IEEE
OCEANIC ENGINEERING SOCIETY
NEWSLETTER

VOLUME XIII NUMBER 1

EDITOR: HAROLD A. SABBAGH SPRING 1984 (USPS 420-910)

PRESIDENT'S COMMENTS

Have you ever asked yourself the following two questions: Why am I a member of the IEEE Oceanic Engineering Society? Am I getting the maximum benefit from my membership? I suppose I would answer the first question like most people — to keep up with what's going on in oceanic engineering related areas. Technology changes are not just occurring, they are accelerating. I don't want to be left behind, so I subscribe to the Journal and I attend technical exhange forums like the OCEANS and Offshore Technology Conferences.

The second question is more difficult to answer. To find an answer, I might ask myself some subsidiary questions: Am I reading the Journal as much as I should? Do I attend the Conferences, and do I sit in on each of the technical sessions that have potential for me? Do I talk in person with the experts at the Conferences and obtain their perspective on issues of concern to me? In other words: am I learning? These are valuable questions to ask. However, if I could answer affirmatively to these subsidiary questions, would that necessarily mean that I am getting the maximal benefit from my membership?

To answer this question more fully, I must respond to yet another question: am I contributing to my full capacity? The old adage says: "The teacher learns more than the student." Does the precept: "It is better to give than to receive." produce only a superficial, warm feeling, or is there something more? To paraphrase the words of John F. Kennedy: "Ask not what your Society can do for you, but what you can do for your Society."

Perhaps even more directly to the point is a paradox of scripture: "He that seeketh his life shall lose it, but he that loseth his life for my sake shall find it." While this has a deeper meaning, these words also apply to our thoughts here — he that seeks to benefit without contributing shall be disappointed, but he that seeks to contribute shall receive a greater benefit in return. When we publish in the Journal or give a presentation at a Conference, or serve in another capacity, we interact with our peers and end up learning more than if we only read or listened. Not only do we learn, but we also grow as persons. We have achieved something of our potential and we have increased our potential even more.

I suppose I am appealing to your enlightened self interest, an appeal for you to serve that you may be served. If you understand it that way, you are right. This is an invitation to you to consider contributing to the community of your professional peers known as the IEEE Oceanic Engineering Society. Besides submitting papers to the Journal and presenting papers at the OCEANS or OTC Conferences, there are many other ways to contribute. We are looking for people to help in organizing local chapters of OES (including San Diego, San Francisco, Seattle, Washington, D.C., New England, Eastern Canada and others). We are seeking people to help form technology committees, to augment our Current Measurements Technology Committee (including Oceanographic Instrumentation, Marine Communication and Navigation, Remote Sensing, Oceanic Data Systems, Underwater Acoustics, Arctic Instrumentation, and underwater robotics, to name a few). We need people to represent OES or various IEEE Committees (including Communications and Information Policy, Man and Radiation, Research and Development, Social Implications of Technology and Professional Activities). We would like to add Associate Editors for the Newsletter (including patents and puzzles).

If you would like to expand your involvement in the Society by participating in one of these ways, I invite you to contact me. Drop me a note indicating your willingness to serve and the area in which you are interested. We are growing as a Society, and we invite you: come grow with us.

Sincerely,

Stanley G. Chamberlain

OCEANIC ENGINEERING SOCIETY

ADCOM ORGANIZATION

ADCOM EXECUTIVE COMMITTEE

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Results of the AdCom Election Ballot

January 20, 1984

TO: All Nominees for Election to the Administrative Committee of the IEEE Oceanic Engineering Society

FROM: Irving Engelson, Staff Director

SUBJECT: RESULTS OF THE ADCOM ELECTION BALLOT

As you know, a ballot for the election of twenty-one IEEE Oceanic Engineering Society Administrative Committee members was issued on November 25, 1983. The ballots returned have been counted and the following candidates have been elected for terms beginning on January 1, 1984:

Three-Year Term	Two-Year Term	One-Year Term
Walter L. Bacon	Daniel L. Alspach	J. David Irwin
Arthur B. Baggeroer	Lloyd R. Breslau	Robin B. Lake
Donald M. Bolle	Robert H. Cassis, Jr.	Lloyd Zell Maudlin
Stanley G. Chamberlain	Thomas M. Dauphinee	Glen N. Williams
Stanley L. Ehrlich	Edward W. Early	
Anthony I. Eller	Richard C. Robinson	
Robert C. Spindel	Harold A. Sabbagh	
Arthur S. Westneat	Joseph R. Vadus	
	David E. Weissman	

We wish the newly elected AdCom members success and thank the nominees for their willingness to serve and for permitting their names to be included on the ballot.

IE:dc

OES Members Elected to Fellow Status

Congratulations to the following members of the OES who were recently elected to Fellow status by the IEEE:

Professor Wolfgang-Martin Boerner
Department of Electrical Engineering
and Computer Science
University of Illinois at Chicago
Communications Laboratory
851 South Morgan Street, 1104 SEO
Post Office Box 4348
Chicago, Illinois 60680

For advancement in inverse methods in sensing systems and in high-resolution broad band Doppler radar polarimetry.

Dr. Gentei Sato
4-1-37 Kamikizaki
Urawa
Saitama-ken, Japan 338

For research and development in the field of specialized antenna design.

