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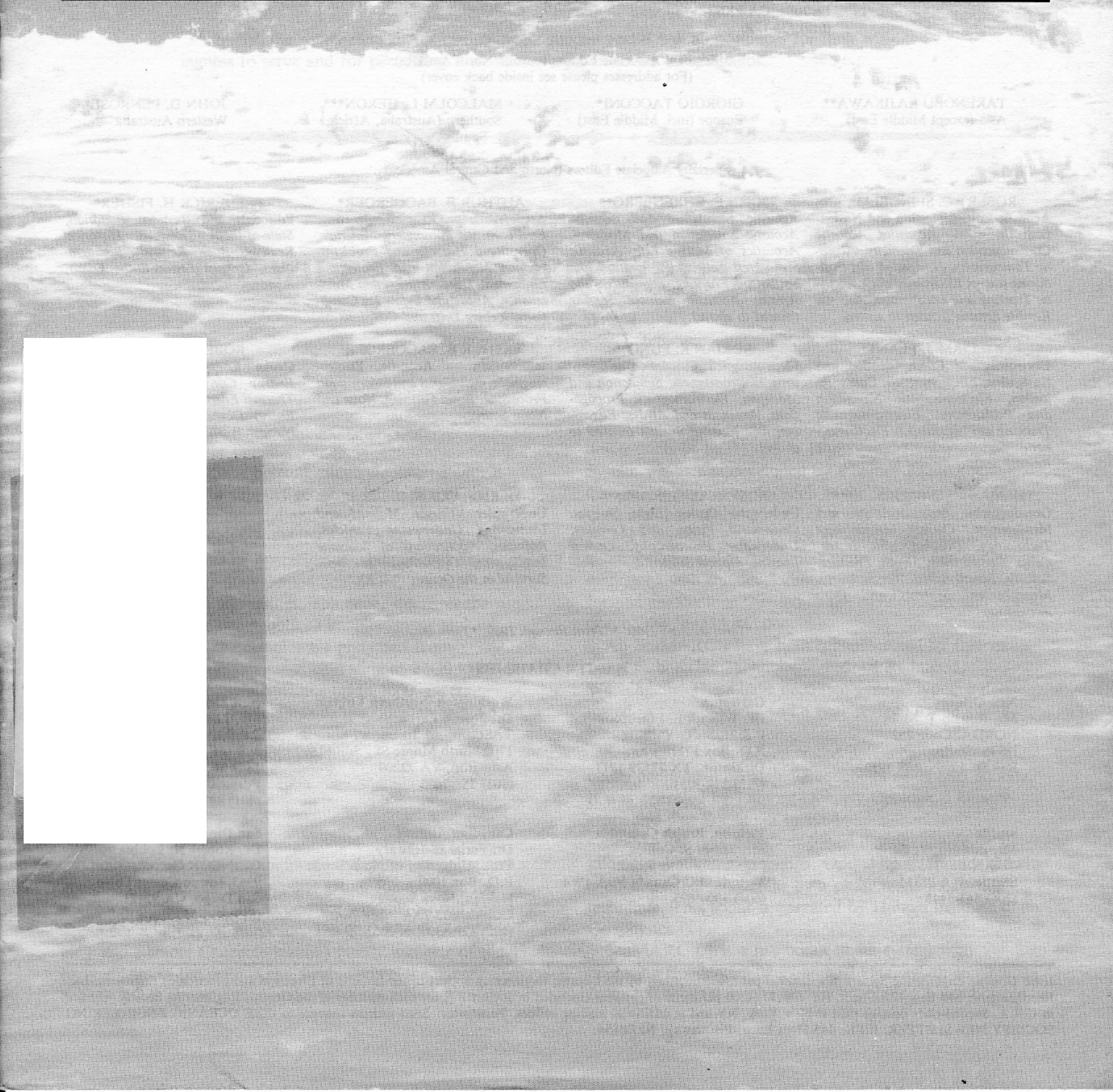

IEEE OCEANIC ENGINEERING SOCIETY

(Continued on inside back cover)

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RESULTS OF THE ADCOM ELECTION BALLOT

As you know, a ballot for the election of seven IEEE Oceanic Engineering Society Administrative Committee members was issued on May 5, 1989. The ballots returned have been counted, and the following candidates have been elected for a three-year term ending December 31, 1991:

Stanley G. Chamberlain
Joseph Czika
Rui J. P. de Figueiredo
Edward W. Early
Robert W. Farwell
Michael Serotta
Robert C. Spindel

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

(Reprinted from *OCEANS '88 Proceedings*)

