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NEWS RELEASE

Local Engineer Honored by Worldwide Engineering Society
Recognized as Centennial Young Engineer by IEEE During Its Centennial

SAN JOSE, CA, January 16: Lie-Yauw Oey, a local Georgia electrical engineer and scientist with the Skidaway Institute of Oceanography in Savannah, was honored here recently as a Centennial Young Engineer by The Institute of Electrical and Electronics Engineers, Inc. (IEEE). Dr. Lie-Yauw Oey was recognized at a special banquet concluding IEEE's Centennial Year, attended by some 700 engineers and scientists as well as leaders from government, industry, and academe. The Institute is the world's largest technical professional organization with more than 250,000 members in over 120 countries.

Cited by the IEEE Oceanic Engineering Society, Lie-Yauw Oey received a "Centennial Key to the Future" from IEEE President Richard J. Gowen. The "Keys to the Future" were presented to 34 individuals representing the Institute's 33 technical societies. Each recipient was identified as an individual in the early stages of his/her career "who best demonstrates sound understanding of the evolving technologies" in the individual's chosen field and whose "progress shows the greatest promise for applying these technologies to the development of new industrial products and systems for the improvement of society."

The keys were laser cut from a three-inch silicon disc composed of 256k metal oxide semiconductor (MOS) material. The Oceanic Engineering Society is part of IEEE Division IX encompassing the signals and applications area.

Lie-Yauw Oey received the B.Sc. First Class Honors Degree from the University of London, England, in 1974, as well as the M.A./M.Sc., and Ph.D. degrees from Princeton in 1976 and 1978, respectively. He is currently an Associate Professor at the Skidaway Institute of Oceanography, where he constructs mathematical models for use in supercomputers to study the Gulf Stream and the ocean circulation of the continental shelt of the South Atlantic Bight. In addition, he has held numerous research scientist positions, both in academic and industrial research institutions.

In remarks addressed to the Centennial Young Engineers, an actor portraying Benjamin Franklin, perhaps the first great electrical engineer, issued a challenge encouraging the Key recipients to follow in the tradition of excellence and innovation of their forebears, serving others with technical skills.

SONOBUOYS—PART II
AFTER WW II

RUSSELL I. MASON

Reprinted from the IEEE AESS Newsletter, October, 1984

THE SONOBUOY COMES OF AGE

At the end of War 2 the OSRD Laboratories, including the Columbia University New London Laboratory, finished their work and the staffs dismantled and generally returned to their former professional lives. The New London lab, where the sonobuoys had been born and nurtured, was absorbed as an activity of the Naval Research Laboratory. This was not an airborne oriented or sponsored Laboratory. NRL announced almost immediately that sonobuoy work would be terminated. The majority of the sonobuoy engineering staff, discouraged at this abandonment of worthwhile work they were so proud of, left and returned to peacetime jobs. The termination was a tragic mistake because airborne ASW was left without any Navy Laboratory to watch out for the interest of a promising new technology. Airborne ASW, sonobuoys included, went into a long dark period, nearly to 1950 without intelligent technical guidance.

The sonobuoys that had been designed and used in War 2 were indeed simple, primitive technology. All they could do was to just listen for the sounds made by a submarine, broadband passive sonar at its simplest, and transmit those non-directional aural detections via a high fidelity FM low power transmitter. The general location of a submarine was estimated by judgement of the sounds, (comparative listening) received on widely separated buoys. War needs did not allow time for proper scientific or engineering study and measurement of design parameters. The use of intuition and "common sense" by good engineers, directed and expedited the engineering. That sufficed for this crash effort in an unknown field; it was not good enough for further development of the technology.

There was no one in the immediate post-war topsy-turvy Washington bureaucracy that had technical competence to write intelligent specifications or to furnish good program guidance. NRL's abandonment of sonobuoys left no Navy Laboratory assigned a guiding and monitoring role. It was early in the 1950's when this void started to be filled by the Naval Air Development Center (NADC) at Warminster, Pennsylvania. In the interim, Industry did as best they could without any experienced and intelligent Navy guidance and inputs.

It was quite evident that sonobuoys had to be better designed for production, more easily serviced, and be less of a problem in storage and launching. Better producibility demanded use of materials more suitable for assembly line techniques. Servicing demanded the design of tune-up test stands for use by the squadrons. Storage and launching problems meant more attention to shipping and handling problems and better means than messy static lines to open the parachutes. These problems were all tackled. The buoys were repackaged in aluminum or plastic tubes. Test stands were delivered to the squadrons. Rotochutes (autogyro like rotating blades, see Figure 3) replaced parachutes and static lines.

It became evident that many of the buoy reliability problems were really caused by Squadron maintenance. This problem led to the most significant decision of all. Buoy develop-

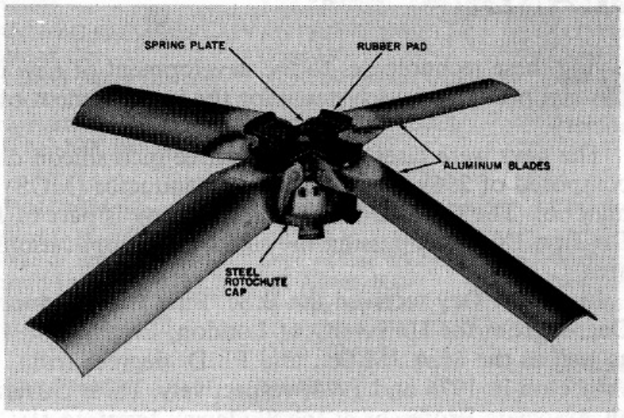


Figure 3. Rotochute Assembly

ment centered on designs that would not require any tune-up, or battery replacement, whatever. Buoys were engineered to be shipped from the factories to the Fleet and launched without any servicing at all. This, plus better engineering, raised buoy reliability from around 75% to well over 90%. This design policy has been of lasting importance.

The designers, and the Washington control authorities, were by 1950 back on the road to wisdom. They were erring, but less, and less, and less. Around 1950 airborne ASW started to mature. The Canadians and the British began to show real National interest in sonobuoys. The United States Navy, realizing the need for integration of these separate National interests, fostered the forming of a Tripartite Sonobuoy Committee. This, with yearly meetings, was to make all sonobuoy developments compatible with Allied needs. Standardization of buoy types was to be to the degree that all three Nations could use each other's buoys in all their ASW aircraft. This farsighted concept achieved the desirable goal of having true interoperability of sonobuoy systems between the Allied Nations. It has since been expanded to include other Allied Nations such as Australia and New Zealand. Around the same time, the Naval Air Development Center at Warminster, Pennsylvania became the Navy Laboratory with airborne ASW responsibilities. Airborne ASW had indeed come out of the neglect that followed War 2. It was about to start significant achievements.

More reliable sonobuoys were the first goal. Directional sonobuoys were recognized as another needed development; unfortunately, the AN/CRT-4, a mechanical rotating sonobuoy, was either hidden or forgotten during the 1946 to 1950 era (see Figure 4). That effort was restarted with new mechanical 360 degree scanning approaches. These reached acceptance after 1955 but the subsequent all electronic DIFAR buoy was soon to obsolete those mechanically rotated directional buoys. The concepts of CODAR and JULIE also stole the show from directional sonobuoy developments. CODAR utilized two or more standard passive sonobuoys. By passive correlation of the same submarine signals received at slightly different times on each separated buoy, direction of the sound could be obtained. JULIE used small explosive charges (PDC, practice depth charges) dropped near a passive standard sonobuoy. This off-set charge with its high energy, broad band sound pulse, could produce an echo from a submarine. This made the simple passive buoy an echo-ranging buoy. Both CODAR and JULIE systems were intensely developed and used in the Fleet. There was one other sonobuoy approach

Figure 4. Early Sonobuoys

started in the early 1950's. Herb West of NADC, in an indication of NADC's growing sonobuoy maturity, designed the first active echo-ranging sonobuoy, the SSQ-15. This transmitted CW acoustic pulses at about 30 kilohertz. Exploitation of this was unfortunately delayed in favor of CODAR and JULIE. It has since surfaced very successfully in the CASS/DICASS active buoys.

The story of how a sonobuoy was named "JULIE" is worth telling. The engineers working on this explosive echo-ranging sonobuoy concept were relaxing at a Philadelphia night club. The entertainment featured a beautiful, comely and renowned "strip dancer" named Julie Gibson. One of the engineers watching her remarkable (and memorable!) performance observed that Julie turned passive boys into active boys! This was what was happening to the passive sonobuoy used with an explosive charge, and so the system was then and there quite aptly named JULIE and the name endured. (Girls names such as Julie, Jezabel and Gertrude are common in USN.)

The British started development of their own directional buoys including both passive and active types. These achieved moderate acceptance by the British at the time but since have been replaced with their adoption of the American DIFAR and newer, still struggling concepts. The Canadians, who did significant JULIE work, also developed sonobuoys somewhat different from the American approaches. The Canadians, with their large and heavy ship launched-air monitored NUTMEG buoy, gave impetus to the concept of long life, moored sonobuoys for use in barrier applications. Magnavox and Sanders Associates made notable contributions to this moored concept with small, lightweight, air deployable SCARAB and LOLITA buoys. These enjoyed considerable and impressive developmental success but unfortunately were repeatedly sidetracked and delayed by political interference and decisions, hopefully corrected today.