The Fellow Committee of the IEEE looks forward to greater participation by the IEEE Societies in the Fellow nomination process in the coming year. If you wish to nominate someone for this prestigious award, contact Don Bolle at the previously published address or the Staff Secretary, IEEE Fellow Committee, 345 East 47th Street, New York, NY 10017 (212) 705-7750).

FROM THE TECHNOLOGY EDITOR

Roderick Mesecar

BIOGRAPHICAL SKETCH

Dr. Roderick Mesecar is head of the Technical Planning and Development Group and a faculty member in the College of Oceanography at Oregon State University. He formed the T.P. & D. group in 1967 to foster the development and application of engineering technology for the full suite of university marine research programs. For nine years he chaired the annual Ocean Technologists Meetings and edited and published EXPOSURE, the newsletter for Ocean Technologists, for ten years.

A good idea is in the mind of the beholder,
It can become an even better idea when it is
shared with others.

As two authors have done in this issue, you are invited to share through photographs, illustrations and text some of those technical innovations that have made your efforts more successful. The subject matter of these articles is going to be kept general but within the interest scope of the Oceanic Engineering Society.

A typical article is two to four pages, double spaced with appropriate illustrations. You are also encouraged to include a short biographical sketch and photograph as a means of introducing yourself to the readership.

If you are interested in participating in this program, please write or give me a call:

Roderick Mesecar, Technology editor
IEEE/OES Newsletter
Oregon State University
College of Oceanography
Corvallis, OR 97331
(503) 754-2208

COASTAL RESEARCH AMPHIBIOUS BUGGY (CRAB)

BACKGROUND

Scientists and engineers working in the surf zone face particularly difficult data collection problems. Fixed oceanographic instrumentation usually must be installed under less-than-ideal conditions, and once operational, the sensors are exposed to a wide variety of hazards which can greatly affect data quality. Accurate bottom surveys of the nearshore area (particularly through the surf zone) are difficult to obtain using conventional boat-mounted fathometers. To overcome such difficulties, the Coastal Research Amphibious Buggy or CRAB (Fig. 1) was designed and built by the Wilmington District Corps of Engineers. It is operated by the U.S. Army Coastal Engineering Research Facility in Duck, North Carolina. The CRAB is modeled after a vehicle originally built by Marine Travelift and Engineering for use in monitoring a beach nourishment project at Rockaway, New York.

SPECIFICATIONS AND CAPABILITIES

The CRAB consists of a 35 ft. (10.6 m) tall tripod constructed of 8-inch (20.3 cm) schedule-80 aluminum pipe connected at the base by horizontal members 7 ft. (21 m) above the ground. Power is supplied by a 53 hp Volkswagon engine on the deck which drives a variable stroke hydraulic pump. This main pump in turn pumps hydraulic fluid at 800 psi (5.52 x 10^6 pa) to hydraulic motors on each wheel. The variable stroke feature of the pump allows an infinitely variable gear ratio in either forward or reverse drive at constant engine speed. The system also supplies power steering to the steerable front wheel. For strength and corrosion resistance, all hydraulic lines are stainless steel except for short flexible sections at the front wheel. Though it appears top heavy, the liquid-filled tires and wide wheelbase make it very stable. The large tires have only negligible effect on a hard rippled sand bottom. However, scour around the tires has been noticed in areas of active wave breaking or strong currents, and the CRAB cannot be used on soft, silty, or loose bottoms. Total vehicle weight is about 18,000 lbs. (80 kN). Top speed of the CRAB is 2 mph (3.2 kph) on land and somewhat less in water depending on wave conditions. One major drawback of the vehicle is its lack of portability. It is most easily moved by CH-5 Chinook helicopter, but meets the helicopter's maximum payload of 15,000 lbs. (6,804 kg). It has also been barged to a study area and off-loaded by crane. Design of a more portable CRAB is being considered to meet Corps' survey requirements.

Author biography on page 9.

SURVEYING

Surveys are conducted using a Zeiss Elta-2, which incorporates in one compact unit a first order electronic distance meter and theodolite, microprocessor, rechargeable power supply, and interchangeable solid-state memory. When optically aimed at a reflecting prism assembly located on the CRAB, the instrument calculates, records, and displays the cartesian coordinates of the CRAB's position. The combined CRAB/Zeiss system is capable of horizontal and vertical accuracies of ± 0.1 ft. (0.03 m) or better at a range of 1 mile (1.6 km). Only about 10 seconds are required to aim, shoot, and record a data point. A typical survey of 50 points, over a 3,500 ft. (1,000 m) long profile, takes about 45 minutes. Because the actual coordinates of each point are displayed, the