THE WIDE SWATH, DEEP TOWED SEAMARC

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ABSTRACT

The advantages of sea bottom imagery collected with a deep towed system to support geophysical studies of the deep seafloor for commercial and research applications are frequently not appreciated. Of the SeaMARC family, no two are alike in terms of operating capabilities and data output. Only the privately owned SeaMARC 1A cuts across and supports all regimes. The paper discusses the use of deep towed wide swath bottom imaging sonar and sub-bottom profiler. Data examples are presented from SeaMARC 1A, a sidescan sonar operating at 27-30 kHz to image the seafloor in swath widths up to 5000 meters. Acoustic response of the seafloor to the sidescan and 4.5 kHz sub-bottom profiler from a wide range of environments are examined, and the image processing techniques are shown.

INTRODUCTION

The many sidescan sonars in use today for mapping and imaging fall into two groups; one group for working the shallower waters, and the second for working to full ocean depth for a variety of purposes. The SeaMARC (Sea Mapping and Remote Characterization) family was one of the early entries in the deep ocean field. Today, the name SeaMARC is almost synonymous with towed sidescan deep ocean imagery or swath bathymetry. These devices are descendants of the HSES or High Speed Exploration System which was developed by a consortium for manganese nodule exploration in the late seventies. (The U.S. member of this consortium was the International Nickel Company which is not an active participant in offshore exploration at this time.) Many of the personnel associated with the development of the HSES subsequently formed associations that led to the development and operation of the SeaMARC line.

All SeaMARC's have been manufactured by International Submarine Technology, Ltd. of Redmond, Washington. There have been two general types; a deep-towed imaging system, and a near surface towed swath bathymetry system.

SeaMARC I was a deep-towed device capable of full ocean depth with operating frequencies of 27 and 30 kHz. It was operated by Lamont-Doherty Geological Observatory and was lost at sea in 1984.

SeaMARC II is a shallow-towed device capable of 10 kilometer bathymetric swaths. Operating at 11 and 12 kHz, it obtains off track depths by a phase angle measuring technique. This sonar is operated by Hawaii Institute of Geophysics.

SeaMARC IA is a full ocean depth system with operating frequencies of 27 and 30 kHz, swath capabilities from 500 to 5000 meters and incorporating a sub-bottom profiler and a digital processing system. It is owned by International Deep Sea Survey, Inc. and operated by Williamson & Associates, Inc.

SeaMARC IB was similar to SeaMARC I and was initially purchased by Lamont-Doherty but was subsequently transferred to Woods Hole Oceanographic Institution. It was lost at sea this year.

The SeaMARC CL-X is a smaller system which operates at 150 kHz with a maximum swath width of 800 meters. It was developed as an experimental model in 1985 and is operated by Williamson & Associates, Inc.

The SeaMARC S is a medium depth, production follow-on to the CL-X manufactured for Seafloor Surveys International, Inc. in 1986. SSI has developed a phase angle measuring system for swath bathymetry which has been integrated into this system.

In addition to complete systems, IST has also provided arrays and primary electronics to customers for their own further development. In early 1988, International Submarine Technology ceased operations and sold the rights to the SeaMARC line to Honeywell Inc. Reportedly, more SeaMARC's are in process at the Honeywell plant near Everett, Washington.

SYSTEM DESCRIPTION

The major components of the SeaMARC IA system are the towfish, cable and depressor, topside handling equipment, surface electronics package, and data acquisition and processing systems. The towfish (Figure 1) carries the port and starboard sidescan arrays and associated electronics, the toroidal beam pattern 4.5 kHz sub-bottom profiler, and various sensors and recovery beacons. The towfish weighs 1600 pounds in air and is slightly buoyant; it tows well at speeds up to five knots. A standard 0.68 inch marine coax of up to 30,000 feet connects the towfish to the winch. A 1600 pound depressor is positioned three hundred feet ahead of the towfish to eliminate towing vessel heave and to mitigate the effects of pilot error. The topside handling components are a towpoint, which resembles a half A-frame with a gallows block, a hydraulic winch with level wind, and a crane for towfish launch and recovery. If the support vessel doesn't have a hydraulic deck outlet, a diesel power pack is also necessary. The surface electronics package contains the sonar controls and the analog-to-digital processors. Transmit power, receiver gain, swath width selection, pulse burst length, and bandwidth can be controlled for each sonar. The data acquisition and image processing systems consist of the recorders, computers, video monitors and tape and disk decks which are used to simultaneously record and process the data.

