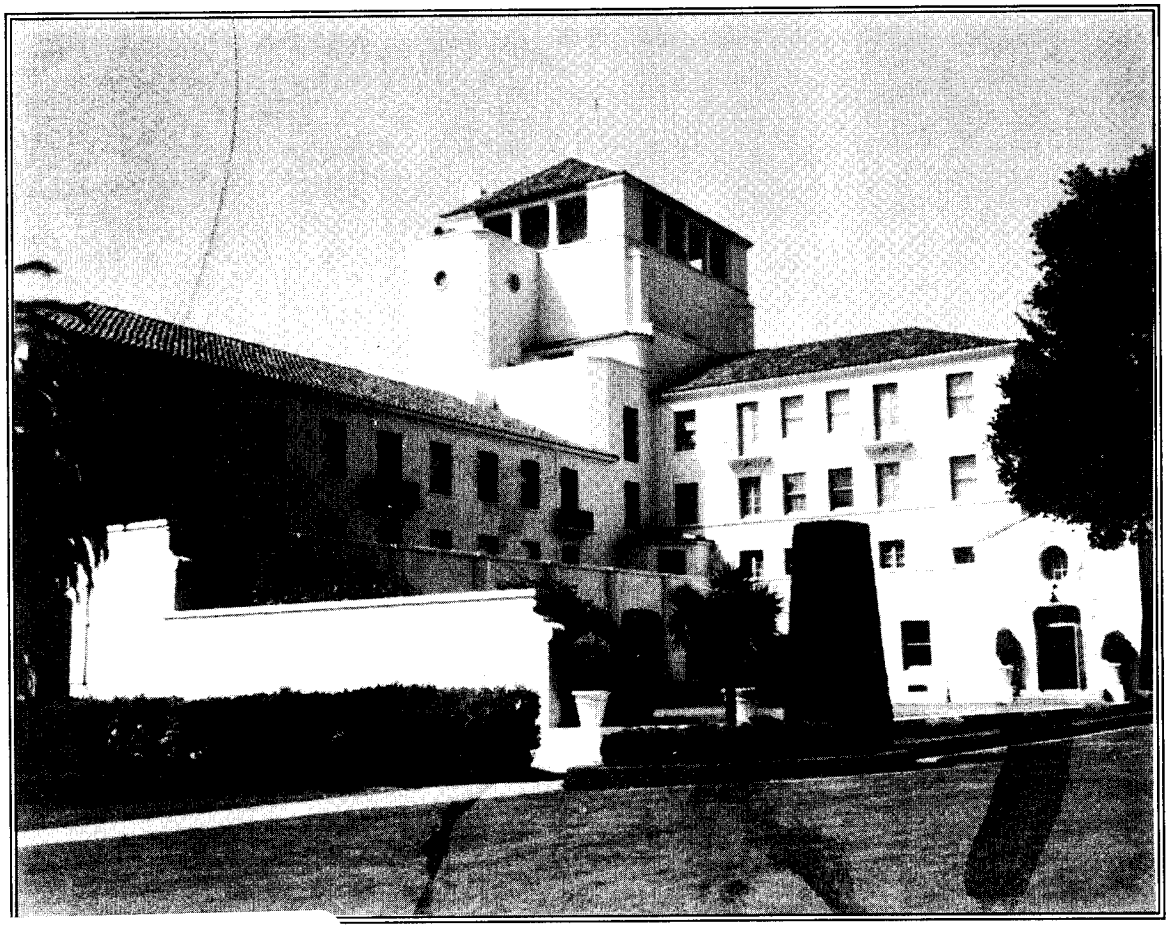
Naval Postgraduate School
Monterey, California 93943-5138

DTIC
ELECTE
APR 07 1995
B

COMPILATION OF ABSTRACTS OF THESES SUBMITTED BY CANDIDATES FOR DEGREES

OCTOBER 1992 TO SEPTEMBER 1993



19950406 047

DISTRIBUTION STATEMENT A
Approved for public release
Distribution Unlimited

NAVAL POSTGRADUATE SCHOOL
Monterey, California 93943-5000

Rear Admiral T.A. Mercer
Superintendent

H. Shull
Provost

The work reported herein was supported by various Department of Defense activities and Federal Government agencies.

Reproduction of this report is authorized.

Reviewed by:

P.J. Marto
Dean of Research

Released by:

Harrison Shull
Provost

DTIC QUALITY INSPECTED 5

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY *(Leave blank)*	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
		Summary 10/1/92 to 9/30/93

4. TITLE AND SUBTITLE

COMPILATION OF ABSTRACTS OF THESES SUBMITTED BY CANDIDATES FOR DEGREES

5. FUNDING NUMBERS

6. AUTHOR(S)

Students of the Naval Postgraduate School - Candidates for degrees

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

Naval Postgraduate School
Monterey, CA 93943-5000

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSORING / MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

The views expressed in this report are those of the authors and do not reflect the official policy or position of DoD or the U.S. Government.

12a. DISTRIBUTION / AVAILABILITY STATEMENT

Approved for public release; distribution is unlimited.

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 words)*

This publication contains the abstracts of theses submitted during the period of 1 October 1992 to 30 September 1993 by candidates for Doctoral, Master's and Engineer's degrees at the Naval Postgraduate School, Monterey, CA 93943-5000.

14. SUBJECT TERMS	15. NUMBER OF PAGES 472
	16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	

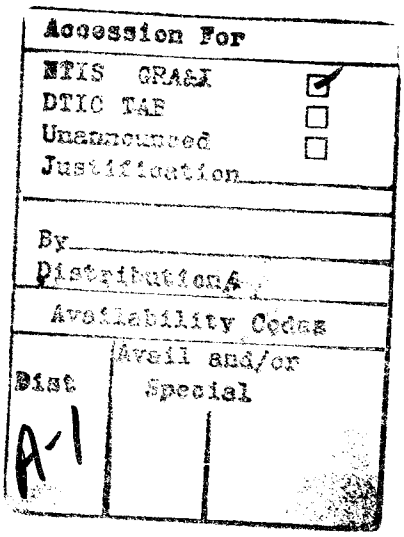
NAVAL POSTGRADUATE SCHOOL
Monterey, California

At the Naval Postgraduate School, most of curricula in which advanced degrees are offered require the submission of an acceptable thesis.

This publication contains unclassified abstracts of theses submitted for the degrees of Doctor of Philosophy, Engineer, Master of Science, and Master of Arts/Science during the period of 1 October 1992 to 30 September 1993.

This compilation of abstracts of theses is published in order that those interested in the fields represented may have an opportunity to become acquainted with the nature and substance of the student research that has been undertaken. Copies of theses are obtainable for those wishing more detailed information according to the procedures outlined on the following page.

Additional information about programs and curricula at the Naval Postgraduate School can be obtained from the Director of Programs, Code 03. For further information about student and faculty research at the school, contact the Dean of Research, Code 08, Naval Postgraduate School, Monterey, California, 93943-5000.



NAVAL POSTGRADUATE SCHOOL
Monterey, California 93943

Copies of publications with unlimited distribution may be obtained from either of the following agencies depending upon the particular circumstances:

Individuals affiliated with a research and development activity within the U.S. Government or its associated contractors, subcontractors, or grantees, under current U.S. Government contract, should order from:

DEFENSE TECHNICAL INFORMATION CENTER
Cameron Station
Alexandria, Virginia 22134-5000

Organizations or individuals who do not fall within the above categories may order from:

NATIONAL TECHNICAL INFORMATION SERVICE
U.S. Department of Commerce
Springfield, Virginia 22161

A given document may be obtained by submitting a bibliographic citation including: 1) author, 2) title, 3) publication date, 4) the Naval Postgraduate School Report Number or reference to the document as a Naval Postgraduate School thesis.

General inquiries concerning faculty and student research at the Naval Postgraduate School should be addressed to:

Superintendent
Naval Postgraduate School
Code 08
Research Office
Monterey, California 93943-5019

TABLE OF CONTENTS

ADVANCED DEGREES

DOCTOR OF PHILOSOPHY		PAGE
Stephen C. Brawley Lieutenant, U.S. Navy	Aerodynamic Design Using Parallel Processors	3
Daniel J. Brett Captain, U.S. Air Force	Orbital Parameter Estimation Using an Extended Kalman Filter	3
Ronald Benton Byrnes, Jr. Major, U.S. Army	The Rational Behavior Model: A Multi-Paradigm, Tri-Level Software Architecture for the Control of Autonomous Vehicles	4
John Casey Church Lieutenant Commander, U.S. Navy	Topics in Longshore Currents	4
Patrick A. Harr	Large-Scale Circulation Regimes and Tropical Cyclone Characteristics Over the Western Pacific Ocean	5
David L. Krueger Lieutenant Commander, U.S. Navy	Parametric Uncertainty Reduction in Robust Multivariable Control	5
Shang-Wu Li	A Three-Dimensional Study of the Influence of Mountains on a Front	6
David L. MacPherson Lieutenant Commander, U.S. Navy	Automated Cartography by an Autonomous Mobile Robot Using Ultrasonic Range Finders	6
David R. Pratt	A Software Architecture for the Construction and Management of Real-Time Virtual Worlds	7
Keith Alan Sturgess Captain, U.S. Army	A Study of the Amplification of Laser and VLF Waves Using a Simple Pendulum Model	7
Timothy Daniel Tisch Lieutenant, National Oceanic and Atmospheric Administration	Assessing the Energetic Interactions of Subtidal Flow Flow on the Continental Slope in an Eastern Boundary Region	8
Gary E. Yale Captain, U.S. Air Force	Cooperative Control of Multiple Space Manipulators	8
Tien-Chiang Yeh	Effects of Taiwan Orography on the Motion and Structure of Typhoons	9

AERONAUTICAL & ASTRONAUTICAL ENGINEER

Matthew R. Avila Lieutenant, U.S. Navy	Computational and Experimental Investigation of the Aerodynamic Characteristics of a Windsurfing Sail Section	13
Joseph Jean-Paul Daniel Gibeau Captain, Canadian Air Force	Missile Design PC Trap: An Improved PC Trap for Tactical Missile Design	13
William J. Nieusma, Jr. Lieutenant, U.S. Navy	An Investigation of Two Propeller Tilt Wing V/Stol Aircraft Flight Characteristics	14
William H. Reuter Lieutenant, U.S. Navy	Flowfield Computations Over the Space Shuttle Orbiter With a Proposed Canard at a Mach Number of 5.8 and 50 Degrees Angle of Attack	14
Robert Brian Stoney Lieutenant Commander, U.S. Navy	Design, Fabrication and Test of a Vertical Altitude Takeoff and Landing Unmanned Air Vehicle	15
Thomas Dean Stuart Lieutenant Commander, U.S. Navy	Experimental Study of the Effect of Helical Grooves on an Infinite Cylinder	15

ELECTRICAL ENGINEER

Rui Manual Alves Francisco Lieutenant, Portuguese Navy	Improvement of Miss Distance of Missiles With Imaging Seekers by Utilizing Dynamic Image Processing	19
Leven Misirlioglu Lieutenant Junior Grade, Turkish Navy	Acquisition Time Analysis of Non-Coherent PN Sequence Acquisition Schemes	19
Fernando Jorge Pires Lieutenant, Portuguese Navy	Design of a Decentralized Asynchronous Membership Protocol and an Implementation of its Communications Layer	20

MECHANICAL ENGINEER

Vance Hiro Adams Lieutenant Commander, U.S. Navy	Theoretical Study of Laminar Film Condensation on Horizontal Elliptical Tubes Under Conditions of Free and Forced Convection	23
John B. Carroll Lieutenant, U.S. Navy	Free-Surface/Vorticity Interaction	23
Dean J. Cottle Lieutenant, U.S. Navy	Mine Avoidance and Localization for Underwater Vehicles Using Continuous Curvature Path Generation and Non-Linear Tracking Control	24

Kent William Kettell Lieutenant, U.S. Navy	Correlation of Flux Composition and Inclusion Characteristics With Submerged Arc Weld Metal Properties in HY-100 Steel	24
Eric S. McDonald Lieutenant, U.S. Navy	Optimization Techniques for Contact Stress Analysis	25
Jeffery Scott Riedel Lieutenant, U.S. Navy	Pitchfork Bifurcations and Dive Plane Reversal of Submarines at Low Speeds	25

MASTER OF SCIENCE DEGREES

AERONAUTICAL ENGINEERING

Waleed Isa Al-Hashel Lieutenant, Bahrain Amiri Air Force	Two-Dimensional Boundary Surfaces for Axi-Symmetric External Transonic Flows	29
Robert L. Baldocchi Lieutenant, U.S. Navy	Modification and Calibration of the Naval Postgraduate School Academic Wind Tunnel	29
Clayton E. Brown Captain, U.S. Army	A Comparative Flow Visualization Evaluation of a Coanda Cylinder and Ellipse	30
Mark Allen Couch Lieutenant, U.S. Navy	A Finite Wake Theory for Two-Dimensional Rotary Wing Unsteady Aerodynamics	30
Antonio M. Cricelli	Unsteady Airfoil Solutions on Moving Zonal Grids	31
Daniel Scott Dietrich Lieutenant, U.S. Navy	Predicting Radiation Characteristics From Antenna Physical Dimensions	31
David Michael Dober Lieutenant, U.S. Navy	Three-Dimensional Fiber-Optic LDV Measurements in the Endwall Region of a Linear Cascade of Controlled-Diffusion Stator Blades	32
Andrew John Dobrei Captain, Canadian Air Force	A Kinematic Upgrade to an Infrared Air-to-Air Missile With Dual-Interrupted-Thrust Technology and its Effect on Lethality	32
Colleen Laverna Ellis Lieutenant Commander, U.S. Navy	Preliminary Design of a Water Cooled Avionics Cooling Rack	33
Gregory J. Fick Lieutenant, U.S. Navy	Acquisition, Design Modification, Assembly, and Ground Test of NPS Hummingbird Remotely Piloted Helicopter	33
Joseph Jean-Paul Daniel Gibeau Captain, Canadian Air Force	Missile Design PC Trap: An Improved PC Trap for Tactical Missile Design	34

Stephen Gulakowski Lieutenant, U.S. Navy	An Apparatus for Measurement of Ignition and Burning Characteristics of Metallic Particles	34
Nancy Lynne Heckman Lieutenant, U.S. Navy	Testing a Wheeled Landing Gear System for the TH-57 Helicopter	35
Thomas A. Johnston Commander, U.S. Navy	Computational Investigation of the Compressible Dynamic Stall Characteristics of the Sikorsky SSC-A09 Airfoil	35
Burke R. Kaltenberger Lieutenant, U.S. Navy	Unmanned Air Vehicle/Remotely Piloted Vehicle Analysis for Lethal UAV/RPV	35
Karl Allen Klopp Lieutenant, U.S. Navy	Antenna Gain Loss and Pattern Degradation Due to Transmission Through Dielectric Radomes	36
David R. Kuechenmeister Captain, U.S. Marine Corps	A Non-Linear Simulation for an Autonomous Unmanned Air Vehicle	36
Carl W. Marquis, III Lieutenant, U.S. Navy Reserve	Integration of Differential GPS and Inertial Navigation Using a Complementary Kalman Filter	37
Aaron Mitchell McAtee Lieutenant, U.S. Navy	Adaptations to "Micropep" and "Rocket" to Allow Performance Evaluation of Multiple Grain and/or Airbreathing Motors	37
Douglas G. McBane Lieutenant, U.S. Navy	Close-Coupled Oscillating Canard Effects on Post-Stall Lift Enhancement	38
Gary P. McVaney Major, U.S. Army	Procedural Guide to Modelling and Analyzing the Flight Characteristics of a Helicopter Design Using Flightlab	38
Patrick J. Moran Lieutenant Commander, U.S. Coast Guard	Control Vane Guidance for a Ducted-Fan Unmanned Air Vehicle	39
Gregory S. Morin Lieutenant, U.S. Navy	Service Life Prediction of Composite Structures Through Fiber Testing	39
David Daniel Myre Lieutenant, U.S. Navy	Model Fan Passage Flow Simulation	40
Thomas Elliott Neely Lieutenant, U.S. Navy	Performance of Coded Coherent FSK Lightwave System With NonCoherent Detection	40
Robert Kirk Nicholson, Jr. Major, U.S. Army	Computer Code for Interactive Rotorcraft Preliminary Design Using a Harmonic Balance Method for Rotor Trim	41
David Arthur Perretta Lieutenant, U.S. Navy	Laser Doppler Velocimetry Across a Normal Shock in Transonic Flow	41

David B. Porter Lieutenant Commander, U.S. Navy	A Numerical Study of Airplanes Flying in Proximity	41
Patrick J. Quinn Commander, U.S. Navy	An Application of Parameter Estimation to the Stability and Control of the BQM-147 Unmanned Aerial Vehicle	42
Peter J. Riester Lieutenant Commander, U.S. Navy	A Computational and Experimental Investigation of Incompressible Oscillatory Airfoil Flow and Flutter Problems	42
Ronald F. Salyer Major, U.S. Army	Flow Visualization and Experimental Optimization of Three Inlet-Side-Dump Liquid-Fuel Ramjet Combustors	42
Daniel G. Sergent Lieutenant, U.S. Navy	A Concluding Study of the Altitude Determination Deficiencies of the Service Aircraft Instrumentation Package (SAIP)	43
Michael V. Skelly Lieutenant, U.S. Navy	Fatigue Life Program Using Strain-Life Methods	43
Byron L. Smith Lieutenant, U.S. Navy	Mean Strain Effects on the Strain Life Fatigue Curve	43
Gregory David Thomas Lieutenant, U.S. Navy	Measurement and Prediction of the Flow Through an Annular Turbine Cascade	44
Gregory Glenn Van Dyke Lieutenant, U.S. Navy	Parametric Study of a Finite Element Model of the Sidewinder Missile	44
Michael John Wagner Lieutenant Commander, U.S. Navy	AEW Aircraft Design	45
Matthew Allen Webber Lieutenant, U.S. Navy	Determining the Effect of Endwall Boundary Layer Suction in a Large Scale Subsonic Compressor Cascade	45
Mark S. Wilsey Lieutenant Commander, U.S. Navy	A Parametric Analysis of Endoatmospheric Low-Earth-Orbit Maintenance	46
Walter M. Wirth, Jr. Major, United States Army	Linear Modeling of Rotorcraft for Stability Analysis and Preliminary Design	46
Joseph H. Woodward Lieutenant, U.S. Navy	Safety Enhancement of Composites Via Periodic Proof Testing	47
Craig J. Zgraggen Lieutenant, U.S. Navy	Lift Enhance of a Wing/Strake Using Pneumatic Blowing	47

ASTRONAUTICAL ENGINEERING

Joseph A. Bruening Lieutenant, U.S. Navy	Analysis of Radiation Damaged and Annealed Gallium Arsenide and Indium Phosphide Solar Cells Using Deep Level Transient Spectroscopy	51
William Earle Clifton Lieutenant Commander, U.S. Navy	Thermoelectric Cooler Design	51
Michael A. Hecker Lieutenant, U.S. Navy	An Expert System for Processing Uncorrelated Satellite Tracks	52
Richard E. Johnson Lieutenant, U.S. Navy	Effects of Thrust Vector Control on the Performance of the Aerobang Orbital Plane Change Maneuver	52
Bruce Howard Mathers Lieutenant, U.S. Navy	Mathematical Modeling and Control Law Development for the Atmospheric Monitoring and Control System of the Controlled Environment Research Chamber (CERC) at NASA Ames Research Center	53
J. David McCrorie, II Lieutenant, U.S. Navy	Particle Behavior in Solid Propellant Rocket Motors and Plumes	53
Scott M. Newman Lieutenant, U.S. Navy	Active Damping Control of a Flexible Space Structure Using Piezoelectric Sensors and Actuators	54
David Ray Price Lieutenant, U.S. Navy	Optimization and Performance Analysis of a Supersonic Conical-Flow Waverider for a Deck-Launched Intercept Mission	54
Bruce Charles Urbon Lieutenant, U.S. Navy	Atomization and Combustion of a Gelled, Metallized Slurry Fuel	55

APPLIED MATHEMATICS

David J. Albert Lieutenant, U.S. Navy	Numerically Solving a Transient Heat Conduction Problem With Convection and Radiation	59
Michael A. Bernhard Lieutenant, U.S. Navy	Introduction to Chaotic Dynamical Systems	59
Donald D. Cersovsky Captain, U.S. Army and Edward Kleinschmidt Captain, U.S. Army	Mathematical Model and Analysis of the Tactical Unmanned Ground Vehicle (TUGV) Using Computer Simulation	60
Annette P. Cornett Lieutenant, U.S. Navy	Multigrid Approach to Solving the Long Transportation Problem on a Regular Grid in Cost Space	60
Antonio Pietro Fontana Lieutenant, U.S. Navy	On a Proposed Symbolic Dynamics for the Hénon Map	60

James E. Heyman Lieutenant, U.S. Navy	On the Use of Chaotic Dynamical Systems to Generate Pseudorandom Bitstreams	61
Michael Rudolf Huber Captain, U.S. Army	An Investigation of Low Marangoni Number Fluid Flow in a Cold Corner	61
Edward Kleinschmidt Captain, U.S. Army and Donald D. Cersovsky Captain, U.S. Army	Mathematical Model and Analysis of the Tactical Unmanned Ground Vehicle (TUGV) Using Computer Simulation	61
Joseph A. Kowalewski Lieutenant, U.S. Navy	The Resonant Interaction of a Submarine's Wake With a Stratified Fluid	62
Sara R. Ostrom Lieutenant, U.S. Navy	Parallelization of the Air Force Space Command (AFSPACECOM) Satellite Motion Models	62
Dennis Arthur Polaski Captain, U.S. Army	Use of Computers in the Instruction of Integral Calculus	62
APPLIED SCIENCE		
Robert Eric Coleman Lieutenant, U.S. Navy	An Evaluation of a Tactical Active Multi-Environment Acoustic Prediction System vs Measured Data	65
Douglas Lee Cuthbert Lieutenant, U.S. Navy	Experimental Determination of the Surface Displacement of a Small Flexural Disk Sonar Transducer from Surface Strain Measurements	65
Michael Thomas Huff Lieutenant, U.S. Navy	A Comparison of Astral and Raymode Propagation Loss Models and Their Use in Air ASW Platforms	65
Theodore W. L. Huskey Lieutenant, U.S. Navy	Scattering of Underwater Sound From a Porous Solid Sphere	66
William Michael Sawrey Commander, U.S. Navy	A Comparison of Passive Propagation Loss Predictions as Generated by the Tactical Environmental Support System (TESS V.2.2A) and ASW Tactical Decision Aid (ASWTDA V.2.1.2.1)	66
COMPUTER SCIENCE		
Thor Davis Aakre Lieutenant, U.S. Navy	A Resource Constrained Loop Pipelining Technique for for Perfectly-Nested Loop Structures	69
Cem Akin Lieutenant Junior Grade, Turkish Navy	Efficient Scheduling of Real-Time Compute-Intensive Periodic Graphs on Large Grain Data Flow Multiprocessor	69

Metin Balci Lieutenant Junior Grade, Turkish Navy and Erhan Saridogan Lieutenant Junior Grade, Turkish Navy	Design and Implementation of a Graphical User for a Multimedia Database Management System	87
Mark R. Boone	NPSNET: Real-Time Walkthrough and Rendering of Urban Terrain	70
Paul Alan Bourgeois Captain, U.S. Marine Corps	The Instrumentation of the Multimodel and Multilingual User Interface	70
Bernadette Clemente Brooks	Structured Versus Object-Oriented Design of a Navy Battle Group Logistics Simulation System	71
Zeki Bulent Bulbul Lieutenant Junior Grade, Turkish Navy	Protocol Validator for the SCM and CRSM Models	71
Terence Edward Busmire Captain, U.S. Marine Corps	Concept Definitions and Security Requirements of a Cooperative Execution Environment for Distributed Computing	72
Turgay Çinçe First Lieutenant, Turkish Army	Design and Implementation of a Query Editor for the Amadeus System	73
Daniel Patrick Corbin Lieutenant, U.S. Navy	NPSNET: Environmental Effects for a Real-Time Virtual World Battlefield Simulator	73
David M. Cross Captain, U.S. Army	Usefulness of Compile-Time Restructuring of Large Grain Data Flow Programs in Throughput-Critical Applications	74
Mark Joseph DeClue Lieutenant, U.S. Navy	Object Recognition Through Image Understanding for an Autonomous Mobile Robot	74
Scott Joel Dolgoff Captain, U.S. Army	Automated Interface for Retrieving Reusable Software Components	75
Mustafa Eser First Lieutenant, Turkish Army	Object-Oriented Implementation of Field Artillery Tactical Data System	75
Todd Gregory Estes Lieutenant, U.S. Navy and Eric Martin Mueller Lieutenant, U.S. Navy	The Covering Property of the Object-Oriented Database Model Design and Implementation Issues	76

Robert William Fish Lieutenant Commander, U.S. Navy	An Expert System for High Level Motion Control for an Autonomous Mobile Robot	76
Chen-Hua Fu Captain, R.O.C. Army	An Implementation of Traffic Monitoring for UNIX Network Performance Management	77
Carl Joseph Grim Lieutenant, U.S. Navy Reserve	An Object-Oriented Program Specification for a Mobile Robot Motion Control Language	77
James Phillip Hargrove Lieutenant Commander, U.S. Navy	Design and Implementation of an Interface Editor for for the Amadeus Multi-Rational Database Front-End System	78
John Henry Hearne, Jr. Lieutenant, U.S. Navy	NPSNET: Physically Based, Autonomous, Naval Surface Agents	78
Michael A. Hecker Lieutenant, U.S. Navy	An Expert System for Processing Uncorrelated Satellite Tracks	79
Antonius Herusutopo Major, Indonesian Navy	A Study of Computer Security Policies for the Indonesian Navy	79
Wayne High Lieutenant, U.S. Navy	A Formal Protocol Test Procedure for the Survivable Adaptable Fiber Optic Embedded Network (SAFENET)	80
Gregory Morris Johnson Captain, U.S. Army	A Real-Time U.S. Army Tactical Telephone Network Management System	80
Richard Karl Johnston Lieutenant Commander, U.S. Navy	The Relational-to-Object-Oriented Cross-Model Accessing Capability in a Multi-Model and Multi-Lingual Database System	81
Turgay Karlidere Lieutenant Junior Grade, Turkish Navy and John William Moore Lieutenant, U.S. Navy	The Design and Implementation of an Object-Oriented Interface for the Multimodel/Multilingual Database System	82
Timothy James Kelly Lieutenant, U.S. Navy	An Evaluation of a Test Scheduling Solution	82
Charles P. Lombardo	Hyper-NPSNET: Embedded Multimedia in a 3D Virtual World	83
Nancy Jo McClellan Lieutenant, U.S. Navy	Development of Dynamic, Context-Driven Help Systems	83
Andrew Perry Meeks Lieutenant, U.S. Navy	The Instrumentation of the Multibackend Database System	84

John William Moore Lieutenant, U.S. Navy and Turgay Karlidere Lieutenant, Junior Grade, Turkish Navy	The Design and Implementation of an Object-Oriented Interface for the Multimodel/Multilingual Database System	84
Eric Martin Mueller Lieutenant, U.S. Navy and Todd Gregory Estes Lieutenant, U.S. Navy	The Covering Property of the Object-Oriented Database Model Design and Implementation Issues	85
Robert Romero Ordonio Captain, U.S. Army	An Automated Tool to Facilitate Code Translation for Software Fault Tree Analysis	85
Dogan Ozdemir Lieutenant Junior Grade, Turkish Navy	The Design and Implementation of a Reusable Component Library and a Retrieval/Integration System	86
John Howard Quigg Captain, U.S. Army	Scheduling Techniques for Multiple Processor Systems in Real-Time Environments	86
Michael Alan Randall	Proof of Fault Coverage for a Formal Protocol Test Procedure	87
David Joseph Sacha Captain, U.S. Army	Design and Specification of the Xpress Transfer High-Speed Protocol	87
Erhan Saridogan Lieutenant Junior Grade, Turkish Navy and Metin Balci Lieutenant Junior Grade, Turkish Navy	Design and Implementation of a Graphical User Interface for a Multimedia Database Management System	88
Dennis Arvin Schmidt Commander, U.S. Navy	NPSNET: A Graphical Based Expert System to Model P-3 Aircraft Interaction With Submarines and Ships	88
Thomas Scholz Lieutenant Commander, German Navy	The State Transition Diagram With Path Priority and its Applications	89
Randall C. Scott Captain, U.S. Navy	Reengineering Real-Time Software Systems	89
Richard S. Smith Captain, U.S. Army	NPSNET: Scripting of Three-Dimensional Interactive Systems for Use in the Janus Combat Simulator	90
Clark Daniel Stevens Lieutenant Commander, U.S. Navy	A Software Architecture for a Small Autonomous Underwater Vehicle Navigation System	90

Francius Suwono Lieutenant Colonel, Indonesian Air Force	A Graphical User-Interface Development Tool for Intelligent Computer-Assisted Instruction Systems	91
Frederick Perry Boynton Thornton, Jr. Captain, U.S. Marine Corps	A Concurrent, Object-Based Implementation for the Tactical Level of the Rational Behavior Model	91
Michael Jay Timmerman Lieutenant Commander, U.S. Navy Reserve	A Genetic Algorithm Based Anti-Submarine Warfare Warfare Simulator	92
Kevin John Walsh Major, U.S. Army	An Automated Ada Physical Source Line Counter	92
Stanley Hugh Watkins Major, U.S. Marine Corps	A Porting Methodology for Parallel Database Systems	93
Roy David Young Captain, U.S. Marine Corps	NSPNET IV: A Real-Time 3D Distributed Interactive Virtual World	93
Stanley Nelson Zehner Lieutenant Commander, U.S. Navy	Modeling and Simulation of a Deep Submergence Rescue Vehicle (DSRV) and its Networked Application	94
Steven Randall Zeswitz Captain, U.S. Marine Corps	NPSNET: Integration of the Distributed Interactive Simulation (DIS) Protocol for Communication Architecture and Information Interchange	94

ELECTRICAL ENGINEERING

Michael D. Anderson Lieutenant, U.S. Navy	Resolution in Radar Mapping	97
Nelson A. Armas Lieutenant, Ecuadorian Navy	Low Sidelobe Reflector Antenna Design for Communications	97
John Douglas Ashe Lieutenant, U.S. Navy	Petite Amateur Naval Satellite Spacecraft Digital Control System: A Hardware Design	97
Arthur Brooks Billingsley, Jr. Lieutenant, U.S. Navy	An Investigation of Memory Latency Reduction Using an Address Prediction Buffer	98
Eldon Wade Bingham Captain, U.S. Marine Corps	Stray Insensitive Switched Capacitor Composite Operational Amplifiers	98
Georgios Theodoros Bougioukos Lieutenant, Hellenic Navy	The Design and Evaluation of Transmit and Receive Antennas for an Ionospheric Communication Probe System: B. Sloping-Vee Beams	98

William Allen Brooks, Jr. Lieutenant, U.S. Navy	Ultra-Wideband Radar Transient Signal Detection Using Time-Frequency and Wavelet Transforms	99
Arnold O. Brown, III Lieutenant, U.S. Navy	Communications Subsystem for the Petite Amateur Satellite (PANSAT)	99
Dean C. Bruckner Lieutenant, U.S. Coast Guard	Automatic Pulse Shaping With the AN/FPN-42 and AN/FPN-44A Loran-C Transmitters	99
Michael P. Butler Lieutenant Commander, U.S. Navy	Test Methods and Custom Hardware for Functional Testing of a High-Speed GaAs Dram	100
Nancy J. Carter Lieutenant Commander, U.S. Navy	Implementation of Cyclic Spectral Analysis Methods	100
David M. Cross Captain, U.S. Army	Usefulness of Compile-Time Restructuring of Large Grain Data Flow Programs in Throughput-Critical Applications	101
Ronald Anthony Crowell Commander, U.S. Navy	Digitally Programmable Composite Operational Amplifier Applications	101
Sandra Lynne Davidson Lieutenant, U.S. Navy	An Experimental Comparison of CLOS and C++ Implementations of an Object-Oriented Graphical Simulation of Walking Robot Kinematics	102
Joseph Peden Davis Captain, U.S. Marine Corps	The Design of a Robust Autopilot for the Archytas Prototype Via Linear Quadratic Synthesis	102
Abdon B. de Paula Lieutenant Commander, Brazilian Navy	An Introduction to Doppler Effect and Fading in Mobile Communication	102
Aper Erdemir Lieutenant Junior Grade, Turkish Navy	Data Compression by Using Wavelet Transforms and Vector Quantization	103
Stanley L. Fox, II Lieutenant, U.S. Navy	Networked Workstations and Parallel Processing Utilizing Functional Languages	103
Rui Manuel Alves Francisco Lieutenant, Portuguese Navy	Improvement of Miss Distance of Missiles With Imaging Seekers by Utilizing Dynamic Image Processing	103
Thomas Murray Fritz Lieutenant, U.S. Navy	A Biphase Shift Keying Direct Sequence Spread Spectrum Modem for Petite Amateur Navy Satellite (PANSAT)	104

Donald Dwight Gerry Lieutenant Commander, U.S. Navy	Mathcad Computer Applications Predicting Antenna Parameters from Antenna Physical Dimensions and and Ground Characteristics	104
Neil Anthony Hamlett Lieutenant, U.S. Navy	Comparison of Multiresolution Techniques for Digital Signal Processing	105
Gifford Allen Hammar Lieutenant, U.S. Coast Guard	FDDI Installation and Performance Analysis	105
Zafer Inceoglu Lieutenant Junior Grade, Turkish Navy	Trellis Coded CPFSK	106
Betülhan Kahraman Lieutenant Junior Grade, Turkish Navy	Performance Evaluation of UHF Fading Satellite Channel by Simulation for Different Modulation Schemes	106
Robert T. Kay Lieutenant, U.S. Navy	A Comparison of Some of the Most Current Methods of Image Compression	106
Chau Giang Le Lieutenant, U.S. Navy	Application of a Back-Propagation Neural Network to Isolated-Word Speech Recognition	107
Bruce Allen Legge Lieutenant Commander, U.S. Navy	Code Division Multiple Access Local Area Network Communications Employing Fiber Optic Signal Processing Techniques	107
Panayiotis Petros Lemos Lieutenant, Hellenic Navy	A Computer Analysis of a Conical Monopole for Use at Naval High Frequency Direction Finding Receiving Sites Part I, II	108
James True Loeblein Lieutenant, U.S. Navy	A Digital Hardware Test System Analysis With Test Vector Translation	108
Rena M. Loesch Lieutenant, U.S. Navy	Crosstalk Analysis of Synchronous and Asynchronous Optical Chip Interconnects With Direct Detection	109
Jeffrey F. McAloon Lieutenant, U.S. Navy	Comparison of Higher Order Moment Spectrum Estimation Techniques	109
John W. McKinstry Lieutenant, U.S. Navy	A Comparison of Trans-Equatorial Ionosphere Propagation Predictions From AMBCOM With Measured Data	110
Paul Vincent Merz Lieutenant, U.S. Navy	Development and Testing of the Digital Control System for the Archytas Unmanned Air Vehicle	110
Gerasimos Dionisios Milatos Lieutenant, Hellenic Navy	Evaluation of Site Effects on a High Frequency Direction Finding Single Site Location System	111

Ramiro Moreira-Paredes Major, Ecuadorian Air Force	Nontraditional Windows in Spectral Analysis	111
Michael Andrew Morris Lieutenant, U.S. Navy	Gallium Arsenide Dynamic Random Access Memory Support Circuitry	112
Terrence J. Murray Lieutenant Commander, U.S. Navy	Four Frequency-Shift Keying (4-FSK) Spread Spectrum Modulator and Demodulator	112
Jose L. Nadal Lieutenant, Peruvian Air Force	A Comparison of Ionospheric Propagation Mode Delay Predictions From Advanced Prophet 4.3 With Measured Data	113
Athanasios Nassopoulos Lieutenant Junior Grade, Hellenic Navy	The Three-Dimensional Ray Trajectories of the WKB Fiber Optics	113
Thomas Elliot Neely Lieutenant, U.S. Navy	Performance of Coded Coherent FSK Lightwave System With Noncoherent Detection	114
Charles Louis Nicholson Lieutenant Commander, U.S. Navy	Localization of Acoustic Transients in Shallow Water Environments	114
Gary Joseph Nowicki Lieutenant, U.S. Navy	The Design and Implementation of a Read Prediction Buffer	115
Stephens W. Nunnally, Jr. Lieutenant, U.S. Navy	A Study of Electrical Aspects of Neural Conduction With an Emphasis on the Phenomenon of Pain	115
Paul Arthur Ohrt Major, Canadian Army	Development of Radar Algorithms for Instructional Use at USNPGS	115
Jennifer Park Lieutenant, U.S. Navy	Design of a Matching Network for Dipole Antennas	116
Dimitrios Ioannis Peppas Lieutenant Junior Grade, Hellenic Navy	A Computer Analysis of Proportional Navigation and Command to Line of Sight of a Command Guided Missile for a Point Defense System	116
Sortiris Georgios Perros Lieutenant, Hellenic Navy	The Design and Evaluation of Transmit and Receive Antennas for an Ionospheric Communications Probe System: A. Multiband Dipole Antenna	116
Christopher Raymond Pietras Lieutenant Commander, U.S. Navy	Hybrid Power System for Remote Communications Stations	117
Rogerio Nacimento Costa Pinto Lieutenant Commander, Brazilian Navy	Three-Dimensional Finite Element Model of a High Power, Low Frequency Ring-Shell Flextensional Sonar Transducer	117

Fernando Jorge Pires Lieutenant, Portuguese Navy	Design of a Decentralized Asynchronous Membership Protocol and an Implementation of its Communications Layer	118
Robert L. Poitras Lieutenant, U.S. Navy	Microprocessor Controlled Instrumentation/Navigation Package for Hostile Marine Environments	118
Murray Michael Regush Major, Canadian Army	Development of a Lidar for Integration With the Naval Postgraduate School Infrared Search and Target Designation (NPS-IRSTD) System	119
William H. Reid Lieutenant, U.S. Navy	Microcomputer Simulation of a Fourier Approach to Ultrasonic Wave Propagation	119
George A. Sagos Lieutenant Junior Grade, Hellenic Navy	A Three-Dimensional Coupled Normal Mode Model for Sound Propagation in Shallow Water With Irregular Bottom Bathymetry	120
Aldo Bruen Schenone Lieutenant, Peruvian Navy	Modeling and Simulation of a Fiber Distributed Data Interface	120
Charles Andrew Schue, III Lieutenant, U.S. Coast Guard	Simulation of Tripod Gaits for a Hexapod Underwater Walking Machine	120
Gary Alan Sipe Lieutenant, U.S. Navy	Target Detection Via Kalman Filtering	121
Janet Emerson Stevens Lieutenant, U.S. Coast Guard	Trellis Coded Modulation Applied to Orthogonal Signals	121
Daniel Thomas Sullivan Lieutenant, U.S. Navy	Computer Simulation Studies of Two-Dimensional Beamforming for Linear Arrays Using a Parallel Computer System	121
David P. Swank Lieutenant, U.S. Navy	Large Grain Data-Flow Graph Restructuring for EMSP Signal Processing Benchmarks on the ECOS Workstation System	122
Tiong Beng Tay Major, Republic of Singapore Navy	Numerical Modeling of a Free-Flooded Piezoelectric Ring Sonar Transducer	122
Brian E. Terpening Lieutenant, U.S. Navy	Application of Kalman Filter on Multisensor Fusion Tracking	123
Keem Boon Thiem	Design of Broadband Wire Antennas for Frequency Hopping Applications	123
Christopher Bryan Vagts Lieutenant Commander, U.S. Navy	A Single-Transistor Memory Cell and Sense Amplifier for a Gallium Arsenide Dynamic Random Access Memory	124

Martha M. VanDerKamp Lieutenant, U.S. Navy	Modeling and Classification of Biological Signals	124
Carlos H. Velasco Lieutenant Commander, Columbian Navy	ARMA Modeling of Signals in the Time Domain	124
Yung-Chung Wei Lieutenant, R.O.C. Taiwan Navy	Probability of Detection Calculation Using MATLAB	125
John D. Wood Lieutenant, U.S. Coast Guard	Mimo Recursive Least Squares Control Algorithm for the AN/FPN-44A Loran-C Transmitter	125
Cem Yildirim Lieutenant Junior Grade, Turkish Navy	Multiple-Valued Programmable Logic Array Minimization by Concurrent Multiple and Mixed Simulated Annealing	125

ENGINEERING ACOUSTICS

Douglas Lee Cuthbert Lieutenant, U.S. Navy	Experimental Determination of the Surface Displacement of a Small Flexural Disk Sonar Transducer from Surface Strain Measurements	129
Chun-Hua Che Commander, R.O.C. Navy	Investigation of Thermoacoustic Muffler	129
Kevin A. Grundy Lieutenant, U.S. Navy	Determination of the Complex Mass Density of Air Contained in a Rigid Porous Solid by an Acoustic Method	129
Fan-Ming Kuo Lieutenant, R.O.C. Navy	Stability Curves for a Thermoacoustic Prime Mover	130
Richard T. Lawrence Lieutenant, U.S. Navy	Experimental Inquiries into Collective Sea State Modes in Deep Water Surface Gravity Waves	130
Charlotte Virginia Leigh Lieutenant Commander, U.S. Navy	Breakdown of Adiabatic Invariance	131
Glenn A. Miller, Sr. Lieutenant, U.S. Navy	Underwater Sound Radiation from Single Large Raindrops at Terminal Velocity: The Effects of a Sloped Water Surface at Impact	131
Rogerio Nacimento Costa Pinto Lieutenant Commander, Brazillian Navy	Three-Dimensional Finite Element Model of a High Power, Low Frequency Ring-Shell Flextensional Sonar Transducer	132
George A. Sagos Lieutenant Junior Grade, Hellenic Navy	A Three-Dimensional Coupled Normal Mode Model for Sound Propagation in Shallow Water With Irregular Bottom Bathymetry	132

Ron J. Stockermans Captain, Canadian Forces	Comparison Calibration of Piezoresistive Microphones for Acoustic Power Measurements	133
Tiong Beng Tay Major, Republic of Singapore Navy	Numerical Modeling of a Free-Flooded Piezoelectric Ring Sonar Transducer	133
Robert Kerry Yarber	Development and Calibration of Two and Four Wire Water Surface Wave Height Measurement Systems	134

ENGINEERING SCIENCE

James Dudley Atkinson, IV Lieutenant, U.S. Navy	Implementation and Use of a Computational Ray-Tracing Program for the Design and Analysis of Complex Optical Systems	137
Carl S. Barbour Lieutenant Commander, U.S. Navy	Prototyping of Two-Beam Laser Interferometer for Measurement of Optical Turbulence Along Extended Paths	137
Neil Robert Bourassa Lieutenant Commander, U.S. Navy	Modeling and Simulation of Fleet Air Defense Systems Using EADSIM	138
Michael Thomas Coleman Lieutenant Commander, U.S. Navy	The Use of Backscattered Electron Imaging Mode to Assess the Effect of Fine Dispersions on Development of Superplastic Microstructures in Al-Mg Alloys	138
Cengiz Ekin Lieutenant Junior Grade, Turkish Navy	Efficient Grid Based Techniques for Solving the Weighted Region Least Cost Path Problem on Multicomputers	139
Rolf Michael Lokensgard Captain, U.S. Marine Corps	A Moment Plotting Method of Characterizing Aircraft Fatigue Data Population Distributions	139
Benjamin Frank Roper Lieutenant Commander, U.S. Navy	Exergy Decrease in Shock Waves and Boundary Layers of Space Launch Vehicles	139
Kevin B. Taylor Lieutenant, U.S. Navy	Dual-Beam Multiple-Wavelength Light Transmittance Measurement for Particle Sizing in Rocket Motor Plumes	140
Huseyin Alphan Tipici Lieutenant Junior Grade, Turkish Navy	Specification and Analysis of a High Speed Transport Protocol	140
Joseph Matthew Utschig Lieutenant, U.S. Navy	Laser Doppler Velocimetry in a Low Speed Multistage Compressor	141
John K. Vaughn Captain, U.S. Army	Measurement of Sub-Micron $A1_2O_3$ Particles in Rocket Plumes	141

Kenneth M. Wallace, Jr. Lieutenant Commander, U.S. Navy	Design of a High Resolution Spatial Heterodyne Interferometer	141

INFORMATION SYSTEMS

Lucille Charlotte Clark	Information Engineering and the Information Engineering Facility Versus Rapid Application Development and Focus	145
Carl William Deputy Lieutenant, U.S. Navy	Design of Telecommunication Network for Geographic Information Systems for the Appalachian Council of Governments: A Case Study	145
Dwayne Lynn Eldridge Lieutenant, U.S. Navy	The Use of Neural Networks for Determining Tank Routes	146
Judy Harr	A Data Base System to Track NPS Navy Officer Graduates	146
P. Denise Hutton	A Prototype of a Faculty and Staff Executive Information System	146
Richard M. Powell, Jr. Major, U.S. Marine Corps	Computer Based Economic Analysis Techniques to Support Functional Economic Analysis	147

INFORMATION TECHNOLOGY MANAGEMENT

Clayton Richard Allen Lieutenant, U.S. Navy	Assessing Research Productivity of Academic IS Departments	151
Chuck Howard Bane, Jr. Lieutenant Commander, U.S. Navy	The Management Issues of Implementing Telecommunicating: A Case Study	151
Kevin Albert Bianchi Lieutenant, U.S. Navy	Design and Implementation of a Database Management System for a Navy Medical Administrative Unit	152
Gary Lynn Brister Lieutenant, U.S. Navy	An Analysis of the Implementation and Effect of Early Industrial Policies in the United States	152
James Calvin Broadwater Lieutenant, U.S. Navy	Implementing the Modern Office Environment: Some Experience With Windows for Workgroups and Groupware	153
Thomas Lynn Brown Lieutenant, U.S. Navy	Security Evaluation of Unix Networks	153
Robert Murray Byron Lieutenant, U.S. Navy	SEMATECH, a Case Study: Analysis of a Government-Industry Partnership	154

Daniel K. Carpenter Major, U.S. Marine Corps and Donald J. Ebner Lieutenant, U.S. Navy	Using Software Applications to Facilitate and Enhance Strategic Planning	154
Maxie Yvonne Davis Lieutenant, U.S. Navy	Concepts and Methods of Measuring Productivity at the Orgainizational Level	155
Donald J. Ebner Lieutenant, U.S. Navy and Daniel K. Carpenter Major, U.S. Marine Corps	Using Software Applications to Facilitate and Enhance Strategic Planning	155
Donald M. Elliott Major, U.S. Marine Corps	Application of a Genetic Algorithm to Optimize Quality Assurance in Software Development	156
Eric Thomas Elser Lieutenant, U.S. Navy	Multiple Goals in Dynamic Decision Making: An Experimental Approach	156
Dorothy L. Filbert Lieutenant Commander, U.S. Navy and Jamel B. Weatherspoon Lieutenant, U.S. Navy	Cognitive Psychology and Design Paradigms in the Development of Multimedia Courseware	157
Paul C. Gibbons Major, U.S. Marine Corps	Telecommunications Services for Multimedia Data Exchange Support	157
Richard M. Hancock Captain, U.S. Marine Corps	A Functional Bar Code Inventory System for Marine Corps Systems Command	157
John D. Harrigan Major, U.S. Marine Corps	Analysis of Disaster Preparedness Planning Measures in DoD Computer Facilities	158
Gale Alicia Harrington Captain, U.S. Army and Kathleen Marie Rondeau Lieutenant Commander, U.S. Navy	An Investigation of Requirements Traceability to Support Systems Development	158
TeddiAnn S. Hayes Lieutenant, U.S. Navy and Winnie L. Huskey Lieutenant, U.S. Navy	An Evaluation of Techniques for Ranking Academic Information Systems Journals	159
Frank J. Hughes Lieutenant Commander, U.S. Navy and Steven C. Kendall Captain, U.S. Marine Corps	An Implementation of the REpresentation and MAintenance of Process Knowledge (REMAP) Model in the Knowledge-Based Software Assistant Concept Demonstration System	159

Winnie L. Huskey Lieutenant, U.S. Navy and TeddiAnn S. Hayes Lieutenant, U.S. Navy	An Evaluation of Techniques for Ranking Academic Information Systems Journals	160
Robert Alan Jacobs Captain, U.S. Marine Corps and John Phillip Steiner Lieutenant, U.S. Navy	Improvements to Autonomous Forces Through the Use of Genetic Algorithms and Rule Base Enhancement	160
Michael Alan Kelly Lieutenant, U.S. Navy	A Methodology for Software Cost Estimation Using Machine Learning Techniques	161
Steven C. Kendell Captain, U.S. Marine Corps and Frank J. Hughes Lieutenant Commander, U.S. Navy	An Implementation of the REpresentation and MAintenance of Process Knowledge (REMAP) Model in the Knowledge-Based Software Assistant Concept Demonstration System	161
James W. Kilby Lieutenant, U.S. Navy	Performance Measurement Systems: A Statistical Analysis	162
Mark Richard Laxen Lieutenant, U.S. Navy	Government Open Systems Interconnection Profile (GOSIP) Transition Strategy	162
Clinton Dean Lewis Lieutenant Commander, U.S. Navy	Development of a Maintenance Advisor Expert System for the MK 92 MOD 2 Fire Control System: FC-1 Designation - Time, FC-1 Track - Bearing, Elevation and Range, and FC-2 Track - Bearing, Elevation and Range	162
Joseph A. Martinelli Lieutenant, U.S. Navy	An X11 Graphical Interface for the REpresentation and MAintenance of Process Knowledge (REMAP) Model	163
Charles Lynn McBee Lieutenant, U.S. Navy	Evaluation of Wireless Local Area Networks	163
Desmond P. McGlade Major, U.S. Marine Corps	Information Systems Strategy in Air Transport	163
Debra A. Morris Lieutenant, U.S. Navy and Tina M. Paco Lieutenant, U.S. Navy	Towards an Information Model and Mechanisms for Design Rationale Capture and Use	164
Tina M. Paco Lieutenant, U.S. Navy and Debra A. Morris Lieutenant, U.S. Navy	Towards an Information Model and Mechanisms for Design Rationale Capture and Use	164

Timothy Patrick Powers Lieutenant Commander, U.S. Navy and Curtis David Stubbs Lieutenant, U.S. Navy	A Study on Current Practices of Requirements Traceability in Systems Development	165
Lane L. Pritchard Lieutenant Commander, U.S. Navy	Distributed Computing Environment for Mine Warfare Command	165
Kenneth Charles Ritter Lieutenant, U.S. Navy	Implementing Change: A Guide for the DoD Functional Manager	166
Kathleen Marie Rondeau Lieutenant, U.S. Navy and Gale Alicia Harrington Captain, U.S. Army	An Investigation of Requirements Traceability to to Support Systems Development	166
Spencer Rutledge, III Captain, U.S. Marine Corps	Comparative Effects of Decision Strategies and the the Effects of Learning in Dynamic Environments: A Computer Simulation Approach	167
Claude David Smith Lieutenant, U.S. Navy	Development of a Maintenance Advisor Expert System for the MK 92 MOD 2 Fire Control System: FC-1 Designation - Time, Range, Bearing, FC-1 Acquisition, FC-1 Track - Range Bearing, and FC-2 Designation - Time, Range, Bearing, FC-2 Acquisition, FC-2 Track - Range, Bearing, and FC-4 and FC-5	167
John Phillip Steiner Lieutenant, U.S. Navy and Robert Alan Jacobs Captain, U.S. Marine Corps	Improvements to Autonomous Forces Through the Use of Genetic Algorithms and Rule Base Enhancement	168
Curtis David Stubbs Lieutenant, U.S. Navy and Timothy Patrick Powers Lieutenant Commander, U.S. Navy	A Study on Current Practices of Requirements Traceability in Systems Development	168
Kenneth W. Sweltz Major, U.S. Marine Corps	Analysis of Implementing Multimedia Computing Systems for Training Applications Within the United States Marine Corps	169
Helen V. Thompson Lieutenant, U.S. Navy	Navy Health Care Strategic Planning Process: A Draft Functional Description	169
Hsin-Yen Tsai Lieutenant, Taiwan Navy	Implementing a Multiple Criteria Model Base in Co-Op With a Graphical User Interface Generator	169

George Van Haroutunian, Jr. Lieutenant Commander, U.S. Navy	Security Aspects of Computer Supported Collaborative Work	170
Jerry L. Warwick Lieutenant Commander, U.S. Navy	Business Process Redesign: Design the Improved Process	170
Jamel B. Weatherspoon Lieutenant Commander, U.S. Navy and Dorothy L. Filbert, Commander, U.S. Navy	Cognitive Psychology and Design Paradigms in the Development of Multimedia Courseware	171
MANAGEMENT		
Richard Lee Aasland Lieutenant Commander, U.S. Navy	Economic Incentives for Military Housing Residents to Conserve Utilities	175
David J. Albritton Lieutenant, U.S. Navy	An Analysis of the Post-Commissioning Officer Performance for the Graduates of the Naval Academy Preparatory School (NAPS)	175
Michael D. Anderson Lieutenant, U.S. Navy	Unit Costing in the Shipyard Environment	176
Thomas Daniel Anderson Captain, U.S. Army	A Feasibility Analysis of Implementing C/SCSC Concepts at U.S. Army Depots	176
Timothy R. Anderson Lieutenant, U.S. Navy	A Financial Analysis for the Acquisition of Ready Reserve Force Ships	176
Vincent B. Atkins Lieutenant, U.S. Coast Guard and Robert S. Thien Captain, U.S. Marine Corps	A Comparative Analysis of Total Quality Management and Compliance Inspections as the Control Mechanism for the Coast Guard's Afloat Centralized Supply System	177
Nancy L. Avila Lieutenant Commander, U.S. Navy and Kurt B. Knobloch Lieutenant, U.S. Navy	Outpatient Treatment of Alcoholics in the Navy: A Feasible and Cost Effective Alternative	177
Richard Price Baldwin Lieutenant Commander, U.S. Navy	Aircraft Engine Reliability Analysis Using Lower Confidence Limit Estimate Procedures	178
Lisa C. Barfield Lieutenant, U.S. Navy	An Analysis of Enlisted Navy Recruiter Productivity and Incentive Programs, FY 1988-FY 1990	178

Sharon Barrett Lieutenant, U.S. Navy and Janet Wiley Lieutenant, U.S. Navy	Ocean Venture '92: An Assessment of a Maritime Maritime Prepositioning Force/Joint Logistics Over the Shore Instream Offload Exercise	179
Robert Charles Barrieault Lieutenant, U.S. Navy	Financial Accounting Concepts and DoD/DoN Financial Reporting Practice	179
John D. Barth Captain, U.S. Marine Corps and Robert M. McGuiness Captain, U.S. Marine Corps	Decreasing Budget Flexibility for Commander of Marine of Marine Corps Installations in the Pacific: Sources Significance and Solutions	180
Stephen Warren Bartlett Lieutenant Commander, U.S. Navy and Paul Francis Braun Lieutenant Commander, U.S. Navy	A Feasibility Study of Expanding the F404 Aircraft Engine Repair Capability at the Aircraft Intermediate Maintenance Department	180
Dwayne Fulghum Baxter Lieutenant, U.S. Navy	Women and Nontraditional Occupations in the Navy: A Study of Qualification Over Time	181
Kimberley Ann Beeson Lieutenant, U.S. Navy	Expanded Applications and Benefits of a Taxonomy of Goods Procured by the Federal Government	181
David A. Berchtold Lieutenant, U.S. Navy and David W. Danner Lieutenant Commander, U.S. Navy	Utilities Cost Comparison Analysis Between a Public Work Center and the Non-DoD Sector	182
Thomas M. Besch Captain, U.S. Army	Indentification of Negotiation Tactics and Strategies of Army Negotiators	182
Bryan McDonald Bowen Lieutenant, U.S. Navy	Computer-Based Instructional Technology in the AEGIS Training Program	183
Paul Francis Braun Lieutenant Commander, U.S. Navy and Stephen Warren Bartlett, Sr. Lieutenant Commander, U.S. Navy	A Feasibility Study of Expanding the F404 Aircraft Engine Repair Capability at the Aircraft Intermediate Maintenance Department	183
Gregory F. Breen Lieutenant Commander, U.S. Navy	The Feasibility of Long-Term Contracting in the Department of Defense	184
Edward W. Brown Lieutenant, U.S. Navy	A Cost-Benefit Analysis for Revision and Reimplementation of the Office Paper Recycling Program at Naval Postgraduate School, Monterey	184

Marshall B. Brown Lieutenant, U.S. Navy	An Analysis of the Propensity for Nontraditional Occupations Among Civilian and Navy Women	185
Donald F. Burns, III Captain, U.S. Army	Software Reuse and the Army Program Development Process	185
Brian James Byrne Captain, U.S. Marine Corps	An Evaluation of Artificial Neural Network Modeling for Manpower Analysis	186
Maureen M. Cahill Lieutenant Commander, U.S. Navy	NROTC Four-Year Scholarship Attrition: A Descriptive Analysis	186
Wayne Cecil Cain Captain, U.S. Army	An Analysis of Contractor Logistical Support for Nondevelopmental Items	187
James B. Canby, IV Lieutenant, U.S. Navy	Cost Reporting at a Navy Branch Medical Clinic	187
Sandra Kay Chachula Lieutenant, U.S. Navy	Performance Measurement Systems: A Best Practices Study	187
Gregory Bryant Chitwood Lieutenant Commander, U.S. Navy	Quicktrans and Alternative Commercial Transportation: A Cost Comparison	188
Steven Micheal Christy Captain, U.S. Army	Investigating the Linkage Between Intrinsic Motivation and Quality	188
Christopher A. Clayton Lieutenant Commander, U.S. Navy	The Impact of Declining Navy Budgets on United States Shipyards	189
Gregory Kelly Cohen Captain, U.S. Marine Corps	An Assessment of the Implementation of Total Leadership at Marine Corps Logistics Base, Albany, Georgia	189
Michael A. Colesar Lieutenant Commander, U.S. Navy	Utilization of Navy Selected Reserve Personnel in Defense Contract Management Command Reserve Units	190
Michael J. Craft Lieutenant Commander, U.S. Navy	Successful Achievement of TQL in DoN Activities	190
Peter E. Dahl Lieutenant, U.S. Navy	The Impact of the Establishment of the Defense Health Program Appropriation of the Planning, Programming, and Budgeting System Within the Department of Defense	191

Mark Anthony D'Amato Captain, U.S. Army and David Joseph McNamara Lieutenant Commander, U.S. Navy	Apply the Theory of Constraints (TOC) to the Component Section of Naval Aviation Depot (NADEP), North Island	191
David W. Danner Lieutenant Commander, U.S. Navy and David A. Berchtold Lieutenant, U.S. Navy	Utilities Cost Comparison Analysis Between a Public Work Center and the Non-DoD Sector	192
Patrick J. Dennison Lieutenant, U.S. Navy	A Case Study of the USS *DWIGHT D. EISENHOWER* Collision and its Implications	192
Robert Cameron Douglass Lieutenant, U.S. Navy	An Assessment of the FCIM DSS for the Effects of Lead Time on Procurement Decisions	193
Robert F. Dudolevitch Lieutenant Commander, U.S. Navy	A Cost Comparison Between Active and Naval Reserve Force FFG 7 Class Ships	193
Dennis Lee Duren Lieutenant, U.S. Navy	Cost/Benefit Analysis and Job Design for Naval Construction Force Liaison Officer Billets on Marine Expeditionary Force Staffs	193
David S. Eaton Captain, U.S. Marine Corps	Alternative Dispute Resolution: A Viable Method for Resolving Government Contract Disputes	194
Gregory William Eaton Lieutenant Commander, U.S. Navy	Fiscal Oversight of the Budget for Defense Research, Development, Test and Evaluation, Fiscal Years 1983-1992	194
Lee G. Ebert Lieutenant, U.S. Navy	Special Tooling Disposition for Aircraft Entering Post Production Support	195
Michael V. Edwards Commander, U.S. Navy Reserve	Flight Hour Costing at the Type Commander and Navy Staff Levels: An Analytical Assessment	195
Robert W. Ernst Lieutenant, U.S. Navy and Robert J. Gilbeau Lieutenant, U.S. Navy	Gender Bias in the Navy	196
Douglas H. Fairfield Captain, U.S. Marine Corps	Leadership and Management of Medical Treatment Facilities: Case History of Charleston Naval Hospital, 1988-1993	196

Leslie K. Finley Lieutenant, U.S. Navy	Career Planning in the Medical Service Corps: Assessing the Validity of Current Guidelines Through a Comparative Analysis of Duty Tours and Training Schools	196
Daniel J. Ford Lieutenant, U.S. Navy	An Evaluation of Organizational Effectiveness at the Naval Air Warfare Center, Aircraft Division, Indianapolis	197
James Allen Frank Lieutenant, U.S. Navy	An Assessment of the Forecasting Accuracy of the Accession Planning System for Officers (STRAP-O) Model	197
Gregory Harold Freeburn Lieutenant Commander, U.S. Navy	Transportation Pricing Policy for the Foreign Military Sales Program	198
John Vincent Fuller Lieutenant, U.S. Navy	Measuring Damage Control Assistant's (DCA) Decision Making Proficiency in Integrated Damage Control Training Technology (IDCTT) Training Scenarios	198
Marco S. Furforo Lieutenant Commander, U.S. Navy	A Dictionary of Acquisition and Contracting Terms	
Halil Tamer Gedik First Lieutenant, Turkish Army	Turkey in the New Environment: Evaluation of Strategy Alternatives Through a Strategic Planning Model	199
Daniel F. Geldermann Lieutenant Commander, U.S. Navy	A Financial Review and Cost-Benefit Analysis of Fuel Storage Tank Upgrades at the Navy Exchange Gas Station, Naval Postgraduate School, Monterey, California	199
Salvatore J. Giarrizzo Lieutenant, U.S. Navy	An Analysis of Enlisted Early Separations Under the Navy's VSI/SSB Program: The Impact of Eligibility and Program Benefits	200
Eliyau Zeev Gilat Commander, Israeli Navy	The Arab Boycott of Israel Economic Political Warfare Against Israel	200
Robert J. Gilbeau Lieutenant, U.S. Navy and Robert W. Ernst Lieutenant, U.S. Navy	Gender Bias in the Navy	201
Dale Wellington Goeller Lieutenant, U.S. Navy	Spreadsheet Techniques for Logistics Decision Support	201
Leonard Bret Gordon Lieutenant Commander, U.S. Navy	An Analysis of the Correlation Between the J52 Engine Component Improvement Program and Improved Maintenance Parameters	201

Bruce E. Green, Jr. Lieutenant Commander, U.S. Navy	Containerization of Unit Equipment During Surge Deployments	201
Robert Norman Greenberg Lieutenant Commander, U.S. Navy	Analysis of the Two-Tier Cost Structure for Aviation Jet Fuels on the Naval Reserve's C-9 Airlifr Services Program	202
Robert F. Haidvogel, Jr. Lieutenant, U.S. Navy	The Afloat Maintenance Command: Organizational and Funding Issues in Navy Ship Maintenance, Repair, and Modernization	203
Telemachus C. Halkias Captain, U.S. Army, Richard A. Parker Commander, U.S. Navy and Jonathan D. Miller Lieutenant Commander, U.S. Navy	Effects of DLA IPG I Surcharges on DDRW End User Activity Inventory Policy	203
S. Travis Hayes Lieutenant, U.S. Navy	A Dictionary of Acquisition and Contracting Terms	204
John Frederick Hemleben Major, U.S. Marine Corps	USMC Voluntary Separation Incentive and Special Separation Benefit: Who's Leaving? A Focus on Quality	204
Juan Jose Hernandez Captain, U.S. Army	A Comparative Analysis of Options for Preserving the Tank Industrial Base	204
Eugene Alfred Herrera Major, U.S. Marine Corps	Purchasing and Contracting at Marine Corps Air Stations: A Case Study Analysis	205
Dixon Kendall Hicks Lieutenant, U.S. Navy	Applicability of Computer Spreadsheet Simulation for for Solving Resource Allocation Problems	205
Jon Victor Hitchcock Lieutenant Commander, U.S. Navy	Using Credit Vendor Databases to Apprehend Deserters	206
Michael Edward Hogan Captain, U.S. Army	Management of Joint Service Acquisition: An Analysis of the Joint Unmanned Aerial Vehicles Program	206
Mark Edward Hogenmiller Lieutenant, U.S. Navy	Utilization of Award Fee Contracts at Navy Regional Contracting Centers	206
Claude R. Husson Lieutenant, U.S. Navy and Charles M. Lilli Lieutenant Commander, U.S. Navy	Wholesale Level Reorder Point and Reorder Quantity Computation During Periods of Declining Demand	207

Phillip E. Jackson Lieutenant, U.S. Navy	Analysis of Naval Hospital Long Beach Efforts to Recoup Subsistence Cost From Referral of Active Duty Members to Civilian and VA Hospitals for Inpatient Care	207
Paul T. Jenson Lieutenant Commander, U.S. Navy	Electronic Data Interchange in U.S. Navy Contracting Activities	208
Ramon Antonio Jimenez Lieutenant, U.S. Navy	Third Party Collection Program: Case Study of Naval Hospital Oakland and Community Hospital of Monterey Peninsula	208
Tommy Joel Johnson Lieutenant, U.S. Navy	Seashed, a Sealift Enhancement Feature: An Analysis of Methods Employed for Lifting DoD's Outsize Cargo	209
Kenneth William Joseph Commander, Royal Australian Navy	A Comparative Analysis of Ship Operational Test and Evaluation in the United States Navy and the Royal Australian Navy	209
Donna Marie Joyal Lieutenant, U.S. Navy	Case Studies of the Recruitment, Selection, Retention and Career Development of Women in the Navy	210
David Gilbert Keas Lieutenant, U.S. Navy	Analysis of Production Constraints at NADEP Alameda: A TQL Approach	210
Bill Carver Kinney Lieutenant Commander, U.S. Navy and Stephen Brooks Symonds Lieutenant, U.S. Navy	Just-In-Time Inventory Management: Application and Recommendations for Naval Hospital, Oakland	211
Mary A. Kirby Lieutenant, U.S. Navy	A Multivariate Analysis of the Effects of VSI/SSB Separation Program on Navy Enlisted Personnel	211
Ellen Kay Kneller Lieutenant Commander, U.S. Navy	Assessment of the Total Quality Leadership Education and Experience Levels of Naval Officers Entering the Naval Postgraduate School in July 1993	212
Kurt B. Knobloch Lieutenant, U.S. Navy and Nancy L. Avila Lieutenant Commander, U.S. Navy	Outpatient Treatment of Alcoholics in the Navy: A Feasible and Cost Effective Alternative	
Winford Wesley Knowles Lieutenant Commander, U.S. Navy	The Budget Enforcement Act of 1990: Supplemental Appropriation Spending Control Effectiveness	213

Kim Leslie Kotlar Lieutenant, U.S. Navy	Predicting Actions Taken to Counter Economic Sanctions An Examination of U.S. Government Financial Data Collection and its Usefulness in Determining if Foreign Governments Anticipate Economic Sanctions: A Case Study of Iraq	213
Kurt Lance Kunkel Lieutenant, U.S. Navy	Fiscal Oversight of Defense Department Environmental Cleanup and Compliance Activity, Fiscal Years 1984-1993	214
Mark Daniel LaViolette Captain, U.S. Marine Corps	The Impact of Report of Investigation Writing Style on the Assessment Time, Impression, Perception, and Preferences of Adjudicators	214
Jeffrey D. Lee Captain, U.S Marine Corps	Implementation of the Total Quality Leadership Process in U.S. Marine Corps Field Contracting Offices	215
Man-Ying Lee Lieutenant Commander, R.O.C. Navy	Red Flags in the Prospective Contractor's Financial Statement	215
Charles M. Lilli Lieutenant Commander, U.S. Navy and Claude R. Husson Lieutenant, U.S. Navy	Wholesale Level Reorder Point and Reorder Quantity Computation During Periods of Declining Demand	216
Lawrence Wayne Longcoy Major, U.S. Marine Corps	A Case Study on the Implementation of DMRD 910 and its Impact on a Marine Field Disbursing Office	216
Vance G. Mahaffey Lieutenant Commander, U.S. Navy and Raymond A. Walker Lieutenant, U.S. Navy	An Analysis of Specific Cognizance Symbol Material in the Advanced Traceability and Control (ATAC) Program	217
Keith Lynn Marchbanks Lieutenant, U.S. Navy	Ships Maintenance, Repair and Modernization Overseas: Requirements Concepts and Funding Issues in Maintaining Material Readiness of Deployed Forces	217
Scott L. Martens Lieutenant, U.S. Navy	Estimating Characteristic Life and Reliability of an Aircraft Engine Component Improvement in the Early Stages of the Implementation Process	217
Robert M. McGuiness Captain, U.S. Marine Corps and John D. Barth Captain, U.S. Marine Corps	Decreasing Budget Flexibility for Commander of Marine Corps Installations in the Pacific: Sources, Significance and Solutions	218

John Arthur McGuire Lieutenant, U.S. Navy	An Analysis of the Effective of Reserve Participation and Training on Civilian Employment and Earnings	218
Jon E. McIver Lieutenant Commander, U.S. Navy	The F-14 Contract: A Case Study in Major Weapons Systems Acquisition and Program Management	219
David Joseph McNamara Lieutenant Commander, U.S. Navy and Mark Anthony D'Amato Captain, U.S. Army	Apply the Theory of Constraints (TOC) to the Component Section of Naval Aviation Depot (NADEP), North Island	219
Richard A. Mendez Lieutenant Commander, U.S. Navy and Gerald A. Rivas, Lieutenant, U.S. Navy	A Dictionary of Acquisition and Contracting Terms	220
Robert Leo Michels Lieutenant, U.S. Navy	Using the Industrial Modernization Incentive Program to Preserve Critical Processes	220
Robert Francis Miedzinski Lieutenant, U.S. Navy	An Evaluation of the Department of Defense Contractor Risk Assessment Guide Program	221
Jonathan D. Miller Lieutenant Commander, U.S. Navy, Telemachus C. Halkias Captain, U.S. Army and Richard A. Parker Commander, U.S. Navy	Effects of DLA IPG I Surcharges on DDRW End User Activity Inventory Policy	221
Scott A. Morgen Lieutenant, U.S. Navy	Cooperative Research and Development Agreement (CRDA)	222
John Richard Morrison Lieutenant, U.S. Navy	The Relationship Betwen the Perceived Executive Management Capabilities of Senior Navy Medical Department Executives and Their Reported Managerial Requirements	222
Christopher John Mullarky Lieutenant Commander, U.S. Navy	Cost Savings and Benefits Associated With Naval Aviators Within the C-9 Community of the Naval Air Reserve	223
Paul R. Myrick Captain, U.S. Army	The Dynamics of Successful Program Management: The Case of Army TACMS	223
Mary Beth Newton Lieutenant Commander, U.S. Navy	Effective Leadership Through Empowerment: A Case Study	224

Cynthia Ann Nixon Lieutenant, U.S. Navy	Improving Hospital Productivity: An Analysis of the Contribution of Administrative/Clerical Staff to Physician Productivity	224
Roy Louis Nixon Lieutenant, U.S. Navy	Defense Downsizing and Blacks in the Military	225
Mark L. Noblit Major, U.S. Marine Corps	Forecasting VSI/SSB Take-Rates for Enlisted Marine Corps Personnel	225
Joseph F. Nolan Lieutenant, U.S. Navy	An Analysis of Surface Warfare Officer Measures of Effectiveness as Related to Commissioning Source, Undergraduate Education, and Navy Training	226
Michael Murray O'Connor Lieutenant Commander, U.S. Navy	Policy Decisions for Strategic Shipyard Survival	226
Sean Patrick O'Day Captain, U.S. Army	An Assessment of Critical Factors Affecting the Selection of Various Acquisition Alternatives Used to Resolve Component Nonavailability	227
John Chrysostom O'Keefe Captain, U.S. Marine Corps	A Supply Allocation and Optimization Model for the U.S. Marine Corps Intermediate Supply Level	227
George Luis Omeechevarria Lieutenant Commander, U.S. Navy	A Dictionary of Acquisition and Contracting Terms	227
Michael Andrew Palmer Lieutenant Commander, U.S. Navy	A Comprehensive Analysis of the Maintenance Requirement System	228
Richard Todd Palmer Lieutenant, U.S. Navy	An Analysis of the Navy's Financial Management Subspecialty Requirements	228
Hua-Fu Pao Lieutenant, R.O.C. Navy	Security Management of Electronic Data Interchange	228
Richard R. Parker Commander, U.S. Navy, Jonathan D. Miller Lieutenant Commander, U.S. Navy and Telemachus C. Halkias Captain, U.S. Army	Effects of DLA IPG I Surcharges on DDRW End User Activity Inventory Policy	229
John Bigelow Perkins Lieutenant, U.S. Navy	Surface Ship Decision Analysis	229

Marlene J. Peterson Lieutenant, U.S. Navy	A Management Case Study: The Implementation of the Rapid Acquisition of Manufactured Parts (RAMP) Program	230
Christopher Duncan Platt Major, U.S. Marine Corps	Applicability of Spares Acquisition Integrated With Production (SAIP) to Naval Aviation Weapon Systems	230
Michael David Pockette Captain, U.S. Marine Corps	Value Engineering: Application to the Procurement of Spare Parts	231
Dennis Eric Pytel, Jr. Lieutenant, U.S. Navy	The Efficacy of Machine Learning Programs Navy Manpower Analysis	231
Loren Norbert Reith Lieutenant, U.S. Navy	An Analysis of AEGIS CASREP and 2-KILO Maintenance Failure Data	232
Gerald A. Rivas Lieutenant, U.S. Navy and Richard A. Mendez Lieutenant Commander, U.S. Navy	A Dictionary of Acquisition and Contracting Terms	232
Raymond John Rodriguez Lieutenant, U.S. Navy	The Pilot Mentor-Protoge Program: A Viable Program for Government Procurement?	233
Bradley Steven Russell Lieutenant, U.S. Navy	A Comparison of Neural Network and Regression Models for Navy Retention Modeling	233
Philip Gregory Rynn Captain, U.S. Marine Corps	TQL in the Department of the Navy's Operating Forces and Shore Establishment: Does it Differ?	234
Thomas W. Sachse Lieutenant, U.S. Navy	A Statistical Analysis of Active Duty Navy Bankruptcies at the Jacksonville, Florida and San Diego, California Bankruptcy Courts	234
Woo Young Saw Lieutenant, R.O.K. Navy	Predicting Performance: Analysis of Background Factors and Probability of Promotion in the Surface Warfare and Submarine Officer Communities	235
Alan Schachman, Jr. Captain, U.S. Marine Corps	An Examination of Current Navy Medical Professionals Management Oriented Service Short Courses	235
Roy Randolph Schleiden Major, U.S. Marine Corps	The Impact of the Defense Acquisition Workforce Improvement Act on the Professionalization and and Training of the Marine Corps' Enlisted Acquisition Workforce	236

David S. Schulz Captain, U.S. Marine Corps	A Comparison of Alternative Measures of the Qualified Military Available and Interested Recruit Market	236
Robert B. Sergeson Lieutenant Commander, U.S. Navy	Implementing Electronic Data Interchange With Small Business Suppliers in the Pre-Award Acquisition Process	237
Israel Shafir Lieutenant Colonel, Israeli Air Force	The Effect of Immigration of Soviet Jews to Israel on Israel's Economy and Human Resources	237
Edward W. Sheehan, Jr. Lieutenant, U.S. Navy	A Taxonomy of Goods Procured by the Federal Government: Applications and Benefits	238
Carol E. Shivers Lieutenant, U.S. Navy	Marshaling and Acquiring Resources for the Process Improvement Process	238
David M. Simboli, Jr. Lieutenant, U.S. Navy	Subspecialty Utilization in the Navy: A Longitudinal Analysis of Unrestricted Line Officers Who Graduated From the Naval Postgraduate School	238
Gregory Scott Simmons Lieutenant, U.S. Navy	A Study of the Comparability of Naval Activity Motor Vehicle Costs	239
Peggy F. Simpson Lieutenant Commander, U.S. Navy	Promotion Opportunities of Minorities to the Controlled Grades in the Navy Nurse Corps	239
Walter Mark Skinner Commander, U.S. Navy	A Cost and Operational Effectiveness Analysis of Alternative Anti-Surface Warfare Platforms	240
David J. Skocik Commander, U.S. Navy	A Longitudinal Analysis of the Acceptance Rates Rates of the Navy's Voluntary Separation Incentive/ Special Separation Benefit (VSI/SSB) Program	240
Mark Raymond Sliepcevic Lieutenant, U.S. Navy	An Analysis of Post-Service Career Earnings of Female Veterans	241
Daniel Joseph Smith Lieutenant, U.S. Navy	Electronic Payments in DoD Contracting	241
Michael James Snyder Captain, U.S. Marine Corps	Predicting Success at Marine Security Guard (MSG) School Utilizing the Headquarters Master File (HMF)	242
Frank W. Spencer Commander, U.S. Navy	Activity-Based Costing in a Service Organization	242
Kathleen M. Steckler Lieutenant, U.S. Navy	Naval Air Station Cubi Point: A "Hot Turnover"? A Management Case Study	242

Larry Jerome Steckler Lieutenant, U.S. Navy	The United States Government Withdrawal and Subsequent Closure of the United States Naval Complex at Subic Bay, Republic of the Philippines: A Management Case Study	243
Jack Lloyd Stem Lieutenant, U.S. Navy	A Universal Dictionary of Acquisition and Contracting Terms	243
Chris Kennedy Stream Lieutenant Commander, U.S. Navy	Application of the Minitrial in Department of Defense Contract Disputes	244
Roch Anthony Switlik Captain, U.S. Army	The Identification of Early Warning Signals Prior to Contractor Default	244
Stephen Brooks Symonds Lieutenant, U.S. Navy and Bill Carver Kennedy Lieutenant Commander, U.S. Navy	Just-In-Time Inventory Management: Application and and Recommendations for Naval Hospital, Oakland	245
David A. Tagg Captain, U.S. Marine Corps	Evaluating the Bias of Alternative Cost Progress Models: Tests Using Aerospace Industry Acquisition Programs	245
Robert S. Thien Captain, U.S. Marine Corps and Vincent B. Atkins Lieutenant, U.S. Coast Guard	A Comparative Analysis of Total Quality Management Management and Compliance Inspections as the Control Mechanism for the Coast Guard's Afloat Centralized Supply System	246
James B. Thomas Lieutenant, U.S. Navy	Optical Disk Storage and Retrieval of NPS Theses	246
Terry Nelson Toy Lieutenant Junior Grade, U.S. Coast Guard	A Mathematical Model for Fixed-Price-Incentive-Firm Contracts	247
Shinji Tsukigi Commander, Japan Maritime Self-Defense Force	External and Internal Factors Shaping the Japan Maritime Self-Defense Force (JMSDF)	247
James Ming Tung Lieutenant Commander, U.S. Navy	The Effects of the Maintenance Training Improvement Program on Unit Performance	247
Leslie S. Turley Lieutenant, U.S. Navy	The Impact of the Defense Budgeting Process on Operational Readiness	248
Lawrence Leroy Turner, Jr. Captain, U.S. Army	An Analysis of Traditional Operational Testing to Project How Testing Will Be Conducted in the Future	248

Robert Burchel Turner Lieutenant, U.S. Navy	Implementation of Electronic Data Interchange in the Department of Defense: Lessons Learned From Private Industry	249
Kelly A. Vandever Lieutenant, U.S. Navy	An Analysis of Navy Direct Appointment Physician Recruitment	249
Cleve Jan Van Haasteren Lieutenant Commander, U.S. Navy	Using A Unit Cost Model to Predict the Impact of Budget Cuts on Logistics Products and Services	250
Frank Varnado Captain, U.S. Army	The Effects on Weapon Systems' Producibility of Suspending System Development After Advanced Technology Demonstration (ATD)	250
Kirk F. Vollmecke Captain, U.S. Army	Finding Best Value in Two-Step Sealed Bidding	251
Raymond A. Walker Lieutenant, U.S. Navy and Vance G. Mahaffey Lieutenant Commander, U.S. Navy	An Analysis of Specific Cognizance Symbol Material in the Advanced Traceability and Control (ATAC) Program	251
Kurt R. Wellington Lieutenant Commander, U.S. Coast Guard	An Analysis of Coast Guard Enlisted Retention	252
Lisa R. Werkhaven Lieutenant Commander, U.S. Navy	A Cohort Analysis of Career Progression for Ethnic and Female Officers in the U.S. Navy	252
Derric Thomas White Lieutenant, U.S. Navy	An Evaluation of the DoD Inventory Reduction Plan and Its Effects on Inventory Management Practices at the Aviation Supply Office and Fleet Readiness at NADEP Alameda	253
Thomas Frederick Wiechelt Lieutenant, U.S. Navy	Analysis of Military Cost Cutting Initiatives Identified During the Defense Management Review Process	253
Janet Wiley Lieutenant, U.S. Navy and Sharon Barrett Lieutenant, U.S. Navy	Ocean Venture '92: An Assessment of Maritime Prepositioning Force/Joint Logistics Over the Shore Instream Offload Exercise	254
James M. Williams Captain, U.S. Marine Corps	An Analysis and Development of a Process and Guide for the Conduct of the Procurement Management Review Within the U.S. Marine Corps	254

Edwin Ferebee Williamson Lieutenant Commander, U.S. Navy	A Comparison of the Post-Cold War Defense Budget Reduction to Prior Post-Conflict Reductions After World War II, Korea and Vietnam	255
Kris Winter Lieutenant, U.S. Navy	Evaluating the Trade-Offs Inherent in Strategic Sealift	255
Milton E. Wynn, III Captain, U.S. Army	Spare Parts Nonavailability: The Identification of Impediments to Spares Acquisition	255
Maher M. Zarou Lieutenant Commander, U.S. Navy	A Dictionary of Acquisition and Contracting Terms	256

MECHANICAL ENGINEERING

Vance Hiro Adams Lieutenant Commander, U.S. Navy	Theoretical Study of Laminar Film Condensation on Horizontal Elliptical Tubes Under Conditions of Free and Forced Convection	259
David P. Anderson Captain, U.S. Army	A Surface Integral Algorithm for the Motion Planning Nonholonomic Mechanical Systems	259
Ibrahim Aydin Lieutenant Junior Grade, Turkish Navy	Out of Plane Solutions of Submarines in Free Positive Buoyancy Ascent	260
George Michael Bertsch Lieutenant, U.S. Navy	Nucleate Pool Boiling Characteristics of R-124	260
Richard Peter Blank Lieutenant, U.S. Navy	A Structured Programming Approach for Complex AUV Mission Control	260
James P. Brown Lieutenant Commander, U.S. Navy	Four Quadrant Dynamic Model of the AUV II Thruster	261
Daniel E. Butler Lieutenant, U.S. Navy	The Quantitative Microstructural Characterization of Multipass TIG Ultra Low Carbon Bainitic Steel Weldments and Correlation With Mechanical Properties	261
John B. Carroll Lieutenant, U.S. Navy	Free-Surface/Vorticity Interaction	262
Clifford T. Christy Lieutenant, U.S. Navy	Numerical Modeling of a Propagating Crack	262
Robert Lee Cobb Lieutenant Commander, U.S. Navy	The Influence of Wall Conductivity on Film Condensation With Integral Fin Tubes	262

Steven E. Cody Lieutenant Commander, U.S. Navy	An Experimental Study of the Response of Small Tunnel Thrusters to Triangular and Square Wave Inputs	263
Dean J. Cottle Lieutenant Commander, U.S. Navy	Mine Avoidance and Localization for Underwater Vehicles Using Continuous Curvature Path Generation and Non-Linear Tracking Control	263
David M. Cox Lieutenant, U.S. Navy	Design of a Multi-DOF Tuned Mounting Fixture for the Navy's Mediumweight Shock Machine	263
George Patrick Cummings Lieutenant Commander, U.S. Navy	Stability and Bifurcation of Autonomous Vehicles in the Presence of Positional Information Time Lags	264
Daniel James Cunningham, II Lieutenant, U.S. Navy	Sway, Yaw and Roll Coupling Effects on Straight Line Stability of Submersibles	264
Michael A. Delaney Lieutenant Commander, U.S. Navy	Numerical Field Model Simulation of Full Scale Fire Tests in a Closed and Open Compartment	264
Jeffrey Robert Dunlap Lieutenant, U.S. Navy	Study of Grain Refinement in Al Alloy 2519 Using Backscatter Orientation-Contrast Method in the Scanning Electron Microscope	265
Edward Allan Faxlanger, Jr. Lieutenant, U.S. Navy	Thermally Induced Stresses in a Composite Exposed to Fire	265
Candonino Pagaduan Franche Lieutenant, U.S. Navy	Determination of GTA Welding Efficiencies	265
Charles A. Gunzel, III Lieutenant, U.S. Navy	FSR Based Force Torque Transducer Design	266
Barry W. Ingold Lieutenant, U.S. Navy	Key Feature Identification from Image Profile Segments Using a High Frequency Sonar	266
Adrian Johan Jansen Lieutenant, U.S. Navy	Natural Convection Above a Horizontal Heat Source	288
Lloyd H. Jones Lieutenant, U.S. Navy	Machinery Monitoring and Diagnosis Using Pseudo Wigner-Ville Distribution and Backpropagation Neural Network	267
Pernell Arthur Jordan Lieutenant, U.S. Navy	Feedback Control of a Three-Link Planar Under-Actuated Manipulator Using a "Surge" Velocity	267
Kent William Kettell Lieutenant, U.S. Navy	Correlation of Flux Composition and Inclusion Characteristics With Submerged Arc Weld Metal Properties in HY-100 Steel	267

David L. Klein Lieutenant, U.S. Navy	Modeling of a Full Vision System Using Combined Visual/Haptic Search for Remote Object Identification	268
Ole Knudson Captain, U.S. Army	Transportability Analysis of the M119 Howitzer in the Firing Configuration	268
Dean Michael Krestos Lieutenant, U.S. Navy	An X-Ray Diffraction Investigation of α-Al_2O_3 Addition to Yttria Stabilized Zirconia (YSZ) Thermal Barrier Coatings Subject to Destabilizing Vanadium Pentoxide (V_2O_5) Exposure	268
Matthew B. Long Lieutenant, U.S. Navy	Filmwise Condensation of Steam on Horizontal Corrugated and Wire-Wrapped Corrugated Tubes	269
Fredric W. Longenecker Lieutenant, U.S. Navy	An Analysis of the Microstructure and Reinforcement Distribution for an Extruded Particle-Reinforced A1 6061 10 Volume Percent $A1_2O_3$ Metal Matrix Composite	269
Eric S. McDonald Lieutenant, U.S. Navy	Optimization Techniques for Contact Stress Analysis	270
Kurt Alwin Muller Lieutenant Commander, U.S. Navy	Effect of Post-Fabrication Processing on the Tensile Properties of Centrifugally Cast SiC Particulate Reinforced Aluminum Composites	270
Mary Catherine Murphy Lieutenant, U.S. Navy	A Study of the Structural Stability of an Unbalanced Sandwich Composite Configuration	271
Michael Joseph Neibert Lieutenant, U.S. Navy	Thermal Stresses of a Trimaterial Medium in a Nonuniform Temperature Field	271
Donald E. Neubert, Jr. Lieutenant, U.S. Navy	Trailing Vortex/Free Surface Interaction	271
Larry P. Ondrey Lieutenant, U.S. Navy	Three Axis Force Override Rate Control of a Puma 560 Manipulator	272
Zeki Okan Oral Lieutenant Junior Grade, Turkish Navy	Hopf Bifurcations in Path Control of Marine Vehicles	272
Gregory K. Parker Lieutenant, U.S. Navy	Heat Transfer Parametric System Identification	272
George D. Perry Lieutenant, U.S. Navy	The Effect of Oil on the Onset of Nucleate Pool Boiling of R-124 From a Single Horizontal Tube	273

Ronald G. Rahall Lieutenant Commander, U.S. Navy	Convective Heat Transfer From Discrete Heat Heat Sources in a Liquid Filled Vertical Channel	273
Jeffrey Scott Riedel Lieutenant, U.S. Navy	Pitchfork Bifurcations and Dive Plane Reversal of Submarines at Low Speeds	274
Michael Patrick Rousseau Lieutenant, U.S. Navy	Dynamic Response of a Filament Wound Composite Cylinder Exposed to Underwater Shock	274
Ricky Arthur Seraiva Lieutenant, U.S. Navy	The Study of Single-Pass GMS Welds With Different Cover Gas Compositions on HSLA-100 Steel	275
Fred O.P. Vollweiler Lieutenant, U.S. Navy	Intermetallic Growth at the Interface Between Between Copper and Bismuth-Tin Solder	275
Peter Joseph Zohorsky Lieutenant, U.S. Navy	Study of Precipitation and Recrystallization in in Al Alloy 2519 by Backscattered Electron Imaging Fields	276

METEOROLOGY

Paul H. Dobos	Evaluations of 404 MHZ Radar Wind Profiler Observations at Okinawa During TCM-90	279
Yu-Heng Kuo Lieutenant, Taiwan, R.O.C. Navy	Errors Caused by Incompatible Wind and Buoyancy Forcing in the Ocean General Circulation Models	279
Eric J. McKinley Captain, U.S. Air Force	An Analysis of Mesoscale Convective Systems Observed During the 1992 Tropical Cyclone Motion Field Experiment	280
Steven Austin Rugg Captain, U.S. Air Force	An Investigation of the Ground-Based High-Resolution Interferometer Sounder (GB-HIS) in a Coastal Marine Environment	280
Kevin L. Stone Captain, U.S. Air Force	Three-Dimensional Cloud Visualization Based on Satellite Imagery	281

METEOROLOGY AND PHYSICAL OCEANOGRAPHY

Robert Martin Bassett Lieutenant Commander, U.S. Navy	Automated Satellite Image Navigation	285
James Berdeguez Lieutenant, U.S. Navy	The Sensitivity of Ageostrophic Circulations to Model Resolution: A Case Study Using NGM Forecasts of ERICA IOP-4	285
A. Henry Brookins Lieutenant, U.S. Navy	Ocean Wave Height Transformation Model Using Surface Roller Theory	286

Steven Richard Cameron Lieutenant Commander, U.S. Navy	Mesoscale Frontal Evolution of ERICA IOP-5A Cyclone	286
Grant Alexander Cooper, IV Lieutenant, U.S. Navy	An Observational Study of the Local and Remote Response of the Equatorial Pacific to Westerly Wind Events During the 1991-92 El Niño	287
Marcia A. DeCaria Lieutenant, U.S. Navy	Rapid Marine Cyclogenesis Forecast Sensitivity to High Resolution Sea Surface Temperatures During ERICA IOP-5	287
Damacene Villaflor Fernandez Lieutenant Commander, U.S. Navy	Incorporation and Comparative Evaluation of a Non-Convective Cloud Parameterization Scheme in the Naval Research Laboratory West Coast Mesoscale Weather Prediction Model	288
Randall T. Humiston Lieutenant, U.S. Navy	Cross-Shore Sediment Transport on a Naturally Barred Beach	288
Simon Konstantinidis Lieutenant, Hellenic Navy	C-Vector Derived Three Dimensional Circulations in Farallones National Marine Sanctuary	289
John W. Lutz Lieutenant Commander, U.S. Navy	Ship Tracks a Geographical and Statistical Study	289
Douglas Craig Marble Lieutenant, U.S. Navy	A Model Analysis of Potential Vorticity on Isopycnal Surfaces for the Globlal Ocean	290
Thomas M. Millman Lieutenant, U.S. Navy	A Temporal Analysis of East Pacific and East Atlantic Ship Tracks	290
Gonzalo Montenegro Lieutenant, Ecuadoran Navy	Three Dimensional Vorticity Field in the the California Current System	291
Anthony J. Negron Lieutenant Commander, U.S. Navy	Measurement of Ocean Currents Across the Continental Margin Off Point Sur, California During March 1989	291
Michael Thomas Neith Lieutenant, U.S. Navy	Intraseasonal Relationships Between Tropical Heating and Extratropical Jets	292
Ernest Paul Petzrick Lieutenant Commander, U.S. Navy	Currents Through the Golden Gate	292
Robert Dominic Round Lieutenant, U.S. Navy	Climatology and Analysis of the Monterey Bay Sea Breeze	293
Karen Marie Ruppe Lieutenant, U.S. Navy Reserve	A Maritime and Continental Aerosol-Cloud Interaction Study From ASTEX '92	293

Steven John Rutherford Lieutenant, U.S. Navy	Arctic Cyclones and Marginal Ice Zone (MIZ) Variability	294
Julia Marcia Spinelli Lieutenant, U.S. Navy	An Investigation of the ERICA IOP-5A Cyclone	294
William Christopher Swett Lieutenant Commander, U.S. Navy	Spectral Analysis of Synoptic Time Scale Disturbances Over the Tropical Eastern Pacific During Summer 1989, 1990 and 1991	295
Steven Walter Warren Lieutenant, U.S. Navy	Ensemble Forecasting Techniques in Medium-Range Forecasting	295
Claudia S. Whitney Lieutenant, U.S. Navy	Modeling the Tropical Ocean Response to Westerly Wind Forcing	296
Kenneth A. Wos Lieutenant Commander, U.S. Navy	A Climatology of Polar Low Occurrences in the Nordic Seas and an Examination of Katabatic Winds as a Triggering Mechanism	297

NATIONAL SECURITY AFFAIRS

Mark A. Admiral Lieutenant, U.S. Navy	The Evolution of Russian Offensive Air Warfare Doctrine: From Deep Battle to Aerospace War	301
William Hamilton All, IV Lieutenant, U.S. Navy	The Trend Toward Free Trade Areas: Economic Consequences and Policy Implications for the United States	301
Erik Narve Anderson Lieutenant, U.S. Navy	The United States, Latin America, and the Potential for Naval and Defense Industrial Partnership: The Case of Brazil	302
Brian Blake Bales Lieutenant Commander, U.S. Navy	Ethnic Russians in the Baltic States and Russia's Foreign Policy	302
Miriam D. Becker Lieutenant, U.S. Navy	Strategic Culture and Ballistic Missile Defense: Russia and the United States	303
Robin Claire Bedingfield Lieutenant Commander, U.S. Navy	The Mexican Military and Political Transition	303
Jon C. Belanger Lieutenant, U.S. Navy	Understanding the Economic Power of Oil	304
Patrick Hahler Brady Lieutenant Commander, U.S. Navy	Implications for the U.S. Navy of a 50 Percent Decrease in Defense Spending	304

Eric Hugh Brandenburg Lieutenant Commander, U.S. Navy	National Unification and Transition in the German Armed Forces	305
Elizabeth A. Breland Lieutenant, U.S. Navy	Prerequisites for Democracy in Cuba: Promoting Liberalization Via Civil Society	305
Daniel T. Button Major, U.S. Marine Corps	Marine Corps Intelligence and All-Source Fused Analysis Support to Marine and Joint Operating Forces: Complexities, Problems, Challenges for the Future	306
Joseph R. Chiaravallotti Lieutenant, U.S. Navy	Southeast Asian Perception of U.S. Security Policy in the Post-Cold War Era	306
Stephen Michael Clarke Lieutenant, U.S. Navy	The Technology Revolution at Sea: A Case Study of Small Combatants	307
Phillip M. Cochran Lieutenant, U.S. Air Force	U.S. Interests in European Security Following the Cold War	307
Timothy M. Conroy Lieutenant, U.S. Navy	A Coming of Age: The Implications of Precision-Guided Munitions for Air Power	308
Martin J. DeWing Lieutenant Commander, U.S. Navy	Ukraine: Independent Nuclear Weapons Capability Rising	308
Todd Anthony Dixon First Lieutenant, U.S. Air Force	Nuclear Proliferation: Lessons Learned From the Iraqi Case	308
Michael L. Donner, Sr. Lieutenant, U.S. Navy	An Historical Comparison Between the Southern Secession Movement of 1860 and the Soviet Secession Movements of Today	309
Joseph R. Donovan, Jr.	The Effect of Leadership Changes in Taipei and Beijing on the Cross Straits Relationship	309
Susan D. Fink Lieutenant, U.S. Navy	From "Chicken Kiev" to Ukrainian Recognition: Domestic Politics in U.S. Foreign Policy	310
Joanne Marie Fish Lieutenant Commander, U.S. Navy	The United Nations' Plan for Collective Security - Is it Relevant Today?	310
Paul N. Fujimura Lieutenant, U.S. Navy	Peacemaking in Cambodia: Blueprint for a New World Order?	311
Dale G. Fuller Lieutenant, U.S. Navy	NATO's Out-of-Area Disputes: Prospects for Common Western Strategies in the Middle East	311

Gregory S. Gilmour Lieutenant, U.S. Navy	From SAC to STRATCOM: The Origins of Unified Command Over Nuclear Forces	312
Kerry Spencer Gilpin Lieutenant, U.S. Navy	The United States, the United Nations, and the Legitimation of the Use of Force	312
Virginia B. Graf Lieutenant Commander, U.S. Navy	The Russians Debate the Kuril Island Terroritorial Dispute: An Aspect of Russo-Japanese Relations in the Post-Cold War World	313
Adam Grove Captain, U.S. Air Force	The Role of Ukraine's Communists in the Ukranian Independence Movement	313
Todd Alan Gunerman Lieutenant, U.S. Navy	U.S. Naval Presence in Southeast Asia: Is it Necessary?	314
Edward G. Gunning, Jr. Lieutenant, U.S. Navy	Germany and the Future of Nuclear Deterrence in Europe	314
Randy D. Haldeman Lieutenant, U.S. Navy	Trade and Technology: Maintaining the U.S. Japan Security Relationship in the Post-Cold War Era	315
Michael Anthony Hall Lieutenant, U.S. Navy	Defense Policymaking: The Post-Cold War Roles and Missions Debate	315
David B. Hanson Lieutenant, U.S. Navy	A Model of Defense for Russia	316
Edward Laurens Hasell Lieutenant, U.S. Navy	Korean Unification and United States Security Alternatives in Northeast Asia	316
Charles M. Heron Lieutenant Commander, U.S. Navy	Probable Trends in Terrorism in Western Europe	317
Brian Thomas Howes Lieutenant, U.S. Navy	Determining the Future of the U.S. Submarine Force	317
Hesham H. Islam Lieutenant, U.S. Navy	The Roots of Regional Ambitions	318
James L. Jaworski Captain, U.S. Army and James F. McIlmail Lieutenant, U.S. Navy	The Russian Military in the Year 2000	318
Robert M. Johnson Lieutenant Commander, U.S. Navy	The Baruch Plan Revisited	319
Todd G. Langdon Lieutenant, U.S. Navy	Has Power Shifted Back to the Chairman of the the Defense Committees?	319

Kenneth S. Lundgren Captain, U.S. Army	Brazil's National Defense Strategy: Prospects for the Twenty-First Century	319
Jean MacIntyre Captain, U.S. Air Force	Political Socialization of Youth in the Soviet Union: Its Theory, Use, and Results	320
Lewis D. Madden Captain, U.S. Navy	Kazakhstan, Strategic Problems of an Emerging Republic	320
Lili D. Mann Captain, U.S. Air Force	Entrenchment of the Status Quo in the Arab-Israeli Conflict	320
James F. McIlmail Lieutenant, U.S. Navy and James L. Jaworski Captain, U.S. Army	The Russian Military in the Year 2000	321
William H. McRaven Commander, U.S. Navy	The Theory of Special Operations	321
Robert Miranda Captain, U.S. Air Force	Islamic Resurgence in Turkey? An Analysis of Political and Social Elements	322
Matthew K. Moeller Lieutenant, U.S. Air Force	The United States Air Force in Europe: An Analysis Within the Post-Cold War Environment	322
William J. Nault Lieutenant, U.S. Air Navy	The Strategic Impact Upon the United States of Future Naval Rivalries in South and Southeast Asia	323
Elizabeth D. Olmo Lieutenant Commander, U.S. Navy	China's Nuclear Agenda and the Implications for United States Foreign Policy	323
Donald R. Owens Lieutenant, U.S. Navy	Russia in the United Nations: From Confrontation to Cooperation	323
Anthony M. Packard U.S. Air Force	The U.S.-Indonesian Relationship in the 1990's and Beyond	324
James Edward Pitts Lieutenant, U.S. Navy	Theater Ballistic Missile Defenses: An Emerging Role for the Navy?	324
Daniel R. Redmond Lieutenant, U.S. Navy	American Persian Gulf Policy After the Gulf War	325
Eric N. Reeves Captain, U.S. Air Force	The Potential for Korean Reunification in a Post-Cold War Environment and Implications for United States Security Interests in Northeast Asia	325
Glenn D. Reisweber Captain, U.S. Army	U.S. Army Guard and Reserves: Beyond Desert Storm and Into the Future	326

James C. Rix Captain, U.S. Air Force	Beyond Guzman? The Future of the Shining Path in Peru	326
Michael B. Ryan Lieutenant, U.S. Navy	Calha Norte: Explaining Brazilian Army Presence in the Amazon	327
Patricia A. Scott Lieutenant Commander, U.S. Navy	Preserving the American Interest in Hong Kong After 1997	327
Jon A. Skinner Lieutenant, U.S. Navy	Sweden After the Cold War: Implications for U.S. Regional Strategies	327
Robert J. Smith, Jr. Captain, U.S. Air Force	Russia and Moldova: Developing Relations Between Two Countries	328
Shawn B. Stith Captain, U.S. Marine Corps	Foundation for Victory: Operations and Intelligence Harmoniously Combine in Jackson's Shenandoah Valley Campaign (1862)	328
Kenneth John Szczublewski Lieutenant, U.S. Navy	The V-22: A Turning Point in Congressional Behavior?	329
Michael W. Ward Lieutenant Commander, U.S. Navy	A Strategic Plan for the Persian Gulf Region: Options for Deterring and/or Defeating an Emerging Threat	329
Scott A. Weidie Lieutenant, U.S. Navy	An Analysis of Regime Transition: The Characteristics Mechanism and Types of Change in Modern Political Systems	330
Randall G. Williams Lieutenant, U.S. Navy	An Alternative American Foreign Policy for Ukraine	330

OPERATIONS RESEARCH

Mark A. Adams Captain, U.S. Marine Corps	An Optimal Program Initiative Selection (OPIS) Model for USMC Program Objective Memorandum Planning	333
Ronda J. Beagle Lieutenant, U.S. Navy	The Navy's Search for a Few Good Women: Analysis of a Direct Mail Campaign	333
Richard D. Bolster Lieutenant, U.S. Navy	Analyzing NPS Scheduling Using OSIRIS	334
James L. Brown, Jr. Lieutenant, U.S. Navy	A Cost Benefit Analysis of Two Products of the Fleet Numerical Oceanography Center	334
Bryan Douglas Burris Captain, U.S. Army	Missioning With Minimal Delayed Entry Program (DEP) Loss	334

Douglas R. Burton Lieutenant, U.S. Navy	Software Reliability Management Through Metrics	335
Tun-Jen Chang Lieutenant Commander, Chinese Navy	Assessing the Possible Return on Investment Resulting From Upgrading a Subsystem	335
John Joseph Costello Lieutenant Commander, U.S. Navy	Optimizing Emergency Sortie and Storm Evasion Planning	336
Matthew H. Dolan Lieutenant, U.S. Navy	Air Tasking Order (ATO) Optimization Model	336
Michael A. Dorko Lieutenant, U.S. Navy and Robert G. Schultz Lieutenant, U.S. Navy	A Simulation and Evaluation of NATO Standardization Agreement (STANAG) 4214	337
Mark Jeffrey Fiebrandt Lieutenant Commander, U.S. Coast Guard	A Manpower Model and Structural Analysis for a Coast Guard Enlisted Rating	337
Aasgeir Gangsaas Lieutenant, U.S. Navy	A Barrier Search Model Using Active Bistatic Sonar to Protect a Channel	338
Wesley G. Gillman Captain, U.S. Army	Evaluating Army Base's Ability to Support Maneuver Training: A Linear Programming Approach	338
Robert S. Guarino Captain, U.S. Army	Optimally Locating Container Stuffing Sites	338
Thomas William Hair Lieutenant, U.S. Navy	The Application of Search Theory to the Timely Location of Tactical Ballistic Missiles	339
James J. Hamm, III Captain, U.S. Marine Corps	Different Success Rates and Associated Factors at Three Levels of Career Progression Among US Marine Corps Officers	339
Lesley Jean Painchaud Henson Lieutenant Commander, U.S. Navy	An Approximation for Computing Reduction in Bandwidth Requirements Using Intelligent Multiplexers	340
Tracy Lynn Howard Lieutenant, U.S. Navy	An Analytical Model for the Treatment and Evacuation of Casualties in a Low-Intensity Conflict	340
Wu Hsi-Hsien Major, R.O.C. Army	A Prototype Model for Scheduling Courses at the Naval Postgraduate School	341
Barry D. Justice Captain, U.S. Marine Corps	A Scheduling Model for the U.S. Marine Corps Communication-Electronics School	341

John F. Keane Lieutenant Commander, U.S. Navy	An Analysis of Multiple Sensor System Payloads for Unmanned Aerial Vehicles	342
Yeo Gim Koon	An Analytical Approach to Assessing the Vulnerability of Bomb Shelters to Aerial Bombing and Artillery Attack	342
David Stanley Kunzman Captain, U.S. Marine Corps	Optimally Scheduling Instructors at the Defense Language Institute: An Integer Programming Approach	343
John D. Lape Lieutenant Commander, U.S. Navy	Optimizing Resource Allocation When Establishing a Multinational Maritime Logistics Force	343
Kevin J. Maher Lieutenant Commander, U.S. Navy	A Simulated Single-Item Aggregate Inventory Model Model for U.S. Navy Repairable Items	344
Gustavo H. A. Martins Lieutenant Commander, Brazilian Navy	A New Branch-and-Bound Procedure for Computing Optimal Search Paths	344
Joseph Paul Mattis Lieutenant Commander, U.S. Navy	The Application of Random Search Theory to the Detection of Tactical Ballistic Missile Launchers	345
Willie J. McFadden Captain, U.S. Army	Comparison of Janus(A) Simulated Terrain Vegetation Codes to Modified Janus(A) Terrain Vegetation Codes for the Javelin Antitank Operational Test	345
William H. McQuail Captain, U.S. Army	Evaluating the Analytic Hierarchy Process and Recommended Modifications for its Use in Multi-Attribute Decision Making	345
Robert Scott Murphy Lieutenant, U.S. Navy	The Tactical and Logistical Operations Simulator - TALOS	346
Jack S. Noel, II Lieutenant, U.S. Navy	An Object-Oriented Logistics Over the Shore Simulation: An Aid in Throughput Estimation	
Bradley Lohrbauer Olds Lieutenant, U.S. Navy	The Impact of Wingships on Strategic Lift	346
Brian Alan Osborn Lieutenant, U.S. Navy	MPAMOD: An Optimization Model for Maritime Patrol Aviation Modernization Planning	347
Charles Abbot Pate Captain, U.S. Army	Javelin: A Case Study in Model-Test-Model	347

Maria C. Pate Captain, U.S. Army	Comparison of Janus and Field Test Helicopter Engagement Ranges for the Line-of-Sight Forward Heavy System	348
James J. Pellack Lieutenant, U.S. Navy	A Descriptive Analysis of the 1992 Active-Duty Physician Asset: With Comparisons to the Kaiser-Permanente Physician Staff Model Data	348
Robert A. Reifenberger Lieutenant, U.S. Navy	Decision Analysis Applied to the Deployment of Modularized Ocean Basing Systems	349
William Vaughn Ridings Lieutenant, U.S. Navy	An Analysis of Effects of Variable Factors on Weapon Performance	349
Mark Raymond Rios Lieutenant Commander, U.S. Navy	Optimizing Aegis Ship Stationing for Active Theater Missiles Defense	350
Sue M. Romans Captain, U.S. Army	Modeling the Enhanced Integrated Soldier System System (TEISS) Using Janus(A)	350
Laureano Enrique Oñate Rubinao Lieutenant Commander, Columbian Navy	An Analysis of the Coast Guard Enlisted Attrition	351
Dimitrios Sakellariou Lieutenant Commander, Hellenic Navy	The Effect of Staying Power on Offensive and and Defensive Power of a Modern Warship	351
Almir Garnier Santos Lieutenant Commander, Brazilian Navy	Using Multiple Searchers to Locate a Randomly Moving Target	352
Robert G. Schultz Lieutenant, U.S. Navy and Micheal A. Dorko Lieutenant, U.S. Navy	A Simulation and Evaluation of NATO Standardization Agreement (STANAG) 4214	352
Garry S. Schwartz Captain, U.S. Marine Corps	Realigning the U.S. Navy Recruiting Command	353
Curt William Steigers Lieutenant, U.S. Navy	A Critical Analysis of a Range Dependent Probability of Kill for the NATO Seasparrow Missile System	353
James B. Sweeney, III Captain, U.S. Marine Corps	A Network Optimizer for the U.S. Marine Corps Staffing Goal Model (OSGM-NET)	354
Johann Thoma Captain, Federal Republic of Germany Army	Two Optimization Models for Small-Scale Routing of Military Units in a Road Network	354

Lian Tian Tse	Application of Logistic Regression and Survival Analysis to the Study of CEPT, Manpower Performance and Attrition	355
John D. Van Brabant Lieutenant, U.S. Navy	A Monthly Squadron Sortie Scheduling Model for Improved Combat Readiness	355
Sandra A. Williams Lieutenant, U.S. Navy	Development of Cost Estimating Relationships for Missile Engineering Manufacturing Development (EMD) Costs and Warship Fuel Consumption	356
Takashi Roy Yamamoto Lieutenant, U.S. Navy	United States Navy Surface Ship Employment and Crisis Response Model (ECRM)	356

PHYSICAL OCEANOGRAPHY

Rogerio Paulo Antunes Chumbinho Lieutenant, Portuguese Navy	Objective Analysis of a Coastal Ocean Eddy Using Using Satellite AVHRR and in Situ Hydrographic Data	359
Paolo Giannetti Lieutenant Commander, Italian Navy	The Velocity Field in the Northeast Atlantic From Satellite-Tracked Drifting Buoys	359
Kevin Austin Samuel Hays Lieutenant, U.S. Navy	A Water Mass Analysis of the 1991-1992 El Niño Signal in the Farrallon Islands Region	360
Michael Robert Hicks Lieutenant, U.S. Coast Guard	Alongshore Sub-Thermocline Variability in the Central California Current System	360
Wei-Szu Li Lieutenant Commander, Chinese Navy	Using the C-Vector Method to Derive the Three-Dimensional Circulation Pattern Near the East Greenland Polar Front	361
Ross P. Mitchell Lieutenant, U.S. Navy	A Numerical Study of Seasonal Wind Forcing on the California Current System	361
Martin James Sauze Lieutenant Commander, Royal Navy	An Investigation Using Empirical Orthogonal Functions and Objective Analysis to Analyze the Vertical Temperature Structure of a Gulf Stream Meander	362
Monty Graham Spearman Lieutenant, U.S. Navy	Water Masses and the Thermohaline Circulation at the Entrance to the Gulf of California	362

PHYSICS

James Dudley Atkinson, IV Lieutenant, U.S. Navy	Implementation and Use of a Computational Ray-Tracing Program for the Design and Analysis of Complex Optical Systems	365

Joseph T. Carlson Lieutenant, U.S. Navy	Visible Spectrum of Table Sonoluminescence	365
Scott M. Carlson Lieutenant, U.S. Navy	Validation of the Design of a High Resolution All-Reflection Michelson Interferometer for Atmospheric Spectroscopy	365
Daryl L. Caudle Lieutenant, U.S. Navy	Very Low Frequency Signals and Whistler-Mode Amplification in the Magnetosphere and Limit-Cycle Behavior in the CEBAF Infrared Free Electron Laser	366
Bruce E. Chase Lieutenant, U.S. Navy	A Calibration of the Naval Postgraduate School's Middle Ultraviolet Spectrograph (MUSTANG)	366
David R. Cherry Major, U.S. Army	Calibration of a High Frequency Monostatic Ecosounder	367
Kay L. DiNova Lieutenant, U.S. Navy	Enhanced Higher Order Parametric X-Radiation Production	367
Thomas J. Fasanello, Jr. Lieutenant, U.S. Navy	Solid State X-Ray Detector Calibration Techniques and Linac Beam Intensity Measurements	367
Michael Dale Joyce Lieutenant, U.S. Navy	Quadruplet Expansion of the Acoustic Pressure Field in a Wedge Shaped Ocean	368
Eric Stanley Lantto Lieutenant Commander, U.S. Navy	Detailed Analysis Case Studies of Trapped Plasmas at the Earth's Magnetic Equator	368
John Samuel Laszakovits Lieutenant, U.S. Navy	Ionospheric Photoelectrons Measured at Geosynchronous Orbit	368
Stephen D. Lewia Lieutenant, U.S. Navy	Spectra of Stable Sonoluminescence	369
Donald P. MacNeil Lieutenant, U.S. Navy	Normal Modes of Oscillation of the Vulcan PHALANX Close-in-Weapon System	369
Kenneth L. McElroy, Jr. Lieutenant, U.S. Navy	The Atmospheric Emission Method of Calculating the Neutral Atmospheric and Charged Particle Densities in the Upper Atmosphere	370
Charles Curtis Meisenheimer Lieutenant, U.S. Navy	A Comparison of Two Computer Models of Sound Propagation for a Wedge Shaped Ocean Over a Penetrable Bottom	370
Ferdinand Joseph Metzger, Jr. Lieutenant, U.S. Navy	Investigation of a Background Suppression Transimpedance Amplifier for Photovoltaic Detectors	370

John C. Peterschmidt Lieutenant, U.S. Navy	Normal Modes of Vibration of the PHALANX Gun	371
Allan David Risley, Jr. Lieutenant, U.S. Navy	Developmental Testing of a Prototype All-Reflection Michelson Interferometer	371
Daniel S. Roper Captain, U.S. Army	Investigation of Systematic Effects in Atmospheric Microthermal Probe Data	372
George M. Sutton Lieutenant, U.S. Navy	Investigations of Self-Pumped Phase Conjugate Laser Beams and Coherence Length	372
Kenneth M. Wallace, Jr. Lieutenant Commander, U.S. Navy	Design of a High Resolution Spatial Heterodyne Interferometer	373
Terry Scott Wichert Lieutenant Commander, U.S. Navy	Feature Based Neural Network Acoustic Transient Signal Classification	373
Wade F. Wilkenson Lieutenant, U.S. Navy	A Theory for Optical Wavelength Control in Short Pulse Free Electron Laser Oscillators	374
Gregory Willis Lieutenant, U.S. Navy	Investigation of Onset of Plasma Formation at Anode of Fast-Pulsed High-Voltage Vacuum Diode	374
SYSTEMS ENGINEERING		
Patrick J. Bowman Lieutenant, U.S. Navy	Combatting Inherent Vulnerabilities of CFAR Algorithms and a New Robust CFAR Design	377
David Charles Chang Lieutenant, U.S. Navy	A Comparison of Computed and Measured Transmission Data for the AGM-88 Harm Radome	377
Kyle M. Craigie Lieutenant Commander, U.S. Navy	Assessment of Atmospheric Influence on Surveillance Radar Performance in Littoral Zones	377
Thomas Peter Hekman Lieutenant, U.S. Navy	Far Ultraviolet Images of the Nighttime Ionosphere	378
Doo Jong Kim Captain, Korean Army	New Binary Integration Strategies and Corresponding R_{90} Calculations	378
Efthimios Mikros Lieutenant Junior Grade, Hellenic Navy	Mitigation of EMI/RFI Produced by a 1.2 kW Uninterruptible Power Supply	378
Juan Carlos Minuto Lieutenant, Argentine Navy	Simulation of Adjacent Channel Interference in a UHF Satellite System	379

B.B. Nityananda	Spurs in Digital Radio Frequency Memory and Applications of DRFM	379
Ali Ozkara Lieutenant Junior Grade, Turkish Navy	Methods for Improving Low-Angle, Low-Altitude Radar Tracking Accuracy	379
Göran Sven Erik Pettersson Major, Swedish Army	An Illustrated Overview of ESM and ECM Systems	380
Samuel Jody Strange Lieutenant, U.S. Navy	Removal of Coherent Extremely Low Frequency (ELF) Background Noise by Adaptive Noise Cancellation	380
SYSTEMS TECHNOLOGY		
Robert R. Armbruster Lieutenant, U.S. Navy	Cognitive Limitations in Coordination in Hierarchical Information Processing Structures	383
Kipp A. Collins Captain, U.S. Marine Corps	A Concept of Unmanned Aerial Vehicles in Amphibious Operations	383
Stefani Green Cuthbert Lieutenant, U.S. Navy	Navy C3 in a Sociological Context: Why Forward Presence Matters	384
Daniel Quintin Egge Captain, U.S. Marine Corps	A Framework for Evaluating Evolutionary Upgrade Paths of Command, Control, and Communications Systems	384
Mary Kay Ellis Captain, U.S. Air Force	Computer-Aided Prototyping System (CAPS) Within the Software Acquisition Process: A Case Study	385
Bruce O. Fagerland Captain, U.S. Air Force	Telecommunications Internetworking and Integration: A Primer for C3 Students	385
Raymond C. Gaw Lieutenant, U.S. Navy	Electron Beams at Geosynchronous Orbit	386
Hugh Allen Henry Major, U.S. Marine Corps	Military Satellite Communications Decision Support System Requirements Analysis and User Interface Design	386
Ronald Gene Kearns Captain, U.S. Air Force	A Conceptual Database Design and Performance Analysis of the MILSATCOM Requirements Database	386
Kathleen Schmidt Loper Captain, U.S. Army	Multilevel Security Within the Army Tactical Command and Control System: An Implementation Strategy	387
Thomas Cameron Loper, II Captain, U.S. Army	A Candidate Functional Architecture Design for for the Detection and Monitoring Process of a Counterdrug Joint Task Force	387

William Michael Major Captain, U.S. Air Force	Design and Implementation of a Prototype PC Based Graphical and Interactive MILSATCOM Requirements Database System	388
William Stanley Pendergrass Lieutenant, U.S. Navy	Combat Analysis for Command, Control and Communications: A Primer 1993 Edition	388
Frederick Walter Reichert, Jr. Major, U.S. Army	Data Link Development for the Archytas Vertical Takeoff and Landing Transitional Flight Unmanned Aerial Vehicle	388
Jeffrey Scott Richardson	Comparison of Information Delay Tapes and Levels in Tactical Tic-Tac-Toe (T-4)	389
Warren Wilson Snow Major, U.S. Air Force	The Organizational Preparation of Existing Relational Databases for the Integration of Expert Systems	389
Timothy James White Lieutenant, U.S. Navy	On the Exploitation of Human Inductive Thought and Intuition in Future Global Command and Control Architectures	390

SYSTEMS TECHNOLOGY (COMMAND, CONTROL, AND COMMUNICATIONS)

Patrick Joseph Kanewski Captain, U.S. Marine Corps	Combined Arms Staff Trainer Feasibility Study for Use in the NPS C3 Curriculum	393
Michael D. Landers Captain, U.S. Army	A Proposed Battalion and Below Command and Control (B2C2) System Architecture for the Armor Battalion	393
Stephen McKinney Captain, U.S. Army	Combat Vehicle Command and Control System ($CV2^2$): The Development of the Measures and Evaluation Techniques	393
Kurt Charles Reitinger Major, U.S. Army	Analysis of Simulated Drift Patterns of a High Altitude Balloon Surveillance System	394
Eugene Marco Zarillo Lieutenant, U.S. Navy	A Systems Evaluation Approach to Analysis Tactical Tic-Tac-Toe (T-4) Generated Data	394

SYSTEMS TECHNOLOGY (SPACE SYSTEMS OPERATIONS)

Paul Alan Forbes Lieutenant, U.S. Navy	Using a Wargame to Explore the Effects of the Information Content of Messages on CVBG Anti-Air Warfare Defense	397

William K. Henderson Lieutenant Commander, U.S. Navy and Brian D. Nuenfeldt Lieutenant Commander, U.S. Navy	A Survey of Uncontrolled Satellite Reentry and Impact Prediction	397
Franklin D. Hixenbaugh Lieutenant, U.S. Navy	A Study of Piezoelectric Actuators and Sensors for Vibration Control of Flexible Space Structures	398
Brian D. Nuenfeldt Lieutenant Commander, U.S. Navy and William K. Henderson Lieutenant Commander, U.S. Navy	A Survey of Uncontrolled Satellite Reentry and Impact Prediction	398
Benjamin Frank Roper Lieutenant Commander, U.S. Navy	Exergy Decrease in Shock Waves and Boundary Layers of Space Launch Vehicles	399
Melissa A. Sturgeon Captain, U.S. Army	Spectral and Polarimetric Analysis of Hyperspectral Data Collected by an Acouso-Optic Tunable Filter System	399
Theodore Arnold Vetter Lieutenant, U.S. Navy	Considerations for Space and Naval Aviation Applications of Ferroelectric Memory	399
Larry E. Whitmeyer Lieutenant Commander, U.S. Navy	Application of Space Shuttle Project Hercules Imagery in the Investigation of Ship Cloud Tracks	400

DOCTOR
OF
PHILOSOPHY

AERODYNAMIC DESIGN USING PARALLEL PROCESSORS

Stephen C. Brawley-Lieutenant, United States Navy
B.S., United States Naval Academy
M.S., Naval Postgraduate School
Doctor of Philosophy in Aeronautical Engineering-September 1993
Advisor: Garth V. Hobson-Department of Aeronautics

An airfoil design technique has been developed which decreases the computational processing time by more than an order of magnitude when optimizing aerodynamic performance. The practicality of airfoil design using parallel processors and Navier-Stokes flow solvers has been demonstrated. Typically, an airfoil is designed to meet certain criteria based upon its aerodynamic performance at set flight conditions. If an optimization technique is used for airfoil design, the shape of the airfoil is varied, and the aerodynamic performance of numerous airfoil geometries are evaluated using computational fluid dynamics. Multiple aerodynamic performance evaluations require the vast majority of computational processing time used in airfoil design optimization. Efficient Euler and Navier-Stokes flow solvers which take advantage of the vector processing capabilities of modern processors are used with optimization schemes for internal and external aerodynamic design. Processors of the iPSC/860 Intel hypercube parallel computer are utilized to simultaneously evaluate the performance of numerous airfoil shapes. The utilization of multiple processors in parallel greatly decreases the computational processing time and increases the efficiency of the optimization design process.

