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PROCEEDINGS

SIXTH SHIP CONTROL SYSTEMS SYMPOSIUM

26 - 30 OCTOBER 1981

SUPPLEMENT

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FOREWORD

The Director General Maritime Engineering and Maintenance (DGMEM) is pleased to present the Proceedings of the Sixth Ship Control System Symposium held at the Chateau Laurier/National Conference Centre complex in Ottawa, Canada, 26-30 October 1981. This is the sixth in a series of symposia on ship control systems. The First Ship Control Systems Symposium was convened in 1966.

The technical papers presented at the Symposium and published in these proceedings cover the entire spectrum of ship control systems and provide an insight into technological developments which are continuously offering the ship control system designer new options in addressing the complex man/machine operation. The microprocessor and its apparently unlimited development potential in future digital, distributed control systems appears ready to reshape the conventional concepts now so familiar in control system designs. There are many concerns that the advantages of the new technologies will be negated by the inability of training systems to graduate technicians who can adequately cope with these new systems.

The response to "Call For Papers" was outstanding and the papers selection committee constrained by the time available for presentations, was hard pressed to make their final selections from the many fine abstracts submitted. The final papers represent a unique international flavour which includes authors from every facet of the ship control system community. The final program is a balance of both theoretical and practical control system papers.

These Proceedings constitute the major record of the Sixth Ship Control Systems Symposium. The contents indicate the success of the Symposium and provide some insight into the effort that was required to ensure this success. The Symposium organizing committee, advisory groups, publications branch, authors, session chairmen, international coordinators, clerical and administrative personnel, and management all provided positive and cooperative support to the many tasks that had to be performed in organizing and presenting the Symposium.

This Symposium has continued to explore and present a number of specific aspects of ship control systems and undoubtedly the next symposium will include new concepts and ideas which were unavailable for this Symposium. As in the past, we hope these Proceedings become a source document on ship control along with the previous proceedings. It is our hope that the Symposium has provided stimulation to those who will continue to advance this technical field.

Bruce H. Baxter
General Chairman

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Philip V. Penny
Technical Chairman

SUPPLEMENT

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KEYNOTE ADDRESS

"SHIP CONTROL SYSTEMS - CHALLENGES FOR THE 80's AND BEYOND"

by Vice Admiral John Allan
Deputy Chief of the Defence Staff

The Sixth Ship Control Systems Symposium has been convened at a most opportune time, for as the theme suggests, in the rapid advancement of technology it is essential that as well as operations, reliability and maintainability considerations be brought to the fore. There are a myriad of pressures in the design to cost methodology of today that will cause the rationalization of effective design decisions. These pressures create the problems with which we are all familiar; namely, operational non-readiness at critical times, systems which are temporarily-permanently degraded and of course, the endless influx of dollars to correct and support unsound modifications to a basically sound design. The latter is the bane of the modern designer as he interprets operational requirements. I am sure this problem has been encountered, on at least one occasion by all of you. It is not my purpose this morning to dwell on the niceties of system design or the match of hardware, firmware and software required to implement the designs, for you will be dealing with these subjects in depth during the Symposium. Rather, I will address in general terms the role of high technology in ship control systems for the 80's and beyond, and its relationship to ship retro-fits, mid-life refits, new construction programs, and in particular, the effect of constrained budgets on these.

It is sad but true that in the inevitable race to meet milestones and budget constraints inferior equipment/systems often result. The inferior label is not meant to demean the designer but, rather, to point out that an original system designed to cost could probably have been designed to better meet the requirement if phased cost parameters had not been a major design constraint. Where complex systems such as warships are designed within a tight cost control system, a trade-off process between, generally, operational capability, reliability and maintainability must be made for each of the systems within the complex. Where the selection of off-the-shelf for any given system within the complex is an option, there has in the past been very little room for design modification to enhance either the reliability or maintainability of those systems. Today's technology can be applied in such a way to extend the new design advantage to certain off-the-shelf systems with new development systems, particularly in the control system area. The net effect of cost driven design cuts is that they generally affect what is desired the most, ie, reliable, maintainable and available equipment/systems. The obvious question is how do we, as responsible managers, designers, builders, etc. cater for this underlying current that tends to negate our best efforts. I submit that the best weapon you have is a total awareness of the technology available and how to incorporate it in designs at a conceptually early stage, ie, lock in reliability and maintainability criteria so that they are relatively immune to the budget paring knife. If the responsible manager is presented with a plethora of good and proven systems utilizing high technology with inherent advantages such as self-diagnostics, reliability, maintainability, built in redundancy and modularity, it becomes a powerful lobby in the decision process which he cannot ignore.

Up to this point I have talked in generalities about high technology and ship control systems, perhaps it would be wise now to expand on the high technology aspects. High technology is such a common phrase these days that it means different things to different people. In the context of my remarks it is the ability to place a myriad of information (be it applications, diagnostics, redundancy, etc.) on a single silicon chip. The capabilities that can be achieved with proven large scale integration (LSI) and the current very large scale integration (VLSI) techniques are truly amazing. It is now possible with VLSI to place entire redundant systems on a single chip complete with internal diagnostics and self-check routines that literally make the chip a highly reliable system oblivious to the outside world. It is this capability of high technology that I believe should be exploited to provide the systems we require. Current and future designs that are driven by some of the pressures I mentioned earlier (ie, costs and availability/reliability criteria) will naturally gravitate to chips of this type. A point to ponder before I go on, the pin-ball machine has been relegated to museum status by the silicon chip which is responsible for the electronic games we see today. These electronic games possess degrees of difficulty options that would rival the operations room displays of modern fighting ships.

Of particular interest to the Canadian Navy (and I'm sure to most navies and merchant fleets) is that, once having made the decision on how to utilize high technology the all important question of "manning" arises, particularly in the areas of numbers and skills required. I suggest that the answers forthcoming from the manning question are of paramount importance, for ships will always have a crew. Technology and people must co-exist in the same environment if maximum benefits are to be obtained. One of the true challenges of the 80's is this co-existence of crew and technology. This is a delicate balance of pseudo-artificial intelligence and human intelligence, and I submit there is a place for both in a ship, the challenge is to define the mix. Granted, that defining the mix will not be an easy task since those responsible for implementing your designs tend to be a rather conservative group and rightly so, for experience tells them that the betting proposition is to go with the tried and true. It is your task, as I stated before, to be aware of the capabilities of high technology, particularly those attributes that appeal to the conservative implementer. It is a fact of life that available technology will precede those equipment/systems currently fitted or scheduled to be fitted in a ship. Hence the manning/technology mix I spoke of earlier must be achievable and realistic.

Like our neighbour, the USN, and several other navies, the Canadian Navy is comprised of volunteer members. Another vital manning consideration is the truly challenging task of enticing competent recruits. With the ever present industrial alternative for our men, the onus is on us to make the Navy and merchant marine an attractive and viable career. Our Navy is becoming more and more dependent on high technology systems, and with this dependence the manning requirement will change. It is tempting, I know, to consider technology as the panacea for the manning problems we have today and those predicted for the next classes of ships. However, I suggest that this philosophy be given careful consideration. As I mentioned earlier, there exists the premise that technology will dictate the requirement for a low skill level recruit. I contend that the opposite is true and that the requirement for this highly skilled recruit will exist into the foreseeable future. For this reason we must endeavour to make the Navy and merchant marine an attractive alternative to industry and at the same time not sacrifice the enormous gains to be had from utilizing high technology.

An important consideration for any shipboard system must be, as the theme of the Symposium suggests, the reliability and maintainability criteria. What are these criteria? Are they realistic? Do they unduly rule out good designs on cost alone? If the design is ruled out on cost alone, are we shortsighted? These questions are valid and have no universal answers. Furthermore, these questions are a mere smattering of those that could be asked. I submit that we are now in a position to be able to address these criteria with a new confidence that properly designed high technology systems will result in reliable and maintainable ship's systems. Digital electronics and the current level of high technology makes this possible. A challenge of the 80's is to meet realistic reliability and maintainability criteria, for if we do not, our ships will be traversing the oceans with control systems whose performance and reliability is questionable to the point of unacceptability. I am sure that the reliability and maintainability panel to be convened later this week will discuss these problems in depth.

Let us reflect for a moment on the initial sequence of events we could envisage for retro-fitting a typical control system in a warship. Firstly, the control system of interest is probably interfaced to other systems or pieces of hardware in an ill-defined fashion at best, which necessitates moving the boundary of the initial retro-fit accompanied, of course, by increased cost. Secondly, it becomes immediately apparent that something has to go and that something is usually a reduced set of desirable design criteria which will eventually result in a degraded final system that bears little or no resemblance to the original. The unfortunate part of this exercise is that it will generally affect, in part or totally, the system design criteria alluded to earlier. The point I'm making with this insignificant example is that it emphasizes the problem inherent in ships of the Canadian Navy, and I'm sure other navies, namely the lack of a cohesive ship system integration process in the original design phase. With a structured top-down approach to ship design/building we can quite easily take advantage of what high technology has to offer and substantially reduce the considerable time delay between presently available systems and what is actually fitted in a ship. In addition, the cost highlighted in the retro-fit example would no longer be significant, which would greatly enhance the decision for fitting the system.