A critical component of the SeaMARC IA operation is the availability of tools and spare parts so that any casualty short of towfish loss can be overcome. Once offshore, clients take a dim view of having to suspend an operation to return to port for repairs. So, included in the support equipment are all tools that could conceivably be required, a replacement board for surface and subsurface systems board, many spare hardware, electrical and electronic

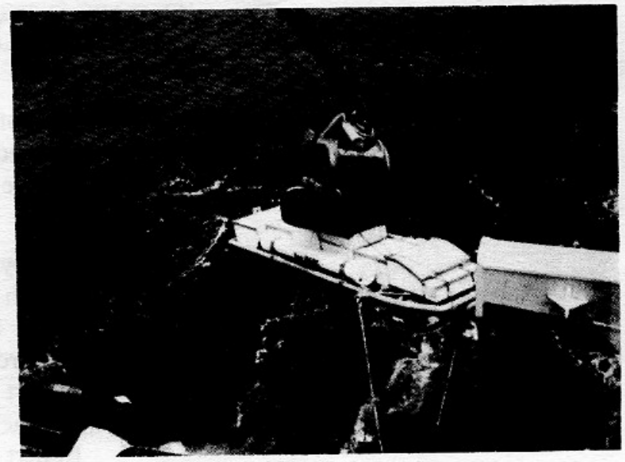

Figure 1. SeaMARC IA Towfish

items, and a complete library of technical publications and drawings.

A variety of navigation systems has been used with SeaMARC IA. Two types of positioning must be considered; vessel positioning, and towfish to vessel positioning. For vessel navigation, advances in electronic and satellite navigation in recent years have improved the accuracy in positioning. The increase in the number of GPS satellites will further increase the accuracy of vessel positioning. Determining the towfish position relative to the ship can be done with a short baseline system, or in the situation where the cable length is over 10,000 feet, a manual calculation has to suffice. The most accurate method is a long baseline system in which an interrogator on the SeaMARC towfish queries a calibrated transponder array. This removes the ship from the calculation and has provided results to a two meter accuracy.

SeaMARC IA has been to sea on vessels ranging in length from 120 to 350 feet. The basic requirements are that the vessel accommodate the personnel and equipment and be able to maintain track in the sea conditions expected in the survey area. Frequently other activities in addition to SeaMARC operations are planned which mandates additional equipment and space integration. The ship must have sufficient room for the handling equipment, and working area for the SeaMARC IA electronics, processing equipment, and navigation computers. The personnel count varies according to the requirement for on-board processing and evaluation, but an average SeaMARC and navigation scientific party numbers about ten. While the SeaMARC IA has operated in gale conditions, the limiting factor in such adverse weather has been the ability of the ship to maintain track. Bow thrusters have been used to advantage in some circumstances and are a desirable feature.

All the equipment except the winch and crane fit into a twenty foot long container that is easily road transportable and can be welded to the deck of the support vessel for a support and maintenance center at sea. If necessary the system is also air transportable (but it is in the client's better interest to find a crane locally). Mobilization requires two to three days with the critical path generally involving welding.

SEAMARC IA OPERATING FUNDAMENTALS

The key advantage of deep-towed sidescan sonars is that all the errors associated with the water column effects and beam spreading are eliminated, and the arrays are transmitting and receiving in the immediate vicinity of the "target". Inaccuracies in depth measurements caused by ray path bending and bottom penetration by the relatively low frequencies of surface systems and modulation of return signal characteristics by the water column are also avoided. The philosophy of this sonar is to present the best imagery possible and the operating parameters have been selected accordingly. In the design phase, two desired capabilities for SeaMARC IA were the ability to image large areas of seafloor in a wide swath mode and the ability to find small targets in the narrow swath, high resolution mode. The flexibility offered by the variable swath widths from 500 to 5000 meters provides the seafloor mission planner with powerful capability. In any areal survey, the ability to obtain an initial wide swath look at the target area precludes navigational surprises and indicates those areas which deserve a closer look. The ability to accomplish both wide area and high resolution missions with the same machine saves capital costs and hours at sea in recovering and restreaming equipment.

The design selection of frequency for a sidescan sonar is dependent on the maximum swath width desired. Once the frequency has been selected, the mechanics of the transducer array construction determine the characteristic of the resonance curve which is assigned a value known as "Q". A lower Q means that a wider bandwidth about the center frequency is available for signal processing. An important point concerning resolution of a sonar is that high resolution is not dependent on high frequency but rather on pulse duration. A sonar puts power in the water in pulses, the length or duration of which determines the minimum size of a discernible object and the shape of which determines the sharpness of the return signals. The key to a short, well shaped pulse burst is wide bandwidth. The best resolution of an analog signal is equal to the velocity of sound in water times the pulse width expressed as time with due regard for units. In a digital presentation, the best resolution attainable is the physical size of a pixel in the cross-track direction and is equal to the swath width divided by the number of pixels in the scan line. For optimum results digital and analog resolution should be matched.

