomalous cloud lines produced by stack exhaust from ships in the North Pacific Ocean basin are analyzed. These cloud lines or "ship tracks" are observed most clearly in the channel 3 near-infrared satellite imagery obtained from the NOAA-9 AVHRR sensor. The ship tracks are produced as hot exhaust gases are expelled into the atmosphere creating an aerosol concentration higher than background areas. These aerosols serve as cloud condensation nuclei (CCN) and cause a shift in the cloud droplet distribution to a higher concentration of smaller droplets. Channel 3 AVHRR data are sensitive to cloud droplet size and show these ship tracks as an increase in radiance.

An existing ship track detection algorithm is examined and improvements are developed and evaluated. The existing algorithm works well in areas with uniform cloud cover which contain well defined ship track cloud lines. However, it begins to break down in areas with no ship tracks, cloud free areas and regions of transition from one could regime to another. An improved algorithm is developed which is able to improve the analysis in these problem areas. Comparison of this algorithm with the original algorithm shows a twofold increase in the percentage of valid ship tracks detected. Neither algorithm is capable of fully representing all the ship track pixels in a given image but the feasibility of this type of analysis is clearly shown. The

detection algorithm is also adapted to evaluate large scale areas of data as a precursor to the development of a ship track cloud climatology for the North Pacific Ocean. While computer processing time becomes a limitation, some ability is shown for the analysis of large scale areas.

Master of Science in
Meteorology and Oceanography
September 1988

Advisors: P.A. Durkee
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Meteorology

AN ANALYSIS OF HORIZONTAL TEMPERATURE GRADIENTS AND HEAT CONTENT IN THE MIXED LAYER AND OF THE SURFACE FORCING DURING PATCHEX

John J. Murray
Lieutenant, United States Navy
B.S., Florida Institute of Technology, 1979

This study is an analysis of high resolution measurements taken during the PATCHEX experiment. PATCHEX was designed to study shear related mixing in the upper thermocline. As a participant in the study, the R/V POINT SUR's contribution was to survey an 8 kilometer square area centered on the R/P FLIP which was moored at $34^{o}N127^{o}W$. The survey which was conducted from 4-16 November 1986, gathered high resolution CTD, microconductivity and current velocity data to allow a detailed analysis of the small scale dynamics and thermohaline structure of the site. The thesis examined a subset of the R/V POINT SUR measurements to describe the vertical and horizontal thermohaline structure, surface fluxes and heat content of the upper 120 meters at the PATCHEX site.

A two-layer mixed layer system existed during the first half of the study period due to the effects of precipitation, a 0.1 N/m^2 mean wind stress and strong diurnal heating. A 0.04 to 0.06 ppt salt deficit and $0.25^{o}K$ temperature excess were measured in the surface layer which ranged from 10 to 35 meters depth. The depth of the seasonal mixed layer varied between 42 and 62 meters in response to the internal wave field in the upper thermocline.

Significantly different horizontal gradients were analyzed in the time series of temperature and salinity at 10 meters and 40

meters. This motivated an attempt to map those gradients on to a uniform grid by objective analysis. Th horizontal gradients at 10 meters were determined to decrease most rapidly toward the southeast corner of the survey area. Weaker gradients at 40 meters increased nominally from west to east. This further illustrated the decoupling of the upper and lower layers from 6-12 October.

Convective mixing from a 100 W/m^2 mean daily maximum latent heat loss combined with a 75 percent insolation reduction erased the surface layer on 8 and 9 October and continued cooling the entire layer. A net surface heat loss of 35 ± 5 MJ/m^2 (0.7 ± 0.1 MJ/m^3 through the surface) balanced a 0.6 to 0.8 MJ/m^3 overall mixed layer heat loss. This confirmed that the surface flux was the dominant heat transfer mechanism from 8-12 October.

Master of Science in
Meteorology and Oceanography
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Advisor: T.P. Stanton
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THE CLIMATOLOGICAL SEASONAL RESPONSE OF THE OCEAN MIXED LAYER IN THE EQUATORIAL AND TROPICAL PACIFIC OCEAN

Harry J. Ries, Jr.
Lieutenant, United States Navy
B.A., Pennsylvania State University
University Park, Pennsylvania, 1979

The seasonal changes of mixed layer depth (MLD) can be related to the forcing by net surface heating and wind speed. This is shown in this study by comparing the monthly mixed layer depth from temperature profiles in the Bauer-Robinson Numerical Atlas with monthly net surface heating and wind speed obtained from the Weare Marine Climatic Atlas of the Tropical Pacific Ocean. Using a conceptual model based on mixed layer physics, ocean response and atmospheric forcing are examined using the Obukhov mixing length. A pattern in the seasonal variation of upwelling along the Equator is also examined. The model links the atmospheric and oceanic climatologies through the derived MLD (oceanic data) and Obukhov mixing lengths (forcing data). The results show a high degree of pattern similarity between the seasonal response of the ocean and the seasonal changes in atmospheric forcing. The pattern of seasonal influence of MLD at the Equator is very weak in comparison to that of the tropics and sub-tropics.

Master of Science in
Meteorology and Oceanography
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Advisor: R.W. Garwood
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METEOROLOGICAL FEATURES DURING THE MARGINAL ICE ZONE EXPERIMENT FROM 20 MARCH TO 10 APRIL 1987

Ryan R. Schultz
Lieutenant, United States Navy
B.S., United States Naval Academy, 1981

Described are synoptic and mesoscale meteorological conditions which occured during the Marginal Ice Zone Experiment (MIZEX-87) conducted from 20 March to 10 April 1987 in the marginal ice zone (MIZ) of the Greenland Sea (Fram Strait). Meteorological measurements were made from three ships and weather analysis and ice edge location analysis were provided by shore meterological support at Tromso, Norway.

MIZEX 1987 is separated into five periods with distinct meteorological conditions. In the first period, from 20 to 23 March, the MIZ region was dominated by a large scale surface high pressure system. During the second period, from 24 to 27 March, a mesoscale boundary-layer front dominated the MIZ. This front was the object of a more detailed case study. During the third period, from 28 to 31 March, a weak surface synoptic scale low pressure system dominated the MIZ. During the fourth period, from 1 to 3 April, a low developed 100 km east of Greenland and subsequently moved to the east, filling when it reached central Norway. During the fifth and final period, from 4 to 10 April, two lows developed 100 km north of Iceland which traveled northeastward along the classic secondary climatological storm track to a position 100 km southwest of the Svalbard Islands. When the first low of this fifth period stalled and was overtaken

by the second low of this fifth period a combined and considerably enhanced system developed which extended along the west coast of the Svalbard Islands to the Norwegian Sea. All described features appeared clearly on NOAA 9 and 10 imagery and surface sensed properties are related to the satellite sensed properties.

Master of Science in
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Advisor: K.L. Davidson
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SYNOPTIC PATTERNS RELATED TO TROPICAL CYCLONE RECURVATURE

Brett T. Sherman
Lieutenant Commander, United States Navy
B.S., State University of New York, Stony Brook, 1972

Relative vorticity fields calculated from the U.S. Navy operational Global Band Analysis are used to relate synoptic and storm parameters to the track of tropical cyclones in the western North Pacific Ocean. In this preliminary study, synoptic patterns are developed, described and discussed from the perspective of a pattern recognition technique to assist the forecasters at the Joint Typhoon Warning Center, Guam. The focus is on track turning motions to the left and right of the persistence track and on trying to accurately predict the point of the turn or recurvature in relation to the time evolution of the vorticity patterns. The developmental sample of storms indicates that there is potential for using synoptic patterns in the Global Band Analysis to guide the selection of the appropriate track aid in the 48-60 hour time range.

Master of Science in
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Department of
Meteorology

MARINE BOUNDARY LAYER DEPTH AND RELATIVE HUMIDITY ESTIMATES USING MULTISPECTRAL SATELLITE MEASUREMENTS

Steven P. Smolinski
Lieutenant Commander, United States Navy
B.A., University of Virginia, 1978

A technique is presented to estimate surface relative humidity and boundary layer depth from multispectral satellite measurements using the AVHRR sensor on TIROS-N generation satellites. A sensitivity study quantifies the effect of a combination of input measurement errors of sea-surface temperature, optical depth and total water vapor used in the technique to produce outputs of surface relative humidity and boundary layer depth under simulated conditions and model atmospheres. Technique verification is then accomplished with satellite data compared to ship and aircraft vertical soundings and sea-surface temperature measurements. The root mean square differences between the surface relative humidity boundary layer depth satellite-measured estimates and verified measurements are 6% and 75 m respectively. Finally, synoptic-scale mapping of the surface relative humidity and boundary layer depth on the order of kilometers can be visually detected from these images.

Master of Science in
Meteorology and Oceanography
March 1988

Advisor: P.A. Durkee
Department of
Meteorology

SEA SURFACE TEMPERATURE AND SALINITY STRUCTURE OF COLD UPWELLING FILAMENTS NEAR POINT ARENA AS OBSERVED USING CONTINUOUS UNDERWAY SAMPLING SYSTEMS

Richard L. Snow
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1976

Three quasi-synoptic maps of the surface expression of cold filaments off Point Arena, California were made during a pilot program cruise for the Coastal Transition Zone Experiment from 15-28 June 1987. This study provides a description of the sea surface temperature and salinity fields as observed by the continuous underway sampling system installed onboard the R/V POINT SUR.

Transects across the survey region revealed the presence of three distinct filaments. Filament A was typically ~ 100 kilometers in width, extended ~ 300 kilometers offshore and was characterized by 12.5-13.0^{o}C temperatures and 32.7-33.0 o/oo salinities. It was observed as a persistent feature throughout the survey period. Imbedded within filament A were two smaller features. Filament B was 25-30 kilometers wide and appeared from imagery to have originated from the north near Cape Mendocino. It was characterized by a 12.0^{o}C and 32.7 o/oo signature. Filament C was a narrow, cold, more saline core of water originating in the coastal upwelling region near Point Arena. It was typically 15-25 kilometers wide with temperatures from 10.8-11.3^{o}C and salinities greater than 33.0 o/oo It's surface signature was transient with a 6-10 day lifetime.

All of the observed filaments had boundaries characterized by strong surface temperature gradients ranging from 0.23 to $1.66^{o}Ckm^{-1}$. The gradient at the southern boundary of the filaments was much stronger than the gradient at the northern boundary. Anomalous heating of the sea surface was observed during one transect where the maximum difference between the skin temperature and the two meter temperature was $4.7^{o}C$. This difference can be accounted for by solar heating of a surface microlayer less than two meters deep.

Master of Science in
Meteorology and Oceanography
June 1988

Advisor: S.R. Ramp
Department of
Oceanography

STRATOCUMULUS AND CLOUD-FREE REFLECTANCE FROM MULTI-SPECTRAL SATELLITE MEASUREMENTS

Frederic M. Tettelbach, Jr.
Lieutenant, United States Navy
B.S., United States Naval Academy, 1981

A summary of the multi-spectral radiative characteristics of marine stratocumulus clouds and pre-cloud suspended aerosols was compiled for August 1986 over the offshore regions of the North American west coast. NOAA-9 AVHRR data were utilized at Channel 1 visible (0.63) μm), Channel 2 red visible/near infrared (0.90 μm), Channel 3 near infrared (3.7 μ m), and Channel 4 thermal infrared (11.0 μm) wavelengths. Stratus cloud pixels and cloud-free area pixels were identified within the data set, and average radiation parameters with associated standard deviations were calculated for the two pixel classifications. The Channel 3 radiance values were reduced to reflectances through a unique procedure that removed the emittance from the total radiance using the detected Channel 4 emittance. Additionally, radiance ratios were determined that compared Channel 1 to Channel 2 reflectances and Channel 1 to Channel 3 reflectances. Significant results included a concentration of high cloud-free Channel 1/Channel 2 reflectance ratios (greater than 1.70) along the entire continental coast, implying the presence of a large number of smaller (less than 1 μ m, continental-like) suspended aerosols relative to aerosols over the Pacific Ocean with reflectance ratios less than 1.60 (marine-like). Stratocumulus cloud characteristics were derived from the cloud Channel 1/Channel 3

reflectances ratios. Lower ratios implied relatively thin, dry stratus with a low liquid water content (low Channel 1 reflectance) and a greater number of smaller cloud droplets (high Channel 3 reflectance). Low reflectance ratios (less than 2.50) were observed for stratus generally in the same location and downwind of continental-like aerosols. A distinct correlation exists between the aerosols acting as CCN and the stratus that develops along the coast. Observations of sea surface temperatures (SST), coastal clearing, and stratus persistence and coverage are also described.

Master of Science in
Meteorology and Oceanography
December 1987

Advisor: P.A. Durkee
Department of
Meteorology

WIND FORCING OF EDDIES AND JETS IN THE CALIFORNIA CURRENT SYSTEM

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B.S., United States Naval Academy, 1976

A high-resolution, multi-level, primitive equation ocean model is used to examine the response to wind forcing of an idealized flat-bottomed oceanic regime along an eastern ocean boundary. A band of steady winds, either with or without a curl, is used as forcing on both an f-plane and a β-plane. In addition, a stability analysis is made to determine if the necessary and sufficient conditions for instability processes to occur are satisfied. It is seen that when the wind driven coastal jet and undercurrent are unstable (which occurs in the cases of wind with no curl), eddies and jets are generated. In the case of wind with curl, since the Davidson Current develops rather than the coastal jet and undercurrent, no eddies develop. A comparison of model results with available observations shows that both the time-averaged and instantaneous model simulations of the coastal jet, undercurrent and eddies are consistent with available observational data. The results of this study support the hypothesis that wind forcing can be an important eddy generation mechanism for the California Current System.

Master of Science in
Meteorology and Oceanography
June 1988

Advisor: M.L. Batteen
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Oceanography

THE SPATIAL AND TEMPORAL VARIABILITY OF THE ARCTIC ATMOSPHERIC BOUNDARY LAYER AND ITS EFFECT ON ELECTROMAGNETIC (EM) PROPAGATION

Zdenka S. Willis
Lieutenant, United States Navy
B.S., University of South Carolina, 1981

Gradients of temperature, pressure and moisture affect the propagation of electro-magnetic (EM) waves. Navy systems which are dependent on EM propagation can be either enhanced or degraded due to atmospheric conditions which affect atmospheric refractive index profiles. The Navy's model for predicting the refractive indexes is the Integrated Refractive Effects Prediction System (IREPS) version 2.2, developed by Naval Ocean Systems Center (NOSC). Atmospheric parameters of temperature, vapor pressure and relative humidity - with relative humidity being the most critical - are used by IREPS to predict the atmospheric refractivity.

Data collected in the Fram Strait during MIZEX-84 (18 June-15 July) showed that the refractive structure varied over the ice, the MIZ and the water adjacent to the ice edge. Spatial studies showed that the average values of duct height, thickness and strength were lower over the pack ice and the MIZ than over the water. A large increase in these values were seen as one travels away from the ice in the adjacent water. Little spatial homogeneity was seen in the refractive conditions. Ducting was clearly dependent on the synoptic situation. A majority of the ducts were detected when high pressure dominated. No ducts were

recorded when a cyclone moved directly over the ships. Stationarity was present to a limited degree.

A significant number of profiles showed an unusual feature of the dewpoint curve in that, once it became saturated below the inversion, this curve continued to indicate saturation above the inversion. It could not be determined whether this was solely due to a sensor problem or a real meteorological phenomenon. Therefore, the data were analyzed with and without correction for this behavior.

Master of Science in
Meteorology and Oceanography
December 1987

Advisor: W.J. Shaw
Department of
Meteorology

MASTER OF SCIENCE
IN
OCEANOGRAPHY

EVAPORATION EFFECTS ON THE MEDITERRANEAN SEA MIXED LAYER DYNAMICS

Ahmet Turker
Lieutenant, Turkish Navy
B.S., Naval Academy, 1982

The OPBL (Oceanic Planetary Boundary Layer) model is used to determine the relative effects of the seasonally varying surface fluxes of heat, salt and momentum on the seasonal thermocline and mixed layer in the Mediterranean Sea. Three combinations of surface forcing are tested to find their relative contributions to mixing. In the first case free convection forcing and, in the second case wind forced convection and case free convection forcing and, in the second case wind forced convection and buoyancy flux due only to heat are considered to determine their individual effects on the mixed layer deepening. Then in the third case both free and wind forced convections are applied to the model to order to determine their combined effect on the mixed layer depth.

As a result, evaporation is shown to have a significant impact on the mixed layer deepening and on the temperature and salinity structure of the seasonal pycnocline. It has been shown that deepening due to evaporation exceeds the deepening due to wind stress between October and January. In the late winter the strong, cold dry winds from North to Northwest (Mistral, Tramontane) causes forced convection which exceeds the deepening due to evaporation at this time of the year.

Master of Science in
Oceanography
September 1988

Advisors: R.W. Garwood
P. Chu
Department of
Oceanography

MASTER OF SCIENCE
IN
OPERATIONS RESEARCH

THE EFFECT OF THE COVARIANCE FACTOR ON THE PROCUREMENT PROBLEM VARIANCE OF NET LEADTIME DEMAND

Keith T. Adams
Lieutenant Commander, United States Navy
B.S., Purdue University, 1973
M.E., University of Missouri, 1975

An analysis is made of the formulae used by the Navy's Inventory Control Points in calculating the variance of Net Leadtime Demand of repairable items. A new formula is then derived, which makes use of actual calculations of covariance between regenerations and demands. The resulting variance values derived from the new formula are compared with the variance values resident on the Navy's Ships Parts Control Center data base and are shown to produce lower variances. The new formula is also compared to the option path formula to determine which formula produces the smallest variance. The comparison suggests an underestimation of variance results when the option path with its estimate of the covariance is used. The thesis concludes with recommendations for implementation of the new formula.

Master of Science in
Operations Research
September 1988

Advisor: A.W. McMasters
Department of
Operations
Research

ANALYTICAL EVALUATION OF UNREP METHODS USING THE MODEL BFORM

Steven L. Barnaby
Lieutenant, United States Navy
B.S., Pennsylvania State University, 1982

This thesis measures the operational cost to the battle group due to refueling, using an Average on Station Time (AST) as the measure of effectiveness. Present day ship characteristics and capabilities are used. Three generic battle group formations are examined, each of which looks at both an extended and a close-in formation. The commodity considered is fuel (DFM and JP-5). Variables evaluated included Speed of Advance (SOA), UNREP speed, and method of UNREP.

Using the results from a model called BFORM, the thesis gives an analytical evaluation of the trade offs between two methods of UNREP (delivery boy and service station). Results show quantitatively the extent of the advantage of the delivery boy method over the service station method. The advantage held for all circumstances investigated. Another major study focus was on AOE idle time. Whenever idle time is greater than 15% over a ten day period the formation can be serviced, no matter how many ships are involved, how wide their separation, or how great the SOA.

Master of Science in
Operations Research
September 1988

Advisor: W.P. Hughes
Department of
Operations
Research

SMALL SAMPLE PROPERTIES OF BOOTSTRAP

Stefan Bernhardt
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Dipl. Ing., Federal Army College Darmstadt, West Germany, 1981

The Bootstrap method is a nonparametric statistical technical for estimating the sampling distribution of estimators of unknown parameters. While the asymptotic theory for bootstrap is well established, this thesis investigates the behavior of the bootstrap for small sample sizes. For the exponential distribution and for normal linear regression the bootstrap estimates of the parameters and their variances are compared with the theoretical sampling distributions. The small sample properties of bootstrap confidence intervals using the percentile method and the bias-corrected percentile method are also investigated.

Master of Science in
Operations Research
September 1988

Advisor: T. Jayachandran
Department of
Mathematics

AN ANALYSIS OF BUILDING A SUBMARINE BASE IN THE ARCTIC

Truman J. Best
Lieutenant, United States Navy
B.S., United States Naval Academy, 1981

This thesis addresses the feasibility of constructing and operating a U.S. submarine base in the Arctic. Location, command and control, force operation, logistic support and appropriate force size are elements that are considered. Included in the thesis is a limited cost effectiveness analysis which suggests that such a base would not be cost effective for peacetime activities but would likely be cost effective in a conflict with the Soviet Union.

Master of Science in
Operations Research
March 1988

Advisors: R.N. Forrest
D.C. Boger
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Operations Research

THE VISIOCEILOMETER AND ITS TACTICAL APPLICATIONS

Mary A. Bridges
Captain, United States Army
B.S., South Carolina State College, 1976
M.A., Webster College, 1979

This thesis investigates the tactical applicability of the visioceilometer in terms of its ability to measure visual range and to identify the density level of an obscurant. This is accomplished by analyzing test data obtained from Smoke Week VIII tests conducted at Eglin Air Force Base, Florida. Thirty smoke clouds from a total of seven obscurants are examined. The accuracy and consistency of agreement between the visioceilometer and the multispectral imagery digital acquisition system (MIDAS) measurements of visual range is examined. The visioceilometer and a human observer identification of the density level of an obscurant is compared to examine the agreement between the two.

Master of Science in
Operations Research
December 1987

Advisor: H.J. Larson
Department of
Operations
Research

AN ALGORITHM FOR GENERATING SHIP SCHEDULES FOR A CRISIS DEPLOYMENT PROBLEM

Svein Buvik
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B.S., Norwegian Naval Academy, 1980

A deployment is the movement of armed forces from their home bases to their strategic locations. The movement of these forces usually involves the transportation of military personnel as well as equipment and supplies. In a crisis situation, it is essential that the deployment is carried out in an expeditious manner.