ORBITAL PARAMETER ESTIMATION USING AN EXTENDED KALMAN FILTER

Daniel J. Brett-Captain, United States Air Force
M.S., Air Force Institute of Technology, 1983
Doctor of Philosophy in Electrical Engineering-December 1992
Advisor: Harold A. Titus-Department of Electrical and Computer Engineering

The problem of orbital parameter estimation using angles only observations is examined. Direction cosine measurements, obtained from satellite passage of an earth-based stationary planar radar beam, are assimilated by an extended Kalman filter to improve estimates of a classical orbital element set. Several progressively comprehensive orbital motion models are considered and compared. The relative effectiveness of these models is illustrated by applying them to actual satellite data.

THE RATIONAL BEHAVIOR MODEL: A MULTI-PARADIGM, TRI-LEVEL SOFTWARE ARCHITECTURE FOR THE CONTROL OF AUTONOMOUS VEHICLES

Ronald Benton Byrnes, Jr.-Major, United States Army
B.S., Midwestern State University, 1979
M.S.E.E., Naval Postgraduate School, 1989
Doctor of Philosophy in Computer Science-March 1993
Advisor: Robert B. McGhee-Department of Computer Science

There is currently a very strong interest among researchers in the fields of artificial intelligence and robotics in finding more effective means of linking high level symbolic computations relating to mission planning and control for autonomous vehicles to low level vehicle control software. The diversity exhibited by the many processes involved in such control has resulted in a number of proposals for a general *software architecture* intended to provide an efficient yet flexible framework for the organization and interaction of relevant software components. The Rational Behavior Model (RBM) has been developed with these requirements in mind and consists of three levels, called the *Strategic,* the *Tactical,* the *Execution* levels, respectively. Each level reflects computations supporting the solution to the global control problem based on different abstraction mechanisms. The unique contribution of the RBM architecture is the idea of specifying different programming paradigms to realize each software level. Specifically, RBM uses rule-based programming for the Strategic level, thereby permitting field reconfiguration of missions by a mission specialist without reprogramming at lower levels. The Tactical level realizes vehicle *rationalizing* their interaction. The Execution level is programmed in any imperative language capable of supporting efficient execution of real-time control of the underlying vehicle hardware. The viability of this architecture has been established through computer simulation studies of control of an autonomous submarine, the NPS Autonomous Underwater Vehicle. These experiments have confirmed that the RBM architecture provides important advantages in terms of program conciseness, maintainability, reliability, and modifiability. In addition, by constraining the interfaces between the levels and limiting the accessibility of state variables, the team development of autonomous vehicle control software is significantly enhanced.

TOPICS IN LONGSHORE CURRENTS

John Casey Church-Lieutenant Commander, United States Navy
B.S., University of Michigan, 1981
Doctor of Philosophy in Physical Oceanography-September 1993
Advisor: Edward B. Thornton-Department of Oceanography

The momentum equation governing mean longshore currents on straight beaches is a balance of forcing from the momentum transfer of the oscillatory wave motion, turbulent momentum transfer (mixing), and bottom stress. Of these, the wave's contribution is well understood, but the remaining two are not, principally due to the complicated hydrodynamics of the surf-zone. Addressing the bottom stress term, a longshore current model is developed which includes a modification of the bottom stress due to the effects of breaking-wave induced turbulence. A one-dimensional turbulent kinetic energy equation is used to model this breaking-wave induced turbulence, producing a spatially varying bottom friction coefficient. The modeled longshore current cross-shore profiles show improved agreement with field observations. In a second bottom stress study, vertical profiles of mean longshore currents are examined using field data obtained with vertically stacked electromagnetic current meters with the goal of measuring the bottom stress and its associated drag coefficient. The profiles are observed to become vertically uniform whenever the ratio of wave height to depth exceeds 0.3, indicating that nearly all of the waves passing a given location are breaking. Finally, horizontal turbulent momentum transfer (mixing) is examined for the case of shear instabilities of the longshore current. These instabilities are linked to the potential vorticity pattern produced by the horizontal shear of the longshore current. The model generated stream function amplitudes are calibrated via observed energy density spectra. For the barred beach studied, the predicted mixing is in qualitative agreement with that required for modeled longshore current profiles to agree with observed profiles.

LARGE-SCALE CIRCULATION REGIMES AND TROPICAL CYCLONE CHARACTERISTICS OVER THE WESTERN PACIFIC OCEAN

Patrick A. Harr
B.S., Miami University, 1976
M.S., Colorado State University, 1978
Doctor of Philosophy in Meteorology-June 1993
Advisor: Russell L. Elsberry-Department of Meteorology

The basic structure of the variability of the large-scale circulations over the tropical western North Pacific is investigated with respect to its influence on tropical cyclone characteristics. A vector empirical orthogonal function analysis and a fuzzy cluster algorithm are used to define six recurrent 700 mb circulation patterns that represent large-scale variabilities associated with the monsoon trough and subtropical ridge. Three circulation patterns are associated with an active monsoon trough, and two patterns represent an inactive monsoon trough. One pattern depicts small deviations from the long-term climatology. The 700 mb circulation patterns are shown to be physically consistent with outgoing longwave radiation anomalies and the 200 mb streamfunction and velocity potential anomalies. A seventh set of circulation patterns is defined to contain transition periods between the active, inactive and small anomaly patterns. Transitions between recurrent circulation patterns may be within the active or the inactive patterns, or be transitions across the active/inactive boundary that are associated with major circulation changes. These significant transitions occur over a very limited set of paths, which are shown to be associated with interactions among tropical and midlatitude circulation systems. The recurrent circulation patterns and their transitions are shown to explain much of the observed intraseasonal variability in the occurrence and track types (recurving versus straight-moving) of tropical cyclones over the western North Pacific.

PARAMETRIC UNCERTAINTY REDUCTION IN ROBUST MULTIVARIABLE CONTROL

David L. Krueger-Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1979
M.S.A.E., Naval Postgraduate School, 1986
Doctor of Philosophy in Electrical Engineering-September 1993
Advisor: Roberto Cristi-Department of Electrical Engineering

This dissertation presents a method for reducing the number of parametric uncertainties used in the design of a robust H_∞ controller. The resulting controller is shown to meet robust stability and performance requirements in the presence of all the modeled uncertainties. The approach used involves grouping parametric variations affecting the same open loop eigenvalue, then scaling one or more of these variations to accommodate the eigenvalue change caused by all the parametric uncertainties. This method is effective in those cases where a large number of parametric uncertainties cause current computer aided design software to fail to find a robust controller for the plant.

A THREE-DIMENSIONAL STUDY OF THE INFLUENCE OF MOUNTAINS ON A FRONT

Shang-Wu Li
B.S., Chinese Culture University, 1979
M.S. National Taiwan University, 1986
Doctor of Philosophy in Meteorology-December 1992
Advisors: Melinda S. Peng & Roger T. Williams-Department of Meteorology

This study investigates mountain effects on a frontal system in three dimensions. A numerical hydrostatic primitive-equation model is employed. The frontal system is developed in the model from the most unstable Eady wave in a baroclinic state and is then introduced into a new model domain that contains mountain ridges of different sizes, shapes and orientations. The cold front experiences a weakening on the upwind slope and strengthening on the downwind slop of a mountain. Mountain-induced frontogenetic/frontolysis at different locations. The deformation and the distortion of the front by a mountain is a superposition effect of the mountain-induced frontogenesis regions and the original front. The front recovers its original horizontal structure after moves away from the mountain. The frontogenetic forcing is dominated mainly by the convergence/divergence associated with the flow over the mountain. Major intensification occurs on the lee side convergence zone. Frontal intensity returns approximately to the original level when the front moves away from the mountain. Mountain orientation is an important factor that determines the frontal distortion.

AUTOMATED CARTOGRAPHY BY AN AUTONOMOUS MOBILE ROBOT USING ULTRASONIC RANGE FINDERS

David L. MacPherson-Lieutenant Commander, United States Navy
B.S., Rensselaer Polytechnic Institute, 1981
M.S., Naval Postgraduate School, 1986
Doctor of Philosophy in Computer Science-September 1993
Advisor: Yutaka Kanayama-Department of Computer Science

The problem solved was for an autonomous mobile robot to generate a precise map of its orthogonal, indoor environment. The maps generated by the robot's sensors must be perfect so they can be used in subsequent navigation tasks using the same sensors. Our approach performed map-making incrementally with a partial world data structure describing incomplete polygons. A striking feature of the partial world data structure was that they consist of "real" and "inferred" edges. Basically, in each learning step, the robot's sensors scan an unexplored region to obtain new "real" and "inferred" edges by eliminating at least one "inferred" edge. The process continues until no "inferred" edges remain in the partial world. In order to make this algorithm possible, linear fitting of sensor input, smooth vehicle motion control, dead reckoning error correction, and a mapping algorithm were developed. This algorithm was implemented on the autonomous mobile robot *Yamabico-11*. The results of this experiment using *Yamabico-11* were threefold. (1) A smooth path tracking algorithm resulted in motion error of less than 2% in all experiments. (2) Dead reckoning error correction experiments revealed small, consistent vehicle odometry errors. The maximum observed error was 1.93 centimeters and 1.04° over a 9.14 meter course. (3) Precise mapping was demonstrated with a map accuracy in the worst case of 25 centimeters and 2° of hand measured maps. The ability to explore an indoor world space while correcting dead reckoning error is a significant improvement over previous work [Leonard 91] [Crowley 86] [Cox 91].

A SOFTWARE ARCHITECTURE FOR THE CONSTRUCTION AND MANAGEMENT OF REAL-TIME VIRTUAL WORLDS

David R. Pratt
B.S.E.E., Duke University, 1983
M.S.C.S., Naval Postgraduate School, 1988
Doctor of Philosophy in Computer Science-June 1993
Advisor: Michael J. Zyda-Department of Computer Science

As military budgets shrink, the Department of Defense (DoD) is turning to virtual worlds (VW) to solve problems and address issues that were previously solved by prototype or field exercises. However, there is a critical void of experience in the community on how to build VW systems. The Naval Postgraduate School's Network Vehicle Simulator (NPSNET) was designed and built to address this need. NPSNET is a populated, networked, interactive, flexible, three dimensional (3D) virtual world system. This dissertation covers the construction and management of the VW in NPSNET. The system, which uses both standard and non-standard network message formats, is fully networked allowing multiple users to interact simultaneously in the VW. Commercial off the shelf (COTS), Silicon Graphics Incorporated (SGI) workstations, hardware was used exclusively in NPSNET to ensure the usefulness and the portability of the system to many DoD commands. The core software architecture presented here is suitable for any VW.

A STUDY OF THE AMPLIFICATION OF LASER AND VLF WAVES USING A SIMPLE PENDULUM MODEL

Keith Alan Sturgess-Captain, United States Army
B.S., Florida Institute of Technology, 1983
Doctor of Philosophy in Physics-June 1993
Advisor: William B. Colson-Department of Physics

The Lorentz force equation governing the interaction between radiation and charged particles in the presence of a static magnetic field can be reduced to the form of the simple pendulum equation, when applied to the Free Electron Laser (FEL) and to the amplification of whistler waves in the magnetosphere. The first topic in this thesis is the start-up of an FEL with a compact design having a small, spatial undulator period, many periods, and a small undulator field strength. Under these conditions, the number of photons spontaneously emitted into the resonator mode each pass is so small that a classical field cannot be established. Quantum fluctuations affect the wave-particle interaction and therefore diminish weak-filed gain. An FEL start-up condition, several orders of magnitude more restrictive than determined by quantum recoil alone, is derived from the photon rate equation. The next topic is the evolution of a weak, classical radiation field driven by a long electron pulse. Assuming low gain, it is possible to reduce the coupled optical wave and electron pendulum equation to a simple, first-order, partial differential equation including electron dynamics, slippage, desynchronism, and resonator loss. This analytical method is used to study coherence development, and the effects of varying the electron beam pulse shape. Next, the Boeing Average Power Laser Experiment (APLE) is investigated using two and three dimensional numerical simulations. Various methods of reducing the electron-radiation coupling in the oscillator are examined in order to minimize the electron beam energy spread introduced into the FEL amplifier. An alternative for achieving high power makes use of the oscillator alone, but with a tapered undulator to increase the electron-radiation coupling. The final topic is charged particles, following helical trajectories, traveling in the magnetosphere between mirror points along the earth's magnetic field lines. When electrons interact with a whistler wave near the geomagnetic equator, their motion can again be described by the simple pendulum equation. The inhomogeneity of the earth's magnetic field near the geomagnetic equator is analogous to the field in a tapered undulator. Numerical phase-space simulations are developed to investigate the interaction.

ASSESSING THE ENERGETIC INTERACTIONS OF SUBTIDAL FLOW ON THE CONTINENTAL SLOPE IN AN EASTERN BOUNDARY REGION

Timothy Daniel Tisch-Lieutenant, National Oceanic and Atmospheric Administration
B.S., State University of New York, Maritime College, 1982
M.S., Naval Postgraduate School, 1990
Doctor of Philosophy in Physical Oceanography-December 1992
Advisors: Steven R. Ramp & Curtis A. Collins-Department of Oceanography

Seventeen-month time series (May 1989 - October 1990) of current, temperature and conductivity were obtained from 100, 350, and 500 m depth at site P2, located on the 800 m isobath off Point Sur, and one-year time series (May 1990 - May 1991) of the same variables at similar depths were obtained from site P3, approximately 25 km farther offshore on the 1800 m isobath. Results show that no net growth or decay of eddy potential energy (EPE) occurred at either mooring site during their respective deployment periods. At mooring P2, baroclinic instabilities within the water column were signaled by downgradient horizontal eddy heat fluxes that converted mean potential energy (MPE) to EPE at both 225 and 425 m. The dominant balance at 225 m was between mean flow advection (source) and upward eddy heat fluxes (EPE to eddy kinetic energy, EKE), with additional losses coming from downstream advection by the eddy flow. At 425 m, the dominant balance was between downgradiant eddy heat fluxes (source) and downstream advection by eddy flow (sink). Unlike 225 m, vertical eddy heat fluxes at 425 m were a weak source (EKE to EPE) while mean flow advection was negligible. At P3, the net balance involved only downward eddy heat fluxes (source) and downstream advection by eddy flow (sink), as mean advection and MPE-EPE conversions were negligible. Analysis of energetic events within the time series of terms in the EPE equation did not reveal any canonical or common pattern which would explain the temporal means described above, but suggest the flow in this region is highly variable. In fact, during most events magnitudes of terms were anywhere from 10 to 200 times that of the associated temporal mean. Events at P2 involved both horizontal and vertical processes and had longer time scales (several days to weeks) compared to those at P3, which had much shorter time scales and appeared to involve vertical processes only.

COOPERATIVE CONTROL OF MULTIPLE SPACE MANIPULATORS

Gary E. Yale-Captain, United States Air Force
B.S., United States Air Force Academy, 1981
M.S., Massachusetts Institute of Technology, 1984
Doctor of Philosophy in Aeronautical ad Astronautical Engineering-September 1993
Advisor: Brij N. Agrawal-Department of Aeronautics and Astronautics

This research concerns the development of cooperative control of two spacecraft mounted two-link manipulators as they reposition a common payload. Lagrangian formulation is used to determine the system equations of motion. Lyapunov stability theory is used to develop the cooperative control by using a reference trajectory and reference actuator torques. Polynomial curves represent potential reference trajectories. Numerical methods select specific reference trajectories to minimize the disturbance torque transmitted to the spacecraft during the payload repositioning maneuver. The reference actuator torques are selected to minimize weighted norms of the torques. Analytical and experimental models of planar motion are used to study the performance of different cooperative controllers. The fifth order polynomial reference trajectory leads to superior performance in terms of spacecraft attitude accuracy, actuator torque magnitude, payload repositioning accuracy, and maneuver time. The higher order polynomial reference trajectory results in only minor improvement in performance. The experimental results verify the concept of cooperative control.

EFFECTS OF TAIWAN OROGRAPHY ON THE MOTION AND STRUCTURE OF TYPHOONS

Tien-Chiang Yeh
B.S., National Central University, Taiwan, 1977
M.S., National Central University, Taiwan, 1979
Doctor of Philosophy in Meteorology-December 1992
Advisors: Russell L. Elsberry & Chih-Pei Chang

Effects of steep island terrain on typhoon motion and structure changes are studied by both observational analyses and numerical simulations. The analyses involve calculation of center position deviations from a second-order polynomial curve fitted to the best tracks, and an empirical orthogonal function analysis to determine the terrain-induced surface structures. The simulations use a limited-area model, with a elliptical-shaped barrier and a "spun-up vortex" to represent the typhoon, to demonstrate the sensitivity on track and structure relative to vortex intensity, approach direction and translation speed. Both observational and simulation studies show that the orography induces significant track deflections and structure distortions, especially for a weaker and slowly moving typhoon approaching central or southern Taiwan. As the typhoon approaches, the outer edge of the circulation accentuates the blocking effect of the barrier. Asymmetric gyres are induced by a vortex-terrain interaction as the vortex moves closer to the barrier, which accounts for the significant track deflections from a simple barrier effect. The simulations suggest that a center-following algorithm based on the wind field would be more representative than on the pressure field. A track discontinuity occurs when the secondary vortex created from flow deflections around the barrier becomes the primary center downstream.

AERONAUTICAL
AND
ASTRONAUTICAL ENGINEER

COMPUTATIONAL AND EXPERIMENTAL INVESTIGATION OF THE AERODYNAMIC CHARACTERISTICS OF A WINDSURFING SAIL SECTION

Matthew R. Avila-Lieutenant, United States Navy
B.S., United States Naval Academy, 1984
Aeronautical and Astronautical Engineer-December 1992
Advisor: Maximilian F. Platzer-Department of Aeronautics and Astronautics

In this thesis results of a computational and experimental investigation of the aerodynamic characteristics of a sail section used in windsurfing sails are presented. State-of-the-art computational methods (panel,, direct boundary layer, viscous-inviscid interaction, Euler, and steady/unsteady Navier-Stokes) were used to predict the aerodynamic loading and stall characteristics. These predictions were found to be in satisfactory agreement with tuft and smoke flow visualization experiments carried out in the Naval Postgraduate School low speed wind tunnel at a Reynolds number of 800,000. Further, all computational work was completed on the Silicon Graphics Indigo workstation to demonstrate that only modest computer facilities will be necessary for these methods to migrate to the field of sail design.

MISSILE DESIGN PC TRAP: AN IMPROVED PC TRAP FOR TACTICAL MISSILE DESIGN

Joseph Jean-Paul Daniel Gibeau-Captain, Canadian Air Force
B.Eng., Royal Military College of Canada, 1987
Aeronautical and Astronautical Engineer-September 1993
Master of Science in Aeronautical Engineering-September 1993
Advisor: Conrad F. Newberry-Department of Aeronautics and Astronautics

The Missile Design Personal Computer Trajectory Analysis Program (Missile Design PC TRAP) is a simple and compact multi-purpose tactical missile simulation program that runs quickly on any IBM-compatible personal computer. It is an improved version of the USAF PC TRAP computer program, in that it adds guidance laws, simulates two extra intercept scenarios (surface-to-air and air-to-surface), and provides more simulation options, such as flight envelope generation and Monte Carlo simulations. Missile Design PC TRAP is proposed as a substitute for complex main-frame simulation models, such as TRAP for conceptual and preliminary missile design phases, trade-off studies, academic purposes, and military operational applications. Missile Design PC TRAP can simulate the launch aircraft, the target and the missile in three-dimensions as point mass vehicles in air-to-air, surface-to-air, or air-to-surface intercept scenarios. Real time graphics display of the vehicle trajectories is available. Seven tactical missile guidance laws are derived, detailed and implemented into the Missile Design PC TRAP algorithms. The missile aerodynamic, propulsion, and physical characteristics are estimated from a small amount of input data. The program can simulate one-on-one engagements, generate launch envelopes in two planes, and perform Monte Carlo simulations with random initiation of the selected target evasive maneuvers. Its computing time is generally less than real time on a 486 33Mhz personal computer chip. Comparison to missile flight paths generated by Missile Design PC TRAP and a more complete simulation program (TRAP) shows agreement between the simulation results. A complete description of the algorithms is offered, as well as a comprehensive user's manual.

AN INVESTIGATION OF TWO PROPELLER TILT WING V/STOL AIRCRAFT FLIGHT CHARACTERISTICS

William J. Nieusma, Jr.-Lieutenant, United States Navy
B.S., University of Michigan, 1985
M.S., Naval Postgraduate School, 1992
Aeronautical and Astronautical Engineer-June-1993
Advisors: Conrad F. Newberry-Department of Aeronautics and Astronautics &
L.D. Corliss & G.B. Churchill-NASA

The results of a two-propeller tilt wing aircraft static stability and performance simulation utilizing a NASA-Ames computer code, Tilt Wing Application General (TWANG), are presented with comparisons to actual test flight data. The Canadair CL-84 tilt wing aircraft was used as a model for the geometric data utilized by the computer simulation. Aerodynamic data for the simulation were obtained from previous NASA Ames research related to a four-propeller model. Variables used included a wide range of parameters associated with flight conditions from hovering flight to maximum cruise speeds at several different altitudes and wing tilt configurations. Longitudinal pitch stability was the driving factor in determining aircraft static stability for the various flight conditions. Results of the simulation indicate that the TWANG computer code provides an accurate prediction of both generic and specific tilt wing aircraft static pitch performance characteristics, as well as the additional capability of providing the required mathematical parameters for incorporation into the NASA Ames Vertical Motion simulator as software inputs.

FLOWFIELD COMPUTATIONS OVER THE SPACE SHUTTLE ORBITER WITH A PROPOSED CANARD AT A MACH NUMBER OF 5.8 AND 50 DEGREES ANGLE OF ATTACK

William H. Reuter-Lieutenant, United States Navy
B.S., University of Florida, 1984
M.S., Naval Postgraduate School, 1992
Aeronautical and Astronautical Engineer-June 1993
Advisors: Richard M. Howard & Garth V. Hobson-Department of Aeronautics and Astronautics &
P.G. Buning-NASA Ames Research Center

Advances in computational fluid dynamics capabilities (CFD) in the last decade have allowed engineers to better analyze cases of hypersonic flight. The Space Shuttle Orbiter has increased over 30,000 pounds in weight since its initial design in 1974, resulting in limitations on its operational capability. One of these limitations is the allowable forward center-of-gravity location resulting from lateral-directional and longitudinal controllability constraints. One method to relax this limitation is to employ the use of a canard. A canard can produce an additional nose-up pitching moment to relax the center-of-gravity constraint as well as to alleviate the need for large, lift-destroying elevon deflections required to maintain the high angles of attack required for effective hypersonic flight. A configuration is developed using known Orbiter aerodynamic data and a canard computational grid is generated. The Orbiter-Canard configuration is analyzed at a Mach number of 5.8 and angle of attack of 50 degrees using flowfields generated by the OVERFLOW three-dimensional computer code. Comparison is made with a baseline solution and results are presented.

DESIGN, FABRICATION AND TEST OF A VERTICAL ATTITUDE TAKEOFF AND LANDING UNMANNED AIR VEHICLE

Robert Brian Stoney-Lieutenant Commander, United States Navy
B.S., Iowa State University, 1980
Aeronautical and Astronautical Engineer-June 1993
Advisor: Richard M. Howard-Department of Aeronautics and Astronautics

Future fleet needs for real-time intelligence require an unmanned platform capable of operations from small surface combatants without the need for extensive support personnel or equipment and without causing disruption to the operations of the ship from which it operates. A candidate must not only takeoff and land vertically but also be capable of high forward flight speeds and efficient on-station performance. The design and initial fabrication of a Vertical Attitude Takeoff and Landing (VATOL) Unmanned Air Vehicle (UAV) airframe was completed at the Naval Postgraduate School. The vehicle, called Archytas, was a combination of two existing UAV's -- the AROD and Aquila -- as well as locally manufactured components, including a canard support structure and wing spar. The objective of creating Archytas was to provide a proof-of-concept platform for research to explore performance trade-offs and stability augmentation. A three-degree-of-freedom simulation was used as the focus of the design efforts, to validate design decisions made in the fields of propulsion, aerodynamics, structures and flight mechanics. Engine tests were conducted to determine thrust and control power. Structural components were designed, fabricated and then tested, making modifications where necessary to ensure sufficient airframe strength. A longitudinal control system was designed, validated by simulation, and tested structurally.

EXPERIMENTAL STUDY OF THE EFFECT OF HELICAL GROOVES ON AN INFINITE CYLINDER

Thomas Dean Stuart-Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1983
M.S., University of Tennessee, 1990
M.S., Naval Postgraduate School, 1992
Aeronautical and Astronautical Engineer-December 1992
Advisor: Louis V. Schmidt-Department of Aeronautics

A series of low-speed wind-tunnel investigations were conducted to determine the aerodynamic behavior of a grooved inclined cylinder representing a long-trailing wire antenna towed from an orbiting airplane. The large angle-of-attack range of the trailing wire required two different model configurations. The first configuration, using full-scale wire lengths suspended between steel stanchions, was mounted on a flush four-degree-of-freedom wall balance. The second configuration used a 15-scale grooved cylinder model with an ogive nose mounted on a six-degree-of-freedom sting balance. Wall balance wire data, valid for higher angles of attack, were integrated with low angle-of-attack sting balance data. Empirical relationships for the normal and axial force coefficients were verified with historical references for tested clean circular cylinders and extended for the grooved configurations. Existence of a side force coefficient due to circulation caused by the helical grooves was discovered, expressed analytically, and verified with flow-visualization techniques. Finally, the experimental coefficients were used to improve an existing simulation model describing the static equilibrium conditions of a cable towed by an airplane in a circular orbit. Inclusion of the side force influence in the static model proved consistent with the lateral skew angle and direction observed during flight test.

ELECTRICAL ENGINEER

IMPROVEMENT OF MISS DISTANCE OF MISSILES WITH IMAGING SEEKERS BY UTILIZING DYNAMIC IMAGE PROCESSING

Rui Manuel Alves Francisco-Lieutenant, Portuguese Navy
B.S., Portuguese Naval Academy, 1985
Electrical Engineer-March 1993
Master of Science in Electrical Engineering-March 1993
Advisor: Jeffrey B. Burl-Department of Electrical and Computer Engineering

This thesis deals with improving the miss distance of a missile, with imaging seeker(s), by utilizing dynamic image processing. In an encounter with a missile, a target tries to avoid the missile by performing a evasive maneuver when the missile is at a relative distance which maximizes the miss distance. Dynamic image processing permits us to identify the evasive maneuver of the target by estimating its acceleration in magnitude and direction. This thesis studies methods of utilizing this additional information about the target's behavior in order to improve the missile's performance. First the proportional navigation guidance law is explored in order to verify its advantages and weaknesses. Then, methods of obtaining the time dependent 3-D movement of a target from its image plane feature point correspondences are derived. The 3-D components of the target's acceleration are obtained by using a Kalman filter. Missiles with two cameras, one camera and one seeker (radar or IR), and only one camera are considered. Methods to get stereo vision by using the one camera plus one seeker setup and the single camera setup are proposed. Advanced guidance laws, namely advanced proportional navigation and optimal guidance are derived, for a 3-D environment. A three dimensional simulation program is developed using classical proportional navigation, advanced proportional navigation, and optimal guidance. The engagement is simulated using state variable design and the performance of the guidance laws is compared.

ACQUISITION TIME ANALYSIS OF NON-COHERENT PN SEQUENCE ACQUISITION SCHEMES

Leven Misirlioglu-Lieutenant Junior Grade, Turkish Navy
B.S., Turkish Naval Academy, 1987
Electrical Engineer-September 1993
Master of Science in Electrical Engineering-September 1993
Advisor: Alex W. Lam-Department of Electrical and Computer Engineering

In direct-sequence spread-spectrum systems, successful communications require phase synchronization of the incoming pseudonoise (PN) coded waveform with a locally generated replica at the receiver. It has been previously shown that sequential PN code acquisition schemes have the potential to achieve the best performance, but they are the least analyzed because of the analytical difficulties. The acquisition time for a PN code acquisition scheme is an important parameter for system design purposes. This thesis investigates the performance of two acquisition schemes in terms of the acquisition time. A fixed sample size (FSS) test and a truncated sequential probability ratio test (TSPRT) are studied with noncoherent demodulation in a classical additive white Gaussian noise (AWGN) channel and in presence of fading. Optimal selection of desired detection and false alarm probabilities, the effects of penalty time, majority logic verification schemes and channel signal to noise ratio (SNR) mismatch problems are thoroughly studied using the flow graph technique. Our results show that the TSPRT is efficient, robust (against fading), fast and suitable for real time low cost implementations.

DESIGN OF A DECENTRALIZED ASYNCHRONOUS MEMBERSHIP PROTOCOL AND AN IMPLEMENTATION OF ITS COMMUNICATIONS LAYER

Fernando Jorge Pires-Lieutenant, Portuguese Navy
B.S.E.E., Escola Naval, Lisbon, Portugal, 1986
Electrical Engineer-March 1993
Master of Science in Electrical Engineering-March 1993
Advisor: Shridhar B. Shukla-Department of Electrical and Computer Engineering

For development of group-oriented distributed applications, a group membership protocol provides the mechanisms to dynamically adapt to changes in the membership, ensuring consistent views among all members of the group. This is achieved, by executing a distributed script that implements a protocol at each member to maintain a sequence of identical views, in spite of continuous changes, either voluntary or due to failure, to the membership. In asynchronous distributed environments, the protocol has to operate over a network that does not bound delivery times. This thesis presents a decentralized membership protocol, designed to operate on asynchronous environments, that organizes the members in a logical ring. The protocol assumes reliable FIFO channels, that fully interconnect all members to be available. These assumptions are later relaxed to adapt the protocol to real-world environments. Reconfigurations of the group are carried out using a two-phase algorithm. An agreement phase makes the change known to all operational members, and a commit phase integrates the change at all members, in the correct order. The protocol supports failures of one or more members, either successive or simultaneous, voluntary departures, and joining of new members. In the case of simultaneous events, the protocol ensures that they are incorporated one at time, and following the same sequence, at all members. All actions are token-based and the protocol ensures that no tokens are lost or duplicated regardless of changes in the membership during any phase of the protocol. The main feature of this protocol is that, by ordering the group in a logical ring, and by decentralizing the responsibility of the monitoring and reconfiguration processes, the need for a dedicated manager is eliminated. Execution of the protocol is symmetric relative to the type of change, and to the responsibility distribution among members. The complete specification of the protocol is presented, along with a correctness proof and performance analysis. A full implementation design is presented and the actual implementation (coding) issues for a Unix-based environment are discussed. Since there are no other known full implementations of a decentralized protocol, comparisons are made with a centralized protocol, to determine message cost, and scalability characteristics.

MECHANICAL ENGINEER

THEORETICAL STUDY OF LAMINAR FILM CONDENSATION ON HORIZONTAL ELLIPTICAL TUBES UNDER CONDITIONS OF FREE AND FORCED CONVECTION

Vance Hiro Adams-Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1978
Mechanical Engineer-March 1993
Master of Science in Mechanical Engineering-March 1993
Advisors: Paul J. Marto & Steven B. Memory-Department of Mechanical Engineering

Analytical studies have been made of laminar film condensation on a horizontal elliptical cylinder in a pure saturated vapor under conditions of free and forced convection. Estimation of interfacial shear stress was made in two ways: the first involving an asymptotic value of the shear stress under conditions of infinite condensation rate and the second based on simultaneously solving the two-phase vapor boundary layer and condensate equations. The latter approach enables the determination of the vapor boundary layer separation point. For the assumption of asymptotic shear stress, effects of surface tension and pressure gradient in the condensate film have also been included. At the extremes of eccentricity, corresponding to a circular tube and a vertical flat plate, the results are compared with theoretical and experimental work of others. Improvement in the condensation heat transfer coefficient was found for elliptical tubes under both free and forced convection conditions when compared to circular tubes of the same surface area. In the latter case, this improvement was due mainly to the reduced drag of the elliptical tube providing a higher vapor velocity for the same pressure drop as that across a circular tube.

FREE-SURFACE/VORTICITY INTERACTION

John B. Carroll-Lieutenant, United States Navy
B.S.M.E., Worcester Polytechnic Institute, 1984
Mechanical Engineer-September 1993
Master of Science in Mechanical Engineering-September 1993
Advisor: T. Sarpkaya-Department of Mechanical Engineering

The unsteady flow phenomena resulting from the interaction of wakes and vortices with the free surface are of particular importance in naval hydrodynamics. Ship and submarine wakes produce a three-dimensional complex signature, comprised of a narrow dark band bordered by two bright lines in synthetic-aperture-radar (SAR) images. The dark band signifies the suppression of waves at the Bragg frequency as a consequence of the interaction between the free surface and the imposed vorticity. In the present investigation, the vorticity field is provided by a single tip vortex generated by an airfoil. The results, obtained with an LDV, have shown that the free surface redistributes part or all of the normal turbulent kinetic energy into streamwise and spanwise components. The turbulent kinetic energy first decreases sharply with increasing vertical distance from the vortex and then remains nearly constant within a thin layer below the 'roughened' free surface. The results explain the longevity of the structures and lend further credence to the simulation of near-surface structures via vortex- or contour- dynamics.

MINE AVOIDANCE AND LOCALIZATION FOR UNDERWATER VEHICLES USING CONTINUOUS CURVATURE PATH GENERATION AND NON-LINEAR TRACKING CONTROL

Dean J. Cottle-Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1980
Mechanical Engineer-September 1993
Master of Science in Mechanical Engineering-September 1993
Advisor: Anthony J. Healey-Department of Mechanical Engineering

Many underwater vehicles have been designed to follow a straight path using linear approximations about that path. Tracking a dynamic path of arbitrary but continuous curvature may often be desired. This will require a nonlinear controller with enhanced robustness properties. One point of this thesis is to show how nonlinear control using sliding modes may be applied to follow a dynamic path. In a mine warfare setting using Autonomous Underwater Vehicles (AUVs), reflexive maneuvers will be required for mine avoidance. This thesis presents one way in which paths for mine avoidance maneuvers may be generated automatically and used as inputs to the nonlinear tracking control system of the vehicle. It has been shown through simulation that a random minefield can be traversed by an AUV while localizing and avoiding detected mines using these control concepts.

CORRELATION OF FLUX COMPOSITION AND INCLUSION CHARACTERISTICS WITH SUBMERGED ARC WELD METAL PROPERTIES IN HY-100 STEEL

Kent William Kettell-Lieutenant, United States Navy
B.S., United States Naval Academy, 1985
Mechanical Engineer-September 1993
Master of Science in Mechanical Engineering-September 1993
Advisor: Alan G. Fox-Department of Mechanical Engineering

Submerged arc weldments of HY-100 steel prepared under standard conditions with five commercially available fluxes were analyzed to discern a basis for the variation in mechanical properties associated with different flux use. The variations in flux chemistry resulted in alloyed weldments with diverse weld metal mechanical properties as evident by Charpy impact, tensile, dynamic tear, and microhardness tests. The microstructures and macrostructures were examined using optical and electron microscopy in order to determine the basis for the variations in strength and toughness. Scanning electron microscope and energy dispersive x-ray experiments were performed to determine the size, type, distribution and volume fraction of the non-metallic inclusions in the weld metal. Inclusion characterization revealed that the role of the flux in alloying had a more significant effect on the strength and toughness than did the presence of specific inclusions.

OPTIMIZATION TECHNIQUES FOR CONTACT STRESS ANALYSIS

Eric S. McDonald-Lieutenant, United States Navy
B.S., United States Merchant Marine Academy, 1986
Mechanical Engineer-December 1992
Master of Science in Mechanical Engineering-December 1992
Advisor: Young W. Kwon-Department of Mechanical Engineering

The analysis of stresses induced by contact between two bodies is inherently difficult because the size of the contact zone is unknown and constantly changing throughout loading. To overcome these difficulties, two approximation methods have been developed to determine the magnitude of contact stresses using the Rayleigh-Ritz method and the finite element method. Numerical optimization methods are employed to solve the contact problem. The solution techniques are compared to known analytical solutions and shown to yield accurate results. An application of this approach to solving the contact problem is illustrated by examining the response of a clamped sandwich composite beam to low velocity impact. It was found that the maximum shear stress is insensitive to lamina thickness, however an increase in the contact layer thickness resulted in a reduction in interfacial shear stress. In addition, it was noted that a nonlinear bending stress distribution in the contact layer intensified as the thickness of this layer increased. This phenomenon was found to be localized to the region of contact. Finally, it was found that the compressive transverse normal stresses increased as the thickness of the contact lamina increased.

PITCHFORK BIFURCATIONS AND DIVE PLANE REVERSAL OF SUBMARINES AT LOW SPEEDS

Jeffery Scott Riedel-Lieutenant, United States Navy
B.S., Maine Maritime Academy, 1986
Mechanical Engineer-June 1993
Master of Science in Mechanical Engineering-June 1993
Advisor: Fotis A. Papoulias-Department of Mechanical Engineering

The ability of a submarine to maintain ordered depth, especially during periscope depth operations at low speeds, is vital for the vessel to perform its mission and avoid detection. Modern submarines exhibit an inherent phenomenon that produces an undesirable ship response at low speeds, commonly referred to as a dive plane reversal. The physical parameters that govern this occurrence are related in this thesis to the problem of multiple steady state solutions in the vertical plane. Generic solution branching, in the form of pitchfork bifurcations, can occur when the nominal level flight path loses its stability. A systematic study reveals the existence of a critical Froude number, based on the vessel's speed and metacentric height, where this branching occurs. Bifurcation theory techniques and numerical computations are utilized to classify the effect that geometric parameters, trim and ballast conditions, and hydrodynamic properties have on the existence of these multiple solutions.

MASTER OF SCIENCE
IN
AERONAUTICAL ENGINEERING

TWO-DIMENSIONAL BOUNDARY SURFACES FOR AXI-SYMMETRIC EXTERNAL TRANSONIC FLOWS

Waleed Isa Al-Hashel-First Lieutenant, Bahrain Amiri Air Force
B.S., Northrop University, 1987
Master of Science in Aeronautical Engineering-March 1993
Advisor: Oscar Biblarz-Department of Aeronautics and Astronautics

Investigation of two-dimensional transonic flows is extended to axi-symmetric problems. This is of considerable practical interest, for example, with regard to missiles or aircraft engines which approximate much more closely bodies of revolution than two-dimensional bodies. The main concern with axi-symmetric flows lies not only with the complexity of the governing nonlinear partial differential equation which is mixed of elliptic-hyperbolic type but also with the lack of a general method for accurately solving this type of equation. We solve the nonlinear transonic equation using separation of variables technique, which yields two nonlinear ordinary differential equations using separation of variables technique, which yields two nonlinear ordinary differential equations. The x-dependence can be integrated numerically, and the solution for the r-dependence can be obtained using the expansion method originated by Van Dyke. This works well with only three terms in the expansion. The sonic solution of these equations is obtained analytically since both equations are simple enough to be integrated for this case $M_\infty = 1.0$). The small parameter $1\text{-}M_\infty^2$) plays an important role in specifying the shape of the boundary surfaces for external axi-symmetric steady flow of interest for design. A Navier-Stokes solver was used to compute the inviscid flow to confirm our results in the region over the surface where the small perturbations apply.

MODIFICATION AND CALIBRATION OF THE NAVAL POSTGRADUATE SCHOOL ACADEMIC WIND TUNNEL

Robert L. Baldocchi-Lieutenant, United States Navy
B.S., United States Naval Academy, 1983
Master of Science in Aeronautical Engineering-December 1992
Advisor: Louis V. Schmidt-Department of Aeronautics and Astronautics

Since the early 1980s, the Academic Wind Tunnel has operated with only one half its designed power section. Resultant flow qualities have limited the use of this facility. A damping screen was installed in the settling chamber to reduce the level of turbulence intensity in the tunnel. Following this modification, calibration measurements in the vertical centerplane were performed to document flow conditions in the test section. The tunnel calibration investigated lateral pressure variations, flow angularity, and turbulence intensity and included an airspeed calibration. When available results were compared to data from calibrations performed before the tunnel modification. Results indicate the total and static pressure lateral variation is within 1.0%, angular variation of approximately $\pm 1.0°$ exists in the test section, and a 25.0% reduction in turbulence intensity was obtained due to the presence of the damping screen. Flow separation in the diffuser is believed to be influencing total pressure oscillation in the test section.

A COMPARATIVE FLOW VISUALIZATION EVALUATION OF A COANDA CYLINDER AND ELLIPSE

Clayton E. Brown-Captain, United States Army
B.S., United States Military Academy, 1983
Master of Science in Aeronautical Engineering-September 1993
Advisor: E. Roberts Wood-Department of Aeronautics and Astronautics

Two acrylic models were constructed for the purpose of comparing water flow through and around the models in the Naval Postgraduate School Flow Visualization Water Tunnel. Both models, a cylinder and a fifty percent ellipse, were constructed with variable tangential slots along the longitudinal axis to allow water to be injected into and through the models for Coanda effect research. Since the models were made of translucent acrylic, both internal and external flows could be observed, with and without the Coanda effect present. Results showed that the point of flow separation on the models could be varied by angle of attack, slot height and internal and external flow velocity. Results also showed that after the point of boundary layer attachment was made, the attachment was relatively stable, and not subject to minor angle of attack, or flow variations. Recommendations for further study are made.

A FINITE WAKE THEORY FOR TWO-DIMENSIONAL ROTARY WING UNSTEADY AERODYNAMICS

Mark Allen Couch-Lieutenant, United States Navy
B.S., Purdue University, 1984
Master of Science in Aeronautical Engineering-September 1993
Advisor: E. Roberts Wood-Department of Aeronautics and Astronautics

The unsteady aerodynamic forces and moments of an oscillating airfoil for the fixed wing case were determined by Theodorsen along with the development of a lift deficiency function. Loewy subsequently developed an analogous lift deficiency function for the rotary wing case in which there are an infinite number of layers of shed vorticity, or wakes, below the reference airfoil. With the advent of computer panel codes that calculate the time histories of the wakes generated by oscillating airfoils, a theory is developed for the rotary wing case in which there are a finite number of layers of shed vorticity below the reference airfoil. This theory includes a lift deficiency function that is completely analogous to Loewy and Theodorsen. It has long been recognized that an airfoil oscillating in pure plunge produces a propulsive force ("Katzmayr effect"). Garrick used Theodorsen's work to develop equations for the propulsive force that included the lift deficiency function as a parameter. When either Loewy's lift deficiency function of the finite wake lift deficiency function is used, the effect of the propulsive force is greatly enhanced with the proper phase relationship of the wakes. The finite wake theory along with Garrick's work is used to describe the performance characteristics of Higher Harmonic Control. Specifically for the OH-6A, coupled pitch-plunge motion results in a propulsive force that significantly reduces the rotor drag force.

UNSTEADY AIRFOIL FLOW SOLUTIONS ON MOVING ZONAL GRIDS

Antonio M. Cricelli
B.S., Penn State University, 1987
Master of Science in Aeronautical Engineering-December 1992
Advisors: John A. Ekaterinaris-NASA Ames Research Center &
Max F. Platzer-Department of Aeronautics and Astronautics

Subsonic and transonic steady and unsteady flowfields over airfoils are investigated with the numerical solution of the governing equations. This study aims to enhance the performance of rotary wing and fixed wing aircraft by better understanding and by taking advantage of unsteady phenomena such as dynamic lift. In the past few years many advances have been made in algorithm development for the numerical solution of the Euler and the Navier Stokes equations. In this study, these new zonal techniques are applied. A zonal approach is more computationally efficient in solving the governing equations than previous approaches, and has certain advantages over the standard single moving grid approach. The zonal grid consists of two grids, one being the inner grid which is fixed to the airfoil, and the other being the outer grid which extends to the far field or to a specified outer boundary. The inner grid is allowed to rotate with the body, while the outer grid remains fixed. The thin-layer Navier-Stokes equations are solved for the inner grid, while the Euler equations are solved for the outer grid. Communication between the two grids is accomplished by interpolating the flow quantities at the zonal interface. Solutions are obtained for flows at fixed angles of incidence, and for unsteady flows over pitching and oscillating airfoils. The computed results are in good agreement with available experimental data.

PREDICTING RADIATION CHARACTERISTICS FROM ANTENNA PHYSICAL DIMENSIONS

Daniel Scott Dietrich-Lieutenant, United States Navy
B.A., Franklin and Marshall College, 1984
Master of Science in Aeronautical Engineering-December 1992
Advisor: R. Clark Robertson-Department of Electrical and Computer Engineering

This report explains the fundamental theory and equations used in writing a set of software applications which predict antenna radiation parameters. Each application predicts the radiation characteristics of a particular type of antenna over a planar surface which serves as a model of either earth or seawater. The radiation parameter predictions are based solely on an antenna's physical dimensions, the properties of the underlying surface, and electromagnetic theory. Existing electric field equations provide the basis for radiation parameter predictions, and the accuracy of the predicted radiation parameters is totally dependent upon the extent to which the electric field equations used realistically model the actual radiated electromagnetic fields of the antennas. In addition to a review of applicable electromagnetic field theory, this report is also intended to be a user's guide for the corresponding computer applications. The appendices contain computer hardcopies of sample calculations for several antenna types and remarks regarding the conformity of predicted radiation parameters to expectations. Radiation parameters computed thus far are consistent with expectations based on other computational programs and empirical measurements.

THREE-DIMENSIONAL FIBER-OPTIC LDV MEASUREMENTS IN THE ENDWALL REGION OF A LINEAR CASCADE OF CONTROLLED-DIFFUSION STATOR BLADES

David Michael Dober-Lieutenant, United States Navy
B.S., United States Naval Academy, 1983
Master of Science in Aeronautical Engineering-March 1993
Advisor: Garth V. Hobson-Department of Aeronautics and Astronautics

Measurments were taken of the vortex system that results from the interaction between a stator blade tip and the approaching endwall boundary layer in a linear cascade of controlled-diffusion compressor stator blades. Measurements were taken at Reynold's numbers based on stator blade chord of 240000 and 711000. Total pressure measurements were first conducted upstream and downstream of the controlled-diffusion stator blades. The approaching boundary layer was characterized and the downstream vortex locations were approximated. Upstream and downstream three-dimensional fiber-optic LDV surveys were then conducted to observe the velocity profiles of the approaching boundary layer and to map the location and velocity characteristics of the downstream vortex system. Results clearly show the effect that the overall secondary flow in the blade passage has on the location of the two oppositely rotating vortices. The downstream flow characteristics were also shown to be periodic.

A KINEMATIC UPGRADE TO AN INFRARED AIR-TO-AIR MISSILE WITH DUAL-INTERRUPTED-THRUST TECHNOLOGY AND ITS EFFECT ON LETHALITY

Andrew John Dobrei-Captain, Canadian Air Force
B.Eng., Royal Military College of Canada, 1987
Master of Science in Aeronautical Engineering-June 1993
Advisor: Robert E. Ball-Department of Aeronautics and Astronautics

This study determines the increase in the kinematic performance and lethality of a generic Short-Range Air-to-Air Missile (SRAAM) due to the introduction of Dual-Interrupted-Thrust (DIT) technology to the missile motor. Data for the study was collected using the U.S. Air Force Trajectory Analysis Program (TRAP). The SRAAM modeled was similar in capability to the AIM-9 Sidewinder currently in U.S. and Canadian Forces (CF) inventories. Quantification of kinematic performance was based on Performance Indices (PIs) which took into account range and time of flight constrained by a maximum miss distance (the lethal radius of the warhead) for seven selected scenarios. Comparison of missile lethality was based on the ratios of the distances between the outer and inner launch boundaries for the generic and modified SRAAMs. The results showed that DIT technology improves the kinematic performance and lethality of a SRAAM, provided the missile is not "seeker limited", i.e., the lethality benefits are greatest for rear aspect and shoot-up engagements.

PRELIMINARY DESIGN OF A WATER COOLED AVIONICS COOLING RACK

Colleen Laverna Ellis-Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1982
Master of Science in Aeronautical Engineering-March 1993
Advisor: Allan D. Kraus-Department of Electrical and Computer Engineering

Military electronics are frequently operated in excessively confined spaces aboard ships and aircraft. This limited space impacts significantly on the space available for cooling equipment. The optimal solution is the development of one universal, modular rack for shipboard or aviation use. With a modular design, upgrades to equipment could also be accompanied by an upgrade to the cooling rack itself with very little additional cost or difficulty. A water cooled avionics rack can provide sufficient cooling for any piece or combination of avionics equipment if enough water flow paths are used, the water is at the appropriate temperature and the water is properly distributed within the passages. To determine if the cooling medium, water, is sufficiently distributed within a modular cooling rack, an analysis of the flow and pressure distribution of the coolant is required. This thesis presents a computer code that has been developed as an initial step in the total design of a modular cooling rack for avionics equipment. In itself, the code details a specific design technique and allows for the determination of whether a proposed configuration, including source location, characteristics of the cooling water, and the size and shape of the proposed flow passages will indeed provide a proper distribution of the coolant.

ACQUISITION, DESIGN MODIFICATION, ASSEMBLY, AND GROUND TEST OF NPS HUMMINGBIRD REMOTELY PILOTED HELICOPTER

Gregory J. Fick-Lieutenant, United States Navy
B.S., University of Notre Dame, 1986
Master of Science in Aeronautical Engineering-September 1993
Advisor: E. Roberts Wood-Department of Aeronautics and Astronautics

The *Hummingbird* is a 150-lb. gross weight, remotely piloted helicopter (RPH) with a 50-lb. payload and a rotor radius of 10.25 ft. It is powered by a 25 h.p. air cooled two-cylinder Westlake engine. As such it represents one of the largest RPH's in the world. It was purchased from Gorham Model Products in 1992 to provide a suitable rotor craft research flight test platform for the Department of Aeronautics and Astronautics at the Naval Postgraduate School. The helicopter was delivered disassembled and was accompanied by an ample supply of replacement and spare parts. Also included was a second helicopter in a partially assembled condition that had been previously flown. Assemblies provided comprised the chassis, main rotor transmission, rotor head assembly and tailboom with tail rotor gear box and rotor. The task undertaken by this thesis was to fabricate one complete fully operable RPH and to design, fabricate and install whatever new assemblies that were required for its NPS mission and to make up for deficiencies in the previous design. The work completed required: (1) Design, fabrication and installation of a new skid-type landing gear system; (2) Redesign, and incorporation of a new engine mount system; (3) Modification of the engine and main rotor transmission coupling; (4) Upgrade of the electrical system and elongation of the nose section; and (5) Conduct initial engine run. Recommendations for future modifications to the helicopter and laboratory facilities, and development of a static hover test fixture are also included.

MISSILE DESIGN PC TRAP: AN IMPROVED PC TRAP FOR TACTICAL MISSILE DESIGN

Joseph Jean-Paul Daniel Gibeau-Captain, Canadian Air Force
B.Eng., Royal Military College of Canada, 1987
Master of Science in Aeronautical Engineering-September 1993
Aeronautical and Astronautical Engineer-September 1993
Advisor: C. F. Newberry-Department of Aeronautics and Astronautics

The Missile Design Personal Computer Trajectory Analysis Program (Missile Design PC TRAP) is a simple and compact multi-purpose tactical missile simulation program that runs quickly on any IBM-compatible personal computer. It is an improved version of the USAF PC TRAP computer program, in that it adds guidance laws, simulates two extra intercept scenarios (surface-to-air and air-to-surface) and provides more simulation options, such as flight envelope generation and Monte Carlo simulations. Missile Design PC TRAP is proposed as a substitute for complex main-frame simulation models, such as TRAP for conceptual and preliminary missile design phases, trade-off studies, academic purposes, and military operational applications. Missile Design PC TRAP can simulate the launch aircraft, the target and the missile in three-dimensions as point mass vehicles in air-to-air, surface-to-air, or air-to-surface intercept scenarios. Real time graphics display of the vehicle trajectories is available. Seven tactical missile guidance laws are derived, detailed and implemented into the Missile Design PC TRAP algorithms. The missile aerodynamic, propulsion, and physical characteristics are estimated from a small amount of input data. The program can simulate one-on-one engagements, generate launch envelopes in two planes, and perform Monte Carlo simulations with random initiation of the selected target evasive maneuvers. Its computing time is generally less than real time on a 486 33Mhz personal computer chip. Comparison to missile flight paths generated by Missile Design PC TRAP and a more complete simulation program (TRAP) shows agreement between the simulation results. A complete description of the algorithms is offered, as well as a comprehensive user's manual.

AN APPARATUS FOR MEASUREMENT OF IGNITION AND BURNING CHARACTERISTICS OF METALLIC PARTICLES

Stephen Gulakowski-Lieutenant, United States Navy
B.A., Washington and Jefferson College, 1986
Master of Science in Aeronautical Engineering-September 1993
Advisor: D. W. Netzer-Department of Aeronautics and Astronautics

An apparatus was designed for use in determining ignition and combustion characteristics of metallic fuel particles and liquid fuel droplets. The design was tailored around the available data acquisition systems and diagnostic instruments. The apparatus consisted of a small windowed combustion bomb, a CO_2 laser for particle ignition, a thermal imaging camera for recording the ignition process, a helium-neon laser and a 1024 element linear diode array sampled at 1Mhz for measuring forward scattered light and determining particle size (Fraunhofer diffraction). All major components were individually utilized. However, equipment limitations prevented actual use of the system for measurement of the burning rates of particles. Recommendations are made which would permit the original objectives to be met.

TESTING A WHEELED LANDING GEAR SYSTEM FOR THE TH-57 HELICOPTER

Nancy Lynne Heckman-Lieutenant, United States Navy
B.S., United States Naval Academy, 1985
Master of Science in Aeronautical Engineering-December 1992
Advisor: Ramesh Kolar-Department of Aeronautics and Astronautics

Using the main gear from a Cessna 182 and the nose gear from a Grumman AA1-B, a comparison with the skid gear currently installed on the TH-57 helicopters was conducted. The initial comparison was done using a structural analysis program, GIFTS, to simultaneously analyze and compare the gear systems. Experimental data was used to verify program results. Experimental testing was conducted for further code validation and analysis of each system's advantages and disadvantages. While the benefits of a wheeled system merit further study, the system analyzed requires modification to eliminate premature failure of the nose wheel attachment tube.

COMPUTATIONAL INVESTIGATION OF THE COMPRESSIBLE DYNAMIC STALL CHARACTERISTICS OF THE SIKORSKY SSC-A09 AIRFOIL

Thomas A. Johnston-Commander, United States Navy
B.S., United States Naval Academy, 1978
Master of Science in Aeronautical Engineering-September 1993
Advisor: M. F. Platzer-Department of Aeronautics and Astronautics

Steady and unsteady two-dimensional flowfield analysis was conducted for a Sikorsky SSC-A09 airfoil in compressible, high Reynolds number flows. Limited verification with experimental measurement was achieved. Computational methods included a steady, linear panel method with compressibility corrections; a laminar and turbulent boundary layer method; an unsteady, linear panel method; and a numerical solution method of the thin layer, compressible, Navier-Stokes equations using a body-fitted C-type computational grid. The Baldwin-Lomax, two-layer, zero-equation turbulence model was used. Wind tunnel wall interference effects were ignored. Steady and unsteady airloads and instantaneous flow pictures are presented. In steady flow with little or no separation, computed lift, drag, pitching moment, and skin friction coefficients, as well as displacement thickness and boundary layer velocity profiles at several angles-of-attack were generally found to be in good agreement with experimental data.

UNMANNED AIR VEHICLE/REMOTELY PILOTED VEHICLE ANALYSIS FOR LETHAL UAV/RPV

Burke R. Kaltenberger-Lieutenant, United States Navy
B.S., University of Nebraska, 1985
Master of Science in Aeronautical Engineering-September 1993
Advisor: Isaac I. Kaminer-Department of Aeronautics and Astronautics

An investigation was conducted to provide a comprehensive evaluation of current Unmanned Aircraft Vehicle/Remotely Piloted Vehicle (UAV/RPV) systems and its applicability as a lethal weapon system. Numerous systems were evaluated while concentrating on the Department of Defense more prominent programs, the Pioneer UAV, Vertical Takeoff and Landing (VTOL) UAV and BQM-147A (EXDRONE) UAV. Israel has proven time and time again, that UAVs/RPVs, when properly integrated into the combat arena as a lethal weapon system, can contribute significantly at a lower cost with less risk to an aircrew man in a manned aircraft system. In general, the thesis shows many capable UAV/RPV systems designs are available in the market place today. These systems are assessed to determine their viability in the ever changing combat environment.

ANTENNA GAIN LOSS AND PATTERN DEGRADATION DUE TO TRANSMISSION THROUGH DIELECTRIC RADOMES

Karl Allen Klopp-Lieutenant, United States Naval Reserve
B.S., University of Maine at Orono, 1985
Master of Science Aeronautical Engineering-March 1993
Advisor: David C. Jenn-Department of Electrical and Computer Engineering

A computer model for axially symmetric dielectric radomes in the near field of a circular aperture has been developed. This model, based on a method of moments solution for bodies of revolution, is used to determine the electric field pattern of a linearly polarized circular aperture radiating through a dielectric radome. The program is written FORTRAN and can accommodate rotationally symmetric radome shapes. Arbitrary illumination distributions for the aperture can be specified, and phased scanning of the aperture in both azimuth and elevation is allowed. Computational run time has been reduced by taking advantage of mode symmetry. A separate program has been developed to compute gain, and together these programs are used to determine the pattern degradation and gain loss due to the presence of a radome in the near field.

A NON-LINEAR SIMULATION FOR AN AUTONOMOUS UNMANNED AIR VEHICLE

David R. Kuechenmeister-Captain, United States Marine Corps
B.S., The Ohio State University, 1981
Master of Science in Aeronautical Engineering-September 1993
Advisors: Isaac I. Kaminer & Richard M. Howard-Department of Aeronautics and Astronautics

Unmanned Air Vehicles have become increasingly important on the modern battlefield. The restrictive requirement for runways and special equipment to take off and land was partially solved by the vertical take off and landing Airborne Remotely Operated Device, AROD. Work done at the Naval Postgraduate School has modified the AROD to not only land and launch vertically, but to fly horizontally for the majority of the mission. To realize these capabilities, as well as that of autonomous flight, an accurate computer model was required of both the AROD and the avionics test bed aircraft, Bluebird, in order to design the control and navigation systems. High fidelity, non-linear equations of motion were derived in matrix form that represented any six degree of freedom aircraft model, and were then tailored for use on specific aircraft. Computer modeling of the resulting equations of motion, as well as the sensors used on the aircraft, was done using SIMULINK and MATLAB software. The resulting computer model provides a non-linear system of equations, which are easily linearized at any desired flight condition, as required by the proposed control and navigation system design.

INTEGRATION OF DIFFERENTIAL GPS AND INERTIAL NAVIGATION USING A COMPLEMENTARY KALMAN FILTER

Carl W. Marquis, III-Lieutenant, United States Naval Reserve
B.S., Rensselaer Polytechnic Institute, 1985
Master of Science in Aeronautical Engineering-September 1993
Advisor: Isaac I. Kaminer-Department of Aeronautics and Astronautics

Precise navigation with high update rates is essential for automatic landing of an unmanned aircraft. Individual sensors currently available - INS, AHRS, GPS, LORAN, etc. - cannot meet both requirements. The most accurate navigation sensor available today is the Global Positioning System or GPS. However, GPS updates only come once per second. INS, being an on-board sensor, is available as often as necessary. Unfortunately, it is subject to the Schuler cycle, biases, noise floor, and cross-axis sensitivity. In order to design and verify a precise, high update rate navigation system, a working model of Differential GPS has been developed including all of the major GPS error sources - clock differences, atmospherics, Selective Availability and receiver noise. A standard INS system was also modeled, complete with the inaccuracies mentioned. The outputs of these two sensors - inertial acceleration and pseudoranges - can be optimally blended with a complementry Kalman filter for positioning. Eventually, in the discrete case, the high update rate and high precision required for autoland can be achieved.

ADAPTATIONS TO "MICROPEP" AND "ROCKET" TO ALLOW PERFORMANCE EVALUATION OF MULTIPLE GRAIN AND/OR AIRBREATHING MOTORS

Aaron Mitchell McAtee-Lieutenant, United States Navy
B.S.A.E., Auburn University, 1985
Master of Science in Aeronautical Engineering-June 1993
Advisor: David W. Netzer-Department of Aeronautics and Astronautics

Adaptations to two existing rocket motor performance computer programs were made. MICROPEP, a FORTRAN program developed by the Naval Air Warfare Center Weapons Division, China Lake, California to evaluate theoretical performance of various propellants in rocket motors, was modified to allow calculation of the effects of non-ideal expansion and mixed shifting equilibrium-frozen composition nozzle flow on performance. In addition, the ability to handle vitiated air heaters, to calculate combustion chamber Mach number and to calculate stagnation pressure for airbreathing engines was incorporated. ROCKET, an internal ballistics program written by the Lockheed Corporation and modified by the Naval Air Warfare Center Weapons Division, was updated to purge the program of unused code and allow input of performance losses in both the combustor and nozzle flows.

CLOSE-COUPLED OSCILLATING CANARD EFFECTS ON POST-STALL LIFT ENHANCEMENT

Douglas G. McBane-Lieutenant, United States Navy
B.S., Texas Tech University, 1984
Master of Science in Aeronautical Engineering-June 1993
Advisor: Richard M. Howard-Department of Aeronautics and Astronautics

The effects of an oscillating close-coupled canard on the canard/wing vortex interaction for increased lift enhancement were studied. Two test conditions were studied: the first with a model angle of attack of 22° and the second of 34°. The canard was positioned at three mean deflection angles equal to 4°, 7° and 10° for the model angle of attack of 22° and -4°, -7° and -10° for the model angle of attack of 34°. At each of the canard mean deflection angles, the canard was oscillated with amplitudes of ±5° and ±10° with reduced frequencies ranging from 0.046 to 0.232. Because of the small effects noted which were of the order of accuracy of the balance, only general trends are discussed. The trends indicate that for this particular model configuration and geometry, lift was decreased slightly with increasing canard frequency and amplitude. No-lift-enhancement benefits were revealed during the study.

PROCEDURAL GUIDE TO MODELLING AND ANALYZING THE FLIGHT CHARACTERISTICS OF A HELICOPTER DESIGN USING FLIGHTLAB

Gary P. McVaney-Major, United States Army
B.S., United States Military Academy, 1980
Master of Science in Aeronautical Engineering-September 1993
Advisor: E. Roberts Wood-Department of Aeronautics and Astronautics

This thesis presents one method for modelling and analyzing a helicopter design using Flightlab. Flightlab is a computer program that provides for engineering design, analysis and simulation of aircraft using non-linear dynamic modeling techniques. The procedure to model a single main rotor helicopter is outlined using the sample helicopter design in the book "Helicopter Performance, Stability, and Control" by Ray Prouty. The analysis procedure contains computer program scripts for determining the time response of the helicopter to standard control inputs such as longitudinal impulse, a lateral step, and a pedal doublet. A linear model of the helicopter can be extracted from the non-linear model, and a comparison of the time response to the control inputs based on these two models is presented. The procedure for conducting frequency sweep testing for the linear model is also discussed. This guide to using Flightlab for aircraft modeling and analysis is designed to make it easier to use Flightlab for creating additional aircraft models for use in control system analysis and additional engineering design.

CONTROL VANE GUIDANCE FOR A DUCTED-FAN UNMANNED AIR VEHICLE

Patrick J. Moran-Lieutenant Commander, United States Coast Guard
B.S., United States Coast Guard Academy, 1981
Master of Science in Aeronautical Engineering-June 1993
Advisors: Richard M. Howard & Michael K. Shields-Department of Aeronautics and Astronautics

Control of airborne vehicles was originally conceived to be done entirely by human pilots. Improvements in electronics in the last 50 years have allowed many flight control functions to become automated, with the pilot continuously monitoring flight parameters from within the vehicle cockpit. With the advent of small unmanned air vehicles (UAV's), which are limited in size and weight-carrying capacity, a pilot is now able to fly an airborne vehicle from a distant ground-fixed position. Miniature electronic instruments control or direct vehicle movements either through pilot commands or autonomously. In order to accomplish reliable, continuous control of a UAV, many sensors are necessary aboard the vehicle. This thesis designed and installed necessary hardware and developed software to guide a UAV's aerodynamic control vanes, with feedback from sensors aboard the vehicle, in order to facilitate ground-based pilot control. Previous thesis work accomplished on this project achieved control of a UAV, names Archytas, in one degree-of-freedom, roll, while mounted on a test stand. Umbilical-controlled guidance of Archytas' control vanes from a forward-mounted sensor pod was set as the goal for this phase of the Archytas project. This work focused on modification of hardware to generate and access required signals, programming of analog-to-digital (A/D) and counter/timer peripheral boards mounted in a personal computer to control electrical and signal flow, and implementation of single-input-single-output (SISO) control equations developed concurrently in another thesis.

SERVICE LIFE PREDICTION OF COMPOSITE STRUCTURES THROUGH FIBER TESTING

Gregory S. Morin-Lieutenant, United States Navy
B.S., United States Naval Academy, 1986
Master of Science in Aeronautical Engineering-September 1993
Advisor: Edward M. Wu-Department of Aeronautics and Astronautics

Increasing the severity of the stress history of a structure reduces it's service life. Feasibility studies to increase the zero fuel weight of the P-3 Orion depend heavily on the resulting decrease in service life of the wing box and airframe. One option of extending the service life of existing aircraft is through the replacement or augmentation of critical structural members with composite materials. Since structural composites do not yet have adequate service life statistics, life predication must be through probability modeling. Such modeling can begin with experimental data on accelerated testing of fiber life under several sustained load levels. This data can be the basis for an appropriate strength-life model of the fiber, which can in turn be related to the strength-life model of the composite by the local-load sharing model. The local load sharing model captures the physical failure sequence of fiber failure within a composite. Such a strength-life model, when combined with structural analysis, can be used to predict an airframe's service life under the changed conditions associated with the zero fuel weight increase.

MODEL FAN PASSAGE FLOW SIMULATION

David Daniel Myre-Lieutenant, United States Navy
B.S.A.E., United States Naval Academy, 1984
Master of Science in Aeronautical Engineering-December 1992
Advisor: Raymond P. Shreeve-Department of Aeronautics and Astronautics

Two-dimensional experimental and numerical simulations of a transonic fan blade passage were conducted at a Mach number of 1.4 to provide baseline data for the study of the effects of vortex generating devices on the suction surface shock-boundary layer interaction. In the experimental program, a probe and traverse system were designed and constructed. A new data acquisition system was adapted to record data from probe surveys and multiple scans of static pressure ports. Impact pressure behind two model fan passages and static pressures across the schock-boundary layer interaction were measured for a design and one off-design flow incidence in a blow-down wind tunnel. The passage shocks were positioned in similar locations by rotating the model to a decreased flow incidence. Fan passage losses were obtained by integrating the probe measurements. The losses compared favorably with a numerical Navier-Stokes solution and one engineering model. Static pressure distributions were also found to compare favorably with numerical results.

PERFORMANCE OF CODED COHERENT FSK LIGHTWAVE SYSTEM WITH NONCOHERENT DETECTION

Thomas Elliott Neely-Lieutenant, United States Navy
B.S., Ohio State University, 1983
Master of Science in Aeronautical Engineering-March 1993
Master of Science in Electrical Engineering-March 1993
Advisors: Tri T. Ha-Department of Electrical and Computer Engineering &
Daniel J. Collins-Department of Aeronautics and Astronautics

The original coherent lightwave systems were expected to offer significant performance gains relative to standard direct detection systems. This expectation has not been realized due to the effects of laser phase noise. The laser phase noise process results in the integration of a random variable that transitions over the integration period from a Gaussian distribution to a uniform distribution. The use of convolutional coding effectively replaces a single bit time, with its mostly noncoherently integrating latter portion, by several more coherently integrating bits. This primary bit-time effect comes in addition to the normal coding effect of efficiently trading bandwidth for error performance. The improvement in performance brought about from coding may enable coherent systems to live up to previous expectation. The contributions of this thesis include the visualization of the phase noise process, the efficient computation of the laser phase noise power factor probability density function, and the computation of performance curves for uncoded and coded systems. Additional sections on coherent lightwave systems and coding provide tutorial information. A potential military application is discussed, along with practical implementation issues.

COMPUTER CODE FOR INTERACTIVE ROTORCRAFT PRELIMINARY DESIGN USING A HARMONIC BALANCE METHOD FOR ROTOR TRIM

Robert Kirk Nicholson, Jr.-Major, United States Army
B.S., United States Military Academy, 1980
Master of Science in Aeronautical Engineering-September 1993
Advisor: E. Roberts Wood-Department of Aeronautics and Astronautics

The Joint Army/Navy Rotorcraft Analysis and Design (JANRAD) computer program was developed to aid in the analysis of helicopter rotor performance, stability and control, and rotor dynamics. JANRAD is an interactive, user friendly program, capable of accurately and quickly solving helicopter design problems at the preliminary design level. The program was written as a collection of MATLAB® script and function files (M-files) using the 386-MATLAB® version 3.5 programming language. The M-file *janrad.m* invokes the user interface routines and calls various analysis modules (M-files) which contain the appropriate analysis and output routines. Each of these modules use a common routine, *trim.m*, which employs blade element theory and a harmonic balance method for rotor trim. The program is limited to conditions of steady flight with no winds and is accurate at a hover and for forward airspeeds greater than to equal to 50 knots.

LASER DOPPLER VELOCIMETRY ACROSS A NORMAL SHOCK IN TRANSONIC FLOW

David Arthur Perretta-Lieutenant, United States Navy
B.S., Marquette University, 1982
Master of Science in Aeronautical Engineering-March 1993
Advisor: Garth V. Hobson-Department of Aeronautics and Astronautics

One-dimensional laser-Doppler velocimetry measurements were taken with standard optics in back scatter mode across a normal shock at a Mach number of 1.35. Back pressure on a blow-down supersonic tunnel was controlled to place a normal shock in a 4 by 4 inch test section and schlieren visualization techniques were used to verify and record shock position and behavior. Velocity surveys were taken across the shock, using various filtering techniques, in an attempt to quantify shock unsteadiness. Additional surveys were performed to further characterize the flow in the test section. The velocity surveys upstream and downstream of the shock compared favorably with pressure and temperature data and normal shock relations. Surveys across the shock indicated distinct and repeatable velocity patterns, and the measured location of the shock matched schlieren photographs.

A NUMERICAL STUDY OF AIRPLANES FLYING IN PROXIMITY

David B. Porter-Lieutenant Commander, United States Navy
B.S.A.E., United States Naval Academy, 1980
Master of Science in Aeronautical Engineering-September 1993
Advisor: Richard M. Howard-Department of Aeronautics and Astronautics

During an emergency such as an unsafe landing gear indication, a second aircraft is often used to perform an airborne visual inspection of the landing gear. The chase airplane may be quite dissimilar in size and wing loading and consequently experience unexpected aerodynamic forces and moments caused by the other airplane. A numerical study of the inherent danger involved with the aerodynamic interaction of aircraft flying in proximity was made using the low-order panel code PMARC (Panel Method Ames Research Center). PMARC validation was made by comparing wind tunnel and analytically-derived stability data for T-34 and F-14 models with PMARC results. A T-34 was then placed at various distances underneath an F-14 to determine changes in lift and pitching moments on the T-34. Color illustrations of pressure coefficients were used to highlight the changes in aerodynamic forces and moments as vertical separation between the two aircraft was decreased. PMARC showed that 4.5 degrees of elevator trim change were required as a T-34 approached to within its semispan of an F-14.

AN APPLICATION OF PARAMETER ESTIMATION TO THE STABILITY AND CONTROL OF THE BQM-147 UNMANNED AERIAL VEHICLE

Patrick J. Quinn-Commander, United States Navy
B.S., Northern Michigan University, 1975
Master of Science in Aeronautical Engineering-June 1993
Advisor: Richard M. Howard-Department of Aeronautics and Astronautics

Parameter estimation methods were used to obtain estimates of stability and control derivatives for the Marine Corps BQM-147 Unmanned Air Vehicle. The results from a simple, PC-based linear model and those from a more robust non-linear model, pEst, were compared. A Cramer-Rao bound was used to assess the accuracy of the estimates for both methods. The bounds were high for both the longitudinal case and the lateral-directional case due to the limited maneuvers tested, high levels of noise in the same general frequency range as the control input, and the lack of body-angle data. The linear model failed to provide estimates for the lateral-directional case. Though the results may be used as starting points for a dynamic model of the aircraft it is recommended that the flight test procedures be modified to address the issues raised concerning noise, recorded signals and the need for repeated maneuvers.

A COMPUTATIONAL AND EXPERIMENTAL INVESTIGATION OF INCOMPRESSIBLE OSCILLATORY AIRFOIL FLOW AND FLUTTER PROBLEMS

Peter J. Riester-Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1981
Master of Science in Aeronautical Engineering-June 1993
Advisor: Maximilian F. Platzer-Department of Aeronautics and Astronautics

In this thesis several incompressible oscillatory flow and flutter problems were investigated. First, a previously developed unsteady panel code was modified so that systematic comparisons with Theodorsen's classical theory could be accomplished. It was found that the panel code is in excellent agreement with the Theodorsen results. Second, the panel code was applied to the analysis of bending-torsion flutter. Again, general agreement with Theodorsen's flutter predictions was obtained. In the experimental part of the thesis two flow visualization experiments were performed. First, the vortical flow patterns generated by an airfoil executing harmonic plunge oscillations was visualized. In the second experiment, the interference effects between a stationary airfoil and a small vane executing plunge oscillations were explored.

FLOW VISUALIZATION AND EXPERIMENTAL OPTIMIZATION OF THREE INLET-SIDE-DUMP LIQUID-FUEL RAMJET COMBUSTORS

Ronald F. Salyer-Major, United States Army
B.S., United States Military Academy, 1981
Master of Science in Aeronautical Engineering-September 1993
Advisor: D. W. Netzer-Department of Aeronautics and Astronautics

Three distinct inlet-side-dump ramjet-combustor geometric configurations were investigated. Non-intrusive water-tunnel flow-visualization techniques were utilized to qualitatively determine optimum flame-stabilization dome lengths and fuel-injection locations. The results were in good agreement with the results from previous studies. The optimum dome lengths which provided good fuel distribution and steady mixing all had lengths between 0.31 D and 1.4 D. Fuel injection in a narrow region on the upstream side of the inlet cross section was the only location capable of distributing fuel into the flame-holding region. Multiple injection locations in the inlet were required to distribute fuel uniformly into the main combustion region. The dual, axially-in-line side-dump configuration demonstrated the best potential for increasing performance across a wide range of operating conditions due to the ancillary combustion region between the inlets and the ability to control the size and strength of the region by varying air mass flow through the two inlet dumps.

A CONCLUDING STUDY OF THE ALTITUDE DETERMINATION DEFICIENCIES OF THE SERVICE AIRCRAFT INSTRUMENTATION PACKAGE (SAIP)

Daniel G. Sergent-Lieutenant, United States Navy
B.S., Seattle University, 1985
Master of Science in Aeronautical Engineering-March 1993
Advisor: Oscar Biblarz-Department of Aeronautics and Astronautics

Previous research at the Naval Postgraduate School addressed the aerodynamic effects that caused the altitude determination errors in the Service Aircraft Instrumentation package (SAIP). This thesis builds on the previous work and focused on establishing a correction for the SAIP using both aerodynamic and atmospheric corrections to the Extended Area Test System (EATS) system evaluator program. By using a quadratic function of Mach number to estimate the Cp, the aerodynamic errors can be reduced to enable the SAIP to measure altitude correctly to within 100 ft for velocities up to Mach 0.8. This correction is used to modify the static pressure read by the SAIP. Further flight tests will have to be accomplished to determine the correction for a range of altitudes and aircrafts. The atmospheric errors can be corrected by analyzing the sounding data generated by the Geophysics Department at Pt. Mugu and substituting actual lapse rate information into the standard altitude equation. This model is shown to predict altitudes to within 200 feet up through 60,000 feet.

FATIGUE LIFE PROGRAM USING STRAIN-LIFE METHODS

Michael V. Skelly-Lieutenant, United States Navy
B.S., Duke University, 1984
Master of Science in Aeronautical Engineering-March 1993
Advisor: Gerald H. Lindsey-Department of Aeronautics and Astronautics

A user friendly program was developed to calculate fatigue life using Strain-Life equations, given either a stress or strain history. Additionally, the material parameters and associated stress concentration factors can be varied. Since certain material constants, such as cyclic strength coefficients (K') and strain hardening exponents (n') vary during a material's fatigue life, the program is capable of either keeping them constant or varying them as a function of elapsed cycles. The program was then utilized to examine the effects of varying K' and n' on the calculated fatigue life of aluminum 7075-T6 under a typical flight load history.

MEAN STRAIN EFFECTS ON THE STRAIN LIFE FATIGUE CURVE

Byron L. Smith-Lieutenant, United States Navy
B.S., Florida Institute of Technology, 1983
Master of Science in Aeronautical Engineering-March 1993
Advisor: Gerald H. Lindsey-Department of Aeronautics and Astronautics

Aluminum 7075-T6 was tested using a Fatigue Material Test System. After creating the monotonic and cyclic stress-strain curves to verify material properties, strain life test data were replicated twenty times each to obtain the statistical description of a standard strain life curve for zero mean strain. The mean strain was then varied to create a total of four statistically described curves. Accounting for the statistical distribution, various characteristics were plotted in order to better understand the effects of mean strain. For example, strain range was plotted against the mean strain for given lives and results were compared to equations in use today that account for mean stress.

MEASUREMENT AND PREDICTION OF THE FLOW THROUGH AN ANNULAR TURBINE CASCADE

Gregory David Thomas-Lieutenant, United States Navy
B.S., Colorado School of Mines, 1985
Master of Science in Aeronautical Engineering-June 1993
Advisor: Garth V. Hobson-Department of Aeronautics and Astronautics

An annular turbine cascade was designed and manufactured for laser Doppler velocimetry and probe measurements in a small-scale rig. The purpose of the experiment was to determine the limitations of these measurements in a confined annulus, and to compare the experimental results with numerical predictions. Downstream probe surveys were conducted at a Reynolds number of 500000. Total pressure and temperature measurements were taken upstream of the test section, and hub static pressure was measured downstream of the cascade. A two-dimensional laser anemometer was used to obtain preliminary velocity field measurements for code validation. The two main problem areas identified were the type of seeding material used and the configuration of the optical access window. Flowfield characteristics were predicted using a three-dimensional viscous code, which were than compared to experimental measurements. The comparison showed that the numerical simulator predicted well the general features of the flow field that were measured in the experiment. Recommendations are made which would improve the mapping of the velocity field for a more complete code validation.

PARAMETRIC STUDY OF A FINITE ELEMENT MODEL OF THE SIDEWINDER MISSILE

Gregory Glenn Van Dyke-Lieutenant, United States Navy
B.S., Southern Utah State University, 1982
Master of Science in Aeronautical Engineering-March 1993
Advisor: Edward M. Wu-Department of Aeronautics and Astronautics

The long-range Maritime Patrol mission has evolved and expanded such that the U.S. Navy's maritime patrol aircraft (P-3C Orion) has become an attractive platform from which to employ a wide variety of air launched weapons. Specifically the need for a stand alone air-to-air defensive capability was identified. In 1989 the Naval Air Test Center at Patuxent River, Maryland began investigation for this through the P-3C/AIM-9 integration program. Naval Postgraduate School responded to this with the construction of a ground vibration test stand and the conduction of a preliminary vibration test stand and the conduction of a preliminary vibrational characterization of the AIM-9 missile. From these tests a two degree of freedom lumped mass model was developed along with the determination of the primary and secondary missile resonant modes in pitch. In addition, a mathematical model of the AIM-9 missile was developed using finite element techniques. This model was used to analytically determine the modal parameters of the missile and set up a modal test system to experimentally verify the model parameters in view of natural frequencies, mode shapes and transient response. This investigation extends the finite element model utility by refining the model structural code to incorporate an improved mass distribution geometry, thus providing more accurate correspondence between observed natural frequencies and model generated modes and performing a parametric study on the model to discover its sensitivity to conformation and material changes. This would anticipate any future missile block upgrades, provide further verification of the finite element model and provide model refinement to more accurately represent the physical structure and behavior. These techniques are inherently missile generic and could, with proper calibration be applied to any weapon to be loaded on any platform. This would provide the Navy with an accurate and cost effective methodology for identifying a potential wing flutter problem prior to ever loading and flying a weapon.

AEW AIRCRAFT DESIGN

Michael John Wagner-Lieutenant Commander, United States Navy
B.S., La Salle College, 1982
Master of Science in Aeronautical Engineering-December 1992
Advisor: Conrad F. Newberry-Department of Aeronautics and Astronautics

The aging E-2C fleet is expected to be retired by the year 2015. In order to provide Airborne Early Warning (AEW) for the battle group during the transitional years and beyond, the design of a replacement aircraft must begin soon. In order to conform with present day economic realities, one possible configuration is a new airframe using the radar system and rotodome which currently operates on the E-2C. Other likely requirements for a new AEW aircraft includes a high-speed (M=0.7-0.85) dash capability, an extended mission time (up to 7.5 hours), turbofan engines, and an aircrew ejection system. The results of this design effort includes an investigation of a possible configuration and the aerodynamics involved. Performance and Stability & Control characteristics are also discussed briefly. Finally, a qualitative analysis of the use of the E-2C's radar system on a new airframe will be presented.

DETERMINING THE EFFECT OF ENDWALL BOUNDARY LAYER SUCTION IN A LARGE SCALE SUBSONIC COMPRESSOR CASCADE

Matthew Allen Webber-Lieutenant, United States Navy
B.S., University of Kansas, 1987
Master of Science in Aeronautical Engineering-March 1993
Advisor: Garth V. Hobson-Department of Aeronautics and Astronautics

An arrangement of suction slots was installed in the Naval Postgraduate School's subsonic cascade wind tunnel. The aim was to improve flow two-dimensionality to enable flow separation of the installed controlled-diffusion blades at high incidence. The slots were located 17.25 inches upstream of the test section. Pressure and laser Doppler velocimetry measurements were made, for a Reynolds number of 711000 and an inlet flow angle of 44.4°, upstream and downstream of the test section to determine the effects of varying suction. The set of baseline inlet flow field measurements was to be used for comparison purposes in future tunnel modifications. The results showed that the tunnel endwall boundary layers were asymmetric for the baseline configuration. Uniform suction was not achieved in both the pitchwise and spanwise directions. However, the axial velocity ratio was reduced by 1.9% and the blade loading increased slightly with increased suction.

A PARAMETRIC ANALYSIS OF ENDOATMOSPHERIC LOW-EARTH-ORBIT MAINTENANCE

Mark S. Wilsey-Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1979
Master of Science in Astronautical Engineering-March 1993
Advisor: I. Michael Ross-Department of Aeronautics and Astronautics

With the advent of long-term low Earth-orbiting satellites comes the requirement to maintain a specified orbital radial band. Optimal control theory suggests that periodic thrusting is more efficient than forced Keplerian motion in orbital maintenance through the use of Primer vectoring. This thesis examined the efficiency of fixed-angle transverse thrusting as an alternative to Primer vectoring. Numerical analysis shows that a thrust angle of 65-70 degrees is feasible for radial band control for a wide range of parameters. Fuel usage can be minimized through the proper selection of radial bandwidth, thruster size, and thrust angle. This thesis shows that forced Keplerian motion is always superior to fixed-angle transverse thrusting from a fuel usage standpoint, and hence that thrust vectoring must be utilized.

LINEAR MODELING OF ROTORCRAFT FOR STABILITY ANALYSIS AND PRELIMINARY DESIGN

Walter M. Wirth, Jr.-Major, United States Army
B.S., United States Military Academy, 1981
Master of Science in Aeronautical Engineering-September 1993
Advisor: E. Roberts Wood-Department of Aeronautics and Astronautics

This thesis investigates linear state space modeling of single main rotor helicopters culminating in a computer program that can be used for 1) stability and control analysis for any single main rotor helicopter or 2) preliminary design of a helicopter. The trim solution for a flight condition is found, the aircraft is perturbed about the nominal point, and the stability and control derivatives are determined. State space models and analysis tools are provided by the program. A notional attack helicopter designed for the 1993 American Helicopter Society Design Competition and a notional utility helicopter are used as examples.

SAFETY ENHANCEMENT OF COMPOSITES VIA PERIODIC PROOF TESTING

Joseph H. Woodward-Lieutenant, United States Navy
B.S., University of New Mexico, 1986
Master of Science in Aeronautical Engineering-September 1993
Advisor: Edward M. Wu-Department of Aeronautics and Astronautics

The development of new composite materials, which lack the historical field data base, has led to the need for an accelerated life testing method applicable to composites. Accelerated life testing by increasing the sustained stress level requires the modeling and validation of a strength-life relation. Proof testing of composite fibers by over-loading is one step in the understanding of the relationship. It is also important in the reliability and safety assurance in deployment of composite structures. A parametric study examined the strength life relation of composite fibers and a methodology to analyze the fiber failures after proof testing. The fiber statistical strength was modeled by a probability of failure model while a deterministic approach was taken while considering individual fibers and the associated life reduction each fiber experienced during the proof testing procedure. Also studied was the distribution of the first failure to occur after proof testing in order to understand the effects of the sustained load and the proof load on fiber life.

LIFT ENHANCEMENT OF A WING/STRAKE USING PNEUMATIC BLOWING

Craig J. Zgraggen-Lieutenant, United States Navy
B.S., Gannon University, 1984
Master of Science in Aeronautical Engineering-March 1993
Advisor: Richard M. Howard-Department of Aeronautics and Astronautics

A low-speed wind-tunnel study to quantitatively measure the lift and drag effects of pneumatically controlling strake and leading-edge vortices generated by a half-span, generic fighter model was conducted. The study measured the increase in lift and drag on the model throughout a range of angles of attack. The study utilized various blowing tubes of different geometries and orientations. Results showed that blowing produced changes in lift with minimal effect on drag. Blowing appeared to reattach flow during the initial stages of stall. Blowing increased lift a maximum of 9 percent at an angle of attach of 20 degrees, and up to 7 percent at angles of attack greater than 20 degrees. Blowing rates were varied from C_μ of 0.0094 to C_μ of 0.022. Near axial blowing produced the largest increases in lift. It was found that lift increases were directly proportional to changes in blowing rate.

MASTER OF SCIENCE
IN
ASTRONAUTICAL ENGINEERING

ANALYSIS OF RADIATION DAMAGED AND ANNEALED GALLIUM ARSENIDE AND INDIUM PHOSPHIDE SOLAR CELLS USING DEEP LEVEL TRANSIENT SPECTROSCOPY

Joseph A. Bruening-Lieutenant, United States Navy
B.S., The Ohio State University, 1982
Master of Science in Astronautical Engineering-September 1993
Advisor: Sherif Michael-Department of Electrical and Computer Engineering

Degradation of solar cell performance from radiation damage was found to be reversed through annealing processes. The mechanisms behind the degradation and recovery is based on deep-level traps, or defects, in the lattice structure of the solar cell. Through a process known as Deep Level Transient Spectroscopy (DLTS), a correlation can be made between damage/recovery and trap energy level/concentration of the cell. Gallium Arsenide (GaAs) and Indium Phosphide (InP) solar cells were subjected to 1 MeV electron irradiation by a Dynamitron linear acceleration at two fluence levels of 1E14 and 1E15 electrons/cm^2. The process of annealing included thermal annealing at 90°C with forward bias current and thermal annealing alone for (GaAs). After each cycle, DLTS measurements were taken to determine the energy level of the traps and their concentration. Multiple cycles of irradiation, and annealing and DLTS were performed to observe the correlation between degradation and recovery to trap energy level and concentration. The results show that the lower energy level traps are associated with the recovery of the cells while the higher level traps are associated with the overall permanent degradation of the cells. Applying this information to future research could allow for significant increases in satellite mission life and potentially increase mission payload.

THERMOELECTRIC COOLER DESIGN

William Earle Clifton-Lieutenant Commander, United States Navy
B.A., University of California at Los Angeles, 1977
Master of Science in Astronautical Engineering-December 1992
Advisor: Allan D. Kraus-Department of Electrical and Computer Engineering

Thermoelectric Cooler Design is a Microsoft Windows program to be used as an aid in the design of thermoelectrcic cooler devices. This program was written to be used to quickly model and compare alternative designs. A couple's optimum coefficient of performance and maximum heat pumping can be quickly determined. Other major features of the program include the ability to change material properties and dimensions of couples, analyze cascaded couples, and graph performance parameters. A brief description of thermoelectric cooler theory, modelling assumptions and complete source code listing is included.

AN EXPERT SYSTEM FOR PROCESSING UNCORRELATED SATELLITE TRACKS

Michael A. Hecker-Lieutenant, United States Navy
B.S., United States Naval Academy, 1979
Master of Science in Astronautical Engineering-December 1992
Master of Science in Computer Science-December 1992
Advisors: Yutaka Kanayama-Department of Computer Science &
I. Michael Ross-Department of Aeronautics and Astronautics

Through an array of ground based radar sights and optical cameras, the United States military tracks objects in near and far Earth orbit. The sensors provide epoch and ephemeris information that is used to update a database of known objects. While a majority of the sensor observations are matched to their corresponding satellites, a small percentage are beyond the capabilities of current software and cannot be correlated. These uncorrelated targets, UCT's, must be manually fitted by orbital analysts in a labor intensive process. As an alternative to this human intervention, the use of artificial intelligence techniques to augment the present computer code was explored. Specifically, an expert system for processing UCT's at the Naval Space Surveillance Command was developed. Rules were generated through traditional knowledge engineering methods and by a novel application of machine learning. The initial results are very good with the operational portions of the system matching the performance of the experts with an accuracy of 99%. Although not yet complete, the code developed in this research definitely shows the potential of using artificial intelligence to process UCT's.

EFFECTS OF THRUST VECTOR CONTROL ON THE PERFORMANCE OF THE AEROBANG ORBITAL PLANE CHANGE MANEUVER

Richard E. Johnson-Lieutenant, United States Navy
B.S., United States Naval Academy, 1984
Master of Science in Astronautical Engineering-June 1993
Advisor: I. Michael Ross-Department of Aeronautics and Astronautics

The aerobang maneuver, one of three types of aero-assisted orbital change methods, holds the possibility of reducing fuel consumption for orbital craft capable of atmospheric entry. It has been previously shown that different types of vehicles provide varying results over a constant heating rate trajectory. Further investigation into the optimization of the aerobang maneuver in this thesis includes the effects of using thrust vector control, the examination of the effects of increasing fuel mass fraction to increase orbital inclination changes, and the effects of that increase on both angle of attack and heating rate. The aerobang maneuver is shown to be capable of significant changes in orbital inclination in either a fixed heating rate or a fixed angle of attack mode for the Maneuverable Reentry Research Vehicle.

MATHEMATICAL MODELING AND CONTROL LAW DEVELOPMENT FOR THE ATMOSPHERIC MONITORING AND CONTROL SYSTEM OF THE CONTROLLED ENVIRONMENT RESEARCH CHAMBER (CERC) AT NASA AMES RESEARCH CENTER

Bruce Howard Mathers-Lieutenant, United States Navy
B.S., University of Colorado, 1982
Master of Science in Astronautical Engineering-December 1992
Advisor: Roberto Cristi-Department of Electrical and Computer Engineering

The objective of this research is to develop a mathematical model and control algorithm for the maintenance of the environmental system within the Controlled Environment Research Chamber (CERC) located at the National Aeronautics and Space Administration (NASA) Ames Research Center, Moffet Field, California. The hypobaric research chamber is currently undergoing renovation as part of the Human Exploration Development Project (HEDP), an effort on behalf of NASA for advanced life support research. A broad overview of the chamber is provided which includes a physical description, preliminary system hardware and associated performance, and potential experimental uses. A mathematical model of the chamber air mass has been developed based on key energy and mass balances. Two methods of adaptive control have been implemented for the coupled control of temperature, oxygen concentration, pressure and humidity within the closed environment. Simulations testing algorithm performance have been conducted, including a step and modified ramp response. The results of the simulations indicate the adaptive methods performed well for the model presented. Further research is required in refining the chamber model for algorithm optimization and validation including the integration of selected hardware dynamics.

PARTICLE BEHAVIOR IN SOLID PROPELLANT ROCKET MOTORS AND PLUMES

J. David McCrorie, II-Lieutenant, United States Navy
B.S., Auburn University, 1985
Master of Science in Astronautical Engineering-December 1992
Advisor: David W. Netzer-Department of Aeronautics and Astronautics

The particle size distribution inside the combustion chamber and the changes that occurred across the exhaust nozzle were measured in a subscale solid propellant rocket motor with a 2% aluminized end-burning propellant grain and a highly underexpanded nozzle. A combination of diagnostic techniques were used. Size distributions in the exhaust plume were determined by a Single particle Counter, a Malvern 2600 ensemble particle sizer, and by Scanning electron Microscope (SEM) examinations of particles collected on a timed exposure impact probe. Size distributions inside the combustion chamber were determined by Malvern 2600 measurements through windows at the nozzle entrance, SEM examinations of particles collected from the nozzle entrance wall, and exhaust plume measurements of a helium quenched motor. It was determined that agglomeration processes dominated in the flow from the center of the combustion chamber up to the nozzle entrance. Particle breakup processes dominated particle behavior from the nozzle entrance, through the nozzle, and into the exhaust.

ACTIVE DAMPING CONTROL OF A FLEXIBLE SPACE STRUCTURE USING PIEZOELECTRIC SENSORS AND ACTUATORS

Scott M. Newman-Lieutenant, United States Navy
B.S., United States Naval Academy, 1984
Master of Science in Astronautical Engineering-December 1992
Advisor: Brij Agrawal-Department of Aeronautics and Astronautics

This thesis details the experimental analysis of an active damping control technique applied to the Naval Postgraduate School's Flexible Spacecraft Simulator using piezoceramic sensors and actuators. The mass property of the flexible arm is varied to study the frequency effects of the Positive Position Feedback (PPF) algorithm. Multi-modal dynamic response is analytically studied using a finite-element model of a cantilevered beam while under the influence of three different control laws: a basic law derived from the Lyapunov Stability Theorem, PPF and Strain Rate Feedback (SRF). The advantages and disadvantages of using PPF and SRF for active damping control are discussed.

OPTIMIZATION AND PERFORMANCE ANALYSIS OF A SUPERSONIC CONICAL-FLOW WAVERIDER FOR A DECK-LAUNCHED INTERCEPT MISSION

David Ray Price-Lieutenant, United States Navy
B.S., United States Naval Academy, 1985
Master of Science in Astronautical Engineering-June 1993
Advisor: Conrad F. Newberry-Department of Aeronautics and Astronautics

An aircraft configuration for a deck launched intercept mission was investigated as part of an on-going waverider study by the Naval Postgraduate School and the NASA Ames Research Center. The mission requirements for the carrier-launched and recovered aircraft included Mach 6 cruise out to a 1000 nautical mile combat radius and 20 minutes of combat followed by return to the carrier. A conical-flow waverider served as the starting point for the aircraft configuration. A hydrocarbon scramjet was integrated with the waverider body. The aft end of the waverider was faired to decrease the base area thereby reducing the transonic base drag. A numerical optimization was then completed to maximize the product of L/D (lift to drag ratio) and I_{sp} (specific impulse). Variables for the optimization included the cone shock angle (used to derive the conical flow waverider) and the geometry of both the waverider body and the integrated propulsion system. The vehicle was constrained to a minimum volume of 3240 cubic feet, a maximum span of 60 feet and a fixed length of 60 feet. The integrated propulsion system was constrained to produce a minimum contraction ratio of 12.0 and assurance that the cowl shock was within an acceptable distance of the inlet shoulder of the combustor. The optimum configuration met or exceeded all constraints. L/D comparisons were made between the integrated configuration (i.e., the subject of this study), pure Mach 6 optimized waveriders and historical trends. Additionally, model design, test media and test parameter selection were studied for planned low speed wind and water tunnel tests as well as performance predictions for the planned wind tunnel tests.

ATOMIZATION AND COMBUSTION OF A GELLED, METALLIZED SLURRY FUEL

Bruce Charles Urbon-Lieutenant, United States Navy
B.S., Ohio State University, 1985
Master of Science in Astronautical Engineering-December 1992
Advisor: David W. Netzer-Department of Aeronautics and Astronautics

Two commercially available atomizers were tested for their ability to atomize a gelled boron slurry fuel. Particle size distributions were measured in non-reacting flow using a Malvern 2600 HSD Laser Diffraction Particle Sizer. A sub-scale ramjet combustor was designed and fabricated which utilized a sudden expansion inlet dump together with inlet air swirl for flame stabilization. An airblast atomizer, produced sufficiently small particles for good combustion, but at the cost of a high pressure drop across the atomizer, making it impractical for use in a slurry fueled ramjet. Sustained steady combustion of the slurry fuel was not achieved using the airblast atomizer. A whistle type ultrasonic atomizer also produced sufficiently small particles and at a much lower pressure drop across the atomizer. Sustained stable combustion was achieved using the ultrasonic atomizer which yielded a combustion efficiency of 76% at 96 psia and an equivalence ration of 0.78.

MASTER OF SCIENCE
IN
APPLIED MATHEMATICS

NUMERICALLY SOLVING A TRANSIENT HEAT CONDUCTION PROBLEM WITH CONVECTION AND RADIATION

David J. Albert-Lieutenant, United States Navy
B.S., University of North Carolina, 1985
Master of Science in Applied Mathematics-June 1993
Advisor: Jeffery J. Leader-Department of Mathematics

The transient surface temperature distribution is determined for the flat plate and sphere subjected to cooling by combined convection and radiation. In the study, the initial boundary value problem is reduced to a singular nonlinear Volterra integral equation of the second kind using the integral transform method. Several numerical techniques are introduced in an attempt to find an approximate solution of the problem: The method of successive approximations, the Runge-Kutta method, and the finite difference method. The integral equation is solved numerically by the Runge-Kutta method of orders 1, 3, and 5. In addition, the finite difference method is implemented to solve the initial boundary value problem, and the solutions are compared with those generated by the Runge-Kutta method. All the numerical results are presented graphically. Limitations and difficulties involved in these schemes are discussed. At the end, a numerical algorithm for solving the problem is proposed.

INTRODUCTION TO CHAOTIC DYNAMICAL SYSTEMS

Michael A. Bernhard-Lieutenant, United States navy
B.S., University of Illinois, 1987
Master of Science in Applied Mathematics-December 1992
Advisor: Ismor Fischer-Department of Mathematics

The emerging discipline known as "chaos theory" is a relatively new field of study with a diverse range of applications (economics, biology, meteorology, etc.). Despite this, there is not as yet a universally accepted definition for "chaos" as it applies to general dynamical systems. Various approaches range from topological methods of a qualitative description, to physical notions of randomness, information, and entropy in ergodic theory, to the development of computational definitions and algorithms designed to obtain quantitative information. This thesis develops some of the current definitions and discusses several quantitative measures of chaos. It is intended to stimulate the interest of undergraduate and graduate students and is accessible to those with a knowledge of advanced calculus and ordinary differential equations. In covering chaos for continuous systems it serves as a complement to the work done by Philip Beaver [Ref. 1], which details chaotic dynamics for discrete systems.

MATHEMATICAL MODEL AND ANALYSIS OF THE TACTICAL UNMANNED GROUND VEHICLE (TUGV) USING COMPUTER SIMULATION

Donald D. Cersovsky-Captain, United States Army
B.S., United States Military Academy, 1984
Master of Science in Applied Mathematics-June 1993
and
Edward Kleinschmidt-Captain, United States Army
B.S., United States Military Academy, 1984
Master of Science in Mathematics-June 1993
Advisors: Bard K. Mansager & Beny Neta-Department of Mathematics

The purpose of this thesis is to mathematically model the Tactical Unmanned Ground Vehicle (TUGV) in the Janus(A) Combat Model. The TUGV has three sensors, an optical, thermal, and acoustic sensor. Algorithms currently exist in Janus(A) for both optical and thermal sensors. An acoustic detection algorithm exists although not available to all Janus(A) system users. This thesis examines the TUGV prototype, explains the Janus(A) TUGV model, discusses existing acoustic detection algorithms, and tests the TUGV model in a scenario driven experiment.

MULTIGRID APPROACH TO SOLVING THE LONG TRANSPORTATION PROBLEM ON A REGULAR GRID IN COST SPACE

Annette P. Cornett-Lieutenant, United States Navy
B.S., University of Southern Colorado, 1984
Master of Science in Applied Mathematics-June 1993
Advisors: Van Emden Henson & Craig W. Rasmussen-Department of Mathematics

Multigrid methods were developed to solve partial differential equations. Research has shown that these methods are applicable to a broader range of problems. This thesis investigates the application of multigrid techniques to minimal cost flow problems, specifically the long transportation problem. This research shows that multigrid techniques can be successfully applied to large-scale long transportation problems posed on a three-dimensional, regular grid in cost space. A V-cycle algorithm is developed for the long transportation problem. Analogies to the multigrid components of restriction, interpolation and relaxation are detailed. Performance of the algorithm is discussed, and computational cost is analyzed. Future research is likely to include the development of more sophisticated restriction and interpolation schemes to provide integer-valued flows, and the development of a method to map an irregularly spaced problem to a regular grid, and to map the regular grid solution back to the original problem domain.

ON A PROPOSED SYMBOLIC DYNAMICS FOR THE HÉNON MAP

Antonio Pietro Fontana-Lieutenant, United States Navy
B.S., United States Merchant Marine Academy, 1985
Master of Science in Applied Mathematics-June 1993
Advisor: Jeffery J. Leader-Department of Mathematics

The utility of a computationally simple yet cryptologically robust rule for generating pseudorandom bitstreams cannot be overstated. In most applications we strive to detect and avoid chaotic behavior; here we embrace a particular chaotic discrete dynamical system to exploit its use as a driver for a pseudorandom number generator. The map from the Hénon attractor to the binary domain {0,1} proposed by Forré/Heyman has been tested cryptologically and statistically with mixed results. In this thesis we mathematically evaluate this symbolic dynamics scheme to investigate more rigorously its utility as a plausible pseudorandom number generator. Specifically, we demonstrate how the property of being one-to-one holds, but hat the property of being onto does not.

ON THE USE OF CHAOTIC DYNAMICAL SYSTEMS TO GENERATE PSEUDORANDOM BITSTREAMS

James E. Heyman-Lieutenant, United States Navy
B.A., Macalester College, 1982
Master of Science in Applied Mathematics-March 1993
Advisor: Jeffery J. Leader-Department of Mathematics

There exist a variety of coding applications that require the generation of pseudorandom bitstreams. Such sequences must meet the conflicting requirements that they be reliably repeatable as well as unpredictable. That is, neither knowledge of a small sub-sequence nor an imperfect knowledge of the initial conditions (i.e., the key) will be sufficient to recover the entire sequence. In this thesis we exploit the inherent unpredictability of a chaotic discrete dynamical system. Specifically, we develop a mapping of the Hénon horseshoe attractor into the binary domain {0,1} and demonstrate that the sequences produced meet specified criteria of pseudorandomness.

AN INVESTIGATION OF LOW MARANGONI NUMBER FLUID FLOW IN A COLD CORNER

Michael Rudolf Huber-Captain, United States Army
B.S., Loyola College, 1982
M.S.E., The Johns Hopkins University, 1984
Master of Science in Applied Mathematics-June 1993
Advisor: David Canright-Department of Mathematics

A large pool of liquid with a horizontal free surface is bounded on one side by a vertical solid wall. The wall is maintained at a cold temperature to a depth of unity, with a warmer temperature below that point. The fluid surface is assumed adiabatic, and average surface tension forces keep the surface flat. Surface tension is assumed to be a decreasing function of temperature, so that the surface thermal gradient associated with the temperature variations drives flow toward the corner. This problem is examined numerically for different Marangoni numbers ranging from 1 to 300 using a Green's function approximation method for the viscous case (in the limit as the Reynolds number approaches zero).

MATHEMATICAL MODEL AND ANALYSIS OF THE TACTICAL UNMANNED GROUND VEHICLE (TUGV) USING COMPUTER SIMULATION

Edward Kleinschmidt-Captain, United States Army
B.S., United States Military Academy, 1984
Master of Science in Mathematics-June 1993
and
Donald D. Cersovsky-Captain, United States Army
B.S., United States Military Academy, 1984
Master of Science in Applied Mathematics-June 1993
Advisors: Bard K. Mansager & Beny Neta-Department of Mathematics

The purpose of this thesis is to mathematically model the Tactical Unmanned Ground Vehicle (TUGV) in the Janus(A) Combat Model. The TUGV has three sensors, an optical, thermal, and acoustic sensor. Algorithms currently exist in Janus(A) for both optical and thermal sensors. An acoustic detection algorithm exists although not available to all Janus(A) system users. This thesis examines the TUGV prototype, explains the Janus(A) TUGV model, discusses existing acoustic detection algorithms, and tests the TUGV model in a scenario driven experiment.

THE RESONANT INTERACTION OF A SUBMARINE'S WAKE WITH A STRATIFIED FLUID

Joseph A. Kowalewski-Lieutenant, United States Navy
B.S., United States Naval Academy, 1985
Master of Science in Applied Mathematics-June 1993
Advisor: Chris L. Frenzen-Department of Mathematics

Through the use of asymptotic and perturbation methods, this thesis presents a theoretical study of the flow of a stratified fluid over variable topography as a model of the resonant interaction of a submarine's wake with a stratified fluid. Such resonant interactions may be able to produce significant upstream disturbances. The long time solution obtained in our model exhibits growth in time for the resonant case, indicating that perhaps nonlinear effects, balanced by dispersion, could cause significant upstream disturbances. These disturbances could allow the possibility of detecting a submarine by the internal waves its wake generates in the resonant case.

PARALLELIZATION OF THE AIR FORCE SPACE COMMAND (AFSPACECOM) SATELLITE MOTION MODELS

Sara R. Ostrom-Lieutenant, United States Navy
B.S., University of Arizona, 1986
Master of Science in Applied Mathematics-March 1993
Advisors: Beny Neta & Don Danielson-Department of Mathematics

The Air Force space command (AFSPACECOM) uses an analytic satellite motion model based on the Brouwer theory, referred to as SGP4, for near-earth objects, and another satellite motion model based on the work of Hujsak, referred to as SDP4, for deep-space objects. These models assist in tracking over 7000 objects around the Earth each day. also, the original satellite motion model used by the AFSPACECOM based on the work of Kozai and Brouwer, known as the Simplified General Perturbations model or SGP, is an analytic model still being used at several sensor sites. Based on the increasing number of space objects that require tracking and the desire for increased accuracy, there is a growing need to reduce computation time in implementing satellite motion models. Parallel computing offers one method to achieve this objective. This thesis investigates the parallel computing potential of SGP, SGP4, and SDP4 using the Intel iPSC/2 hypercube multicomputer. This thesis chooses a parallel algorithm and applies it to SGP, SGP4, and SDP4 for implementation on the hypercube, and reports on the potential reduction in computer time by first considering only the calculational portion of the algorithm and then including the effects of the reading and writing portions. A diskette containing the Fortran software developed is available upon request from bneta@moon.math.nps.navy.mil.

USE OF COMPUTERS IN THE INSTRUCTION OF INTEGRAL CALCULUS

Dennis Arthur Polaski-Captain, United States Army
B.S., United States Military Academy, 1983
Master of Science in Applied Mathematics-June 1993
Advisors: Beny Neta & David Canright-Department of Mathematics

One of the most difficult concepts in the area of integral multivariate calculus is finding the limits of integration. This thesis describes an interactive computer program designed to help students understand this important concept. The program shows how a given domain is plotted and teaches how to find the limits of integration when evaluating two-dimensional integrals. The program allows the user to enter any known information about a region and then evaluates the integral. The region is plotted, the limits of integration are given along with the area of the region. The program handles cartesian and polar coordinate, two-dimensional integral problems. This program could be used independently by the student and/or used by the calculus instructor in the classroom.

MASTER OF SCIENCE
IN
APPLIED SCIENCE

AN EVALUATION OF A TACTICAL ACTIVE MULTI-ENVIRONMENT ACOUSTIC PREDICTION SYSTEM VS MEASURED DATA
Robert Eric Coleman-Lieutenant, United States Navy
B.S., United States Naval Academy, 1987
Master of Science in Applied Science-September 1993
Advisor: Micheal J. Pastore-NRL

This thesis evaluates the capabilities of MAPS (Multi-Environment AIM (Acoustic Interference Monitor) Prediction System) to determine if the system can accurately predict shallow water propagation loss. SHAREM 102 produced real world propagation loss data from the Gulf of Oman that was used to conduct comparison runs using MAPS. It was found that MAPS was an accurate, user friendly, tactical decision aid for littoral shallow water predictions.

EXPERIMENTAL DETERMINATION OF THE SURFACE DISPLACEMENT OF A SMALL FLEXURAL DISK SONAR TRANSDUCER FROM SURFACE STRAIN MEASUREMENTS
Douglas Lee Cuthbert-Lieutenant, United States Navy
B.S., United States Naval Academy, 1985
Master of Science in Applied Science-June 1993
Master of Science in Engineering Acoustics-June 1993
Advisor: Steven R. Baker-Department of Physics

The normal displacement of a flexural disk sonar transducer's radiating face was measured using both a laser doppler vibrometer and surface mounted strain gages. The laser doppler vibrometer measurements were used to calibrate the strain gages, allowing a single measurement of strain to be used to define the displacement over the transducer's entire face. The feasibility of investigating the interaction of closely spaced array elements through the use of surface strain measurements was established by experiments with a submerged two element array. The surface strain, measured as a function of the transducer separation, increases the understanding of sonar transducer element interaction in densely packed array.

A COMPARISON OF ASTRAL AND RAYMODE PROPAGATION LOSS MODELS AND THEIR USE IN AIR ASW PLATFORMS
Michael Thomas Huff-Lieutenant, United States Navy
B.S., Jacksonville University, 1987
Master of Science in Applied Science-September 1993
Advisor: Alan B. Coppens-Department of Physics

The development of new decision support systems for Antisubmarine warfare will entail the installation of propagation loss models on ASW aircraft. The decision to put either a range dependent or range independent model in the system will affect the predicted ranges, the overall probability of detection, and the computation time. Comparisons of the range dependent ASTRAL and range independent RAYMODE propagation loss models were made in the Eastern Mediterranean, the Gulf of Oman and the South China Sea for eight source/receiver/frequency combinations. Computation time differences between the two models were not significant at either of the source frequencies (50 Hz or 400 Hz). RAYMODE showed much better correlation with the split step PE model which was used as a standard. The ASTRAL model often predicted lower transmission losses than either RAYMODE or PE. For the short detection ranges normally encountered in air ASW the more complex range dependent models are not necessary. The RAYMODE model or a comparable range independent model will provide adequate propagation loss predictions.

SCATTERING OF UNDERWATER SOUND FROM A POROUS SOLID SPHERE

Theodore W. L. Huskey-Lieutenant, United States Navy
B.S., United States Naval Academy, 1986
Master of Science in Applied Science-September 1993
Advisor: Steven R. Baker-Department of Physics

An experiment was performed to measure the scattering of underwater sound from a porous solid for the first time. Two porous solid spheres composed of heat-epoxied glass beads of 100 and 500 micron mean bead diameter were used. The permeability, porosity, and shear modulus of each sample were estimated from measurements made on cylindrical samples which had been manufactured at the same time and of the same glass beads as the spheres. These material properties were used as input to a theoretical model for the sound scattered from a poro-elastic sphere imbedded in a poro-elastic host developed by Kargl and Lim. The experimental data were compared to the theoretical calculations. Theoretical calculations with 0%, 3%, and 10% skeletal frame damping were compared to experimental data. Very good agreement between measured and predicted scattering was obtained for each sample over certain frequency ranges, taking 10% frame damping in the calculations. For other frequency ranges the agreement was less than good. No systematic trend in the agreement could be discerned with regard to porous grain size or sound frequency.

A COMPARISON OF PASSIVE PROPAGATION LOSS PREDICTIONS AS GENERATED BY THE TACTICAL ENVIRONMENTAL SUPPORT SYSTEM (TESS V.2.2A) AND ASW TACTICAL DECISION AID (ASWTDA V.2.1.2.1)

William Michael Sawrey-Commander, United States Navy
B.S., Baldwin Wallace College, 1972
Master of Science in Applied Science-March 1993
Master of Science in Engineering Acoustics-June 1993
Advisor: Peter J. Rovero-Department of Oceanography

The United States Navy uses a number of different systems to predict underwater acoustic transmission loss for operational forces. Historically, these systems have used different acoustic models and supporting databases, resulting in significantly different predictions. Major efforts to bring all acoustic models and databases under configuration control in the Oceanographic and Atmospheric Master Library (OAML) have reduced, but not eliminated, differences in acoustic predictions. Comparisons of 1600 transmission loss runs from the AntiSubmarine Warfare Tactical Decision Aid (ASWTDA) and the Tactical Environmental Support System (TESS) were made in the Mediterranean and Sea of Japan for the months of January and July. All inputs to the acoustic models were provided by the respective system databases. Significant differences between ASWTDA and TESS in the areas investigated are evident in regions of complex bathymetry, and these differences become more acute with higher frequency.

MASTER OF SCIENCE
IN
COMPUTER SCIENCE

A RESOURCE CONSTRAINED LOOP PIPELINING TECHNIQUE FOR PERFECTLY-NESTED LOOP STRUCTURES

Thor Davis Aakre-Lieutenant, United States Navy
B.A., Saint Olaf College, 1984
Master of Science in Computer Science-September 1993
Advisor: Amr M. Zaky-Department of Computer Science

This thesis presents a new technique for loop pipelining of perfectly-nested for-loop structures which is designed to optimize loop execution on VLIW machines. Previously implemented loop pipelining techniques provide limited performance benefit because they explicitly include the constraints imposed by a loop's cyclic dependences in their loop pipelining process. Some loop pipelining techniques have also ignored the realistic constraint of finite resource availability in the creation of final pipelined execution schedules. The new approach presented in this thesis eliminates the problem of cyclic dependences by first applying a linear transformation to the nested loop index space to ensure a cycle-free innermost loop, which is then pipelined using modulo scheduling for a known set of resources. The transformation guarantees that the target machine's available resources are the only limit to the amount of exploitable fine-grained parallelism within the innermost loop. This results in pipelined execution schedules having near-optimal Inter-Iteration Initiation Intervals (III) with the achievable performance being scalable with the addition of resources. Consequently, our loop pipelining method utilizes more fine-grained parallelism than other loop pipelining techniques which directly incorporate a loop's cyclic dependences in their pipelining process. We also explicitly provide a procedure for creating the resultant pipelined execution schedules. In addition, we investigate the negative effect that the transformation has on data locality and the cache miss rate, as well as the use of iteration space tiling to restore data locality and cache miss rate to the levels expected from sequential loop execution.

EFFICIENT SCHEDULING OF REAL-TIME COMPUTE-INTENSIVE PERIODIC GRAPHS ON LARGE GRAIN DATA FLOW MULTIPROCESSOR

Cem Akin-Lieutenant Junior Grade, Turkish Navy
B.S., Turkish Naval Academy, 1987
Master of Science in Computer Science-March 1993
Advisor: Amr Zaky-Department of Computer Science

Architectures of computer systems based on Data Flow (DF) concepts attracted great attention as an alternative to conventional sequential architectures (Von Neumann). DF architectures are capable of efficiently exploiting a massive amount of parallelism inherent in many types of computation. They are programmed using directed graphs whose vertices are function modules and whose edges denote data dependencies between function modules. An important subclass of DF is Large Grain Data flow (LGDF) which is efficiently used in computation intensive applications, such as signal processing. Presently, most leadoffs incorporate nondeterministic run-time technique to allocate system resources to support the execution (One such technique could be First Come First Served). Despite the usual simplistic nature of scheduling techniques which, results in a low run-time overhead, the system throughput and predictability could rapidly degrade under high system load. To provide uniform output and improve the resource usage even under a high load, a compile-time technique called Revolving Cylinder (RC) was introduced. In this thesis, we present a LGDF simulator and a Graph restructurer that restructures the given graph according to the RC technique. We then perform a comparative experimental study of the different implementation of RC and the FCFS scheduling techniques. Our results demonstrate that there is a high potential for the RC technique, if a satisfactory node mapping technique is developed.

DESIGN AND IMPLEMENTATION OF A GRAPHICAL USER INTERFACE FOR A MULTIMEDIA DATABASE MANAGEMENT SYSTEM

Metin Balci-Lieutenant Junior Grade, Turkish Navy
Turkish Naval Academy, 1986
Master of Science in Computer Science-September 1992
and
Erhan Saridogan-Lieutenant Junior Grade, Turkish Navy
Master of Science in Computer Science-December 1992
Advisors: Neil C. Rowe & C. Thomas Wu-Department of Computer Science

The purpose of this thesis was to design and implement a graphical user interface for a multimedia database management system prototype previously implemented at the Naval Postgraduate School. Because of complexity of data types and difficulty of manipulating them, it was very hard for a casual user to use the previous system. Since graphical interface using C++ and InterViews 3.0.1 for a Sun-3 workstation under Unix X-Windows environment with mouse support. We then connected this interface to the multimedia database system prototype. Our interface supports incremental query specification using extended SQL and can be connected to database applications in several different ways. An embedded global data structure, a text file or character string can be used for connections. A second version of the interface for a Sun-4 workstation was built and connected to another database system using the character string and text file. This version demonstrated even better performance.

NPSNET: REAL-TIME WALKTHROUGH AND RENDERING OF URBAN TERRAIN

Mark R. Boone
B.S., University of Missouri-Rolla, 1987
Master of Science in Computer Science-June 1993
Advisors: Michael J. Zyda & Dave R. Pratt-Department of Computer Science

The focus of this thesis is performing walkthroughs of urban environments in real-time. This encompasses the environment both inside and outside of the building, whereby a user can traverse the external virtual world and then enter any building and move throughout the interior. While inside the building, the user can see the exterior world via any windows present. The transition from one environment to the other is transparent to the user. The 2D terrain file used as source data is converted and rendered in 3D. This 3D representation of the model can then be used for Military Operations in Urban Terrain (MOUT) training. To help maintain the real-time response, new methods of visibility determination are used to lessen the overall polygon flow through the graphics pipeline. The radiosity lighting model is used for the walkthrough of building interiors.

THE INSTRUMENTATION OF THE MULTIMODEL AND MULTILINGUAL USER INTERFACE

Paul Alan Bourgeois-Captain, United States Marine Corps
B.S., Economics, United States Naval Academy, 1987
Master of Science in Computer Science-March 1993
Advisor: David K. Hsiao-Department of Computer Science

The traditional approach to database-management-system (DBMS) designs focuses upon the implementation of a single data model and its corresponding data language in order to support applications for a given database task. Each of these monomodel and monolingual database systems represents a homogeneous database system, since only one data model-language can be supported on a single database system. The application diversity forces many organizations to operate several different homogenous database systems to support its operations. A different approach to database-system design is the development of a DBMS which supports multiple data models and their data languages. This approach is the focus of the multimodel and multilingual database system (MM&MLDS) as implemented on the Multibackend Database Supercomputer (MDBS). With the proliferation of new data model-languages in the database technology, the objective of MM&MLDS is to incorporate these new data model languages onto the same MDBS. The goal of this thesis is to develop procedures, methods, and tools for the incorporation of new data model-languages into MM&MLDS as new interfaces. Three areas of research are critical to achieving this goal. First, the development of a MDBS user's manual for familiarization as well as instruction for system users. Second, the specification of generic processing algorithms used as a foundation for each module of the new model-language interface. Third, our software methodology considerations for new data model-language interface implementation.