I suggest that a challenge of the 80's is to design ships that have well structured system boundaries. These ships would enable people engaged in the ship-control systems field, and other areas of expertise, to offer Management the potential of utilizing proven state-of-the-art control systems to enhance a ship's operational capability or to deal with changing manning requirements at costs that do not strain limited budgets. The potential cost savings associated with our ability to fit improved mission capability systems with greatly reduced interface costs in a ship 10, 15 or 20 years after commissioning are enormous. As Dr. Mann stated during his keynote address given at the Fifth Ship Control Systems Symposium, "there is a need to get the budget down," and in this day of limited budgets these words continue to ring true.

In conclusion, I am aware that not all of the challenges presented this morning, or those which you will hear throughout the symposium, will be successfully resolved. The ever-present cost implication will take a heavy toll. However, I suggest it is incumbent on you as ship control systems people to accept these challenges, particularly the reliability and maintainability aspects and the relationships between high technology and manning requirements.

The initial system costs should not be considered as being insurmountable, for if we were to adopt this attitude progress would be miniscule. Rather, effort should be spent on understanding the benefit to be gained from the high front end costs associated with the reliability and maintainability criteria. When these high costs are considered over the life-cycle a convincing argument readily develops. I suggest that in a majority of cases the high front-end costs would have saved and will save us many downstream costs. The message is clear; there is a place for high technology in ship control systems, but do not sacrifice people for the technology, rather search out and define that boundary where they mutually co-exist.

Thank you.

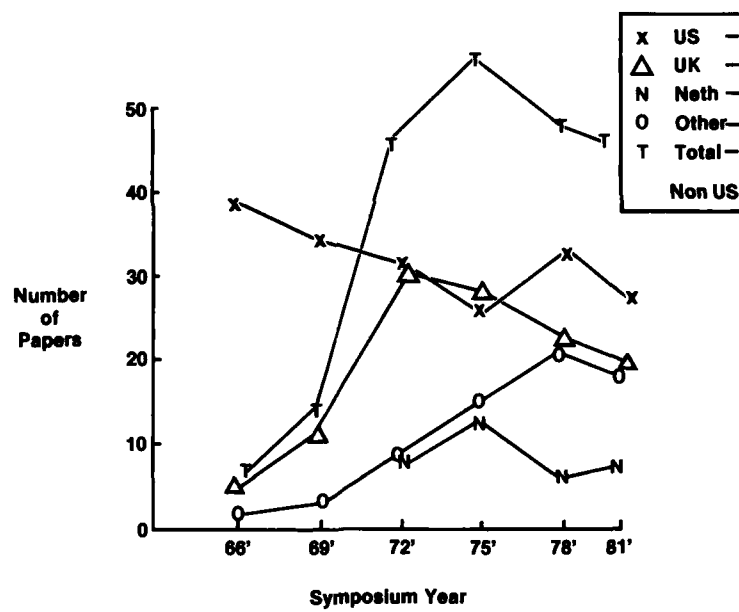


FIGURE 1
Major Contributors to the Ship Control Systems Symposium.

	Overview	Piloting & Navig.	Bridge	Steering Contr.	Collision Avoid.	Maneuvering	Maneuver. - Simulation	Stabilizers	Automat & Control	Propul. Plants	Propul. Control	Propul. Simulation	Propellers	Auto Monitoring	Electrical Power	Microprocessors	Human Factors	Special Craft	Systems Analysis	Total
USA	1	3	3	1	1	1	4	1	3		2			3	3					26
UK	1		5			2	3	1	1	1	3			2	1					20
Neth	1	1	1	1		1								1	1					7
Canada	1	1	1						2	1				1						7
W Ger									1	2										3
Italy								1												1
Japan					1															1
Sweden						1														1
Denmark			1																	1
Spain			1																	1
Neth/UK														1						1
Italy/Neth			1																	1
Total	4	5	12	2	1	5	7	3	6	1	2	7	0	4	6	3	0			70

Figure 2. Technology Contributions by Country - 1981
(Sixth Ship Control Systems Symposium)

		Overview Piloting & Navig. Bridge Steering Contr. Collision Avoid. Maneuvering Maneuvering Stabilizers - Simulation Autonet & Control Propul. Plants Propul. Control Propul. Simulation Auto. Monitoring Electrical Power Microprocessors Human Factors Special Craft Systems Analysis Total																			
1	USA	8	12	10	10	4	10	14	7	16	5	18	9	7	10	1	2	12	31	4	190
2	UK	3	2		6		7	5	13	5	2	22	9	4	12	5	7	6	1	6	115
3	Neth	1	6	1	6	1	2	3	1		3	3		1	2	2	1	4			37
4	Canada	2	1	4						1	2	4		1				2	4		19
5	W Ger					1					1	1	1		2			1		2	9
6	Norway		1				1						2		4	1					9
7	Japan				2		1	2					1							1	7
8	Sweden				1		2		1				1	1				1			7
9	Italy				1						2	1									4
10	Spain				1	1															2
11	France							1		1											2
12	Denmark				1																1
13	Israel										1										1
14	Neth/UK																1				1
15	Italy/Neth				1																1
	Total	14	22	16	29	6	23	25	22	23	16	49	23	14	30	9	11	26	36	13	405

Figure 4 Total Symposium Papers (1966-1981)

Technology Area	'66	'69	'72	'75	'78	'81	Total
Overview	3	2	0	1	4	4	14
Piloting & Navigat.	3	4	6	0	3	5	21
Bridge	5	0	2	5	3	1	16
Steering Contr.	-	-	-	6	11	12	29
Collision Avoid.	-	-	-	4	0	2	6
Maneuvering	2	4	4	9	3	1	23
Maneuver-Simulation	5	6	2	8	3	1	25
Stabilizers	3	5	6	3	0	5	22
Automation & Contr.	6	2	8	0	0	7	23
Propul. Plants	0	2	4	0	2	3	11
Propul. Control	3	4	11	12	13	6	49
Propul. Simulation	3	4	3	5	7	1	23
Propellers	1	3	5	3	0	2	14
Auto. Monitoring	0	3	8	4	8	7	30
Electrical Power	0	0	6	1	2	0	9
Microprocessors	-	-	-	0	7	4	11
Human Factors	2	1	3	7	7	6	26
Special Craft.	8	9	3	6	7	3	36
Systems Analy.			6	6	0		13
Total	45	49	77	80	80	70	401

Figure 3. Technology Area Contributions by Symposium Year

SYMPOSIUM ~~Authors~~ AND CHAIRMEN BIOGRAPHIES



LCdr R.W. Allen Royal Navy is serving on exchange with the Canadian Armed Forces. He joined the Royal Navy in 1970 after nine years in industry and has served as an engineering officer on a number of ships. He is presently a sub section head in charge of marine propulsion transmissions at the National Defence Headquarters in Ottawa.



Job van Amerongen obtained his Master's degree in Electrical Engineering at Delft University of Technology in 1971. During his military service with the Royal Netherlands Navy he worked on automatic steering of ships. In 1973 he joined the Control Laboratory of the Electrical Engineering Department at Delft University of Technology where he is at present a senior scientific staff member. His research interests are the applications of modern control theory in ship automation and in electrical power plants.



LCdr Michael Ashworth, RN graduated from the University of Durham in 1959 and subsequently did research and development in the guided weapons field with the Hawker Siddeley Group. Later, he held a research appointment with the turbo-alternator manufacturers, C.A. Parsons Ltd. as leader of the special projects section. In 1965 he joined the Instructor Branch of the Royal Navy and Cdr Ashworth is now serving at the Royal Naval Engineering College, Plymouth, where he is a senior lecturer in control engineering. Since 1975 he has been a visiting research associate of the Dynamic Analysis Group in the Department of Mechanical Engineering and Engineering Production of the University of Wales Institute of Science and Technology, where he has worked closely with Professor Towill.



Jordi Ayza graduated from the High Technical School of Industrial Engineering, Barcelona as an industrial engineer in 1970. He received his Ph. D. (Engineering) from the Polytechnical University of Barcelona in 1978. He is presently Head of Research in the Automatic Control Dept. of the Institute of Cybernetics, U.P.B.



Dave Beevis, after engineering training, obtained a Masters Degree in Ergonomics from the College of Aeronautics, Cranfield, England. He has since worked in industry in Canada and in the U.K., specializing in the human engineering problems in the design of man/machine systems. He has worked on a variety of maritime systems including Operations Room equipment, and the bridges of several specialized ships. For the past ten years he has worked on a number of major Canadian Forces procurement programmes, at DCIEM in Toronto, where he is currently Head of the Human Engineering Section.



Luis Basanez graduated as an industrial engineer from the High Technical School of Industrial Engineering in Barcelona in 1967, receiving his Ph. D. (Engineering) from the Polytechnical University of Barcelona in 1975. He is presently the Vice Director of the Institute of Cybernetics, C.S.I.C.



Cdr B.H. Baxter joined the Canadian Navy in 1957 as a marine engineering apprentice. Twenty-Four years training and experience have culminated in present posting as section head of the Canadian Forces design authority for propulsion control and interior communication systems. Qualifications include post-graduate academic and destroyer command (Part 1).