This study considers the problem of constructing a deployment plan for sealift assets which transport military personnel, equipment, and supplies to their designated location in the least amount of time. In the construction of such a plan, feasible transportation schedules for each asset must be specified. When the number of movement requirements is large, the problem of arranging schedules for the assets is nontrivial. This thesis, therefore, describes an algorithm to generate these schedules. Based on several examples, this algorithm is shown to be effective and can be used in conjunction with algorithms for solving the overall deployment problem as well.

Master of Science in
Operations Research
September 1988

Advisor: S. Lawphongpanich
Department of
Operations
Research

A GAMS-BASED MODEL OF THE U.S. ARMY WARTIME AMMUNITION DISTRIBUTION SYSTEM FOR THE CORPS LEVEL

Mark J. Cain
Captain, United States Army
B.A., Eastern Washington University, 1978

The U.S. Army Wartime Ammunition Distribution System (WADS) will experience an unprecedented demand for ammunition under the operational concept of Airland Battle. To meet demand, proper storage facility location and an efficient flow through the distribution network will be required.

Using information from Army Field Manuals, maps and simulation data for demand, both a mixed integer program (MIP) and a sequential, optimization-based heuristic are developed to model the WADS. The Generalized Algebraic Modeling System is used to implement both models. The sequential heuristic locates ammunition facilities with a binary integer program and then directs ammunition through those facilities utilizing a network flow model with side constraints. The MIP integrates location and flow decisions in the same model. For a general scenario, the sequential heuristic locates a 21 node, 30 arc network with ammunition flows over 30 time periods in 22 CPU seconds on an IBM 3033AP. For the same scenario the MIP obtains a solution for only a 3 time period problem in 87 CPU seconds.

Results indicate shortcomings in the WADS as it currently exists. The models and analysis show that current doctrine is

infeasible unless there is an increase in lift assets at the Corps level storage facilities and a reduction in inventory goals at the Ammunition Supply Points.

Master of Science in
Operations Research
March 1988

Advisor: R.K. Wood
Department of
Operations
Research

ESTIMATING RELIABILITY WITH DISCRETE GROWTH MODELS

James D. Chandler
Captain, United States Army
B.S., United States Military Academy, 1978

Determining the reliability of newly designed systems is one of the most important functions of the acquisition process in the military. Tracking the growth in reliability of a system as it is developed and modified repeatedly is an important part of the acquisition process.

This thesis extends and expands a reliability growth simulation program written previously. It analyzes the capabilities and limitations of two discrete reliability growth models to determine which models are most applicable in estimating system reliability under a variety of different growth patterns. Negative growth patterns are also considered. The result of this thesis is a FORTRAN simulation which enables a more accurate estimate of system reliability using test data generated during the development phase of an acquisition program.

Master of Science in
Operations Research
March 1988

Advisor: W.M. Woods
Department of
Operations
Research

A HELICOPTER SUBMARINE SEARCH GAME

Edmund Cheong Kong Chuan
Captain, Republic of Singapore Navy
B. Eng., National University of Singapore, 1985

This thesis examines a two-person zero sum game where a submarine, after revealing his position by causing a 'flaming datum,' is hunted by a helicopter which arrives on the scene after a time delay. Various helicopter and submarine strategies are explored and simulation runs are used to determine the detection probability (payoffs) for each combination of helicopter and submarine strategy. The value of the game (detection probability) with the related optimal strategies is then obtained using linear programming. A modified random search equation is also derived using probabilities of detection obtained from different combinations of parameters used in the game. Similar and related games are also discussed with emphasis on the differences in assumptions made and approaches taken in order to solve the problem.

Master of Science in
Operations Research
September 1988

Advisor: A.R. Washburn
Department of
Operations
Research

THE QUANTIFIED JUDGEMENT MODEL AND HISTORIC GROUND COMBAT

Joseph F. Ciano
Captain, United States Marine Corps
B.S., United States Naval Academy, 1979

Historic ground combat can be analyzed qualitatively and quantitatively. Qualitative analyses of combat are simply historical accounts or case studies. Quantitative analyses, on the other hand, address the mathematical and statistical aspects of ground combat.

This thesis selects for study one particular quantitative methodology called the Quantified Judgement Method of Analysis, or more simply, the Quantified Judgement Model (QJM). The QJM has been used to analyze historic battles and predict future battle outcomes. However, this thesis focuses solely on describing the QJM, analyzing its reasonableness from a military viewpoint, and applying it to historic ground combat. The QJM consists of two submodels whose interactions represent several battlefield intangibles such as leadership, morale, and training. The thesis tests the reasonableness of those submodels and investigates their sensitivity to changes in the model parameters.

Analysis of the model indicates that it is generally sound and reasonable. However, two equations (Combat Power Ratio and Ability to Gain or Hold Ground) were found to be questionable from a military perspective. Further investigations are suggested at the end.

Master of Science in
Operations Research
September 1988

Advisor: M.D. Weir
Department of
Mathematics

ANALYSIS OF PACIFIC FLEET UNDERWAY REPLENISHMENT DATA

Timothy E. Conley
Lieutenant, United States Navy
B.S., University of Missouri, 1975

A data analysis is conducted on approximately 3900 underway replenishments in the Pacific Fleet between January 1984 and June 1985. The data was reported in accordance with COMNAVSURFPACINST 3180.2E. There are four results obtained in the study. The first result is that refueling transfer rates in NWP-14C, Replenishment at Sea compare favorably with the observed data for average value events. Secondly for single station conventional replenishment (CONREP) of ammunition and stores, short tons per hour as a transfer rate measure (the transfer rate in NWP-14C) is not a significant predictor of the required transfer time. Therefore the study recommends measuring conventional replenishment transfer rates in minutes per lift. Third a simple linear regression model is proposed to describe single station refueling and CONREP transfer rates. And finally a logarithmic multiple regression model is proposed to describe the total time required for an underway replenishment, for situations in which several commodities are transferred.

Master of Science in
Operations Research
September 1988

Advisor: W.P. Hughes
Department of
Operations
Research

COAST GUARD DRUG INTERDICTION: A RENEWAL-REWARD APPROACH TO DETERMINE OPTIMUM INVESTIGATION TIME

Eric A. Copeland
Lieutenant, United States Navy
B.S., Texas A&M University, 1980

A renewal-reward model is developed to predict the optimum amount of time that Coast Guard personnel should spend investigating a vessel for illicit substances. The optimal investigation time is determined with respect to three criteria; maximizing the number of arrests, maximizing the quantity of drugs confiscated, and minimizing the quantity of drugs that escape detection. A simulation study indicates that the optimal investigation time is very sensitive to underlying distributional assumptions. The basic service system model may have wider application, i.e., to combat modelling, where it may be desirable to investigate a potential target to estimate its value before committing limited resources. An adaption of the model may also be of help in allocating resources for mineral exploration.

Master of Science in
Operations Research
March 1988

Advisor: D.P. Gaver
Department of
Operations
Research

DYNAMIC STUDY OF FACTORS IMPACTING ON COMBAT POWER

Paul M. Crawford
Captain, United States Army
B.S., Alabama A&M University, 1979

This thesis extends the development of the Generalized Value System (GVS), used in the Airland Advanced Research Model (ALARM), as an on-going research effort at the Naval Postgraduate School. Specifically, the problem of determining the multidimensional mapping of the state variables that represent the condition of an entity into the power function is addressed. The methods described in this thesis provide a means of acquiring this mapping function by the use of a Degraded Power Function (DPF). The DPF provides a basis for estimating the future state of an entity based on the state (condition) of the entity, virtually eliminating the exponential decay function presently in use.

Master of Science in
Operations Research
March 1988

Advisor: S.H. Parry
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Operations
Research

WORKLOAD MEASURES FOR NAVY INVENTORY CONTROL POINTS

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Lieutenant, United States Navy
B.S., University of the Philippines, 1974

The Operations and Maintenance, Navy (O&MN) budget for the two Navy Inventory Control Points (ICPs) has shown an overall increase over the past 15 years. However, the numerous outputs or workload measures being used at the ICPs do not seem to show the same trend as O&MN. The Naval Supply Systems Command (NAVSUP) wants to relate the budget to the various workload measures. In fact, NAVSUP would like a single measure of workload applicable to the two ICPs which could explain most of the behavior of O&MN. This measure of workload could serve as a simple but useful predictive tool for budget requests. This thesis examined data for O&MN and workload indicators representing the major functions performed by each ICP. The data covered the time interval from 1973 to 1987. Models using single and multiple variables were then developed through exploratory data analysis and regression analysis in an attempt to describe how O&MN is related to or can be explained by the workload indicators. The models using only a single workload measure did not do very well at explaining the behavior of O&MN, although if a single variable model must be chosen, the number of repairable line items appeared to be the best O&MN predictor. The

multivariate models were too data limited to be useful immediately. However, the potential for developing accurate models using multiple variables appears to be very good.

Master of Science in
Operations Research
September 1988

Advisor: A.W. McMasters
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Operations
Research

A MODEL THAT USES PSYCHOMOTOR TESTING TO PREDICT NAVAL AVIATOR PRIMARY FLIGHT GRADES

Walter Richard Deckert, Jr.
Lieutenant, United States Navy
B.G.S., University of Nebraska, Omaha, 1980

With the costs of pilot training escalating, it is becoming increasingly important to maKe as few mistakes as possible in the selection of potential aviators. In the early days of aviation the use of psychomotor testing played a big role in this selection process, but the physical complexities of the system caused its discontinuance. More recently, researchers at the Naval Aerospace Medical Research Laboratory, using microcomputers, have developed two new series of psychomotor tests. This thesis uses stepwise and multiple regression techniques to confirm the viability of using such a series of psychomotor tests to predict the flight grades of student aviators in primary flight school. The fitted regression model accounted for 77% of the variance in the primary flight grade data examined and appeared to be approximately 4.5 times better than the model currently used.

Master of Science in
Operations Research
September 1988

Advisors: T. Mitchell
D. Gaver
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Operations Research

REFINEMENT AND EXTENSION OF SHRINKAGE TECHNIQUES IN LOSS RATE ESTIMATION OF MARINE CORPS OFFICER MANPOWER MODELS

Charles R. Dickinson
Captain, United States Marine Corps
B.S., United States Naval Academy, 1978

This thesis is a continuation of previous work to apply modern multiparameter estimation techniques to the problem of estimating attrition rates for a large number of small inventory cells in manpower planning models used by the U.S. Marine Corps. The main advances involve the promising introduction of empirical Bayes (non-constant shrinkage) techniques, recognition of the non-symmetric nature of the errors with a response to this, and some insight into all aggregation plans that should help provide greater stability for the estimation methods. In addition, the roles of some middle level methodological choices are explored.

Master of Science in
Operations Research
March 1988

Advisor: R.R. Read
Department of
Operations
Research

AN ANALYSIS OF AN AUTO-ALERT SONOBUOY DETECTION MODEL

Robert Walter Filanowicz
Commander, United States Navy
B.S., United States Naval Academy, 1972

This thesis presents a method for estimating some parameter values that are involved in the design of a passive broadband auto-alert sonobuoy. The importance of establishing a false alarm rate that is compatible with tactical requirements is stressed. A FORTRAN program is listed for empirically calculating a lateral range curve based on a Square Law detection model.

Master of Science in
Operations Research
March 1988

Advisor: R.N. Forrest
Department of
Operations Research

A COMPARISON OF THE NATIONAL TRAINING CENTER AND THE JANUS (T) COMBAT MODEL BATTLE RESULTS

John P. Gardner
Captain, United States Army
B.S., United States Military Academy, 1979

This thesis compares the weapon systems losses experienced at the National Training Center (NTC) with the weapon systems losses in the high resolution combat model JANUS (TRASANA) for the Defend in Sector battle scenario at the Siberia location of the NTC. The scenario is fought between a United States Army Battalion Task Force against a Soviet Motorized Rifle Regiment. The comparison is conducted at both the aggregate and individual weapon system level. The comparison showed that the JANUS (T) model results in a higher number of losses for both the red and blue forces than was observed at the NTC. Additionally, the comparison showed the red force BMP weapon system and the blue force TOW weapon system (both wire guided anti-tank missile platforms) to be much more lethal in the JANUS (T) model than was observed at the NTC.

Master of Science in
Operations Research
September 1989

Advisor: H.J. Larson
Department of
Operations Research

CHEMICAL MUNITION DECISION METHODS FOR THE VECTOR-IN-COMMANDER COMBAT SIMULATION

Jerry A. Glasow
Captain, United States Army
B.S., Texas A&M University, 1982

This thesis develops decision logic for the employment of chemical artillery munitions for use in the U.S. Army's Vector-in-Commander (VIC) Combat Simulation. There are three parts to this thesis. The first part uses VIC's "current state" decision methodology to produce an immediately usable improvement to VIC. This part can be used to write the code necessary for incorporation into VIC. The second part uses the "future state" Generalized Value System (GVS) decision methodology. The third part is a stand alone document which identifies, explains, and contrasts the theoretical "underpinnings" of the VIC decision methodology and the GVS decision methodology.

Master of Science in
Operations Research
September 1988

Advisor: S. Parry
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Operations
Research

PRIORITIZATION OF ADVANCED BASE FUNCTIONAL COMPONENTS

Linda A. Guadalupe
Lieutenant Commander, United States Navy
B.S., Fairleigh Dickinson University, 1977

This thesis explores the use of two analytical methods for obtaining a priority ranking of selected Advanced Base Functional Components (ABFCs) with regard to relative importance to mission accomplishment during the early days of a general wartime scenario. Specifically, eleven of the ABFCs most frequently mentioned by the Fleet Commanders-in-Chief as being their most urgent requirements were rated in two survey formats, one using categorical judgements and the other using a method of paired comparisons. In examining the results of using these methods, this study: 1) provides one-time relative rankings of the ABFCs that were compared, 2) describes the differences in scope and application of the two techniques, and 3) provides a foundation for further study to obtain meaningful quantitative measurements of the need for selected ABFCs, measurements which can be used as aids to decision making in the budgetary process.

Master of Science in
Operations Research
September 1988

Advisor: S.H. Parry
Department of
Operations
Research

A MARKOV MODEL FOR MEASURING ARTILLERY FIRE SUPPORT EFFECTIVENESS

Dennis M. Guzik
Captain, United States Marine Corps
B.S., The Ohio State University, 1982

This thesis presents a Markov model, which, given an indirect fire weapon system's parameters, yields measures of the weapon's effectiveness in providing fire support to a maneuver element. These parameters may be determined for a variety of different scenarios. Any indirect fire weapon system may be candidate for evaluation. This model may be used in comparing alternative weapon systems for the role of direct support of a Marine Corps infantry battalion. The issue of light gun vs. heavy gun was the impetus for the study. The thesis also provides insight into the tactic of frequently moving an indirect fire weapon to avoid enemy detection, and possible subsequent attack.

Master of Science in
Operations Research
September 1988

Advisor: D.P. Gaver, Jr.
Department of
Operations
Research

IMPROVING TARGETING METHODS FOR CHEMICAL WEAPONS

Darrell Miles Hamilton
Captain, United States Army
B.S., Georgia Institute of Technology, 1982

This thesis demonstrates through the use of a computer model and simple analytic methods that chemical weapons can be employed more efficiently by modifying the way in which they are currently aimed. The basic method is to theorize a relationship between chemical weapon efficiency and the weather. A computer simulation is run to quantify the relationship. The results of the simulation form the basis of the analysis. Through the analysis it is determined that a "best" aiming method is to aim all rounds at the center of the target independent of weather considerations. This "best" solution is tested for robustness through another computer simulation against the Army's current method of aiming chemical weapons. The final result is that the initial "best" method, in all aspect of the final test, is more efficient than current doctrine.

Master of Science in
Operations Research
September 1988

Advisors: R.R. Read
B. Mansager
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Operations Research

ANALYSIS OF UNIT-LEVEL ATTRITION IN THE UNITED STATES ARMY RESERVE

Harold S. Hardrick
Captain, United States Army
B.S., United States Military Academy, 1979

This thesis investigates the influence of unit characteristics on unit-level manageable attrition and manageable losses suffered by USAR units. The objective is to determine whether there are differences in manageable attrition rates/losses of units with different levels of the unit characteristics, and if so, examine the differences. The sample data consist of 914 randomly selected USAR units (TPUs). The data were selected from FY87 files of the Recruit Market Network System maintained by Litton Computer Services. Analysis of variance techniques were used to examine the differences. The unit characteristics analyzed were found to cause significant differences in attrition rates/losses.

Master of Science in
Operations Research
September 1988

Advisor: H.J. Larson
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Operations
Research

A MODEL OF THE EFFECT OF SPARING AND REPAIR TURNAROUND TIME OF THE INERTIAL NAVIGATION SYSTEM ON AIRCRAFT READINESS FOR THE F/A-18

Christopher A. Hase
Lieutenant, United States Navy
B.S., Auburn University, 1979

Modern aircraft design allows for short turnaround times by removing the failed component and installing an operational one. The defective component is then either repaired in the squadron or turned in to supply which then sends the defective component to an Intermediate Maintenance Activity (IMA) for repair. The aircraft is unable to be turned around for another flight if supply is out of stock of that component without resorting to additional maintenance measures. This is when aircraft readiness experiences a measurable deterioration due to supply not having the part on hand. Aircraft readiness, as defined in this thesis, is the ability of a specific F/A-18 to perform all of its missions. A simulation model which measures the time that an aircraft is not ready (downtime) was developed to relate the turnaround time at the IMA and the quantity of spare parts maintained by the supply system to this lack of readiness. The model developed showed that a decrease in the turnaround time of a part at the IMA, the increase in quantity of spare parts maintained by the supply system cause a nonlinear reduction in aircraft readiness. This model could be used to aid decision

makers in determining the effect changes in spare parts quantities and IMA turnaround times could have on aircraft readiness.

Master of Science in
Operations Research
June 1988

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Research

EVALUATION OF THE MOSCOW LOW RESOLUTION LAND COMBAT MODEL

James C. Hoffman
Captain, United States Army
B.S., University of Arizona, 1977

This thesis assesses the methodology and input sensitivity of the Method of Screening Operational Concepts of Warfare (MOSCOW) model. This assesement illuminates the fundamental assumptions underlying the model's methodology and evaluates the model's sensitivity to small percentage changes of inputs. Results provide an estimate of MOSCOW's limitations, suggesting which parts of the model may need to be improved.

Master of Science in
Operations Research
September 1988

Advisor: S.H. Parry
Department of
Operations
Research

AN ANALYSIS AND DEVELOPMENT OF A PRODUCTION PREDICTOR MODEL FOR THE ARMY RESERVE OFFICER TRAINING CORPS PROGRAM

William C. Hopkinson
Captain, United States Army
B.S., United States Military Academy, West Point 1980

The purpose of this thesis is to examine and model the Army Reserve Officer Training Corps (ROTC) commissioning process in terms of several possible explanatory variables. Each of the variables, which included unemployment rate, average yearly college tuition, ROTC enrollment by class, advertising budget, scholarship program and propensity towards military service, were analyzed for trends in the data with respect to the dependent variable, the number of second lieutenants commissioned in a year. Four regression models were fitted to numerous combinations of the explanatory variables and the dependent variable. Three variables were found to be significant and possess the potential to predict the number of second lieutenants commissioned each year within the range of the data used for modeling.

Master of Science in
Operations Research
September 1988

Advisor: H.J. Larson
Department of
Operations
Research

TARGET SELECTION SCHEMES

Bernard C. Hughes, Jr.
Captain, United States Army
B.S., United States Military Academy, 1979

This thesis investigates and subjectively evaluates four high resolution combat models' algorithmic depiction of a direct firer's target selection under combat conditions. The target selection algorithms of the Janus (T), Janus (L), Carmonette, and STAR models are investigated in detail. The models' target selection algorithms are analyzed first with respect to a direct firer's target selection as dictated by doctrine and then compared with each other. The evaluation showed there is a parallelism between the model builders decision logic and doctrinal rules. The benefits derived from target selection algorithms far outweigh their inability to accurately depict the intangible variables of actual combat. Use of the models allow the Army's leaders to sharpen their tactical skills and provide a means to analyze results of combat decisions in a non-combat environment.

Master of Science in
Operations Research
March 1988

Advisor: D.R. Barr
Department of
Operations
Research

A COMPARISON OF AVAILABILITY CENTERED INVENTORY MODELS USING THE TIGER SIMULATION PROGRAM

Paul D. Huscher
Lieutenant, United States Navy
B.A., University of Nebraska-Lincoln, 1979

Developing and updating shipboard repair part allowances for the tremendous number of Navy shipboard equipments is a large-scale, complex task. In order to avoid excessive downtime on these critical equipments, more sophisticated allowance computation techniques which account for system characteristics and availability requirements are needed. This study examines three availability centered inventory models used to determine repair part allowances. The models are the Availability Centered Inventory Model (ACIM), the Lagrangian Equipment Optimization (LEO) model, and the Spares Economically and Automatically Selected to Criteria Applied for Performance Effectiveness (SEASCAPE) model. Model effectiveness will be compared using a hypothetical ship steering system. After inventory levels are computed by each of the models through internal optimization techniques, operational availability (A_o) is estimated by simulation of a ship's mission timeline using the Naval Sea Systems Command's TIGER program. The comparison is made by examining the availability of the hypothetical system using the TIGER model under the following conditions: fixed budget, variable budgets, and variable mean supply response times (MSRT).

