IEEE

Oceanic Engineering Society Newsletter

VOLUME XXXIX NUMBER 1

EDITOR: FREDERICK H. MALTZ WINTER 2005 (USPS 420-910) ISSN 0746-7834

IEEE OCEANIC ENGINEERING SOCIETY

EX-OFFICIO

ELECTED ADMINISTRATIVE COMMITTEE

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Modeling, Simulation & Visualization, DR. WARREN L. J. FOX
Marine Communication Navigation & Positioning, DAVID CHADWELL
Oceanographic Instrumentation, MICHAEL HARRIS
Current Measurements, STEVEN ANDERSON
Underwater Acoustics, DR. KENNETH G. FOOTE, PROF. MASAHIKO FURUSAWA, & PROF. MANELL E. ZAKJARIA
Unmanned Underwater Vehicles, CLAUDE P. BRANCART
Air/Space Remote Ocean Sensing, DR. DAVID E. WEISSMAN
Ocean Policy Technology, DR. JOSEPH CZIKA, JR.
Sonar Signal & Image Processing, DR. JAMES CANDY
Non-Acoustic Image Processing, DR. FRANK M. CAIMI & PROF. JOHN WATSON
Neural Networks and Information Processing, V. WILLIAM (BILL) PORTO
Environmental Technology, TBD
Environmental Acoustics Technology, KENNETH G. DIAL
Submarine Cable Technology, ROBERT T. BANNON & PAMELA J. HURST
Homeland Security, PAMELA J. HURST & ROBERT T. BANNON
Technology Committees Coordinator, DR. STANLEY G. CHAMBERLAIN

IEEE Oceanic Engineering Society Newsletter (ISSN 0746-7834) is published quarterly by the Oceanic Engineering Society of the Institute of Electrical and Electronics Engineers, Inc. Headquarters: 3 Park Avenue, 17th Floor, NY 10017-2394. $1.00 per member per year (included in Society fee) for each member of the Oceanic Engineering Society. Printed in U.S.A. Periodicals postage paid at New York, NY and at additional mailing offices. Postmaster: Send address changes to IEEE OCEANIC ENGINEERING SOCIETY NEWSLETTER, IEEE, 445 Hoes Lane, Piscataway, NJ 08854

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Retiring President's Column for the OES Winter 2004-2005 Newsletter

It's been a wonderful ride!

I have been delighted and honored to be President of the IEEE Oceanic Engineering Society for the past four years. During that time I have been privileged to work with an outstanding group of dedicated men and women. Their efforts have been instrumental in maintaining the Society's leadership in our community. Please thank them for their hard work and dedication when you speak to them.

The most exciting thing that has happened in the Society during the past four years is the commitment to hold two OCEANS Conferences each year. This is a leap of faith on the part of your Administrative Committee. We believe that we should be offering the OCEANS Conference regularly outside of North America, We also believe that there are many in our profession who wish to participate in the conference but who are not able to travel regularly to North America. It is there people who will step up and serve the profession by contributing their time and energy to presenting the additional conferences. We expect that with more opportunities to present papers and to meet with their colleagues, we will se an increase in total attendance at OCEANS Conferences. We also expect that as we reach out to our Asian and European colleagues, that more companies will seize the opportunities to exhibit at our conferences. This all depends on our members encouraging their colleagues to join them in this great effort.

Meanwhile, as you can see from Stan Chamberlain's article in this Newsletter, we are poised to take our Technology Committees to the next level. As we pursue our charter by disseminating knowledge of our profession world-wide, we need to involve our colleagues from all over the world. Expanding the size and reach of our Technology Committees as Stan suggests is an important contribution we can make. We all need to be active in inviting our distant colleagues to participate, to reap the benefits offered by our Society's activities, and to enjoy rewards of contributing to our profession and to society. In addition to the Chair of each Technology Committee, we should have a Co-Chair in Asia, in Europe, and in America. Right now America practically means North America, but (another coup for Joe Vadus, our newly-reelected Vice President for International Affairs) with the planned workshop in Chile in 2006, we can begin to involve our South American colleagues. When that happens, America will truly mean all of America.

Last summer I mentioned the revision of the Society's Constitution and Bylaws. Since the Constitution and Bylaws Revision Committee, under the leadership of Jim Collins, has been pursuing that task. We have had a number of significant discussions dealing with the underlying principles and aims of our Society. We have generally moved less significant matters from the Constitution to the Bylaws. The Committee will propose a somewhat restructured Vice Presidential line up, and a significant change in the ex officio membership of the Administrative Committee. As important as anything the Committee is doing is the codification of the Policies and Procedures that the Society has adopted from time to time.

As a reminder, revision of the Constitution requires approval of the membership by a mail ballot. Revision of the Bylaws may be done by the Administrative Committee provided that advance notice of the meeting is given. We will propose that revision of the Policies and Procedures, when adopted, may be made by the Administrative Committee as an item of regular business. I hope that we will complete our work this spring and the Membership will be able to vote on the revision to the Constitution this summer.

The Smithsonian Institution of the United States is embarking on an Ocean Science Initiative. You can read more about it at http://www.mnh.si.edu/ocean/. The Initiative has three parts: Ocean Hall, a large continuing exhibit at the American Museum of Natural History in Washington, D.C., U.S.A.; an Ocean Web Portal, reaching out to the public, students, scientists, conservationists, and policymakers; and a Center for Ocean Science, to expand knowledge of the oceans' physical and biological interactions. Recently, in company with Jim Barbera and Joe Czika, I met with the Director of the Museum, Dr. Cristián Samper, to discuss opportunities for the IEEE Oceanic Engineering Society to cooperate in and to support this venture. He was generally receptive to our thoughts, and has asked us to meet with Associate Director for Public Programs: Robert D. Sullivan, to discuss our proposals in detail. In response to requests from the OCEANS '05 America Organizing Committee, Dr. Samper or Dr. Sullivan may agree to be a Keynote Speaker. They are also considering an exhibit at the Convention describing their Ocean Science Initiative. This is a great opportunity for the Society, as well as a model for other contributions we can make at museums throughout the world.

In the summer of 2003, representatives of 33 countries and the European Union, as well as 26 non-government organizations (such as Central American Commission for the Environment and Development , Food and Agriculture Organization of the United Nations , and Global Ocean Observing System) met in Washington, D.C. to "Affirm the need for timely, quality, long-term, global information as a basis for sound decision making." (More information is at http://earthobservations.org/.) Their ultimate objective is to develop a global system of systems to observe, collect, archive, and distribute data about the earth, such as precipitation, winds, ocean currents and temperature, seismic activity, and agricultural activity, to name a few. At that meeting, Dr. Jay Pearlman, a member of the IEEE Geoscience and Remote Sensing Society, informally asked a number of the delegates whether they thought the IEEE, as a professional organization, might contribute to the objectives of the Group. Upon receiving an affirmative answer, Jay spoke to Charles Luther, then President of the IEEE/GRSS. He invited me to meet with him and jay to discuss how to respond to this. We formed a committee to begin involvement in the in the activities of the Group on Earth Observations. We proposed to the IEEE Technical Activities Board that we be recognized as an IEEE activity, and were accepted as the IEEE Committee on Earth Observation. Jay Pearlman is the Chair. We commented on the proposed implementation plan, and many of our recommendations were accepted. We have also been officially accepted as a Non-Governmental Organization in the Group. Next February, the IEEE delegation to the Earth Observation Summit III in Brussels, Belgium, will be led by Dr, Michael Lightner, President-Elect of the IEEE. Dr. René Garello of the IEEE/OES will be a member of the delegation. Among other IEEE/OES members participating are David Weissman, Sandy Williams, and Stan Chamberlain. If you would like to get involved in the exciting work, please let me know.

Finally, let me congratulate Jim Barbera on his election to the Presidency of our Society. I look forward to great things for us under Jim's leadership.

Let's Get Famous!

Incoming President's Corner

During the recent AdCom meeting held in Kobe Japan at the OTO 04 conference I traded my Treasurer's pen for the President's gavel. So for the next two years I will attempt to lead our society to become the "place to go" when ocean issues are of concern to obtain a learned analyst of the issues. To this end , I will ask the technology committees , JOE editors and chapter chairs to formally interact with one another so that emerging technologies can be properly identified and presented to our membership. A first step in this direction is to make use of the journal editors as distinguished lecturers for chapter meetings in their area of expertise. In addition, each technical committee chair will be asked to develop a short presentation of their technology area to be given at chapter meetings . A chapter program can then be established such that a common presentation can be given in the same calendar quarter using the previously mentioned resources.

We have discussed over the years the establishment of a scholarship to be awarded on an annual basis . I intend to appoint a group to examine the mechanics and establish the financial impact on the society so that the AdCom can vote on this issue in Brest in June. Another area that will be addressed is the establishment of CEU's for the tutorials presented at our OCEANS conferences with an eye toward developing a procedure to establish Certified Ocean Engineers.

The society is entering an ambitious era with the advent of two OCEANS conferences beginning next June. We will need the full support of our membership to successfully implement these meetings. Get involved in your society and you will get much more for your membership dollar.

Several interesting functions are to be pursued during this calendar year. As previously mentioned the society is sponsor-

ing two OCEANS conferences this year. The first will be in Brest , France from 20-23 June and the second will be in Washington DC with our MTS colleagues from 19-23 September. So sharpen your wits and your pencils and submit a paper to make the conferences successful ventures.

Other activities that will happen during the year include the society involvement in the Human Powered Submarine Races that will be held in late June at the David Taylor Model Basin in Carderock , Maryland . This year there will be over 20 entries. Those members in the Washington DC area should make an effort to attend this event . Our Current Measurements Technology Committee is holding a symposium in Southampton UK in late June the next in a successful series that they have been running Another event that the society supports is the National Ocean Science Bowl run by CORE. The finals this year will be in Biloxi MS in late April. The students involved in the competition are most impressive. Another event the society supports is MATE that has as its main sponsor the MTS ROV group.

In December we met with the Smithsonian Institute to determine what our society could supply as input to their Ocean Initiatve. We were well received and will be included in their planning efforts to establish an Ocean Hall in the Natural History Museum, a web portal and oceans exhibits . Your past president , Tom Weiner, has agreed to be the poc for this effort. Please contact him if you are interested in being a volunteer for our input.

As you can see the society is very active in student activities as well as major conferences. Therefore, there is plenty of volunteer space to be filled by society members. I would urge you to get involved in one or more of these activities. As you know you can get specific information on these events by visiting our web site at www.oceanicengineering.org .

Jim Barbera
IEEE/OES President

Taking OES Technology Committees to the Next Level

By Stan Chamberlain, OES VP for Technical Activities

The Oceanic Engineering Society has had Technology Committees (TCs) dating back to 1978 when the Current Measurements TC held its first working conference. Since then the number of OES TCs has grown to 15. The function of the TCs, as spelled out in the OES Bylaws, is to promote activities in their technology fields. They do this by organizing and chairing sessions at the annual (semi-annual starting in 2005) OCEANS conferences, organizing workshops and specialty symposia, encouraging publication of papers in the Journal of Oceanic Engineering and keeping the community abreast of developments through articles in the OES Newsletter.

Over the past few years the Society has moved to increase its global activities by developing plans to hold annual OCEANS conferences in non-North American venues. In the years between 1970 and 2004, there were only three OCEANS conferences outside North America. The first two were in France (Brest in 1994 and Nice in 1998) and the third in Japan (Kobe in 2004). From 2005 on, non-North American conferences are to be held in the Spring of every odd year in Europe (2005 in Brest, France; 2007 in Aberdeen, Scotland; 2009 in Bremen, Germany; etc) and of every even year in Asia (2006 in Singapore; 2008 in TBD; etc) as well as every Fall in North America (2005 in Washington, DC; 2006 in Boston, MA; 2007 in Vancouver, BC, Canada; 2008 in Quebec City, Quebec, Canada; etc).

The OES has also expanded its global activities by sponsoring the bi-annual Underwater Technology Conferences, held in Asia in even years (1998, 2000 & 2002 in Tokyo, Japan and 2004 in Taipei, Taiwan, R.O.C.), the bi-annual US-Baltic Conference in even years (2004 in Klaipeda, Lithuania), and the 8th Current Measurement Technology Workshop (to be held in June, 2005 at the Southampton Oceanography Center, Southampton, UK).

To support these increased OCEANS conference and global activities, it would appear desirable to increase the scope and constituency of our Technology Committees. Below I will explore potential directions in which we could go and thereby take them to the next level. Before that, let me identify the TCs and look at some of their recent activities.

The fifteen OES Technology Committees, along with their Chairs (and Co-Chairs or Vice-Chairs, as noted) are as follows. Additional information, including the technology scope of each Committee, can be found on the OES Web site at: http://www.oceanicengineering.org/. The new Technology Committees Coordinator is Dr. Albert (Sandy) J. Williams, 3rd, Woods Hole Oceanographic Institution, Woods Hole, MA, awilliams@whoi.edu. Only one TC is currently without a chair, the Environmental Technology TC. If you know someone who would like to contribute as chair of this Committee, please contact either Sandy Williams or me.