Russel A. Benel received his Ph.D. in engineering psychology from the University of Illinois at Urbana-Champaign. He is currently a Senior Research Scientist with Essex Corporation where he is the manager of the Human Factors Engineering Programs. He is responsible for scientific studies associated with that program, specifically the development, application, and validation of human factors engineering technology for surface ship systems such as aircraft launch and recovery, propulsion engineering, combat direction, weapons, and total ship systems.



Ronald Benjamin is an electronic engineer in the machinery centralized control systems branch of the U.S. Navy's Naval Sea Systems Command. A 1973 graduate of the University of Maryland, he specializes in new control system design.



John F. Best received the B.S. degree in electrical engineering and the M.S. degree in control systems from the University of Connecticut, Storrs, Connecticut in 1974 and 1978, respectively. From 1974 through 1978 he held teacher and research assistantships in the Electrical Engineering and Computer Science department at the University of Connecticut. In 1978, he joined ORI, Inc. in Silver Spring, Maryland. His work at ORI, Inc. is in the areas of application of optimal control techniques for the control of surface ships and high performance vessels (hydrofoil, air-cushioned craft, (SWATH) and for the development of human operator models for submarine control. Current efforts include the development of a team model for the submarine planesmen (stern and forward) during depth and coursekeeping.



George Blackwell graduated from Glasgow University, Scotland in 1950 with B.Sc. in Electrical Engineering. Became section head of Maritime Electrical Power Systems Section in 1970. Appointed Director Maritime Engineering Support in 1979, responsible for Naval Maintenance Management Systems and for the provision of specialist services in noise, vibration and shock materials engineering, habitability, human engineering and computer-aided design.



Mr. Luther M. Blackwell is presently the Multiplex Systems Acquisition Manager in the Bridge Control, Monitoring, and Information Transfer Branch of the Naval Sea Systems Command (NAVSEA). He graduated from the University of Maryland in 1964, receiving his BS degree in Electrical Engineering. After graduation he was employed in the Bureau of Ships where he held project engineering assignments on various Ships Entertainment, magnetic tape recordings, fiber optics, and mass memory systems. He is currently pursuing graduate studies in Engineering Management at the George Washington University.



Walter J. Blumberg received his BSEE degree in 1950 and his MSEE degree in 1955, both from the University of Maryland. He is currently Head of the Machinery Automation and Control Division of the David Taylor Naval Ship Research and Development Center, Annapolis Laboratory. Since 1964, he has held research and development positions at the Annapolis Laboratory as Senior Project Engineer, Program Manager, Head of the Control and Simulation Branch and Division Staff Assistant. During this period, he continuously promoted programs in surface ship advanced bridge control systems and displays, ship control systems, automation and computer simulation as a research tool. He was also General Chairman of the First, Second, and Fifth Ship Control Systems Symposium.



Ms. Bozzi received her bachelors degree from the University of Maryland, graduating Magna Cum Laude in 1973 and received a Masters in Numerical Science from the John's Hopkins University in 1978. Ms. Bozzi has been working in control system development since 1974, writing software simulations and analysis tools, and performing the analyses. These efforts have been for submarine controller designs and for a Monte Carlo Human/Submarine simulation model. She has also been responsible for data analysis projects for JEFF craft full scale trials, SES Model Carriage tests, and has designed and supervised software for an Aircraft flight procedures interactive design program for the Environmental Protection Agency.



A.W. Brink graduated in aeronautics at the Delft University of Technology. In 1970 he joined TNO-IWECO, which is the Dutch abbreviation for the Institute for Mechanical Constructions of the Organization for Applied Scientific Research in the Netherlands. Since then, he has been involved in simulation of ships, and particularly in studies on automatic control.



Commander (E) J. Brink, received his commission as an officer in the Royal Netherlands Navy (branche-marine engineering) in 1960. After six years serving at sea in destroyer type ships and three years service at the Royal Netherlands Naval College; he studied mechanical engineering at the Technological University of Delft and received his degree in 1973. He is now serving as head of the Materiel Standardization office of the Directorate-General Materiel in The Hague.



Dr. D.R. Broome graduated in Mechanical Engineering from London University in 1965. He joined the engineering development staff of Elliot Automation Ltd., working mainly on reactor control systems for commercial and submarine propulsion applications. In 1970 he became a Lecturer in Control Engineering in the Dept. of Mechanical Engineering, University College London, and received his Ph.D. in 1976. Current research interests include identifying ship dynamics from free-running scale model experiments, computer controlled diesel engine testing, and human operation of ships' autopilots.



C.J. Bruce joined the staff of the National Gas Turbine Establishment in 1969 and worked in the Diesel Engine Test Section. In 1970 he left the Establishment to obtain a BSc in Mechanical Engineering from the Polytechnic of Central London. After graduating in 1973 he returned to the Machinery Control Section of NGTE(WD) and has worked on projects concerned with ship motion control and the application of processor based systems to the control of ships' machinery. For the past three years he has worked as the System Support Manager, setting up the Naval Machinery Control Evaluation Centre.



Mr. W.H.P. Canner has been a lecturer in Ship Control Technology since 1961 at the Department of Maritime Studies in the University of Wales, U.K. He holds an M.Sc. degree in Ship Control, is a Chartered Engineer and a member of the Institute of Electronic and Radio Engineers. Prior to lecturing at the University, he was working on aircraft control systems after following a career as both aircraft navigator and electronic engineering in the aircraft industry. He has published a number of articles in various journals and has made two previous contributions to this series ship control symposia.



Chun-Che Fung completed the Marine Electronic Officer Course in the Hong Kong Polytechnic in 1974, served in Merchant Navy as Radio/Electronic Officer for three years. He graduated with first Class Honours in Maritime Technology from University of Wales, Institute of Science and Technology in 1981.



M. Clarke joined Decca Radar Ltd as a student Apprentice and gained a B.Sc. in Electrical Engineering (Electronics) at Surrey University. After graduation, joined the Marine Laboratory responsible for the design of Marine, Military Ground and Airborne Radar Systems. Since 1970, with Muirhead Vactric Components Ltd. he has been responsible for the design of optical shaft angle encoders, including associated modular electronics as applied to Military and Civil data processing systems. In 1978, he was promoted to Chief Engineer in charge of Muirhead Vactric's System Engineering capability. During this time, projects for the U.S. Navy, Royal Navy and the system described in the paper have been completed.



Mr. Cook is Chief of Simulator Operations at Ship Analytics, Incorporated. He was project manager of the LOOP simulator study being presented at the symposium, and has examined the application of real and fast time vessel operations models for the development of other ports. Mr. Cook is currently engaged in at-sea and simulator evaluations of floating, fixed and electronic radio aids to navigation. In particular, he is investigating the effectiveness of RACON placement and electronic display enhancements on radar pilotage.



Mr. Cooper is the director of a U.S. Coast Guard study for determining the effectiveness of certain shipboard electronic navigation displays for harbor pilotage. Mr. Cooper has spent almost fifteen years in the operational evaluation of collision avoidance systems, navigation systems, and pilotage techniques both at sea and in ship simulators. Aside from the project discussed in the symposium paper, Mr. Cooper has conducted the development and evaluation of standardized merchant ship bridge designs. He is presently engaged in writing a draft specification and guidelines for the design of automated merchant ships' bridges, and would welcome suggestions on his endeavor from symposium attendees.



Dr. H. Corleis following secondary school joined the Technical University of Aachen to read General Electrical Engineering, obtaining the degree of Dipl. Ing. Since October, 1962, on the staff with AEG - TELEFUNKEN, employed in various areas, such as development, project engineering - and sales department. From 1966 onward he specialized in electrical technology for naval vessels, being appointed General Manager for Naval Systems in 1972. In 1972 he was awarded a doctorate (Dr. Ing.) by the University of Aachen.



Hua Tu Cuong received a BSE (Naval Architecture and Marine Engineering) from the University of Michigan in 1971. From 1971-1975, worked for the Department of Public Works, Saigon, Viet Nam. From 1975-1979, attended graduate school at the University of Michigan while working as a Research Assistant. Received MSE (Naval Architecture and Marine Engineering) in 1976, MSE (Computer Information and Control Engineering) in 1977, and Ph.D (Naval Architecture and Marine Engineering) in 1980. Appointed Assistant Research Scientist in same department in 1980. Joined Westinghouse Marine Division in September, 1981.



Since graduating from Cardiff in 1970 with an Honours degree in Electrical Engineering, Mike Curran has spent eight years in the aerospace industry prior to joining H.S.D.E. During this period, he was engaged in Flight Test instrumentation on prototype aircraft using both analogue and digital recording systems, with responsibility for designing special transducer interfaces. On moving to the Marine Systems Division of Hawker Siddeley he was engaged in the design of a Digital Distributed Controls System, followed by work on several distributed surveillance systems for the military marine market.



Warren C. Dietz is a graduate of the University of Washington (BS in Physics) and MIT (ScD in Marine Engineering). Dr. Dietz is a member of SNAME and ASNE. He is currently Head, Propulsion and Auxiliary Systems Department and Associate Technical Director for Propulsion and Auxiliary Systems, David Taylor Naval Ship Research and Development Center (DTNSRDC), Bethesda, Maryland. Prior to joining DTNSRDC in 1979, he was Chief, Ship Design Branch, Naval Engineering Division, U.S. Coast Guard Headquarters from 1975 to 1979.