Master of Science in Operations Research
March 1988

Advisor: W.M. Woods
Department of Operations Research

ANALYSIS OF CHEMICAL WARFARE USING A TRANSIENT SEMI-MARKOV FORMULATION

Michael O. Kierzewski
Captain, United States Army
B.S., Virginia Tech University, 1982

This thesis proposes an analytical model to test various assumptions about conventional/chemical warfare. A unit's status in convention/chemical combat is modeled as states in a semi-Markov chain with transient and absorbing states. The effects of differing chemical threat levels, availability of decontamination assets and assumed personnel degradation rates on expected unit life and capabilities are tested. The model results indicate a possible optimal mix of conventional and chemical weapons. Also the availability of decontamination assets affects expected unit life more than decisions as to when to decontaminate a unit.

Master of Science in
Operations Research
September 1988

Advisors: S.H. Parry
Department of
Operations
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A.L. Schoenstadt
Department of
Mathematics

USE OF HIGH RESOLUTION SIMULATIONS FOR TRAINING DEVELOPMENT

James C. Kolding
Major, United States Army
B.S., United States Military Academy, West Point, N.Y.

This thesis outlines the use of the Training-Modeling Integration TM-I process for development of training information. High resolution simulations portray weapon system operations in sufficient detail for the training developer to use the simulation to formulate task information and training insights. Training developers have relied heavily on observable information for developing training. Through the use of the TM-I process, training developers can now use high resolution simulations to observe system employment and operation. Straightforward data analysis techniques are used to analyze simulation derived data files. The unique nature of this methodology is embodied in the synthesis of training development needs, analytical techniques and high resolution simulation data.

Master of Science in
Operations Research
September 1988

Advisor: S. Parry
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Operations
Research

MONITORING THE CALIBRATION OF A TORPEDO TEST RANGE

Sukru Korlu
Lieutenant JG, Turkish Navy
B.S., Turkish Naval Academy, 1982

Post-test analysis of vehicle tracking data taken from a three dimensional underwater range requires the splicing together of several pieces of track individually produced by distinct transducer arrays. The locations and orientations of the arrays must be known precisely in order to convert locally determined tracks into a coherent record in the general range coordinate system. The maintenance of calibration of the system is a problem and this study presents some least squares methodology that uses the tracking data itself to monitor it. More specifically, methodologies are developed to improve upon the array displacement and orientation correction algorithms and to estimate timing synchronization offsets. Applications are made to real data.

Master of Science in
Operations Research
September 1988

Advisor: R.R. Read
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Operations
Research

AN ANALYSIS OF SECURITY BACKGROUND INVESTIGATION DATA AND THE RELATIONSHIP WITH SUBSEQUENT DISCHARGE

Edward R. Koucheravy
Captain, United States Army
B.S., United States Military Academy, 1978

This thesis is concerned with the analysis of security investigation data extracted from the investigative files of 564 U.S. Navy first-term enlisted personnel who came on active duty between 1979 and 1982. The individuals had all completed their first term of service and had either completed service satisfactorily or had been released early with an adverse discharge. The data was selected from six character-of-service categories: good, homosexual, drug/alcohol abuse, misconduct, court martial, and character and behavior disorders. The purpose of the thesis was to investigate optimal ways to configure a large, categorical data base and to look for and quantify relationships between investigative data and final disposition of service. Several noteworthy relationships were found between derogatory information developed in the investigation and the subsequent character-of-service. Further avenues of investigation using this data are suggested.

Master of Science in
Operations Research
September 1988

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

A MICROCOMPUTER SIMULATION PROGRAM TO MODEL TRANSIENT AND STEADY-STATE DETECTION OF AN EVADING SUBMARINE BY A SEARCHING SUBMARINE IN A FALSE TRANSIENT ENVIRONMENT

J. Brad Kratovil
Lieutenant, United States Navy
B.S., University of Southern California, 1982

This thesis describes the development and demonstrates the use of SUBTRAN, a submarine transient detection computer simulation model. SUBTRAN provides, at the microcomputer level, a framework that can be used to investigate how transient detection and false transient detection opportunities affect the expected time to steady-state (continuous) detection. Monte Carlo methods are employed to simulate a submarine versus submarine passive acoustic detection search scenario. The scenario terminates when steady-state detection occurs. Detection is modeled using a signal excess threshold crossing model. Random fluctuations in the acoustic signal excess are modeled using a Lambda-Sigma Jump process. Both submarines are assumed to have a fixed speed and are constrained within a defined search area. The "target" submarine is assumed to be unable to counter-detect the "searching" submarine. Transient signals and false transient signals are determined by independent Poisson processes. Summary statistics for the times to detection are provided as output of the simulation.

Master of Science in
Operations Research
September 1988

Advisors: R.N. Forrest
J.N. Eagle
Department of
Operations Research

METHODOLOGIES FOR RESOLVING ANOMALOUS POSITION INFORMATION IN TORPEDO RANGE TRACKING USING SIMULATION

William M. Kroshl
Lieutenant Commander, United States Navy
B.A., Northwestern University, 1975

This thesis investigates the problem of resolving dual path records of torpedoes being tracked on an acoustic range using short baseline arrays. An acoustic signal is sent out by a torpedo at short intervals. This signal is then received by the four hydrophones of a short baseline array. Arrival time differences in the signal are used to determine an estimated position for the torpedo at the time the signal was emitted using spherical equations and acoustic raytracing. In those areas where two arrays can track a target simultaneously, two sets of estimated positions are generated. These estimates usually do not coincide.

A simulation of the range is developed using actual range positions and sound velocity data. Deliberate errors are then introduced into the sound velocity profile data and the timing data. Three methods of resolving the resulting positional ambiguity are presented. Each method is compared to the actual position for idealized (no deliberate error) and the deliberate error models.

Master of Science in
Operations Research
March 1988

Advisor: R.R. Read
Department of
Operations
Research

SOLUTION OF LARGE-SCALE MULTICOMMODITY NETWORK FLOW PROBLEMS VIA A LOGARITHMIC BARRIER FUNCTION

Heinrich Lange
Lieutenant Commander, Federal German Navy
Diplom Kaufmann, German Armed Forces University, 1978

A new algorithm is presented using a logarithmic barrier function decomposition for the solution of the large-scale multicommodity network flow problem. Placing the complicating joint capacity constraints of the multicommodity network flow problem into a logarithmic barrier term of the objective function creates a nonlinear mathematical program with linear network flow constraints. Using the technique of restricted simplicial decomposition, we generate a sequence of extreme points by solving independent pure network problems for each commodity in a linear subproblem and optimize a nonlinear master problem over the convex hull of a fixed number of retained extreme points and the previous master problem solution. Computational results on a network with 3,300 nodes and 10,400 arcs are reported for four, ten and 100 commodities.

Master of Science in
Operations Research
March 1988

Advisor: R.K. Wood
Department of
Operations
Research

A COMPARISON OF SIX REPAIR SCHEDULING POLICIES FOR THE P-3 AIRCRAFT

Peter James Latta
Lieutenant, United States Navy
B.S., *University of Southern California*

There are a finite number of identical aircraft each of which contain a number of different types of components which fail at different rates. In order for an aircraft to be operational, all of its components must be operational. Each component type has a finite number of spares. Failed components are repaired at a single server facility. Simulation is used to study the effect of 6 different repair scheduling policies. The repair policies are compared on the basis of average number of operating aircraft at the end of a mission period of one week. It is found that a repair policy which first repairs the component of the type with the fewest operating components is the best. In particular, it is much better than first-in, first-out, and also may well improve upon policy that serves the longest waiting line first. A simple spares stockage policy is developed and evaluated when the above scheduling policy is in use.

Master of Science in
Operations Research
March 1988

Advisor: D.P. Gaver
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Operations
Research

A SIMULATION STUDY OF ESTIMATES OF SYSTEM AVAILABILITY

Chong Ho Lee
Major, Republic of Korea Army
B.A., Korea Military Academy, 1978

A system which is either working or under repair is modeled as an alternating renewal process. Data is in the form of a finite number of independent lifetimes and repair times. Several semi-parametric estimators of the probability that the system is up at a finite time t are studied via simulation. The estimators are based on an exponential approximation to the true system availability at time t and use empirical Laplace transforms of the lifetimes and repair times.

Master of Science in
Operations Research
September 1988

Advisor: P.A. Jacobs
Department of
Operations
Research

PARAMETRIC ANALYSIS OF AIRLAND COMBAT MODEL IN HIGH RESOLUTION

Jae Yeong Lee
Major, Republic of Korea Army
B.S., Korea Military Academy, 1980

A high resolution deterministic combat model is analzyed in this thesis. Actual Republic of Korea (ROK) terrain data is employed in the model. The goal of the thesis is to analyze key parameters which are routinely used in high resolution combat models. These parameters are attrition rate coefficients, force size, courses of action, and the Weiss parameter (in the equation for Helmbold type combat). The model's scenario divides the battlefield into three regions; indirect fire, minefields, and direct fire. Lethality of Firing Theory and Lanchester type differential equations are used to compute unit casualties and unit speed in a discrete time increment. The model's output (unit casualties and survivors, duration of battle, loss exchange rate) are termed of Measures of Effectiveness (MOEs), which are analyzed by Utility Theory and Game Theory methodologies. Sensitivity analysis is applied to each battle option to determine how changes to one or more input parameters affect the model's output. Additionally, the model operates in an interactive mode using network attribute data. The model can easily be expanded or modified to satisfy a user's requirements by adding submodels or changing input data.

Master of Science in
Operations Research
September 1988

Advisor: S.H. Parry
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Operations
Research

DEVELOPMENT OF A MODEL WHICH PROVIDES A TOTAL SYSTEM APPROACH TO INTEGRATING VOICE RECOGNITION AND SPEECH SYNTHESIS INTO THE COCKPIT OF U.S. NAVY AIRCRAFT

Margaret A. Lee
Lieutenant, United States Navy
B.A., Mississippi State University, 1975

Pilot workload saturation in the cockpit of U.S. Navy Aircraft has become a serious concern. Literature, studies, and flight tests indicate that utilizing a voice interactive system for certain cockpit tasks can reduce this workload by decreasing the time required to perform the task.

This being the case, the problem which remains is one of deciding which tasks to convert. Therefore, a model has been developed which provides the designer with a total systems approach for use in deciding what combination of tasks, which if converted for performance by the voice interactive system, will result in the greatest workload reduction without overloading the pilot's voice channels.

Master of Science in
Operations Research
September 1988

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Operations
Research

A COLUMN GENERATION TECHNIQUE FOR A CRISIS DEPLOYMENT PLANNING PROBLEM

Newton Rodrigues Lima
Lieutenant, Brazilian Navy
B.S., Escola Naval, Rio de Janeiro, Brazil, 1977

This study is concerned with the problem of constructing an optimal military deployment plan for sealift assets during a period of conflict. The deployment problem is formulated as a set-partitioning optimization problem with a minimax objective. An algorithm for solving this problem is presented and it is based on solving a sequence of related, but simpler, linear programming problems by the column generation technique. The results of the model are ship schedules to meet the cargo requirements of the deployment plan in a minimum amount of time. Various implementation strategies are discussed as well as the occurrence of integer solutions. In addition, computational experiments for several small to medium size examples are presented.

Master of Science in
Operations Research
September 1988

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Operations
Research

COMPUTER SIMULATION MODEL FOR STUDYING AIRCRAFT TAKE-OFF SCHEDULES AT A TRAINING AIR FORCE BASE

Dimitris G. Macropoulos
Captain, Hellenic Air Force

A computer simulation model for studying take off schedules at Kalamata Air Force Base in Greece. Six aircraft take off schedules were examined and a comparison of results was based upon factors of performance and efficiency/safety. The overall simulation model can be easily modified to examine other aircraft take off schedules.

Master of Science in
Operations Research
March 1988

Advisor: A.F. Andrus
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Operations
Research

CONVERGENCE CHARACTERISTICS OF FICTITIOUS PLAY IN A SEARCH GAME

Richard O. Madson, Jr.
Lieutenant Commander, United States Navy
B.A., Miami University, 1975

The convergence characteristics of an iterative method for solving area search games were investigated. This method, Fictitious Play, was first introduced by G.W. Brown and solves two-person zero-sum games by having each player sequentially select a pure strategy based on the combined past actions of his opponent. The Fictitious Play method was successfully implemented for an area search game in which two players, a searcher and a target, move independently through an area. In this game, the payoff is the number of detections of the target by the searcher. For each iteration of the game, an upper and lower bound on the value of the game were determined and as the number of iterations of the game increased, these bounds converged to the actual solution. In the games examined, the convergence of the bounds was closely approximated by a power function (αn^{B}), with large games converging more slowly. Because of the observed symmetrical convergence of the bounds, an accurate approximation of the value of the game was obtainable from the average of the upper and lower bounds.

Master of Science in
Operations Research
September 1988

Advisors: J.N. Eagle
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NUMBER OF SAMPLES NEEDED TO OBTAIN DESIRED BAYESIAN CONFIDENCE INTERVALS FOR A PROPORTION

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

This thesis analyzes a Bayesian method for determining the number of samples that are needed to produce a desired confidence interval size for a proportion or probability. It compares the necessary sample size from Bayesian methods with that from classical methods and develops computer programs relating sample size and confidence interval size when a Beta prior distribution is employed. Tables and graphs are developed to assist an experimenter in determining the number of samples needed to produce desired confidence in this estimate of a proportion or probability.

Master of Science in
Operations Research
March 1988

Advisor: G.F. Lindsay
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Operations
Research

DISCRETE RELIABILITY GROWTH

Pamela A. Markiewicz
Lieutenant, United States Navy
B.A., Duke University, 1981

Three methods for weighting the exponential regression model to estimate discrete reliability growth were derived and tested. The first method systematically applies greater weight to test phases whose estimates have less variability. The second method similarly applies heavier weight to the most recent test phase estimate. The third method allows the user to choose the weighting scheme.

These methods were evaluated against eight patterns of actual reliability by altering a previously developed Monte-Carlo simulation. Their performance was then compared to the unweighted exponential regression and Maximum Likelihood Estimate With Discounting (MLEWD) models. The second weighting method appears to perform the best under rather general constraints. Also, comparison is made of the least squares estimates for reliability growth using two different unbiased estimates for the negative of the natural logarithm of the failure rate.

Master of Science in
Operations Research
September 1988

Advisor: W.M. Woods
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Operations
Research

A COMPARATIVE ANALYSIS OF TILT ROTOR AIRCRAFT VERSUS HELICOPTERS USING SIMULATOR RESULTS

Gregory K. Mislick
Captain, United States Marine Corps
B.S., United States Naval Academy, 1980

This thesis conducts a comparative analysis of the tilt rotor aircraft with conventional helicopters using simulator results from LHX-representative missions. Results regarding inter-aircraaft differences using Ordinary Least Squares regression analysis are discussed. Also examined are single versus dual piloted airframe configurations, cockpit designs, varied background inter-pilot differences, those transitions from the helicopter to the tilt rotor causing the most difficulties, those flight missions causing the most operator overloads, and what automated features best help relieve these workloads. In addition, pilot opinions from a questionnaire concerning these subjects are presented. Results show the tilt rotor superior in hard, maximum effort turns and in firing at elevated and depressed targets, while the helicopter has the advantage in lateral movements and quick hover up/hover down maneuvers. The two-man cockpit configuration is notably safer with significantly less operator overloads. Pilot differences between communities were found to be negligible in this study.

Master of Science in
Operations Research
September 1988

Advisor: D.C. Boger
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Administrative
Sciences

SIMULATION STUDY OF ESTIMATORS FOR THE SURVIVAL PROBABILITY OF A FIRST PASSAGE TIME FOR A SEMI-MARKOV PROCESS USING CENSORED DATA

Byung Goo Park
Major, Republic of Korea Air Force
B.S., Korea Air Force Academy, 1980

Finite state space semi-Markov processes find application in many areas. Often interest centers on whether or not the process has hit a particular state before a time t. This thesis reports results of a simulation study of the small sample behavior for three estimators of the survival probability of a first passage time for a semi-Markov porcess using censored data.

Master of Science in
Operations Research
September 1988

Advisor: P.A. Jacobs
Department of
Operations
Research

MINE/COUNTERMINE BASIS OF ISSUE OPTIMIZATION PLAN

Thomas D. Pijor
Captain, United States Army
B.S., United States Military Academy, 1978

The mobility and effective employment of tanks in a future conflict may be seriously threatened by enemy land mines.

This thesis presents a high resolution stochastically based simulation to be used in the evaluation of measures of effectiveness to determine the optimal basis of issue of mine/countermine equipment. A discussion of the types of breaching equipment and the tactics involved is used to provide background for the simulation.

Several measures of effectiveness are used to determine how the various configurations of breaching equipment affect the battle and battle outcome.

Master of Science in
Operations Research
June 1988

Advisor: S.H. Parry
Department of
Operations
Research

A DECISION ALGORITHM FOR NUCLEAR, BIOLOGICAL, AND CHEMICAL DECONTAMINATION USING DYNAMIC PROGRAMMING

John Crawford Roberts
Captain, United States Army
B.S., University of Tampa, 1982

This thesis describes a decision algorithm developed to schedule land combat units for Nuclear, Biological, and/or Chemical (NBC) decontaminatin. It is an application of the Generalized Value System (GVS) of assigning unit value and power over time. The actual model is a PC based FORTRAN model that determines the optimal scheduling of contaminated units using a dynamic programming technique. Optimal in this application means minimal total time required for the decon operation. The schedule developed is based on the latest possible start time, thus allowing for the most flexibility. The model is a high resolution stand alone type. It depicts up to six units with three different vehicle types, ten or more decon sites, and one decon team. The terrain is modelled as an undirected network and has distance and trafficability attributes.

Master of Science in
Operations Research
September 1988

Advisor: S.H. Parry
Department of
Operations
Research

OPTIMAL LOAD LISTS OF ORDNANCE FOR THE AE-26 CLASS AMMUNITION SHIP

John Kevin Rowland
Lieutenant, United States Navy
B.S., United States Naval Academy, 1983

This study provides alternative optimal ordnance load lists for the AE-26 class ammunition ship in a station ship role. A survey questionnaire was developed based on a wartime scenario. The questionnaire was administered to 40 Naval officers, who were asked to prioritize various ordnance types in the order of their contributions to the mission described in the scenario. The survey results, along with a linear optimizing equation and equations based on several real-world constraints, were used as input into a linear program. Sensitivity analysis was performed by substituting other nonlinear optimizing equations for the objective function in the program, and observing the changes in the ordnance load lists. Inherent advantages and disadvantages of the various objective functions, reflected in the optimal load lists, were noted, and are described in detail.

Master of Science in
Operations Research
September 1988

Advisor: D.C. Boger
Department of
Operations
Research

ANALYSIS OF AIRCRAFT COMBAT SUSTAINABILITY USING A MARKOV CHAIN

Gregory C. Ruess
Captain, United States Marine Corps
B.S., United States Naval Academy, 1977

This thesis develops a combat sustainability analysis which examines the effectiveness of the H-60 and V-22 in conducting assault support operations once ashore. An analytical model, represented as a finite state Markov chain in conjunction with first step analysis, is employed. Several measures of effectiveness are evaluated: survivability, productivity, and the build up of combat power. Sensitivity analysis is conducted on the parameters of sustainability, maintainability, and probability of detection.

Master of Science in
Operations Research
September 1988

Advisor: S.H. Parry
Department of
Operations
Research

DECOY EFFECTIVENESS IN A MULTIPLE SHIP ENVIRONMENT

Cengiz Sengel
Lieutenant JG, Turkish Navy
B.S., Turkish Naval Academy, Istanbul

The primary objective of this project is to estimate the effectiveness of decoys against incoming missile attacks in a multiple-ship battle group (BG) environment.

In this problem, we allow the number of ships, number of decoys, and the values of ships to vary. We also vary the values of the hard kill probabilities, the splash probabalities of decoyed missiles, probabilities that a missile's lock is broken by seduction decoys and the quality factor of the distraction decoys.

When an ASCM attacks a BG, it may hit a ship, it may get shot down, or it may get diverted. If it gets diverted it may lock onto a neighboring friendly ship. The measure of effectiveness (MOE) is the probability that all ships survive the missile attack.

Master of Science in
Operations Research
September 1988

Advisor: E.B. Rockower
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Operations
Research

SIMULATION STUDY OF TRAFFIC FLOW AT A THREE WAY INTERSECTION

Chong Chul Song
Major, Republic of Korea Army
B.S., Korea Military Academy, 1980

This study develops simulation models for the evaluation of the traffic performance at a three way intersection with no signal. In particular, the models were designed to test and to evaluate the wartime road capacity of the current and a proposed road system in the Korean theater. The models describe how traffic at the road intersection will vary with changes to the input variables and priority rules. An analysis is performed to compare performance measures of the intersection given various traffic conditions. Specifically, the analysis will enable an efficient modification of the roads or an appropriate road usage plan in wartime.

Master of Science in
Operations Research
September 1988

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

AN ACCURACY ANALYSIS OF ARMY MATERIAL SYSTEM ANALYSIS ACTIVITY DISCRETE RELIABILITY GROWTH MODEL

Rio M. Thalieb
Major, Indonesia Air Force

The accuracy of the discrete reliability growth model developed by Army Material System Analysis Activity (AMSAA) is analyzed. The mean, standard deviation, and 95 percent confidence interval of the estimate of reliability resulting from simulating the AMSAA discrete reliability growth model is compared with the mean of the relibility estimate using the Exponential discrete reliability growth model developed at the Naval Postgraduate School and with the actual reliability which was used to generate test data for the replications in the simulations. The testing plan simulated in this study assumes that the mission tests (go-no-go) are performed until a predetermined number of failures occur at which time a modification is made. The main results are that the AMSAA discrete reliability growth model always performs well with concave growth patterns and has difficulty in tracking the actual reliability which has convex growth pattern of constant growth pattern when the number of failures specified equal one.