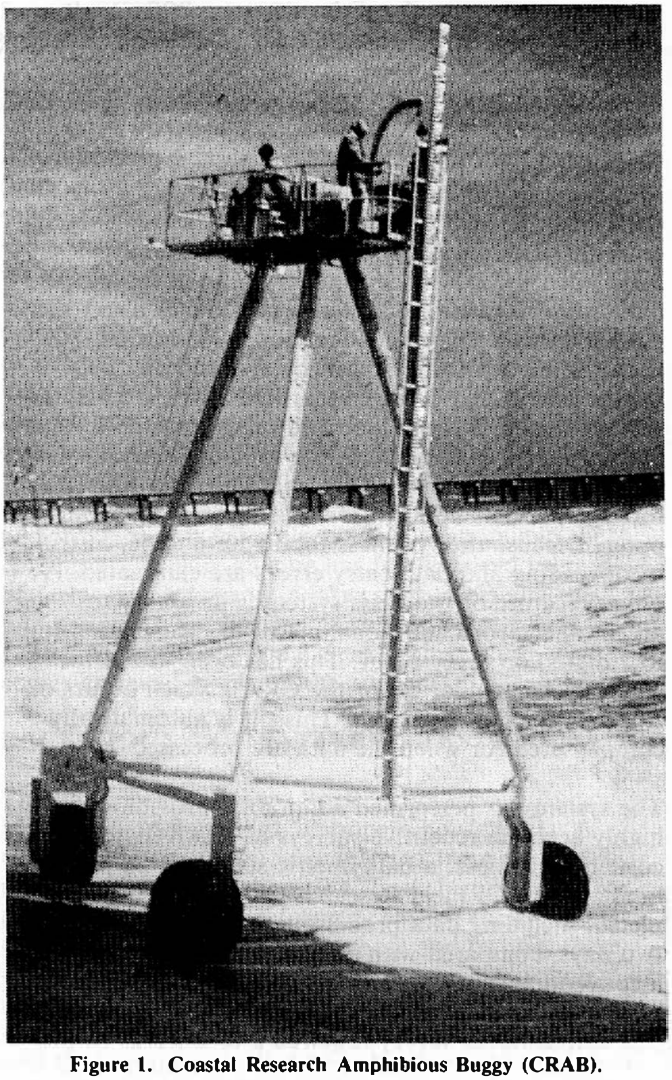


Figure 1. Coastal Research Amphibious Buggy (CRAB).

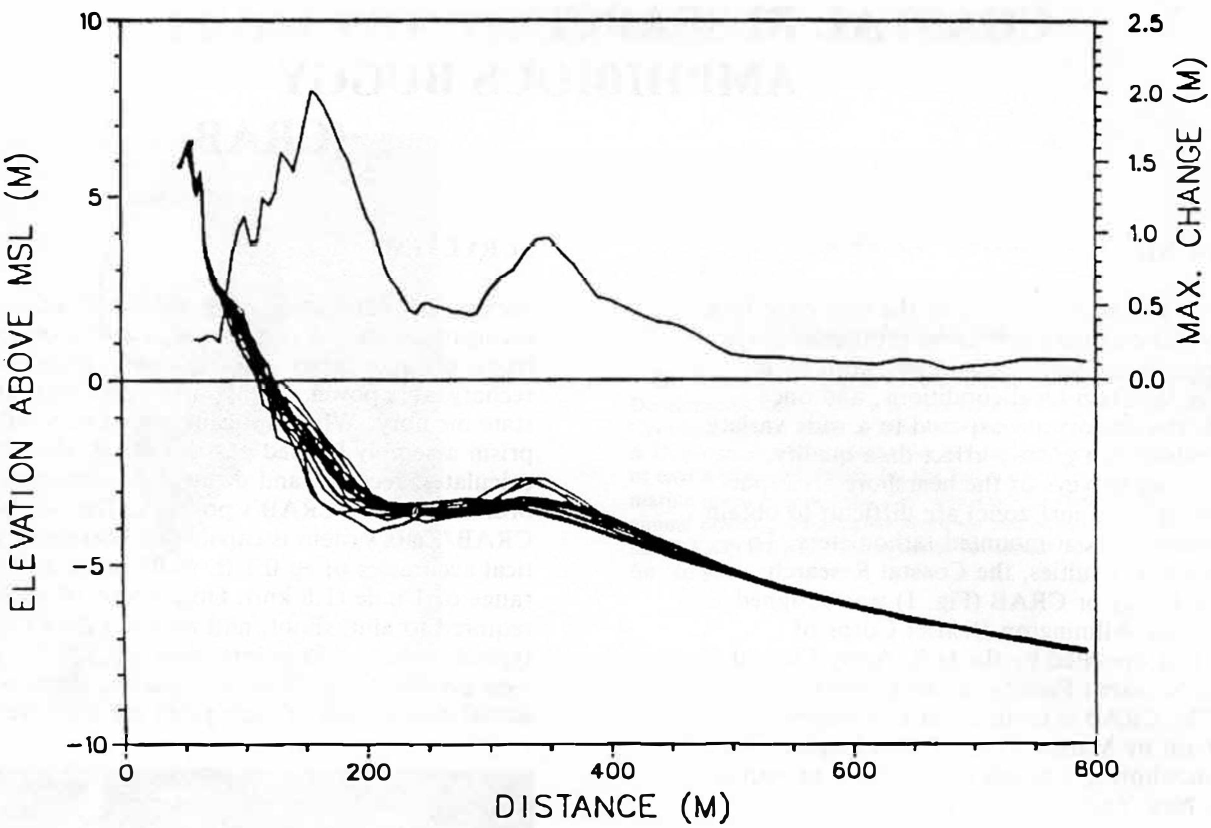


Figure 2. 24 repetitive surveys from November 17, 1981 to September 1, 1982 using the CRAB/Zeiss system.