W.S. Dines obtained his B.Sc in Mathematics in 1976 from Hatfield Polytechnic. From 1974 to 1978 he was with Hawker Siddeley Dynamics as senior engineer on the Sea Dart missile system. He is presently with HSD Engineering as principal engineer working on design of future and development of current microprocessor propulsion control systems.



A.M. Dorrian is a Chartered Engineer, and a Member of the Institution of Mechanical Engineers, and the Royal Institution of Naval Architects. He received his B.Sc. (Hons) degree in Mechanical Engineering from Strathclyde University after serving a general engineering apprenticeship. He joined YARD LTD in 1970, working, for a time, in the Acoustics Group. He later transferred to the Controls and Simulation Group of which he is now Manager, and is currently responsible for studies of machinery and marine vehicle dynamics, control and surveillance system design and Defence Analysis Systems and Failure Mode and Effect Analysis.



Mr. Ducco attended University of the Torino Politecnico where he obtained his degree in Electronic Engineering in 1972. He then followed a Scholarship post-graduate advanced course on Control Systems Engineering of the GALILEO FERRARIS electrotechnics Institute. He joined SEPA Marine Automation Department in 1974 and has been involved in the design of digital and analogue interface circuits and of the single lever proportional control system in connection with the Italian Navy Lupo Class frigates. He has been responsible for the modifications acceptance tests and implementation of the Mathematical models proposed for the above mentioned Lupo Class frigates.



Lyle W. Ferguson was educated at Tulane University in New Orleans, Louisiana, and received a Bachelor of Science in Mechanical Engineering in 1962 and a Master of Science in Mechanical Engineering in 1964. He has been employed by TANO Corporation since 1968 as Mechanical Engineer, Project Engineer and Program Manager. Mr. Ferguson is a member of the American Society of Mechanical Engineers and the Louisiana Engineering Society.



Edward David Michael Floyd entered the Royal Naval College at Dartmouth in 1951 as a Naval Cadet. After obtaining his degree in Mechanical Sciences at Trinity Hall, Cambridge he undertook two further years of study in naval engineering before taking up his first sea appointment in a Battle Class Destroyer. He subsequently served at sea in 4 other destroyers as the Weapons Engineer. His shore appointments included a period on guided missile systems in the Weapons Department, 3 years in the Ship Department designing control and instrumentation systems for nuclear submarines, and more recently he attended the NATO Staff Course in Rome before serving on the staff of C in C Allied Forces Southern Europe. He took up his current appointment as Head of the Control Sections in the Ship Department 3 years ago.



R. Foulkes obtained a B.Sc. (First Class Hons) degree in Electronics, Telecommunications, Computer Technology and General Electrical Engineering at the University of Salford, while serving an undergraduate apprenticeship with the British Aircraft Corporation. He was awarded the Governors' Prize. Since joining YARD LTD in 1971 he has been involved, mainly, in the development of computer software and man/machine interfacing. He is currently Chief Engineer, responsible for the technical quality of both hardware and software in the Computer Systems and Software Group.



J.S. Gardenier received his BA in Philosophy from Yale University in 1959, his MS in Business Administration in 1968, and his DPA in 1973 both from George Washington University. A former naval officer and research consultant in automated information systems he is presently employed as an Operations Research Analyst with the US Coast Guard Office of Research and Development.



Alex Gerba attended the University of Louisville, Kentucky, where he received the degree of Bachelor of Electrical Engineering in 1946. Graduate study was undertaken at the University of Illinois where he received the degree of Master of Science in 1957. He joined the faculty of the Department of Electrical Engineering at the Naval Postgraduate School in 1959 as Assistant Professor. From 1962, he has held the rank of Associate Professor teaching in the area of controls, circuits and electronics. Naval Sea Systems Command sponsored research activities from 1973-80 have been in the simulation and control system design for the high speed surface effect ships of the captured air bubble type. Starting in early 1980, sponsored research for Naval Underwater System Center was undertaken on the development of Event Technology for torpedo control in the classified Project Courageous.



Cornelis C. Glansdorp obtained his M Sc. Naval Architecture at Delft University in 1966. In 1967 he joined the Royal Netherlands Navy as a Royal Netherlands Reserve Navy Officer. In 1968 he joined the Shipbuilding Laboratory of the department of Naval Architecture Delft of the University of Technology, specialising in manoeuvring of surface vessels. Subjects which were covered: PMM-test, simulator tests, calculation of linear manoeuvring derivatives. In 1974 he joined the chair of navigation of same department. In 1976 he became a part-time consultant of the Navigation Research Centre of the Netherlands Maritime Institute, which was founded in late 1973. In 1978 he was appointed as a fellow of the Royal Institute of Navigation. May 1st 1981 he was appointed as head of the Navigation Research Centre of NMI.



Mr. Gorrell obtained a B.A.Sc. degree in Mechanical Engineering from the University of Waterloo (Canada) in 1969. He subsequently studied in England as an Athlone Fellow and received his M.Sc. Degree in Ergonomics from the University of London in 1971. Mr. Gorrell is presently employed as a defence scientist by the Defence and Civil Institute of Environmental Medicine, Toronto, where he is responsible for a number of human engineering projects.



Ernst Grunke graduated in 1954 with a degree in Electrical Engineering. Originally employed with Siemens AG he is at present Head of the Electrical Engineering Department, Ships System Division of MTG Marinetechnik Planungsgesellschaft mbH.



Commodore Healey enrolled in the Royal Canadian Navy as an Officer Cadet in September 1953. He was promoted Commander in March 1970 and posted to Canadian Forces Headquarters, Ottawa, as Section head, Prime Movers and Boilers Design Section. Upon promotion to Captain(N) in August 1974 he moved to Headquarters, Training Command as Deputy Chief of Staff, Leadership and Support Training. On 16 June 1980 he was promoted to his present rank of Commodore. He assumed the duties of Program Manager of the Canadian Patrol Frigate Program 27 June 1980.



Rear Admiral Hopkins graduated from Cornell University with a Bachelor of Science Degree in Mechanical Engineering and was commissioned as Ensign in the U.S. Navy in February 1948. Rear Admiral Hopkins also received a degree as "Naval Engineer" from the Massachusetts Institute of Technology in 1955. He is presently assigned as Deputy Commander for Ship Systems, Naval Sea Systems Command (NAVSEA 05). Prior to his present assignment, he served as Assistant Chief of Staff, Maintenance and Material Readiness (Fleet Maintenance Officer) on the Staff of Commander in Chief U.S. Atlantic Fleet from May 1977 until September 1980. In addition to the two Meritorious Service Medals, Rear Admiral Hopkins holds the Naval Unit Commendation for his service on USS PROTEUS (AS-19).



Cdr Ironside escaped from McMaster University in Hamilton in 1966 with a B. Eng in Engineering Physics, and from the University of Manchester in 1968 with a MSc in Automatic Control Systems. He is presently head of the SHINPADS project section in National Defence Headquarters, Ottawa, where he is responsible for completion of the development aspects of the system.



Claes G. Kallstrom received his Civilingenjor degree (Master of Science) in Electrical Engineering in 1970 and his Teknisk Doktor degree (Doctor of Science) in Automatic Control in 1979, both at the Lund Institute of Technology, Lund, Sweden. From 1970 to 1979 he was Research Engineer at the Department of Automatic Control, Lund Institute of Technology. Since 1979 he has been employed as Research Engineer at the Swedish Maritime Research Centre, SSPA, Gothenburg, Sweden.



Paul Kaplan received the BS in Physics in 1950, the MS in Fluid Dynamics in 1951 and the D.Sc in Applied Mechanics in 1955 all from the Stevens Institute of Technology. He was President and Technical Director of Oceonics, Inc. from 1961 to 1979 and is currently President of Hydromechanics, Inc. Dr Kaplan's work has included dynamic stability and control analysis of hydrofoil craft, submarines, underwater missiles and ships, wave generation, propagation, and interaction with bodies near or on a free surface; steady and unsteady supercavitating flow; hydroelasticity (flutter and divergence); forces and moments acting on bodies in waves; motions in waves of hydrofoil craft, ships, submarines and underwater missiles, including generalized harmonic analysis for random sea conditions; propeller design; unsteady propeller forces; studies related to ship vibration and bending moments on bodies in waves; turbulence and flow noise study surveys.



Dr. D.F. Liang received the B.Sc. and M.Sc degrees from the University of Manitoba in 1969 and 1971, respectively, and the Ph.D. degree in 1974 from the University of Alberta, Canada. From 1974 to 1975 he was employed in Canadian telecommunication industry. From 1975 to 1977 he was with the Defence Research Establishment Valcartier, working in the areas of missile guidance and control. Since 1977 he has been with the Defence Research Establishment Ottawa.



Denis Lidstone was originally employed by the Ministry of Defence, H.M. Devonport Dockyard, Plymouth, as an Electrical Fitter Apprentice and a Test Engineer subsequently Qualified through H.M. Dockyard Technical College in Electrical/Electronic Engineering. Passed Institution of Electrical Engineers Degree Course following study at the Plymouth Polytechnic in 1969. Joined Vickers Shipbuilding's Electrical Design Office in 1969 as a Design Engineer in Control & Instrumentation. Presently at Vickers Shipbuilding & Engineering Ltd as Assistant Design Manager (Light Current), responsible for all Control & Instrumentation aspects of current contracts, mainly in the field of Machinery Control. Became a Chartered Electrical Engineer in 1974.