In the case of SeaMARC IA, the desired maximum swath of 5000 meters mandated a maximum frequency of 30 kHz. (The lower 27 kHz on the port side array is for the purpose of eliminating cross-talk.) This selection of 30 kHz also set the minimum pulse width obtainable because the lowest "Q" achievable with the transducer arrays dictated a maximum bandwidth of 6 kHz. This converts to a pulse duration of 0.15 milliseconds which equates to a pulse width of 22.5 centimeters in seawater. This 22.5 centimeters is the smallest dimension that can be discriminated by the analog system. In the SeaMARC IA operating procedures the 0.15 millisecond pulse duration is for highest resolution on the 500 meter swath. Since there are 2000 pixels in a scan line, the digital resolution of the system is 25 centimeters which essentially matches the analog resolution.

The altitude and control settings normally used for the various swath widths for the SeaMARC IA are:

Swath meters	Altitude meters	Pulse Length milliseconds	Bandwidth Hertz
500	25- 125	.15, .2, .3	5000
1000	25- 250	.3, .4, .6	2000
2000	50- 500	.8, 1.2	1000, 2000
5000	125-1250	1.2, 1.6, 2.4	500, 1000

The bandwidths tabulated above are related to tuning of circuits in the electronics signal processing section and are not the same as the mechanical transducer array bandwidth referred to earlier.

As opposed to the resolution of a sidescan sonar in the cross-track direction being set by its operating characteristics, the resolution and consequently the pixel dimension along track is set by vessel speed. For a given beam width, if the vessel moves too fast a small target may be missed. But, if the vessel moves such that each point is imaged several times, and the towfish is stable in pitch, roll, and heading, then a small target whose return signal is slightly higher than background will appear as a short, sharp vertical line at the appropriate range (Figure 2). Therefore, the along track dimension of a target or feature can be calculated from knowledge of the angular dimension of the beam width, the range to a target, and the ship's speed.

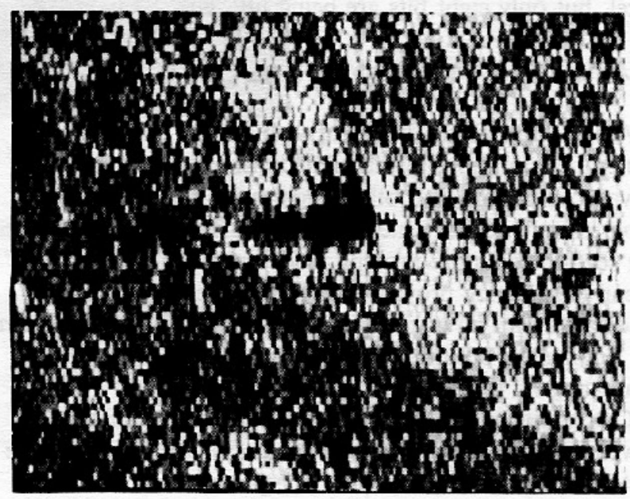

Figure 2. Zoomed Image of a Small, Hard Target (Note the 25 cm Pixels)

For good imagery, returning intensity levels must be displayed in as many shades or colors as the human eye can discern. The SeaMARC IA Image Processing System sorts incoming signals into 256 intensity levels and displays them in 16 shades of gray or other pseudo-color. The number of intensity levels assigned to any of the 16 colors can be varied or "thresholded" so that specific portions of