STRUCTURED VERSUS OBJECT-ORIENTED DESIGN OF A NAVY BATTLE GROUP LOGISTICS SIMULATION SYSTEM

Bernadette Clemente Brooks
B.S, Psychology, Georgetown University, 1980
M.A., International Studies, the Johns Hopkins University, 1988
Master of Science in Computer Science-March 1993
Advisor: C. Thomas Wu-Department of Computer Science

This thesis deals with the design of a Navy battle group logistics simulation system to support battle group logistics coordinators. BGLCSS 2.0, the Battle Group Logistics Coordinator Support System, was designed and developed using a structured programming paradigm. A subset of BGLCSS 2.0 was then designed using an object-oriented programming paradigm. We present the components of each of these designs in C and C++. Our approach was to compare and critique these two designs with respect to the extent to which their respective programming paradigms meet the software goals of software reusability and ease of program extension and maintenance. We designed the graphical user interface using TAE Plus which generated code in both C and C++. This mechanism provides an easy way to transport the interface from a C implementation to a C++ implementation in the future. The design of this real world Navy tactical decision aid clearly demonstrate the problems associated with using structured programming paradigm and the benefits of using an object-oriented programming paradigm, especially for large systems.

A PROTOCOL VALIDATOR FOR THE SCM AND CRSM MODELS

Zeki Bulent Bulbul-Lieutenant Junior Grade, Turkish Navy
B.S., Turkish Naval Academy, 1987
Master of Science in Computer Science-June 1993
Advisor: G.M. Lundy-Department of Computer Science

This thesis introduces and describes a software tool called *Mushroom* which automates the analysis of network protocols specified by the Systems of Communicating Machines (SCM) and the Communicating Finite State Machines (CFSM) models. SCM is a formal model for the specification, verification, and testing of communication protocols. This model was originally developed to improve the CFSM model which is a simpler and earlier Formal Description Technique (FDT). The program is developed as two separate programs in the Ada programming language. The first program automates either the system state analysis (*Smart Mushroom*), or the full global analysis *(Big Mushroom)* for a protocol specified by the SCM model. The second program called *Simple Mushroom*, automates the global reachability analysis for the CFSM model. *Mushroom* greatly facilitates the use of these models for protocol design and analysis. The run time and memory efficiency of a previous program was improved to allow the analysis of larger and more complex protocols. The program was also extended to accept up to eight machines (processes) in the protocol specification. The user interface of the program has also been improved. *Mushroom* has been used to verify some well known protocols specified by the SCM and CFSM models such as the token bus protocol, Go Back N and Lap-B data link control protocol.

CONCEPT DEFINITIONS AND SECURITY REQUIREMENTS OF A COOPERATIVE EXECUTION ENVIRONMENT FOR DISTRIBUTED COMPUTING

Terence Edward Busmire-Captain, United States Marine Corps
B.S., United States Naval Academy, 1984
Master of Science in Computer Science-September 1993
Advisor: Timothy J. Shimeall-Department of Computer Science

The problem that this thesis addresses is how to utilize the idle machine cycles of a network of workstations in an efficient, secure manner to accomplish cooperative execution of computationally-intense processes, without adversely affecting the normal use of the network resources by interactive users. The approach taken is to model a supervisory system of processes capable of monitoring the execution of computationally-intense procedures on individual workstations, halting computation and yielding the workstation resources when required to allow direct access by interactive users. The supervisory system will allow computation to resume when user access has ceased. Consideration has been made to maintain the security of network resources accessed by both users and cooperative execution processes. The result is a specification of the requirements for such a system, validated through experimental implementation and operation on a sample application.

DESIGN AND IMPLEMENTATION OF A QUERY EDITOR FOR THE AMADEUS SYSTEM

Turgay Çinçe-First Lieutenant, Turkish Army
B.S., Turkish Land Forces Academy, 1987
Master of Science in Computer Science-September 1993
Advisor: C. Thomas Wu-Department of Computer Science

One side effect of the proliferation of relational databases within a single organization is that sharing of data to access a global information base is difficult. People erroneously assume that since almost all of the commercially available RDBMSs support the *Structured Query Language (SQL)*, sharing of data is easy. Unfortunately, currently available systems only support a specific dialect of SQL. The Amadeus front-end system overcomes the data-sharing problem. With the Amadeus front-end system, database users can use one common language called *Dataflow Query Language (DFQL)* to access heterogeneous RDBMSs. A query specified in DFQL is correctly translated into a SQL dialect that the connected RDBMS recognizes. With this front-end approach, the user can access data from multiple databases by writing a single DFQL query, instead of writing multiple SQL queries. A prototype query builder is reimplemented using an object-oriented design. This component of Amadeus interacts with the user for creating DFQL queries. Adding a connection to a new SQL-based RDBMS requires minimum modification to the code, due to the object-oriented implementation of the query builder. This object-oriented implementation allows the smooth integration of the additional features of the query editor into the older version of Amadeus.

NPSNET: ENVIRONMENTAL EFFECTS FOR A REAL-TIME VIRTUAL WORLD BATTLEFIELD SIMULATOR

Daniel Patrick Corbin-Lieutenant, United States Navy
B.S., Mathematics, University of Florida, 1985
Master of Science in Computer Science-September 1993
Advisor: Michael Zyda-Department of Computer Science

The Computer Science Department at the Naval Postgraduate School in Monterey, California has developed a low-cost real-time interactive simulation system using the Distributed Interactive Simulation (DIS) Protocol, known as NPSNET, that works on commercially available Silicon Graphics IRIS workstations. The DIS protocol has provisions for an environmental effects Protocol Data Unit (PDU), but effects of a changing environment have not been implemented to use it. Furthermore, this lack of environmental effects reduces the realism of the simulations, such as NPSNET, that use the DIS protocol. The challenge in implementing environmental effects such as smoke, dust and the passage of time is to develop a model that users perceive as realistic, but is computationally cheap enough to be used in real-time application. It is the lack of environmental effects, usable in interactive simulations, that we attempt to solve. This thesis focuses on creating a library of visually realistic environmental effects for NPSNET that includes smoke, flames, clouds, lightning, the passage of time and night observation devices. The algorithms were initially derived from physical models, but were found to be too computationally intensive to be used in a real-time application. Thus, it was necessary to simplify the model by depending mainly on visual realism over physical models in creating the effects presented here. The result is a library of environmental effects that are both "visually accurate" and usable in real-time applications.

USEFULNESS OF COMPILE-TIME RESTRUCTURING OF LARGE GRAIN DATA FLOW PROGRAMS IN THROUGHPUT-CRITICAL APPLICATIONS

David M. Cross-Captain, United States Army
B.S.E.E., Rensselaer Polytechnic Institute, 1986
M.S.B.A., Boston University
Master of Science in Computer Engineering-September 1993
Advisors: Shridhar B. Shukla-Department of Electrical and Computer Engineering &
Amr Zaky-Department of Computer Science

In this thesis, Large Grain Data Flow (LGDF) representation of parallelism is applied to throughput-critical applications that process periodically arriving data. The applications are represented by directed acyclic graphs in which a vertex represents an indivisible node program execution and an arc represents data flow from its source node to sink node. The machine and graph parameters are assumed to be such that the time to transfer one unit of data is comparable to the time to execute one operation at a processor. The machine model consists of a set of processors connected to a set of memory modules by a cross-bar interconnection network. Execution of LGDF graphs on such machines either requires a run-time mechanism to dispatch executable nodes on available processors or a compile-time static scheduling of nodes to processors. The former approach, although flexible and robust, suffers from contention-related overhead and the latter, although capable of eliminating contention, is rigid and computationally intensive. It is shown by simulation that throughput can be improved when compile-time graph restructuring is coupled with simple first-come-first-serve dispatching. The restructuring is based on selectively adding control dependencies between graph nodes. This technique, called the revolving cylinder analysis, is shown to be an effective framework for achieving communication/computation overlap and reducing memory contention.

OBJECT RECOGNITION THROUGH IMAGE UNDERSTANDING FOR AN AUTONOMOUS MOBILE ROBOT

Mark Joseph DeClue-Lieutenant, United States Navy
B.S., United States Naval Academy, 1986
Master of Science in Computer Science-September 1993
Advisor: Yutaka Kanayama-Department of Computer Science

The problem addressed in this research was to provide a capability for sensing previously unknown rectilinear, polyhedral-shaped objects in the operating environment of the autonomous mobile robot *Yamabico-11*. The approach to the system design was based on the application of edge extraction and least squares line fitting algorithms of [PET92] to real-time camera images with subsequent filtering based on the environmental model of [STE92]. The output of this processing was employed in the recognition of obstacles and the determination of object range and dimensions. These measurements were then used in path tracking commands, supported by *Yamabico's* Model-based Mobile Robot Language (MML), for performing smooth, safe obstacle avoidance maneuvers. This work resulted in a system able to localize objects in images taken from the robot, provide location and size data, and cause proper path adjustments. Accuracies on the order of one to ten centimeters in range and one-half to two centimeters in dimensions were achieved.

AUTOMATED INTERFACE FOR RETRIEVING REUSABLE SOFTWARE COMPONENTS

Scott Joel Dolgoff-Captain, United States Army
B.S., Lehigh University, 1983
M.B.A., Lehigh University, 1984
Master of Science in Computer Science-September 1993
Advisor: Lucia Luqi-Department of Computer Science

The Computer Aided Prototyping System (CAPS) contains software components described by formal specifications written in the Prototype System Description Language (PSDL). One problem addressed by this thesis is to develop a retrieval mechanism for extracting components that match user-provided PSDL specifications. Another problem addressed is the integration of a retrieved component into a software prototype. The approach taken was to match specifications by comparing operations and parameter types to include indirect subtype relations. Integrating a selected software base component required generating mappings to account for different operation and parameter orderings and, for generics, automatic instantiation. The result was a tool which implements automated assistance for finding reusable components in a large software repository. Methods were developed for parameter and operator mapping, parameter type matching, and ensuring instantiation of a generic was possible. Upon receipt of a PSDL specification query, these methods are employed to automate the retrieval of all matching components and integrate the selected component into the software prototype. This has been fully implemented for operator components and partially implemented for type components. The retrieval mechanism, a potential processing bottleneck, is extremely accurate and reasonably fast. A query on a 1000 component repository retrieved all 50 possible matches in under 3 minutes.

OBJECT-ORIENTED IMPLEMENTATION OF FIELD ARTILLERY TACTICAL DATA SYSTEM

Mustafa Eser-First Lieutenant, Turkish Army
B.S., Turkish Land Force Academy, 1987
Master of Science in Computer Science-September 1993
Advisor: C. Thomas Wu-Department of Computer Science

The U.S. Army lacks a single automated fire support system. The goal of the Army's ongoing project of Advanced Field Artillery Tactical Data System (AFATDS) is to integrate all of its fire power under a single automated system to provide an efficient fire support in the battlefield. AFATDS is being implemented using the language ADA for battalion and above level. The problem for this research is to implement AFATDS for battalion (just for technical fire direction) level and below. In addition, we want to add a Graphical User Interface (GUI), use modern software engineering principles and add multitasking. The approach taken was to apply object-oriented paradigm for the design and development of the battery level of AFATDS using Microsoft Windows' operating environment which provides (non-preemptive) multitasking and a GUI, and Borland C++ as the development tool. The results are as follows: The battery level software of AFATDS is implemented. The GUI provided a better interface which facilitates easier training [Ref. 17]. Multitasking allowed multiple firing missions to execute concurrently which was not possible with BCS. Object-oriented features of Borland C++ provided 60% improvement for GUI development than traditional programming languages.

THE COVERING PROPERTY OF THE OBJECT-ORIENTED DATABASE MODEL DESIGN AND IMPLEMENTATION ISSUES

Todd Gregory Estes-Lieutenant, United States Navy
B.A., University of Rochester, 1986
Master of Science in Computer Science-September 1993
and
Eric Martin Mueller-Lieutenant, United States Navy
B.A., University of California, Davis, 1982
Master of Science in Computer Science-September 1993
Advisor: David K. Hsaio-Department of Computer Science

Inheritance is a necessary condition for construction of an object-oriented data model (OODM), but it is not sufficient. This is because inheritance applies to only one hierarchy. The covering construct meets this deficiency because covering maps an object in one hierarchy to a class of objects in another hierarchy. To date, covering has not been implemented into an existing OODM application. This thesis implements the covering construct into a functioning object-oriented database environment. Implementation was achieved through modification of data constructs and the creation of a user-defined relation linking two or more hierarchies. Using the Multi-model Multi-lingual Database Supercomputer (MDBS), a sample, working application is described illustrating real world applications. The results of this thesis show that the covering property can be implemented into an existing OODM without sacrificing the integrity of the data model. The cross-hierarchical mapping afforded by covering is a powerful construct that expands the capabilities of the model beyond pure inheritance. This makes the OODM suitable for a far wider range of applications. Together, inheritance and covering meet the necessary and sufficient conditions of the OODM.

AN EXPERT SYSTEM FOR HIGH LEVEL MOTION CONTROL FOR AN AUTONOMOUS MOBILE ROBOT

Robert William Fish-Lieutenant Commander, United States Navy
B.S.S.E., United States Naval Academy, 1980
Master of Science in Computer Science-June 1993
Advisor: Yutaka Kanayama-Department of Computer Science

The Computer Science Department at the Naval Postgraduate School in Monterey, California performs research on the control and operation of autonomous mobile robots. One such robot, Yamabico-11, is an excellent test platform for the study of path planning and obstacle avoidance. The ability to operate in an area where unforeseen obstacles are present, and still attain the specified goal, is a highly desirable behavior in an autonomous mobile robot. This thesis takes a step in that direction by proposing and implementing an expert system for high level motion control of the robot. The expert system combines basic path planning routines and advanced obstacle avoidance techniques to direct the robot as it performs the mission.

AN IMPLEMENTATION OF TRAFFIC MONITORING FOR UNIX NETWORK PERFORMANCE MANAGEMENT

Chen-Hua Fu-Captain, Republic of China Army
B.S., National Defense Management College, 1977
Master of Science in Computer Science-March 1993
Advisor: Chin-Hwa Lee-Department of Computer Science

Efficient performance and high throughput are the major goals of the network performance management. How can we achieve these goals? First, it is necessary to know the network traffic situations. This thesis research implements a network traffic query utility for users to monitor the network traffic situations. There are several network traffic situation reports available for users to understand the traffic situation over the network. The network users also can query the network/system status of their respective computer hosts. This information would help users to diagnose the network problems. Realizing the network traffic situation, manager and users can schedule the network applications, reconfigure the network configuration, or reallocate the network resources to improve the network performance and throughput. the Naval Postgraduate School campus network will be used as an example to demonstrate and illustrate the usage of this network traffic query utility.

AN OBJECT-ORIENTED PROGRAM SPECIFICATION FOR A MOBILE ROBOT MOTION CONTROL LANGUAGE

Carl Joseph Grim-Lieutenant, United States Naval Reserve
B.A.S., Capital University, 1985
Master of Science in Computer Science-March 1993
Advisor: Yutaka Kanayama-Department of Computer Science

The Yamabico Research Group at the Naval Postgraduate School is actively pursuing improvements in design and implementations of applications for its family of autonomous mobile robots. This paper describes a new high level language for controlling the Yamabico-11, surnamed OOPS-MML (Object-Oriented Program Specification for a Mobile robot Motion control Language). Conceptual goals included a user friendly, high level interface coupled with an abstract, efficient and compartmentalized architecture to employ a path tracking and motion control application developed at NPS. The result is a robust and flexible robot control system that is intended to be implemented and employed onboard the Yamabico-11.

DESIGN AND IMPLEMENTATION OF AN INTERFACE EDITOR FOR THE AMADEUS MULTI-RATIONAL DATABASE FRONT-END SYSTEM

James Phillip Hargrove-Lieutenant Commander, United States Navy
B.A., University of California, Berkeley, 1981
Master of Science in Computer Science-March 1993
Advisor: C. Thomas Wu-Department of Computer Science

This thesis extends the Graphical User Interface of a prototype multi-relational database front-end system, called Amadeus. System enhancements are realized through the application of Object-Oriented Programming (OOP) and Human-Computer Interface (HCI) design principles. Knowledge gained from each topic has been incorporated into the design and implementation of a Form-based interface for database data entry and display. The focus of this thesis is divided between two issues: the development of a set of tools for creating and using *Form* objects; and the design of the *Form* object itself. Form creation is accomplished using an application program called the *Interface Editor module.* The Interface Editor is one of six modules which, together, comprise the Amadeus system. Form manipulation occurs in a second application which implements basic program methods for controlling data entry and display processes. Design and implementation of this thesis was accomplished using the Prograph programming language and development environment, which provided a basic set of system classes essential to the implementation of the Form object and the Graphical User Interfaces developed for this thesis.

NPSNET: PHYSICALLY BASED, AUTONOMOUS, NAVAL SURFACE AGENTS

John Henry Hearne, Jr.-Lieutenant, United States Navy
B.A., University of North Carolina, 1985
Master of Computer Science-September 1993
Advisor: David R. Pratt-Department of Computer Science

The Computer Science Department at the Naval Postgraduate School in Monterey, California has developed a low-cost real-time interactive simulation system using the Distributed Interactive Simulation (DIS) Protocol, known as NPSNET, that works on commercially available Silicon Graphics IRIS workstations. In NPSNET, vehicular movement is determined by either a script or by control through input devices. A few vehicles have a reactive intelligent capability, but none possess the ability to cooperate and interact with one another. Additionally, there are no ships incorporated into NPSNET. Therefore, the problem addressed by this thesis is to add intelligent, autonomous movement to physically based vehicles in NPSNET. The approach is to use an expert systems tool, CLIPS, to simulate naval surface units, modeled using computer graphics, for evaluating the effectiveness of this control method. The rules were developed and debugged on a test platform and then networked to NPSNET. Under the NPSNET harness, the autonomous forces are handled separately from the main program, thus reducing processor time and allowing for more complex environments. There are several noteworthy accomplishments resulting from this work. First is the ability to interface graphics C functions with CLIPS, actually invoking and controlling graphics programs from the CLIPS prompt. Second is the development of an autonomous agents test bed. The rules from this test bed are then incorporated into the NPSNET autonomous agent control program. Third is the development of intelligent physically based ships which have the ability to maneuver to avoid collisions with static and non-static objects. Fourth, the foundation for future work on rule based simulation is in place. Finally, there are autonomous, physically based naval surface forces that can operate over a DIS network realistically, in real-time.

AN EXPERT SYSTEM FOR PROCESSING UNCORRELATED SATELLITE TRACKS

Michael A. Hecker-Lieutenant, United States Navy
B.S., United States Naval Academy, 1979
Master of Science in Computer Science-December 1992
Master of Science in Astronautical Engineering-December 1992
Advisors: Yutaka Kanayama-Department of Computer Science &
I. Michael Ross-Department of Aeronautics and Astronautics

Through an array of ground based radar sights and optical cameras, the United States military tracks objects in near and far Earth orbit. The sensors provide epoch and ephemeris information that is used to update a database of known objects. While a majority of the sensor observations are matched to their corresponding satellites, a small percentage are beyond the capabilities of current software and can not be correlated. These uncorrelated targets, UCT's, must be manually fitted by orbital analysts in a labor intensive process. As an alternative to this human intervention, the use of artificial intelligence techniques to augment the present computer code was explored. Specifically, an expert system for processing UCT's at the Naval Space Surveillance Command was developed. Rules were generated through traditional knowledge engineering methods and by a novel application of machine learning. The initial results are very good with the operational portions of the system matching the performance of the experts with an accuracy of 99%. Although not yet complete, the code developed in this research definitely shows the potential of using artificial intelligence to process UCT's.

A STUDY OF COMPUTER SECURITY POLICIES FOR THE INDONESIAN NAVY

Antonius Herusutopo-Major, Indonesian Navy
B.E., in Electronics Engineering, Naval Electronics School, 1972
Master of Science in Computer Science-June 1993
Advisor: Timothy J. Shimeall-Department of Computer Science

The Indonesian Navy recognized the need for a computer security program over ten years ago. They published their first computer security regulation in 1981. But that regulation is now obsolete because of the advances in technology and the increased availability of powerful computer systems. As computer systems become bigger, more complicated, easier to use, more interconnected, and more important, they become more vulnerable to hackers, terrorist, and disgruntled employees. This thesis demonstrates the need for an updated computer security regulation. To add in meeting that need, the thesis proposes a security program for the Indonesian Navy that is based on the multilevel trusted computer criteria published by the NCSC in the 'Orange Book', the Canadian Trusted Product Evaluation Criteria and ITSEC. The proposed program includes additional regulations concerning physical security, data security, integrity and availability, and recommended trusted evaluation guide.

A FORMAL PROTOCOL TEST PROCEDURE FOR THE SURVIVABLE ADAPTABLE FIBER OPTIC EMBEDDED NETWORK (SAFENET)

Wayne High-Lieutenant, United States Navy
B.S., Computer Science, University of South Carolina, 1986
Master of Science in Computer Science-March 1993
Advisor: G.M. Lundy-Department of Computer Science

This thesis focuses upon a new method for verifying the correct operation of a complex, high speed fiber optic communication network. These networks are of growing importance to the military because of their increased connectivity, survivability, and reconfigurability. With the introduction and increased dependence on sophisticated software and protocols, it is essential that their operation be correct. Because of the speed and complexity of fiber optic communication networks being designed today, they are becoming increasingly difficult to test. Previously, testing was accomplished by application of conformance test methods which had little connection with an implementation's specification. The major goal of conformance testing is to ensure that the implementation of a profile is consistent with its specification. Formal specification is needed to ensure that the implementation performs its intended operations while exhibiting desirable behaviors. The new conformance test method presented is based upon the System of Communicating Machine model which uses a formal protocol specification of the implementation to generate a test sequence. The major contribution of this thesis is the application of the System of Communicating Machine model to formal profile specifications of the Survivable Adaptable Fiber Optic Embedded Network (SAFENET) standard which results in the derivation of test sequences for a SAFENET profile. The results of applying this new method to SAFENET's OSI and Lightweight profiles are presented.

A REAL-TIME U.S. ARMY TACTICAL TELEPHONE NETWORK MANAGEMENT SYSTEM

Gregory Morris Johnson-Captain, United States Army
B.S., Florida Agricultural and Mechanical University, 1984
Master of Science in Computer Science-September 1993
Advisor: G. M. Lundy-Department of Computer Science

The U.S. Army is currently developing a network management system for theater-level communications called the Integrated System Control. One limitation of this system is the lack of a real-time telephone network monitoring capability. Without this capability, communication commanders will not have a rapid and efficient tool for identifying and diagnosing network outages. The current semi-manual network reporting procedures are slow and error prone. This approach implements a real-time software monitoring system which displays the telephone network's status to the operator. This system allows the operator to locate and diagnose network outages in real-time. The result is an Ada program which receives line-of-sight radio shelter status messages and displays their effects on the network's status. The telephone network is represented by a series of display panels. Each panel provides the user with a different level of network detail, i.e., the network level, nodal level, internodal level, or line-of-sight radio shelter component level. The network's objects (line-of-sight radio shelters, circuit switches, telephone multiplexers, and radio and cable links) are represented by individual display objects. A color scheme is used to indicate a display object's status. This program is tested by simulating status messages via randomly reading a file.

THE RELATIONAL-TO-OBJECT-ORIENTED CROSS-MODEL ACCESSING CAPABILITY IN A MULTI-MODEL AND MULTI-LINGUAL DATABASE SYSTEM

Richard Karl Johnston-Lieutenant Commander, United States Navy
A.B., University of Georgia, 1975
Master of Science in Computer Science-March 1993
Advisor: David K. Hsiao-Department of Computer Science

Conventional *database management systems* (DBMS) are stand-alone, each supporting a single *data model and corresponding data language* (ML). One organization might operate several stand-alone DBMS independently, each of which requires the knowledge of a different ML to operate. The *multi-model and multi-lingual database system* offers a different approach. This system supports multiple MLs in a single database system. Thus, a relational database user of the multi-model and multi-lingual database system can create and manipulate a database according to the relational model and the SQL data language. On the same system, a hierarchical user can create and manipulate a database according to the hierarchical model and DL/I data language, and so on. Besides supporting many different models and languages on a single system, the multi-model and multi-lingual database system also allows the user to access a database created according to one ML as if it were created according to another. Thus, a relational user could manipulate a hierarchical database as if it is relational, i.e., the user would use a relational schema and SQL commands to manipulate a hierarchical database. The base-model and base-language (i.e., hierarchical and DL/I) are invisible to the user. This additional capability is termed the *cross-model accessing capability.* At this time the multi-model and multi-lingual database system supports the following MLs: relational and SQL, hierarchical and DL/I, network and CODASYL-DML, and object-oriented and the object-oriented data language. The system also supports a relational-to hierarchical cross-model accessing capability. The work of this thesis adds to the system a relational-to-object-oriented cross-model accessing capability. A relational user can now access an object-oriented database using SQL commands and viewing the object-oriented database via a relational schema. The thesis analyzes the semantic equivalencies of the relational and object-oriented data models. The analysis is necessary in order to establish the rules for transforming the object-oriented schema into an equivalent relational schema. The work also describes the software design and integration with the existing system and outlines future development steps for new cross-model accessing capabilities.

THE DESIGN AND IMPLEMENTATION OF AN OBJECT-ORIENTED INTERFACE FOR THE MULTIMODEL/MULTILINGUAL DATABASE SYSTEM

Turgay Karlidere-Lieutenant Junior Grade, Turkish Navy
B.S., Turkish Naval Academy, 1987
Master of Science in Computer Science-March 1993
and
John William Moore-Lieutenant, United States Navy
B.S., New Hampshire College, 1983
Master of Science in Computer Science-March 1993
Advisor: David Hsiao-Department of Computer Science

Database design in today's information-intensive environment, challenge the database-system user to adhere to strict and somewhat archaic means, i.e., traditional data models and their data languages, of expressing their database applications. In light of these requirements, the user must purchase the new database system that supports the latest data model and its data language. We design and implement a comprehensive data-model-and-data-language interface which is a simple and yet effective alternative to the costly and cumbersome standard method of purchasing or developing a new database system. Our solution is two-fold. First, we use the concept of a data-model-and data-language interface to an existing database system. This not only eliminates the costs associated with building a separate, stand-alone database system to support each new data model and its language, but also allows for resource consolidation and data duplication elimination. Second, using the data-model-and-data-language interface concept, we design and implement an object-oriented-data-model and data-language interface for the multimodel/multilingual database system.

AN EVALUATION OF A TEST SCHEDULING SOLUTION

Timothy James Kelly-Lieutenant, United States Navy
B.B.A., Wichita State University, 1984
Master of Science in Computer Science-March 1993
Advisor: Timothy J. Shimeall-Department of Computer Science

As recognized in the software engineering process, software testing during development is an aspect that must be improved to accurately predict and reduce probabilities of future software failures. A possible method of improving software reliability is to concentrate on the scheduling of the test process to reduce costs and increase coverage. Software test scheduling is the process of sequencing the test procedures to manage costs and maximize verification and validation of the system being evaluated. Changing the methodologies of software testing by implementing a scheduling process can affect many issues in software testing. Software testing is an evolutionary process; to be effective, the test scheduling problem and solution must be continuously revisited, revised and permitted to change according to the events as they occur. This implies that the test scheduling solution is dependent upon many factors, including software design model, results of previous test(s), and the time and resources available for further testing. This empirical study takes the testing information from a Published Specification and performs a detailed analysis of a scheduled solution. Based on the results of this work, it has been determined that the work and resources required to design and develop a software test schedule outweigh the resulting benefits.

HYPER-NPSNET: EMBEDDED MULTIMEDIA IN A 3D VIRTUAL WORLD

Charles P. Lombardo
M.S., University of Washington, 1988
Master of Science in Computer Science-September 1993
Advisor: Michael J. Zyda-Department of Computer Science

As virtual world systems continue to evolve, the need exists to embed multimedia information into the world so users can query objects for additional information while maintaining frame rates greater than 15 frames per second. The need also exists for software tools to aid in the creation of multimedia documents intended for virtual worlds. This thesis addresses the problems of how to attach/query multimedia information to/from 3D locations in a virtual world and the design of a Graphical User Interface (GUI) to facilitate the creation of multimedia documents. The method chosen is to attach the multimedia information files to fixed 3D locations called Anchors. The anchors can be queried by the user and the multimedia information retrieved. Through the same interface, users can create multimedia documents by creating and/or editing anchor properties. The approach used differs from previous work in that navigation through the virtual world is unconstrained and a variety of information types may be attached to a single anchor. With video running and fully interactive navigation underway, the implementation presented gives rendering performance greater than 15 frames per second for high-end graphics workstations.

DEVELOPMENT OF DYNAMIC, CONTEXT-DRIVEN HELP SYSTEMS

Nancy Jo McClellan-Lieutenant, United States Navy
B.S., Business Administration, University of Kansas, 1984
Master of Science in Computer Science-March 1993
Advisors: Timothy J. Shimeall & David A. Erickson-Department of Computer Science

This thesis develops a methodology to identify and employ elements of the user's context in the help system architecture, thereby improving the response provided by the online help system. Typical online help system structures are static, providing a pre-programmed response to a specific assistance request and are not effected by the dynamics of the user or the task being attempted. A dynamic, context-driven help system has been developed that uses user- and system-based components of the working environment to influence the system access and presentation strategies. The provided response is tailored specifically to the user, based on the user's level of experience and help system command history; and specifically to the situation, based on the task being attempted. The resulting online system provides a more flexible interface that can serve the needs of all types of users and can evolve as the user's skill with the application grows. The dynamic, context-driven help system methodology is explained through design and implementation of a prototype help system for an interactive software environment. TAE+ Help is a help component designed to assist users of the Transportable Applications Environment Plus (TAE+). It is initiated separately from TAE+ but runs concurrently in the XWindows environment. When the user requests assistance, TAE+ Help initiates a dialogue with the user, collecting situational environmental information and employs these dynamics in the help system access process.

THE INSTRUMENTATION OF THE MULTIBACKEND DATABASE SYSTEM

Andrew Perry Meeks-Lieutenant, United States Navy
B.S., Purdue University, 1985
Master of Science in Computer Science-June 1993
Advisor: David K. Hsiao-Department of Computer Science

Most database system designs and implementations are limited to single language (monolingual) and single model (monomodel) database systems. No one database language and model can meet every data processing need. As a result, diverse (heterogeneous) database management systems are used in a large organization. This approach results in more processing cost and less data sharing. Therefore, there is a growing need for a solution to the processing cost and data sharing problems of heterogeneous database systems. One solution is a multimodel and multilingual database system (MM & MLDS) as implemented on the Multibackend Database Supercomputer (MDBS). This solution can support an appropriate language and model corresponding to each set of application requirements. In addition, this solution lends itself to data sharing by not only storing all the data in one kernel data model form, but also by allowing cross-model data accessing. The goal of this thesis is to make the MDBS viable as a kernel database management system. First, we introduce the multimodel, multilingual, multibackend database supercomputer which has been found as a solution towards heterogeneous database sharing. Second, we increase the utilization of MDBS by introducing the system generation software management tool. Finally, we ease the learning curve associated with MDBS by documenting the entire system structure including all the files needed to compile and run the system.

THE DESIGN AND IMPLEMENTATION OF AN OBJECT-ORIENTED INTERFACE FOR THE MULTIMODEL/MULTILINGUAL DATABASE SYSTEM

John William Moore-Lieutenant, United States Navy
B.S., New Hampshire College, 1983
Master of Science in Computer Science-March 1993
and
Turgay Karlidere-Lieutenant Junior Grade, Turkish Navy
B.S., Turkish Naval Academy, 1987
Master of Science in Computer Science-March 1993
Advisor: David Hsiao-Department of Computer Science

Database design in today's information-intensive environment, challenge the database-system user to adhere to strict and somewhat archaic means, i.e., traditional data models and their data languages, of expressing their database applications. In light of these requirements, the user must purchase the new database system that supports the latest data model and its data language. We design and implement a comprehensive data-model-and-data-language interface which is a simple and yet effective alternative to the costly and cumbersome standard method of purchasing or developing a new database system. Our solution is two-fold. First, we use the concept of a data-model-and data-language interface to an existing database system. This not only eliminates the costs associated with building a separate, stand-alone database system to support each new data model and its language, but also allows for resource consolidation and data duplication elimination. Second, using the data-model-and-data-language interface concept, we design and implement an object-oriented-data-model and data-language interface for the multimodel/multilingual database system.

THE COVERING PROPERTY OF THE OBJECT-ORIENTED DATABASE MODEL DESIGN AND IMPLEMENTATION ISSUES

Eric Martin Mueller-Lieutenant, United States Navy
B.A., University of California, Davis, 1982
Master of Science in Computer Science-September 1993
and
Todd Gregory Estes-Lieutenant, United States Navy
B.A., University of Rochester, 1986
Master of Science in Computer Science-September 1993
Advisor: David K. Hsiao-Department of Computer Science

Inheritance is a necessary condition for construction of an object-oriented data model (OODM), but it is not sufficient. This is because inheritance applies to only one hierarchy. The covering construct meets this deficiency because covering maps an object in one hierarchy to a class of objects in another hierarchy. To date, covering has not been implemented into an existing OODM application. This thesis implements the covering construct into a functioning object-oriented database environment. Implementation was achieved through modification of data constructs and the creation of a user-defined relation linking two or more hierarchies. Using the Multi-model Multi-lingual Database Supercomputer (MDBS), a sample, working application is described illustrating real world applications. The results of this thesis show that the covering property can be implemented into an existing OODM without sacrificing the integrity of the data model. The cross-hierarchical mapping afforded by covering is a powerful construct that expands the capabilities of the model beyond pure inheritance. This makes the OODM suitable for a far wider range of applications. Together, inheritance and covering meet the necessary and sufficient conditions of the OODM.

AN AUTOMATED TOOL TO FACILITATE CODE TRANSLATION FOR SOFTWARE FAULT TREE ANALYSIS

Robert Romero Ordonio-Captain, United States Army
B.S., McIntire School of Commerce, University of Virginia
Master of Science in Computer Science-September 1993
Advisor: Timothy J. Shimeall-Department of Computer Science

A safe system is defined as a system that prevents unsafe states from producing safety failures, where an unsafe state is defined as a state that may lead to safety failure unless some specific action is taken to avert it. The problem that this thesis addresses is how to find places in Ada programs where faults are likely to occur during program execution. The approach is to build an automated translation tool that translates Ada programs into a software fault tree. [Lev 83] The tool works as follows: 1). The Ada parser and lexical analyzer calls the Automated Code Translation Tool (ACTT) upon recognition of an Ada statement; 2). The ACTT produces a template representing the statement; 3). The templates are linked together as a software fault tree. The result is a program that takes Ada source code as input and produces a software fault tree as output.

THE DESIGN AND IMPLEMENTATION OF A REUSABLE COMPONENT LIBRARY AND A RETRIEVAL/INTEGRATION SYSTEM

Dogan Ozdemir-Lieutenant Junior Grade, Turkish Navy
B.S., Turkish Naval Academy, 1986
Master of Science in Computer Science-December 1992
Advisors: Yuh-Jeng Lee & Lucia Luqi-Department of Computer Science

Rapid prototyping with automated retrieval of reusable software components is a software development method to construct software systems expeditiously. This thesis describes a tool to enhance the practice of software reuse within the Computer Aided Prototyping System (CAPS). A software base interface provides prototype designers with the means to retrieve components and integrate them into new applications. Reusable components are retrieved from the software base using a formal specification as the search key or through a browser. The specification language used is the Prototype System Description Language (PSDL). The software base stores the reusable components in an object oriented database management system (ONTOS) with an appropriate PSDL specification. Following a query conducted by the PSDL specification, chosen retrieved components are transformed and integrated to the system under development. All software base procedures, including the storage, retrieval, and integration of the components, are conducted through a graphical user interface which is designed to demonstrate and manipulate available software base operations.

SCHEDULING TECHNIQUES FOR MULTIPLE PROCESSOR SYSTEMS IN REAL-TIME ENVIRONMENTS

John Howard Quigg-Captain, United States Army
B.S., United States Military Academy, 1984
Master of Science in Computer Science-September 1993
Advisor: Amr M. Zaky-Department of Computer Science

Directed Acyclic Graph Scheduling is a technique used to implement the real-time execution of Digital Signal Processing applications on multiple-processor data-flow machines that support variable-grained parallelism. The approach used in the Navy's AN/UYS-2 Digital Signal Processor statically schedules an application graph at run-time using a First-Come-First-Served (FCFS) policy. Research by Shukla and Zaky [Shukla 91] developed a new algorithm, the Revolving Cylinder (RC), to ameliorate the inherently non-deterministic output flow of the FCFS scheduling approach currently used in the system. Although the RC technique solved the problem of output-flow determinism there was no broad coverage of other current research in the very specialized field of real-time data-flow machines. This thesis reviews Revolving Cylinder analysis and then surveys, compares, and evaluates research in the field using the review as a baseline for comparison. The RC approach is best at improving the throughput and output flow determinism of a narrow range of applications on a particular architecture. Each of the other approaches offer improvements over RC scheduling in either performance as measured by throughput or through flexibility in applications handled. For each of these improvements, however, significant trade-offs are made and so improvements become relative when they affect system robustness and an ability to handle repeated execution of application graphs. The AN/UYS-2 can implement RC scheduling with a minimum of cost and no hardware reconfiguration and this makes it the best approach for short-term system improvement.

PROOF OF FAULT COVERAGE FOR A FORMAL PROTOCOL TEST PROCEDURE

Michael Alan Randall
B.S., University of Maryland, Baltimore County, 1988
Master of Science in Computer Science-December 1992
Advisor: G.M. Lundy-Department of Computer Science

Due to the speed and complexity of communication networks being designed today, it is imperative to ensure that they operate correctly. Today's fiber optic networks, which can transmit billions of bits per second over thousands of miles, are heavily dependent on sophisticated software and protocols which are becoming increasingly difficult to test. Conformance testing is a method that is used for this purpose: to test the design of a protocol against an implementation of the design. This thesis provides some insight into the conformance testing problem by first providing background on some current protocol test methods, and then focusing on a newer method, which is based on a formal protocol specification. A proof is given that demonstrates the method's error detection capabilities. Two well known local area network protocols, Token Bus and Fiber Distributed Data Interface (FDDI), are used as examples to illustrate how the test method is applied to a specification.

DESIGN AND SPECIFICATION OF THE XPRESS TRANSFER HIGH-SPEED PROTOCOL

David Joseph Sacha-Captain, United States Army
B.S. General Engineering-United States Military Academy, 1983
Master of Science in Computer Science-September 1993
Advisor: G. M. Lundy-Department of Computer Science

The use of fiber optics in high-speed data networks has significantly increased throughput and reliability at the physical layer. Consequently, the transport layer has become a bottleneck to the data transfer potential of high-speed networks. This bottleneck has forced an investigation of transport protocols and standards to be used in future networks. The Xpress Transfer Protocol (XTP) is a transport layer protocol designed to perform efficiently in networks where high data rates, densely packed bit pipes and low bit error rates are normal operating conditions. However, XTP is a relatively new protocol which has not yet undergone extensive testing and analysis to verify its ability to resolve the transport layer bottleneck. In this thesis the specification and analysis of the XTP protocol, using the System of Communicating Machines (SCM) model is presented. A comparison is then made with an alternative high-speed protocol called SNR, originated at AT&T Bell Labs. Based on this study, it is concluded that the XTP protocol provides several mechanisms, such as rate control and extended sequence numbering, that should be included in developing high-speed transport protocols. Furthermore, it is concluded that XTPs flexible characteristics allow for multiple paradigm implementations at the cost of some complexity, making a more complete analysis of this protocol difficult. As work on high-speed transport protocols continues, many of the XTP mechanisms should be considered for inclusion into evolving standards. It is also concluded that there are some critical features for high-speed protocols that are not in XTP. The ideal transport protocol should include these other features such as implicit timers and data blocking.

DESIGN AND IMPLEMENTATION OF A GRAPHICAL USER INTERFACE FOR A MULTIMEDIA DATABASE MANAGEMENT SYSTEM

Erhan Saridogan-Lieutenant Junior Grade, Turkish Navy
Turkish Naval Academy, 1986
Master of Science in Computer Science-December 1992
and
Metin Balci-Lieutenant Junior Grade, Turkish Navy
Turkish Naval Academy, 1986
Master of Science in Computer Science-September 1992
Advisors: Neil C. Rowe & C. Thomas Wu-Department of Computer Science

The purpose of this thesis was to design and implement a graphical user interface for a multimedia database management system prototype previously implemented at the Naval Postgraduate School. Because of complexity of data types and difficulty of manipulating them, it was very hard for a casual user to use the previous system. Since graphical interface using C++ and InterViews 3.0.1 for a Sun-3 workstation under Unix X-Windows environment with mouse support. We then connected this interface to the multimedia database system prototype. Our interface supports incremental query specification using extended SQL and can be connected to database applications in several different ways. An embedded global data structure, a text file or character string can be used for connections. A second version of the interface for a Sun-4 workstation was built and connected to another database system using the character string and text file. This version demonstrated even better performance.

NPSNET: A GRAPHICAL BASED EXPERT SYSTEM TO MODEL P-3 AIRCRAFT INTERACTION WITH SUBMARINES AND SHIPS

Dennis Arvin Schmidt-Commander, United States Navy
B.S.E.E., University of Texas, 1975
Master of Science in Computer Science-June 1993
Advisor: Michael J. Zyda-Department of Computer Science

The Computer Science Department at Naval Postgraduate School in Monterey, California has developed a low-cost battlespace simulation system, known as NPSNET, to work on commercially available Silicon Graphics IRIS workstations. Initial work on NPSNET has concentrated primarily on ground-based forces with only limited work focusing on naval or maritime air forces. With the present movement of the military towards totally integrated joint force operations, there exists a need to expand existing modeling and simulation programs to include all aspects of military operations. This thesis takes a step in that direction by incorporating naval maritime air units into NPSNET, expanding its capability to include naval and Antisubmarine Warfare (ASW) units. This work focuses on several areas of research, including modeling of the P-3 aircraft, aircraft motion control, aircraft ordnance ballistics modeling, interstation networking using the Distributed Interactive Simulation (DIS) protocol and development of an expert system to autonomously control aircraft behavior.

THE STATE TRANSITION DIAGRAM WITH PATH PRIORITY AND ITS APPLICATIONS

Thomas Scholz-Lieutenant Commander, German Navy
Diplom-Kaufmann, Universität der Bundeswehr Hamburg, 1983
Master of Science in Computer Science-September 1993
Advisor: Se-Hung Kwak-Department of Computer Science

The overall software structure of the Naval Postgraduate School Autonomous Underwater Vehicle (NPS AUV) is the Rational Behavior Model (RBM), a tri-level, multilingual software architecture which is based on three levels of abstraction called the Strategic, Tactical, and Execution level. In this study, interests were focussed on the implementation of the Strategic level in CLIPS such that it exhibits the same behavior as the already existing implementation written in Prolog. As a tool for translating a backward chaining version of the Strategic level software (like Prolog) to a forward chaining one (like CLIPS), the State Transition Diagram With Path Priority (STDWP) was introduced in this study. Specifically, STDWP allows *graphical* translation between backward and forward chaining versions of the Strategic level. This research shows empirically that the translation is always possible and that the two versions hold logical and behavioral equivalence. Thus, STDWP bridges two approaches in robot control which are based on forward and backward chaining.

REENGINEERING REAL-TIME SOFTWARE SYSTEMS

Randall C. Scott-Captain, United States Army
B.S., Syracuse University, 1982
Master of Science in Computer Science-September 1993
Advisor: Yutaka Kanayama-Department of Computer Science

The problem this thesis solves is how to reengineer existing real-time applications implemented without software engineering (SE) attributes; with poor modularity and robustness, and that are difficult to read and maintain. The real-time system chosen for this study was the Model-based Mobile robot Language (MML) used on the Yamabico-11 mobile robot, which was implemented without SE attributes. The approach taken was reengineering MML with a focus on improving modifiability while preserving functionality. First, we developed a systematic plan using manual static analysis, then we incrementally reengineered the application with thorough system-level testing. Code review was used to locate and remove dead code, and synonymous and redundant variables and functions (improving modifiability, readability, and robustness). Call-hierarchy tracing was used to gain explicit module restructuring insight for tighter cohesion (improving modifiability, modularity, and readability). Global-variable tracing was used to improve module coupling by localizing and minimizing global variables (improving modularity, readability, and robustness). The results were as follows: A method for applying SE to existing real-time applications after-the-fact called "Reengineering Real-Time Software Systems" was developed, which improves modifiability, modularity, robustness and readability. MML now has improved modularity and robustness, and is easier to read and maintain.

NPSNET: SCRIPTING OF THREE-DIMENSIONAL INTERACTIVE SYSTEMS FOR USE IN THE JANUS COMBAT SIMULATOR

Richard S. Smith-Captain, United States Army
B.F.A., Arizona State University, 1978
Master of Science in Computer Science-September 1993
Advisor: David Pratt-Department of Computer Science

The problems addressed in this thesis are that the combat simulator Janus does not generate combat scenarios in a three-dimensional interface, and that Janus scenarios are incompatible with the three-dimensional NPSNET. Janus' two-dimensionality led in some cases to less realistic path and position selections, and more realism was desired for evaluations of combat systems. The approach to solving the problems was to generate a script file for NPSNET from a Janus combat scenario. Then the scripted scenario was run on NPSNET where interactions between combat systems could be observed in a three-dimensional virtual battlefield. Entities could be maneuvered in NPSNET to create more realistic paths. The maneuvers were written to a script which was then merged with the original Janus scenario. The result of this work is six programs which assemble a Janus scenario into an NPSNET script file; and two programs which write the results of the NPSNET maneuvers into the original Janus scenario. With these programs users can develop or evaluate Janus scenarios from the more realistic perspective of a soldier on the battlefield rather than from an artificial perspective above a two-dimensional battlefield. Also, combat systems can be evaluated in a more realistic environment. These results provided greater realism for an existing combat simulator.

A SOFTWARE ARCHITECTURE FOR A SMALL AUTONOMOUS UNDERWATER VEHICLE NAVIGATION SYSTEM

Clark Daniel Stevens-Lieutenant Commander, United States Navy
B.S., University of South Carolina, 1979
Master of Science in Computer Science-June 1993
Advisor: Se-Hung Kwak-Department of Computer Science

This thesis documents the development of an interim Small Autonomous Underwater Vehicle (AUV) Navigation System (SANS), a self-contained, externally mountable navigation package. The purpose of SANS is to determine the position of a submerged object of interest located by an AUV. The volume of SANS must not exceed 120 cubic inches and total system accuracy of 10.0 meters rms or better is required. An Inertial Navigation System (INS) is implemented to compute the ascent path during transit from an object of interest to the surface. INS hardware components include miniature spin gyroscopes, a compass and a depth transducer interfaced through an analog to digital converter. Global Positioning System (GPS) is used to determine the AUV's location after reaching the surface. The reciprocal of the ascent vector is applied to the AUV's GPS position to accurately determine the location of the target of interest. A primarily object-oriented software architecture is implemented here with extensive software testing to verify the proper operation of key modules. The objective of this thesis is to quantify the adequacy of the selected components in meeting these requirements and to develop a breadboard design demonstrating the basic functions of the interim SANS. This research concludes that the components selected for the interim SANS meet the accuracy requirements provided the AUV maintains a climb angle which is equal to or steeper than 12 degrees from a typical mission depth of 20 meters.

A GRAPHICAL USER-INTERFACE DEVELOPMENT TOOL FOR INTELLIGENT COMPUTER-ASSISTED INSTRUCTION SYSTEMS

Francius Suwono-Lieutenant Colonel, Indonesian Air Force
B.S. Aeronautics, Indonesian Air Force Academy, 1969
Master of Science in Computer Science-September 1993
Advisor: Neil C. Rowe-Department of Computer Science

An interactive graphical interface helps intelligent computer-assisted instruction systems, because many applications can be well represented by graphic objects. One approach is a facility whereby a teacher constructing a tutor can associate specific graphics with specific predicate-calculus expressions describing a state in a tutoring simulation. This further requires a specification of the arrangement of graphic objects on the screen, how graphic objects can change position with simulation states. It also requires a language for teachers to specify graphic objects. This thesis addresses both. We introduce a broader application of cartoon animation modeling ideas to tutoring, that have been limited so far by the complexity of their implementation. The special tools provided help computer-inexperienced instructors to develop their own cartoon animation modeling tutor without the need of mathematical description of shapes or activities to be represented. The tutor generator used employs means-ends analysis, and the language for the teachers is built using Prowindows, a Prolog extension for object-oriented design.

A CONCURRENT, OBJECT-BASED IMPLEMENTATION FOR THE TACTICAL LEVEL OF THE RATIONAL BEHAVIOR MODEL

Frederick Perry Boynton Thornton, Jr.-Captain, United States Marine Corps
B.A. Duke University, 1983
Master of Science in Computer Science-September 1993
Advisor: S. H. Kwak-Department of Computer Science

The middle, or Tactical, level of the Rational Behavior Model (RBM) is the essential bridge linking the top and bottom levels of the model together. To insure an autonomous vehicle maintains control and thus exhibits rational behavior during such time-consuming tasks as search, homing, and route replanning, the Tactical level must be able to handle concurrency. Until now, this level has been implemented in only a limited way using an object-oriented language and sequential operations. The objective of this thesis is to construct an implementation model that represents the concurrency inherent in the Tactical level within the framework of the design model already developed. The method for building this implementation is to use the Ada *task* construct for concurrency to represent the objects of the design model and their communication with each other. This research creates a Tactical level implementation in Ada for the NPS Autonomous Underwater Vehicle (AUV) simulator that successfully executes a mission scenario involving *transit, search, task,* and *return* phases and the same mission scenario with route replanning. This work thus provides a foundation for future development of concurrent implementations of this level of RBM.

A GENETIC ALGORITHM BASED ANTI-SUBMARINE WARFARE SIMULATOR

Michael Jay Timmerman-Lieutenant Commander, United States Naval Reserve
B.S., United States Naval Academy, 1980
Master of Science in Computer Science-September 1993
Advisor: Man-Tak Shing-Department of Computer Science

This research was aimed at improving the genetic algorithm used in an earlier anti-submarine warfare simulator. The problem with the earlier work was that it focused on the development of the environmental model, and did not optimize the genetic algorithm which drives the submarine. The improvements to the algorithm centered on finding the optimal combination of mutation rate, inversion, rate, crossover rate, number of generations per turn, population size, and grading criteria. The earlier simulator, which was written in FORTRAN-77, was recoded in Ada. The genetic algorithm was tested by the execution of several thousand runs of the simulation, varying the parameters to determine the optimal solution. Once the best combination was found, it was further tested by having officers with anti-submarine warfare experience run the simulation in various scenarios to test its performance. The optimum parameters were found to be: population size of eight, five generations per turn, mutation rate of 0.001, inversion rate of 0.25, crossover rate of 0.65, grading criteria of sum of the fitness values of all alleles while building the strings, and checking the performance against the last five environments for the final string selection. The use of these parameters provided for the best overall performance of the submarine in a variety of tactical situations. The submarine was able to close the target and execute an attack in 73.1% of the two hundred tests of the final configuration of the genetic algorithm.

AN AUTOMATED ADA PHYSICAL SOURCE LINE COUNTER

Kevin John Walsh-Major, United States Army
B.S.C.S., Youngstown State University, 1979
Master of Science in Computer Science-September 1993
Advisor: T. J. Shimeall-Department of Computer Science

Tools to count lines of code have not been standardized or automated in a flexible fashion. This lack of flexibility can lead to ambiguous interpretations of the size of software modules, especially when the person performing the measurement does not use the method or rules expected by the person requesting the measurement. The Software Engineering Institute (SEI) Framework for Size Measurement provides a basis for flexible design of software measurements. The SEI framework describes measurements using nine attributes. This Framework is part of recently proposed DoD guidelines for software process measurement. The problem that this thesis addresses is how to implement the SEI Framework for Size Measurement to flexibility count lines of the code in Ada software. The approach is to build an automated Ada Physical Source Line Counter that measures Ada source files and generates the appropriate reports. The tool works as follows: the user defines the measurement constraints to the tool, which calls an Ada parser to generate counts to be included in user-specified reports. The result is a program that takes user requests and Ada source files and produces measurement reports as output. This program fully captures the flexibility of the SEI framework along five of the nine measurement attributes.

A PORTING METHODOLOGY FOR PARALLEL DATABASE SYSTEMS

Stanley Hugh Watkins-Major, United States Marine Corps
B.S., United States Naval Academy, 1980
Master of Science in Computer Science-September 1993
Advisor: David K. Hsiao-Department of Computer Science

The Multibackend Database Supercomputer (MDBS) pioneered in the Naval Postgraduate School Laboratory for Database Systems Research offers an elegant solution to the four most pressing problems associated with the traditional approach to very large database management systems: capacity growth, performance improvement, data sharing, and resource consolidation. The purpose of this thesis is to develop a theory of systems software portability for this large and complex network application which will facilitate others in the installation and utilization of MDBS. The first challenge is the almost total lack of documentation about MDBS software of use to system porters. A second set of issues revolves around the use of hardware by MDBS, particularly the use of mass storage devices for the storage and manipulation of base- and meta-data. A third challenge concerns the portability of system calls, shell programs, and the C language implementation. A final set of portability issues arises from the extensive use of inter-process and inter-machine communications by MDBS. Our approach to this project involves first analyzing the aforementioned portability issues. This analysis is tested by porting the most advanced version of MDBS software to a different platform supported by different hardware and operating system software. This thesis provides a framework in which to understand and assess specific portability concerns about MDBS. We describe the original routines for accessing the mass storage devices and explain why it was necessary to modify them for portability. We identify and discuss other hardware-specific information coded into MDBS. We identify and correct problems related to the recompilation of the MDBS code on the new platform. We provide a detailed analysis of the requirements for and the implementation of inter-process and inter-machine communications for MDBS. In addition, we expand system debugging features, improve documentation, provide a new demonstration database, and offer advice for future porters of MDBS.

NPSNET IV: A REAL-TIME 3D DISTRIBUTED INTERACTIVE VIRTUAL WORLD

Roy David Young-Captain, United States Marine Corps
B.S., Southern Illinois University, 1987
Master of Science in Computer Science-September 1994
Advisor: Michael J. Zyda-Department of Computer Science

The problems addressed by this research are to develop a new NPSNET simulator to allow simulations with any simulator that complies with the Distributed Interactive Simulation (DIS) protocol; to provide a more realistic simulation by maximizing the use of the Silicon Graphics Inc. (SGI) Reality Engine; and to provide for future extensions to the system. The approach taken for this research was to develop a DIS based simulator. To provide greater realism, Performer, a 3-D toolkit made by SGI was used to take advantage of its multiprocessing management capabilities, real-time scene management, and other rapid rending tools. To enhance the systems extensibility, C++ object classes were used to encapsulate entity behaviors and user inputs. The result of this work is the NPSNET-IV simulation system. This system uses the DIS protocol to interact with other heterogeneously developed simulators as was demonstrated in a week long simulation between NPSNET-IV and two different simulation systems written by the Air Force Institute of Technology. Performer's direct access to the Reality Engine hardware and real-time scene management allows integration of more realistic models and higher rates of movement in the virtual world. The extensibility of the system is enhanced through the use of C++ objects, which was proven by the addition of a submersible vehicle type to the simulation.

MODELING AND SIMULATION OF A DEEP SUBMERGENCE RESCUE VEHICLE (DSRV) AND ITS NETWORKED APPLICATION

Stanley Nelson Zehner-Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1978
Master of Science in Computer Science-June 1993
Advisors: Robert B. McGhee & David R. Pratt-Department of Computer Science

Computer real-time graphical simulations are in great demand. They save time, money and effort in the development of new hardware and training resources. Only recently have advances in computer hardware and software achieved a level which allow realistic simulations to run in real-time. The phenomena we wish to simulate is increasingly complex. This in turn means that the software is becoming increasingly difficult to develop and maintain. The object oriented paradigm is one method of analysis and implementation which addresses the problems of increasing complexity. This thesis examines the object oriented method by applying it to the problem domain of simulating the performance and handling characteristics of a U.S. Navy Deep Submergence Rescue Vehicle (DSRV). It performs an analysis of the key abstractions and implements the resulting design using the object oriented facilities of the C++ computer language.

NPSNET: INTEGRATION OF THE DISTRIBUTED INTERACTIVE SIMULATION (DIS) PROTOCOL FOR COMMUNICATION ARCHITECTURE AND INFORMATION INTERCHANGE

Steven Randall Zeswitz-Captain, United States Marine Corps
B.S., National University, 1987
Master of Science in Computer Science-September 1993
Advisor: David R. Pratt-Department of Computer Science

The Computer Science Department at the Naval Postgraduate School in Monterey, California has developed a low-cost real-time interactive network based simulation system, known as NPSNET, that uses Silicon Graphics workstations. NPSNET has used non-standard protocols which constrains its participation in distributed simulation. DIS specifies standard protocols and is emerging as the international standard for distributed simulation. This research focused on the development of a robust, high-performance implementation of the DIS Version 2.0.3 protocol to support graphic simulation systems (e.g., NPSNET). The challenge was to comply with the standard and minimize network latency thereby maintaining the time and space coherence of distributed simulations. The resulting DIS Network Library consists of an application program interface (API) to low level network routines, a host of network utilities, and a network harness that takes advantage of multiprocessor workstations. The library was successfully tested on our local network and two configurations of a T-1 based internet, the Defense Simulation Internet (DSI), with the Air Force Institute of Technology and Advanced Research Projects Agency. The testing confirmed that the semantics and syntax of the DIS protocol is properly implemented and the latency incurred by the network does not adversely effect the simulation application.

MASTER OF SCIENCE
IN
ELECTRICAL ENGINEERING

RESOLUTION IN RADAR MAPPING

Michael D. Anderson-Lieutenant, United States Navy
B.S.E.E., United States Naval Academy, 1987
Master of Science in Electrical Engineering-March 1993
Advisor: G. Gill-Department of Electrical and Computer Engineering

Signal processing has led to great performance gains in radar mapping. The most critical feature of these systems is cell size, which determines resolution. Cell size is defined by range resolution and azimuth resolution. Range resolution is improved through pulse compression. Phase or frequency modulation of a waveform yields increased bandwidth and shorter effective pulse width without reducing total signal energy. Several families of codes are investigated emphasizing matched filter output and doppler tolerance. Azimuth resolution is improved through beam sharpening. Several beam sharpening techniques are illustrated with radar images provided by Hughes Aircraft. Range bin output plots demonstrate the effectiveness of these techniques. With these techniques, "near Sar" quality output can be obtained from real beam mapping radars allowing the real-time and all aspect capabilities of real beam systems to be more fully employed in tactical missions.

LOW SIDELOBE REFLECTOR ANTENNA DESIGN FOR COMMUNICATIONS

Nelson A. Armas-Lieutenant, Ecuadorian Navy
Master of Science in Electrical Engineering-September 1993
Advisor: David C. Jenn-Department of Electrical and Computer Engineering

The current antenna used in the Marine Radio AN/MRC-142 is a focal point fed reflector with a first sidelobe of -10 dB. A new antenna design is required with a sidelobe reduction of another 10 dB, and a minimum impact on the system upgrade cost. An improved feed consisting of a fed dipole and disk in the vicinity of a parasitic ring was designed for use with the current reflector. The disk acts as a ground plane for the dipole with the ring narrowing the beamwidth, resulting in a stronger edge taper on the reflector. An existing computer code based on the method of moments was used to compute the gain and the radiation pattern. Circular parabolic reflectors of 36 inches and 48 inches were analyzed. The results show that the 36 inch reflector cannot satisfy the conditions over the entire frequency band (1350 to 1850 MHz) simultaneously. The 48 inch reflector came very close to satisfying all the conditions, although the sidelobe level is off by approximately 2 dB at wide angles in the H-plane.

PETITE AMATEUR NAVAL SATELLITE SPACECRAFT DIGITAL CONTROL SYSTEM: A HARDWARE DESIGN

John Douglas Ashe-Lieutenant, United States Navy
B.S., University of Tennessee, 1984
Master of Science in Electrical Engineering-March 1993
Advisor: R. L. Wight-Space Systems Academic Group

This thesis provides the foundational hardware design for the Digital Control System of the Petite Amateur Navy Satellite (PANSAT). The design implements a multitasking operating system to provide store and forward communications. This design contains "pair and a spare" technology to provide redundancy for space operations. Addresses necessary for software design are discussed and examples of initializing commands for the more complex sections are given. CMOS technology was used throughout the design to minimize the power requirements. RS422 protocol was used on all communications lines to lessen the impact of noise. The M80C186 microprocessor coupled with an 82C55 Programmable Peripheral Interface are the cornerstone of the design. All peripheral sections, Telemetry, Memory, and Communications are designed to be controlled by the M80C186 via the 82C55. Since the mission of PANSAT may be changed slightly before the launch of the vehicle, the hardware design contained in this document is engineered to be upwardly compatible where possible.

AN INVESTIGATION OF MEMORY LATENCY REDUCTION USING AN ADDRESS PREDICTION BUFFER

Arthur Brooks Billingsley, Jr.-Lieutentant, United States Navy
B.S.E.E., Auburn University, 1985
Master of Science in Electrical Engineering-December 1992
Advisor: Douglas Fouts-Department of Electrical and Computer Engineering

Developing memory systems to support high-speed processors is a major challenge to computer architects. Cache memories can improve system performance but the latency of main memory remains a major penalty for a cache-miss. A novel approach to improve system performance is the use of a *memory prediction buffer*. The *memory prediction buffer*(MPB) is inserted between the cache and main memory. The MPB predicts the next cache-miss address and pre-fetches the data. The use of an MPB in a computer system is shown to decrease main-memory latency and increase system performance.

STRAY INSENSITIVE SWITCHED CAPACITOR COMPOSITE OPERATIONAL AMPLIFIERS

Eldon Wade Bingham-Captain, United States Marine Corps
B.S., United States Naval Academy, 1981
Master of Science in Electrical Engineering-March 1993
Advisor: Sherif Michael-Department of Electrical and Computer Engineering

In this research, analog active circuits are designed combining the properties of switched capacitors and composite operational amplifiers. This combined design improves upon the single operational amplifier's finite dc gain, smaller bandwidth, lower slew rate, finite input impedance, and less than ideal output impedance. The switched capacitor is implemented using both the toggle switched capacitor and the modified open-circuit resistor techniques. The composite operational amplifier is implemented using the C2OA-1 and C2OA-2 designs from the CNOA-*i* possibilities. These four designs are evaluated in a finite-gain circuit and their results are compared with the results obtained from the continuous circuits of the same design.

THE DESIGN AND EVALUATION OF TRANSMIT AND RECEIVE ANTENNAS FOR AN IONOSPHERIC COMMUNICATIONS PROBE SYSTEM: B. SLOPING-VEE BEAMS

Georgios Theodoros Bougioukos-Lieutenant, Hellenic Navy
B.S., Hellenic Naval Academy, 1984
Master of Science in Electrical Engineering-December 1992
Advisor: R. W. Adler-Department of Electrical and Computer Engineering

The purpose of this study was to design and evaluate the performance of a transmitting antenna for an HF communications probe system. Monterey, CA, was selected as the transmit site, and San Diego, CA, was selected as the receive site to establish an ionospheric communication link to test the equipment involved in the probe system. A Sloping-vee antenna was chosen for initial "shakedown" tests to support the transmitting requirements of the probe system at 5.6, 11, and 16.8 MHz. The Eyring Ground Measurement Probe was used to measure the ground constants at the NPS beach site. The Numerical Electromagnetics Code (NEC) was utilized to analyze the performance of the antenna at the NPS beach, and for average, poor, and arctic ground conditions. The antenna provides a maximum gain of 1.46 dBi at 5.6 MHz, 5.56 dBi at 11 MHz, 8 dBi at 16.8 MHz, and positive gain at take-off angles between 3° and 33° at frequencies from 5.6 to 16.8 MHz. The VSWRs with a standard 600 Ohm to 50 Ohm impedance matching transformer (12:1) are 1.73 at 5.6 MHz, 1.77 at 11 MHz, and 1.53 at 16.8 MHz.

ULTRA-WIDEBAND RADAR TRANSIENT SIGNAL DETECTION USING TIME-FREQUENCY AND WAVELET TRANSFORMS
William Allen Brooks, Jr.-Lieutenant, United States Navy
B.S., University of Missouri at Rolla, 1980
M.S., University of Missouri at Rolla, 1983
Master of Science in Electrical Engineering-December 1992
Advisor: M. Fargues-Department of Electrical and Computer Engineering

Detection of weak ultra-wideband (UWB) radar signals embedded in non-stationary interference presents a difficult challenge. Classical radar signal processing techniques such as the Fourier transform have been employed with some success. However, time-frequency distributions or wavelet transforms in non-stationary noise appears to present a more promising approach to the detection of transient phenomena. In this thesis, analysis of synthetic signals and UWB radar data is performed using time-frequency techniques, such as the short time Fourier transform (STFT), the Instantaneous Power Spectrum and the Wigner-Ville distribution, and time-scale methods, such as the *á trous* discrete wavelet transform (DWT) algorithm and Mallat's DWT algorithm. The performance of these methods is compared and the characteristics, advantages and drawbacks of each technique are discussed.

COMMUNICATIONS SUBSYSTEM FOR THE PETITE AMATEUR SATELLITE (PANSAT)
Arnold O. Brown, III-Lieutenant, United States Navy
B.S.E.E., San Diego State University, 1987
Master of Science in Electrical Engineering-September 1993
Advisor: Tri T. Ha-Department of Electrical and Computer Engineering

This thesis describes a prototype design for a binary phase shift keyed (BPSK) direct sequence spread spectrum (DSSS) communications subsystem intended for use in a small lightweight satellite called the Petite Amateur Navy Satellite (PANSAT). The system was designed using parameters that were established from a link analysis. Included as part of this thesis are the link analysis, schematics, and RF board layouts.

AUTOMATIC PULSE SHAPING WITH THE AN/FPN-42 AND AN/FPN-44A LORAN-C TRANSMITTERS
Dean C. Bruckner-Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1985
Master of Science in Electrical Engineering-December 1992
Advisors: Murali Tummala & Roberto Cristi-Department of Electrical and Computer Engineering

Automatic pulse shape control is simulated for the AN/FPN-42 and AN/FPN-44A tube type transmitters. A linear, time invariant (LTI) pole-zero model is developed for each transmitter at a typical operating point using the least squares modified Yule-Walker method and Shank's method. LTI models for a range of operating points are catenated to represent observed nonlinear behavior, and observed time variations are added. After these combined models are tested, a linear controller based on the method of steepest descent is implemented. These models, the control algorithm and transmitter system details such as power supply droop, dual rating and noise are then incorporated into a MATLAB simulation program. In a variety of realistic tests the control algorithm successfully shaped the Loran-C pulse, except the zero-crossing times were not always in tolerance and the algorithm showed a sensitivity to noise. The algorithm controlled Envelope-to-Cycle Difference, produced an entire Phase Code Interval of pulses while compensating for droop and phase code bounce, and produced a near-optimal transmitter drive waveform for the transmitter/antenna system using the dummy load.

TEST METHODS AND CUSTOM HARDWARE FOR FUNCTIONAL TESTING OF A HIGH SPEED GaAs DRAM

Michael P. Butler-Lieutenant Commander, United States Navy
B.S., U.S. Naval Academy, 1979
Master of Science in Electrical Engineering-September 1993
Advisor: Douglas J. Fouts-Department of Electrical and Computer Engineering

The goal of this project is to produce a digital circuit operating near a frequency of 250 MHz to test a new experimental Gallium Arsenide (GaAs) Dynamic Random Access Memory (DRAM). This thesis presents the design of the digital circuit using "off-the-shelf" Emitter Coupled Logic (ECL) and the design of a six layer printed circuit test fixture. The use of ECL is illustrated including general design rules, high speed design considerations, and basic transmission line theory. Finally, the design is laid out and simulated using commercially available Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM) tools. Examples and shortcomings of schematic capture, logic simulation, PCB design and autorouting are discussed as applicable to fabrication of the final product.

IMPLEMENTATION OF CYCLIC SPECTRAL ANALYSIS METHODS

Nancy J. Carter-Lieutenant Commander, United States Navy
B.S., University of Maryland College Park, 1981
Master of Science in Electrical Engineering-December 1992
Advisor: Herschel H. Loomis, Jr.-Department of Electrical and Computer Engineering

Phase-shift keyed (PSK) signal modulation methods are coming into increasing use in modern communications. This thesis describes the implementation of three methods of computing the cyclic spectrum to determine the presence of PSK signals. The Strip Spectral Correlation Algorithm (SSCA) and the Fast Fourier Transform (FFT) Accumulation Method (FAM) both estimate the full cyclic spectral plane. The Sub-FFT Accumulation Method (SUBFAM) program computes the Spectral Correlation Function (SCF) for a set of possible spectral frequencies for a single cyclic frequency. The results of algorithm performance are presented along with a discussion of promising areas for performance enhancement and automation of signal detection and classification.

USEFULNESS OF COMPILE-TIME RESTRUCTURING OF LARGE GRAIN DATA FLOW PROGRAMS IN THROUGHPUT-CRITICAL APPLICATIONS

David M. Cross-Captain, United States Army
B.S.E.E., Rensselaer Polytechnic Institute-1986
M.S.B.A., Boston University, 1989
Master of Science in Electrical Engineering-September 1993
Master of Science in Computer Science-September 1993
Advisors: Shridhar B. Shukla-Department of Electrical and Computer Engineering &
Amr Zaky-Department of Computer Science

In this thesis, Large Grain Data Flow (LGDF) representation of parallelism is applied to throughput-critical applications that process periodically arriving data. The applications are represented by directed acyclic graphs in which a vertex represents an indivisible node program execution and an arc represents data flow from its source node to sink node. The machine and graph parameters are assumed to be such that the time to transfer one unit of data is comparable to the time to execute one operation at a processor. The machine model consists of a set of processors connected to a set of memory modules by a cross-bar interconnection network. Execution of LGDF graphs on such machines either requires a run-time mechanism to dispatch executable nodes on available processors or a compile-time static scheduling of nodes to processors. The former approach, although flexible and robust, suffers from contention-related overhead and the latter, although capable of eliminating contention, is rigid and computationally intensive. It is shown by simulation that throughput can be improved when compile-time graph restructuring is coupled with simple first-come-first serve dispatching. The restructuring is based on selectively adding control dependencies between graph nodes. This technique, called the revolving cylinder analysis, is shown to be an effective framework for achieving communication/computation overlap and reducing memory contention.

DIGITALLY PROGRAMMABLE COMPOSITE OPERATIONAL AMPLIFIER APPLICATIONS

Ronald Anthony Crowell-Commander, United States Navy
B.S., University of California at Berkeley, 1977
Master of Science in Electrical Engineering-September 1993
Advisor: Sherif Michael-Department of Electrical and Computer Engineering

In this study, CMOS implementation of composite operational amplifiers onto a single chip is examined. Composite operational amplifiers are realized by interconnecting two or more single operational amplifiers in any one of four high performance circuit topologies. These high performance topologies result in composite operational amplifiers having useful bandwidths that are significantly larger than those associated with their constituent operational amplifiers without sacrificing closed loop gain. Computer simulations using PSPICE are compared with experimental results for performance evaluation. As an application, a multiple feedback bandpass filter implementation is examined. This work successfully demonstrates that composite topologies can satisfactorily be implemented onto a single chip.

AN EXPERIMENTAL COMPARISON OF CLOS AND C++ IMPLEMENTATIONS OF AN OBJECT-ORIENTED GRAPHICAL SIMULATION OF WALKING ROBOT KINEMATICS

Sandra Lynne Davidson-Lieutenant, United States Navy
B.S., United States Naval Academy, 1986
Advisor: Robert B. McGhee-Department of Electrical and Computer Engineering

The ability to conduct research in the robotic field in new areas can be accomplished safely and efficiently using computer graphical simulation. Object-oriented languages provide a powerful and flexible capability in defining rigid body manipulators that can be adapted in the use and design of many types of systems. The very nature of object-oriented programming permits modification and improvement of the code with ease. This thesis examines the major capabilities of object-oriented programming in conjunction with kinematics equations that simulate a six-legged walking robot. A comparison is conducted between programs using CLOS (LISP) and C++ to graphically simulate the Aquarobot - an existing underwater walking robot. It is found that both languages are effective, but CLOS programming is easier while C++ code executes more than twice as fast as compiled CLOS.

THE DESIGN OF A ROBUST AUTOPILOT FOR THE ARCHYTAS PROTOTYPE VIA LINEAR QUADRATIC SYNTHESIS

Joseph Peden Davis-Captain, United States Marine Corps
B.E., University of Mississippi, 1986
Master of Science in Electrical Engineering-December 1992
Advisor: Jeffrey B. Burl-Department of Electrical and Computer Engineering

The purpose of this research is to design, simulate and implement a robust autopilot system for the vertical mode of operation of the Archytas prototype. Archytas is an Unmanned Air Vehicle that is designed to take off and land vertically, and to transition to horizontal forward flight. A feedback control scheme is designed for both the single-input, single-output and the multi-input, multi-output subsystems using optimal control techniques. In this research, the linear quadratic regulator performance measure is modified to allow for its application to the tracking problem solution. Additionally, the control systems are designed using reduced order models. Computer simulations show that the reduced order controller designs provide results comparable to the full order controller designs. Successful hardware tests with the roll rate control system validated the reduced order model design philosophy used in this research.

AN INTRODUCTION TO DOPPLER EFFECT AND FADING IN MOBILE COMMUNICATION

Abdon B. de Paula-Lieutenant Commander, Brazilian Navy
B.S., Brazilian Naval Academy
B.S., Sao Paulo University
Master of Science in Electrical Engineering-December 1992
Advisor: Tri Ha-Department of Electrical and Computer Engineering

In this research we present an introductory analysis of a complex aspect of mobile communications: Doppler effect is evaluated in both Ricean and Rayleigh channels. A noncoherent 2-FSK scheme is selected to evaluate the behavior of the system under very strong fading channel conditions. The analysis is conducted for the binary case due to the possibility of developing closed form solutions. Therefore, the approach is simplified avoiding long lasting simulations that may obscure the concepts. The probability of bit error for the 2-FSK case can also be used as an initial bound for a M-FSK scheme. Diversity is evaluated as a means of combating fading and Doppler effects. Error correcting codes, in the form of convolutional codes, are also used and applied to both effects.

DATA COMPRESSION BY USING WAVELET TRANSFORMS AND VECTOR QUANTIZATION

Aper Erdemir-Lieutenant Junior Grade, Turkish Navy
B.S., Turkish Naval Academy, 1987
Master of Science in Electrical Engineering-June 1993
Advisor: M. Tummala-Department of Electrical and Computer Engineering

This thesis proposes a new analysis/synthesis procedure for speech and image compression. The algorithm applies the discrete wavelet transform to the subject data in order to obtain a set of multiresolution wavelet coefficients. The wavelet coefficients are then encoded by using a multiresolution codebook designed using the generalized Lloyd algorithm. The statistical properties of the wavelet coefficients are utilized to determine the number of resolution levels as well as the codebook size at each resolution level. Coding results show that the new procedure provides a significant improvement in the quality of the reproduced data. The data tested includes speech, image, and transient signals.

NETWORKED WORKSTATIONS AND PARALLEL PROCESSING UTILIZING FUNCTIONAL LANGUAGES

Stanley L. Fox, II-Lieutenant, United States Navy
B.S., University of Oklahoma, 1986
Master of Science in Electrical Engineering-March 1993
Advisor: Douglas J. Fouts-Department of Electrical and Computer Engineering

Alternative computer architectures are necessary to replace the traditional 'von Neumann' computer organization in order to obtain large increases in performance. The traditional 'von Neumann' architecture uses a timer based (e.g., the program counter), sequentially programmed, single processor approach to problem solving. Today's new hardware technology allows for the utilization of multiple processors. By programming and operating these processors in parallel, this alternative architecture will provide for greater computing speed, improved system reliability, enhanced software manageability, and a more cost-effective approach than our present computing practices.

IMPROVEMENT OF MISS DISTANCE OF MISSILES WITH IMAGING SEEKERS BY UTILIZING DYNAMIC IMAGE PROCESSING

Rui Manuel Alves Francisco-Lieutenant, Portuguese Navy
B.S., Portuguese Naval Academy, 1985
Master of Science in Electrical Engineering-March 1993
Electrical Engineer-March 1993
Advisor: Jeffrey Burl-Department of Electrical and Computer Engineering

This thesis deals with improving the miss distance of a missile, with imaging seeker(s), by utilizing dynamic image processing. In an encounter with a missile, a target tries to avoid the missile by performing an evasive maneuver when the missile is at a relative distance which maximizes the miss distance. Dynamic image processing permits us to identify the evasive maneuver of the target by estimating its acceleration in magnitude and direction. This thesis studies methods of utilizing this additional information about the target's behavior in order to improve the missile's performance. First, the proportional navigation guidance law is explored in order to verify its advantages and weaknesses. Then, methods of obtaining the time dependent 3-D movement of a target from its image plane feature point correspondences are derived. The 3-D components of the target's acceleration are obtained by using a Kalman filter. Missiles with two cameras, one camera and one seeker (radar or IR), and only one camera are considered. Methods to get stereo vision by using the one camera plus one seeker setup and the single camera setup are proposed. Advanced guidance laws, namely advanced proportional navigation and optimal guidance are derived, for a 3-D environment. A three dimensional simulation program is developed using classical proportional navigation, advanced proportional navigation, and optimal guidance. The engagement is simulated using state variable design and the performance of the guidance laws is compared.

A BIPHASE SHIFT KEYING DIRECT SEQUENCE SPREAD SPECTRUM MODEM FOR PETITE AMATEUR NAVY SATELLITE (PANSAT)

Thomas Murray Fritz-Lieutenant, United States Navy
B.S., United States Naval Academy, 1985
Master of Science in Electrical Engineering-December 1992
Advisor: Tri T. Ha-Department of Electrical and Computer Engineering

The development of biphase shift keying (BPSK), direct sequence, spread spectrum modem is conducted for the purpose of developing a prototype design to be implemented in Petite Amateur Navy Satellite (PANSAT). The design discussion includes the hardware used in the functional realization of a working design. The design itself, encompasses selection of components, and demonstrates through circuit diagrams and waveforms produced that the preliminary operational characteristics of a spread spectrum BPSK modulation scheme for PANSAT have been achieved. Limited performance analysis is conducted through IF loop-back testing and analyzes the demodulator output waveforms providing the proof of concept for the design. The development of the final version operating at the specified radio frequency (RF) is not conducted.

MATHCAD COMPUTER APPLICATIONS PREDICTING ANTENNA PARAMETERS FROM ANTENNA PHYSICAL DIMENSIONS AND GROUND CHARACTERISTICS

Donald Dwight Gerry-Lieutenant Commander, United States Navy
B.S., University of Notre Dame, 1980
Master of Science in Electrical Engineering-June 1993
Advisor: R. Clark Robertson-Department of Electrical and Computer Engineering

This report provides the documentation for a set of computer applications for the evaluation of antenna parameters. The applications are written for the Mathcad personal computer software for various antenna types listed in the thesis index. Antenna dimensions and, in some cases, ground parameters are the only required inputs for each application. The chapters of this thesis are intended to provide Mathcad antenna application users with the background information necessary to readily use and interpret the software for each antenna type. Each application has an introductory paragraph and a table of required inputs. The Mathcad software provides various numerical outputs and performance predictions, as well as a graphical representation of radiation patterns in the far-field. Mathcad application results are consistent with the predictions of applicable publications, as well as other antenna numerical analysis programs.

COMPARISON OF MULTIRESOLUTION TECHNIQUES FOR DIGITAL SIGNAL PROCESSING

Neil Anthony Hamlett-Lieutenant, United States Navy
B.S.E.E., University of Kansas, 1985
Master of Science in Electrical Engineering-March 1993
Advisors: Ralph Hippenstiel & Monique P. Fargues-Department of Electrical and Computer Engineering

A comprehensive study of multiresolution signal processing techniques is conducted. Background material in functional analysis and Quatrature Mirror Filter (QMF) banks is presented. The development of Mallat's algorithm for multiresolution decomposition and reconstruction is outlined and demonstrated to be equivalent to QMF banks. The Laplacian pyramid and the à trous algorithm are described and demonstrated. General multiresolution structures are constructed from cascades of QMF and pseudo-QMF banks and are demonstrated for applications in signal decomposition and reconstruction and for signal detection and identification.

FDDI INSTALLATION AND PERFORMANCE ANALYSIS

Gifford Allen Hammar-Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1981
Master of Science in Electrical Engineering-December 1992
Advisor: Lucia Luqi-Department of Computer Science

This thesis discusses the theory behind collision based and noncollision based network protocols. From this thesis, a complete theoretical performance analysis is performed on both Ethernet and FDDI. The CAPSnet FDDI installation is discussed and evaluated. Actual performance tests for both Ethernet and FDDI are provided and the results are discussed in detail. The test results are compared and analyzed. Actual performance is compared to theoretical performance. An explanation is provided to explain why actual performance does not match theoretical performance.

TRELLIS CODED CPFSK

Zafer Inceoglu-Lieutenant Junior Grade, Turkish Navy
B.S., Turkish Naval Academy, 1986
Master of Science in Electrical Engineering-December 1992
Advisor: Paul Moose-Department of Electrical and Computer Engineering

Continuous Phase Frequency Shift Keying (CPFSK) is a potentially attractive modulation scheme with constant envelop and good spectral characteristics for energy constrained and bandlimited satellite channels. This research deals with Orthogonal Frequency Shift Keying (FSK), Minimum Shift Keying (MSK) which is a special case of CPFSK, uncoded quaternary CPFSK and finally coded quaternary CPFSK. Orthogonal FSK is simulated by making the modulation index (h) equal to one, and all the other simulations are performed with $h=1/2$. A rate 1/2 convolutional encoder with constraint lengths (k), $k=2$, 3, and 4 are used in coded quaternary CPFSK simulations. Good coding gains are obtained with a slight increase in receiver complexity. Soft decision with the Viterbi Algorithm was applied to all CPFSK and one MSK application. Hard decision was applied to Orthogonal FSK and another MSK application.

PERFORMANCE EVALUATION OF UHF FADING SATELLITE CHANNEL BY SIMULATION FOR DIFFERENT MODULATION SCHEMES

Betülhan Kahraman-Lieutenant Junior Grade, Turkish Navy
B.S., Naval Postgraduate School, 1990
Master of Science in Electrical Engineering-December 1992
Advisor: Paul H. Moose-Department of Electrical and Computer Engineering

In this report, we discuss the physics of fading and summarize the methods to mitigate its devastating effects for communication channels. We evaluated performance curves of Differentially Encoded Binary Phase Shift Keying (DBPSK), Rate 1/2 Convolutionally Encoded Differential Quadrature Phase Shift Keying (DQPSK) and Minimum Shift Keying (MSK), by simulation for both AWGN and fading channels. Further, we simulated typical transponder components of a UHF satellite system and evaluated their effect for the above modulations structures. Finally, we calculated the carrier-to-noise ratios by using simulation curves to assess link margins for the UHF Follow-On Satellite.

A COMPARISON OF SOME OF THE MOST CURRENT METHODS OF IMAGE COMPRESSION

Robert T. Kay-Lieutenant, United States Navy
B.S.M.E., United States Naval Academy, 1987
Master of Science in Electrical Engineering-June 1993
Advisor: Ron J. Pieper-Department of Electrical Engineering

In this report, commonly used lossless and lossy image compression algorithms are heuristically presented and then compared in terms of performance. The lossy algorithms, JPEG (Joint Photographic Experts Group) and Fractal compression, are compared in terms of their respective sensitivities between compression ratio and image fidelity. Compression algorithms based on the lossless models of Huffman, Adaptive Huffman, and Arithmetic coding are compared in terms of compression ratio and compression/decompression time requirements. High fidelity image reconstructions of JPED and Fractal compressions are also included in the comparison. Results, for the images tested, indicate that if imperceptible losses in fidelity can be tolerated, then among the current versions of the algorithms tested, the JPEG results in higher compression with less process time.

APPLICATION OF A BACK-PROPAGATION NEURAL NETWORK TO ISOLATED-WORD SPEECH RECOGNITION

Chau Giang Le-Lieutenant, United States Navy
B.S., University of California, San Diego, 1985
Master of Science in Electrical Engineering-June 1993
Advisor: Murali Tummala-Department of Electrical and Computer Engineering

The primary objective of this research is to explore how a back-propagation neural network (BNN) can be applied to isolated-word speech recognition. Simulation results show that a BNN provides an effective approach for small vocabulary systems. The recognition rate reaches 100% for a 5-word system and 94% for a 10-word system. The general techniques developed in this thesis can be further extended to other applications, such as sonar target recognition, missile seeking and tracking functions in modern weapons systems, and classification of underwater acoustic signals.

CODE DIVISION MULTIPLE ACCESS LOCAL AREA NETWORK COMMUNICATIONS EMPLOYING FIBER OPTIC SIGNAL PROCESSING TECHNIQUES

Bruce Allen Legge-Lieutenant Commander, United States Navy
B.S., Illinois State University, 1978
Master of Science in Electrical Engineering-September 1993
Advisor: John P. Powers-Department of Electrical and Computer Engineering

This thesis investigated the feasibility of implementing a code-division multiple-access (CDMA) local area network (LAN) employing all-optical signal processing. A two-user unidirectional data link was built and successfully tested. This data link utilized variations of optical orthogonal code sequences (OOCs) generated by serially connected fiber optic delay lines and 2x2 couplers. A special feature of this network design was use of the same hardware to decode the signal as was used to encode the signal. A detailed review of the various coding techniques and the generation of spread spectrum signals was also performed. The results of the overall system design effort demonstrated that high-data-rate signal traffic can be supported by the network and in a more power efficient and affordable manner than previous designs.

A COMPUTER ANALYSIS OF A CONICAL MONOPOLE FOR USE AT NAVAL HIGH FREQUENCY DIRECTION FINDING RECEIVING SITES PART I, II

Panayiotis Petros Lemos-Lieutenant, Hellenic Navy
B.S.E.E., Hellenic Naval Academy, 1984
Master of Science in Electrical Engineering-December 1992
Advisor: R. W. Adler-Department of Electrical and Computer Engineering

The Naval Security Group (NSG) High Frequency Direction Finding (HFDF) sites use large circularly disposed antenna arrays (CDAA) with moderate to high gain beams. Omnidirectional coverage is presently obtained by combining 8 to 120 elements of the CDAA. Recent measurements of site performance reveal that most HFDF sites suffer from high noise levels. Much of the noise is generated in the RF distribution system. This noise contaminates the CDAA omni signals, greatly reducing their effectiveness. One proposed solution to the problem is to use a semi-remotely located broadband conical monopole (CM), which does not connect through the noisy RF distribution system. A proof-of-performance comparing the CM and CDAA omnis is commencing at NSG. In this thesis, the performance of the model 2012AA Conical Monopole Antenna is studied in the presence of finite ground using the Numerical Electromagnetics Code (NEC-3). Ground constants used in this study were obtained for two locations where the CM are installed; Northwest, VA, and Winter Harbor, ME. The performance of the combined antenna/ground system was simulated over a frequency range from 2 to 30 Mhz (HF), for various ground constants, with particular emphasis on the elevation plane radiation patterns. The study concludes that the CM operates effectively in the frequency range of interest with some exceptions. These occur at frequencies where there is a probable transitional range where the mode of operation of the antenna is transferred from that of an inverted cone to that of a broad monopole. Finally, this thesis confirms that in order for an antenna/ground model to provide a representative and effective simulation, the ground constants in the vicinity of the antenna should be carefully measured over an adequate number of samples.

A DIGITAL HARDWARE TEST SYSTEM ANALYSIS WITH TEST VECTOR TRANSLATION

James True Loeblein-Lieutenant, United States Navy
B.S., United States Naval Academy, 1985
Master of Science in Electrical Engineering-December 1992
Advisor: C. H. Lee-Department of Electrical and Computer Engineering

Digital logic testing occurs in two different test environments, digital simulation and actual hardware testing. A computer aided design (CAD) tool applies a set of stimulus/response test vector patterns to check the functionality of a digital circuit design. Once manufactured, the chip with this design is tested by a hardware tester system (i.e., automatic test equipment (ATE). The ATE performs many tests in addition to the functionality test. However, the stimulus/response test vector formats used in these two environments are different and, therefore, incompatible in present form. This thesis is aimed at two major objectives. First, a systems study will be performed on the GenRad-125 VLSI Hardware Tester System, including its usage, test capabilities and limitations. Secondly, this thesis addresses the problem of test vector format incompatibility between the two testing environments. Special UNIX tools, Lex & Yacc, are used to create a software translator which changes the CAD simulation file into the GenRad-125 Hardware Test System format.

CROSSTALK ANALYSIS OF SYNCHRONOUS AND ASYNCHRONOUS OPTICAL CHIP INTERCONNECTS WITH DIRECT DETECTION

Rena M. Loesch-Lieutenant, United States Navy
B.S., University of California, Los Angeles, 1983
Master of Science in Electrical Engineering-September 1993
Advisor: Tri T. Ha-Department of Electrical and Computer Engineering

This thesis provides a crosstalk analysis of optical ship interconnects via singlemode waveguides with synchronous transmission and asynchronous transmission. This crosstalk model is general and can be used for any type of waveguide network. Three cases of laser sources will be considered: (1) each channel operates with an independent laser source, (2) all laser sources have the same mean wavelength but with different phase noise processes, and (3) all laser sources are identical with the exception of the initial phases. The analysis takes into account the coupling-induced crosstalks between adjacent waveguides, the laser linewidth, the shot noise, the dark current generated the photodiode, and the post-detection thermal noise. Bit error probabilities versus received peak powers are presented together with power penalties.

COMPARISON OF HIGHER ORDER MOMENT SPECTRUM ESTIMATION TECHNIQUES

Jeffrey F. McAloon-Lieutenant, United States Navy
B.S.E.E., University of South Florida, 1983
Master of Science in Electrical Engineering-September 1993
. Advisors: Ralph Hippenstiel & Monique Fargues-Department of Electrical and Computer Engineering

This thesis compares the detection performance of the 1-1/2 D instantaneous power spectrum (1-1/2 D_{ips}), the bispectrum, the instantaneous higher-order moment slice (IHOMS) method, and the spectrogram for multi-component stationary signals, harmonically related stationary signals, and multi-component linear FM signals corrupted by additive white Gaussian noise. In addition, a determination of the relative processing gain between the 1-1/2 D_{ips} method and the spectrogram is made for stationary signals in noise. The results of this thesis show that 1-1/2 D_{ips} has a processing gain advantage over that of the spectrogram for a range of input SNR that depends upon the size of the data window. Under some conditions, the bispectrum can detect both harmonic coupling and phase coupling between the components of multi-component signals. IHOMS' ability to detect linear chirps in noise is limited to chirps having different slew rates, and the method has a significantly greater computational cost than both the spectrogram and 1-1/2 D_{ips}.

A COMPARISON OF TRANS-EQUATORIAL IONOSPHERE PROPAGATION PREDICTIONS FROM AMBCOM WITH MEASURED DATA

John W. McKinstry-Lieutenant, United States Navy
B.S., Furman University, 1984
Master of Science in Electrical Engineering-March 1993
Advisor: R. W. Adler-Department of Electrical and Computer Engineering

This thesis examines radio propagation conditions over trans-equatorial (TE) paths. The study precedes Project PENEX, a field experiment to measure and collect calibrated HF skywave signal strength data for polar, equatorial, and near-vertical incidence propagation paths. PENEX will benchmark the absolute accuracy of the signal-to-noise models in the MEDUSA propagation model now being developed by the Naval Command, Control and Ocean Surveillance Center. Since only minimal information is available about TE paths, a comprehensive review of the published literature on TE experiments was completed, with emphasis on TE paths between magnetic conjugate points. Data from such paths have revealed the presence of unusual propagation modes which are not predicted by standard propagation programs such as PROPHET, IONCAP, and AMBCOM. The review of literature revealed that Stanford Research Institute (SRI) published measured data on a TE path between the Pacific islands of Kauai and Rarotonga. A comparison was made between the SRI data and predictions for the same path to assess the usefulness of current prediction programs for TE paths. The SRI AMBCOM program was used for this comparison. As expected, sizeable differences were found between the predicted and measured results, especially during times when unusual propagation modes were present. This suggests that prediction programs should be modified to include the observed TE modes.

DEVELOPMENT AND TESTING OF THE DIGITAL CONTROL SYSTEM FOR THE ARCHYTAS UNMANNED AIR VEHICLE

Paul Vincent Merz-Lieutenant, United States Navy
B.S., University of Mississippi
Master of Science in Electrical Engineering-December 1992
Advisor: H. A. Titus-Department of Electrical and Computer Engineering

The purpose of this study was to develop the digital sampling and control system for an Unmanned Air Vehicle (UAV) designed to takeoff and land vertically and to transition to forward flight. The system is designed to operate from a personal computer through an umbilical cable tethered to the platform for hover tests. The computer controls the sampling and digital conversion of onboard analog sensor signals and sends control-surface commands for pitch, roll and yaw motions. The thesis effort includes the following four parts: 1) Design of a controllable Pulse-Width-Modulated Signal (PWMS) to command the servos which operate various aerodynamic surfaces. This control is accomplished with software written to a counter/timer card installed in the computer. 2) Sampling and conversion of the signals to the sensors through the programming of an analog-to-digital card installed in the computer. 3) Sensor power-up and parameter verification of onboard devices. Development of various power networks to allow operation of onboard systems prior to engine start with the ability to be self-sustaining once the engine is running. The system was fully tested during ground runs on a thrust/torque test stand. Integration of the system with the robust controller designed in a concurrent thesis will provide for the stability necessary for the innovative unmanned vehicle.

EVALUATION OF SITE EFFECTS ON A HIGH FREQUENCY DIRECTION FINDING SINGLE SITE LOCATION SYSTEM

Gerasimos Dionisios Milatos-Lieutenant, Hellenic Navy
B.S.E.E., Hellenic Naval Academy, 1984
Master of Science in Electrical Engineering-March 1993
Advisor: R. W. Adler-Department of Electrical Engineering

An important resource for Signal Intelligence activity in High Frequency Direction Finding (HFDF) is the use of Single Site Location (SSL) systems. Present research and development is aimed at developing tactical, mobile, easy to deploy SSL systems for locating hostile HF transmitters. These systems can detect, determine azimuth and elevation angles of incoming signals, and using ionospheric height information can calculate emitter location. The success or failure of SSL systems is dependent on many different factors, some of which are associated with site effects. System operation over different ground parameters can affect the accuracy of locating emitters. In this thesis, the performance of an "X"-shaped interferometer HF SSL system is examined using the Numerical Electromagnetics Code (NEC). Performance in the presence of two different types of lossy ground conditions are investigated.

NONTRADITIONAL WINDOWS IN SPECTRAL ANALYSIS

Ramiro Moreira-Paredes-Major, Ecuadorian Air Force
B.S., Ecuadorian Army Polytechnic, 1982
Master of Science in Electrical Engineering-June 1993
Advisor: Ralph Hippenstiel-Department of Electrical and Computer Engineering

This thesis studies a new data weighting function, which consists of a complex valued window known as the linear complex valued FM chirp window. This type of window, when used with the Fourier transform, produces a magnitude spectrum which permits identification of single sinusoids and multiple sinusoids which can be separated in frequency by less than one DFT bin. This allows determination of whether or not one or multiple signals are present. The chirp window seems to have better resolution properties than classical windows. When the chirp window is used with a signal that contains a frequency step (i.e., FSK), the resultant spectrum is markedly different for the upward shift and downward shift cases. The work of this thesis consists of replicating the results of J. Griffiths in his paper "A Novel Window for High Resolution Fourier Transform" to establish the signal to noise ratio dependency of this type of window, and to study its behavior when damped sinusoids are present. Additionally, a review of classical windows and sidelobe behavior is presented. All simulations were performed using MATLAB.

GALLIUM ARSENIDE DYNAMIC RANDOM ACCESS MEMORY SUPPORT CIRCUITRY

Michael Andrew Morris-Lieutenant, United States Navy
B.S.E.E., University of South Carolina, 1987
Master of Science in Electrical Engineering-March 1993
Advisor: D. J. Fouts-Department of Electrical and Computer Engineering

This thesis presents the design and layout of a Gallium Arsenide (GaAs) Dynamic Random Access Memory (DRAM) array of eight four-bit words including refresh circuitry. In the last several years, there are been significant research investigating the possibilities of producing much faster, lower power and high density DRAM using GaAs. Thus far, this research has yielded success on a limited basis using special materials and fabrication techniques. This design, tested and simulated using HPICE, supports a memory access time of approximately three nanoseconds, faster than present commercial Static Random Access Memory (SRAM). The logic circuits are designed using GaAs enhancement-mode and depletion-mode (E/D) metal semiconductor field-effect transistors (MESFETs). Charge storage is facilitated by a single GaAs MESFET connected to a parallel plate capacitor and the required minimum time between refresh is approximately three milliseconds. Power consumption is acceptable and fabrication by Vitesse Semiconductor Corporation using the HGaAs3 process is in progress. The design techniques, power consumption and timing are discussed and demonstrated for the basic logic circuits and the memory array read, write, and refresh cycles. A significant increase in DRAM memory bandwidth is gained narrowing the memory bandwidth differential between primary memory and the processor.

FOUR FREQUENCY-SHIFT KEYING (4-FSK) SPREAD SPECTRUM MODULATOR AND DEMODULATOR

Terrence J. Murray-Lieutenant Commander, United States Navy
B.S., Northern Arizona University, 1977
Master of Science in Electrical Engineering-March 1993
Advisor: Tri T. Ha-Department of Electrical and Computer Engineering

This thesis explores the potential use of a four frequency-shift keying (4-FSK), spread spectrum modulator and demodulator (MODEM) is a low orbit satellite. In this first approach a short maximal length sequence of 127 chips would be used to spread the four frequencies. After successful implementation, the design could be extended to longer codes which would provide for greater processing gain. This MODEM was not preselected for use in satellite communications based on the merits of 4-FSK, but was assigned as one of four possible digital communication designs. A MODEM would be selected for use in the Petite Amateur Navy Satellite after a thorough design review.

A COMPARISON OF IONOSPHERIC PROPAGATION MODE DELAY PREDICTIONS FROM ADVANCED PROPHET 4.3 WITH MEASURED DATA

Jose L. Nadal-Lieutenant, Peruvian Air Force
B.S., Peruvian Air Force Academy, 1988
Master of Science in Electrical Engineering-December 1992
Advisor: R. W. Adler-Department of Electrical and Computer Engineering

This thesis compares the outputs of the ionospheric propagation prediction model ADVANCED PROPHET, 4.3 to measurements of propagation mode delay for a High Frequency communications link between Monterey and San Diego, California. Mode delay variations throughout the day are presented for experimental data and PROPHET predictions. A margin of error of less than 0.5 msec was considered acceptable and the number of acceptable predictions per day was generated. Acceptable predicted data collected over the test period was analyzed to establish which hours of the day PROPHET accurately predicts propagation mode delay, independent of frequency, date and power levels. During the first six hours of the day PROPHET data tracks experimental data for mode delay change patterns. On a daily basis, predictions are best between 1400 and 1700 GMT (0600 and 0900 local time), although patterns could not be established for other hours of the day. Predicted mode delay percentage distributions show greater correlation during the first three hours of the morning and at sunset.

THE THREE-DIMENSIONAL RAY TRAJECTORIES OF THE WKB FIBER OPTICS

Athanasios Nassopoulos-Lieutenant Junior Grade, Hellenic Navy
B.S.E.E., Hellenic Naval Academy, 1984
Master of Science in Electrical Engineering-March 1993
Advisor: R. J. Pieper-Department of Electrical and Computer Engineering

A model that produces three-dimensional ray trajectories in an optical fiber is derived through the use of a simple correspondence rule. The analysis and simulations presented will be in terms of dimensionless parameters. The curves prepared are presented for allowed radial and azimuthal mode numbers and are presented in terms of dimensions which are normalized by the core radius. The model presented will be shown to be in agreement with the standard Eikonal ray theory and will serve as a link between the ray trajectories and the mode numbers of the WKB waveguide solutions of an optical fiber.

PERFORMANCE OF CODED COHERENT FSK LIGHTWAVE SYSTEM WITH NONCOHERENT DETECTION

Thomas Elliott Neely-Lieutenant, United States Navy
B.S., Ohio State University, 1983
Master of Science in Electrical Engineering-March 1993
Master of Science in Aeronautical Engineering-March 1993
Advisors: T. T. Ha-Department of Electrical and Computer Engineering &
D. J. Collins-Department of Aeronautics and Astronautics

The original coherent lightwave systems were expected to offer significant performance gains relative to standard direct detection systems. This expectation has not been realized due to the effects of laser phase noise. The laser phase noise process results in the integration of a random variable that transitions over the integration period from a Gaussian distribution to a uniform distribution. The use of convolutional coding effectively replaces a single bit time, with its mostly noncoherently integrating latter portion, by several more coherently integrating bits. This primary bit-time effect comes in addition to the normal coding effect of efficiently trading bandwidth for error performance. The improvement in performance brought about from coding may enable coherent systems to live up to previous expectations. The contributions of this thesis include the visualization of the phase noise process, the efficient computation of the laser phase noise power factor probability density function, and the computation of performance curves for uncoded and coded systems. Additional sections on coherent lightwave systems and coding provide tutorial information. A potential military application is discussed, along with practical implementation issues.

LOCALIZATION OF ACOUSTIC TRANSIENTS IN SHALLOW WATER ENVIRONMENTS

Charles Louis Nicholson-Lieutenant Commander, United States Navy
B.S., William March Rice University, 1981
Master of Science in Electrical Engineering-December 1992
Advisor: James H. Miller-Department of Electrical and Computer Engineering

Determination of an underwater target's position using passive acoustic sensors is of considerable use for the Navy, both for anti-submarine warfare (ASW) and underwater surveillance. This thesis proposes and develops localization algorithms capable of passively determining the location of a transient source given some broad constraints. In particular, this thesis investigates the effect of the source signal uncertainty on localizer performance. The localization process consists of two parts. First, a time domain propagation modeling code determines the impulse response of the environment from all possible source locations to a single hydrophone. This program predicts the signal as it would appear at the receiver from a grid of possible source locations. Second, source localization results from finding the maximum correlation between the positionally dependent, numerically modeled signals and the actual received signal. The position of the maximum cross correlation reveals an estimate of source position. Using model to model correlation, this technique successfully localized acoustic sources in both Monterey Bay and Barents Sea scenarios.

THE DESIGN AND IMPLEMENTATION OF A READ PREDICTION BUFFER

Gary Joseph Nowicki-Lieutenant, United States Navy
B.S.E.E., University of South Carolina, 1987
Master of Science in Electrical Engineering-December 1992
Advisor: D. Fouts-Department of Electrical and Computer Engineering

Cache memories, which are the level of memory between the CPU and the main memory, hold small amounts of data and instructions, and allow the CPU to access the contents in them very quickly. This significantly reduces the read access time for the CPU if the required information is available in the cache. However, caches are small and can only hold the most commonly used data and instructions required by the CPU. When information requested does not appear in the cache, a "cache miss" occurs and the CPU must fetch the required data from the main memory. The Read Prediction Buffer reduces this time-costly read access by attempting to predict the possible miss address, and pre-fetch the read data.

A STUDY OF ELECTRICAL ASPECTS OF NEURAL CONDUCTION WITH AN EMPHASIS ON THE PHENOMENON OF PAIN

Stephens W. Nunnally, Jr.-Lieutenant, United States Navy
B.S.E., University of Central Florida, 1984
Master of Science in Electrical Engineering-December 1992
Advisor: H. A. Titus-Department of Electrical and Computer Engineering

A study of the electrical nature of neural communication is performed. The study provides a background for the evaluation of an electrical mechanism, set forth by the author, as a possible explanation for the effect of acupuncture. The electrical and biological processes involved in the conduction of the nervous impulse, as well as the limits of understanding of those processes, are studied. The role of the arrangement of individual neurons into the human nervous system is examined. Also, the phenomena of pain and referred pain are investigated.

DEVELOPMENT OF RADAR ALGORITHMS FOR INSTRUCTIONAL USE AT USNPGS

Paul Arthur Ohrt-Major, Canadian Army
B. Eng (Elec), Royal Military College of Canada, 1982
Master of Science in Electrical Engineering-December 1992
Advisor: G. S. Gill-Department of Electrical and Computer Engineering

This thesis is concerned with the use of simulation in the teaching of radar signal processing (RSP). The aspects of RSP to be investigated and simulated are the development of the DFT as a filter bank for radar applications, filter sidelobe reduction by the use of weighted DFT doppler filter banks and the generation of pulse compression coding schemes under doppler conditions. Simulation programs have been written in MATLAB for the above processes. These simulations are cost effective, convenient to use and easy to reproduce since they are run on personal computers that are readily available to students. This provides a learning environment which cannot be achieved by traditional methods alone and complements classroom teaching. In particular, it aids the student by removing a major computational burden which allows the student to explore the non-trivial real world problems which he could not do before.

DESIGN OF A MATCHING NETWORK FOR DIPOLE ANTENNAS

Jennifer Park-Lieutenant, United States Navy
B.S.E.E., University of Missouri, 1985
Master of Science in Electrical Engineering-March 1993
Advisor: Ramakrishna Janaswamy-Department of Electrical and Computer Engineering

The input impedance of an antenna is highly dependent on the frequency range in which it operates. For an electrically small antenna to operate in a broad frequency range, the antenna must be properly matched. This thesis presents the design of a matching network for a 1-meter monopole antenna, operating over 30-90 MHz using real frequency method (RFM). It outlines the mathematical steps needed to determine the equalizer function, which ultimately leads to the circuit design. The goal of the RFM, given the real frequency data, is to optimize the Transducer Power Gain (TPG), and minimize the reflection coefficient or power lost due to the impedance mismatch. A complete design including network realization is given. However, no experimental results are presented.

A COMPUTER ANALYSIS OF PROPORTIONAL NAVIGATION AND COMMAND TO LINE OF SIGHT OF A COMMAND GUIDED MISSILE FOR A POINT DEFENSE SYSTEM

Dimitrios Ioannis Peppas-Lieutenant Junior Grade, Hellenic Navy
B.S.E.E., Hellenic Naval Academy, 1984
Master of Science in Electrical Engineering-December 1992
Advisor: H. A. Titus-Department of Electrical and Computer Engineering

This thesis compares two types of command guidance to be used by a point defense system: Proportional Navigation and Command to Line of Sight (CLOS). The system block diagram was first defined. The necessary transfer functions were derived. Two forward time models were evaluated, one for each guidance method, using state variable analysis. Two three dimensional scenarios were defined and their results used to compare the two methods. Parameters considered in the comparison were miss distance and acceleration load on the missile.

THE DESIGN AND EVALUATION OF TRANSMIT AND RECEIVE ANTENNAS FOR AN IONOSPHERIC COMMUNICATIONS PROBE SYSTEM: A. MULTIBAND DIPOLE ANTENNA

Sotiris Georgios Perros-Lieutenant, Hellenic Navy
B.S., Hellenic Naval Academy, 1984
Master of Science in Electrical Engineering-December 1992
Advisor: R. W. Adler-Department of Electrical and Computer Engineering

This thesis reports the design, performance evaluation and construction of a transmitting antenna for an HF communications probe system. A short range ionospheric communication link between Monterey, CA (transmit site) and San Diego, CA (receive site), was established to test the software and hardware of this probe system. The Multiband Dipole Antenna was selected as the more practical antenna for this link, using less real estate and support structure than other alternatives. The antenna was constructed and installed at the NPS beach site where the ground constants were measured accurately. Numerical Electromagnetics Code (NEC) analysis and measurements show that the antenna operates with low input VSWR (< 1.5), is insensitive to electrical ground characteristics and has excellent radiation patterns for short range ionospheric communication links. Based on the observed signal strengths at San Diego, the antenna appears to be performing very well.

HYBRID POWER SYSTEM FOR REMOTE COMMUNICATIONS STATIONS

Christopher Raymond Pietras-Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1983
Master of Science in Electrical Engineering-September 1993
Advisor: Sherif Michael-Department of Electrical and Computer Engineering

The United States Coast Guard is upgrading communications equipment at remote sites in Alaska in support of the Coastal Voice Distress Network. The VHF-FM Search and Rescue sites are powered by a primary power system consisting of a thermoelectric generator. Thermoelectric generators are very inefficient devices which consume vast quantities of propane to create electricity. The upgrade necessitates added power requirements on the power supply systems at the remote sites. These requirements compel the redesign and/or upgrade of the power system. If thermoelectric generators continue as the primary power system, additional helicopter visits to the sites to deliver propane will be required. These helicopter flights are costly and sometimes hazardous due to severe weather. This thesis investigates a variety of power system options capable of providing electrical power to the communications sites. Specifically, this thesis addresses three objectives. The first is a discussion of current alternative energy source technology available to supply the required power. The second is an analysis of the specific power system requirements and constraints. The third objective and major thrust of the research, is the design of a reliable hybrid power system for this application, capable of utilizing the inexhaustible natural energy available at the remote sites. The engineering parameters for a hybrid power system were studies and calculations made based on commercially available components. The difficulties in the design due to extreme weather conditions and unavailability of natural power resource information at specific sites are addressed. This thesis presents the groundwork associated with hybrid power system designs for use at remote sites.

THREE-DIMENSIONAL FINITE ELEMENT MODEL OF A HIGH POWER, LOW FREQUENCY RING-SHELL FLEXTENSIONAL SONAR TRANSDUCER

Rogerio Nacimento Costa Pinto-Lieutenant Commander, Brazilian Navy
B.S., Brazilian Naval Academy, Rio de Janeiro, 1978
B.S., University of Sao Paulo, Sao Paolo, 1984
Master of Science in Electrical Engineering-December 1992
Master of Science in Engineering Acoustics-December 1992
Advisors: S. R. Baker & O. B. Wilson-Department of Physics &
R. J. Pieper-Department of Electrical and Computer Engineering

A three-dimensional finite element model of a high power, low frequency flextensional transducer (Sparton of Canada, Ltd., Model 34A0610) was developed for use with the ATILA code. This transducer model is to be coupled with an analytical acoustic field description in order to model a dense sonar array of U.S. Navy interest. The three-dimensional model was derived from a two-dimensional model provided by the Naval Undersea Warfare Center. Two types of finite-element analyses were performed using ATILA: (1) an in-air modal analysis, in which the eigenfrequencies and eigenmodes are computed, and (2) an in-water harmonic analysis, in which the pressure field at a desired driving frequency is computed. The frequency of the ring mode computed for the three-dimensional model in the modal analysis was found to be 5 percent higher than the corresponding value for the two-dimensional model. From the harmonic analyses, the maximum sound pressure level on the acoustic axis was found to be 4 dB higher than the manufacturer's measured value and is located at exactly the same frequency.

DESIGN OF A DECENTRALIZED ASYNCHRONOUS MEMBERSHIP PROTOCOL AND AN IMPLEMENTATION OF ITS COMMUNICATIONS LAYER

Fernando Jorge Pires-Lieutenant, Portuguese Navy
B.S.E.E., Escola Naval, Lisbon, Portugal, 1986
Master of Science in Electrical Engineering-March 1993
Electrical Engineer-March 1993
Advisor: Shridhar B. Shukla-Department of Electrical and Computer Engineering

For development of group-oriented distributed applications, a group membership protocol provides the mechanisms to dynamically adapt to changes in the membership, ensuring consistent views among all members of the group. This is achieved by executing a distributed script that implements a protocol at each member to maintain a sequence of identical views, in spite of continuous changes, either voluntary or due to failure, to the membership. In asynchronous distributed environments, the protocol has to operate over a network that does not bound delivery times. This thesis presents a decentralized membership protocol, designed to operate on asynchronous environments, that organizes the members in a logical ring. The protocol assumes reliable FIFO channels, that fully interconnect all members to be available. These assumptions are later relaxed to adapt the protocol to real-world environments. Reconfigurations of the group are carried out using a two-phase algorithm. An agreement phase makes the change known to all operational members, and a commit phase integrates the change at all members, in the correct order. The protocol supports failures of one or more members, either successive or simultaneous, voluntary departures, and joining of new members. In the case of simultaneous events, the protocol ensures that they are incorporated one at a time, and following the same sequence, at all members. All actions are token-based and the protocol ensures that no tokens are lost or duplicated regardless of changes in the membership during any phase of the protocol. The main feature of this protocol is that, by ordering the group in a logical ring, and by decentralizing the responsibility of the monitoring and reconfiguration processes, the need for a dedicated manager is eliminated. Execution of the protocol is symmetric relative to the type of change, and to the responsibility distribution among members. The complete specification of the protocol is presented, along with a correctness proof and performance analysis. A full implementation design is presented and the actual implementation (coding) issues for a Unix-based environment are discussed. Since there are no other known full implementations of a decentralized protocol, comparisons are made with a centralized protocol, to determine message cost, and scalability characteristics.

MICROPROCESSOR CONTROLLED INSTRUMENTATION/NAVIGATION PACKAGE FOR HOSTILE MARINE ENVIRONMENTS

Robert L. Poitras-Lieutenant, United States Navy
B.S., United States Naval Academy, 1985
Master of Science in Electrical Engineering-March 1993
Advisor: Douglas F. Fouts-Department of Electrical and Computer Engineering

Currently, many shipboard instrumentation systems are inoperative or inaccurate when AC power is lost to the bus supplying power to the instrumentation. Instrumentation is also subject to failure when it comes into contact with water during a flooding, fire, or steamline rupture casualty. A small, inexpensive, standardized instrumentation package that is water resistant and capable of being powered from a standby battery power source is needed. This research is directed toward developing such an instrumentation system. To prove the water resistance of the system it was first installed on a windsurfing craft. Water resistant sensors using readily available components were also developed in this project.

DEVELOPMENT OF A LIDAR FOR INTEGRATION WITH THE NAVAL POSTGRADUATE SCHOOL INFRARED SEARCH AND TARGET DESIGNATION (NPS-IRSTD) SYSTEM

Murray Michael Regush-Major, Canadian Army
B.Eng, Royal Military College of Canada, 1981
Master of Science in Electrical Engineering-June 1993
Advisor: A. W. Cooper-Department of Physics

A lidar was designed and manufactured at the Naval Postgraduate School, Monterey, California, to provide range information regarding atmospheric features, such as clouds. It is further planned to integrate the lidar with the Naval Postgraduate School's Infrared Search and Target Designation System (NPS-IRSTD) at some future date. The NPS-IRSTD uses two vertical infrared linear focal plane arrays for target detection, and target direction can be determined very accurately but the system does not provide any useful range information. The lidar was proposed as the solution for this shortcoming. The lidar used a frequency-doubled Nd: YAG laser which had an energy output of 2 millijoules. The laser beam was expanded to 17.75 inches using Dall-Kirkham telescope to operate within laser safety limitations. The theoretical analysis of the "Klett" method for the inversion of lidar returns was derived and a MATLAB program was written to demonstrate the process. A daytime and nighttime maximum range equation for the lidar was developed. The considerations for integrating the lidar with the NPS-IRSTD is listed and a solution is proposed to obtain the mean extinction coefficient along the path in the infrared spectrum using the lidar inversion extinction coefficient profile at 532 nanometers.

MICROCOMPUTER SIMULATION OF A FOURIER APPROACH TO ULTRASONIC WAVE PROPAGATION

William H. Reid-Lieutenant, United States Navy
B.S., Virginia Military Institute, 1985
Master of Science in Electrical Engineering-December 1992
Advisor: J. P. Powers-Department of Electrical and Computer Engineering

This thesis uses a linear systems approach and the Fourier transform as the basis for a microcomputer program to model pulsed ultrasonic wave propagation. The program computes the acoustic potential in a plane at a given distance from the source. The mathematical development establishes the importance of the total impulse response as the Green's function meeting the boundary conditions and solving the wave equation. Four excitation functions are presented. The square and circular piston excitations are used to verify the program. Excitation functions also modeled are the circularly truncated Gaussian distribution and the circularly truncated Bessel profile. All programs were written using the MATLAB software package, This work provides a computationally efficient means to analyze pulsed ultrasonic wave propagation of a spatially filtered source.

A THREE-DIMENSIONAL COUPLED NORMAL MODE MODEL FOR SOUND PROPAGATION IN SHALLOW WATER WITH IRREGULAR BOTTOM BATHYMETRY

George A. Sagos-Lieutenant Junior Grade, Hellenic Navy
B.S., Hellenic Naval Academy, 1985
Master of Science in Electrical Engineering-December 1992
Advisors: C. S. Chiu-Department of Oceanography &
J. H. Miller-Department of Electrical and Computer Engineering

A three-dimensional (3D) coupled normal mode model for studying sound propagation in a complex coastal environment is developed. This development corresponds to a significant upgrade of an earlier version of the model in which a flat, rigid bottom was used. By imposing the general boundary conditions for an irregular, non-rigid bottom, the coupling coefficient integrals in the system of differential equations governing the mode amplitudes is reformulated. The model upgrade entails a numerical implementation of the revised formula. With the improved physics, this latest version is capable of modeling the 3D acoustic wave-field in shallow water where sound speed, water depth and sediment properties can vary with horizontal location. To demonstrate this enhanced capability, the model is used here to simulate the interactions of the normal modes as they propagate up a sloping bottom.

MODELING AND SIMULATION OF A FIBER DISTRIBUTED DATA INTERFACE

Aldo Brune Schenone-Lieutenant, Peruvian Navy
B.S., Peruvian Naval Academy, 1986
Master of Science in Electrical Engineering-September 1993
Advisor: Shridhar Shukla-Department of Electrical and Computer Engineering

In this thesis, the performance of the fiber distributed data interface (FDDI) local area network is evaluated by software simulation. The network is modeled with OPNET, a communication network simulation tool. The main focus of the model is on the medium access control (MAC) and the timing requirements that need to be met for the correct behavior of the protocol. Simulation data is presented to support results from previous analytic studies of distinctive features of the protocol, including the behavior of the token rotation time, synchronous frame delays, fairness of channel access for nodes transmitting asynchronous traffic, etc. Comparisons between the simulated and theoretical results confirm the accuracy of the OPNET simulation tools and demonstrate that it may be used to model other protocols of particular interest.

SIMULATION OF TRIPOD GAITS FOR A HEXAPOD UNDERWATER WALKING MACHINE

Charles Andrew Schue, III-Lieutenant, United States Coast Guard
B.S., Naval Postgraduate School, 1992
Master of Science in Electrical Engineering-June 1993
Advisor: Yutaka Kanayama-Department of Computer Science

This thesis develops the mathematical relationships necessary to implement alternating tripod gais on the hexapod underwater walking machine, *AquaRobot*. Analysis of documentation and application of Denavit-Hartenberg kinematic modeling techniques determine the fundamental vehicle parameters. Smooth leg motion models following elliptical and cycloidal trajectories are devised. Gait planning algorithms, using the elliptical smooth leg motion model, are developed for both discrete and continuous body motion. Statically stable, alternating tripod gait simulations are implemented in the C++ programming language. A stick figure graphics display allows examination and testing of the gait algorithms prior to incorporation in follow-on 3D graphics simulations or in real-time operation.

TARGET DETECTION VIA KALMAN FILTERING
Gary Alan Sipe-Lieutenant, United States Navy
B.S., Tri State University, 1985
Master of Science in Electrical Engineering-March 1993
Advisor: H. A. Titus-Department of Electrical and Computer Engineering

A simple, time domain method is used to analyze moderate to high PRF radar signals. The quantities of interest are the signal's PRF, SNR, and time of arrival. The time of arrival problem is important because it can be used, with multiple sensors, to determine the position of the emitting target. An algorithm is described which will produce these values using Kalman filtering. Individual pulses in a pulsed type radar are measured against a threshold using a two sample detection scheme to provide some glitch rejection. Results of individual, time domain measurements of the signal parameter are smoothed with a Kalman filter. Integrating the pulse train envelope during the radar dwell time provides the energy centroid for a scan cycle. This centroid, time differenced with multiple sensors provides observables for an Extended Kalman Filter for emitter localization. The work here simulates all data. Tests of the algorithms developed were conducted on real, classified data in addition to the work presented here.