1. **Modeling, Simulation & Visualization**
   Dr. Warren L. J. Fox
   Applied Physics Laboratory
   University of Washington
   Seattle, WA
   warren@apl.washington.edu

2. **Marine Communication, Navigation & Positioning**
   Dr. C. David Chadwell
   Marine Physical Laboratory
   Scripps Inst. of Oceanography, UCSD
   La Jolla, CA
   cchadwell@ieee.org

3. **Oceanographic Instrumentation**
   Michael Harris
   US Naval Research Laboratory
   Stennis Space Center, MS
   mike.harris@nrlssc.navy.mil

4. **Current Measurements**
   Steven P. Anderson
   Horizon Marine, Inc
   Marion, MA
   steve@horizonmarine.com

5. **Underwater Acoustics**
   Dr. Kenneth G. Foote
   Woods Hole Oceanographic Institution
   Woods Hole, MA
   kfoote@ieee.org

   Prof. Masahiko Furusawa (Vice-Chair, Asia)
   Tokyo University of Marine Science and Technology
   Tokyo, Japan
   frsw@s.kaiyodai.ac.jp

   Prof. Manell E. Zakjaria (Vice-Chair, Europe)
   Ecole Navale (EN) / French Naval Academy
   Institut de Recherche de l'EN / Research Institute of the FNA
   Brest, FRANCE
   zakharia@ecole-navale.fr

6. **Autonomous Underwater Vehicles**
   Claude P. Brancart
   Brunswick, ME
   c.brancart@ieee.org

7. **Air/Space Remote Ocean Sensing**
   Dr. David E. Weissman
   Hofstra University
   Hempstead, NY
   eggdew@hofstra.edu

8. **Sonar Signal & Image Processing**
   Dr. James Candy
   University of California
   Lawrence Livermore National Laboratory
   Livermore, California
   candy1@llnl.gov

9. **Subsea Optics & Vision**
   Dr. Frank M. Caimi
   SkyCross, Inc
   Melbourne, FL
   f.m.caimi@ieee.org

   Professor John Watson (Vice-Chair, Europe)
   University of Aberdeen
   Aberdeen, United Kingdom
   j.watson@eng.abdn.ac.uk

10. **Neural Networks and Information Processing**
    V. William (Bill) Porto
    Natural Selection, Inc.
    LaJolla, CA
    bporto@natural-selection.com

11. **Environmental Technology**
    TBD

12. **Submarine Cable Technology**
    Robert T. Bannon
    Bannon International Consulting LLC
    East Stroudsburg, PA
    rtbannon@ieee.org

    Pamela J. Hurst (Co-Chair)
    See below

13. **Homeland Security Technology**
    Pamela J. Hurst
    Lockheed Martin Marine Systems & Surveillance
    Perry Technologies
    Westerly, RI
    pjhurst@ieee.org

    Robert T. Bannon (Co-Chair)
    See above

14. **Ocean Engineering & Technology Policy**
    Dr. Joseph Czika, Jr.
    Annandale, VA
    j.czika@ieee.org

15. **Environmental Acoustics Technology**
    Kenneth G. Dial
    Arlington, VA
    leekendi@earthlink.net

The Technology Committee chairs have been very active in soliciting and reviewing abstracts and chairing sessions at OCEANS Conferences. The number of sessions and papers in the technology areas of the OES TCs that have been held in recent OCEANS Conferences are given in Table 1. There are wide variations both across TCs and across the years for each TC. These variations provide an indication of the technical interests in the registrants from one technology area to another and from one geographic region to another. The most active technologies have been Underwater Acoustics, Autonomous Underwater Vehicles and Sonar Signal & Image Processing. The locations of the Conferences were 1999: Seattle, WA; 2000: Providence, RI; 2001: Honolulu, HI; 2002: Biloxi, MS; 2003: San Diego, CA and 2004: Kobe, Japan. I note that OCEANS'03 was held in conjunction with the Centennial of Scripps Institution of Oceanography and OCEANS'04 was held jointly with the biannual Japanese TechnoOcean'04 Conference. I also note that each of these OCEANS Conferences was jointly sponsored by the Marine Technology Society and the IEEE OES. Hence, the numbers of sessions and papers listed in Table 1 are only those that fall into the OES TC technology areas and not the total number of sessions and papers at each Conference.

OES Tech Comm. Technologies at OCEANS Conferences		# Sessions in These Technologies							# Papers in These Technologies						
TC#	OES Technology Committee	99	00	01	02	03	04	Ave	99	00	01	02	03	04	Ave
TC1	Modeling, Simulation & Visualization	5	5	7	16	3	2	6	18	18	30	60	17	7	25
TC2	Communications, Navig. & Positioning	6	13	9	11	4	6	8	25	36	48	36	22	17	31
TC3	Oceanography Instrumentation	10	4	7	13	2	4	7	44	14	33	47	12	13	27
TC4	Current Measurements	1	6	2	3	1	2	3	4	22	10	10	13	8	11
TC5	U/W Acoustics	9	19	10	13	11	12	**12**	37	69	49	59	52	47	**52**
TC6	Autonomous U/W Vehicles	6	18	12	9	9	13	**11**	21	52	52	28	47	45	**41**
TC7	Air/Space Remote Sensing	6	2	3	5	7	3	4	20	5	11	18	35	8	16
TC8	Sonar Signal & Image Processing	3	23	16	11	20	4	**13**	13	69	74	39	78	15	**48**
TC9	Non-Acoustic Image Processing	3	3	3	7	1	6	4	10	10	11	29	3	23	14
TC10	Neural Networks & Info Processing	2	4	2	2	3	6	3	10	13	12	8	26	19	15
TC11	Environmental Technology	-	2	-	2	1	4	4	-	7	-	8	8	16	10
TC12	Submarine Cable Technology	-	-	1	1	3	3	2	-	-	4	3	10	14	8
TC13	Homeland Security Technology	-	-	-	-	1	2	2	-	-	-	-	4	5	5
TC14	Ocean Technology Policy	-	-	-	-	1	1	1	-	-	-	-	4	4	4
	Totals:	51	99	72	93	67	68	75	202	315	334	345	331	241	295

Table 1. Number of Sessions and Papers at OCEANS Conferences in the Technology Areas of the OES Technology Committees:

Several of the Technology Committees have also been active in organizing workshops and specialty symposia. Table 2 identifies these activities.

Workshop / Symposium / Working Conference	Date	Location	# Sessions	# Papers	# Exhibits	# Attendees
Sixth Working Conference on Current Measurement (CMTCí99)	March 11-13, 1999	San Diego, CA	10	40	25	120
AUV 2002 Symposium on Autonomous Underwater Vehicles (AUVí02)	June 20, 21, 2002	San Antonio, TX	4	23	-	59
Seventh Working Conference on Current Measurement (CMTCí03)	March 13-15, 2003	San Diego, CA	8	56	14	72
Homeland Security Technology Workshop (HSTWí03)	December 10-11, 2003	Warwick, RI	30	90	43	355
AUV 2004 Symposium on Autonomous Underwater Vehicles (AUVí04)	June 17-18, 2004	Sebasco, Maine	4	20	-	56
Homeland Security Technology Workshop (HSTWí04)	December 7-8, 2004	Valley Forge, PA	24	85	22	218

Table 2. Technology Specialty Workshops, Symposia and Conferences sponsored by one of the OES Technology Committees.

As we evaluate the makeup and activities of the OES Technology Committees and seek to define the direction to go to bring the TCs to the next level, we can ask a series of reflective questions. Such questions are delineated below. Over the next few months we will be asking for the viewpoints on these questions from each of our TC Chairs and others active in the OES. If you would like to see us move in a particular direction, we would greatly appreciate knowing that, along with your responses to these questions. Please email your thoughts and responses to Dr. Sandy Williams and me.

Potential Directions in Taking the OTS Technology Committees to the Next Level:

1. Do our TCs cover the full OES technology waterfront?

2. Are our current TC areas the best distribution across OES technologies and application areas?

3. Is it time for new leadership of some of our TCs?

4. Do we have the best balance of TC chairs across university labs, government labs and industry?

5. How do we move toward global TCs?

6. How should we be organized to support two OCEANS per year, one in North America and one in either Europe or Asia?

7. How can we expand our TCs into multi-person teams (vis-à-vis single person committees)?

8. Should each TC in the last session of their OCEANS Conference track have a discussion/summary of current state-of-the-art, gaps/challenges & future R&D agenda?

9. Should we have a standard (baseline) set of OCEANS Calls for Papers topics & subtopics (One for America with MTS / one for Europe-Asia)?

10. Should we be encouraging workshops for more of our TC?

11. Should we be encouraging our TCs to co-sponsor work shops with other societies (e.g., an Underwater and Satellite Remote Sensing Workshop cosponsored by OES Underwater Acoustics TC and GRS Ocean Remote Sensing TC)?

12. How should we expand to take advantage of IEEE's recent broadening of its charter (e.g., Environmental Technology, Ocean Science, —-)?

13. How do we best address the GEOSS/GOOSS (Global Earth Observation Sys of Sys / Global Ocean Observation Sys of Sys) challenge & opportunity (such as in the IEEE-capable areas of Standards, Systems of Systems Engineering, Information Technology and Capacity Building)?

14. Should we create additional new TC areas (e.g., Ocean Renewable Energy, GEOSS / GOOSS, Standards, New Technology, Biotechnology, Advanced MEMS / Advanced Actuators, - - -)?

15. Should we schedule a longer time period at OCEANS Conferences to discuss our TC activities than that currently allocated for our working luncheons?

16. Should individual TCs have separate Web pages on the OES Web site?

17. Should TCs somehow be coordinated with JOE Associate Editors? If so, how?

18. Should TCs have members from OES Chapters?

19. Should our TCs identify one or more Distinguished Lecturers in their technology areas (who could be made available as speakers for our chapters)?

20. Should our TCs identify one or more Tutorial Tutors in their technology areas to give tutorials at OCEANS Conferences?

21. Should the OES TIP (Technical Interest Profile) be aligned with our TCs? If so, how should the TCs utilize the TIP information?

22. Should we group our 15 TCs in 4-6 logical groupings (akin to the grouping of IEEE Societies in Divisions)?

23. Should our TC chairs take on a larger role in nominating/selecting the OES Distinguished Technical Achievement Awardees? If so, how?

24. Should each TC expand its committee by adding a Vice-Chair for Europe and a Vice-Chair for Asia (to assist by taking the lead for the TC in supporting future OCEANS 'XX Europe and OCEANS'YY Asia, respectively)?

25. Are there other directions in which you would like our TCs to go?

As we move forward in taking the OES Technology Committees to the next level, we would like your input. How would you like to see the OES TCs expand or improve? Would you like to see a more focused forum for presentation and discussion of advances in your technology area at future OCEANS Conferences? If so, would you be willing to chair a TC focused in that area? Please drop me an email with your thoughts. Thanks for helping us take the OES TCs to the next level.

Stan Chamberlain
IEEE OES Vice President for Technical Activities
s.chamberlain@ieee.org

Distinguished Technical Achievement Award Oceanic Engineering Society OCEANS 2004

John. P Craven, PhD

Dr. John Craven holds a BS Degree in Civil Engineering from Cornell University, an MS in Mechanical Engineering from the California Institute of Technology, a Ph.D. in Hydraulics from the University of Iowa and a JD from George Washington University.

During his career, John Craven has been responsible for numerous major innovations in ocean technology.

- As applied physicist at the United States Navy David Taylor Model Basin (1951 – 1958), he received the Navy Meritorious Civilian Service Award for major changes in the structure of the nuclear submarine Nautilus.
- As Chief Scientist for Navy Special Projects (1958 – 1970), he made major contributions to the technology of the Polaris Fleet Ballistic Missile System. These included warhead, guidance, missile propulsion, navigation, shipboard systems, hull and structure technologies.
- As Project Manager of the Navy's Deep Submergence Systems Program (1965 – 1970), he had overall responsibility for the design, development and initial deployment of the Deep Submergence Rescue Vehicle, Sea Lab 2 and Sea Lab 3, the nuclear powered small submersible NR-1, and numerous search and rescue systems and operations.
- In 1970, he became Marine Affairs Coordinator for the State of Hawaii, where he was responsible for the concept development (with Japanese Architect Kyonori Kikutake) of the Hawaii floating city. Subsequently, he assisted Kikutake in the design and deployment of Aquapolis at the Okinawa fair and the publication of a book on the redesign of Kobe as a marine city and papers on the reconstruction of Kobe after the earthquake.
- He was the founder of the Natural Energy Laboratory of Hawaii where he sponsored the Mini OTEC generation and assisted in the development of Deep Ocean Water OTEC (open and closed cycle) air conditioning and aquaculture.
- In 1990, he founded Common Heritage Corp, which is committed to managing innovation for the benefit of the Common Heritage. At Common Heritage, he developed a demonstration project for an environmentally sustainable habitat. This included his development of coldwater agriculture, the growing of more than 200 temperate and tropical zone crops on a tropical coastal dessert, the development of the "Hurricane Tower" and Skywater for low cost desalination of seawater, electrical power systems utilizing the "Seebeck effect" (as alternatives to OTEC), and human rejuvenation therapy based on the thermodynamic application of cold deep ocean water.
- He holds patents on Coldwater Aquaculture, the Hurricane Tower, Skywater and Coldwater Therapy.