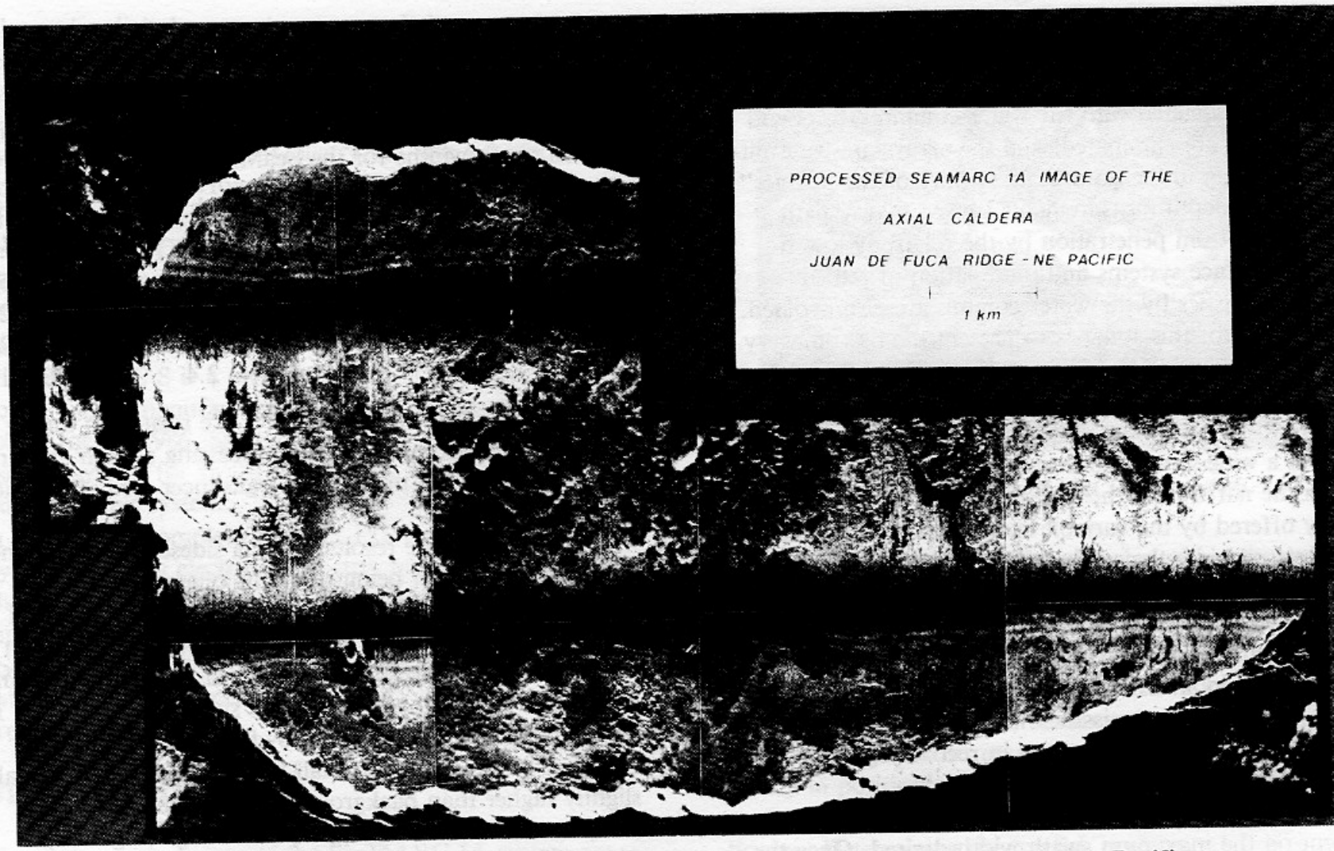

Figure 3. SeaMARC IA Mosaic of the Axial Seamount Caldera in the Northeast Pacific The Image Represents 2 Tracklines Run with a 2 km Swath Width.

the returning intensity level spectrum can be assessed. In signal processing terms, twelve bits are reserved for each pixel, but only eight bits are being utilized.

SEAMARC IA EMPLOYMENT

As offshore oil development, cable route surveys, mineral exploration, installation of sensor platforms, salvage operations and other engineering projects occur in progressively deeper water, traditional methods of obtaining seafloor data are proving inadequate. The high cost of ocean engineering projects and the financial penalties associated with an engineering failure place a high premium on finding the optimum location for a project and evaluating all the potential geo-hazards.

Conventional hull mounted multi-beam and shallow towed sidescan interferometric sonar systems may measure water depth to an accuracy of one percent and can generate contour maps of the seafloor which provide general indications of depths and slopes but little information on seafloor properties.

Figure 3 is a SeaMARC IA mosaic of the caldera on top of Axial Seamount in the northeast Pacific. Although the rim wall, which is up to 150 meters above the caldera floor, dominates the image, other geomorphological features are well expressed. The high reflectivity of the caldera floor on the left-most part of the image is due to fresh basalt which has probably emanated from the large fissure intersecting the rim wall in that area. The small cone in the lower left may be still building, while the collapsed remnant of an older one can be seen just above it.

Figure 4 is a two kilometer swath image showing a seafloor fault running upwards and to the right. In the lower left portion, sharp spires of basaltic material are shown which project several tens of meters from the seabed. Both the fault and spires should be considered significant hazards to a pipeline installation, cable route or a mining operation.