Master of Science in
Operations Research
March 1988

Advisor: W.M. Woods
Department of
Operations
Research

SIMPLIFIED RESILIENCY ANALYSIS OF U.S. ARMY TOE UNITS

James R. Thomas
Captain, United States Army
B.S., Western Kentucky University, 1977
M.S., University of Southern California, 1981

The objective of this research is to develop and demonstrate the use of an alternative methodology for the Army force structure community to determine the resiliency of U.S. Army Table of Organization and Equipment (TOE) units. A survey was developed to gain an understanding of the TOE design environment, TOE procedures, and those design characteristics which have an impact on the resiliency of a unit. The survey was distributed by mail to various Army organizations involved with the TOE design process and 59 of 150 surveys were returned. The research led to the conclusion that a simplified resiliency methodology could be used to estimate a unit's resiliency. This methodology is demonstrated.

Master of Science in
Operations Research
March 1988

Advisor: T.P. Moore
Department of
Operations
Research

A CHEMICAL WARFARE MODULE FOR THE AIRLAND ADVANCED RESEARCH MODEL (ALARM)

Layne A. Van Arsdale
Major, United States Army
B.A., University of Colorado, 1970

This thesis incorporates an explicit depiction of chemical warfare (CW) in the AirLand Advanced Research Model (ALARM), being developed at the Naval Postgraduate School based on the Army's AirLand Battle doctrine. The CW module centers on a planning algorithm using the generalized value system (GVS) for future state decision making. The planning algorithm comprises the Commander's Estimate of the Situation. The GVS quantifies capabilities and importance of all battlefield entities. The CW module represents key chemical staff functions. The algorithm's decision rule is extended, adding aspects of utility theory. The basic concepts of the module are demonstrated in an application computer program running a combat scenario. The program generalizes previous development work on the GVS and the planning algorithm, producing a plan consisting of the courses of action of greatest value in performing the mission. It's interactive structure provides the basis for a staff training aid or decision support system.

Master of Science in
Operations Research
December 1987

Advisor: S.H. Parry
Department of
Operations Research

AN ANALYSIS OF CONTRACTING ALTERNATIVES FOR BASE OPERATIONS SUPPORT (BOS) FUNCTIONS

Priscilla A. Vanderpool
Lieutenant Commander, United States Navy
B.A., Pennsylvania State University, 1978

The federal government encourages contracting for the purpose of reducing operating costs. Military base operating support (BOS) functions are a prime area for such contracting. However, there exists only limited review of how effective this policy has been.

This thesis analyzes the results of the various contracting alternatives implemented by bases within different naval warfare communities. It was found that, in most cases, contracting of BOS functions did indeed result in reduced costs. Additionally, it was found that, most of the time, full base BOS contracts performed better than other contracting alternatives.

Master of Science in
Operations Research
September 1988

Advisor: D.C.Boger
Department of
Administrative
Sciences

COST ESTIMATING RELATIONSHIP ASSOCIATING ENGINEERING DRAWING QUALITY WITH INSTALLATION COST GROWTH FOR USN SHIP ALTERATIONS

Kurt Willstatter
Lieutenant, United States Navy
B.A., Texas A&M University, 1982

This is an analysis of existing feedback in the Fleet Modernization Program (FMP) planning and design process using the FFG-7 class of ships as a case study. This analysis attempts to relate the engineering drawing revision rate (inverse measure of drawing quality) and the number of ships affected by those drawing revisions (measure of availability concurrence) to the cost growth attributable to the FMP portion of U.S. Navy ship availabilities. Due to the lack of actual cost data, budget estimates were used as a surrogate and unfortunately firm relationships could not be established.

However, the methodology developed has potential for application to any large ship class which may experience numerous concurrent availabilities, as actual cost data become available. It is meant to be a tool for the engineering design agent to assess the financial impact of the quality of engineering design products on the installing activities and to assess the potential value policy changes which improve the quality of those products.

Master of Science in
Operations Research
March 1988

Advisors: D.C. Boger
Department of
Administrative
Sciences

COMPARISON OF TEST SITE AND OVERSEAS DEPLOYMENT SITE INTERVISIBILITY CHARACTERISTICS

David A. Wood
Captain, United States Army
B.S., United States Military Academy, 1977

Intervisibility characteristics are critical to ground combat forces in shaping results of U.S. Army operational tests. An important question is: "Are the results of a test conducted at a specific test site valid for a different deployment site?" This thesis develops a methodology to help answer this question. It commences by tracing the background studies of intervisibility analysis, and then compares by computer simulation the intervisibility characteristics of several sites, and determines which sites are most nearly alike. Transformation equations are developed to facilitate extrapolation of certain continental United States (CONUS) test results to selected outside continental United States (OCONUS) sites.

Master of Science in
Operations Research
December 1987

Advisor: D.L. Barr
Department of
Operations
Research

A SPARES OPTIMIZATION MODEL FOR DEPLOYABLE U.S. MARINE CORPS UNITS

Paul R. Yorio
Captain, United States Marine Corps
B.S., United States Naval Academy, 1982

The U.S. Marine Corps deploys Marine Air-Ground Task Forces (MAGTFs) by airlift or sealift to participate in numerous short-term exercises. These exercises are of such duration that resupply of the MAGTF by strategic airlift or sealift is not practical. Thus, only stocked spare parts are available for repairs during the exercise.

A model is developed which provides the operational commander with a stockage policy for spare secondary reparables (e.g., tank engines, amtrack transmissions, etc.) that optimizes the probability of successful mission completion subject to weight or volume constraints imposed by the MAGTF's mode of deployment. Optimization of this stockage policy is stochastically modeled using data from the Marine Corps Integrated Maintenance management System data base and then solved as an integer program.

The integer program is coded using the Generalized Algebraic Modeling System language and solved using the Zero/One Optimization Methods mixed integer program solver. Operational data for a Marine Amphibious Unit yields an integer program with 190 binary variables and 26 constraints. A solution within 0.07% of optimality is obtained on an IBM 3033AP computer in 3.9 seconds and on a Zenith Z-248 personal computer in 176 seconds.

Master of Science in Operations Research
March 1988

Advisor: D.P. Gaver
Department of Operations Research

THE USE OF COLOR IN THE OUTPUT ANALYSIS OF STATISTICAL SIMULATIONS, AND ANALYSIS OF ESTIMATORS OF SERIAL CORRELATION

Robert L. Youmans
Captain, United States Army
B.S., Francis Marion College, South Carolina, 1980

The use of color in the organization and analysis of the output of multifactor statistical simulations is investigated with the computer package SIMTBED (A Simulation Test Bed). Updating of this system to the current technology of color line printers is performed. It is shown how color can be used to code some factors in a multifactor simulation, compacting the output and enhancing analysis. An application to the analysis of the lag one serial correlation of normal and non-normal time series using four estimators (moment, maximum likelihood, robust regression, and the Cressie estimator) is provided as a demonstration of the uses of SIMTBED in statistical simulations. These estimators are examined for robustness and asymptotic bias, as well as relative behavior with various sample sizes. It is shown that for some time series the robust estimators of serial correlation are not acceptable due to bias and other considerations.

Master of Science in
Operations Research
September 1988

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

MASTER OF SCIENCE
IN
PHYSICS

THEORETICAL MODEL OF THE CATHODE SPOT IN A UNIPOLAR ARC

Dwayne H. Curtiss
Lieutenant, United States Navy
B.S., University of the State of New York, 1981

A theoretical study and computer analysis of the cathode spot of a unipolar arc was conducted. The underlying theories of Plasma Physics, Space Charge Effects, and Electron Emission needed for an understanding of cathode phenomena are presented. Two models of unipolar arcing are reviewed and an analysis of the cathode spot is begun. A stationary model of the cathode spot is formulated with a system of equations that is not closed. A method of solution, using the Steenbeck Minimum Principle, is utilized and a computer program developed to determine the cathode spot parameters. Results of the analysis are presented for arc currents of 100, 150, 175, 200, 300, and 400 Amperes. It is found that for copper stable arcs occur only for arc currents greater than 200 Amperes.

Master of Science in
Physics
December 1987

Advisor: F. Schwirzke
Department of
Physics

THE INFLUENCE OF IONIZATION WITHIN A PLASMA OPENING SWITCH

Wenzel G. Evans, Jr.
Captain, United States Army
B.S., United States Military Academy, 1978

An alternate description of the Plasma Opening Switch (POS) is presented. In addition, a preliminary study was conducted into the ionization of sesorbed carbon particles from the cathode surface in the switch region. The formation of a locally dense plasma layer surrounding the cathode is shown to influence the elctric field and the Debye screening distance. This effect influences the emission of electrons from the cathode as well as providing a mechanism for opening the switch.

Master of Science in
Physics
December 1987

Advisor: F.R. Schwirzke
Department of
Physics

A MOLECULAR DYNAMICS SIMULATION STUDY OF LIQUID METAL TARGETS USING THE EMBEDDED ATOM METHOD

Michael Lee Fisher
Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1981

A molecular dynamics digital simulation was used to investigate the sputtering yields from both liquid and solid metal targets. The system consisted of 1.0 keV Argon ions bombarding Rhodium targets. The embedded atom method of calculating potentials was used with a modified Moliere/Morse potential function. The yields from the solid and liquid targets were compared with the liquid showing a slightly higher yield than the solid. The liquid was simulated by random displacements of the atoms from a solid crystal lattice. Changing the seed, used by the random number generator to produce the liquid, effected the sputtering yield similar to moving the impact point. Four different sampling methods were investigated which produced similar results. Hence, the models described in this thesis should provide a basis for general sputtering simulations of liquids.

Master of Science in Physics
September 1988

Advisor: R. Smith
Department of Physics

ELECTRODYNAMIC DRIVER FOR THE SPACE THERMOACOUSTIC REFRIGERATOR (STAR)

Michele Fitzpatrick
Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1980

The objective of the STAR project is to test and space qualify a new continuous cycle cryogenic refrigeration system for cooling of sensors and electronics which is based upon the newly discovered thermoacoustic heat pumping effect. The new refrigerator has no sliding seals, a cycle frequency of about 300 Hz, and uses acoustic resonance to enhance the overall power density and efficiency. This thesis is concerned specifically with the design and testing of the electrodynamic transducer which is responsible for the electro-acoustic power conversion. A computer model of the driver/resonator system is presented along with the techniques for measurement of the electrical and mechanical parameters used as input for the model.

A final driver design (including dimensional drawings) utilizing a modified JBL 2450J neodymium-iron-boron compression driver and associated leak-tight electrical feed-throughs, microphone, accelerometer, pressure gage, pressure housing, and resonator interface is provided.

Master of Science in Physics
March 1988

Advisors: S.L. Garrett
T. Hofler
Department of Physics

THE CHARACTERISTICS OF REDUCED-DENSITY CHANNELS IN NH3-N2 GAS MIXTURES

William A. Goodwin
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1977

A CO2 laser was used to generate reduced-density channels in various gas mixtures of ammonia and nitrogen. Inteferometers were used to record the changing density resulting from the NH3 absorption of the CO2 laser radiation. One method used to determine the characteristics of the channel was based on the assumption that the resulting density profile was Gaussian shaped. The second method used the Abel Integral Transformation, requiring no pre-conditions on the density profile except that it was cylindrically symmetric. While used extensively in plasma spectroscopy, this technique is not generally well known for analyzing interferometric data. The results show that for a fixed laser energy long, shallow reduced-density channels were formed in gas mixtures of low ammonia concentration and short, deep channels were formed in gas mixtures of high ammonia concentration. These results qualitatively agree with an earlier experiment in which gas mixtures of nitrogen and sulfur-hexaflouride were used. Both experiments support the concept of reduced-density channel formation and lay the foundation for future studies of relativistic electron beam propagation for application in the Strategic Defense Initiative.

Master of Science in Physics
June 1988

Advisor: J.R. Neighbours
Department of Physics

EFFECTS OF NEUTRON IRRADIATION ON HIGH TEMPERATURE SUPERCONDUCTORS

John J. Hammerer, Jr.
Lieutenant Commander, United States Navy
B.S., University of South Carolina, 1976

Neutron irradiation of high temperature superconductors was performed in order to determine the effects of nuclear weapons on these novel materials. This radiation could also be encountered in space radiation belts, fusion reactors and particle accelerators. Fluences used were on the order of 10^{18} fast and thermal neutrons/cm^2. The result of the irradiation was a complete loss of observed superconductivity in $YBa_2Cu_3O_7$ and $ErBa_2Cu_3O_7$. A combination of gamma heating of 5 W/g and fast neutron flux imposed severe thermal stress on sample pellets. In two cases, the pellets were reduced to powder. Samples were prepared at the Naval Research Laboratory and the National Bureau of Standards. They were checked for the Meissner effect using magnetic levitation. The de four terminal method was used to determine the transition temperature. Irradiation of samples was conducted in the Omega West Nuclear Reactor at the Los Alamos National Laboratory.

Master of Science in
Physics
June 1988

Advisor: F.R. Buskirk
Department of
Physics

REFRACTIVE TURBULENCE PROFILES VIA BINARY SOURCE INTENSITY SCINTILLATION CORRELATIONS

Ricky R. Holland
Lieutenant, United States Navy Reserve
B.A., Unversity of Florida, 1981

This study examines the binary source correlation technique for determining vertical profiles of the refractive index structure parameter, C_n^2. Theoretical intensity scintillation covariance functions and power spectra for atmospheric layers of depth Δh at a mean altitude of h are derived. These functions are related to the photoelectron counting statistics and the spatial covariance of photoelectron counts for binary point sources. A linear detector array in the exit pupil of a optical system is examined, and the effects of the detection process uncertainty are explored. A lower bound for the expected error of a experimental determination of the spatioangular covariance of counts is derived. This error is then minimized via a least squares analysis using the redundant information available in pairwise multiple correlations of a signal from the detector elements of a ten element linear array. The refractive index structure parameter profile is then derived and found to be the undetermined coefficients of the spatial covariance weighting functions in the least squares analysis.

Master of Science in Physics
September 1988

Advisor: D.L. Walters
Department of Physics

MONTE CARLO CALCULATION OF ELECTRON MULTIPLE SCATTERING IN THIN FOILS

Daniel Christian Jenson
Lieutenant, United States Navy Reserve
B.S., Michigan State University, 1983

The electron/photon transport code ITS has many applications in the physics and medical industries. The code was originally intended for use in determining particle transport in thick materials. The code breaks down for very thin targets because the multiple scattering approximation used to determine the electron deflection angles for thin steps is inadequate. A method of correction has been developed by Tom Jordan and Joseph Mack which combines a small angle approximation theory to the multiple scattering and an explicit large angle treatment based on a Poisson distribution. This method has been validated against several experiments with great success. The multiple scattering theory of Moliere has also been incorporated into a correction scheme and shows good agreement with experimental data.

Master of Science in
Physics
June 1988

Advisor: X.K. Maruyama
Department of
Physics

A TRANSITION RADIATION EXPERIMENT TO MEASURE THE ELECTRON BEAM MODULATION INDUCED BY THE FREE ELECTRON LASER: A DESIGN STUDY

Jack E. Joynson
Lieutenant, United States Navy
B.S., United States Naval Academy, 1982

The modulated beam of the free electron laser when passed through a thin target should produce strong transition radiation. The measurement of the transition radiation is a direct measurement of the electron beam modulation in the free electron laser. A transition radiation experiment using the Stanford MKIII Infrared Free Electron Laser (IRFEL) has been proposed. The analysis has centered on TRANSPORT, a computer program used for designing charged particle beam systems. The MKIII IRFEL wiggler exit bending magnet system was modeled using TRANSPORT. Analysis reveals that the transverse emittance and momentum spread characteristics will cause the modulated beam to demodulate along the path of the central trajectory. A detector location 10 millimeters downstream of the first bending magnet is found suitable for the measurement of the electron beam modulation. For this case the thin foil must be rotated approximately 11.25 degrees about the y-axis to yield a minimum effective picobunch extent as seen by the thin foil. Alternate FEL systems are suggested for investigation.

Master of Science in
Physics
December 1987

Advisors: F.R. Buskirk
X.K. Maruyama
Department of
Physics

EFFECT OF CHARGE DISTRIBUTION WITHIN A PARTICLE BEAM ON THE SUB-CERENKOV RADIATION

Yun Su Jung
Lieutenant Colonel, Republic of Korea Army
B.S., Republic of Korea Military Academy, 1974

The charge distribution of periodic electron beam pulses generates patterns of sub-Cerenkov radiation distinctive of the distribution of charge within a bunch. Mapping the radiation pattern from different charge shapes may provide insight into whether charge pulse shapes can be determined from observed radiation patterns. The radiation patterns of Gaussian, Level, and Trapezoidal function were mapped by computer simulation. near 90^{o} to the beam, the radiation patterns of all three charge distributions developed an envelope proportional to the fourier transform of the charge bunch distribution when the wavelength of the emitted radiation was comparable to the size of the bunch. For the Gaussian function, the envelope is Gaussian, for the level function it is a sinc function. Since the envelope for the trapezoidal function is the product of two sinc functions it is more difficult to analyze. This work may provide a basis for determining the charge shape of electron beam pulses from the sub-Cerenkov radiation based on the radiation intensity pattern.

Master of Science in Physics
December 1987

Advisor: J.R. Neighbours
Department of Physics

A COMPUTERIZED INVESTIGATION USING THE METHOD OF IMAGES TO PREDICT THE SOUND FIELD IN A FLUID WEDGE OVERLYING A SLOW FLUID HALF-SPACE

Carolus Kaswandi
Commander, Indonesian Navy
B.S., Indonesian Navy Electronics School, 1967
Eng., Indonesian Navy Institute of Science, 1979

Sound fields in wedge-shaped ocean layers, modeling conditions on the continental shelf, have been studied at the Naval Postgraduate School in the last few years using the method of images. These studies are carried further in the present work. The method is implemented in different environmental conditions. This thesis examines the influence of parameters in developing the sound field in the wedge-shaped fluid overlying a slow bottom and downslope propagation using a computer program model. By changing the parameters, the change of the profile is observed. The thesis concludes that for validating this model, experimental data are required.

Master of Science in
Physics
December 1987

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

SKY RADIANCE DISTRIBUTIONS FOR THERMAL IMAGING BACKGROUNDS

Apostolos Kotsis
Lieutenant, Hellenic Navy
B.S., Hellenic Naval Academy, 1979

The Background Measurements and Analysis program (BMAP) operated mostly by Naval Surface Weapons Center (NSWC) is a program of measurement and analysis of background scenes appropriate to generic infrared imaging systems.

A computer code generated under contract, for this program, has been made available to NACIT (Naval Academic Center for Infrared Technology) at the Naval Postgraduate School (NPS) by NSWC. This code includes two stored measurement data sets for 2 dimensional Fast Fourier Transform comparison and other processing techniques, a version of LOWTRAN propagation code and high resolution graphics. This work is the evaluation of this code for use to provide test data sets to the IRSTD data processing /acquisition system, the evaluation of AGA DISCO program for use with the BMAP, the evaluation of the present IRSTD/MASSCOMP system for use with the BMAP and the transfer of the extracted BMAP data sets, obtained during an experiment conducted mid-September 1984 at the Raytheon company location, at Bedford MA, to the Masscomp computer of the IRSTD system is IRSTD data form.

Master of Science in
Physics and Engineering Science
December 1987

Advisors: A. Cooper
Department of
Physics

J. Powers
Department of
Electrical and Computer
Engineering

RADIATION EFFECTS ON RARE EARTH PERMANENT MAGNETS

Henry Buenviaje Luna
Lieutenant, United States Navy
B.S., United States Naval Academy, 1979

With continuing improvements in rare earth permanent magnet (REPM) technology, applications for their use are being discovered that were previously not possible. Two such applications for permanent magnets are in focusing elements for linear accelerators and ion sources, and in insertion devices (wigglers and undulators) used to produce synchrotron radiation. However, these magnetic transport elements are subjected to high radiation levels. Consequently, there is considerable interest in the United States and abroad to discover and quantify the effects of radiation on REPMs. Using the Lawrence Livermore National Laboratory (LLNL) 100 MeV Linac, four different samples of REPM were irradiated to one to two gigarads of exposed dose from a bremsstrahlung production target in an attempt to simulate the consequences of beam spills of a high energy primary electron beam. Of the samples irradiated, Sm_2Co_{17} proved to be the most resistant to gamma radiation. The electron transport code CYLTRAN of the Integrated Tiger Series (ITS), which is an electron and photon Monte Carlo simulation code, was used to determine the angular and energy spectra for both electrons and photons produced by the target used at the LLNL Linac.

Master of Science in Physics
June 1988

Advisors: X.K. Maruyama
N.J. Colella
Department of Physics

THERMAL IMAGING WITH AGA THERMOVISION

Tim R. McKaig
Captain, United States Army
B.S., United States Military Academy, 1978

Thermal images of a ship target were recorded with an AGA Thermovision 780 thermal imaging system on 6-13 May 1987. These images were used to produce temperature distributions of the ship. The temperatures predicted with the AGA computer-processing algorithm were compared to actual temperatures measured with thermistors at eight locations on the ship's superstructure. An empirical modification based on the identity of the ambient and local atmospheric conditions was developed for the atmospheric compensation algorithm. The predicted temperatures were found to agree with the actual temperatures within 1.5 ^{o}C 77% of the measurements. The Contrast Transfer Function (CTF), Modulation Transfer Function (MTF), and Minimum Resolvable Temperature Difference (MRTD) were determined for the Thermovision using flat black painted aluminum bar targets. The resultant curves showed the expected form with some experimental scatter at higher spatial frequencies.