Oceanic Engineering Society

Distinguished Technical Achievement Award

1975 Robert Frosch
1976 Werner Kroebel
1977 Howard A. Wilcox
1978 Richard K. Moore
1979 David W. Hyde
1980 Neil Brown
1981 No Award
1982 Ira Dyer
1983 Alan Berman
1984 John B. Hersey
1985 William N. Nierenberg
1986 Robert J. Urick
1987 James R. McFarlane
1988 Chester M. McKinney
1989 Victor C. Anderson
1990 Robert C. Spindel
1991 Henry Cox
1992 Arthur B. Baggeroer
1993 William J. Plant
1994 Edmund J. Sullivan
1995 Mack O'Brien
1996 Frederick H. Fisher
1997 Newell Booth
1998 Burton G. Hurdle
1999 William M. Carey
2000 Albert J. Williams
2001 Werner Alpers
2002 James Candy
2003 Georges Bienvenu

Address from Mr. Tatsuo Yada, Mayor of Kobe

Address from Mr. Naochika Namba, Chair of CJO

Keynote Lecture I "GEOSS : Towards Bridging the Gaps in our Global Observational Capacity" Vice Admiral Conrad C. Lautenbacher, Jr., U.S. Navy (Ret.) Under Secretary of Commerce for Oceans and Atmosphere and NOAA Administrator

Keynote Lecture II,"Large Scale Simulation of Strong Ground Motions from Recent Damaging Earthquake in Japan",Dr. Takashi Furumura, Associate Professor, Earthquake Research Institute, The University of Tokyo

Special Session 1 -"Establishment and Performance of 10-year Implementing Plan for the Earth Observation"

From the left, Yasuhiro Kato, President of JAMSTEC, VADM Conrad C. Lautenbacher Jr, NOAA Administrator, Ted Brockett, President of MTS, Tatsuo Yada, Mayor of Kobe, Naochika Namba, Chairman of CJO (Consortium of the Japanese Organizers for OTO'04), Thomas F. Wiener, President of IEEE/OES, Joseph R. Vadus, Vice President, IEEE/OES, and Tamaki Ura, Chair of OTO'04 Executive Committee

Kobe University Symphony Orchestra


Joseph V. Vadus and VADM Lautenbacher, NOAA Administrator at the Ribbon-Cut Ceremony


VADM Lautenbacher with Dr. Jay Pearlman, Chair of IEEE Committee on Earth Observation (CEO)


Ken Ferrer with Dr. John Craven at OES Booth


Special Dinner


Tutorial 1


Tutorial 2


Left to right – Bob Wernli, Dr. Rick Spinrad and Hirouki Nakahara

Ice Breaker Reception and Exhibits

Exhibition

Ice Breaker Reception

Ice Breaker Reception

Conference Chairmans & AdCom Dinners

J. Barbera, N. Namba, OTO'04 Chairman, T. Sakou, President Techno-Ocean Network, and J. Vadus at the Chairman's Dinner

R. Spinrad, NOAA/NOS Administrator and H. Nakahara, OTO '04 Executive Chair

"Navy Table" at Conference Chairman Namba's Dinner - Japanese sytle. On left, B.Stamey, RDML McGee, and E. Gough of CNMOC

Professor Chiu, Taiwan, Y. Ishii, Japan Chapter Treasurer, P. Barbera, J. Barbera, J. Collins and M. Hashikura, OTO '04 Coordinator

Pam Hurst, John Wiltshire, Jerrry Boatman, Enson Chang, Elizabeth Creed, at OES AdCom dinner

H. Maeda, A. Balasuriya, J. Boatman, J. Carroll and N. Miller at OTO '04 Chairman's Dinner - Japanese style

IEEE/OES Luncheon Awards

2004 Techno Ocean Award
Recipient : Mr. Joseph R. Vadus

CITATION

Mr. Joseph .R. Vadus not only has been a recognized leader in the field of ocean resources and underwater technology but has also dedicated himself to the causes of international ocean community. He has been instrumental in organizing international and interdisciplinary conferences, workshops, seminars and meetings, and has helped and encouraged those who are not familiar with the international ocean community to participate in and interact with it. As his title, Chair Emeritus, UJNR, clearly shows, he has been the leader in the US-Japan ocean community exchange and collaboration. He lectured, chaired and advised the Techno-Ocean Conferences and often contributed his expertise to the public education and outreach activities at home and abroad. The Techno-Ocean Network recognizes that he truly deserves to be the first person to receive the Techno-Ocean Award on the occasion of OTO'04 with the theme, Bridges Across the Ocean.

Jim Collins, Joe and Van Czika, and Peggy and Jim Barbera

Ferial El-Hawary, Claude Brancart, Joe Vadus, Dr. John Craven, and Louise and Tom Wiener

Joelle and Rene Garello, Pam Hurst, and Liz Creed

Dr. John Watson, Oceans '07 Aberdeen General Chair

Tom Wiener Presenting Award to OES Secretary Steve Holt

Dr. John Watson, Steve Holt, Norman Miller, Ken Ferer, Bob Wernli, and Ken Foote

Steve Holt, Tom Wiener, and Jim Barbera

Conference Chairs Hakahara, Ishii, Takagi and others

Tom Wiener Presenting Award to OES Treasurer Jim Barbera

Tom Wiener Presenting Distinguished Technical Achievment Award to Dr. John Craven

Dr. John Craven Accepting DistinguishedTechnical Achievment Award

Naochika Namba Presenting Joe Vadus the Techno-Ocean Award

General Chair Tamaki Ura

Naochika Namba Presenting Joe Vadus City of Kobe Image

Joe Vadus Accepting Techno-Ocean Award

Bridges Across the Oceans

Stan Chamberlain with Japanese Dancer

OES Treasurer Steve Holt's daughter participating in Cultural Exchange

Banquet, “Kobe Cruise Night”

Theme, Bridges Across The Oceans and World Champion Boston Red Sox Caps

Japanese Culture Corner

Banquet, “Kobe Cruise Night”

Cruise Ship

Kobe Night Image

Picture of Fall Colors in Kobe

Student Poster and IEEE/OES Japan Chapter Award

Student Poster 1st Place Winner
Mr. Charles Humphrey

Student Poster Awards Memorial Photo

Student Poster IEEE/OES Japan Chapter Awards

Student Poster

Student Poster

Stutudent Poster Second Place winners: Mr. Stephen Licht, Mr. Hotaro Ichikawa, Dr. Narita, and Dr. Tagaki

Student Poster Awards Memorial Shot. First row - Dr. Narita, Mr. Charles Humphrey, Norman D. Miller, Dr. Ken Takagi, and Dr. Tamaki Ura

Student Poster Third Place winners: Mr. Gerard Llort Pujol, Ms. Maria Palmese, Mr. Christopher Scott, Dr. Hitoshi Narita, Dr, Ken Takagi

Student Poster First Place winner Mr. Charles Humphrey, Dr. Narita, and Dr. Takagi

Oceans 2004 MTS/IEEE Student Poster Session

Once again we had a highly successful Student Poster Session at the OCEANS '04 Conference. Dr. Ken Takagi of Kyoto University was the chairman for the session and did and outstanding job of getting the program organized. The "Call for Posters" resulted in 83 abstracts submitted by the deadline of April 16, 2004. Some additional abstracts came in later. The initial budget plan was to invited 30 student posters. Thanks to funding from the Office of Naval Research, CERN, MTS and the Japan Section of the IEEE, 34 students were invited and 33 posters were presented. The posters are as follows:

Mr. Yoshito Ando - Osaka University, Japan
"Precision Maneuvering of Underwater Robot by Mechanical Pectoral Fins"

Ms. Cristina Carollo - University of Reading, United Kingdom
"Extreme events in ocean currents through depth in vicinity of the Iceland-Scotland Ridge"

Mr. Ousmane Fall - Tokyo University, Japan
"Integrated approach remote sensing and GIS to monitor the coastline changes of the Senegal River estuary: Responses of the sand spit anthropogenic driven changes"

Mr. Jose-Esteban Garacia - University of Hanover, Germany
"Ad Hoc Positioning for Sensors in Underwater Acoustic Networks"

Mr. Mathew Greytak - MIT, USA
"A Dynamic Control System for a Model Planning Hull"

Ms. Miyuki Hirose - Hokkaido University, Japan
"Acoustic backscattering characteristic of live jellyfish Stomolophus nomurai"

Mr. Charles Humphrey - University of Newfoiundland, Canada
"Design and Fabrication of a Collective and Cyclic Pitch Propeller"

Mr. Kotaro Ichikawa - Kyoto University, Japan
"Acoustic monitoring of dugong"

Mr. Masakatsu Inada - University of Tokyo, Japan
"Direct estimation of relative vorticity of the Kuroshio off Bosco"

Mr. Takahiko Inoue - Ehime University, Japan
"Direct estimation of drifting coastal sand as basic data for protections against coastal erosion based on "Geoslicer"

Mr. Makoto Ishituka - Kyushu University, Japan
"Development of and underwater manipulator mounted for an AUV"

Mr. Akihiro Iwase - University of Ryukyus, Japan
"Effects of tropical typhoon on coral reefs in Ishigaki Island, the Ryukus: implication on coral community structure"

Mr. Tomohiro Kojiya - Tokohu University, Japan
"Automatic Power Supply System to Underwater Vehicles Utilizing Non-contacting Technology"

Ms. Allison LaBonte - Scripps Institution of Oceanography, USA
"Measuring fluid flow response to tectonic strain: An optical flow meter for detecting transient hydrological processes"

Mr. Carl Licht - MIT/WHOI, USA
"A Biometric Flapping Foil Underwater Vehicle"

Mr. Gerard Llort Pujol - ENST Bretagne, France
"Improvement of seafloor bathymetry accuracy"

Mr. Joseph Long - Oregon State University, USA
"Systehsis of Numerical Circulation Results and Remote Sensing Observations in Nearshore Region"

Mr. Hirohisa Mieno - Kobe University, Japan
"Effects of of new antifouling bicides on marine plankton"

Ms Yuka Motohara - Osaka University, Japan
"Development of Image Processing Algorithm for Automated Recognition of Zooplankton"

Mr. Hernando Nieto, Jr. - Florida Atlantic University, USA
"Planing HYSWAS Integrated Node (PHIN) Unmanned Surface Vehicle (USV) Scale Model Development"

Mr. Kohei Nishi - Hiroshima University, Japan
"Reducing the wave load of oyster rafts in Hiroshima Bay"

Mr. Shuhei Hishi - Kyushu Institute of Technology, Japan
"Adaptive Navigation System based on Self-organizing Map and its application to AUV"

Mr. Tsuyoshi Ohta - Osaka University, Japan
"Conversion of Natural Energy to Electricity on Artificial Island Called VLMOS"

Ms. Maria Palmese - University of Genoa, Italy
"A Flexible Method to Simulate 3-D Underwater Sub-Botom Images"

Mr. Edward Pilbrow - University of Canterbury, UK
"Autofocus of Active Beacons for MEasuring the Tow-path of a Synthetic Aperture Sonar"

Mr. Christopher Scott - Oregon State University, USA
"Scaling and turbulence estimation in a large-scale laboratory surf zone"

Mr. Christopher Smith - University of Oxford, UK
"Wave interactions with FPSO Vessel"
Mr. Ibnu Sofian - Kobe University, Japan
"Sea Level Variation in the Java Sea and the relationship with the Makassar Strait"

Mr. Michael Stanway - MIT, USA
"The development of an artificial gill to supply oxygen to a submerged microbial fuel cell"

Ms Konomi Takakura - Osaka Prefecture University, Japan
"A Study on Seaweed Bed Restoration Using Deep Ocean Water"

Mr. Manuel Toscana-Jimenez - University of Seville, Spain
"A Three-Scales Model for the Dispersion of Radioactive Spots from Nuculear Emergencies: Application to the Baltic Sea after the accident of Chernobyl"

Mr. Daniel Walker - MIT, USA
"Amphibious Tetrapod"
Ms. Kathyrn Wasserman - MIT, USA
"From Waves to Watts: A Wave Energy Conversion Device for the Charles River Basin Massachusetts"

The posters were on display outside of the Exhibits entry and were available on Wednesday and Thursday of the Conference. Judging of the posters took place onWednesday and the awards were given during the Kobe Cruise on Thursday evening. The awards were presented by Dr. Hitoshi Narita from the ONR Office in Tokyo. The poster winners were:

First Place - Mr. Charles Humphrey - University of Newfoundland

Second Place - Mr. Kotaro Ichikawa - Kyoto University
- Mr. Stephen Licht - MIT

Third Place - Mr. Gerard Llort Pujol - ENST Bretagne
- Ms. Maria Palmese - University of Genoa
- Mr. Christopher Scott - Oregon State University

In addition to the above awards, the Japan Section of the IEEE presented two additional awards to Japanese students:

Mr. Tomohiro Kojiya -Tohoku University
Mr. Kohei Nishi - Hiroshima University

The dinner cruise was a fitting way to end a very exciting competition!

Norman D. Miller, P.E.
IEEE/OES
Student Activities Coordinator

Special Session 2: Future Ocean Advances for 2020, November 10, 2004, Oceans '04

Special Session

Opening Remarks

Joseph R. Vadus LF IEEE
Vice President, IEEE Oceanic Engineering Society

Kunichi wa. Welcome to Session 2: "Future Ocean Advances for 2020". . I am Joseph Vadus, Vice President with IEEE Oceanic Engineering Society, and, I am Co-Chairing this session with Professor Hisaaki Maeda of Nihon University.

Over 500 years ago, Christopher Columbus tried to convince scientists that the world was round, not flat, and you would not be able to sail off the end.

In 1883, Lord Kelvin, then President of the Royal Society predicted that X-rays will never be useful. In 1889.the Commissioner of the U.S. Patent Office announced that "everything that can be invented, has already been invented".

In 1932, 72 years ago, Albert Einstein remarked that there is no indication that nuclear energy will ever be obtainable. Franklin Roosevelt, when he was Secretary of the Navy, predicted that airplanes would never be useful in battle with a fleet of ships.

The passage of time makes some of the smartest people look like fools.

Not trying to predict the future is like driving a car and not looking at the long road ahead. We need to encourage prophets to help us narrow the field of infinite possible choices by continually doing reconnaissance of the future

In this session, we are offering suggestions of new ideas, new technologies and concepts for possible future advances by 2020, 16 years from now. 16 years ago, I was here attending Techno Ocean '88 with Dr Kenji Okamura as Chair. There were discussions of floating bases and artificial islands… and today we have Port and Rokko Islands and Kansai Airport…all once a dream and today a reality.

Remote Sensing of the Oceans in the Twenties

René GARELLO, Senior Member IEEE
GET - ENST Bretagne
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29238 BREST Cedex - FRANCE

When I was requested to do this paper, I asked myself: is 2020 so far from now[1]? What kind of achievement are we expecting? I do not believe that we will witness a technological leap in the domain of the Observation of the earth from Space. Indeed, I think that all the sensors (spaceborne or airborne) that will be launch by then are already almost sketched (or blue printed) somewhere. They are at least scheduled.