TRELLIS CODED MODULATION APPLIED TO ORTHOGONAL SIGNALS
Janet Emerson Stevens-Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1988
Master of Science in Electrical Engineering-March 1993
Advisor: Tri T. Ha-Department of Electrical and Computer Engineering

A method for the design of trellis codes for coherent detection of orthogonal signals in *additive white Gaussian noise* (AWGN) channels is presented. This method utilizes the landmark works of Ungerboeck in *trellis coded modulation* (TCM). After examining the channel capacity, it is shown that a coding method requiring the same bandwidth efficiency for the orthogonal signal space and *maximum likelihood* (ML) soft decoding using the Viterbi algorithm can achieve large asymptotic coding gains. Several codes are analyzed using Ungerboeck's technique of set-partitioning and mapping, then applying the analytic code description method of Calderbank and Mazo to *M-ary frequency shift keying* (M-FSK). The general finding of this paper is that relative to uncoded modulation, asymptotic coding gains of 3-4 dB can be achieved.

COMPUTER SIMULATION STUDIES OF TWO-DIMENSIONAL BEAMFORMING FOR LINEAR ARRAYS USING A PARALLEL COMPUTER SYSTEM
Daniel Thomas Sullivan-Lieutenant, United States Navy
B.S.E.E., University of Illinois, 1984
Master of Science in Electrical Engineering-December 1992
Advisor: Chin-Hwa Lee-Department of Electrical and Computer Engineering

Computer simulation results of a parallel system conducting beamforming for a linear hydrophone array are presented. These studies were performed to determine the best mapping and partitioning of a sequential beamformer program onto a parallel system. Different partition designs and programming methodologies were examined, as well as latencies caused by inter-processor communications. Results of these simulation studies demonstrate that linear scalability in performance is possible by programming with host-node methodology and utilizing efficient inter-processor communications.

LARGE GRAIN DATA-FLOW GRAPH RESTRUCTURING FOR EMSP SIGNAL PROCESSING BENCHMARKS ON THE ECOS WORKSTATION SYSTEM

David P. Swank-Lieutenant, United States Navy
B.A., East Stroudsburg State College, 1982
Master of Science in Electrical Engineering-June 1993
Advisor: Shridhar B. Shukla-Department of Electrical and Computer Engineering

This thesis documents a procedure for implementing the Revolving Cylinder scheduling algorithm for parallel programs on the ECOS Workstation System (EWS), designed specifically by AT&T for simulation of the Enhanced Modular Signal Processor (EMSP) currently in use by the United States Navy. The Revolving Cylinder (RC) algorithm provides a methodology for forcing First Come First Served (FCFS) schedulers to follow a more systematic utilization of available resources. The methods of implementation used to take advantage of the Graphical Editor (gred) to insert additional data dependencies into the program structure. The thesis utilizes applications written in Signal Processing Graph Notation (SPGN), viz., a simple correlator function and the active subroutine of the U.S. Navy Sonobuoy benchmark. Results for standard FCFS scheduling and RC modified scheduling are presented for both. Special attention is paid throughout the thesis to enhancement of manufacturer supplied documentation with regard to implementation of the non-standard RC structures. Impact of the algorithm on throughput and latency is discussed, as well as performance determination using the tools provided with the ECOS Workstation System.

NUMERICAL MODELING OF A FREE-FLOODED PIEZOELECTRIC RING SONAR TRANSDUCER

Tiong Beng Tay-Major, Republic of Singapore Navy
B.Eng.(Hons), National University of Singapore, 1985
Master of Science in Electrical Engineering-March 1993
Master of Science in Engineering Acoustics-March 1993
Advisors: Steven R. Baker, Oscar B. Wilson-Department of Physics &
Ron J. Pieper-Department of Electrical and Computer Engineering

A two-dimensional finite element model of a low frequency, free-flooded piezoelectric thin ring sonar transducer was developed for use with the ATILA code. Effective material properties for the ring were determined from in-air modal analyses using ATILA. These were adjusted to obtain the closest agreement between the calculated ring resonance frequency and coupling coefficient and measured data supplied by the manufacturer. In addition, equations for the electrical admittance for this transducer in air were developed based on an analytical approach published by Hong-zhang Wang (J. Acoust. Soc. Am. 79, 164-176 (1986)). A MATLAB program was written to implement these equations and to calculate various electromechanical network parameters. The calculated values agreed with measured values to within 5 percent. An in-water harmonic analysis, in which the transmitting voltage response and the directivity pattern are computed, was performed using the ATILA code. In general, results obtained using the finite element model and manufacturer's measured values agree within 10 percent. The effects of changes in material properties on acoustic performance of the transducer were investigated; the results are discussed.

APPLICATION OF KALMAN FILTER ON MULTISENSOR FUSION TRACKING

Brian E. Terpening-Lieutenant, United States Navy
B.A., Louisiana Tech. University, 1984
Master of Science in Electrical Engineering-December 1992
Advisor: H. Titus-Department of Electrical and Computer Engineering

The use of Kalman filtering in tracking targets and the reconstruction of a target's track are addressed in two separate fusion schemes. First, the Kalman filter is used to provide estimates of the position and velocity of a target based upon observations of the target's bearing. Two sensors, a radar in receive mode and an infra-red sensor, take bearings to the target at different scan rates. This information is then fused within the filter to obtain the target's track. Secondly, range, bearing, and frequency are used in fusion. Kalman filtering, Kalman smoothing, and maneuver detection are all used in the reconstruction of a target's track. Improvements are implemented in the method of forcing the excitation matrix and the results documented.

DESIGN OF BROADBAND WIRE ANTENNAS FOR FREQUENCY HOPPING APPLICATIONS

Keem Boon Thiem
B.S., California State Polytechnic University, Pomona, 1990
Master of Science in Electrical Engineering-March 1993
Advisor: R. Janaswamy-Department of Electrical and Computer Engineering

For a variety of mechanical and electrical reasons, the U.S. Army prefers to use a wire antenna for its mobile applications in the HF and VHF bands. However, due to the rapid fluctuation of impedance with frequency, a simple wire antenna is not suitable. This research will look into the aspects of electronic switching of the antenna length and electronic switching of the accompanying tuning network for frequency hopping applications. Two separate schemes will be studied. The first one involves a chosen wire antenna loaded with PIN diodes. The diodes will be selectively switched ON or OFF at different frequencies to control the input impedance of the antenna. In the second scheme, a monopole antenna of fixed length will be considered and data on its input impedance over many sub-bands within 30 to 90 MHz will be generated. Tuning networks composed of resistors, inductors and capacitors will be designed over each sub-band. The various networks will then be connected via PIN diodes and selectively switched to provide matching over a much wider band.

A SINGLE-TRANSISTOR MEMORY CELL AND SENSE AMPLIFIER FOR A GALLIUM ARSENIDE DYNAMIC RANDOM ACCESS MEMORY

Christopher Bryan Vagts-Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1981
Master of Science in Electrical Engineering-December 1992
Advisor: Douglas J. Fouts-Department of Electrical and Computer Engineering

This thesis presents the design and layout of a Gallium Arsenide (GaAs) Dynamic Random Access Memory (DRAM) cell. Attempts have been made at producing GaAs DRAM cells, but these have dealt with modifications to the fabrication process, are expensive, and have met with little success. An eight-address by one-bit memory is designed, simulated, and laid out for a standard GaAs digital fabrication process. Three different configurations of RAM cells are considered: the Three-Transistor RAM Cell, the One-Transistor RAM Cell with a Diode and the One-Transistor RAM Cell with a capacitor. All are tested and compared using the circuit simulator HSPICE. The chosen DRAM design uses the One-Transistor RAM Cell with a parallel plate capacitor and a five-transistor differential sense amplifier that handles reading as well as refreshment of the memory cells. The differential sense amplifier compares a dummy cell with a memory cell to perform a read. The required timing is presented and demonstrated with read, write, and refresh cycles. Actions to minimize charge leakage are also considered and discussed. The design is simulated for access rates of approximately five nanoseconds, but the basic design can work at much faster rates with little modification.

MODELING AND CLASSIFICATION OF BIOLOGICAL SIGNALS

Martha M. VanDerKamp-Lieutenant, United States Navy
B.S., University of the State of New York, 1983
Master of Science in Electrical Engineering-December 1992
Advisor: Roberto Cristi-Department of Electrical and Computer Engineering

This thesis examines a number of marine biological signals and the problem of modeling by autoregressive techniques using a Prony-SVD algorithm to accurately represent segments of biological signals. Two methods are employed to classify the biological signals from the model parameters. The first classification method is based on a Neural Network implementation using a commercial software package. The second method is accomplished by using a distance measure, based on spectral ratios, with respect to modeled reference signals.

ARMA MODELING OF SIGNALS IN THE TIME DOMAIN

Carlos H. Velasco-Lieutenant Commander, Columbian Navy
B.S.E.E., Colombian Naval Academy, 1988
Master of Science in Electrical Engineering-December 1992
Advisor: Charles W. Therrien-Department of Electrical and Computer Engineering

This thesis develops an iterative algorithm for the design of ARMA models of signals in the time domain. The algorithm is based on optimization techniques, particularly a gradient technique known as the *restricted step method* is used. The new algorithm is called the *iterative Prony method*, and the results obtained using this new method are compared to those obtained using the iterative prefiltering algorithm. The thesis shows that the performance of the iterative Prony method is in most of the cases comparable or superior to that of the iterative prefiltering algorithm.

PROBABILITY OF DETECTION CALCULATION USING MATLAB
Yung-Chung Wei-Lieutenant, R.O.C. Taiwan Navy
B.S., Chinese Navy Academy, 1984
Master of Science in Electrical Engineering-June 1993
Advisor: Gurnam S. Gill-Department of Electrical and Computer Engineering

A set of highly efficient computer programs based on the Marcum and swerling's analysis on radar detection has been written in MATLAB to evaluate the probability of detection. The programs are based on accurate methods unlike the detectability method which is based on approximation. This thesis also outlines radar detection theory and target models as a playground. The goal of this effort is to provide a set of efficient computer programs for student usage and teacher's aid. Programs are designed to be user friendly and run on personal computers.

MIMO RECURSIVE LEAST SQUARES CONTROL ALGORITHM FOR THE AN/FPN-44A LORAN-C TRANSMITTER
John D. Wood-Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1988
Master of Science in Electrical Engineering-September 1993
Advisor: Murali Tummala-Department of Electrical and Computer Engineering

A multiple-input, multiple-output (MIMO) recursive least squares (RLS) algorithm is developed to shape and control the Loran-C RF pulse of the AN/FPN-44A tube type transmitter. The control algorithm is incorporated into a transmitter simulation program, where it seeks to produce an optimal transmitter drive waveform (TDW). An optimal TDW produces a near ideal RF pulse. The control algorithm uses a MIMO reference model of the transmitter; parameters of the model are obtained using recursive least squares multichannel time series techniques. The MIMO reference model has the ability to adapt to the non-LTI characteristics of the simulated transmitter. The MIMO RLS control algorithm is implemented in both an ideal and a realistic noisy environment. In the ideal environment, when representing the RF pulse with parameters of its half-cycle peak amplitudes and zero-crossings, the MIMO RLS controller is able to shape the RF pulse and control its zero-crossings. Quantization and system noise in the non-ideal environment results in performance deterioration of the control algorithm. The performance of the MIMO RLS algorithm is compared against another method of control, the steepest descent algorithm.

MULTIPLE-VALUED PROGRAMMABLE LOGIC ARRAY MINIMIZATION BY CONCURRENT MULTIPLE AND MIXED SIMULATED ANNEALING
Cem Yildirim-Lieutenant Junior Grade, Turkish Navy
B.S., Turkish Naval Academy, 1985
Master of Science in Electrical Engineering-December 1992
Advisor: Jon T. Butler-Department of Electrical and Computer Engineering

The process of finding a guaranteed minimal solution for a multiple-valued programmable logic expression requires an exhaustive search. Exhaustive search is not very realistic because of enormous computation time required to reach a solution. One of the heuristics to reduce this computation time and provide a near-minimal solution is simulated annealing. This thesis analyzes the use of loosely-coupled, course-grained parallel systems for simulated annealing. This approach involves the use of multiple processors where interprocess communication occurs only at the beginning and end of the process. In this study, the relationship between the quality of solution, measured by the number of products and computation time, and simulated annealing parameters are investigated. A simulated annealing experiment is also investigated where two types of moves are mixed. These approaches provide improvement in both the number of product terms and computation time.

MASTER OF SCIENCE
IN
ENGINEERING ACOUSTICS

EXPERIMENTAL DETERMINATION OF THE SURFACE DISPLACEMENT OF A SMALL FLEXURAL DISK SONAR TRANSDUCER FROM SURFACE STRAIN MEASUREMENTS

Douglas Lee Cuthbert-Lieutenant, United States navy
B.S., United States Naval Academy, 1985
Master of Science in Engineering Acoustics-June 1993
Master of Science in Applied Science-June 1993
Advisor: Steven R. Baker-Department of Physics

The normal displacement of a flexural disk sonar transducer's radiating face was measured using both a laser doppler vibrometer and surface mounted strain gages. The laser doppler vibrometer measurements were used to calibrate the strain gages, allowing a single measurement of strain to be used to define the displacement over the transducer's entire face. The feasibility of investigating the interaction of closely spaced array elements through the use of surface strain measurements was established by experiments with a submerged two element array. The surface strain, measured as a function of the transducer separation, increases the understanding of sonar transducer element interaction in a densely packed array.

INVESTIGATION OF THERMOACOUSTIC MUFFLER

Chun-Hua Che-Commander R.O.C. Navy
B.S., R.O.C. Naval Academy, 1978
Master of Science in Engineering Acoustics-December 1992
Advisor: Anthony A. Atchley-Department of Physics

The design, construction and testing of a thermoacoustic muffler is discussed. The performance of the muffler is characterized by measuring its ability to reduce the quality factor Q of an acoustic resonator. Measurements of the Q of a helium filled muffler were made for temperature differences ranging from 0 to -130°C. The measured Q-reduction, approximately 30%, agrees with predicted reductions. The predictions are based on a standing wave analysis of thermoacoustic engines published by Atchley (J. Acoust. Soc. Am. 92, 2907-2914, 1992). These results indicate that Q-reduction is possible. Future work should concentrate on optimization, to determine if a thermoacoustic muffler is, in fact, practical.

DETERMINATION OF THE COMPLEX MASS DENSITY OF AIR CONTAINED IN A RIGID POROUS SOLID BY AN ACOUSTIC METHOD

Kevin A. Grundy-Lieutenant, United States Navy
B.S., University of Idaho
Master of Science in Engineering Acoustics-September 1993
Advisor: Steven R. Baker-Department of Physics

An acoustical method for determining the frequency dependent complex effective mass density $\tilde{\rho}_{eff}$ of air contained in a rigid porous solid is investigated. An apparatus was designed and built which holds an air-filled porous solid sample within a cylindrical tube capped on each end by identical moving-coil loudspeakers. A quantity of air ia made to oscillate back and forth as a plug through the porous solid sample. $\tilde{\rho}_{eff}$ is obtained from pressure and acceleration measurements taken at the ends of the sample tube. A description of the apparatus and the experimental results are presented.

STABILITY CURVES FOR A THERMOACOUSTIC PRIME MOVER

Fan-Ming Kuo-Lieutenant, Republic of China Navy
B.S., Chinese Naval Academy, 1989
Master of Science in Engineering Acoustics-June 1993
Advisor: Anthony A. Atchley-Department of Physics

The purpose of this thesis is to investigate the stability curves for and steady state waveforms in a helium filled prime mover for both the fundamental and second modes. The predicted and measured stability limits are in reasonable agreement for both modes at most mean pressures. There is, however, evidence that the stability of one mode is affected by the presence of the other. It is also observed that one mode can suppress the other. Measurements were also made on a prime mover modified such the fundamental mode was selectively inhibited. Results indicate that the reduced fundamental amplitude allows the stability curve for the second mode to extend into the regions where the fundamental mode previously dominated. This produces a region where both modes are simultaneously excited. Analysis of the waveforms show that the resulting oscillations are quasiperiodic.

EXPERIMENTAL INQUIRIES INTO COLLECTIVE SEA STATE MODES IN DEEP WATER SURFACE GRAVITY WAVES

Richard T. Lawrence-Lieutenant, United States Navy
B.S., Physics, United States Naval Academy, 1984
Master of Science in Engineering Acoustics-December 1992
Advisor: Robert M. Keolian-Department of Physics

An experiment designed to find collective sea state modes in deep water surface gravity waves was performed. The experiment was conducted in a large water tank with fans to create wind driven background sea state. This background sea state may be more precisely referred to as a condition of wave turbulence. The background sea state was perturbed with an additional burst of waves created at one end of the tank by a computer controlled mechanical paddle. Different wind speeds and input burst waveforms were used. The wave height was measured with a four wire probe, with integrated circuit implementation. Data acquisition, manipulation, and averaging were automated. The probable collective mode can be seen in spectral density versus time images as a nondispersive decrease in background spectral density. It was estimated that this decrease in spectral density propagated independently of the input wave burst by examining its arrival time relative to burst energy arrival time for different probe to paddle distances. Additionally, input burst energy at frequencies above the background spectral peak was not observed to propagate.

BREAKDOWN OF ADIABATIC INVARIANCE

Charlotte Virginia Leigh-Lieutenant Commander, United States Navy
B.S., Hawaii Pacific University, 1991
Master of Science in Engineering Acoustics-March 1993
Advisor: Bruce Denardo-Department of Physics

Adiabatic invariance, in which certain quantities of a system remain unchanged as a parameter of the system is infinitely slowly altered, plays a fundamental role in many areas of physics. For any harmonic oscillator, the adiabatic invariant is the energy divided by the frequency. When the alterations are slow but occur over a finite time, there is predicted to be an *exponential suppression* of the change in a adiabatic invariant; that is, if e is a dimensionless positive number that tends to zero in the limit of infinitely slow alterations, then the change in adiabatic invariant is proportional to exp(-1/e). We report numerical simulations of three oscillators whose parameters are varied at rates ranging from very slow to very fast compared to the oscillation frequency. The models are single-degree-of-freedom oscillators that are based on simple physical systems. The exponential suppression is not observed, which indicates that its observation may be extremely difficult or impossible. Furthermore, the change in adiabatic invariant is found to depend upon the initial phase even in the limit of infinitely slow changes. In the case of abrupt alterations, the numerical simulations verify some theoretical calculations, but reveal that other theoretical calculations are incorrect.

UNDERWATER SOUND RADIATION FROM SINGLE LARGE RAINDROPS AT TERMINAL VELOCITY: THE EFFECTS OF A SLOPED WATER SURFACE AT IMPACT

Glenn A. Miller, Sr.-Lieutenant, United States Navy
B.S., United States Naval Academy, 1986
Master of Science in Engineering Acoustics-December 1992
Advisors: Herman Medwin-Department of Physics &
Jeffrey A. Nystuen-Department of Oceanography

Previous studies have shown that terminal velocity raindrops striking a smooth water surface create oscillating bubbles that radiate significant underwater sound energy. Those studies identified two diameter ranges that produce bubbles: small drops (0.8-1.1 mm diameter) which produce bubbles by one mechanism and large drops (2.2-4.6 mm diameter) which create bubbles by a different mechanism. Effects of oblique incidence have been studied only for small drops. Average energy spectra were calculated for a range of raindrop sizes striking a smooth water surface. This work deals with the real life situation of large raindrops of a size often present in heavy rainfall (4.6 mm diameter) striking a sloped water surface. Terminal velocity is used to simulate natural rainfall, and the sloped surface is used to simulate the surface gravity waves of a natural sea. The effects of a sloped water surface on the frequency spectra and energy for 4.6 mm raindrops are estimated. By comparing energy spectra generated by single drops in an anechoic laboratory tank to underwater sound spectra measured at sea, it will be possible to estimate heavy rainfall rate by means of remote underwater listening devices.

THREE-DIMENSIONAL FINITE ELEMENT MODEL OF A HIGH POWER, LOW FREQUENCY RING-SHELL FLEXTENSIONAL SONAR TRANSDUCER

Rogerio Nacimento Costa Pinto-Lieutenant Commander, Brazilian Navy
B.S., Brazilian Naval Academy, Rio de Janeiro, 1978
B.S., University of Sao Paulo, Sao Paulo, 1984
Master of Science in Engineering Acoustics-December 1992
Master of Science in Electrical Engineering-December 1992
Advisors: Steven R. Baker & Oscar B. Wilson-Department of Physics &
Ron J. Pieper-Department of Electrical and Computer Engineering

A three-dimensional finite element model of a high power, low frequency flextensional transducer (Sparton of Canada, Ltd., Model 34A0610) was developed for use with the ATILA code. This transducer model is to be coupled with an analytical acoustic field description in order to model a dense sonar array of U.S. Navy interest. The three-dimensional model was derived from a two-dimensional model provided by the Naval Undersea Warfare Center. Two types of finite-element analyses were performed using ATILA: (1) an in-air modal analysis, in which the eigenfrequencies and eigenmodes are computed, and (2) an in-water harmonic analysis, in which the pressure field at a desired driving frequency is computed. The frequency of the ring mode computed for the three-dimensional model in the modal analysis was found to be 5 percent higher than the corresponding value for the two-dimensional model. From the harmonic analyses, the maximum sound pressure level on the acoustic axis was found to be 4 dB higher than the manufacturer's measured value and is located at exactly the same frequency.

A THREE-DIMENSIONAL COUPLED NORMAL MODE MODEL FOR SOUND PROPAGATION IN SHALLOW WATER WITH IRREGULAR BOTTOM BATHYMETRY

George A. Sagos-Lieutenant Junior Grade, Hellenic Navy
B.S., Hellenic Naval Academy, 1985
Master of Science in Engineering Acoustics-December 1992
Master of Science in Electrical Engineering-December 1992
Advisors: Ching-Sang Chiu-Department of Oceanography &
James H. Miller-Department of Electrical and Computer Engineering

A three-dimensional (3D) coupled normal mode model for studying sound propagation in a complex coastal environment is developed. This development corresponds to a significant upgrade of an earlier version of the model in which a flat, rigid bottom was used. By imposing the general boundary conditions for an irregular, non-rigid bottom, the coupling coefficient integrals in the system of differential equations governing the mode amplitudes is reformulated. The model upgrade entails a numerical implementation of the revised formula. With the improved physics, this latest version is capable of modeling the 3D acoustic wave-field in shallow water where sound speed, water depth and sediment properties can vary with horizontal location. To demonstrate this enhanced capability, the model is used here to simulate the interactions of the normal modes as they propagate up a sloping bottom.

COMPARISON CALIBRATION OF PIEZORESISTIVE MICROPHONES FOR ACOUSTIC POWER MEASUREMENTS

Ron J. Stockermans-Captain, Canadian Forces
B.Eng., Royal Military College of Canada, 1982
Master of Science in Engineering Acoustics-December 1992
Advisors: Tom J. Hofler & Steven L. Garrett-Department of Physics

A calibration of two Endevco piezoresistive microphones was carried out under static and dynamic pressures. The dynamic pressure calibrations were done by comparison with a B&K condenser microphone. The calibration was carried out in a small closed volume in air and helium. In helium, the closed volume was pressurized to atmospheric pressure and then 10 Atm. The dynamic calibration would determine the "flatness" of the calibration curve, as well as determine a sensitivity value over the range of frequencies used. The results showed that the calibration curve for the piezoresistive microphones are flat from static pressures to about 300 Hz and then begin to fall off. The value of the sensitivity of the "flat" region of the calibration curve for one microphone was within 0.4% of the value for sensitivity calculated under the static pressure calibration. For the other microphone the static and dynamic sensitivities were within 1.3% of each other. Thus, the static calibration of one microphone may be used under dynamic conditions with a less than 1% error while using the other microphone similarly will produce an error of greater than 1%.

NUMERICAL MODELING OF A FREE-FLOODED PIEZOELECTRIC RING SONAR TRANSDUCER

Tiong Beng Tay-Major, Republic of Singapore Navy
B.Eng.(Hons), National University of Singapore, 1985
Master of Science in Engineering Acoustics-March 1993
Master of Science in Electrical Engineering-March 1993
Advisors-Steven R. Baker & Oscar B. Wilson-Department of Physics &
Ron J. Pieper-Department of Electrical and Computer Engineering

A two-dimensional finite element model of a low frequency, free-flooded piezoelectric thin ring sonar transducer was developed for use with the ATILA code. Effective material properties for the ring were determined from in-air modal analyses using ATILA. These were adjusted to obtain the closest agreement between the calculated ring resonance frequency and coupling coefficient and measured data supplied by the manufacturer. In addition, equations for the electrical admittance for this transducer in air were developed based on an analytical approach published by Hong-zhang Wang (J. Acoust. Soc. Am. 79, 164-176, 1986). A MATLAB program was written to implement these equations and to calculate various electromechanical network parameters. The calculated values agreed with measured values to within 5 percent. An in-water harmonic analysis, in which the transmitting voltage response and the directivity pattern are computed, was performed using the ATILA code. In general, results obtained using the finite element model and manufacturer's measured values agree within 10 percent. The effects of changes in material properties on acoustic performance of the transducer were investigated; the results are discussed.

DEVELOPMENT AND CALIBRATION OF TWO AND FOUR WIRE WATER SURFACE WAVE HEIGHT MEASUREMENT SYSTEMS

Robert Kerry Yarber
Masters of Science in Engineering Acoustics-December 1992
Advisors: Robert M. Keolian-Department of Physics &
Steven L. Garrett-Department of Physics

Capacitance and conductance measurements using two and four wire techniques were developed and statically and dynamically calibrated in this thesis. The voltage sensitivities range from 7.3 to 8.1 ± 0.1 mV/cm for the two wire capacitance system static calibrations. This is ± 5.2% of the limiting theoretical value. The voltage sensitivities range from 0.3 to 0.4 ± 0.1 V/cm for the four wire conductance system static calibrations. Dynamic calibrations were only completed for the conductance system. The dynamic calibration results were weakly frequency dependent with a $\omega^{-0.15}$ decay in a limited, 2-4 Hz range. Wind power spectrum measurements were taken in the existing Upper Ocean Simulations Facility at the Naval Postgraduate School. There was excellent agreement in the spectra with both techniques. Driven gravity wave frequency downshifting and wind energy dumping was observed in the combined gravity wave and wind-wave measurements. The power spectra peaked near two Hertz and decayed at 50 to 70 dB per decade, or as ω^{-5} to ω^{-7} for both systems. Gravity wave phase speed and wavelength measurements were performed with the capacitance system. The results were approximately 40% higher than theory.

MASTER OF SCIENCE
IN
ENGINEERING SCIENCE

IMPLEMENTATION AND USE OF A COMPUTATIONAL RAY-TRACING PROGRAM FOR THE DESIGN AND ANALYSIS OF COMPLEX OPTICAL SYSTEMS

James Dudley Atkinson, IV-Lieutenant, United States Navy
B.S., Louisiana State University, 1985
Master of Science in Engineering Science (Astronautics)-March 1993
Master of Science in Physics-March 1993
Advisor: David D. Cleary-Department of Physics

A new ray-tracing computer program is presented as an analysis and design tool for the development of complex optical systems. The algorithms for the ray-tracing are presented for a wide variety of optical surface types. Unique methods for the prediction of two-beam interference patterns are implemented so that amplitude-splitting interferometers can be modeled. Modules for line shape analysis and data storage are also described. This program (DART) is validated using the previously established characteristics of the Middle Ultraviolet Spectral analysis of Nitrogen Gasses (MUSTANG) instrument, which has a resolution of 10 Å, and X-axis field-of-view of 1.2 milliradians, a Y-axis field-of-view of 37 milliradians, and a 1600 Å band-pass. DART is used to predict the optical characteristics of a new instrument, ISAAC, that is planned for satellite deployment in 1995. The full wavelength range of ISAAC is 1250 Å, and the instantaneous band-pass is approximately 250 Å. The full wavelength coverage is obtained by rotating a reflection grating in five discreet steps. Based on the DART calculations, the resolution of the ISAAC instrument will exceed 1.30 Å for all bands, with resolutions as low as 1.06 Å at the longer wavelengths. The predicted X-axis field-of-view is 0.5 milliradians and the Y-axis field-of-view is 36 milliradians.

PROTOTYPING OF TWO-BEAM LASER INTERFEROMETER FOR MEASUREMENT OF OPTICAL TURBULENCE ALONG EXTENDED PATHS

Carl S. Barbour-Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1980
Master of Science in Engineering Science-December 1992
Advisor: Scott Davis-Department of Physics

This thesis demonstrates a proof-of-concept experimental validation of a prototype two-beam, division of wavefront laser interferometer that provides a real-time measurement of the optical path difference, and subsequent phase distortion, caused by atmospheric turbulence along an extended horizontal path. Prototype's signal processing incorporates use of specialized phase comparator circuit developed by author's advisor, D.S. Davis. Photographs and results cited of the prototype receiver's output offer proof of the validity of the basic design. Further research of this technology is expected to support future laser/adaptive optics long-range weapon applications.

MODELING AND SIMULATION OF FLEET AIR DEFENSE SYSTEMS USING EADSIM

Neil Robert Bourassa-Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1982
Master of Science in Engineering Science-June 1993
Advisor: Robert E. Ball-Department of Aeronautics and Astronautics

The goal of this thesis is to develop a capability to simulate naval anti-air warfare (AAW) systems at the Naval Postgraduate School (NPS). Students in many curricula at NPS can use such a model in thesis research or course work related to air defense. Examples of courses in the Department of Aeronautics and Astronautics in which there is a use for AAW simulation are AE3705 "Air Defense Lethality" and AE3251 "Aircraft Combat Survivability". The Extended Air Defense Simulation (EADSIM) was selected as the model to acquire and install on the Silicon Graphics computer workstations of the Computer Center Visualization Laboratory. EADSIM was developed by Teledyne Brown Engineering for the U.S. Army Space and Strategic Defense Command and is a powerful analysis tool that can model many aspects of air warfare. The author has used EADSIM to develop AAW and Strike Warfare scenarios for use in AE3705 and AE3251. These scenarios required the creation and modification of platforms within the graphical user interface to simulate naval units. These scenarios can be run and displayed as animated playback files for analysis. In addition, the EADSIM weapon performance model was studied. The default values for weapon systems probability of kill (P_K) were modified, and the results were examined to determine the overall effect of P_K within a simulation.

THE USE OF BACKSCATTERED ELECTRON IMAGING MODE TO ASSESS THE EFFECT OF FINE DISPERSIONS ON DEVELOPMENT OF SUPERPLASTIC MICROSTRUCTURES IN AL-MG ALLOYS

Michael Thomas Coleman-Lieutenant Commander, United States Navy
B.A., Grambling State University, 1978
Master of Science in Engineering Science-June 1993
Advisor: Terry R. McNelley-Department of Mechanical Engineering

Microstructural evolution during thermomechanical processing of several Al-Mg alloys was studied using backscattered orientation contrast imaging in the scanning electron microscope. The microstructural evolution in Al-8Mg-0.1Zr was characterized in 3 phases: (a) in initial stages, precipitation occurred on prior boundaries and microbands were observed in the grain interiors; (b) during intermediate stages, higher order microbands were observed and precipitates formed throughout the microstructure on both lower- and higher-order microbands; (c) in final stages, equiaxed regions appeared around larger particles suggesting particle stimulated nucleation of recrystallization. A higher Mg content alloy (Al-10 Mg-0.1Zr) was compared at two processing stages and seen to provide a greater volume fraction of similar sized precipitate. A finer recrystallized microstructure and greater superplastic response was observed in the Al-10Mg-0.1Zr alloy.

EFFICIENT GRID BASED TECHNIQUES FOR SOLVING THE WEIGHTED REGION LEAST COST PATH PROBLEM ON MULTICOMPUTERS

Cengiz Ekin-Lieutenant Junior Grade, Turkish Navy
B.S., Turkish Naval War Academy, 1986
Master of Engineering Science-December 1992
Advisor: Amr Zaky-Department of Computer Science

This thesis explore the possibilities of developing fast grid-based parallel algorithms to solve the Weighted Region Least Cost Path problem. Two complementary steps have been undertaken. First, an efficient sequential algorithm to solve the above problem was developed. The algorithm is a modification of a Gauss-Seidel-like algorithm for obtaining the minimum costs. The most salient feature of the algorithm is the reduction of the number of nodes and edges in cheaper regions of the grid. The reported experimental results ascertain the superiority of this algorithm with regard to computer running time at a modest reduction in the accuracy of the obtained solution. Parallel implementations of grid-based algorithms were studied. A simple grid-based variant was implemented on a network of Transputers. The overall approach employed could be used to develop a parallel version of the above sequential algorithm on a Transputer network, combining both advantages of efficiency and parallelism.

A MOMENT PLOTTING METHOD OF CHARACTERIZING AIRCRAFT FATIGUE DATA POPULATION DISTRIBUTIONS

Rolf Michael Lokensgard-Captain, United States Marine Corps
B.A., Saint Olaf College, 1985
Master of Science in Engineering Science-September 1993
Advisor: G. H. Lindsey-Department of Aeronautics and Astronautics

A method was developed where, by statistically analyzing samples of aircraft fatigue data from a population, the population's probability distribution function is determined. The method uses plots of a sample's coefficient of variation, and measures of skewness and kurtosis, superimposed on templates of curves created from the moment functions of Normal, Lognormal, Weibull and Exponential distributions. The moment functions are derived for each distribution. The plotting technique is combined with a comparison of goodness of fit statistics to form the complete distribution selection method. The method is first tested on random numbers generated from known distributions to see if the correct distributions are selected; then the method is applied to helicopter loads data, fatigue life characterization test data, and counting accelerometer data.

EXERGY DECREASE IN SHOCK WAVES AND BOUNDARY LAYERS OF SPACE LAUNCH VEHICLES

Benjamin Frank Roper-Lieutenant Commander, United States Navy
B.S., Stephen F. Austin State University, 1977
Master of Science in Engineering Science-March 1993
Master of Science in Systems Technology (Space Systems Operations)-March 1993
Advisor: Conrad F. Newberry-Department of Aeronautics and Astronautics

The exergy method of analysis uses both the First and Second laws of Thermodynamics to determine where losses occur. This method has been shown to be superior to conventional heat balance analyses. A primary contributor to the exergy decrease is the production of entropy. Entropy is produced in shock waves and boundary layers, as well as in other regions of the flowfield. A method of analysis is presented to quantify the entropy that is produced in the bow shock wave and the boundary layer of a space launch vehicle for Mach numbers between 1.1 and 10.

DUAL-BEAM MULTIPLE-WAVELENGTH LIGHT TRANSMITTANCE MEASUREMENT FOR PARTICLE SIZING IN ROCKET MOTOR PLUMES

Kevin B. Taylor-Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1981
Master of Science in Engineering Science-June 1993
Advisor: David W. Netzer-Department of Aeronautics and Astronautics

A multiple-wavelength light transmittance measurement system previously used in a laboratory environment to study particles in solid rocket propellant exhaust plumes was modified for use in the field, where high levels of vibration can degrade the accuracy of data. The system was converted from a single light beam configuration to a dual beam configuration which was capable of obtaining a complete set of 1024 reference and scene measurements in 10 ms. Modifications included designing, building and testing a new analog-to-digital data converter trigger circuit, and a rotating-wheel light chopper. Optical components including beam splitters, lenses and a fiber optic cable were installed, and existing data collection system software was modified. The new system was tested by measuring soot from an oxy-acetylene torch to prove the design concept. Test results and system performance were documented. Recommendations for further modifications, improvements and applications are presented.

SPECIFICATION AND ANALYSIS OF A HIGH SPEED TRANSPORT PROTOCOL

Huseyin Alphan Tipici-Lieutenant Junior Grade, Turkish Navy
B.S., Turkish Naval Academy, 1987
Master of Engineering Science (Computer Science)-June 1993
Advisor: G.M. Lundy-Department of Computer Science

While networks have been getting faster, perceived throughput at the application has not always increased accordingly and the bottleneck has moved to the communications processing part of the system. The issues that cause the performance bottlenecks in the current transport protocols are discussed in this thesis, and a further study on a high speed transport protocol which tries to overcome these difficulties with some unique features is presented. By using the systems of Communicating Machines (SCM) model as a framework, a refined and improved version of the formal protocol specification is built over the previous work, and it is analyzed to verify that the protocol is free from logical errors such as deadlock, unspecified reception, unexecuted transitions and blocking loops. The analysis is conducted in two phases which consists of the application of the associated system state analysis and the simulation of the protocol using the programming language ADA. The thesis also presents the difficulties encountered during the course of the analysis, and suggests possible solutions to some of the problems.

LASER DOPPLER VELOCIMETRY IN A LOW SPEED MULTISTAGE COMPRESSOR

Joseph Matthew Utschig-Lieutenant, United States Navy
B.A., Marquette University, 1985
Master of Science in Engineering Science (Aeronautics)-September 1994
Advisor: G. V. Hobson-Department of Aeronautics and Astronautics

Two-dimensional Laser Doppler Velocimetry (LDV) measurements were taken in the Low Speed Multistage Compressor (LSMSC) with data indexed to the rotor position. Laser measurements were conducted at two axial positions downstream of the second rotor and one axial position downstream of the second stator. The entire rotor periphery was measured at fixed radial displacements at each location and ensemble averaged. The survey downstream of the stator attempted to quantify the unsteady flow of the stator passage. Attempts were made to quantify the absolute flow angle behind both the rotor and the stator and compare them to pneumatic data collected at the same axial and circumferential positions respectively. Absolute flow angles calculated from the laser measurements were in agreement with pneumatic probe data. In addition, the surveys were conducted in an attempt to quantify the velocity profile from the rotor passage. The laser surveys indicated distinct and repeatable patterns in both the axial and circumferential components of the rotor exit velocity. Data downstream of the stator proved inconclusive.

MEASUREMENT OF SUB-MICRON AL_2O_3 PARTICLES IN ROCKET PLUMES

John K. Vaughn-Captain, United States Army
B.S., United States Military Academy
Master of Science in Engineering Science-December 1992
Advisor: David W. Netzer-Department of Aeronautics and Astronautics

Transmission measurements using six wavelengths were made through the edges of plumes for solid propellant rocket motors using various propellants and motor geometries. The average values of obtained for the aluminum oxide particles were a Sauter mean diameter of 0.30+/0.02 microns, an index of refraction of 1.64+/-.04 and standard deviation of 1.52+/-.12 for the assumed monomodal, log-normal size distribution. The results indicated that the small aluminum oxide particles in the plume edge were gamma-Al_2O_3, independent of propellant composition, motor operation conditions and nozzle geometry. The good correlation of the data indicated that the small particles can be adequately represented by a monomodal, log-normal distribution.

DESIGN OF A HIGH RESOLUTION SPATIAL HETERODYNE INTERFEROMETER

Kenneth M. Wallace, Jr.-Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1978
Master of Science in Engineering Science (Astronautics)-December 1992
Master of Science in Physics-December 1992
Advisor: David D. Cleary-Department of Physics

Several new spatial heterodyne interferometers were evaluated using ray tracing analysis. A spherical grating interferometer was examined and found to have nonlinear fringe patterns that are difficult to interpret. A new plane grating interferometer was designed, built and tested using a visible light laser as the source. The new design uses two mirrors and a single, planar diffraction grating to divide and recombine incident collimated light. The zero and first order ray paths recombine to produce a high contrast, linear, interference fringe pattern suitable for Fourier Transform analysis. The instrument has the potential to perform extremely high resolution spectroscopy in the FUV and EUV portions of the electromagnetic spectrum with resolving powers on the order of 10^6. High resolution analysis of emission line profiles should enable an observer to more accurately determine atmospheric temperature and density profiles. The simple, lightweight and compact instrument has no moving parts and is suitable for remote sensing from sounding rocket or satellite platforms.

MASTER OF SCIENCE
IN
INFORMATION SYSTEMS

INFORMATION ENGINEERING AND THE INFORMATION ENGINEERING FACILITY VERSUS RAPID APPLICATION DEVELOPMENT AND FOCUS

Lucille Charlotte Clark
B.A., Princeton University, 1984
Master of Science in Information Systems-December 1992
Advisor: Barry A. Frew-Department of Systems Management

The Management Information Systems Department of the Naval Postgraduate School (NPS) is considering using the information engineering methodology with Texas Instrument's Information Engineering Facility (IEF), an integrated computer-aided software engineering toolset, for application development. The costs and benefits of introducing information engineering and IEF versus the rapid application development methodology and fourth generation programming language, FOCUS, were analyzed through a case study developed in both IEF and FOCUS. IEF offers a one model implementation, a standard computerized methodology, consistency checking, management tools for the application developer, and superior diagramming features and screen design whereas FOCUS offers rapid prototyping, numeric functions, a report facility, security within the data model, inherent database management facilities and excellent documentation. The benefits of IEF did not outweigh its costs. RAD and FOCUS were determined to be the methodology and tool of choice respectively for application development for the MIS department.

DESIGN OF TELECOMMUNICATION NETWORK FOR GEOGRAPHIC INFORMATION SYSTEMS FOR THE APPALACHIAN COUNCIL OF GOVERNMENTS: A CASE STUDY

Carl William Deputy-Lieutenant, United States Navy
B.S., Virginia Tech, 1985
Master of Science in Information Systems-September 1993
Advisor: Myung W. Suh-Department of Systems Management

The South Carolina Appalachian Council of Governments (SCACOG) is a nonprofit organization located in Greenville. One of its many functions is to establish and maintain Geographic Information Systems. Due to the expected growth in the Greenville area following the opening of a new BMW plant, a method of sharing the area's geographic data is desired. The five buildings wishing to be interconnected are located within a three mile circle. This thesis is written as a public service to increase overall networking knowledge and to aid in the solving of an actual Information Resources problem. In doing so, several technologies were investigated that would suitably satisfy the SCACOG's connectivity requirements given a funding constraint. Infrared and microwave were discounted because of their costs and/or limited range. Spread spectrum and dedicated T-1 lines from the local phone company fell within the range and price constraints. Spread spectrum and TCP/IP, both originally developed for the military, were selected as the telecommunication service and file transfer product to fulfill the SCACOG's requirements.

THE USE OF NEURAL NETWORKS FOR DETERMINING TANK ROUTES

Dwayne Lynn Eldridge-Lieutenant, United States Navy
B.S., Indiana University, 1983
Master of Science in Information Systems-December 1992
Advisor: Tung X. Bui-Department of Systems Management

The U.S. Army uses a combat simulator, Janus(A), to simulate high-tech ground battle exercises. The algorithms used to represent battlefield behavior and to generate battle scenarios must be calibrated by well-trained, combat-experienced technicians. The calibration is time-consuming and subject to human errors. A Single Exercise Analysis System (SEAS) is under development for automating and improving the battle scenario generation process for Janus(A). A neural network based model has been proposed to support the route determination process within SEAS. The purpose of this thesis is to (1) determine the best neural network architecture for determining tank routes and (2) develop a prototype for generating these routes.

A DATA BASE SYSTEM TO TRACK NPS NAVY OFFICER GRADUATES

Judy Harr
B.S., University of California San Jose State, 1978
Master of Science in Information Systems-June 1993
Advisor: Richard Elster-Dean of Instruction

In response to Department of Defense queries regarding the effectiveness of graduate education for Navy officers at the Naval Postgraduate School (NPS), the Dean of Instruction found it necessary to provide a system for Navy graduates. The data for this system was initially acquired from the Navy officer personnel data files and a subset was selected by matching with the current NPS Navy student population. Design and development of the system includes the Navy Officer Master file (OMF) records, Unite Identification Code (UIC) index file, and Billet Sequence Code (BSC) index file. The prototype for the OMF is complete and operational for the personnel Office Master File Extract (OMFX) personnel data base maintenance and reporting.

A PROTOTYPE OF A FACULTY AND STAFF EXECUTIVE INFORMATION SYSTEM

P. Denise Hutton
B.A., Mary Baldwin College, 1983
Master of Science in Information Systems-March 1993
Advisors: Shu Liao & Gail F. Thomas-Department of Systems Management

This thesis prototypes an alternative *Naval Postgraduate School Faculty and Staff Resume Book.* It designs and begins the development of a multimedia faculty and staff executive information system (EIS). This EIS is being developed using Asymetrix's Multimedia ToolBook authoring software. It uses computer graphics capability to display faculty and staff member photographs. In addition, the database component supports the manipulation and storage of large text fields. This thesis also discusses the hardware and software components of multimedia computing.

COMPUTER BASED ECONOMIC ANALYSIS TECHNIQUES TO SUPPORT FUNCTIONAL ECONOMIC ANALYSIS

Richard M. Powell, Jr.-Major, United States Marine Corps
B.A., Virginia Military Institute, 1978
Master of Science in Information Systems-September 1993
Advisor: William J. Haga-Department of Systems Management

The purpose of this thesis is to present different economic analysis techniques available for evaluating costs and benefits associated with the procurement of Information Systems. The thesis will address each of these techniques in detail and develop a problem set supporting this discussion. The standard set will be used to perform a functional test of PC Econpack, a decision support system (DSS) currently fielded by the Army Corps of Engineers. DSS output will be evaluated to determine the accuracy and examine the portability of this software application to support functional economic analysis methodology as contained in DoD Directive 8000.1. Results will be analyzed to determine conditions of mutual support, conflict and consistency.

MASTER OF SCIENCE
IN
INFORMATION TECHNOLOGY
MANAGEMENT

ASSESSING RESEARCH PRODUCTIVITY OF ACADEMIC IS DEPARTMENTS

Clayton Richard Allen-Lieutenant, United States Navy
B.S., University of Georgia, 1985
Master of Science in Information Technology Management-September 1993
Advisor: William J. Haga-Department of Systems Management

This study ranks academic information systems (IS) departments according to their publishing record of their faculty members. The rankings are presented in two forms: by a per capita ranking and by a ranking in which the frequency of publication is multiplied by prestige weights for each journal. The rankings are presented in cumulative form for the 1985-92 period and are also broken down on an annual basis to track trends and changes in academic production. Recommendations are made for future research and implications are drawn for the application of the techniques developed here for the evaluation of the research production of DoD laboratories and schools.

THE MANAGEMENT ISSUES OF IMPLEMENTING TELECOMMUTING: A CASE STUDY

Chuck Howard Bane, Jr.-Lieutenant Commander, United States Navy
B.B.A., University of New Mexico, 1982
Master of Science in Information Technology Management-September 1993
Advisor: Susan P. Hocevar-Department of Systems Management

This thesis is a case study of the implementation of telecommuting by CalComp at the Telecommuting Workcenter of Riverside County and is a real life example of the management issues that surround telecommuting. The issues brought forth in this study will enable those responsible for implementing a telecommuting program to better understand the impact of this change on their organization and how a telecommuting center may be used in their program. Using this study as background, the military use of telecommuting for U.S. Navy detailers will be developed. Developing a peacetime telecommuting program could help train Navy personnel to function as a remote staff member for a Battle Group or Joint Commander. A conceptual application of telecommuting for the Department of the Navy (DON) could be to allow selected officer and enlisted detailers to telecommute up to three days a week. This insight, properly used, will help program managers avoid problems that other programs have experienced during their transition to telecommuting. Recommendations for further research and use of telecommuting for the Department of the Navy are provided.

DESIGN AND IMPLEMENTATION OF A DATABASE MANAGEMENT SYSTEM FOR A NAVY MEDICAL ADMINISTRATIVE UNIT

Kevin Albert Bianchi-Lieutenant, United States Navy
B.S., United States Naval Academy, 1985
Master of Science in Information Technology Management-September 1993
Advisor: Shu Liao-Department of Systems Management

The Navy Medical Administrative Unit (NMAU) for the Monterey Peninsula has a challenging mission which encompasses many administrative tasks. Medical readiness and occupational health requirements are tracked for all Navy and Marine Corps personnel in the region. In order to fulfill their mission satisfactorily, it was necessary for NMAU to get an automated database management system. The Flight Surgeon at the Naval Postgraduate School works very closely with NMAU. The Flight Surgeon's administrative responsibilities would also benefit from a database system. Based on the requirements for NMAU, a database system was designed and implemented in their clinic. Based on the Flight Surgeon's requirements, the data base system was further analyzed in order to assist future upgrades that would employ the flight surgeon's requirements. The primary objective, however, was to get a system on line for NMAU that would enable them to effectively and efficiently execute their mission. The Navy Medical Administrative Unit Database System (NMAUDS 1.0) was the result of the previously described endeavors; it was written in dBASE IV version 1.5.

AN ANALYSIS OF THE IMPLEMENTATION AND EFFECT OF EARLY INDUSTRIAL POLICIES IN THE UNITED STATES

Gary Lynn Brister-Lieutenant, United States Navy
B.A., University of Oklahoma, 1987
Master of Science in Information Technology Management-September 1993
Advisor: Katchan L. Terasawa-Department of Systems Management

This thesis provides a brief historical overview of federal policies designed to promote the expansion or economic viability of certain industries. Federal railroad, irrigation, and tariff policies are then explored in greater detail to determine their effect on both the target industry and the economy as a whole. The outcome of this study can assist in determining the desirability of an expanded role by the Federal Government, and specifically the Department of Defense (DOD) through the Advanced Research Project Agency (ARPA), into a more broad based industrial policy. The past and present federal policies dealing with the railroads, irrigation, and tariffs have all failed to make any of the target industries financially self sustaining. They have instead created a number of bureaucratic bodies designed to service the needs of their respective industries. The aggregate costs of these programs far exceed any imagined benefit. To adopt similar policies with DOD in order to target specific industries for the promotion of economic rather than national security concerns could only prove detrimental to both.

IMPLEMENTING THE MODERN OFFICE ENVIRONMENT: SOME EXPERIENCE WITH WINDOWS FOR WORKGROUPS AND GROUPWARE

James Calvin Broadwater-Lieutenant, United States Navy
B.S., University of Idaho, 1983
Master of Science in Information Technology Management-September 1993
Advisor: Tung X. Bui-Department of Systems Management

This thesis attempts to transform the typical non-digital office into an efficient and productive digital office. The digital office will function as an environment that will operate as a system, integrating routine office functions with groupware. The design will utilize Windows for Workgroups as the network operating system and integrate groupware as tools to enhance office operations. The lessons learned from this experience will serve as a baseline for future experiments in the integration of commercial off-the-shelf products to a networked office environment.

SECURITY EVALUATION OF UNIX NETWORKS

Thomas Lynn Brown-Lieutenant, United States Navy
B.A., University of Texas at Austin, 1982
Master of Science in Information Technology Management-September 1993
Advisor: Roger Stemp-Department of Computer Science

In recent years, computer networks have significantly increased in both complexity and number, and these networks are attractive targets for attack and intrusion. Unix networks being managed by the government and providing access to unclassified sensitive information are particularly vulnerable to attack. Ensuring the security of sensitive information will be one of the single most important management issues in computer/information security in the foreseeable future. Unfortunately, the number of automated security tools for Unix, as well as the number of computer security experts within DOD, has not increased sufficiently to keep up with the improvements in technology. The author proposes the concept of a security toolbox, containing a proposed standard set of automated security tools, to support Unix networks. The toolbox can be used to enhance system security, automating many of the security related tasks required of the network administrator. Additionally, organizational changes will be necessary to improve the availability of computer security advice and assistance. It is recommended that a study of the function and organization of computer security expertise be conducted, so that access to and validation of security tools, along with consistent guidance for network administrators and security officers, can be accomplished effectively. The combination of a security toolbox and expert advice can then help bridge the gap in the development of computer security expertise.

SEMATECH, A CASE STUDY: ANALYSIS OF A GOVERNMENT-INDUSTRY PARTNERSHIP

Robert Murray Byron-Lieutenant, United States Navy
B.S., United States Naval Academy, 1985
Master of Science in Information Technology Management-September 1933
Advisors: William Gates & David R. Henderson-
Department of Systems Management

SEMATECH proponents argue that the SEMATECH consortium model represents future government-industry consortia. This thesis examines the Semiconductor Manufacturing Technology Initiative (SEMATECH). Analysis of SEMATECH includes: (1) its dissection as a consortium and as a government-industry venture; (2) the impact of SEMATECH on both semiconductor research and development (R&D) and the American chipmaking industry; and (3) the political implications of SEMATECH. SEMATECH is funded through the Advanced Research Programs Agency (ARPA). Federal support of the semiconductor industry via the ARPA seems incompatible with Department of Defense interests. There are instances when federal support of R&D is justified. It seems doubtful that the semiconductor industry is one of those instances, but if it were, SEMATECH would not be the best way to channel government support. This thesis shows that SEMATECH is not responsible for the turnaround of the semiconductor industry; that SEMATECH is not an appropriate model for government-industry partnerships; and that federal funding of SEMATECH should cease.

USING SOFTWARE APPLICATIONS TO FACILITATE AND ENHANCE STRATEGIC PLANNING

Daniel K. Carpenter-Major, United States Marine Corps
B.A., University of Mississippi, 1979
Master of Science in Information Technology Management-September 1993
and
Donald J. Ebner-Lieutenant, United States Navy
B.S., University of Pittsburgh, 1985
Master of Science in Information Technology Management-September 1993
Advisor: Nancy C. Roberts-Department of Systems Management

This thesis is an evaluation of current computer software applications and their use in strategic planning. Military and business strategy are reviewed and discussed and the premise for sharing ideas between communities is proposed. The concepts of cognitive mapping and analytic hierarchy process, while not recent developments, will still be new to many readers of this thesis. A discussion of the strengths, weaknesses and capabilities of each approach is presented. Each of these approaches is also used as the basis for the two computer software applications which are discussed and evaluated in the thesis. Cognitive mapping, with its concepts linked by relationships to form a network map, is used by Graphics COPE to structure the problem being considered by a planning group. The Analytic Hierarchy Process, using multi-variable criteria, is capable of "what if" analysis and goal seeking to choose among alternatives during a planning process. The planning process, and where these two fit into it, will be discussed step by step. Rationale for considering using this process will be discussed, as will the reasons for using computers in support of military strategic planning. And, advice will be given to those military analysts and planners who feel the need to search for computer applications to help them do their job.

CONCEPTS AND METHODS OF MEASURING PRODUCTIVITY AT THE ORGANIZATIONAL LEVEL

Maxie Yvonne Davis-Lieutenant, United States Navy
B.S., Tuskegee Institute, 1980
Master of Science in Information Technology Management-September 1993
Advisors: William J. Haga & William R. Gates-Department of Systems Management

This thesis addresses the concepts of productivity measurement. Productivity measurements are generally expressed as a ratio between outputs and inputs. The criteria for identifying and quantifying the output and input components are explored. The methodology used by the Bureau of Labor and Statistics are examined to provide insight into the application of the concepts of productivity measurement. Business and government sectors outputs are identified and partial and multifactor productivity measurements defined. Common methodologies for measuring productivity at the organization level are also outlined. These methodologies are examined for their applicability to phenomena of the post-industrial society, particularly the rise in the white collar work force, information technology and process reengineering. Adaptations of these methodologies are proposed as an appropriate measurement technique for Department of Defense (DOD) functional managers.

USING SOFTWARE APPLICATIONS TO FACILITATE AND ENHANCE STRATEGIC PLANNING

Donald J. Ebner-Lieutenant, United States Navy
B.S., University of Pittsburgh, 1985
Master of Science in Information Technology Management-September 1993
and
Daniel K. Carpenter-Major, United States Marine Corps
B.S., University of Mississippi, 1979
Master of Science in Information Technology Management-September 1993
Advisor: Nancy C. Roberts-Department of Systems Management

This thesis is an evaluation of current computer software applications and their use in strategic planning. Military and business strategy are reviewed and discussed and the premise for sharing ideas between communities is proposed. The concepts of cognitive mapping and analytic hierarchy process, while not recent developments, will still be new to many readers of this thesis. A discussion of the strengths, weaknesses and capabilities of each approach is presented. Each of these approaches is also used as the basis for the two computer software applications which are discussed and evaluated in the thesis. Cognitive mapping, with its concepts linked by relationships to form a network map, is used by Graphics COPE to structure the problem being considered by a planning group. The Analytic Hierarchy Process, using multi-variable criteria, is capable of "what if" analysis and goal seeking to choose among alternatives during a planning process. The planning process, and where these two fit into it, will be discussed step by step. Rationale for considering using this process will be discussed, as will the reasons for using computers in support of military strategic planning. And, advice will be given to those military analysts and planners who feel the need to search for computer applications to help them do their job.

APPLICATION OF A GENETIC ALGORITHM TO OPTIMIZE QUALITY ASSURANCE IN SOFTWARE DEVELOPMENT

Donald M. Elliott-Major, United States Marine Corps
B.S., Auburn University, 1980
Master of Science in Information Technology Management-September 1993
Advisor: Balasubramaniam Ramesh-Department of Systems Management

Quality Assurance is an important aspect of the software development lifecycle. With declining Department of Defense dollars, the development of a Quality Assurance scheme, that minimizes total software development project costs in large scale systems, is extremely valuable. This research aims at developing such a scheme which will provide a staffing profile for Quality Assurance. As there are no analytical solutions available to solve this nonlinear optimization problem and the potential search space of all possible solutions is extremely large, a genetic algorithm is used to arrive at an optimal solution. The results indicate that the solution obtained using this approach performs better than several other approaches, such as expert simulators and pattern search techniques, that have been attempted. The scheme is developed using a software project simulation model that incorporates data from an actual software development project. The simulation model allows for the examination of the consequence of staffing profile decisions on total project cost.

MULTIPLE GOALS IN DYNAMIC DECISION MAKING: AN EXPERIMENTAL APPROACH

Eric Thomas Elser-Lieutenant, United States Navy
B.S., Pennsylvania State University, 1986
Master of Science in Information Technology Management
Advisor: Kishore Sengupta-Department of Systems Management

Leaders in both the military and civilian sectors make a series of interrelated decisions in real time to achieve goals. These decisions involve the allocation of resources, such as ships and aircraft to influence the situation facing the decision maker. NEWFIRE is a computer-based simulation of a forest fire fighting task that allows the experimenter to control both the goals and the environment in which the decisions are made and thereby explore the effects these variables have on the decision maker. The objective of this thesis was to use the NEWFIRE microworld to determine the effects that multiple goals and system complexity have on decisions. Specifically, subjects were given one, two or three goals, and confronted with three scenarios of varying complexity. The results show that subjects given only one objective outperformed those given two or three objectives. The results also show that the performance of subjects on the most complex scenario was worse than on the less complex scenarios.

COGNITIVE PSYCHOLOGY AND DESIGN PARADIGMS IN THE DEVELOPMENT OF MULTIMEDIA COURSEWARE

Dorothy L. Filbert-Lieutenant Commander, United States Navy
B.A., Southern Connecticut State College
Master of Science in Information Technology Management-September 1993
and
Jamel B. Weatherspoon-Lieutenant, United States Navy
B.S., Ball State University
Master of Science in Information Technology Management-September 1993
Advisors: Kishore Sengupta & Balasubramaniam Ramesh-Department of Systems Management

Multimedia courseware has the promise of becoming a staple of instructional technology, but it must be built around sound design theories in order to be effective. The design of multimedia courseware should be based on instructional design theory, human factors, and cognitive learning theories. If these elements are not included in a deliberate manner, the multimedia courseware will not be an effective instructional tool. This thesis explores relevant cognitive learning theories and design paradigms for multimedia courseware. It includes examples from a prototype system designed to train naval officers who must witness a pre-firing inspection of the 76mm/62 caliber gun mount.

TELECOMMUNICATIONS SERVICES FOR MULTIMEDIA DATA EXCHANGE SUPPORT

Paul C. Gibbons-Major, United States Marine Corps
B.B.A., National University, 1987
Master of Science in Information Technology Management-June 1993
Advisor: Myung Suh-Department of Systems Management

Multimedia holds the promise of increased knowledge, creativity and productivity for virtually any application that can be imagined. The ability to present information in both an informative and entertaining way can lead to an enhanced quality of life for an increasingly larger segment of the world's population. However, information generated in a multimedia format presents special challenges for communications networks. This thesis is an attempt to understand the impact of multimedia computing as it relates to the transmission requirements to support large volume data exchange in a distributed computing environment. With a good understanding of these requirements one will be better equipped to evaluate the various physical transmission media and communication services available to meet the high transmission bandwidth demands imposed by multimedia data exchange.

A FUNCTIONAL BAR CODE INVENTORY SYSTEM FOR MARINE CORPS SYSTEMS COMMAND

Richard M. Hancock-Captain, United States Marine Corps
B.S., Randolph-Macon College, 1985
Master of Science in Information Technology-September 1993
Advisor: William J. Haga-Department of Systems Management

Marine Corps Systems Command, located in Quantico, Virginia, maintains a large amount of computer assets to support its vast and varied operations. This property requires accurate record keeping to assure accountability of each item throughout its lifetime, from initial acquisition through disposal. This thesis designs and implements a Bar Code Inventory System (BCIS) to support the management and accountability of the command's assets. The BCIS is a fully tested, menu driven system designed to increase the efficiency and effectiveness of the inventory process.

ANALYSIS OF DISASTER PREPAREDNESS PLANNING MEASURES IN DOD COMPUTER FACILITIES

John D. Harrigan-Major, United States Marine Corps
B.S., Pittsburgh State University, 1980
Master of Science in Information Technology-September 1993
Advisor: William J. Haga-Department of Systems Management

This thesis will analyze a disaster recovery plan currently in use at a selected DoD computer facility, as well as investigate facility contingency planning documents actually tested during recent natural disasters. The primary goal of this thesis is to measure the effectiveness of two selected DoD facilities' disaster recovery plans following significant natural disasters, and to study what characteristics of these planning documents were most useful to facility personnel. Equally as important is the analysis of why established plans, or portions of those plans were less than effective. From this appraisal, advantages, disadvantages and lessons learned should assist DoD information managers in identifying and correcting potential weaknesses in their disaster recovery plans.

AN INVESTIGATION OF REQUIREMENTS TRACEABILITY TO SUPPORT SYSTEMS DEVELOPMENT

Gale Alicia Harrington-Captain, United States Army
B.S., United States Military Academy, 1982
Master of Science in Information Technology Management-September 1993
and
Kathleen Marie Rondeau-Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1980
Master of Science in Information Technology Management-September 1993
Advisor: Balasubramaniam Ramesh-Department of Systems Management

Department of Defense Standard 2167A mandates that requirements traceability be conducted during the development of government systems. This and other standards, as well as current literature, however, do not provide a comprehensive model of what information should be captured as a part of a traceability scheme. The primary goal of this research is to develop a model of requirements traceability at the level of systems design which relates requirements to all system components. An empirical study using focus groups was conducted with various stakeholders involved with the development of large, complex systems. Based on an analysis of the information obtained by the focus group sessions, a model for traceability was developed. This model describes the various relationships or linkages between requirements and system components that must be captured and maintained to support various system development activities. Finally, several issues which must be addressed in successfully implementing a comprehensive scheme for traceability are discussed.

AN EVALUATION OF TECHNIQUES FOR RANKING ACADEMIC INFORMATION SYSTEMS JOURNALS

TeddiAnn S. Hayes-Lieutenant, United States Navy
B.S., University of California, Davis, 1980
Master of Science in Information Technology Management-September 1993
and
Winnie L. Huskey-Lieutenant, United States Navy
B.A., Marquette University, 1988
Master of Science in Information Technology Management-September 1993
Advisor: William J. Haga-Department of Systems Management

In an evolution from academic journal prestige ranking procedures used in economics, marketing, sociology and previous efforts in information systems (IS), this study developed prestige weights for IS journals based on a probability sample of 400 MIS faculty in the United States and Canada. The weights are derived from subjective rankings by survey questionnaire. In addition to developing a master schedule of journal prestige weights, differences in prestige weighting are examined according to location of respondents' employing school, respondents' academic specialties within IS, types of degrees held by the respondents, and years in which respondents earned terminal degree at a graduate school with a national ranking. Characteristics of respondents are compared to nonrespondents to test the hypothesis the respondents are representative of the sample frame. Implications of the procedure developed here are discussed in terms of its application to evaluation of research productivity in DoD laboratories.

AN IMPLEMENTATION OF THE REPRESENTATION AND MAINTENANCE OF PROCESS KNOWLEDGE (REMAP) MODEL IN THE KNOWLEDGE-BASED SOFTWARE ASSISTANT CONCEPT DEMONSTRATION SYSTEM

Frank J. Hughes-Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1980
Master of Science in Information Technology Management-September 1993
and
Steven C. Kendall-Captain, United States Marine Corps
B.S., Iowa State University, 1984
Master of Science in Information Technology Management-September 1993
Advisor: Balasubramaniam Ramesh-Department of Systems Management

The REpresentation and MAintenance of Process knowledge (REMAP) model supports the various stakeholders involved in software design during development and maintenance by capturing the rationale behind design decisions. This process knowledge is invaluable with changing requirements and assumptions. In the context of formal software development, process knowledge about the development of formal specifications from informal requirements will facilitate the understanding and maintenance of such specifications. We have implemented the REMAP model in the United States Air Force Rome Laboratory's KBSA Concept Demonstration system (a formal software development environment) to capture this process knowledge. We provide a graphical browser to facilitate the instantiation, browsing and modification of REMAP model primitives and an mechanism to reason with the knowledge in the Concept Demonstration system.

AN EVALUATION OF TECHNIQUES FOR RANKING ACADEMIC INFORMATION SYSTEMS JOURNALS

Winnie L. Huskey-Lieutenant, United States Navy
B.A. Marquette University, 1988
Master of Science in Information Technology Management-September 1993
and
TeddiAnn S. Hayes-Lieutenant, United States Navy
B.A., University of California, Davis, 1980
Master of Science in Information Technology Management-September 1993
Advisor: William J. Haga-Department of Systems Management

In an evolution from academic journal prestige ranking procedures used in economics, marketing, sociology and previous efforts in information systems (IS), this study developed prestige weights for IS journals based on a probability sample of 400 MIS faculty in the United States and Canada. The weights are derived from subjective rankings by survey questionnaire. In addition to developing a master schedule of journal prestige weights, differences in prestige weighting are examined according to location of respondents' employing school, respondents' academic specialties within IS, types of degrees held by the respondents, and years in which respondents earned terminal degree at a graduate school with a national ranking. Characteristics of respondents are compared to nonrespondents to test the hypothesis the respondents are representative of the sample frame. Implications of the procedure developed here are discussed in terms of its application to evaluation of research productivity in DoD laboratories.

IMPROVEMENTS TO AUTONOMOUS FORCES THROUGH THE USE OF GENETIC ALGORITHMS AND RULE BASE ENHANCEMENT

Robert Alan Jacobs-Captain, United States Marine Corps
B.A., University of Mississippi, 1983
Master of Science in Information Technology Management-September 1993
and
John Phillip Steiner-Lieutenant, United States Navy
B.S., University of New Mexico, 1986
Master of Science in Information Technology Management-September 1993
Advisor: Hemant K. Bhargava-Department of Systems Management

This thesis discusses two approaches to enhancing the performance of intelligent autonomous agents in a computer combat simulation environment so that their performances more closely model the tactical decisions made by human players. The first approach addresses incorporating a genetic algorithm (GA) into the NPSNET Autonomous Force Expert System (NPSNET AF), while the second approach focuses on enriching the existing rule base and decision strategies. First, we develop a functional genetic algorithm with the intent of providing dynamic, real-time learning within the NPSNET AF. However, we conclude that the GA is better suited for a static problem, such as artillery battery registering of fires, rather than for the dynamic battlefield of the NPSNET. Second, we enrich the NPSNET AF expert system by enabling it to choose from among four formations and by providing a mechanism for transitioning between them. We enable the expert system to make formation decisions based upon general terrain characteristics and target location.

A METHODOLOGY FOR SOFTWARE COST ESTIMATION USING MACHINE LEARNING TECHNIQUES

Michael Alan Kelly-Lieutenant, United States Navy
B.S. Tulane University, 1983
Master of Science in Information Technology-September 1993
Advisor: Balasubramanium Ramesh-Department of Systems Management

The Department of Defense expends billions of dollars on software development and maintenance annually. Many Department of Defense projects fail to be completed, at large monetary cost to the government, due to the inability of current software cost-estimation techniques to estimate, at an early project stage, the level of effort required for a project to be completed. One reason is that current software cost-estimation models tend to perform poorly when applied outside of narrowly-defined domains. Machine learning offers an alternative approach to the current models. In machine learning, the domain specific data and the computer can be coupled to create an engine for knowledge discovery. Using neural networks, genetic algorithms, and genetic programming along with a published software project data set, several cost estimation models were developed. Testing was conducted using a separate data set. All three techniques showed levels of performance that indicate that each of these techniques can provide software project managers with capabilities that can be used to obtain better software cost estimates.

AN IMPLEMENTATION OF THE REPRESENTATION AND MAINTENANCE OF PROCESS KNOWLEDGE (REMAP) MODEL IN THE KNOWLEDGE-BASED SOFTWARE ASSISTANT CONCEPT DEMONSTRATION SYSTEM

Steven C. Kendall-Captain, United States Marine Corps
B.S., Iowa State University, 1984
Master of Science in Information Technology Management-September 1993
and
Frank J. Hughes-Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1980
Master of Science in Information Technology Management-September 1993
Advisor: Balasubramanium Ramesh-Department of Systems Management

The REpresentation and MAintenance of Process knowledge (REMAP) model supports the various stakeholders involved in software design during development and maintenance by capturing the rationale behind design decisions. This process knowledge is invaluable with changing requirements and assumptions. In the context of formal software development, process knowledge about the development of formal specifications from informal requirements will facilitate the understanding and maintenance of such specifications. We have implemented the REMAP model in the United States Air Force Rome Laboratory's KBSA Concept Demonstration system (a formal software development environment) to capture this process knowledge. We provide a graphical browser to facilitate the instantiation, browsing and modification of REMAP model primitives and an mechanism to reason with the knowledge in the Concept Demonstration system.

PERFORMANCE MEASUREMENT SYSTEMS: A STATISTICAL ANALYSIS

James W. Kilby-Lieutenant, United States Navy
B.S., United States Naval Academy, 1986
Master of Science in Information Technology Management-September 1993
Advisor: Kenneth J. Euske-Department of Systems Management

This study assessed the performance management systems used by companies, in an effort to identify the evolution of new management techniques in corporations. The sample consisted of 119 individual survey respondents from "high performing" entities. The data collected was part of a larger performance measurement study conducted by Euske, Lebas and McNair (1993). "High performing" entities were identified by the management of companies included in this study. Companies selected for the study were identified by the CAM-I research consortia or directly identified by Euske, Lebas or McNair.

GOVERNMENT OPEN SYSTEMS INTERCONNECTION PROFILE (GOSIP) TRANSITION STRATEGY

Mark Richard Laxen-Lieutenant, United States Navy
B.S., Northwestern University, 1987
Master of Science in Information Technology Management-September 1993
Advisors: Myung Suh & Barry Frew-Department of Systems Management

This thesis analyzes the Government Open Systems Interconnection Profile (GOSIP) and the requirements of the Federal Information Processing Standard (FIPS) Publication 146-1. It begins by examining the International Organization for Standardization (ISO) Open Systems Interconnection (OSI) architecture and protocol suites and the distinctions between GOSIP version 1 and 2. Additionally, it explores some of the GOSIP protocol details and discusses the process by which standards organizations have developed their recommendations. Implementation considerations from both government and vendor perspectives illustrate the barriers and requirements faced by information systems managers, as well as basic transition strategies. The result of this thesis is to show a transition strategy through an extended and coordinated period of coexistence due to extensive legacy systems and GOSIP product unavailability. Recommendations for GOSIP protocol standards to include capabilities outside the OSI model are also presented.

. DEVELOPMENT OF A MAINTENANCE ADVISOR EXPERT SYSTEM FOR THE MK 92 MOD 2 FIRE CONTROL SYSTEM: FC-1 DESIGNATION - TIME, FC-1 TRACK - BEARING, ELEVATION AND RANGE, AND FC-2 TRACK - BEARING, ELEVATION AND RANGE

Clinton Dean Lewis-Lieutenant Commander, United States Navy
B.S., University of California, Santa Barbara, 1979
Master of Science in Information Technology Management-September 1993
Advisor: Magdi Kamel-Department of Systems Management

The MK 92 MOD 2 Fire Control System (FCS) is a fast reaction, lightweight, low manned, high performance multi-function fire control system that gives a ship all the combat functions required for independent tactical operation. The MK 92 MOD 2 FCS Maintenance Advisor Expert System (MAES) was proposed to assist Fire Control technicians in the troubleshooting of this complex fire control system. This thesis addresses the development of a fully functional prototype expert system for the performance parameters of the Daily System Operability Test (DSOT). Specific issues covered include: scope of the project, project background, the expert system development life cycle, hardware and software selection, knowledge acquisition, knowledge representation, knowledge implementation, and lessons learned in the process.

AN X11 GRAPHICAL INTERFACE FOR THE REPRESENTATION AND MAINTENANCE OF PROCESS KNOWLEDGE (REMAP) MODEL

Joseph A. Martinelli-Lieutenant, United States Navy
B.S., Marquette University, 1986
Master of Science in Information Technology Management-September 1993
Advisor: Balasubramanium Ramesh-Department of Systems Management

The REpresentation and MAintenance of Process knowledge (REMAP) model provides support to various stakeholders involved in software projects by capturing the history of design decisions. This knowledge can assist the Department of Defense (DoD) in driving down the development and maintenance costs of large scale software systems. It is extremely important to have user friendly mechanisms to aid in the use of the REMAP model. This thesis implements a graphical user interface (GUI) under X11 Windows using the Andrew Toolkit. This implementation facilitates the instantiation, incremental modification, and ad-hoc querying of REMAP model primitives.

EVALUATION OF WIRELESS LOCAL AREA NETWORKS

Charles Lynn McBee-Lieutenant, United States Navy
B.B.A/M.I.S., Texas Tech University, 1984
Master of Science in Information Technology Management-September 1993
Advisor: Myung W. Suh-Department of Systems Management

This thesis is an in-depth evaluation of the current wireless Local Area Network (LAN) technologies. Wireless LANs consist of three technologies; they are infrared light, microwave, and spread spectrum. When the first wireless LANs were introduced, they were unfavorably labeled slow, expensive, and unreliable. The wireless LANs of today are competitively priced, more secure, easier to install, and provide equal to or greater than the data throughput of unshielded twisted pair cable. Wireless LANs are best suited for organizations that move office staff frequently, buildings that have historical significance, or buildings that have asbestos. Additionally, an organization may realize a cost savings of between $300 to $1,200 each time a node is moved. Current wireless LAN technologies have a positive effect on LAN standards being developed by the Defense Information System Agency (DISA). DoD as a whole is beginning to focus on wireless LANs and mobile communications. If system managers want to remain successful, they need to stay abreast of this technology.

INFORMATION SYSTEMS STRATEGY IN AIR TRANSPORT

Desmond P. McGlade-Major, United States Marine Corps
B.S., Iona College, 1979
Master of Science in Information Technology Management-September 1993
Advisor: William J. Haga-Department of Systems Management

Seeking to improve the role of Information Technology (IT) and business practices in the Department of Defense, organizations were sought to serve as a model to aid in the improvement process. Southwest Airlines, a major U.S. carrier based in Dallas, Texas was chosen because of its record of profitability and its unique use of information technology. This case study describes Southwest's mission, goals, organization, business decisions, attitude, growth and information technology. The primary focus is the fact that Southwest does not participate in a major carrier's reservation system. Lessons learned for a military officer in terms of Information Technology are to avoid redundancy, improve functionality, avoid expensive enhancements that do not contribute to your requirements, and don't discount old technologies.

TOWARDS AN INFORMATION MODEL AND MECHANISMS
FOR DESIGN RATIONALE CAPTURE AND USE

Debra A. Morris-Lieutenant, United States Navy
B.S., University of Utah, 1985
Master of Science in Information Technology Management-September 1993
and
Tina M. Paco-Lieutenant, United States Navy
B.S., Tulane University, 1985
Master of Science in Information Technology Management-September 1993
Advisor: Balasubramanium Ramesh-Department of Systems Management

Every year the Department of Defense's (DoD) expenditures on software alone amount to almost ten billion dollars, with maintenance costs comprising the majority of this figure. Recent studies have indicated that an effective solution to help curtail the large maintenance cost is by capturing the rationale which was used to create the systems requirements and designs, and using this information throughout the life cycle. However, various models proposed by current research for capture of design rationale address only some specific aspects of the design process rather than the entire design process. This thesis identifies the important components of a comprehensive design rationale information model, proposes mechanisms to facilitate their capture, and identifies the generic functionalities of a design rationale management tool to use the rationale in various systems development activities.

TOWARDS AN INFORMATION MODEL AND MECHANISMS
FOR DESIGN RATIONALE CAPTURE AND USE

Tina M. Paco-Lieutenant, United States Navy
B.S., Tulane University, 1985
Master of Science in Information Technology Management-September 1993
and
Debra A. Morris-Lieutenant, United States Navy
B.S., University of Utah, 1985
Master of Science in Information Technology Management-September 1993
Advisor: Balasubramanium Ramesh-Department of Systems Management

Every year the Department of Defense's (DoD) expenditures on software alone amount to almost ten billion dollars, with maintenance costs comprising the majority of this figure. Recent studies have indicated that an effective solution to help curtail the large maintenance cost is by capturing the rationale which was used to create the systems requirements and designs, and using this information throughout the life cycle. However, various models proposed by current research for capture of design rationale address only some specific aspects of the design process rather than the entire design process. This thesis identifies the important components of a comprehensive design rationale information model, proposes mechanisms to facilitate their capture, and identifies the generic functionalities of a design rationale management tool to use the rationale in various systems development activities.

A STUDY ON CURRENT PRACTICES OF REQUIREMENTS TRACEABILITY IN SYSTEMS DEVELOPMENT

Timothy Patrick Powers-Lieutenant Commander, United States Coast Guard
B.S., United States Coast Guard Academy, 1980
Master of Science in Information Technology Management-September 1993
and
Curtis David Stubbs-Lieutenant, United States Navy
B.S., University of the State of New York, 1985
Master of Science in Information Technology Management-September 1993
Advisor: Balasubramaniam Ramesh-Department of Systems Management

The Department of Defense (DoD) currently spends approximately four percent of the total life cycle costs on requirements traceability efforts in large scale systems development. As current DoD standards that require traceability do not clearly specify what information should be captured and used, the practices and usefulness of traceability vary considerably across systems development efforts. The goal of this research is to conduct a comprehensive study of current practices to provide the various views and uses of traceability by the different stakeholders in the System Development Life Cycle (SDLC). Using a field study of 35 systems development organizations, this research profiles the "low end" users who use traceability only within their own domain of the SDLC and the "high end" users who view traceability as a means to force higher quality into systems design implementing a traceability methodology across all areas of systems development. Models describing low end and high end uses of traceability practice are also developed. Finally, a detailed case study of a DoD systems development organization was conducted providing a comprehensive view of use and perceived benefits of traceability.

DISTRIBUTED COMPUTING ENVIRONMENT FOR MINE WARFARE COMMAND

Lane L. Pritchard-Lieutenant Commander, United States Navy
B.A., Miami University, 1978
Master of Science in Information Technology Management-June 1993
Advisor: Myung Suh-Department of Systems Management

The Mine Warfare Command in Charleston, South Carolina has been converting its information systems architecture from a centralized mainframe based system to a decentralized network of personal computers over the past several years. This thesis analyzes the progress of the evolution as of May of 1992. The building blocks of a distributed architecture are discussed in relation to the choices the Mine Warfare Command has made to date. Areas that need further attention and development are discussed based on the research findings. Finally, recommendations for future planning, procurement and improvements to the system are made. Lessons learned by this command during the conversion to a networked system are described.

IMPLEMENTING CHANGE: A GUIDE FOR THE DOD FUNCTIONAL MANAGER

Kenneth Charles Ritter-Lieutenant, United States Navy
B.A., San Diego State University, 1985
Master of Science in Information Technology Management-September 1993
Advisor: William J. Haga-Department of Systems Management

The Department of Defense (DoD) has launched the Corporate Information Management (CIM) initiative to help improve DoD acquisition and implementation of information systems. Key to the successful implementation of information systems is the improvement or redesign of current DoD business processes, rather than automating an existing inferior process. Once the functional manager has improved or redesigned the processes, the next step is to implement them within the manager's organization. To effectively implement change, the manager must establish a plan for implementation, manage the implementation, effectively communicate the changes to the organization, monitor and evaluate the changes, and then execute changeover to the new system. This thesis provides a guide for the DoD functional manager for the implementation of business process improvement changes.

AN INVESTIGATION OF REQUIREMENTS TRACEABILITY TO SUPPORT SYSTEMS DEVELOPMENT

Kathleen Marie Rondeau-Lieutenant, United States Navy
B.S., United States Naval Academy, 1980
Master of Science in Information Technology Management-September 1993
and
Gale Alicia Harrington-Captain, United States Army
B.S., United States Military Academy, 1982
Master of Science in Information Technology Management-September 1993
Advisor: Balasubramaniam Ramesh-Department of Systems Management

Department of Defense Standard 2167A mandates that requirements traceability be conducted during the development of government systems. This and other standards, as well as current literature, however, do not provide a comprehensive model of what information should be captured as a part of a traceability scheme. The primary goal of this research is to develop a model of requirements traceability at the level of systems design which relates requirements to all system components. An empirical study using focus groups was conducted with various stakeholders involved with the development of large, complex systems. Based on an analysis of the information obtained by the focus group sessions, a model for traceability was developed. This model describes the various relationships or linkages between requirements and system components that must be captured and maintained to support various system development activities. Finally, several issues which must be addressed in successfully implementing a comprehensive scheme for traceability are discussed.

COMPARATIVE EFFECTS OF DECISION STRATEGIES AND THE EFFECTS OF LEARNING IN DYNAMIC ENVIRONMENTS: A COMPUTER SIMULATION APPROACH

Spencer Rutledge, III-Captain, United States Marine Corps
B.S., University of Francis Marion, 1985
Master of Science in Information Technology Management-September 1993
Advisor: Kishore Sengupta-Department of Systems Management

Models of aggregation in management science and economics are not consistent with micro-empirical knowledge of individual decision making. This has occurred as a result of using heuristics that are derived from behavioral studies which focused on discrete incidents. This approach fails to recognize decision making as a continuous process and overlooks the importance of feedback. This study examines the performance of various decision strategies (heuristics) in dynamic environments through computer simulation. Within dynamic task environments, three classes of strategies are examined: (a) feedback oriented strategies, (b) non-feedback oriented strategies and; (c) a strategy that incorporates learning. The relative efficacies of these strategies are compared. The results show that feedback oriented strategies achieved a higher level of performance than non-feedback oriented strategies. And the strategy that incorporated learning outperformed all other strategies. A few abnormalies exist and may require additional sampling. The implications of these findings for command decision making indicate that, feedback from prior military actions can play an important role in adapting existing systems to meet new military roles in changing environments.

DEVELOPMENT OF A MAINTENANCE ADVISOR EXPERT SYSTEM FOR THE MK 92 MOD 2 FIRE CONTROL SYSTEM: FC-1 DESIGNATION - TIME, RANGE, BEARING, FC-1 ACQUISITION, FC-1 TRACK - RANGE, BEARING, AND FC-2 DESIGNATION - TIME, RANGE, BEARING, FC-2 ACQUISITION, FC-2 TRACK - RANGE, BEARING, AND FC-4 AND FC-5

Claude David Smith-Lieutenant, United States Navy
B.S., University of South Carolina, 1985
Master of Science in Information Technology Management-September 1993
Advisor: Magdi Kamel-Department of Systems Management

The MK 92 MOD 2 Fire Control System is a complex weapons system based on 1970's technology. It is a maintenance intensive system, requiring extensive technical trouble-shooting and, occasionally, supplemental shore based support. Development of an expert maintenance system for the MK 92 MOD 2 Fire Control System offers a viable solution to the labor intensive efforts of the technicians, reduces the number of visits by shore based support staff, and provides relief to an already overburdened maintenance budget. It will also significantly reduce the depot repair "no fault evident" rate which is the result of good parts replaced because of defective trouble-shooting. This thesis addresses the first iteration of prototype development of the performance channels of the MK 92 MOD 2 Maintenance Advisor Expert System. Specific issues covered include the scope of the project, hardware selection, system shell selection, knowledge acquisition, knowledge representation, knowledge implementation, and lessons learned in the process.

IMPROVEMENTS TO AUTONOMOUS FORCES THROUGH THE USE OF GENETIC ALGORITHMS AND RULE BASE ENHANCEMENT

John Phillip Steiner-Lieutenant, United States Navy
B.A., University of New Mexico, 1986
Master of Science in Information Technology Management-September 1993
and
Robert Alan Jacobs-Captain, United States Marine Corps
B.A., University of Mississippi, 1983
Master of Science in Information Technology Management-September 1993
Advisor: Hemant K. Bhargava-Department of Systems Management

This thesis discusses two approaches to enhancing the performance of intelligent autonomous agents in a computer combat simulation environment so that their performances more closely model the tactical decisions made by human players. The first approach addresses incorporating a genetic algorithm (GA) into the NPSNET Autonomous Force Expert System (NPSNET AF), while the second approach focuses on enriching the existing rule base and decision strategies. First, we develop a functional genetic algorithm with the intent of providing dynamic, real-time learning within the NPSNET AF. However, we conclude that the GA is better suited for a static problem, such as artillery battery registering of fires, rather than for the dynamic battlefield of the NPSNET. Second, we enrich the NPSNET AF expert system by enabling it to choose from among four formations and by providing a mechanism for transitioning between them. We enable the expert system to make formation decisions based upon general terrain characteristics and target location.

A STUDY ON CURRENT PRACTICES OF REQUIREMENTS TRACEABILITY IN SYSTEMS DEVELOPMENT

Curtis David Stubbs-Lieutenant, United States Navy
B.S., University of the State of New York, 1985
Master of Science in Information Technology Management-September 1993
and
Timothy Patrick Powers-Lieutenant Commander, United States Coast Guard
B.S., United States Coast Guard Academy, 1980
Advisor: Balasubramaniam Ramesh-Department of Systems Management

The Department of Defense (DoD) currently spends approximately four percent of the total life cycle costs on requirements traceability efforts in large scale systems development. As current DoD standards that require traceability do not clearly specify what information should be captured and used, the practices and usefulness of traceability vary considerably across systems development efforts. The goal of this research is to conduct a comprehensive study of current practices to provide the various views and uses of traceability by the different stakeholders in the System Development Life Cycle (SDLC). Using a field study of 35 systems development organizations, this research profiles the "low end" users who use traceability only within their own domain of the SDLC and the "high end" users who view traceability as a means to force higher quality into systems design implementing a traceability methodology across all areas of systems development. Models describing low end and high end uses of traceability practice are also developed. Finally, a detailed case study of a DoD systems development organization was conducted providing a comprehensive view of use and perceived benefits of traceability.

ANALYSIS OF IMPLEMENTING MULTIMEDIA COMPUTING SYSTEMS FOR TRAINING APPLICATIONS WITHIN THE UNITED STATES MARINE CORPS

Kenneth W. Sweltz-Major, United States Marine Corps
B.A., Juniata College, 1976
Master of Science in Information Technology Management-September 1993
Advisor: Barry A. Frew-Department of Systems Management

This is a study of implementing multimedia computing systems for training applications in the United States Marine Corps. Multimedia computing is the presentation of information combining text, graphics, audio, animation, and full-motion video. A brief review of multimedia technology is provided followed by its context within the Department of Defense, current use within the Marine Corps, and the role it can play in training Marines. Multimedia training was found to be widely used throughout the Department of Defense and its use is supported by research study and policy directives. Current use within the Marine Corps was found to be minimal. Focus groups were conducted to examine why the Marine Corps' role is so limited and to discuss future implementation. Recommendations are provided for the Marine Corps to expand their use of multimedia as a means to augment conventional training methods.

NAVY HEALTH CARE STRATEGIC PLANNING PROCESS: A DRAFT FUNCTIONAL DESCRIPTION

Helen V. Thompson-Lieutenant, United States Navy
B.S., Winona State University, 1989
Master of Science in Information Technology Management-September 1993
Advisors: William J. Haga & Magdi Kamel-Department of Systems Management

This thesis explores the Navy Health Care Strategic Planning Process (NHCSPP) and attempts to apply the Department of Defense Automated Information Systems (AIS) Documentation Standard (DOD-STD-7935A) to develop a draft of a functional description for the automation of the NHCSPP as module of the Navy Medical Executive Information System. The thesis begins with a discussion of Wartime and Peacetime Health Care Planning. This is followed by an in depth evaluation of the Navy Health Care Strategic Planning Process. The Navy Medical Executive Information System is the discussed, followed by the Functional Description Overview. The research indicates that Navy Health Care Strategic Planning is an extremely complex and intricate process and as such, traditional methodologies that emphasize capturing and representing users' requirements upfront, i.e., DOD-STD-7935A, are not appropriate for automating the planning process. Additionally, the health care planning process needs to be standardized across all branches of the armed services. It is further recommended that Navy Medicine create a workgroup of end-users and functional experts to develop a more detailed functional description.

IMPLEMENTING A MULTIPLE CRITERIA MODEL BASE IN CO-OP WITH A GRAPHICAL USER INTERFACE GENERATOR

Hsin-Yen Tsai-Lieutenant, Taiwan Navy
B.S., Chinese Naval Academy, 1989
Master of Science in Information Technology Management-September 1993
Advisor: Tung X. Bui-Department of Systems Management

This thesis designs and implements prototype Multiple Criteria Decision Making (MCDM) modules to add into the Cooperative Multiple Criteria Group Decision Support System (Co-op) for Windows. The algorithms and the graphical user interfaces for these modules are implemented using Microsoft Visual Basic under the Windows based environment operating in an IBM compatible microcomputer. Design of the MCDM programs interface is based on general interface design principles of user control, screen design, and layout.

SECURITY ASPECTS OF COMPUTER SUPPORTED COLLABORATIVE WORK

George Van Haroutunian, Jr.-Lieutenant Commander, United States Navy
B.S., Florida State University, 1974
Master of Science in Information Technology Management-September 1993
Advisors: Tung X. Bui-Department of Administrative Sciences &
Roger Stemp-Department of Computer Sciences

Computer Supported Collaborative Work (CSCW) is topic of considerable academic inquiry and rapid commercial development. Meeting Room Systems, Conferencing Systems, Co-authoring and Argumentation Systems, Message Systems and Autonomous Agents which support group collaboration currently exist; however, Department of Defense (DoD) computer security requirements as they impact CSCW systems design has received little attention. This thesis describes CSCW systems and relates group dynamic issues to predict the form of the sophisticated CSCW which will probably become commonplace in the future. Next, the Trusted Computer Security Evaluation Criteria (TCSEC) with which all DoD systems must comply are synopsized. An extension of the Bell-LaPadula model underlying the TCSEC requirements is proposed which would allow "Functionally Trusted CSCW" (FT-CSCW), CSCW which would meet many but not all of the TCSEC requirements. Possible first order (efficiency) effects of FT-CSCW including the effect of sparse group domains, the breakdown of compartmentation, and organizational stratification are discussed. Second order (social) effects are also discussed, as are possible FT-CSCW problems (unstable group membership, attempts to implement Quality Improvement Circles, inter-group CSCW and the effect of visitors). Finally, some suggestions are made for future FT-CSCW research.

BUSINESS PROCESS REDESIGN: DESIGN THE IMPROVED PROCESS

Jerry L. Warwick-Lieutenant Commander, United States Navy
B.S., Pembroke State University, 1982
Master of Science in Information Technology Management-September 1993
Advisors: William J. Haga & Kenneth J. Euske-Department of Systems Management

This thesis reports the results of a business activity modeling exercise to explore how a functional manager in DoD can best improve and redesign one's business processes. The validity of exercise results was assessed and found to be generally accurate with minor modifications. The business activity model was constructed by a faculty/student team in August 1992, in support of DoD's Corporate Information Management (CIM) initiative. This team used an Integrated Definitions Language (IDEFO) supported software tool (Design/IDEF by Meta Software of Cambridge, Massachusetts) to construct their model.

COGNITIVE PSYCHOLOGY AND DESIGN PARADIGMS IN THE DEVELOPMENT OF MULTIMEDIA COURSEWARE

Jamel B. Weatherspoon-Lieutenant Commander, United States Navy
B.A., Southern Connecticut State College
Master of Science in Information Technology Management-September 1993
and
Dorothy L. Filbert-Lieutenant Commander, United States Navy
B.S., Ball State University
Master of Science in Information Technology Management-September 1993
Advisors: Kishore Sengupta & Balasubramaniam Ramesh-Department of Systems Management

Multimedia courseware has the promise of becoming a staple of instructional technology, but it must be built around sound design theories in order to be effective. The design of multimedia courseware should be based on instructional design theory, human factors, and cognitive learning theories. If these elements are not included in a deliberate manner, the multimedia courseware will not be an effective instructional tool. This thesis explores relevant cognitive learning theories and design paradigms for multimedia courseware. It includes examples from a prototype system designed to train naval officers who must witness a pre-firing inspection of the 76mm/62 caliber gun mount.

MASTER OF SCIENCE
IN
MANAGEMENT

ECONOMIC INCENTIVES FOR MILITARY HOUSING RESIDENTS TO CONSERVE UTILITIES

Richard Lee Aasland-Lieutenant Commander, Civil Engineer Corps, United States Navy
B.S.E.E., University of Washington, 1979
Master of Science in Management-December 1992
Advisor: Katchan Terasawa-Department of Systems Management

The literature reviewed provides strong evidence that individually metering resident utilities provides an estimated 10 - 35 percent utility reductions simply by providing a financial incentive for tenants to conserve utilities. The two key aspects of individual metering are, the financial incentives for tenants to conserve utilities and the ability to hold tenants responsible for consumed utilities through accurate utility meter readings. The five alternatives for the conservation of utilities in military housing proposed by the Deputy Assistant Secretary of Defense (Installations and Housing) are reevaluated in this thesis. When evaluated from the tenants' perspective, the cost effectiveness prioritization of the five proposed DoD alternatives is reversed. Dod chose building and equipment improvement as the most cost effective way to conserve utilities but this alternative is only a half measure which ignores economic incentives for the tenants to conserve utilities.

AN ANALYSIS OF THE POST-COMMISSIONING OFFICER PERFORMANCE FOR THE GRADUATES OF THE NAVAL ACADEMY PREPARATORY SCHOOL (NAPS)

David J. Albritton-Lieutenant, United States Navy
B.S., United States Naval Academy, 1988
Master of Science in Management-September 1993
Advisor: M. J. Eitelberg-Department of Systems Management

This thesis analyzes the military performance of Naval officers who graduated from the Naval Academy Preparatory School (NAPS) and subsequently received a commission through the United States Naval Academy (USNA). Using a sample from the Navy Personnel Research and Development Center's USNA Longitudinal Officer Data Base, two measures of performance were examined for officers commissioned between 1980 and 85. Retention was first evaluated by creating a binary criterion to designate whether an officer was on active duty or not as of June 1990, producing a continuation rate for each year group in the study. A performance index was also developed based on the number of recommendations for early promotion (REP) appearing on all qualified fitness reports. The results indicate that retention rates tend to be higher for USNA graduates who attended NAPS than for those who did not. However, NAPS graduates are less likely than other USNA officers to receive a REP on their fitness report. Performance differences were found based on demographic characteristics, education, and Navy experience. Several recommendations for future research on NAPS graduates are offered.

UNIT COSTING IN THE SHIPYARD ENVIRONMENT

Michael D. Anderson-Lieutenant, United States Navy
B.S.E.E., United States Naval Academy, 1987
Master of Science in Management-March 1993
Advisor Katchan Terasawa-Department of Systems Management

Unit costing is the latest initiative to achieve savings in DoD. Shipyards, which operate on a cost per unit system, illustrate the potential gains and hazards of unit costing. Economic theory is applied to provide a basis of comparison for shipyard operations. Unit cost theory is illustrated along with definitions of controllability, scale and efficiency. A model of shipyard operations is proposed and compared to theory. Questions of output measure and quality are addressed under the model. Dangers of output comparison are illustrated by example. The validity and limits of unit cost theory are established by applying the shipyard model A practical investigation into the applicability of the unit cost system to government operations focuses on elasticity, budget variability and performance evaluation. This study concludes that unit costing alone is not sufficient to meet stated objectives. Additional incentives and increased autonomy are required to meet efficiency goals.

A FEASIBILITY ANALYSIS OF IMPLEMENTING C/SCSC CONCEPTS AT U.S. ARMY DEPOTS

Thomas Daniel Anderson-Captain, United States Army
B.S., Michigan Technological University, 1981
Master of Science in Management-March 1993
Advisor: Thomas H. Hoivik-Department of Systems Management

This thesis analyzes the feasibility of using Cost/Schedule Control Systems Criteria (C/SCSC) concepts at U.S. Army Depots. C/SCSC compliance is commonly used by the defense industry when contracting with the U.S. Government for large production and R&D (research and development) programs. However, program managers of acquisition programs that opt to have significant work efforts performed at Army depots may also need methods of tracking cost and schedule performance. One method may be the implementation of C/SCSC management techniques at these depots. This thesis analyzes current Army depot methods for controlling and reporting cost/schedule performance. The viability and benefits of using the techniques of C/SCSC are compared to the depot methods. This thesis concludes with recommendation on what aspects of C/SCSC should be incorporated by U.S. Army Depots and guidelines to follow for implementation. The methodology utilized for this thesis can also be applied to other DoD field activities for C/SCSC concept exploration.

A FINANCIAL ANALYSIS FOR THE ACQUISITION OF READY RESERVE FORCE SHIPS

Timothy R. Anderson-Lieutenant, United States Navy
B.S., United States Merchant Marine Academy, 1986
Master of Science in Management-December 1992
Advisor: O. Douglas Moses-Department of Systems Management

The recent Defense Mobility Requirements Study determined there is an urgent need for Ready Reserve Force (RRF) ships to meet the sealift follow-on surge requirements. There are three alternatives for acquiring these ships: purchase and convert older commercial ships (inactive RRF), build militarily useful, yet commercially viable ships and lease them to the commercial shipping industry (active RRF), or subsidize the construction of commercial ships with National Defense Features. This thesis conducted a financial analysis of these three alternatives to determine which is the most cost effective. The results of this analysis show that each alternative is a cost effective approach to acquiring ships under different values for the most critical factors: acquisition costs, lease rate and discount rate. Even so, with the current political and economic environment, and the current military "budget crisis" the inactive RRF presents the only viable alternative for the near future.

A COMPARATIVE ANALYSIS OF TOTAL QUALITY MANAGEMENT AND COMPLIANCE INSPECTIONS AS THE CONTROL MECHANISM FOR THE COAST GUARD'S AFLOAT CENTRALIZED SUPPLY SYSTEM

Vincent B. Atkins-Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1982
Master of Science in Management-December 1992
and
Robert S. Thien-Captain, United States Marine Corps
B.S., Rochester Institute of Technology, 1985
Master of Science in Management-December 1992
Advisors: Susan Hocevar & Gail F. Thomas-Department of Systems Management

This thesis examines the Coast Guard's current compliance-oriented inspections and considers Total Quality Management (TQM) as an alternative control mechanism aboard the Coast Guard's High Endurance Cutters. This comparative analysis is based on a review of applicable literature and data gained through field interviews. The Coast Guard's use of an overlay structure to increase innovation is analyzed. Research on parallel learning structures suggests that questions remain about the impact such structures may have on transforming Coast Guard culture. A comparative analysis is used to weigh the merits of compliance systems and the self-control mechanisms of The Quality Advantage, the Coast Guard variant of TQM. A basic model of control serves as a framework for comparison. Significant differences in philosophy, control processes and results are noted. The major goals of organizational efficiency and innovativeness are impacted differently by the two systems.

OUTPATIENT TREATMENT OF ALCOHOLICS IN THE NAVY: A FEASIBLE AND COST EFFECTIVE ALTERNATIVE

Nancy L. Avila-Lieutenant Commander, United States Navy
B.S., Louisiana State University, 1978
Master of Science in Management-June 1993
and
Kurt B. Knobloch-Lieutenant, Supply Corps, United States Navy
B.A., Cal-State San Bernardino, 1981
Master of Science in Management-June 1993
Advisors: William R. Gates & Jeffrey M. Nevels-Department of Systems Management

The Navy provides inpatient treatment for diagnosed alcoholics. Replacing some of the inpatient treatment with outpatient treatment is feasible, especially when treatment matching occurs. The major objective for using outpatient treatment is to capture considerable savings while maintaining treatment effectiveness. The results indicate that the Navy should be able to implement an outpatient treatment model for early stage alcoholics and maintain a success rate comparable to the impatient treatment model. This would reflect a savings in program costs and replacement costs.

AIRCRAFT ENGINE RELIABILITY ANALYSIS USING LOWER CONFIDENCE LIMIT ESTIMATE PROCEDURES

Richard Price Baldwin-Lieutenant Commander, United States Navy
B.S., University of Washington, 1980
Master of Science in Management-December 1992
Advisor: Walter M. Woods-Department of Operations Research

In this thesis, a spreadsheet model was developed to compute the lower confidence limit (LCL) for the reliability of a complex weapon system using a personal computer. The LCL is an estimate of the lowest reliability a system is expected to have at a given point in time with a given level of confidence. The reliability model is based on a Weibull distribution for the system component failure times. The reliability of LCL procedures has been extensively validated and determined to be quite accurate when the expected number of failures is at least 10. This model is capable of supporting LCL decisions in support of the Component Improvement Program or new weapon system procurement where reliability growth analysis is used as a decision support tool. This procedure also provides program managers and engineers with a method to perform LCL analysis and thereby reduce their dependence on contractor supplied reliability data.

AN ANALYSIS OF ENLISTED NAVY RECRUITER PRODUCTIVITY AND INCENTIVE PROGRAMS, FY 1988 - FY 1990

Lisa C. Barfield-Lieutenant, United States Navy
B.S., Oregon State University, 1983
Master of Science in Management-September 1993
Advisor: David R. Henderson-Department of Systems Management

This thesis analyzes the productivity of Navy enlisted recruiters for the time period FY 1988-FY 1990. The objectives of this thesis are to examine: (1) productivity by geographic area, (2) productivity with respect to the racial/ethnic background of the recruiter and the individual recruited, (3) productivity by gender of recruiter and gender of recruit, and (4) recruiter productivity under two separate incentive program eras. Descriptive statistics are used to show the actual productivity differences, followed by multivariate regression analysis to examine specific effects of gender, ethnicity and geographic location on recruiter production. Bivariate analysis is employed to compare the differences in recruiter productivity between the two incentive program eras. The results show that, with respect to ethnic background, recruiters are significantly more productive when recruiting individuals like themselves than when recruiting individuals of a different ethnicity. Females were found to be more productive than males when recruiting females and geographically, the southwest area of the country was most often significantly more productive than other areas. The thesis provides recommendations to assist Navy Recruiting Command in the assignment of the most effective and productive recruiters to the field in response to possible changes in specific goal requirements. Further study with current, detailed goal information is needed to assess the impact of incentive programs on recruiting and to examine the trends that should now be established with the current incentive programs.

OCEAN VENTURE '92: AN ASSESSMENT OF A MARITIME PREPOSITIONING FORCE/JOINT LOGISTICS OVER THE SHORE INSTREAM OFFLOAD EXERCISE

Sharon Barrett-Lieutenant, United States Navy
B.F.A., University of Cincinnati, 1982
Master of Science in Management-June 1993
and
Janet Wiley-Lieutenant, United States Navy
B.S., Winona State University, 1980
Master of Science in Management-June 1993
Advisors: Dan C. Boger & David G. Brown-Department of Systems Management

The movement of supplies from ship to shore to support military forces in or near combat areas has historically been difficult and time consuming. The Marine Corps and the Army have developed their own systems for satisfying their logistical needs. The Marine Corps had embraced the prepositioning concept, while the Army has relied on moving forces and utilizing logistics over the shore capabilities. Regardless of the offload method used, the efficient delivery of containerized cargo and equipment is critical to the establishment of forces ashore. During May 1992, a Maritime Prepositioning Force (MPF) and Joint Logistics Over the Shore (JLOTS) exercise was conducted at Onslow Beach, North Carolina, to test these delivery systems. Ocean Venture '92 provided a low- to mid-intensity platform for examining MPF and JLOTS capabilities. This thesis presents the organizations and equipment requirements for MPF and JLOTS operations and assesses the effectiveness of Ocean Venture '92 with respect to accomplishing key objectives, problem identification, lessons learned and recommendations for improving future MPF and JLOTS operations.

FINANCIAL ACCOUNTING CONCEPTS AND DOD/DON FINANCIAL REPORTING PRACTICE

Robert Charles Barrieault-Lieutenant, United States Navy
B.S., New Hampshire College, 1987
Master of Science in Management-March 1993
Advisor: Douglas Moses-Department of Systems Management

The objective of this thesis is to assist financial management students at the Naval Postgraduate School to relate the concepts learned in Financial Accounting (MN2150) and Financial Reporting and Analysis (MN4159) so the applications in the DoN/DoD. To accomplish the objective this thesis identified nine basic financial accounting/reporting concepts broadly relevant to all organizational accounting/reporting systems, identified specific DoN/DoD applications of those concepts, and documented the relevance of the concepts to DoN/DoD practice in a series of essays.

DECREASING BUDGET FLEXIBILITY FOR COMMANDER OF MARINE CORPS INSTALLATIONS IN THE PACIFIC: SOURCES, SIGNIFICANCE AND SOLUTIONS

John D. Barth-Captain, United States Marine Corps
B.A., University of Washington, 1985
Masters of Science in Management-December 1992
and
Robert M. McGuiness-Captain, United States Marine Corps
B.A., East Stroudsburg University, 1983
Masters of Science in Management-December 1992
Advisor: Richard B. Doyle-Department of Systems Management

This thesis establishes the importance of budget execution flexibility at the installation commander level in terms of efficient allocation of resources. It then documents the erosion of budget flexibility from fiscal year 1988 to fiscal year 1991 at three Marine Corps installations: Marine Corps Air Stations, El Toro, California and Kaneohe Bay, Hawaii; and Marine Corps Base, Camp Pendleton, California. Two primary sources of erosion are identified: 1) increasing spending requirements in the form of mandates from higher authorities and rising fixed costs; and 2) decreasing top-line budget authority. The significance of decreasing flexibility is examined based upon the analysis of budget data gathered from all three subject installations. Finally, potential solutions to the current situation are offered for all levels in the budget hierarchy. Although the data are obtained from Marine Corps installations, the analysis and results are pertinent to all military installations.

A FEASIBILITY STUDY OF EXPANDING THE F404 AIRCRAFT ENGINE REPAIR CAPABILITY AT THE AIRCRAFT INTERMEDIATE MAINTENANCE DEPARTMENT

Stephen Warren Bartlett, Sr.-Lieutenant Commander, United States Navy
B.S., Georgia State University, 1978
Master of Science in Management-June 1993
and
Paul Francis Braun-Lieutenant Commander, United States Navy
B.S., Northern State College, 1976
Master of Science in Management-June 1993
Advisor: Jeffrey A. Warmington-Department of Systems Management

This thesis provides a feasibility study and cost analysis to determine what generic engine depot level capabilities should be shifted to "selected" Aircraft Intermediate Maintenance Departments (AIMD) to reduce costs and improve fleet support of F404-GE-400/402 turbofan engines. The downsizing of the military in the next decade, the resulting budget constraints and the reality of base closures will force the Navy to adopt innovative cost saving measures. This thesis used simulation modeling of the F404 engine repair process at AIMDs Cecil Field and Lemoore to evaluate the feasibility of expanding repair capabilities. The simulation model outcomes provided strong indications that such expansion of the AIMDS is both feasible and cost effective. The researchers recommend shifting selected depot repair capabilities to the AIMD. Recommendations include positioning a spin-balance machine and increasing the welding repair capability at "selected" AIMDs to reduce BCM actions, turnaround times and repair costs for the F404 aircraft engine.

WOMEN AND NONTRADITIONAL OCCUPATIONS IN THE NAVY: A STUDY OF QUALIFICATION OVER TIME

Dwayne Fulghum Baxter-Lieutenant, United States Navy
B.A., Virginia Polytechnic Institute, 1986
Master of Science in Management-September 1993
Advisor: M. J. Eitelberg-Department of Systems Management

This thesis examines the qualifications of women for nontraditional ratings over time using the Armed Services Vocational Aptitude Battery (ASVAB). The study focuses on seagoing, nontraditional ratings that are likely to be affected by changes in laws and policies that currently exclude women from combat. Using data from Navy accession files for the years 1981, 1983, 1986, 1989, and 1992, tables were created that compare qualification for four ASVAB composites by various demographic variables, including gender, racial/ethnic group and Recruiting Area. The results indicate that, in general, women who join the Navy qualify at lower rates than men for nontraditional ratings. Further, no improvements have apparently occurred since 1981 in the qualification rates of women for technical, seagoing ratings. To improve the qualification rate of women for nontraditional occupations in the near term, minimum requirements would need to be modified or alternative standards developed. Further research in this area is recommended.

EXPANDED APPLICATIONS AND BENEFITS OF A TAXONOMY OF GOODS PROCURED BY THE FEDERAL GOVERNMENT

Kimberley Ann Beeson-Lieutenant, Supply Corps, United States Navy
B.A., University of Iowa
Master of Science in Management-June 1993
Advisor: David V. Lamm-Department of Systems Management

Recent research has proposed the transformation of contracting from a management art to a science. To this end, a description and classification of the subject matter has been undertaken and a model developed that classifies goods procured by the Federal Government. A great deal of effort has been given to validation of this model. The rudimentary model has been refined and purposes for its application have been presented. This thesis offers three potential applications and benefits of the previously developed taxonomical structure for classifying goods procured by the Federal Government. These potential applications are identification and utilization of commercial items, workload management and staffing.

UTILITIES COST COMPARISON ANALYSIS BETWEEN A PUBLIC WORK CENTER AND THE NON-DOD SECTOR

David A. Berchtold-Lieutenant, United States Navy
B.S., United States Naval Academy
Master of Science in Management-December 1992
and
David W. Danner-Lieutenant Commander, United States Naval Reserve
B.S., Trenton State College
Master of Science in Management-December 1992
Advisor: Joseph G. San Miguel-Department of Systems Management

The purpose of this thesis is to provide a unit cost comparative analysis of electricity and water utility services between Navy Public Works Center San Francisco Bay and three local non-Department of Defense public and private enterprises. The research focused primarily on procurement costs and the direct costs of distribution for fiscal years 89, 90, and 91. The latter costs include direct labor, direct material, and contract costs associated with preventative maintenance, repairs, and capital improvements. A review of the Navy's facility management strategy, the historical perspective of Navy facilities management, and the impact of Defense Management Review Decisions 967 (consolidation) and 971 (Defense Business Operating Fund) on Public Works Center San Francisco Bay is also provided. The research is conclusive in comparing procurement costs. While the Navy's water procurement costs were favorable, its electrical procurement costs were found to be 10% to 35% higher on a unit cost basis than the other sites. Electrical and water distribution costs for the Navy were very high in comparison to the other sites, but a number of factors exist which prevent any conclusive findings regarding the Navy's efficiency.

IDENTIFICATION OF NEGOTIATION TACTICS AND STRATEGIES OF ARMY NEGOTIATORS

Thomas M. Besch-Captain, United States Army
B.S., United States Military Academy, 1982
Master of Science in Management-December 1992
Advisor: David V. Lamm-Department of Systems Management

This research examines the tactics and strategies used most frequently by 138 Army negotiators randomly selected from throughout the continental United States. Respondents selected from 32 tactics those which they used most often, and those which they felt industry used most often against them. Respondents also rank ordered ten strategies according to the frequency in which they were used, and the order in which they preferred their use. The strategies were also examined for preference under five different contract situations. The survey questionnaire method was used to collect information of demographics, and negotiator's use of tactics and strategies. Frequency distributions, Kendall Tau_b and the Spearman rank correlation tests were used to examine tactics and strategies for preference of use and to test for agreement. Analysis indicates that Army negotiators employ tactics and strategies that rely on statistical analysis, and negotiate in as professional and straightforward a manner as possible. However, evidence indicated that an adversarial relationship exists between Government and industry.

COMPUTER-BASED INSTRUCTIONAL TECHNOLOGY IN THE AEGIS TRAINING PROGRAM

Bryan McDonald Bowen-Lieutenant, United States Navy
B.B.A., Middle Tennessee State University
Master of Science in Management-September 1992
Advisors: Alice M. Crawford & Benjamin J. Roberts-Department of Systems Management

The purpose of this thesis is to examine how the AEGIS Training Program is utilizing Computer-Based Instructional Technology (CBIT) to increase efficiency and effectiveness in a period of declining budgets and increasing technology. The AEGIS Training Program is faced with a variety of logistical, educational, and manpower-related issues that are not adequately addressed by traditional methods of training and instruction. In response, the AEGIS Training Center (ATC), Dahlgren, Virginia, is testing an electronic "Classroom of the Future" concept. This thesis provides an overview of the background, development, and early testing of the AEGIS "Classroom of the Future" and the associated Interactive Electronic Technical Manual (IETM) project. Problems encountered, expected benefits, and early testing results are discussed as well as recommendations for further analysis.

A FEASIBILITY STUDY OF EXPANDING THE F404 AIRCRAFT ENGINE REPAIR CAPABILITY AT THE AIRCRAFT INTERMEDIATE MAINTENANCE DEPARTMENT

Paul Francis Braun-Lieutenant Commander, United States Navy
B.S., Northern State College, 1976
Master of Science in Management-June 1993
and
Stephen Warren Bartlett, Sr.-Lieutenant Commander, United States Navy
B.S., Georgia State University, 1978
Master of Science in Management-June 1993
Advisor: Jeffrey A. Warmington-Department of Systems Management

This thesis provides a feasibility study and cost analysis to determine what generic engine depot level capabilities should be shifted to "selected" Aircraft Intermediate Maintenance Departments (AIMD) to reduce costs and improve fleet support of F404-GE-400/402 turbofan engines. The downsizing of the military in the next decade, the resulting budget constraints and the reality of base closures will force the Navy to adopt innovative cost saving measures. This thesis used simulation modeling of the F404 engine repair process at AIMDs Cecil Field and Lemoore to evaluate the feasibility of expanding repair capabilities. The simulation model outcomes provided strong indications that such expansion of the AIMDS is both feasible and cost effective. The researchers recommend shifting selected depot repair capabilities to the AIMD. Recommendations include positioning a spin-balance machine and increasing the welding repair capability at "selected" AIMDs to reduce BCM actions, turnaround times and repair costs for the F404 aircraft engine.

THE FEASIBILITY OF LONG-TERM CONTRACTING IN THE DEPARTMENT OF DEFENSE

Gregory F. Breen-Lieutenant Commander, Supply Corps, United States Navy
B.S., University of Delaware, 1981
Master of Science in Management-June 1993
Advisor: Rebecca Adams-Department of Systems Management

This study attempts to identify to what extent long-term contracting is feasible by the Department of Defense (DoD). It was primarily accomplished by examining the long-term contracting literature base and through surveys and follow-up telephone interviews with individuals from private industry and with individuals from DoD. The surveys and interviews were conducted in order to specifically identify and characterize any barriers which may be restricting DoD's ability to use a long-term contracting approach; and if so, to determine how these barriers can best be overcome, by comparing DoD's long-term contracting practices to the long-term contracting practices of private industry. The research concludes that although DoD does face greater barriers (primarily due to Government procurement practices and regulations concerning competition and budgeting) than commercial buying organizations; there are enough contracting types and arrangements, as well as special contracting methods available which allows those DoD activities, which so desire, to still establish long-term relationships with suppliers.

A COST-BENEFIT ANALYSIS FOR REVISION AND REIMPLEMENTATION OF THE OFFICE PAPER RECYCLING PROGRAM AT THE NAVAL POSTGRADUATE SCHOOL, MONTEREY

Edward W. Brown-Lieutenant, United States Navy
B.S.C.E., New Jersey Institute of Technology, 1985
Master of Science in Management-December 1992
Advisors: William Gates & David Henderson-Department of Systems Management

This thesis examines the current waste paper recycling program at the Naval Postgraduate School, Monterey. The thesis evaluates the costs and benefits of the existing recycling program and a new revised waste paper recycling program. The thesis shows that a new program can be implemented and increase the benefits to the school by $6,000 per year. It shows inefficiencies in the current Solid Waste disposal practices. It also shows that the Public Works Department, Supply Department and Morale Welfare and Recreation Departments must work together to make recycling work. In addition to waste paper recycling, this thesis identifies a need for increased cardboard recycling, as well as source reduction.

AN ANALYSIS OF THE PROPENSITY FOR NONTRADITIONAL OCCUPATIONS AMONG CIVILIAN AND NAVY WOMEN

Marshall B. Brown-Lieutenant, United States Navy
B.S., United States Naval Academy, 1987
Master of Science in Management-September 1993
Advisors: Stephen L. Mehay & Carol A. Mitchell-Department of Systems Management

This thesis explores women's propensity to select nontraditional occupations. Specifically, it analyzes the "desired" occupations of a sample of civilians of enlistment age and a sample of Navy enlistees. Data taken from the Navy's 1991 New Recruit Survey and the 1979/1982 National Longitudinal Survey of Youth are analyzed to determine differences in propensity between young civilian women and female enlistees. Differences in occupational preferences between male and female civilians and male and female enlisted personnel are analyzed. Multivariate regression models are developed indicating factors that affect women's occupational choices for both the Navy and in the civilian samples. The study reveals that Navy women are more likely than young civilian women to choose nontraditional occupations. Young civilian men and male Navy enlistees are more likely than either civilian women and female Navy enlistees to choose nontraditional occupations. Three determinants of nontraditional occupational choice are consistent across female models using both civilian and military samples. Women of high ability, who desire high-tech training, and who expect uninterrupted labor force participation have higher propensity for nontraditional jobs than other women. Recommendations are for focused advertising to attract those women into the Navy who desire nontraditional occupations. Outreach in high schools and during the recruiting and enlistment process also can identify those women with greater propensity for nontraditional ratings.

SOFTWARE REUSE AND THE ARMY PROGRAM DEVELOPMENT PROCESS

Donald F. Burns, III-Captain, United States Army
B.S., Louisiana Tech University, 1982
Master of Science in Management-June 1993
Advisor: David V. Lamm-Department of Systems Management

This thesis examines the current Army Program Management software development effort with respect to the application and implementation of software reuse. This study examines current efforts by the Department of Defense and related agencies to implement software reuse into the development and life cycle of both embedded and host application software for automated weapon systems. The DoD software development cycle templates are examined for software reuse applicability, integration, and implementation. Broad overview and analysis of potential, real and perceived reuse implementation inhibitors and barriers is conducted by category (Management, Standards, Library, Legal, and Education), and in conjunction with interviews of critical personnel within the Program Management structure to assess current knowledge and opinion on software reuse. Identified software reuse inhibitors and program personnel concerns are addressed by category, with the intention of finding generalized solutions and application or execution points within the parameters of the software program development structure.

AN EVALUATION OF ARTIFICIAL NEURAL NETWORK MODELING FOR MANPOWER ANALYSIS

Brian James Byrne-Captain, United States Marine Corps
B.A., University of Colorado at Boulder, 1985
Master of Science in Management-September 1993
Advisor: G. W. Thomas-Department of Systems Management

This thesis evaluates the capabilities of artificial neural networks in forecasting the "take-rates" of the Voluntary Separations Incentive/Special Separations Benefit (VSI/SSB) programs for male, Marine Corps enlisted personnel in the grades of E-5 and E-6. The Artificial Neural Networks models are compared with the forecasting abilities of a classical regression model. The data are taken from the Headquarters Marine Corps Enlisted Master File which contains military and personal background on each enlisted member of the United States Marine Corps. The classical regression model is a causal model constructed based upon the theory of occupational job choice. The neural network models are presented with all available data elements. Empirical results indicate that artificial neural networks provide forecasting results at least as good as, if not better than, those obtained using classical regression techniques. However, artificial neural networks are limited in their usefulness for policy analysis.

NROTC FOUR-YEAR SCHOLARSHIP ATTRITION: A DESCRIPTIVE ANALYSIS

Maureen M. Cahill-Lieutenant Commander, United States Navy
B.S., California State Polytechnic University, Pomona, 1977
Master of Science in Management-March 1993
Advisors: Alice M. Crawford & Mark J. Eitelberg-Department of Systems Management

The purpose of this thesis was to examine attrition behavior by individuals who have received Naval Reserve Officer Training Corps (NROTC) four-year national scholarships. Information on the attrition of students between 1983 and 1987 was derived from data provided by Chief of Naval Education and Training. Differences in attrition rates from NROTC were found by gender, racial/ethnic group, technical or non-technical college major, reason for disenrollment, and other factors. This study found NROTC patterns of attrition were similar to those of the college dropout, though attrition rates for certain demographic groups differed due to the unique nature of the NROTC program. Results also suggest that a major share of early attrition is driven by the policy that obligates students for Naval service. Further research is recommended to examine causal relationships between background and performance characteristics of students who disenroll from NROTC for motivational reasons.