Master of Science in
Physics
December 1987

Advisor: A.W. Cooper
Department of
Physics

UTILIZATION OF DENSE PACKED PLANAR ACOUSTIC ECHO-SOUNDERS TO IDENTIFY TURBULENCE STRUCTURE IN THE LOWEST LEVELS OF THE ATMOSPHERE

Louis Robert Moxcey
Lieutenant, United States Navy
B.S., Jacksonville University, 1981

Coherent light beams propagating through the atmosphere undergo considerable phase perturbations due to fluctuating temperature structures in the atmosphere. Understanding and measuring these structures on a real-time altitude dependent basis is inherent to successful deployment of ground based lasers and particle beams.

One method used to detect these temperature structures is an acoustic profiler, or echosounder. Of immediate interest is the ability of high frequency (5 kHz) planar array sounders to rapidly detect low level turbulence (below 200 meters) and quantify the results.

This thesis involves design improvements of previously developed echosounder arrays and associated software. Particularly, this thesis demonstrates that tighter packing of elements on a planar acoustic array produces better side lobe reduction than less densely packed arrays. This results in higher energy density in the main lobe and increased performance.

Also included in this thesis is a computer method which allows relatively accurate beam pattern prediction from any given planar array.

Master of Science in Physics
December 1987

Advisor: D.L. Walters
Department of Physics

IONS GENERATED ON OR NEAR SATELLITE SURFACES

Christopher William Norwood
Lieutenant, United States Navy
B.S., Villanova University, 1981

Observations of positively charged particles that are generated on or near satellite surfaces have been made on several spacecraft. This thesis postulates sputtering of the satellite surface due to ambient ion impact as the generating mechanism. Calculations are made using the Sigmund-Thompson sputtering theory to determine the response at the particle detectors. These calculations indicate that surface sputtering creates a sufficient flux to account for the observed phenomena. The NASA Charging Analyzer Program was run to determine the trajectories for actually observed particles. The calculated trajectories were determined to lead to the spacecraft surface, again indicating that surface emission was the source. The sputtering flux as calculated was insufficient to cause any significant short-term damage to the spacecraft, beyond thin coating erosion.

Master of Science in
Physics
June 1988

Advisor: R.C. Olsen
Department of
Physics

OBSERVATIONS OF A HYDROMAGNETIC WAVE IN THE EARTH'S MAGNETOSPHERE

John Woodward Patterson, III
Lieutenant, United States Navy
B.S., Purdue University, 1979

Measurements of a continuous hydromagnetic micropulsation event, which occurred in the pre-dawn magnetosphere on July 29, 1979, are reported as observed by wave and particle instruments onboard the P78-2 (SCATHA) spacecraft. Calculations of the Poynting vector make it clear that the wave is a traveling Alfven wave guided by the earth's magn· ic field line. Plasma densities are calculated at L = 7. The phase relationship between the plasma flux and the electromagnetic fields is investigated. A self-consistent set of particle density and particle velocity data is determined, in order to verify the measurement of the electric field. Current magnetospheric models predicting Alfven wave speeds, Alfven wave periods and plasma densities are supported by the study.

Master of Science in Physics
December 1987

Advisor: R.C. Olsen
Department of Physics

MECHANICAL-CHEMICAL ENERGY TRANSFER OBSERVATIONS OF VAPORIFIC EXPLOSIONS

Gilberto Rodriquez
Captain, United States Army
B.S., University of Puerto Rico, 1980

This study incorporates an experiment performed with the objective of expanding the existing knowledge about "Vaporific Explosions." This phenomenon, known to produce extensive damage to targets, is studied for a possible energy transfer mechanism occurring during the projectile-target impact interaction. This investigation is concentrated mainly to observe the distribution and combustion of fragments (aluminum particles) within the fragment beam and the transfer of kinetic energy to surfaces on the target. The results indicated no evidence of combustion of fragments (aluminum particles) within the fragment beam and the transfer of kinetic energy to surfaces on the target. The results indicated no evidence of combustion for the selected targets. Tha analysis of the closed target configurations showed that the main cause for damage was the transfer of kinetic energy to the surface within the target.

Master of Science in
Physics
June 1988

Advisor: G.F. Kinney
Department of
Physics

DEVELOPMENT OF A SYSTEM FOR ACOUSTIC MEASUREMENTS OF BISTATIC TARGET STRENGTHS

Glenn Reverdy Snyder
Lieutenant, United States Navy
B.S., United States Naval Academy, 1982

A digital data acquisition system was implemented for the study and collection of scattered waveforms from various simple objects. Reflected waveforms were extracted from interference with other signals by a simple subtraction technique. Backscattered and bistatic reflections were observed and recorded. Various effects on scattered waveforms, including target composition, pulse length, and frequency, were experimentally observed. Bistatic scattering results from a styrofoam sphere at a ka value of 10 were in agreement with theoretical predictions for a rigid sphere. Bistatically measured data at 70 kHz from a styrofoam cylinder of length 20 cm and diameter 2.5 cm followed a trend for bistatic angles up to 150 degrees but became amorphous as the bistatic angle approached 180 degrees.

Master of Science in Physics
September 1988

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

THERMODYNAMIC IMPROVEMENTS FOR THE SPACE THERMOACOUSTIC REFRIGERATOR

Michael Paul Susalla
Lieutenant, United States Navy
B.S., United States Naval Academy, 1979

The objective of the STAR project is to test and space qualify a new continuous cycle cryogenic refrigeratin system for cooling of sensors and electronics which is based upon the newly discovered thermoacoustic heat pumping effect. The new refrigerator has no sliding seals, a cycle frequency of about 300 Hz, and uses acoustic resonance to enhance the overall power density and efficiency. This thesis is concerned specifically with the design and testing of the thermodynamic element (or stack), which is responsible for the thermo-acoustic power conversion, and the testing of binary inert gas mixtures as working fluids. Using the refrigerator's coefficient of performance relative to the ideal Carnot coefficient of performance as a measure of efficiency, we have achieved a 93% improvement over previous designs.

Master of Science in
Physics
June 1988

Advisor: T.J. Hofler
Department of
Physics

EFFECTS OF 67.5 MEV ELECTRON IRRADIATION ON Y-BA-CU-O AND GD-BA-CU-O HIGH-TEMPERATURE SUPERCONDUCTORS

Eric Lynn Sweigard
Lieutenant, United States Navy
B.S., United States Naval Academy, 1979

High-temperature superconductors ($YBa_2Cu_3O_{6+\delta}$ and $GdBa_2Cu_3O_{6+\delta}$, both with $\delta \leq 1$) with $Tc \approx 92$ K and manufactured at the University of Houston were irradiated with 67.5 MeV electrons at fluences of 10^{13}, 10^{14}, 10^{15} and 5×10^{15} electrons/cm^2. The irradiation effects were studied by analyzing resistance versus temperature curves developed using the four-probe resistance measuring technique. The $YBa_2Cu_3O_{6+\delta}$ sample showed irradiation effects in the form of a normal state resistance drop after the 10^{13} irradiation (.3 Mrad) and an isolated failure to achieve total superconductivity above 77 K after the 10^{14} irradiation (3 Mrad). The same sample re-established its high-T_c (92 K) after subsequent irradiations. This was presumed to indicate microscopic damage to superconducting channels. It also displayed granular crumbling in the vicinity of the electrical contacts. This was interpreted as an effect of the differences in thermal expansion rates between the contacts and the superconductor. The $GdBa_2Cu_3O_{6+\delta}$ sample showed no such effects until its 10^{15} irradiation where it showed localized crumbling as well. In view of these results, the $GdBa_2Cu_3O_{6+\delta}$ was concluded to be superior to $YBa_2Cu_3O_{6+\delta}$ for use in high irradiation environments, although neither material should require any

extraordinary shielding in such environments. Difficulties maintaining electrical contacts on the superconductors for these measurements hindered the conclusiveness of the data.

Master of Science in Physics
December 1987

Advisor: F.R. Buskirk
Department of Physics

ION GUN GENERATED ELECTROMAGNETIC INTERFERENCE ON THE SCATHA SATELLITE

Leonard Earl Weddle
Lieutenant, United States Navy
BS., Purdue University, 1979

Spcecraft charging at geosynchronous orbit can cause satellite anomalies and failure. Experiments in charge control were conducted on the joint Air Force/NASA P78-2 (SCATHA) satellite using both electron and positive ion emission systems. These experiments were monitored by a variety of plasma wave and particle detectors. Plasma wave data show that arcing was taking place during non-neutralized ion beam emission. The arcing was seen to cease when either the beam was neutralized or the beam acceleration voltage was turned off. Evidence exists which indicate that the arcing is due to differential charging on the satellite surface. A possible effect of non-neutral, non-accelerated ion beam emission is the shielding of the electric field antenna from ion gun generated plasma waves. The effect of shielding these signals is an increase in the sensitivity of the electric field receiver to natural signals.

Master of Science in
Physics
December 1987

Advisor: R.C. Olsen
Department of
Physics

ION GUN OPERATIONS AT HIGH ALTITUDES

Paul W. Werner
Lieutenant, United States Navy
B.S., University of Utah, 1980

Experiments in charge control were conducted on the P78-2 (SCATHA) satellite as part of a joint Air Force/NASA program on spacecraft charging at high altitudes. Experiments with the SCATHA ion gun were monitored by charged particle detectors and the electric field experiment. It was found that the electric field experiment could be used to measure satellite potential during ion beam emission in sunlight and eclipse. Unneutralized ion beam emission in high energy (1-2 KeV) and high current (1-2 mA) modes resulted in the satellite momentarily charging to a negative potential near the magnitude of the beam voltage and then rising to some less negative value, typically -500 to -800 V. The net emitted current was apparently limited by the formation of a virtual anode. Low current (20-30 μA), high voltage (1 kV) resulted in -10 to -50 V satellite potentials. Trickle mode (20-80 μA, no accel voltage) operations resulted in satellite potentials near zero Volts. In sunlight the spacecraft potential exhibited a spin modulation, attributed to variations in the neutralization of the beam as it passed through the photoelectron cloud. Rapid fluctuations of the spacecraft potential occured which may be explained qualitatively by space-charge instabilities.

Master of Science in Physics
June 1988

Advisor: R.C. Olsen
Department of Physics

A TECHNIQUE FOR DIGITIZING OSCILLOSCOPE VOLTAGE VERSUS TIME PHOTOGRAPHS FOR FREQUENCY ANALYSIS USING A TEKTRONIX DIGITIZING CAMERA SYSTEM

Danny Ben Williams
Lieutenant Commander, United States Navy
B.S.E., Purdue University, 1975

This thesis develops a system that digitizes photographically recorded oscilloscope traces for computer analysis. It is based on a Tektronix Digitizing Camera System. Five hundred and twelve data points per photo are generated. Additionally, a fourier analysis program is developed in Fortran that reads files generated by the Digitizing Camera System. The program plots input waveforms in voltage versus time as well as the fourier decomposition in signal strength (both db and normalized) versus frequency. These plots can be printed automatically in batch mode or individually using the Disk Operating System print screen command. Data files listing frequencies and corresponding signal strengths are optionally generated for specific analysis.

Master of Science in
Physics
December 1987

Advisor: J.R. Neighbours
Department of
Physics

MASTER OF SCIENCE
IN
SYSTEMS TECHNOLOGY
ANTISUBMARINE
WARFARE (ASW)

MONTEREY BAY ACOUSTIC TOMOGRAPHY: RAY TRACING AND ENVIRONMENTAL ASSESSMENT

Theresa W. Rowan
Electronics Engineer, Naval Training Systems Center
B.S., Florida Technological University, 1971
B.S., University of Central Florida, 1980

This thesis recommends the locations for placement of five sonobuoys which are to be used in the 12-16 December 1988 acoustic tomography experiment in Monterey Bay. The experiment will test a low-cost tomographic system for studying internal waves and surface waves. The five sites were determined to be the most optimal locations for acoustic signal acquisition, based on predicted eigenray simulation and oceanic environment assessment. The Multiple Profile Ray-Tracing (MPP) simulated the probable ray paths from the specified source location to receiver positions throughout Monterey Bay, predicted eigenrays for the various sites, and determined the arrival time, transmission loss, and ray path for each eigenray.

Master of Science in
Systems Technology
(Antisubmarine Warfare)
September 1988

Advisor: J.H. Miller
Department of
Electrical and
Computer Engineering

MASTER OF SCIENCE
IN
SYSTEMS TECHNOLOGY
COMMAND, CONTROL
AND COMMUNICATIONS
(C3)

AN INITIAL STUDY EXAMINING THE FEASIBILITY OF EXPERT SYSTEM TECHNOLOGY FOR COMMAND AND CONTROL OF SUPPORTING ARMS IN THE UNITED STATES MARINE CORPS

Michael C. Albano
Major, United States Marine Corps
B.S., United States Naval Academy, 1974

Robert A. Gearhart, Jr.
Captain, United States Marine Corps
B.A., Virginia Military Institute, 1980

The authors of this thesis propose the use of knowledge based expert system technology to automate Marine Corps fire support command and control. It investigates the need for such support for the control of supporting arms and the ways to achieve it. The authors provide general information about artificial intelligence (specifically, expert system technology) and its potential use for automating command and control functions for Marine Corps combat functions. In particular, they examine the complexities of system design (especially critical man-machine interfaces) within the context of basic command, control, communication, and intelligence (C3I) architecture. Finally, the authors investigate the potential use of expert system technology for improving the effectiveness of command and control of various combat and combat support activities, but focus on fire support coordination: they illustrate the feasbility of using a so-called "expert system" to aid a Marine Air Ground Task Force (MAGTF) commander in the employment of supporting arms.

Master of Science in Systems Technology (Command, Control and Communications)
March 1988

Advisor: J.G. Taylor
Department of Operations Research

LO-CO-GRAF: GENERATING MAPS TO SUPPORT COMMAND AND CONTROL/CRISIS MANAGEMENT USING SMALL COMPUTERS

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B.S., Texas Tech University, 1981

Robert P. Sabo
Lieutenant, United States Navy
B.A., University of Oklahoma, 1979

This thesis describes and tests a system for Low Cost Graphics (LO-CO-GRAF) which enables a small computer to generate and display high quality cartographic maps from a remote mainframe computer database. A small computer must emulate a graphics terminal while interfacing with a mainframe program which processes the necessary data. This solution has been accomplished through four smaller tasks.

The tasks include communicating with the source system, emulating a graphics terminal, interfacing with a map generation program, and producing a local hardcopy of the generated map. All software and hardware required for these component parts, in addition to the use of standard methodologies, were selected for their widespread availability at Department of Defense (DoD) agencies.

Research was conducted using the Heath/Zenith Z-120 as the small microcomputer and the Tektronix 4010 graphics terminal was chosen to model and emulate; two separate source graphics packages were used to generate maps. Concept validation involved the use of DISSPLA, the primary graphics package used on an IBM 3033 mainframe computer at the Naval Postgraduate School, and the

Briefing Aid System, a map generation program maintained on the VAX mainframe computer at University of Southern California's Information Systems Institute, which was accessed and employed via Defense Data Network (DDN).

Specific "how-to" instructions were developed for application to the Heath/Zenith Z-100 series microcomputer. These instructions, which are provided as Appendices, include programs which cause the Z-100 microcomputer to emulate a Tektronix 4010 graphics terminal, provide microcomputer to mainframe computer communications using KERMIT, present interactive DISSPLA map generation programs, and explain how to access the Briefing Aid System map generation program via the DDN.

Master of Science in
Systems Technology (Command,
Control and Communications)
March 1988

Advisor: J.S. Stewart, II
Department of
Operations Research

A METHODOLOGY FOR DESIGNING LOCAL AREA NETWORKS FOR THE AIR FORCE

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B.S., State University of New York, 1977

This thesis effort examines applying local area network (LAN) technology to the Air Force. Long haul nets such as the Automatic Digital Network (AUTODIN) and Defense Data Network (DDN) are vital elements of command and control (C2) for the Air Force, but this functionality has not yet been extended to cover base-level C2 requirements. The principle elements of this study concern the need for LANs on Air Force bases, the best local area network design for Air Force bases, and a local area network implementation strategy.

LANs have the additional advantage of being able to provide information sharing between microcomputers that use different operating systems. Three interconnection scenarios are described and potential solutions for each one are presented, with the author's recommendation for the best solution in each case. These solutions build the case for Air Force local area network standards: a broadband backbone connecting a variety of networks designed to support a variety of users.

Master of Science in
Systems Technology
(Command, Control and
Communications)
March 1988

Advisor: N. Rowe
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Computer Science

A METHODOLOGY FOR VALIDATION OF HIGH RESOLUTION COMBAT MODELS

Michael Paul Coville
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B.S., United States Military Academy, 1978

Senior officers in the United States Army have a high degree of confidence that National Training Center simulated combat results are representative, under similar circumstances, of actual combat. A validation methodology for high resolution combat models, primarily based on data acquired from the National Training Center, is the focus of this thesis. The validation methodology, where appropriate, translates confidence in National Training Center realism, to confidence in the combat model. Theoretical issues, existing methodologies, and the impact of model purpose are considered in this research. The final product is a validation methodology that makes use of a realistic representation of combat, automatically updates validation criteria to account for changes in weapons and tactics, and is responsive to the purpose for which the model was designed.

Master of Science in
Systems Technology (Command,
Control, and Communications) and
Operations Research
June 1988

Advisor: S.H. Parry
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Research

A HISTORY OF RUSSIAN AND SOVIET NAVAL DEVELOPMENT

Richard Wayne Daniel
Lieutenant, United States Navy
B.S., Texas A&M University, 1981

This thesis seeks to provide an historical understanding of Russian and Soviet naval developments. This historical basis is provided to complement technological analysis of Soviet naval concepts and systems. The origins of Soviet naval traditions are examined, beginning with the establishment of the ancient Russian state of Kiev, the birth of the Tsarist Navy (under Peter I), the origins of the Communist State and Navy, and concluding with the Soviet naval developments during the Second World War. In examining these developments, significant naval victories (Sweden, 1721; and Tchesme, 1770) and defeats (Crimean, 1853; and Tsushima, 1905) are noted, along with non-combat administrative reforms. The employment of the Russian Navy in World War One and the Soviet Navy in World War Two are also examined. The conclusion is drawn that the primary mission of the Soviet Navy is to support the Soviet Army in a continental theater. This conclusion is based on the historical failure of the Russian and Soviet Navies in conducting bluewater operations (inferring a notion of perceived futility in attempting these operations), the historical success in conducting coastal operations in support of the army (inferring the utility of these types of operations), and the historical land combat bias of the Russian and Soviet militaries.

Master of Science in
Systems Technology (Command,
Control and Communications)
March 1988

Advisor: J.G. Taylor
Department of
Operations
Research

APPLICATION OF SPEECH RECOGNITION TO THE INTEGRATED TACTICAL DECISION AID (ITDA)

Jerry Kim Hall
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B.S., United States Military Academy, 1977

The author investigates the operation of the "Integrated Tactical Decision Aid," (ITDA), using a VOTAN 6050 series II, speaker dependent, continuous Speech Recognition Device, (SRD). The ITDA's unique features directly affect the application of an SRD. It is an interactive, menu driven program designed to be operated from the keyboard only. The SRD must be connected to the host computer, the HP 9020, through a remote user port. The ITDA is multi-leveled with several menu names being assigned to different levels. The SRD can not assign more than one meaning to the same word. These problems were mostly overcome and the ITDA was successfully operated by voice. The recommended vocabulary for the ITDA "CONTACTS" module is presented. Speech Recognition applications to C3 systems is summarized as a very efficient method of man-machine interface. The current ITDA software does not permit an efficient application of speech. Software changes to the ITDA are recommended as well as further studies in this area.

Master of Science in
Systems Technology (Command,
Control and Communications)
March 1988

Advisor: G.K. Poock
Department of
Operations Research

AN EVALUATION OF THE DEFENSE NUCLEAR AGENCY EXPLORATORY DEVELOPMENT PROGRAM IN SUPPORT OF TNF C3 SURVIVABILITY (SUPPORT OF V CORPS/81D DISPERSED COMMAND POST) USING MCES

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B.S., North Carolina State University, 1981

The purpose of this thesis is to evaluate the Staff Planning and Decision Support System (SPADS). The analysis presented uses the Modular Command and Control Evaluation Structure (MCES), a structured approach to evaluate C^2 systems using standard and evolving operational research tools. The analysis answered the following three problems by assessing the effectiveness of SPADS. Did SPADS provide the V Corps commander and his staff with the ability to exercise command and control of combat assets to meet overall mission objectives? Did SPADS demonstrate that the dispersed command post concept enhanced command survivability? Did SPADS evolve as a command and control force effectiveness system for the V Corps DCP based upon operational lessons learned? Appropriate measures of performance, effectiveness, and force effectiveness were identified to answer these problems. These measures and their assessment are presented as a strawman for consideration by the analytical community. As SPADS evolved from August 1981 to March 1985, it provided distinct advantages to the V Corps commander and his staff in terms of effective C2

mission orientation, enhanced command survivability, and increased C^2 force effectiveness.