The rough numbers that we can read here and there about human beings is that about _ of humanity lives - on the average - within 30 km of the oceans (or seas). On the other hand, it is well known that more than 70% of the Earth surface is water. Another fact is that we are daily facing a stream of data pouring from space. We are all familiar with the words "Mega" (10^6) or "Giga" (10^9): here we are talking "Terabytes" (10^{12}) or "Petabytes" (10^{15}) of data to download, analyze, understand, transform in an accessible way to the end-user.

Hence the focus should be shifted towards a more efficient management of the processing chain – from the sensor to the user – but also towards a more concentrated field of interest – coastal zone monitoring and management. In 2001, the emphasis was put on a Global scale, first by ESA and the European

1 Joe Vadus will not even be 100 years old by then.
2 Global Monitoring for Environment and Security to be establish in 2008.
3 Committee of Earth Observation Satellites, 1997
4 Oceanic Engineering
5 Geoscience and Remote Sensing
6 Global Earth Obsevation System of Systems

Community through its action plan GMES[2]. This program recognized a need that was already part of the discussions in the earlier CEOS[3]. The aim is, as usual, on a promotion of a sustainable development.

The initial statements of these groups are set on a requirement for "high quality, timely and independent information" and on the recognition that "policies on the environment and security suffer by having to rely on information that is fragmentary and of uneven quality and value".

More recently, on July 31, 2003, at the Earth Observation Summit held in Washington, D.C., 34 nations plus the European Commission joined in adopting a Declaration calling for action in strengthening global cooperation on Earth observations, referred to by the acronym "GEO" (Group on Earth Observations). Details about the initiative can be found at http://www.earthobservationsummit.gov. A GEO 10-year implementation plan in which IEEE is actively involved (through its society on OE[4] and GRS[5]) is presently developed.

The program will revolve around the notion of yet another acronyms: GEOSS[6]. The statement is again similar to the one output by the European Commission: "GEOSS is envisioned as a large national and international cooperative effort to bring together existing and new hardware and software, making it all compatible in order to supply data and information at no cost".

The Global Observation System is a unique capability that will have significant impacts on the way Earth's environment is managed. Its effect will be pervasive, in science, in industry, in the improvements of health and social welfare.

So as a conclusion - and if all these programs are for real – I can say that a vision for the near future passes through a better use of the resources, not from an energy point of view but from an information one. I hope that the technology and its by-product, the information, will be dedicated "to serve the Man".

Future Ocean Advances for 2020 The Challenge of exploring extreme Ecosystems in the Oceans

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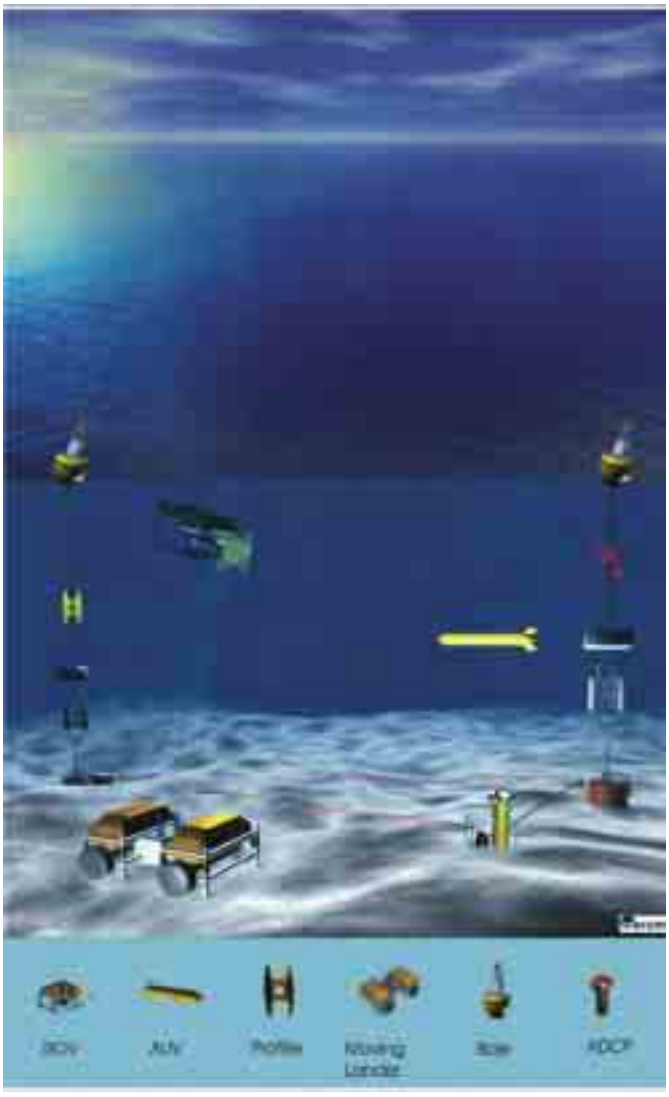
I. General ideas

Due to the rapid development in communication and electronic technology major changes in the way ocean sciences are conducted are underway. The scientific planning for the next decades focus on establishing and maintaining highly complex infrastructures for permanent observation of scientific relevant ocean regions. This effort implies the shared use of the ac-cording infrastructures between different programs and disciplines. A template for the organisation of such an enterprise can be found in space sciences where the management of complex programs is permanently driven towards perfection. Interestingly enough there are scientific problems in space and in ocean sciences that also suggest a closer cooperation between these two fields. In space sciences it is the quest for water on other planets and ultimately the origin of life that drives the development. An analogous research area has evolved during the last decade in ocean sciences. The investigation of ecosystems under extreme environmental stress where their mere existence seem to be in contradiction to previous dogmas has been in the focus of exploration. First results lead scientists to the conclusion that the hydrothermal vent ecosystems may be the "crucible of creation". Here the final goals of space sciences and ocean sciences merge. Will the same apply to the development of marine and space technology and can they benefit from each other? Certainly yes! The investigation of Lake Vostok in Antarctica is planned to be conducted by dedicated autonomous robots. Similar vehicles can be used to investigate the conjectured ocean on Jupiter moon Europa. Recent discoveries also suggest that the frozen continent and other extreme environments like the Mid Atlantic Ridge may also have lessons for us about the possibilities of oceanic life on (or, rather, in) the Jupiter moon Europa.

A major push in ocean sciences for innovative and better technology will certainly come from the investigation of the described extreme ecosystems. What observation strategies are



needed? Besides fixed platforms interconnected by cables with real time or quasi real time access to shore dedicated autonomous vehicles have to be developed. A fleet of small, energy efficient platforms will be set in place to cover a wide range of investigation around the communications nodes be it under the ice or in regions of hot vents. These robots will be either ground or free swimming vehicles with endurance of months to years. They have to carry a multitude of multidisciplinary instruments. The limitations in energy capacity will remain a major limiting factor and therefore compact, energy efficient devices for taking measurements or probing the ocean floor have to be realised. Additional to that these devices have to survive strong temperature gradients and aggressive, corrosive environmental conditions. New principles have to be evaluated and realised on the base of current available technologies. Another limiting factor for long term observations is the limitation in data transmission bandwidths. Acoustic data transmission will be improved but will probably always be limited to 10's of Kbit/s. To transmit short video sequences or high resolution pictures one has to reach data rates of the order of MBit/s. Concepts of optical transmissions have to be evaluated either through free transmission through the water column or by employing optical fibres. On the surface the transmission bandwidth can be improved with a certain number of buoys deployed or ships underway to form a transitional transmission network. Solar powered aircrafts or balloon transponder will further enhance the capabilities if according environmental conditions can be met.

It can be foreseen that ocean technology will keep up with the pace of space sciences by transferring technological concepts where it is possible. The benefit of this approach is clear but the realisation is still open for speculation.

AUV Challenges for 2020

By Claude P. Brancart
Past President, IEEE-Oceanic Engineering Society
IEEE-OES Technical Committee Chair: Unmanned Underwater Vehicles

The year 2020 is not far away. In people time, it is 16 years from now. In computer capability time, it is approximately 11 generations of system upgrades. Presently, the capability computers present to us far exceeds our capability to use it both efficiently and effectively. Yet we must learn to use it if we are to achieve the goals possible with this technology.

I have been involved with Autonomous Underwater Vehicles (AUVs) since the first remotely operated vehicle (ROV) severed its umbilical. The first few generations of AUVs were really untethered ROVs, for man was still in the command and control loop via acoustic links. As the need arose, AUV systems were developed and put into operation. The Hugin 3000, operated by C&C Technologies, is an excellent example. This vehicle is capable of surveying a predetermined area in deep water and collects detailed acoustic images of bottom topography and obstacles. The cost for this system is approximately $7-plus millions not counting the necessary surface support. The day-rate cost is high, but considering its capability, in many situations it has proven to be competitive.

The AUV vehicles in existence, and there are many, have proven that the major vehicle systems, namely pressure hull, propulsion and control, oceanographic-type sensors, and relative (local) navigation are technically very mature. Energy systems tend to limit vehicle endurance, but this is being worked on. The major progress in AUV technology will take place when a system of cooperating AUVs undertakes a mission. These vehicles would be small, relatively inexpensive, readily deployed, and result in higher mission success because of the multiplicity of vehicles. All tools, hardware, and knowledge exist to undertake the construction of the individual vehicles, but the vision and concept parameters to incorporate multiple AUVs into the system have yet to be created and implemented.

Where could multiple-cooperating AUVs undertake tasks to enhance our knowledge and capability? Some possible missions are presented below.

Bottom Surveys:
Multiple AUVs could be the elements of a large acoustic array used for active beam forming. All recorded data would be localized by relative position of all the AUVs. One or more AUVs could be configured to establish absolute position via transit to the surface and satellite positioning. The amount of data processed would be immense, but with the computer technology available, it would be achievable.

Fish Monitoring:
Our fisheries are dying due to pollution and over-fishing. We need to know more about the life cycle of these fisheries. Small AUVs could readily monitor all elements of the life cycle of specific species. Again, the issue will be to decipher the data for meaningful results, conclusions, and subsequent recommended actions.

Environmental Monitoring:
Global warming threatens to destroy our environment. Small AUVs can monitor the spatial and temporal variations for the critical environmental measurement parameters, whether in the deep ocean, large gulfs, or coastal estuaries with river outflows. Data processing and subsequent results should give us some guidance to reduce environmental damage.

Underwater Construction:
We have the capability to drill very deep holes in the search for petroleum reserves in very deep water, 10,000 feet and deeper. The major concern is the cost to develop these reservoirs into producing fields. The sea-bottom system required to place a well on-line is complex, large, heavy, expensive, and costly. The deeper the water, the larger the surface support platforms, resulting in a day rate of around two hundred thousand dollars.

A sub-sea completion is man-made. It could be designed in modules small enough to transport and manipulated by AUVs, very simple ones for the transport task, and more sophisticated ones with manipulative capabilities for assembly and construction. Surface support could be from offshore supple vessels (OSVs). A spar buoy could generate power and communication capabilities delivered to the bottom via an anchoring umbilical with charging stations and contact or short-range communications for the AUVs.

This concept could even be applied to the harsh environments of the high latitude ocean areas. These areas have proven petroleum reserves, and also have an air-sea interface that makes surface operations very difficult, dangerous, and costly. This will happen. We need the oil, and it will come from the deeper waters and high latitude areas.

Area Protection:

The threat of hostile entities entering our coastal harbors, cities, and facilities dictates the need to monitor a large volume of water to detect any intrusions by terrorists. Small AUVs could do this task.

We will have to go to multiple, cooperating AUVs to undertake many or all of the missions identified above. The large AUVs presently in use would make the cost prohibitive. If we produce small AUVs in very large quantities, they will be like our inexpensive automobile, which are everywhere. But automobiles do not cooperate. We have to concentrate now on processing data techniques and create models that simulate the environment in which the cooperating multiple AUVs system is operating. We will do this.

Ultra-Ultra Large Scale Floating Structure Giga-Float Concept

Hisaaki Maeda
*Nihon University**

1. INTRODUCTION

Global warming is not serious problem, while global freezing is serious problem. We do not die without air-conditioning system, while we die without central heating system in winter especially in polar area.

Interglacial epoch is no problem, while glacial epoch is serious for our living. Interglacial epoch continues only 20,000 years, while glacial epoch lasts more than 80,000 years.

The most stable energy in future must be solar energy which is ever lasting so long as the sun exists. Other kind of energy could not last for 80,000 years.

The most appropriate place to collect solar energy is the tropical zone. If we utilize the belt of the equator in the Pacific, Indian and Atlantic Oceans installing a very large floating structure on which solar energy panels are installed, the sufficient energy which covers the present consumption of the total energy worldwide can be available.

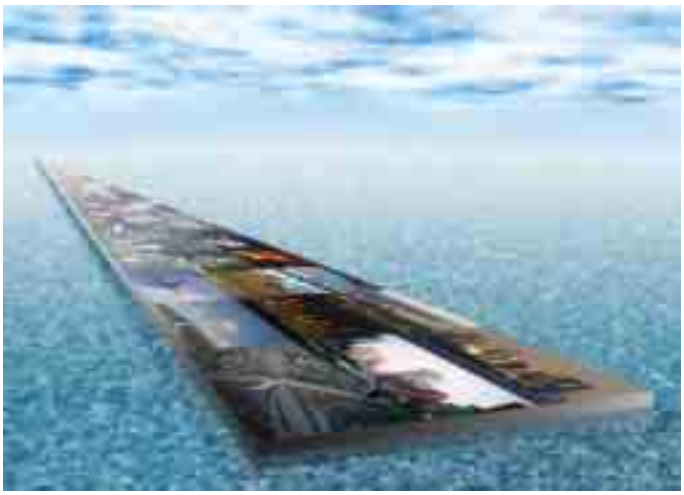


Figure 1: Image of Giga-Float

This kind of a floating structure is also used as a platform for the OTEC (ocean thermal energy conversion) system which is based on the Stommel's ever lasting upwelling. The OTEC system can not only generate electricity but also supply the nutrient, cold and pathogen-free deep ocean water which can be utilized to a cooling system, aquaculture, aquaponics, and other medical manufactures or healthy foods.