AN ANALYSIS OF CONTRACTOR LOGISTICAL SUPPORT FOR NONDEVELOPMENTAL ITEMS

Wayne Cecil Cain-Captain, United States Army
B.S., Clemson University, 1978
M.A., Clemson University, 1979
Master of Science in Management-March 1993
Advisor: Thomas H. Hoivik-Department of Systems Management

The purpose of this thesis is to analyze non-traditional logistical support approaches for Nondevelopmental Items (NDI). NDI acquisition capitalizes on the use of commercial "state-of-the-art" technologies while providing DoD with effective and economical solutions to near-term operational requirements. This thesis primarily focuses upon contractor logistical support strategies which are unique to NDI acquisition programs. Four current NDI programs were researched for logistical implications. These included: 1) the AN/ARN-148 Omega Navigational System, 2) the Secure Telephone Unit III, 3) the AN/PSS-12 Mine Detector, and 4) the AN/PSN-11 PLGR GPS Receiver. The NDI logistical support strategies identified and analyzed were: 1) no support required (discard system upon failure), 2) total contractor support, 3) organic support, and 4) a combination of organic and contractor support. The advantages and disadvantages of these support methods were analyzed. Potential logistical support strategies are identified that may enable U.S. Army program managers to maximize the benefits of using individualized and tailored support strategies for NDI acquisition. This thesis concludes by summarizing the potential support problems for future NDI programs.

COST REPORTING AT A NAVY BRANCH MEDICAL CLINIC

James B. Canby, IV-Lieutenant, United States Navy
B.S., Golden Gate University, 1983
Master of Science in Management-March, 1993
Advisors: Douglas Moses & Kenneth Euske-Department of Systems Management

This thesis examines cost reporting at a Navy Branch Medical Clinic. Costs are traditionally reported under a partial cost reporting system. By applying basic principles of managerial accounting, a proposed full cost reporting system is created. Under the traditional system, one figure representing total consumption for each quarter is reported for each workcenter. Under the full costing model, costs are disaggregated into fixed and variable components. The thesis further explores the application of activity based cost reporting to create a second proposed costing system in which costs are reported as a function of the activities which drive them.

PERFORMANCE MEASUREMENT SYSTEMS: A BEST PRACTICES STUDY

Sandra Kay Chachula-Lieutenant, United States Navy
B.S., United States Naval Academy, 1985
Master of Science in Management-December 1992
Advisor: Kenneth J. Euske-Department of Systems Management

The purpose of this cost management research was the identification and analysis of internal performance measurement best practices which can serve as a benchmark for companies who seek to improve their performance measurement systems and competitiveness. The study used data that were previously collected from eleven diverse, high performing companies. This study identified twenty-one characteristics of performance measurement systems across eleven companies and across levels of management. The twenty-one characteristics have previously been identified in the performance measurement literature as characteristics necessary for organizations to maintain their competitive edge. The study, therefore, is confirmatory. The summary of performance measurement "best practices" identified in this study, then, can be used as a benchmark for organizations who seek to improve their performance measurement systems and their competitiveness.

QUICKTRANS AND ALTERNATIVE COMMERCIAL TRANSPORTATION: A COST COMPARISON

Gregory Bryant Chitwood-Lieutenant Commander, United States Navy
B.A., University of Oregon, 1976
Master of Science in Management-December 1992
Advisor: Dan C. Boger-Department of Systems Management

The purpose of this thesis is to determine if the Navy's QUICKTRANS system could be replaced with a more cost effective combination of commercial air freight and trucking service. QUICKTRANS is used to transport DoD cargo between major continental United States Navy operating sites. The history, components, billing structure, and total cost of the QUICKTRANS system are described. Types of material moved as QUICKTRANS shipments are examined with particular emphasis on dirty freight shipments, those which require special handling. A cost model is developed to estimate the cost of moving cargo currently shipped in QUICKTRANS by readily available alternative commercial transportation assuming four different scenarios for determining which shipments move by premium air transportation. The cost for QUICKTRANS compares favorably with the cost required for alternative commercial transportation as computed by the cost model. Continued QUICKTRANS operation is recommended unless the shipment volume continues to decline in FY 93.

INVESTIGATING THE LINKAGE BETWEEN INTRINSIC MOTIVATION AND QUALITY

Steven Michael Christy-Captain, United States Army
B.S., Central Missouri State University, 1977
M.S., Boston University, 1990
Master of Science in Management-December 1992
Advisors: Kenneth W. Thomas & Gail F. Thomas-Department of Systems Management

This thesis proposes that it is workers' intrinsic motivation that leads them to produce quality work. It reviews two different types of evidence -- "expert opinion" and empirical studies -- to attempt to evaluate a link between intrinsic motivation and work quality. The thesis reviews the works of Total Quality writers and behavioral scientists for any connection they might have made between intrinsic motivation and quality. The thesis then looks at the works of Deming and his followers in an attempt to establish a match between Deming's motivational assumptions and the four task rewards in the Thomas/Tymon model of intrinsic motivation: choice, competence, meaningfulness and progress. Based upon this analysis, it is proposed that the four Thomas/Tymon task rewards are a promising theoretical foundation for explaining the motivational basis of quality for workers in Total Quality organizations.

THE IMPACT OF DECLINING NAVY BUDGETS ON UNITED STATES SHIPYARDS

Christopher A. Clayton-Lieutenant Commander, Supply Corps, United States Navy
B.B.A., Emory University
Master of Science in Management-December 1992
Advisors: Dan C. Boger & Alan W. McMasters-Department of Systems Management

United States shipyards are an integral component of the Nation's defense infrastructure. Shipyards provide shipbuilding capability and repair support for the U.S. Navy and the U.S.-flag fleet. During the 1980s, however, U.S. Navy shipbuilding, repair, and modernization programs achieved dominance over commercial vessel shipyard work. Commercial business at U.S. shipyards declined to a point where by 1991 Navy work accounted for ninety percent of the direct labor hours at the biggest five shipyards within the U.S. With the end of the Cod War and the downsizing of the armed forces, U.S. shipyards now face years of declining Navy budgets. This thesis addresses the shipbuilding industry, the factors contributing to the decline in commercial shipbuilding orders, the growth of Navy shipbuilding work, and proposes avenues whereby U.S. shipyards can regain a competitive foothold in the international commercial shipbuilding market.

AN ASSESSMENT OF THE IMPLEMENTATION OF TOTAL QUALITY LEADERSHIP AT MARINE CORPS LOGISTICS BASE, ALBANY, GEORGIA

Gregory Kelly Cohen-Captain, United States Marine Corps
B.B.A., Texas A&M University, 1986
Master of Science in Management-December 1992
Advisor: James E. Suchan-Department of Systems Management

The implementation of Total Quality Leadership (TQL) is a continuous process; consequently the Marine Corps Logistics Base (MCLB) in Albany, Georgia identified a need to assess their TQL implementation. This study describes Marine Corps Logistics Base, Albany's TQL models and tools, identifies quality assessment guides, and selects the Department of the Navy's TQL Climate Survey as the guide that best meets the needs of the organization. The study also discusses the methodology of administering the survey and an analysis of the survey results. The analysis revealed that the TQL philosophy is prevalent throughout MCLB, but actual implementation has not reached the lower levels of the organization. The study also identified a blockage of the implementation process at the first line supervisor level; it also revealed that the implementation has not yet reached the line worker level.

UTILIZATION OF NAVY SELECTED RESERVE PERSONNEL IN DEFENSE CONTRACT MANAGEMENT COMMAND RESERVE UNITS

Michael A. Colesar-Lieutenant Commander, United States Navy
B.S., University of Richmond, 1979
Master of Science in Management-June 1993
Advisor: Jeffrey M. Nevels-Department of Systems Management

Faced with a continually shrinking defense budget it has become increasingly important to fully employ all resources available. The reserves represent one resource that can be exploited further in this quest for efficiency. This thesis focuses on the utilization of the Naval Selected Reserves affiliated with the Defense Contract Management Command. The objective was to examine how these units are currently employed, and how they might be used more effectively in the future. Ancillary issues such as a structured reserve acquisition career path and the impact of the Defense Acquisition Workforce Improvement Act (DAWIA) were also raised. The most important conclusion derived from this research is that the reserve acquisition forces represent a vast array of skills and experience, and that these forces can be most effectively utilized when their civilian-based skills are drawn upon and employed. Additionally, it became readily apparent that the non-productive drains upon the reservists' time must be eliminated or streamlined. Finally, the issue of applying DAWIA to the reserve forces is currently undecided, but consensus recommends against any formal application.

SUCCESSFUL ACHIEVEMENT OF TQL IN DON ACTIVITIES

Michael J. Craft-Lieutenant Commander, United States Navy
B.A., Washington State University, 1976
Master of Science in Management-June 1993
Advisor: Susan P. Hocevar-Department of Systems Management

The primary objective of this thesis is to investigate the continued achievements and barriers to implementing Total Quality Leadership (TQL) in three Department of the Navy (DoN) organizations that had participated in Carolyn Applegate's thesis, completed September 1991. Phone interviews were conducted to gather data regarding current status. Follow-up interviews were also conducted on specific innovative practice noted by Carolyn Applegate in order to evaluate their current status. Additionally, a questionnaire was distributed throughout the commands. This questionnaire was used to determine the perceptions that employees, had about their organization with regards to light aspect of quality management. Conclusions reached were that initial implementation of TQL at all three activities was successful and that ongoing refinements are being identified and implemented. Critical factors in successful implementation were top management commitment and involvement, extensive "top/down" training, innovative methods of expanding employee's roles through empowerment, self-managing teams, and joint teams.

THE IMPACT OF THE ESTABLISHMENT OF THE DEFENSE HEALTH PROGRAM APPROPRIATION ON THE PLANNING, PROGRAMMING, AND BUDGETING SYSTEM WITHIN THE DEPARTMENT OF DEFENSE

Peter E. Dahl-Lieutenant, United States Navy
B.A., North Park College, 1982
Master of Science in Management-June 1993
Advisors: Richard B. Doyle-Department of Systems Management &
George W. Conner-Department of Operations Research

This thesis examines the impact of the establishment of the Defense Health Program (DHP) Appropriation on the Planning, Programming, and Budgeting System (PPBS) within the Department of Defense. A brief history of the PPBS is presented to explain why the Department of Defense adopted the system in the early 1960s. The PPBS process is then described, with the focus on the Programming portion from a Department of the Navy perspective. The events which led to the creation of the DHP Appropriation are recounted, and the provisions of Program Budget Decision 742 which created the DHP are examined. The effect of the DHP on the PPBS and specifically on preparing the Program Objectives Memoranda (POMs) for fiscal years 1994-1999 and 1996-2001 are then discussed. Finally, problems with using the PPBS to estimate medical program costs and several proposed reforms are addressed.

APPLY THE THEORY OF CONSTRAINTS (TOC) TO THE COMPONENT SECTION OF NAVAL AVIATION DEPOT (NADEP), NORTH ISLAND

Mark Anthony D'Amato-Captain,, United States Army
B.A., Kent State University, 1981
Master of Science in Management-December 1992
and
David Joseph McNamara-Lieutenant Commander, United States Navy
B.S., University of Massachusetts, 1980
Master of Science in Management-December 1992
Advisor: Dan Trietsch-Department of Systems Management

Eliyahu M. Goldratt first introduced TOC as a means of managing and synchronizing repetitive manufacturing operations. This thesis explores the extent to which TOC management principles can be applied to a repair job shop within the Naval Aviation Depot (NADEP) at North Island, San Diego, California. This thesis begins with a description of TOC and an overview of how the NADEP is organized. It continues with a description of how Shop 93302, (hydraulic component repair) operates in the depot. Against this backdrop, we discuss the extent to which TOC can be used to evaluate current repair policies and procedures within this shop. We offer some ideas and suggestions for changing and improving existing operations and the probable effect these changes will have on production, inventory, and repair turnaround time (TAT). We conclude that TOC is an effective means of implementing and focusing continual improvements in Shop 93302 and ultimately in the depot as a whole.

UTILITIES COST COMPARISON ANALYSIS BETWEEN A PUBLIC WORK CENTER AND THE NON-DOD SECTOR

David W. Danner-Lieutenant Commander, United States Naval Reserve
B.S., Trenton State College
Master of Science in Management-December 1992
and
David A. Berchtold-Lieutenant, United States Navy
B.S., United States Naval Academy
Master of Science in Management-December 1992
Advisor: Joseph G. San Miguel-Department of Systems Management

The purpose of this thesis is to provide a unit cost comparative analysis of electricity and water utility services between Navy Public Works Center San Francisco Bay and three local non-Department of Defense public and private enterprises. The research focused primarily on procurement costs and the direct costs of distribution for fiscal years 89, 90, and 91. The latter costs include direct labor, direct material, and contract costs associated with preventative maintenance, repairs, and capital improvements. A review of the Navy's facility management strategy, the historical perspective of Navy facilities management, and the impact of Defense Management Review Decisions 967 (consolidation) and 971 (Defense Business Operating Fund) on Public Works Center San Francisco Bay is also provided. The research is conclusive in comparing procurement costs. While the Navy's water procurement costs were favorable, its electrical procurement costs were found to be 10% to 35% higher on a unit cost basis than the other sites. Electrical and water distribution costs for the Navy were very high in comparison to the other sites, but a number of factors exist which prevent any conclusive findings regarding the Navy's efficiency.

A CASE STUDY OF THE USS *DWIGHT D. EISENHOWER* COLLISION AND ITS IMPLICATIONS

Patrick J. Dennison-Lieutenant, United States Navy
B.S., The Citadel, 1986
Master of Science in Management-September 1993
Advisor: Nancy C. Roberts-Department of Systems Management

Collisions at sea have and continue to be one of the most misunderstood phenomena of our modern transportation era. This thesis is a case analysis of the USS *DWIGHT D. EISENHOWER* (CVN 69) collision. Building on data from the National Transportation Safety Board's and the United States Navy Judge Advocate General Corps' investigations, it attempts to resolve inconsistencies between these governmental sources and interviews from four of the six principal officers involved in the mishap. The findings reveal that numerous causal factors were not sufficiently explored by the investigative bodies. Of greatest significance, was the neglect of the *EISENHOWER* bridge organization, which was in disarray in the moments prior to the collision. This disorganization was the result of a six-month deployment in which specific Officers of the Deck focused their watch routines on the whims of the ship's Navigator. This dependence resulted in a poor decision process, and ultimately the inability to act appropriately in situations requiring prompt action.

AN ASSESSMENT OF THE FCIM DSS FOR THE EFFECTS OF LEAD TIME ON PROCUREMENT DECISIONS

Robert Cameron Douglass-Lieutenant, Supply Corps, United States Navy
B.S., Drexel University, 1977
Master of Science in Management-December 1992
Advisors: Kenneth J. Euske & Kishore Sengupta-Department of Systems Management

The development of automated manufacturing technology and the creation of Department of Defense (DoD) RAMP facilities which use this technology has required the development and use of improved decision support software (DSS) products. The new technology has allowed the facilities to reduce procurement lead time in the manufacturing process which now must be factored into the procurement and inventory management of the Navy and the DoD. This thesis examines a DSS product developed by Fleet Material Support Office for the RAMP Project Office which compares competing bids from RAMP sites and private contractors for the manufacture of repair parts. The DSS uses a modified version of the Wilson economic order quantity formula to determine optimum quantities to buy, minimizing the total relevant cost. It will be used to decide between competing bids which may vary in unit price, and delivery schedules. The author concludes that the theory for the calculation of total relevant cost is adequate but that reports generated do not highlight the benefits of reduced lead time and have significant computational errors.

A COST COMPARISON BETWEEN ACTIVE AND NAVAL RESERVE FORCE FFG 7 CLASS SHIPS

Robert F. Dudolevitch-Lieutenant Commander, Supply Corps, United States Navy
Master of Science in Management-June 1993
Advisor: David R. Henderson-Department of Systems Management

This thesis is a cost comparison between Active Fleet and Naval Reserve Force (NRF) Oliver Hazard Perry class guided missile frigates (FFG). It examines the rationale for having a Naval Reserve surface ship program and documents the savings attributable to the transfer of a ship to the NRF. A representative annual cost to operate an Active Fleet FFG is compared to the annual cost of a NRF FFG; the primary source of cost data is the Visibility and Management of Operating and Support Costs (VAMOSC) data base provided by the Naval Center for Cost Analysis. This thesis also sets up theoretical depreciation schedules for selected ships to examine how this expense would affect annual operating costs for both NRF and Active Fleet ships.

COST/BENEFIT ANALYSIS AND JOB DESIGN FOR NAVAL CONSTRUCTION FORCE LIAISON OFFICER BILLETS ON MARINE EXPEDITIONARY FORCE STAFFS

Dennis Lee Duren-Lieutenant, Civil Engineer Corps, United States Navy
B.S.C.E., University of Nebraska, 1985
Master of Science in Management-December 1992
Advisor: James M. Fremgen-Department of Systems Management

This thesis provides a cost/benefit analysis and job design for the placement of Naval Construction Force (NCF) Liaison Officer billets on each Marine Expeditionary Force (MEF) staff. The three MEFs are the largest, most capable form of a Marine Air-Ground Task Force (MAGTF). Each MEF has been authorized a billet for a Navy Civil Engineer Corps (CEC) Lieutenant as the NCF Liaison Officer. The NCF (or Seabees) have supported the Marine Corps with a wide range of advanced-base construction from the origin of the Seabees during World War II through the Persian Gulf War. Discussion of this support role and the organizational/command relationships between the NCF and the marine Corps is provided. Discussion of the benefits and costs expected to be realized from these billets will lead to a proposed job design. This design of responsibilities attempts to optimize results from the billets. Job characteristics for work motivation for the officers assigned are also considered.

ALTERNATIVE DISPUTE RESOLUTION: A VIABLE METHOD FOR RESOLVING GOVERNMENT CONTRACT DISPUTES

David S. Eaton-Captain, United States Marine Corps
B.A., Colorado State University, 1983
Master of Science in Management-June 1993
Advisor: David R. Henderson-Department of Systems Management

While arbitration and mediation have gained almost universal acceptance for settling commercial contract disputes, resolution of contract disputes in the Federal Government has continued to be slow, time consuming, and expensive. The participants in these processes have turned toward a new approach that offers an expedient, inexpensive, and less adversarial method for settling these disputes known as Alternative Dispute Resolution (ADR). This thesis provides information on various methods of ADR, detailing advantages, disadvantages, and characteristics for case suitability. The research found, through the interviews conducted and the literature reviewed, that there are general misconceptions and impediments to the implementation of ADR. There was a general lack of knowledge of the different methods of ADR available. Many of the personnel interviewed did not know of their full authority to use ADR as provided by the Administrative Dispute Resolution Act. One major obstacle that was found in evaluating ADR is that there is an absence of reliable data to support the claims of ADR. Personnel interviewed in the Federal Government indicated that there is a lack of incentives for the Government to use ADR. One reason for this was due to the use of the "continued performance" clause. What the interviews and literature do point to is that ADR methods may not save the participants as much money as was originally believed, but that the cases are generally processed more quickly and that the parties are more satisfied with the process and outcomes. However, a final determination as to whether ADR is a viable method for settling contract disputes in the Federal Government cannot be made until more empirical data have been established.

FISCAL OVERSIGHT OF THE BUDGET FOR DEFENSE RESEARCH, DEVELOPMENT, TEST AND EVALUATION, FISCAL YEARS 1983-1992

Gregory William Eaton-Lieutenant Commander, United States Navy
B.S., Western Michigan University, 1980
Master of Science in Financial Management-December 1992
Advisor: Richard B. Doyle-Department of Systems Management

This thesis examines the importance of the Defense Research, Development, Test and Evaluation (RDT&E) budget. The relevance and value of the budget are addressed. The composition and size of the RDT&E budget as a share of the defense and investment budgets over time are evaluated. The origin of congressional oversight and the development of Department of Defense RDT&E budget formats are explained. The defense, procurement, and RDT&E budgets are examined from Presidential request through the appropriation over a ten-year period. Analysis includes the authorization and appropriation changes to the budget, as well as the House and Senate impact on the three budgets. Five major conclusions were drawn. First, the period between FY 1983 and FY 1988 saw significantly greater conflict between Congress and the executive branch over priorities regarding the defense budget. Second, the budget reductions were smaller during the FY 1989 to FY 1992 period due to greater cooperation between the President and Congress and between the two houses of Congress. Third, the Senate is more supportive of RDT&E spending than is the House. Fourth, the appropriation for procurement was funded more than the presidential request three of the four years during the FY 1989 to FY 1992 period. Fifth, the RDT&E budget receives the greatest relative reductions from both the authorization and appropriation committees.

SPECIAL TOOLING DISPOSITION FOR AIRCRAFT ENTERING POST PRODUCTION SUPPORT

Lee G. Ebert-Lieutenant, Supply Corps, United States Navy
B.S., The Citadel, 1982
Master of Science in Management-December 1992
Advisors: Alan W. McMasters & Roger D. Evered-Department of Systems Management

This thesis identifies and analyzes an important element of Department of Defense (DoD) Post Production Support (PPS) for planning and execution: the disposition of special tooling used to support future manufacturing of aircraft components. As a first step, PPS and its goals are described. Next, the DoD policies for special tooling management are described. Finally, the effects of special tooling disposition are analyzed and a decision process for disposition is presented which incorporates these effects. Further research is recommended to measure the effects tooling disposition decisions have on lead times and manufacturing costs when considering conventional, Rapid Acquisition of Manufactured Parts (RAMP) or Flexible Manufacturing System (FMS) manufacturing methods.

FLIGHT HOUR COSTING AT THE TYPE COMMANDER AND NAVY STAFF LEVELS: AN ANALYTICAL ASSESSMENT

Michael V. Edwards-Commander, United States Naval Reserve
B.S., United States Naval Academy, 1976
Master of Science in Management-December 1992
Advisor: Lawrence R. Jones-Department of Systems Management

This thesis is an analysis of current methods utilized to predict flying hour expenditures for budget formulation and execution purposes. This study explains, compares, and contrasts the methods for determining Cost Per (Flight) Hour (CPH) among the aviation Type Commanders (COMNAVAIRPAC/COMNAVAIRLANT/ COMNAVAIRESFOR) as well as representatives from the office of the Chief of Naval Operations (OPNAV). While an overview of the individual techniques for flight hour costing lays the groundwork for this thesis, the focus of this work is on the differences in CPH formulation, variances in eventual products, and the consequences of these variances. An analysis of recently-emerging problems associated with the Flight Hour Program (FHP) and their potential significance in an era of reduced military funding is included. Additional information on the administrative programs instituted to computerize aircraft maintenance and flying hour documentation is also presented, as well as some of the implications of transitioning to a "paperless Navy". Finally, some proposed solutions are evaluated and suggestions for further study are offered to enhance the efficiency and effectiveness of the Navy's Flight Hour Program.

GENDER BIAS IN THE NAVY

Robert W. Ernst-Lieutenant, United States Navy
B.S., United States Naval Academy, 1984
Master of Science in Management-June 1993
and
Robert J. Gilbeau-Lieutenant, United States Navy
B.S., United States Naval Academy, 1983
Master of Science in Management-June 1993
Advisors: Frank J. Barrett & Gail Fann Thomas-Department of Systems Management

An investigation of sexual harassment, gender bias, and women in combat was conducted via personal interviews with male Navy and Marine Corps officers. This study, unlike most, addresses these issues from the male perspective. This thesis includes a review of important historical events leading to the integration of women into the military. An explanation of the interview protocol will help show how major themes were obtained in the analysis of data. Problem areas in the Navy environment will be addressed in conclusion section. Also, this section will give the most common occurring themes and practical recommendations for integrating women into combatant roles in the Navy.

LEADERSHIP AND MANAGEMENT OF MEDICAL TREATMENT FACILITIES: CASE HISTORY OF CHARLESTON NAVAL HOSPITAL, 1988-1993

Douglas H. Fairfield-Captain, United States Marine Corps
B.S., North Carolina State University, 1986
Master of Science in Management-June 1993
Advisor: James Edward Suchan-Department of Systems Management

This thesis is a series of case studies that explore a wide variety of management issues and problems encountered in a Navy medical treatment facility. Management issues covered include: decision making and problem solving, creating and communicating a vision, managing change, empowering subordinates, implementing Total Quality Leadership, conflict management, and leadership during times of crisis and uncertainty. The cases are based on events that occurred at the Charleston Naval Hospital between 1988 and 1993.

CAREER PLANNING IN THE MEDICAL SERVICE CORPS: ASSESSING THE VALIDITY OF CURRENT GUIDELINES THROUGH A COMPARATIVE ANALYSIS OF DUTY TOURS AND TRAINING SCHOOLS

Leslie K. Finley-Lieutenant, Medical Service Corps, United States Navy
B.S., California State University Northridge, 1987
Master of Science in Management-March 1993
Advisors: Alice M. Crawford & Benjamin J. Roberts-Department of Systems Management

This thesis examines whether or not a more refined career path can be established for Medical Service Corps officers in the United States Navy. Historical duty tour and service school distribution patterns are analyzed to detect relationships between a Medical Service Corps officer's rank and particular duty tour types. Specifically, the patterns in U.S. hospital tours, clinic tours, overseas tours, full-time duty under instruction tours, ship tours, overseas-homeported ship tours, recruiting tours, and tours in the Washington D.C. area are investigated. Results indicate that ship tours, Washington, D.C. area tours, clinic tours, and U.S. hospital tours are most related to specific officer grades (rank), and that these relationships vary according to a Medical Service Corps officer's specialty and (to a lesser extent) gender.

AN EVALUATION OF ORGANIZATIONAL EFFECTIVENESS AT THE NAVAL AIR WARFARE CENTER, AIRCRAFT DIVISION, INDIANAPOLIS

Daniel J. Ford-Lieutenant, United States Navy
B.S. Saint John's University, 1985
Master of Science in Management-September 1993
Advisors: Susan P. Hocevar, Gail F. Thomas, and Frank J. Barrett-Department of Systems Management

This thesis assesses organizational effectiveness at the Naval Air Warfare Center, Aircraft Division, Indianapolis (NAWC-ADI) after its restructuring to a matrix organization. Data were collected using a survey designed by the author and his advisors. Survey data were gathered from 454 NAWC-ADI personnel from all levels of the organization. The survey asked employees to rate their organization on various "effectiveness"-related variables. The effectiveness variables were categorized as independent, intermediate process, or outcome variables in an organizational effectiveness model. The variables from each category were correlated with each other to test the veracity of the model. The mean scores evaluated for NAWC-ADI as a whole, and sub-group analyses by level and assignment were conducted. Ratings of information availability in several areas were correlated with the model. The results were used to evaluate NAWC-ADI as a newly restructured matrix organization. All model variables were strongly intercorrelated. NAWC-ADI scored high in the areas of team and individual empowerment, job satisfaction and team cohesiveness. Lower ratings were found for organizational responsiveness, motivational communication, effectiveness of top management, intergroup cooperation, organizational effectiveness, team and individual influence, customer service, and quality of work. Information availability was highest in the area of specific scheduling requirements and lowest in career and advancement paths. Recommendations are offered for further research.

AN ASSESSMENT OF THE FORECASTING ACCURACY OF THE STRUCTURE ACCESSION PLANNING SYSTEM FOR OFFICERS (STRAP-O) MODEL

James Allen Frank-Lieutenant, United States Navy
B.A., University of Florida, 1983
Master of Science in Management-June 1993
Advisor: Stephen L. Mehay-Department of Systems Management

This thesis evaluates the forecasting accuracy of the Structured Accession Planning system for Officers (STRAP-O) model. The vehicle for this examination is the implementation plan for the Aviation Continuation Pay (ACP) program. An important policy question to be addressed is whether the ACP bonus program will increase the continuation rate of mid-grade aviators sufficiently to fulfill department head requirements in the mid 90s? The design of the STRAP-O system and its components are explained and a synopsis of the ACP program is included. The methodology used for determining the accuracy of the STRAP-O model is outlined, as well as the results obtained by running STRAP-O. These results are compared to the results of a CNA study on the ACP program and to the actual number of ACP recipients in 1989. In addition, suggestions are made to assist in the creation of a personal computer version of the Strap-O model that will replace the current mainframe version.

TRANSPORTATION PRICING POLICY FOR THE FOREIGN MILITARY SALES PROGRAM

Gregory Harold Freeburn-Lieutenant Commander, United States Navy
B.S., University of Florida, 1980
Master of Science in Management-December 1992
Advisor: Dan C. Boger-Department of Systems Management

On 1 October 1991 the Department of Defense implemented the Defense Management Review Decisions (DMRDs) in an effort to reorganize the supply system and reduce overall costs. These changes were implemented without regard for the Foreign Military Sales (FMS) program. This paper analyzes the changes forced on the FMS program since implementation of the DMRD initiatives and evaluates those changes in terms of the legislative requirement for cost recovery and effect on customer service. An analysis of the rates assessed FMS customers to use the Defense Transportation System is performed and are compared to the actual charges being billed to the FMS transportation trust fund account. An alternate transportation pricing model is reviewed for applicability and recommendations are made for changes to the FMS transportation pricing policy.

MEASURING DAMAGE CONTROL ASSISTANT'S (DCA) DECISION-MAKING PROFICIENCY IN INTEGRATED DAMAGE CONTROL TRAINING TECHNOLOGY (IDCTT) TRAINING SCENARIOS

John Vincent Fuller-Lieutenant, United States Navy
B.S., United States Naval Academy, 1987
Master of Science in Management-March 1993
Advisors: Alice M. Crawford & Frank C. Petho-Department of Systems Management

This thesis developed a numeric index to evaluate the quality of decisions made by Damage Control Assistants (DCAs) while managing simulated shipboard damage control crises in support of the Total Ship Survivability (TSS) training doctrine. TSS is a doctrinal shift away from simply saving a ship after it is damaged, to both saving it and restoring its ability to fight. This doctrine imposes a new set of complex requirements on DCAs. They must comprehend, integrate, and simultaneously manage accurate, ambiguous, and frequently excessive levels of information. The Integrated Damage Control Training Technology (IDCTT) program was designed to meet these new requirements. The decision making proficiency index developed in this thesis was designed to validate the IDCTT approach. Recommendations were made to validate the index and to explore emerging technologies to enhance DCA training.

A DICTIONARY OF ACQUISITION AND CONTRACTING TERMS

Marco S. Furforo-Lieutenant Commander, United States Navy
B.S., University of Central Florida, 1980
Master of Science in Management-December 1992
Advisor: David V. Lamm-Department of Systems Management

This thesis is a continuation of research initiated by Lieutenant Commander Ryan, Supply Corps, United States Navy to establish a basis for defining words and terms used in the field of contracting. The ten terms selected for this thesis were synthesized from collected definitions, Government regulations and contracting literature and reviewed in some cases more than once by National Contract Management Association professionals in previous research efforts. This work differs from previous research in that it takes the terms from those efforts which generated significant diversity and refines them using a modified Delphi Technique. This research is a joint effort conducted by students at the Naval Postgraduate School, Monterey, California, and the Air Force Institute of Technology, Wright-Patterson Air Force Base, Dayton, Ohio.

TURKEY IN THE NEW ENVIRONMENT: EVALUATION OF STRATEGY ALTERNATIVES THROUGH A STRATEGIC PLANNING MODEL
Halil Tamer Gedik-First Lieutenant, Turkish Army
B.S., Turkish Army Academy, Ankara, 1988
Master of Science in Management-June 1993
Advisor: Roger D. Evered-Department of Systems Management

This thesis provides the reader with a discussion of possible national strategies that Turkey's leadership might wish to evaluate for the future of the country. As with any other organization, Turkey has the task of formulating its strategy and making the appropriate changes to protect its vital interests and achieve its objectives in the changing environment. The author gives a background on the evolution of Turkey's present strategy, and outlines Turkey's current external and internal environments that are relevant to Turkey's strategic choices. Strategic issues are identified and the possible major strategies for Turkey are discussed. Turkey has seen many dramatic changes in its surrounding environment with the end of the Cold War and disintegration of the Soviet Union, and has experienced several setbacks with its relations with the West, all of which requires it now to identify its objectives and formulate new strategies in order to meet the demands of the current situation and not to lack behind the events. The aim of this thesis is to apply a strategic planning model to the task of identifying viable alternative strategies for consideration by Turkey's national leadership.

A FINANCIAL REVIEW AND COST - BENEFIT ANALYSIS OF FUEL STORAGE TANK UPGRADES AT THE NAVY EXCHANGE GAS STATION NAVAL POSTGRADUATE SCHOOL, MONTEREY CALIFORNIA
Daniel F. Geldermann-Lieutenant Commander, United States Navy
B.S., Marquette University, 1981
Master of Science in Management-June 1993
Advisors: William R. Gates & Jeffrey M. Nevels-Department of Systems Management

The thesis examines the costing allocations at the Navy Exchange Gas Station, Naval Postgraduate School, Monterey, California. From this a complete cost picture has been provided from which to improve cost data for future upgrade and maintenance decisions involving the facilities. This is becoming more critical in light of both the funding reductions currently being experienced by the military services, and the growing complexity and expense of complying with increasingly stringent environmental regulations. Additionally, this study determines if three facilities upgrade options faced by the Navy Exchange are financially justified and which of them is the most desirable. This study found that the Navy Exchange costing practices are sound, and with some minor adjustments, an even higher accuracy of record keeping could be attained. To meet environmental compliance concerns, Alternative II, replacing the underground storage tanks with new ones in 1998, is the best of the three options considered. Present value 1993 costs of this alternative is $214, 451 and the estimated payback is 15.5 months.

AN ANALYSIS OF ENLISTED EARLY SEPARATIONS UNDER THE NAVY'S VSI/SSB PROGRAM: THE IMPACT OF ELIGIBILITY AND PROGRAM BENEFITS

Salvatore J. Giarrizzo-Lieutenant, United States Navy
B.S., United States Naval Academy, 1986
Master of Science in Management-September 1993
Advisor: Stephen L. Mehay-Department of Systems Management

This thesis investigates the behavior of Navy enlisted personnel who were eligible for the FY93 VSI (Voluntary Separation Incentive)/SSB (Special Separation Bonus) Program. The thesis uses DMDC data on program takers as of February 1993. The objectives of the thesis are: (1) to identify factors that influence individuals to accept or not accept a voluntary separation bonus; (2) to compare FY93 results with FY92 results to determine if the same factors are consistent for both years of the program; (3) to determine the forecasting accuracy of the binomial logit model in predicting VSI/SSB behavior; and (4) to evaluate the effect of changes in the availability of transition benefits in 1993. Both binomial and multinomial logit models are estimated to explain the decision to take a bonus, and also which of the two options to accept. The results show that the statistically significant factors are consistent over the two years, and are consistent with economic theory. The binomial logit model is found to be highly accurate in predicting take behavior and program choice. Finally, making transition benefits available to VSI recipients increased the proportion of leavers choosing VSI. The thesis provides recommendations for improving forecasting accuracy and for future research.

THE ARAB BOYCOTT OF ISRAEL ECONOMIC POLITICAL WARFARE AGAINST ISRAEL

Eliyau Zeev Gilat-Commander, Israeli Navy
Master of Science in Management-December 1992
Advisor: Richard Doyle-Department of Systems Management

This thesis examines the effectiveness of the Arab Boycott of Israel from an economic and a political perspective. This study covers the Arab boycott from 1946 until 1990. It demonstrates that economically and politically, the Arab boycott had three distinct phases. The first of these was the period from the declaration of the Arab boycott in 1946 until the 1973 War. The second phase took place between the 1973 War and the 1979 peace agreement between Israel and Egypt. The third phase began with the 1979 Egyptian-Israeli peace agreement and ends in 1990. This study suggests that the boycott was most effective when supported by the threat of an oil embargo in effect between 1973 and 1979. United States actions against the Arab boycott were also effective. Finally, this thesis contends that the 1979 peace agreement between Israel and Egypt brought frustration to those who expected that Israel's trade with such a close and large country as Egypt would open a huge trade market. In sum, the Arab boycott did not succeed in destroying Israel's economy, as was its declared intention.

GENDER BIAS IN THE NAVY

Robert J. Gilbeau-Lieutenant, United States Navy
B.S., United States Naval Academy, 1983
Master of Science in Management-June 1993
and
Robert W. Ernst-Lieutenant, United States Navy
B.S., United States Naval Academy, 1984
Master of Science in Management-June 1993
Advisors: Frank J. Barrett & Gail Fann Thomas-Department of Systems Management

An investigation of sexual harassment, gender bias, and women in combat was conducted via personal interviews with male Navy and Marine Corps officers. This study, unlike most, addresses these issues from the male perspective. This thesis includes a review of important historical events leading to the integration of women into the military. An explanation of the interview protocol will help show how major themes were obtained in the analysis of data. Problem areas in the Navy environment will be addressed in conclusion section. Also, this section will give the most common occurring themes and practical recommendations for integrating women into combatant roles in the Navy.

SPREADSHEET TECHNIQUES FOR LOGISTICS DECISION SUPPORT SYSTEMS

Dale Wellington Goeller-Lieutenant, United States Navy
B.S., University of Missouri at Kansas City, 1979
Master of Science in Management-June 1993
Advisor: Keebom Kang-Department of Systems Management

This thesis considers the use of spreadsheet techniques as a foundation for the development of logistics decision support systems. An inventory model is presented to show the flexibility of spreadsheet techniques and demonstrate the use of various graphical interface techniques. We used several time series models to display the graphical capabilities of spreadsheet programs for decision making. Finally a process control model is presented and its implications discussed. Sample spreadsheet coding is provided for all models presented with a primary emphasis on graphic output to aid the logistics manager in decision making.

AN ANALYSIS OF THE CORRELATION BETWEEN THE J52 ENGINE COMPONENT IMPROVEMENT PROGRAM AND IMPROVED MAINTENANCE PARAMETERS

Leonard Bret Gordon-Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1980
Master of Science in Management-December 1992
Advisor: Alan W. McMasters-Department of Systems Management

This thesis is a study of the J52 Engine Component Improvement Program (CIP). The objective of the thesis was to determine if the correlation between J52 CIP expenditures and improved maintenance parameters at the component level could be quantified. The major focus of the study revolved around developing a methodology to accomplish the objective using existing databases and open dialogue between the J52 engine manufacturer (Pratt & Whitney), NAVAIRSYSCOM Engine Program Manager, and various NADEP engineers. The methodology evolved using the Fuel Nozzle Support Assembly and was validated using the Fuel Pump. The thesis reached the conclusion that observed improvements in maintenance parameters can be linked to CIP expenditures at the component level.

CONTAINERIZATION OF UNIT EQUIPMENT DURING SURGE DEPLOYMENTS

Bruce E. Green, Jr.-Lieutenant Commander, Supply Corps, United States Navy
B.S., George Mason University, 1979
Master of Science in Management-March 1993
Advisors: Dan C. Boger & David G. Brown-Department of Systems Management

The purpose of this thesis is to examine issues and concerns resulting from the utilization of containers to transport unit equipment during surge phase deployments and to appraise transportation decision-makers of potential problem areas. This thesis provides an overview of container operations during Operation Desert Shield/Desert Storm. It examines the effects of containerization of unit equipment on unit integrity from both the unit commander and the transportation provider perspectives. It examines container policy, availability and supply, and militarily useful configurations. The use of procured and leased containers is examined and potential costs and benefits associated with each method, as well as the effects on the container market as a whole, are assessed. Tracking capabilities and visibility of in-transit containers are also examined from both the military and commercial perspective.

ANALYSIS OF THE TWO-TIER COST STRUCTURE FOR AVIATION JET FUELS ON THE NAVAL RESERVE'S C-9 AIRLIFT SERVICES PROGRAM

Robert Norman Greenberg-Lieutenant Commander, United States Naval Reserve
B.B.A., Wichita State University, 1980
Master of Science in Management-June 1993
Advisor: O. Douglas Moses-Department of Systems Management

The purpose of this thesis was to examine the two-tier cost structure for military and commercial contract aviation jet fuels and its effect on the Naval Reserve's C-9 Airlift Services Program. In the past, a single-tier system was in place in which the services were charged the same price for fuel purchased at military bases or at commercial airports under contract. The problem was that in reality a higher price existed for commercial contract fuel. This difference was absorbed by the Department of Defense. The two-tier system formally established a separate price for commercial contract fuel, which is now charged to and paid for by the services. The analysis compared the differences in total jet fuel costs between the original and new cost structures. It also projected probable quantities of fuel purchases for a given total cost (budget) and price, based on different assumptions and scenarios under the two-tier system.

THE AFLOAT MAINTENANCE COMMAND: ORGANIZATIONAL AND FUNDING ISSUES IN NAVY SHIP MAINTENANCE, REPAIR, AND MODERNIZATION

Robert F. Haidvogel, Jr.-Lieutenant United States Navy
B.S., United States Naval Academy, 1985
Master of Science in Management-December 1992
Advisor: Lawrence R. Jones-Department of Systems Management

The goal of current Navy surface ship maintenance and repair strategy is to sustain readiness and to maximize both combat capability and the amount of time ships are available for employment during their lifetime. The established organizational framework of the Navy to perform this task includes a complex array of activities that are effective overall, but at the expense of efficiency. The current drawdown in budget resources requires that the goals of ship maintenance and modernization be met with improved efficiency. The Afloat Maintenance Command is a proposal to restructure the existing maintenance hierarchy. Improvements in the process of maintenance and modernization are incorporated in the Afloat Maintenance Command through the elimination of redundancies in capabilities and the improvement of funding flows to enhance organizational efficiency and effectiveness. This thesis will provide an overview of the Afloat Maintenance Command and its possible organization in consolidating assets from existing maintenance activities. Additionally, funding alternatives for the Afloat Maintenance Command will be developed and assessed.

EFFECTS OF DLA IPG I SURCHARGES ON DDRW END USER ACTIVITY INVENTORY POLICY

Telemachus C. Halkias-Captain, Quartermaster Corps, United States Army
B.S., United States Military Academy, 1982
Master of Science in Management-December 1992
and
Richard A. Parker-Commander, Supply Corps, United States Navy
B.S., Bethune-Cookman College, 1970
Master of Science in Management-December 1992
and
Jonathan D. Miller-Lieutenant Commander, Supply Corps, United States Navy
B.A., University of Iowa, 1979
Master of Science in Management-December 1992
Advisor: Alan W. McMasters-Department of Systems Management

The purpose of this thesis is to examine the effects on retail customers of surcharges proposed by the Defense Logistics Agency (DLA) on Issue Priority Group I (IPG) requisitions. The intent of these surcharges is to enable DLA to recapture a portion of the costs incurred in meeting IPG I time standards. Additional goals are to discourage IPG I requisitioning for frivolous reasons, and when maintenance of small retail inventories may be less costly to the government. Data was collected from the Naval Supply Centers at Oakland and San Diego, and the former Sharpe Army Depot, now incorporated with Defense Depot San Joaquin (DDJC). Two types of surcharges were applied to this data. A variety of flat rates per requisition were examined. Alternately, several percentage levels were applied to an item's unit price to test their effectiveness as surcharges. Combinations of flat and percentage rates were also studied. This evaluation found flat rates tend to impact lower unit price and high annual demand items first. Percent of unit price surcharges tend to have a relatively even impact as they are increased. Combinations of surcharges tend to cause most items to be stocked rapidly.

A DICTIONARY OF ACQUISITION AND CONTRACTING TERMS

S. Travis Hayes-Lieutenant, United States Navy
B.S., Central Missouri State University, 1982
Master of Science in Management-December 1992
Advisor: David V. Lamm-Department of Systems Management

This thesis is a continuation of research initiated by Lieutenant Commander Daniel F. Ryan, Supply Corps, United States Navy to establish a basis for defining words and terms used in the field of contracting. Concurrent research in this area is being conducted by students at the Naval Postgraduate School, Monterey, California and the Air Force Institute of Technology, Wright-Patterson Air Force Base, Dayton, Ohio. Published definitions of twenty-five terms presently used in Government contracting were examined and a synthesized definition was developed for each term. The synthesized definitions were then scrutinized by a selected group of contracting professionals. Their feedback was used to develop a proposed definition based upon consensus.

USMC VOLUNTARY SEPARATION INCENTIVE AND SPECIAL SEPARATION BENEFIT: WHO'S LEAVING? A FOCUS ON QUALITY

John Frederick Hemleben-Major, United States Marine Corps
B.S., Iowa State University, 1976
Master of Science in Management-March 1993
Advisors: Benjamin J. Roberts & Ronald A. Weitzman-Department of Systems Management

An attempt was made to determine what categories of Marines took the fiscal year 1992 (FY92) Voluntary Separation Incentive/Special Separation Benefit (VSI/SSB) programs. This thesis has the specific focus of determining whether quality Marines have been unintentionally targeted by the VSI/SSB policy. Data taken from the Headquarters master file (HMF) and from the Performance Evaluation System, Headquarters, U.S. Marine Corps (HQMC) were used for multivariate econometric modeling and bivariate data profiling. Variables created from the data represented proxies for behavioral variables found in prior studies of job turnover and military careerist retention. Empirical evidence is presented reflecting consistencies between the two quantitative analyses. This evidence offers insight into new approaches for future research or for policy redesign.

A COMPARATIVE ANALYSIS OF OPTIONS FOR PRESERVING THE TANK INDUSTRIAL BASE

Juan Jose Hernandez-Captain, United States Army
B.S., United States Military Academy, 1982
Master of Science in Management-March 1993
Advisor: Thomas H. Hoivik-Department of Systems Management

This thesis analyzes the impact of potential closure of the sole tank production facility in the United States, including the effects of closure on future tank production. The analysis is based on the FY93 DoD budget which appropriated funds for upgrades to existing M1 Abrams tanks through 1995. Three possible alternatives to preserving the tank industrial base are presented and analyzed with respect to applicable factors currently facing decision makers in DoD, Congress and industry. The three alternatives are: (1) terminate production upon completion of the initial upgrade in 1995, (2) continue the upgrade from 1996 to 1999, or (3) slow down existing production rates to stretch out production and minimize production stoppages. These alternatives are analyzed utilizing factors such as workforce effects, costs, subcontractor base impact, mobilization/surge impact, spare parts requirements, and operational effectiveness. The thesis concludes with a recommendation on how to preserve the tank industrial base with additional recommendations and areas requiring further study. The methodology utilized here can be applied to other DoD systems and programs dependent on a single manufacturer for systems facing a similar predicament.

PURCHASING AND CONTRACTING AT MARINE CORPS AIR STATIONS A CASE STUDY ANALYSIS

Eugene Alfred Herrera-Major, United States Marine Corps
B.S., Portland State University, 1985
Master of Science in Management-December 1992
Advisor: Nancy C. Roberts-Department of Systems Management

Current directives require purchasing and contracting responsibilities for Marine Corps Air Stations be conducted under the cognizance of the Naval Supply Systems Command. Several MCAS's are geographically much closer to Marine Corps Base purchasing support and are more disposed to utilize the services of the local Marine procurement office rather than traveling to a distant location for support by the Navy Field Contracting System. The thesis provides the reader with an evaluation of the current situation of Navy procurement support for Marine Corps Air Stations. This relationship is codified in appropriate instructions and orders from both Services. Current procedure, authorized by Headquarters Marine Corps, allows some deviation to occur from established guidelines and directives, resulting in an uneven purchasing and contracting policy for Marine Corps Air Stations. The thesis examines alternatives to current procedure for accomplishing MCAS purchasing and contracting. Finally, alternatives are proposed, taking into account the current political and technological environment as well as the potential benefit to the Navy and Marine Corps. These alternatives describe pro-active strategic planning in addressing this issue.

APPLICABILITY OF COMPUTER SPREADSHEET SIMULATION FOR SOLVING RESOURCE ALLOCATION PROBLEMS

Dixon Kendall Hicks-Lieutenant, United States Navy
Georgia Institute of Technology, 1985
Master of Science in Management-March 1993
Advisors: Shu S. Liao & Richard D. Milligan-Department of Systems Management

This thesis investigates the possibility of employing computer spreadsheets as a sophisticated tool to resolve resource allocation dilemmas through simulation techniques. *Microsoft's Excel 4.0* is used to analyzed three separate and unique resource allocation problems. First, an inventory distribution system involving different distribution points to illustrate the magnification of uncertainty as the distribution system is lengthened. Second, queuing utilization problem faced by an emergency room of a hospital. The third scenario looks at the uncertainty in financial budgeting situation as reflected in the Navy's CHAMPUS budget. A spreadsheet macro using simulation techniques is created for each scenario to illustrate that computer spreadsheets are fully capable of analyzing resource allocation enigmas through simulation methodology.

USING CREDIT VENDOR DATABASES TO APPREHEND DESERTERS

Jon Victor Hitchcock-Lieutenant Commander, United States Navy
B.S., Emporia State University, 1973
Master of Science in Management-June 1993
Advisor: Jerry L. McCaffery-Department of Systems Management

The purpose of this thesis is to determine if there are efficiencies to be gained by using credit vendor database address lead information in order to locate and apprehend deserters from the Department of Defense. A pilot program was performed by the U.S. Army Deserter Information Point, which used address leads supplied by three nationwide credit vendors -- CBI (Equifax), TRW, and TU (Trans Union). As a result of using this information, the Army returned to military custody one hundred thirty-five deserters, including nine of forty-six (20 percent) of the missing deserters who had additional military charges. The study determined a more effective and efficient manner of locating deserters would be to utilize address lead information from two nationwide credit vendors (CBI and TRW). Multiple credit vendor use is recommended based on the demonstrated strengths and weaknesses of the vendors in the geographical areas covered during the study.

MANAGEMENT OF JOINT SERVICE ACQUISITION: AN ANALYSIS OF THE JOINT UNMANNED AERIAL VEHICLES PROGRAM

Michael Edward Hogan-Captain, United States Army
B.S., United States Military Academy, 1981
Master of Science in Management-December 1992
Advisor: Thomas H. Hoivik-Department of Systems Management

In an era of declining defense budgets, the DoD must revise its modernization strategy if it is to continue to field world class equipment. One viable alternative strategy is to combine funds and effort whenever possible through the use of joint service acquisition programs. However, the Services have been reluctant in the past to initiate joint service programs and will probably continue to be reluctant in the future unless certain changes are made to the acquisition process. This thesis examines the Unmanned Aerial Vehicles (UAV) program and identifies issues through a series of interviews with key Government individuals within the UAV Short Range (SR) program office and the UAV Joint Program Office (JPO), as well as with representatives of the users within the Army and Marine Corps. Comments received during the interviews were used in conjunction with program documentation to formulate issues which impact the UAV-SR program and are a direct result of the joint status of the program. The issues identified are not all currently problem areas for the UAV-SR, but they have the potential to become problem areas. The recommendations made in this thesis are specific to the UAV-SR and may also be applicable to other joint service acquisition programs in general.

UTILIZATION OF AWARD FEE CONTRACTS AT NAVY REGIONAL CONTRACTING CENTERS

Mark Edward Hogenmiller-Lieutenant, Supply Corps, United States Navy
B.S., University of Pittsburgh, 1984
Master of Science in Management-December 1992
Advisors: Katchan L. Terasawa & William R. Gates-Department of Systems Management

The use of the award fee contract is an unique incentive structure that provides the Government a method of subjective, after the fact evaluation of contractor performance and affords the Government additional flexibility to reward and motivate the contractor for above average performance. Use of cost-plus-award-fee and fixed-price-award-fee contracts has many applications at the Field Contracting Activity Level. The use of award fee contracts has many benefits and costs not associated with other types of incentive contracts. To better facilitate its use, barriers need to be recognized that are preventing more applications at the field level and what can be done to overcome these barriers.

WHOLESALE LEVEL REORDER POINT AND REORDER QUANTITY COMPUTATION DURING PERIODS OF DECLINING DEMAND

Claude R. Husson-Lieutenant, Supply Corps, United States Navy
B.B.A., University of Central Arkansas, 1982
Master of Science in Management-December 1992
and
Charles M. Lilli-Lieutenant Commander, Supply Corps, United States Navy
B.A., Muhlenberg College, 1980
Master of Science in Management-December 1992
Advisor: Thomas P. Moore-Department of Systems Management

For several decades the U.S. Navy has used a set of specific mathematical inventory models to help wholesale item managers make management decisions concerning consumable items of material. Implicit in these models is the assumption that the mean of quarterly demand for an item remains constant over time. This assumption is violated often, particularly during periods of force reduction or when equipment is retired. When this declining demand pattern occurs, the inventory models usually keep stock levels too high. This results in excess material known as "inapplicable" inventory. Recently, inapplicable inventory in the Navy was estimated to be as high as 10.4 billion dollars. Navy logisticians have invested a great deal of effort in solving this problem, mainly by focusing on forecasting. While improved forecasting may reduce inapplicable inventory to some extent, it will not, by itself, solve the problem. This research has explored the problem of inapplicable inventory, its model-based causes and alternative solutions. The resulting inventory model, designed specifically to work easily within the existing Navy UICP inventory information system, significantly reduced inapplicable inventory in several simulations which were run in this research.

ANALYSIS OF NAVAL HOSPITAL LONG BEACH EFFORTS TO RECOUP SUBSISTENCE COST FROM REFERRAL OF ACTIVE DUTY MEMBERS TO CIVILIAN AND VA HOSPITALS FOR IMPATIENT CARE

Phillip E. Jackson-Lieutenant, United States Navy
B.B.A., National University, 1985
Master of Science in Management-December 1992
Advisor: Jerry L. McCaffery-Department of Systems Management

This thesis analyzes the efforts of Naval Hospital, Long Beach to recoup subsistence cost from the referral of active duty members to civilian and Veterans Administration hospitals for inpatient care. The analysis encompasses Fiscal Years 1990, 1991, and 1992 and begins by providing an overview of the Navy Medical Department. Additionally, pertinent background information directly related to the area of research is elaborated on to facilitate understanding. Particular attention is devoted to the Collection Agent, Admissions Office, and Command Referral Clerk operations and interactions. Pay Adjustment Authorization procedures are reviewed along with a glance at AQCESS MSA to ascertain whether the current version of software provides the existing capability to account for occupied bed days outside the hospital. A questionnaire is employed to gather the data necessary to evaluate the processes used at the hospital and estimate the amounts available for recoupment. Comparisons of the estimated amounts are contrasted against funding authority and reimbursable. The analysis concludes with a cost and benefit analysis, a brief observation of three other medical treatment facilities, and recommendations.

ELECTRONIC DATA INTERCHANGE IN U.S. NAVY CONTRACTING ACTIVITIES

Paul T. Jensen-Lieutenant Commander, Supply Corps, United States Navy
B.S., University of Wisconsin - Platteville, 1978
Master of Science in Management-December 1992
Advisor: David V. Lamm-Department of Systems Management

Electronic Data Interchange (EDI) the computer-to-computer or more specifically the application-to-application exchange of business data in a standard format. Achieving the large savings mandated by, Defense Management Review Decision (DMRD) 941 requires integration of EDI capability into Navy automated procurement systems. This thesis examines the use of EDI in the U.S. Navy procurement function, as well as areas for expanded utilization of EDI, current barriers to implementation, and lessons learned while planning and implementing EDI initiatives. United States Navy EDI initiatives involve a wide range of projects in the procurement process. The initial areas targeted are the high volume found in the small purchase area, and delivery orders against established contracts. A major barrier to full use of EDI in U.S. Navy Contracting Activities is the legal and regulatory impediments, resulting from a lack of specific guidance in the Federal Acquisition Regulation. Contributing to the success of EDI are, command involvement, functional area participation, and networking among users.

THIRD PARTY COLLECTION PROGRAM: CASE STUDY OF NAVAL HOSPITAL OAKLAND AND COMMUNITY HOSPITAL OF MONTEREY PENINSULA

Ramon Antonio Jimenez-Lieutenant, United States Navy
B.S., Minot State College, 1983
Master of Science in Management-December 1992
Advisor: Jerry L. McCaffery-Department of Systems Management

This thesis presents an analysis of the Third Party Collection Program (TPC) for inpatient and outpatient care at Naval Hospital Oakland (NHO), its implementation and its comparison with a civilian counterpart. The implementation is in accordance with DoD Instruction 6010.15 and the comparison is conducted with the Community Hospital of Monterey Peninsula (CHOMP). This thesis briefly introduces the reader to the hospital TPC program, the concept, the Law, and the program implementation responsibilities. It gives a brief explanation of the DoD Inspector General TPC program inspection of August 1990, conducted at twenty-five different military hospitals nationwide. Also, it provides historical data and health services information of NHO and CHOMP. Third party potential collections data are broken down by individual services (Army, Air Force, and Navy) from 1988 to 1994. The author concludes that NHO has established an effective inpatient TPC program in accordance with DoD Instruction 6010.15 but that the billing and collection process is not as effective as CHOMP. The outpatient TPC program is still in its developing stage, and NHO is working hard to have an effective and efficient program.

SEASHED, A SEALIFT ENHANCEMENT FEATURE:
AN ANALYSIS OF METHODS EMPLOYED FOR LIFTING DOD'S OUTSIZE CARGO
Tommy Joel Johnson-Lieutenant, United States Navy
B.S., Oregon State University, 1986
Master of Science in Management-September 1993
Advisors: Dan C. Boger & David G. Brown-Department of Systems Management

This thesis examines seasheds as a method for carrying non-containerizable military cargo on commercial containerships in the U.S. merchant marine fleet. Seasheds are enhancement features for containerships that convert them for the purpose of carrying military unit equipment. Seasheds were developed by the Department of Defense during the 1980s to provide carriage of outsize military cargo for strategic deployments, and they have not been utilized for commercial applications. They have been used in only two military employments, Display Determination '89 and Operation Desert Sortie in 1991. Performance reports indicate they successfully handled outsized military cargo which otherwise could not be transported on unmodified containerships. However, the lack of commercial application hinders their usefulness outside of DOD sealift requirements. Costs and times required to load and unload a containership under the normal sequence of seashed activities are compared with activities required if seasheds were preboarded on a specified containership to enhance readiness of merchant marine fleet containerships by making them more compatible with DOD's sealift requirements. A cost-benefit analysis is performed to assess the time and expenses that could be saved for DOD if seasheds were preboarded on containerships. Examination of seasheds is recommended for contingencies that require logistics-over-the-shore (LOTS) operations.

A COMPARATIVE ANALYSIS OF SHIP OPERATIONAL TEST AND EVALUATION
IN THE UNITED STATES NAVY AND THE ROYAL AUSTRALIAN NAVY
Kenneth William Joseph-Commander, Royal Australian Navy
B.E.E., University of New South Wales, 1976
Master of Science in Management-December 1992
Advisor: Thomas H. Hoivik-Department of Systems Management

This thesis provides a comparative analysis of ship Operational Test and Evaluation (OT&E) in the United States Navy (USN) and the Royal Australian Navy (RAN). It also reviews the acceptance and introduction into service procedures for warships in both Navies, including the input from OT&E. This study analyzes USN and Ran Ship OT&E organization, policy, and procedures, and then compares and contrasts the two systems. The study finds that the RAN OT&E system, although originally based on USN OT&E philosophy, now differs in the importance, interpretation, application and focus of OT&E. It concludes that to achieve efficient and effective trials and acceptance of the new higher risk warships currently under construction, the RAN OT&E system needs to be revised. A model for OT&E in the RAN is proposed based on the principles derived from the USN system. The recommendations include the initial conduct of OT&E in land-based test sites, followed by dedicated "Whole Ship" OT&E for the first of class.

CASE STUDIES OF THE RECRUITMENT, SELECTION, RETENTION AND CAREER DEVELOPMENT OF WOMEN IN THE NAVY

Donna Marie Joyal-Lieutenant, United States Navy
B.S., University of South Carolina, 1987
Master of Science in Management-March 1993
Advisor: Nancy C. Roberts-Department of Systems Management

This thesis provides professors and Navy facilitators curricula to be used in personnel and human resource management courses. The study presents four cases that follow a female Naval recruit through several phases of her career development. Material in the case studies relate to recruitment, selection, training, retention, and career development of women in the Navy. Teaching notes are provided for each case to assist and guide facilitators in conducting classroom discussion. An overall analysis discusses the cases in relation to current Navy policy and career development theory.

ANALYSIS OF PRODUCTION CONSTRAINTS AT NADEP ALAMEDA: A TQL APPROACH

David Gilbert Keas-Lieutenant, United States Navy
B.S., San Jose State University, 1983
Master of Science in Management-June 1993
Advisors: Keebom Kang & Dan Trietsch-Department of Systems Management

W. Edwards Deming introduced the idea of a systems approach to management as a means of looking at a network of processes as a whole. This thesis follows such an approach in looking at management systems, human factors, policies, causes of observed problems and production constraints, at the Naval Aviation Depot (NADEP) powerplants division at Alameda, California. This thesis uses the Theory of Constraints as espoused by Eliyahu M. Goldratt, as the guiding theory for analyzing barriers to throughput. The analytical models were developed using linear programming and a queuing network. Throughout the thesis an approach of looking at the whole system first before focusing in on problem areas is used. Ideas for preparing depot level maintenance databases for further evaluation by computer analysis are given, as well as potential areas for improving the system under which the NADEP operates.

JUST-IN-TIME INVENTORY MANAGEMENT: APPLICATION AND RECOMMENDATIONS FOR NAVAL HOSPITAL, OAKLAND

Bill Carver Kinney-Lieutenant Commander, Medical Service Corps, United States Navy
B.B.A., New Mexico State University, 1977
M.S.H.A., University of Colorado at Denver, 1989
Master of Science in Management-December 1992
and
Stephen Brooks Symonds-Lieutenant, Medical Service Corps, United States Navy
B.A., Franklin Pierce College, 1974
M.A., Central Michigan University, 1980
Master of Science in Management-December 1992
Advisor: Nancy Roberts-Department of Systems Management

The purpose of this research was to provide recommendations to personnel at Naval Hospital, Oakland, in examining the applicability of a Just-in-Time (JIT) inventory management system. JIT is a philosophy that can be applied to inventory management operations to reduce waste, achieve cost savings, maximize space, and improve quality of care. In the healthcare environment, a prime vendor program is essential to a successful JIT program. With the advent of a prime vendor program at Naval Hospital, Oakland, the advantages offered by JIT become available. With diminishing budgets, material managers must adopt innovative practices that reduce resource requirements, while providing high quality care. JIT is an innovative approach to inventory management that has been successfully applied in the healthcare industry. The authors examine JIT and how this philosophy can further the goals of the prime vendor program and increase quality of care.

A MULTIVARIATE ANALYSIS OF THE EFFECTS OF THE VSI/SSB SEPARATION PROGRAM ON NAVY ENLISTED PERSONNEL

Mary A. Kirby-Lieutenant, United States Navy
B.G.S., Rhode Island College, 1984
Master of Science in Management-March 1993
Advisors: Stephen L. Mehay & Carol A. Mitchell-Department of Systems Management

This thesis investigates the behavior of Navy enlisted personnel who were eligible for, and offered, early voluntary separation under one of two monetary incentive programs during FY1992. The two programs were the voluntary separation incentive (VSI) and the special separation bonus (SSB). The purpose is to identify the factors that influence (1) the voluntary separation decision and (2) the decision between the two programs. Multivariate logit models were estimated to explain the decision to accept a voluntary separation incentive and the decision which program to accept. The results show that the statistically significant factors affecting the separation decision are consistent with simple economic theory. Recommendations regarding future implementation of the separation programs and for future research are provided.

ASSESSMENT OF THE TOTAL QUALITY LEADERSHIP EDUCATION AND EXPERIENCE LEVELS OF NAVAL OFFICERS ENTERING THE NAVAL POSTGRADUATE SCHOOL IN JULY 1993

Ellen Kay Kneller-Lieutenant Commander, United States Navy
B.S., The Ohio State University
M.A., Webster University
Master of Science in Management-September 1993
Advisors: Alice M. Crawford & Linda E. Wargo-Department of Systems Management

The purpose of this thesis was to assess the Total Quality Leadership (TQL) knowledge, experience, and attitude levels of Naval officers entering the Naval Postgraduate School in July 1993. A survey was designed, administered, and analyzed to establish a baseline of data to compare to future cohorts to assess whether TQL knowledge and experience is increasing at various career check points. A descriptive analysis was conducted to calculate frequencies and aggregate percentages of survey responses. In general, the cohort had a low level of TQL knowledge and experience. The study revealed some skepticism among the cohort about the need for TQL, and its transformation in the Department of the Navy. This skepticism was attributed to a lack of knowledge and experience, and the belief that long-term commitment from senior leadership is lacking. Recommendations were made to incorporate TQL theory and concepts at every accession point (NROTC, OCS, OIS, etc.) and schools (Department Head, PXO, Naval Academy, NPS, PO INDOC, NAVLEAD, etc.) to disseminate the TQL knowledge in a uniform manner.

OUTPATIENT TREATMENT OF ALCOHOLICS IN THE NAVY: A FEASIBLE AND COST EFFECTIVE ALTERNATIVE

Kurt B. Knobloch-Lieutenant, Supply Corps, United States Navy
B.A., Cal-State San Bernardino, 1981
Master of Science in Management-June 1993
and
Nancy L. Avila-Lieutenant Commander, United States Navy
B.S., Louisiana State University, 1978
Master of Science in Management-June 1993
Advisors: William R. Gates & Jeffrey M. Nevels-Department of Systems Management

The Navy provides inpatient treatment for diagnosed alcoholics. Replacing some of the inpatient treatment with outpatient treatment is feasible, especially when treatment matching occurs. The major objective for using outpatient treatment is to capture considerable savings while maintaining treatment effectiveness. The results indicate that the Navy should be able to implement an outpatient treatment model for early stage alcoholics and maintain a success rate comparable to the impatient treatment model. This would reflect a savings in program costs and replacement costs.

THE BUDGET ENFORCEMENT ACT OF 1990:
SUPPLEMENTAL APPROPRIATION SPENDING CONTROL EFFECTIVENESS
Winford Wesley Knowles-Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1982
Master of Science in Management-December 1992
Advisor: Richard Doyle-Department of Systems Management

This research identifies and evaluates the impact of the Budget Enforcement Act of 1990 (BEA) on the supplemental appropriation process. The pattern of requests for and enactment of supplemental appropriation bills following the passage of the BEA are examined to identify the major factors that determine supplemental appropriation spending control. These results are then compared to baseline figures determined for pre-BEA supplemental appropriations to determine whether the changes brought about by the BEA have had any noticeable impact upon spending control within supplemental appropriation legislation. The study reveals that changes brought about by the BEA did not enhance supplemental appropriation spending control.

PREDICTING ACTIONS TAKEN TO COUNTER ECONOMIC SANCTIONS
AN EXAMINATION OF U.S. GOVERNMENT FINANCIAL DATA COLLECTION AND ITS USEFULNESS IN DETERMINING IF FOREIGN GOVERNMENTS ANTICIPATE ECONOMIC SANCTIONS: A CASE STUDY OF IRAQ
Kim Leslie Kotlar-Lieutenant, United States Navy
B.S., New York Board of Regents, 1982
Master of Science in Management-December 1992
Advisor: William Gates-Department of Systems Management

Economic sanctions have been a long-standing strategic policy instrument used by the United States. While much research has been conducted on the effectiveness of sanctions, little has been written on whether governments anticipate economic sanctions and take measures to protect assets held in foreign countries. Using Iraq as a case study, this thesis uses publicly available U.S. Government-collected information to track the flow of foreign financial data within the United States to determine if it is possible to identify events which may indicate that a country is attempting to protect its foreign assets in anticipation of economic sanctions. The thesis concludes that Iraq did not anticipate U.S. imposed economic sanctions prior to invading Kuwait in August 1990, and that financial data collected by various U.S. Government agencies are not particularly useful in conducting timely financial flow analysis.

FISCAL OVERSIGHT OF DEFENSE DEPARTMENT ENVIRONMENTAL CLEANUP AND COMPLIANCE ACTIVITY, FISCAL YEARS 1984-1993

Kurt Lance Kunkel-Lieutenant, Supply Corps, United States Navy
B.S., United States Naval Academy, 1982
Master of Science in Management-December 1992
Advisor: Richard B. Doyle-Department of Systems Management

This thesis investigates the legislative and fiscal oversight role the Congress has played in directing and funding Department of Defense environmental cleanup and compliance efforts for fiscal years 1984 through 1993. Congressional funding profiles of the Operations and Maintenance, Research, Development, Test and Evaluation, and Military Construction Appropriations are provided for the areas of environmental restoration, research and development, and base closure cleanup, respectively. The study reveals that DoD environmental cleanup funding has risen dramatically during the 1990s following a period of relatively moderate growth in the 1980s. The research indicates an evolution in Congressional oversight of defense environmental funding from appropriations review to emphasis on specific activities, reflecting a shift in national security priorities. The research concludes that widening responsibilities, continued base closures, and legal considerations will continue to place pressure on DoD's ability to contain environmental cost growth.

THE IMPACT OF REPORT OF INVESTIGATION WRITING STYLE ON THE ASSESSMENT TIME, IMPRESSION, PERCEPTION, AND PREFERENCES OF ADJUDICATORS

Mark Daniel LaViolette-Captain, United States Marine Corps
B.S., University of Virginia, 1986
Masters of Science in Management-December 1992
Advisor: James E. Suchan-Department of Systems Management

This thesis examined the impact of document design, organization, and writing style of a Report of Investigation (ROI) on the adjudicators charged with assessing them. Specifically, the adjudicators' assessment time, impression of case information, perception of the field agent writing the cases, and writing style preferences were analyzed. A total of (40) Army, Navy, DISCR, and Air Force adjudicators were tested using both "high" and "low-impact" style ROI's. A four part questionnaire captured their assessment times, impressions, perceptions, and preferences between the two different style cases. The results show that the two style cases produce statistically different adjudicator impressions of case information, and perceptions of the field agents writing the cases. They also show that adjudicators prefer the high-impact style over the low-impact ones. However, the high-impact style cases don't show statistically significant assessment time improvements over the low-impact style.

IMPLEMENTATION OF THE TOTAL QUALITY LEADERSHIP PROCESS IN U.S. MARINE CORPS FIELD CONTRACTING OFFICES

Jeffrey D. Lee-Captain, United States Marine Corps
B.S., Portland State University, 1983
Master of Science in Management-June 1993
Advisor: Susan Page Hocevar-Department of Systems Management

The implementation of the Total Quality Leadership process (TQL) is a continuous process; this thesis identifies the status of implementation within the ten U.S. Marine Corps Field Contracting Offices. The thesis also includes a brief case study involving a field contracting office. The case study examines field contracting personnel views regarding the implementation of the TQL process and how TQL impacts on their performance as organizational boundary spanners in the customer/supplier relationship. The research revealed a wide variation regarding the implementation of the TQL process and TQL training in the field contracting offices. In a majority of the field contracting offices, actual implementation has not yet reached the lowest levels. The research revealed that field contracting personnel view implementation of the TQL process as having a positive effect on improving the conduct of the contracting process.

RED FLAGS IN THE PROSPECTIVE CONTRACTOR'S FINANCIAL STATEMENT

Man-Ying Lee-Lieutenant Commander, Republic of China Navy
B.S., Chinese Naval Academy, 1983
Master of Science in Management-December 1992
Advisor: Roger Evered-Department of Systems Management

This thesis attempts to identify warning signals in the contractors' financial statement, or "red flags", which may be used to identify those prospective contractors who are likely to become delinquent in the performance of their contracts. A "red flags" compiled from the current literature was sent to financial analysts in the thirty-eight Financial Service Branches, Defense Contract Management Command Area Offices (FSDCMAOs) to determine the "red flags" most widely used. Additional issues are examined. The first is whether geographical location and length of field experience of the reviewing analysts might influence the choice of "red flags". Secondly, are different approaches used in conducting financial statement analysis of a manufacturer versus a vendor? The study identifies the ten "red flags" used by more than half of the responding analysts and there appears to be no difference in "red flags" used based on geographical location of the analysts or as a consequence of their length of field experience.

WHOLESALE LEVEL REORDER POINT AND REORDER QUANTITY COMPUTATION DURING PERIODS OF DECLINING DEMAND

Charles M. Lilli-Lieutenant Commander, Supply Corps, United States Navy
B.A., Muhlenberg College, 1980
Master of Science in Management-December 1992
and
Claude R. Husson-Lieutenant, Supply Corps, United States Navy
B.B.A., University of Central Arkansas, 1982
Master of Science in Management-December 1992
Advisor: Thomas P. Moore-Department of Systems Management

For several decades the U.S. Navy has used a set of specific mathematical inventory models to help wholesale item managers make management decisions concerning consumable items of material. Implicit in these models is the assumption that the mean of quarterly demand for an item remains constant over time. This assumption is violated often, particularly during periods of force reduction or when equipment is retired. When this declining demand pattern occurs, the inventory models usually keep stock levels too high. This results in excess material known as "inapplicable" inventory. Recently, inapplicable inventory in the Navy was estimated to be as high as 10.4 billion dollars. Navy logisticians have invested a great deal of effort in solving this problem, mainly by focusing on forecasting. While improved forecasting may reduce inapplicable inventory to some extent, it will not, by itself, solve the problem. This research has explored the problem of inapplicable inventory, its model-based causes and alternative solutions. The resulting inventory model, designed specifically to work easily within the existing Navy UICP inventory information system, significantly reduced inapplicable inventory in several simulations which were run in this research.

A CASE STUDY ON THE IMPLEMENTATION OF DMRD 910 AND ITS IMPACT ON A MARINE FIELD DISBURSING OFFICE

Lawrence Wayne Longcoy-Major, United States Marine Corps
B.S., United States Naval Academy, 1978
Master of Science in Management-March 1993
Advisors: Jeffrey Nevels & Douglas Moses-Department of Systems Management

The purpose of this thesis is twofold. First, it is designed to provide a general overview of current DMRD 910 requirements, the current status of DFAS efforts in implementing policy to satisfy those requirements, and what impact the requirements have had on a Marine Field Disbursing Office. The second purpose is to produce a single source document for use by future Marine Corps graduates in Financial Management that encompasses a historical background of DMRD 910 and its objectives, and overview of DFAS's Implementation Plan and concept of operations, an overview of the Marine Corps Implementation and Transition Plans, and a detailed review of the organizational structure and concept of operations of a Marine Field Disbursing Office before and after implementation of DMRD 910. The research for this thesis uncovered several key points concerning DMRD 910 and its impact on a Marine Field Disbursing Office.

AN ANALYSIS OF SPECIFIC COGNIZANCE SYMBOL MATERIAL IN THE ADVANCED TRACEABILITY AND CONTROL (ATAC) PROGRAM

Vance G. Mahaffey-Lieutenant Commander, United States Navy
B.B.A., Valdosta State College, 1979
Master of Science in Management-December 1992
and
Raymond A. Walker-Lieutenant, United States Navy
B.A., North Carolina State University, 1979
Master of Science in Management-December 1992
Advisor: Alan W. McMasters-Department of Systems Management

The purpose of this thesis is to conduct a statistical analysis of the behavior of Deport Level Repairables (DLRs) by individual Cognizance Symbol (COG) in the Advanced Traceability and Control (ATAC) Program. It begins with a background of the ATAC program and the steps of current operating procedures of ATAC. The ATAC system is then analyzed by individual COG at each step to show a characteristic day-to-day behavior of a COG in the system. The database maintained by the Navy Material Transportation Office (NAVMTO) spanning one year, from 31 August 1990 to 31 August 1991, was used to obtain the necessary details. Finally, problems identified in the NAVMTO database and problems discovered in the DLR turn-in process are discussed.

SHIPS MAINTENANCE, REPAIR AND MODERNIZATION OVERSEAS: REQUIREMENTS CONCEPTS AND FUNDING ISSUES IN MAINTAINING MATERIAL READINESS OF DEPLOYED FORCES

Keith Lynn Marchbanks-Lieutenant, United States Navy
B.S., Lake Superior State College, 1981
Master of Science in Management-December 1992
Advisor: Larry R. Jones-Department of Systems Management

This thesis identifies material readiness issues and the effects of funding constraints on surface ship maintenance and repair requirements overseas. A background discussion of innovative surface ship maintenance and repair concepts is provided. The identification of material readiness and funding issues is accomplished through an examination of overseas surface ship maintenance resource requirements, focusing on the regional areas of Western Asia and the Mediterranean Sea. An assessment of alternative source maintenance costs, underlying issues confronting overseas maintenance and repair contracting, and the effects of current and projected funding trends are presented. The resulting research provides supportive evidence that mobile repair ship capability has, and will continue to be, a critical prerequisite to sustain material readiness of deployed forces in remote geographical locations during periods of regional crisis.

ESTIMATING CHARACTERISTIC LIFE AND RELIABILITY OF AN AIRCRAFT ENGINE COMPONENT IMPROVEMENT IN THE EARLY STAGES OF THE IMPLEMENTATION PROCESS

Scott L. Martens-Lieutenant, United States Navy
B.B.A., Iowa State University, 1985
Master of Science in Management-December 1992
Advisors: Alan W. McMasters-Department of Systems Management &
W. Max Woods-Department of Operations Research

This thesis describes the data base needed to assess improvement in the performance of a modification to the long electroless nickel (LEN) fuel tube of the TF-34-400 engine during the time the modified component is being introduced into the fleet. It also provides the methods and equations for estimating the reliability of a modified component during its implementation. The component failure times are assumed to have a Weibull distribution. When implemented, this methodology will provide engine program management teams more timely information which should enhance their decision-making process significantly.

DECREASING BUDGET FLEXIBILITY FOR COMMANDER OF MARINE CORPS INSTALLATIONS IN THE PACIFIC: SOURCES, SIGNIFICANCE AND SOLUTIONS

Robert M. McGuiness-Captain, United States Marine Corps
B.A., East Stroudsburg University, 1983
Masters of Science in Management-December 1992
and
John D. Barth-Captain, United States Marine Corps
B.A., University of Washington, 1985
Masters of Science in Management-1992
Advisor: Richard B. Doyle-Department of Systems Management

This thesis establishes the importance of budget execution flexibility at the installation commander level in terms of efficient allocation of resources. It then documents the erosion of budget flexibility from fiscal year 1988 to fiscal year 1991 at three Marine Corps installations: Marine Corps Air Stations, El Toro, California and Kaneohe Bay, Hawaii; and Marine Corps Base, Camp Pendleton, California. Two primary sources of erosion are identified: 1) increasing spending requirements in the form of mandates from higher authorities and rising fixed costs; and 2) decreasing top-line budget authority. The significance of decreasing flexibility is examined based upon the analysis of budget data gathered from all three subject installations. Finally, potential solutions to the current situation are offered for all levels in the budget hierarchy. Although the data are obtained from Marine Corps installations, the analysis and results are pertinent to all military installations.

AN ANALYSIS OF THE EFFECT OF RESERVE PARTICIPATION AND TRAINING ON CIVILIAN EMPLOYMENT AND EARNINGS

John Arthur McGuire-Lieutenant, United States Navy
B.S., Florida State University, 1987
Master of Science in Management-March 1993
Advisor: Stephen L. Mehay-Department of Systems Management

Utilizing data from the 1986 Reserve Components Surveys, this thesis implements a test of the hypothesis that a positive relationship exists between occupational training received in the reserves and increased benefits and wages on reservists' civilian jobs. The null hypothesis was that no such relationship exists, or that it exists for relatively few reservists, so that reserve participation is mainly a form of moonlighting with few spillover benefits to the individual or society in the form of increased worker productivity. Log-earnings regression equations were specified to test the basic hypothesis. The two-stage least squares (2SLS) estimating technique was utilized to estimate the models due to the existence of simultaneity bias in the regression equations. It was determined that affiliating with the reserves to receive training results in an increase in civilian benefits and wages. Therefore the null hypothesis was rejected, leading to the conclusion that reserve training does appear to provide important benefits to some enlistees, namely those who are motivated to seek skill training that can be used on their civilian job or used to find a better civilian job.

THE F-14 CONTRACT: A CASE STUDY IN MAJOR WEAPONS SYSTEMS ACQUISITION AND PROGRAM MANAGEMENT

Jon E. McIver-Lieutenant Commander, United States Navy
B.A., Weber State College, 1977
Master of Science in Management-June 1993
Advisor: Walter Owen-Department of Systems Management

Contracting for major weapons systems within the U.S. Government is a professional and political challenge. From the initial concept development, to the acceptance of a complete working weapon system, military acquisition professionals must balance pressure from the Executive and Legislative branches of the Government with the user requirements. This balance must be achieved using Government generated policy and procedures as they apply to purchases from private sector corporations. A historical study of the initial F-14 acquisition will identify the distinctive problems in this type of procurement. Success can be duplicated, and failures can be avoided by matching historical patterns of major weapons system acquisition with current contracting requirements. Comparing the steps in the F-14 acquisition to the acquisition of any major weapon system will provide key steps to successful future weapons systems purchases.

APPLY THE THEORY OF CONSTRAINTS (TOC) TO THE COMPONENT SECTION OF NAVAL AVIATION DEPOT (NADEP), NORTH ISLAND

David Joseph McNamara-Lieutenant Commander, United States Navy
B.S., University of Massachusetts, 1980
Master of Science in Management-December 1992
and
Mark Anthony D'Amato-Captain,, United States Army
B.A., Kent State University, 1981
Master of Science in Management-December 1992
Advisor: Dan Trietsch-Department of Systems Management

Eliyahu M. Goldratt first introduced TOC as a means of managing and synchronizing repetitive manufacturing operations. This thesis explores the extent to which TOC management principles can be applied to a repair job shop within the Naval Aviation Depot (NADEP) at North Island, San Diego, California. This thesis begins with a description of TOC and an overview of how the NADEP is organized. It continues with a description of how Shop 93302, (hydraulic component repair) operates in the depot. Against this backdrop, we discuss the extent to which TOC can be used to evaluate current repair policies and procedures within this ship. We offer some ideas and suggestions for changing and improving existing operations and the probable effect these changes will have on production, inventory, and repair turnaround time (TAT). We conclude that TOC is an effective means of implementing and focusing continual improvements in Ship 93302 and ultimately in the depot as a whole.

A DICTIONARY OF ACQUISITION AND CONTRACTING TERMS

Richard A. Mendez-Lieutenant Commander, United States Navy
B.A., Rutgers University, 1980
Master of Science in Management-June 1993
and
Gerald A. Rivas-Lieutenant, United States Navy
B.S., United States Naval Academy, 1983
Master of Science in Management-June 1993
Advisor: David V. Lamm-Department of Systems Management

This thesis is a continuation of research initiated by LCDR Daniel Ryan, Supply Corps, United States Navy to establish a basis for defining words and terms used in the field of contracting. The twenty terms selected for this thesis were synthesized from collected definitions, Government regulations and contracting literature and reviewed in some cases more than once by National Contract Management Association professionals in previous research efforts which lacked significant consensus and refines them using a Delphi Technique. This research is a joint effort conducted by students at the Naval Postgraduate School, Monterey, California, and the Air Force Institute of Technology, Wright-Patterson Air Force Base, Dayton, Ohio.

USING THE INDUSTRIAL MODERNIZATION INCENTIVE PROGRAM TO PRESERVE CRITICAL PROCESSES

Robert Leo Michels-Lieutenant, United States Navy
B.A., University of Wisconsin Eau Claire, 1983
Master of Science in Management-December 1992
Advisor: Jeff Warmington-Department of Systems Management

This thesis attempted to justify using the Industrial Modernization Incentive Program (IMIP) to meet Government needs. Its primary objective was to demonstrate maintaining critical processes that would otherwise be lost by using IMIP. A secondary objective was to demonstrate the flexibility of IMIP and how it can be tailored to meet individual Government contract requirements. Other secondary objectives were: 1. examine the changing Defense acquisition environment, 2. examine Government Return On Investment (GROI) and Contractor Return on Investment (CROI), 3. provide examples as to how IMIP could be used to meet Government needs instead of project needs. The thesis examined Defense acquisition objectives for the future as identified by leaders of Government, and how they applied to IMIP objectives. Information was obtained from written documentation addressing IMIP and the Defense industrial base, with feedback from knowledgeable and experienced Government contracting personnel. Broad examples were used to apply conversion to IMIP.

AN EVALUATION OF THE DEPARTMENT OF DEFENSE CONTRACTOR RISK ASSESSMENT GUIDE PROGRAM

Robert Francis Miedzinski-Lieutenant, Supply Corps, United States Navy
B.S., Towson State University, 1980
Master of Science in Management-June 1993
Advisor: David V. Lamm-Department of Systems Management

The Contractor Risk Assessment Guide Program (CRAG) was developed in 1988 in response to a primary recommendation of the President's Blue Ribbon Panel on Defense Management that the Government promote contractor self-governance as a means to improve the efficiency and effectiveness of Government oversight. This thesis reviews the background leading to the development of the CRAG program and reviews the individual Chapters of the CRAG program. The objectives of the thesis are to assess the achievement of the goals of the CRAG program since its implementation, identify any deficiencies in the CRAG as it exists, make recommendations for modification of the program and provide a medium for Government and defense industry personnel to express their opinions on the relative success of the CRAG. The research resulted in the conclusion that the CRAG has met its goals of improving contractor internal control systems and improving the efficiency and effectiveness of Government oversight efforts. The research also resulted in recommendations by the researcher of methods to enhance promotion of the CRAG and its benefits to the defense industry.

EFFECTS OF DLA IPG I SURCHARGES ON DDRW END USER ACTIVITY INVENTORY POLICY

Jonathan D. Miller-Lieutenant Commander, Supply Corps, United States Navy
B.A., University of Iowa, 1979
Master of Science in Management-December 1992
and
Telemachus C. Halkias-Captain, Quartermaster Corps, United States Army
B.S., United States Military Academy, 1982
Master of Science in Management-December 1992
and
Richard A. Parker-Commander, Supply Corps, United States Navy
B.S., Bethune-Cookman College, 1970
Master of Science in Management-December 1992
Advisor: Alan W. McMasters-Department of Systems Management

The purpose of this thesis is to examine the effects on retail customers of surcharges proposed by the Defense Logistics Agency (DLA) on Issue Priority Group I (IPG) requisitions. The intent of these surcharges is to enable DLA to recapture a portion of the costs incurred in meeting IPG I time standards. Additional goals are to discourage IPG I requisitioning for frivolous reasons, and when maintenance of small retail inventories may be less costly to the government. Data was collected from the Naval Supply Centers at Oakland and San Diego, and the former Sharpe Army Depot, now incorporated with Defense Depot San Joaquin (DDJC). Two types of surcharges were applied to this data. A variety of flat rates per requisition were examined. Alternately, several percentage levels were applied to an item's unit price to test their effectiveness as surcharges. Combinations of flat and percentage rates were also studied. This evaluation found flat rates tend to impact lower unit price and high annual demand items first. Percent of unit price surcharges tend to have a relatively even impact as they are increased. Combinations of surcharges tend to cause most items to be stocked rapidly.

COOPERATIVE RESEARCH AND DEVELOPMENT AGREEMENT (CRDA)

Scott A. Morgen-Lieutenant, United States Navy
B.S., University of Wisconsin-R.F., 1985
Master of Science in Management-September 1993
Advisor: Rodney Matsushima-Department of Systems Management

The topic of this thesis is the Cooperative Research and Development Agreement (CRDA), a method employed to transfer technology from Government Owned, Government Operated (GOGO) laboratories to private industry. The unique aspect of the CRDA is that it provides an avenue for government researchers to negotiate agreements with private industry without being ladened by numerous government regulations, such as the Federal Acquisition Regulations (FAR), or its Department of Defense supplement, the Defense Federal Acquisition Regulations Supplement (DFARS). The issue discussed during the research was whether a CRDA was a useful method to both expand the body of knowledge learned at government laboratories to private industry and bring much needed funds to government facilities and staff. The result of the study was an overall favorable opinion in the use of the CRDA, and a recommendation to expand future use of CRDA's in the environment of budget declines for government agencies.

THE RELATIONSHIP BETWEEN THE PERCEIVED EXECUTIVE MANAGEMENT CAPABILITIES OF SENIOR NAVY MEDICAL DEPARTMENT EXECUTIVES AND THEIR REPORTED MANAGERIAL REQUIREMENTS

John Richard Morrison-Lieutenant, Medical Service Corps, United States Navy
B.S., Southern Illinois University, 1986
Master of Science in Management-June 1993
Advisors: Alice M. Crawford & Benjamin J. Roberts-Department of Systems Management

The Naval Postgraduate School (NPS) has entered into a partnership with the Bureau of Medicine and Surgery (BUMED) to identify the competencies necessary to effectively function in executive management positions within Navy Medicine and, once the specific competencies are identified, design and conduct a customized, cost effective, executive development program to improve the management competencies of senior Navy Medical Department executives. As part of the needs assessment process used to identify these competencies, a survey instrument was mailed to 720 senior officers within Navy Medicine to identify their current level of skill and their perception of the required level of skill in eight management activity groups. The purpose of this thesis is to provide an initial analysis of the survey responses and identify any gaps, or deltas, between the current level of skill reported by the respondent and the required level of skill for their current position with respect to the respondents corps, rank, and organizational position cohorts. The results indicate that the responses vary by cohort with the gaps between current and required skills directly related to rank, seniority, and previous management experience.

COST SAVINGS AND BENEFITS ASSOCIATED WITH NAVAL AVIATORS WITHIN THE C-9 COMMUNITY OF THE NAVAL AIR RESERVE

Christopher John Mullarkey-Lieutenant Commander, United States Naval Reserve
B.S., University of South Carolina, 1980
Master of Science in Financial Management-September 1993
Advisor: Doug Moses-Department of Systems Management

This study quantifies the annual pay and allowance cost savings associated with Selective Reserve pilots employed within the C-9 community of the Naval Air Reserve. The present method of combined active duty and reserve pilot manning of the C-9 community is compared to three hypothetical all active duty manning scenarios to determine aggregate cost savings. A Days of Pay Model is developed and used to determine the Average Annual Base Pay Cost of Selective Reserve C-9 pilots and Base Pay Cost Savings associated with Selective Reserve manning of C-9 squadrons. Additional analysis quantify cost savings associated with Basic Allowance for Quarters, Variable Housing Allowance, Basic Allowance for Subsistence, Career Incentive Pay, and Retirement Pay. Further analysis is presented pertaining to the Average Annual Flight Time Benefits which are gained through Selective Reserve C-9 pilots who are airline pilots. Areas for further study associated with cost savings pertaining to Selective Reserve pilot manning are suggested.

THE DYNAMICS OF SUCCESSFUL PROGRAM MANAGEMENT: THE CASE OF ARMY TACMS

Paul R. Myrick-Captain, United States Army
B.S., Rochester Institute of Technology, 1983
Master of Science in Management-March 1993
Advisor: Nancy C. Roberts-Department of Systems Management

Project management has evolved as a successful tool to manage complex weapon systems. As budgets decline, Department of Defense project managers are challenged to improve their skills and competencies for successful project management. While the current literature specifies the overall requirements necessary for successful project management, it does not detail and describe how those requirements are to be fulfilled on a daily basis. The purpose of this thesis is to provide future project managers with an in-depth glimpse of how a successful project manager operates in real time. The project manager of the Army Tactical Missile System (TACMS) was selected to study because he was named by the Army as the 1991 Project Manager of the Year. The analysis is based on interviews with the Project Manager (PM), his team, and outside stakeholders, such as the office of the Program Executive Officer. This research identifies two area of factors that impact success: factors within the PM's control and factors beyond the PM's control. Further analysis of the factors within the PM's control identified three domains of competencies: leadership, stakeholder relations, and management. This research presents the approaches used by the Army TACMS PM to manage the three domains while achieving successful project management.

EFFECTIVE LEADERSHIP THROUGH EMPOWERMENT: A CASE STUDY

Mary Beth Newton-Lieutenant Commander, United States Navy
B.A., State University of New York at Stony Brook, 1979
Master of Science in Management-June 1993
Advisors: Kenneth W. Thomas & Kenneth L. Orloff-Department of Systems Management

In recent years the topic of empowerment has gained much attention among managers. This thesis is a case study analysis of one Naval Hospital Commanding Officer, Captain William R. Rowley, who has a reputation in his community as an innovator and advocate for empowerment. It presents a model of Captain Rowley's leadership philosophy. This model was found to be consistent with empowering leadership strategies as demonstrated by the close fit with two theories of empowerment. Captain Rowley's leadership was found to result in the achievement of positive change and improvement at Naval Hospital Camp Pendleton and to be consistent with sound practices of management control. His leadership model was also found to be consistent with the basic tenets of TQL and has resulted in successful progress toward full implementation of TQL at the command. Based on the successes described in this thesis, it is proposed that this model is useful for Navy Medicine as a viable leadership option.

IMPROVING HOSPITAL PRODUCTIVITY: AN ANALYSIS OF THE CONTRIBUTION OF ADMINISTRATIVE/CLERICAL STAFF TO PHYSICIAN PRODUCTIVITY

Cynthia Ann Nixon-Lieutenant, United States Naval Reserve
B.S., Florida Agricultural and Mechanical University, 1987
Master of Science in Management-June 1993
Advisor: Ronald A. Weitzman-Department of Systems Management

During the mid 1980s, Navy medicine was under constant criticism by its users, providers, and members of Congress. Between FY85 and FY88, the number of outpatient visits declined 21 percent within Navy Medical Treatment Facilities (MTFs), while CHAMPUS outpatient visits increased 78 percent. During this same period fleet operational assignments tripled and other programs were implemented that reduced Navy's ability to provide patient care in the U.S. In addition, between fiscal years 1980 through 1988, physician retention rates within Navy declined to 43 percent, lower than the rates for Army and Air Force. According to the GAO, one of the chief complaints of all military physicians is inadequate levels of administrative/clerical support. Thus, it has become more important that Navy manpower requirements be determined with increased accuracy to evaluate the functional relationship between administrative staff mix and physician productivity across similar hospital, focusing on workcenters in the primary care areas, where the need is greatest. Data used in this study is from the Medical Expense and Reporting Performance System (MEPRS). Unfortunately, when comparing hospitals the data appear to be inadequate for demonstrating a relationship between administrative/clerical staffing and physician productivity, although when comparing workcenters the results appear more promising.

DEFENSE DOWNSIZING AND BLACKS IN THE MILITARY

Roy Louis Nixon-Lieutenant, United States Navy
B.S., Florida Agricultural and Mechanical University, 1987
Master of Science in Management-June 1993
Advisor: Mark A. Eitelberg-Department of Systems Management

Blacks have joined the enlisted ranks of the American military in record numbers since the end of the draft. However, the armed forces are now engaged in the process of downsizing, and there is some speculation that blacks may be disproportionately affected by the reduction-in-force. This study analyzes defense drawdown policies, force demographics, historical trends, and environmental factors in an attempt to determine the overall impact of the proposed cuts in military manpower on persons n different racial/ethnic groups. The results show that black representation in the military has declined somewhat since 1990; and that it may continue to fall as the force reduction processes over the next several years and possible beyond. It is recommended that further study be undertaken of the differential effects of the force downsizing on persons in the various racial/ethnic groups; and that the search continue for effective alternatives to the current enlistment test in screening applicants to the military.

FORECASTING VSI/SSB TAKE-RATES FOR ENLISTED MARINE CORPS PERSONNEL

Mark L. Noblit-Major, United States Marine Corps
B.A., Villanova University, 1980
Master of Science in Management-March 1993
Advisor: Stephen L. Mehay-Department of Systems Management

This thesis involves the development of multivariate models to estimate probabilities that enlisted Marines take the voluntary Separation Incentive/Special Separation Benefit (VSI/SSB) program, and also to forecast the distribution of "takers" between the VSI and the SSB programs. The data were obtained from the Headquarters Marine Corps enlisted master file which includes demographic and military background information on all Marines who were eligible for the VSI/SSB between 15 January and 30 June 1992. The theory of labor supply and occupational choice provides the theoretical framework for the model. The probability of taking the program is modeled as a function of military compensation, expected civilian earnings, and other non-pecuniary factors. Logit regression equations are applied to develop "best fit" equations that predict the probability eligible enlisted Marines will take the VSI/SSB, and the probability that a program taker will choose the SSB. Empirical results indicate that paygrade and military occupation are the most important factors in predicting the probability of taking the VSI/SSB. Gender, race, job assignment, location, time-in-grade, promotion rate, and years until the end of active service had significant but smaller effects on predicted probabilities. Lower paygrades, non college education, less time-in-grade, and a faster promotion rate increase the probability that a Marine chooses the SSB.

AN ANALYSIS OF SURFACE WARFARE OFFICER MEASURES OF EFFECTIVENESS AS RELATED TO COMMISSIONING SOURCE, UNDERGRADUATE EDUCATION, AND NAVY TRAINING

Joseph F. Nolan-Lieutenant, United States Navy
B.S., United States Naval Academy, 1983
Master of Science in Management-March 1993
Advisors: Alice M. Crawford & Stephen L. Mehay-Department of Systems Management

This thesis develops multivariate models to estimate the determinants of three measures of effectiveness for surface warfare officers (SWO): retention, promotion, and early professional qualifications. Using data from the Navy Officer Master File, Navy Officer Loss File, and Navy Personnel Research and Development Center's Traintrack System File, logit regression equations are employed to estimate the probability of SWO retention between the Lieutenant and Lieutenant Commander selection boards (1981-90), the probability of promotion to Lieutenant Commander (1985-90), and the probability of receiving early professional qualifications by the time of the Lieutenant selection boards (1981-85). The probabilities are modeled as a function of background factors that represent personal demographics, undergraduate education, Navy experience, and Navy training. The findings reveal that a large portion of the variation in SWO measures of effectiveness reflect differences in human capital acquired via pre-commissioning education or via Navy training. Performance differences by commissioning source and college selectivity of undergraduate education are specifically highlighted. Based upon the research results, it is recommended that a cost-benefit analysis be conducted to determine the optimal officer accession source mix.

POLICY DECISIONS FOR STRATEGIC SHIPYARD SURVIVAL

Michael Murray O'Connor-Lieutenant Commander, United States Navy
B.S., Purdue University, 1980
Master of Science in Management-December 1992
Advisor: Jeff Warmington-Department of Systems Management

This thesis research focused on the evaluation of the shipyard industrial base as it relates to the requirements of the U.S. Navy. It characterizes shipyard capabilities, investigates legislative initiatives, evaluates subsidy programs and interprets Navy requirements and the status of business conducted at the U.S. shipyards. It looks at whether the Navy should let the competitive market dictate where and which shipyards will survive, or should policy/legislation be enacted to support a few strategically located shipyards.

AN ASSESSMENT OF CRITICAL FACTORS AFFECTING THE SELECTION OF VARIOUS ACQUISITION ALTERNATIVES USED TO RESOLVE COMPONENT NONAVAILABILITY

Sean Patrick O'Day-Captain, United States Army
B.S., University of Texas at San Antonio
Master of Science in Management-December 1992
Advisor: Rebecca J. Adams-Department of Systems Management

The ability to maintain and sustain the Army during peacetime operations and wartime utilization requirements, depends greatly on the availability of repair and spare parts. The readiness of aging systems in the Army;s inventory is threatened by the component nonavailability problems. This thesis focuses on situations in which contracting officers and item managers are faced with critical factors affecting their decisions as to which acquisition alternative they chose. This study identifies and defines the component nonavailability issues, discusses why they occur, reviews current spare parts acquisition techniques, presents advantages and disadvantages associated with each acquisition alternative, and discusses and analyzes the critical factors that affect the decision making process. The researcher also proposes the use of the Rapid Acquisition of Manufactured Parts (RAMP) program to address the problems of high costs, growing leadtimes, and diminishing sources for spare parts.

A SUPPLY ALLOCATION AND OPTIMIZATION MODEL FOR THE U.S. MARINE CORPS INTERMEDIATE SUPPLY LEVEL

John Chrysostom O'Keefe-Captain, United States Marine Corps
B.B.A., Texas A&M University, 1981
Master of Science in Management-December 1992
Advisor: K. Terasawa-Department of Systems Management

As spending cuts for defense intensify, the Marine Corps must try to maximize its readiness with a reduced budget. Replenishment supplies and parts stocked at the U.S. Marine Corps intermediate supply level are currently stocked according to historical usage data and Combat Essentiality-Criticality Codes (CECs). However, this system may not result in maximum readiness. Items with the same CEC may differ in the degree to which they contribute to combat readiness, and historical demand is not necessarily an indicator of item importance. This thesis presents a model which demonstrates a theory for allocating funds for supplies and parts at the intermediate supply level subject to a budget constraint, based upon weighted essentiality values for inventory items. Analysis of the model shows that, given a budget reduction, a proportionate allocation policy is the optimal policy to pursue after steady state consumption is reached. The model analysis will also provide a basis for further research into-readiness-oriented stockage.

A DICTIONARY OF ACQUISITION AND CONTRACTING TERMS

George Luis Omeechevarria-Lieutenant Commander, Supply Corps, United States Navy
B.S., University of South Florida, 1980
Master of Science in Management-December 1992
David V. Lamm-Department of Systems Management

This thesis is a continuation of research initiated by Lieutenant Commander Daniel Ryan, Supply Corps, United States Navy to establish a basis for defining words and terms used in the field of contracting. The ten terms selected for this thesis were synthesized from collected definitions, Government regulations and contracting literature and reviewed in some cases more than once by National Contract Management Association professionals in previous research efforts. This work differs from previous research in that it takes the terms from those efforts which generated significant diversity and refines them using a modified Delphi Technique. This research is a joint effort conducted by students at the Naval Postgraduate School, Monterey, California, and the Air force Institute of Technology, Wright-Patterson Air Force Base, Dayton, Ohio.

A COMPREHENSIVE ANALYSIS OF THE MAINTENANCE REQUIREMENT SYSTEM

Michael Andrew Palmer-Lieutenant Commander, United States Naval Reserve
B.A., University of Illinois, 1981
Master of Science in Management-June 1993
Advisor: Larry R. Jones-Department of Systems Management

The Navy's efficiency and effectiveness is dependent on the material readiness of its ships. It is essential that the programming mechanism for surface ship maintenance account for all required repair work and the relative risk associated with resource allocation, especially during this era of reduced defense spending. The Maintenance Requirement System (MRS) is a tool that appears to accomplish this by defining maintenance requirements, projecting those requirements into the future, and assessing the risk of not fully funding maintenance requirements in terms of degraded mission capability. This thesis examines MRS, current and future issues that impact MRS, and the similarities between MRS and performance budgeting.

AN ANALYSIS OF THE NAVY'S FINANCIAL MANAGEMENT SUBSPECIALTY REQUIREMENTS

Richard Todd Palmer-Lieutenant, United States Navy
B.S., Central Missouri State University
Master of Science in Management-December 1992
Advisor: James M. Fremgen-Department of Systems Management

This study analyzes the current financial management needs of the Navy in terms of the skills required for officers to perform effectively in a wide range of financial management subspecialty billets, and in terms of the development of these skills through Master's degree level education at the Naval Postgraduate School. The study identifies and defines the most required financial management skills and observes significant skill requirement patterns and relationships between these skills and a set of billet "identifier" categories. The identifier categories used are the billets' command echelon within the Navy's budgeting hierarchy, the billets' rank and designator requirements, and the billets' P or Q code. In addition, this study determines that the subspecialty's Educational Skill Requirements and the Naval Postgraduate School financial management curriculum both provide adequate coverage of all of the Navy's P and Q coded financial management billets' most required financial management skills.

SECURITY MANAGEMENT OF ELECTRONIC DATA INTERCHANGE

Hua-Fu Pao-Lieutenant, R.O.C. Navy
B.S., National Defense Management College, 1987
Master of Science in Management-June 1993
Advisor: Jon T. Butler-Department of Electrical and Computer Engineering

This thesis considers the security management issue of electronic data interchange (EDI) and the security tools that are used for secure EDI implementation. Management considerations of EDI are considered to be an integration of EDI and security services. The background of EDI is surveyed along with EDI implementation procedures and Digital Signature (DS) techniques. The security services that are being used today are discussed in Chapter V including the EDI-related security standards. Finally, a security management model is presented that may be used to improve the security of an EDI implementation. The model is based on the perceived threats and vulnerabilities to the EDI, and the availability of security services and mechanisms. Included in the model are the setting of security goals, the determination of security policies, the determination of priorities for EDI security, and the construction of security architecture and management activities. This thesis was written to survey the concepts of EDI and DS. The survey of EDI-related security standards may provide an opportunity to understand security services and security mechanisms available when designing an EDI system. Also, the security management model may help to improve the security of an organization.

EFFECTS OF DLA IPG I SURCHARGES ON DDRW END USER ACTIVITY INVENTORY POLICY

Richard A. Parker-Commander, Supply Corps, United States Navy
B.S., Bethune-Cookman College, 1970
Master of Science in Management-December 1992
and
Jonathan D. Miller-Lieutenant Commander, Supply Corps, United States Navy
B.A., University of Iowa, 1979
Master of Science in Management-December 1992
and
Telemachus C. Halkias-Captain, Quartermaster Corps, United States Army
B.S., United States Military Academy, 1982
Master of Science in Management-December 1992
Advisor: Alan W. McMasters-Department of Systems Management

The purpose of this thesis is to examine the effects on retail customers of surcharges proposed by the Defense Logistics Agency (DLA) on Issue Priority Group I (IPG) requisitions. The intent of these surcharges is to enable DLA to recapture a portion of the costs incurred in meeting IPG I time standards. Additional goals are to discourage IPG I requisitioning for frivolous reasons, and when maintenance of small retail inventories may be less costly to the government. Data was collected from the Naval Supply Centers at Oakland and San Diego, and the former Sharpe Army Depot, now incorporated with Defense Depot San Joaquin (DDJC). Two types of surcharges were applied to this data. A variety of flat rates per requisition were examined. Alternately, several percentage levels were applied to an item's unit price to test their effectiveness as surcharges. Combinations of flat and percentage rates were also studied. This evaluation found flat rates tend to impact lower unit price and high annual demand items first. Percent of unit price surcharges tend to have a relatively even impact as they are increased. Combinations of surcharges tend to cause most items to be stocked rapidly.

SURFACE SHIP DECISION ANALYSIS

John Bigelow Perkins-Lieutenant, United States Navy
B.S., Maine Maritime Academy, 1985
Master of Science in Management-December 1992
Advisor: Larry R. Jones-Department of Systems Management

Efficient Surface Ship Maintenance and repair is vital to the U.S. Navy. With defense budgets tightening, accurate and economically sound decision making in this program is essential. To improve decision making, it would be helpful to have an accurate analysis program to evaluate the adequacy of ship maintenance and repair decisions. This system should use available overhaul information to identify errors made during the overhaul process. This thesis analyzes current Navy ship maintenance and repair feedback processes to determine if any system is used presently that adequately measures the accuracy of decisions made within the Surface Ship Maintenance Program. Further, this thesis develops an Overhaul Decision Analysis Model to assess the present Navy Surface Ship decision process. Finally, this thesis draws conclusions based on application of the model. These findings address both cost and equipment readiness issues to demonstrate the benefits of an effective Surface Ship Decision Analysis Program.

A MANAGEMENT CASE STUDY: THE IMPLEMENTATION OF THE RAPID ACQUISITION OF MANUFACTURED PARTS (RAMP) PROGRAM

Marlene J. Peterson-Lieutenant, United States Navy
B.A., University of California San Diego, 1982
Master of Science in Management-June 1993
Advisor: Kenneth Euske-Department of Systems Management

This thesis is a management case study which describes the implementation of the Navy's Rapid Acquisition of Manufactured Parts (RAMP) program. The RAMP program was implemented in 1989 by the Naval Supply Systems Command (NAVSUP) to address the problems in procurement of spare parts for the Navy's weapon systems. RAMP technology proposed the use of flexible manufacturing systems and computer integrated manufacturing (CIM) capability to develop self-contained computerized manufacturing cells used to produce small machined parts and printed wire assemblies. The goal of RAMP was to develop and use computerized parts specifications to reduce lead time and cost for manufactured spare parts. The management case study concentrates on the examination of how new technology is implemented into current established organizations. The main focus is on the relationships between the Navy commands involved in the implementation: the Navy Ramp sites and the Inventory Control Points (Aviation Support Office and Ships Parts Control Center). The case includes the background and a description of the program, strategic planning, key players, identification of parts, establishment of technical data, cost and competition issues and the steps taken to organize and implement RAMP technology. Teaching notes are included which identify the important issues of the case including strategic planning, customer needs, organizational policy, bid procedures and the communication process.

APPLICABILITY OF SPARES ACQUISITION INTEGRATED WITH PRODUCTION (SAIP) TO NAVAL AVIATION WEAPON SYSTEMS

Christopher Duncan Platt-Major, United States Marine Corps
B.B.A., Stephen F. Austin State University, 1976
Master of Science in Management-June 1993
Advisor: Jeffrey Warmington-Department of Systems Management

Spares Acquisition Integrated with Production (SAIP) is a technique for obtaining economies of scale in spares acquisition by placing orders for spares concurrently with other customer's orders for items requiring the same, or similar, materials and processes. Coordinating such procurement actions to optimize savings, particularly replenishment actions, can be a difficult and time consuming process. The difficulties involved in implementing the technique raise questions with respect to the utility of the technique in achieving savings, the circumstances, if any, under which it should be used, and whether a process can be developed to make implementation of the technique easier and more systematic. This thesis explores these questions from a Naval aviation perspective and concludes that the technique is worth the effort, but some processes used to implement it are of questionable value. A revised transactional model that builds on an earlier prototype process is offered as a possible alternative for achieving more systematic SAIP savings.

VALUE ENGINEERING: APPLICATION TO THE PROCUREMENT OF SPARE PARTS

Michael David Pockette-Captain, United States Marine Corps
M.S., Naval Postgraduate School, 1993
Master of Science in Management-June 1993
Advisor: Jeffrey Warmington-Department of Systems Management

The purpose of this thesis is to determine how and to what extent the Department of Defense Value Engineering (VE) effort can be utilized to improve the procurement of spare parts. An in-depth research effort was undertaken in this area. Interviews were conducted and data were collected from the DoD, DLA, and Navy Supply Systems Command regarding this topic. A comparative analysis of the data revealed trends and opportunities for VE application to the procurement of spare parts, which resulted in three conclusions: First, VE is a proven cost saving tool but is underutilized in spare parts procurement. To maximize savings, VE should be emphasized in the replenishment spare parts process. DoD must initiate efforts to encourage more contractor VE participation in the spare parts procurement process. Second, there continues to be a lack of top management support within the DoD for VE as a whole, which directly impacts on VE investment in spare parts procurement. An intensive training and education process is necessary for Government and contractor acquisition personnel emphasizing the benefits of the VE program. The third conclusion is that the current DoD procurement environment of reduced budgets and fewer major weapons acquisitions heightens the need for greater use of VE in the spare procurement process. Proper use of the Value Engineering program, in major systems acquisitions and spare parts procurement, possess numerous opportunities and advantages for both the Government and contractors alike.

THE EFFICACY OF MACHINE LEARNING PROGRAMS NAVY MANPOWER ANALYSIS

Dennis Eric Pytel, Jr.-Lieutenant, United States Navy
A.B., University of California, Davis, 1985
Master of Science in Management-March 1993
Advisors: George W. Thomas & Daniel R. Dolk-Department of Systems Management

This thesis investigated the efficacy of two machine learning programs for Navy manpower analysis. Two machine learning programs, AIM and IXL, were compared to conventional statistical techniques. A large manpower data set and a logistic regression equation were obtained. The same data set was used to generate models from the two commercial machine learning programs. Using a held out sub-set of the data the capabilities of the three models were evaluated. AIM generated results comparable to those of the logistic regression equation; both in number of correct predictions and computed partial effects of the independent variables. IXL had significantly fewer correct predictions than the other two models and does not support evaluation of partial effects. The author recommended further investigation of AIM's capabilities, and testing in an operational environment.

AN ANALYSIS OF AEGIS CASREP AND 2-KILO MAINTENANCE FAILURE DATA

Loren Norbert Reith-Lieutenant, United States Navy
B.S., University of Idaho
Master of Science in Management-March 1993
Advisor: Ronald Weitzman-Department of Systems Management

This thesis attempts to determine if the maintenance technicians who graduate from the AEGIS Training Center (ATC) receive a sufficient amount of training. Using the AEGIS CASREP and 2-KILO maintenance history files from the NAVSEALOGCEN located in Mechanicsburg, Pennsylvania, an analysis is conducted to determine: (1) if the percentage of curriculum training hours devoted to the components of a specific equipment identification code (EIC) match with the percentage of total maintenance hours spent repairing those components in the fleet, and (2) if an analysis of the CASREP and 2-KILO Direct-Indicator element codes will identify any areas where formal training has been insufficient. Based on the findings of this thesis, recommendations were made: (1) to reduce the amount of training for eleven EIC's, and (2) to increase the amount of training for nine EIC's. Additionally, the Direct-Indicator element codes were found to be poor indicators for identifying areas of insufficient training. The results of this thesis are expected to provide the AEGIS Training Center with more information on how to better determine the training requirements of its students.

A DICTIONARY OF ACQUISITION AND CONTRACTING TERMS

Gerald A. Rivas-Lieutenant, United States Navy
B.S., United States Naval Academy, 1983
Master of Science in Management-June 1993
and
Richard A. Mendez-Lieutenant Commander, United States Navy
B.A., Rutgers University, 1980
Master of Science in Management-June 1993
Advisor: David V. Lamm-Department of Systems Management

This thesis is a continuation of research initiated by LCDR Daniel Ryan, Supply Corps, United States Navy to establish a basis for defining words and terms used in the field of contracting. The twenty terms selected for this thesis were synthesized from collected definitions, Government regulations and contracting literature and reviewed in some cases more than once by National Contract Management Association professionals in previous research efforts which lacked significant consensus and refines them using a Delphi Technique. This research is a joint effort conducted by students at the Naval Postgraduate School, Monterey, California, and the Air Force Institute of Technology, Wright-Patterson Air Force Base, Dayton, Ohio.

THE PILOT MENTOR-PROTEGE PROGRAM: A VIABLE PROGRAM FOR GOVERNMENT PROCUREMENT?

Raymond John Rodriguez-Lieutenant, United States Navy
B.S., United States Naval Academy, 1983
Master of Science in Management-June 1993
Advisors: David V. Lamm & Susan P. Hocevar-Department of Systems Management

The Pilot Mentor-Protege Program was implemented on October 1, 1991. It is a voluntary program that provides incentives for major defense contractors to provide developmental assistance to Small Disadvantaged Businesses (SDBs) developmental assistance provided should enhance the capabilities of SDBs to perform as subcontractors and suppliers under Government and commercial contracts and increase Small Disadvantaged Business participation in Department of Defense subcontracting. This study was undertaken to assess the current perceptions of industry regarding the program and to determine if the program has a viable future in Government procurement. The results of the study indicate an overall positive impression of the program exists in industry, especially among current participants. There are active mentor-protege relationships in which the assistance being provided is improving the capabilities of the protege. There are, however, some undesirable aspects and barriers that limit participation and effectiveness.

A COMPARISON OF NEURAL NETWORK AND REGRESSION MODELS FOR NAVY RETENTION MODELING

Bradley Steven Russell-Lieutenant, United States Navy
B.S., Southern Oregon State College, 1984
Master of Science in Management-March 1993
Advisors: Advisors: G. Thomas & Daniel Dolk-Department of Systems Management & T. Hill-University of Hawaii

This thesis evaluates a possible use of artificial neural networks for military manpower and personnel analysis. Two neural network models were constructed to predict the reenlistment behavior of a select group of individuals in the Navy, from a sample of 680 individuals. The data were extracted from the 1985 DoD Survey of Officer and Enlisted Personnel. Explanatory variables were grouped into demographic/personal, military characteristics, perceived probability of civilian employment, educational level, and satisfaction with military life and military benefits. The first neural network model was compared to a more traditional method of statistical modeling (logistic regression analysis) to determine the strengths and weaknesses of the neural network model. Both models used the same set of 17 variables and were tested using a holdout sample of 100 observations. The neural network model was found to be comparable to the logistic regression model as a predictor, but deficient as a policy analysis model. The second neural network model was constructed using the same data set and architecture as the first neural network model, including the original 17 variables, plus an additional 11 variables that consisted of variables with and without theoretical foundation for predicting reenlistment. The two neural network models were then compared and found to be similar at predicting reenlistment. Both neural network models were considered to be deficient as tools for policy analysts.

TQL IN THE DEPARTMENT OF THE NAVY'S OPERATING FORCES AND SHORE ESTABLISHMENT: DOES IT DIFFER?

Philip Gregory Rynn-Captain, United States Marine Corps
B.S., University of Rhode Island, 1983
Master of Science in Management-December 1992
Advisor: James E. Suchan-Department of Systems Management

This thesis makes available to DoN TQL educators and practitioners data gathered about differences between DoN operating force and shore establishment organizations in the conduct of TQL. A survey was conducted to assess what TQL tools and processes were used by the two organization types, and statistical testing was used to determine how the organizations differed in the use of TQL tools and processes. The results of the statistical testing indicate that although there were some significant differences found when the compared organization types had less than one year of TQL exposure, the compared organizations with a least one year of TQL exposure were generally similar in their conduct of TQL. Components of an Open Systems model of organizations: "culture", "behavior and processes", "inputs", and "purposes" were used to explain the differences in TQL conduct by the two organization types, and form the basis for recommendations on how to reduce differences between them.

A STATISTICAL ANALYSIS OF ACTIVE DUTY NAVY BANKRUPTCIES AT THE JACKSONVILLE, FLORIDA AND SAN DIEGO, CALIFORNIA BANKRUPTCY COURTS

Thomas W. Sachse-Lieutenant, United States Navy
B.S., Pennsylvania State University, 1984
Master of Science in Management-June 1993
Advisor: James M. Fremgen-Department of Systems Management

This thesis presents the results of a statistical analysis conducted on active duty Navy bankruptcy cases filed in 1991 at the Jacksonville, Florida and San Diego, California bankruptcy courts. Results are presented for over 60 variables which were analyzed for the 96 active duty Navy bankruptcy cases in the sample. In addition, it provides a detailed explanation of the processes involved in filing Chapter 7 or Chapter 13 bankruptcy. The results of the analysis indicate that active duty Navy personnel in Jacksonville and San Diego file bankruptcy more often than the civilian population. In addition, active duty Navy personnel are filing bankruptcy with a significantly lower debt burden than civilians who file bankruptcy. The results also indicate that there is little difference between the financial conditions of sailors who file bankruptcy in Jacksonville and San Diego.

PREDICTING PERFORMANCE: ANALYSIS OF BACKGROUND FACTORS AND PROBABILITY OF PROMOTION IN THE SURFACE WARFARE AND SUBMARINE OFFICER COMMUNITIES

Woo Young Saw-Lieutenant, Republic of Korea Navy
Master of Science in Management-September 1993
Advisor: Gregory G. Hildebrant-Department of Systems Management

This thesis estimates the determinants of promotion probability to Lieutenant Commander over the period 1985-1990 for Surface Warfare Officers (SWOs) and Submarine Officers (SOs). Using data from the Naval Officer Promotion History Data Files, the analysis first examines the frequency distribution of the explanatory variables, then employs a logit regression analysis. The probabilities of promotion are modeled as a function of background factors, which include personal demographics, undergraduate education, and Navy experience. The findings reveal that having a high GPA, a graduate education, more than 3 additional qualification designators (AQDs), and having been screened for command each have a positive effect on promotion for SWOs and are statistically significant. By contrast, being an ROTC graduate, being older, and having a low GPA each have a negative effect on probability of promotion and are statistically significant in the SWO model. In the SO model, having a high GPA, a graduate education, more than 3 AQDs, and a technical undergraduate major are positively significant. Based on the results, it is recommended that the Republic of Korea focus its recruiting efforts on highly qualified officer candidates if it can be demonstrated that the results of this analysis apply to Korea.

AN EXAMINATION OF CURRENT NAVY MEDICAL PROFESSIONALS MANAGEMENT ORIENTED SERVICE SHORT COURSES

Alan Schachman, Jr.-Captain, United States Marine Corps
B.S., Northern Michigan University, 1985
Master of Science in Management-June 1993
Advisor: James E. Suchan-Department of Systems Management

This thesis describes and analyzes the Navy's service short courses available to medical professionals. The description covers course content (subjects being taught), describes contact hours (time a class is taught), and evaluates the depth and breadth of content. The information from each course is compared to the needs of a medical treatment facility (MTF) manager, as determined by the Naval Postgraduate School "Needs Assessment." This examination shows that many Navy medical professional service short courses cover parts of the knowledge and skills needed to manage a medical treatment facility. The courses examined focus mainly on leadership and management skills. In order to more accurately describe and analyze these courses, obtaining more detailed information, observing the courses being taught, and interviewing course instructors is recommended.

THE IMPACT OF THE DEFENSE ACQUISITION WORKFORCE IMPROVEMENT ACT ON THE PROFESSIONALIZATION AND TRAINING OF THE MARINE CORPS' ENLISTED ACQUISITION WORKFORCE

Roy Randolph Schleiden-Major, United States Marine Corps
B.S., United States Naval Academy, 1978
M.S., Golden Gate University, 1982
Master of Science in Management-December 1992
Advisor: Jeffrey Warmington-Department of Systems Management

Public Law 101-510, Defense Acquisition Workforce Improvement Act became effective upon its passage for Fiscal Year 1992. The intent of the legislation is to increase the training and professionalism of the Department of Defense Acquisition Workforce. The DAWIA outlines specific requirements and qualifications for various specialties within the General Series (GS) workforce and states requirements for the qualifications of military personnel who are filling acquisition billets. This thesis will focus on the functions performed by Marines classified by Military Occupational Specialty (MOS) 3044, Contract and Acquisition Specialists. The work performed by 3044 Marines will be compared with the job descriptions of the GS-1105 (Purchasing Series) and GS-1102 (Contracting Series) positions. An evaluation will determine if there should be any changes to the 3044 classification, and what other training and entrance requirements could/should be implemented in compliance with the DAWIA initiative; thus ensuring an increase in competency, proficiency and professionalism of the 3044 MOS Marines.