CODAR and JULIE have been totally replaced by the DIFAR and DICASS sonobuoys. DIFAR is a passive, non-mechanical, directional sonobuoy that has become standard in most of the Allied Navies. It is still being further developed in different varieties with new impressive capabilities. DICASS (directional active commanded sonobuoy system) is an echo-ranging sonobuoy.

One attribute of sonobuoys deserves mention. A ship or a submarine sonar is a massive, expensive development. The designs are not easily changed or replaced. A sonobuoy, being small and inexpensive, can be succeeded by better types without much development or procurement trauma. Thus, sonobuoys are changed rapidly to meet new situations. They represent dynamic progress.

DESIGN AND PRODUCTION OF SONOBUOYS

Sonobuoy designs represent a different design philosophy from most military equipments. Torpedoes, missiles, etc., are procured through "design data packages" (DDP). The manufacturers produce the design supplied them in a 'data package'. Changes and innovation are not encouraged. Units from various manufacturers are really clones. Sonobuoys, however, are not built that way. They are built to rigid performance specifications. The buoys must meet TRIPARTITE interoperability standards regarding weight, size, launching, etc., but they can be and are different in design. Externally they look rather much alike. Internally they are completely different, manufacturer to manufacturer. Unlike design data package procurements, innovation is encouraged in sonobuoy design. Sonobuoys are not clones. Competition is fierce. Costs are a life and death feature. The Navy does not direct what the manufacturer supplies as long as it meets the interoperability and performance standards. This differing procurement philosophy continues to be a bitter argument between the weapons community and the sonobuoy community. The sonobuoy developers proudly note that the reliability and performance of sonobuoys has gone up and up while their production price, even with inflation (and factoring in complexity), has gone down and down. Sonobuoys probably represent the best value bought by the Department of Defense. The manufacturers and their competitive innovation deserve emulation in other procurements.

Sonobuoys are bought from the manufacturers in lots. Generally 800 to 3000 buoys are built as a lot. Samples from each lot are selected at random and sent to Navy sonobuoy test facilities (operated by NAD Crane) for rigorous quality and performance testing, including flight drops. If the lot samples fail to meet a high standard of around 95% reliability with specified performance, the entire lot is rejected and must be reworked at the manufacturer's expense for another submission. All failures are critically analyzed so corrective measures and improvements can be made. Thus, the production lines get better and better as the learning curve matures. Manufacturers get wiser and wiser, or fewer and fewer. Accepted lots are put into the supply pipeline.

The engineering that goes into good sonobuoy design appears simple, deceptively so. A brief summary of the technological requirements should illustrate the complexities.

The first essential information is the need for a good understanding of Underwater Acoustics. The extensive studies by the OSRD labs had, by the end of the War, made quantum leaps in understanding the complex physics of "sound" in the oceans. Even so, that was elemental compared to today's knowledge. The designer has to know acoustic facts about attenuation, reverberation, temperature layers, ambient noise, bottom and surface reflections and absorption, sound ducting, deep and shallow water acoustics, convergence zone phenomena, sound spreading, sea states, ocean currents, and so on. These all vary widely in different seas, areas, and seasons. In addition, he must have knowledge about Nature's sounds. Fish, storms, geological disturbances, all produce underwater sounds. Ships, submarines, oil rigs, etc., all produce the bedlam that must be known so one can do proper signal processing.

The sonobuoy designers must know how to design instruments that can receive or transmit acoustic energy, the hydrophones and projectors (transducers). A hydrophone can be the size of a twenty five cent piece or it can be many feet in diameter and height. The sonobuoy must be made so the largest transducers can be stored in a very small and lightweight package, no mean trick. Hydrophones a hundred feet long, with many transducer elements and great lengths of cable, are stored with the required batteries and electronics in a buoy less than five inches in diameter and three feet long! A Magnavox AN/SSQ-53 DIFAR buoy is shown in Figure 5. These all require ingenious collapsible designs. The application demands ways to make these hydrophones directional both for target bearings and for selection of sounds from the best acoustic paths and channels. They must, in certain buoys, have both horizontal and vertical directivity. The designs call for hydrophones and projectors to operate at the best possible depths, sometimes selectable depending on operational and

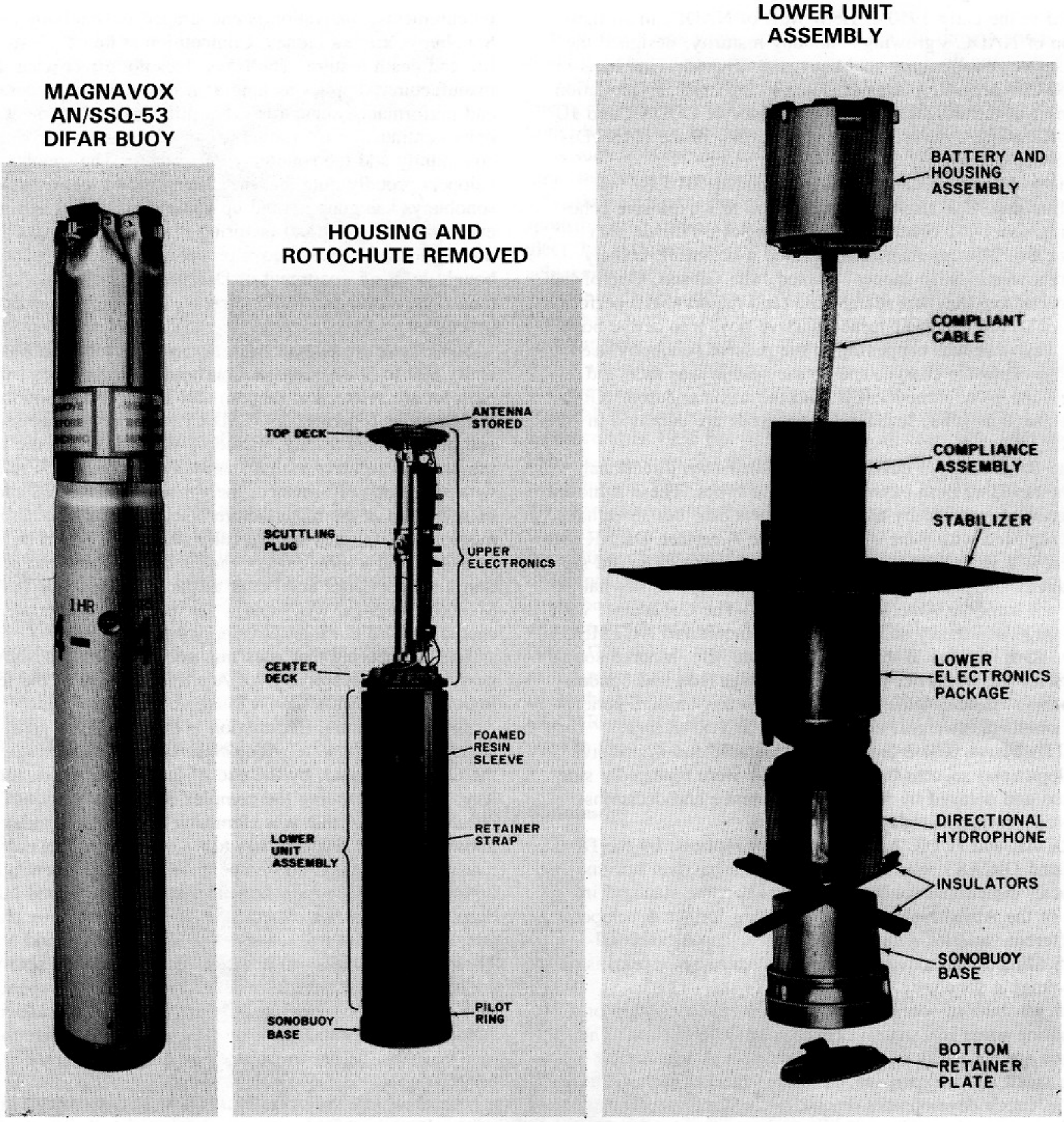


Figure 5. AN/SSQ-53 DIFAR Sonobuoy

oceanographic factors. Sonobuoys are generally supported by small, gas inflated flotation bags. The entire buoy may weigh only 20 to 40 pounds in air. There must be no water leaks even though the sonobuoy may leave the aircraft unpressurized bays at 20,000 feet altitude. The hydrophone and electronics assembly must then quickly descend and, in some designs, operate thousands of feet deep at enormous pressures in the ocean. A typical deployment sequence is shown in Figure 6. The entire underwater transducer assembly, when deployed, must be designed to be stationary, almost zero up-and-down motion, even though it is cable supported by a surface buoy that may have fast vertical excursions of dozens of feet due to waves. This transducer assembly, be it simple or complex, must have low self noise.