Master of Science in
Systems Technology
(Command, Control, and
Communications)
March 1988

Advisor: T.J. Brown
Command, Control, and
Communications
Academic Group

THE NEAR REAL TIME INFORMATION SYSTEM

Francis G. Mahon
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B.S., University of Delaware, 1977

Mark R. Wise
Captain, United States Army
B.S., University of Washington, 1977

This thesis is a study in which the authors define and develop a U.S. Army requirement for automatic generation and distribution of near real time battlefield information for command and control. This information consists of identification, position, combat posture, and operational readiness, and allows commanders and staffs to more effectively and efficiently command and control U.S. forces on the AirLand battlefield. The proposed system interfaces with and complements the Army Tactical Command and control System. Methodologies are developed and applied to determine operational and organizational requirements. A technical solution to the stated requirement is proposed and developed. The technical concept integrates mature, off the shelf, very low frequency, radar beacon and computer technologies in a realistic, technically feasible approach to generate the desired battlefield information. A methodology to assess operational merit is developed and applied to the concept. The proposed solution is shown to be a low cost, low risk, high payoff system which meets the stated requirement. The product of this work is an Operational and Organizational Plan.

Master of Science in
Systems Technology (Command,
Control and Communications)
March 1988

Advisor: MAJ T.J. Brown
C3 Academic Group

THE COMMAND POST: A COMPARISON OF TACTICAL COMMAND DOCTRINE OF THE U.S. AND SOVIET ARMIES

James R. Sajo
Captain, United States Army
B.G.S., University of Kansas, 1979
B.S., United States Military Academy, 1981

The purpose of this thesis is to compare the employment of tactical Command Posts in the U.S. and Soviet armies. In both the U.S. concept of AirLand Battle and the Soviet doctrine of Offense in Depth, the Command Post is the facility from which command and control is exercised. Therefore, understanding its characteristics, functions, and structure are of great importance. In pursuit of that understanding, this paper provides definitions for the fundamental concepts of command and control, and the Soviet counterpart, troop control. These definitions are then applied to a model for the management of military forces. The warfighting doctrine of each army is then reviewed with special emphasis on how the doctrine impacts on the functions of management. Finally, a detailed examination of Command Posts explores whether they adequately support C2 needs, based on the warfighting doctrine. The principal conclusion is that there exists a dire need for the U.S. to clearly and distinctly define the concept of a C2 process in order to gain an understanding of how CPs fit into the C2 picture.

Master of Science in
Systems Technology (Command,
Control and Communications)
March 1988

Advisor: J.G. Taylor
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Research

ARMS CONTROL AND NATIONAL SECURITY: REVEALED THROUGH TWO CASE STUDIES

Randle Eric Scott
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B.S., United States Military Academy, 1978

The task of this research is to explore the relationship between arms control and national security. The author suggests that national security issues must dominate arms control initiatives and that the military command establishment should have an expanded role in shaping current arms control initiatives. The author considers two case studies to analyze this relationship. The first case study involves cruise missiles and reveals how issues such as politics, budgets, military missions, technology, stability and verification can impact on arms control negotiations and national security. The second case study shows the control that the military can and should exert in areas dealing with both arms control and national security interests. Lastly, the author proposes how the balance of arms control and national security should be achieved in the future.

Master of Science in
Systems Technology (Command,
Control and Communcations)
March 1988

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REPETITIVE USE OF JOINT THEATER LEVEL SIMULATION (JTLS) FOR INVESTIGATION OF HEADQUARTERS EFFECTIVENESS

Thomas Douglas Sloan
Lieutenant, United States Navy
B.S., United States Naval Academy, 1980

This thesis is a discussion of the Headquarters Evaluation Assessment Tool (HEAT), Command, Control and Communications (C3), and the Joint Theater Level Simulation (JTLS) wargame. The discussion is based upon a history of past experiments and present, such as a series of experiments conducted at the Naval Postgraduate School in August and September 1987 and the experiment analysis conducted by government contractors and NPS students. Using background material, research documents and analysis reports from government agencies and contractors, this thesis reports on one particular experiment focusing on a comprehensive review. By this, the author hopes to stimulate interest in experimentation and analysis of C3 processes as a means of developing C3 principles.

Master of Science in
Systems Technology (Command,
Control and Communications)
March 1988

Advisor: J.S. Stewart, II
Department of
Operations
Research

SIMULATING METEOR BURST COMMUNICATIONS WITH THE SIMSTAR COMMUNICATIONS MODEL

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B.S., United States Air Force Academy

The purpose of this thesis is to explore the ability of the SIMSTAR computer model to simulate meteor communications systems. The SIMSTAR computer model is described, as was the type information necessary to run the SIMSTAR model and systems SIMSTAR has been used to simulate.

Meteor communications is examined from a theoretical standpoint and examples of operational meteor communications systems are described. One operational system, the 25th North American Aerospace Defense Command (NORAD) Region system, was looked at more closely as it was used as the standard against which SIMSTAR's results were compared. The 25th NORAD system was modeled with SIMSTAR in five test cases, which were described.

The results of the test cases led to the conclusion that SIMSTAR does not accurately simulate meteor communications. Recommendations included modifying SIMSTAR, redoing the tests, and using SIMSTAR to simulate other communication systems in further research.

Master of Science in
Systems Technology (Command,
Control and Communications)
March 1988

Advisor: J.S. Stewart, II
Department of
Operations
Research

SOVIET NAVAL FORCE CONTROL AND THE RED NAVAL C3 SYSTEM: WHAT THE BLUE COMMANDER NEEDS TO KNOW

Jennifer L. Tondu
Lieutenant, United States Navy
B.S., United States Naval Academy, 1982

Soviet Naval Force Control is the process that the Soviets use to control naval forces during execution of assigned missions, as well as create and maintain combat readiness and fighting efficiency. It is the underlying basis of the Red naval C3 system; it provides control throughout a system composed of command posts, intelligence sensors, naval forces and weapons, and an interconnecting communications network. The concept of Soviet Naval Force Control and its support of the Red naval C3 system is discussed in this thesis. Emphasis is placed on how the Blue commander can use this information to enhance his decision making process concerning the utilization of his own C3 system. Major concepts examined in the thesis include Marxist-Leninist theory, Soviet military thought, cybernetics, and the Naval Force Control process. The assumption is made by the author that a Blue commander who is aware of and conversant with the major concepts presented in this thesis will have a better understanding of the Soviet approach to the C3 process and how it affects Soviet actions. In turn, this understanding will increase his ability to control his own C3 system and successfully achieve his goal in battle outcome.

Master of Science in Systems Technology (Command, Control and Communications)
March 1988

Advisor: J.G. Taylor
Department of Operations Research

INTEROPERABILITY IN THE COMMAND AND CONTROL PROCESS

Brette M. Walker
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B.S., Central Michigan University, 1978

The objective is to give the reader a better understanding of interoperability as it applies to command and control (C2), in order to advocate the appropriate degree of interoperability required for successful military operations. The author defines and describes C2 in terms of a commander's requirement to effectively carry out an assigned mission. Interoperability is defined and described in the context of effective C2. The following questions about interoperability are answered: what it is, why it's important, how much is really needed, how it's achieved, how we know we have it, and how we keep it at the desired level. The author compares and contrasts the US interoperability concept with the Soviet interoperability perspective. The author concludes with a summary of problems the U.S. has in obtaining the appropriate levels of interoperability and recommends education as the means to gain the correct understanding of the importance of interoperability in the C2 process.

Master of Science in
Systems Technology
(Command, Control and
Communications)
March 1988

Adivsor: J.G. Taylor
Department of
Operations
Research

MASTER OF SCIENCE
IN
SYSTEMS TECHNOLOGY
SPACE SYSTEMS OPERATIONS
(SSO)

THE EFFECTS OF A PITCHED FILED ORIENTATION ON HAND/EYE COORDINATION

Cynthia J. Ballinger
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B.S., University of Florida, 1981

Ten subjects judged eye level by making verbal and pointing responses while looking into a box that was pitched at angles of approximately -15, -7.5, 0, 7.5 and 15 degrees. The mean verbal judgements changed as a function of the box's pitch angle according to the relationship:

Judged Eye Level = 0.48 (Box Pitch Angle) - 0.31 Degrees

which agrees with the results of previous studies. The mean pointing responses were also a function of the box's pitch angle:

Pointing Response = -0.19(Box Pitch Angle) - 5.39 Degrees

Thus, the mean pointing responses change at approximately 40 percent of the rate of the perceptual responses, as indicated by the verbal judgements, and are in the opposite direction. These errors have implications for the design of displays and controls for vehicles that operate in environments where pitched visual fields are encountered.

Master of Science in
Systems Technology
(Space Systems Operations)
September 1988

Advisor: T.M. Mitchell
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Operations
Research

ACCURACY OF SATELLITE DATA NAVIGATION

William J. Bethke
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B.S., University of Nebraska, 1982

Image navigation is critical to the effective use of digital imagery for meteorological and oceanographic studies. This thesis reviews various methods used to navigate imagery to the earth and investigates the accuracy of the Naval Postgraduate School (NPS) model. An explanation of how the NPS navigation process works is included for completeness. Results from 22 separate runs of the NPS model are studied. The following points are discussed in Chapters VI and VII:

1. Abilities of user affects accuracy.
2. Apparent upper bound for navigation landmarks.
3. Centrally oriented navigation landmarks enhance accuracy.
4. Evenly distributed navigation landmarks enhance accuracy.

The thesis concludes with observations and suggestions to stimulate further research into the effective use of the NPS image navigation system.

Master of Science in
Systems Technology
(Space Systems Operations)
March 1988

Advisors: C.H. Wash
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Meteorology

A STANDARD LIBRARY FOR MODELING SATELLITE ORBITS ON A MICROCOMPUTER

Kenneth Lawrence Beutel
Captain, United States Marine Corps
B.S., State University of New York, Buffalo, 1981

Introductory students of astrodynamics and the space environment are required to have a fundamental understanding for the kinematic behavior of satellite orbits. This thesis develops a standard library that contains the basic formulas for modeling earth orbiting satellites. This library is used as a basis for implementing a satellite motion simulator that can be used to demonstrate orbital phenomena in the classroom.

This thesis surveys the equations and principles taught to introductory orbital mechanics and space systems students. The library organizes these orbital elements, coordinate systems and analytic formulas into a standard method for modeling earth orbiting satellites. The standard library is written in the C programming language and is designed to be highly portable between a variety of computer environments.

The simulation draws heavily on the standards established by the library to produce a graphics-based orbit simulation program written for the Apple Macintosh computer. The simulation demonstrates the utility of the standard library functions but,

because of its extensive use of the Macintosh user interface, is not portable to other operating systems.

Master of Science in Systems Technology (Space Systems Operations) and Computer Science
March 1988

Advisor: D. Davis
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A PROTOTYPE FAULT DIAGNOSIS SYSTEM FOR NASA SPACE STATION POWER MANAGEMENT AND CONTROL

Gina L. Hester
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B.S., United States Naval Academy, 1983

The Power Management and Distribution System (PMAD) Prototype utilizes a computer graphics interface with a computer expert system running transparent to the user and a computer communications interface that links the two together, all enabling the diagnosis of PMAD system faults. The prototype design is based on the concept that an astronaut on a space station will instruct an expert system through a graphics interface to run a system or component check on the PMAD system. The graphics interface determines which type of evaluations was requested and sends that information through the communications interface to the expert system. The expert system receives the information and, based on the type of evaluation requested, executes the appropriate rules in the knowledge base and sends the resulting status back to the graphics interface and the astronaut. The PMAD System Prototype serves as a proposed training tool for NASA to use in the training of new personnel who will be designing and developing the NASA Space Station expert systems.

Master of Science in
Systems Technology
(Space Systems Operations)
September 1988

Advisor: R.B. McGhee
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Computer Science

SOVIET CONCEPTS OF BALLISTIC MISSILE DEFENSE

Kevin P. Seavey
Lieutenant, United States Navy
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The purpose of this thesis is to characterize the Soviet concept of ballistic missile defense (BMD) in order to better understand and predict future Soviet BMD decision making. The Soviet concept of BMD is fundamentally different from that in the West. Soviet BMD is clearly an integral component of a much larger Soviet strategic defense effort which consists of strategic air defense as well as passive measures, such as mobility, deep underground command and control facilities and civil defense. As the Soviet military literature demonstrates, Soviet strategic air defense encompasses defense against a continuum of threats - from aircraft to ballistic missiles to satellites to "space-strike weapons." Soviet strategic air defense weapons therefore appear optimized to counter a wide range of airborne threats. In the Soviet view, surface-to-air missiles may be a primary tactical BMD weapon. Additionally, Soviet strategic BMD weapons may be a primary Soviet anti-satellite weapon. Furthermore, manned space platforms play a particulary significant role in Soviet thinking about the future of BMD and space warfare.

Master of Science in
Systems Technology
(Space Systems Operations)
June 1988

Advisor: D.S. Yost
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DESIGN OF AN ELF/VLF SATELLITE FOR UNDER THE ICE SUBMARINE COMMUNICATIONS

Gary C. Thompson
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B.A., The Ohio State University, 1980

This thesis proposes the design of a space based tethered antenna satellite system for ELF/VLF communications with submarines in the far northern latitudes, and under the polar ice. By using the dynamo effect of a moving wire in a (geo)magnetic field, the tether cable can produce tens of kilowatts of its own radiation power. The transmitted signal of 1KHz-3KHz will use whistler mode propagation to couple to the earth's field lines and follow them down to the surface. The signal can penetrate 100m of seawater, and ice of unlimited thickness. A constellation of 12 satellites will provide 75% duty cycle coverage for each submarine operating area of over four million square kilometers. Issues examined are: tether electrodynamics and mechanics, debris survivability, ionospheric radio and plasma physics, plasma contactors, satellite and constellation design concepts, cost analysis, and military mission needs analysis.

Master of Science in
Systems Technology
(Space Systems Operations)
September 1988

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Physics

USE OF THE TRACKING AND DATA RELAY SATELLITE SYSTEM (TDRSS) WITH LOW EARTH ORBIT (LEO) SATELLITES: A DECISION GUIDE

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Lieutenant Commander, United States Navy
B.A., Vanderbilt University, 1975
M.B.A., New Hampshire College, 1970

With increased military interest in relatively inexpensive, mission variable "lightsats" for proliferation and reconstitution purposes, and efficient means for information flow must be found. This information includes control of the mission satellite as well as retrieval of mission data. A possible selection to provide this channel is the Tracking and Data Relay Satellite System (TDRSS). This research was conducted to assemble the critical decision elements as a guide to prospective "lightsat" users of TDRSS. When TDRSS is complete, orbital coverage will be at least 85%, making this an attractive option over alternatives. Greater link ranges and signal peculiarities are limiting factors in selecting this option. Issues covered include TDRSS operational architecture, signal design and requirements, user spacecraft orbital considerations, link evaluation of all services for low earth orbits (LEOs) and cost and documentation

requirements. A recommended decision path is provided for early determination of TDRSS suitability to mission needs.

Master of Science in
Systems Technology
(Space Systems Operations) and
Electrical Engineering
June 1988

Advisors: G.A. Myers
Department of
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Computer Engineering

C.R. Jones
Space Systems
Academic Group

THE DEVELOPMENT OF AN INTELLIGENT GRAPHICS INTERFACE FOR THE RESA WARGAMING SIMULATION TERMINALS; A PROOF OF CONCEPT

George L. Yungk
Lieutenant Commander, United States Navy
B.S., University of Colorado, Boulder, 1975
M.S., University of Southern California, 1986

Comparisons have been made between many different methods of command input for wargame simulations. Much has been said and written about the relative merits of using a visual interface, menu and "mouse" input method for command input to various wargaming simulations. This document, which is the actual command interface program as implemented on an ATARI ST desktop computer, is Proof of the Concept that a "visual inteface" as applied to the Research Evaluation Systems Analysis (RESA) simulation, is possible, given the complex command structure of RESA.

Master of Science in
Systems Technology
(Space Systems Operations)
June 1988

Advisor: J.S Stewart
Department of
Operations Research

MASTER OF SCIENCE
IN
TELECOMMUNICATIONS
SYSTEMS
MANAGEMENT

CONSTRUCTION OF A LAN FOR THE TURKISH NAVAL BASE

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Lieutenant JG, Turkish Navy
B.S., Turkish Naval Academy, 1982

Recep Oylan**
Lieutenant JG, Turkish Navy
B.S., Turkish Naval Academy, 1982

This research discusses the design issues and fundamental techniques of a local area network (LAN). It then constructs and chooses a LAN for the Turkish Naval Base. Three ships and headquarters will have their own PCs, and they need to rapidly and accurately exchange information among them.

The thesis examines the issues for designing a LAN and discusses four fundamental technical issues. These are (1) topology, (2) transmission media, (3) access control, and (4) transmission techniques. Finally we introduce PC LANs, and select and recommend a PC LANs, and select and recommend a PC LAN broadband system with coaxial cable.

Master of Science in
Telecommunications Systems
Management
September 1988*
June 1988**

Advisor: N.F. Schneidewind
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Administrative
Sciences

ADMINISTRATIVE (ZYB) MESSAGE PROCESSING: A SIMULATION AND ANALYSIS OF IMPLEMENTATION STRATEGIES

Paul Anthony G. Cruz
Lieutenant, United States Navy
B.A., University of California, Berkeley, 1980

In July 1985, the Chief of Naval Operations (CNO) in response to increasing message traffic on the Fleet Broadcast System mandated the creation of the Administrative Message designation and the capability to remove or intercept such messages from the Fleet Broadcast should queue conditions warrant. In June 1986, the Commander, Naval Telecommunications Command (CNTC), promulgated guidance concerning the activation of an administrative message intercept. The CNTC guidance on activation of an intercept was based on output queue level of the congested Fleet Broadcast channel. Based on results generated from a GPSS V simulation of a single Fleet Braodcast output channel and the message responses of the affected Naval Communications Area Master Stations (NAVCAMS) to the CNTC guidance, a more comprehensive framework, consisting of two phases, policy and guidance development and on-station decision making, is proposed for use in decision making on the activation of an administrative intercept. The implementation of the recommended strategy would ensure a decision making process that

is sensitive to both the priorities of the policy makers and the variables present in the communication environment.

Master of Science in
Telecommunications Systems
Management
March 1988

Advisor: C.R. Jones
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Sciences

AN ANALYSIS OF THE EFFECTIVINESS OF ELECTRONIC MAIL IN THE UNITED STATES COAST GUARD

Robert Eugene Day, Jr.
Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1980

This study investigates and analyzes the effectiveness of electronic mail as a communication channel in the United States Coast Guard. The study develops and uses a multi-perspective approach to measure effectveness; channel effectiveness is measured from an organizational, technical, and personal perspective. The concept of perceived effectiveness is used to measure effectiveness with each of the multi-perspectives.

The study uses input data from survey forms returned by 108 Coast Guard Officers, Civilian, and Enlisted personnel stationed at United States Coast Guard Headquarters, Washington, D.C.

The study arrives at several statistically significant conclusions on how the Coast Guard should evaluate, design, and manage communication systems such as electronic mail in order to maximize effectiveness. Specifically, the study found that:

* A multi-perspective design for analyzing effectiveness is a useful method to assess the social and human impact of communication systems such as electronic mail.

* Personnel perceive significant differences between the e-mail and record message channel from each perspective Specifically, e-mail was found to be perceived as more sociable, informal, satisfying, and uninhibiting than record messages. Furthermore, e-mail was found to be more time saving and easier to use than record messages. Record messages were perceived to be more official, influential, and reliable than e-mail.

* the overall perceived effectiveness of the USCG e-mail system is significantly influenced by perceptions from the personal perspective.

Master of Science in
Telecommunications Systems
Management
June 1988

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Administrative
Sciences

COMPARATIVE ANALYSIS OF PASSIVE COMMUNICATIONS SATELLITES EMPLOYING THE SHF AND HF SPECTRUM FOR USE IN A STRATEGIC ROLE

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M.B.A., New Mexico Highlands University, 1983
B.A., University of Rochester, 1976

Passive communications satellites were instrumental in the evolution of today's satellite communications networks. However, since the successful deployment of the first geostationary satellite, research and development into passive communications satellites has almost come to a halt. In addition to examining the characteristics of the historic passive satellites, this thesis evaluates the capabilities of a new design approach for a passive system. The passive backscatter array, which was initially proposed by Joseph Yater, was intended to provide an effective communications satellite with a large radar cross section. Primary emphasis is placed upon this system's survivability within a nuclear stressed environment. The effects of a nuclear burst upon the propagation of an electromagnetic signal are evaluated so as to assess the system's survivability. Both the advantages and disadvantages of a passive communications satellite are evaluated to determine its suitability for use within the Minimum Essential Emergency Communications Network. The concept of developing a passive satellite system that would use the HF spectrum is also explored. It was found that such a system would be untenable due to the large size of the satellite reflector, and excessive signal absorption in a nuclear

environment. Passive satellites which use the SHF band may prove to be effective for the broadcast of strategic messages provided that the potential problem of orbital instability can be resolved.

Master of Science in
Telecommunications Systems
Management
March 1988

Advisor: T.J. Brown
Department of
Electrical and
Computer Engineering

A DYNAMIC SCHEDULER FOR A COMPUTER AIDED PROTOTYPING SYSTEM

Susan L. Eaton
Lieutenant, United States Navy
B.A., Towson State University, 1980

Current software development methodologies have proven to be ineffective for meeting the rising demand for fast production of reliable software for hard real-time computer systems. A computer-aided, rapid prototyping system (CAPS) based on a Prototype System Description Language (PSDL) and a set of software tools including an Execution Support System (ESS), has been proposed by other research and provides a promising and cost effective alternative to the traditional development life cycle of these systems.

This study proposes a four function design for the dynamic scheduler of the CAPS ESS. This design includes a method for invoking processes for the ESS static scheduler and translator, a scheduling algorithm for the scheduling of the prototype's non-time critical processes, and a method for error and interrupt handling during prototype execution.