Warren L. Malone holds a B.S. Degree in Engineering Physics from the University of Illinois and a M.S. Degree in Physics from New York University. He has worked with the Navy Department since 1967. In his positions at the Naval Air Systems Command and the Naval Research Laboratory he conducted several R&D projects related to advanced sensors, signal processing, and propagation of electromagnetic waves. Since 1972 he has been Head of Sensors and Controls in the Surface Effect Ship Project and the Advanced Vehicles Development Office where he is responsible for advanced vehicle related technology in the areas of sensors, controls, and human factors. The current paper is the third presentation at a Ship Control Systems Symposium.



Robert J. Maddock, Bachelor Science, Mechanical Engineering 1946, North Dakota State University Graduate Study Certificate, Univ. of Illinois 1966. During his 35 years with the Fairbanks Morse Diesel Engine plant in Beloit, Wisconsin, Mr. Maddock has had experience in engine design, development and application. As a vibration analyst he has long had a particular interest in propulsion train design. His simulation studies include Propulsion Control Systems, Nuclear Power Safety Systems and a wide range of subsystems and components.



Tim Marwood completed an Honours Degree in Electrical Engineering at London University during an apprenticeship with De Havilland Aircraft Company, now British Aerospace. On moving to Hawker Siddeley Dynamics he designed electronic controls for aero gas turbines and propeller synchronising. With International Computers Ltd. he developed computer mainframe logic and peripheral controllers, before returning to Hawker Siddeley, where he is now Systems Consultant in the Marine Systems Division, working on analogue and digital propulsion controls. He serves on the Control Applications Group Committee of the Institution of Electrical Engineers.



Commander E.R. May served as an Engine-room Artificer in HMS 'Renown' 1942-45, was commissioned in 1945, and attended the R.N. Advanced Engineering Course 1947-1949. He spent nearly 14 years on diesel engine design, manufacture (for submarines) installation and repair, including a total of six years in Admiralty design and specialist sections. He served as Deputy Superintendent and Chief Test Engineer of the Admiralty Marine Test Establishment, before leaving the R.N. in 1970 to join Stone Manganese Marine Ltd. as Engineering Director. He is now Technical Director of Stone Vickers Ltd., Messrs. Vickers having acquired the marine engineering interests of Stone Manganese Marine Ltd. earlier this year.

Leonard Marshall graduated in Psychology (B.A.) from the University of Newcastle-upon-Tyne in 1977, and in the following year obtained his masters degree in Ergonomics (M.Sc.) from London University. Since 1978 he has worked as a research assistant in the Dept. of Mechanical Engineering, University College London. Current research interests include multivariable human problem solving and human performance in the operation of ships' autopilots.



W.B. Marshfield is a Senior Scientific Officer with the Admiralty Marine Technology Establishment (Haslar, Gosport, UK). Since the age of 16 he has been employed in various Admiralty research establishments and has obtained his professional education by various day release courses, the latest of which was an MSc course in Control Technology - the degree being awarded in 1979. After many years in electronic instrumentation work he joined the seakeeping (now hydrodynamics) research section at AMTE in 1975. Since then his principal interest has been the roll motion of ships and its control. In addition to the trials described here he has carried out research work on an active moving weight stabiliser system and is currently concerned with research into the capsize behaviour of ships. The tuning of autopilots was added to this work load in 1978.



J.B. McHale is a Chartered Engineer and Member of the Institution of Electronic and Radio Engineers. In 1967 he obtained HNC with distinction in Electronics Engineering, with endorsements in Control Engineering and Applied Electronics. He joined his present company, YARD LTD, in 1972 and has been primarily responsible for building up the company's capability and expertise in microprocessors. He is currently Manager of the Computer System and Software Group.



Mr. J.C. McMillan received B.Math. and M. Phil. degrees from the University of Waterloo in 1976, 1978 and 1980 respectively. From 1980 to 1981 he was employed by CAE Electronics, Montreal, where he designed and implemented flight simulator software for avionic navigation instruments. Since 1981 he has been with the Defence Research Establishment Ottawa. His main duty here has been the design and simulation analysis of Kalman Filter algorithms for integration of a set of Marine Navigation instruments.



Mr. Mellis attended Central Technical Institute in Kansas City, MO. where he graduated in Electronic Engineering Technology and later attended the University of Minn. in Minneapolis, Minn. At present he works in the Manning and Controls Integration Branch of the Naval Sea Systems Command (NAVSEA) where he is responsible for developing manpower requirements for ship designs and for the coordination of shipboard automation designs with the U.S. Navy's manpower availability. Mr. Mellis is currently developing manpower requirements for the U.S. Navy's DDGX ship design. In this capacity he has examined proposals for shipboard manpower reductions through the use of automation and remote control techniques. Previously, Mr. Mellis was the Electrical and Electronic Subsystem manager in the Navy's Computer-Aided Ship Design office of NAVSEA. Prior to this employment with NAVSEA he worked for General Dynamics/Electronic Division as a Senior Field Engineer on the Apollo Instrumentation Ship (i.e. Vanguard, Redstone, Mercury). He was responsible for Central Data Processing System on the three ships.



Mr. Moretti attended his university course in Turin Politecnico where he obtained his degree in Electronic Engineering in 1971. He joined SEPA S.p.A. - Societa di Elettronica per l'Automazione - in 1971 and was initially involved with the design of automated computerized warehouse systems. In 1973 joined Marine Automation Department where he became engaged in the System Engineering of the Italian Navy Lupo Class Frigates Propulsion Automation System. He has then been responsible for the implementation, commissioning and test trials of the same equipment and Frigates. Mr. Moretti is currently responsible for the Marketing and Technical Sales of surface ships propulsion automation and control systems.



LCdr Neil Mort, after graduating from the University of Leicester (1971) and the University of Manchester Institute of Science and Technology, Control Systems Centre (1972), joined the Royal Navy as an Instructor Officer in January 1973. Following a 2 1/2 year appointment in the Air Engineering School, HMS DAEDALUS, Lee-on-Solent, he moved to his current position as a lecturer in the Control Engineering Section of the Royal Naval Engineering College in August 1975. Professional interests are ship dynamics, autopilot design, identification, self-tuning and adaptive control, human operator modelling.



Neil Munro obtained his B.Sc. in Electrical Engineering from Strathclyde University in 1962, and his M.Sc. in 1967 and his Ph.D. in 1969 in Control Engineering from the University of Manchester where he was appointed a Lecturer in 1969, Senior Lecturer in 1973 and Professor of Applied Control Engineering in 1979 in the Control Systems Centre, University of Manchester Institute of Science and Technology. He is the author or co-author of over 40 papers concerned with the development, implementation and application of computer aided design techniques for multi-variable systems. He has also spent some 10 years in industry as an electronics technician, development engineer and senior design engineer working for Barr & Stroud Ltd., Ferranti, Parkinson Cowan Measurements, and I.C.L.



Bryan Nakagawa is a design engineer currently on an education leave from the Engine and Turbine Controls Division of the Woodward Governor Company. His eight years at the Woodward Governor Company include four years in Field Service and four years in Engineering assisting in the development of programmable sequencers. Bryan received a BSEE from the University of Colorado and is working toward an MSEE from Colorado State University.



Mr. I.E.F. Ogilvie obtained his degree in Mechanical Engineering from Queen's University in 1972, and served as a Marine Engineering Officer in the Canadian Navy until 1978. He has since worked for the Department of National Defence on the design and analysis of helicopter hauldown systems in a consultant capacity to the USN 'LAMPS' program; and more recently in the Naval Propulsion section with responsibility in the area of propeller and shafting systems.



Mr. O'Neill was born in 1952 at Athy, Ireland. After spending five years in the Merchant Navy as a Radio Officer, he studied Electronics in Cardiff Wales. Since 1980 he has been a lecturer in Electronics at Carlow Regional Technical College Ireland.



Michael Parsons attended Oregon State College, University of Michigan (BSE in Naval Architecture and Marine Engineering, 1963) and University of Oregon on Naval ROTC Scholarship. Received certificate from the Westinghouse Bettis Reactor Engineering School and attended George Washington University and the Catholic University of America (MEE in Mechanical Engineering, 1969) while on active duty. Received Ph.D. in Applied Mechanics specializing in optimal control from Stanford University in 1972. Returned to the University of Michigan in 1972 and has been department chairman since July 1981. Current research interests include optimal control, optimization, and computer applications in naval architecture and marine engineering.



Edwin M. Petrisko received his BSME in 1964 from the University of Pittsburgh and a Masters Degree in Technology of Management in 1973 from American University. He is currently Head of the Control and Simulation Branch of the David Taylor Naval Ship Research and Development Center, Annapolis Laboratory. Since 1964 he has held various positions at the Annapolis Laboratory dealing with instrumentation, monitoring control, and computer simulation of shipboard machinery systems. He is a member of the American Society of Naval Engineers and the Severn Technical Society. He was also Registration Chairman for the Fifth Ship Control Systems Symposium.