The electronic designer must know submarines acoustic signatures to maximize detections. The designs must accommodate a wide dynamic range of signal levels ranging from close by weapon explosions to signals far below the existing ambient noise level. Accurate electronic compasses must be designed to enable directionality reference. Some buoys have directional transducer beam-formers built-in. Some have many hour, precision magnetic tape recorders. Some buoys can be commanded to change operational modes by radio from the aircraft. The electronics include an extremely stable, wide band, high fidelity FM transmitter with about one watt RF output. The transmitters now must be able to operate on any of about 100 RF frequencies in some designs. The rugged electronics design must consume very little power. Shelf life

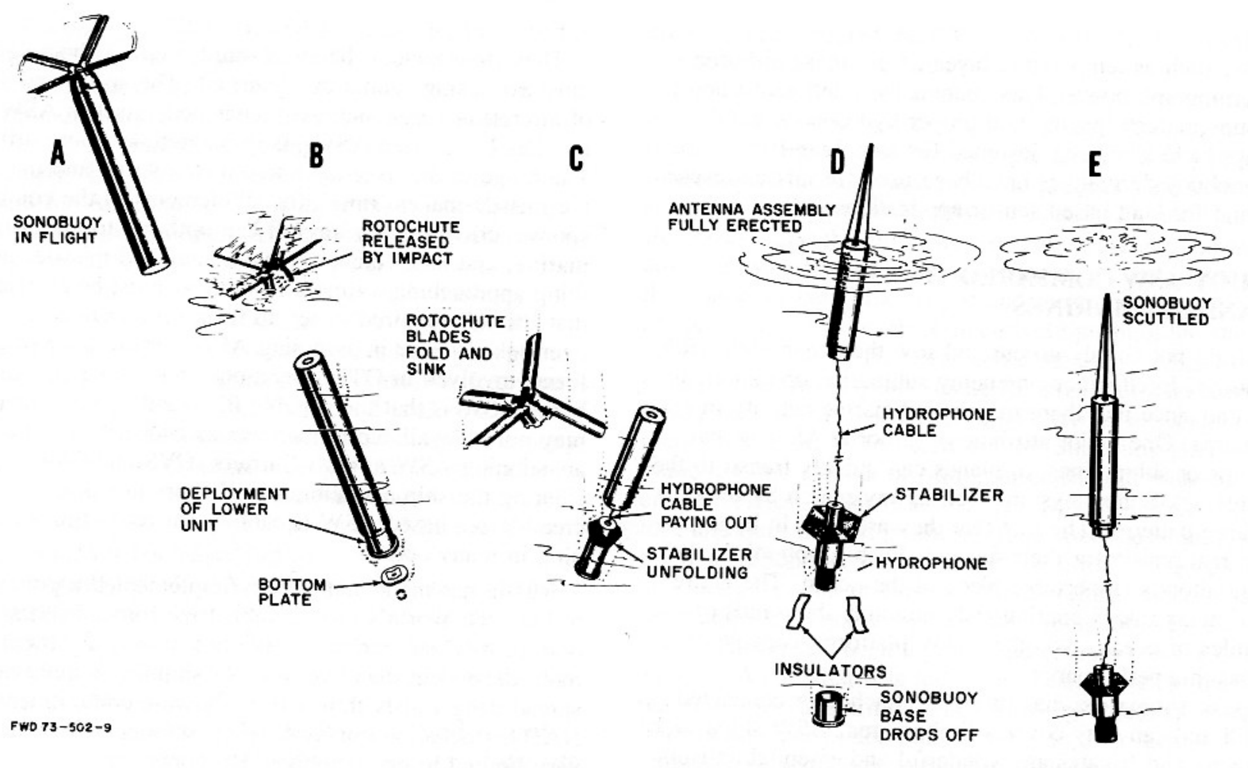


Figure 6. Sonobuoy Mechanical Functions

is measured in years. Despite the complexity of the design, the whole complex electronic assembly must be high quality, high volume producible and low in cost.

The echo ranging buoy, an example of the above rigorous disciplines, is indeed a wonderful piece of engineering. It contains a complete sonar system and radio remote command electronics. The designers have succeeded in packaging a sophisticated sonar, with range performance equivalent to many types of massive ship sonars, into an "A" size buoy weighing about 35 pounds. This directional sonobuoy (DICASS), on command from the aircraft, can "ping" in several remotely selectable modulation and pulse lengths modes with its transducer at a chosen best depth for detection. This "attack" buoy is generally used after the location of the submarine has been determined from far off by non-alerting passive (DIFAR) sonobuoys. The DICASS buoys are laid around the area of the submarine and commanded, at an appropriate time, to 'ping'. The then alerted submarine, no matter which escape course is taken, must run towards one of the echo ranging buoys. This is enough to give any submariner severe ulcers. The situation is a promising set-up for a weapon drop.

Sonobuoys are generally powered by sea-water activated batteries. Silver chloride, cuprous chloride, silver magnesium, and other types are used depending on the type of sonobuoy. By using sea-water as the electrolyte, they have years long shelf life. Lithium batteries are also used.

Flight ballistics are a major concern in sonobuoy design. Buoys must be dropped from aircraft altitudes ranging from a few hundred feet to very high altitudes. Flight trajectories must be known for accurate placement in the sea. Flight must be stable. Low "G" water entry is desirable even though descent time through the air has to be fast to lessen wind drift problems. The buoy is generally ejected from the aircraft by small explosive cartridges (CAD) so it clears the aircraft safely. Parachutes are again the usual descent retardation devices. These have high "G" opening forces. Weight and balance are all included in the design problem.

ASW aircraft must know where all sonobuoys are at all times. The initial sonobuoy pattern geometry in the sea changes with time due to wind and sea conditions. Floating buoys must have low windage area to lessen wind drift problems. The first sonobuoys used dye markers for daytime visual spotting of individual buoys. Lights were then added for night time location. Then radar transponders were added. The aircraft installed "on-top" buoy radio sensing systems. Active RF transponders were developed but complicated buoy design and have been replaced by passive location systems installed in the ASW aircraft. These, based upon phased-array antennas on the aircraft, now permit the plane at any place within radio range of the sonobuoys to accurately know where each and every buoy is at all times.

Sonar designers for other platforms are often puzzled by the many types of sonobuoys that have been introduced. Sonars for ships and submarines are massive, expensive systems which, once installed, are scheduled to last for many years. Modernization is through a series of modifications because it is not affordable to replace entire systems. A submarine or ship sonar may last the life of the platform on which it has been installed. The system may cost millions of dollars. A typical sonobuoy costs between $150 to $1500 depending on both complexity and production quantities. Sonobuoys therefore live and thrive on obsolescence. New designs with better performance are easily and affordably introduced.

The sonobuoys discussed so far do not encompass the entire field of "sonobuoy" engineering. There have been many special designs for limited or unique operational situations and needs. Link buoys have been designed and produced allowing aircraft in flight to communicate with friendly submarines. Buoys that monitor and radio oceanographic conditions to aircraft are common. Any ASW aircraft instantly knows sonar conditions, such as temperature layers, from these airborne bathy-thermograph buoys. This enables the intelligent selection of buoy pattern spacing and proper hydrophone depths. Sonobuoys have also been designed for launching from ships guns. Sonobuoy derivatives have been used for air-sea rescue devices and for land based sensor applications.

SONOBUOY ASW COMPARED TO ASW SHIPS AND SUBMARINES

Aircraft do not simply go out and sow the ocean with fields of sonobuoys. Intelligence on enemy submarine operations indicates in advance that there may be submarine activity in a specified area. One major attribute of airborne ASW is that, unlike ships or submarines, airplanes can quickly transit to the area of interest. Sonobuoys are used in any search by the dozens, in large patterns. The fact that they are used in large patterns is a real reason for their success. Each sonobuoy in the pattern monitors a respectable piece of the ocean. The entire pattern of many buoys continuously monitors thousands of square miles of ocean. No other ASW platform, capable of attack, has this performance.

A ship, or submarine, has its sonar attached or connected to the hull and can only cover a limited area. ASW ships such as destroyers and frigates are wonderful and essential antisubmarine platforms for countering torpedo firing submarines which have to come within torpedo range of the ship. Passive sonobuoys cannot be used near noisy ships. It is no secret that some ships now have towed passive sonars which, under proper conditions, can detect submarines at long over-the-horizon (OTH) ranges. Recently, helicopters with good ASW system capabilities (LAMPS 3) have been designed to prosecute at long ranges the ship detected, over-the-horizon, submarine by carrying sonobuoys and weapons to the suspected area of the submarine, well outside of the ships 'on-board' weapon systems. There are, however, operational difficulties with helos for OTH in the too common Winter weather conditions prevalent in the North Atlantic shipping lanes (or in any severe weather situation). Much of the time the ASW ships have severe operational degradation due to icing gales or heavy seas. A recent survey article in the "Proceedings of the Naval Institute" was quite negative regarding such ships common bad weather performance. Furthermore, ships carry only one or two LAMPS helos. Helos take time to launch and have limited endurance. It takes further time to plant the sonobuoys, redetect, re-identify, track, and set-up for an attack.