A huge floating structure can be also used as a platform for the nuclear power plant which is free from earthquakes.

A huge floating structure can be used as a platform for any kind of ocean energies such as wind, wave, current energies besides solar energy which are all renewable energy.

A huge floating structure will be a kind of a huge floating city with any necessary facilities such as a desalination plant, waste disposal plant, power plant, etc which are required for living on a structure. The energy will be stored as hydrogen in future which may be consumed through electricity generated by a fuel cell.

This kind of a huge floating structure may be called as a New Noah's Ark in the global warming period, while the huge floating structure may be called as the Great Wall on the Ocean in the global freezing period. The generated power on a huge floating structure can be used to generate ocean currents to make the global climate more stable and mild.

We may call this kind of a floating city as a Giga-Float.

2. New NOAH'S ARK

If the ice on both North and South Poles are melt due to the global warming after the destruction of the global environment, and if the sea level rising reaches up to 90 m, the whole area of the center of Tokyo is sunk under the sea surface. In the global sense, about 70% of the residential area on the earth would be lost.

If we construct a ultra very large floating structure, the length 3000 km, and the width 100 km, it is possible for whole population on the earth, 6 billion people to live on the floating structure allocating 800 m2 to each person. If the width of the structure is extended to 200 km, 10 billion people are available. Practically speaking, this ultra large floating structure could be divided to appropriate size and deployed in appropriate locations of the Pacific Ocean, Atlantic Ocean and Indian Ocean. If the life time of the ultra large floating structure is 50 years, the

cost might be 15 trillion US$ which is about 30 times of the 2003 annual budget of the US DOD. Then US saves the DOD budget for 30 years, then the US Government could save the whole world forever.

The difficulty due to the sea level rising can occur only in the Inter Glacial Epoch which lasts only for at most 20,000 years.

3. THE GREAT WALL ON OCEAN

The Glacial Epoch lasts for 80,000 years in which the sea level lowering might be 200 m down from the present sea level. In the Glacial Epoch major cities in the world might be covered by ice and human beings could not live in those cities. If an ultra large floating structure, with total length 3,000 km and total width 100 km, is separately deployed in the Pacific Ocean, the Atlantic Ocean and the Indian Ocean, dividedly, and if the decks of those structures are used for collectors of solar energy, the whole electric power consumed in the present world can be supplied by these solar power stations. If the power efficiency of the solar power system is 0.35Kw/m2, then the total power generated becomes 1 billion Kw. If more power is required, just enlarge the width of the ultra large floating structure. This kind of a ultra large floating structure can be called as the Great Wall on the Ocean which was firstly proposed by Prof. Noriyuki Nasu.

4. CONCLUSION

The Ocean is absolutely necessary for living of human beings on the earth. Even though human beings could not live on land not only because of the sea level rising due to the global warming, but also because of freezing major cities on land due to the Glacial Epoch, an ultra large floating structure deployed along the equator on the Ocean could provide human beings a reliable living foundation. This ultra large floating structure could supply sufficient electricity due to solar power station distributed on the deck of the structure, and could produce sufficient food cultivated on the deck of the structure. In any emergency, the Ocean could guarantee the possibility of the living of human beings on the earth.

An ultra ultra large scale floating structure may be called as a new Noah's Ark or as a Giga-Float (Fig. 1).

It is said that the sustainable development is the only solution for the 3E tri-lemma of Economic Development, Energy Limitation and Global Environment, while the Ocean utilization can realize the sustainable development in which the living right among the fundamental human rights is guaranteed. The Ocean utilization can make the human living prosperous.

Most of the desires to be realized in the Ocean may be feasible technically and economically, while it is important for them to be feasible socially and politically.

We need not worry about the difficulty of the movie "The Day After Tomorrow", while a Giga-Float will save us, human-beings, in future.

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(http://www.meti.go.jp/report/whitepaper/index.html)

[2] Noriyuki Nasu: Half century being enchanted by the ocean, pp.412, 30th Anniversary Publication, Japan Marine and Science Center, 2001

[3] Maeda,H. and Kada, R. (Editor):Interdisciplinary Approach to the Ocean, The Society of the System for Oceans and Human-beings, 2004, (to be published)

THE NEED FOR AIR DROPABLE SMALL LOW COST AUVS

Dr. James R. McFarlane
International Submarine Engineering Ltd

President John F. Kennedy stated the importance of Ocean Research:

"Knowledge of the oceans is more than a matter of curiosity. Our very survival may hinge upon it."

Reference: Kennedy, J.F. "Message to Congress on Oceanography, Executive Communication No. 734"

In spite of our awareness of the need to study the oceans, forty years later the oceans are still undersampled.

Today satellites provide a huge amount of data about the surface of the ocean. In fact, it is oversampled. However, the subsurface is grossly undersampled to the point that in some cases the data is useless. In order to characterize processes the sampling frequency must be greater than twice the highest frequency component in the data: This is Nyquists theorem. This means that a process with substantial spatial and time variability needs many data points in a short time frame for characterization. That is, We need more data to understand the health and carrying capacity of our oceans. Ships and large AUVs can provide some of the data and large AUVs can run long transects. However, the cost per pixel is high and the data set sizes are inadequate to handle issues related to relatively short time variability. For example, a limited number of samples would not be useful in the Gulf Stream where velocities are relatively large and huge gyres are present. Ship born sensors and AUVs vehicles speed are too slow to characterize process in the Gulf Stream. This will demand a large number of smaller lower cost platforms which will range from beer can size to sonoboy size devices. It also means that the cost of delivery platforms will have to be reduced. Dr. Larry Clark at the US National Science Foundation says an AUV is an autonomous platform capable of movement which goes in the water and carries a sensor.

We need to define missions and then establish realistic sampling needs. We do not seem to use properly established criterion to define what is oversampling and what is undersampling. The level of sampling required is an important issue which not only has major effect on cost but also on the usefulness of the data.

Will AUVs provide the data which will rectify this problem so that the cost per pixel becomes affordable? The British say that the science community want them to produce a long range vehicle. This vehicle would perform long transects. It would

cycle up and down to full ocean. Well are they right? I guess they are as long as the sampling rate is at least twice the frequency of the process they are trying to characterize. But what process are they looking at? For example, it would not be universally useful in the Gulf Stream where velocities are relatively large and huge gyres are present. The vehicle speed is too slow. To characterize process in the Gulf Stream this I believe that you would need large numbers of large beer can to 48 ounce juice can sized vehicles. They would be air deployed like sonbuoys. These vehicles would move up and down in the water column by adjusting ballast. Some work on a boomerang and high aspect ratio gliders has been undertaken at the University of Victoria and Woods Hole.

To date most of the emphasis on the use of AUVs has been placed on military and surveying applications. It is suggested that in the future science could become a very important use for AUVs.

The Gulf Stream process might be measured by using 900 or 1000 small boomerang AUVs. Each one would have sensors, a GPS and a radio. Each one would have an ID Code. Each time they surfaced they would transmit their position, ID Code and sensor data.

A typical cost might be:

AUV, Boomerang, Beer Can/Juice Can	Aircraft: $7,000/hr x 10 hours	$70,000.
	AUVs: $20,000 each for 900 drops in 30 x 30 matrix on 10 mile spacing between sensors	$18,000,000.
Total:		$18,070,000.

What is obvious is that the cost of the aircraft is trivial.

Vehicles can be recovered using small vessels or offering a buy back from fishermen.

The information thus obtained can be augmented by using animals carrying sensors. Seals, sea lions and other marine creatures are in many ways the perfect AUVs. They have engines which provide the same range as nuclear devices. They also know how to find other marine species. They are orders of magnitude smarter than cybernates. Some small CPS/Radio/Sensor packages have been fitted to animals and in my view, the results have already shown that animals are important and viable delivery platforms. If they are to eat at the "same table" we do then they will have to be part of the solution.

FUTURE OCEAN ADVANCES FOR 2020
Some Basic Needs and Concepts for 2020

Joseph R. Vadus, LF IEEE
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IEEE Oceanic Engineering Society
Potomac, Maryland USA

As population continues to multiply, perhaps by another _ billion by 2020, the basic needs will continue to be food and water, energy, and the environment. However the capacity must be increased to keep pace. Modest growth along the same path may not be enough. Innovations in science, technology and management are needed. Perhaps, thinking "out of the box".

Food and Water— These are essential to maintain even the most minimal standard of living. The ocean is rich in seafood resources with great potential for future sustainable growth. Innovations, just to keep pace are needed. and suggested below.

Clusters of adjacent islands (e.g. Palau) can be joined by fences to create a large lagoon that would be fed from nutrients in deep ocean water pumped from the seafloor. The fish would multiply and be harvested in various ways and even sucked up into processing facilities for selection for various markets, including fish protein concentrate.

Another idea using upwelling is to divert portions of the near bottom currents, e.g. nearby in shallower waters of the Kuroshio and Gulf Stream, to bring nutrients into the photonic zone to increase abundance of fisheries. Also, free standing pipes in coastal waters can be used to pump deep cold water nutrients using wave and photo voltaic energy.

Potable Water—This is a vital commodity, now sold in bottles costing more than gasoline. Uncontaminated supplies are dwindling. Desalination of sea water will be greatly expanded and perhaps combined with OTEC. Towing icebergs to supply northern cities has been considered. Instead, perhaps large barge-like structures can be used to transport huge house-size blocks and towed in a "sea train" to coastal stations for melt down. Another approach is to melt down glacial ice by PV or small nuclear plant and collect it in large underwater tanks or huge rubber bags and transferred to tankers or directly into tankers by gravity from higher land sites.

New Energy Sources—Wind, wave and PV power is being accelerated. These can be integrated offshore using the same platform. In fact, where conditions are favorable OTEC can also be integrated and provide other by-products such as fresh water, hydrogen and nutrients for fisheries. OTEC requires a temperature difference of 20 degrees Celsius and such a difference can be found in sub zero regions. Why not use the near freezing water at 1 or 2 degrees and the outside cold atmosphere as a minus 20 degree source.

Methane hydrate resources along the deep waters of the continental shelves represent a gas source more than twice as large of all existing fossil fuels. The big problem is environmental safety and cost-effective production. Since these gases can be released by disturbing the temperature and deep pressure, an encompassing collector such as a submerged sports field dome (inverted funnel) is needed to capture the gas from a disturbed field of methane hydrates.

Another energy idea is to use geothermal energy sources, especially those in coastal waters, for generating electricity to produce hydrogen fuel via electrolysis of sea water.

Nuclear plants may be more safely operated, and guarded offshore, away from the populace, using large tanker-type ships and power cabled to shore.

Global Environment—In order to accelerate development of the oceans and their resources in a sustainable manner while faced with natural hazards, it is essential to fully understand the global environment. The international GOOS activities planned and underway is a major step. A broader plan, having the developed nations of the world each or jointly accept a regional responsibility to collect GOOS data in accordance with accepted standards and enter it in a Global Geographic Information System (GGIS) for the world to access as needed. Perhaps the NEC Earth Simulator super computer can handle it on a part time basis allowing periodic windows to update and access.

The environment near coastal cities can be protected by incinerating municipal waste at sea, and using its energy to produce hydrogen via electrolysis. Incinerated by- products may have other uses or can be disposed of more safely.

The aforementioned ideas need science and engineering research to fully exploit and perhaps yield alternate solutions. These concepts can promote international cooperation contributing to the OTO'04 theme, "Bridges Across the Oceans". The concept of "Future Ocean Advances for 2020" was proposed by my wife, Gloria.

FUTURE OCEAN ADVANCES FOR 2020 WERNLI'S "LAW OF MORE"

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When asked to write a futuristic paper regarding the oceans with a projected date of 2020, I was temporarily at a roadblock for ideas. As I was walking along the beach in San Diego, "Moore's Law" came to mind; the law where the number of transistors per given area on a chip will double about every 18 months. As a mechanical engineer, the analogous "Law of More" began to form in the recesses of my mind. What is the "Law of More" and how does it apply to the ocean? Read on.

I am presently preparing a technical paper for presentation at the Underwater Intervention 2005 conference in New Orleans. The topic of that paper, an update of a paper given at OCEANS 2000, addresses commercial AUVs (autonomous underwater vehicles) and "who is leading the pack now?"

Four years ago, the AUV market was projected to begin to grow exponentially because of the cost savings of such vehicles over conventional towed systems. After all, the offshore market was booming, especially in route surveys for telecommunication cables, and would certainly continue, regardless of the cries of "irrational exuberance" in the U.S. stock market by such icons as Warren Buffett and Alan Greenspan. Unfortunately for the other 99% of those invested in the stock market, including yours truly, the dynamic duo was right and the resulting collapse took the telecommunication market with it.

The other fact was that the optimists were right: these new AUVs could reduce the cost of offshore surveys from 50-80%. The success of vehicle's such as C&C Technologies' Hugin 3000 has resulted in them sitting at the dock waiting for the next job, which is normally completed in record time with great savings. It seems that the many other AUVs that were going to take their share of the offshore market are also waiting for the work to again appear.

Could this also be "irrational exuberance?" History seems to repeat itself. In the 1960's and 1970's, manned submersibles were the only way to do underwater intervention. At that time, nearly every major company involved in the ocean and/or defense built their version of the next great submersible. In reality, most ended up displayed in front of the lobbies of those same companies, partly because of their abundance, cost, and because of the arrival of the ROV (remotely operated vehicle).

The ROVs appeared on the stage as underwater "eyeballs" that would never replace the manned submersibles, nor the divers. These robotic intruders rose in popularity in the 1980's and were then integrated into the offshore infrastructure in the '90's as the companies pushed into deeper and deeper waters. Is this also a case of "irrational exuberance?" Not necessarily, but just as in the stock market, the large number of players in the "heavy-duty work vehicle" arena began to shake out and now there are a few players, the most dominant being Oceaneering, which has over half of the offshore ROVs working worldwide.