Anton Charles Pijcke, entered the Royal Netherlands Naval College at Den Helder (branch: Marine engineering) in 1949 and received his commission in 1952. He has been senior lecturer in Marine Engineering at the Royal Netherlands Naval College during several years and was also head of the Department of Technical Studies. He left the Royal Netherlands Navy as a Commander and is now a staff member of the National Foundation for the Co-ordination of Maritime Research at Rotterdam. He obtained his M.Sc. degree at London University, is Fellow of the Institute of Marine Engineers and is a chartered engineer.



Ian Watson Pirie was educated in Scotland and completed a Student Apprenticeship with the Ministry of Defence before being sponsored for a first degree at Manchester University. After post graduate training he joined the Admiralty's Surface Weapons Establishment and worked on the First of Class commissioning and sea trials of the Sea Dart missile system. He transferred to Ship Department in Director General Ships Bath in 1975 and since then has been involved in a major research and development programme for machinery controls and surveillance. He was the Project Leader for the development of a new digital Propulsion Control System then in 1980 he was promoted to take responsibility for all future control systems.



Mr. Plato graduated from the City College of New York in 1956 with a Bachelor of Mechanical Engineering Degree. In 1972, he received a Master of Science degree in the Technology of Management. At present he is the Head of the Manning and Controls Integration Branch of the Naval Sea Systems Command (NAVSEA). He is responsible for insuring that accurate manpower requirements are established for all new construction and major overhaul ship projects for the U.S. Navy. In addition, Mr. Plato must coordinate shipboard controls integration and automation aspects with manpower requirements to insure that a compatible solution is developed. Civil Affairs Career Course, Command and General Staff College and the U.S. Naval War College.



Miguel Alvaro Marques Policarpo, graduated from the Portuguese Naval Academy in 1973. Received the degree of Bachelor of Science in E.E. From Naval postgraduate school, Monterey, California in 1979 and a Master of Science in 1980. At the present time he is a consultant engineer on staff at Portuguese Naval Headquarters.



Joseba Quevedo received his degree in Electrical Engineering from the High Polytechnical School of Mondragon in 1972 and his Ph.D. in Automatic Control from the Science University of Toulouse in 1976. He is at present a member of the research staff in the Automatic Control Dept. at the Institute of Cybernetics at the Polytechnical University of Barcelona.



Capt(N) Reilley enrolled in the Royal Canadian Navy in 1957 as an Officer Cadet and received his Bachelor of Science degree in 1962 from Royal Military College Kingston. He has held various positions during his Naval career and was promoted to his present rank in July 1979. Capt(N) Reilley is presently employed in National Defence Headquarters, Ottawa as the Director of Marine and Electrical Engineering. He is also actively participating on the Executive and Editorial Board of the Canadian Institute of Marine Engineers Digest.



Mr. Rein, a former Engineering Duty Officer with the U.S. Navy, graduated in 1957 from General Motors Institute with a bachelor's degree in industrial engineering and later received a bachelor's degree in mechanical engineering from the U.S. Naval Postgraduate School. At present he is the Director for Fleet Support Systems with Columbia Research Corporation, a firm specializing in technical management support to the U.S. Navy with offices throughout the United States, and he has been active throughout his career in the areas of ship design and logistic support. In his present capacity, Mr. Rein is involved with several U.S. Navy projects such as TRIDENT, SSN 668, FFG7, DDGX and Ship System Engineering Standards.



Ron Rhodenizer attended Royal Roads and the Royal Military College of Canada graduating with a Bachelor of Engineering (Mechanical) degree. After serving in various engineering capacities in Canadian Naval Vessels and HMC Dockyards he attended Royal Naval Engineering College Manadon England. Graduating with a Masters of Science Degree in Marine Engineering he returned to Canada to work as a project officer in the Directorate of Marine and Electrical Engineering (DMEE) of National Defence Headquarters. His next posting took him to Director General Ships Bath England where he was Assistant Project Engineer in the Spey Marine Gas Turbine Development Project. Recently he returned to the Machinery Controls Section of DMEE.



Arnold Rowlandson was educated at Barrow Grammar School. He served an apprenticeship with Barrow Corporation Electricity Department and subsequently joined the staff of the North Western Electricity Board as a Commercial Engineer. Following a short tour of duty as Contracts Manager in Sierra Leone, West Africa, he returned to the Electricity Supply Industry in England. In 1967 he was appointed as Chief Commercial Engineer with Zambia Electricity Supply Corporation in Lusaka, Zambia. His next post was as Head of Services dept. with an international Consultancy based in Nairobi, Kenya, from where he returned to England in 1972 and joined the staff of Vickers Shipbuilding & Engineering. He is currently employed as a Senior Design Engineer and heads a team engaged in the detailed design and constructional supervision of all types and sizes of Control Consoles.



Karl-Ferdinand Schultz received his degree in Mechanical Engineering at the University of Hanover in 1961. Previously employed in the design of turbo compressors and steam turbines he is presently the Head of the Mechanical Engineering Department of MTG Marinetechnik Planungsgesellschaft mbH.



Miss Scott graduated from the University of Virginia with a B.A. in mathematics, receiving high distinction for her efforts. Valerie began work with O.R.I. in Silver Spring, Maryland shortly thereafter. For several years she provided mathematical modeling and software in the area of ship and submarine control systems. Projects included ship motion and control system simulations for the TRIDENT submarine and the 688 submarine, submarine human operator modeling, and automatic control feasibility studies for the twin hull ship SWATH. Valerie currently works for O.R.I. doing anti-submarine warfare. She will receive a Masters in Numerical Science from the Johns Hopkins University in May 1982.



J. Stark began his engineering career with Brown Brothers & Co. Ltd. He was educated at the Royal High School and the Heriot Watt College in Edinburgh, subsequently pursuing Control Engineering studies at Queens University, Belfast. Joining the Controls Group of YARD LTD in 1969, Mr. Stark has been involved in the design and development of a variety of control systems for Surface Ships and Submarines. Appointed a Director of YARD LTD in 1980, Mr. Stark is responsible for the Computer Applications Division which embraces Simulation, Controls, Digital Systems, Software, Acoustics and Operations Analysis.



Brian Kenneth Tanner completed a Student Apprenticeship with the Ministry of Defence before being sponsored for a first degree at the Royal Naval Engineering College, Plymouth. After post graduate training he joined Ship Department Bath where he was involved in the operation and support of the first all gas turbine major warship HMS EXMOUTH. In 1973 he attended the Advanced Marine Engineering Course, subsequently joining the Admiralty Surface Weapons Establishment for work in the concepts section of the Launcher Division. He returned to Bath in 1977 and since then has been involved in a major research and development programme in machinery controls and surveillance. Particular work areas have been gas turbine control and systems engineering including plant and ship simulations.



George Thaler received his B.E. in 1940 and the Doctor of Engineering in 1947 both from the Johns Hopkins University. Prof. Thaler is a consultant for the International Business Machines Corp., Microcomputer Systems Corp., and Diablo Systems Div. of Xerox. His publications include seven books in the area of linear and nonlinear feedback control theory, plus about 100 research papers and reports. His research interests are broad, including linear, nonlinear and sampled data controls. His present emphasis is on multivariable systems, computer aided design, and ship control system design. The Naval Postgraduate School has honored him with the Sigma Xi research award and the Distinguished Professor award.



Doctor Antonio Tiano is a Doctor in Applied Mathematics at Genoa University. Awarded a fellowship at the Computing Center of Genoa University and Assistant Professor at the Faculty of Science of the same University. Joined the I.A.N. (Institute of Ship Automation) of the Italian National Council of Researches in 1972 as a scientific researcher, working in different fields, such as: optimization of ship routes, collision avoidance, integrated navigation systems, autopilot design, etc. In the recent years the main research activities are constituted by identification and adaptive control of ship dynamics.



Denis R. Towill holds the degree of B.Sc. (Eng) from the University of Bristol, and the degrees of M.Sc. and D.Sc. from the University of Birmingham. Prior to taking up his present appointment he was a Senior Lecturer in Automatic Control at the Royal Military College of Science, Shrivenham, a Consulting Engineer, and a Dynamic Analyst with the British Aircraft Corporation. He is presently Professor of Engineering Production and Head of the Dynamic Analysis Group at the University of Wales Institute of Science and Technology (UWIST), Cardiff, United Kingdom.



Jan C. van Capelle was born in 1956 in Oss, the Netherlands. He studies Electrical Engineering at Delft University of Technology. At present he is completing his Master's thesis on "Rudder Roll Stabilization".



Mr. Van Vrancken holds a Bachelor of Science in Engineering Sciences from Louisiana State University in New Orleans. He is a senior member of the New Orleans Section of ISA with over 10 years experience in petrochemical/marine instrumentation and control systems. He is at present Manager of Systems Engineering of TANO Corporation, New Orleans, Louisiana, where his responsibilities include design and development of automation systems for the petrochemical and marine industries.



Lieutenant Commander Willem Verhage joined the Royal Netherlands Navy in 1961 and served as an instructor at the Naval Communications School in Amsterdam. In 1969 he was granted his engineering degree in naval architecture from Delft University of Technology, receiving an award for his doctoral thesis. He then served as an assistant manager at the government shipyard in Den Helder. Since 1970 Mr. Verhage serves at the Royal Netherlands Naval College in Den Helder. In addition to his teaching duties in the Department of Naval Architecture he is head of a research team which developed a nocturnal simulator.