Time is critical for success. Considering all these factors raises doubts about the practicality of depending upon ASW ships for consistent OTH operations against missile firing submarines.

Submarines have excellent sonar systems and can move faster in heavy weather than ships. However, a submarine attempting to close a target, while running at speeds required for many operations, produces noise which may make it vulnerable to detection by the enemy submarine and counterattack. Subs to be effective, must be equipped with long range, over-the-horizon, missile systems for OTH attacks against submerged submarines, no easy task. This does not detract from their great potential in "Barrier" operations denying an enemy safe transit of a strait. Submarines, also, are the only platform that can, with acceptable risk, penetrate waters where the enemy cóntrols the sea or the air. ASW ships and aircraft cannot risk that challenge.

These few factors, believed valid, make airborne ASW the most promising submarine deterrant. The speed and surprise of aircraft is a tremendous, unmatched, asset in ASW. Cruise missiles have made ASW many magnitudes more difficult. The range to the over-the-horizon submarine and the speed of the missile makes 'time', for all elements in the counter-response, critical. Only aircraft can both get to the firing submarine, and take action against a launched missile, in anything approaching a timely fashion. It must be emphasized that "time" required to set-up for a submarine kill is a greatly overlooked factor in assessing ASW performance of all platforms involved in OTH operations. The major problem in airborne ASW is that the capable P3C land based patrol aircraft may not be available in many areas and the Navy has, since abandoning ASW aircraft Carriers (CVS and CVE), and considering the ship and submarine factors just discussed, no credible sea-based ASW capability for protecting supply shipping in many oceans.

Russia has made and already implemented a policy decision to have the World's largest submarine force. She knows from both history and current geopolitics how to use them. We are more dependent than ever on vast shipping requirements and spread dangerously thin with worldwide commitments. NATO, (including our own troops stationed overseas) has very limited reserve supplies. Resupply can only be through massive shipping. Furthermore, the United States is far from self sufficient. Oil is only one of the dozens of essential materials that must be imported by sea. U.S. commerce and foreign trade now uses the Pacific for high-value cargo more than the Atlantic. 13 million long tons used the Pacific versus about 5 million for the Atlantic in 1982. Russia does not have this sea-supply and protection problem. She is essentially self-sufficient by the European, Near East, and Far East contiguous land supply sources and routes. It should be apparent to all that if Russian submarines, by a number of obvious strategies, can cut our sea lines, we will not, with the present policy, have time to come to arms and save our overseas interests.

DOD and Navy policy changes are required that will recognize the over-the-horizon submarine threat to shipping as the major ASW problem. The priority should now shift from Battle Group ASW Defense to ASW Shipping Defense. The solution by any realistic evaluation, must give greater and deserved recognition to airborne ASW, both land and sea-based. This includes ASW Carriers with dedicated ASW aircraft flying off CVS, and reborn CVE carriers. The latter are affordable. Sonobuoy based systems, which cannot be discussed here, through recent developments appear to be the logical solution. The sonobuoy community is ready to meet the challenge.

ACKNOWLEDGEMENTS

This article relating the importance of the relatively anonymous "sonobuoy" must recognize a few of those contributors who made this revolution in ASW possible. The "Founder's Honors" must go to the original team at Columbia University, United States Navy Underwater Sound Lab (CUDWR) at New London, Connecticut. Jim McNary, Ted Carpenter, John Ripkin, Joe Barkson, Henry Jasper, Ed Troup, Cal Gongwer, Henry Suter, George Breeze, Walt Widlar pioneered the engineering. Those civilians who voluntarily took the units to War at great personal risk include Walt Clearwaters and Ray Mur-

phy, both of whom got a U-boat, and Russ Lewis, Price Fish, George Klumpf and others. With what they started and did, the Navy should (but doesn't) have a plaque at the New London Lab commemorating the "Birthplace of Sonobuoys".

The Naval Air Development Center at Warminster, Pennsylvania since early 1950 has inclusively done the Research and Development for Airborne ASW far more than covered here. NADC's Jim Howard and the other engineers too numerous to individually recognize have continuously pushed the state-of-the-art. NADC work includes the computerized sonobuoy based systems for the P3C ORION, the S3A VIKING, and the derivative LAMPS 3. These were initiated and brought to success by (last ranks given) Captain Ed Skidmore, Rear Admiral Fred Baughman, Capt. Bill Cody, and Isadore Zaslow and others of the NADC "ANEW" team working in harmony with Naval Air Systems Command people like Captain Guy Buck. The late Irving Gatsky was the memorable and driving person on the sonobuoy scene in Washington. More recently, Dan Rosso took over his leadership role.

Air Development Squadron VX-1 (Key West and Patuxent) deserve recognition for their testing of the developments. Captain Hank McCaulley and others of VX-1, with their ASW knowledge, devotion and enthusiasm helped make sonobuoys what they are today.

The whole ASW community has to give fond and special recognition to the perception, intelligence and drive of the late Vice Admiral Charles Martell, USN. As CNO Op95, he became the finest supporter airborne ASW ever had. He recognized and accelerated the P3C, S3A, and DIFAR developments. We miss him greatly.

Finally, and with equal sincerity, the Sonobuoy Industry must be given deserved credit. RCA made the very first sonobuoys. GE, Freed, and Emerson produced the first production sonobuoys. Hazeltine designed and produced the first modern sonobuoy types under the drive of Pete Duffy and Charles Berendson, and the company has been a major contributor to advanced sonobuoy technology. Magnavox and Sparton share the honors of being the largest and most consistent producers of sonobuoys, with each competitively pushing the state-of-the-art. The late R. H. Dreisbach directed the Magnavox engineering for many years. Gene Robertson of Magnavox, and Deloy Monroe of Sparton, each still active, are sonobuoy giants who must be included in the "Sonobuoy Hall of Fame". Ernie Kessler of Motorola made contributions. Sanders Associates, under Harold Pope, Tom Woodruff, Len Newton, and Sam Ballard produced good sonobuoys and continue to advance sonobuoy technology. Rockwell and Sippican are new designers and producers. The individual and collective innovation, cost consciousness, and competition of the Sonobuoy Industry has been a proud and essential factor in making airborne ASW what it is today: the best answer to the very real threat of submarines. The Industries' production of millions of sonobuoys and contributions to their technical development represents engineering at its finest.

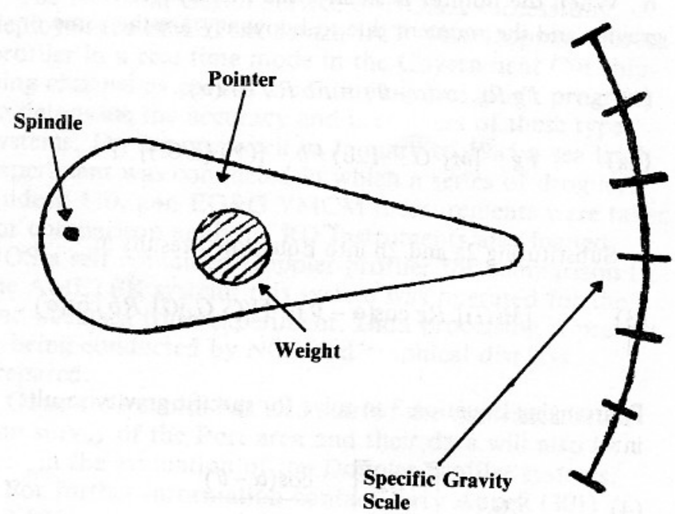
Lastly, I owe sincere thanks to the cooperation and guidance of Dr. Richard Kenefic, of Magnavox, in the preparation of this paper.

'TIS A PUZZLEMENT

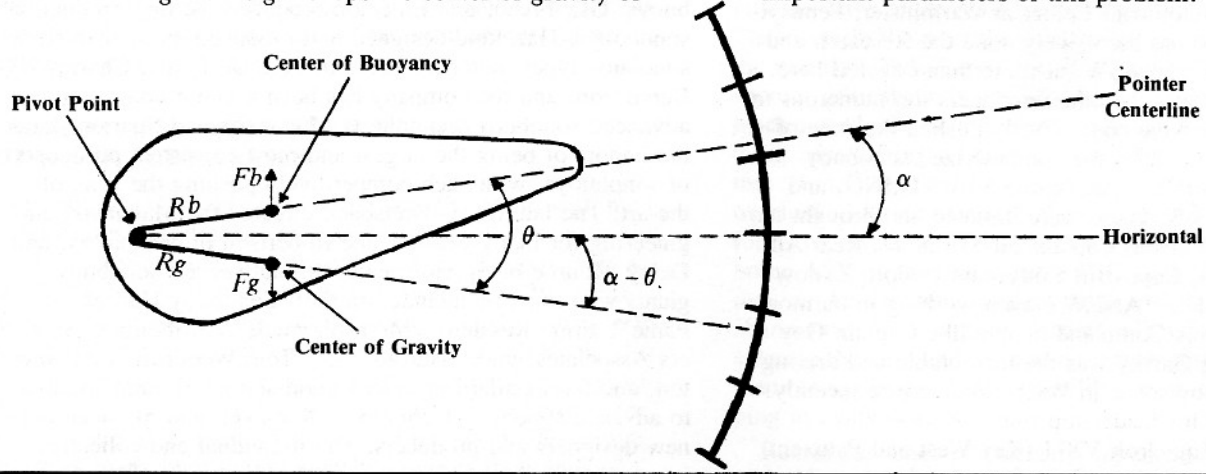
SOLUTION TO LAST PUZZLE:

Angling for An Answer

Last quarter's puzzle was centered around a hydrometer I used to determine the salinity in my aquarium. A sketch of the hydrometer is shown to the right, and the object was to determine the relationship between the specific gravity of the water and the angle of the pointer.