Another geo-hazard, shallow gas, is depicted in Figure 5. Taken on a 500 meter swath, this image shows gassy sediment at the seafloor and free gas venting from the bottom. Much of the sub-bottom detail is masked in the gassy area due to differences in acoustic velocity.

CONCLUSIONS

Records from a deep-towed sidescan sonar and sub-bottom profiler such as SeaMARC IA supplement the information available from surface systems and provide the quality data necessary to plan modern seafloor engineering projects. Where additional geotechnical information is necessary, the SeaMARC records will indicate the most promising positions for taking core samples or conducting ROV operations. The greater costs associated with deep towed operations are minor compared to the risks involved in the loss of a pipeline or cable route because a fault or other geo-hazard was not detected and evaluated.

ACKNOWLEDGMENT

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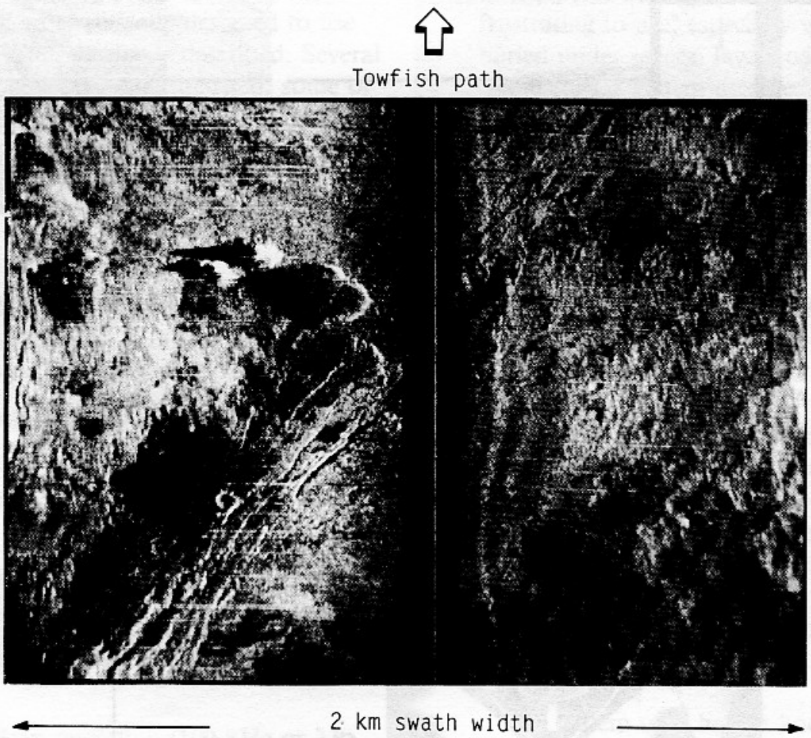