CRAB can be kept on line to within ± 2 ft. (± 1 m) or better. There is, of course, no requirement to survey profile lines since area surveying in three dimensions is possible. It is also possible to direct the CRAB to a predetermined location. This is most useful when deploying and recovering **in situ** instruments. Land areas inaccessible to the CRAB are surveyed using a prism mounted on a range pole. Once a survey is completed, the solid-state memory is removed from the instrument and data are transmitted through a Zeiss-supplied interface directly to a computer. Because the system is totally automatic, instrument reading and data entry errors are eliminated. A unique feature of the Zeiss system is its ability to accept and record additional pieces of information (up to 7 digits) on every point. This has been useful for entering the angular tilt of the CRAB which occurs on steep sections of the beach. This tilt is automatically compensated for when the data are processed.

The system has performed admirably, providing highly accurate repetitive surveys at relatively low cost. For example, a bathymetric survey of 26 profile lines at CERC's Field Research Facility can be completed, including data processing, by two people in two days, compared with eight people and a week for a conventional survey. Other intangible benefits of the system are reduced office time, faster data analysis (the conventional survey required 2 to 3 weeks of processing) and higher accuracy. Idle time is also reduced since the CRAB can operate in more adverse wave conditions (up to 6 ft. or 2 m waves), than conventional surveying equipment.

The high accuracy of the system can be seen in Figure 2, which shows 24 repetitive surveys of a single profile line from November 17, 1981 to September 1, 1982. While there is considerable movement close to shore, the relative stability of the off-shore zone (deeper than 20 ft. or 6 m) is of greater interest. Maximum variation in this zone is less than 0.6 ft. (0.2 m). This would be difficult, if not impossible, to measure using any conventional survey technique.

OTHER USES

The CRAB has also been used to meet a wide variety of other nearshore research objectives. Its greatest advantage has been its deployment as a mobile, yet stable, platform from which to conduct research in the surf zone. Geologists collected bottom surface samples at precise locations using a sampler lowered from the deck. Long cores where also collected in the surf zone, on the barrier island, and in the adjacent sound using a vibra-core and core-tube assembly. Cameras and lights were attached to the legs to qualitatively observe the distribution of bedforms on the sea bottom. Scuba divers installed several types of underwater instrumentation using the CRAB as a work platform, and instrument mounts along with their connecting cables were towed from shore to predetermined positions, and then lowered to the ocean bottom.

Since the CRAB vibrates under moderate wave action, measurements of waves and currents have been made using a towed instrumented sea sled. Data from several sensors on the sled were multiplexed and telemetered to shore from an antenna mounted on the sled's mast. The sled system could also be used to evaluate and intercompare instruments at low deployment and retrieval costs.

ACKNOWLEDGMENT

Portions of this paper have been previously published elsewhere. Results presented herein, unless otherwise noted, are based on research conducted at the Coastal Engineering Research Center, Waterways Experiment Station, under the Coastal Flooding and Storm Protection Program, Coastal Engineering Functional Area, Civil Works Research and Development, U.S. Army Corps of Engineers. The findings reported are not to be construed as an official Department of the Army position unless so designated by other authorized documents. Permission to publish this information was granted by the Chief of Engineers.

PERFORMANCE TESTS OF AGED LITHIUM BATTERIES

INTRODUCTION

The Naval Ocean Research and Development Activity (NORDA) purchased a quantity of lithium sulphur dioxide batteries during 1977-78 for experimentation in advanced self-contained remote measurement systems. A Navy moratorium on the use of lithium battery technology in the Fall of 1979 caused the collection and "bunker" storage of these batteries until the summer of 1982 when a pressing research need dictated that NORDA seek special permission for use of these batteries from the Naval Sea Systems Command Safety Office (NAVSEA Code 06H). After an in-depth review of the intended application, the Safety Office granted permission to use lithium batteries as the power source but added the stipulation that use of the existing stored batteries would require verification of performance consistent with the manufacturer's original specifications. This article briefly describes the results of these performance tests.

REQUIREMENT FOR SAFETY CERTIFICATION

The development of lithium based battery systems seems to have been clouded from the beginning by occasional spectacular "accidents"; some resulting in serious injury or death to the user. A particularly tragic accident in Bermuda in mid-1979 resulted in a Navy moratorium on the use of lithiums in Navy systems or operations, establishment of a Navy Lithium Battery Safety Program, and issuance of an upgraded lithium battery safety instruction, NAVSEA INST. 9310.1A. This instruction specifies for all Naval Activities the responsibilities and guidelines for the design, acquisition, testing, evaluation, use, packaging, transportation, storage, and disposal of lithium batteries. This instruction provides excellent guidance to users of lithium batteries and is available from the Commander, Naval Sea Systems Command, Attention SEA 06H, Washington, DC 20362.

INTEREST IN USING "OLD" BATTERIES

It would have been simpler to have spent the few thousand dollars necessary to purchase new lithium sulphur dioxide batteries for the project and avoided the necessity of proof testing a sample of the existing lot to verify their acceptability. Had this been done, however, a rare opportunity would have been missed; namely, the verification of one of the primary claims of lithium battery technology regarding the extremely long shelf-life achievable. At the time, it appeared that an existing resource (the stored lithiums) could be put to good use and that some interesting data could be collected on claims of 10-year shelf-life for this type battery. It has subsequently been found that the performance data set collected is very unique in the community (hardly anyone has five-year-old lithium batteries laying around in large quantities) and this fact has led to publication of the test results as NORDA Technical Note 239. A limited number of copies are available from the author.