A COMPARISON OF ALTERNATIVE MEASURES OF THE QUALIFIED MILITARY AVAILABLE AND INTERESTED RECRUIT MARKET

David S. Schulz-Captain,, United States Marine Corps
B.S., Villanova University, 1987
Master of Science in Management-March 1993
Advisors: George W. Thomas & Kathryn M. Kocher-Department of Systems Management

This thesis compares two alternative measures of recruit market potential: Production-Weighted Qualified Military Available (PQMA) and High-Quality Qualified Military Available and Interested (HQ QMJ). The services rely on estimates of market potential to allocate recruiting resources efficiently and establish enlistment goals. Using 1990 accession data, regression and correlation analysis were used to determine the relationship between accessions and estimated market potential for both all services and Marine Corps accessions with the following results: (1) the relationship between actual accessions and the PQMA and HQ QMJ estimates of market potential differs by race/ethnic group, market size and region, (2) there are differences in the relationship between actual accessions and estimates of recruit market potential both for all services and Marine Corps accessions, (3) counties with significant variation between PQMA and HQ QMJ estimates of market potential were identified, and (4) 1990 PQMA and HQ QMJ estimates of market potential did not adequately account for differences in the qualification and propensity to enlist by region and socioeconomic status. Recommendations for further research in the area of recruit market potential include applying the methodology in this study to several years of accession data, applying the 1990 census population and socioeconomic information to the PQMA and HQ QMJ estimates of market potential, and examining the counties identified in this study having substantial variation in the measures of market.

IMPLEMENTING ELECTRONIC DATA INTERCHANGE WITH SMALL BUSINESS SUPPLIERS IN THE PRE-AWARD ACQUISITION PROCESS

Robert B. Sergeson-Lieutenant Commander, Supply Corps, United States Navy
B.A., University of Washington, 1980
Master of Science in Management-June 1993
Advisor: Myung W. Suh-Department of Systems Management

This thesis examines the implementation of electronic data interchange (EDI) with small business suppliers in the pre-award acquisition process. The results of a small business survey are analyzed to provide insight on the barriers and impediments to implementing EDI with small business concerns. Additionally, interviews with major corporations were conducted to identify their lessons learned and their efforts to implement EDI with their small business supplier base. The major conclusion drawn is that DoD can successfully implement EDI with its small business supplier base in the pre-award acquisition process. It was determined that the following key factors were crucial to successful implementation of EDI with small business: 1) provide effective training; 2) specifically direct grant funding to the Procurement Technical Assistance Centers; 3) require the Small Business Administration to aggressively sponsor and implement EDI training; 4) draft legislation to modify or eliminate restrictive laws and regulations; and 5) foster the use of Value-Added Networks, Trading Partner Agreements, and EDI Service Bureaus. These efforts would provide the basic infrastructure to enable DoD to train, nurture, and help problem solve with small businesses once DoD becomes totally reliant upon EDI.

THE EFFECT OF THE IMMIGRATION OF SOVIET JEWS TO ISRAEL ON ISRAEL'S ECONOMY AND HUMAN RESOURCES

Israel Shafir-Lieutenant Colonel, Israeli Air Force
Master of Science in Management-June 1993
Advisor: Roger D. Evered-Department of Systems Management

This thesis investigates the expected effects of the 1990s immigration wave of Jews from the former USSR to Israel in terms of the economic and social aspects. The influx of some 500,000 immigrants has incremented Israel's population by some 10 percent in three years. The immigrants' human capital is considered exceptionally high in educational and occupational terms. It can give Israel a labor force of unparalleled quality assuming it will not be wasted. The Israeli economic structure is heavily regulated and lacks incentives for entrepreneurialism. The challenge facing Israel is to transform its economic political and social structure so it is geared toward harnessing the special opportunity accorded by the immigrants. In the fast changing global market, capitalizing on the immigrants characteristics is a key for Israel's success. The immigrants pose a burden as well in the form of public debt to be incurred by the veteran population in the near future for their successful assimilation. Israel's ability to find the right approach to their absorption depends on its ability to forge a strategic vision for the future and follow it to implementation.

A TAXONOMY OF GOODS PROCURED BY THE FEDERAL GOVERNMENT: APPLICATIONS AND BENEFITS

Edward W. Sheehan, Jr.-Lieutenant, Supply Corps, United States Navy
B.B.A., University of Massachusetts, 1982
Master of Science in Management-December 1992
Advisor: David V. Lamm-Department of Systems Management

Important research efforts have advocated the concept of contracting as a science. One of the key criteria required for a discipline to be recognized as science is a description and classification of the subject matter. In order to meet this criterion, a model was developed which classifies goods procured by the Federal Government. Further research validated the classification scheme and suggested some improvements. An important criterion of any classification scheme is its usefulness. This thesis examines potential applications and benefits of the previously developed taxonomical structure for classifying goods procured by the Federal Government. Potentially useful applications of the taxonomy of goods include market research, procurement regulation, and training and education.

MARSHALING AND ACQUIRING RESOURCES FOR THE PROCESS IMPROVEMENT PROCESS

Carol E. Shivers-Lieutenant, United States Navy
B.S., Golden Gate University, 1983
Master of Science in Management-June 1993
Advisors: Kenneth J. Euske & Jeffrey M. Nevels-Department of Systems Management

This thesis examines the issues associated with the marshaling and acquisition of resources available to the Department of Defense functional manager for implementing and continuing the process improvement process. Additionally, it identifies resources which are currently available and provides points of contact for obtaining further information about them. The thesis also illustrates how process improvement resources are organized within the Department of the Navy and provides points of contact for those, as well.

SUBSPECIALTY UTILIZATION IN THE NAVY: A LONGITUDINAL ANALYSIS OF UNRESTRICTED LINE OFFICERS WHO GRADUATED FROM THE NAVAL POSTGRADUATE SCHOOL

David M. Simboli, Jr.-Lieutenant, United States Navy
B.A., The College of Wooster, 1986
Master of Science in Management-March 1993
Advisor: Mark J. Eitelberg-Department of Systems Management

This thesis focuses on a cohort of unrestricted line (URL) officers who graduated from the Naval Postgraduate School (NPS) in 1985 through 1991. The thesis begins with a description of the officers and their subspecialty codes. Patterns of subspecialty utilization are then analyzed by rank, designator, and gender. Results show that the subspecialty utilization rate (as of 1991) for the cohort is 82.4 percent; and the utilization rate for those with degrees from the Department of Administrative Sciences is 85.5 percent. Most officers were Commanders (54.6) percent) at the time of the study, and 87.1 percent were in compliance with Department of Defense (DoD) guidelines for utilization. Surface warfare officers accounted for 41.5 percent of the 1985 cohort; and 75.4 percent met the DoD utilization guidelines. The cohort consisted mostly of males (85.9 percent), 80.7 percent of whom were utilized in compliance with DoD guidelines. Further research should be conducted with respect to the graduate education policies of the other Services, that NPS seek to develop a more accurate procedure and data base for tracking its graduates, and that the Navy consider modifying the current policy for subspecialty utilization.

A STUDY OF THE COMPARABILITY OF NAVAL ACTIVITY MOTOR VEHICLE COSTS

Gregory Scott Simmons-Lieutenant, United States Navy
B.S., Texas A & M University, 1985
Master of Science in Management-June 1993
Advisor: James M. Fremgen-Department of Systems Management

This thesis reports on a study conducted to determine the feasibility of using a sampling technique within the Department of the Navy to compare in-house motor vehicle costs with the costs that would be incurred were the General Services Administration or a civilian fleet management contractor employed to meet the Navy's motor vehicle needs. Such cost comparison studies are required by the Consolidated Omnibus Budget Reconciliation Act of 1985 (Public Law 99-272). The doubtful quality and wide dispersal in the available data on Naval activity in-house costs made it impossible to determine if costs are sufficiently similar between activities to justify the use of a sampling technique. It was recommended that the Navy remain watchful through the cost study process for indications that sampling may still be a viable technique. Additionally it was recommended that the cost reporting system be improved.

PROMOTION OPPORTUNITIES OF MINORITIES TO THE CONTROLLED GRADES IN THE NAVY NURSE CORPS

Peggy F. Simpson-Lieutenant Commander, Nurse Corps, United States Navy
B.S., Trenton State College, 1974
Master of Science in Management-December 1992
Advisor: Stephen L. Mehay-Department of Systems Management

Nursing is an overwhelmingly white, female occupation, a situation that has continued despite years of shortages in the nurse labor market as well as a general blurring of gender and racial/ethnic roles in society. This thesis analyzes the promotion opportunities of minorities (which includes men in nursing) to the controlled grades in the Navy Nurse Corps. Data are drawn from the Officer Master Files and the Officer Summary Records. Multivariate logistic regression models are estimated for each controlled grade; the models control for demographic, education, and Navy experience factors. Minority status and gender are found to be statistically insignificant factors affecting promotion at the Captain and Commander selection levels; however, at the Lieutenant Commander selection level, gender and minority status have a statistically significant negative effect on promotion. The thesis suggests further areas of research that will be necessary to identify other performance factors that may be associated with promotion differences by race/ethnic or gender status.

A COST AND OPERATIONAL EFFECTIVENESS ANALYSIS OF ALTERNATIVE ANTI-SURFACE WARFARE PLATFORMS

Walter Mark Skinner-Commander, United States Navy
B.S., United States Naval Academy, 1977
Master of Science in Management-June 1993
Advisor: Michael G. Sovereign-Department of Operations Research

A Cost and Operational Effectiveness Analysis (COEA) is performed for three alternative anti-surface warfare (ASUW) platforms that will conduct operations in multi-service, regional scenarios. Estimated program costs, historical cost variances, and measures of operational effectiveness are determined for each COEA alternative, and service life extension effects are examined. The data is merged in a mixed-integer optimization model, MPAMOD1, that develops the best implementation plan for each alternative. The solution of choice is an ASUW Improvement Program modified P-3C whose service life is extended through a Sustained Readiness Program. Historical cost variance of P-3C cost estimates proves inconsequential over the planning horizon. A second question is then examined, that of the cost effectiveness of major modification programs versus new production aircraft. Cost effectiveness of major modification programs becomes doubtful only when modification costs exceed 150% of original cost estimates.

. . . A LONGITUDINAL ANALYSIS OF THE ACCEPTANCE RATES OF THE NAVY'S VOLUNTARY SEPARATION INCENTIVE/SPECIAL SEPARATION BENEFIT (VSI/SSB) PROGRAM

David J. Skocik-Commander, United States Navy
B.S., United States Naval Academy
Master of Science in Management-September 1993
Advisor: Stephen L. Mehay-Department of Systems Management

This thesis investigates the behavior of Navy enlisted personnel who were eligible for the fiscal 1992 or fiscal 1993 VSI (Voluntary Separation Incentive) and SSB (Special Separation Bonus) Program. The objectives of this thesis are: (1) to determine the characteristics of individuals who do not accept VSI or SSB when initially offered, but rather wait for a period of time before making the acceptance decision, and (2) to determine if individuals are more likely to take the separation bonus during the initial phase of eligibility or during a later phase. Using data provided by the Defense Manpower Data Center, binomial and multinomial logit models are estimated to explain the factors affecting the timing of the separation decision. The results show that the statistically significant factors in the timing of the acceptance decision are consistent with those identified in previous studies as being significant to the overall take decision, and that the overwhelming majority of those who accept either VSI or SSB do so during their initial phase of eligibility. In addition, individuals who were eligible during the previous fiscal year (1992) are less likely to accept one of the separation bonuses in fiscal 1993. The thesis provides recommendations for adjusting program eligibility criteria to achieve desired acceptance results and also recommends future research.

AN ANALYSIS OF POST-SERVICE CAREER EARNINGS OF FEMALE VETERANS

Mark Raymond Sliepcevic-Lieutenant, United States Navy
B.A., University of Illinois at Chicago
Master of Science in Management-March 1993
Advisor: Stephen L. Mehay-Department of Systems Management

This thesis analyzes the post-service earnings of female veterans. A review of the literature on veterans' post-service earnings was conducted to gain some insight on the topic. The literature on womens' force participation was also reviewed. An empirical analysis was conducted based on a dataset constructed from the Reserve Components Survey of 1986. A log-earnings model was specified based on human capital theory. The intent of the model was to measure the effects of military training and veteran status on the post-service earnings of female veterans. These results were compared to a similar model of male veterans to analyze veteran-nonveteran wage differentials by gender. Overall, no measurable loss of income was incurred by female veterans who transferred their military skills to the civilian sector. Nonwhite females realized the greatest return to earnings from military experience. Also, there may be a real gain in earning power for female veterans when compared to male nonveterans. The relative gains in wages from military experience may last up to an average of nine years for female veterans.

ELECTRONIC PAYMENTS IN DOD CONTRACTING

Daniel Joseph Smith-Lieutenant, United States Navy
B.A., University of Notre Dame, 1982
Masters of Science in Management-June 1993
Advisor: Marty McCaffrey-Department of Systems Management

Electronic payment methods are rapidly changing the way in which invoices are paid, displacing the traditional paper check method. Electronic payments can provide a secure, rapid, accurate, and cost effective means for issuing and receiving payment, if properly implemented. This study provides an assessment as to whether or not the expanded use of electronic payments for DoD contracts is improving the contract payment process. Three DoD contract paying activities which have implemented electronic payment systems are examined: DFAS-Columbus Center (MOCAS system), Aviation Supply Office, Philadelphia (IDA system), and DFAS-Cleveland (STARS/SEPS system). An analysis of these systems, their objectives, and the difficulties associated with DoD payment/accounting processes is presented. A survey of defense contractors provides an assessment of electronic payment usage in private industry, as well as an evaluation of DoD's electronic payment capabilities from a "customer" perspective. Several suggestions which may help make DoD electronic payment capabilities more effective are offered.

PREDICTING SUCCESS AT MARINE SECURITY GUARD (MSG) SCHOOL UTILIZING THE HEADQUARTERS MASTER FILE (HMF)

Michael James Snyder-Captain United States Marine Corps
B.B.A., University of Texas, 1984
Master of Science in Management-March 1993
Advisors: Alice M. Crawford & Benjamin J. Roberts-Department of Systems Management

The objective of this study is to utilize background characteristics to determine predictors of success from Marine Security School. The data used consist of files on fifteen MSG Classes of sergeants (E5s), corporals (E4s), and lance corporals (E3s) who reported to MSG Battalion for school. These classes cover the period from December 1989 to September 1991. The data file included close to 20 background characteristics that were evaluated in this study. The logistic procedure was selected to analyze this data set since it gives a more precise picture of results than simple regression when using multiple independent variables. Six variables were found to be statistically significant below the ten percent level in predicting success of Marines at MSG school. These are the physical fitness score, rifle score, GT score, current age, current grade, race, and time in grade. Using the logit model, example cases are presented to show the user how each Marine's individual characteristics affect the probability of success or failure from MSG school.

ACTIVITY-BASED COSTING IN A SERVICE ORGANIZATION

Frank W. Spence-Commander, United States Navy
B.S., United States Naval Academy, 1977
Master of Science in Management-June 1993
Advisor: Kenneth J. Euske-Department of Systems Management

Relative to the research on activity-based costing in manufacturing environments, very little research has been done in service organizations. This thesis is a comparative analysis of a traditional cost accounting system with an activity-based cost accounting system in a medium-sized mass transit system. The purpose of the analysis was to determine whether activity-based accounting techniques can effectively be applied in a service industry. In addition, a goal for the thesis was to determine which costing system reports a more precise estimate of the cost of the output. The author concluded that an activity-based system does provide a more precise estimate of the output costs.

NAVAL AIR STATION CUBI POINT: A "HOT TURNOVER"? A MANAGEMENT CASE STUDY

Kathleen M. Steckler-Lieutenant, United States Navy
B.A., University of New Mexico, 1985
Master of Science in Management-September 1993
Advisor: Kenneth J. Euske-Department of Systems Management

This thesis could be used as a complementary case to the case study entitled "U.S. Naval Complex at Subic Bay", by LT Larry J. Steckler, January 1993, to provide a follow-on Navy example of a management case study for use at the graduate teaching level. While the former case provides a general overview of the entire United States Naval Complex at Subic Bay, Republic of the Philippines, this case focuses on the withdrawal evolution in a narrower perspective, specifically the unique "Hot Turnover" of Naval Air Station Cubi Point, with a myriad of strategic planning problems and emerging management control systems. The intent of this case is to continue the analysis of the planning and controls to encompass the politically sensitive "Hot Turnover" issue, and complete the entire withdrawal process within the constraints of the partially executed Subic Bay withdrawal effort.

THE UNITED STATES GOVERNMENT WITHDRAWAL AND SUBSEQUENT CLOSURE OF THE UNITED STATES NAVAL COMPLEX AT SUBIC BAY, REPUBLIC OF THE PHILIPPINES: A MANAGEMENT CASE STUDY

Larry Jerome Steckler-Lieutenant, United States Navy
B.A., University of New Mexico, 1985
B.B.A., National University, San Diego, 1985
Master of Science In Management-December 1992
Advisor: Kenneth Euske-Department of Systems Management

There are numerous examples of corporate and public management case studies in use at various institutions of higher learning. Few military specific examples of published case studies are available from which to compare and contrast management principles currently used in the United States Navy to those employed in the corporate and public sectors. This thesis uses data from the recently completed withdrawal and closure of the United States Naval Complex at Subic Bay, Republic of the Philippines, to develop a Navy example of a management case study for use at the graduate teaching level. The focus of the case is to illustrate the issues in the development and operation of a large scale control system that has limited life purpose. Specifically, the case focuses on events occurring from late calendar year 1991 through the beginning of calendar year 1992 and demonstrates the evolution of management controls by the Commander-in-Chief United States Pacific Fleet to implement planning strategies for the eventual closure of the Subic Bay Naval Complex.

A UNIVERSAL DICTIONARY OF ACQUISITION AND CONTRACTING TERMS

Jack Lloyd Stem-Lieutenant, United States Navy
B.S., United States Naval Academy, 1985
Master of Science in Management-June 1993
Advisor: David V. Lamm-Department of Systems Management

This thesis is the initial effort to establish a universal dictionary of acquisition and contracting terminology. As a continuation of research initiated by LCDR Daniel Ryan, Supply Corps, United States Navy to establish a basis for defining words and terms used in the field of contracting, the fifty terms selected for this thesis were taken from the dictionary of acquisition and contracting terms which is maintained through thesis research conducted within the National Contract Management Association. This work differs from previous research in that it takes the terms from those efforts and attempts to attain, through questionnaire results from four national acquisition and contracting professional associations, a general consensus for commonly held terminology. This research is the initial effort conducted by students at the Naval Postgraduate School, Monterey, California.

APPLICATION OF THE MINITRIAL IN DEPARTMENT OF DEFENSE CONTRACT DISPUTES

Chris Kennedy Stream-Lieutenant Commander, Supply Corps, United States Navy
B.S., Saint Louis University, 1981
Master of Science in Management-June 1993
Advisor: Nancy C. Roberts-Department of Systems Management

Contract disputes between the Department of Defense (DoD) and its contractors are steadily rising. This growth in Government contract litigation is fueled in large part by the myriad of procurement regulations and laws that now permeate the acquisition and contracting arena. This thesis first explores previous Government attempts to arrest the proliferation of litigation through the Contract Disputes Act of 1978, and then discusses initial attempts at utilizing alternative disputes resolution (ADR) methods as alternatives to traditional courtroom battles. One such ADR methodology is the minitrial, which has been used successfully by private industry since the early 1980s. Details of a "typical" minitrial are provided, including its advantages and disadvantages. Additionally, criteria are established to assist in determining whether a minitrial would be beneficial in resolving disputes between the DoD and one of its defense contractors. Finally, recommendations are presented for utilizing ADR, specifically the minitrial, as a viable alternative to litigation.

THE IDENTIFICATION OF EARLY WARNING SIGNALS PRIOR TO CONTRACTOR DEFAULT

Roch Anthony Switlik-Captain, United States Army
B.B.A., Pittsburg State University, 1984
Master of Science in Management-December 1992
Advisor: David V. Lamm-Department of Systems Management

The purpose of this thesis was to investigate the contract administration process, during contract performance, prior to the point at which a Termination for Default (T for D) decision is made. The objective of this thesis was to determine if there are systemic indicators that may provide early warning signals to contract administrators, during performance of the contract, that the contractor may fail in complying with the contractual obligations, thus being Terminated for Default. This research was limited to Fixed-Price Supply-type contracts. The data for this research were obtained through literature research, telephone interviews and survey questionnaires conducted with various Defense Logistics Agency organizations. This thesis concludes by providing a "Performance Indicator Management Model," developed by the researcher, based upon the data obtained from this research. This model focuses on the major areas of contract performance, monitored by contract administrators and provides the most effective indicators, that provide advance warning of contractor difficulty, that may lead to default.

JUST-IN-TIME INVENTORY MANAGEMENT: APPLICATION AND RECOMMENDATIONS FOR NAVAL HOSPITAL, OAKLAND

Stephen Brooks Symonds-Lieutenant, Medical Service Corps, United States Navy
B.A., Franklin Pierce College, 1974
M.A., Central Michigan University, 1980
Master of Science in Management-December 1992
and
Bill Carver Kinney-Lieutenant Commander, Medical Service Corps, United States Navy
B.B.A., New Mexico State University, 1977
M.S.H.A., University of Colorado at Denver, 1989
Master of Science in Management-December 1992
Advisor: Nancy Roberts-Department of Systems Management

The purpose of this research was to provide recommendations to personnel at Naval Hospital, Oakland, in examining the applicability of a Just-in-Time (JIT) inventory management system. JIT is a philosophy that can be applied to inventory management operations to reduce waste, achieve cost savings, maximize space, and improve quality of care. In the healthcare environment, a prime vendor program is essential to a successful JIT program. With the advent of a prime vendor program at Naval Hospital, Oakland, the advantages offered by JIT become available. With diminishing budgets, material managers must adopt innovative practices that reduce resource requirements, while providing high quality care. JIT is an innovative approach to inventory management that has been successfully applied in the healthcare industry. The authors examine JIT and how this philosophy an further the goals of the prime vendor program and increase quality of care.

EVALUATING THE BIAS OF ALTERNATIVE COST PROGRESS MODELS: TESTS USING AEROSPACE INDUSTRY ACQUISITION PROGRAMS

David A. Tagg-Captain, United States Marine Corps
B.S., Auburn University, 1986
Master of Science in Management-December 1992
Advisor: O. Douglas Moses-Department of Systems Management

This study evaluates the quality of cost estimates produced by each of four cost progress models -- a random walk model, the traditional learning curve model, a production rate model (fixed-variable model), and a model incorporating both learning curve and production rate effects (Bemis production rate adjustment model). Emphasis is on assessing the level of bias associated with these models and determining the influence of various factors on model performance. Findings indicate, on average, the learning curve and Bemis models underestimate unit costs, while the random walk and fixed-variable models overestimate unit costs. Different factors are evaluated to determine their significance in explaining variations in the bias of unit cost predictions and relationships between the significant variables and model cost prediction bias are described. Findings indicate the Bemis model is superior to the other cost progress models because it exhibits the least bias and is not significantly influenced (in terms of bias) by variations in the factors considered.

A COMPARATIVE ANALYSIS OF TOTAL QUALITY MANAGEMENT AND COMPLIANCE INSPECTIONS AS THE CONTROL MECHANISM FOR THE COAST GUARD'S AFLOAT CENTRALIZED SUPPLY SYSTEM

Robert S. Thien-Captain, United States Marine Corps
B.S., Rochester Institute of Technology, 1985
Master of Science in Management-December 1992
and
Vincent B. Atkins-Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1982
Master of Science in Management-December 1992
Advisors: Susan Hocevar & Gail F. Thomas-Department of Systems Management

This thesis examines the Coast Guard's current compliance-oriented inspections and considers Total Quality Management (TQM) as an alternative control mechanism aboard the Coast Guard's High Endurance Cutters. This comparative analysis is based on a review of applicable literature and data gained through field interviews. The Coast Guard's use of an overlay structure to increase innovation is analyzed. Research on parallel learning structures suggests that questions remain about the impact such structures may have on transforming Coast Guard culture. A comparative analysis is used to weigh the merits of compliance systems and the self-control mechanisms of The Quality Advantage, the Coast Guard variant of TQM. A basic model of control serves as a framework for comparison. Significant differences in philosophy, control processes and results are noted. The major goals of organizational efficiency and innovativeness are impacted differently by the two systems.

OPTICAL DISK STORAGE AND RETRIEVAL OF NPS THESES

James G. Thomas-Lieutenant, Supply Corps, United States Navy
B.B.A., University of New Mexico, 1981
Master of Science in Management-December 1992
Advisor: Barry Frew-Department of Computer and Information Services

Storage and retrieval of hard copy Naval Postgraduate School theses is time consuming, and costly in man-hours and storage space. Storage and retrieval of thesis from optical disk can be faster and more cost effective. If NPS theses are stored on optical disk, an efficient means of retrieval would be required to gain access to the stored information. This requires a specialized software program dedicated to retrieving the stored information. There are numerous software products available commercially that retrieve stored information. These products range from very basic and inexpensive to more sophisticated and expensive. This thesis will attempt to determine which commercial retrieval software should be used to access theses stored on optical disk.

A MATHEMATICAL MODEL FOR FIXED-PRICE-INCENTIVE-FIRM CONTRACTS

Terry Nelson Toy-Lieutenant Junior Grade, United States Coast Guard
B.S., United States Coast Guard Academy, 1989
Master of Science in Management-December 1992
Advisor: Katchan L. Terasawa-Department of Systems Management

This research focuses on a mathematical model for Fixed-Price-Incentive-Firm (FPIF) type contracts. The model revolves around the concept of a balanced trade-off among different options available to the user. At one extreme, the model develops a FPIF arrangement that gives the contractor a strong incentive to underrun costs, but strict penalties if he overruns. At the other extreme, the model develops a FPIF arrangement that gives the contractor minimal incentive to underrun, yet significant protection against an overrun. The mathematics of the model uses integral calculus to balance each of the options such that both the expected profit for the contractor and the expected cost to the Government do not change as the user selects different options. In this computation, the subjective probability density function for the cost is assumed to remain constant. This process attempts to accommodate the contractor based on his composite attitude toward risk and utility, yet does not obstruct the Government's objective to minimize cost.

EXTERNAL AND INTERNAL FACTORS SHAPING THE JAPAN MARITIME SELF-DEFENSE FORCE (JMSDF)

Shinji Tsukigi-Lieutenant Commander, Japan Maritime Self-Defense Force
B.S., Japan Defense Academy, 1980
Master of Science in Management-June 1993
Advisors: Katchan L. Terasawa & Gregory G. Hildebrandt-Department of Systems Management

This thesis examines factors shaping the Japan Maritime Self-Defense Force (JMSDF). It focuses on issues concerning Japan's financial resources to improve the JMSDF in the future and the level of complementarity overall between the JMSDF and the U.S. Navy. The examination reveals that there is a high level of complementarity overall between the JMSDF and the U.S. Pacific Fleet. This relationship is most likely going to continue into the future. The JMSDF most likely will not have financial resources it will need to enhance its inventory much beyond its current force level because of the mounting pressure of other domestic budgetary needs and a lower expected Gross National Product (GNP) rate of growth. It is concluded that the future direction of the JMSDF will be that of keeping an effective complementary relationship with that of the U.S. Navy.

THE EFFECTS OF THE MAINTENANCE TRAINING IMPROVEMENT PROGRAM ON UNIT PERFORMANCE

James Ming Tung-Lieutenant Commander, United States Navy
B.S., Northrop Institute of Technology, 1973
Master of Science in Management-June 1993
Advisor: Alice Crawford-Department of Systems Management

A study was conducted to determine whether the Maintenance Training Improvement Program (MTIP) has any relationship to unit performance of the west coast F-14 and E-2 squadrons. Using correlation analysis, the MTIP completion rate was compared with operational measures such as the Full Mission Capable (FMC) rate, the number of no-defect (malfunction code A-799) maintenance actions, and the Direct Maintenance Manhours per Flight Hour (DMMH/FH). A moderate positive correlation was found between the MTIP completion rate and the FMC rate, and a moderately weak negative correlation was found between the MTIP completion rate and the number of A-799 maintenance actions. There was no correlation found between the MTIP completion rate and the DMMH/FH. These relationships have provided some insight with encouraging implications for further research to assess the existing training program.

THE IMPACT OF THE DEFENSE BUDGETING PROCESS ON OPERATIONAL READINESS

Leslie S. Turley-Lieutenant, United States Navy
B.G.S., University of Kansas, 1984
Master of Science in Management-March 1993
Advisors: Patrick J. Parker-Department of National Security Affairs &
Larry R. Jones-Department of Systems Management

This thesis will examine the Department of Defense Planning System, past, present, and one of the many alternatives proposed for the future. Emphasis will be placed on the impact the present planning system has on near-term warfighting capabilities. The present system, centered in the Pentagon, has a time horizon of 5 to 15 years. Emphasis is placed on planning future programs and addressing outyear costs and capabilities; near-term warfighting capabilities may not receive the attention necessary to achieve current combat readiness. It is the contention of this thesis that in conjunction with reforms implemented to enhance the responsibility and authority of the unified and specified commands, the resource allocation process must also be changed to provide this level of management direct control of resources to meet the acquisition and operational needs necessary to achieve mission objectives.

AN ANALYSIS OF TRADITIONAL OPERATIONAL TESTING TO PROJECT HOW TESTING WILL BE CONDUCTED IN THE FUTURE

Lawrence Leroy Turner, Jr.-Captain, United States Army
B.S., Texas A&M University, 1983
Master of Science in Management-September 1993
Advisor: Nancy C. Roberts-Department of Systems Management

The purpose of this thesis is to analyze current operational testing and to alert the reader to how testing will be conducted in the future. This analysis is conducted from a tester's point of view and is targeted at program offices so that Program Managers will be able to ensure that beneficial operational testing is conducted on their programs. The thesis also provides a detailed description of current and future systems used to instrument development systems, analyze the test data, and produce a final test report. It also provides a detailed analysis of a testing tool called Model-Test-Model (M-T-M). The goal of M-T-M is to save the Army time and money by using a validated model to provide operational test data. Finally, the thesis provides an analysis of the changes that will need to be made in the T&E community as a result of a new defense environment. These areas include the need for minimizing duplication between development and operational testing, using modeling and simulation, and taking advantage of other areas where testing costs can be reduced.

IMPLEMENTATION OF ELECTRONIC DATA INTERCHANGE IN THE DEPARTMENT OF DEFENSE: LESSONS LEARNED FROM PRIVATE INDUSTRY

Robert Burchel Turner-Lieutenant, United States Navy
B.S., Clemson University, 1980
Master of Science in Management-June 1993
Advisor: Myung W. Suh-Department of Systems Management

The Department of Defense (DoD) has emphasized Electronic Data Interchange (EDI) since 1988 when the Deputy Secretary of Defense issued a policy directive that EDI was to become "the way of doing business" for DoD in the future. The focus of this research is on how private industry is implementing EDI, and specifically how EDI is being used in the procurement and acquisitions environment. The results from a survey of private industry showed that 1) EDI use will continue to grow in the procurement environment and that most impediments to EDI will be resolved with time and experience; 2) EDI must be adopted by the critical mass before the full benefits and savings will be recognized by DoD and industry; 3) top level management support and a detailed, well thought out strategic EDI plan are mandatory for successful implementation of EDI; and 4) the transaction sets currently being used by private industry for procurements and acquisitions limit DoD EDI opportunities for large purchases. Recognizing these conclusions, recommendations to DoD are then presented.

AN ANALYSIS OF NAVY DIRECT APPOINTMENT PHYSICIAN RECRUITMENT

Kelly A. Vandever-Lieutenant, United States Navy
B.A., Iowa State University, 1985
Master of Science in Management-March 1993
Advisors: Stephen L. Mehay & Carol Mitchell-Department of Systems Management

The Navy recruits a portion of its physician manpower directly from the civilian work force and from medical residency programs. The Navy has had difficulty recruiting these doctors, called direct appointment physicians, for the past 13 years. This study analyzes some of the pecuniary and nonpecuniary aspects of physician recruitment in an effort to improve the recruitment process. A regression model was estimated to establish a baseline projecting model for physician supply. The results support the hypothesis that, if the pay gap between military and civilian physicians narrows or if the number of recruiters increases, the number of direct appointment physicians accessed will increase, all else constant. However, the changes necessary to increase the number of physicians recruited are substantial. A survey was conducted to ascertain what nonpecuniary factors were important to direct appointment physicians. Only one factor, patriotism,was indicated by a majority of survey respondents as a reason for joining the Navy, and that was mentioned by only 51.9 percent of the respondents. The thesis recommends that additional data be collected to estimate a more robust regression model and that the survey of all Navy direct appointment physicians be redesigned.

USING A UNIT COST MODEL TO PREDICT THE IMPACT OF BUDGET CUTS ON LOGISTICS PRODUCTS AND SERVICES

Cleve Jan Van Haasteren-Lieutenant Commander, Supply Corps, United States Navy
B.S., Central Connecticut State University, 1980
Master of Science in Management-December 1992
Advisor: William R. Gates-Department of Systems Management

The Director of the Trident Integrated Logistics Support Division at the Naval Sea Systems Command manages a complex and dynamic budget that supports the provision of logistics products and services to the Trident Submarine Fleet. This thesis focuses on analyzing the Logistics Division budget and developing a model where the impact of a budget cut can be predicted by employing marginal cost. The thesis also explores the use of regression analysis as a means of forecasting the output of logistics end products. These forecasts are used in conjunction with historical cost data in the unit cost model. Recommendations for further research are included in Chapter V.

THE EFFECTS ON WEAPON SYSTEMS' PRODUCIBILITY OF SUSPENDING SYSTEM DEVELOPMENT AFTER ADVANCED TECHNOLOGY DEMONSTRATION (ATD)

Frank Varnado, Captain, United States Army
B.S., Austin Peay State University, 1989
Master of Science in Management-March 1993
Advisor: Thomas H. Hoivik-Department of Systems Management

The purpose of this thesis is to analyze the significant effects on producibility of weapons systems caused by suspending system development after prototype development. The focus of this thesis is to develop and recommend appropriate actions that DoD could take to reduce the producibility risk associated with implementation of Advanced Technology Demonstration (ATD) strategies. It includes an analysis of the Defense Science and Technology Strategy Thrust Seven, "Technology for affordability." It also provides a critical examination of ATD interfaces: SIMNET, CAD/CAM, CIM, CAE, CAPP, CADFM, Rapid Prototyping, and Agile (flexible) Manufacturing. An in depth analysis of Design For Manufacturability (DFM) and its potential effects on program cost is also conducted. Representative producibility assessments performed on the A-12 composite air frame and the Comanche helicopter airframe provide a basis for comparative analysis. The thesis concludes that rapid advances in manufacturing and information technologies offer potentially significant improvements in future RD&A efforts. It recommends that DoD pursue advanced technology enabling methodologies, enhanced (computer aided) systems integration, increased standardization and optimized use of critical manufacturing resources. It also recommends that DoD organize and capitalize a Defense Science and Technology Affordability Research Center (DSTARC).

FINDING BEST VALUE IN TWO-STEP SEALED BIDDING

Kirk F. Vollmecke-Captain, United States Army
B.A., Centre College of Kentucky, 1984
Master of Science in Management-December 1992
Advisor: David V. Lamm-Department of Systems Management

Two-step sealed bidding is a viable procurement method for expanding the role of best value and nondevelopmental item (NDI) acquisitions. The objective of this research was to determine the feasibility of using two-step for obtaining best value in NDI acquisitions. The research was conducted by a review of regulations, policy guidance, and previously published materials. An important aspect of the research was the interview process conducted with procurement officials in the Defense Department and industry. The research provides a comprehensive look at NDI acquisitions, two-step sealed bidding, and best-value contracting. This study analyzed the following major issues: defining best value, increasing the effectiveness of NDI acquisitions, and finding best value in a two-step method. The research developed a two-step model for getting best value in NDI acquisitions. Major conclusions are: the concept of best value can be applied to a two-step method, much ambiguity exists in regards to the true meaning of "nondevelopmental," and regulatory impediments keep two-step from implementing a conventional best-value approach. major recommendations are: a two-step model should be used for obtaining best value in NDI acquisitions, and two potential modifications should be made to strengthen this model by allowing supplier prequalification and fixed-price-award-fee contract type.

AN ANALYSIS OF SPECIFIC COGNIZANCE SYMBOL MATERIAL IN THE ADVANCED TRACEABILITY AND CONTROL (ATAC) PROGRAM

Raymond A. Walker-Lieutenant, United States Navy
B.A., North Carolina State University, 1979
Master of Science in Management-December 1992
and
Vance G. Mahaffey-Lieutenant Commander, United States Navy
B.B.A., Valdosta State College, 1979
Master of Science in Management-December 1992
Advisor: Alan W. McMasters-Department of Systems Management

The purpose of this thesis is to conduct a statistical analysis of the behavior of Deport Level Repairables (DLRs) by individual Cognizance Symbol (COG) in the Advanced Traceability and Control (ATAC) Program. It begins with a background of the ATAC program and the steps of current operating procedures of ATAC. The ATAC system is then analyzed by individual COG at each step to show a characteristic day-to-day behavior of a COG in the system. The database maintained by the Navy Material Transportation Office (NAVMTO) spanning one year, from 31 August 1990 to 31 August 1991, was used to obtain the necessary details. Finally, problems identified in the NAVMTO database and problems discovered in the DLR turn-in process are discussed.

AN ANALYSIS OF COAST GUARD ENLISTED RETENTION

Kurt R. Wellington-Lieutenant Commander, United States Coast Guard
B.S., United States Coast Guard Academy, 1978
Master of Science in Management-March 1993
Advisor: George W. Thomas-Department of Systems Management

This thesis investigated the factors that influence the retention of Coast Guard enlisted personnel. A multivariate regression model was developed for a sample of 377 first-term, four-year males. The model was estimated using data from the Coast Guard Personnel Management Information System data base (demographic, trainability, enlisted, enlisted performance and unit characteristics), and results from the Coast Guard 1991-1992 CAREER DECISION SURVEY to determine their relative importance in retention behavior. The results suggested that members' trainability (measured by AFQT scores) and age upon original entry into the service had important effects upon retention. Personnel who thought about leaving the service most due to command climate and coworker issues were more likely to leave the service than personnel who thought about leaving the service most due to pay and benefits, self-development, working environment and family and personal life issues. This suggests that policies which improve general working conditions and job satisfaction, as well as self-development and pay and benefits issues and service impact upon personal and family life appear to have positive impacts upon retention. Detailed recommendations were provided for additional variables in the model and survey improvement. These findings can help Coast Guard managers and manpower planners understand the important influences upon junior enlisted personnel retention decisions and the impact personnel policies can have upon those decisions.

A COHORT ANALYSIS OF CAREER PROGRESSION FOR ETHNIC AND FEMALE OFFICERS IN THE U.S. NAVY

Lisa R. Werkhaven-Lieutenant Commander, United States Navy
B.S., Muskingum College, 1980
Master of Science in Management-March 1993
Advisor: Paul R. Milch-Department of Operations Research

The goal of this thesis was to conduct a cohort analysis to compare the career opportunities, it terms of loss and promotion rates, of Black, Hispanic and female naval officers with those of white ethnic and male officers, respectively. Inventory and promotion data was compiled from the Officer Personnel Information System data file to compute ethnic/gender loss and promotion rates for year groups 1960-1991 in the Surface, General Unrestricted Line, Aviation and Submarine communities. Computation of loss and promotion rates was conducted in three stages. The first stage computed rates for each year group by year of service (YOS). The second stage computed rates averaged across year groups for each YOS. The third stage computed rates within milestone periods which grouped YOSs into six or seven significant periods in each community's career path. Rates were averaged for each milestone period across several year groups and all YOS's within that period. This study found differences in loss and promotion rates specific to each community and ethnic/gender group. In many cases, higher loss rates were accompanied by lower promotion rates for the ethnic and gender groups studied, with notable exceptions. Further research is recommended to determine reasons for differences in loss and promotion rates as well as to conduct a similar study in five to ten years, in which time more data would become available.

AN EVALUATION OF THE DOD INVENTORY REDUCTION PLAN AND ITS EFFECTS ON INVENTORY MANAGEMENT PRACTICES AT THE AVIATION SUPPLY OFFICE AND FLEET READINESS AT NADEP ALAMEDA

Derric Thomas White-Lieutenant, Supply Corps, United States Navy
B.B.A., Northeast Louisiana University, 1981
Master of Science in Management-June 1993
Advisor: David G. Brown-Department of Systems Management

The DoD Inventory Reduction Plan (IRP) was mandated by Congress in May 1990 to meet the challenge of re-sizing Defense inventories while maintaining the gains in readiness resulting from the defense strategy of the 1980s. This thesis is an evaluation of the effects of implementing the IRP on Navy inventory management practices at ASO, and on readiness at NADEP Alameda. "G" management (GMAN) reports and supply effectiveness data provided by FISC Oakland were utilized in making overall readiness and level of service determinations. The Navy's organization and major management initiatives relating to the IRP are also discussed. Finally, an assessment is made of what is currently being done by the private sector to reduce inventory levels and whether application of these systems and/or practices can be utilized by the military to reduce secondary item inventory levels.

ANALYSIS OF MILITARY COST CUTTING INITIATIVES IDENTIFIED DURING THE DEFENSE MANAGEMENT REVIEW PROCESS

Thomas Frederick Wiechelt-Lieutenant, United States Navy
B.S., Clarion University of Pennsylvania, 1981
Master of Science in Management-December 1992
Advisor: Dan C. Boger-Department of Systems Management

Faced with the likely prospect of steadily declining defense budgets President Bush initiated the Defense Management Review (DMR). In response to this review, DoD agencies identified $38B in cost savings initiatives. This thesis provides the reader with a comprehensive analysis of those transportation-related initiatives addressed by specific Defense Management Review Decisions (DMRD) as well as those that indirectly emanated from the general DMR process. Also included is an introduction to the complicated issue of transportation funding which covers both the Defense Business Operations Fund (DBOF) and unit costing. Finally, the author discusses the current funding shortfall that the Air Mobility Command (AMC) is experiencing as a result of the reduction in military transportation budgets. The author concludes with a summary of the discussed issues, highlighting the strengths and weaknesses of each.

OCEAN VENTURE '92: AN ASSESSMENT OF A MARITIME PREPOSITIONING FORCE/JOINT LOGISTICS OVER THE SHORE INSTREAM OFFLOAD EXERCISE

Janet Wiley-Lieutenant, United States Navy
B.S., Winona State University, 1980
Master of Science in Management-June 1993
and
Sharon Barrett-Lieutenant, United States Navy
B.F.A., University of Cincinnati, 1982
Master of Science in Management-June 1993
Advisors: Dan C. Boger & David G. Brown-Department of Systems Management

The movement of supplies from ship to shore to support military forces in or near combat areas has historically been difficult and time consuming. The Marine Corps and the Army have developed their own systems for satisfying their logistical needs. The Marine Corps had embraced the prepositioning concept, while the Army has relied on moving forces and utilizing logistics over the shore capabilities. Regardless of the offload method used, the efficient delivery of containerized cargo and equipment is critical to the establishment of forces ashore. During May 1992, a Maritime Prepositioning Force (MPF) and Joint Logistics Over the Shore (JLOTS) exercise was conducted at Onslow Beach, North Carolina, to test these delivery systems. Ocean Venture '92 provided a low- to mid-intensity platform for examining MPF and JLOTS capabilities. This thesis presents the organizations and equipment requirements for MPF and JLOTS operations and assesses the effectiveness of Ocean Venture '92 with respect to accomplishing key objectives, problem identification, lessons learned and recommendations for improving future MPF and JLOTS operations.

AN ANALYSIS AND DEVELOPMENT OF A PROCESS AND GUIDE FOR THE CONDUCT OF THE PROCUREMENT MANAGEMENT REVIEW WITHIN THE U.S. MARINE CORPS

James M. Williams-Captain, United States Marine Corps
B.S., United States Naval Academy, 1985
Master of Science in Management-December 1992
Advisor: Rebecca J. Adams-Department of Systems Management

This thesis analyzes the conduct of the Procurement Management Review (PMR) within the Defense Logistics Agency (DLA), the Army, the Navy, and the Air Force in order to develop a process and guide for the Marine Corps in its conduct of the PMR on the Marine Corps Field Contracting System. The objectives are to produce a user/management guide that will focus review efforts on the goal of procurement process improvement instead of deficiency reporting; minimize preparation time by HQMC evaluators; streamline the preparation effort and performance by the field contracting offices; and create a cooperative, nonadversarial environment in order to improve procurement efficiency and effectiveness. The development will proceed with a study of DLA and other Services' procedures concerning their management philosophy regarding PMR conduct, their organization for conducting PMRs, and their measurement of legal and regulatory compliance. An incremental approach to Total Quality Management (TQM) implementation will be introduced to the conduct of the PMR.

A COMPARISON OF THE POST-COLD WAR DEFENSE BUDGET REDUCTION TO PRIOR POST-CONFLICT REDUCTIONS AFTER WORLD WAR II, KOREA AND VIETNAM

Edwin Ferebee Williamson-Lieutenant Commander, United States Navy
B.S., East Carolina University, 1976
Master of Science in Financial Management-September 1993
Advisor: Jerry M. McCaffery-Department of Systems Management

This thesis compares the current drawdown in defense budgets to those which occurred after World War II, Korea and Vietnam. Each post-conflict period is examined with respect to the Department of Defense and Department of the Navy, comparing the degree and rate of reductions in budgets, manning and ships. There are three principal conclusions drawn from the research. First, that President Eisenhower was uniquely successful among post-conflict Presidents in maintaining the balance between force levels and funding during post-conflict drawdowns. Second, that the post-Vietnam "hollow forces" occurred when funding was insufficient in the face of inflation to sustain the change to the all volunteer force. Third, that early signs in the current reduction point to the possibility of similar difficulties in balancing reductions in forces and budgets.

EVALUATING THE TRADE-OFFS INHERENT IN STRATEGIC SEALIFT

Kris Winter-Lieutenant, United States Navy
B.A., West Virginia Wesleyan College, 1984
M.B.A., University of LaVerne, 1991
Master of Science in Management-June 1993
Advisors: Dan C. Boger & David G. Brown-Department of Systems Management

This thesis examines some of the trade-offs to be considered when assigning sealift to a deployment. How sealift costs are defined, calculated and assigned is discussed. The trade-offs between different voyage characteristics, vessel types, and vessel mixes are compared using time and money as the standard measures. Recommendations for further use of trade-off analyses are also presented.

SPARE PARTS NONAVAILABILITY: THE IDENTIFICATION OF IMPEDIMENTS TO SPARES ACQUISITION

Milton E. Wynn, III-Captain, United States Army
B.A., North Georgia College, 1982
Master of Science in Management-December 1992
Advisor: Rebecca J. Adams-Department of Systems Management

The primary intent of this research effort is to provide an identification and analysis of impediments to the acquisition of spare parts. The focus of the research was in the area of Army rotary wing aviation spare parts. The researcher delved into both pre-nonavailability and post nonavailability issues and sought to establish responsibility for their resolution. It looked at such factors as those general factors shaping the procurement environment, and information gathered through archival research, interviews, questionnaires and selected component case analysis. It was apparent from the research that a myriad of causes of spares nonavailability exist. Some of these are controllable and some are outside the realm of reasonable control by those in the acquisition community. It also discussed the aggressive, iterative use of risk management to apply limited resources to those areas with demand the most attention due to their relative program impact should difficulties in sustainability be encountered.

A DICTIONARY OF ACQUISITION AND CONTRACTING TERMS

Maher M. Zarou-Lieutenant Commander, Supply Corps, United States Navy
B.S., George Mason University, 1979
Master of Science in Management-December 1992
Advisor: David V. Lamm-Department of Systems Management

This thesis is a continuation of research initiated by Lieutenant Commander Daniel F. Ryan, Supply Corps, United States Navy to establish a basis for defining words and terms used in the field of contracting. Concurrent research in this area is being conducted by students at the Naval Postgraduate School, Monterey, California and the Air Force Institute of Technology, Wright-Patterson Air Force Base, Dayton, Ohio. The twenty-five terms selected for this investigation were taken from a master list of contracting terms developed by previous researchers. A synthesized definition was developed for each term from various published sources. The synthesized definitions were then scrutinized by a selected group of contracting professionals. Their comments were then used to develop a revised definition based upon consensus.

MASTER OF SCIENCE
IN
MECHANICAL ENGINEERING

THEORETICAL STUDY OF LAMINAR FILM CONDENSATION ON HORIZONTAL ELLIPTICAL TUBES UNDER CONDITIONS OF FREE AND FORCED CONVECTION

Vance Hiro Adams-Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1978
Master of Science in Mechanical Engineering-March 1993
Mechanical Engineer-March 1993
Advisors: Paul J. Marto & Steven B. Memory-Department of Mechanical Engineering

Analytical studies have been made of laminar film condensation on a horizontal elliptical cylinder in a pure saturated vapor under conditions of free and forced convection. Estimation of interfacial shear stress was made in two ways: the first involving an asymptotic value of the shear stress under conditions of infinite condensation rate and the second based on simultaneously solving the two-phase vapor boundary layer and condensate equations. The latter approach enables the determination of the vapor boundary layer separation point. For the assumption of asymptotic shear stress, effects of surface tension and pressure gradient in the condensate film have also been included. At the extremes of eccentricity, corresponding to a circular tube and a vertical flat plate, the results are compared with theoretical and experimental work of others. Improvement in the condensation heat transfer coefficient was found for elliptical tubes under both free and forced convection conditions when compared to circular tubes of the same surface area. In the latter case, this improvement was due mainly to the reduced drag of the elliptical tube providing a higher vapor velocity for the same pressure drop as that across a circular tube.

A SURFACE INTEGRAL ALGORITHM FOR THE MOTION PLANNING OF NONHOLONOMIC MECHANICAL SYSTEMS

David P. Anderson-Captain, United States Army
B.S., United States Military Academy, 1983
Master of Science in Mechanical Engineering-December 1992
Advisor: Ranjan Mukherjee-Department of Mechanical Engineering

The number of coordinates needed to completely describe the configuration of a holonomic mechanical system is equal to the number of degrees of freedom possessed by that system. In contrast, nonholonomic systems always require more coordinates for their description than their degrees of freedom due to the nonintegrable nature of the governing velocity constraints. The task of nonholonomic motion planning applied to a given system is to develop trajectories of the independent coordinate variables such that the entire system is driven to some desired point in its configuration space. An algorithm for constructing these trajectories is presented. In this algorithm, the independent variables are first converged to their desired values. The dependent variables are subsequently converged using closed trajectories of the independent variables. The requisite closed trajectories are planned using Stoke's Theorem which converts the problem of finding a closed path in the space of the independent variables to that of finding a surface area in that same space such that the dependent variables converge to their desired values as the independent variables traverse along the boundary of the surface area. The use of Stoke's Theorem simplifies the motion planning process and also answers important questions pertaining to the system. The salient features of the algorithm are apparent in the two examples discussed: a planar space robot and a disk rolling without slipping on a flat surface.

OUT OF PLANE SOLUTIONS OF SUBMARINES IN FREE POSITIVE BUOYANCY ASCENT

Ibrahim Aydin-Lieutenant Junior Grade, Turkish Navy
B.S., Turkish Naval Academy, 1987
Master of Science in Mechanical Engineering-June 1993
Advisor: Fotis A. Papoulias-Department of Mechanical Engineering

This thesis analyzes the problem of motion stability of submarines in free positive buoyancy ascent under casualty conditions such as control surface jam and loss of propulsion system response. We employ fully nonlinear, coupled six degree of freedom equations of motion and we allow response to occur in combined vertical and horizontal planes. Continuation and homotopy theory techniques are utilized to trace all possible steady state solutions in six degrees of freedom, while local perturbation reveals their stability properties. Vehicle geometric properties and control surface deflections are used as primary bifurcation parameters. Regions in parameter spaces are identified where extreme sensitivity of solutions to geometric properties and hydrodynamic modeling is present.

NUCLEATE POOL BOILING CHARACTERISTICS OF R-124

George Michael Bertsch-Lieutenant, United States Navy
B.S., Massachusetts Maritime Academy, 1985
Master of Science in Mechanical Engineering-March 1993
Advisors: Paul J. Marto & Stephen B. Memory-Department of Mechanical Engineering

This thesis examines the pool boiling heat transfer characteristics of HCFC-124 and HCFC-124/oil mixtures with up to 10% (by weight) miscible alkylbenzene oil. One smooth and 4 enhanced tubes were tested: a 19 and 26 low integral-fin tube (GEWA-K); a modified finned tube (TURBO-B); and a porous coated tube (HIGH FLUX). The tests were carried out using the procedure used for CFC-114 at the same saturation temperature of 2.2 °C. This allowed for direct comparison of the pool boiling heat transfer characteristics between the two refrigerants. The smooth and GEWA-K 19 fin per inch tube performance in pure HCFC-124 and HCFC-124/oil mixtures ranged between 10 to 50% better than in pure CFC-114 and CFC-114/oil mixtures for all heat fluxes. The HIGH FLUX and TURBO-B tubes were similar in performance. With pure HCFC-124, the finned tubes typically provided enhancements in the heat transfer coefficient between 2 and 3 times that of a smooth tube. The HIGH FLUX and TURBO-B surfaces typically provided additional enhancements 2 times that of the finned tubes. With the addition of oil, the heat transfer increased from the smooth and finned tubes but decreased from the HIGH FLUX and TURBO-B tubes. The HIGH FLUX and TURBO-B tubes therefore exhibited enhancements less than the finned tubes at high oil concentrations and high heat fluxes.

A STRUCTURED PROGRAMMING APPROACH FOR COMPLEX AUV MISSION CONTROL

Richard Peter Blank-Lieutenant, United States Navy
B.S., Worcester Polytechnic Institute, 1987
Master of Science in Mechanical Engineering-September 1993
Advisor: Anthony J. Healey-Department of Mechanical Engineering

Reconfigurability and reliability are two keys for the success of an AUV mission control software. Practical applications can lead to complex missions which dictate that their mission parameters and failure mode operations be readily configured by the user. The Strategic layer of a Rational Behavior Model is the level where the code will change to meet the requirements of a specific mission. Structured programming is one method of developing this logical control code for the Strategic level. This thesis will show that the structured programming approach is an alternative to the strict rule based languages currently being used.

FOUR QUADRANT DYNAMIC MODEL OF THE AUV II THRUSTER

James P. Brown-Lieutenant Commander, United States Navy
B.A., Western Maryland College
Master of Science in Mechanical Engineering-September 1993
Advisor: Anthony J. Healey-Department of Mechanical Engineering

The dynamic behavior of the AUV II thruster was mathematically modeled by a four quadrant mapping of the propeller blade lift/drag coefficients as a function of fluid effective angle of attack. The model was validated with experimental transient response test tank data of the actual AUV II thruster, yielding improved predicted results with respect to previous models. Open loop inverse static mapping control was formulated and simulated utilizing the new model.

THE QUANTITATIVE MICROSTRUCTURAL CHARACTERIZATION OF MULTIPASS TIG ULTRA LOW CARBON BAINITIC STEEL WELDMENTS AND CORRELATION WITH MECHANICAL PROPERTIES

Daniel E. Butler-Lieutenant, United States Navy
B.S., Virginia Military Institute, 1987
Master of Science in Mechanical Engineering-September 1993
Advisor: Alan G. Fox-Department of Mechanical Engineering

The U.S. Navy has maintained a continuous research, development and certification program in ULCB steels as a possible replacement for the HY and HSLA steels currently being used in ship construction. The overall aim of this program is to develop a high strength steel with improved weldability. Improved weldability could eliminate the requirement of preheating, (a necessary and costly step required to prevent weld metal cracking in HY steels). The strength of ULCB steel weldments can be correlated to the weld metals composition in a simple manner, however, the toughness of the weldment seems to fluctuate in complex manner depending on the weld metal composition, weld power, and possibly the non-metallic inclusion size, type, number and distribution. This study attempted to correlate the embrittlement of ULCG/ULCB multipass TIG weldments to the given microstructure and to the type, size, number and distribution of the nonmetallic inclusions within the weldment. This work led to the following conclusions: ; (A) The embrittlement of ULCB weldments appeared to be the result of microscopic transgranular cracking, (B) there exists a need to design a process which can manufacture reproducible multipass weldments to facilitate testing, and (C) the type, size, number and distribution of the nonmetallic inclusions did not appear to be a factor in the toughness of the weldments investigated.

FREE-SURFACE/VORTICITY INTERACTION

John B. Carroll-Lieutenant, United States Navy
B.S.M.E., Worcester Polytechnic Institute, 1984
Master of Science in Mechanical Engineering-September 1993
Advisor: Turgut Sarpkaya-Department of Mechanical Engineering

The unsteady flow phenomena resulting from the interaction of wakes and vortices with the free surface are of particular importance in naval hydrodynamics. Ship and submarine wakes produce a three-dimensional complex signature, comprised of a narrow dark band bordered by two bright lines in synthetic-aperture-radar (SAR) images. The dark band signifies the suppression of waves at the Bragg frequency as a consequence of the interaction between the free surface and the imposed vorticity. In the present investigation, the vorticity field is provided by a single tip vortex generated by an airfoil. The results, obtained with an LDV, have shown that the free surface redistributes part or all of the normal turbulent kinetic energy into streamwise and spanwise components. The turbulent kinetic energy first decreases sharply with increasing vertical distance from the vortex and then remains nearly constant within a thin layer below the 'roughened' free surface. The results explain the longevity of the structures and lend further credence to the simulation of near-surface structures via vortex- or contour- dynamics.

NUMERICAL MODELING OF A PROPAGATING CRACK

Clifford T. Christy-Lieutenant, United States Navy
B.S., Pennsylvania State University, 1985
Master of Science in Mechanical Engineering-June 1993
Advisor: Young W. Kwon-Department of Mechanical Engineering

In the numerical modeling of the crack propagation in dynamic fracture using stationary elements, a discrete and sudden release of node at the crack tip creates spurious oscillation in the kinetic and strain energy values. In order to reduce the oscillation, a moving node element was utilized. This element can model a continuous crack tip movement more closely. The moving node element is compatible with surrounding regular isoparametric elements and no remeshing is required during the crack propagation. In addition, two different central difference schemes were compared, and their results were almost the same.

THE INFLUENCE OF WALL CONDUCTIVITY ON FILM CONDENSATION WITH INTEGRAL FIN TUBES

Robert Lee Cobb-Lieutenant Commander, United States Navy
B.S., Winston-Salem State University, 1979
Master of Science in Mechanical Engineering-September 1993
Advisors: Paul J. Marto & Stephen B. Memory-Department of Mechanical Engineering

Heat transfer performance of steam condensing on horizontal finned tubes made of copper, aluminum, copper nickel(90/10), and stainless steel(316) was studied using a condenser test rig at both vacuum and atmospheric conditions. Integral fin tubes included conventional rectangular shaped fins as well as rectangular fins having a radiussed root geometry (i.e., a fillet radius equal to half the fin spacing). All finned tubes had an inner and outer diameter of 12.70mm and 15.88mm respectively, and had a fin thickness of 1.0mm and a fin spacing of 1.5mm. The overall heat transfer coefficient (U_o) was determined experimentally and the outside heat transfer coefficient (h_o) was obtained utilizing a modified Wilson Plot procedure. Results indicated that the performance of a finned tube was strongly dependent on the tube material and weakly dependent on fin geometry. Radiussing the fin root to remove condensate between fins in the unflooded portion (i.e., top portion) of a finned tube reduced the heat transfer compared to a conventional rectangular shaped integral fin. Experimental data were compared to the model of Beatty and Katz as well as to a modified model of Rose.

AN EXPERIMENTAL STUDY OF THE RESPONSE OF SMALL TUNNEL THRUSTERS TO TRIANGULAR AND SQUARE WAVE INPUTS

Steven E. Cody-Lieutenant Commander, United States Navy
B.S., College of William and Mary in Virginia, 1978
Master of Science in Mechanical Engineering-December 1992
Advisor: Anthony J. Healey-Department of Mechanical Engineering

The response of small tunnel thrusters to triangular and square wave changes in applied voltages to the thruster motor is studied. Previous mathematical models have attempted to identify the dynamic characteristics in thruster responses in order to minimize limit cycling in underwater vehicle position control. These experiments validate the effect of fluid inertia in the tunnel for long and shorter period commands. Additionally, the presence of a transient lag between changes in propeller speed and affected water column velocity has been identified which delays and reduces the transient peak thrust for shorter period triangular waves and square wave input signals.

MINE AVOIDANCE AND LOCALIZATION FOR UNDERWATER VEHICLES USING CONTINUOUS CURVATURE PATH GENERATION AND NON-LINEAR TRACKING CONTROL

Dean J. Cottle-Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1980
Mechanical Engineer-September 1993
Master of Science in Mechanical Engineering-September 1993
Advisor: Anthony J. Healey-Department of Mechanical Engineering

Many underwater vehicles have been designed to follow a straight path using linear approximations about that path. Tracking a dynamic path of arbitrary but continuous curvature may often be desired. This will require a nonlinear control using sliding modes may be applied to follow a dynamic path. In a mine warfare setting using Autonomous Underwater Vehicles (AUVs), reflexive maneuvers will be required for mine avoidance. This thesis presents one way in which paths for mine avoidance may be generated automatically and used as inputs to the nonlinear tracking control system of the vehicle. It has been shown through simulation that a random minefield can be traversed by an AUV while localizing and avoiding detected mines using these control concepts.

DESIGN OF A MULTI-DOF TUNED MOUNTING FIXTURE FOR THE NAVY'S MEDIUMWEIGHT SHOCK MACHINE

David M. Cox-Lieutenant, United States Navy
B.S.M.E., Old Dominion University, 1988
Master of Science Mechanical Engineering-June 1993
Advisor: Young S. Shin-Department of Mechanical Engineering

A near miss underwater explosion can significantly damage improperly shock hardened combat systems equipment and render the ship unable to "fight hurt". MIL-S-901D currently requires shock qualifying mediumweight equipment to a "generic" shock excitation on the Navy's Mediumweight Shock Machine (MWSM). This shock excitation is severe but not always characteristic of the actual ship structure response to an underwater explosion. This study proposes a design modification which will allow using a multi-DOF equipment mounting fixture on the MWSM which can be "tuned" to simulate shipboard shock characteristics determined from modal testing or previous ship shock trial data. Equipment qualified in this manner could be highly relied on to survive in battle.

STABILITY AND BIFURCATION OF AUTONOMOUS VEHICLES IN THE PRESENCE OF POSITIONAL INFORMATION TIME LAGS

George Patrick Cummings-Lieutenant Commander, United States Coast Guard
B.S., United States Coast Guard Academy, 1982
Master of Science in Mechanical Engineering-September 1993
Advisor: Fotis A. Papoulias-Department of Mechanical Engineering

The track keeping characteristics of an autonomous ocean vehicle in the presence of a realistic time lag on the vehicle's position information is examined in two ways. A Hopf bifurcation analysis is applied to better predict vehicle behavior within its region of linearized classical stability. Additionally, the effects on guidance/control stability by the use of a single stage memory model incorporating the two previous vehicle positions in place of a single position data point is investigated. Results are presented using a dynamic model of the Naval Postgraduate School Autonomous Underwater Vehicle II (NPS AUV II).

SWAY, YAW, AND ROLL COUPLING EFFECTS ON STRAIGHT LINE STABILITY OF SUBMERSIBLES

Daniel James Cunningham, II-Lieutenant, United States Navy
B.A., The University of Vermont, 1983
Master of Science in Mechanical Engineering-March 1993
Advisor: Fotis A. Papoulias-Department of Mechanical Engineering

This thesis analyzes the sway, yaw, and roll dynamic stability of neutrally buoyant submersibles. Utilizing the hydrodynamic coefficients for a Mark IX Swimmer Delivery Vehicle (SDV) as a base-line model, the linearized equations of motion for the decoupled steering and roll systems are compared to the coupled system. Two different configurations of hydrodynamic coefficients are considered along with the effects of varying the vertical (Z_g) and longitudinal (X_g) centers of gravity of the vehicle while the longitudinal center of buoyancy (X_b) is held constant. Results demonstrate the significant effects on stability of coupling the steering and roll equations of motion, and the importance of Z_g and X_g selection in minimizing those effects while retaining stability. Perturbation analysis results confirm the essential dependence of the linearized coupled equations on the separation of X_g and X_b.

NUMERICAL FIELD MODEL SIMULATION OF FULL SCALE FIRE TESTS IN A CLOSED AND OPEN COMPARTMENT

Michael A. Delaney-Lieutenant Commander, United States Navy
B.S., State University of New York, College at Oneonta
Master of Science in Engineering-December 1992
Advisor: Matthew D. Kelleher-Department of Mechanical Engineering

The intent of this study is to adapt a general numerical model of fires within an enclosure to a specific experimental test facility. The test facility is operated at the Naval Air Warfare Center China Lake, California. The research facility is in the process of studying missile fuel fires in a surface ship combatant setting. The numerical method employed is capable of generating temperature, velocity, pressure, and density fields for a three dimensional rectangular enclosure. This study is considered preliminary in that much of it concerns the treatment of various difficulties encountered in trying to model a fire with a solid rocket propellant energy release rate using the given computer code. The specific objectives of this thesis are to subject the model to a very high heat input rate and derive results for both a closed and open compartment. To analyze the open compartment it was necessary to modify the code to incorporate a vent in one of the enclosure walls. A National Center for Atmospheric Research graphics program is used to present isotherm and velocity distribution results.

STUDY OF GRAIN REFINEMENT IN AL ALLOY 2519 USING BACKSCATTER ORIENTATION-CONTRAST METHOD IN THE SCANNING ELECTRON MICROSCOPE

Jeffrey Robert Dunlap-Lieutenant, United States Navy
B.S.M.E., Virginia Polytechnic Institute, 1986
Master of Mechanical Engineering-December 1992
Advisors: Terry R. McNelley & Roy Crooks-Department of Mechanical Engineering

The effects of variations in thermomechanical processing (TMP) parameters on grain refinement in 2519 Al-Cu alloy were studied. Refined grains enhance tensile ductility and are a prerequisite for superplastic response. The TMP variables were adjusted based on particle stimulated nucleation (PSN) theory. Process modifications included increased initial overaging time and decreased subsequent warm rolling temperatures. Backscatter orientation-contrast (BSOC) techniques for the scanning electron microscope (SEM) were developed to achieve grain-orientation contrast. An accelerating voltage of 5KV resulted in increased intensities for atomic number and orientation contrast. Both grains and Θ-phase (Al_2Cu) precipitates were revealed on the same micrograph at higher resolutions than attainable in the optical microscope. Quantitative data from micrographs were obtained using image analysis methods. A method based on statistical considerations was developed to determine an approximate critical Θ-phase particle diameter (d_{crit}) for PSN. The Θ-phase particle distribution was shown to be an important factor for grain refinement via PSN.

THERMALLY INDUCED STRESSES IN A COMPOSITE EXPOSED TO FIRE

Edward Allan Faxlanger, Jr.-Lieutenant, United States Navy
B.S.Ch.E., University of South Carolina, 1987
Master of Science in Mechanical Engineering-December 1992
Advisor: David Salinas-Department of Mechanical Engineering

This thesis investigates the behavior of Graphite-Epoxy composites subjected to fires as may occur on the decks of naval aircraft carriers. The analytical model consists of two parts; one for the determination of the temperature field within the composite due to a fire and the other for determining the stresses within the composite due to the temperature field. Both problems are provided one-dimensional finite element models. Appropriate failure criteria are incorporated to predict the survivability of composites in various fire environments. Parametric studies were performed with the results presented in both graphical and tabular form.

DETERMINATION OF GTA WELDING EFFICIENCIES

Candonino Pagaduan Franche-Lieutenant, United States Navy
B.S.M.E., FEATI University, Philippines, 1974
M.B.A., National University, CA, 1990
Master of Science in Mechanical Engineering, March 1993
Advisors: Yogendra Joshi & Indranath Dutta-Department of Mechanical Engineering

A method is developed for estimating welding efficiencies for moving arc GTAW processes. Under quasi-steady conditions, the net heat transfer rate from the weld pool to the workpiece is estimated from a 3-D numerical heat transfer conduction model. The dimensions of the weld pool used in the computational model are obtained experimentally using a laser vision system and by metallurgical examination. The welding efficiency is then calculated by dividing the net heat transfer rate by the total power input during the experiments. Efficiencies are measured for a range of power inputs and torch speeds and then compared with those available in the literature.

FSR BASED FORCE TORQUE TRANSDUCER DESIGN

Charles A. Gunzel, III-Lieutenant, United States Navy
B.S., Oregon State University, 1986
Master of Science in Mechanical Engineering-June 1993
Advisor: Morris R. Driels-Department of Mechanical Engineering

This thesis report discusses the design, construction and calibration of two force-torque transducers for use in a force control override of a rate control system. Pre-loaded force sensing resistors were used in a computer model to determine the number and location of sensors necessary to resolve three forces and three moments. An analysis was conducted on this full order model to determine redundance limits. A reduced order model was then used to determine the sensor configuration required to resolve three forces and only one moment. Prototypes of the reduced order model were then built in two different sizes, and used to sense and display applied forces and moments.

KEY FEATURE IDENTIFICATION FROM IMAGE PROFILE SEGMENTS USING A HIGH FREQUENCY SONAR

Barry W. Ingold-Lieutenant, United States Navy
B.S., United States Merchant Marine Academy, 1985
Master of Science in Mechanical Engineering-December 1992
Advisor: Anthony J. Healey-Department of Mechanical Engineering

Many avenues have been explored to allow recognition of underwater objects by a sensing system on an Autonomous Underwater Vehicle (AUV). In particular, this research analyzes the precision with which a Tritech ST1000 high resolution imaging sonar system allows the extraction of linear features from its perceived environment. The linear extraction algorithm, as well as acceptance criteria for individual sonar returns are developed. Test results showing the actual sonar data and the sonar's perceived environment are presented. Additionally, position of the sonar relative to the perceived image is determined based on the identification of key points in the scene.

NATURAL CONVECTION ABOVE A HORIZONTAL HEAT SOURCE

Adrian Johan Jansen-Lieutenant, United States Navy
B.A., University of California, Los Angeles, 1984
Master of Science in Mechanical Engineering-March 1993
Advisor: Yogendra Joshi-Department of Mechanical Engineering

An investigation of natural convection heat transfer from a flush mounted heater on a larger horizontal substrate in water has been conducted. The focus of the present investigation was on the buoyant flow above the heat source. Temperature measurements in the buoyant plume were made at various locations and heights, for a number of input powers using a traversing thermocouple probe. Simple signal processing was performed on the temperature measurements to attempt to investigate the reported meandering motions in the plume and the transition from laminar to turbulent buoyant flow. These measurements are interpreted based on flow visualizations.

MACHINERY MONITORING AND DIAGNOSIS USING PSEUDO WIGNER-VILLE DISTRIBUTION AND BACKPROPAGATION NEURAL NETWORK

Lloyd H. Jones-Lieutenant, United States Navy
B.S., University of South Carolina, 1986
Master of Science in Mechanical Engineering-September 1993
Advisor: Young S. Shin-Department of Mechanical Engineering

Artificial Neural Networks provide a data based approach to problem solving, patterned after neurological systems, which has proven successful on unique and noisy data. The pseudo Wigner-Ville distribution provides an excellent characterization of a stationary or non-stationary input signal by transforming a time signal into a joint time-frequency domain. This characterization provides an energy level associated with any processed characteristic frequency, which when used as an input to an artificial neural network will aide in the detection of location and severity of machinery faults. Research is presented where the union of an artificial neural network, utilizing the highly successful backpropagation paradigm, and the pseudo Wigner-Ville distribution are demonstrated and shown to provide remarkable success as a tool for machinery monitoring.

FEEDBACK CONTROL OF A THREE-LINK PLANAR UNDER-ACTUATED MANIPULATOR USING A "SURGE" VELOCITY

Pernell Arthur Jordan-Lieutenant, United States Navy
B.S., Norfolk State University, 1987
Master of Science in Mechanical Engineering-September 1993
Advisor: Ranjan Mukherjee-Department of Mechanical Engineering

An under-actuated robot manipulator is one that has fewer number of joint actuators than the number of degrees of freedom of the manipulator. Such manipulators are studied with the objective of developing "smarter" mechanical systems; ones that can provide low-cost automation, and enable design simplification. While in space these manipulators can afford to have any kind of mechanical structure, on earth they need to be strictly planar to be feasible. In this paper, we develop a control scheme for a three link planar robot manipulator with two actuators such that it can reach any joint configuration from any other. We assume that the first joint of the robot is passive, and is provided with a brake and a rotary dashpot. We show that our control is robust to the variations in certain parameters and unmodelled dynamics like stiction.

CORRELATION OF FLUX COMPOSITION AND INCLUSION CHARACTERISTICS WITH SUBMERGED ARC WELD METAL PROPERTIES IN HY-100 STEEL

Kent William Kettell-Lieutenant, United States Navy
B.S., United States Naval Academy, 1985
Master of Science in Mechanical Engineering-September 1993
Advisor: Alan G. Fox-Department of Mechanical Engineering

Submerged arc weldments of HY-100 steel prepared under standard conditions with five commercially available fluxes were analyzed to discern a basis for the variation in mechanical properties associated with different flux use. The variations in flux chemistry resulted in alloyed weldments with diverse weld metal mechanical properties as evident by Charpy impact, tensile, dynamic tear, and microhardness tests. The microstructures and macrostructures were examined using optical and electron microscopy in order to determine the basis for the variations in strength and toughness. Scanning electron microscope and energy dispersive x-ray experiments were performed to determine the size, type, distribution and volume fractions of the non-metallic inclusions in the weld metal. Inclusion characterization revealed that the role of the flux in alloying had a more significant effect on the strength and toughness than did the presence of specific inclusions.

MODELING OF A FULL VISION SYSTEM USING COMBINED VISUAL/HAPTIC SEARCH FOR REMOTE OBJECT IDENTIFICATION

David L. Klein-Lieutenant, United States Navy
B.A., Mathematics, University of Illinois, 1983
Master of Science in Mechanical Engineering-December 1992
Advisor: Morris R. Driels-Department of Mechanical Engineering

It is proposed that a hybrid sensory feedback system comprising a visual peripheral component together with a haptic component corresponding to that of visual foveal information, is equivalent to that of full visual sensory feedback. Such a system is constructed and the ability of subjects to perceive objects using it is investigated by observing and classifying their search strategy. Although the provision of a peripheral component provides advantages over a purely haptic system, it is concluded that subjects rely heavily on the haptic data, and the resulting hybrid system is not equivalent to full vision.

TRANSPORTABILITY ANALYSIS OF THE M119 HOWITZER IN THE FIRING CONFIGURATION

Ole Knudson-Captain, United States Army
B.S., United States Military Academy, 1982
Master of Science in Mechanical Engineering-September 1993
Advisor: Anthony J. Healey-Department of Mechanical Engineering

This study was undertaken to determine if the U.S. Army's M119 Howitzer could be safely towed in the "firing" position using the existing A-Frame brace to support the gun tube during movement. A computer model of the howitzer was developed that would predict motions of the howitzer and consequently, loads on critical components. The results obtained from this computer model were validated by comparing them to actual data obtained from an instrumented test done on the howitzer at Aberdeen Proving Grounds, MD. The validated model was used to predict the "worst case" loads on the howitzer's A-Frame and the T-Bar during movement in the "firing" position. The maximum predicted stresses in the A-Frame and the T-Bar from the "worst case" loads were compared to the yield stress. These comparisons showed that the A-Frame and T-Bar were strong enough to withstand the "worst case" predicted loads that would be caused by towing the M119 Howitzer in the "firing" position.

AN X-RAY DIFFRACTION INVESTIGATION OF α-Al_2O_3 ADDITION TO YTTRIA STABILIZED ZIRCONIA (YSZ) THERMAL BARRIER COATINGS SUBJECT TO DESTABILIZING VANADIUM PENTOXIDE (V_2O_5) EXPOSURE

Dean Michael Krestos-Lieutenant, United States Navy
B.S., Miami University Oxford, 1984
Master of Science in Mechanical Engineering-September 1993
Advisor: Alan G. Fox-Department of Mechanical Engineering

Since the mid 1970's the U.S. Navy has used Yttria-stabilized zirconia (YSZ) as thermal barrier coatings for hot stage gas turbine components. Use of low cost, high contaminant fuels has led to shortened component life from failure of YSZ coatings due to corrosive attack by vanadium and other combustion oxides. The object of this investigation was to determine the reactivity of adding α-Al_2O_3 to current YSZ ceramics for creation of a ceramic composite which could improve mechanical properties and show improved durability to corrosive chemical attack. Ten powder samples of $ZrO_2$8mol%Y_2O_3, α-Al_2O_3, and V_2O_5 of varying compositions were annealed at 900°C for 100 hours. X-Ray Diffraction analysis utilizing a standard 'search and match' method was used to determine the phases present in the reacted powder samples. Peak intensity comparisons between reacted and un-reacted samples allowed for a quantitative determination for the reactivity of α-Al_2O_3 with the YSZ system exposed to V_2O_5. This investigation indicated that α-Al_2O_3 is non-reactive in all YSZ samples exposed to V_2O_5 at 900°C.

FILMWISE CONDENSATION OF STEAM ON HORIZONTAL CORRUGATED AND WIRE-WRAPPED CORRUGATED TUBES

Matthew B. Long-Lieutenant, United States Navy
B.S., University of Washington, 1985
Master of Science in Mechanical Engineering-June 1993
Advisors: Paul J. Marto-Department of Mechanical Engineering &
Stephen B. Memory-Department of Mechanical Engineering, University of Miami

Heat transfer performance of horizontal roped tubes was studied using an evaporator/condenser test rig. The condenser section contained a single horizontal tube and was operated at both vacuum and atmospheric conditions. A vacuum pump was integral to the system to ensure the presence of noncondensible gasses did not affect the results. The test tubes were Wolverine MHT Korodense titanium tubes with an outside diameter of 16.07 mm and a corrugation pitch of 8 mm. The effect of wire-wrapping was studied using titanium wires ranging from 0.1 to 1.6 mm in diameter corresponding to a range of pitch to diameter ration from 80 to 5. The outside heat transfer coefficient h_o, was determined by first experimentally obtaining the overall heat transfer coefficient, U_o, and then utilizing a modified Wilson Plot procedure. Results obtained for steam condensation indicate that the MHT Korodense titanium tube provides negligible enhancement compared to the a titanium tube. The addition of wire-wrapping provided minimal increase in the outside heat transfer coefficient, about 8% at a fractional coverage of approximately 5% corresponding to a pitch to wire diameter ratio near 20.

AN ANALYSIS OF THE MICROSTRUCTURE AND REINFORCEMENT DISTRIBUTION FOR AN EXTRUDED PARTICLE-REINFORCED A1 6061 10 VOLUME PERCENT $A1_2O_3$ METAL MATRIX COMPOSITE

Fredric W. Longenecker-Lieutenant, United States Navy
B.S., The Pennsylvania State University, 1983
Master of Science in Mechanical Engineering-September 1993
Advisor: Terry R. McNelley-Department of Mechanical Engineering

This research was performed in conjunction with funding by DURALCAN-USA through a Cooperative Research and Development Agreement (CRDA). DURALCAN seeks to improve the ductility of cast and extruded A1 6061-$A1_2O_3$ metal matrix composite (MMC) material. In this work, annealing stages were introduced into a process combining extrusion and drawing during the fabrication of the MMC. This work has included a comprehensive analysis of the composite's microstructure as a result of introducing strains ranging from zero to 5.32 during the extrusion/drawing process. As the strains were increased, the particle distribution tended to become less clustered, requiring strains of approximately 3.5 to 4.5 in order to disperse the bands which had developed in the processing axis direction. Also, the grain size of the Al matrix decreased as increased processing strain was applied to the material. This was observed to be independent of any additional solution heat treatment once a strain of approximately 4.5 was applied to the MMC. An attempt at quantifying the effect of processing strain on nearest neighbor distance, maximum particle diameter, mean particle diameter, and aspect ratio was unsuccessful. Only a very slight rise in first nearest neighbor distance was noticed.

OPTIMIZATION TECHNIQUES FOR CONTACT STRESS ANALYSIS

Eric S. McDonald-Lieutenant, United States Navy
B.S., United States Merchant Marine Academy, 1986
Master of Science in Mechanical Engineering-December 1992
Mechanical Engineer-December 1992
Advisor: Young W. Kwon-Department of Mechanical Engineering

The analysis of stresses induced by contact between two bodies is inherently difficult because the size of the contact zone is unknown and constantly changing throughout loading. To overcome these difficulties, two approximation methods have been developed to determine the magnitude of contact stresses using the Rayleigh-Ritz method and the finite element method. Numerical optimization methods are employed to solve the contact problem. The solution techniques are compared to known analytical solutions and shown to yield accurate results. An application of this approach to solving the contact problem is illustrated by examining the response of a clamped sandwich composite beam to low velocity impact. It was found that the maximum shear stress is insensitive to lamina thickness, however an increase in the contact layer thickness resulted in a reduction in interfacial shear stress. In addition, it was noted that a nonlinear bending stress distribution in the contact layer intensified as the thickness of this layer increased. This phenomenon was found to be localized to the region of contact. Finally, it was found that the compressive transverse normal stresses increased as the thickness of the contact lamina increased.

EFFECT OF POST-FABRICATION PROCESSING ON THE TENSILE PROPERTIES OF CENTRIFUGALLY CAST SiC PARTICULATE REINFORCED ALUMINUM COMPOSITES

Kurt Alwin Muller-Lieutenant Commander, United States Navy
B.S.N.E., University of Florida, 1979
Master of Science in Engineering-September 1993
Advisor: Indranath Dutta-Department of Mechanical Engineering

A centrifugally cast A356 aluminum-matrix composite reinforced with silicon carbide (SiC) particles was thermo-mechanically processed by rolling and the resulting properties were studied. Tensile testing, hardness testing and optical microscopy were conducted. This study included evaluations of the mechanical properties of the composite following rolling at varying total strains, temperature, strain per pass and aging treatments. The effects of both single and multi-step rolling processes were evaluated, and the composites were tested following solution treatment. Testing revealed that the ductility of the composite increased significantly with increasing total strain, while the strength generally decreased. The improvement in ductility was associated with progressive homogenization of the particulate distribution at increasing strain levels. It was found that rolling just under the solvus temperature produced poorer mechanical properties for the composite than for those rolled at a temperature significantly above or below the solvus temperature. Strain per pass was found to have an insignificant effect on the final properties, with total strain being the controlling factor. For equal strength conditions, the underaged composite was more ductile than the overaged composite.

A STUDY OF THE STRUCTURAL STABILITY OF AN UNBALANCED, SANDWICH COMPOSITE CONFIGURATION

Mary Catherine Murphy-Lieutenant, United States Navy
B.A., Temple University, 1983
Master of Science in Mechanical Engineering-June 1993
Advisor: Young W. Kwon-Department of Mechanical Engineering

An unbalanced, sandwich composite structure consisting of TI 6AL-4V and GRP (Glass Reinforced Plastic) skins with a phenolic honeycomb core is being considered for construction of a surface ship mast which will enclose critical shipboard equipment. Stability of the structure is one of the major concerns in the design process. This research focuses on analytical and experimental studies of an unbalanced composite sandwich beam subject to a compressive axial load. The limit load of each skin material separately, and two failure modes of the sandwich construction (general buckling and core shearing), are measured in the laboratory. An analytical model is developed for predicting the limit load of the unbalanced, sandwich composite configuration.

THERMAL STRESSES OF A TRIMATERIAL MEDIUM IN A NONUNIFORM TEMPERATURE FIELD

Michael Joseph Neibert-Lieutenant, United States Navy
B.S., Colorado State University, 1981
Master of Science in Mechanical Engineering-March 1993
Advisors: David Salinas & Young W. Kwon-Department of Mechanical Engineering

The objective of this investigation was to conduct a parametric study of the effect of a nonuniform temperature field on the system behavior of a trilayered medium. In particular, the resulting shear and normal stresses along the media interfaces are analyzed. A finite element model utilizing a recently developed element which provides for both axial and lateral displacement continuity is employed. First, the effect of the material properties, that is, Young's Modulus and coefficient of thermal expansion, is examined. Then, the effect of the geometric properties, that is, length and thickness dimensions of the midlayer, is analyzed. Finally, a study of the effect of a nonuniform temperature field on the trimaterial medium is conducted.

TRAILING VORTEX/FREE SURFACE INTERACTION

Donald E. Neubert, Jr.-Lieutenant, United States Navy
B.C.E., Villanova University, 1985
Master of Science in Mechanical Engineering-December 1992
Advisor: Turgut Sarpkaya-Department of Mechanical Engineering

An investigation of the interaction of a trailing vortex with a free surface has been undertaken for the purpose of understanding the origin of scars and striations. Velocity and turbulence measurements have been carried out through the use of a Laser-Doppler-Velocimeter (LDV) for various positions of the vortex relative to the free surface. The results have shown that the vortex motion affects the free surface and is affected by it. This mutual interaction leads to the development of surface scars comprised primarily of heterotrophic vortices normal to the free surface. Furthermore, the velocity and turbulence characteristics are affected such that the vertical components of turbulence decay rapidly and the horizontal components stretch in the horizontal plane. The experiments have provided sufficient understanding of the physics of the phenomenon for the subsequent undertaking of the development of a predictive numerical model.

THREE AXIS FORCE OVERRIDE RATE CONTROL OF A PUMA 560 MANIPULATOR

Larry P. Ondrey-Lieutenant, United States Navy
B.S., United States Naval Academy, 1984
Master of Science in Mechanical Engineering-March 1993
Advisor: Morris R. Driels-Department of Mechanical Engineering

This paper discusses the implementation of unilateral force control override of rate control of a PUMA 560 robot manipulator in three degrees of freedom. A control system is developed utilizing the necessary sensors, hardware, and software interface to enable one to operate the manipulator in rate control with unilateral force control override. A review of the theory behind such a controller is conducted and stability issues addressed. A comparison of experimental results with theoretical results is conducted and a simple program is developed to simulate the manipulator's response. These simulation results are compared to the experimental data.

HOPF BIFURCATIONS IN PATH CONTROL OF MARINE VEHICLES

Zeki Okan Oral-Lieutenant Junior Grade, Turkish Navy
B.S., Turkish Naval Academy, 1987
Master of Science in Mechanical Engineering-June 1993
Advisor: Fotis A. Papoulias-Department of Mechanical Engineering

The problem of loss of stability of marine vehicles under cross track error control in the presence of mathematical versus actual system mismatch is analyzed. Emphasis is placed on studying the response of the system after initial loss of stability of straight line motion. Center manifold reduction and integral averaging techniques are used in order to study the bifurcations to periodic solutions and stability of the resulting limit cycles. Numerical integrations are utilized to confirm the theoretical results and to establish regions of asymptotic stability. The methods used in this work demonstrate the significance of nonlinear terms in assessing the final response of the system.

HEAT TRANSFER PARAMETRIC SYSTEM IDENTIFICATION

Gregory K. Parker-Lieutenant, United States Navy
B.S., DeVry Institute of Technology, 1984
Master of Science in Mechanical Engineering-June 1993
Advisor: Morris R. Driels-Department of Mechanical Engineering

This work describes the development of a computer based model that would allow for determination of the transient response characteristics of jet vanes of any size. The model used a thermal lump approach method, considering only conductive and convective heat transfer properties. A constrained optimizer was used to adjust the unknown variables until an adequate match was achieved between the calculated values of the energy balance equations and the experimental data obtained from test firings of a rocket motor. The full scale modeling results were compared to previous quarter scale models in an attempt to determine the applicability of the quarter scale results to full scale vanes. It was determined that the quarter scale model did not provide an accurate representation of the heat transfer process in larger scale vanes, although the full scale model provided a sufficient representation of the thermal response of the jet vane.

THE EFFECT OF OIL ON THE ONSET OF NUCLEATE POOL BOILING OF R-124 FROM A SINGLE HORIZONTAL TUBE

George D. Perry-Lieutenant, United States Navy
B.S.C.E., University of Washington, 1984
Master of Science in Mechanical Engineering-June 1993
Advisor: Paul J. Marto-Department of Mechanical Engineering

An investigation of the effect of oil on the onset of nucleate boiling of R-124 from a single horizontal tube was conducted at saturation temperature of 2.2°C. Pure R-124 and R-124/oil mixtures of 3% and 10% (by weight) miscible alkylbenzene oil were used. The tubes tested were: (1) smooth tube, (2) 19 fins per inch and (3) 26 fins per inch low-integral finned (GEWA-K) tubes, and (4) porous-coated (HIGH FLUX) tube. The effect of dissolved gases, subcooling and pressure on the onset of nucleate boiling were also investigated. An oil concentration of 3% tends to delay the onset of nucleate pool boiling (compared to pure R-124) on the smooth tube and GEWA-K 19 fins per inch tube, but not on the GEWA-K 26 fins per inch and HIGH-FLUX tubes. The reason for this is not known precisely but is very repeatable. A 10% oil concentration tends to delay the onset of nucleate pool boiling on all tubes tested. This is due mainly to the increase of surface tension, and saturation temperature with increase in oil concentration. The presence of dissolved gases in the pool tends to lower the onset of nucleate pool boiling by increasing the number of entrapped vapor nuclei. Pressurization and subcooling tend to increase the onset of nucleate pool boiling by deactivating potential nucleation sites.

CONVECTIVE HEAT TRANSFER FROM DISCRETE HEAT SOURCES IN A LIQUID FILLED VERTICAL CHANNEL

Ronald G. Rahall-Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1979
Master of Science in Mechanical Engineering-December 1992
Advisor: Yogendra Joshi-Department of Mechanical Engineering

Natural, mixed and forced convection liquid cooling of discrete heat sources in a vertical channel were investigated experimentally. Ten heat sources were flush mounted to one wall of a water filled channel, while the opposite wall was unheated. Measurements of heater surface temperatures were made for a channel Reynolds number range of 0 - 1700 and heat flux range of 1050 - 4500 W/m^2. In the mixed convection regime, both aiding and opposed flow were examined. Temperature patterns on the heated surface were visualized using liquid crystals.

PITCHFORK BIFURCATIONS AND DIVE PLANE REVERSAL OF SUBMARINES AT LOW SPEEDS

Jeffery Scott Riedel-Lieutenant, United States Navy
B.S., Maine Maritime Academy, 1986
Master of Science in Mechanical Engineering-June 1993
Mechanical Engineer Degree-June 1993
Advisor: Fotis A. Papoulias-Department of Mechanical Engineering

The ability of a submarine to maintain ordered depth, especially during periscope depth operations at low speeds, is vital for the vessel to perform its mission and avoid detection. Modern submarines exhibit an inherent phenomenon that produces an undesirable ship response at low speeds, commonly referred to as dive plane reversal. The physical parameters that govern this occurrence are related in this thesis to the problem of multiple steady state solutions in the vertical plane. Generic solution branching, in the form of pitchfork bifurcations, can occur when the nominal level flight path loses its stability. A systematic study reveals the existence of a critical Froude number, based on the vessel's speed and metacentric height, where this branching occurs. Bifurcation theory techniques and numerical computations are utilized to classify the effect that geometric parameters, trim and ballast conditions, and hydrodynamic properties have on the existence of these multiple solutions.

DYNAMIC RESPONSE OF A FILAMENT WOUND COMPOSITE CYLINDER EXPOSED TO UNDERWATER SHOCK

Michael Patrick Rousseau-Lieutenant, United States Navy
B.S.M.E., Worcester Polytechnic Institute, 1987
Master of Science in Mechanical Engineering-September 1993
Advisor: Young W. Kwon-Department of Mechanical Engineering

As composite materials are used more frequently in the design of ships and marine structures, the ability to predict underwater shock effects on those ships and structures will become increasingly important. In this report a numerical study is presented to predict the strain response in a multi-ply composite cylinder subjected to the shock wave generated by an underwater explosion. The cylinder is made of 10 plies of S-glass/epoxy ([0/45/90/-45/90/45/90-45/90/90]) oriented for a "side on attack". The numerical results of strain response for an elastic composite cylinder model compares well with experimental measurements in early times. However, the results diverge at late times. Both material damage as well as geometric imperfections in the composite cylinder were studied to further investigate this discrepancy.

THE STUDY OF SINGLE-PASS GMA WELDS WITH DIFFERENT COVER GAS COMPOSITIONS ON HSLA-100 STEEL

Ricky Arthur Seraiva-Lieutenant, United States Navy
B.S., Temple University, 1986
Master of Science in Mechanical Engineering-September 1993
Advisor: Alan G. Fox-Department of Mechanical Engineering

The purpose of this study was to investigate the effect of varying cover gas composition on the microstructure and mechanical properties of single run gas-metal arc welds (GMAW) on HSLA-100 plate and seven different cover gas compositions containing varying amounts of argon, oxygen,and carbon dioxide. A statistical and quantitative analysis of the nonmetallic inclusions in the weld metal was performed by scanning electron microscopy (SEM) and energy dispersive analysis of x-rays (EDX). These results showed that increasing the oxygen content of the cover gas reduced the inclusion size but increased the number density compared with pure argon cover gas, and that this was reflected in the weld metal microstructure since increasing amounts of acicular ferrite were detected as oxygen was added. The composition of these inclusions was found predominantly to be of the spessartite composition ($3MnO$, $A1_2O_3$, $3SiO_2$). As a result of increasing cover gas oxygen the strength of the weld metal appeared to be lowered due to the oxidation of aluminum, silicon, manganese, and possibly titanium. In addition, the toughness was improved for weld metal generated from cover gases containing oxygen because the ductile-to-brittle transition temperature was lowered by the increasing amounts of acicular ferrite.

INTERMETALLIC GROWTH AT THE INTERFACE BETWEEN COPPER AND BISMUTH-TIN SOLDER

Fred O. P. Vollweiler-Lieutenant, United States Navy
B.S., University of Pittsburgh, 1984
Master of Science in Mechanical Engineering-September 1993
Advisors: Shantanu Mitra & Jeffrey Perkins-Department of Mechanical Engineering

Tin-bismuth alloys have been proposed as alternatives to lead containing solders for interconnection and packaging applications. Consequently, the interface between copper metallizations and bismuth-tin solders needs to be evaluated with respect to brittle intermetallic formation. In the binary BI-Sn alloys both the Cu_6Sn_5 and Cu_3Sn intermetallic phases were found at the Cu/solder interface after exposure at 250, 300, and 350°C. Bi-Sn-Sb alloys were also studied and in addition to the aforementioned intermetallic compounds, Cu-Sb intermetallics were found. Kinetic growth laws have been established for the intermetallics at various temperatures and solder compositions. In addition, bulk samples of the solder were tested in compression in the furnace-cooled and quenched condition. Quenching appeared to result in higher strain rate dependence. Furthermore, the tin-rich compositions were more strain rate sensitive than the bismuth rich composition.

STUDY OF PRECIPITATION AND RECRYSTALLIZATION IN AL ALLOY 2519 BY BACKSCATTERED ELECTRON IMAGING METHODS

Peter Joseph Zohorsky-Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1983
Master of Science in Mechanical Engineering-September 1993
Advisor: Terry R. McNelley-Department of Mechanical Engineering

This study examines the effects of prestrain deformation temperature, overaging temperature, and other variations in thermomechanical processing (TMP) on the mean size and size distribution of θ-phase precipitate particles in Al alloy 2519. Examination was performed using the scanning electron microscope in the backscatter imaging mode and quantitative image analysis methods were employed. The goal was to find a combination of TMP parameters which produces θ-phase particles exceeding a critical diameter for particle-stimulated nucleation (PSN) of recrystallization. A necessary prerequisite for superplasticity is a uniformly fine, equiaxed grain size and PSN is theorized to be capable of such grain refinement. Such a microstructure has been developed in Aluminum alloys containing large second phase particles when the alloys are subjected to cold work and recrystallization treatments.

MASTER OF SCIENCE
IN
METEOROLOGY

EVALUATIONS OF 404 MHZ RADAR WIND PROFILER OBSERVATIONS AT OKINAWA DURING TCM-90

Paul H. Dobos
B.S., Pennsylvania State University, 1987
Master of Science in Meteorology-December 1992
Advisor: Russell L. Elsberry-Department of Meteorology

A comparison is made of rawinsondes and radar wind profiler observations recorded in Okinawa during the Tropical Cyclone Motion (TCM-90) field experiment. The rawinsondes were launched from Naha, 18.5 km south-southwest of the wind profiler at Kadena AB. An examination of wind speed, and u- and v- components shows the two wind measuring systems to be in excellent agreement. Wind speed differences are less than 1.5 m/s, and u- and v- component differences are less than 2 m/s. Surface wind data recorded 1 km from the radar wind profiler site at Kadena are used to derive statistical relationships between the wind at the five lowest profiler range gates and the surface sustained wind and gusts. The accuracy of regression equations derived from the surface and upper-level data is compared to that of simple wind ratios derived from the same data. The data are also stratified with respect to daytime versus nighttime, and winds having a trajectory from the ocean versus winds with a trajectory from the land. Although the regression equations generally produce a statistically significant smaller prediction error compared to prediction errors from the ratios, the less than 2 m/s improvement in surface wind estimates is not operationally significant.

ERRORS CAUSED BY INCOMPATIBLE WIND AND BUOYANCY FORCING IN THE OCEAN GENERAL CIRCULATION MODELS

Yu-Heng Kuo-Lieutenant, Taiwan, R.O.C. Navy
B.S., Chinese Naval Academy, 1984
Master of Science in Meteorology-December 1992
Advisor: Peter C. Chu-Department of Oceanography

The Geophysical Fluid Dynamics Laboratory Modular Ocean Model (GFDL MOM) is used to investigate the model difference between compatible and incompatible surface wind and buoyancy forcing. The atmosphere is a physical system in which surface wind and temperature fields are related, however in most ocean numerical models, the wind stress and buoyancy forcing are usually specified separately, i.e., no constraint between the surface wind stress and surface air temperature is considered. In reality, only one of these two fields can be prescribed in the atmosphere-driven ocean models. When the surface wind field is prescribed, the surface air temperature should be derived, and vice versa. If the two related fields are treated as totally independent in forcing the ocean models the results will be distorted. Since the model solutions depend upon the atmospheric forcing, it is important that we study the compatibility between the wind and buoyancy forcings and the effect which incompatibility might have on the ocean numerical models. This study shows that the surface wind and buoyancy forcing widely used in ocean numerical models are incompatible. Such an incompatibility results in 21% error in the total northward transport of heat, 16% error in the total northward transport of salt, 25% error in v velocity, and 16% error in w velocity.

AN ANALYSIS OF MESOSCALE CONVECTIVE SYSTEMS OBSERVED DURING THE 1992 TROPICAL CYCLONE MOTION FIELD EXPERIMENT

Eric J. McKinley-Captain, United States Air Force
B.S., Plymouth State College, 1984
Master of Science in Meteorology-December 1992
Advisor: Russell L. Elsberry-Department of Meteorology

An analysis of two tropical Mesoscale Convective Systems (MCS) observed during the Tropical Cyclone Motion - 92 (TCM-92) mini-field experiment is accomplished. A discussion of TCM-92, its primary and secondary missions, and the resulting data sets is provided. Primary data sets for the two cases include high-density (one minute) WC-130 aircraft data, 44 omega dropwindsondes and visual and infrared (IR) geostationary satellite imagery. The observed characteristics exhibited by the tropical MCSs of the two cases are related to the hypothesized characteristics of midlatitude MCSs as suggested by Frank and Chen (1991), Raymond and Jiang (1990), Hertenstein and Schubert (1991), Menard and Fritsch (1989) and others. Thus, the goal of the analyses is to document, for the first time, the horizontal and vertical scales in terms of the expected structure and evolution of the tropical MCS. The MCSs of the two cases were in the mature and decaying stages of the convective life cycle. Mid-level (500 mb) vortices that are apparently created in the stratiform rain regions of the MCSs are clearly discernable in the wind fields. In both cases, these vortices are seen to build upward to 300 mb or originate higher than the 500 mb surface. Downward translation of the vortex to 700 mb is evident in both aircraft and satellite data in one case. Convective signatures in the temperature and dewpoint fields are not as significant as the wind fields. Because signatures are observed in the synoptic scale, such as anticyclonic outflow in the MCS regions, these systems apparently were significant mesoscale features of sufficient intensity and duration to alter the large-scale regime for over 24 h.

AN INVESTIGATION OF THE GROUND-BASED HIGH-RESOLUTION INTERFEROMETER SOUNDER (GB-HIS) IN A COASTAL MARINE ENVIRONMENT

Steven Austin Rugg-Captain, United States Air Force
B.S., University of Arizona, 1987
Master of Science in Meteorology-December 1992
Advisor: Carlyle H. Wash-Department of Meteorology

Vertical temperature and moisture profiles from the Ground-Based High-Resolution Interferometer Sounder (GB-HIS) are studied for the coastal marine atmosphere. In May of 1991 and 1992 the GB-HIS instrument was operated on the Research Vessel Point Sur during a cruise off the central California coast. The ability of the GB-HIS retrieval algorithm to produce accurate temperature and moisture profiles is evaluated using Root Mean Square (RMS) difference, Bias, and Explained Variance statistics. In addition, objective analysis is performed on timesections of temperature and moisture. Temperature retrievals, on average, attained significant skill throughout the low troposphere. Moisture retrievals attained moderate skill in the lower and upper boundary layer, but no skill in the mid-boundary layer due to non-depiction of small scale moisture features. Results showed a maximum RMS temperature difference of < 3 °C and RMS dewpoint difference of < 12 °C in the low troposphere (up to 700 mb) over both cruises. Preliminary analysis of the updated retrieval algorithm is performed and further improvements are discussed.

THREE-DIMENSIONAL CLOUD VISUALIZATION BASED ON SATELLITE IMAGERY

Kevin L. Stone-Captain, United States Air Force
B.S., University of Lowell, 1987
Master of Science in Meteorology-December 1992
Advisors: Carlyle H. Wash & Phillip A. Durkee-Department of Meteorology

This thesis presents three dimensional visualizations of cloud scenes created with scientific visualization software implemented on high-performance graphics workstations. Cloud scenes are constructed for four separate cases, low stratus clouds off the California coast, stratus over the Great Plains, convective cumulus over the Gulf Coast region and Hurricane Andrew as it crossed southern Florida. The user interacts with the cloud scenes on the computer screen, allowing the clouds to be studied from different perspectives. Procedures have been modified to integrate satellite information with sounding data to construct cloud tops. Techniques have been developed to integrate gridded surface observations with topography data to construct cloud bases with varying heights. Cloud bases determined in this manner are a more realistic representation than previous methods of using a constant height for all cloud bases in the cloud scene.

MASTER OF SCIENCE
IN
METEOROLOGY
AND
PHYSICAL OCEANOGRAPHY

AUTOMATED SATELLITE IMAGE NAVIGATION

Robert Martin Bassett-Lieutenant Commander, United States Navy
B.S., University of Mississippi, 1980
Master of Science in Meteorology and Physical Oceanography-December 1992
Advisor: Carlyle H. Wash-Department of Meteorology

This study investigated the automated satellite image navigation method (Auto-Avian) developed and tested by Spaulding (1990) at the Naval Postgraduate School. The Auto-Avian method replaced the manual procedure of selecting Ground Control Points (GCP's) with an autocorrelation process that utilizes the World Vector Shoreline (WVS) provided by the Defense Mapping Agency (DMA) as a "string" of GCP's to rectify satellite images. The automatic cross-correlation of binary reference (WVS) and search (image) windows eliminated the subjective error associated with the annual selection of GCP's and produced accuracies comparable to the manual method. This study expanded the scope of Spaulding's (1990) research. The worldwide application of the Auto-Avian method was demonstrated in three world regions (eastern North Pacific Ocean, eastern North Atlantic Ocean and Persian Gulf). Using five case studies, the performance of the Auto-Avian method on "less than optimum" images (i.e., islands, coastlines affected by lateral distortion and/or cloud cover) was investigated. The results indicated that utilizing the Auto-Avian method on these "less than optimum images" could achieve navigational accuracies approaching those obtained by Spaulding (1990).

THE SENSITIVITY OF AGEOSTROPHIC CIRCULATIONS TO MODEL RESOLUTION: A CASE STUDY USING NGM FORECASTS OF ERICA IOP-4

James Berdeguez-Lieutenant, United States Navy
B.S., United States Naval Academy, 1985
Master of Science in Meteorology and Physical Oceanography-December 1992
Advisor: Patricia M. Pauley-Department of Meteorology

The effect of model resolution on the ageostrophic circulations and dynamics of a rapidly deepening extratropical cyclone that occurred during the Intensive Observing Period (IOP) 4 (4-5 January 1989) of the Experiment on Rapidly Intensifying Cyclones over the Atlantic (ERICA) is examined using the psi-vector technique proposed by Keyser et al. (1989). A comparison of forecasts made by the National Meteorological Center's Nested Grid Model (NGM) using operational (C-grid) and double-resolution (D-grid) versions indicated central pressure and frontal evolution differences between the two forecasts. The IOP-4 cyclone was observed to deepen by 60 mb in 24 h to a central pressure of 936 mb. The NGM C-grid forecast attained a central pressure at 0000 UTC 5 Jan of 959 mb, while the D-grid forecast attained a central pressure of 949 mb. Differences in the laterally coupled jet streaks between the C- and D-grid forecasts enabled the D-grid forecast to depict stronger transverse ageostrophic circulations that produced stronger ascent and greater spin-up of the low-level cyclone.

OCEAN WAVE HEIGHT TRANSFORMATION MODEL USING SURFACE ROLLER THEORY

A. Henry Brookins-Lieutenant, United States Navy
B.S., United States Naval Academy, 1986
Master of Science in Meteorology and Physical Oceanography-June 1993
Advisor: Edward B. Thornton-Department of Oceanography

A wave height transformation model is developed using surface roller theory. Roller energy production is included in the energy flux balance equation to predict rms wave height for randomly varying, irregular waves over arbitrary bathymetry. The dissipation function is defined using wave roller theory, where the area of the roller is defined from a simple bore analogy. The Rayleigh distribution is used to statistically describe wave heights as waves shoal, break, and dissipate. Model predictions are compared with data acquired on both barred and near planar beaches. The surface roller wave height transformation model predicts rms wave heights with an average rms error of 6.5% for a barred beach over three days, 3.0% for two planar beaches over four days, and within 4.5% average error for all locations over seven days. The model has two free parameters, σ representing the type of breaker, and γ but not σ. The surface roller model improves the bore dissipation model (*Thornton and Guza,* 1983) by decreasing the average rms error by 40% while decreasing model sensitivity to input parameters.

MESOSCALE FRONTAL EVOLUTION OF ERICA IOP-5A CYCLONE

Steven Richard Cameron-Lieutenant Commander, United States Navy
B.S., West Virginia University, 1979
Master of Science in Meteorology and Physical Oceanography-September 1993
Advisors: Carlyle H. Wash & Paul A. Hirschberg-Department of Meteorology

A synoptic investigation was conducted of the rapid coastal cyclogenesis that occurred during Intensive Observation Period (IOP) 5A of the Experiment on Rapidly Intensifying Cyclones over the Atlantic (ERICA). Navy Operational Regional Analysis and Prediction System (NORAPS) forecasts were examined in order to study the mesoscale frontal evolution associated with this rapidly deepening coastal cyclone. The ability of the NORAPS forecasts to accurately depict the frontal positions and intensity was also investigated. The frontal evolution showed characteristics of a classical occlusion, similar to the Norwegian cyclone model and of marine frontal structure as in Shapiro and Keyser (1990). The frontal evolution was highly influenced by the prior presence of the strong polar and coastal fronts. These fronts intensified during the course of the storm development and did not develop as a result of the cyclogenesis. The NORAPS model forecasts were compared against satellite imagery, station reports and observed soundings taken during the ERICA study. The NORAPS model was found to be an excellent tool for forecasting the mesoscale frontal structure and intensity of this rapidly deepening coastal cyclone.

AN OBSERVATIONAL STUDY OF THE LOCAL AND REMOTE RESPONSE OF THE EQUATORIAL PACIFIC TO WESTERLY WIND EVENTS DURING THE 1991-92 EL NIÑO

Grant Alexander Cooper, IV-Lieutenant, United States Navy
B.S., San Diego State University, 1984
Master of Science in Meteorology and Physical Oceanography-December 1992
Advisor: J.T. Murphree-Department of Meteorology

The upper equatorial Pacific Ocean response to anomalous westerly wind forcing during the 1991-92 El Niño was examined using observed oceanographic and atmospheric data from equatorial moorings and the Navy's operational atmospheric analyses. A strong 30-60 day signal was observed in the zonal winds and is mainly a result of westerly wind events. The local response to anomalous westerly winds differed between the western and eastern equatorial Pacific. In the western Pacific, westerly wind events tended to produce rapid decreases in sea surface temperature (SST) (up to 1°C). These decreases were followed several days later by SST increases due to horizontal warm water advection and downwelling. In the central and eastern equatorial Pacific, westerly wind events were expressed mainly as weakenings of the easterlies. These weakenings caused decreases in equatorial upwelling and SST increases. Westerly wind events in the western Pacific were also associated with large thermocline temperature fluctuations (on the order of 10°C) in the central and eastern equatorial Pacific. These fluctuations propagated eastward at phase speeds consistent with first baroclinic equatorial Kelvin wave dynamics (i.e., 2.0 - 3.5 ms^{-1}). The ocean temperature fluctuations indicate basin wide wavelengths (about 15 x 10^3 km), with periods of 30-60 days.

RAPID MARINE CYCLOGENESIS FORECAST SENSITIVITY TO HIGH RESOLUTION SEA SURFACE TEMPERATURES DURING ERICA IOP-5

Marcia A. DeCaria-Lieutenant, United States Navy
B.A., University of Montana, 1982
Master of Science in Meteorology and Physical Oceanography-December 1992
Advisor: Patricia M. Pauley-Department of Meteorology

The influence of high resolution sea surface temperatures (SST) on Nested Grid Model (NGM) predictions of rapid marine cyclogensis is examined. Satellite data provides a gridded SST analysis with a resolution of 50 km. Forecasts using the operational "blended" SST analysis with a neutral stratification assumed in the calculation of the surface exchange coefficient over the ocean are compared to forecasts using the high resolution SST analysis with a stability dependent surface exchange coefficient. Further comparison is made to NGM forecasts with no surface fluxes. This study covers the Intensive Observation Period (IOP) 5 of the Experiment on Rapidly Intensifying Cyclones over the Atlantic (ERICA). Results show little sensitivity of central pressure and storm position to the high resolution SST's. However, differences in mesoscale features are present, primarily surface fluxes, precipitation, and frontal circulations.

.... INCORPORATION AND COMPARATIVE EVALUATION OF A NON-CONVECTIVE CLOUD PARAMETERIZATION SCHEME IN THE NAVAL RESEARCH LABORATORY WEST COAST MESOSCALE WEATHER PREDICTION MODEL

Damacene Villaflor Ferandez-Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1981
Master of Science in Meteorology and Physical Oceanography-June 1993
Advisor: Ted R. Holt-Department of Meteorology

This study describes the incorporation of the Sundqvist et al. (1989) explicit non-convective cloud liquid water scheme into the Naval Research Laboratory (NRL) limited area dynamical weather prediction model. Comparisons were made between model runs with the non-convective cloud water scheme and those without the scheme to evaluate mesoscale wind pattern, longwave radiation, temperature, and cloud simulations over the U.S. West Coast for the time period 0000 UTC 02 May 1990 to 1200 UTC 03 May 1990. The most significant improvement in the updated model was the more physically realistic horizontal and vertical non-convective cloud structures produced by the cloud liquid water fields.

CROSS-SHORE SEDIMENT TRANSPORT ON A NATURALLY BARRED BEACH

Randall T. Humiston-Lieutenant, United State Navy
B.S., University of Illinois at Carbondale, 1984
Master of Science in Meteorology and Physical Oceanography-March 1993
Advisor: Edward B. Thornton-Department of Oceanography

Bailard's sediment transport model (1981) is evaluated using field data obtained on a naturally barred beach. Principal field measurements consist of a cross-shore array of bi-directional current meters spanning the surf zone and daily bathymetric surveys. The model predicts bed and suspended load transport separately based on various velocity moments. The velocities are partitioned into mean currents, long waves (< 0.05 Hz) and short waves (> 0.05 Hz) to determine their relative importance to the transport. Velocity moments are then computed over 90 minute intervals to resolve tidal fluctuations. Finally, predicted transport rates are integrated and compared with daily cross-shore bathymetric profiles (averaged over a 400m length of beach). Results indicate that suspended load was consistently greater than bed load, as much as an order of magnitude during episodes of large incident waves, owing to the slow fall velocity (2cm/s) of the fine grain sand within the surf zone. The contribution by the mean current, long and short waves to the cross-shore transport were of the same order. Variance of transport during all stages of tide and over a range of incident waves were consistently greater in the vicinity of the bar and trough than seaward of the bar and on the beach face. Tidal signatures were apparent in all modes of transport. The model appeared to under-predict measured bathymetry during low-energy periods and over-predict during high-energy conditions. However, the model does correctly predict the first order movement of the bar.

C-VECTOR DERIVED THREE DIMENSIONAL CIRCULATIONS IN FARALLONES NATIONAL MARINE SANCTUARY

Simon Konstantinidis-Lieutenant, Hellenic Navy
B.S., Hellenic Naval Academy, 1982
Master of Science in Physical Oceanography and Meteorology-December 1992
Advisor: Peter C. Chu-Department of Oceanography

Neglecting the ageostrophic circulation is not very realistic for ocean circulation in coastal waters and particularly in regions with strong temperature and salinity gradients like the Farallones National Marine Sanctuary. The C-Vector method has been developed to diagnose the three dimensional flow including ageostrophic circulation. This thesis uses the C-Vector method and data collected from the *R/V Point Sur* inn the area of Farallones National Marine Sanctuary in order to describe and illustrate the three dimensional pseudo-vorticity fields of the ageostrophic circulation and the total circulation (geostophic and ageostrophic) of the region.

SHIP TRACKS A GEOGRAPHICAL AND STATISTICAL STUDY

John W. Lutz-Lieutenant Commander, United States Navy
B.S., University of Nebraska, 1978
Master of Science in Meteorology and Physical Oceanography-December 1992
Advisor: Philip A. Durkee-Department of Meteorology

Anomalous cloud lines are frequently seen in satellite images as curvilinear features. These cloud lines or "ship tracks" are likely due to products of ship-produced hot exhaust gases that are expelled into the atmosphere, increasing the aerosol concentration in the ship track plume. NOAA 9 and 10 AVHRR data are sensitive to cloud droplet size and show the ship tracks as increases in radiance due to reflectance. Twenty-eight NOAA 9/10 satellite passes are analyzed. Twenty-two of the passes are found to contain a total of 316 shop tracks which is significantly more than that expected by earlier ship track studies. An existing ship track detection algorithm is used to conduct a statistical comparison of ship track and non-ship track, or ambient pixel reflectance of the NOAA 9 and 10 AVHRR channels 1 (0.63 μm), 3 (3.7 μm), and 4 (11 μm). The results of the statistical analysis confirm, as found in previous studies, that the ship track pixels displayed a significant increase in values for channels 1 and 3 and a very slight increase for channel 4.

A MODEL ANALYSIS OF POTENTIAL VORTICITY ON ISOPYCNAL SURFACES FOR THE GLOBAL OCEAN

Douglas Craig Marble-Lieutenant, United States Navy
B.S., University of South Carolina, 1986
Master of Science in Meteorology and Physical Oceanography-September 1993
Advisor: Albert J. Semtner-Department of Oceanography

Charts of potential vorticity (q) within four different density layers, calculated from an eddy resolving global ocean general circulation model, are presented for the Atlantic, Pacific, and Indian Ocean Basins. Potential vorticity is evaluated as $(q) = (f/\rho) * (\Delta\sigma/\Delta z)$, a formulation that is valid for large, slow scales and allows it to be readily calculated from model output. Here, f is Coriolis, ρ in-situ density, σ the potential density referred to the sea surface, and z the vertical coordinate. The model is shown to represent oceanic density structure with reasonable accuracy. The most significant departure from observations are the steep density gradients on the northern boundary of the Antarctic Circumpolar Current. This may be due to model convective adjustment parameterizations and the extent of the smoothing in the cataloged data, which may be greater in the southern oceans due to relatively scarce observations. Model derived values of potential vorticity correspond well with those calculated from observations. In the middle and lower layers, the three basins tend toward homogenization, representing unventilated layers. "Gyres" of q in the upper layers of the northern Atlantic and Pacific Oceans, with their northern boundaries anchored in the outcrop region, illustrate the ventilation of these layers.

A TEMPORAL ANALYSIS OF EAST PACIFIC AND EAST ATLANTIC SHIP TRACKS

Thomas M. Millman-Lieutenant, United States Navy
B.S., United States Naval Academy, 1986
Master of Science in Meteorology and Physical Oceanography-December 1992
Advisor: Philip A. Durkee-Department of Meteorology

The spatial, temporal and radiative properties of ship tracks are described with an analysis of AVHRR (Advanced Very High Resolution Radiometer) imagery. Fifteen cases are analyzed including 6 from the Atlantic Stratocumulus Transition Experiment (ASTEX) in the Azores islands, 6 from ship tracks observed off the coast of Oregon and 3 from the 1987 First ISCCP (International Satellite Cloud Climatology Project) Regional Experiment (FIRE) (Starr, 1987). The reflectance in channel 3 (3.7 microns) of each ship track and associated background are analyzed as a function of time. The width of each ship track is also plotted as a function of time to determine their spatial and dispersive qualities. The east Pacific Ocean ship tracks are generally less dispersive, but two ASTEX ship tracks were more dispersive than what would be consistent over land. In individual cases, higher ambient reflectances are associated with environments that are less sensitive to ship effluent resulting in lower ship track reflectances. But in the composite of all ship track cases, higher ambient reflectances are associated with environments that are more sensitive to ship effluent resulting in higher ship track reflectances. Though the number of cases was limited due to weather and other phenomena, the reflectance, width and dispersion analysis highlight the commonalities and differences between the ship tracks from the two areas. This indicates that the state of the atmosphere has a substantial effect on ship track formation.

THREE DIMENSIONAL VORTICITY FIELD IN THE CALIFORNIA CURRENT SYSTEM

Gonzalo Montenegro-Lieutenant, Ecuadoran Navy
Ecuadoran Naval Academy, 1983
Master of Science in Meteorology and Physical Oceanography-March 1993
Advisor: Peter Chu-Department of Oceanography

Hydrographic data has traditionally been used only to determine dynamical features, specifically dynamic topography and geostrophic currents relative to an assumed level of no motion. However, the assumption of geostrophic balance has been questioned because of the neglect of ageostrophic effects. Measuring vorticity and vertical motion has always been technically demanding and costly. Due to the importance of these parameters new techniques have been developed, among them a diagnostic technique known as the C-vector Method, which uses the wind stress and the geostrophic balance as forcing functions to infer these quantities. Using this technique, the three dimensional vorticity field was computed for the California current system during the Coastal Transition Zone (CTZ) program (17-26 March, 1987). Hydrographic (CTD) and wind data sets were used, assuming a "quasi-geostrophic" system. Also computed was the vertical vorticity of the C-vector, known as the ψ function, which has a direct relationship with the vertical velocity, making it possible to infer upward or downward motion in coastal waters. A satisfying correlation was found between surface temperature fields, satellite imagery, and vertical motions inferred from the ψ function. The C-vector has therefore been shown to be a very reliable method of diagnosing vorticity and vertical circulation.

MEASUREMENT OF OCEAN CURRENTS ACROSS THE CONTINENTAL MARGIN OFF POINT SUR, CALIFORNIA, DURING MARCH 1989

Anthony J. Negron-Lieutenant Commander, United States Navy
B.S., Jersey City State College, 1978
Master of Science in Meteorology and Physical Oceanography-March 1993
Advisor: Curtis A. Collins-Department of Oceanography

Mean currents and density were measured off Point Sur, California in March 1989 using Pegasus and CTD instruments. Velocity, temperature, salinity, and density fields are examined to discern the structure of the California and Davidson currents. Velocities measured by Pegasus are compared to flow fields derived from geostrophy. The Davidson Current flows poleward at the surface in its winter configuration despite northerly winds and coastal upwelling which normally drive the flow subsurface in the summer months.