Figure 4. Image of a Fault in 2500 m of Water, Recorded on the 2 km Swath Width

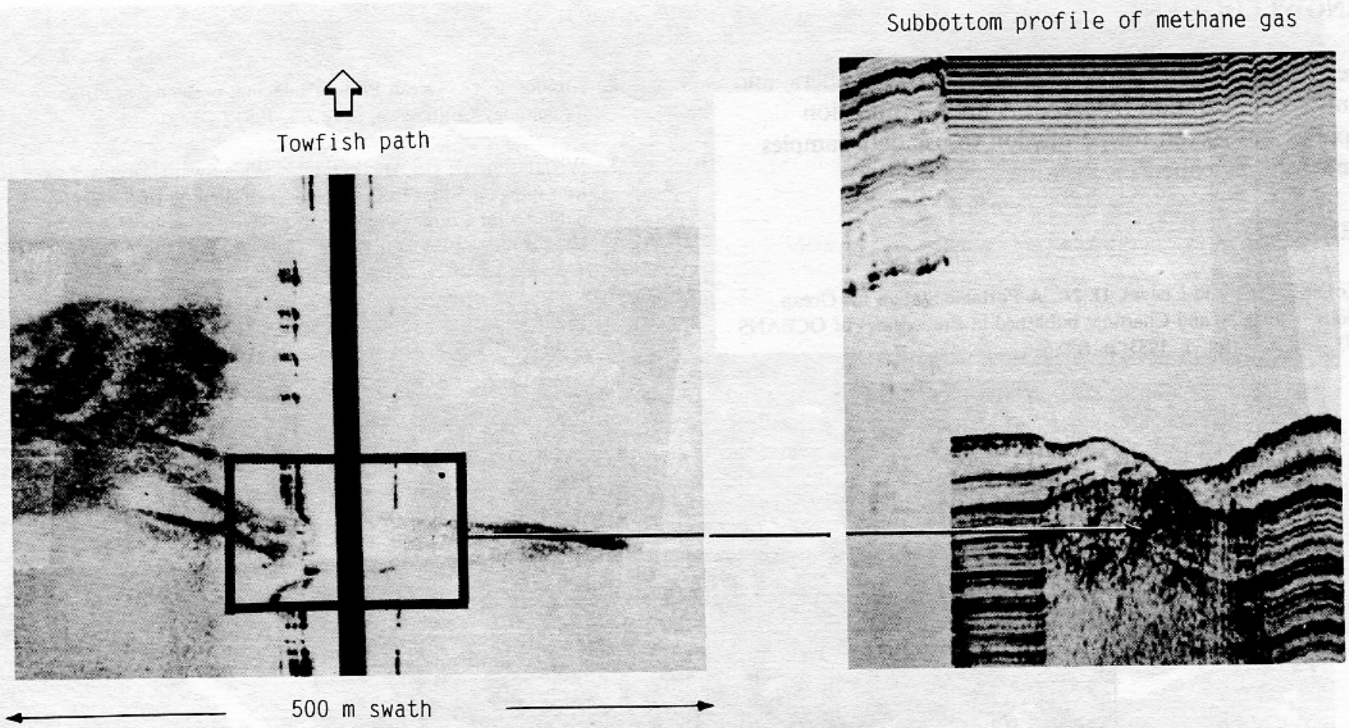

Figure 5. 500 Meter Swath of Shallow Methane Gas. Also Shown Is the 4.5 kHz Subbottom Profile as the Towfish Crossed above the Degassing Area.

(Reprinted from *OCEANS '88 Proceedings*)

A NEW GENERATION SIDE SCAN SONAR

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ABSTRACT

Side Scan sonar has traditionally used a graphic paper recording system for the display and annotation of the data. A new Side Scan system specifically designed to use color video as the primary data display is described. Several design considerations and trade-offs are discussed, some of which are unique to a system using a video display.

A parametric Sub Bottom Profiler and towfish orientation sensors are also integrated into the system.

INTRODUCTION

The Mesotech Model 972 is a new Color Side Scan Sonar with an optional Sub Bottom Profiler function. Some of the main features of the system are:

— High resolution full color display (1280 x 1024 pixels x 7 bits/pixel).

— Tape recording/playback using standard VHS cassettes.

— Neutrally buoyant towfish de-coupled from ship motion.

— Sensors in the towfish to monitor depth, altitude, pitch, roll and speed.

— Dual frequency Side Scan operation (100 kHz or 330 kHz).

— Display corrections for speed and altitude of the towfish.

— Only two conductors required in the cable to the towfish.

— Operation from 110/220 VAC or 20 to 50 VDC.

SOME DESIGN CONSIDERATIONS

Operating Controls

There is a tendency to use keypads and displays as the operating controls for much of today's electronic equipment. Several reasons for this approach are:

— there are often too many variables to control to allow the use of a dedicated control for each function;

— invalid or illogical control setting combinations can be easily prevented or warned against;

— changes or special features can be added requiring only software modifications;

— it makes for a simple, clean looking control panel;

— it is inexpensive.

The main objection to this scheme is that it can be very frustrating to use, especially when the control to be set is buried under several layers of menus.

This sonar system uses dedicated controls in the form of conventional rotary switches and potentiometers for all of the most often used controls. Secondary controls are adjusted using a software driven menu system and a simple keypad.

Choice of a Color Display

The most desirable characteristic of the color video display is its ability to display data with a much wider dynamic range than is possible with a paper recorder system.

Images are formed on the display because the intensity of the reflected acoustic return varies continuously within each shot. If the return is too low in amplitude, it will be shown in black and will not be visible. If the return is too high in amplitude, it will be clipped to the maximum display level and information will be lost.

Therefore, there is a limited range of reflected signal levels which can be displayed. This is the dynamic range of the display.

The system used here is known as an analog RGB video system, meaning that the intensity of the three primary colors, red, green, and blue can be independently controlled in very small steps. A total of 128 return levels can be distinguished by controlling both color and intensity of each pixel on the display. This is considerably more than the 8 or 16 levels which can be distinguished on a typical black and white paper recorder.

The Neutrally Buoyant Towfish

Ideally, the towfish would be towed through the water at a constant speed and depth with no pitch, roll, or yaw. However, the towing vessel is normally subject to surface wave action which will result in continuously changing tension on the tow cable.