BACKGROUND OF BATTERIES TESTED

The batteries tested were Power Conversions, Inc., Model 660-5AS rated at 30 ampere hours (AH). A total of 32 units (cells) were selected from a lot of 281 units and tested to exhaustion. Both forming and discharge tests were performed. During the 4-5 years that had elapsed between purchase and testing, these units had been subjected to a variety of environmental conditions. On the average, each cell was in an air conditioned laboratory for approximately two years and then an uncontrolled "bunker" for the next three years. In southern Mississippi, bunker storage means a temperature range of upper teens to upper 90's fahrenheit, and high relative humidity, year round. While not a completely realistic applications situation, the storage treatment of these cells is representative of long-term standby use in a field situation. The principal question was how well would these batteries perform if called upon to give rated performance? In the intended application, slightly more than one ampere would be required from the most heavily loaded cells and a total energy of at least 30 AH per cell was desired.

PERFORMANCE TEST RESULTS

Two basic tests were performed on each cell; time to form using the highest in-service drain current and time to discharge using the same in-service current.

It is well-known that lithium sulphur dioxide batteries form a passivating layer on the cell anode during periods of non-use. This layer, created by the self-discharge current internal to the cell, acts as a high resistance impediment to further self-discharge. It is this characteristic of lithium cell electro-chemistry that gives these batteries their extremely long shelf-life and causes a cell to not give full rated voltage and current until sometime after the load has been applied and the passivating layer electro-chemically reduced. Table 1 is a summary of the forming test results. The table is divided into three parts. The first part summarizes the initial forming test on all 32 units and gives the typical results; also shown are the results for the cells having the highest and lowest starting (no load) voltages. Parts two and three show the highest and lowest starting voltages for a second forming test one week later on 16 units (8 at 3.18 ohms load and 8 at 2.06 ohm load). The 16 units were idle (no use) between the forming tests.

The forming tests demonstrated the passivating effect but not quite as expected. The times taken to reduce the passivation effect and return to "normal" operation were much longer than expected (we had expected less than 60 seconds). This recovery time is likely due to the relatively small forming current and, therefore, slow rate of conversion of the passivation layer. The second forming test shows that the passivation layer was not fully removed (or reformed very quickly) again implying a low forming current. Being interested only in how these old cells would perform in the contemplated application, and observing that the forming results were acceptable, no further forming tests were done.

The discharge tests constituted the final evaluation of each cell's performance capability. A summary of the results for the 32 cells tested is given in Table 2. This table has been constructed from the detailed data given in the previously cited NORDA TN 239 and requires some explanation. The average values shown (line 1) are for all 32 cells and clearly demonstrate the ability of these "old" cells to supply, on the average, more than the 30 AH capacity originally specified. The time to transition from a load voltage of 2.0 volts to 1.0 volts was measured to examine the steepness of the extinction portion of the discharge curve. Considering the 33 AH capacity at about one amp, the 31 minute transition demonstrates a rather steep extinction slope. Line 2 of Table 2 gives some maximum values used and/or measured during the discharge tests; these values do **not** pertain to a given cell but are maximums achieved for various cells within the sample of 32 units. Line 3 gives the set of minimums experienced; again for various cells. It should be mentioned that the "virgin" quality of these 32 cells could not be verified and that some of the cells may have been used for short-term experiments prior to the "bunker" storage. A review of the detailed data reveals that two cells gave 20 AH or less, four cells 25 AH or less, and eight cells 30 AH or less, meaning that the vast majority (24 or 75%) gave more than rated capacity. This is a rather significant accomplishment after five years of less than ideal storage and handling.

CONCLUSIONS

The lithium sulphur dioxide cells tested performed very well when rated against the manufacturer's original performance specifications. None of the 32 cells acted in any adverse way although four cells gave considerably less total energy than anticipated (there is the possibility they were already partially used). It would appear from the data that these lithium cells provide very predictable performance without requiring special precautions regarding storage temperature or humidity control.

Table 1 — Summary Results of Forming Tests

	No load voltage	T start voltage	T end voltage	T end time	Load resistance	
Typical:	2.52v	2.45v	2.71v	552 sec	3.10 ohms	
Highest	2.74v	2.64v	2.74v	523 sec	3.10 ohms	(Part 1)
Lowest	2.28v	2.20v	2.72v	600 sec	3.10 ohms	
Highest	2.64v	2.56v	2.73v	522 sec	3.18 ohms	(Part 2)
Lowest	2.52v	2.48v	2.73v	437 sec	3.18 ohms	
Highest	2.58v	2.51v	2.71v	348 sec	2.06 ohms	(Part 3)
Lowest	2.25v	2.25v	2.63v	571 sec	2.06 ohms	

Table 2 — Summary Results of Discharge Tests

	Load resistance	Amp hours to 2.0v	Time for 2.0v to 1.0v	Load voltage	Load current
Average:	-	33.3 AH	31.3 min.	-	-
Max:	3.18 ohm	45.1 AH	132 min.	2.82v	1.44 amp
Min:	1.95 ohm	18.1 AH	6 min.	2.67v	.87 amp