If the pointer did not have a weight inserted, the center of buoyancy and the center of gravity of the pointer would both be at the geometric center of the pointer. Adding the weight drops the center of gravity of the pointer but has no effect on the center of buoyancy of the pointer. The sketch below shows the relative position of these points after adding the weight and illustrates the important parameters of this problem.



Fb – Buoyant force acting on pointer at center of buoyancy

Fg – Weight of pointer acting at center of gravity

Rb – Distance from pivot to center of buoyancy

Rg – Distance from pivot to center of gravity

α – Angle from horizontal to centerline of pointer

θ – Angle between center of buoyancy and center of gravity

M – Mass of pointer

V —Volume of pointer

S.G.–Specific gravity of water = density of water in $^{gr}/cc$

G – Gravitational constant

The goal is to determine the relation between *S.G.* and α. When the pointer is steady, the moment due to gravity and the moment due to buoyancy are the same or

(1) $$Fg\,Rg\cos(\alpha-\theta) = Fb\,Rb\cos(\alpha)\ .$$

(2a) $$Fg = [M]\ G \quad \text{(2b)}\ Fb = [(V)\,(S.G.)]\ G\ .$$

Substituting 2a and 2b into Equation 1 results in:

(3) $$[M(G)]\ Rg\cos(\alpha-\theta) = [V(S.G.)G]\ Rb\cos(\alpha)\ .$$

Rearranging Equation 3 to solve for specific gravity results in:

(4) $$S.G. = \left[\frac{MRg}{VRb}\right]\ \frac{\cos(\alpha-\theta)}{\cos(\alpha)}$$

(5) $$\operatorname{Cos}(\alpha-\theta) = \cos\alpha\cos\theta - \sin\alpha\sin\theta\ .$$

Substituting 5 into 4 results in:

(6) $$S.G. = \frac{M\,Rg\cos\theta}{V\,Rb} - \frac{M\,Rg\sin\theta}{V\,Rb}\ \tan\alpha\ .$$

Since θ is constant, equation 6 can be simplified to:

(7) $$S.G. = K_1 - K_2\ \tan\alpha\ .$$

This is the relation between specific gravity and the angle of the pointer.

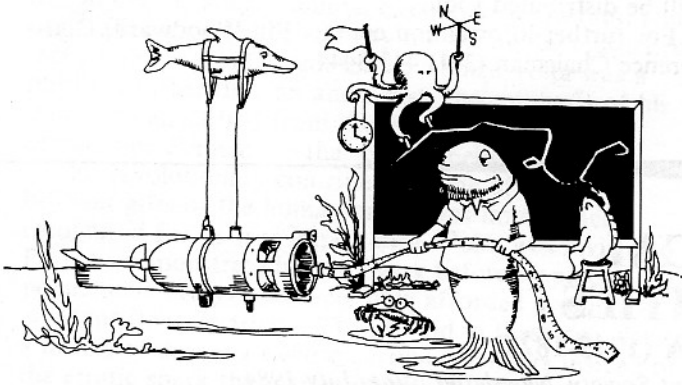
THIS QUARTER'S PUZZLE:

Up on the High Wire

Let's play an easy little game called "Just Imagine." First, imagine you are fed up with your job and your boss (I told you it was easy!), and you have decided to quit your job to follow a childhood dream of joining the circus. Imagine you get an interview with the circus owner during which he asks you what circus experience you have. You tell him you used to do a lot of tightrope walking in your previous position. Your lucky day! The circus needs a new tightrope walker. Of course, like any new job, you have to start at the bottom and work your way up. You are assigned the job of setting up the tightrope.

Usually a strain gage is used to ensure that the tension in the tight-rope is correct. However, tonight the strain gage is broken, but the show must go on, and you have to come up with another way to measure the tension of the tightrope. How are you going to do it?

Dave Hollinberger
1607 Mahan Avenue
Bremerton, WA 98310



CURRENT MEASUREMENT TECHNOLOGY COMMITTEE NEWS AND INFORMATION

A primary objective of the Current Measurement Technology Committee (CMTC) of the Oceanic Engineering Society (OES) is to provide a focus for information exchange and promote cooperation and coordination among those in the marine community involved in current measurement. To this end, this column has been established as a regular feature of the OES Newsletter and everyone is encouraged to participate by submitting news items and information about active or planned current measurement efforts to Bill Woodward (301) 443-8444 or Jerry Appell (301) 443-8026 for publication in the column. This will be an effective forum only if everyone participates, so let's hear from you.

The Institute of Ocean Sciences, Patricia Bay, Canada is coming to the completion of the field programs of a general survey of the currents and circulation around the Queen Charlotte Islands which began in May 1983. Five major cruises at four to six month intervals involved CTD surveys combined with recovery, servicing and redeployment of the current meter moorings, typically 30 in number carrying in the vicinity of 80 instruments. In addition some 10 near-shore bottom pressure recorders have been maintained in the area including three on the southern coast of Alaska. The final cruise to recover the instruments, most of which having been in almost continuous service for a period of two years, is scheduled for the three week period starting April 29, 1985 aboard CSS Parizeau.

Most of the moorings are conventional subsurface moorings using Aanderaa RCM4's at depths greater than 50 m and modified Neyrpic CMDR current meters as close as 20 m to the surface. Several surface-following moorings were deployed in summer using Marsh-McBirney 585 current meters at 5 m below the surface.

On each of these cruises data processing was completed up to the calibrated and edited state using a Hewlett-Packard 1000 mini-computer system with interactive graphics. In most cases it was found possible to do preliminary data analysis before the moorings were redeployed giving an opportunity to respond with adjustments to the sampling scheme. This short processing turnaround simplified instrument servicing as faults were identified quickly with resulting improvements in data quality.

A multi-investigator cooperative experiment dubbed FASINEX for frontal air-sea interaction experiment, designed to investigate the role of horizontal variability in air-sea interaction will be conducted in the subtropical convergence zone south of Bermuda beginning in the winter of 1985-86 and ending in July 1986. The multi-institutional effort will include deployment of at least five LOTUS (long term upper ocean study) type surface moorings with vector measuring current meters (VMCM) and vector averaging current meters (VACM) at six depths from 10 m to 700 m as well as vector averaging wind-recorders (VAWR) and meterological recorders (MR) at the surface. Other measurements are also planned that will involve five subsurface moorings with profiling current meters, aircraft overflights, and real-time profiling instruments including an AMETEK-Straza shipboard acoustic Doppler current profiler. Horizontal variability in the ocean and in the atmosphere are essential elements of the dynamics governing the atmospheric and oceanic circulation. On mesoscale and smaller space scales and on synoptic and shorter time scales relatively little is known about the scales of horizontal variability in the upper ocean and lower atmosphere and about how horizontal variability on one side of the air-sea interface influences the fluid on the other side.

Results of recent air-sea interaction studies have shown that the effects of mesoscale and smaller horizontal variability are observable and, at times, large. As a result, at an ONR-sponsored air-sea interaction meeting held at NCAR in early 1983, both meteorologists and oceanographers expressed the need for further investigation. The open ocean front which exists in many locations throughout the world oceans provides a place for such studies in an environment relatively stationary (as opposed to eddys) and lacking in very strong velocities (such as in the Gulf stream) which tend to play havoc with instrumentation. Such a front exists in the region south of Bermuda in the Atlantic bounded by 62 and 72W, and 25 and 30N. This area is logistically convenient for the oceanographic and meteorological field work.

Inquires or requests for information can be addressed to Nancy Pennington, Woods Hole Oceanographic Institution, Woods Hole, MA 02543, 617-548-1400 extension 2779.

The National Ocean Service of NOAA successfully deployed the AMETEK Straza DCP 4400 Doppler current profiler in a real time mode in the Government Cut shipping channel as part of a continuing evaluation program to determine the accuracy and usefulness of these type systems. During one week in January of 1985 a sea truth experiment was conducted in which a series of drogue, Endeco 110, and EG&G VMCM measurements were taken for comparison analysis. RD Instruments also loaned NOS a self contained Doppler profiler for comparison to the AMETEK system; this system was operated for the one week sea truth experiment. Data processing is presently being conducted by NOS and graphical displays prepared.