Now, in the new millenium, the AUVs are entering from stage right. Their projection for the last four years was not realized, and the military is still trying to squeeze a ton of technology out of a 21-inch submarine tube. I will admit, however, that many countries are successfully integrating them on their surface ships for mine countermeasure (MCM) missions. Still, the number of the high cost military vehicles are few and far behind.

With this dire picture of AUV utilization, how in the world is the future going to become bright, and what became of the "Law of More?" Well, as in a good book, we'll leave the answer of the puzzle to the end.

The one area I have yet to address is that of the low-cost (at least as compared to the larger vehicles, especially the military versions), small AUVs, such as Hydroid's REMUS and Bluefin Robotics' 9-inch diameter vehicle. What do these vehicles have in common? They were both spin-offs of academically developed vehicles; vehicles that were put together in an environment of meager budgets and inexpensive labor. And they were developed to work and come back because they couldn't afford to lose them.

Now, in several of my past papers regarding AUVs, I've ended with the battle cry: "Now is the time to lose some AUVs." Blasphemy you say? Not necessarily. If you have a device that is cheap enough, and you have enough of them, then you don't lose any sleep over the fact that you lose one once in a while. Torpedoes are expendable; cruise missiles are expendable; and now Unmanned Air Vehicles (UAVs) are expendable. They aren't cheap, but compared to the benefits, and potential alternatives without them, the loss is no big deal in the overall scheme of things.

So, where is this leading? I can spend pages on a discussion of all the areas of research where there is not enough

information regarding the world's oceans; weather, climate, fisheries, EEZ surveys, pollution, defense, etc., etc., etc. But if you're reading this, you are already versed in such problems and the sad fact that we know more about the other side of the moon than the underwater world of our own planet. We're missing the knowledge that is critical for the maintenance of mankind itself.

Let me dust off my crystal ball and get to the year 2020. My profound projection is that the academic community's commercial spin-offs of AUV technology are the ocean's version of Microsoft. They were there first, with a vision of how to cost-effectively solve a problem, and built the infrastructure to do it. The small, low-cost, AUVs will grow exponentially from now into the future. Moore's Law supports the fact that the world of electronics will continue to shrink. This will drive the technology to allow smaller sensors, more efficient energy sources, and ultimately, smaller, cheaper AUVs.

By the year 2020, Wernli's "Law of More" will have been in effect for 16 years: more vehicles being used will have caused acceptance, which will have caused more vehicles, which will have resulted in the loss of many vehicles, which will have caused more to be built. And someone is going to get rich; maybe not like Bill Gates, but there is money to be made by mass producing there excellent machines. The more these AUVs are used, the more they will be used. They will go far, go deep, and do much from the shore or from small boats. They will live for years in remote sites where they suckle their energy from arrays such as that envisioned by Project Neptune, conduct their investigations, and periodically dump their data onto the Internet.

The military will also, eventually, get on the bandwagon, abandon their multi-million dollar behemoths, and pick up some six-packs of small expendable vehicles at the local 7-11 defense market; these vehicles will do the job, feed back the information, and disappear in the environment, never to be seen again. Military AUVs need to become more like toothpaste: a small amount squeezed out of a tube will quickly do a satisfactory job and leave the user with a bright smile.

Another key factor, which will probably put a few lawyers out of work, is that these small vehicles will not pose a problem to shipping. If they are run over by a ship, it will be no worse that the ship hitting some ever-present flotsam. The vehicle will sink and, properly designed, will biodegrade into the benthic ooze.

By the year 2020, there will be thousands of small AUVs working the worlds oceans. For proof of this vision, please attend my technical presentation at the OCEANS 2020 conference: "The Law of More—More Than a Theory."

"Now is the time to lose some AUVs!"

Request for Nominations to the Administrative Committee, Class of 2006

The IEEE Oceanic Engineering Society is governed by an Administrative Committee is 18 members. Six are elected each year to serve three-year terms. Members are limited to two consecutive terms, although they may be reelected after a lapse of one year.

The Nomination and Appointments Committee is Chaired by the Junior Past President, with the Senior Past President and the most recently retired Senior Past President completing the Committee. We are charged with proposing a slate of nominees and with conducting the elections, which is done by mail to the entire membership.

Qualifications for Administrative Committee membership are membership in the IEEE and OES, and a willingness to serve the oceanic engineering profession. We wish to have the Administrative Committee characteristics reflect characteristics of the IEEE membership. We are particularly interested in increasing the Asian and European membership of the Committee.

I request that you identify and nominate qualified candidates for the Administrative Committee. Self-nomination is encouraged.

The Nomination Packet should include a Letter of Nomination accompanied by a one page biographical sketch of the proposed candidate and a one-page statement from the proposed candidate giving his or her views of the opportunities and challenges facing the Society and steps to be taken to advance the IEEE Oceanographic Engineering Society.

Nominations will be accepted through 31 May 2005 and should be submitted to:

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Report to IEEE OES Newsletter on the IEEE OES AdCom Meeting and OTO'04 Conference, held in Kobe, Japan, from 9-12 November 2004

by Steve Holt, OES Secretary

This article summarizes the report written by Steve Holt, the OES Secretary, on the IEEE OES AdCom Meeting and OTO'04 Conference separate meetings, held in Kobe, Japan, from 9-12 November 2004. The IEEE OES AdCom Meeting commenced on 9 November, 2004 at the Kobe International Convention Center in Kobe, Japan.

The meeting began with a call to order and an official welcome from Dr. Thomas Wiener. A formal roll call of the OES AdCom members was then conducted by Stephen Holt (OES Secretary).

- Introductory comments were made by Tom Wiener as OES President and Chair for the AdCom meeting. Tom discussed the agenda and plans for how the day's meeting would be conducted. Tom discussed the end of his tenure as President and expressed his gratitude for all those who helped to make the OES a better society.

Many presentations were given at this meeting. They were:

- Tom Wiener gave a detailed presentation entitled the President's Report.
- Stan Chamberlain gave his presentation as Vice-President of Technical Activities. He described the work of the technical committees and issues in taking OES technology committees to the next level. He mentioned that Sandy Williams has graciously accepted the position as the Technical Committee Coordinator to allow him to concentrate on his duties as a Vice President. Stan also chaired a separate Technical Committees Meeting on Friday, 12 November.
- Sandy Williams gave a presentation on the upcoming CMTC'05 Conference.
- Claude Brancart gave a presentation of the upcoming 2005 Offshore Technology Conference, to be held in Houston, Texas from 2-5 May, 2005.
- Pam Hurst gave a presentation on the upcoming OES Homeland Security Workshop, to be held from 6-8 December, 2004 in Valley Forge, PA.
- Bob Bannon's gave a presentation on the Submarine Cable Technologies and Scientific Cable Technologies Committee. The next Scientific Cables Technologies Symposium will be held in early October, 2005 in Dublin, Ireland.
- Stan Chamberlain gave a presentation on the OES involvement with the IGARSS'04 Conference, held in Anchorage, Alaska in September, 2004.
- Joe Vadus and Jim Barbera gave a presentation on the US-Baltic Conference held in Klaipeda, Lithuania. They are now looking for another conference in Vilnius, Lithuania in 2006. The theme will be Ocean Observation Systems.
- Rene Garello discussed Joint Oceans Advisory Board (JOAB)/RECON and Marine Technology Society (MTS) agreements. Specifically addressed was the passing of the RECON work to the JOAB. Rene also chaired a separate JOAB Meeting held on 8 November.
- Tamaki Ura gave a presentation on the status of OTO'04.
- Rene Garello gave a presentation on the progress of Oceans 2005 Europe in Brest, France.
- Barry Stamey gave a presentation on the progress of Oceans 2005 North America in Washington, DC.
- Stan Chamberlain gave a presentation on Oceans '06 North America in Boston, MA.
- Joe Vadus gave a presentation addressing several future conferences from 2006 on. Joe also chaired a special RECON meeting on 11 November. Joe was followed by several representatives who gave their own presentations on these conferences. They were: Arjuna Balasuriya discussing Oceans '06 Asia-Pacific (Singapore); John Watson and Brian Horsburgh discussing Oceans '07 Europe in Aberdeen, Scotland; Debbie Kill (standing in for Jim McFarlane) discussing Oceans '07 North America in Vancouver, British Columbia; Ferial El-Haraway discussing Oceans'08 in Quebec City, Quebec; Christoph Waldmann discussing Oceans '09 in Bremen, Germany; and Mal Heron discussing the possibility of an Oceans conference in Australia in Cairns in 2008, 2010, or 2012. Jim Collins also discussed the possibility of having an Oceans conference in Australia in Sydney in 2010.
- Tamaki Ura discussed the possibility of having a future conference again in Japan, or perhaps even China or Korea.
- Joe Vadus discussed the possibility of having a future Chile-US Workshop on Coastal and Ocean Engineering sometime in October/November in late 2005.
- The OES Officers election was then held, with Claude Brancart introducing the candidates for three positions and explaining the voting process. Those qualified to vote were each of the elected AdCom members present, plus the Executive Committee (ExCom) members present, excluding the Secretary (who has a purely appointed position). The voting members of the ExCom consisted of the President, the three Vice Presidents, the Treasurer, and the Senior and Junior Past Presidents. There were a total of 18 voting members present. The votes were to be gathered and tallied by Norm Miller and Steve Holt.
  - The first election was for President. Jim Barbera and Bob Bannon each gave introductory remarks, followed by voting by a confidential paper ballot. Jim Barbera then emerged as the next OES President.
  - The second election was for Vice President of International Activities. Joe Vadus and Ferial El-Hawary each gave introductory remarks, followed by a confidential

paper ballot. Joe Vadus then emerged as the next OES Vice President of International Activities.
  - The third election was for Vice President of Technical Activities. Stan Chamberlain ran unopposed or this office and was reelected for another term.
  - In addition, Jerry Carroll has agreed to become the new OES Treasurer. Steve Holt agreed to a reappointment as the OES Secretary.
- Christian de Moustier gave a status of the Journal of Oceanic Engineering (JOE).
- Stan Chamberlain, standing in for Fred Maltz, gave a presentation on the state of the OES Newsletter. It was noted that John Irza has accepted the position of Associate Editor for the OES Newsletter and Dr. John Watson has also been asked if he would like to serve as Associate Editor and represent Region 8, Europe, Mid. East, and Africa. Fred also asked Dr. Sheng-Wen Cheng if he would like to serve and represent Region 10, Asia & Pacific.
- Diane DiMassa discussed the status of the OES E-Newsletter, and asked that all announcements to the OES be handled through the OES Electronic Newsletter and be sent to her first, and then she will forward them on.
- Todd Morrison discussed Publicity and Web Activities and asked that correspondence with Veraprise be handled through him first.
- Jim Collins discussed the status of the OES Chapters.
- It was announced that Dr. John Craven was the recipient of the IEEE OES Distinguished Technical Achievement Award. The IEEE OES Distinguished Service Award was awarded to Dr. William M. Carey. However, Dr. Carey was not at this meeting to receive this award.
- Stan Chamberlain stated that the archive of all Tutorials for the Oceans conferences will now be maintained by Diane DiMassa.
- Ken Ferer gave a presentation on the Membership Report. He reported on the IEEE survey of why members left the Society at time of renewal, why they originally joined, etc. He also reported on current member demographics. He stated that member growth rates have approximately 3% growth.
- Norm Miller gave a presentation on his Student Affairs and PACE activities.
- Ferial El-Hawary discussed the status of the Distinguished Lecturers project.
- Jim Collins discussed the status of the redesign of the OES Constitution and Bylaws.
- Jim Barbera, the OES Treasurer, gave a presentation on the state of the OES finances.
- Stan Chamberlain discussed the status of the History Project. Steve Holt asked to continue working with Stan on this project.
- The status of the OES Branding Project was presented.
- The upcoming 2005 Current Measurement Technology Conference (CMTC) Meeting was held on Friday, 12 November, and was chaired by Judy Rizoli White.
- Steve Holt wrote a report on the results on the joint MTS/OES/Japanese "Hot Wash" Meeting, which was held on Friday, 12 November at the conference.
- Several legacy action items distributed at the start of the meeting were either closed out, or stayed open and had their due dates readjusted.
- To summarize, there were five motions generated at this meeting. They are:
  (1) Mot-Kobe-AdCom-04-1: Steve Holt made a motion to accept the previous OES AdCom minutes from the previous OES AdCom meeting in May, 2004 in Houston, Texas. The motion was voted upon and passed unanimously.
  (2) Mot-Kobe-AdCom-04-2: Stan Chamberlain made a motion to appoint all of the Technical Committee people to another two year term. This motion was voted upon and passed unanimously.
  (3) Mot-Kobe-AdCom-04-3: Pam Hurst put forth a motion that provisional approval be given for a Homeland Security Workshop for 2006 in either Washington, DC or Warwick, RI. This motion was voted upon and passed unanimously.
  (4) Mot-Kobe-AdCom-04-4: Joe Vadus put forth a motion to grant provisional approval to have a US-Baltic Conference on a biannual basis. This motion was voted upon and approved unanimously.
  (5) Mot-Kobe-AdCom-04-5: Joe Vadus put forth a motion to grant provisional approval to have a future Chile-US Workshop on Coastal and Ocean Engineering sometime in October/November in late 2005. This motion was voted upon and approved unanimously.

Who's Who in the OES

Biographical Sketch for Robert Wernli

Robert L. Wernli received his B.S. degree in mechanical engineering from the University of California Santa Barbara in 1973 and an M.S. degree in engineering design from San Diego State University, San Diego, CA in 1985.