INTRASEASONAL RELATIONSHIPS BETWEEN TROPICAL HEATING AND EXTRATROPICAL JETS

Michael Thomas Neith-Lieutenant, United States Navy
B.S., Allentown College of St. Francis de Sales, 1986
Master of Science in Meteorology and Physical Oceanography-December 1992
Advisor: J.T. Murphree-Department of Meteorology

Intraseasonal variations of the northern midlatitude circulation and their relationships with the global tropical heating field are investigated using climate model fields. The greatest intraseasonal variance in the midlatitude flow is found in the vicinity of the major jets, and in the areas immediately downstream of the jet exits. The model kinetic energy field associated with these jets shows a clear 30-60 day variation and eastward propagation within and between the different jet regions. This intraseasonal behavior is found to be well correlated with heating anomalies in many parts of the global tropics. For each of the jet regions, we use a simple composite analysis to identify the global heating patterns associated with periods of strong and weak flow. For the North Pacific jet, strong flow occurs during and after periods of positive heating anomalies in the tropical western and central Pacific, and negative heating anomalies in the Indian Ocean. Conversely, the North Pacific flow is weak when these heating anomalies are reversed. The North Atlantic jet shows a similar relationship, with positive heating anomalies in the tropical western and eastern Pacific, and negative heating anomalies in the tropical Indian and Atlantic Oceans, before and during periods of strong flow. These intraseasonal teleconnections between individual jets and the global scale tropical heating are especially clear for the North Pacific and North Atlantic jets. In addition to relatively direct forcing from nearby tropical heat sources, the jets may be influenced by relatively remote tropical heat sources, whose signals propagate through upstream jets. These intraseasonal teleconnections between the global tropical heating field and the North Pacific and North Atlantic jets may have important implications for extended range forecasting in North America and Europe.

CURRENTS THROUGH THE GOLDEN GATE

Ernest Paul Petzrick-Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1982
Master of Science in Meteorology and Physical Oceanography-September 1993
Advisor: Curtis A. Collins-Department of Oceanography

From 9 November through 15 December 1992, a bottom mooring consisting of an upward looking acoustic doppler current profiler (ADCP) and an conductivity-temperature pressure (CTD) instrument were deployed in the Golden Gate. Tidal constituents were derived from least squares fit on pressure and current data. The amplitude of the M2 tide was 0.6 meter and 100 cm/s, and primary tidal constituents were about 0.3 meter and 20 cm/s. Current profiles were largely barotropic and one dimensional. Overtides and compound tides had amplitudes less than 0.02 meters and 5 cm/s but had baroclinic structure and two dimensional hodographs. Tidal currents appear to be hydraulically driven. Mean flow and transport were directed at 110° T at 23 cm/s and 45 m^3/s; indicative of the two dimensional structure of the Golden Gate. Mean energy fluxes at the site were $3X10^4$ W for kinetic energy advection and $8.5X10^6$ W for the work done by pressure. If representative of the channel, they imply a total energy flux of $8.5X10^9$ W through the Gate.

CLIMATOLOGY AND ANALYSIS OF THE MONTEREY BAY SEA BREEZE

Robert Dominic Round-Lieutenant, United States Navy
B.S., United States Naval Academy, 1986
Master of Science in Meteorology and Physical Oceanography-September 1993
Advisor: Carlyle H. Wash-Department of Meteorology

Sea breeze events on the Monterey Bay are examined from a single station at the mouth of the Salinas Valley. Data analyzed are continuous, two-minute samples of windspeed, wind direction, temperature, dew point, incoming shortwave irradiance, and incoming longwave irradiance. A speed index is defined using the average hourly maximum and minimum windspeeds oriented in the cross-shore direction thereby reflecting the thermally induced diurnal windspeed enhancement. Large-scale effects on this mesoscale circulation are presented through evaluation of changes in boundary layer depth with changes in speed index. Boundary layer depth as reflected in trends of inland stratus penetration and offshore flow provide insight for anticipating sea breeze intensity.

A MARITIME AND CONTINENTAL AEROSOL-CLOUD INTERACTION STUDY FROM ASTEX '92

Karen Marie Ruppe-Lieutenant, United States Naval Reserve
B.A., University of Virginia, 1978
M.S., Old Dominion University, 1981
Master of Science in Meteorology and Physical Oceanography-December 1992
Advisor: Philip A. Durkee-Department of Meteorology

Variations in marine stratocumulus microphysics during FIRE IFO 1992 are observed and analyzed through the use of NOAA 10/11/12 AVHRR satellite data. Maritime and continental aerosols in clear-air and cloudy regions are characterized by particle size index, optical depth, and low cloud analysis at visible and 3.7 μm wavelengths. Use of satellite-detected radiances to resolve aerosol type and distribution prove useful in determining implications of cloud reflectance changes due to modification by aerosol particles. Air masses were clearly defined and showed distinctive signatures in aerosol characteristics and cloud reflectances at 3.7 μm wavelengths. Air mass characteristic sources consisted of industrial aerosols out of Europe and desert dust from the Sahara Desert.

ARCTIC CYCLONES AND MARGINAL ICE ZONE (MIZ) VARIABILITY

Steven John Rutherford-Lieutenant, United States Navy
B.S., State University of New York at Albany, 1984
Master of Science in Meteorology and Physical Oceanography-March 1993
Advisor: Kenneth L. Davidson-Department of Meteorology

The Seasonal Ice Zone Experiment (SIZEX), conducted in January 1992, was designed as the European Space Agency's ERS-1 synthetic-aperature radar (SAR) validation experiment. The satellite was placed in a three-day exact repeat orbit, with ascending and descending passes which crossed the Greenland Sea marginal ice zone. In conjunction with SAR imagery collected by the Nansen Environmental and Remote Sensing Center, the research vessel HÄKON MOSBY recorded meteorological data on station near the ice edge in the Greenland Sea. The marginal ice zone was subjected to atmospheric and oceanographic forcing during the 7-16 January period which resulted in significant changes in ice edge morphology. As intense low-pressure systems propagated across the Greenland Sea, strong easterly and northerly winds dominated oceanic forcing and created a compact ice edge which correlated with the 50% ice concentration isopleth from the SSM/I passive microwave sensor. Conversely, during periods of weak atmospheric forcing, the ice edge became diffused and the ice edge morphology was determined by a variety of oceanographic circulations. In such instances, the actual ice edge position was well correlated with the SSM/I 30% ice concentration isopleth.

AN INVESTIGATION OF THE ERICA IOP-5A CYCLONE

Julia Marcia Spinelli-Lieutenant, United States Navy
B.S., United States Naval Academy, 1985
Master of Science in Meteorology and Physical Oceanography-December 1992
Advisors: Carlyle H. Wash and Paul A. Hirschberg-Department of Meteorology

A synoptic investigation was conducted of the rapid coastal cyclogenesis event that occurred during Intensive Observation Period (IOP) 5A of the experiment on Rapidly Intensifying Cyclones over the Atlantic (ERICA). Navy Operational Regional Analysis and Prediction System (NORAPS) objective analyses, utilizing operationally available and some special ERICA data, were examined in order to study the environment in which rapid development took place and to determine key synoptic and subsynoptic features important in the evolution of this storm. Additionally, the ability of NORAPS to accurately simulate the rapid cyclogenesis was investigated. Several processes contributed to the storm's intense development including strong low tropospheric temperature advection and upper-level cyclonic vorticity advection and divergence associated with a mobile trough and jet streak. NORAPS forecasts initialized 12 h prior to the explosive deepening phase of the IOP-5A cyclone provided a reasonably accurate simulation of the event. However, subjective hand analyses of hourly data for the period surrounding the onset of rapid deepening revealed the presence of a mesoscale coastal cyclone, which influenced the development of the storm. The development of this separate cyclone was not resolved by the model, resulting in a forecast track north of the actual storm's path.

SPECTRAL ANALYSIS OF SYNOPTIC TIME SCALE DISTURBANCES OVER THE TROPICAL EASTERN PACIFIC DURING SUMMER 1989, 1990 AND 1991

William Christopher Swett-Lieutenant Commander, United States Navy
B.S., Jacksonville University, 1983
Master of Science in Meteorology and Physical Oceanography-March 1993
Advisors: Chih-Pei Chang & Tom Murphree-Department of Meteorology

In this study we used data analyzed by the Navy Operational Global Analysis and Prediction System (NOGAPS) to study the 4-10 day disturbances over the eastern tropical Pacific. The period of study is May-September of 1989, 1990 and 1991. Spectral and cross-spectral analyses were used to determine the structure of the disturbances. The results show zonal wavelengths of 3000 to 8000 kilometers and a tendency of northeast-southwest tilt in the meridional direction. The results show that 1991 appears to be the most active year, based on the highest relative variance in the 4 - 10 day window and the highest coherence between parameters. The vertical tilt was found to be westward with height above 300 - 400 hpa in 1989 and above 200 hpa in 1990 and 1991. This interannual variation was consistent with the change in vertical shear of the mean zonal wind. Below 400 hpa in 1989 and 200 hpa in 1990 and 1991, the vertical tilt was eastward with height. The thermal structure was consistent with the hydrostatic relationship in all three years. Waves transport heat poleward above 200 hpa and equatorward below 200 hpa.

ENSEMBLE FORECASTING TECHNIQUES IN MEDIUM-RANGE FORECASTING

Steven Walter Warren-Lieutenant, United States Navy
B.S., University of Oklahoma, 1983
Master of Science in Meteorology and Physical Oceanography-March 1993
Advisor: Wendell A. Nuss-Department of Meteorology

A continuing trend in numerical weather prediction (NWP) is the desire for reduced model forecast error. Developments in NWP such as advanced computing power and improved model physics and analysis methods have been successful in lowering error but are potentially limited. The regression method of ensemble forecasting is used to further reduce mean forecast error when compared to individual model forecast performances. A statistical regression scheme is utilized to achieve an optimum combination fitting of the National Meteorological Center, the European Centre for Medium-Range Weather Forecasts, and the U.S. Navy Fleet Numerical Oceanography Center forecast models. The performance of the regression model is evaluated for 72-h and 108-h prediction cycles through statistical and subjective comparisons with the individual models and an equally weighted ensemble model at the surface and at 500 hPa. The regression model is shown to produce significant gains through the reduction of systematic error present in the individual model forecasts.

MODELING THE TROPICAL OCEAN RESPONSE TO WESTERLY WIND FORCING

Claudia S. Whitney-Lieutenant, United States Navy
B.S., University of California, Irvine, 1985
Master of Science in Meteorology and Physical Oceanography-December 1992
Advisors: Tom Murphree-Department of Meteorology &
Roland W. Garwood, Jr.-Department of Oceanography

A primitive equation ocean general circulation model, with mixed layer physics, has been developed and applied to an investigation of the equatorial ocean. The major physical problem addressed with this model is the response of the upper ocean to westerly wind events, such as those that occur during tropical cyclones and during El Niño events. In the model development phase, several configurations of the mixed layer physics, domain size, and wind stress were tested. The best overall simulations were produced when both Richardson number dependent mixing and a bulk mixed layer model were included. Small model domains were found to be especially sensitive to the prescribed lateral boundary conditions and wind stress. Smaller domains required more realistic wind stress fields in order to achieve reasonable current structures. In addition, the off-equatorial currents were particularly responsive to changes in the zonal gradient of the wind stress. The final configuration of the model produces realistic simulations of climatological three-dimensional temperature and current structures in the equatorial ocean. In the model application phase, synoptically varying winds for the tropical Pacific were used to force the model. The winds came from the Navy's Operational Global Atmospheric Prediction System's (NOGAPS) daily analyses for the 1991-92 El Niño, which included several strong westerly wind events. The strong temporal and spatial variability in these winds produced complex fluctuations of the model's temperatures, currents, and internal waves, including reversals of the South Equatorial Current and equatorially trapped Kelvin waves. Model verification was performed by comparison with an observational study of in-situ equatorial Pacific buoy data. This comparison showed that synoptic scale variations in the wind stress are needed to simulate the ocean's strong responses to westerly wind events.

A CLIMATOLOGY OF POLAR LOW OCCURRENCES IN THE NORDIC SEAS AND AN EXAMINATION OF KATABATIC WINDS AS A TRIGGERING MECHANISM

Kenneth A. Wos-Lieutenant Commander, United States Navy
B.S., State University of New York, College at Oswego, 1979
Master of Science in Meteorology and Physical Oceanography-December 1992
Advisor: Kenneth L. Davidson-Department of Meteorology

Existing polar low climatologies for the region from Cape Farewell, Greenland east to Novaya Zemlya, Russia are incomplete. They primarily address storms affecting a particular geographic area or a limited time period. This study examines polar low formation frequency, origin region and storm tracks in the entire Nordic Sea region for complete polar low season and identifies the prevailing synoptic situation common to polar low formation. The number of polar lows detected through TIROS-N satellite imagery between September 1988 and May 1989 was significantly greater than one would expect from previous studies. No minimum wind speed requirement was applied to storm selection, as in some studies. Many polar lows were detected over the land areas of Greenland, Iceland and Svalbard away from a direct surface heat source. The storms detected over Greenland generally formed at the outflows of glacial valleys. Due to 12 hour or greater gaps in satellite imagery each day, storm detection positions were not necessarily those of formation. To determine probable formation areas, polar lows were linerally backtracked along the reciprocal of their storm tracks. A significant number were backtracked to glacier outflows along the Greenland coast. These formation locations suggest a katabatic influence on storm formation, possible due to vortex stretching, or the enhancement and distortion of an over-ice or over-land boundary layer baroclinic zone. Katabatic flows were examined by analyzing one month of regional surface synoptic observations and NOGAPS 1000 mb height gradients. To develop aids to enhance polar low forecasting, monthly mean 1000 and 500 mb fields for chart times closest to polar low detection, or time backtracked to Northern, Central and Southern Greenland, were calculated from archived NOGAPS 12 hourly analyses and compared to the monthly averaged climatology fields of height and temperature. The overall monthly synoptic patterns for polar lows detected over and backtracked to the three geographic areas were very similar to those for polar lows detected there. There was also significant agreement between the months for the three geographic areas. Both overland and backtracked storms form in regions of stronger than normal off-shore 1000 mb height gradients. At 500 mb, polar lows forming north of 68 North generally formed under ridges while those south of 68 North formed under troughs.

MASTER OF ARTS/SCIENCE
IN
NATIONAL SECURITY AFFAIRS

THE EVOLUTION OF RUSSIAN OFFENSIVE AIR WARFARE DOCTRINE: FROM DEEP BATTLE TO AEROSPACE WAR

Mark A. Admiral-Lieutenant, United States Navy
B.A., University of Southern California
Master of Arts in National Security Affairs-June 1993
Advisor: James J. Tritten-Department of National Security Affairs

This thesis examines the development of Russian offensive air warfare theory from 1930 to the present day. The revolution in military affairs caused by the development of high-precision weaponry and advanced methods of detection has transformed traditional concepts of warfare, making "remote strikes" by aircraft and missiles an increasingly vital factor in modern war. To Russian observers, the Persian Gulf War offered proof that a paradigm shift has indeed taken place. Despite radical technological change, the traditional concepts of airpower employment developed in the 1930's and perfected during the Second World War remain essentially valid despite visionary views on independent air warfare strategy. However, the battle between offensive airpower and air defense is now considered the critical factor in determining the course and outcome of a war, but within the context of combined arms operations and not independent strategic action. The high effectiveness of emerging strike technology in the Gulf War has led to priority Russian development of both countermeasures and analogous capabilities. However, there is agreement that the means of air defense alone are not sufficient, and preemptive offensive conventional strikes are widely viewed as the only acceptable alternative, even in the framework of a defensive strategy.

THE TREND TOWARD FREE TRADE AREAS: ECONOMIC CONSEQUENCES AND POLICY IMPLICATIONS FOR THE UNITED STATES

William Hamilton All, IV-Lieutenant, United States Navy
B.A., Emory University, 1982
Master of Arts in National Security Affairs-December 1992
Advisor: Robert E. Looney-Department of National Security Affairs

Because America's economy relies to a significant degree on export markets and external sources of raw materials, the health of the international trading system is critical to the national security of the United States. This thesis demonstrates that the organization on which America has relied for the management of the international trading system since the 1950s, the General Agreement on Tariffs and Trade (GATT), is failing to effectively fulfill its role of international trade regulation. It is argued that because of that failure, an alternative global trading structure based on a triad of large regional free trade areas (FTAs) is developing. It is proven, using the generally accepted tenets of customs union theory, that the impact on the United States of such a triad could be generally positive in the absence of a functioning GATT. Based on this economic analysis, broad American trade policy guidelines are proposed to maximize American advantage in the evolving system.

THE UNITED STATES, LATIN AMERICA, AND THE POTENTIAL FOR NAVAL AND DEFENSE INDUSTRIAL PARTNERSHIP: THE CASE OF BRAZIL

Erik Narve Anderson-Lieutenant, United States Navy
B.A., University of Virginia, 1981
Master of Arts in National Security Affairs-March 1993
Advisor: Thomas C. Bruneau-Department of National Security Affairs

The purpose of this thesis is to analyze U.S. security interests in Latin America and examine the potential for a Latin American nation, under a revised maritime strategy, to become both a naval and a defense industrial partner of the United States. The thesis is divided into three parts. The first examines the need to revise the U.S. maritime strategy and makes a case for a greater focus of that strategy on Latin America. The second part assesses the relative strengths and weaknesses of Latin American national and maritime capabilities. The third part examines the potential for armaments cooperation between the United States and Brazil. The thesis concludes that the potential for collaboration between the United States and Brazil is limited because of political and economic constraints in both countries.

ETHNIC RUSSIANS IN THE BALTIC STATES AND RUSSIA'S FOREIGN POLICY

Brian Blake Bales-Lieutenant Commander, United States Navy
B.B.A., University of Iowa
Master of Arts in National Security Affairs-March 1993
Advisor: Mikhail Tsypkin-Department of National Security Affairs

Since the collapse of the Soviet Union, ethnic Russians living in the former republics of Estonia, Latvia, and Lithuania have alleged that their civil and human rights are being violated. The issue has generated a great deal of concern from both progressive and conservative elements within the Russian government. Although Russia has vital military and economic interests in the Baltic region, and the human rights problem could possible play into the hands of those who would use the issue as a pretext for maintaining a military presence in the area, this thesis will examine the possibility that the human rights agenda is not so much a cover for geostrategic interests as it is a political problem that facilitates the Russian foreign policy for keeping a foothold in the Baltic States. The situation may also represent a beneficial condition for the Russian military who have been pressing for support of a foreign policy that would discontinue the withdrawal of Russian troops from the Baltics, retain a Russian military presence in the area, and address their interests and concerns.

STRATEGIC CULTURE AND BALLISTIC MISSILE DEFENSE: RUSSIA AND THE UNITED STATES

Miriam D. Becker-Lieutenant, United States Navy
B.A., University of Illinois, 1987
Master of Arts in National Security Affairs-June 1993
Advisor: David S. Yost-Department of National Security Affairs

This thesis examines U.S. and Russian history and current policy debates to advance understanding of: 1) the strategic cultures of these nations, particularly with respect to BMD policies in the recent past; and 2) whether and how their strategic cultures and approaches to BMD are changing and how that may affect future strategic BMD developments and the status of the ABM Treaty. The development of BMD strategies, including policies concerning the ABM Treaty, within the framework of the established American and Russian strategic cultures is studied, with due attention to the Soviet experience and legacy in the Russian case. U.S. strategic culture does not seem to have changed significantly with the end of the Cold War, but U.S. BMD priorities have been redefined to reflect a higher priority attached to regional and theater-level defenses. It is apparent that the Soviet experience did have a significant impact on Russian strategic culture. Faced with major changes in its international status, domestic political-military arrangements, and scope of national security concerns, Russian strategic culture is nonetheless moving beyond the old Soviet culture. Future Russian policies regarding the transfer of BMD technology, sharing early warning data, and participating in a global protective system are heavily dependent on domestic political developments.

THE MEXICAN MILITARY AND POLITICAL TRANSITION

Robin Claire Bedingfield-Lieutenant Commander, United States Navy
B.A., Mary Washington College, 1981
Master of Arts in National Security Affairs-December, 1992
Advisor: Scott D. Tollefson-Department of National Security Affairs

This thesis assesses the future Mexican civil-military relations. Mexico is unique among Latin American nations for its professionalized and depoliticized military. While the Mexican Armed Forces have shunned an active role in politics since 1940, they continue to rely on the hegemonic political party, the *Partido Revolucionario Institucional*, or PRI, for power and prestige. This dictates a close and mutually-supportive working relationship. Within the next 20 years, however, the PRI is likely to lose its hegemonic position to increasing political opposition, severely straining the military's 60-year tradition of loyalty to both its Constitution and Party. The military will be pressured to take on a more dynamic political role with the demise of its long-standing patron. This thesis demonstrates that the Mexican Armed Forces are likely to resist this temptation to repoliticize.

UNDERSTANDING THE ECONOMIC POWER OF OIL

Jon C. Belanger-Lieutenant, United States Navy
B.A., University of Florida, 1985
Master of Arts in National Security Affairs-December 1992
Advisor: Ralph H. Magnus-Department of National Security Affairs

Oil has become a single global market in which oil price fluctuations now have the ability to rock the world economy. The purpose of this thesis is to examine the changing nature of this threat and by doing so, show that Saudi Arabia, which has acted as the primary stabilizing tool by American foreign policy makers, will no longer suffice in this capacity. Rather, Saudi Arabia, which has for the most part cooperated with the United States in helping to stabilize oil price and supply disruptions, will become increasingly less cooperative in a much shorter time frame than might be anticipated with regard to oil supplies. This thesis proposes possible avenues for U.S. national security policy by exploring pathways that might further ensure economic security and stability of the Middle East region in light of the new nature of the oil threat. The goal of economic security and stability can only be realized through an understanding of the oil producing nations and their relationships with the international community and world economy.

IMPLICATIONS FOR THE U.S. NAVY OF A 50 PERCENT DECREASE IN DEFENSE SPENDING

Patrick Hahler Brady-Lieutenant Commander, United States Navy
United States Naval Academy, 1981
Master of Arts in National Security Affairs-December 1992
Advisor: James J. Tritten-Department of National Security Affairs

This thesis addresses the capabilities of the 300-ship Navy that could be afforded with an assumed fifty percent decrease in defense spending and the restrictions that this size navy would place on U.S. foreign policy. This navy could fulfill the Nation's strategic deterrence requirements for the post Cold War era. The SSBN force alone provides the required EMT to provide the Nation with an assured destruction capability. This navy could also fulfill the Nation's forward presence requirements. However with the ability to maintain only two CVBGs forward deployed, the Navy would be forced to use non-traditional methods, such as new deployment force structures or a mix of high cost/high capability and low cost/low capability ships, to fulfill this role. The requirements for crisis response can be fulfilled but only at the tactical level of warfare. It is unlikely that this navy could even lift one division to conduct forced entry missions with. Even if one division was lifted, it is too small to conduct forced entry missions even at the low end of the operational level of warfare. This would force the U.S. to rely more heavily on joint and coalition warfare. Additionally, the ability of this navy to handle more than one crisis at a time is doubtful. Finally, this navy could fulfill the Nation's reconstitution requirements if given the full assumed warning period (8 to 10 years) to reconstitute forces.

NATIONAL UNIFICATION AND TRANSITION IN THE GERMAN ARMED FORCES

Eric Hugh Brandenburg-Lieutenant Commander, United States Navy
B.S., University of Utah, 1982
Master of Arts in National Security Affairs-June 1993
Advisor: Donald Abenheim-Department of National Security Affairs

This study analyzes the factors that have contributed to the contemporary reshaping of the German armed forces. It describes the burdens of history prior to 1945, treaty and constitutional restraints on armed forces, the establishment of the armed forces in the 1950s and 1960s, and the culture of reticence in military affairs that cannot easily or even willingly be modified. Further sections address national unification, the contemporary determinants of German security policy, the complications of absorbing the veterans of the East German military, and manpower and budgetary considerations. Lastly, from a national defense force posture aligned within NATO forward defense, the German armed forces are making a transition into highly mobile, rapid reaction units that can be deployed at short notice to world trouble spots. These rapid reaction units may eventually conduct peacekeeping, humanitarian aid, and crisis reaction missions under the auspices of the UN, NATO, or WEU. Internal and external anxieties about German military participation in such missions have produced a confused defense policy. Germany is nonetheless restructuring its military to demonstrate the achievement of sovereignty and to improve its ability to defend national and allied interests in a new international context.

PREREQUISITES FOR DEMOCRACY IN CUBA: PROMOTING LIBERALIZATION VIA CIVIL SOCIETY

Elizabeth A. Breland-Lieutenant, United States Navy
B.S., Davis and Elkins College, 1982
Master of Arts in National security Affairs-June 1993
Advisor: Scott D. Tollefson-Department of National Security Affairs

This thesis examines current U.S. policy vis-a-vis Cuba, and its impact on the development of democracy in Cuba. It argues that U.S. policy is counterproductive in promoting a sustainable inclusive democracy in Cuba, because it demands that the Castro regime hold "free and fair" elections prior to any normalization in the relations between the two countries. This demand ignores the fact that Cuban Civil society is woefully underdeveloped, and is not prepared to effectively participate in the creation and maintenance of a truly representational government. Without a vibrant civil society, Cuba is likely to fail under the control of an authoritarian, populist regime whose relationship to the United States may prove no more cordial than Castro's The thesis recommends practical steps through which the United States can reward Cuban liberalization without requiring immediate political democratization. The goal of these steps is to encourage the opening of political space within which Cuban associational groups with a clear stake in a freer society can flourish.

MARINE CORPS INTELLIGENCE AND ALL-SOURCE FUSED ANALYSIS SUPPORT TO MARINE AND JOINT OPERATING FORCES: COMPLEXITIES, PROBLEMS, CHALLENGES FOR THE FUTURE

Daniel T. Button-Major, United States Marine Corps
B.A., Political Science, University of Idaho, 1979
Master of Arts in National Security Affairs-June 1993
Advisor: Peter R. Hull-Department of National Security Affairs

This thesis examined the status of all-source fused intelligence support within the United States Marine Corps. Deficiencies in this area were identified in the late 1980s and the Marine Corps created two new organizations dedicated to the production of all-source fusion intelligence: the service level Marine Corps Intelligence Activity and three MAGTF All-Source Fusion Centers. Despite the creation of these organizations, a number of factors continue to complicate and inhibit Marine Corps Intelligence from providing more than rudimentary all-source, fused, tailored intelligence support to Marine Corps and joint operating forces. A survey questionnaire returned by nearly half of all Marine Corps intelligence officers, and research into these new all-source fusion organizations, determined that continued manning and structure deficiencies, inadequate training and education, and problems with experience level and assignments are the main problems. The Marine Corps is taking active steps to correct these deficiencies, but with downsizing and budget cutbacks, all-source, fused intelligence support by Marines to Marines, may remain more a goal than a reality.

SOUTHEAST ASIAN PERCEPTION OF U.S. SECURITY POLICY IN THE POST-COLD WAR ERA

Joseph R. Chiaravallotti-Lieutenant, United States Navy
B.A. Stockton State College, 1985
Master of Arts in National Security Affairs-June 1993
Advisor: Claude A. Buss-Department of National Security Affairs

The end of the Cold War has changed the political environment in Southeast Asia and the parameters in which United States policy makers previously worked within are no longer the same. The United States' strategies are based on assumptions of how the rest of the world perceives it, but the views of other nations may not concur with the United States policy makers' assumptions. This thesis is concerned with the United States policy in Southeast Asia and brings to light the Southeast Asians' perceptions of the issues in which the United States is formulating its national security policies; how the negative perceptions differ from American assumptions; and offer suggestions on how to deal with the differences. The aim of this thesis is to provide security policy makers with information that could be used in exercising judgment to find solutions to current, and prospective, policy problems in Southeast Asia. It produces policy-relevant information that may be used to resolve specific policy problems and pursue preferable courses of action in the region. This thesis shows a single policy towards Southeast Asia is misguided. Each state in the region has its own interests, and American policies must be formulated with each individual state, one by one.

THE TECHNOLOGY REVOLUTION AT SEA: A CASE STUDY OF SMALL COMBATANTS

Stephen Michael Clarke-Lieutenant, United States Navy
B.S., University of Southern California, 1986
Master of Science in National Security Affairs-September 1993
Advisor: Jan S. Breemer-Department of National Security Affairs

The U.S. Navy's doctrine"...From the Sea" anticipates that future naval confrontations will likely occur in the littoral regions of the world in support of operations ashore. One of the challenges facing naval forces are corvette or light frigate warships incorporating advanced technologies. In this thesis, a review of the historical developments of these limited displacement warships is presented. World War II escorts of the Allied Forces formed the backbone of many of the navies which formed after the war. Technological improvements have allowed corvettes and light frigates to develop from being ships of limited capabilities to being the "capital ship" for smaller navies. It was determined that while more countries, particularly Pacific Rim countries, are producing warships, the number of producers of technologically advanced weapons and sensors is still primarily limited to the countries of Western Europe. The anti-ship missile is expected to continue as the primary weapon, however, its capabilities are going to increase as higher speeds, lower radar cross sections, and passive seekers are incorporated.

U.S. INTERESTS IN EUROPEAN SECURITY FOLLOWING THE COLD WAR

Phillip M. Cochran-Lieutenant, United States Air Force
B.S., Central Missouri State University, 1989
Master of Arts in National Security Affairs-December 1992
Advisor: David S. Yost-Department of National Security Affairs

The need for U.S. involvement in European security affairs did not end with the Cold War. History provides evidence to support this. Periods in which the U.S. pursued neutralist or isolationist policies towards Europe resulted in instability on the continent. However, since 1949, the U.S. has pursued an alliance policy and Europe has experienced relative peace. With the end of the Cold War, the United States must reevaluate its interests in Europe. These interests include the future of Russia, the stability of Eastern and Western Europe, the future of European security institutions, and a place at the European economic and political table for the U.S. These interests must be kept in mind as the United States analyzes associated issues regarding further reductions in the defense budget and military presence in Europe. These issues include the U.S. security guarantee to Europe, the cost of U.S. involvement in the Atlantic Alliance, the search for a "peace dividend," and European support for a continued U.S. military presence on the continent. After examining these issues, the thesis concludes that further reductions in the U.S. defense budget and military presence in Europe must proceed at a responsible rate, if the U.S. is to avoid past mistakes and preserve European stability.

A COMING OF AGE: THE IMPLICATIONS OF PRECISION-GUIDED MUNITIONS FOR AIR POWER

Timothy M. Conroy-Lieutenant, United States Navy
B.A., University of California, Berkeley, 1983
Master of Arts in National Security Affairs-June 1993
Advisor: Patrick J. Parker-Department of National Security Affairs

The thesis argues that air power now dominates modern warfare. The overwhelming victory of the Gulf War stands as a symbol of the maturity of air power. In effect, technology has caught up with nearly a century of air power theory, the early prophets of air power were basically correct. The air war in the Gulf was revolutionary in the sense that very few bombs were required to achieve an enormous amount of very focused, precise destruction. The existence of precision-guided munitions allows single aircraft to accomplish what, in the past, would have taken literally thousands of aircraft to accomplish or could not have been accomplished at all. The argument is based on a comparison of the employment of air power in previous conflicts. A comparison is then made with the employment of air power in the Gulf War. In the context of modern war, the implications of the air war in the Gulf have profound implications for every warfare specialty. However this thesis only considers the implications of precision guided munitions for naval air power.

UKRAINE: INDEPENDENT NUCLEAR WEAPONS CAPABILITY RISING

Martin J. DeWing-Lieutenant Commander, United States Navy
B.A., University of California, Irvine, 1980
Master of Arts in National Security Affairs-June, 1993
Advisor: Roman A. Laba-Department of National Security Affairs

This thesis argues that Ukraine will move from possession of CIS-controlled nuclear weapons to the development of an independent nuclear capability. It attempts to show how the factors driving Ukraine towards remaining a nuclear state outweigh the factors acting in restraint. This thesis describes the contents of the Ukrainian arsenal, reviews its current material condition and investigates the likelihood that Ukraine can directly control it. This thesis also shows why Ukraine's most likely course of action in developing an independent nuclear weapons capability will be to retain its 46 SS-24 ICBMs.

NUCLEAR PROLIFERATION: LESSONS LEARNED FROM THE IRAQI CASE

Todd Anthony Dixon-First Lieutenant, United States Air Force
B.A., Indiana State University, 1989
Master of Arts in National Security Affairs-December 1992
Advisor: David S. Yost-Department of National Security Affairs

The nuclear weapons inspection regime implemented in Iraq following the United Nations coalition victory in Desert Storm is the most intrusive in history. Important conclusions about the current non-proliferation regime can therefore be determined from a study of Iraq's progress. This thesis examines Iraq's efforts to acquire nuclear weapons. The supply side of the equation is also studied, with a concentration upon the contributions of NATO nations. The strategic culture of Iraq is discussed, in an effort to discover why Iraq sought nuclear weapons. Finally, policy prescriptions are advanced. The current non-proliferation regime needs to be improved if the spread of nuclear weapons is to be halted, or even slowed. The most promising way to improve this regime is to involve the U.N. Special Commission and the U.N. Security Council in the management of the problem of nuclear proliferation.

AN HISTORICAL COMPARISON BETWEEN THE SOUTHERN SECESSION MOVEMENT OF 1860 AND THE SOVIET SECESSION MOVEMENTS OF TODAY

Michael L. Donner, Sr.-Lieutenant, United States Navy
B.S., United States Naval Academy, 1983
Master of Science in National Security Affairs-December 1992
Advisor: Frank M. Teti-Department of National Security Affairs

This thesis uses an historical interpretation of the Southern secession movement of 1860 in order to formulate a secession theory consisting of three separate elements: 1) the growth of political faction; 2) a characteristic of the factional clash which renders the resulting crisis particularly unsuitable for constitutional or governmental adjudication; and 3) the existence of a subordinate governmental infrastructure, controlled by the minority faction, which can be used to effect a secession movement. An historical review of the Southern secession movement is undertaken in light of the above secession theory in order to argue for the theory's validity; then the theory is applied to the various Soviet secession movements with a view towards proposing U.S. policy options.

THE EFFECT OF LEADERSHIP CHANGES IN TAIPEI AND BEIJING ON THE CROSS STRAITS RELATIONSHIP

Joseph R. Donovan, Jr.
B.S.F.S., Georgetown University, 1973
Master of Arts in National Security Affairs-September 1993
Advisor: Claude A. Buss-Department of National Security Affairs

It is unlikely that the fast growing relationship between Taiwan and the China mainland will lead to political re-unification. The operational codes of new leaders in Taipei and Beijing will be shaped by the distinct forces at work on both sides of the straits and by the dynamic of the contacts themselves. Taiwan leaders will be selected by an increasingly pluralistic system but one which remains biased heavily in favor of the ruling KMT. A new generation of Taiwanese KMT leaders will pursue policies that contribute first to the island's security and prosperity and only secondly benefit any notion of a greater China. Power in Beijing is shifting to a generation that is the product of the Chinese Communist system. Beijing leadership contenders' pressing need to: consolidate factional networks in the absence of an institutionalized succession process; strengthen the legitimacy of the Communist Party; and re-integrate Hong Kong into China suggest that they may place low priority on re-unification with Taiwan. Despite the absence of a compelling interest in political re-unification, the increasing scope and complexity of cross straits ties constitutes a dynamic that will stimulate greater cooperation between Taiwan and the mainland. This combination of the powerful forces expanding cross straits ties and the absence of incentives for new leaders to pursue overall political integration may lead to the evolution of an entity that is less than a modern nation-state but more than a trading bloc.

FROM "CHICKEN KIEV" TO UKRAINIAN RECOGNITION: DOMESTIC POLITICS IN U.S. FOREIGN POLICY

Susan D. Fink-Lieutenant, United States Navy
B.S., United States Naval Academy, 1986
Master of Arts in National Security Affairs-June 1993
Advisor: Roman A. Laba-Department of National Security Affairs

This thesis uses original research to achieve two goals. First, it is meant to give the first analytical account of U.S. recognition of Ukraine, along with its political significance. Second, it proposes a new theory of ethnic groups in U.S. foreign policy. This thesis proposes that ethnic groups will have an increasing role in American foreign policy for three reasons. First, they have superior knowledge to elites who are encrusted in Cold War ways of thinking and divorced from their electorate. Second, Congress is more active in foreign policy and more permeable to the ethnic lobby. Third, the ethnic population of the United States is growing. The thesis works on a least five levels. First: the role of nationalism in world politics, especially in the collapse of the Soviet Union which now increasingly challenges the system of sovereign states. Second: the way in which foreign policy is made in Washington, including the roles of the President, his bureaucracy, Congress and the media. Third: the role of lobbies in the foreign policy making process. Fourth: electoral politics and its role in decision making. Fifth: East European ethnics, Ukrainian-Americans in particular, and their role as subjects and objects in the struggle between Democrats and Republicans for the ethnic vote.

THE UNITED NATIONS' PLAN FOR COLLECTIVE SECURITY IS IT RELEVANT TODAY?

Joanne Marie Fish-Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1983
Master of Arts in National Security Affairs-June 1993
Advisor: James J. Wirtz-Department of National Security Affairs

This study analyzes the original intentions of the creators of the United Nations for a collective security arrangement to provide for international peace and security. The study answers the questions: What kind of world order was the United Nations designed for? What was the perceived threat be that the United Nations was designed to meet? What role did was envisioned for the Security Council? Under what conditions did the United Nations envision the need for force? How was force through the United Nations to be used - specifically, what kind of force and what type of control would there be over this force? The study does a focused comparison between the 1943-1945 period and the current situation to determine if the 1943-1945 period is an appropriate historical analogy for a current assessment of the United States role in the United Nations. The study begins with an historical overview of the development of the United Nations, followed by a detailed discussion of the UN collective security plan. The study next looks at the current world situation with regard to the need for collective security, exploring what kind of world order is emerging and evaluates current threats. The study concludes with an analysis of how well the original UN collective security plan meets the current needs of the world system.

PEACEMAKING IN CAMBODIA: BLUEPRINT FOR A NEW WORLD ORDER?

Paul N. Fujimura-Lieutenant, United States Naval Reserve
B.A., University of California, Berkeley, 1986
Master of Arts in National Security Affairs-June 1993
Advisor: Claude A. Buss-Department of National Security Affairs

This thesis examines the peacemaking process as it has unfolded in Cambodia. The end of the Cold War has engendered a new spirit of multi-lateral activism in the international community. Intervention in the domestic affairs of a sovereign country is deemed legitimate, necessary, and desired to secure more worldly goals of peace, stability and respect for human rights. The United Nations-sponsored peacemaking process brought to Cambodia sought to achieve these goals by establishing a cease-fire and setting Cambodia upon the road of a comprehensive political settlement through democratic self-determination in the form of elections in May 1993. The analysis of this study has identified the Cambodian peace plan as flawed in content and context as an externally imposed solution to an internal problem entrusted to an institution without the ability to enforce peace and order. The mandate establishing the UN mission in Cambodia simply did not vest it with the proper authority to enforce compliance with the terms of the peace plan. Cambodian political culture possesses a dynamic which is resistant to national reconciliation. The winner-take-all mentality of the Khmer *deva-rajas* is poor soil for democratic pluralism to take root. Restoring peace and stability and establishing democracy in Cambodia will require more than an eighteen-month lull in the fighting, a single election, and the new constitution that the United Nations can bring to the situation. As such, the UN mandated peacekeeping plan for Cambodia, as it has unfolded, has exposed so many shortcomings of good intentions gone awry that it cannot be adopted as the universal model for a peacemaking process in the new world order. The elections of May 1993 may not be a solution to Cambodia's political difficulties, although they may serve as a milestone on a longer road of development and reconciliation. Whatever the future may hold, the Cambodian people will have to work out their own fate. They may choose to seek help from the outside, but they must reconcile their differences at least to the extent that they can live together in peace.

NATO'S OUT-OF-AREA DISPUTES: PROSPECTS FOR COMMON WESTERN STRATEGIES IN THE MIDDLE EAST

Dale G. Fuller-Lieutenant, United States Navy
B.A., University of Minnesota, 1985
Master of Arts in National Security Affairs-December 1992
Advisor: David S. Yost-Department of National Security Affairs

This thesis traces the origins of NATO's out-of-area debate and suggests that the Middle East was a major strategic concern from the outset. However, NATO has been unable to formulate a common security policy to protect Western interests in the Middle East. The thesis suggests that out-of area contingencies in the Middle East might be dealt with more effectively through United States-Western European Union (WEU) cooperation than under NATO auspices. This assessment is made in view of the successful ad hoc co-ordination of Western naval operations in the 1987-1988 "Tanker War" and in the 1990-1991 Persian Gulf War. Cooperation between the United States and the WEU, both pillars of NATO, seems to be more practical politically than through NATO itself. The thesis concludes that the allies concerned must develop improved institutional links between the WEU and NATO in order to respond to future contingencies beyond Europe. In this way the United States and the WEU can utilize all of their capabilities and assets effectively.

FROM SAC TO STRATCOM: THE ORIGINS OF UNIFIED COMMAND OVER NUCLEAR FORCES

Gregory S. Gilmour-Lieutenant, United States Navy
B.A., The Citadel, 1986
Master of Arts in National Security Affairs-June 1993
Advisor: R. Mitchell Brown, III-Department of National Security Affairs

This thesis examines the creation of the United States Strategic Command (USSTRATCOM). This assessment reviews the past and recent attempts to create a unified strategic command over nuclear forces. Interviews conducted by the author with the major individuals involved in the current creation of STRATCOM, along with a historical review of past attempts to consolidate nuclear forces provide the basis for this thesis. In examining why STRATCOM was created, two competing arguments were used to answer the question presented. The main argument for the creation of STRATCOM was the fact that there was no need to keep strategic nuclear forces in separate commands at the end of the Cold War. The counter argument is that the Goldwater-Nichols Act of 1986 alone forced the creation of STRATCOM. The results from this research show that there is now a trend among the military leaders to cooperate among themselves. The author uses the reasons for the creation of STRATCOM as a possible blueprint for how the Services will react to possible Unified Command Plan changes in the future.

THE UNITED STATES, THE UNITED NATIONS, AND THE LEGITIMATION OF THE USE OF FORCE

Kerry Spencer Gilpin-Lieutenant, United States Navy
B.A., Yale University, 1985
Master of Arts in National Security Affairs-June 1993
Advisor: David S. Yost-Department of National Security Affairs

Utilizing Martin Wight's analysis of three theoretical traditions concerning international relations - Realism, Rationalism, and Revolutionism - this thesis examines the hypothesis that the U.S. executive seeks, as a precondition of domestic political debate, legitimacy from the United Nations to justify the use of force in the post-Cold War political environment. To place the analysis in a meaningful context, the first part of the thesis reviews the evolution of sovereignty and war in the Western tradition since the sixteenth century, specifically the dispersion of sovereignty from autocrats to peoples, with an attendant shift in "just" war aims. The next part examines the legitimacy of the use of force in post-Cold War conflicts within the framework of the Charter of the United Nations and international law. Finally, the thesis assesses changes in public and Congressional acceptance of various justifications for the use of force within the U.S. political process. The thesis concludes that the U.S. finds useful legitimacy in the U.N., but U.N. endorsement is *not* a political prerequisite to use force; furthermore, a U.N. mandate does not *compel* the U.S. to employ force if U.S. interests are not also thereby served. Massive U.S. military involvement in the former Yugoslavia is therefore improbable unless (or until) the U.S. perceives a more tangible threat to its own security interests.

THE RUSSIANS DEBATE THE KURIL ISLAND TERRITORIAL DISPUTE: AN ASPECT OF RUSSO-JAPANESE RELATIONS IN THE POST-COLD WAR WORLD

Virginia B. Graf-Lieutenant Commander, United States Navy
B.A., California State University, Chico, 1975
Master of Arts in National Security Affairs-June 1993
Advisor: Claude A. Buss-Department of National Security Affairs

Both Japan and the Russian Federation still claim rightful ownership of a small group of islands between Japan's Hokkaido Island and the Russian Federation's Northern Kuril Islands. Russia seized the islands in the course of World War II. The disposition of the islands has prevented the two countries from signing a peace treaty. The objectives of this thesis will be to analyze Russia's political, economic, strategic, and social perspectives of the Kuril Islands debate, during 1992, as an indication of the post-Cold War international relations between Moscow and Tokyo. It is the hypothesis of this thesis that although the breakup of the Soviet Union has eased tensions between the "West" and "East," international relations between Moscow and Tokyo continue to reflect Soviet philosophies and policies. this not only hurts the Russian Federation's future development in the Pacific Rim but acts as an obstacle for cooperative, interdependent ties between all the countries of the world.

THE ROLE OF UKRAINE'S COMMUNISTS IN THE UKRAINIAN INDEPENDENCE MOVEMENT

Adam Grove-Captain, United States Air Force
B.S., University of Arizona, 1985
Master of Arts in National Security Affairs-June 1993
Advisor: Roman A. Laba-Department to National Security Affairs

Contrary to nearly all predictions, Ukraine's Communists supported the Ukrainian declaration of independence in 1991. Closer scrutiny reveals this should have been no surprise because Communist support for independence was the result of Marxist-Leninist ideology's failure to resolve the conflict between nationalism and Communism. Because of this contradiction, Ukrainian Communists were promised national self-determination but were forbidden to exercise it. Similarly, Ukraine's pre-Communist national consciousness survived and was even nurtured by the Soviet system. These two factors, acting simultaneously, meant the idea of an independent Ukrainian nation was never far from the thoughts of Ukraine's Communists. Thus, when the opportunity came to realize self-determination for the third time this century, Ukraine's Communists, still retaining national consciousness and marching under the banner of Marxism-Leninism, joined and even led the move toward independence.

U.S. NAVAL PRESENCE IN SOUTHEAST ASIA: IS IT NECESSARY?

Todd Alan Gunerman-Lieutenant, United States Navy
B.A., Pennsylvania State University, 1986
Master of Arts in National Security Affairs-September 1993
Advisor: Claude A. Buss-Department of National Security Affairs

This thesis is an examination of the need for a U.S. Naval presence in Southeast Asia. With the rapid changes in the world geopolitical order following the collapse of the Soviet Union in 1989, the need for American military presence in all parts of the world is being reexamined. This thesis examines the most recent policy and strategy statements of both the President and the Pentagon and how Southeast Asia might fit in to this new strategy. U.S. national interests in Southeast Asia are reevaluated for the post-Cold War era, concluding that the United States does indeed have strong interests, primarily economic, in the region. There are several potential threats to U.S. interests in Southeast Asia, both internal and external to the region. The internal threats are the traditional rivalries within the region. Potential external threats are from China and Japan seeking regional hegemony. A strong U.S. naval presence will be superior to any regional navy and is essential to ensuring U.S. national interests in the region remain secure.

GERMANY AND THE FUTURE OF NUCLEAR DETERRENCE IN EUROPE

Edward G. Gunning, Jr.-Lieutenant, United States Navy
B.S., United States Naval Academy, 1985
Master of Arts in National Security Affairs-December 1992
Advisor: David S. Yost-Department of National Security Affairs

The dissolution of the Soviet Union and the unification of Germany have fundamentally changed the politics of security in Europe. This thesis analyzes German perspectives on the international security environment and offers judgements about the probable future role of nuclear deterrence in Europe. The thesis begins with a survey of the role of nuclear deterrence in the security policy of the Federal Republic of Germany during the period prior to reunification in 1989-1990. This is followed by an analysis of German views on the West European nuclear powers: the United Kingdom and France. German views on the U.S. nuclear presence and U.S. commitments to Europe are then examined. German views on nuclear weapons in the former Soviet Union and the potential for proliferation on Europe's periphery complete the survey. For the short term, Germany will not change its present policies regarding nuclear deterrence in Europe. The German nation is likely to remain preoccupied with the reunification process for several years, and German politicians are not disposed to seek a debate on nuclear deterrence. The Germans generally consider Britain and France incapable of providing adequate nuclear protection for the Federal Republic in the near term, so the Germans will continue to rely on the United States for a nuclear guarantee.

TRADE AND TECHNOLOGY: MAINTAINING THE U.S. JAPAN SECURITY RELATIONSHIP IN THE POST-COLD WAR ERA

Randy D. Haldeman-Lieutenant, United States Navy
B.S., West Chester University, 1985
Master of Arts in National Security Affairs-December 1992
Advisor: Edward A. Olsen-Department of National Security Affairs

The mainstay of Japan's domestic and foreign policy successes after the Occupation has been its economic prowess. The reforms implemented throughout the Occupation, combined with the strong Japanese concepts of loyalty and willingness to work, proved successful ingredients for a healthy economic recovery. Many restrictive policies and protectionist practices were implemented in an effort to ensure the survivability of Japan's newly restructured industrial base. The end of the Cold War and emergence of a new emphasis on economic-related factors has resulted in strong criticisms from both the United States and Japan and is causing them to reevaluate the nature of their relationship. This thesis examines the role of trade and technology in U.S.-Japan relations in the post-Cold War era. If trade/technology-related tensions continue to grow, they may become detrimental to the mutually favorable relationship. The danger is that they will undermine the U.S.-Japan relationship. The challenge is to find a basis for compromise.

DEFENSE POLICYMAKING: THE POST-COLD WAR ROLES AND MISSIONS DEBATE

Michael Anthony Hall-Lieutenant, United States Navy
B.S., University of South Carolina, 1985
Master of Arts in National Security Affairs-June 1993
Advisor: Paul N. Stockton-Department of National Security Affairs

This thesis examines the ability of the President, Congress and Armed Services to formulate and implement defense policy that eliminates duplication and inefficiencies within service roles and missions. The hypothesis examined is that the Joint Chiefs of Staff and the four military Services will be unable to formulate any significant changes in their own roles and missions because of a dichotomy between what the Services see as significant change (read structure) and what Congress sees as significant change (read budget). The Services inability to make change will force Congress to take the lead in the defense reform effort. However, congressional efforts to formulate and implement defense policy will prove imperfect again, unless Congress can first reform itself. Secretary of Defense, Les Aspin, has the best opportunity to formulate and implement defense policy for a post-Cold War environment. This thesis begins with a brief overview on the origins of the present day roles and missions debate, and is followed by an examination of the Goldwater-Nichols Act that provides insight as to how legislators might work with or against the President and Services in reallocating service roles and missions. The current debate over service roles and missions is examined along with constraints and implications of defense policymaking.

A MODEL OF DEFENSE FOR RUSSIA

David B. Hanson-Lieutenant, United States Navy
B.A., Augustana College, 1980
Master of Arts in National Security Affairs-June 1993
Advisor: James J. Tritten-Department of National Security Affairs

This thesis constructs an original model of defense for Russia. This model is developed in the context of Russia's current military situation, but can easily be adapted to other nations. It explains the geographic extent that a nation will defend through the interplay of two factors: the cost of defense and the propensity to defend. The dissolution of the Warsaw Pact and the collapse of the Soviet Union have left Russian forces based in potentially hostile territory which is logistically insupportable in the event of hostilities. To support its troops, Moscow must redeploy them and prepare new theaters of military operations. The requirement for prepared theaters was discussed by the Russian military strategist, A.A. Svechin. However, first Moscow must determine where wars are likely, and what territory it will defend. The model draws upon the work of Halford Mackinder, Johann von Thünen, Yi-Fu Tuan, and Walter Christaller. The model addresses the complexity of the elements which compose the cost of defense and the propensity to defend. These elements can come into conflict with each other over specific geographic areas. Three regions of conflict are addressed: the Caucasus, Central Asia, and Ukraine. The thesis concludes with some policy implications.

KOREAN UNIFICATION AND UNITED STATES SECURITY ALTERNATIVES IN NORTHEAST ASIA

Edward Laurens Hasell-Lieutenant, United States Navy
B.S., State University of New York at Buffalo, 1983
Master of Arts in National Security Affairs-June 1993
Advisor: Edward A. Olsen-Department of National Security Affairs

The end of the Cold War has removed the external restraints placed on the Republic of Korea and the Democratic People's Republic of Korea that in the past have proved to be a barrier to unification of the two states on the Korean peninsula. An inter-Korea Cold War lingers on, frustrating both governments plans for unification of the peninsula. North and South Korea have made unification a major goal of their governments, and they will eventually succeed in unifying the Korean peninsula. Unification of the Korean peninsula removes the primary basis for a U.S. military presence on the peninsula, that of deterring North Korea. Even in the post Cold War context, the Korean peninsula remains an area of strategic importance to the United States, and to Japan, China, and Russia. The United States has enduring political, economic, and security interests in Korea and Northeast Asia. The United States should expand its relations with North Korea which can now be done without damaging relations with South Korea. Unification of the Korean peninsula would reduce tension and the potential for instability, so the United States should work toward that goal. In the post Cold War, multipolar world of competing economic and political interests, a strong unified Korea as an ally would be an asset to the United States in Northeast Asia, particularly if relations between the U.S., Japan, and China suffer serious setbacks. It would still best serve the interests of the United States to maintain a military presence on the Korean peninsula in cooperation with the unified Korea government.

PROBABLE TRENDS IN TERRORISM IN WESTERN EUROPE

Charles M. Heron-Lieutenant Commander, United States Navy
B.A., West Chester State College, PA, 1978
Master of Arts in National Security Affairs-December 1992
Advisor: David S. Yost-Department of National Security Affairs

Terrorism is a continuing international concern which has particularly plagued the security of Western Europe. This thesis analyzes probable trends in terrorism in the 1990s in this region. The thesis examines the sources of terrorism affecting Western Europe: indigenous and foreign terrorist organizations. Semtex and nuclear materials that could contribute to future terroristic acts are discussed, as well as current nationalist-separatist movements in Western Europe, with particular emphasis on the ETA and the FLNC. The potential significance for terrorism of immigration and the implementation of the Single European Act in 1993 is considered. Finally, the thesis reviews cooperative efforts to combat terrorism within Western Europe. The cooperative effort by European governments to deter and deal with terrorism must be expedited to keep pace with the new challenges that are bound to arise.

DETERMINING THE FUTURE OF THE U.S. SUBMARINE FORCE

Brian Thomas Howes-Lieutenant, United States Navy
B.S., Northwestern University, 1986
Master of Arts in National Security Affairs-December 1992
Advisor: James J. Tritten-Department of National Security Affairs

The end of the Cold War has been the watershed event for changes in the international and national security environments that present tremendous implications for the U.S. submarine force. These changes include calls for significant U.S. defense cuts to reap a "peace dividend," the increasing importance of economics as a *determinant* of defense spending, and the disintegration of the Soviet Union resulting in the absence of a clear tangible global threat to U.S. national interests. What has resulted from these changes is the formulation of a new U.S. national security strategy that focuses on regional contingencies, and the decision to cut U.S. defense forces by at least 25% over five years including the cancellation of the *Seawolf* submarine program. This thesis addresses the implications of these tremendous changes on the U.S. submarine force. Specifically, issues that are addressed include roles and missions, force structure, submarine design, and changing the institutional mindset of the submarine community. The issue of roles and missions involves demonstrating the applicability of the submarine to regional warfare. The issue of submarine force structure deals with both the short-term and long-term factors affecting submarine force reductions and ultimate submarine force size. The issue of submarine design addresses concerns over the submarine industrial base, the *Centurion* program, and design requirements for a regional warfighting submarine. The need to change the institutional mindset of the submarine community is addressed to illuminate the fact that in order to adapt to and absorb the enormous changes occurring in the international environment, the submarine community also must change.

THE ROOTS OF REGIONAL AMBITIONS

Hesham H. Islam-Lieutenant, United States Navy
B.S., Arabian Gulf Academy, 1980
Master of Arts in National Security Affairs-December 1992
Advisor: Glenn E. Robinson-Department of National Security Affairs

The Persian Gulf area is vital to United States national interest, because oil is essential to America's economy. Sixty percent of the world's oil production comes from the Persian Gulf, and the U.S. consumes ten percent of this oil. A series of potential threats in the region can draw the world into confrontation. Inter-Arab politics and the Arab-Israeli conflict are two major threats that jeopardize U.S. national objectives and continue to reduce the possibility of regional stability. These threats are core issues in the Baathi ideology which is essential to the Iraqi regime. The Iraqi Arab Baath Socialist Party programs and ideology provide a source of energy to Inter-Arab politics and the Arab-Israeli conflict in the region. Although the United States with its regional allies may be capable of ousting Saddam Hussein, the analysis provided in this thesis indicates that without fundamental changes in the Iraqi Baath regime, the 1990 Gulf War is unlikely to be the last conflict between Iraq and neighboring Gulf States.

THE RUSSIAN MILITARY IN THE YEAR 2000

James L. Jaworski, Captain, United States Army
B.S., Loyola University of Chicago, 1982
Master of Arts in National Security Affairs-December 1992
and
James F. McIlmail-Lieutenant, United States Navy
B.A., University of New Mexico, 1985
Master of Arts in National Security Affairs-December 1992
Advisor: James J. Tritten-Department of National Security Affairs

Through the use of content analysis, this paper attempts to paint a picture of the Russian military in the year 2000 and its impact on the U.S. national security strategy. The research begins by defining the origin of Russian national security policy and how that translates into military policy and doctrine. A framework for evaluating Russian military doctrines is provided with a chronology of the military reform process and the related doctrinal reforms that has its birth in the 1987 announcement of a "defensive defense." Following from the doctrinal variant framework the new strategic missions of the 1992 draft military doctrine are presented with an analysis that shows they are a clear departure from the past and a truly "defensive defense" type doctrine. Additionally, a comparison is made between the current military reform ongoing in Russia and the historical precedent of the Russian military reform of 1924-25. A rough outline of the separate branches of the Russian military both present and future is provided based on the ongoing trends in the reform process. This thumbnail sketch of the Russian military then assists in the analysis and conclusion that even after a possible 50% cutback in U.S. military spending, in the year 2000 the conventional Russian military will not pose a threat to U.S. national security. The major caveat to this conclusion is in the realm of nuclear weapons and this issue is therefore discussed in some length.

THE BARUCH PLAN REVISITED
Robert M. Johnson-Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1981
Master of Arts in National Security Affairs-September 1993
Advisor: Patrick J. Parker-Department of National Security Affairs

The primary concern in world politics is the proliferation of nuclear weapons. With the end of the Cold War, and dramatic changes in Eastern Europe, many experts believe that international control of nuclear weapons is possible. This thesis examines the Baruch Plan as a model for international control of nuclear weapons. In doing so, this thesis outlines the original plan and details the initial criticism. The International Atomic Energy Agency is examined for its capability in the areas of inspections and verification. The enforcement capability of the United Nations is also discussed. This thesis concludes that the political climate is favorable for such dramatic changes, however, the organizations which would be responsible for the maintenance of the system, namely the IAEA and the United Nations, are not yet ready to assume their role.

HAS POWER SHIFTED BACK TO THE CHAIRMEN OF THE DEFENSE COMMITTEES?
Todd G. Langdon-Lieutenant, United States Navy
B.A., Geneseo State College, 1984
Master of Arts in National Security Affairs-December 1992
Advisor: Paul N. Stockton-Department of National Security Affairs

This thesis argues that the chairmen of the defense-related committees in the House and Senate continue to wield enormous power offer defense legislation. This thesis is based on a detailed empirical analysis of the fate of amendments offered to the defense authorization and appropriation bills from 1981-1992. To measure the power of the chairmen, the thesis assesses how often their positions were sustained on floor amendments. Data also is analyzed on which members tended to offer amendments, whether the passage rate was higher for amendments that did not alter defense spending, and a variety of related issues. It was found that on 95.53% of amendments offered to defense authorization bill in the Senate and 95.1% in the House, the full Senate and House voted in accordance with the preference of the chairmen of their respective Armed Services Committees. An even higher percentage of victory (96.1) was achieved by the chairmen of the House and Senate Defense Appropriations Subcommittees. Data analysis shows that when amendments are offered to defense legislation, committee chairmen still call the shots.

BRAZIL'S NATIONAL DEFENSE STRATEGY:
PROSPECTS FOR THE TWENTY-FIRST CENTURY
Kenneth S. Lundgren-Captain, United States Army
B.S., Brigham Young University, 1983
Master of Arts in National Security Affairs-June 1993
Advisor: Scott D. Tollefson-Department of National Security Affairs

This thesis analyzes the factors that have contributed to the reshaping of Brazil's national defense strategy. It addresses the role of geopolitics, the impact of regional economic integration through Mercosur, renewed nationalism, and the uncertain political realities facing Brazil in the 1990s. Further sections review the historical role of the Brazilian armed forces, the fading importance of the Superior War College, the new civil-military relationships, and the concept of strategic planning in Brazil. Lastly, it examines the dilemma facing Brazil's armed forces in attempting to move from an internal to external security orientation. It discusses the military mission to develop and integrate the Amazon, and argues that this nation-building mission is in its final phase. In assessing the implications of all these factors, the study concludes that Brazil is restructuring its military strategy to demonstrate sovereignty in the Amazon while aspiring to occupy the role of regional hegemon.

POLITICAL SOCIALIZATION OF YOUTH IN THE SOVIET UNION: ITS THEORY, USE, AND RESULTS

Jean MacIntyre-Captain, United States Air Force
B.S., United States Air Force Academy, 1986
Master of Arts in National Security Affairs-June 1993
Advisor: Mikhail Tsypkin-Department of National Security Affairs

The political socialization of youth in the Soviet Union was recognized by the early Bolsheviks as critical to the future of the new socialist society. Their efforts included plans for Unified Labor Schools and compulsory education to develop a literate and politically-aware proletarian force to continue the communist struggle. Later schools and political socialization became a matter of strict Communist Party control from the smallest Octobrist unit to the Young Pioneer zarnitsa camps to the university Komsomol organizations. Despite the vast resources dedicated to vospitanie and Basic Military Training for youth, these socialization efforts were remarkably unsuccessful in producing the New Soviet Man. This lack of success in political socialization was clearly demonstrated by numerous factors, among them the many youth resisting the draft prior to the break up of the Soviet Union, the speed of that break up, the emerging ties to the capitalist west, and the lack of faith in the economy. This does not mean that 70 years of life in a communist society did not socialize the youth to some extent. This research suggests that they were more affected by the lack of information about non-communist topics, such as a market economy and democracy, than they were by political socialization from the state.

KAZAKHSTAN, STRATEGIC PROBLEMS OF AN EMERGING REPUBLIC

Lewis D. Madden-Captain, United States Navy
B.S., United States Naval Academy, 1967
M.S., Naval Postgraduate School, 1977
Master of Arts in National Security Affairs-June 1993
Advisor: James J. Wirtz-Department of National Security Affairs

This thesis uses utility theory to derive an equation expressing the utility of deterrent strategies. The resulting equation is then tested against the deterrent options available to the newly independent Republic of Kazakhstan. It predicts the failure of current United States policy and the retention, by Kazakhstan, of some form of nuclear deterrence in order to counter Russian aggression brought on by ethnic unrest in Kazakhstan. It further suggests that the deterrent option chosen by Kazakhstan may be irrationality-based deterrence which may lead to the development of some form of "doomsday machine."

ENTRENCHMENT OF THE STATUS QUO IN THE ARAB-ISRAELI CONFLICT

Lili D. Mann-Captain, United States Air Force
B.S., Boston University, 1976
Master of Arts in National Security Affairs-September 1993
Advisor: Ralph H. Magnus-Department of National Security Affairs

This study examines those endemic factors which contribute to the entrenchment of the status quo in the Arab-Israeli conflict. By removing the dynamics of the Cold War, the particular circumstances of the main actors--Israel, the Palestinian Liberation Organization, Syria, the United States and the United Nations--become apparent. It is the thesis of this paper that the underlying causes in the creation and perpetuation of the Arab-Israeli conflict include (1) the importance of ideology and security to Israel, (2) a lack of political will among the players to alter the status quo, (3) a plethora of systemic organizational constraints, and (4) limitations faced by the UN that inhibit its usefulness as an intermediary. While compelling arguments should move the actors toward a resolution of the conflict, particularly when a window of opportunity now exists in the aftermath of Desert Storm, the factors cited above comprise powerful counterforces which both serve to sustain Israel's de facto borders and provide a pretext for Arab hostility.

THE RUSSIAN MILITARY IN THE YEAR 2000

James F. McIlmail-Lieutenant, United States Navy
B.A., University of New Mexico, 1985
Master of Arts in National Security Affairs-December 1992
and
James L. Jaworski, Captain, United States Army
B.S., Loyola University of Chicago, 1982
Master of Arts in National Security Affairs-December 1992
Advisor: James J. Tritten-Department of National Security Affairs

Through the use of content analysis, this paper attempts to paint a picture of the Russian military in the year 2000 and its impact on the U.S. national security strategy. The research begins by defining the origin of Russian national security policy and how that translates into military policy and doctrine. A framework for evaluating Russian military doctrines is provided with a chronology of the military reform process and the related doctrinal reforms that has its birth in the 1987 announcement of a "defensive defense." Following from the doctrinal variant framework the new strategic missions of the 1992 draft military doctrine are presented with an analysis that shows they are a clear departure from the past and a truly "defensive defense" type doctrine. Additionally, a comparison is made between the current military reform ongoing in Russia and the historical precedent of the Russian military reform of 1924-25. A rough outline of the separate branches of the Russian military both present and future is provided based on the ongoing trends in the reform process. This thumbnail sketch of the Russian military then assists in the analysis and conclusion that even after a possible 50% cutback in U.S. military spending, in the year 2000 the conventional Russian military will not pose a threat to U.S. national security. The major caveat to this conclusion is in the realm of nuclear weapons and this issue is therefore discussed in some length.

THE THEORY OF SPECIAL OPERATIONS

William H. McRaven-Commander, United States Navy
B.J., University of Texas, Austin
Master of Arts in National Security Affairs-June 1993
Advisor: Russel H.S. Stolfi-Department of National Security Affairs

This thesis develops a theory that explains why special operations succeed. This theory is important because successful special operations defy conventional wisdom. Special operations forces are usually numerically inferior to the enemy and generally these small forces are attacking fortified positions. According to Carl Von Clausewitz both of these factors should spell defeat, and yet, time and again -- these missions succeed. This thesis presents eight historical cases and demonstrates how certain principles of special operations can be combined to achieve *relative superiority.* Relative superiority is the condition that exists when a smaller force gains a decisive advantage over a larger or well defended enemy. It is how special operations forces achieve this decisive advantage that explains their success. In essence, special operations forces gain that advantage when they have a simple plan, carefully concealed, realistically rehearsed and executed with surprise, speed and purpose. This advantage is tenuous however, and is subject to the frictions of war. Through the use of a Relative Superiority Graph, this thesis demonstrates how, historically, that advantage has been maintained and in the conclusions proposes mission "profiles" that reduce the frictions of war and hasten the achievement of relative superiority.

ISLAMIC RESURGENCE IN TURKEY? AN ANALYSIS OF POLITICAL AND SOCIAL ELEMENTS

Robert Miranda-Captain, United States Air Force
B.S., United States Air Force Academy, 1986
Master of Arts in National Security Affairs-June 1993
Advisor: Glenn E. Robinson-Department of National Security Affairs

Myth and hysteria are probably the two most common attributes of western discourse on Islamic fundamentalism. Current discussions in policy circles often depict this "green menace" as a threat to the stability of regimes friendly to the United States. A recent incarnation of this argument is the suggestion, following apparent unprecedented electoral gains by Islamic fundamentalists in 1991, that Turkey may be the next Iran or Algeria. This thesis debunks the "fundamentalist threat" argument in Turkey by critically examining the evidence used to support such an argument. A careful examination of the election results in 1991 shows the Islamic fundamentalists actually suffered a *decline* in electoral support. The thesis concludes that the secular democratic nature of the Turkish republic is not seriously threatened by Islamic fundamentalism, and that the evidence used to suggest such a development does not stand up to critical scrutiny.

THE UNITED STATES AIR FORCE IN EUROPE: AN ANALYSIS WITHIN THE POST-COLD WAR ENVIRONMENT

Matthew K. Moeller-Lieutenant, United States Air Force
B.S., San Jose State University, CA, 1989
Master of Arts in National Security Affairs-December 1992
Advisor: R. Mitchell Brown-Department of National Security Affairs

A United States Air Force presence in Europe promotes stability in the region and displays an ongoing U.S. commitment towards a peaceful and prosperous Europe. These forces also enable the U.S. to have an important voice in European security matters that directly affect the United States. In addition, a United States Air Force presence in Europe provides flexible and mobile combat forces which are essential in sustaining American and allied security interests within the new international order. While the U.S. Air Force in Europe is being reduced in size, it is adjusting and reorganizing to more effectively and efficiently perform its still critical roles within the region. According to current plans, there will be approximately three forward deployed active duty fighter wings stationed in Europe. United States nuclear guarantees for Europe will be supported by U.S. Air Force multi-role fighter/attack aircraft. To maintain effective strategic agility capabilities within the region, it will be essential that the United States continue to stay actively involved within the European political and military environment.

THE STRATEGIC IMPACT UPON THE UNITED STATES OF FUTURE NAVAL RIVALRIES IN SOUTH AND SOUTHEAST ASIA

William J. Nault-Lieutenant, United States Navy
B.A., Trinity College, 1985
Master of Arts in National Security Affairs-December 1992
Advisor: David Winterford-Department of National Security Affairs

This thesis argues that the removal of the Cold War's stabilizing effect on Asian-Pacific security has revealed an escalating level of anxiety and growing mutual mistrust among the nations of this region, indicating future instability and possible conflict. The scaling back of military commitments in the region by the United States, combined with historical Asian animosities are currently fueling a regional maritime arms race among China, India, Japan, and the nations of ASEAN. These nations are preparing to utilize improved naval forces to play an influential if not leading role in the emerging regional power structure. Naval development programs of these nations are examined in detail. This thesis posits that the United States maintains vital economic and security interests in this region and therefore must be actively involved in the formation of a new regional security structure. The thesis concludes with an examination of future options for U.S. military presence in Asia.

CHINA'S NUCLEAR AGENDA AND THE IMPLICATIONS FOR UNITED STATES FOREIGN POLICY

Elizabeth D. Olmo-Lieutenant Commander, United States Navy
B.A., University of South Florida, 1980
Advisor: Claude A. Buss-Department of National Security Affairs

This thesis covers the history of China's nuclear development and examines the changes in its nuclear policies over the past three decades. It examines the issues of China's nuclear and defense strategies, nuclear and defense policies, arms transfer policies, proliferation policies and its foreign policy. Implications for American foreign policy vis-a-vis China's evolving nuclear status are discussed.

RUSSIA IN THE UNITED NATIONS: FROM CONFRONTATION TO COOPERATION

Donald R. Owens-Lieutenant, United States Navy
B.A., University of Washington, 1983
Master of Arts in National Security Affairs-December 1992
Advisor: Mikhail Tsypkin-Department of National Security Affairs

The recent atmosphere of cooperation in the United Nations (UN) has resulted in many nations, including the Russian Federation, proposing increases in the scope and nature of security missions that the UN should undertake. This thesis will focus on those security arrangements in the UN from the Russian perspective. This thesis will first examine the historical policy of the former Soviet Union and discuss those aspects that relate to the emerging Russian policy in the UN, namely, the rationale behind a cooperative approach and the factors which might return Russia to those confrontational policies of its predecessor's past. This will be followed by a discussion of Russia's assumption of Soviet responsibilities in the UN and the emerging foreign policy debate within the Russian government. This thesis will then highlight the recent Russian security initiatives in the UN which include proposals for strengthen peacekeeping, peacemaking and preventive diplomacy ventures. Finally, an overview of the motivations and impediments behind Russia's renewed emphasis on strengthening security management within the UN will be presented. Current diplomatic activity within the Russian Federation and United Nations clearly illustrates that Russia is seeking, through a cooperative approach, to expand its influence within the United Nations. However, in the future, political infighting within the Russian government will determine the extent of this cooperative policy in the UN.

THE U.S. - INDONESIAN RELATIONSHIP IN THE 1990'S AND BEYOND

Anthony M. Packard-Captain, United States Air Force
B.S., U.S. Air Force Academy, 1988
Master of Arts in National Security Affairs-December 1993
Advisor: Claude A. Buss-Department of National Security Affairs

This thesis argues that while Indonesia and the United States are not the closest of allies, new approaches to the way both countries formulate foreign policy will lead to a stronger friendship. A summary of U.S.-Indonesian relations is placed within the context of Indonesian history, so as to provide an appropriate vantage point from which to view future developments. The national goals of each country are examined next, with the belief that any improvement in bilateral relations will naturally stem from the common interests of the two countries. Where differences are noted, it is often a case of similar underlying objectives driving incongruent policies. It is in these areas that modern approaches to American foreign policy will reap the largest rewards. This thesis contends that from the political, economic, and security points of view, both Indonesia and the United States have much to gain from an improved relationship. The domestic and foreign policies of the two countries can be furthered simultaneously; first, Indonesia must soften its anti-colonial rhetoric, and the United States must take post-Cold War approaches to formulate post-Cold War foreign policy.

THEATER BALLISTIC MISSILE DEFENSES: AN EMERGING ROLE FOR THE NAVY?

James Edward Pitts-Lieutenant, United States Navy
B.S., United States Naval Academy, 1986
Master of Arts in National Security Affairs-December 1992
Advisor: Joseph Sternberg-Department of National Security Affairs

The end of the Cold War has brought about significant changes in the international and national security environments that present tremendous implications for the U.S. military. The strategic threat of global nuclear war has diminished considerably. While that threat is diminished, a new threat is emerging. Ballistic missile proliferation and related weapons of mass destruction are one of the major threats to stability in the new security environment. Ballistic missile systems are seen as destabilizing weapons that are a threat to regional peace and American vital interests in certain regions. This thesis addresses the possible need for theater ballistic missile defenses in the U.S. Navy as one element of a national strategy to defeat ballistic missiles in future regional conflicts. Specifically, it addresses the naval role for ballistic missile defenses, including an analysis of the present and future threat, an examination of how the missile defenses dovetail into the national security strategy of regional contingencies, and the means by which the defenses can be employed. The issue of the threat involves demonstrating that a threat presently exists and that technological improvements in the future will greatly increase their utility and put many more targets,including U.S. Navy ships, at risk. The issue of the role that missile defenses fill in the national security strategy deals with their contributions to the fundamental pillars of that strategy. The issue of naval roles addresses the missions and tasks that a sea-based system can provide across the spectrum of naval warfare. The means which the defenses can be employed is addressed to demonstrate how the U.S. Navy can be a major contributor using the Aegis construct.

AMERICAN PERSIAN GULF POLICY AFTER THE GULF WAR

Daniel R. Redmond-Lieutenant, United States Navy
B.S., United States Naval Academy, 1986
Master of Arts in National Security Affairs-December 1992
Advisor: Ralph H. Magnus-Department of National Security Affairs

American policy in the Persian Gulf since the end of the Gulf War has dangerously overemphasized military instruments to protect United States interests in the region. This military focus suggests that threats to American interests are external and visible. At the same time it neglects the challenges posed to U.S. interests by internal political upheaval in the pro-American regimes of the Gulf Cooperation Council and ignores the societal disruptions associated with modernizing societies. Despite their considerable oil wealth, these polities will be increasingly vulnerable to instability if the regimes in power continue their monopoly on political power. Moreover, the highly visible and active presence of American armed forces in the Gulf today intensifies the perception of the U.S. as an imperial super power and unknowingly threatens to undermine the stability of the GCC states by providing opposition groups with a powerful symbol with which to challenge the political status quo.

THE POTENTIAL FOR KOREAN REUNIFICATION IN A POST-COLD WAR ENVIRONMENT AND IMPLICATIONS FOR UNITED STATES SECURITY INTERESTS IN NORTHEAST ASIA

Eric N. Reeves-Captain, United States Air Force
B.A., Indiana University, 1986
Master of Arts in National Security Affairs-March 1993
Advisor: Edward A. Olsen-Department of National Security Affairs

This thesis argues that the end of the global Cold War has provided North and South Korea with a greater opportunity to end the country's division. Through an assessment of North and South Korean reunification policies, this analysis suggests that ideological differences in policy content should be seen as a reflection of the ideological systems of their respective benefactors (Soviet Union and United States). The implementation of Gorbachev's Glasnost and Roh's Nordpolitik substantially reduced the barriers between East and West but left an increasingly isolated, and potentially dangerous, North Korea. This thesis contends that instability on the Korean peninsula threatens regional stability, a condition inclining both Koreas to take a more realistic approach to the issue of reunification. It is therefore in the best interest of the United States to take a more active role in reducing tensions on the peninsula, in order to influence a reunification outcome most favorable to U.S. interests.

U.S. ARMY GUARD AND RESERVES: BEYOND DESERT STORM AND INTO THE FUTURE

Glenn D. Reisweber-Captain, United States Army
B.S., United States Military Academy, 1984
Master of Arts in National Security Affairs-December 1992
Advisor: Rodney K. Minott-Department of National Security Affairs

The United States Army, unlike the other services, relies heavily on its reserve components for reinforcing forces and for augmentation in the support areas. There are currently two heated debates taking place over the Guard and Reserves. One debate is taking place within the Army. The other debate is being heard on Capitol Hill as the Department of Defense continues to request for reductions in the politically well-connected Guard and Reserves. As the Army continues to draw down its forces and faces demands for further reductions, the number of Army reservists, as well as their roles and missions, will become even more controversial. This thesis begins with an examination of the intended role of the reserves as established in the Total Force Policy adopted in 1973. The discussion continues with the performance of the reserves during the Persian Gulf War, followed by an assessment of the role of the reserves in the New National Security Strategy. The Congressional attitude towards the reserves is addressed, including a discussion of how the Army might meet the conditions of a hypothetical Base Force II proposal and its impact on the reserves. Prior to the conclusion, recommendations are offered for altering the roles, missions, and structure of the reserves to improve the effectiveness of the Total Army.

BEYOND GUZMAN? THE FUTURE OF THE SHINING PATH IN PERU

James C. Rix-Captain, United States Air Force
B.A., Miami University, 1984
Master of Arts in National Security Affairs-December 1992
Advisor: Gordon H. McCormick-Department of National Security Affairs

Peru's Shining Path revolutionary movement is at a crossroads. With the September 1992 capture of its founder Abimael Guzman and much of its Central Committee, the movement that appeared so strong has now been decapitated. Given this, it is tempting to dismiss the Shining Path as a significant threat to Peru's current order. This thesis contends that it is too early to close the book on the Shining Path as a long-term threat. The most important determinant of the Shining Path's fate will be its ability to contain the damage of Guzman's capture by adapting to a new state of affairs. This thesis analyzes the organization's record of flexibility and appeal by examining the ideology, strategy, and tactics employed through the course of its 12 year war. The thesis concludes that the organization, while uncompromising at the ideological level, has demonstrated an exceptional degree of flexibility at the tactical level. This flexibility will be essential if the organization is to regroup and continue its assault. While the outcome is uncertain this soon after Guzman's capture, the Shining Path's demonstrated capacity to adapt to diverse circumstances suggests that the organization has the capability, after a period of reconsolidation, to renew itself and continue its revolutionary war.

CALHA NORTE: EXPLAINING BRAZILIAN ARMY PRESENCE IN THE AMAZON

Michael B. Ryan-Lieutenant, United States Navy
B.S., University of Notre Dame, 1985
Master of Arts in National Security Affairs-June 1993
Advisor: Scott D. Tollefson-Department of National Security Affairs

This thesis examines the rationale behind the Brazilian Army project, Calha Norte. The project was initiated in 1985 to satisfy geopolitical needs of Brazil. However, since 1985, the situation in Brazil has changed, which has caused the rationale for the Calha Norte project to change as well. This thesis argues that the project has expanded to include not only geopolitical goals, but also a justification for the military's budget and legitimacy. Furthermore, it is argued that the expanded rationale has resulted in the Brazilian Army enlarging its presence in the Amazon. The thesis recommends that Brazil continue to expand the Calha Norte project, as it has favorable effects on regional and international security interests in the Amazon. The interests reviewed by this thesis include: border conflicts, narco-trafficking and environmental conservation. The United States should support the expansion of this project.

PRESERVING THE AMERICAN INTEREST IN HONG KONG AFTER 1997

Patricia A. Scott-Lieutenant Commander, United States Navy
B.A., East Carolina University, 1980
Master of Arts in National Security Affairs-June 1993
Advisor: Claude A. Buss-Department of National Security Affairs

On 01 July, 1997, Hong Kong will revert back from British rule to Chinese sovereignty, becoming a Special Administrative Region (SAR) under the Central People's Government of the People's Republic of China. The United States and its citizens have a tremenolony that could be placed at risk by the change in sovereignty. This thesis reviews the development of United States' interest in the colony and defines the current interests in the colony. The retrocession developments are then examined as are the current attempts to modify the Basic Law of "mini-constitution" for Hong Kong. Alternative scenarios are suggested for post-1997 Hong Kong. The thesis is optimistic about the Hong Kong Special Administrative Region and about the United States' ability to continue its involvement in and with China, to include Hong Kong.

SWEDEN AFTER THE COLD WAR: IMPLICATIONS FOR U.S. REGIONAL STRATEGIES

Jon A. Skinner-Lieutenant, United States Navy
B.A., University of Alaska, Fairbanks, 1981
Master of Science and Master of Arts in National Security Affairs-September 1993
Advisors: Jim J. Tritten & Rodney K. Minott-Department of National Security Affairs

In support of U.S. regional strategy requirements, this thesis focuses on Sweden. The change in Sweden's neutrality policy, coupled with an increased defence budget, are the two most apparent developments. Less visible are changes in Swedish defence doctrine, missions and capability. This thesis will attempt to predict the **degree** and **character** of Sweden's move toward integration into broader security arrangements and identify the relevant implications. Further, this thesis contends that the two developments of that are shaping Swedish security policy in new directions are the **end of the Cold War and Sweden's integration into the European Community (EC)**. In the short term, this implies for Sweden a security policy more closely paralleled with U.S. objectives. In the long term what has been largely a bilateral Swedish-U.S. strategic relationship will be engulfed in larger U.S.-European questions. Within an integrated Europe, Sweden will be in a grouping of European states the most favorable to U.S. policy.

RUSSIA AND MOLDOVA: DEVELOPING RELATIONS BETWEEN TWO COUNTRIES

Robert J. Smith, Jr.-Captain, United States Air Force
B.A., University of Maryland, 1986
Master of Arts in National Security Affairs-March 1993
Advisor: Mikhail Tsypkin-Department of National Security Affairs

The breakup of the Soviet Union has created a myriad of problems not the least of which is determining were each of the resulting states belongs in the world order and how each should develop international relations. Russia and Moldova are driven together by economic necessity and by the continuing conflict in the Dniester Republic of Moldova. While their relationship should be that of two sovereign states trying to solve a mutual problem, it has not been that simple. Both states are still searching for a direction for foreign and domestic policy. Russia is trying to balance her foreign policy emphasis between relations with the West and the Near Abroad. Moldova's inexperienced government is struggling in attempts to formulate both domestic and foreign policy. This thesis examines the Russian-Moldovan relationship at the national level, looking a how the countries are trying to defend national interests while developing relations. It will also examine how their bilateral relationship impacts their relations with other countries. The conclusion reached is that Russia is not willing to treat Moldova as a sovereign state. Russia is trying to maintain control of not just the bilateral relationship, but also relations between Moldova and other members of the international community. Russia maintains this control primarily by being uncooperative in talks designed to remove Russian troops from Moldova.

FOUNDATION FOR VICTORY: OPERATIONS AND INTELLIGENCE HARMONIOUSLY COMBINE IN JACKSON'S SHENANDOAH VALLEY CAMPAIGN (1862)

Shawn B. Stith-Captain, United States Marine Corps
B.A., History, University of Central Florida, 1983
Master of Arts in National Security Affairs-June 1993
Advisor: Russel H.S. Stolfi-Department of National Security Affairs

Using the Shenandoah Valley campaign of 1862 as a case study, the thesis examined fundamental principles which determine the effectiveness of intelligence in the planning and execution of military operations. General Thomas J. (Stonewall) Jackson aggressively obtained intelligence as the foundation of his operation plans, enabling his numerically inferior force to win victories of strategic importance. Jackson centrally controlled intelligence at the operational level, emphasized analysis of the area of operations, and effectively used technical experts throughout the campaign, allowing him to recognize operational threats and opportunities as they arose. The Confederate commander personally directed the intelligence effort and his operational flexibility guaranteed a harmonious relationship between intelligence and operations. Modern armed forces would do well to extract and apply the warfighting intelligence fundamentals revealed in Jackson's campaign, which remain independent of time, place, and technology.

THE V-22: A TURNING POINT IN CONGRESSIONAL BEHAVIOR?

Kenneth John Szczublewski-Lieutenant, United States Navy
B.A., University of Toledo, 1984
Master of Arts in National Security Affairs-December 1992
Advisor: Paul N. Stockton-Department of National Security Affairs

Why do legislators vote for some defense programs but against others? This issue is especially important now that Congress faces the need to cut defense programs while preserving U.S. security. The history of the V-22 offers a prime case study for examining Congressional voting behavior for the post-Cold War era. This thesis reviews the literature on three possible explanations for Congressional voting behavior: parochialism (the desire to benefit constituents), the Military-Industrial Complex or MIC (where votes are "bought" by industry campaign contributions), and the personal preferences of individual members. The thesis uses logit equations to test and assess the validity of these hypotheses in the case of the V-22. No reliable connection was found between personal preference and voting on the V-22. Liberal Democrats that were assumed to be "dovish" on defense spending were just as likely as "hawkish" conservative Republicans to support this program. Nor was any evidence found to support the MIC hypothesis that voting behavior is driven by PAC dollars. The likelihood of a representative supporting the V-22 actually *decreased* as PAC contributions **increased**. The parochial hypothesis was supported in the House but not in the Senate. Further research is required to find alternative explanations for defense voting behavior in the post-Cold War era.

A STRATEGIC PLAN FOR THE PERSIAN GULF REGION: OPTIONS FOR DETERRING AND/OR DEFEATING AN EMERGING THREAT

Michael W. Ward-Lieutenant Commander, United States Navy
B.B.A., Ohio University, 1978
Master of Arts in National Security Affairs-December 1992
Advisor: R. Mitchell Brown, III-Department of National Security Affairs

The Persian Gulf region is, in all likelihood, going to remain crucial to American interests through the next several decades. The world depends on the petroleum reserves of the Gulf region to fuel its economic engine. The recent history of the region has been rife with conflict, and the U.S. has had to intervene militarily on several occasions to ensure its vital interests were protected. This thesis examines the strategic circumstances in the Gulf region and ways in which American political, diplomatic, and military policy can help shape the environment to conform to its interests. Several scenarios are developed which attempt to forecast the results of different environments on regional stability. The thesis reaches the conclusion that the United States must take a proactive role if its short- and long-term interests are to be protected. The short-term goal of U.S. policy must be to maintain a balance of power and regional correlation of forces which serves to deter any would-be aggressor nations. In the long run, the United States must seek a comprehensive regional peace. Various methods of achieving these goals are examined.

AN ANALYSIS OF REGIME TRANSITION: THE CHARACTERISTICS, MECHANISM AND TYPES OF CHANGE IN MODERN POLITICAL SYSTEMS

Scott A. Weidie-Lieutenant, United States Navy
B.S., Millsaps College, 1985
Master of Arts in National Security Affairs-June 1993
Advisor: Scott D. Tollefson-Department of National Security Affairs

This thesis is an analysis of regime transition in modern political systems. These transitions can occur gradually or dramatically and may lead to changes in the basic characteristics of a government. Occasionally the changes in the basic characteristics are significant enough to affect the type of government. This thesis analyzes the basic characteristics of political systems and develops a model for explaining regime transition. The thesis specifically examines changes in the power relationship between elite and mass participation in civil society, political society and the state, leading to the following processes: liberalization, regression, revolution and coups d'etat. These processes can result in transitions of democratic regimes to non-democracies and vice versa. The model developed in this thesis addresses a basic definitional problem that exists in previous analyses and it simplifies the systematic cross-national analysis of regime types and transitions. Finally, the thesis applies the model to the case studies of Argentina (1976 and 1983), Germany (1919-1934), and Guatemala (1993). The case study analysis advances the hypothesis that the mechanism of regime transition is the same in all political systems even though the types of transition are different.

AN ALTERNATIVE AMERICAN FOREIGN POLICY FOR UKRAINE

Randall G. Williams-Lieutenant, United States Navy
B.A., St. Lawrence University, 1982
Master of Arts in National Security Affairs-June 1993
Advisor: Roman A. Laba-Department of National Security Affairs

American policy makers have largely ignored Ukraine in their global policy planning. This lack of consideration shows a neglect of the potential for conflict in Eastern Europe. American foreign policy toward Ukraine, that is rooted in the START and NPT Treaties, is doomed to fail, and will actually sow the seeds of chaos, unless the United States: 1) comes to understand the motivations that drive Ukrainian foreign policy, and 2) facilitates significant positive alterations to the security and economic environment that has developed since the breakup of the Soviet Union. This thesis examines Western security goals and analyzes the current means available to achieve those goals. The contention of this thesis is that present Western policy pursuits will lead to a regenerated authoritarian Russian superpower that will be a threat to the security of Ukraine and Europe. The potentially dangerous consequences of an authoritarian Russia could be avoided by facilitating the development of a strong and stable Ukraine to act as a balance to Russian power in Eastern Europe.

MASTER OF SCIENCE
IN
OPERATIONS RESEARCH

AN OPTIMAL PROGRAM INITIATIVE SELECTION (OPIS) MODEL FOR USMC PROGRAM OBJECTIVE MEMORANDUM PLANNING

Mark A. Adams-Captain, United States Marine Corps
B.I.E., Georgia Institute of Technology, 1985
Master of Science in Operations Research-March 1993
Advisor: Siriphong Lawphongpanich-Department of Operations Research

This thesis formulates the problem of selecting modernization program initiatives for implementation by the Marine Corps as a mixed integer programming problem. The problem is a generalization of the traditional resource allocation problem in operations research. When implemented as a computer system, it offers several enhancements over the system currently used by the Marine Corps planners. The system simultaneously maximizes benefit values and minimizes budget under utilization. When combined with the proposed acceleration procedure, it also allows for rapid "what if" analysis, an extremely useful feature for decision making. The prototype system was implemented using commercially available software. It is flexible and relatively easy to maintain. Data from the previous Future Year Defense Plan (FYDP) was used to demonstrate the various applications and features of the system.

THE NAVY'S SEARCH FOR A FEW GOOD WOMEN: ANALYSIS OF A DIRECT MAIL CAMPAIGN

Ronda J. Beagle-Lieutenant, United States Navy
B.S., United States Naval Academy, 1984
Master of Science in Operations Research-September 1993
Advisor: So Young Sohn-Department of Operations Research

The purpose of this thesis was to attempt to select significant individual characteristics of women who met Navy Recruiting Command standards for enlisting in technical rates. Additionally, it attempted to select geographic characteristics of these qualified women. To that end, a logistic regression analysis was conducted on data from approximately 100,000 qualified high school juniors and seniors. For a student to be qualified for this study, she must have scored above the 31st percentile on the AFQT and above the 50th percentile on one of three subtests: Auto-Shop Information, Electronics Information, or Mechanical Comprehension. The database contained Military Entrance Processing Command files and 1990 Census data. This research found for individual regression models interactions effects were present between future plans and geographic area, and between service preference and geographic area when determining interest in the military. It found for geographic regression models the proportion of students interested in military service out of those available increased in geographic areas (Naval Recruiting Districts) where more personnel were in the armed services, more people were associated with technical occupations, and where median family income was higher. The analysis found the proportion of students available for military service out of the target market population (females aged 17-21 years) decreased in geographical areas where unemployment rate was higher, more people were associated with technical occupations, more people lived below the poverty level, and where median family income was higher.

ANALYZING NPS SCHEDULING USING OSIRIS

Richard D. Bolster-Lieutenant, United States Navy
B.S., Marquette University, 1984
Master of Science in Operations Research-March 1993
Advisor: Thomas E. Halwachs-Department of Operations Research

This thesis addresses a known problem in class scheduling at the Naval Postgraduate School (NPS). The problem is the lack of an automated system capable of generating schedules for each academic quarter. This results in two Class Schedulers developing schedules manually through a trail-and-error process which takes approximately six weeks to complete. A commercial software package, the Osiris School Administration System, is proposed to assist schedulers in developing schedules for students, instructors and classrooms. The software's capability is demonstrated on a smaller scheduling problem and its potential application to the NPS problem is analyzed.

A COST BENEFIT ANALYSIS OF TWO PRODUCTS OF THE FLEET NUMERICAL OCEANOGRAPHY CENTER

James L. Brown, Jr.-Lieutenant, United States Navy
B.S. University of Pittsburgh, 1985
Master of Science in Operations Research-June 1993
Advisor: Daniel C. Boger-Department of Systems Management

A cost benefit analysis of the Fleet Numerical Oceanography Center (FNOC) is conducted with specific attention to the Optimum Path Aircraft Routing System and the Optimum Track Ship Routing System. These two products out of the many produced by FNOC comprise the bulk of the savings realized by the U.S. Navy through FNOC's work. The Optimum Path Aircraft Routing System (OPARS) is evaluated using modified flight plans received by the system. These plans were resubmitted to OPARS to determine the range of fuel usage around the optimum provided to OPARS. The Optimum Track Ship Routing System (OTSR) is evaluated using an adaptation of Dijkstra's algorithm to determine the optimum routing if perfect wave height information were available compared to a purely greedy strategy capturing the shortest arc available enroute to the destination. The damage sustained is compared to actual damage reported to the Naval Safety Center to determine the savings to the U.S. Navy from the OTSR system.

MISSIONING WITH MINIMAL DELAYED ENTRY PROGRAM (DEP) LOSS

Bryan Douglas Burris, Captain, United States Army
B.S., University of Georgia, 1982
Master of Science in Operations Research-September 1993
Advisor: Siriphong Lawphongpanich-Department of Operations Research

This thesis addresses the mistuning problem which is to determine the number of individuals to be recruited or contracted each month by Army recruiters. After signing the contracts, these individuals are enrolled in the Delayed Entry Program (DEP) prior to their basic training. During DEP, some individuals may renege on their contracts, thus becoming DEP losses. Although DEP is costly, it is necessary since it acts as an inventory of recruits to smooth out the training loads at boot camps and allows the Army to perform a background check for each recruit. The mistuning problem is formulated as a linear program that minimizes the expected DEP loss subject to requirements imposed by the Deputy Chief of Staff for Personnel (DCSPER) and U.S. Army Recruiting Command (USAREC). Integral to the formulation are the estimates of DEP loss probabilities for various combinations of recruit categories and DEP durations. The estimates are based on a Binomial assumption and Isotonic regression. The linear programming model of the mistuning problem is implemented in GAMS and provides results indicating that DEP loss can be reduced from the current level of 11.46% to 8.59%. This translates to nearly $11 million savings annually. Other applications of the model are also provided.

SOFTWARE RELIABILITY MANAGEMENT THROUGH METRICS

Douglas R. Burton, Lieutenant, United States Navy
B.S., Aerospace Engineering, United States Naval Academy, 1985
Master of Science in Operations Research-March 1993
Advisors: Donald P. Gaver-Department of Operations Research &
Norman F. Schneidewind-Department of Systems Management

As systems become increasingly software dependent, their reliability will accordingly depend more so on the reliability of their resident software. Just as techniques and processes were developed and improved to ensure hardware reliability, so must techniques evolve to ensure software reliability. Two questions are addressed by this thesis. First, how do we measure software reliability throughout a project's lifecycle? Second, is there a tool which will provide effective insight into the test-now-or-later problem? The solution to our first question is a U.S. Army software procurement methodology which is briefly outlined as the overall framework for software procurement in this thesis. A software fault analysis tool is developed and programmed. Some results from this algorithm are provided and their potential resource saving impact explored. Program managers of software-intensive projects would be well advised to use the Army's methodology and this fault analysis tool to potentially save critically short procurement resources. Software Reliability Management Through Metrics.

ASSESSING THE POSSIBLE RETURN ON INVESTMENT RESULTING FROM UPGRADING A SUBSYSTEM

Tun-Jen Chang-Lieutenant Commander, Chinese Navy
B.S., Chung Cheng Institute of Technology, 1982
Master of Science in Operations Research-March 1993
Advisors: Donald P. Gaver & Patricia A. Jacobs-Department of Operations Research

This thesis develops a decision aid to assist in assessing the cost effectiveness of upgrading a subsystem. The procedures developed in this thesis are to estimate the time of onset and the magnitude of the degradation of a subsystem and to estimate the best time to upgrade the subsystem. Two procedures are considered to estimate the time of onset of subsystem degradation and the magnitude of the degradation. One is maximum likelihood; the other is a Bayesian procedure. These estimates are then used in a cost model to estimate the cost of remaining with the current subsystem for the remaining planned lifetime of the system. A comparison of this cost with that of investing in the upgraded subsystem can be used to obtain a best time to invest in the upgraded subsystem. Procedures to assess the uncertainty of the cost advantage of upgrading the subsystem are also studied to give further information to the decision maker.

OPTIMIZING EMERGENCY SORTIE AND STORM EVASION PLANNING

John Joseph Costello-Lieutenant Commander, United States Navy
B.A., Virginia Military Institute, 1983
Master of Science in Operations Research-September 1993
Advisor: Richard E. Rosenthal-Department of Operations Research

This thesis develops an optimization model for scheduling sorties of surface ships and submarines that are required to plan for port evacuation during hurricane conditions. At present, Emergency Sortie Plans are prepared manually by the Port Operations schedulers and often do not utilize the limited pilot and tug resources most efficiently. The optimization model introduced in this thesis generates an Emergency Sortie Plan that minimizes the time required to reach the recommended Hurricane Evasion Point, evacuates all seaworthy ships, most efficiently utilizes the available pilots and tugs, and observes necessary safety constraints on basin congestion, nested berthing, and tidal-restricted ships. In a test of the model using data for Naval Station Norfolk during Hurricane Andrew, the model evacuated the ships 40 minutes earlier than the actual 11 hour schedule. In only 22 minutes on a personal computer, the model provided a realistic estimate of the minimum time required to complete an Emergency Sortie, based on known information, not educated guesses.

AIR TASKING ORDER (ATO) OPTIMIZATION MODEL

Matthew H. Dolan-Lieutenant, United States Navy
B.A., University of Notre Dame, 1983
Master of Science in Operations Research-September 1993
Advisor: Richard E. Rosenthal-Department of Operations Research

This thesis addresses a known deficiency of theater level wargames. The problem is the ability to produce a timely, "flyable" Air Tasking Order (ATO) that effectively uses assigned aircraft. During wargames conducted at the Naval War College, I observed that sound military analysis went into strike planning. However, the pace of the wargame and lack of an effective planning tool prevented this strike planning from being effectively implemented in the ATO. The model presented in this thesis offers a solution in the form of a computer based optimization model that produces ATO's. The model assigns strikes against all requested targets if there are sufficient assets, and it chooses which targets not to strike if assets are insufficient. The model decides which strike packages should be assigned against each target and which available launch sites should provide the assets required in the selected strike packages. The output is an ATO in which all assigned aircraft can reach their targets and are in fact available for tasking. This model solves in minutes on a personal computer and allows the pace of the wargame to be unconstrained by ATO production.

A SIMULATION AND EVALUATION OF NATO STANDARDIZATION AGREEMENT (STANAG) 4214

Michael A. Dorko-Lieutenant, United States Navy
B.S., United States Naval Academy, 1986
Master of Science in Operations Research-September 1993
and
Robert G. Schultz-Lieutenant, United States Navy
B.S., Belmont College, 1985
Master of Science in Operations Research-September 1993
Advisor: Michael Bailey-Department of Operations Research
Co-Advisor: William Kemple-Department of Operations Research

An object-oriented simulation model is developed to evaluate the effectiveness of NATO Standardization Agreement (STANAG) 4214, which promulgates the protocol for international telephone call routing and directories for tactical communications. The model simulates communication systems using the STANAG 4214 protocol to isolate discrepancies which could lead to the inability to successfully complete calls within the system. The model also simulates protocol modifications created to correct existing discrepancies and verifies their effectiveness in making the protocol more robust. Results show that these modifications improve STANAG call completion rate from a potential low of under 70 percent to 100 percent, while simultaneously easing the restrictions on lateral communication connections. The model is menu-driven with both graphical and hard copy output, making it useful to network planners, protocol designers, and tactical communications officers.

A MANPOWER MODEL AND STRUCTURAL ANALYSIS FOR A COAST GUARD ENLISTED RATING

Mark Jeffrey Fiebrandt-Lieutenant Commander, United States Coast Guard
B.S., United States Coast Guard Academy, 1979
M.S., Pepperdine University, 1990
Master of Science in Operations Research-September 1993
Advisor: P. R. Milch-Department of Operations Research

The Coast Guard must maintain a balance of personnel inventories to billet requirements while providing adequate promotion opportunities. Future changes in billet requirements must be studied to see the effects they may have on the personnel system. This thesis presents a vacancy personnel model based on Markov theory to forecast future end of year inventories and personnel flows for a seven paygrade Coast Guard rating. The model uses historical data and user input to estimate certain model parameters and executes a five year forecast in a spreadsheet format. Certain real life constraints for promotions and recruitment are also incorporated into the model which is then solved in a manner to minimize end of year differences between personnel inventories and billet requirements. In addition, the model estimates, for each forecasted year, a mean Time in Service to Advancement (TISADV) for those promoted to each paygrade based on linear regression and/or weighted multiplier values. The model, called "Coast Guard Rating Forecast Model", is tested for the Machinist Mate (MK) rating using 1984-1988 data and validated against 1989-1991 actual values. Finally, the model is used to forecast 1993 through 1997 inventories, personnel flows and TISADV values for the MK rating based on beginning of fiscal year 1993 information.

A BARRIER SEARCH MODEL USING ACTIVE BISTATIC SONAR TO PROTECT A CHANNEL

Aasgeir Gangsaas-Lieutenant, United States Navy
B.S., University of Washington, 1986
Master of Science in Operations Research-March 1993
Advisor: Alan R. Washburn-Department of Operations Research

Advances in nuclear and diesel-electric submarine technology have reduced the effectiveness of passive means of detection. The United States is faced with a multipolar threat in part due to the proliferation to Third World nations of advanced diesel-electric submarines. The use of active sonar must be explored to gain back the detection advantage the United States submarine force has enjoyed in the past. The use of bistatic sonar reduces the counter-detection threat resulting from active sonar.

EVALUATING ARMY BASE'S ABILITY TO SUPPORT MANEUVER TRAINING: A LINEAR PROGRAMMING APPROACH

Wesley G. Gillman-Captain, United States Army
B.S., United States Military Academy, 1984
Master of Science in Operations Research-September 1993
Advisor: Robert F. Dell-Department of Operations Research

The United States Army is facing a significant challenge to maintain the training readiness of its force. The supply of training land has not significantly increased since the end of World War II; whereas the demand for training land has substantially increased due primarily to an increase in the size of the force stationed in the Continental United States (CONUS) and improved technologies demanding larger areas for effective training. This thesis develops and solves a linear programming model that evaluates the "military value" of a CONUS Army installation's ability to train stationed units. The model determines what percentage of units can perform required maneuver training, what is the reduction in land size required to allow required maneuver training to be performed, what is the impact of reducing the number of days training areas are available, and what is the impact of increasing the number of stationed units. The model was used for an extensive study of Fort Hood, Texas and indicates only 84% of the required maneuver training can be achieved using the current requirements. All required maneuver training can only be accomplished when some units are assigned only 40% of the required amount of land. When the number of days available for training is reduced by two-thirds, the percentage of required maneuver training accomplished decreases from 84% to 75%. For the 1998 increased number of units at Fort Hood, the percentage of required maneuver training performed again drops to 75%.

OPTIMALLY LOCATING CONTAINER STUFFING SITES

Robert S. Guarino-Captain, United States Army
B.S., United States Military Academy, 1982
Master of Science in Operations Research-September 1993
Advisor: Robert F. Dell-Department of Operations Research

Military Traffic Management and Command Eastern Area (MTMCEA) is the headquarters command responsible for land cargo movements in the eastern United States and Europe. MTMCEA stuffs all cargo destined for Europe into containers. This thesis develops and solves a mixed linear integer program to determine the optimal number and location of container stuffing sites. The formulation models MTMCEA operations with minimization of both cost and time delay. The model was adjusted for analyses of many scenarios including which sites to open ignoring time, varying costs, and limiting sites available. All versions of the model solve in under 2 minutes and indicate a potential for saving up to half a million dollars for MTMCEA container stuffing operations.

THE APPLICATION OF SEARCH THEORY TO THE TIMELY LOCATION OF TACTICAL BALLISTIC MISSILES

Thomas William Hair-Lieutenant, United States Navy
B.S., University of Florida, 1985
Master of Science in Operations Research-March 1993
Advisor: Kneale T. Marshall-Department of Operations Research

The application of search theory provides a systematic approach to the location and interdiction of mobile tactical ballistic missiles. Specifically, the use of an algorithm that employs a negative search to eliminate regions of an area based on terrain and road access is presented in this paper. Defense Mapping Agency digital terrain elevation data is used in conjunction with the algorithm to create probability maps of the search area. Included are five examples of this. With the search area reduced, several distribution functions are examined to simulate search time distribution needed for optimal allocation of search effort.

DIFFERENT SUCCESS RATES AND ASSOCIATED FACTORS AT THREE LEVELS OF CAREER PROGRESSION AMONG US MARINE CORPS OFFICERS

James J. Hamm, III-Captain, United States Marine Corps
B.S., United States Naval Academy, 1984
Master of Science in Operations Research-September 1993
Advisor: Frank C. Petho-Department of Operations Research

Increasing retention of quality minority officers is a high priority of the Marine Corps. Determination of any differences in survivorship among racial and ethnic groups and any factors associated with those differences is a first step. This study analyzed the performance of Marine Corps officers at different career stages to determine what variables were associated with success or failure incrementally at successive career steps or continuously throughout a career. Factors that significantly impacted performance at all steps through selection to major were COMMISSIONING SOURCE, GCT SCORE, and COMPOSITE STANDING at The Basic School. Additionally, samples of the Marine officer population, matched according to level of the significant factors, were used to determine if success was dependent on race. At the career stages of The Basic School, selection to captain, and selection to major, success was independent of race.

AN APPROXIMATION FOR COMPUTING REDUCTION IN BANDWIDTH REQUIREMENTS USING INTELLIGENT MULTIPLEXERS

Lesley Jeanne Painchaud Henson-Lieutenant Commander, United States Navy
B.A., University of South Florida, 1978
M.A., University of Oklahoma, 1988
Master of Science in Operations Research-March 1993
Advisors: Patricia A. Jacobs & Donald P. Gaver-Department of Operations Research

This paper stochastically models a single-node telecommunications system both with and without the use of intelligent multiplexing. Intelligent multiplexers take advantage of the idle periods of silences that occur during the course of speech transmissions to merge (or multiplex) packetized talkspurts from more than one source onto a single channel. This allows for a more efficient use of available bandwidth, thereby reducing the amount of bandwidth required to carry a particular traffic load. Digitizing speech into packets of equal size also allows for compression, further reducing bandwidth needs. By comparing the models for systems both with and without multiplexing, we are able to determine the reduction in bandwidth which may be expected for a particular grade of service (measured by blocking probabilities). A bivariate continuous time Markov chain model for a multiplexer is presented. An approximation is introduced to calculate limiting blocking probabilities much more quickly and for larger systems than is possible by solving a set of linear equations for the bivariate model. The accuracy of the approximation is explored through comparison with the bivariate model; the approximation provides a somewhat conservative estimate of blocking, but is close enough to be used as a tool for the range of relevant values. The approximation is then used to compare blocking probabilities for three different levels of speech activity. Results are shown in tabular form.

AN ANALYTICAL MODEL FOR THE TREATMENT AND EVACUATION OF CASUALTIES IN A LOW-INTENSITY CONFLICT

Tracy Lynn Howard-Lieutenant, United States Navy
B.S., United States Naval Academy, 1986
Master of Science in Operations Research-March 1993
Advisors: Donald P. Gaver & Kneale T. Marshall-Department of Operations Research

This thesis studies the treatment and evacuation of casualties in a Low-Intensity Conflict. The study addresses the effects of the evacuation policy at the medical battalion level, or echelon. The evacuation policy assigns a threshold number of days to guide surgeons in deciding which casualties should be treated and which should be evacuated. The main tradeoff in choosing this policy involves either treating and returning casualties to duty, or evacuating casualties to maintain a reserve capacity for unexpected casualty arrivals. The study develops simple analytical models which provide basic quantitative measures of the effects of the evacuation policy, and it establishes a framework around which more complex models may be built. The potential of the model is illustrated by examining a specific scenario. This analysis provides the decision maker with estimates of the number of available beds, the proportion of patients returned to duty, and the probability of being able to accommodate a mass arrival of casualties.

A PROTOTYPE MODEL FOR SCHEDULING COURSES AT THE NAVAL POSTGRADUATE SCHOOL

Wu Hsi-Hsien-Major, Army of Republic of China
B.S., Chung Cheng Institute of Technology, 1984
Master of Science in Operations Research-September 1993
Advisor: R. Kevin Wood-Department of Operations Research

This thesis develops a prototypic integer programming model to aid in solving the Naval Postgraduate School academic course scheduling problem. The simplified model schedules faculty members to teach their assigned courses in specific rooms at specific times and schedules groups of students to the courses they have requested. The model assures, as best possible, that room capacity is not exceeded, students and faculty have time for lunch, and faculty requesting "back-to-back" courses are accommodated. To make the problem manageable, we concentrate on just one building, Glasgow Hall, and three departments, Operations Research, Mathematics and National Security Affairs. Even doing this, the model generated in GAMS (Generalized Algebraic Modeling System) has about 287,778 variables and 148,161 constraints and is too large to solve. Consequently, a simplified model, restricted to the Operations Research Department, is solved. This problem encompasses 19 faculty members, 26 courses, 83 sections and 11 classrooms. The model has less than 32,000 variables and 17,000 constraints and is solved using GAMS and the X-System on an Amdahl 8995-700A in 3488.4 seconds.

A SCHEDULING MODEL FOR THE U.S. MARINE CORPS COMMUNICATION-ELECTRONICS SCHOOL

Barry D. Justice-Captain, United States Marine Corps
B.S.E.E, Purdue University, 1984
Master of Science in Operations Research-September 1993
Advisor: R. Kevin Wood-Department of Operations Research

This thesis presents a mixed integer program (MIP) as a model for the scheduling of sequences of classes attended by Marines at the Marine Corps Communication-Electronics School in order to qualify them for communications and electronics military occupational specialties. The schedule determines the starting dates and the number of students to enroll in each instance or "class" of various course types. The courses follow a specific sequence and many classes of a course may be scheduled within a fiscal year. Students attend one or more of the courses and may wait some time for a class of a subsequent course to begin. The objective of the MIP is to reduce the amount of delay students incur while waiting for classes of additional courses in the sequence to start. Due to the size and complexity of the model, the MIP initially schedules classes with a weekly resolution but then adjusts the starting dates to produce daily schedule. For 1993 data, the MIP is solved in less than 5 minutes and produces a schedule which has an 84% reduction in delay over the actual schedule for that year.

AN ANALYSIS OF MULTIPLE SENSOR SYSTEM PAYLOADS FOR UNMANNED AERIAL VEHICLES

John F. Keane-Lieutenant Commander, United States Navy
B.S., Virginia Military Institute, 1980
Master of Science in Operations Research-September 1993
Advisor: Michael G. Sovereign-Department of Operations Research

Unmanned Aerial Vehicles (UAVs) presently under consideration by the Program Executive Officer for Cruise Missile Projects and Unmanned Aerial Vehicles (PEOCMPUAV) will be equipped soley with electro-optical (EO) sensors. This thesis provides a comparative analysis of the mission effectiveness between UAVs equipped with EO sensors and those equipped with a multiple sensor system payload. A historical review of UAV development and employment is provided so that the reader may gain some insight into past UAV shortcomings in the hopes that they might be prevented in future systems. A typical Reconnaissance, Surveillance and Target Acquisition (RSTA) mission scenario is defined and a comparison made between UAVs equipped with EO sensors and those equipped with multiple sensor system payloads. The measure of effectiveness used for this comparison is the time required by the UAV to search 100 percent of an assigned area. The physical and operating characteristics of available sensor systems are discussed in detail. We develop an optimization model for selecting multiple sensor payloads from those sensor systems described. The model considers the sensor's physical characteristics, unit cost, identification capability and false alarm rate when determining the optimum payload. The optimum sensor system payloads are selected and the best alternatives to EO sensors for performing RSTA missions in a hostile environment are recommended under a range of budgets.

AN ANALYTICAL APPROACH TO ASSESSING THE VULNERABILITY OF BOMB SHELTERS TO AERIAL BOMBING AND ARTILLERY ATTACK

Yeo Gim Koon
B.Eng(Hons) National University of Singapore
Master of Science in Operations Research-September 1993
Advisor: J. D. Esary-Department of Operations Research

This study examines the vulnerability of bomb shelters to aerial bombing and artillery attack, by modeling the bomb dump, i.e., the area within which the bomb shelters are located, as a cellular target. The stochastic process of hitting the dump with aerial bombs or artillery shells is modeled using suitable probability distributions, depending on scenarios. Two measures of effectiveness are used: (1) The expected proportion of damage to the bomb dump by n weapons (bombs or shells) that are directed at the bomb dump, and (2) the probability that the *ith* shelter will be damaged due to an attack by n weapons that are directed at the bomb dump. A generalized shelter hardness and vulnerability model is derived. Conditions under which shelter probability of kill and dump expected proportion of damage coincide and are independent of the relative shelter values are discussed. The effectiveness of various defender's and attacker's strategies is considered.

OPTIMALLY SCHEDULING INSTRUCTORS AT THE DEFENSE LANGUAGE INSTITUTE: AN INTEGER PROGRAMMING APPROACH

David Stanley Kunzman-Captain, United States Marine Corps
B.S., Oregon State University, 1987
Master of Science in Operations Research-September 1993
Advisor: Robert F. Dell-Department of Operations Research

The Defense Language Institute (DLI) teaches various levels of foreign language competency to Department of Defense personnel. It currently offers 104 courses ranging in length from 2 to 63 weeks in 23 languages. There is a mandated instructor-to-student ratio, which determines the number of sections of each course that must be taught each year. This thesis develops linear integer programs to decide when to start each section of each course. The primary objective guiding the integer programs is the minimization of the full-time staff of instructors required to meet the next three years' projected student input. Secondary objectives are used to improve the face validity of the models' recommendations. When compared with manual methods, decisions developed using the models are superior to current decisions for all measures of effectiveness considered, and they provide DLI with a savings opportunity in excess of $6.5 million over the next three years.

OPTIMIZING RESOURCE ALLOCATION WHEN ESTABLISHING A MULTINATIONAL MARITIME LOGISTICS FORCE

John D. Lape-Lieutenant Commander, United States Navy
B.S.I.M., Purdue University, 1983
Master of Science in Operations Research-September 1993
Advisor: Douglas M. Hartman-Department of Operations Research

The **LOGISTICS ALLOCATION PROGRAM TO EVALUATE THE AVAILABILITY OF RESOURCES (LAPEAR)** presented in this thesis is a decision support system to aid NATO commanders in determining where to get resources to support a Multinational Maritime Logistics Force (MNLF). The problem is constrained by the structure of the desired logistics support organization and the amount of resources member nations are willing to provide in specific operation areas. For long range planning purposes, this model helps identify potential resource shortages in support of conflicts in specific operating areas. When a crisis situation develops, the model can help NATO commanders to quickly decide which nations should be tasked to provide resources. LAPEAR is easy to operate on a PC using the MS-DOS operating system and General Algebraic Modeling System (GAMS) modeling software with an associated solver. For realistic scenarios, LAPEAR provides optimal allocation plans in less than a minute.

A SIMULATED SINGLE-ITEM AGGREGATE INVENTORY MODEL FOR U.S. NAVY REPAIRABLE ITEMS

Kevin J. Maher-Lieutenant Commander, United States Navy
B.A., Western Michigan University, 1975
Master of Science in Operations Research-September 1993
Advisor: Alan W. McMasters-Department of Systems Management

A readiness-based sparing (RBS) model for the repair and replenishment of repairable items is needed by the Navy which considers the aggregate inventory of repaired units and new ones. This thesis presents progress in the development of such a model. In contrast to other such current repairables models in the literature, it also allows for both batch repair and procurement. A theoretical model had been developed earlier at the Naval Postgraduate School for the probability distribution of inventory position for such a model. However, no theoretical model has yet been developed for the probability distribution of net inventory because the real-world inventory management of repairables is quite complex. Therefore, a simulation model was developed of the Navy's repairables management process to explore the nature of that distribution as a function of relevant system parameters. It was then run for a range of values of a subset of those parameters. The net inventory distribution appears to be normally distributed with its mean and variance being a linear function of the product of carcass return rate and repair survival rate. The theoretical distribution for inventory position was not only validated, it was found to be quite robust. Further analyses, however, are required before the effects of all relevant parameters are well understood.

A NEW BRANCH-AND-BOUND PROCEDURE FOR COMPUTING OPTIMAL SEARCH PATHS

Gustavo H. A. Martins-Lieutenant Commander, Brazilian Navy
B.S., Brazilian Naval Academy, 1980
Master of Science in Operations Research-March 1993
Advisors: James N. Eagle-Department of Operations Research &
Craig W. Rasmussen-Department of Mathematics

We consider the problem of a searcher trying to detect a target that moves among a finite set of cells, C = 1, ..., N, in discrete time, according to a specified Markov process. In each time period the searcher chooses one cell to search. Suppose the searcher is in cell j at time t. If the target is in j, it is detected with probability p_j. If the target is not in j, no detection will occur in that time period. The set of cells the searcher can choose in time t+1 is denoted C_j. If T periods of time are available for search, the searcher's objective is to maximize the probability of detecting the target during the T searches. We propose and implement a branch-and-bound procedure for solving the problem above, using the expected number of detections as the bound. We also propose and implement a combination of two heuristics as an effective way of obtaining approximate solutions in polynomial time.

THE APPLICATION OF RANDOM SEARCH THEORY TO THE DETECTION OF TACTICAL BALLISTIC MISSILE LAUNCHERS
Joseph Paul Mattis-Lieutenant Commander, United States Navy
B.S., University of Southern California, 1980
Master of Science in Operations Research-September 1993
Advisor: Kneale T. Marshall-Department of Operations Research

The search for Tactical Ballistic Missile (TBM) launchers is modeled mathematically using the Random Search Model. Special provisions are made in the model to account for the fact that the launcher is not always exposed to detection by the searcher. The probability that the launcher is exposed to detection is assumed to be both deterministic and stochastic. The tactical implications of the results of the model are discussed and several methods are provided to improve search performance based on an analysis of the model parameters.

COMPARISON OF JANUS(A) SIMULATED TERRAIN VEGETATION CODES TO MODIFIED JANUS(A) TERRAIN VEGETATION CODES FOR THE JAVELIN ANTITANK OPERATIONAL TEST
Willie J. McFadden II-Captain, United States Army
B.S., United States Military Academy, 1983
Master of Science in Operations Research-September 1993
Co-Advisors: Bard K. Mansager-Department of Mathematics &
William G. Kemple-Department of Operations Research

The purpose of this thesis is to compare and analyze the effects of the Janus(A) default terrain database and a Janus(A) modified terrain database on a modeled Javelin operational test. An eight meter resolution terrain database was used to create the modified Janus(A) terrain. The eight meter resolution terrain database was extracted from the Perspective View Generator and Analysis Systems for Unmanned Sensors Terrain Database Creation System. Analysis using nonparametric statistics and graphical methods showed that the vegetation code distributions for the default terrain and the modified terrain were not the same. Three scenarios were run using each terrain file, and when the results were compared, the detection ranges were found to be different in the areas where intense vegetation modifications had to be made.

EVALUATING THE ANALYTIC HIERARCHY PROCESS AND RECOMMENDED MODIFICATIONS FOR ITS USE IN MULTI-ATTRIBUTE DECISION MAKING
William H. McQuail-Captain, United States Army
B.S., United States Military Academy, 1983
Master of Science in Operations Research-September 1993
Advisor: Kneale T. Marshall-Department of Operations Research

The Combined Arms Analysis Directorate of the Training and Doctrine Analysis Command (TRAC) uses the Analytic Hierarchy Process (AHP) to evaluate the contribution of modernization initiatives to U.S. Army capabilities. This thesis identifies several problems with using AHP. Most significantly, AHP can cause rank reversal of alternatives if a new alternative is considered, even if the new alternative has the same attribute levels as one of the previous alternatives. This thesis proposes several modifications that would improve results when AHP is used. It contains a different method of weight fitting that appears to provide alternative weights that are more accurate than the traditional AHP eigenvalue method. This thesis has two proposals for improving the nine point integer scale by which pairwise comparisons are made. Most significantly, this thesis proposes a modification to AHP that will maintain a ratio scale and avoid rank reversals. This last improvement requires the decision maker to establish and maintain units of measurement. Additionally, the decision maker must make comparisons of attributes to establish a meaningful scale not sensitive to the abundance or lack of alternatives considered. If units are maintained and the decision maker is consistent in the pairwise comparisons, there will be no rank reversals.