General Oceanics has also started the contract circulation survey of the Port area and their data will also be used in the evaluation of the Doppler profiler systems.

For further information contact Jerry Appell (301) 443-8026.

Planning has begun for the Third Working Conference on Current Measurement. The Conference will be held in the Washington, D.C. area and is targeted for the week of January 20, 1986. A call for papers is being prepared and will be distributed soon.

For further information contact Bill Woodward, Conference Chairman (301) 443-8444.

ELECTRICAL PERSONALITIES

ALESSANDRO VOLTA (1745-1827)

Reprinted from Instrumentation and Measurement Society Newsletter June/July 1984

The scientifically fruitful 1700's ended with electricity still in the form of electrostatic discharges, small ones in the laboratory, shattering ones in the form of lightning. At the very end of the century there was introduced energy in a new form, electricity from a chemical source — the electric "pile" or battery conceived by Alessandro Volta.

Beginning his electrical investigations in 1762, Volta improved the electrical equipment of his day by introducing the electrophorus, a kind of reservoir of electricity. It was one of the first electrical machines that operated by electrostatic induction of "influence" rather than by direct electrostatic generation. The device consisted of a plate of resin placed between an upper and lower plate of metal. The upper plate was lifted by an insulated handle and the resin was charged by being struck by a silken scarf. When the upper plate was laid on the resin, grounded by being touched by the experimenter's finger and then removed, it became charged by induction. This device brought Volta's name before the attention of electrical experimenters everywhere. He invented the condensing electroscope; with it minute quantities of electricity could be detected and it was therefore very useful in the investigations that led to the invention of the pile. It was the publication of the operation of this condenser in the transactions of the Royal Society in 1782 that won him the Society's Copley Medal in 1794 after his election as a Fellow in 1791.

Volta was investigating the recently announced phenomenon of "animal electricity" discovered by Luigi Galvani, Professor of Anatomy at the University of Bologna. Galvani, a shy and retiring scholar, had noticed, while dissecting a frog, that a discharge from a neighboring electrostatic generator had caused the legs of the dissected frog to jerk. He thereupon tried to trace the relationship of the charge and the muscular action. "While one of those who were assisting me touched lightly and by chance the point of his scalpel to the internal crural nerves of the frog, suddenly all the muscles of its limbs were seen to be so contracted that they seemed to have fallen into tonic convulsions." In 1791 he published his observations and theory, one of the key discoveries in the whole histroy of science, in the Transactions of the Bologna Academy of Sciences.

Galvani sent a reprint of his paper to a few of his scientific colleagues, including the professor of physics at Pavia, Volta. In a revolutionary period of the world's history, this paper with its startling significance, aroused the interest of scientists everywhere. Volta concurred in the general theory proposed by Galvani and proceeded to repeat the experiments. As these experiments progressed, Volta became convinced that the true electric source lay not in the tissues of the animals investigated but came from an outer source, the contact of dissimilar metals. The controversy between the two schools of thought was resolved when Volta disclosed the nature of the electric cell in a letter written from Como on March 20, 1800 to Sir Joseph Banks, President of the Royal Society of London. In this letter Volta described his new apparatus which he compared in action to the Leyden jar.

Volta observed that the results produced depended on the kind of metals used in combination. He therefore arranged the common metals into a series and using rubbed rods of glass and of resin in order to obtain positive or negative electricity as a reference, Volta combined these metals and established which combination produced the strongest positive or negative charges. Some combinations produced negative, some positive changes. He therefore became convinced that in kind and degree the result depended on the relative arrangement of the mating metals in a series in which zinc proved most positive and graphite most negative, with lead, tin, iron, copper, silver and gold, between those two. Volta could thereby anticipate the strength of a charge in the relative position of the metals in this (electro-chemical) series; from this he derived his "law of successive contacts." In its final form, Volta proposed a stack of elements consisting of discs of silver and zinc separated by brine-soaked cloth or paper. Thirty such elements formed this pile and caused a flow of sufficient continuous current to be perceptible to a person touching the outerelements of the pile. A modification of the device was to arrange a row of cups containing weak acid or brine; into each cup a zinc and silver plate was placed; alternate elements were connected by metallic strips; this-Volta termed his "crown of cups." This arrangement avoided the weakening of the flow of current that followed when the moisture (electrolyte) dried from the paper or cloth separators in the pile arrangement. He also found copper an improvement over silver in the set.

In his letter to Banks, Volta said that altho the new source of electricity was weaker in character than the discharge from the Leyden jar, it did possess the great advantage of offering a continuous source of electricity. In fact, felt Volta, his pile of copper and zinc discs should supply an inexhaustible and constant electric flow. His letter states "this endless circulation or perpetual motion of the elastic fluid may seem paradoxical, and may prove inexplicable; but it is none the less real and we can, so to speak, touch and handle it" and "I found myself obliged to combat the alleged animal electricity of Galvani, and to declare it an external electricity moved by the mutual contact of metals of different kinds." Since Volta was a physicist rather than an anatomist, the emphasis of his thinking had shifted from the importance of the physiologic elements to that of the metals.

This revolutionary contribution, one of the most brilliant gifts of the human mind, was immediately recognized for its true importance. Volta was invited to Paris to demonstrate his discovery before Napoleon. Experimenters everywhere were now afforded a source of constant-flow electricity. They found in these new devices a means of drawing electric current for hours instead of the erratic spark that came from the electrostatic generators or Leyden jars in use for a century.

With this new instrument Nicholson and Carlisle in England decomposed water into its elements and determined the true volumetric ratio of oxygen and hydrogen. Sir Humphrey Davy, using a large voltaic pile, discovered potassium and sodium. He also drew an electric current from a 500-plate voltaic battery and caused two charcoal electrodes to burn with sun-like brilliance; in this way began electric illumination. With constant flow electricity the electro-magnet was formed by Arago and by Davy. Thus the last century began punctually with the significant forward move that brought electricity from a plaything of the curious to a most important tool in the hands of mankind.

Succeeding generations of electricians, who best understood the magnitude of Volta's contribution, saw fit to measure electromotive force by the term "volt" as proposed by the International Electrical Congress meeting in Paris in 1881. In his eulogy of his colleague Volta, Arago wrote of the electric battery as "the most marvellous instrument created by the mind of man, not excluding even the telescope or the steam engine."

ANNOUNCEMENTS AND CALLS FOR PAPERS

Marine Technology Society

NOAA's National Ocean Service, the Applied Physics Laboratory of the Johns Hopkins University and the Marine Technology Society are joint sponsors of a two-day symposium on "The Applications of Real-Time Oceanographic Circulation Modeling." The meeting will be held in Laurel, Maryland at the APL Conference Center 23-24 May 1985. Three main themes will be emphasized:

- User-Oriented Modeling Applications and Programs
- Real-Time Modeling Systems
- Modeling Techniques for Real-Time Applications

For additional information, contact Sam Seymour, Johns Hopkins APL, Johns Hopkins Road, Laurel, MD 20707 (301) 953-5000 x 4455.

Remote Sensing Laboratory

The Remote Sensing Laboratory of the University of Kansas Center for Research, Inc., announces the availability of a new supplement to their Publications List. It includes publication data and abstracts of all technical reports and published articles written by RSL members during the years 1981 through 1983. The volume consists of 60 pages of entries as well as a numerical listing of RSL technical reports issued during those years and an index of authors.

The cost of the volume is $8.00 including postage and handling. For order forms, please contact:

J. M. Banhart
Remote Sensing Laboratory
Univ. of Kansas Center for Research, Inc.
2291 Irving Hill Drive
Lawrence, Kansas 66045-2969, U.S.A.

1985 International Geoscience and Remote Sensing Symposium (IGARSS '85) and USNC/URSI Commission F Meeting

The 1985 IEEE International Geoscience and Remote Sensing Symposium (IGARSS '85) will be held jointly with USNC/URSI Commission F at the University of Massachusetts, Amherst on 7-9 October, 1985. The technical sessions will be coordinated to provide a comprehensive and well-balanced program. Authors are invited to submit papers on all topics of interest to the Geoscience and Remote Sensing Society and to URSI Commission F (Remote Sensing and Wave Propagation — Neutral Atmosphere). The topics listed below are intended as suggestions; however, consideration will be given to papers on other related subjects. Inquires regarding the program may be directed to Professor Calvin T. Swift, Chairman of the Technical Program Committee.