Bob has worked in the field of underwater robotics research and development at the Space and Naval Warfare Systems Center (SSC) San Diego (formerly the Naval Ocean Systems Center) since 1973. His work there has focused on the development and testing of advanced undersea work systems, manipulators and tools for use to full ocean depths by both manned and unmanned vehicles. A Navy qualified diver, he is presently focusing on the applications of Autonomous Underwater Vehicles for Navy applications and has been part of the team that produced the U.S. Navy's Unmanned Underwater Vehicle (UUV) Master Plan.

He has been actively engaged in promoting the oceans, including the use of remotely operated vehicles, by creating

and chairing the first 10 Remotely Operated Vehicle conferences (ROV '83-ROV '92), co-chairing OCEANS MTS/IEEE '95, OCEANS MTS/IEEE '03 and the Underwater Technology '04 (Taiwan) conferences. He has nearly 30 technical publications and was editor and co-author of the book Operational Effectiveness of Unmanned Underwater Systems, published on CD-ROM in 1999.

Bob is a member of the American Society of Mechanical Engineers, the Institute of Electrical and Electronics Engineers' Oceanic Engineering Society, and a fellow of the Marine Technology Society (MTS). Within OES, he is applying his expertise in conference planning and management as a member of the ADCOM and RECON committees.

He is a recipient of the MTS Special Commendation and Award, the SSC San Diego Exemplary Service Award and the Navy Meritorious Civilian Service Award. In 2002 he received the prestigious Lauritsen-Bennet award for Excellence in Engineering from SSC San Diego.

Bob has been planning his retirement from the government next October by transitioning his writing from non-fiction to fiction. He recently published his first novel, the underwater techno-thriller Second Sunrise, which won first place in an international competition for genre fiction, and hopes to have the sequel available later this year. He lives in San Diego, Ca, with his wife, Beverley, and travels to his mountain cabin in nearby Idyllwild where he enjoys hiking and working on his novels.

Homeland Security Technology Workshop December 2004 - Philadelphia, PA

by Robert Bannon and Pam Hurst, IEEE OES AdCom

The IEEE – Oceanic Engineering Society (IEEE-OES) and NAVSEA-Naval Undersea Warfare Center (NUWC) co-hosted the IEEE-OES Homeland Security Technology Workshop - Ocean and Maritime Technologies for Infrastructure Protection at the Valley Forge Convention Center , King of Prussia, PA on December 6, 7, and 8, 2004. The theme for this second annual workshop was "Under the Water, On the Water, and Over the Water" for the Protection of the Homeland.

The purpose of the workshop was to bring together small technology companies, and large defense contractors, military, government, academia, and not-for-profit institutes who are developing technologies and products for Ocean and Maritime Technologies for Infrastructure Protection. This IEEE-OES workshop provides an unprecedented opportunity to network with engineers, scientists, maritime legal experts, and local, state, and federal government personnel who all share a common concern and goal in providing advance technologies to protect vital maritime infrastructure and provide for the safety of our ports, harbors, coastal eco-systems and our oceans.

Pamela Hurst, IEEE Chair, and Robert Bannon, Fellow of the IEEE and Co-Chair, of this technology forum, along with the Honorable Curt Weldon, U.S. House of Representatives – R-PA 7th District, chose the venue because of the importance that Valley Forge holds for American freedom. Ms. Hurst is from Westerly, RI and Mr. Bannon is from East Stroudsburg, PA; both are AdCom members and OES Technical Chairs, having served the underwater community for over 36 years. Congressman Weldon is serving his 9th term in the U.S. House of Representatives, and is a member of the House Homeland Security and Armed Forces Committees.

The technical program offered two full days, featuring 6 multi-track PowerPoint presentations and papers covering topics below:

- Underwater Telecommunications Protection Issues and International Legislation
- Sensors and Underwater Vehicle Technology for Protecting our Ports, Waterways, and Coastlines
- Preempting and Disrupting Terrorist Threat

Bob Bannon, Curt Weldon and Pam Hurst at the Wednesday OES Luncheon. Congressman Curt Weldon of PA addressed the attendees for over an hour on the current state of affairs in Homeland Security.

Under Secretary Paul McHale, Department of Defense - Homeland Defense

Pam Hurst, Doug Burnett, MaryAnn Malchan and Shawn James – Members of the Industry Panel on Homeland Security Maritime Concerns

Bob Bannon, Co-Chair and Jim Pollock, NUWC Homeland Security Director

- Maritime Domain Awareness
- Biometric and Screening – including Personnel and Containers
- Technologies for Countering Chemical, Bio-terrorist, Terrorist Attacks on Ocean Industries
- HLS First Responders
- Beyond Homeland Defense and Homeland Security – Over the Horizon

The 2004 Valley Forge event featured members of the Congressional House Committees on Homeland Security and Armed Forces, representatives from the Department of Homeland Security and the Department of the Navy, the US Coast Guard, NAVSEA NUWC, NOAA, ONR, NRL and the National Science Foundation. The plenary speakers and panel members represented some of the most recognized individuals and organizations from industry, government and academia. Speakers represented not only views from the United States, but included global issues presented by European Union Community members, England, France, Canada, and Poland, and the Asia-Pacific Rim view was presented by Japanese delegates. A major focus was on underwater communications protection chaired by Bob Bannon and featured presentations by Wayne Nielsen of the Sub Telecom Forum, Jim Coble of AT&T, Doug Burnett of Holland & Knight LLP. CAPT. George Vance, USCG and Asst. Director of the Office of Net Assessment in the Office of the Secretary of Defense addressed Underwater Cable System Vulnerabilities.

The third annual IEEE-OES Homeland Security Technology Workshop co-hosted by NAVSEA NUWC will return to Warwick, RI on December 6, 7, and 8, 2005. In addition to the Hon. Curt Weldon, U.S. Representative (R-PA), Hon. Rob Simmons, U.S. Rep (R-CT), Hon. James Langevin, U.S. Rep (D-RI) are expected to return and address time sensitive issues. We intend to continue to make HSTW'05 the leading technologies workshop for ocean and maritime infrastructure protection with emphasis on underwater telecommunications protection, harbor security and container risk management, maritime first responder issues, interdiction, and unmanned maritime vehicles. It is expected that once again we will host approximately 40 to 50 exhibitors, and run 5 technical tracks featuring between 60 and 70 technical speakers who are the recognized and emerging leaders in their academic, commercial, government, and military fields of expertise. Therefore, we invite you all to come and participate in HSTW'05, it's your opportunity to become recognized as a Homeland Security leader.

Attendees Luncheon at the Valley Forge Convention Center

Pam Hurst and Bob Bannon inviting all the attendees at Valley Forge to participate in HSTW '05 to be held in Warwick, RI –Dec. 6,7,8, 2005

Improving AUV Maneuverability: Development of a Collective and Cyclic Pitch Propeller

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ABSTRACT

Helicopters achieve three-dimensional flight using a rotor capable of both collective and cyclic pitch. It was proposed that this type of propulsion system could propel and maneuver an underwater vehicle. A collective pitch and cyclic pitch propeller (CPCPP) was designed and developed as a full scale-working prototype for autonomous underwater vehicle (AUV) propulsion. This paper discusses the design and construction aspects of the CPCPP.

Keywords - AUV; propulsor; cyclic pitch; propulsion; thruster; propeller.

INTRODUCTION

The ability to achieve three-dimensional flight from a propeller rotating about a single axis was first achieved by the pioneers of the helicopter. Gaetano A. Crocco, an Italian researcher working on helicopter development, patented one of the first designs for cyclic pitch control of the blades in 1906[1,2]. The cyclic pitch control of the blades of a helicopter rotor is mandatory to allow the vehicle to fly forward, backward, or side-to-side and maintain stability in flight (Fig. 1) [2]. While helicopters have been developed into complicated and sophisticated pieces of equipment, they all incorporate some form of a swash plate arrangement to allow cyclic pitch control of the rotor blades (Fig. 2) [2,3].

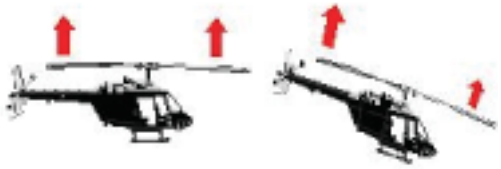

Figure: 1 - Collective and Cyclic Pitch

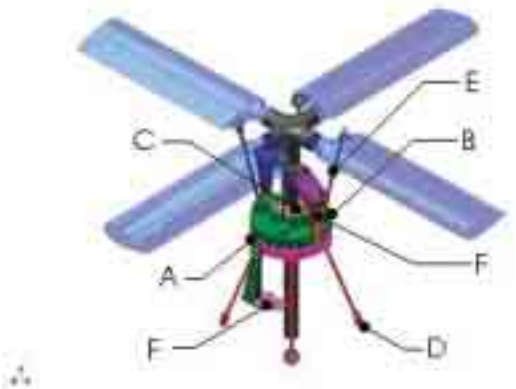

Figure 2: Swash Plate Arrangement

This swash plate arrangement consists of a swash plate (A) that does not rotate that is coupled radially to a swash plate (B) that rotates with the shaft. The two swash plates are mounted with a ball joint (C) to the rotor shaft. The ball joint allows the swash plate to tilt and/or be moved axially along the rotor shaft. The swash plates are moved by linkages (D) from the helicopter controls attached to the stationary swash plate. The linkages (E) that connect the blades to the rotary swash plate adjust the pitch of the blades. There are also sets of linkages (F) that ensure the swash plates remain synchronized with their corresponding parts.

In a paper by Murray et al. [4], the theory and application of cyclic pitch propellers were discussed. A prototype cyclic pitch propeller was constructed and tested on a small navy submersible. Sea trails conducted showed that cyclic pitch propeller technology was a useful way to navigate an underwater vehicle. The following advantages were outlined in the paper:

- Propulsor provides control while hovering
- Smaller turning radii were observed compared to the conventional configurations (i.e.: Fins)
- Propulsor provided depth control while hovering.

These advantages confirmed the statements made in another paper by Stenovec who was conducting research on tandem cyclic pitch propeller systems [5]. This involved placing a cyclic pitch thruster at both ends of a vehicle. The result was a sub sea vehicle capable of exceptional maneuverability.

Memorial University began conducting research into this method of propulsion in the fall of 2001 with a simple cyclic pitch propeller. The test results showed that this propeller had a high potential for propelling and maneuvering an underwater vehicle. A more in depth study of this propulsion system began in the fall of 2002 with a more advanced propeller that is the focus of this paper.

CONCEPTUAL DESIGN

The Canadian Self Contained Off-the-shelf Underwater Test bed or C-SCOUT is an AUV designed and developed jointly by Memorial University of Newfoundland (MUN) and the NRC-IOT (Fig. 3) [6]. The parameters of this modular vehicle were used as a starting point to identify the requirements and constraints. These parameters were then used to design a new controlled and cyclic pitch propulsion system for AUVs.

The first requirement for the new propulsor was to allow the onboard control system to adjust the cyclic and collective pitch of the blades. The use of commercial off the shelf components, where possible in the design, was another requirement of the new system. The new propulsor was required to be easily modified and allow

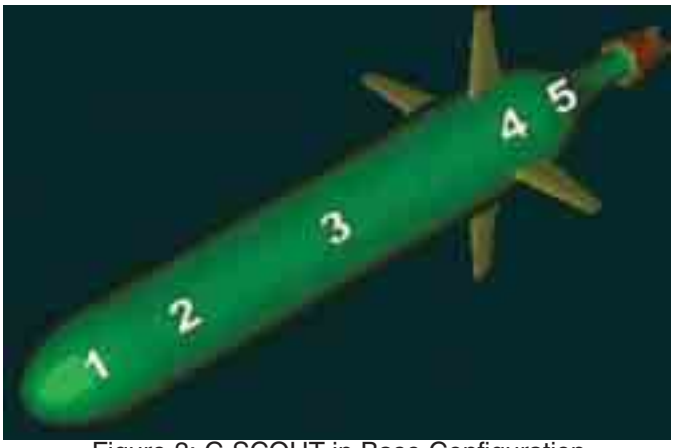

Figure 3: C-SCOUT in Base Configuration

testing of other types of blade designs for future optimization. The blades of the propeller were required to have a large diameter and turn at a slow speed to help maximize propeller efficiency.

The constraints imposed on the design of the new propulsor were determined primarily by the physical and the electrical specifications of C-SCOUT. These constraints are as follows

Mechanical:

Housing Diameter:	15.75" (400mm)
Weight of Module:	Neutral or Positive
Buoyancy	
Propeller Diameter:	< 15.75" (400mm)
Mounting:	Four-Bolt Ring
Exoskeleton	
Design Speed:	4 to 8 knots

Electrical:

Main Motor Power:	~1HP (746W)
Supply Voltage:	24VDC or 48 VDC
Control Voltage:	12VDC or 24VDC
Control Architecture:	I2C or CANBUS (To match C-SCOUT)
Connectors:	SEACON Wet Round Style (To match C-SCOUT)

Once the requirements and constraints were established different design concepts were investigated.

PRE DESIGN CONSIDERATIONS

Before the detailed design of the propulsor began, the actuators to control the swash plate and the main motor were selected. Sufficient space was also allocated for all electronic components that would be required. Bearings, bushings and other off the shelf parts were selected. By pre-selecting all of the off the shelf components before designing the rest of the propulsor, the need to change the design due to component size was virtually eliminated.

Unlike a helicopter, an underwater vehicle propelled by a CPCPP does not pitch to provide motion in the plane of the propeller. The rake of the propeller blades develops this motion. Figure 4 shows the force vectors developed by the blades of the cyclic pitch propeller. If the rake of the blades is zero, then the cyclic pitch propeller only provides a pitch

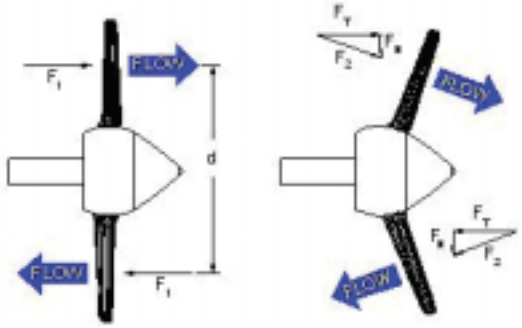

Figure 4: Lift Vectors For CPCPP

and/or a yaw moment about the vehicle's center of gravity. When the blades are raked, the propeller develops a side force as well as a pitch and/or a yaw moment about the centroid of the vehicle. After completing some lifting line calculations on the propeller blades, the rake angle of 20° was chosen. This angle provided excellent forward thrust capability and good side thrust capability.