POSSIBLE FUTURE WORK

We still have a number of the 660-5AS batteries in storage. These cells are entering their seventh year of existence and unless utilized by some as yet unspecified project will be available for a similar evaluation at say ten years of age. Perhaps there will be sufficient interest at that time to pay the cost involved to obtain unique data set on lithium sulphur dioxide batteries. ⊣

For further information, contact:

Randy Holland, Code 252
NORDA, Ocean Technology Division
NSTL, Mississippi 39529

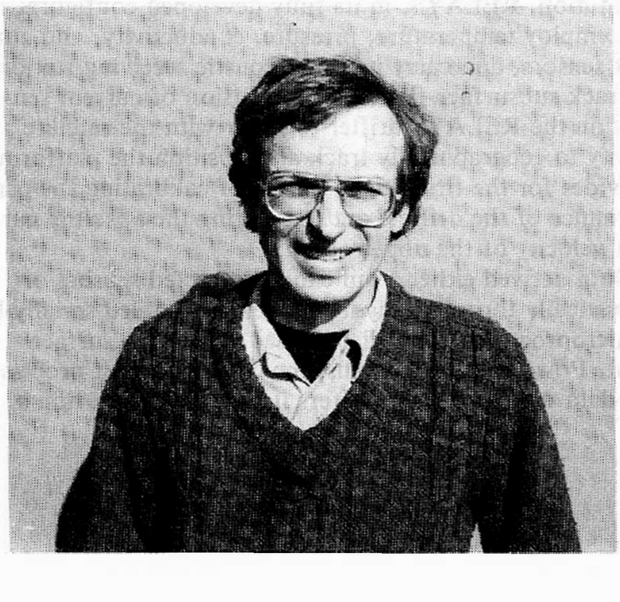
Telephone: (601) 688-4713

Randy Holland is Head of the Instrumentation Branch, Ocean Technology Division, Naval Ocean Research and Development Activity. The Instrumentation Branch develops special purpose data acquisition and control systems for collection of environmental data from a wide variety of Naval platforms. Randy spent more than eight years specializing in the development of self-contained ocean instrumentation packages prior to becoming a Branch Head about two years ago. He has BSEE and MSEE degrees from Washington University, St. Louis, MO, and is a member of Tau Beta Pi and Eta Kappa Nu Honor Societies.

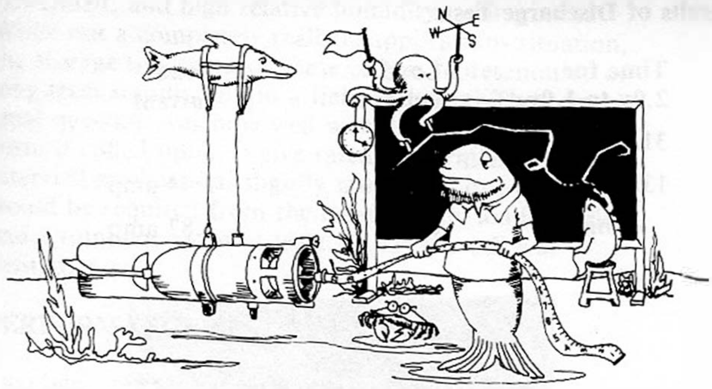
For further information about the coastal research amphibious buggy, contact:

William A. Birkemeier
CERC Field Research Facility
SR Box 271
Kitty Hawk, North Carolina 27949

Telephone: (919) 261-3511



William A. Birkemeier is a Hydraulic Engineer with the Coastal Engineering Research Center's (CERC) Field Research Facility, Duck, North Carolina. He received a BS in Physics from Worcester Polytechnic Institute and a MS in Civil Engineering from the University of Delaware. Since joining CERC in 1975, his main research interests include the effects of storms on beaches, bluff recession in the Great Lakes, and the problems associated with collecting and analyzing accurate beach survey data.



CURRENT MEASUREMENT TECHNOLOGY COMMITTEE NEWS AND INFORMATION

The U.S. Geological Survey in Woods Hole, MA has deployed an array of current moorings across the Continental Shelf and slope near 70°W. This deployment is part of an on-going experiment which began in October 1982 to study current and sediment transport on the slope. Additional measurements conducted as part of the Department of Energy's SEP program (Shelf Edge Exchange Processing) experiment at 70°W and the Mineral's Management Service Mid-Atlantic Slope and Rise studies near 73°W should provide a major new set of current observations along the entire slope of the northeastern United States. For further information contact Brad Butman (617-548-8700)

RELAYS, the Real-time Link and Acquisition Yare System, is a general purpose data acquisition platform uniting two proven measurement technologies into a single instrument system capable of simultaneously transmitting all acquired data via satellite to any number of investigators at multiple locations throughout the world. Under development at the Woods Hole Oceanographic Institution, RELAYS, in its fully developed configuration will employ temperature, pressure, conductivity, and current sensors, and carry its own acoustic receiving station to track subsurface floats. The inclusion of current sensors on the RELAYS drifter together with the satellite's ability to geographically track and position the platform provides for the first time a means of calibrating the performance of the drifters and measuring the absolute current velocity of the upper ocean.