Suggested Topics for IGARSS

Advanced Sensor Technology
Agriculture and Land Use
Air Pollution
Altimetry and Ocean Circulation
Atmospheric Sounding
Atmospheric Trace Constituents
Coastal Zone
Data Correction
Data Evaluation
Extraterrestrial Remote Sensing
Fiber Optic Sensors
Geodynamics
Geological Remote Sensing
Geophysical Inversion Techniques
Ground Based Remote Sensing
Image Processing and Classification
Image Registration
Infrared Systems
Inversion Methods
LIDAR Sensing
Microwave Imaging
Microwave Systems
Millimeter Wave Sensing
Multisensor Monitoring
Multi-temporal Monitoring
New Earth Observations, Missions and Programs (e.g. NROSS, SIR-C, SISEX, etc.)
Ocean Productivity
Ocean Remote Sensing
Optical Sensing
Optical Systems
Radar Imaging Processing
SAR Systems
Sea Ice
Sea Surface Waves, Wind and Currents
Seismic Signal Processing
Snow and Glacial Ice
Soil Moisture and Hydrology
Subsurface Geophysical Probing
Vegetation
Water Pollution

Suggested Special Topics for IGARSS

AgRistars
ERS-1
LANDSAT IV
MOMS
OSSA-II
SPACE LAB
SPACE STATION
SIR-B

Suggested Topics for URSI Commission F

Electromagnetic Techniques: Theoretical Models and Prediction
Modelling and Measurement of Propagation Effects
Optical Sensing of Atmospheric Parameters
Propagation Above the Earth
Propagation Through Random Media
Radio Meteorology: Precipitation Attenuation and Depolarization
Radio Oceanography
Rough Surface and Volume Scattering
Scattering from Land and Vegetation
Scattering by Snow and Ice
Telecommunication Studies
Tropospheric Effects on Propagation

Special Commission F Sessions

Profiling of Atmospheric Parameters

Deadline: All Summaries and Abstracts must be received 15 June, 1985

Address all papers to:

Professor Calvin T. Swift
Technical Program Chairman
Department of Electrical and Computer Engineering
University of Massachusetts
Amherst, Massachusetts 01003

Instructions for All Authors

All papers must be written in English. Both the address and covering letter should clearly direct the manuscript to IGARRS '85 or the URSI Commission F Meeting. The text should be typed single space on white 21.5 cm x 28 cm paper (8½ in. x 11 in.). The title should be centered in capital letters 2.5 cm (1 inch) from the top of the first page. The author's name and complete organization affiliation should be two lines below the title and the text should start three lines below this. Left-and-right hand margins should be 3.85 cm (1½ inches). A 2.5 cm margin (1 inch) should be left at the top and bottom of all pages. Double space between paragraphs.

The Digest will be produced directly from the author's original; therefore, the typing and layout instructions must be followed closely. Failure to comply with the instructions could result in rejection of the paper.

Additional Instructions for IGARSS '85

The summary is to be limited to six pages including all text, references, figures and photographs. The original and three copies of the summary must be submitted in final form. Since there will be a reduction to about 72% in linear dimensions, letters and symbols in all diagrams should be sufficiently large and clear. Figures and photographs (in glossy prints) should be a convenient size and affixed on 8½ x 11 paper with captions typed in appropriate places. Footnotes should not be used except for credits to sponsoring agencies; papers will be considered only if they have been fully cleared by the sponsoring agency.

Additional Instructions for URSI Commission F

The abstract should be as complete as possible, but must be limited to one page, including figures. Do not include tables or lists of references; a few open literature references may be included parenthetically, for example (A.B. Smith, J. Radiophys, 32, 348-392, 1978). The original and three copies of the abstract should be submitted.

Registration

Advance registration and hotel reservation information will be mailed with the Advance Program.

Institute of Offshore Engineering Heriot-Watt University

OFFSHORE INFORMATION CONFERENCE PAPERS 1984

The Fourth Offshore Information Conference was held at the Victoria Hotel, Stavanger, on 20th and 21st September 1984.

The Conference was presented by The Norwegian Petroleum Directorate — the INFOIL Secretariat in association with The Institute of Offshore Engineering, Heriot-Watt University.

Each of the papers describes in detail the information sources relevant to a particular aspect of the offshore industry. Methods of information management are discussed. The papers include many references to publications.

The contents of the 166 page volume are:

Introduction
by Arnold Myers, Information Scientist, Institute of Offshore Engineering.

Information and Legislation on Offshore Accidents and Safety
by Arnold Myers and Jon Side, Institute of Offshore Engineering, Edinburgh.

Information Management Systems in Field Development Projects: Data Flow/Processing/Handling
by Elizabeth N. Mailloux, Mobil Research and Development Corporation, Princeton, New Jersey.

Development of an Inhouse On-line System for Engineering Information and Library Purposes — Acquisition, Computer Storage and Retrieval
by Nicholas Rowe, Engineering Librarian, Britoil, Glasgow.

Latest Developments in Computer Information Systems
by John Whitehead, Office Technology Information Systems Ltd.

Data and Information Sources for Offshore Development Forecasting
by Jean Etherton, Institute of Petroleum, London.

Information Aspects of Exploration Finance by Sylvia James, Information Office, Credit Suisse First Boston Ltd, London.

List of Participants.

Price: £ 11.50 including postage, remittance with order.
ISBN 0 904046 20 6

OTHER IOE INFORMATION CONFERENCE CONTENTS

OFFSHORE INFORMATION CONFERENCE PAPERS 1982

The Third Offshore Information Conference was held at Aberdeen Airport Holiday Inn on 23rd and 24th September 1982.

Introduction by A. Myers, Information Scientist, Institute of Offshore Engineering.
The INFOIL Group Norwegian National Co-Operation on Petroleum Documentation: Practical Results and Spin-Off Products by Grete Schanche, Senior Engineer, Norwegian Petroleum Directorate, Stavange.
Marine Pollution Information by David Moulder, Head, Marine Pollution Information Centre, Marine Biological Association of the United Kingdom, Plymouth.
Technical Information on the Platform — from Project to Production by Alison Gardner, Technical Information Services Supervisor, Conoco (UK) Ltd., Aberdeen.
Scandinavian Databases for Geological, Oceanographic and Meterological Data by George Maisey, Senior Geologist, Continental Shelf Institute, Trondheim.
Norwegian Government Petroleum Activities and Publications by Karl Kalseth, Norwegian Petroleum Consultants, Oslo.
Information for Offshore Market Research by Alastair Mann, Consultant, Oil and Gas Division, P A International Management Consultants, Edinburgh.
List of Participants.

Price: £ 9.50 including postage, remittance with order.
ISBN 0 904046 10 9

NATIONAL OFFSHORE INFORMATION CONFERENCE PAPERS 1980

The Second National Offshore Information Conference was held at the Royal Institution of Naval Architects, London on 26th September 1980.

Introduction by A. Myers, Institute of Offshore Engineering.
North Sea — Economic Fact-Finding by P.M.S. Algar, Continental Oil Company.
Business Information for the Oil Industry by D.J. Edmonds, Aberdeen Commercial Library.
Offshore Engineering Information Sources by J.A. Whittick, Ocean Engineering Information Centre, Memorial University of Newfoundland.
Oceanographic Information and Data by N.C. Flemming, Institute of Oceanographic Sciences.
List of Participants.

Price: £ 7.50 including postage, remittance with order.
ISBN 0 904046 09 5

NATIONAL OFFSHORE INFORMATION CONFERENCE PAPERS 1978

The First National Offshore Information Conference was held on the Riccarton Campus of Heriot-Watt University, Edinburgh on 29th September 1978.

Introduction by A. Myers, Information Officer, Institute of Offshore Engineering.
Offshore — the Current Position by A.R.K. Mackintosh, Partner, Wood, Mackenzie & Company.
The Legal Regime of North Sea Oil by P.W. Birnie, Lecturer, Department of Public International Law, Edinburgh University.
Commercial Information Sources by J.W.F. Gaylor, Head of Commercial Information, The British Petroleum Company.
Government Activities and Publications by G.E. Hamilton, Senior Librarian, Department of Energy.
Technical Information by A.P. Dossett, Chief Information Officer, Constructors John Brown.
Research — Tomorrow's Information by J.R. Atkinson, Deputy Director, Institute of Offshore Engineering.
List of Participants.

Price: £ 6.50 including postage, remittance with order.
ISBN 0 904046 05 2

Remittance must be made in £ sterling, cheques made payable to Heriot-Watt University.

Enquiries and orders to:

Arnold Myers, Information Officer
Institute of Offshore Engineering
Heriot-Watt University
EDINBURGH EH14 4AS, Scotland
Telephone: 031-449 3393 or 031-449 3794

Tenth Anniversary

Joint MTS/IEEE Conference and Exposition

November 12—14, 1985

San Diego, California

FINAL CALL FOR PAPERS!

ABSTRACTS DEADLINE: MAY 1, 1985

ENGINEERING AND THE OCEAN ENVIRONMENT

The Marine Technology Society (MTS) and the Institute for Electrical and Electronics Engineers/Oceanic Engineering Society (IEEE/OES) invite papers from interested authors for the OCEANS '85 CONFERENCE AND EXPOSITION. Accepted papers will be presented at the Town and Country Convention Center, San Diego, California, 12—14 November 1985. Those papers that are accepted, received by the publishing deadline, and considered of professional quality will be presented in the Conference Record, which will be available at the conference.

The OCEANS '85 theme, *Engineering and the Ocean Environment*, will place emphasis on increasing the benefits from ocean engineering projects while preserving the ocean environment.

The conference will include special sessions focusing on the unique problems and challenges of the industrial society's attempts to develop the polar regions.