Master of Science in
Telecommunications Systems
Management
March 1988

Advisor: Luqi
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DEFENSE DATA NETWORK AND THE NAVAL SECURITY GROUP

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B.S., United States Naval Academy, 1983

This thesis describes the Defense Data Network (DDN) and its possible applications for the Naval Security Group. It reviews the background and historical information that contributed to the selection of DDN as the primary long distance data communications system for the Department of Defense. It evaluates some of the advantages and disadvantages of packet switching technology. The survivability, availability, and security features of DDN are presented. Also included are specifications of the hardware equipment, software standards, and operating procedures for DDN. The Naval Security Group does not require direct DDN access to accomplish its operational mission. There are, however, a number of nonoperational requirements that could be facilitated by direct DDN access. This thesis discusses a potential role for DDN in the Naval Security Group. Applications for administration, personnel, supply, and logistics functions are provided. Uses for the electronic mail, remote access, and file transfer networking functions of DDN are also proposed. Potential benefits resulting from DDN access are presented along with recommendations for further investigation.

Master of Science in
Telecommunications Systems
Management
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NAVY SATELLITE COMMUNICATIONS IN THE HELLENIC ENVIRONMENT

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B.S., Hellenic Naval Academy, 1971

This thesis covers the history of satellite communications from its beginning in 1957 until recent years, describes the space subsystem and explains the major components of satellite communications. It defines the practical problems of satellite communications such as radiation and frequency dependence attenuation. It also examines certain aspects of satellite communications in the Hellas environment including reliability and survivability in a hostile environment. The last chapter outlines the major decisions and evaluation required for a tactical satellite system for the Hellenic Navy.

Master of Science in
Telecommunications Systems
Management
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LONG HAUL COMMUNICATIONS IN THE HF SPECTRUM UTILIZING HIGH SPEED MODEMS

Robert H. Ellis
Lieutenant, United States Navy
B.S., University of Washington, 1978

In the past ten years reliable high-speed satellite systems have pushed slower less reliable HF communication systems to the bottom of the list for development programs. Concern over reduced budgets, vulnerability of expensive satellite systems, and recent advances in HF technology are creating new interest in upgrading existing HF communication systems.

Nondevelopment Items (NDI) are defined as the use of off-the-shelf commercial items instead of costly, time-consuming conventional research and development programs. The Navy Department's current policies are designed to ensure the maximum use of NDI to fulfill Navy requirements.

The speed of HF systems can be improved using current signaling and modulation techniques, and reliability can be increased by error-correcting codes or error detection used in conjunction with automatic repeat request (ARQ) schemes. Improved HF systems not only provide survivable backup-capability, but increased capacity for present communication needs.

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MENTAL MODELS FOR TIME DISPLAYED TASKS

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The study described in this thesis attempts to determine whether there is a mental model for time-ordered tasks. The results of this study may be used to assist in the design of cockpit display formats for the Intelligent Air Attack System (IAAS) in the F/A-18, A-6 or other Navy and Air Force tactical aircraft, and may be applicable to telecommunications systems as well. Basic human factors engineering concepts and the characteristics of IAAS and of the Naval Telecommunications System are described. The approach and methodology for determining whether there is a consistent mental model for time-ordered tasks is discussed, and the results of a survey are presented. Based on this survey, it was determined that mental models for time-ordered tasks are not always the same, but instead are task-dependent. Schedules are most logically presented in a calendar-like format. For telecommunications related tasks, a front-to-back format is recommended. For time-ordered events in an aircraft cockpit, a top-to-bottom display order was preferred by a majority of study participants, but aviators preferred a left-to-right presentation.

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A PRELIMINARY INVESTIGATION OF EGO STAGE AND LEADERSHIP EFFECTIVENESS

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

The purpose of this thesis is to investigate a possible relationship between a leader's stage of ego development and his/her effectiveness as a leader. Results, using a small sample of Naval officers and enlisted personnel attached to Naval Communication Station, Stockton, CA, reveal a significant correlation between ego level and leadership effectiveness as measured by military rank. Based on this initial study, further investigation of the relationship between ego level and effectiveness is warranted.

Master of Science in
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THE PERCEIVED EFFECT OF THE COMMUNICATIONS SUB-SPECIALITY ON A NAVAL OFFICER'S CAREER

Robin M. Horne
Lieutenant, United States Navy
B.A., Mount Saint Mary's College, 1980

There seems to be a perception that the Communications Subspecialty is not career enhancing for naval officers, especially warfare specialists. This thesis investigates how the subspecialty is perceived by naval officers with the Communications Systems Technology subspecialty code.

A questionnaire was designed to determine: (1) if the officer felt the subspecialty had affected his or her career, (2) where the subspecialists find information concerning the subspecialty, and (3) if the officer had any suggestions or concerns about the communications subspecialty. The questionnaires were then sent to all officers with the Communications Systems Technology subspecialty code (XX82X).

Responses to the questionnaire show that, in general, officers feel that the subspecialty has had a positive effect on their careers, to the extent that they would recommend the subspecialty to other officers. But there does seem to ba a lack of good career information concerning the Communications Subspecialty. It is therefore recommended that the subspecialty sponsor (OP-941) try to disseminate more useful information to officers concerning the subspecialty.

This thesis also contains information concerning the Navy subspecialty system, the officer career structure in the Navy,

information on the communications subspecialties, and additional thesis topics.

The first chapter outlines the problem. Chapter 2 provides background information on the United States Navy and how it categorized its officers. Sources of career information and career paths is contained in Chapter 3. Chapter 4 consists of a complete description of the methodology of the research including questionnaire design. Chapter 5 discusses the results of the survey, and Chapter 6 contains the conclusions and recommendations.

Master of Science in
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SNAP/DDN INTERFACE FOR INFORMATION EXCHANGE

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B.S., University of Wisconsin, 1975

This thesis examines shipboard non-tactical, unclassified information exchange and recommends a methodology which will reduce message traffic loading on the Naval Telecommunications System (NTS) and improve administrative performance in the fleet. The Navy's organizational information requirements are reviewed and evaluated. Specifically, it explores the advantages and difficulties of connecting Shipboard Non-tactical ADP Program (SNAP) systems to the Defense Data Network (DDN). A review of existing information exchange procedures, including NPS, SNAP II, and DDN, is provided. An overview of the future Navy Data Communications Control Architecture (NDCCA) is presented along with an interim proposal to connect current and future architectures. An analysis of present Navy and commercial organizations using DDN-type applications such as File Transfer Protocol (FTP) and electronic mail is presented.

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STRATEGIC PLANNING IN THE U.S. COAST GUARD: A CASE STUDY OF THE OFFICE OF COMMAND CONTROL AND COMMUNICATIONS

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B.S., United States Coast Guard Academy, 1981

The Coast Guard's planning system is in need of improvement. Questions remain, however, about how much and in what areas the changes need to be made to effect the improvements.

The study uses the Coast Guard's Office of Command, Control and Communications (G-T) as an example for improving the overall Coast Guard planning system. It describes the current planning system and identifies its successes and problems. A method for formally analyzing the quality and effectiveness of the planning system is illustrated through the use of Tichy's model for strategic change management. Recommendations for changes to the strategic planning system are derived from the analysis of G-T.

The study shows the strategic planning system in G-T is in need of improvement. The current system has some advantages, but its problems make the system less effective than it should be. Further, the Tichy model provides a comprehensive insight into planning problems and makes possible the identification of solutions to improve the planning system. It is recommended that managers in G-T become familiar with the Ticky model for future use in aligning the organization with its environment.

Master of Science in
Telecommunications Systems
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A STATIC SCHEDULER FOR THE COMPUTER AIDED PROTOTYPING SYSTEM: AN IMPLEMENTATION GUIDE

Dorothy M. Janson
Lieutenant, United States Navy
B.S., San Francisco State University, 1981

As demand for hard real-time and embedded computer systems increases, a new approach to software development is critical. Software engineers and users would benefit from an automated methodology allowing validation of design specifications or functional requirements early in the development life cycle. A fast, efficient, easy-to-use tool would increase productivity and would enhance user confidence that software would be delivered at less cost and on schedule. The Computer Aided Prototyping System (CAPS) is a conceptualized tool providing these capabilities.

This thesis represents a pioneering effort to develop a Static Scheduler for the CAPS Execution Support System using the Ada programming language. The Static Scheduler initially extracts critical operators, timing constraints and precedence relationships from a high-level prototype source program. The Static Scheduler then creates a static schedule for run-time execution, using worst case scenarios, guaranteeing that timing constraints are met. The primary goal of this thesis is to provide the scheduling algorithms and implementation guidelines for the Static Scheduler. Secondary goals are to demonstrate the significance of continued research to telecommunications applications and to demonstrate the feasibility of Ada as the

implementation language. (Ada is a registered trademark of the United States Government, Ada Joint Program Office.)

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DESIGN OF DEFENSE DATA NETWORK FOR THE REPUBLIC OF KOREA MILITARY

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B.S., Korea Military Academy, 1984

This thesis provides the concepts for the construction of an integrated computer communications network, as would be appropriate for the Republic of Korea (ROK) Defense Data Network (DDN). The current ROK military communications system and its problems are discussed, along with the requirements of the ROK Armed Forces. The basic concepts of data communications and the United States DDN are also analyzed. Through synthesis of these concepts, the goals of the required system and a proposed ROKM DDN model are provided.

Master of Science in
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A LANGUAGE TRANSLATOR FOR A COMPUTER AIDED RAPID PROTOTYPING SYSTEM

Charlie Robert Moffitt, II
Lieutenant, United States Navy
A.B., Central Wesleyan College, 1972

While the cost of computing hardware has decreased steadily, the cost of software design, development and, maintenance has increased. One approach to reduce to cost of software development is rapid prototyping. Further, it has been proposed to combine the design strategy of rapid prototyping with a computer aided software prototyping system. Such a system would allow the software designer to employ a software base of reusable program modules. It would assist in prototyping and would automate a large part of the development effort. An important component of the automation would be a language translator facility. This translator would allow the designer to develop a software prototype in a high level specification language which would be simple and convenient to use and would translate the specification statements into an executable software language.

This thesis demonstrates the feasibility of using a language translator by developing a prototype translator for a computer aided software prototyping system. The translator is written in Attribute Grammar (AG) language and translates software

specifications stated in the Prototype System Description Language (PSDL) into computer executable code in the Ada language.

Master of Science
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Management
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LOCAL AREA NETWORK STANDARDS AND GUIDELINES FOR THE REPUBLIC OF CHINA NAVY

Wang-Nai
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B.S., Republic of China Naval Academy, 1980

This thesis provides a specific outline for Republic of China Navy (ROCN) Local Area Network (LAN) development. The current ROCN communication system and its problems are discussed, along with basic concepts of data communication, protocols, standards, and topologies. Token ring and Ethernet topologies are discussed in detail. Objectives and requirements for ROCN LAN systems are documented. These factors, plus security, budget, training and maintenance, reliability, efficiency, survivability, and performance are considered in proposing a methodology for ROCN LAN development.

Master of Science in
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Management
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A CONCEPTUAL LEVEL DESIGN FOR A STATIC SCHEDULER FOR HARD REAL-TIME SYSTEMS

Joanne T. O'Hern
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B.S., State University of New York, Albany, 1981

This thesis builds upon work previously done in the development of the Computer Aided Prototyping System (CAPS) and the Prototype System Description Language (PSDL) and presents a conceptual design for the pioneer prototype of the static scheduler which is part of the CAPS execution support system. The design of hard real-time system is gaining a great deal of attention in the software engineering field as more and more real-world processes are becoming automated. This increase in automation identified a need for the advancement of software design technology to meet the design requirements for these hard real-time systems. The CAPS and PSDL are tools being developed to aid the software designer in the rapid prototyping of hard real-time systems. PSDL, as an executable design langauge, is supported by an execution support system consisting of a static scheduler, dynamic scheduler, and translator. The static scheduler design includes the scheduling algorithms required to schedule time critical operators contained in a PSDL prototype is such a way that all operator timing constraints and precedence relationships are met to produce a feasible static schedule if one is possible. Implementation of the conceptual design will be the basis for further work in this area.

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COST-EFFECTIVENESS METHODOLOGY FOR EVALUATING A TACTICAL COMMUNICATIONS SYSTEM IN THE KOREAN ARMY

Young Uk Seo
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B.S., Korean Military Academy, 1978

Cost and Effectiveness models are developed for selecting a new tactical communication system in the Korean Army. Alternatives included an "off-the-shelf" purchase of existing U.S. technology and four variants a "self-developed" system. Since exact quantitative military data was not obtainable for security reasons, a subjective approach is taken. Sensitivity analysis is employed to account for errors in effectiveness evaluation and in value assessment. This research recommends the use of the cost-effectiveness methodology in order to provide for selecting a future Korean tactical communications system.

Master of Science in
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Management
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THE POTENTIAL BENEFITS OF USING TELECONFERENCE TECHNOLOGY IN THE CLASSROOM ENVIRONMENT FOR U.S. NAVY TRAINING COURSES

James J. Shannon
Lieutenant, United States Navy
B.S., United States Naval Academy, 1981

This study assesses both the desirability and the feasibility of introducing present videoconference technology into the traditional classroom setting used by most Navy courses.

While training is always a critical need for a high-tech organization like the Navy, the costs involved with training are rising at an alarming rate. This study examines the effectiveness of videoconferencing as a medium for Navy training in light of current trends in videoconference systems that may lower training costs. It also explains why it is widely accepted that there is unlimited potential for video teleconference systems to improve training effectiveness.

First, the current level of effectiveness and efficiency in the Navy training environment is discussed. Then a brief description of teleconferencing affects student productivity and performance is also considered; research indicates students will learn as much through teletraining as in a traditional training environment. Finally, this thesis examines why the Navy training community, specifically local training commands, may experience significant change in hierarchal structure and authority.

Master of Science in Telecommunications Systems Management
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THE IMPACT OF THE DEFENSE DATA NETWORK ON NAVAL COMMUNICATIONS DURING THE 1980S

Victor Bernard Stuckey
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B.S., Savannah State College, Savannah, Georgia, 1979

The Defense Data Network (DDN) is a packet-switching network that provides data transport services to the Department of Defense. The primary focus of this thesis is to assess the DDN's impact upon Naval communications.

The Navy's implementation plan for the transition to the DDN is described. Benefits for Navy subscribers and problem areas associated with the DDN program implementation are discussed. Recommendations are presented that can improve the transition process for future DDN subscribers and alleviate many present-day problems.

This study concludes that the DDN has had minimal impact on Naval communications until now. In order to improve the DDN's acceptability among Navy subscribers and to aviod attention must be focused on the Navy's DDN program. Continuous interaction and dialogue must be maintained between established Navy DDN subscribers and potential subscribers.

Master of Science in
Telecommunications Systems
Management
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A FRAMEWORK FOR MATCHING USER NEEDS TO AN OPTIMAL LEVEL OF OFFICE AUTOMATION

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B.S., University of California, Davis, 1977

This thesis introduces the concept of determining an organization's optimal office automation strategy by investigating seven characteristics commonly used by office managers to describe their organizations.

These organization characteristics are size, structure, geographic dispersion, task, technology, environment and employee skill. These seven characteristics form the input into an office automation framework which mathematically determines which of three office automation strategies is best for a particular organization. These three strategy levels are called low-level operational control, mid-level management control, and high-level strategic control. The newly determined office automation strategy can in turn be used to choose appropriate systems analysis methods for the organization and for the follow-on purchase and integration of an office automation system.

Master of Science in
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A SOCIOTECHNICAL DESIGN FOR IMPLEMENTING THE DEFENSE DATA NETWORK

David L. Woleslagle
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B.B.A., Georgia State University, 1980

This study examines the benefits of implementing the Defense Data Network at a military organization. The effects of computer-mediated communication, both intended and unintended, are examined. Sociotechnical design is discussed as one effective means to implement the DDN in order to maximize its benefits; this theory contends that the social as well as technical aspects of a system must be considered to generate improved performance. A technical analysis of applying this theory to DDN implementation is provided. A social analysis, the result of a questionnaire administered to three independent samples of DDN users, also is included. Conclusions and recommendations for the study are:

* DDN training is generally inadequate at the facilities sampled.
* DDN skills generally are not rewarded at the facilities sampled.
* Management structure and philosophy are critical for successful DDN implementation.
* Participative, team-building activities that encourage the formation of self-managed work teams are recommended for successful DDN implementation.

Master of Science in Telecommunications Systems Management
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IMPLEMENTATION OF ELECTRONIC MAIL FOR INFORMAL NAVAL COMMUNICATIONS

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B.A., Eastern Kentucky University, 1974

This study focuses on electronic mail and its applications for the transfer of informal information within the Department of the Navy. Discussion of the Defense Data Network as an evolutionary development in data switching technology is provided for historical perspective. The utility of electronic mail media is evaluated with an emphasis on the human interface. A brief synopsis of electronic mail cost compared with other message delivery media (telephone, postal mail, and AUTODIN) is provided. The technical aspects of electronic mail involving local area networks, the Base Information Transfer System (BITS), and AUTODIN are provided to demonstrate the feasibility of implementing an electronic mail system.

Master of Science in
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Advisor: N.F. Schneidewind
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MASTER OF ARTS
IN
NATIONAL
SECURITY
AFFAIRS

SOVIET OBJECTIVES IN THE INF NEGOTIATIONS AND EUROPEAN SECURITY

Howard J. Baumgardner
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B.S., Marquette University, 1974

On 12 December 1979, NATO officials announced the decision to deploy 108 Pershing II nuclear missiles and 464 Ground Launched Missiles, in response to the Soviet effort to prevent the deployment of the new missiles. The Soviet effort consisted of negotiations, diplomatic propaganda, and covert measures. When it was clear that the deployment was not going to be stopped, the Soviets agreed to formal INF arms reduction talks. It is this author's opinion that the Soviet negotiation tactics, during the INF talks, supported the long range goal of reducing the military effectiveness of NATO, and also supported the goal of reducing U.S. influence in Europe.

Master of Arts in
National Security Affairs
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THE CURRENT SOVIET PEACE PROGRAM IN ITS LARGER CONTEXT

John M. Brown
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B.S., United States Naval Academy, 1976

The purpose of this study is to advance understanding of the probable intentions of the current Soviet leadership in their initiatives for peace, cooperation, and disarmament. This study concludes that, rather than embodying new political thinking that might evoke well-founded hope in the West for genuine peace and stability, Soviet initiatives reflect a long-term Soviet orientation toward unilateral strategic advantage. The West should therefore respond to these initiatives with caution and vigilance. The primary methodology of this study is qualitative content analysis of key expressions of Soviet policy by authoritative spokesmen. Two areas of background to contemporary Soviet peace programs, the Conference on Security and Cooperation in Europe, 1973-75, and Soviet commentary on U.S. nuclear freeze movements in 1980-84, are examined as well.

Master of Science
National Security Affairs
June 1988

Advisor: D.S. Yost
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CANADIAN SSNS AND THEIR EMPLOYMENT

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B.S., Texas A&M University, 1977

Through the public forum of the 1987 White Paper, the government of Canada announced its intentions to make major changes to Canada's military and to her defense posture. Among other things, the White Paper publicized the planned acquisition of ten to twelve nuclear powered submarines. The government hopes that these submarines will help assert Canada's claim of sovereignty in the waters of the Canadian Archipelago including the Northwest Passage. The United States considers the Northwest Passage to be a strait used for international navigation and subject to the right of transit passage. The SSNs will also have a clearly martial role in protecting Canada's economic interests and her national security responsibilities in the Atlantic, the Pacific, and the Arctic Oceans. This thesis examines these reasons behind Canada's decision to acquire an SSN fleet and their potential employment.

Master of Arts in
National Security Affairs
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AN EXAMINATION OF THE CURRENT REVOLUTION IN SOVIET MILITARY AFFAIRS

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B.S., University of Akron, 1972

Russian and Soviet history is characterized by many unique periods of development. Military doctrine has evolved in such cycles with specific identifiable variables. The Soviet Union has experienced two definite revolutions in military affairs since its inception. This thesis deliniates those variables evident in past doctrinal revolutions. Current events within the Soviet Union are then examined to determine if a third revolution in military affairs is occurring.

Master of Arts in
National Security Affairs
March 1988

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NAVAL TECHNOLOGY TRANSFER AND ARMS TRADE: THE BRAZILIAN CONNECTION

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Technology transfer and acquisition have become hotly debated and controversial policy issues. Examination of U.S. policy toward transfer of naval technology to Brazil raises questions of American national security and the validity of the Brazilian requests. Research reveals a history of dependence on the U.S. Navy and that the Brazilian naval industry also lags behind its military counterparts in domestic production, purchasing most naval equipment from abroad.

This paper examines the dependence of the Brazilian Navy on foreign navies and investigates the naval industry production problems. The U.S./Brazilian relationship reveals a partnership that could be reinforced by making U.S. technology transfer policies more flexible.

Master of Arts in
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SEA LANE DEFENSE: JAPANESE CAPABILITIES AND IMPERATIVES

Daniel I. Gallagher
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B.A., University of Dallas, 1978

Japan has significant capabilities to protect its sealanes out to 1000 nautical miles to the south of its main ports. By concentrating military expenditures on forces to improve air defense, strait control, and convoy operations, Japan could have a credible defense, even in the worst possibility: global war and a Soviet attack.

The Japanese should concentrate on improving the air defense of Japan and the ocean between Iwo Jima and Okinawa, increasing their stockpile of mines and their mine warfare forces, and increasing the numbers of their long-range maritime patrol aircraft and surface escort ships. These improvements all maintain the defensive nature of Japanese forces and are attainable within the next decade.