FINAL DESIGN

Mechanical Systems

The final design for the new propulsor was based on the principle of a removable module for the C-SCOUT vehicle. The back flange of the pressure vessel serves as the main mounting plate for the propulsor. The propulsor is faired using a fiberglass outer shell. The void space between the shell and the pressure hull is filled with foam to increase buoyancy.

All of the electrical components are housed in a one-atmosphere pressure hull along with the swash plate assembly. The main motor and electronics are attached to the large end cap of the pressure vessel (Fig. 5). This allows all electrical components to be removed with the end cap. The main propulsion motor is splined onto the main drive shaft of the propulsor allowing easy separation.


Figure 5: Electrical Mounting Cap

All other components are attached to the small end cap (Fig. 6). This allows the outer pressure hull to be removed and all of the components to be easily accessed for repair, adjustment or modification.

Electric linear ball screw actuators, attached to the small end cap, position the swash plate to the desired location and angle. The linear actuators are the only electrical component in the propulsor that have to be unplugged during disassembly.

Figure 6: Mechanical End Cap

The swash plate rotates about a spherical rod end bearing that is also capable of axial motion on the main drive shaft. This makes the propulsor capable of both cyclic and collective pitch variations of the propeller blades. The swash plate transfers the required blade pitch through the control rod system.

The control rods are connected to the swash plate through a connecting rod with spherical rod end bearings. At the aft end of the control rod, connecting rods with spherical rod end bearings connect to a crank on each of the propeller blades. The crank applies the torque to the blade to position the blade to the required pitch angle.

The blades are held in place by a single bolt. This single bolt allows for the blades to be replaced easily in the event that a different blade shape is to be tested.

The main drive shaft is cantilevered from a set of angular contact ball roller bearings designed to take the thrust of the propeller in either direction. The drive shaft is sealed with a mechanical seal. This ensures that the one atmosphere pressure vessel stays dry.

The propeller hub is completely sealed with O-rings to prevent any water ingress. The propeller hub is also filled with a glycerin solution to prevent any pressure differential between the inside of the hub and the surrounding environment. This helps lubricate the moving components inside the propeller hub and ensures that there is no external water leakage.

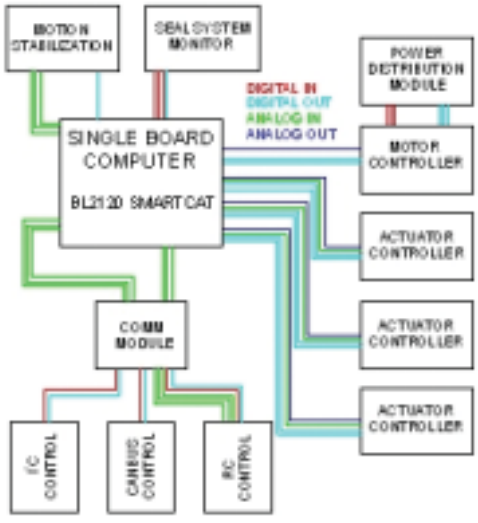

Figure 7: Electrical Schematic

ELECTRICAL SYSTEMS

While the mechanical systems make up the bulk of the design of a CPCPP, the electrical system determines the final effectiveness of the system. The electrical systems for the CPCPP were designed to be compact.

In keeping with the modular design philosophy, the electrical system was broken down into several sub systems (Fig. 7). The drivers for the linear actuator were built as individual modules. The main motor driver was split into two modules: one module for the control and signal processing and the other module for power distribution. The primary controller then controls all of these modules.

The primary controller consists of a BL2120 Smartcat single board computer. The single board computer takes information from the interface module and performs the required calculations to position the linear actuators and control the main motor. The primary controller can also accept inputs from a three-axis accelerometer to use the CPCPP for motion stabilization and station keeping. The interface module is designed to accept digital commands from the C-SCOUT communication backbone and the auxiliary radio control (RC) interface. The interface module then converts the digital communication to a mixture of analog and digital signals to interface with the primary controller.

While the propulsor was designed to integrate with the existing C-SCOUT control architecture, additional provisions were incorporated to ensure maximum functionality. A radio control system has been incorporated into the propulsor as a backup system. In the event that the free-swimming version of C-SCOUT is not available when completing future testing, the captive model of C-SCOUT could be outfitted with a towed antenna attached to a buoy. This would allow the captive model of C-SCOUT to operate as a free-swimming model for testing the CPCPP, while under radio control (Fig. 8).

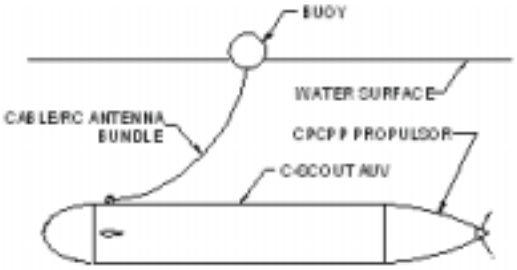

Figure 8: Radio Control Setup

The final result of the design process was the propulsor shown in Figure 9 with the specifications in Table 1.

Figure 9: Completed Propeller

Table 1: Propulsor Specifications

Overall Length:	33" (838mm)
Propeller Diameter:	12" (305mm)
Overall Diameter:	15.8"(400mm)
No. Mounting Bolts:	4 Max
Mounting Bolt Specs:	5/8"-11 TPI
Propeller Area Ratio:	0.15
Blade Rake Angle:	20°
Blade Angle:	±45°
Number of Blades:	4 (2 Optional)
Main Motor Power:	1.1HP (800W)
Propeller Speed (max):	580 RPM
Main Motor Voltage:	48VDC
Control Voltage:	±12VDC
Control Options:	I2C, CANBUS, RC Control, TCP/IP

FUTURE WORK

Now that the new collective and cyclic pitch propulsor has been completed, the next step will be to conduct testing on the design to determine the propulsive effectiveness.

The captive model of C-SCOUT will be outfitted using two different force transducer arrays. The first array is a six-component balance mounted between the hull of C-SCOUT and the propulsor. The function of this balance is to isolate the forces generated by the propulsor from the hydrodynamic forces generated by the hull. The second transducer is a three-component balance to measure the hydrodynamic forces on the body combined with the propulsor forces.

Self-propulsion trials will be conducted to determine the level of thrust and the self-propulsion point. The captive model will then be towed at an angle of attack to the flow to determine the effect of flow angle on the performance of the propulsion system.

After the self-propulsion trials, the propeller can be attached to the free-swimming version of C-SCOUT, and the propulsion system evaluated on the free swimming AUV.

SUMMARY

A new cyclic pitch propulsor has been designed and completed for the AUV C-SCOUT using information from helicopter rotor theory and expired patents of previous technology. The use of 3D parametric design software has enabled many of the design flaws to be rectified before the propulsor went into fabrication. Future testing of the design will determine the effectiveness of the propulsor.

ACKNOWLEDGMENTS

We thank the Natural Sciences and Engineering Research Council, Canada, for financial support through a Strategic Project, "Offshore environmental engineering using autonomous underwater vehicles"

and a graduate scholarship to C. Humphrey. We would also like to thank all of the other sponsors including ISE Ltd., and the project team involved in C-SCOUT.

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BIOGRAPHY

Mr. T. Charles Humphrey graduated with a degree in Mechanical Engineering from the University of Victoria, Victoria, BC, Canada in 2000. He is now completing a master's degree in Naval Architecture at Memorial University, St John's, NL, Canada. Mr. Humphrey has an interest in underwater vehicles and related technologies. He has worked on several submersible projects throughout his career. He is now conducting research on the application of collective and cyclic pitch propellers for underwater vehicle applications.

Oceans'05 Europe Newsletter
WELCOME to BREST in June 2005

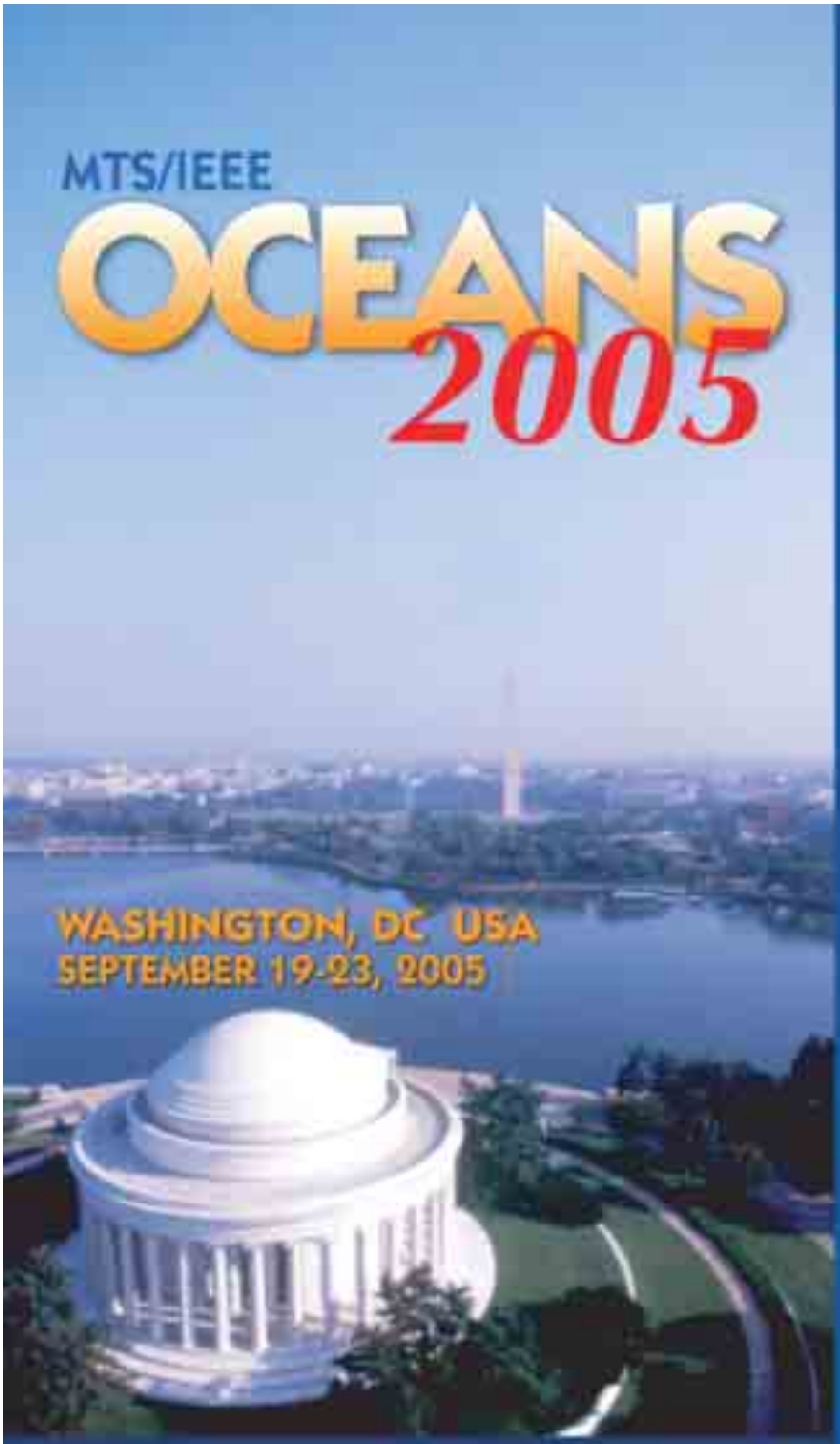
The Oceanic Engineering Society (OES) of the Institute of Electrical and Electronics Engineering - IEEE - sponsors annually the international conference OCEANS. The Oceans Conference is a major forum for scientists, engineers and end-users throughout the world for presenting the latest research results, ideas, developments and applications in all areas of Oceanic Engineering systems. This conference, on the theme "Today's technology for a sustainable future", will provide a review of recent technical advances in oceanic engineering, science and technology. OCEANS'05 Europe will comprise both a Scientific Conference (oral and poster presentations) and a large State of the Art Exhibition in the field of Engineering and Marine Technology. Both will take place in the Brest downtown cozy conference center "Le Quartz".

The conference registration is now open. The registration will be handled directly by the Conference Center "Le Quartz" using their on-line facility. Secure payment will be made available. All accommodations will be subject to a supervision by our travel agency VEB (Voyage en Bretagne). We advise you to book early as the hotel space will be limited at this time of the year.

Brest in France will be indeed the venue for the European edition of this conference in 2005 (Oceans'05 Europe). This conference already took place in Brest in 1994, with a slightly different setting, and was very successful. Since then Oceans has been offshore (i.e. outside North America) only once in Nice in 1998 and will be in Kobe, Japan in 2004.

Brest in Brittany, a rich heritage of Breton culture: language, music, dance and a "spirit" open to the world, curious about others and willing to share its wealth and diversity.

Brest in Finistère, the beginning of the world: steep cliffs, long sandy beaches, sharp reefs and the blue of Armor ("land of the Sea"), the hills and green of Argoat ("land of the Woods").



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Thanks!

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Submit **Abstract** to www.oceans2005.org/papers.htm in an **Area of Interest**. (If other areas should be included, let us know.) Acceptance will be based on quality, originality, and relevance to the **"One Ocean"** and **Plenary Themes**. Papers must be submitted in advance for publication in the *Conference Proceedings* and oral presentation during the conference.

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