Professor Ezio Volta is a Doctor in Electrical Engineering in Genova University. Assistant Professor in the same University, in the fields of Electrical Installations, Electrical Measurements and Instrumentation. At the same time, in technical managing position in industries of Genova and Milano (control equipments). Full professor of Automatic Control at Genova University since 1964. Promoter in 1965 of ships automation studies in Italy, and organizer of the first Italian research group working in the field; director of the "Laboratorio per l'Automazione Navale" of the Consiglio Nazionale delle Ricerche of Italy.



Dr. Ware received the Bachelor and Master of Science in Mechanical Engineering from the University of Detroit and his Ph.D. in control theory and experimental psychology, from the University of Michigan in 1971. From 1971 to 1976 he was employed at the Naval Ship Research and Development Center working on the application of optimal control and estimation theory to the control of advanced naval craft. In 1976 he joined ORI and continued to work in control of naval craft including SWATH, conventional surface ships, submarines, surface effect ships, and hydrofoils. He is currently a Principal Scientist and Technical Director of the Ship Technology Division at ORI.



J.H. Westcott, DSc(Eng), PhD, DIC, BSc (Eng), FEng, F.Inst.MC, FIEE, FBCS, Professor of Control Systems, Imperial College of Science and Technology, London. Professor Westcott received his BSc(Eng) from London University in 1941 and his Ph. D. from Imperial College on 1951. He took up lecturing in the Electrical Engineering Department of the College, later becoming Reader in Automatic Control in 1956 and Professor of Control Systems in 1961. He was Head of the Computing and Control Department from October 1970 until September 1979. As well as filling several consultancy positions, he has been an active member and office holder on various committees and councils of professional bodies in the UK. He is a member of the United Kingdom Automatic Control Council. A past member of the Executive Council of IFAC, he is currently a member of its Policy Committee.



Commander R Whalley MSc Ph.D MIMechE MIEE is Head of Control Engineering at the Royal Naval Engineering College, Manadon, Plymouth.



Henry K. Whitesel received a Bachelor of Science degree from Antioch College and a Master of Science degree from George Washington University. He has been employed by the David Taylor Naval Ship R&D Center since 1963. He has developed ship-board instrumentation in the areas of machinery performance monitoring and control. He is presently a project manager, in the Sensing Systems Branch, responsible for improving monitoring and control sensors for application in the U.S. Navy fleet.

Virgil E. "Bill" Williams received his B.S.E.E. degree from Ohio State University in 1952 and did graduate work at that school and at M.I.T. Presently, Manager of the Headquarters Support Laboratory at the National Maritime Research Center, Kings Point, New York in the Maritime Administration's Office of Commercial Development. Mr. Williams is primarily responsible for research and development in the areas of Ship Performance. Prior to joining MarAd in 1975, Mr. Williams was affiliated with the Sperry Marine System Division for 27 years in management and senior engineering roles.



Professor Desmond Edward Winterbone BSc., PhD., CEng., MIMechE., MSAE. Desmond Winterbone received a BSc in Mechanical Engineering from Rugby College of Engineering Technology in 1965. He was then employed by English Electric Co. as a Design Engineer working on diesel engines until 1967 when he took up a Research Fellowship at the University of Bath (U.K.) and was awarded a Ph.D. in 1970. He joined the Department of Mechanical Engineering of the University of Manchester Institute of Science and Technology (UMIST) as a Lecturer and became Professor in that Department in 1980.



C.C. Wong received his BSc. in Marine Engineering from the U.S. Merchant Marine Academy and MSc in Operations Management from the Northrop Institute of Technology. He is presently employed as Design Group Manager for NFM and Ship Controls with Litton Industries Incorporated.



Johan K. Zuidweg obtained his ingenieur's (=MSc.) degree in electrical engineering from Delft Technological University in 1956. In 1970 he received a doctorate (thesis: "Automatic Guidance of Ships as a Control Problem") from the same University. Dr Zuidweg has been a visiting lecturer/reader at the following universities: Rice University (Houston, Tex., 1961-62), the University of Michigan (Ann Arbor, Mich., 1967) and the University of Nigeria (Nsukka, Nigeria, 1973-74). In 1965, after having been on the staff at the Technological Universities of Eindhoven and Delft, he was appointed to the Royal Netherlands Naval College at Den Helder, where he teaches computer science and control engineering. His current rank is professor.



Phil Penny obtained the Bachelor of Applied Science degree (EE) from the University of Toronto in 1971. After satisfying a desire to see Canada's north (as a foreman in an iron ore mine) he relocated to Nova Scotia and held various design positions in that province's electric utility corporation. Subsequently he was employed by the Department of National Defence as a systems engineer responsible for shipboard electric power distribution, rotary conversion and cathodic protection systems. Currently he is a senior engineer responsible for propulsion control and instrumentation systems. He is completing his thesis for the Master of Engineering degree (EE) at the University of Ottawa.



Bert Tiblin graduated with the BME from the Pratt Institute in 1949. He has also completed graduate courses in Applied Mathematics at Adelphi University. Mr. Tiblin has over 30 years experience with Sperry in the design, development, and manufacture of systems and equipment for the navigation and control of ships and aircraft. He was associated with ship automation projects which include integrated bridge systems for naval and merchant ships. Mr. Tiblin has been awarded seven patents associated with inertial components, medical electronics, collision avoidance and radar video processing. Mr. Tiblin is presently the Program Manager for the development of integrated electronics systems for high speed ships which have included the USS Pegasus (PHM-1), Landing Craft Air Cushion (LCAC), and surface effects ships.



Lanny J. Puckett received the BE degree in Electrical Engineering from Vanderbilt University and the MS degree in Electrical Engineering from Stanford University in 1966. As an officer in the U.S. Navy, Mr. Puckett has served aboard the USS HIGBEE (DD-806) and taught at the U.S. Naval Academy. Mr. Puckett was with the David W. Taylor Naval Ship Research and Development Center for seven years where he was the Project Engineer for the Integrated Bridge System. He is currently an Engineering Section Manager at Sperry Systems Management, Reston, VA and has been involved with the design, construction and testing of HICANS.



Commander Erickson was commissioned an Ensign in the U.S. Navy upon graduation from the U.S. Naval Academy in June 1965. After receiving his commission, Cdr Erickson served aboard the USS JAMES E. KYES and subsequently attended the U.S. Naval Destroyer School at Newport RI. Upon graduation he served on several ships and then returned to U.S. Naval War College at Newport RI in 1973. Following his stay at Newport Cdr Erickson held various naval positions and is currently on staff of the Chief of Naval Operations, Advance Naval Vehicles Branch.



S. Okuda received the bachelor's and master's degree in maritime engineering from Kobe University of Mercantile Marine, Japan, in 1977, and 1981. He joined Furuno Electric Co., Ltd., where he is a research staff member in electronic nautical equipments.



S. Yamamura is an associate professor of the Faculty of Transportation Science at Kobe University of Mercantile Marine. He received the B.E., M.E., and Ph.D. degrees in control engineering from Osaka University, Japan, in 1970, 1972, and 1975. His primary research interests are programming techniques including simulations, and coding theory. He is a member of the Association for Computing Machinery and the Institute of Electrical Communication Engineers of Japan.



K. Karasuno received his master's and doctor's degrees of engineering in naval architecture from Osaka University, Japan, in 1966 and 1972. He is an associate professor of Kobe University of Mercantile Marine and a staff of ship handling simulator development and training project. Furthermore he has taken part in research project of ship motions and controls in currents, winds, waves, towed/moored forces and so on.



Dr. C. de Wit, completed his merchant marine education in 1943 and was employed on bulk carriers as a 3rd and 2nd mate from 1945 until 1949. He studied mathematics at the State University of Leiden and obtained his Ph.D. degree at the Delft University of Technology in 1968. From 1962 until this date he has been working there in the field of Applied Optimization Techniques.

W. Milde completed the trade improvement with examination as mechanical engineer at the North German Lloyd-Yard in Bremerhaven in 1961-1964. In 1964-1973 he was involved in theoretical and practical improvement for ship engineering at the Hochschule für Technik, Bremerhaven. From 1973-1978 he was a student at the Technical University of Berlin (TUB) with examination to certified engineer. Currently he is employed at TUB in the Institut für Schiffstechnik.

T.H. Xuan graduated from the University of Berlin in 1977 and was subsequently employed as a scientific assistant in the Department of Marine Engineering. Currently he is employed in the R&D Department of Borsig Boiler Division.



Mogens Blanke graduated in 1974 (M.Sc.) from The Technical University of Denmark (DTH). He was appointed to the Servolaboratory, DTH, in 1974 and currently holds the position of associate professor. His main research interests are in ship propulsion losses related to automatic steering, ship prime mover control and system identification techniques applied to ships. He is also interested in the application of modern control theory to satellite attitude control and dynamic positioning of vessels.