Data derived either from cable connected sensors or acoustically through a hydrophone are sampled serially by a microprocessor controller housed within the surface float. Powered by solar cells, the controller first processes the data onboard, then buffers it for up to eight hours until one of two polar orbiting satellites is in the field-of-view. The data are then transmitted via a radio (PTT) contained within the surface float to the satellite for distribution. Designed for possible air deployment and with automated sensor check-out and calibration, the expense of operating this multifunctional platform should be significantly less than the systems it replaces.

The initial RELAYS prototype was built and successfully field tested in 1982. Based upon these results, two Mark I RELAYS Systems were constructed and field tested during January 1984 off the Bahama Islands. Systems 01 and 02 were deployed from the R/V Cape Florida on January 11 and 12 with recovery eight days later. Preliminary analyses of the results look extremely promising and we are moving ahead with plans to build a third RELAYS platform. We anticipate that the fully configured three drifter system will undergo extended field testing prior to the end of this calendar year.

For further information, contact Bob Chase at 617/548-1400 ext. 2759 (R. Chase on telemail).

The Remote Acoustic Doppler (RAD) system that was installed by NOAA at Ambrose Light Station, New York, in August of 1983 recently went down because of sea-water leakage in the underwater cable. This bottom-mounted upward looking system was designed by NOAA and used an AMETEK-Straza DCP 4400/300 doppler current profiler as the sensor. It had been operating in real time, transmitting current profile data to Rockville, Maryland, every 6 minutes. The cause of the underwater cable leakage in 23 meters of water has yet to be determined. Approximately 120 meters of 26 conductor, vinyl jacketed cable connected the bottom sitting platform to Ambrose. The cable was supplied by AMETEK Straza and had been overcoated by NOAA with a polyethylene spiral wrap for abrasion protection. During the system installation, the cable was trenched approximately 20 cm into the bottom; however, after one month of operation, a fisherman's danforth anchor snagged the cable and uprooted several hundred meters of cable before parting the anchor line. Plans had been made to retrench the cable to a deeper depth but were precluded by the seawater leakage. NOAA is planning to recover the cable and perform an autopsy to determine the cause of failure.

Contact Jerry Appell (301) 443-8036

Recent Publication:

"Current Velocity Profiles in the Straits of Florida from the Pegasus Current Profiler: Subtropical Atlantic Climate Study (STACS) 1982"

NOAA Technical Memorandum ERL AOML-55

For further information contact Bob Molinari (305-361-4344)

'TIS A PUZZLEMENT

After long and devoted service to *Puzzlers in the Ocean Environment*, Prof. George Mueller is leaving his post as editor of this column. I am certain that those of you who have enjoyed his Puzzlements join me in thanking him for his contributions. The solutions of past puzzles, printed below, terminate this column until we can find a new editor.

PAST PUZZLES

Solution: HARMONIC CONTENT OF A PERIODIC WAVE

A positive portion of an alternating voltage wave follows the curve $y = C_0 + C_1x + C_2x^2$ through the points (0, 0), ($\pi/2$, 120) and (π, 0). A negative portion of the wave follows another curve $y = C_0 + C_1x + C_2x^2$ through the points (π,-80), ($3\pi/2$, -80) and (2π, -80). Determine the fundamental, the second and the third harmonic components of the wave.

By using the equations derived in previous issues of the *Newsletter*, it is found that the equation of the voltage wave is

$$y = 112.85 \sin x - 24.32 \cos 2x + 19.27 \sin 3x .$$

Solution: THE CENSUS TAKER SOLVES A PUZZLE

A census taker (CT) came to a house and wrote down the street number. He then rang the doorbell. A man answered. "How old are you?" the CT asked. The man gave his age. "Are there any others who live at this address?" was the next question. "There are three others," the man replied. "What are their ages?" the CT asked. The man replied, "The product of their ages is six to the fourth power and the sum of their ages equals the street number of this house."

The CT worked for a while with pencil and paper and then said, "I do not have enough information." The man replied, "One of them is older than I." The CT then told him, "Now I know their ages."

Since $6^4 = 1296$, the CT searched for sets of three factors of that number and then added the factors. He found that the factors 2, 8 and 81 add to 91 and that the factors 1, 18 and 72 also added to 91. Hence, he needed more information to determine which set of factors was the correct one. Since the man's age decided the question his age was in the range from 73 through 80 and the ages in question were 2, 8 and 81.

CORRESPONDENCE

Art Westneat and his wife were involved in an auto accident in December. Art writes of his recovery below.

January 9, 1984

Dear Hal,

Many thanks for your welcome card. I am delighted to hear from you.

Did you get the essay I mailed to you some weeks back? Hope so.

Excitement here! Still in traction which is fun. Most of the broken bones are healed and the result of the concussion (which had me in intensive care for a while) is all passed. Also had the fun of an embolism, which is not to be sought in place of a week in the sun. At least two months before I can apply any force to my leg, and crutches 'til mid summer. Wife had six broken ribs, and a broken collarbone.

I owe you a story on the chapter activities in San Francisco, San Diego, Seattle, Halifax and N.E. Moving slowly. As always nothing happens without leadership. We will see how it works here.

Can you press Stan for a summary of chapter activity. I have gotten remote from it during the past several weeks.

Hal — it was a joy to hear from you. Hope all goes well.