Papers are requested that address a variety of viewpoints regarding international developments in science and technology and their environmental, sociological, and political implications. The conference is designed to be a forum for formal and informal meetings of scientists, educators, manufacturers, service organizations, public officials and environmentalists.

To achieve this goal, OCEANS '85 encourages submission of papers that:

- identify world needs that can be met through developing ocean technology;
- explore the impact on the environment of the growing interest in extracting ocean resources and offer solutions;
- describe new frontiers in marine science and technology and their potential for environmentally secure industrial development;
- forecast new areas of research and development, and
- discuss international programs in science and technology.

The general theme has been subdivided into a number of topic or session areas, which are listed on the following page. Papers that do not conform to these suggested topics but contain information on new developments in marine science and technology will receive equal consideration.

• 80 TECHNICAL SESSIONS

• 160 TECHNICAL EXHIBITS

year of the ocean 1984-1985

OCEANS '85 Technical Program Chairman P.O. Box 6830, San Diego, California 92106

CONFERENCE FORMAT

Following a plenary session dedicated to the conference theme, multiple, parallel programs are planned. Each program will focus on the challenges facing the marine sciences and the technologies being applied. Sessions will use either a workshop or paper presentation format. Participants are encouraged to identify challenges, their current status and future goals, and emphasize alternatives for *Engineering and the Ocean Environment.*

DISPLAYS, TECHNICAL PAPERS AND TUTORIALS WILL COVER THESE AREAS:

Ocean Science
biology
fisheries
oceanography
ocean physics
geology and geophysics
geodesy
remote sensing
pollution
ocean energy
meteorology

Marine Resource Management
education and training
policy and law of the sea
international issues
economic potential
economic issues
marine recreation
oil and mineral resources
coastal zone management
food and drug resources
water quality
ocean monitoring

Ocean Engineering
materials technology
viewing and photography
buoys and moorings
cables and connectors
diving and salvage
offshore structures and ships
oceanographic instrumentation
undersea vehicles
power systems
seafloor engineering

Polar Research
through ice geology
under ice geodesy
ice station engineering
under ice operations
sea floor engineering
information exchange
resource management
other polar related topics

Marine Information Systems
communications
acoustic analysis
telemetry techniques
data base management
data processing
navigation
data acquisition
artificial intelligence
information systems
air/sea interface data

Emerging Ocean Technologies
basic research
ocean related research
technology advancement
program development
international activities
ocean investigation
operational capabilities
engineering developments
systems technology
advanced development
other ocean related topics

SUBMITTAL OF ABSTRACTS AND PAPERS

Abstracts should be submitted no later than 1 May 1985 on the form provided in this announcement. Authors of papers selected for presentation at the OCEANS '85 Conference will be notified by mail no later than 1 June 1985. Detailed instructions for the preparation of final manuscripts will be provided following notification of selection. Final manuscripts and accompanying illustrations must be received by the Technical Program Committee by 1 August 1985.

Abstracts should be sent to:
OCEANS '85 Technical Program Chairman
P.O. Box 6830
San Diego, CA 92106
(619) 455-0102

EVALUATION OF ABSTRACTS

Each abstract will be reviewed by the Program Committee. Authors should indicate which category or categories, noted above, they feel to be most appropriate to their subject matter.

EXPENSES RELATED TO PAPERS AND THEIR PRESENTATIONS

Authors are responsible for all expenses incurred, including time spent, costs for preparation of manuscripts and illustrations, travel to the conference, and conference registration fees. It is also the responsibility of the authors to prepare camera-ready manuscripts, including half-tone photographs, for the conference publication.

PRESENTATION OF PAPERS AT THE CONFERENCE

The Technical Program Committee will assign papers to the appropriate sessions. Since formal papers and supporting data will be published in the Conference Record, presentations generally will be limited to 15 to 20 minutes, with 5 minutes for floor discussions. **AUTHORS ARE RESPONSIBLE FOR OBTAINING APPROPRIATE RELEASES FROM GOVERNMENT SPONSORS.**

EXHIBITS

An extensive exhibit of marine products and services is planned as part of the OCEANS '85 conference and exposition. Special events have been scheduled at the exhibit hall to encourage interaction of exhibitors and attendees. San Diego has more than 100 ocean oriented industries, research and military centers.

For information call or write:
OCEANS '85 Exhibits Chairman
P.O. Box 6830
San Diego, CA 92106
(619) 294-5588

DEADLINE . . . 1 MAY 1985

ENGINEERING AND THE OCEAN ENVIRONMENT

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MTS/IEEE

CONFERENCE AND EXPOSITION

12—14 NOVEMBER 1985 TOWN AND COUNTRY CONVENTION CENTER SAN DIEGO, CALIFORNIA

Marine Technology Society - San Diego Section
OCEANS '85 (MTS/IEEE-OES)
TECHNICAL PROGRAM CHAIRMAN
P.O. Box 6830
San Diego, CA 92106

FINAL CALL FOR PAPERS!

OCEANS '85 **ABSTRACT FORMAT** ***Return by 1 May 1985***

PRINCIPAL AUTHOR____________________ TITLE__________

AFFILIATION ____________________

COMPLETE POSTAL ADDRESS ____________________

____

TELEPHONE____________________ TELEX__________

CO-AUTHORS AND AFFILIATIONS ____________________

STATE OR COUNTRY____________________

List names in the order that they should be printed in the program. Provide complete addresses for co-authors on a separate sheet if necessary.

PAPER TITLE ____________________

ABSTRACT (Please limit your abstract to 200 words.)

TOPIC AREA MOST APPROPRIATE FOR THIS PAPER ____________________

OTHER SUGGESTED OCEANS '85 CATEGORY ____________________

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IF SO, INDICATE THE SPONSORING AGENCY AND OFFICE____________________

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Panama City Beach, FL 23407

Harold Sabbagh
Sabbagh Associates, Inc.
Bloomington, Indiana

Dear Harold:

The copies of the first half of the "Sonobuoy" article were forwarded here, where I am spending most of February and March. Thank you for sending them. I was flattered that you thought enough of the article to reprint it in your *Oceanic Engineering Newsletter.*

You may, or may not know, that the IEEE/AESS astounded me by selecting that same article as the 1984 winner of their "Harry Rowe Mimno Award", which is to be presented to me during a luncheon at their WINCON meeting at Costa Mesa on 14 February. Perhaps you are going to attend that meeting and if so I will look forward to the pleasure of meeting you there. I will also attend the NSIA/ADPA meeting at NUSC, San Diego starting 4 March. I plan to see an old friend Howard Talkington, while there, and since he is a leader in Ocean Engineering we might also meet there.

I note that several of your OES associates, like Brackett Hersey and Art Westneat, are old friends of mine, although I have not seen either in some time. Your republishing of the "article" may help to renew those old friendships, although some of the rather frank, but honest, things I said may terminate their respect! Give them my best personal regards should the occasion arise.

I will look forward to receiving copies of the Spring issue at my Glens Falls home. A few more copies for requests will be of help. Again, thank you for thinking enough of the article to republish it.

Sincerely,

Russ

Russell I. Mason

3050 Fairfield Ave.
Bronx, N.Y. 10463

Feb. 6, 1985

Harold A. Sabbagh
Sabbagh Associates, Inc.
2634 Round Hill Lane
Bloomington, IN 47401

Re: Kuraher article on Major Armstrong, Newsletter No. 4

Dear Mr. Sabbagh:

I believe that Mr. Kuraher misinterprets Carson classical analysis of AM vs FM modulation. (John R. Carson, Notes on the Theory of Modulation, Proc. I.R.E., Vol. 10, p. 57, Feb. 1922.) Carson was concerned with the bandwidth required for each system. FM required a large bandwidth, which was too large for the frequencies then in use for broadcasting. I don't believe the term "inferior" was used. Carson did not investigate the question of noise. Investigators look for answers to questions being asked.

Very truly yours,

Abraham Abramowitz

Abraham Abramowitz

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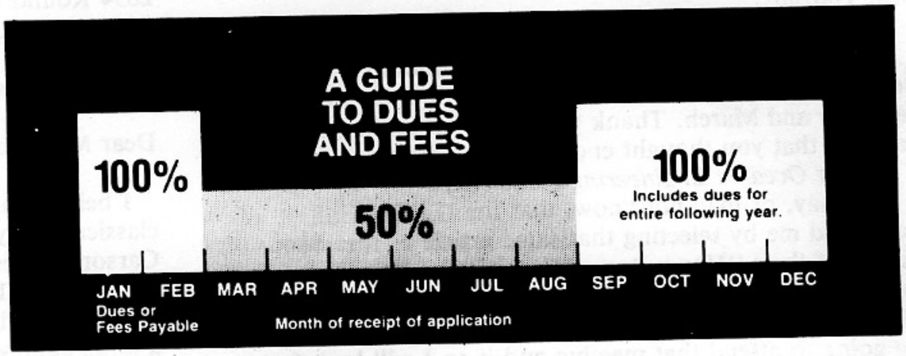

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