Rear Admiral IJzerman entered the Royal Netherlands Naval College as a Midshipman in 1948. After his Naval education he served on HNLMS Dubois during the Korean War. Subsequently he served on various ships as the Navigation Officer. In February 1960, he was appointed to Instructor General Affairs and Instructor Navigation at the Royal Netherlands Naval College. Rear Admiral IJzerman served as Navigation Officer on HNLMS De Zeven Provinciën from August 1968 to August 1970. In August 1970 he returned to the Royal Netherlands Naval College as Teacher Navigation. He served as Commanding Officer of HNLMS Overijssel in 1972 and HNLMS Rotterdam in 1973. In July 1975 he was promoted to Captain. He was appointed to Flag Officer-in-Charge officer training and education at the Royal Netherlands Naval College in 1976 and while there was promoted to Commodore in 1978. He was promoted to Rear Admiral in 1979 and is currently the Defence and Naval Attache USA. Rear Admiral IJzerman holds the Cross of Justice and Freedom (Korea), United Nation Service Medal and Long Service Medal.



George Holland was educated at the United States Merchant Marine Academy and the University of Virginia. Active duty in the U.S. Navy 1950-52. Joined the Naval Ship Engineering Center in 1966 after ten years in private industry, including Esso Research and Engineering Co., Linden, NJ and Parker Aircraft Co., Los Angeles, CA. Since 1980, Deputy Director, Ship Systems Engineering Office, Naval Sea Systems Command. Co-authored paper given at the Fifth Ship Control Systems Symposium, Annapolis, MD, in 1978.



Mr. McGonagle attended Georgetown University in Washington, D.C. where he graduated in 1960 with a BA degree in history. He went on to serve three and a half years in the US Navy as an officer including tours at sea and in Seoul Korea. Upon leaving the Navy, he taught American history at the junior and senior high school levels for a number of years before joining the Navy Department and Naval Sea Systems Command in the personnel and training area. He has worked in the LSD-41 ship program, Undersea Surveillance, Shipboard Pollution Abatement as well as the Marine Gas Turbine Propulsion areas.



DG Moss is a Senior Engineer with the General Electric Company's Simulation and Control Systems Department at Daytona Beach, Fl. He has worked on Machinery Control Systems for the FFG-7, AO-177, T-ARC and 3KSES as well as LM2500 engine controls for the PHM-1 and DD-963. Prior to his assignments on Ship Control he was an Engineering Manager and Reliability Manager on the APOLLO Programs' automatic checkout equipment program. His earliest activity with GE was on the Polaris Fire Control and Guidance Program. Prior to joining GE he was an Asst. Professor of Electrical Engineering at Kansas State University.



Johannes Eriksson received his M.S. degree (Civilingenjör) in electrical engineering, with main interest in computer science and control theory, in 1968 from the Lund Institute of Technology, Lund, Sweden. He was employed at the Swedish Telecommunications Administrations in 1968. He has worked on shipborne integrated navigation systems from 1970 to 1975 at Kockums Shipyard in Malmo, Sweden, and is now design manager at Kockumation AB.



Captain Gatje was commissioned in June 1952 at the NROTC Unit, Rensselaer Polytechnic Institute, Troy, N.Y. After several tours both onshore and at sea Captain Gatje commanded USS CHARLES F ADAMS (DDG 2) from September 1969 to September 1971. A three year tour in the Ship Acquisition Division in the Office of the Chief of Naval Operation was followed by assignment of Officer-in-Charge of the Ship Repair Office in Athens, Greece. Upon termination of home-porting of DESRON TWELVE in Athens, Captain Gatje assumed the duties as Chief Staff Officer, Commander Service Force, U. S. SIXTH Fleet and CTF-63. While so serving Captain Gatje was assigned temporarily as Commanding Officer, USS BUTTE (AS 27) during August and September 1976. He reported to Naval Surface Force Atlantic Readiness Support Group Norfolk, Virginia as Commanding Officer in September 1977.



Dr. T. Koyama received his undergraduate degree from the University of Tokyo in 1962 and was subsequently admitted to Graduate School and granted a Doctor of Engineering in 1967. Since 1979 he has been a Professor at the University of Tokyo. Dr. Koyama is a member of the Society of Naval Architects of Japan, Society of Instrumentation and Control of Japan, Nautical Society of Japan and Society of Naval Architects and Marine Engineers.

Gunter Grossmann received the Dipl.-Ing from the Technical University Braunschweig in 1950. Between 1950-1953 he was in the Design and R&D office, Mak Kiel responsible for the development of supercharged marine diesel engines. He completed the Dr.-Ing Examination in 1953-1957 at the Technical University Hanover, Department of Mechanics. From 1957-1968 he was employed at Howaldtswerke Deutsche Werft AG in R&D. Currently he is Professor of Marine Engineering at the Technical University of Berlin.



Captain Whitman entered RMC in 1959, graduating in 1954, after which he completed a Bachelor of Electrical Engineering degree at McGill University in 1955. After a number of postings as an Electrical Officer, Captain Whitman converted to the more operational field of Weapons in 1960 and served as the Weapons Officer in HMCS Ottawa until 1963. He then participated in a joint CAN US development project to provide automated support to small ships command and control activities. Returning to Canada in 1965 Capt Whitman was responsible for the software development program for the computer assisted Action Information System for the FHE 400 Hydrofoil. He then continued in the computer system development field responsible for computer programming development in the DDH-280 class destroyer program. Capt Whitman moved to the Information Handling Agency in 1971 as the Director responsible for Pay, Personnel and Financial Computer System Developments. In 1975 he became the Director of Computer Systems Engineering and Maintenance responsible for the computers and system software associated with all ADP support to the Department with the exception of operational combat systems. In 1980 Capt Whitman was appointed Director, Maritime Combat Systems responsible for the engineering of naval combat systems, the position he presently holds.



Mr. P.G. Kempers is managing director of C.S.I. B.V. at Vlaardingen The Netherlands. After finishing his studies in electronic engineering he started his career as an R&D engineer, designing high-accuracy electronic measuring equipment for laboratory use. Since 1961 his inherited interest in the sea prompted him to start applying electronics in ships engine rooms. From 1964-1967 he was Western European sales manager for Elliot Marine Automation Ltd. - London - U.K. In 1967 he founded C.S.I., who are now leading manufacturers in Europe of monitoring systems for ships machinery.



Jim E. Cooling joined the Royal Air Force from school, and saw service in the U.K. and Aden. Completed two years as an electrical instructor prior to entering university. Obtained a Bachelor of Science (honours) degree in electrical and electronic engineering, and then worked on the electrical design of flight control systems for the British Aircraft Corporation. Subsequently joined the Control and Simulation Division of Marconi Radar Systems Limited (Leicester), specializing in naval electronic control system design. Now a Lecturer at Loughborough University of Technology. He is a member of the Institution of Electrical Engineers.



Ralph E. Wavle received the degree of Bachelor of Engineering Science, Cleveland State University. He has been employed by the David Taylor Naval Ship Research and Development Center since 1963 where he is responsible for design and development relating to U.S. Navy Shipboard Monitoring and Control Systems.



A.W. MacDonald gained a B.Sc. degree in Mechanical Engineering at Paisley College of Technology while working with Honeywell Ltd. He joined his present company, YARD LTD, in 1973, and has been concerned mainly with the evaluation and testing of control and surveillance systems. He is currently Head of the Electronic Hardware and Advanced Technology Section, responsible for all electronic circuit design work and the implementation of the development plan for a machinery surveillance system.

Barry Semke joined the Royal Navy in 1966 and undertook his initial training at the Royal Naval College, Dartmouth. He obtained his BSc Degree in Engineering while at the Royal Naval Engineering College, Manadon and later in 1975 qualified on the Advanced Marine Engineering Course. His last sea appointment, was as the Deputy Marine Engineering Officer in a LEANDER Class frigate. In 1979 he was appointed to the Controls Section of the Ship Department where he was responsible for the design of Ship Control Centres and surface ship machinery surveillance systems. He is currently serving on the staff of the Royal Naval Engineering College, Manadon.



Commodore Ball joined the Navy in 1951 while a student at the University of Toronto where he graduated with majors in Physics and Chemistry. After engineering training in HMCS BONAVENTURE, he qualified as an Ordnance Engineer with the Royal Navy and served as a combat systems engineer in postings ashore and at sea in destroyers of the Fifth Escort Squadron. He received postgraduate degrees in Electrical Engineering and Physics at the United States Naval Postgraduate School and served in various engineering positions in National Defence Headquarters and as Commanding Officer of the Fleet Maintenance Group. He has also served as naval member of the Directing Staff of the National Defence College. At present, he is the Director General Maritime Engineering and Maintenance. He is a professional engineer, a member of several professional societies and an active member in the Salvation Army.

SYMPOSIUM GUEST SPEAKERS



The Honourable J. Gilles Lamontagne
Welcome Address



Vice Admiral John Allan
Keynote Address



Commodore Ernest Ball
Dinner - Guest Speaker

"Ship Control Systems - Challenges
for the 80's and Beyond"

"The View From Six
Centre Block South"

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DIRECTOR GENERAL MARITIME ENGINEERING AND MAINTENANCE



Commodore E. Ball C.F.
Director General Maritime Engineering and Maintenance



Captain(N) D. Reilley C.F.
Director of Marine and
Electrical Engineering



Captain(N) D.M. Whitman C.F.
Director Maritime Combat
Systems



Captain(N) J. Gruber C.F.
Director Maritime Engineering
and Maintenance



Mr. G. Blackwell
Director Maritime Engineering
Support

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Gordon Edwards
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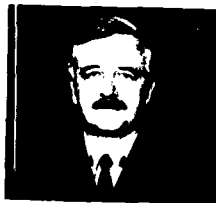
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