THE TACTICAL AND LOGISTICAL OPERATIONS SIMULATOR - TALOS

Robert Scott Murphy-Lieutenant, United States Navy
B.S., Villanova University, 1986
Master of Science in Operations Research-September 1993
Advisor: Donald P. Brutzman-Department of Operations Research

The Tactical and Logistical Operations Simulator - TALOS is an interactive, single user educational wargame. TALOS is designed to educate naval officers as to the importance of naval logistics by simulating the command of a naval force conducting operations in hostile waters. The war game models the fuel and ammunition consumption for the player as naval operations are conducted against a fictional enemy. The player is responsible for the success of the mission against the enemy and for maintaining the readiness of his forces through scheduled resupply efforts. TALOS is written in Turbo Pascal for an IBM compatible computer in the DOS environment.

AN OBJECT-ORIENTED LOGISTICS OVER THE SHORE SIMULATION: AN AID IN THROUGHPUT ESTIMATION

Jack S. Noel, II-Lieutenant, United States Navy
B.S., United States Naval Academy, 1985
Master of Science in Operations Research-September 1993
Advisor: William G. Kemple-Department of Operations Research

This thesis documents the design, validation, and demonstration of a simulation model for the instream offload of vehicles from a Roll On/Roll Off ship. The model is an object-oriented, discrete event simulation written in MODSIM II. The objective is to design and demonstrate a model that can accurately estimate throughput times for the total offload of a vessel instream using various mixes of lighterage. With this tool, Logistics Over the Shore (LOTS) planners will be better able to estimate throughput and possibly tailor their mix of lighterage to a given set of fixed parameters.

THE IMPACT OF WINGSHIPS ON STRATEGIC LIFT

Bradley Lohrbauer Olds-Lieutenant, United States Navy
B.S., United States Naval Academy, 1985
Master of Science in Operations Research-September 1993
Advisor: Dan C. Boger-Department of Systems Management

Operation Desert Shield highlighted tremendous problems with our nation's ability to efficiently move our army and equipment to distant theaters. The wingship, a hybrid air/surface craft is a potential solution to our long-standing sealift deficit. The Sealift Parametric Analysis Model, a simulation provided by the Naval Surface Warfare Center, was modified to adapt wingships so that the vessel's impact on force closure could be analyzed. For a notional force requiring 19 million square feet of combat gear and support equipment, wingships augmenting conventional sealift assets can move the needed equipment into the South Korea or Persian Gulf theaters much faster than is currently possible. Even with the large amount of additional square footage of cargo-carrying capability already programmed for further sealift assets, troops can be deployed and supported much more quickly with wingships. Given the diverse global threat in this rapidly changing world, wingships provide a strategic deterrent of tremendous value to our nation and to our allies.

MPAMOD: AN OPTIMIZATION MODEL FOR MARITIME PATROL AVIATION MODERNIZATION PLANNING

Brian Alan Osborn-Lieutenant, United States Navy
B.A., University of Maine at Orono, 1982
Master of Science in Operations Research-March 1993
Advisor: R. Kevin Wood-Department of Operations Research

This thesis describes an integer programming model to aid in the development of long-range modernization plans for the Navy's Maritime patrol Aviation fleet. The model is a production/inventory model implemented in the General Algebraic Modeling System (GAMS) and solved with the X-System. Over a user-defined planning horizon, at a yearly level of detail, the model determines an optimal schedule for procuring new aircraft, refurbishing the airframes of existing aircraft through the Sustained Readiness Program and the Service Life Extension Program, upgrading avionics, and retiring old aircraft. Constraints enforce minimum inventory levels, mission effectiveness goals by mission area, goals for minimum average life remaining of the force, budget limitations and annual line capacities for producing, refurbishing and upgrading aircraft. A typical model involves 4,800 constraints and 13,000 general integer variables and is solved to within 4% of optimality in 7.5 minutes on an Amdahl 5990-500.

JAVELIN: A CASE STUDY IN MODEL-TEST-MODEL

Charles Abbot Pate-Captain, United States Army
B.S., United States Military Academy, 1982
Master of Science in Operations Research-December 1992
Advisor: Michael Proctor-Department of Operations Research

The acquisition of new weapon systems is a long and expensive process. Test and Evaluation is a critical and costly step in that process. Model-Test-Model (MTM) is an emerging operations research technique that can improve efficiency and effectiveness of weapon system evaluation. For example, MTM can be used to predict whether a given test scenario will yield significant results. The goal of this thesis is to: (1) examine the suitability of proposed scenarios for comparing the existing anti-armor system, Dragon versus the propose system, Javelin; (2) compare the weapon systems according to approved measures of effectiveness (MOE); and (3) identify potential additional test conditions which may cause significant changes in the MOE. The pre-test model using Janus(A), a high resolution, combat simulation will impact on the operational test of the weapon systems occurring in September 1993. Although M-T-M is a DoD approved construct, limited experiments have been done. This thesis is unique because it explores for the first time, using MTM, an infantry weapon system with approved scenarios and MOE; secondly, this thesis has been delivered in time to impact on the Operational Test and Evaluation plan. The results will directly benefit Operational Test and Evaluation Command (OPTEC) in their test design and operational effectiveness analysis.

COMPARISON OF JANUS AND FIELD TEST HELICOPTER ENGAGEMENT RANGES FOR THE LINE-OF-SIGHT FORWARD HEAVY SYSTEM

Maria C. Pate-Captain, United States Army
B.S., United States Military Academy, 1982
Master of Science in Operations Research-December 1992
Advisors: Robert R. Read & Eugene P. Paulo-Department of Operations Research

This thesis compares helicopter engagement ranges from an operational field test to similar ranges generated by simulation of the test in JANUS(A). The purpose is to analyze the feasibility of accrediting the JANUS(A) combat model for the Post-Test Modeling Phase of an Army concept called Model-Test-Model. Means and distributions of helicopter engagement ranges are analyzed. The JANUS engagement ranges are greater than those of the operational test. No common link between the two tests and the scenarios is apparent. Other issues include time taken to ensure that a credible database is entered in JANUS and improvement of terrain and helicopter representation for a more realistic result.

A DESCRIPTIVE ANALYSIS OF THE 1992 ACTIVE-DUTY PHYSICIAN ASSET: WITH COMPARISONS TO THE KAISER-PERMANENTE PHYSICIAN STAFF MODEL DATA

James J. Pellack-Lieutenant, United States Navy
B.S., Illinois Institute of Technology, 1979
M.S., Central Michigan University, 1987
Master of Science in Operations Research-September 1993
Co-Advisors: Donald P. Gaver & CDR Frank P. Petho-Department of Operations Research

In a time of declining military budgets, DoD is reducing health care costs while insuring available, accessible, and quality health care. One area which impacts these factors is physician staffing levels. The problem for DoD is one of maintaining a cadre of active-duty physicians, which is generally based on wartime requirements, while providing peacetime medical care to over eight million beneficiaries. This thesis examines this problem by using data from the Defense Manpower Data Center and the Kaiser-Permanente HMO, northern CA region, in Oakland, CA (K-P). A baseline assessment of the 1992 active-duty physician asset is done by first analyzing each Service's number of active-duty physician specialists and then by comparing DoD active-duty physician staffing levels to the corresponding physician staffing levels of K-P. Additionally, beneficiary demographics are analyzed and compared between each Service, as well as, DoD and K-P. Similarities and differences in physician staffing levels between the Services and between DoD and K-P are discussed.

DECISION ANALYSIS APPLIED TO THE DEPLOYMENT OF MODULARIZED OCEAN BASING SYSTEMS

Robert A. Reifenberger-Lieutenant, United States Navy
B.S., University of Washington, 1987
Master of Science in Operations Research-September 1993
Advisor: Kneale T. Marshall-Department of Operations Research

The decline in the availability of U.S. bases overseas, accompanied by rising permit costs and operational restrictions at many remaining sites, has led to the consideration of ocean-based support sites as an alternative to land-based systems. Specifically, the Carderock Division of the Naval Surface Warfare Center (CDNSWC), Mobile Support Systems Program Office, is conducting a feasibility study of Modularized Ocean Basing Systems (MOBS). Attendant to the development of these high-cost, limited availability systems is the requirement that selection of deployment sites be conducted with the goal of maximizing their effectiveness. This thesis employs the methodology and practice of decision analysis to develop a pilot model for assessment of potential regional deployment sites. Key factors incorporated into the model are the uncertainty associated with the availability of Host Nation Support and the possible escalation of hostilities. MOBS and Host Nation Support effectiveness are measured in terms of capacity and the number of channels available for the flow of personnel and material, modified by the likely support system degradation inherent at higher levels of conflict. Costs associated with the respective systems are incorporated. The decision maker is provided an assessment of the impact of different MOBS deployment policies and insight into a number of related issues.

AN ANALYSIS OF EFFECTS OF VARIABLE FACTORS ON WEAPON PERFORMANCE

William Vaughn Ridings-Lieutenant, United States Navy
B.S., United States Naval Academy, 1985
Master of Science in Operations Research-March 1993
Advisor: Harold J. Larson-Department of Operations Research

Statistical analysis provides a powerful tool for modern decision makers. Unfortunately, this tool can be a two-edged sword. Improper or erroneous analysis can result in incorrect and costly decisions. Many analysis errors can be traced to the misapplication of statistical methods. When examining experimental data, it is first necessary to determine the true nature of that data, specifically, the structure from which the data is drawn. This determination will then be a primary factor in the choice of statistical test. This thesis examines an analysis performed by Surface Warfare Development Group (SWDG). The SWDG analysis is shown to be incorrect due to the misapplication of testing methods. A corrected analysis is presented and recommendations suggested for changes to the testing procedures used by SWDG. Additionally, a computer program to perform basic Analysis of Variance (ANOVA) tests is provided to be appended to the current SWDG statistical software.

OPTIMIZING AEGIS SHIP STATIONING FOR ACTIVE THEATER MISSILES DEFENSE

Mark Raymond Rios-Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1982
Master of Science in Operations Research-September 1993
Co-Advisors: Donald P. Gaver-Department of Operations Research &
LCDR Mary S. Russo, USN-Command, Control, and Communications Academic Group

This thesis utilizes Extended Air Defense Simulation(EADSIM), a government-owned computer model, to determine the optimum stationing of an AEGIS ship in an Anti-Theater Ballistic Missile(ATBM) role defending two cities. The conclusions stated depend upon the validity of that model. The AEGIS ship's command being unsure of enemy launch sites and target intentions, the geometrically worst-case enemy launch points against the cities were modeled. Numerous potential positions from which an AEGIS ship could actively defend the cities with its Surface-to-Air missiles were assessed by simulation. Those positions which appeared advantageous were additionally evaluated in order to obtain greater confidence in the results of the ship's defense from those assigned stations. In order to aid in visualization of the results, expected TBM hits on the cities, and raid attrition by the AEGIS ship, were displayed on scatter, three-dimensional surface, and contour plots, from which the optimal stationing area of the ship was indicated.

MODELING THE ENHANCED INTEGRATED SOLDIER SYSTEM (TEISS) USING JANUS(A)

Sue M. Romans-Captain, United States Army
B.S, The University of Utah, 1983
Master of Science in Operations Research-March 1993
Advisors: Samuel H. Parry & George Stone-Department of Operations Research

The purpose of this thesis is to model The Enhanced Integrated Soldier System (TEISS) and analyze the contributions of several factors associated with increasing the lethality and survivability of TEISS. Of interest is the effort to model TEISS, which is still in the conceptual stage, using the Janus(A) high resolution combat model. The database for TEISS was created based solely on the draft Operational Requirements Document (ORD) and the Rationale Annex (Annex A). A 1/8 fractional factorial design was used for this study. Graphical and statistical analyses were performed to consider the impact of increased detection, acquisition, full solution fire control, body protective overgarment, combat load and speed. The results clearly show that the body protective overgarment contributed most to TEISS's ability to survive and the full solution fire control capability is responsible for TEISS's increased lethality in both defensive and offensive operations.

AN ANALYSIS OF THE COAST GUARD ENLISTED ATTRITION

Laureano Enrique Oñate Rubiano-Lieutenant Commander, Colombian Navy
B.S., Escuela Naval de Cadetes, Cartagena Colombia, 1987
Master of Science in Operations Research-September 1993
Advisor: So Young Sohn-Department of Research Operations

In this thesis, survival analysis is used to study U.S. Coast Guard enlisted attrition behavior in terms of individual personnel characteristics such as sex, marital status, race, paygrade and rating. Results obtained based on 8 years of historical data from FY83 to FY90 are as follows: males and married individuals have higher survival probabilities than their counterparts, respectively; paygrades E-1 to E-5 have higher attrition than paygrades E-6 to E-9; American Indians have the highest attrition and Asian members have the highest survival probabilities; rating 170 (Gunner's Mate) has the highest attrition over all ratings followed by rating 180 (Fire Control Technician); the rating with the highest survival probability is 570 (Aviation Machinist's Mate); a decreasing trend in attrition was found during the last 4 years of the observation period; it was also observed that there was significantly high attrition at the end of the four years service contract and when the enlisted member reaches twenty years of service. Additionally, this thesis provides a regression model in order to predict monthly enlisted attrition figures. Significant predictors selected are the prior month's attrition, the number of enlistments four years prior and the current unemployment rate. The selected regression model explains almost 97% of the total variation of monthly attrition. It turns out to perform better than the current method used by the CG.

THE EFFECT OF STAYING POWER ON OFFENSIVE AND DEFENSIVE POWER OF A MODERN WARSHIP

Dimitrios Sakellariou-Lieutenant Commander, Hellenic Navy
B.S., Hellenic Naval Academy, 1980
Master of Science in Operations Research-March 1993
Advisor: Wayne P. Hughes-Department of Operations Research

This thesis develops the relationship between the three major attributes of a modern warship: staying power, offensive power, and defensive power. Based on W. Hughes' Salvo Model, we show that there is an inverse linear relationship between a ships staying power and its defensive power and a nonlinear relationship between its staying power and its offensive power. Using the embellishments that E. Hatzopoulos added regarding scouting effectiveness and alertness, we also compare the results for survivability which A. Lalis obtained from the Hatzopoulos model using scouting and alertness. We examine survivability using defensive power (or equivalently staying power, because of their linear relationship) and also offensive power.

USING MULTIPLE SEARCHERS TO LOCATE A RANDOMLY MOVING TARGET

Almir Garnier Santos-Lieutenant Commander, Brazilian Navy
B.S., Brazilian Naval Academy, 1981
Master of Science in Operations Research-September 1993
Advisors: Robert F. Dell & James N. Eagle-Department of Operations Research

The need to search effectively for objects presents itself in many civilian and military applications. This thesis develops and tests six heuristics and an optimal branch and bound procedure to solve the heretofore uninvestigated problem of searching for a Markovian moving target using multiple searchers. For more than one searcher, the time needed to guarantee an optimal solution for the problems considered is prohibitive. The heuristics represent a wide variety of approaches and consist of two based on the expected number of detections, two genetic algorithm implementations, one based on solving partial problems optimally, and local search. A heuristic based on the expected number of detections obtains solutions within two percent of the best known solution for each one, two, and three searcher test problem considered. For one and two searcher problems, the same heuristic's solution time is less than that of other heuristics considered. A Genetic Algorithm implementation performs acceptably for one and two searcher problems and highlights its ability, effectively solving three searcher problems in as little as 20% of other heuristic run-times.

A SIMULATION AND EVALUATION OF NATO STANDARDIZATION AGREEMENT (STANAG) 4214

Robert G. Schultz-Lieutenant, United States Navy
B.S., Belmont College, 1985
Master of Science in Operations Research
and
Michael A. Dorko-Lieutenant, United States Navy
B.S., United States Naval Academy, 1986
Master of Science in Operations Research-September 1993
Advisor: Michael Bailey-Department of Operations Research
Co-Advisor: William Kemple-Department of Operations Research

An object-oriented simulation model is developed to evaluate the effectiveness of NATO Standardization Agreement (STANAG) 4214, which promulgates the protocol for international telephone call routing and directories for tactical communications. The model simulates communication systems using the STANAG 4214 protocol to isolate discrepancies which could lead to the inability to successfully complete calls within the system. The model also simulates protocol modifications created to correct existing discrepancies and verifies their effectiveness in making the protocol more robust. Results show that these modifications improve STANAG call completion rate from a potential low of under 70 percent to 100 percent, while simultaneously easing the restrictions on lateral communication connections. The model is menu-driven with both graphical and hard copy output, making it useful to network planners, protocol designers, and tactical communications officers.

REALIGNING THE U.S. NAVY RECRUITING COMMAND

Garry S. Schwartz-Captain, United States Marine Corps
B.S., Illinois Institute of Technology, 1985
Master of Science in Operations Research-March 1993
Advisor: Siriphong Lawphonpanich-Department of Operations Research

This thesis addresses two problems in aligning the recruiting structure for Navy Recruiting Command. The first problem involves two decisions affecting recruiting stations within a single recruiting district: which stations should remain open and how many recruiters should be assigned to each open station? The second problem is to decide how many recruiters and stations each district should have. The first problem is formulated as a nonlinear mixed integer programming problem. To obtain a solution with readily available software, the problem is decomposed into four subproblems that are solved sequentially. This decomposition approach is empirically shown to yield near optimal solutions for problems of varied sizes. The second problem is formulated as a nonlinear resource allocation problem in which the objective function is not expressible in closed form. To efficiently solve this problem, the function is approximated in a piecewise linear fashion using the results from the first problem. To illustrate the applications of these optimization models, solutions were obtained for Navy Recruiting District Boston and Navy Recruiting Area 1, which consists of Albany, Boston, Buffalo, New York, Harrisburg, Philadelphia, Pittsburgh and New Jersey districts.

A CRITICAL ANALYSIS OF A RANGE DEPENDENT PROBABILITY OF KILL FOR THE NATO SEASPARROW MISSILE SYSTEM

Curt William Steigers-Lieutenant, United States Navy
B.S., Naval Architecture, United States Naval Academy, 1985
Master of Science in Operations Research-March 1993
Advisor: W. Max Woods-Department of Operations Research

This thesis provides a method to utilize existing digital simulations and missile reliability data to determine the probability of kill (Pk) versus range for the Seasparrow for each system state. A procedure is presented that uses the Pk versus range curve and the firing doctrine to determine the probability of defeating an anti-ship cruise missile attack for input into a baseline system effectiveness model. A method to optimize the firing doctrine using linear programming techniques is presented. Implemented using the General Algebraic Modeling System (GAMS), the optimized firing doctrine provides a significant enhancement to the probability of defeating an ASCM attack. The thesis enhances the Baseline Systems Effectiveness model for the NATO Seasparrow Missile System (NSSMS) developed by Professor W.M. Woods of the Naval Postgraduate School for the Naval Warfare Assessment Center, Corona, California.

A NETWORK OPTIMIZER FOR THE U.S. MARINE CORPS OFFICER STAFFING GOAL MODEL (OSGM-NET)

James B. Sweeney, III-Captain, United States Marine Corps
B.S., Georgia Institute of Technology, 1983
Master of Science in Operations Research-September 1993
Advisor: R. Kevin Wood-Department of Operations Research

This thesis develops and implements a network linear programming model, called the Officer Staffing Goal Model-Network (OSGM-NET), to assist the United States Marine Corps in the peacetime allocation of active duty officers to meet manpower requirements. Due to their small officer population and diverse range of missions, the Marine Corps is constantly faced with the problem of which officer job positions to fill and which to leave vacant. A set of manning targets, called staffing goals, is needed to ensure the officer population is efficiently used. Targets are obtained by an "allocation model" (a generalized version of an assignment model) that takes the officer population (supply) and manpower requirements (demand) and returns a solution that fills the most requirements with the most suitable officers. A staffing goal for a billet represents the existence of an officer in the population that can fill that billet. The Marine Corps prioritizes requirements into classes, and unmet requirements within a priority class are shared evenly. OSGM-NET's computer implementation comprises a group of portable algorithms written in FORTRAN using the elastic transhipment network solver ENET. OSGM-NET solves the officer staffing goal problem with more requirements filled and unmet requirements more evenly shared than the current computer model, and it executes in a few minutes on a desktop personal computer making it a less expensive, more accessible model.

TWO OPTIMIZATION MODELS FOR SMALL-SCALE ROUTING OF MILITARY UNITS IN A ROAD NETWORK

Johann Thoma-Captain, Federal Republic of Germany Army
Diplom-Ingenieur Univ, University of Munich, 1980
Master of Science in Operations Research-September 1993
Advisor: Richard E. Rosenthal-Department of Operations Research

This thesis describes two integer programming models that are developed to support movement planners in optimally routing military units through a road network with minimal delays. The formulations are based on a multicommodity time-expanded network flow problem. The first model (called *model close column)* is designed for use when all vehicles of a military unit are required to move together over one route. The second model (called *model separate column*) allows a military unit to be split into groups of vehicles which may use different routes and start at irregular times. Variants of the models allow all units to move at just one speed, or allow units to move at one of two speeds, fast or slow. Both models are designed with the German Army in mind, but could be used with minor modifications by other armies. The models are implemented via the General Algebraic Modeling System (GAMS). A hypothetical peacetime scenario based upon completion of a German brigade live exercise is used to test both models. In the test data, five military units are specified such that their movements inside an area of 24 by 12 km would conflict without careful planning. Depending on the model and whether movements are planned with different speeds, these five units are routed with solution times from 14 sec to 131 sec on a 486/33 MHz personal computer with the ZOOM solver. The advantage of movements at different speeds is clearly demonstrated. Evaluation of all results shows that they are accurate and that planners can be effectively supported by the models.

APPLICATION OF LOGISTIC REGRESSION AND SURVIVAL ANALYSIS TO THE STUDY OF CEPT, MANPOWER PERFORMANCE AND ATTRITION

Lian Tian Tse
B.S., National University of Singapore, 1988
Master of Science in Operations Research-September 1993
Advisor: So Young Sohn-Department of Operations Research

This thesis is an application of logistic regression and survival analysis techniques to the study of current estimated potential (CEP), manpower performance, and attrition behavior in the Singapore military. The manpower data includes both active (30%) and reserve personnel (70%) who entered service as early as the late fifties to as recently as the year 1992. The covariates under consideration are education level, academic or overseas military training award, current rank, length of service, rank seniority, age, salary grade, previous year's annual performance grade and CEP estimates. The study identifies the covariates that explain the CEP and annual performance for the binary and polytomous models of the officers who were still on active duty as of 31 Dec 1992. It also examines the trend of attrition behavior of officers using data from both the active and reserve personnel. The results of the study show that (1) higher education level does not necessarily result in a better performance grade although it seems to give an indication of higher CEP, (2) the higher the rank of an officer, the more likely it is for him to have a poorer performance grade than when he was in the previous rank, (3) education level is a significant covariate of the survival functions, and (4) engineering officers generally have a higher attrition rate than the other service support officers.

A MONTHLY SQUADRON SORTIE SCHEDULING MODEL FOR IMPROVED COMBAT READINESS

John D. Van Brabant-Lieutenant, United States Navy
B.S., United States Naval Academy, 1985
Master of Science in Operations Research-September 1993
Advisor: R. Kevin Wood-Department of Operations Research

An integer programming approach is taken to planning sorties for an operational squadron in the U.S. Navy. The model is designed as a decision aid for squadron operations officers in the planning of monthly flight schedules with the goal of maximizing squadron combat readiness by maximizing a weighted sum of readiness levels over all mission areas. Squadrons in each aviation community to try to maximize readiness by flying training "events", subject to certain restrictions including: limited funding, limited availability of training facilities, a required number of aircraft per flight, flight time equity among pilots, and maintaining minimum levels of readiness in each mission area. An integer programming model, applicable to most squadron types, is implemented on a PC to maximize squadron readiness subject to those restrictions. The model is programmed in the GAMS language and solved in 5 minutes on 80486/33MHz computer with the XA solver. The output is a matrix of pilot-to-event assignments and shows the projected squadron readiness following the implementation of the proposed monthly schedule.

DEVELOPMENT OF COST ESTIMATING RELATIONSHIPS FOR MISSILE ENGINEERING MANUFACTURING DEVELOPMENT (EMD) COSTS AND WARSHIP FUEL CONSUMPTION

Sandra A. Williams-Lieutenant, United States Navy
B.A., Loma Linda University, 1983
Master of Science in Operations Research-September 1993
Advisor: Dan C. Boger-Department of Systems Management

The purpose of this thesis is to develop estimating relationships for missile Engineering and Manufacturing Development (EMD) costs and warship fuel consumption to aid the Naval Center for Cost Analysis (NCA) in performing independent cost estimates for new weapons programs. Standard factors, which represent the percent that each cost element is typically allocated from the program's total funding, are currently used to predict whether missile EMD costs are "roughly right." For fuel consumption, estimating relationships have only been developed for existing individual ship types. None have been developed which used pooled ship types to estimate fuel consumption of new ship types. Regression analysis was used to develop estimating relationships based on physical and technical characteristics. The cost estimating relationships (CERs) developed to predict missile EMD costs explained only about 34 percent of the variance. Due to the low explanatory power, no significant physical or technical factors could be determined. Even though the results are not statistically significant, the associated coefficients of variation are lower than the standard factor coefficients of variation. An estimating relationship with high explanatory power was developed to predict fuel consumption for new warships. Three significant physical and performance factors were determined: steaming hours, age and full load displacement. For new ship types, steaming hours and full load displacement are the significant factors.

UNITED STATES NAVY SURFACE SHIP EMPLOYMENT AND CRISIS RESPONSE MODEL (ECRM)

Takashi Roy Yamamoto-Lieutenant, United States Navy
B.S., United States Naval Academy, 1986
Master of Science in Operations Research-March 1993
Advisor: Wayne P. Hughes-Department of Operations Research

Since the collapse of the Soviet Union in 1990, the United States Navy finds itself searching for and defining new roles in the post-cold-war period. Design aids previously utilized to analyze the Soviet threat must be redesigned to assist in timely crisis response and the build-up of appropriate force levels for regional contingencies. Currently, no such model for crisis response exists for an operational commander and his staff that will help select the forces to respond. The Employment and Crisis Response Model, developed to assist in the contingency planning process, provides an indication of the total number of days required for the build-up of the desired force level on scene. The rapid calculation of this information allows decision makers to quickly analyze different response options when faced with a crisis.

MASTER OF SCIENCE
IN
PHYSICAL OCEANOGRAPHY

OBJECTIVE ANALYSIS OF A COASTAL OCEAN EDDY USING SATELLITE AVHRR AND IN SITU HYDROGRAPHIC DATA

Rogério Paulo Antunes Chumbinho-Lieutenant, Portuguese Navy
B.S., Portuguese Naval Academy, 1986
Master of Science in Physical Oceanography-September 1993
Advisor: Roland W. Garwood, Jr.-Department of Oceanography

A common characteristic of the interaction between the coastal topography and eastern boundary currents (EBC) is the appearance of cold filaments and mesoscale eddies. Hydrographic and satellite temperature data obtained during a cruise on board R/V Point Sur off Point Arena, California, in May 1993 were analyzed to study a particular eddy field in this area. The hydrographic data was first used to verify the remotely sensed surface temperature field, using three dimensional data visualization. Selected vertical levels from each hydrographic station were then interpolated into a broader, finer resolution grid domain in preparation for an eventual model initialization, using multiquadric interpolation. The results verify the existence of the eddy and show its signature in the vertical to about 300 meters depth. A sensitivity study of interpolation parameters was performed to evaluate approximately the optimal set of parameters, showing that the multiquadric interpolation resolves very well the temperature field in the upper levels and introduces small amplitude, small scale noise in the deeper levels. This noise can be eliminated by a more thorough parameter sensitivity study. A comparative analysis of satellite AVHRR data, in situ hydrographic data and interpolation results shows that the eddy did not experience significant horizontal translation during the period of the cruise suggesting that the asynopticity between the different data sets is not significant for the purpose of objectively analyzing the temperature field.

THE VELOCITY FIELD IN THE NORTHEAST ATLANTIC FROM SATELLITE-TRACKED DRIFTING BUOYS

Paolo Giannetti-Lieutenant Commander, Italian Navy
B.S., Naval Academy, 1981
Master of Science in Physical Oceanography-September 1993
Advisor: Jeffrey D. Paduan-Department of Oceanography

Data from 36 surface drifters (Holey Socks) were collected for a period of 23 months from July 1991 to May 1993 in the Northeast Atlantic Ocean between the Azores Islands and the Canary Islands as a part of the SUBDUCTION experiment. The position information from those drifters is analyzed in this study to obtain horizontal velocity statistics at the drogue level (15m). Mean currents in the area are found to be less than 2 cm/sec except in the vicinity of the Azores Front where the 2-year mean eastward currents measure 3.9 ± 1.7 cm/sec. Zonally-averaged northward currents are divergent over most of the area in contrast to the convergent surface currents expected in the region due to convergence of the climatological Ekman transport. It is shown, however, that array bias due to the non-uniform distribution of particles in the presence of an eddy field can account for this result. The mean eddy kinetic energy level is 103 cm^2/sec^2 and the mean diffusivity is 5.0×10^7 cm^2/sec. These values are in line with results from previous drifter studies. Mean Lagrangian integral time and length scales are 5.7 days and 48 km, respectively and, in all cases, east-west scales are greater than north-south scales. In general, this long data set is still dominated by the effects of mesoscale eddies. An objective method to select eddy portions of drifter trajectories is presented that may help to characterize the eddy field in future studies.

A WATER MASS ANALYSIS OF THE 1991-1992 EL NIÑO SIGNAL IN THE FARALLON ISLANDS REGION

Kevin Austin Samuel Hays-Lieutenant, United States Navy
B.S., United States Naval Academy, 1984
Master of Science in Physical Oceanography-March 1993
Advisor: Steven R. Ramp-Department of Oceanography

Five hydrographic (CTD) and acoustic Doppler current profiler (ADCP) cruises were conducted in February, May, August and late October/early November, 1991 and February, 1992 near the Farallon Island off of central California in order to determine the seasonal variation of the circulation in the region. The timing of the study was such that the onset of the 1991-1992 El Niño/Southern Oscillation was directly observed in the data obtained. A detailed hydrographic analysis of the data showed single station temperature anomalies as great as 4.48 standard deviations warmer than the historical 40 year CalCOFI mean, and salinity anomalies 5.58 standard deviations fresher during February, 1992. The maximum anomalies for both temperature and salinity were between 100 - 150 m depth and within on Rossby radius (20 km) of the continental shelf break. A T-S analysis suggested that there were no large intrusions of different water mass types, and that the anomalies resulted primarily from altered mixing processes due to thermocline/halocline depression. Strong positive sea level anomalies for the west coast of North and South America occurred simultaneously at the Equator and the far north (Gulf of Alaska) then spread from both directions towards central California. The broadening and strengthening of the Aleutian low caused onshore transport and downwelling at the Farallones site. Oceanic processes propagating northward may have occurred but could not be rigorously identified with this data set.

ALONGSHORE SUB-THERMOCLINE VARIABILITY IN THE CENTRAL CALIFORNIA CURRENT SYSTEM

Michael Robert Hicks-Lieutenant, United States Coast Guard
B.S., United States Coast Guard Academy, 1986
Master of Science in Physical Oceanography-December 1992
Advisor: Steven R. Ramp-Department of Oceanography

Moored current meter observations were made along the central California continental slope from Pt. Piedras Blancas to the Farallon Islands. The study area covered an alongshore distance of approximately 290 km and examined the data from off Pt. Piedras Blancas (P4), Pt. Sur (P2 and P3), Monterey Bay (MB1 and MB2) and the Farallon Islands (D and E). Time and frequency domain analyses were performed on three time segments that included data from combinations of the above mooring locations based on common time periods and depths (350 m - 500 m). Segment 1 revealed a mean poleward flow attributed to the California Undercurrent at all moorings. Segment 2 had a similar mean poleward flow but also exhibited an equatorward reversal at periods between 19.5 and 58.5 days at P2 and MB2 that was less apparent at P3 further offshore and appeared to be coastally trapped. Observed wavelengths were compared with simple wave theory indicating that the observed signal may have resulted from a combination of two theories i.e., a coastally trapped wave. The complex bottom topography between Pt. Sur and the Monterey Bay prohibited more rigorous comparison between theory and the observations. Satellite sea surface temperature imagery during Segment 3 showed an anti-cyclonic meander with a 65 km radius outside of the Monterey Bay. Current and temperature records at P2 and MB2 indicated that the surface feature's position varied and influenced the currents at depths down to 500 m. Time domain empirical orthogonal functions were calculated for alongshore and across-shore components separately. The first two empirical modes accounted for between 81% and 86% of the alongshore variance in all segments and were attributed to the mean California Undercurrent influence (mode 1) and to the deviations from the mean state (mode 2). The first two across shore modes explained between 66% and 81% of the variance and consistently demonstrated opposing current structures between the Pt. Sur and Monterey Bay moorings, likely due to the Monterey Bay meander influence.

USING THE C-VECTOR METHOD TO DERIVE THE THREE-DIMENSIONAL CIRCULATION PATTERN NEAR THE EAST GREENLAND POLAR FRONT

Wei-Szu Li-Lieutenant Commander, Chinese Navy
B.S., Chung Cheng Institute of Technology
Master of Science in Physical Oceanography-December 1992
Advisor: Peter C. Chu-Department of Oceanography

The C-vector method is used to determine the three-dimensional pseudo-vorticity field of the East Greenland Current by using a CTD data set acquired during the 1984 Northwind cruise. The value of the ageostrophic pseudo-vorticity, the total (geostrophic and ageostrophic) pseudo-vorticity and the vertical component of the C-vector curl, ψ , can be calculated by the C-vector method. From these values the pseudo-vorticity can be investigated for the East Greenland Current. Additionally, the positive and the negative vertical motion at each level can be investigated from the ψ value. A two-cell structure with downward motion around the East Greenland Polar Front was found. The C-vector method also demonstrates that the vertical circulation induced by an anticyclonic gyre and the cross-coastal circulation generated by the surface wind can be depicted.

A NUMERICAL STUDY OF SEASONAL WIND FORCING ON THE CALIFORNIA CURRENT SYSTEM

Ross P. Mitchell-Lieutenant, United States Navy
B.S., United States Naval Academy, 1987
Master of Science in Physical Oceanography-March 1993
Advisor: Mary L. Batteen-Department of Oceanography

A high resolution, multi-level, primitive equation ocean model is used to examine the response of an idealized, flat-bottomed, eastern boundary oceanic regime on a beta-plane to both steady and seasonally-varying climatological wind forcing. The focus of this study is the California Current System along the coastal region, from 35° N to 45° N, off the Western United States. With steady equatorward wind forcing, a surface equatorward current and poleward undercurrent develop. Eddies form around days 60 and 70 with initial development in the northern region of the domain. The strong meandering current continues to grow throughout the 360 days of model time and can produce eddies that have wavelengths up to ~200 km and can propagate at least ~200 km offshore. When the alongshore component of the temporally averaged seasonally-varying climatological wind forcing is used, there is a weak poleward undercurrent and equatorward surface current. There is weak upwelling and very little eddy activity with the eddies only propagating to ~100 km offshore. When alongshore component of the time-dependent wind forcing with spatial variability in latitude is used, a surface equatorward jet, poleward undercurrent and eddies are generated. The eddies form throughout the domain in this experiment due to competition between the ß-plane effect and the continuous and stronger equatorward wind forcing in the southern portion of the domain. The eddies in this experiment propagate at least ~150 km from shore. When the full climatological winds are used, there is again a surface equatorward jet and poleward undercurrent generated. The surface currents and eddies reach speeds of ~65-85 cm s^{-1}. The wavelengths of the eddies are ~300 km and can propagate to ~350 km offshore. These results are closest to the observed structure of the California Current System. Therefore, I conclude that both temporal and spatial variability in wind forcing are critical elements in the formation and maintenance of currents and eddies in the California Current System.

AN INVESTIGATION USING EMPIRICAL ORTHOGONAL FUNCTIONS AND OBJECTIVE ANALYSIS TO ANALYZE THE VERTICAL TEMPERATURE STRUCTURE OF A GULF STREAM MEANDER

Martin James Sauze-Lieutenant Commander Royal Navy
B.Ed., Nottingham University England, 1977
Master of Science in Physical Oceanography-March 1993
Advisor: Everett F. Carter-Department of Oceanography

Expendable bathymetric temperature (XBT) data taken from an anticyclonic meander crest within the Gulf Stream (Hummon et al., 1991) is analyzed by looking at the empirical vertical structure. The ensemble averaged data is formed into a projection matrix that compares the value of the temperature at one depth with the temperature at a second depth. The data is smoothed with the correlation analysis being performed at 10 meter intervals from 5 meters to a depth of 800 meters. The first four, or principal, EOFs of the projection matrix are computed and the modal amplitudes for each XBT determined. Using objective analysis the modal amplitudes are interpolated onto a specified grid. Synthetic XBTs are then reconstructed at the grid positions using the interpolated grid modal amplitude values. A measure of the error variance at each grid point is determined. The objective analysis is repeated using successively fewer XBTs from the data set, until the resulting error in the interpolated XBTs at the grid points become unacceptable.

WATER MASSES AND THE THERMOHALINE CIRCULATION AT THE ENTRANCE TO THE GULF OF CALIFORNIA

Monty Graham Spearman-Lieutenant, United States Navy
B.S., University of Tennessee, 1986
Master of Science in Physical Oceanography-September 1993
Advisor: Curtis A. Collins-Department of Oceanography

CTD data obtained during the period 28 December 1992 to 8 January 1993 are used to examine the hydrography and water mass distributions at the entrance to the Gulf of California. Data were collected for one across - and one along-gulf transection that intersected near the Gulf's mouth. The circulation at the Gulf's entrance was generally cyclonic. In the upper 200 m, a narrow, high-salinity core of strong baroclinic outflow (max speed 72 core of strong baroclinic outflow (max speed 72 cm/sec) traversed the western sector of the region. The high-salinity ($S \geq 34.6$ psu) component of the core correlates to Gulf Water that originates in the inner-Gulf. Partitioned at the mid-basin Alarcon Seamount, the mouth's eastern sector was characterized by numerous bands of reversed flow, including inflowing cores of fresher ($S \leq 34.6$ psu) water from the Pacific. The estimated net transport across this section was a 1.9 Sv inflow, with the majority of the flow occurring below 500 m. Comparison with data from an April 1992 cruise along the same across-gulf transection revealed greater transport and the notable absence of Gulf Water. The April circulation may represent simple recirculation of waters resident across the region.

MASTER OF SCIENCE
IN
PHYSICS

IMPLEMENTATION AND USE OF A COMPUTATIONAL RAY-TRACING PROGRAM FOR THE DESIGN AND ANALYSIS OF COMPLEX OPTICAL SYSTEMS

James Dudley Atkinson, IV-Lieutenant, United States Navy
B.S., Louisiana State University, 1985
Master of Science in Physics-March 1993
Master of Science in Engineering Science (Astronautics)-March 1993
Advisor: David D. Cleary-Department of Physics

A new ray-tracing computer program is presented as an analysis and design tool for the development of complex optical systems. The algorithms for the ray-tracing are presented for a wide variety of optical surface types. Unique methods for the prediction of two-beam interference patterns are implemented so that amplitude-splitting interferometers can be modeled. Modules for line shape analysis and data storage are also described. This program (DART) is validated using the previously established characteristics of the Middle Ultraviolet Spectral Analysis of Nitrogen Gasses (MUSTANG) instrument, which has a resolution of 10 Å, an X-axis field-of-view of 1.2 milliradians, a Y-axis field-of-view of 37 milliradians, and a 1600 Å band-pass. DART is used to predict the optical characteristics of a new instrument, ISAAC, that is planned for satellite deployment in 1995. The full wavelength range of ISACC is 1250 Å, and the instantaneous bandpass is approximately 250 Å. The full wavelength coverage is obtained by rotating a reflection grating in five discreet steps. Based on the DART calculations, the resolution of the ISAAC instrument will exceed 1.30 Å for all bands, with resolutions as low a 1.06 Å at the longer wavelengths. The predicted X-axis field-of-view is 0.5 milliradians and the Y-axis field-of-view is 36 milliradians.

VISIBLE SPECTRUM OF TABLE SONOLUMINESCENCE

Joseph T. Carlson-Lieutenant, United States Navy
B.S., University of Wisconsin, Whitewater, 1984
Master of Science in Physics-December 1992
Advisors: Xavier K. Maruyama & Anthony Atchley-Department of Physics

Synchronous emissions of picosecond pulses of light are observed to originate from a bubble trapped at the pressure antinode of a resonant sound field. The spectrum has been measured using a single slit spectrometer equipped with a linear array CCD detector. Spectra from differing solutions of water and glycerin are compared to the visible blackbody spectrum distribution. Assuming a blackbody model, apparent temperatures of 18,900 Kelvins are observed in pure water. Increasing glycerin concentration appears to correlate with cooler blackbody temperatures. The spectrum is also found to continually change with time, independent of input parameters.

VALIDATION OF THE DESIGN OF A HIGH RESOLUTION ALL-REFLECTION MICHELSON INTERFEROMETER FOR ATMOSPHERIC SPECTROSCOPY

Scott M. Carlson-Lieutenant, United States Navy
B.S.S.E., United States Naval Academy, 1985
Master of Science in Physics-June 1993
Advisor: David D. Cleary-Department of Physics

The design of a high resolution Plane Grating All-reflection Michelson Interferometer for ionospheric spectroscopy was analyzed using ray tracing techniques. This interferometer produces an interference pattern whose spatial frequency is wavelength dependent. The instrument is intended for remote observations of the atomic oxygen triplet emission line profile at 1304 Å in the thermosphere from sounding rocket or satellite platforms. The device was modeled using the PC-based ray tracing application, DART, and results analyzed through fourier techniques using the PC with Windows version of the Interactive Data Language (IDL). Through these methods, instrument resolution, resolving power, and bandpass were determined. An analysis of the effects of aperture size and shape on instrument performance was also conducted.

VERY LOW FREQUENCY SIGNALS AND WHISTLER-MODE AMPLIFICATION IN THE MAGNETOSPHERE AND LIMIT-CYCLE BEHAVIOR IN THE CEBAF INFRARED FREE ELECTRON LASER

Daryl L. Caudle-Lieutenant United States Navy
B.S., North Carolina State University, 1985
Master of Science in Physics-December 1992
Advisor: William B. Colson-Department of Physics

Very low frequency (VLF) electromagnetic wave injection experiments were conducted on 23-24 January 1988 from a 42-km horizontal dipole antenna located at Siple Station, Antarctica. The experiment consisted of a diagnostic format transmitted for one minute every five minutes for a 10 hour period between 1700 UT and 0300 UT. These signals were received and recorded at the conjugate magnetic field point location at Lake Mistissini, Canada. A detailed analysis of this data clearly demonstrates hot plasma effects such as saturated power levels, exponential growth rates, sideband formation and triggered emissions due to wave-particle interactions. These hot plasma effects remain constant over a time scale of 30 seconds but show large variations over a time scale of 5 minutes. These VLF signals were used to simulate "whistler waves" which occur naturally and are amplified by energetic electrons spiraling around magnetic field lines near the geomagnetic equator. Navy VLF communications are strongly affected by the presence of whistler waves. The electron and whistler wave interaction can be described by a theoretical model which is very similar to that used for free electron lasers (FEL). Using computer simulation most of the hot plasma effects seen in the Siple Station data can be modeled and compared to free electron laser characteristics such as saturation, electron trapping, tapering, and sensitivity to energy distributions. Two dimensional computer simulations in coordinates z and t have predicted that the CEBAF Infrared (IR) FEL can observe limit-cycle behavior when operating within its design parameters. The IR FEL is driven by a high quality electron beam with a micropulse length comparable to the slippage distance. At moderate values of the desynchronism, the optical power will oscillate periodically over several hundred passes through the resonator. The limit-cycle power oscillations are caused by "marching subpulses" that grow at the trailing edge of the optical pulse through a super-radiant process, and pass through the main optical envelope.

A CALIBRATION OF THE NAVAL POSTGRADUATE SCHOOL'S MIDDLE ULTRAVIOLET SPECTROGRAPH (MUSTANG)

Bruce E. Chase-Lieutenant, United States Navy
B.S., University of Mississippi, 1984
Master of Science in Physics-December 1992
Advisor: David D. Cleary-Department of Physics

The Naval Postgraduate School's Middle Ultraviolet Spectrograph (MUSTANG) was designed to measure the spectrum of the Earth's airglow from 1800 Å 3400 Å. The MUSTANG instrument was tested using standard techniques to determine the wavelength calibration, overall sensitivity, and detector linearity. The instrument was launched on a NASA sounding rocket on March 19, 1992, from White Sands Missile Range, New Mexico. Post-flight tests indicate that the calibration did not change as a result of the rocket experiment.

CALIBRATION OF A HIGH FREQUENCY MONOSTATIC ECOSOUNDER

David R. Cherry-Major, United States Army
B.S., Florida State University, 1977
Master of Science in Physics-June 1993
Advisor: Donald L. Walters-Department of Physics

Atmospheric turbulence degrades a coherent laser beam when it propagates through the atmosphere. Measurements of the distribution of atmospheric turbulence provide insight into the underlying mechanisms that produce optical turbulence and suggest possible means to overcome or circumvent the effects of such turbulence. A variety of acoustic, optical and thermal probe instruments provide measurements of atmospheric turbulence. Of these, the acoustic ecosounder can measure atmospheric density and velocity irregularities. During the course of previous work, questions arose concerning the calibration of the NPS ecosounder. The echosounder appears to detect a higher level of atmospheric turbulence than do other instruments used at the same altitude. This resulting overestimation of atmospheric turbulence could significantly influence programs such as the Advanced Electro-Optic Site (AEOS), a proposed 4 m telescope to be built in Hawaii. This thesis will attempt to identify key components contributing to the sounder calibration including the transducer transmit and receive efficiencies as well as their dependence on pressure and atmospheric density. Additionally a modified acoustic echosounder equation will be developed which more accurately profiles the atmospheric turbulence measured by such a sounder.

ENHANCED HIGHER ORDER PARAMETRIC X-RADIATION PRODUCTION

Kay L. DiNova-Lieutenant, United States Navy
B.A., Rutgers College, 1983
Master of Science in Physics-December 1992
Advisor: Xavier K. Maruyama-Department of Physics

This thesis examines parametric x-radiation (PXR) which is the Bragg scattering of the virtual photons associated with the Coulomb field of relativistic charged particle from the atomic planes of a crystal. Higher order parametric x-radiation from the {002} planes of a thick mosaic graphite crystal have been observed. The raw PXR data was collected using a SiLi detector and a Pulse Height Analyzer (PHA) software program. The data was corrected for various effects including attenuation, detector drift and efficiency. The absolute number of photons per electron was obtained by using the fluorescent x-ray yield from a tin foil backing on the graphite crystal to determine the LINAC current. The number of photons per electron observed greatly exceeds the expected values. Comparison of the ratio of intensity of a given order to the first order [I(n)/I(1)] to the theoretical ratio shows that the ratios increase with order. Not only is the absolute intensity greater than expected, but the higher orders (compared to the first order) are larger than expected. Lastly, the intensity for various crystal angle orientations and a fixed detector angle was measured.

SOLID STATE X-RAY DETECTOR CALIBRATION TECHNIQUES AND LINAC BEAM INTENSITY MEASUREMENTS

Thomas J. Fasanello, Jr.-Lieutenant, United States Navy
Master of Science in Physics-December 1992
Advisor: Xavier K. Maruyama-Department of Physics

X-ray fluorescence from thin foils inserted into the NPS linac has been used to measure the integrated electron beam intensity when the accelerator is operating with dark current only. The measured x-ray flux and the known inner shell ionization cross sections are used to obtain measurements of dark currents of the order of 10^{-14} amperes. The same arrangement allows continuous, in-situ energy calibration of our Si(Li) detector in the electromagnetic noise environment of the linac. This technique was originally developed to perform absolute production efficiency measurements of parametric x-ray generation in the 5-50 KeV range.

QUADRUPLET EXPANSION OF THE ACOUSTIC PRESSURE FIELD IN A WEDGE SHAPED OCEAN

Michael Dale Joyce-Lieutenant, United States Navy
B.S., California State Polytechnic University, Pomona, 1985
Master of Science in Applied Physics-September 1993
Advisor-Alan B. Coppens-Department of Physics

In a wedge shaped ocean, the method of images is used to develop an analytical approximation of the acoustic pressure field. Contemporary work develops acoustic doublets from a combination of the source and surface reflection image using simple dipole theory. The method of images is then used to sum the dipole images. This thesis matches dipole pairs to achieve a quadruplet expansion. A computer program using the derived quadruplet equation is then created to verify the results by comparing them with the "URTEXT" program.

DETAILED ANALYSIS CASE STUDIES OF TRAPPED PLASMAS AT THE EARTH'S MAGNETIC EQUATOR

Eric Stanley Lantto-Lieutenant Commander, United States Navy
B.S., University of Minnesota, 1981
Master of Science in Physics-June 1993
Advisor: Richard C. Olsen-Department of Physics

A previous statistical survey of data from the HPCE experiment on the AMPTE/CCE satellite established probability distributions for trapped ions and electrons. An extension of this survey for ions at 240 442 eV and for electrons at 340 and 770 eV confirmed these distributions. A further detailed analysis of the electron data from 13 individual data collection days also showed the trapped electron distributions to be concentrated in the dawn to noon region, centered at L = 7. These trapped electron distributions can be described as a bi-Maxwellian distribution function and be characterized reasonably by the criteria that the flux has to exceed $5x10^6(cm^2s\ sr)^{-1}$, the distribution has to be within 10^0 of the magnetic equator, the ratio of the perpendicular temperature to the parallel temperature is greater than 3 and that the anisotropy is greater than 2.0 for 150 eV electrons and 4.4 for 340 eV electrons.

IONOSPHERIC PHOTOELECTRONS MEASURED AT GEOSYNCHRONOUS ORBIT

John Samuel Laszakovits-Lieutenant, United States Navy
B.S., University of Kansas, 1982
M.B.A., San Jose State University, 1992
Master of Science in Physics-June 1993
Advisor: Richard C. Olsen-Department of Physics

Measurements of ions and electrons were made by the Los Alamos National Laboratory instrument, the Magnetospheric Plasma Analyzer, onboard spacecraft 1989-046. Observations from five days indicated the presence of both field aligned electrons and equatorially trapped electrons. Correlation existed between occurrences and location in the magnetosphere. Field aligned electrons were measured in the plasmasphere during daylight. On two days, field aligned electrons were also noted in the midnight region of the magnetosphere. Field aligned electron at energies between 1 and 50 eV were characterized. These electron's spectrum were shown to be similar in shape to the ionospheric photoelectron distribution. Conic distributions of photoelectrons were observed between 08:00 and 10:00 local time on days when both photoelectrons and equatorially trapped electrons were present. $V_{parallel}$ versus $V_{perpendicular}$ spectrograms clearly indicated that photoelectrons undergo perpendicular acceleration. Lack of any magnetic field measurements or collection of wave data prevented determining the source of the perpendicular acceleration.

SPECTRA OF STABLE SONOLUMINESCENCE

Stephen D. Lewia-Lieutenant, United States Navy
B.S., United States Naval Academy, 1983
Master of Science in Physics-December 1992
Advisors: Xavier K. Maruyama & Anthony A. Atchley-Department of Physics

The continuous emission of picosecond pulses of light has been observed to originate from a bubble trapped at the pressure antinode of a resonant sound field in water and in water/glycerin mixtures. The spectra of this light in several solutions has been measured with a scanning monochrometer/photomultiplier detector system. The spectra are broadband and show strong emission in the UV region. A comparison of this measurement to two other independently produced spectra is made. The spectra are also modeled by a blackbody radiation distribution to determine an effective blackbody temperature and a size is deduced as if sonoluminescence were characterized by blackbody radiation.

NORMAL MODES OF OSCILLATION OF THE VULCAN PHALANX CLOSE-IN WEAPON SYSTEM

Donald P. MacNeil-Lieutenant, United States Navy
B.S., United States Naval Academy, 1986
Master of Science in Physics-June 1993
Advisors: William B. Colson-Department of Physics &
Joshua Gordis-Department of Mechanical Engineering

A study of the PHALANX CLOSE-IN WEAPON SYSTEM's (CIWS) Mk149 round and the M61A1 Gatling gun focused on modeling the various design factors that influence projectile trajectory and accuracy. The PHALANX currently experiences random and variable dispersion values which can diminish the PHALANX' ability to destroy incoming targets. The focus of the analysis was on determining and understanding the dynamical modes of oscillation and forced response dynamics. A model of the PHALANX' M61A1 Gatling gun was developed in great detail and its normal modes of vibration and natural frequencies were computed. Because dynamic response is comprised of modal responses, it its critical that the modes of the gun are understood. Various excitation forces were applied, simulating a range of firing bursts, and displacements of the firing barrel were recorded in all translational directions. Animation of the normal modes of vibration indicate that PHALANX' six-barrel system plays a significant role in the lower order normal modes, and possibly the most significant contribution to dispersion. Also, results of the dynamic response reveal barrel tip displacements, that are consistent with well-documented dispersion values. The FEM provides a timely method to evaluate proposed design modifications and subsequent analysis. This model will be valuable as part of the Optimized Barrel Design project currently underway.

THE ATMOSPHERIC EMISSION METHOD OF CALCULATING THE NEUTRAL ATMOSPHERE AND CHARGED PARTICLE DENSITIES IN THE UPPER ATMOSPHERE

Kenneth L. McElroy, Jr.-Lieutenant, United States Navy
B.S., United States Naval Academy, 1985
Master of Science in Physics-December 1992
Advisor: David D. Cleary-Department of Physics

This thesis presents a method for the determination of neutral gas densities in the ionosphere from rocket-borne measurements of UV atmospheric emissions. Computer models were used to calculate an initial guess for the neutral atmosphere. Using this neutral atmosphere, intensity profiles for the N_2 (0,5) Vegard-Kaplan band, the N_2 Lyman-Birge-Hopfield band system, and the 0I2972Å line were calculated and compared with the March 1990 NPS MUSTANG data. The neutral atmospheric model was modified and the intensity profiles re-calculated until a fit with the data was obtained. The neutral atmosphere corresponding to the intensity profiles that fit the data was assumed to be the atmospheric composition prevailing at the time of the observation. The ion densities were then calculated from the neutral atmosphere using a photochemical model. The electron density profile calculated by this model was compared with the electron density profile measured by the U.S. Air Force Geophysics Laboratory at a nearby site.

A COMPARISON OF TWO COMPUTER MODELS OF SOUND PROPAGATION FOR A WEDGE SHAPED OCEAN OVER A PENETRABLE BOTTOM

Charles Curtis Meisenheimer-Lieutenant, United States Navy
B.A., University of California, Los Angeles
Master of Science in Applied Physics-September 1993
Co-Advisors: Alan B. Coppens & James V. Sanders-Department of Physics

The problem of determining the acoustic pressure in a wedge shaped wave guide is examined. Two computer models, one using the method of images, the other using coupled normal modes are compared. This comparison is over the benchmark wedge of the Acoustic Society of America. Three scenarios were examined: isovelocity water over a pressure release bottom, isovelocity water over a penetrable, lossless bottom, and isovelocity water over a penetrable, lossy bottom. In all cases good agreement was seen between both models, with some differences due to a rigid sub-bottom in the normal mode model. The strengths and weaknesses of each model is examined. An analytic solution in normal modes of the waveguide with a pressure release surface, rigid bottom, and a discontinuous speed of sound profile is presented. A brief history of research into the wedge problem is included in the introduction.

INVESTIGATION OF A BACKGROUND SUPPRESSION TRANSIMPEDANCE AMPLIFIER FOR PHOTOVOLTAIC DETECTORS

Ferdinand Joseph Metzger, Jr.-Lieutenant, United States Navy
B.S., University of the State of New York, 1985
Master of Science in Physics-December 1992
Advisor: D. Scott Davis-Department of Physics

The current generation of transimpedance amplifier-based detector systems are limited by opamp saturation when operating at a high gain or in the presence of a large background signal. To eliminate saturation, an amplifier that is frequency dependent is developed. Additionally, the noise sources in the conventional transimpedance amplifier and photovoltaic detector are quantified for comparison to any modified circuit. Initial results indicate that the frequency dependent detector system is a viable system, however, further development is required. Further research of this technology is expected to support future infrared and long-range detection applications.

NORMAL MODES OF VIBRATION OF THE PHALANX GUN

John C. Peterschmidt-Lieutenant, United States Navy
B.S., Marquette University, 1987
Master of Science in Physics-June 1993
Advisors: William B. Colson-Department of Physics &
Joshua Gordis-Department of Mechanical Engineering

The PHALANX Close-In-Weapons System provides the last layer of defense against an incoming anti-ship missile. Current dispersion data shows that the rotating six-barrel system firing at 75 shots/second gives variable dispersion greater than 2 mradian. This results in a 4 m spread at its maximum 2000 m range. Computer simulations have shown that a fast missile can penetrate to within a couple hundred yards of the ship, where even if it was destroyed, the resulting ballistic debris would hit the ship in a shotgun blast pattern. In order to investigate the physics behind the dispersion and test future design changes, a detailed finite element model of the PHALANX gun was developed. This is the first finite element mode of the gun ever. The normal modes of a single barrel have been matched favorably with those of a real barrel. This model has been used to calculate the normal modes of vibration of the whole gun in order to predict the motion of the complex system. Barrel tip displacement, which plays a critical role in the dispersion pattern, was determined after applying the periodic firing excitation force and damping. Its motion corresponds well to the 2 mradian dispersion. In addition, its first mode of vibration at 14 Hz appears to be significant in the analysis of the dispersion data. This analysis has focused attention on certain components of the gun, such as the double angular contact bearing, which may be a leading cause of the dispersion pattern. Finally, this gun model can also support design changes such as the addition of barrel restraints or the proposed new barrels and their effect on dispersion predicted prior to any actual hardware tests or procurement orders.

DEVELOPMENTAL TESTING OF A PROTOTYPE ALL-REFLECTION MICHELSON INTERFEROMETER

Allan David Risley, Jr.-Lieutenant, United States Navy
B.S., The Ohio State University, 1985
Master of Science in Physics-June 1993
Advisor: David D. Cleary-Department of Physics

A prototype all-reflective Michelson interferometer is tested using visible laser, sodium, and mercury light sources. The design uses an off-axis parabolic mirror for collimation, a plane diffraction grating and two plane mirrors to divide and recombine incident light. Interference fringes were seen using the laser light source, but instrument performance with other sources was unreliable as a result of difficulties in constructing the instrument with enough mechanical precision. A method of using a full-size template to position the instrument's optical elements was discovered, and the efficacy of an image intensifier/photodiode array combination for use as a detector was verified. The feasibility of the interferometer design was verified by the observation of interference fringes using mercury 5461 Å light. A practical instrument would be compact, light weight, and require no moving parts.

INVESTIGATION OF SYSTEMATIC EFFECTS IN ATMOSPHERIC MICROTHERMAL PROBE DATA

Daniel S. Roper-Captain, United States Army
B.S., United States Military Academy, 1982
Master of Science in Physics-December 1992
Advisor: Donald L. Walters-Department of Physics

The propagation of electromagnetic radiation through the atmosphere is a crucial aspect of laser target acquisition and surveillance systems and is vital to the effective implementation of some Theater Missile Defense systems. Atmospheric turbulence degrades the image or laser beam quality along an optical path. During the past decade, the U.S. Air Force's Geophysics Directorate of Phillips Laboratory collected high speed differential temperature measurements of the atmospheric temperature structure parameter, C_T^2, and the related index of refraction structure parameter, C_n^2. The stratospheric results show a 1-2 order of magnitude increase in day turbulence values compared to night. Resolving whether these results were real or an artifact of solar contamination is a critical Theater Missile Defense issue. This thesis analyzed the thermosonde data from an experimental program conducted by the Geophysics Directorate in December 1990 and found strong evidence of solar induced artifacts in the daytime thermal probe data. In addition, this thesis performed a theoretical analysis of the thermal response versus altitude of fine wire probes being used in a new thermosonde system under development at the Naval Postgraduate School. Experimental wind tunnel measurements were conducted to validate the analytical predictions.

INVESTIGATIONS OF SELF-PUMPED PHASE CONJUGATE LASER BEAMS AND COHERENCE LENGTH

George M. Sutton-Lieutenant, United States Navy
B.S., Southern University, 1986
Master of Science in Physics-March 1993
Advisor: Oscar Biblarz-Department of Aeronautics and Astronautics

The phase conjugation process by a nonlinear, photorefractive crystal is not completely ideal and losses should be expected to occur after a beam is conjugated. This thesis research investigates possible changes in coherence length as a result of internal losses in barium titanate ($BaTiO_3$). Additionally, laser reflections from a corner cube reflector is also examined for changes in coherence length. Experimental findings are inconclusive because the conventional spectrometer used to measure coherence length did not possess the required resolution. It is recommended that an interferometer which can resolve the laser line width be utilized for future coherence length measurements, together with a means of blocking the conjugated beam from entering the laser cavity and destabilizing the oscillations within.

DESIGN OF A HIGH RESOLUTION SPATIAL HETERODYNE INTERFEROMETER

Kenneth M. Wallace, Jr.-Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1978
Master of Science in Physics-December 1992
Master of Science in Engineering Science (Astronautics)-December 1992
Advisor: David D. Cleary-Department of Physics

Several new spatial heterodyne interferometers were evaluated using ray tracing analysis. A spherical grating interferometer was examined and found to have nonlinear fringe patterns that are difficult to interpret. A new plane grating interferometer was designed, built and tested using a visible light laser as the source. The new design uses two mirrors and a single, planar diffraction grating to divide and recombine incident collimated light. The zero and first order ray paths recombine to produce a high contrast, linear, interference fringe pattern suitable for Fourier Transform analysis. The instrument has the potential to perform extremely high resolution spectroscopy in the FUV and EUV portions of the electromagnetic spectrum with resolving powers on the order of 10^6. High resolution analysis of emission line profiles should enable an observer to more accurately determine atmospheric temperature and density profiles. The simple, lightweight and compact instrument has no moving parts and is suitable for remote sensing from sounding rocket or satellite platforms.

FEATURE BASED NEURAL NETWORK ACOUSTIC TRANSIENT SIGNAL CLASSIFICATION

Terry Scott Wichert-Lieutenant Commander, United States Navy
B.S., Oklahoma State University, 1979
Master of Science in Physics-March 1993
Advisor: Daniel J. Collins-Department of Aeronautics and Astronautics

Utilization of neural network techniques to recognize and classify acoustic signals has long been pursued and shows great promise as a robust application of neural network technology. Traditional techniques have proven effective but in some cases are quite computationally intensive, as the sampling rates necessary to capture the transient result in large input vectors and thus large neural networks. This thesis presents an alternative transient classification scheme which considerably reduces neural network size and thus computation time. Parameterization of the acoustic transient to a set of distinct characteristics (e.g., frequency, power spectral density) which capture the structure of the input signal is the key to this new approach. Testing methods and results are presented on networks for which computation time is a fraction of that necessary with traditional methods, yet classification reliability is maintained. Neural network acoustic classification systems utilizing the above techniques are compared to classic time domain classification networks. Last, a case study is presented which looks at these techniques applied to the acoustic intercept problem.

A THEORY FOR OPTICAL WAVELENGTH CONTROL IN SHORT PULSE FREE ELECTRON LASER OSCILLATORS

Wade F. Wilkenson-Lieutenant, United States Navy
B.S., Northwestern University, 1986
Master of Science in Physics-June 1993
Advisor: William B. Colson-Department of Physics

The future safety of the U.S. Navy warship depends on the development of a directed energy self-defense system to keep pace with the ever-improving technology of anti-ship missiles. Two candidates are reviewed. The free electron laser (FEL) has the most advantages, but a chemical laser proposed by TRW is ready for installation on existing ships. Initial testing of issues related to directed energy use at sea can be conducted with the chemical laser. When the technology of the FEL matures, it can replace the chemical laser to provide the best possible defense in the shortest period of time. Continuous tunability is a key advantage of the FEL over the conventional laser. But since the output wavelength is dependent on electron energy, it is subject to random fluctuations originating from the beam source. At the Stanford University Superconducting (SCA) Free Electron laser (FEL) Facility, the effects are minimized through negative feedback by changing the input electron energy proportional to the observed wavelength drift. The process is simulated by modifying a short pulse FEL numerical program to allow the resonant wavelength to vary over many passes. The physical effects behind optical wavelength control are explained. A theory for the preferential nature of the FEL to follow the resonant wavelength from longer to shorter wavelengths is presented. Finally, the response of the FEL to a rapidly changing resonant wavelength is displayed as a transfer function for the system.

INVESTIGATION OF ONSET OF PLASMA FORMATION AT ANODE OF FAST-PULSED HIGH-VOLTAGE VACUUM DIODE

Gregory Willis-Lieutenant, United States Navy
B.S., Tougaloo College, 1984
Master of Science in Physics-March 1993
Advisors: Fred R. Schwirzke & Xavier K. Maruyama-Department of Physics

The mechanism by which plasma forms in a fast pulsed high vacuum diode has been greatly studied. For the most part, efforts have been concentrated on plasma formation at the cathode. Recently, investigators improved the popular explosive emission model, taking into account the ion current density and surface heating through ion bombardment. This model provides total current densities of the order necessary for exploding whiskers on the cathode surface, and explains the cathode spot phenomena. The general belief is that a fast pulsed high voltage diode event is dominated by cathodic processes, and little research into plasma formation at the anode has been conducted. This study presents experimental results which support the above model applied to both the cathode and anode regions of the diode. It is shown here that plasma formation does indeed take place in the anode regions, and, that the formation occurs nearly simultaneously with plasma formation at the cathode. Also, photographic evidence of post-breakdown cratering on the anode surface, similar to the cathode spot phenomena, will be presented.

MASTER OF SCIENCE
IN
SYSTEMS ENGINEERING

COMBATTING INHERENT VULNERABILITIES OF CFAR ALGORITHMS AND A NEW ROBUST CFAR DESIGN

Patrick J. Bowman-Lieutenant, United States Navy
B.S., University of Scranton, 1985
Master of Science in Systems Engineering-September 1993
Advisor: P. E. Pace-Electronic Warfare Academic Group

A current trend in radar technology is automatic detection and tracking systems. An integral part of these automatic systems is the CFAR (Constant False Alarm Rate) detector. A CFAR detector is the signal processing algorithm that controls the rate at which target detections are falsely declared. Given the current state of radar technology, CFAR algorithms are necessary elements of any automatic radar system. Unfortunately, CFAR systems are inherently vulnerable to degradation caused by large clutter edges, multiple targets and jamming environments. This thesis presents eight popular and studied CFAR architectures. A comprehensive review of each system's structure, analysis and performance is detailed. Also, the performance of each CFAR processor for two different inphase (I) and quadrature (Q) detectors: envelope approximation detector and the square law detector are compared numerically. In addition, each system is comprehensively compared to one another in the troublesome environments mentioned above. This thesis continues with the development of an original CFAR architecture, the excision greatest-of (EXGO). Although more complex, this processor is shown to be more robust than the other established techniques particularly in the presence of clutter edges, multiple targets, and electronic countermeasures (ECM) environments.

A COMPARISON OF COMPUTED AND MEASURED TRANSMISSION DATA FOR THE AGM-88 HARM RADOME

David Charles Chang-Lieutenant, United States Navy
B.A., University of Washington, 1985
Master of Science in Systems Engineering-September 1993
Advisor: D. C. Jenn-Department of Electrical and Computer Engineering

This is the continuation of the development of a computer based radome design tool. Measured electric field patterns for a AGM-88 High Speed Antiradiation Missile radome were used to validate the computer model. This computer model is based on a method of moments solution of the E-field integral equation for bodies of revolution.

ASSESSMENT OF ATMOSPHERIC INFLUENCE ON SURVEILLANCE RADAR PERFORMANCE IN LITTORAL ZONES

Kyle M. Craigie-Lieutenant Commander, United States Navy
B.S., University of North Carolina at Greensboro, 1978
Master of Science in Systems Engineering (Electronic Warfare)-September 1993
Advisor: K. L. Davidson-Department of Meteorology

Acoustic sensors, traditionally thought of as the mainstay of modern ASW's means of detection and localization, are rapidly becoming secondary in the littoral zones to active sensors such as radar. The coastal region has a dynamic meteorological environment dominated by surface and near-surface ducts which influence sea clutter. Accurate, timely description of the effects this changing environment has on sensor performance is mandatory for the ASW tactician to utilize his sensors. The Radio Physics Optics (RPO) program and the Engineer's Refractive Effects Prediction System (EREPS) are used to evaluate influence of a measured environment. Both prediction systems are then applied to a Gulf of Oman winter environmental profile with five generic radars operating parameters. EREPS is used to evaluate factors affecting Wallops Flight Facility Space and Ranging Radar (SPANDAR) detected sea clutter in the littoral zone off the United States East Coast.

FAR ULTRAVIOLET IMAGES OF THE NIGHTTIME IONOSPHERE

Thomas Peter Hekman-Lieutenant, United States Navy
B.A., Virginia Polytechnic Institute, 1986
Master of Science in Systems Engineering (Electronic Warfare)-September 1993
Advisor: D. Cleary-Department of Physics

The Naval Research Laboratory's Far Ultraviolet Cameras Experiment is part of an ongoing project to develop a means for real time space based monitoring of the upper atmosphere. The purpose of this paper is to develop a method by which useable data can be extracted from the images obtained from the cameras. The required output is an intensity profile of the light in the band of the camera as a function of observation zenith angle. From this data future analysis can be done to determine the spatial distribution and density of the upper atmosphere. The long term application of this project is to develop a method for using space based imaging of the ionosphere to provide real time radio frequency propagation analysis.

NEW BINARY INTEGRATION STRATEGIES AND CORRESPONDING R_{90} CALCULATIONS

Doo Jong Kim-Captain, Korean Army
B.A., Korea Military Academy, 1987
Master of Science in Systems Engineering (Electronic Warfare)-September 1993
Advisor: Phillip E. Pace-Department of Electrical and Computer Engineering

Often, to increase the probability of having a track that will not later be deleted by a radar, some simple logic criterion is used. This thesis evaluates the performance of a new binary integration technique. This technique requires M hits out of N looks with x<M hits being consecutive. Closed form expressions for the cumulative probability of detection are derived and Monte Carlo methods are used to verify the results. A significant increase in the cumulative probability of detection is shown to occur when this type of logic is imposed. Also derived are the corresponding confidence calculations on R60-R95 (a measure of radar performance defined as the range such that the cumulative probability of detecting an approaching target is 0.60-0.95) for each set of detections.

MITIGATION OF EMI/RFI PRODUCED BY A 1.2 kW UNINTERRUPTIBLE POWER SUPPLY

Efthimios Mikros-Lieutenant J.G., Hellenic Navy
B.S., Hellenic Naval Academy, 1985
Master of Science in Systems Engineering (Electronic Warfare)-September 1993
Advisor: Richard W. Adler-Department of Electrical and Computer Engineering

Recently installed equipment in naval receiving sites, such as Uninterruptible Power Supplies (UPS), digital telephone switching systems, and personal computers, inject noise into receiver systems via power conductors, cable shields, and grounds, thus reducing the probability of intercept of a signal of interest, in the 2-100MHz range. In this thesis a survey of EMI/RFI sources at receiving sites is performed. The effectiveness of a Barrier-Filter-Ground architecture in containing/eliminating EMI/RFI from a 1.2 kW UPS is tested. The spectral and temporal properties of the EMI/RFI from the UPS are recorded, estimates for the EMI/RFI power are obtained from 60Hz to 100kHz, and a possible solution is proposed for obtaining noise power estimates for higher frequencies.

SIMULATION OF ADJACENT CHANNEL INTERFERENCE IN A UHF SATELLITE SYSTEM

Juan Carlos Minuto-Lieutenant, Argentine Navy
Master of Science in Systems Engineering (Electronic Warfare)-September 1993
Advisor: Paul H. Moose-Department of Electrical and Computer Engineering

In this thesis, the adjacent channel interference in an ultra high frequency (UHF) satellite channel is evaluated by simulation and differential binary phase-shift keying (DBPSK) is compared with continuous phase frequency-shift keying (CPFSK). First, a measure of the interfering power is obtained and a method to compute carrier-to-interference ratios in a non-linear channel is developed. Next, a DBPSK receiver is simulated when two interfering channels separated in frequency are present, and bit errors are detected and counted. Then, coherent reception of minimum-shift keying (MSK) and CPFSK with modulation index $h=0.4$ are simulated in the same conditions as DBPSK. Finally, noncoherent MSK is analyzed in the same way and a comparative behavior is obtained. It is found that the best performance in the presence of adjacent channel interference is given by coherent reception of MSK.

SPURS IN DIGITAL RADIO FREQUENCY MEMORY AND APPLICATIONS OF DRFM

B.B. Nityananda
B.E., University of Mysore, 1972
Master of Science in Systems Engineering (Electronic Warfare)-September 1993
Advisor: G. S. Gill-Department of Electrical and Computer Engineering

This thesis presents a method to calculate the power level of harmonics generated in DRFM due to sampling and quantization process. The Fourier series analysis is used for the calculation of the harmonic levels. The quantization process will generate the harmonics of the fundamental signal, which will be folded into the DRFM instantaneous bandwidth by the sampling process. Power level of the harmonics is dependent on the number of quantization bits of the analog-to-digital converter. Further, it is also dependent on the ratio of the signal frequency to sampling frequency. MATLAB programs for computation of harmonic power levels and plots of the harmonic power levels of the multibit DRFM are included in the thesis. Some applications of DRFM like deception jammer, broadband frequency source and radar simulator are also discussed.

METHODS FOR IMPROVING LOW-ANGLE, LOW-ALTITUDE RADAR TRACKING ACCURACY

Ali Ozkara-Lieutenant Junior Grade, Turkish Navy
B.S., Turkish Naval Academy, 1987
Master of Science in Systems Engineering-September 1993
Advisor: D. C. Jenn-Department of Electrical and Computer Engineering

This thesis studies the problem of low-angle, low-altitude target tracking where the presence of multipath causes large angle errors. The problem is examined for a low sidelobe monopulse radar over a flat earth. A detailed multipath model is used to simulate the reflecting surface and the reflected signal is included in the monopulse processing simulation. Using this model the tracking error is obtained, and two multipath error reduction techniques are evaluated. The first method uses frequency agility to measure the angle over a wide frequency range. By averaging the results of many frequencies, the angle estimate can be significantly improved over that of a single frequency. The second method is referred to as difference beam phase toggling. By flipping the difference beam phase by 180° for two subsequent pulses, the return from a reflected path can be made to cancel.

AN ILLUSTRATED OVERVIEW OF ESM AND ECM SYSTEMS

Göran Sven Erik Pettersson-Major, Swedish Army
M.S., Swedish Armed Forces Staff and War College, 1991
Master of Science in Systems Engineering-September 1993
Advisor: D. G. Farley-Department of Electrical and Computer Engineering

This thesis gives an overview of electronic support measures (ESM) and electronic countermeasures (ECM) systems. The objective is to give the intended reader, students of the EW curriculum new to the subject, an introduction to several different electronic warfare systems. The thesis consists of seven chapters discussing different areas of EW. The first two chapters introduce the reader to the definitions of EW and the threat which EW equipment is designed to counter. The following two chapters are a presentation of typical ESM and ECM systems. The final three chapters cover the integration of ESM and ECM systems as well as two subjects, suppression of enemy air defense and directed energy weapons, which differ from the typical ECM systems. Included with each chapter describing systems is a conclusion section which discusses possible future developments for the group of systems.

REMOVAL OF COHERENT EXTREMELY LOW FREQUENCY (ELF) BACKGROUND NOISE BY ADAPTIVE NOISE CANCELLATION

Samuel Jody Strange-Lieutenant, United States Navy
B.S., The Citadel, 1986
Master of Science in Systems Engineering-September 1993
Advisor: D. G. Farley-Department of Electrical and Computer Engineering

The use of the Sequential Regression Algorithm (SER) to coherently remove background noise from an ELF sensor is presented. The SER algorithm is described for a multi-channel application in order to cancel coherent portions of reference sensors from a primary sensor. The algorithm adaptively accounts for differences between two parallel array platforms for the purpose of coherent subtraction. A section on likelihood ratio detector schemes for detecting narrowband signals is also presented. This work is in support of a submerged ELF sensor array project run by the Johns Hopkins University Applied Physics Lab.

MASTER OF SCIENCE
IN
SYSTEMS TECHNOLOGY

COGNITIVE LIMITATIONS IN COORDINATION IN HIERARCHICAL INFORMATION PROCESSING STRUCTURES

Robert R. Armbruster-Lieutenant, United States Navy
M.A., Cambridge University, 1983
Master of Science in Systems Technology-June 1993
Advisor: Michael G. Sovereign-Department of Operations Research

In Command and Control, the majority of decisions require the fusion of inputs from a number of subordinate decision-makers, to arrive at a team decision. Part of the Navy's attempt to address the issue of hierarchical decision making is the Tactical Decision Making Under Stress (TADMUS) program. Under this program, the Coordination in Hierarchical Processing Structures (CHIPS) experiment was conducted at the Naval Postgraduate School during May and June, 1993. The CHIPS experiment is described, and data collected during the experiment used to assess the impact of human cognitive limitations on team performance. Team performance was found to be degraded by increased stress, increased risk and increased feedback to subordinates in the hierarchy. These effects were found to be due to a reduced ability to distinguish between types of contact, rather than use of a less optimal decision criterion. It was further found that increasing the amount of information available to subordinates increased their ability to distinguish between types of contacts, but not by as much as is theoretically possible. There were also indications that there may be an upper limit on the amount of information that can be successfully integrated by the subordinates, beyond which performance declines rather than improving.

A CONCEPT OF UNMANNED AERIAL VEHICLES IN AMPHIBIOUS OPERATIONS

Kipp A. Collins-Captain, United States Marine Corps
B.S.M.E., United States Naval Academy, 1986
Master of Science in Systems Technology-June 1993
Advisor: Michael G. Sovereign-Command, Control and Communications Academic Group

The purpose of this thesis was to perform a conceptual study of using Unmanned Aerial Vehicles (UAVs) in amphibious operations. It focused on the command relations, tasking and critical problems in UAV amphibious operations. This thesis investigated the question of whether using UAVs at sea is a feasible complement to current amphibious operational doctrine and, if so, then what expense is incurred to assets on which it is embarked and assigned to the Amphibious Ready Group. This thesis concluded that UAVs were a feasible complement to current amphibious doctrine, but several critical issues to include EMI, video distribution and air space management, had to be investigated further. Additionally, topics for future research were detailed in Chapter VII.

NAVY C3 IN A SOCIOLOGICAL CONTEXT: WHY FORWARD PRESENCE MATTERS

Stefani Green Cuthbert-Lieutenant, United States Navy
B.S., United States Naval Academy, 1985
Master of Science in Systems Technology-June 1993
Advisor: Richard M. Brown-Department of National Security Affairs

The purpose of this thesis is to determine the impact of forward deployments and combined exercises on U.S. Navy command, control, and communications (C3). This thesis looks beyond the technological, operational, and logistical aspects of Navy C3 into the sociological realm. This thesis proposes that no matter how technologically advanced C3 may become, the human factor and vital human interactions will remain essential to ensure C3 effectiveness. An argument is developed that forward deployments and combined exercises are more than just means to test C3 equipment and procedures. They furnish essential "road tests" for Navy C3; they enable Navy C3 to work on a multinational, coalition basis. Often the first on-scene military force, the U.S. Navy, most likely operating as part of a coalition, will need to establish C3 in the area. To do so, it must be able to interact effectively with coalition partners. A naval force which conducts forward deployments and combined exercises must necessarily be sized for that forward presence mission rather than solely a crisis response mission, which would require a smaller force.

A FRAMEWORK FOR EVALUATING EVOLUTIONARY UPGRADE PATHS OF COMMAND, CONTROL, AND COMMUNICATIONS SYSTEMS

Daniel Quintin Egge-Captain, United States Marine Corps
B.S.E., University of Florida, 1987
Master of Science in Systems Technology-June 1993
Advisors: William G. Kemple-Department of Operations Research &
Carl R. Jones-Department of Systems Management

The author presents a new framework for evaluating the evolutionary upgrade paths of command, control, and communications systems. C^3 system procurements today can be viewed as upgrades to existing C^3 systems. Most operational C^3 functions are performed today by commanders and their staffs with various levels of automated support. The upgrade procurements are intended to increase or improve this automated support. The author examines the shrinking budget, technology initiatives, Evolutionary Acquisition, Commercial-Off-The-Shelf (COTS), Non-Developmental-Items (NDI), and emerging open architecture standards. Current evaluation frameworks, the Mission-Oriented Approach (MOA), the Modular Command and Control Evaluation Structure (MCES), and a Cost and Operational Effectiveness Analysis (COEA), are examined. An illustration of the framework uses the United States Marine Corps' Tactical Combat Operations (TCO) System. Conclusions stress that C^3 systems can be viewed as evolutionary upgrade paths that change over time, that effective evaluations of evolutionary C^3 systems must consider the temporal component, and that a framework, such as the one presented in this thesis, is needed for comparing alternative upgrade paths rather than alternative static C^3 systems.

COMPUTER-AIDED PROTOTYPING SYSTEM (CAPS) WITHIN THE SOFTWARE ACQUISITION PROCESS: A CASE STUDY

Mary Kay Ellis-Captain, United States Air Force
B.S., Pennsylvania State University, 1984
Master of Science in Systems Technology-June 1993
Advisor: Lucia Luqi-Department of Computer Science

This thesis provides a case study which examines the benefits derived from the practice of computer-aided prototyping within the software acquisition process. An experimental prototyping system currently in research is the Computer Aided Prototyping System (CAPS), managed under the Computer Science Department of the Naval Postgraduate School, Monterey, California. This thesis determines the qualitative value which may be realized by applying the Computer-Aided Prototyping System (CAPS) to the initial stages of the acquisition process for a software system on the scale of a prototype model, then projecting the results to a real-time distributed computer system. As a prelude to this analysis, information is presented concerning how the acquisition process is currently managed with DoD and what role prototyping plays within that process. An introduction to the CAPS is then given, along with a description of its capabilities obtained through personal examination of the system. Following this walkthrough of the CAPS, software acquisition is discussed further, including an analysis of its major obstacles and where a CAPS could best be used within the acquisition cycle. This thesis concludes with a cost analysis and results from a comparison of performing a requirements analysis and feasibility study with and without a CAPS.

TELECOMMUNICATIONS INTERNETWORKING AND INTEGRATION: A PRIMER FOR C3 STUDENTS

Bruce O. Fagerland-Captain, United States Air Force
B.S., Brigham Young University, 1980
B.A., University of Washington, 1982
M.S., Troy State University, 1991
Master of Science in Systems Technology-June 1993
Advisors: Y.S. Fu-Command, Control and Communications Academic Group &
Myung Suh-Department of Systems Management

This thesis is a telecommunications internetworking and integration tutorial for command, control, and communications (C3) students, and is intended to supplement coursework material at the Naval Postgraduate School (NPS). It is particularly relevant to students pursuing the internetworking area of emphasis in the C3 curriculum. In order to recognize and tap the potential of internetworking and integration for military applications, C3 students must be "internetworking literate." The objective of this thesis is to help develop that literacy and to serve as a technical reference for understanding terms, standards and concepts associated with the complex field of telecommunications internetworking. As the ultimate Department of Defense (DoD) telecommunications goal is the full integration of voice, data and imagery services, internetworking is looked upon as an essential process on the road to integration. To establish the relevance to U.S. warfighting capability, this thesis describes how internetworking and integration are critical elements of the "C41 for the Warrior" initiative. With this warfighting connection kept in mind, definitions and illustrations present the technical aspects of telecommunications internetworking and integration.

ELECTRON BEAMS AT GEOSYNCHRONOUS ORBIT

Raymond C. Gaw-Lieutenant, United States Navy
B.S.E., Central Missouri State University, 1986
Master of Science in Systems Technology-September 1993
Advisor: Richard C. Olsen-Department of Physics

This thesis surveys electron and ion measurements collected by the geosynchronous satellite 1989-046. In particular, this survey focuses on a phenomenon known as "electron beams", which are attributed to the sudden acceleration of electrons along the earth's magnetic field lines. Observations over a twelve day period reveal electron beam occurrences during the first few minutes of hot plasma injection associated with a magnetospheric substorm. Analysis of distribution functions show these beams have a characteristic peak. The distributions can be approximately fitted as Maxwellians, providing a means of characterizing the temperature, density, and potential drop associated with the beam. Plots of the differential flux also show a general diffusion of the beam into neighboring pitch angles. Theories on the source of the acceleration and diffusion are presented.

MILITARY SATELLITE COMMUNICATIONS DECISION SUPPORT SYSTEM REQUIREMENTS ANALYSIS AND USER INTERFACE DESIGN

Hugh Allen Henry-Major, United States Marine Corps
B.S., United States Naval Academy, 1980
Master of Science in Systems Technology-June 1993
Advisor: Tung X. Bui-Department of Systems Management

This research analyzed and decomposed U.S. Space Command missions to determine the requirements of a Military Satellite Communications Decision Support System (MDSS). Alternative functional architectures for an MDSS were evaluated and a graphical user interface prototype was developed. MDSS system requirements were derived through the combined use of the method of Critical Success Factors and the Representations, Operations, Memory Aids, and Controls method. The "sandwich" architecture was suggested as the most suitable functional architecture for MDSS development. The user interface prototype allowed potential MDSS users to gain an appreciation of the "look and feel" of a potential system so they could more precisely articulate their specific requirements to MDSS builders.

A CONCEPTUAL DATABASE DESIGN AND PERFORMANCE ANALYSIS OF THE MILSATCOM REQUIREMENTS DATABASE

Ronald Gene Kearns-Captain, United States Air Force
B.G.S., University of Nebraska at Omaha
Master of Science in Systems Technology-June 1993
Advisors: Daniel R. Dolk & Magdi Kamel-Department of Systems Management

The Military Satellite Communications Decision Support System (MDSS) project for U.S. Space Command (USSPACECOM) is intended to provide decision makers an integrated information tool to effectively manage military satellite communication (MILSATCOM) resources while satisfying communications requirements. An important aspect of MDSS is the information provided by the MILSATCOM Requirements Database (MRDB). The objective of this thesis is twofold. First, it develops a new conceptual schema for the MRDB using the Entity Relationship Model and transforms it into a relational schema for implementation. Second, it conducts a comparative performance analysis to examine the tradeoffs between normalization and performance. This thesis concludes that a structured approach to designing the MRDB results in a normalized structure that is simple, easy to implement, and provides acceptable performance. A fully normalized database structure does not seem to have a significant impact on overall MRDB retrieval performance.

MULTILEVEL SECURITY WITHIN THE ARMY TACTICAL COMMAND AND CONTROL SYSTEM: AN IMPLEMENTATION STRATEGY

Kathleen Schmidt Loper-Captain, United States Army
B.S., United States Military Academy, 1983
Master of Science in Systems Technology-June 1993
Advisor: Myung Suh-Department of Systems Management

As U.S. forces continue to operate in coalition environments, the need to incorporate Multilevel Security into the ATCCS becomes more apparent. While Army doctrine requires the ATCCS to be MLS to the B2 level, there is currently no product or technology developed to fulfill this requirement, nor is there any implementation strategy devised to address this issue. This thesis proposes two strategies to implement MLS within the ATCCS: a target and near term implementation strategy. These two strategies are based upon the DoD Joint MLS Technology Insertion Program Target Architecture and Implementation Strategy, which provides the vehicle for assessing the current and in development MLS products and capabilities.

A CANDIDATE FUNCTIONAL ARCHITECTURE DESIGN FOR THE DETECTION AND MONITORING PROCESS OF A COUNTERDRUG JOINT TASK FORCE

Thomas Cameron Loper, II-Captain, United States Army
B.S., United States Military Academy, 1983
Master of Science in Systems Technology-June 1993
Advisor: Carl R. Jones-Department of Systems Management

The Counterdrug Joint Task Force (JTF) represents an organizational environment that demonstrates requirements needed by most joint task forces. The nature of a JTF is that of a temporary organization established from many organizations to accomplish a specific task. Once this task is completed the different organizational elements return to their previous command structure. By designing the JTF using a systems engineering approach of top down decomposition, a format for the baseline requirements can be established. This decomposition format can be applied to generate other JTFs or re-applied to existing JTFs to verify systems requirements compliance. This thesis conducts a breadth-first examination of the Counterdrug JTF detection and monitoring process. Systems engineering software using IDEFO facilitates this design and is demonstrated in this thesis. A detailed analysis is then conducted for the data fusion and decision support sub-functions of the detection and monitoring process. The development of an alternative candidate architecture provides a different perspective to accomplishing top level system requirements. Designing a functional architecture using systems engineering tools enhance the performance of a JTF and can assist in the creation of future similar organizations.

DESIGN AND IMPLEMENTATION OF A PROTOTYPE PC BASED GRAPHICAL AND INTERACTIVE MILSATCOM REQUIREMENTS DATABASE SYSTEM

William Michael Major-Captain, United States Air Force
B.S., North Carolina State University, 1982
Master of Science in Systems Technology-June 1993
Advisor: Magdi N. Kamel-Department to Systems Management

This thesis develops a prototype PC based Military Satellite Communications (MILSATCOM) Requirements Database (MRDB) application for U.S. Space Command, using Microsoft's Access relational database management system (DBMS) for Windows. It demonstrates the advantages of using the proposed database system over the existing one and shows how U.S. Space Command can save both time and money by using a PC based interactive, graphical, and user friendly database system. A rapid prototyping approach in concert with a six phase database design process was used to develop the prototype. The first two chapters of the thesis provide a background of the application and describe database management systems in general and Microsoft Access in particular. The application of Access - tables, queries, forms, reports, macros, and modules - to the design of the MRDB are then discussed in the succeeding five chapters. The conclusions describe the advantages and benefits of using the prototype MRDB database system and make recommendations for future improvements.

COMBAT ANALYSIS FOR COMMAND, CONTROL AND COMMUNICATIONS: A PRIMER 1993 EDITION

William Stanley Pendergrass-Lieutenant, United States Navy
B.S., United States Naval Academy, 1986
Master of Science in Systems Technology-June 1993
Advisor: Wayne P. Hughes, Jr.-Department of Operations Research

This thesis is a primer for a combat analysis course for Joint Command, Control and Communications students at the Naval Postgraduate School. It provides a single document which ties together the key concepts of combat modeling and analysis. The thesis introduces various aspects of combat models and illustrates many of their functions, applications and results with examples. Areas included in the primer are: combat theory and the relationship of command and control within that theory, modeling techniques, measures of effectiveness, attrition models, other forms of non-attrition analysis and examples of models currently in use. The thesis introduces basic concepts and identifies readings from which those concepts were extracted. It does not teach students to develop combat models, though it gives insight into how the application affects proper model selection.

DATA LINK DEVELOPMENT FOR THE ARCHYTAS VERTICAL TAKEOFF AND LANDING TRANSITIONAL FLIGHT UNMANNED AERIAL VEHICLE

Frederick Walter Reichert, Jr.-Major United States Army
B.A., Temple University, 1980
Master of Science in Systems Technology-June 1993
Advisor: Michael K. Shields-Department of Electrical and Computer Engineering

This thesis chronicles the development of a data link for the archytas, a vertical takeoff and landing, transitional flight unmanned aerial vehicle (UAV) prototype being built by the Aeronautics Department at the Naval Postgraduate School. Archytas is intended to be a proof-of-concept platform to satisfy the Navy's real-time, over-the-horizon intelligence mission with a UAV that could be launched and recovered from a small combatant ship. This thesis provides a history of the Archytas command and control data link development, a full description of the data link as delivered for use on the prototype, principles for near term enhancements, and future considerations for the data link should the Archytas concept be adapted for use in an operational combat environment.

COMPARISON OF INFORMATION DELAY TYPES AND LEVELS IN TACTICAL TIC-TAC-TOE (T4)

Jeffrey Scott Richardson
B.S., University of New Mexico, 1984
Master of Science in Systems Technology-March 1993
Advisor: Michael G. Sovereign-Department of Operations Research

The objective of this thesis is to design, conduct, and analyze a command, control, and communications conflict simulation to investigate the effects of differing types and quantities of information delay on mission outcomes using the computer simulation game Tactical Tic-Tac-Toe (T4). Three different types of delay were compared: tactical, area, and communications. Each type of delay was delayed from zero to nine moves. The results indicate that tactical delay had the greatest effect on mission outcome. Area delay had less of an impact. Communications delay had the least effect. Contrary to predictions, within each type of delay, different levels of delay did not significantly effect mission outcomes. This may be attributed to the high variability of the game scores. Generally, tactical and area delays graphically showed less mission impact at lower levels of delay, however communication delay indicated no trend in mission outcome at different levels of delay.

THE ORGANIZATIONAL PREPARATION OF EXISTING RELATIONAL DATABASES FOR THE INTEGRATION OF EXPERT SYSTEMS

Warren Wilson Snow-Major, United States Air Force
B.S., United States Air Force Academy, 1979
Master of Science in Systems Technology-June 1993
Advisor: Dan C. Boger-Department of Systems Management

This thesis is a management guide for strategically planning a future integration of relational databases and expert systems. It relates best to an organization with large established relational database(s), that is trying to assess the changes required to integrate expert systems with those databases. Technical considerations for such a change are discussed, and include the role of database normalization and the requirement to maintain applications that are independent of the database structure. The organizational considerations of such an integration are examined, and focus on the people skills required within an organization to develop and maintain database and expert system combinations. Three product categories are established to represent an integrated system, and a commercial off the shelf product from each category is reviewed to illustrate its specific capabilities. The combination of relational databases and expert systems has the potential to deliver information systems of future strategic importance. This thesis serves to assist the information systems management of military organizations in planning the transition to such a system.

ON THE EXPLOITATION OF HUMAN INDUCTIVE THOUGHT AND INTUITION IN FUTURE GLOBAL COMMAND AND CONTROL ARCHITECTURES

Timothy James White-Lieutenant, United States Navy
B.S., Mechanical Engineering, United States Naval Academy, 1987
Master of Science in Systems Technology-June 1993
Advisors: Frank C. Petho-Department of Operations Research &
Dan C. Boger-Department of Systems Management

Enabling technologies available today can be integrated to provide the necessary bandwidth, access, and computational power to support advanced global command and control architectures, but *humans* will ultimately use these architectures to select courses of action. People will continue to make decisions. The interface between the human operator and information collected, processed, fused, and disseminated by these advanced architectures is the element that injects greatest potential risk of failure within these systems. This thesis examines that interface. The technical and doctrinal aspects of advanced command and control architectures are discussed. The concept of "information pull" is examined. The role information fusion plays in human situation assessment of the battlespace is delineated. Computer assisted inductive reasoning which exploits human intuitive powers is introduced as a potential design feature in the user interface. Recommendations for its inclusion in future command and control architectures are made.

MASTER OF SCIENCE
IN
SYSTEMS TECHNOLOGY
(COMMAND, CONTROL, AND COMMUNICATIONS)

COMBINED ARMS STAFF TRAINER FEASIBILITY STUDY FOR USE IN THE NPS C3 CURRICULUM

Patrick Joseph Kanewske-Captain, United States Marine Corps
B.S., United States Naval Academy, 1981
Master of Science in Systems Technology (Command, Control, and Communications)-June 1993
Advisor: Michael Sovereign-Command, Control and Communications Academic Group

The objective of this thesis is to explore the possibility of the Combined Arms Staff Trainer's (CAST) use in the Command, Control, and Communications(C3) Curriculum. War gaming in the United States Armed Forces and at the Naval Postgraduate School is explored. The CAST system is described in its present form as used by the United States Marine Corps, and how the system can be manipulated to suit the needs of the C3 Curriculum. The feasibility of implementing the proposed system changes to satisfy required knowledge elements in the C3 Curriculum is explored. Who will use the CAST, and how the CAST can be facilitated at NPS is also discussed.

A PROPOSED BATTALION AND BELOW COMMAND AND CONTROL (B2C2) SYSTEM ARCHITECTURE FOR THE ARMOR BATTALION

Michael D. Landers-Captain, United States Army
B.B.A., Georgia College, 1982
Master of Science in Systems Technology (Command, Control, and Communications)-June 1993
Advisor: Dan C. Boger-Department of Systems Management

The Army Command and Control System (ACCS) is the system of systems for Army command and control. The tactical portion of ACCS is the Army Tactical Command and Control System (ATCCS). ATCCS applies to Echelons Corps and Below and presently extends down to the brigade level. Efforts within the Army are ongoing to extend the ATCCS to the battalion level but have not yet been completed. This thesis proposes a battalion and below command and control (B2C2) system architecture for the armor battalion. The architecture defines the necessary component systems to be included within the architectural framework and how those component systems should be integrated within a B2C2 framework. The component systems involved are the Intervehicular Information System (IVIS), the Combat Vehicle Command and Control (CVC2) System, the Command and Control Vehicle (C2V), the Common Ground Station, the Single Channel Ground and Airborne Radio System (SINCGARS), Mobile Subscriber Equipment (MSE), Enhanced Position Location and Reporting System (EPLRS), and Common Hardware Software (CHS).

COMBAT VEHICLE COMMAND AND CONTROL SYSTEM (CVC^2): THE DEVELOPMENT OF THE MEASURES AND EVALUATION TECHNIQUES

Stephen Mckinney-Captain, United States Army
B.S., United States Military Academy
Master of Science in Systems Technology (Command, Control, and Communications)-June 1993
Advisor: Michael Sovereign-Department of Operations Research

This thesis examines the development of the measures for evaluating new tactical command and control (C2) systems such as the Combat Vehicle Command and Control System (CVC^2). Using those measures it discusses the various techniques available to evaluate CVC^2 and recommends the selection of one technique. In order to establish a strong foundation for understanding the needs of a battalion task force C2 system, the systems, processes, procedures, and standards available to the commanders are detailed. These assets are related to Orr's Combat Model to aid in the understanding of C2 at battalion level. The thesis concludes with the benefits, advantages, disadvantages, issues, and potential of CVC^2.

ANALYSIS OF SIMULATED DRIFT PATTERNS OF A HIGH ALTITUDE BALLOON SURVEILLANCE SYSTEM

Kurt Charles Reitinger-Major, United States Army
B.S., United States Military Academy, 1980
Master of Science in Systems Technology (Command, Control, and Communications)-June 1993
Advisor: Michael Melich-Command, Control and Communications Academic Group

This study evaluates the potential of high altitude balloons as surveillance platforms. It begins with the mobile Theater Ballistic Missile (TMB) detection problem encountered during the Persian Gulf War of 1990-1991 and it describes a possible scenario using high altitude balloon surveillance systems to locate TBM's accurately enough for effective engagement by strike assets. It presents the history and military use of balloons, and it describes the current state of technology of differing balloon types. Atmospheric circulation impacting balloon drift is presented along with a description of available atmospheric models. Trajectory prediction programs are reviewed and a revised program is used to conduct a simulation of balloon trajectories. Balloon locations at fixed times are analyzed for variability. The study concludes that high altitude balloons have some potential for use as surveillance platforms for limited periods of time.

A SYSTEMS EVALUATION APPROACH TO ANALYSIS TACTICAL TIC-TAC-TOE (T4) GENERATED DATA

Eugene Marco Zarrillo-Lieutenant, United States Navy
B.S., Old Dominion University, 1987
Master of Science in Systems Technology (Command, Control and Communications)-June 1993
Co-Advisor: Michael G. Sovereign-Department of Operations Research

The purpose of this thesis was to design, conduct, analyze and report the results of a C3 experiment. The T4 Simulation, acting as a surrogate for a C3 system, was used to generate data for statistical analysis. The objective was to determine which factors, and which factor levels, effected the MOE. As a result, the optimal *system alignment* was determined which would result in maximum values for the MOE. The factors investigated were Area, Communication, and Tactical Delay, and probability of winning a same turn conflict, P(W). The levels of delay varied from zero to nine moves while levels for P(W) varied from zero to one in increments of one tenth. Analysis showed that only Tactical Delay effected the MOE and that only two levels, zero and one, of Tactical Delay significantly changed the MOE. Analysis also showed that the player with the higher value of P(W), regardless of Tactical Delay, achieves a positive MOE. Therefore, the optimal *system alignment,* under the constraints of the experimental design, would be to assign P(W) = 1.0 to one side, while assigning the maximum value of delay to the other. Thus, this game configuration would maximize the MOE.

MASTER OF SCIENCE
IN
SYSTEMS TECHNOLOGY
(SPACE SYSTEMS OPERATIONS)

USING A WARGAME TO EXPLORE THE EFFECTS OF THE INFORMATION CONTENT OF MESSAGES ON CVBG ANTI-AIR WARFARE DEFENSE

Paul Alan Forbes-Lieutenant, United States Navy
B.S., University of Nebraska, 1983
Master of Science in Systems Technology (Space Systems Operations)-September 1993
Advisor: Samuel H. Parry-Department of Operations Research

This thesis seeks to determine if a man-in-the-loop wargame can be used to analyze the effects of information content of messages on carrier battle group anti-air warfare defense. This is accomplished by examining three levels of information resolution: Low, Medium, and High. The Research, Evaluation, and System Analysis (RESA) wargame is used to compare three carrier air defense scenarios. The forces attacking the carrier battle group in each scenario are scripted to allow uniformity of each scenario between players. By analyzing the number of hostile aircraft penetrating the carrier battle group defenses during a specific information resolution, a correlation between information resolution and carrier defensive capabilities is evaluated. Through the use of four warfare designated officers, results indicate that information resolution directly contributes to the defensive capability of the carrier battle group. Additionally, a man-in-the-loop wargame can be used as an analysis tool for proposed or existing warfare systems.

A SURVEY OF UNCONTROLLED SATELLITE REENTRY AND IMPACT PREDICTION

William K. Henderson-Lieutenant Commander (sel), United States Navy
B. S., University of Texas at San Antonio, 1982
Master of Science in Systems Technology (Space Systems Operations)-September 1993
and
Brian D. Neuenfeldt-Lieutenant Commander, United States Navy
B.A., Western State College of Gunnison Colorado, 1984
Master of Science in Systems Technology (Space Systems Operations)-September 1993
Co-Advisors: I. Michael Ross-Department of Aeronautics and Astronautics &
Joseph F. Liu-Astrodynamics Division, AFSPACECOM

The primary goal of this thesis is to identify the "state-of-the-art" in orbit-decay-induced uncontrolled reentry/impact prediction methods, with an emphasis on the physics of the final few revolutions to impact. This was accomplished through a comprehensive literature survey from the 1950's to the present of unclassified military and civil databases. The results of the survey show that the current U.S. and international reentry/impact prediction methodologies are based on analysis which is over 30 years old. Of the various "extensions" to the current reentry theory, of which the NORAD method is recognized as the international standard, there does not appear to be any one method which is singularly superior to the others. It has also been shown that numerous reentry investigations made simplifying assumptions due to insufficient data needed to accurately model reentry and also because of computing limitations of their day. Also, current deterministic dynamic models appear to inadequately describe the actual uncontrolled reentry process, due to a lack of observational data, uncertainty in determining aerodynamic coefficients, atmospheric density, and point mass modeling where changes in vehicle configuration, altitude and lift are neglected. Stochastic and statistical methods could be applied to the current methodology, to better analyze the various uncertainties, which could help to improve the overall predicted impact time and location; however, further research into these methods along with the physics of uncontrolled reentry is necessary.

A STUDY OF PIEZOELECTRIC ACTUATORS AND SENSORS FOR VIBRATION CONTROL OF FLEXIBLE SPACE STRUCTURES

Franklin D. Hixenbaugh-Lieutenant, United States Navy
B.S., Auburn University, Alabama, 1986
Master of Science in Systems Technology (Space Systems Operations)-September 1993
Advisor: Brij N. Agrawal-Department of Aeronautics and Astronautics

This thesis details the procedure for applying piezoelectric ceramic material to the Naval Postgraduate School's Flexible Spacecraft Simulator (FSS) for the purpose of active damping control. A step-by-step procedure to properly mount and test piezoelectric ceramic actuators and sensors is developed followed by performance demonstration by two control laws: Positive Position Feedback (PPF), and Proportional-Derivative (PD). A digital controller for PD control is also developed.

A SURVEY OF UNCONTROLLED SATELLITE REENTRY AND IMPACT PREDICTION

Brian D. Neuenfeldt-Lieutenant Command (sel), United States Navy
B.S., University of Texas at San Antonio, 1982
Master of Science in Systems Technology (Space Systems Operations)-September 1993
and
William K. Henderson-Lieutenant, United States Navy
B.A., Western State College of Gunnison Colorado, 1984
Master of Science in Systems Technology (Space Systems Operations)-September 1993
Co-Advisors: I. Michael Ross-Department of Aeronautics and Astronautics &
Joseph F. Liu-Astrodynamics Division, AFSPACECOM

The primary goal of this thesis is to identify the "state-of-the-art" in orbit-decay-induced uncontrolled reentry/impact prediction methods, with an emphasis on the physics of the final few revolutions to impact. This was accomplished through a comprehensive literature survey from the 1950's to the present of unclassified military and civil databases. The results of the survey show that the current U.S. and international reentry/impact prediction methodologies are based on analysis which is over 30 years old. Of the various "extensions" to the current reentry theory, of which the NORAD method is recognized as the international standard, there does not appear to be any one method which is singularly superior to the others. It has also been shown that numerous reentry investigations made simplifying assumptions due to insufficient data needed to accurately model reentry and also because of computing limitations of their day. Also, current deterministic dynamic models appear to inadequately describe the actual uncontrolled reentry process, due to a lack of observational data, uncertainty in determining aerodynamic coefficients, atmospheric density, and point mass modeling where changes in vehicle configuration, attitude and lift are neglected. Stochastic and statistical methods could be applied to the current methodology, to better analyze the various uncertainties, which could help to improve the overall predicted impact time and location; however, further research into these methods along with the physics of uncontrolled reentry is necessary.

EXERGY DECREASE IN SHOCK WAVES AND BOUNDARY LAYERS OF SPACE LAUNCH VEHICLES

Benjamin Frank Roper-Lieutenant Commander, United States Navy
B. S., Stephen F. Austin State University, 1977
Master of Science in Systems Technology (Space Systems Operations)-March 1993
Master of Science in Engineering Science-March 1993
Advisor: Conrad F. Newberry-Department of Aeronautics and Astronautics

The exergy method of analysis uses both the First and Second laws of Thermodynamics to determine where losses occur. This method has been shown to be superior to conventional heat balance analyzes. A primary contributor to the exergy decrease is the production of entropy. Entropy is produced in shock waves and boundary layers, as well as in other regions of the flowfield. A method of analysis is presented to quantify the entropy that is produced in the bow shock wave and the boundary layer of a space launch vehicle for Mach numbers between 1.1. and 10.

SPECTRAL AND POLARIMETRIC ANALYSIS OF HYPERSPECTRAL DATA COLLECTED BY AN ACOUSTO-OPTIC TUNABLE FILTER SYSTEM

Melissa A. Sturgeon-Captain, United States Army
B.S., United States Military Academy, 1985
Master of Science in Systems Technology (Space Systems Operations)-September 1993
Advisor: Philip A. Durkee-Department of Meteorology

Analysis of data collected during a ground-based experiment of an acousto-optic tunable filter (AOTF) hyperspectral imaging system illustrates the utility of this technology for military applications. The unique ability of an AOTF system to simultaneously acquire two orthogonally polarized images allows both spectral and polarimetric characterization of targets. The data images selected for analysis contain camouflaged military equipment deployed in a desert background. After geometric and atmospheric correction, spectral analysis is accomplished using two different methods. Comparing images created by the difference between polarizations for each band provides the basis for polarimetric analysis of the data. An algorithm developed to combine the information provided by spectral and polarimetric analysis shows how features within a scene can be distinguished from the background. Results show that AOTF hyperspectral technology has potential to enhance current military intelligence collection capabilities.

CONSIDERATIONS FOR SPACE AND NAVAL AVIATION APPLICATIONS OF FERROELECTRIC MEMORY

Theodore Arnold Vetter-Lieutenant, United States Navy
B.S., Southern Oregon State College, 1984
Master of Science in Systems Technology (Space Systems Operations)-December 1992
Advisor: Rudolf Panholzer-Space Systems Academic Group

The purpose of this thesis is to introduce the reader to Ferroelectric memory and discuss considerations for possible space and Naval aviation applications. Ferroelectric memory's characteristics and basic mechanism are discussed. A broad spectrum of existing computer memory types are presented for comparison. The memory requirements of Space Shuttle, Landsat, Intelsat V and Hubble Space telescope as well as the Navy E-2 Hawkeye and EA-6B Prowler aircraft are given as possible examples of space and Naval aviation applications of ferroelectric memory.

APPLICATION OF SPACE SHUTTLE PROJECT HERCULES IMAGERY IN THE INVESTIGATION OF SHIP CLOUD TRACKS

Larry E. Whitmeyer-Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1978
M.P.A., University of West Florida, 1986
Master of Science in Systems Technology (Space Systems Operations)-September 1993
Advisor: Philip A. Durkee-Department of Meteorology

An assessment is made as to the utility of high-resolution imagery obtained via the Project HERCULES electronic still camera system, utilized onboard the Space Shuttle, toward the MAST Space Test Program investigation of ship-induced cloud tracks. Project HERCULES and MAST concepts are described. A detailed discussion is presented of the integration requirements, mission conduct, and payload support procedures involved in using the HERCULES system during the STS-56 mission to image potential shiptrack areas and Naval-related sites. Five HERCULES imagery cases are analyzed with feature measurements. Alternate camera systems are described, and then compared with the HERCULES system. Recommendations are made for the MAST payload. Although utility is seen in the geolocation and digital format offered by HERCULES images, its present configuration permits only limited use in the shiptrack and Naval-related applications. However, a firm procedural knowledge-base has been established for the MAST experiment.

ADVISOR INDEX

Abenheim, D.	305
Adler, R.W.	98, 108, 110, 111, 113, 116, 378
Adams, S. R.	184, 227, 254, 255
Agrawal, B.N.	8, 54, 398
Atchley, A.A.	129, 130, 365, 369
Bailey, M.P.	337, 352
Baker, S.R.	65, 66, 117, 122, 129, 132, 133
Ball, R.E.	32, 138
Barrett, F.J.	196, 197, 201
Batteen, M. L.	361
Bhargava, H.K.	160, 168
Biblarz, O.	29, 43, 372
Boger, D.C.	179, 188, 189, 198, 202, 209, 253, 254, 255, 334, 346, 356, 389, 390, 393
Breemer, J.S.	307
Brown, D.G.	179, 202, 209, 253, 254, 255
Brown, R.M.	312, 322, 329, 384
Bruneau, T.C.	302
Brutzman, D.P.	346
Bui, T.X.	146, 153, 169, 170, 386
Burl, J.B.	19, 102, 103, 104
Buss, C.A.	306, 309, 311, 313, 314, 323, 324, 327
Butler, J.T.	125, 228
Canright, D.	61, 62

Carter, E.F. 362

Chang, C.P. 9, 295

Chiu, C.S. 132

Chu, P.C. 279, 289, 291, 361

Cleary, D.D. 137, 141, 365, 366, 370, 371, 373, 378

Collins, C.A. 8, 291, 292, 362

Collins, D.J. 40, 114, 373

Colson, W.B. 7, 366, 369, 374

Conner, G.W. 191

Cooper, A.W. 119

Coppens, A.B. 65, 368, 370

Crawford, A.M. 183, 186, 196, 198, 212, 222, 226, 242, 247

Cristi, R. 5, 53, 99, 124

Crooks, R. 265

Danielson, D.A. 62

Davidson, K.L. 294, 297, 377

Davis, D.S. 137, 370

Dell, R.F. 338, 343, 352

Denardo, B.C. 131

Dolk, D.R. 231, 233, 386

Doyle, R.B. 180, 194, 200, 213, 214, 218

Driels, M.R. 266, 268, 272

Durkee, P.A. 281, 289, 290, 293, 399, 400

Dutta, I. 265, 270

Eagle, J.N. 344, 352

Eitelberg, M.J. 175, 181, 186, 225, 238

Elsberry, R.L. 5, 9, 279, 280

Elster, R.S. 146

Erickson, D. 83

Esary, J.D. 342

Euske, K.J. 162, 170, 187, 193, 230, 238, 242, 243

Evered, R.D. 195, 199, 215, 237

Fargues, M.P. 99, 105, 109

Farley, D.G. 380

Fischer, I. 59

Fouts, D.J. 98, 100, 103, 112, 115, 118, 124

Fox, A.G. 24, 261, 267, 268, 275

Fremgen, J.M. 193, 228, 234, 239

Frenzen, C.L. 62

Frew, B.A. 145, 162, 169, 246

Fu, Y.S. 385

Garrett, S.L. 133, 134

Garwood, R.W. 296, 359

Gates, W.R. 154, 155, 177, 184, 199, 206, 212, 213, 250

Gaver, D.P. 335, 340, 348, 350

Gill, G. 97, 115, 125, 379

Gordis, J. 369, 371

Ha, T.T. 40, 99, 102, 104, 109, 112, 114, 121

Haga, W.J. 147, 151, 155, 157, 158, 159, 160, 163, 166, 169, 170

Halwachs, T.E. 334

Hartman, D.M. 343

Healey, A.J. 24, 260, 261, 263, 266, 268

Henson, V.E. 60

Henderson, D.R. 154, 178, 184, 193, 194

Hildebrandt, G.G. 235, 247

Hippenstiel, R. 105, 109, 111

Hirschberg, P.A. 286, 294

Hobson, G. 3, 14, 32, 41, 44, 45, 141

Hocevar, S.P. 151, 177, 190, 197, 215, 233, 246

Hofler, T.J. 133

Hoivik, T.H. 176, 187, 204, 206, 209, 250

Holt, T.R. 288

Howard, R.M. 14, 15, 36, 38, 39, 41, 42, 47

Hsiao, D.K. 71, 76, 81, 82, 84, 85, 93

Hughes, W.P. 351, 356, 388

Hull, P.R. 306

Jacobs, P.A. 335, 340

Janaswamy, R. 116, 123

Jenn, D.C. 36, 97, 377, 379

Jones, C.R. 384, 387

Jones, L.R. 195, 203, 217, 228, 229, 248

Joshi, Y. 265, 266, 273

Kamel, M.N. 162, 167, 169, 386, 388

Kaminer, I.I. 35, 36, 37

Kanayama, Y. 6, 74, 76, 77, 79, 89, 120

Kang, K. 201, 210

Kelleher, M.D. 264

Kemple, W.G. 337, 345, 346, 352, 384

Kennedy-Minott, R. 326, 327

Keolian, R.M. 130

Kocher, K.M. 236

Kolar, R. 35

Kraus, A.D. 33, 51

Kwak, S.H. 89, 90, 91

Kwon, Y.W. 25, 262, 270, 271, 274

Laba, R.A. 308, 310, 313, 330

Lam, A.W. 19

Lamm, D.V. 181, 182, 185, 198, 204, 208, 220, 221, 227, 232, 233, 238, 243, 244, 251, 256

Larson, H.J. 349

Lawphongpanich, S. 333, 334, 353

Leader, J.J. 59, 60, 61

Lee, C.H. 77, 108, 121

Lee, Y.J. 86

Liao, S.S. 146, 152, 205

Lindsey, G.H. 43, 139

Loomis, H.H. 100

Looney, R.E. 301

Lundy, G.M. 72, 80, 87, 140

Luqi, L. 75, 86, 105, 385

Magnus, R. H. 304, 320, 325

Mansager, B.K. 60, 61, 345

Marshall, K.T. 339, 340, 345, 349

Marto, P.J. 23, 259, 260, 262, 269, 273

Maruyama, X.K. 365, 367, 369, 374

Matsushima, R.F. 222

McCaffery, J. 206, 207, 208, 255

McCaffery, M. 241

McCormick, G.H. 326

McGhee, R.B. 4, 94, 102

McMasters, A.W. 189, 195, 201, 203, 217, 221, 229, 251, 344

McNelley, T.R. 138, 265, 269, 276

Mehay, S.L. 185, 197, 200, 211, 218, 225, 226, 239, 240, 241, 249

Melich, M. 394

Memory, S.B. 23, 259, 260, 262, 269

Michael, S. 51, 98, 101, 117

Milch, P.R. 252, 337

Miller, J.H. 114, 120, 132

Milligan, R.D. 205

Mitchell, C.A. 185, 211, 249

Mitchell, J.H. 114, 120, 132

Mitra, S. 275

Moore,T.P. 207, 216

Moose, P. 106, 379

Moses, O.D. 176, 179, 187, 202, 216, 223, 245

Mukherjee, R. 259, 267

Murphree, J.T. 287, 292, 295, 296

Neta, B. 60, 61, 62

Netzer, D.W. 34, 37, 42, 53, 55, 140, 141

Nevels, J.M. 177, 190, 199, 212, 216, 238

Newberry, C.F. 13, 14, 34, 45, 54, 139, 399

Nuss, W.A. 295

Nystuen, J. 131

Olsen, E.A. 315, 316, 325

Olsen, R.C. 368, 386

Orloff, K.L. 224

Owen, W. 219

Pace, P.E. 377, 378

Paduan, J. 359

Panholzer, R. 399

Papoulias, F.A. 25, 260, 264, 272, 274

Parker, P.J. 308, 319

Parry, S.H. 350, 397

Pauley, P.M. 285, 287

Paulo, E.P. 348

Peng, M.S. 6

Perkins, J. 275

Petho, D. 198, 339, 348, 390

Pieper, R.J. 106, 113, 117, 122, 132, 133

Platzer, M.F. 13, 31, 35, 42

Powers, J.P. 107, 119

Pratt, D.R. 70, 78, 90, 94

Proctor, M. 347

Ramesh, B. 156, 157, 158, 159, 161, 163, 164, 165, 166, 168, 171

Ramp, S.R. 8, 360

Rasmussen, C.W. 60, 344

Read, R.R. 348

Roberts, B.J. 183, 196, 204, 222, 242

Roberts, N.C. 154, 155, 192, 205, 210, 211, 223, 244, 245, 248

Robertson, R.C. 31, 104

Robinson, G.E. 318, 322

Rosenthal, R.E. 336, 354

Ross, I.M. 46, 52, 79, 397, 398

Rovero, P.J. 66

Rowe, N.C. 70, 88, 91

Russo, M. 350

Salinas, D. 265, 271

Sanders, J.V. 370

San Miguel, J.G. 182, 192

Sarpkaya, T. 23, 262, 271

Schmidt, L.V. 15, 29

Schneidewind, N.F. 335

Schwirzke, F.R. 374

Semtner, A. 290

Sengupta, K. 156, 157, 167, 171, 193

Shields, M.K. 39, 388

Shimeall, T.J. 72, 79, 82, 83, 85, 92

Shin, Y.S. 263, 267

Shing, M. 92

Shreeve, R.P. 40

Shukla, S. 20, 74, 101, 118, 120, 122

Sohn, S.Y. 333, 350, 355

Sovereign, M.G. 240, 342, 383, 389, 393, 394

Stemp, R. 153, 170

Sternberg, J. 324

Stockton, P.N. 315, 318, 329

Stolfi, R.H.S. 321, 328

Stone, G. 350

Suchan, J.E. 189, 196, 214, 234, 235

Suh, M.W. 145, 157, 162, 163, 165, 237, 249, 387

Terasawa, K. 152, 175, 176, 206, 227, 247

Teti, F.M. 309

Therrien, C.W. 124

Thomas, G.F. 146, 177, 188, 196, 197, 201, 246

Thomas, G.W. 186, 231, 233, 236, 252

Thomas, K.W. 188, 224

Thornton, E.B. 4, 286, 288

Titus, H.A. 3, 110, 115, 116, 121, 123

Tollefson, S.D. 303, 305, 319, 327, 330

Trietsch, D. 191, 210, 219

Tritten, J.J. 301, 304, 316, 317, 318, 321, 327

Tsypkin, M. 302, 320, 323, 328

Tummala, M. 99, 103, 107, 125

Walters, D.L. 367, 372

Wargo, L.E. 212

Warmington, J.A. 180, 183, 220, 226, 230, 231, 236

Wash, C.H. 280, 281, 285, 286, 293, 294

Washburn, A.R. 338

Weitzman, R.A. 204, 224, 232

Wight, R. 97

Williams, R.T. 6

Wilson, O.B. 117, 122, 132, 133

Winterford, D 323

Wirtz, J. 310, 320

Wood, E.R. 30, 33, 38, 41, 46

Wood, R.K. 341, 347, 354, 355

Woods, W.M. 178, 217, 353

Wu, C.T. 70, 71, 73, 75, 78, 88

Wu, E.M. 39, 45, 47

Yost, D.S. 303, 307, 308, 311, 312, 314, 317

Zaky, A. 69, 74, 86, 101, 139

Zyda, M.J. 7, 70, 73, 83, 88, 93