Master of Arts in
National Security Affairs
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THE LOW-RODGERS EXPEDITION: A STUDY IN THE FOUNDATIONS OF U.S. POLICY IN KOREA

Douglas Edward George
Captain, United States Air Force
B.A., University of Maryland, 1976

This thesis reveals the origin and significance of the Low-Rodgers Expedition of 1871 in the evolution of a conscious foreign policy of the United States in East Asia. Entitled "The Low-Rodgers Expedition: A Study in the Foundations of U.S. Policy in Korea," it deals with the Low-Rodgers Expedition not as an isolated event, but as both an outcome and antecedent of other closely interrelated events in an unbroken time continuum. Concentrating on the fundamental regional issues of the times and the national character and interests of the United States and the Kingdom of Korea, this thesis:

1. Reveals, for the first time, the original 1871 diary of U.S. Minister to China, Frederick Ferdinand Low, and the wealth of new historical data therein: his misgivings and motivations; his plans and failings; and his appreciation for the historical importance of the mission which today bears his name.

2. Provides deeper analysis of the contemporary events bearing on the Low-Rodgers Expedition and gives a deeper appreciation of the obstacles which worked against its success from the very moment of its inception.

3. Shows why misconceptions about the expedition and some peripheral events have remained unchallenged for over a century.

4. Explains why Low's efforts to open Korea before the 1882 Shufeldt mission failed, yet still played a more important role

in the development of U.S. policy in Korea and the opening of Korea to the Western world than has been recognized.

Master of Arts in
National Security Affairs
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Affairs

SOVIET POLITICAL OBJECTIVES IN THE FEDERAL REPUBLIC OF GERMANY: INSTRUMENTS AND ASSESSMENTS

Stefanie E. Goebel
Lieutenant, United States Navy
B.S., United States Naval Academy, 1980

This thesis examines apparent Soviet attempts to use its detente policy to exploit the Federal Republic of Germany's membership in NATO, and thereby expand its influence in the FRG and Europe as a whole. It is hypothesized that the Soviet Union chooses to exploit the FRG's position in NATO by cultivating a special relationship with it, and thereby accessing the U.S. and NATO as a whole, rather than making overt efforts to force a near-term split between West Germany and the U.S. The thesis focuses on the instruments the Soviet Union uses to maximize its influence in the FRG and the region. These instruments include West Germany's concerns regarding nuclear war in Europe, Ostpolitik and German-German relations.

Master of Arts in
National Security Affairs
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CANADA: THE DECISION TO PROCURE NUCLEAR ATTACK SUBMARINES AND ITS SIGNIFICANCE FOR NATO

Theodore Guillory
Lieutenant, United States Navy
B.S., University of Houston, 1981

In June 1987 the Canadian government announced plans to procure 10 to 12 nuclear attack submarines (SSNs). The evidence suggests that, for some Canadians, a primary purpose for this submarine program may not be to enhance the security of NATO, but instead to assert Canada's sovereignty, principally against the United States, in the Arctic region. The thesis discusses this decision and its possible implications for the security of North America and NATO. It is argued that the United States must continue to have unimpeded access to the Arctic region to counter the ever increasing threat posed by Soviet nuclear ballistic missile submarines (SSBNs). Finally, the thesis suggests a possible solution to the current sovereignty debate and a potential strategy for employing these SSNs to enhance the security of North America and NATO as a whole.

Master of Arts in
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A THEORY OF NAVAL STRATEGIC PLANNING

John Richard Hafey
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B.S., United States Naval Academy, 1981

This study proposes a theory of naval strategic planning for programming. It identifies and describes those factors which should influence how the Navy determines future force requirements and eventual capabilities. The work is premised upon the following hypothesis: Within the context of national military strategy, naval long-range planning for future forces should be based on an in-depth understanding of three factors: (1) the future role of the sea in national military strategy; (2) the missions naval forces will be required to perform; and (3) future trends in naval warfare. The first task of planning is to guide the organization into an uncertain future. It must identify those factors which can be used to determine future requirements. The resultant force concepts can then be developed as required by the organization's overall needs. Strategic planning in first and foremost a frame of mind for conceptualizing those requirements. This study proposes a theory to establish that framework.

Master of Arts in
National Security Affairs
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CIVILIAN CONTROL AND THE AMERICAN MILITARY: MYTHS AND REALITIES

Joseph Bruce Hamilton
Lieutenant, United States Navy
B.S., Texas A&M University, 1978

This thesis examines civilian control of the American military. It shows that a phobia about losing civilian control of the military establishment has been caused by the misinterpretation of two historical experiences, namely: the American experience of civilian-military relations; and, the German experience of militarism during the First and Second World Wars. A description of the United States National Military Establishment of the twentieth century is included. Discussion of the American experience covers the early Constitutional balance, informal elements and cultural characteristics of the American military, and certain particularly difficult periods during U.S. history. Analysis of the German system shows how the German military was as much subverted from external forces as it was itself subversive. The conclusion made is that the nature of the American military is such that excessive fear of military misuse of power is unwarranted, and that military reform should be based on this concept.

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U.S. SECURITY ASSISTANCE TO THIRD WORLD NATIONS: WHAT DRIVES CONGRESSIONAL SUPPORT?

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Since the Vietnam War, Congress has increasingly asserted itself in U.S. foreign policy, including security assistance relationships with Third World nations. This has led to significant conflict between the executive and legislative branches, and the need to explain Congressional voting behavior on security assistance. Using 15 cases including aid to the Contras and El Salvador during the Reagan presidency, this thesis investigates the relative impact of various factors on Congressional support for security assistance, including public opinion and the level of Soviet bloc assistance. The research concludes that the most powerful determinant is the Third World government whose behavior Congress is trying to change.

Master of Arts in
National Security Affairs
September 1988

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SOVIET NAVAL OPERATIONAL ART

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The Soviet theory of naval operational art is a body of knowledge which focuses the tactical capabilities of the Soviet Navy on achieving the strategic missions assigned them by the leadership of the Soviet Union. This body of knowledge guides the creation and execution of Soviet naval operations. Soviet military science establishes the theoretical foundation for the conduct of independent naval operations. Soviet troop control creates the planning processes by which Soviet naval commander's prepare for combat operations. Western analysis of the Soviet Navy has long neglected the Soviet theory of naval operational art. As a result, several unique characteristics of Soviet naval operations may be overlooked by Western naval officers. This research has found that the Soviet naval planning process is in many ways identical to that of the Soviet ground forces. This work also attempts to explain the role of the independent naval operation in the Soviet view of war. Finally, several analytical tools are suggested which may be employed to explore Soviet views on the conduct of naval operations. The topic of Soviet naval operational art presents many opportunities for future research.

Master of Science in
National Security Affairs
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THE CLOSE ABOARD BASTION: A SOVIET BALLISTIC MISSILE SUBMARINE DEPLOYMENT STRATEGY

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This thesis describes and analyzes a possible deployment posture for the Soviet ballistic missile submarine force. It examines the proposition that the Soviet Navy will establish a point defense, labeled "Close Aboard Bastions" (CABs), for its ballistic missile submarine fleet within the Soviet claimed 12 nautical mile territorial sea. This is a logical derivation of the currently widely held view that the Soviets will establish a "bastion" defense for the strategic portion of their seagoing forces. The thesis concludes that the postulated CAB strategy is a viable option for the Soviet Union during a war that begins conventionally.

Master of Arts in
National Security Affairs
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UNMANNED AIR VEHICLES - REAL TIME INTELLIGENCE WITHOUT THE RISK

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Unmanned Air Vehicles (UAVs) are capable of supporting the officer in tactical command (OTC) by gathering intelligence in real- or near real-time. UAVs now under development will be able to collect high-resolution imagery, and thus provide the OTC with the option of gathering tactical intelligence without using manned reconnaissance platforms.

This thesis asserts that UAVs should be used to supplement existing intelligence sensors, particularly in those cases where current sources are too ambiguous, slow, dangerous or take resources away from their primary duties.

Master of Arts in
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BEYOND THE BLACK BOX: AN ASSESSMENT OF STRATEGIC WAR GAMING

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War games are currently enjoying a revival of interest and popularity within the American defense community. Strategists, analysts, and policy-makers alike are turning more and more to gaming as a medium for education, planning and discovery. This thesis investigates the nature, utility, and limitations of strategic-level war gaming as a tool for strategic planning and international negotiations. It offers a perspective on gaming different (yet complementary) to that of operations research: war games are viewed as sources of synthetic history, to be studied and interpreted by historical-type methods.

Master of Arts in
National Security Affairs
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GOVERNMENT ACTIONS TO CONTROL TERRORIST VIOLENCE; A CASE STUDY ON NORTHERN IRELAND

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Using the historical method, this study of terrorism in Northern Ireland examines the variables of conflict, the existing violence and government endeavors to eradicate that violence. This study does so within the framework of United States' interests. Irish terrorism has been a problem for the British government for centuries. The current round since 1969 has produced vast improvements in the security forces and enforcement techniques, yet the I.R.A. and its political wing, Sinn Fein, survive. Government actions must include measures aimed at the root causes of terrorist movements. The relative degradation of the Catholic community withing Northern Ireland has received international attention and has been the focus of much of the British government's efforts to legislate improvements in Northern Ireland. It appears that only through this process can peace and reconciliation in Northern Ireland take place.

Master of Arts in
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POTENTIAL FOR CONFLICT IN SOUTH AMERICA

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Between 1978 and 1983, a number of violent interstate confrontations in South America, including the Falklands/Malvinas War, indicated that the continent was experiencing a period of tension and instability, with a strong possibility of additional interstate war. Several South American nations were engaged in armamentism, were internally unstable, and displayed considerable animosity towards each other. Meanwhile, U.S. ability to play a constructive security role appeared greatly diminished.

This thesis examines conflict in South America from a historical and contemporary viewpoint analyzing the factors which have led to wars in the past and may (or may not) do so in the future. Geopolitics, militarism, arms races and boundary disputes are discussed, as is the U.S. role in the region in the past and present; a perspective on a broadened U.S. military and policy option is included. The conclusion of the work is that interstate war is not likely in the foreseeable future, especially while democratic regimes remain in power.

Master of Arts in
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STRATEGIC PLANNING, POLARIS, AND TOMAHAWK: TECHNOLOGICAL IMPERATIVE HYPOTHESES

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This thesis examines the force procurement element of the military strategic planning process and is comprised of two parts. First, models are constructed to depict ideal strategic planning. The initial step in each model is the formulation of the national interest. The national interest is defined in terms useful to strategic planners by creating a unique paradigm based on the Constitution. The technological imperative hypothesis is explored as an aberration to the ideal strategic planning process. Second, the technological imperative hypothesis is tested with case studies of the Polaris and the Tomahawk. Even though the hypothesis was disproved in each case, the case studies yielded useful relationships between technology, strategy, and doctrine.

Master of Arts in
National Security Affairs
December 1987

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THE SOVIET OBJECTIVE OF WAR TERMINATION: LIMITS AND CONSTRAINTS

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This abstract discusses the objectives of war termination from the perspective of the Soviet Union. Specifically, considerations relating to the possibililty of limited Soviet objectives for terminating a war are analyzed. A possible future war in Europe is the primary example; it is argued that the political military dissolution of NATO and the decoupling of U.S. military power from the continent might be sufficient Soviet conditions for seeking war termination. The hypothesis that the USSR would prefer to fight a conventional war (and avoid using nuclear weapons) is examined as is the Soviet need to maintain cohesion within the Warsaw Pact. It is concluded that the limits of conventional warfare and the constraints of alliance dynamics could interact in Soviet strategy to limit objectives for terminating a future war in Europe. An appendix supplements and contrasts the thesis text by reviewing Western views on war termination.

Master of Arts in
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THE STRATEGIC VALUE OF THE PANAMA CANAL: VALUE VERSUS COST

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Using the ideas of Alfred Thayer Mahan to define the national interest, this paper analyzes the strategic value of the Panama Canal to the United States. The analysis is based on a review of the historic value and cost of the Isthmus to the power which has controlled it. This review demonstrates that the canal is a valuable component of U.S. Sea Power. The final chapter of this study discusses the future of the canal. Strategic planners should assume that the canal will be available to the United States in wartime until the year 2000. After the year 2000, unless the United States is able to extend its base rights in Panama, the canal will probably not be available during wartime, thus weakening U.S. power projection capability.

Master of Arts in
National Security Affairs
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National Security
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AMERICAN PERSPECTIVES ON THE VAGARIES OF SOVIET NEGOTIATING BEHAVIOR

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Because of their behavior in negotiations from World War II through the 1960s, the Soviets have been widely perceived in the United States as predictably uncooperative. In the 1980s it is important to determine whether this popular image of Soviet negotiating behavior remains consistent, or, as this thesis examines, the possibility that there are significant variations in more recent Soviet arms control negotiating behavior which must be recognized and addressed.

Variations in Soviet negotiating behavior may yield important insights regarding Soviet arms control objectives. This thesis attempts, first, to produce a comprehensive picture of post World War II Soviet negotiating behavior prior to the Limited Test Ban Treaty negotiations. This consists of detailed analysis of specific Soviet negotiating techniques. Through studying the frequency of Soviet use of these techniques a comprehensive picture of what may be considered typical Soviet negotiating behavior may be derived. What may be considered significant variations in Soviet negotiating behavior may be derived. What may be considered significant variations in Soviet negotiating behavior may then be identified by applying/comparing post WWII typical behavior with usage in subsequent negotiating encounters.

Specific arms control negotiations examined are those of the Limited Test Ban Treaty and the first set of Strategic Arms Limitation Talks (SALT I).

Master of Arts in
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ECONOMIC FACTORS OF JAPAN'S NATIONAL SECURITY POLICY

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Economic and security ties comprise the fundamental links in U.S.-Japan relations, which have become strained by criticisms from both sides of the Pacific. As our two nations continue to pursue prosperity and security, rates of domestic consumption, trade balances, overseas investment, and technology development have become tests of bilateral cooperation.

Domestic demand, capital formation, trade and development of science and technology are fundamental concerns of the economy which contribute to Japan's national security posture. With the formation of Comprehensive Security, economic assets, more than military spending alone, have become the pillars of Japan's national security framework. To the Japanese, a strong economy is essential to Japan's national security.

This thesis analyzes the various programs the Japanese have pursued through the postwar period to build a stronger economy and the role they have played in the development and implementaiton of Comprehensive Security. Additionally, this thesis examines comprehensive security as it contributes to mutual U.S.-Japan regional security in light of increasing tensions over the relative roles of economic and military strength.

Master of Arts in
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ARMS CONTROL AND BRITISH AND FRENCH NUCLEAR FORCES

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In February 1987, the Soviets dropped their most recent demands for compensation from the United States for British and French nuclear forces in the INF negotiations, while reserving this demand for future arms control negotiations. This thesis provides background on the recurrent Soviet demands; it includes an historical description of the demands in the major arms control proposals in SALT I, SALT II, INF and START. It examines French and British nuclear forces, employment doctrine and arms control policies. Finally, it reviews Soviet and American policies regarding these weapons and considers implications for the Atlantic Alliance.

Master of Arts in
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THE GOLDWATER - NICHOLS DEPARTMENT OF DEFENSE ACT OF 1986: GENESIS AND POSTSCRIPT

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This thesis examines the Goldwater - Nichols Department of Defense Reorganization Act of 1986 in the light of previous Congressional attempts to legislate Service cooperation by amending the National Security Act of 1947. The hypothesis examined is that attempts to end Service rivalry by amendment have failed because the 1947 Act is itself the product of a legislative attempt to incorporate into an organizational structure two fundamentally incompatible philosophies of how basic defense policy should be formulated. Using an historical approach, this thesis examines the origins of the 1947 Act, the effect of the 1958 amendments on the Kennedy Administration, and the drive for further reform during the Reagan Administration. The conclusion is that while the Goldwater - Nichols Act may increase efficiency in some areas, it will not change the fundamentally competitive nature of the defense budget planning process.

Master of Arts in
National Security Affairs
December 1987

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PRAGMATISM IN THE EAST ASIAN POLICY OF THE UNITED STATES

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There is an ongoing debate between political theorists as to whether "realism" or "idealism" should guide the formulation and implementation of America's foreign policy. In general, policymakers have been characterized by one or the other of these labels based upon a loose conception of their overall policy objectives. Such generalities, however, give inadequate weight to the fact that a policymaker's most solemn commitment is to pursue the national interest, regardless of any other personal inclination.

It is the hypothesis of this paper that the foreign policy process is a pragmatic one, based on practical assessments of the best and most likely methods of achieving national objectives, rather than adherence to an underlying commitment to realism or idealism. This paper demonstrates this fact in a survey of significant instances in the history of America's relations with Asia where presidents and other senior officials were compelled to make pragmatic foreign policy decisions despite reputations or personal inclinations toward either realism or idealism.

Master of Arts in
National Security Affairs
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UNDERSTANDING THE SOVIET THREAT: THE NECESSITY OF ANALYZING SOVIET MILITARY THOUGHT AND ACTIONS FROM A SOVIET PERSPECTIVE

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In order to evaluate the Soviet Officer's actions in war properly, it is not only necessary to know his order of battle and capabilities but also to have some understanding of his preconceptions and values in the thought and decision-making processes and to evaluate his actions from that perspective. To project American values into Soviet military thought is unacceptable due to the conflicting ideological bases of the Soviet and American cultures. Proper interpretation of Soviet military thought must include an understanding of its foundations in the Marxist-Leninist ideology and the Soviet/Russian culture, as well as of its concepts such as military doctrine, science, and art. All of these are radically different from their U.S. counterparts. This thesis is written as a primer for U.S. military officers, all of whom require a fundamental understanding of the Soviet perspective.

Master of Arts in
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December 1987

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JAPAN-USSR: TRADE, TECHNOLOGY TRANSFER, AND IMPLICATIONS FOR U.S.

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M.M., University of South Florida, 1979

This thesis examines trade and technology transfer between the Soviet Union and Japan. The paper discusses the subject from the perspective of both Japan and the USSR and considers the impact of the United States' and other nations' influence on their bilateral relationship. The thesis delineates the affect of political, military, and socio-psychological factors on the economic foundation of the issue. The USSR and Japan are strongly complementary in purely economic terms, but trade is particularly hindered by political and strategic considerations. Both nations claim rightful ownership of the "Northern Territories" - a small group of islands between Japan's Hokkaido and the USSR's Kurile Islands. Japan's government will not promote trade until the islands are returned; the USSR will not give up the islands, which are a part of its strategic nuclear bastion plan. Nonetheless, Japan's private business sector will push for as much trade as possible with the USSR, separating economics from politics. The USSR will promote trade with Japan whenever it can achieve a significant advantage toward modernization and revitalization of the Soviet economy.

Master of Arts in
National Security Affairs
June 1988

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THE NEW SOVIET MILITARY DOCTRINE AND THE FUTURE OF THE MARITIME STRATEGY

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This thesis examines the continued applicability of the bastion concept as a basic assumption of the Maritime Strategy with respect to the new Soviet military doctrine. The methodology employed involves an examination of Soviet literature, naval hardware, and exercise/operating patterns to determine if there has been a shift in the Soviet emphasis upon protecting the SSBN force. The results show that even though the Soviets have made certain changes in the political aspects of their military doctrine, they will most likely continue to emphasize the protection of the SSBN as the primary mission of the Soviet Navy in the event of a war. In fact, as the numbers of strategic nuclear warheads are reduced by future arms control proposals, such as START, the Soviets will probably consider the protection of the SSBN force to be more important than in the past.

Master of Arts in
National Security Affairs
September 1988

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PERCEPTIONS MANAGEMENT: SOVIET DECEPTION AND ITS IMPLICATIONS FOR NATIONAL SECURITY

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An attempt to broaden awareness of Soviet perceptions management. Perceptions management activities are designed to influence public and policy-maker opinion unfavorably toward the United States and favorably toward the Soviet Union. The resources devoted to active measures, propaganda, and disinformation extend throughout the Soviet bureaucratic structure and are directed both internally and abroad. Soviet courting of public opinion within a democracy is designed to turn an open political system against itself.

Master of Arts in
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March 1988

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and Repair, USN
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New Orleans, LA 70142-5700

Supervisor of Shipbuilding Conversion 1
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ATTN: Technical Library
495 Summer St.
Boston, MA 02210

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Fleet Combat Training Center
Atlantic, Dam Neck
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MAGTF Warfighting Center
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USN Public Works Center
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FPO San Francisco, CA 96630-2937 — 1

Base Library
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US NAS Sigonella
FPO New York 09523 — 1

Director
USACSW
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Vint Hill Farms Station
Warrenton, VA 22186 — 1

Library
The Rand Corporation
1700 Main St.
P.O. Box 2138
Sant Monica, CA 90406-2138 — 1

LT Cynthia Wilberg
1401 S. Edgewood St.
Arlington, VA 22204 — 1

Mary Schaefer 1
TASC
1700 N. Moore St.
Suite 1220
Arlington, VA 22209

Commander 1
Naval Space Command
ATTN: VN152
Dahlgren, VA 22448-5170

NOAA Library 1
7600 Sand Point Way NE
Building 3
Seattle, Washington 98115

Fleet Numerical Oceanography Center 1
Monterey, CA. 93940

U.S. Dept. of Trans/TSC 1
Trans. System Center
Kendall Square
Combridge, MASS 02142-1093
ATTN; Althea Philips/DTS 930

Post Library 1
Bldg. 31
Ft. Benjamin Harnson, IND. 46216-5100

Commanding Officer 2
Commanding Library 012L
U.S. Naval Weapons Station
Sill Beach, CA. 90740-5000

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Code WF-13
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