Art Westneat

January 18, 1984

Mr. Harold A. Sabbagh, Editor
IEEE Oceanic Engineering Society Newsletter
Bloomington, Indiana

Dear Mr. Sabbagh:

I am pleased to see your progressive approach about material for the *Oceanic Engineering Society Newsletter* in the Winter 1983 issue (Editor's Comments, p.1).

Technology transfer (from the Government's National Laboratories to private industry) is a vital area of interest in the field of oceanic engineering. I believe a regular column on technology transfer would be a valuable contribution to your readers. I would like to make occasional contributions to such a column, but do not have the time to conduct it continuously.

Incidentally, you may want to republish, in the *Newsletter*, a paper I gave recently at the IEEE Conference on Engineering Management, held at Dayton, Ohio, November 7-9, 1983. The title of this paper is "Cooperation, For Technological Progress, Between Private Industry and the Government's National Laboratories." This paper was published in the PROCEEDINGS of that conference. The copyright on my paper was transferred to the IEEE on the understanding that I can republish it at any time, for my own use. A copy of this paper is enclosed.

The paper, as published in the PROCEEDINGS is quite lengthy (seven 2-column pages). I have just produced a much reduced condensation of it. Would you be interested in receiving a copy of it? It may better suit your space requirements.

Sincerely,

Hyman Olken

A Word About Awards

Don Bolle, Chairman of the OES Awards Committee, seeks nominees for the following awards:

- Distinguished Technical Contributions
- Distinguished Service
- Outstanding Young Engineer

The first two awards are presented at the annual OCEANS' Conference, and the last one is to be presented at the concluding event of the 1984 Centennial year. This event is scheduled for Saturday evening, 1 December, in Santa Clara, CA to honor an outstanding young engineer in each of the 33 IEEE Societies.

If you have questions, or wish to nominate someone for any of these awards, contact Don at:

College of Engineering and Physical Sciences
Packard Laboratory 19
Lehigh University
Bethlehem, PA 18015
(215) 861-4025

Other IEEE awards and their deadlines are:

• Field Awards	April 1 1984
• Medal of Honor	July 1 1984
• Major Annual Awards	July 1 1984
• IEEE Service Award	July 1 1984
• Prize Paper Awards	July 1 1984

SIXTEENTH ANNUAL OFFSHORE TECHNOLOGY CONFERENCE

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- ☐ *New technologies in drilling and production*
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- ☐ *Platform design, construction, installation*
- ☐ *Transportation*
- ☐ *Floating production systems*
- ☐ *Frontier developments in ocean mining*
- ☐ *Arctic offshore development*

Discussion Luncheons: Tuesday and Wednesday luncheons will feature additional presentations of significant offshore developments.

Tuesday, May 8:

"Drilling at 6448 Feet in the Atlantic"
Carl Wickizer, Shell Offshore, Inc.

"Does Regulation Promote Offshore Safety?"
Captain Thomas F. Tutwiler, U.S. Coast Guard

Wednesday, May 9:

"Design Considerations In The Transition From Fixed To Floating Systems"

Moderator:
Joe W. Key, Key Ocean Services, Inc.

Speakers:
Alan C. McClure, Alan C. McClure Associates Inc.
Jay B. Weidler, Brown & Root Inc.
Andrew F. Hunter, Conoco

"Floating Production Processing"
Dr. Christopher Fay, Technical Manager, AS NORSKE Shell

Note: Luncheon seating is limited. Make your reservations early.

Emphasis on Exchange of Information: OTC 1984 is a technical conference only. The exhibition of the very latest in offshore-related equipment and services will return at OTC 1985.

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- ☐ 06 Marine Technology Society
- ☐ 07 Society of Exploration Geophysicists
- ☐ 08 Society of Mining Engineers of AIME
- ☐ 09 Society of Naval Architects and Marine Engineers
- ☐ 10 Society of Petroleum Engineers of AIME
- ☐ 11 The Metallurgical Society of AIME

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			Social Function
______	$15	______	12. OTC Distinguished Achievement Awards Luncheon (Monday, May 7, 12:15-2:00 p.m.)
			Topical Luncheons
(Tuesday, May 8, 12:15-1:30 p.m.)			
______	$10	______	13. "Shell's Exploratory Well in 6,800 ft of Water on the U.S. Atlantic Coast," Shamrock Hilton
______	$10	______	14. "Does Regulation Promote Offshore Safety?" Astro Village Hotel
(Wednesday, May 9, 12:15-1:30 p.m.)			
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______	$10	______	16. "Design Considerations in the Transition From Fixed to Floating Platforms," Astro Village Hotel

*With valid school identification

TOTAL DUE: $ ______

Reminders for Advance Registrants

- A separate registration form must be completed for each individual. Form may be photocopied.
- Forms will not be processed unless accompanied by payment for total amount due.
- No refunds on registration fees will be made after Friday, May 4, 1984. Refund deadline for the OTC Luncheon is 12:00 noon, Saturday, May 5, 1984. A cancellation letter is required for refunds.

Advance Registration materials (badges and tickets) may be picked up as follows:

Sunday, May 6	3:00 p.m. to 8:00 p.m.	Astro Village Hotel Meeting Place I
Monday, May 7– Wednesday, May 9	During Conference Hours	Advance Registration Counters

- NO ONE UNDER 15 YEARS OLD WILL BE ADMITTED TO OTC.

OCEANIC ENGINEERING SOCIETY (continued)

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