Figure 1 illustrates the method used in this system to decouple the towfish from ship motion. The weighted depressor on the end of the armored cable will tend to move up or down as cable tension changes. The neutrally buoyant towfish is not subject to these upwards or downwards forces since it is being pulled horizontally at the end of a neutrally buoyant tether.

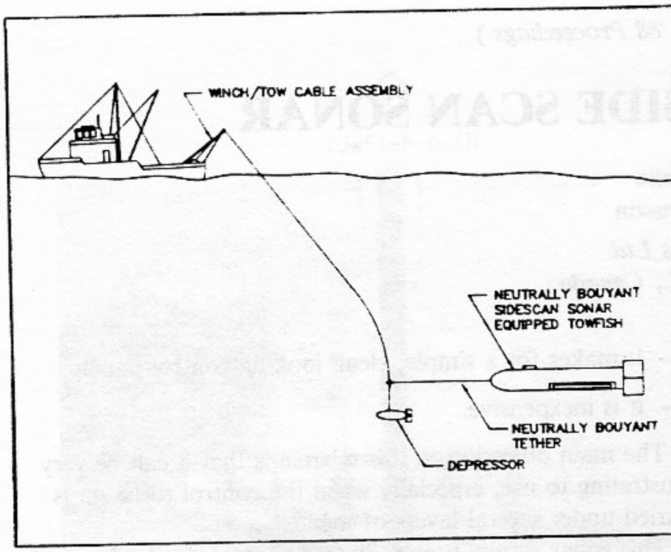


Figure 1. Towfish Decoupling Method

Towfish Orientation Sensors

The towfish includes several orientation sensors. Data from these sensors is displayed on the screen and stored on tape.

The sensors measure the following:

PITCH: over a range of +/− 20 degrees.

ROLL: over a range of +/− 20 degrees.

COMPASS (optional): magnetic heading to a resolution of 1.4 degrees.

SPEED: to a resolution of 0.1 knot.

DEPTH: as measured by a pressure sensor to a maximum range of 300 meters.

ALTITUDE: as measured by a downward looking echo sounder in the towfish to a maximum range of 250 meters.

Only the speed and altitude sensor data is used to make corrections to the display. The other sensors are provided only to verify that the towfish is level and at the expected depth.

Gain Control System

Reflected return signals will vary over a range of more than a million to one, much wider than the display dynamic range. Much of this variation is due to signal loss with increasing range. This loss is fairly predictable and can be compensated for with TVG (Time Varying Gain) amplifiers. There are two main factors causing the loss with range:

1) Spreading Loss
2) Absorption Loss

SPREADING LOSS

When the sonar pulse is transmitted from the transducer, a fixed amount of energy is spread over a small area of water equal to the area of the transducer face. As the pulse travels through the water, it spreads out over a wider area, resulting in less energy per unit area. The energy per unit area will decrease as the square of the distance traveled. By the time some of this energy is reflected back to the transducer, the energy level will be reduced by a *predictable* amount according to how far it has traveled (how long it took).

This loss is compensated in the towfish by a TVG amplifier which increases its gain at the predicted rate of loss due to spreading. There is only one operator adjustment for this gain correction, the START gain. The rate of increase is pre-set to a 20*log(range) function and is *not* adjustable.

ABSORPTION LOSS

As the sound pulse travels through the water, additional energy is lost to the water due to an effect called absorption. The rate of loss varies with frequency as well as with salinity and temperature. This loss is expressed in db/m (decibels per meter) since it is linearly proportional to the distance traveled. It is compensated for in the sonar by a second TVG amplifier whose gain is designed to increase at a constant rate or slope. This SLOPE gain can be adjusted by the operator either up or down from the default values of 0.035 db/m for 120 kHz and 0.065 db/m for 330 kHz. The default values used are representative of data from several published sources. They tend to vary from source to source since they are empirically derived values.

SYSTEM ORGANIZATION

The Mesotech Model 972 Side Scan Sonar System consists of the following major electronic components:

a) Towfish Electronics Module
b) Left and Right Side Scan Transducers
c) Echo Sounder Transducer (and optional Sub Bottom Transducers)
d) Two-Conductor Cable to surface
e) Surface processor module
f) RGB color monitor
g) Tape recording system consisting of a PCM encoder and a VHS video tape recorder.

TOWFISH MODULE

The main function of the Towfish Module is to collect the raw sonar data and send it to the surface for further processing and display.

The Towfish Electronics Module contains the acoustic transmitters, receivers with 20 log R TVG function, telemetry receiver and transmitter, control processors and power supplies. It is designed to operate on a cyclic basis at a rate given by the surface unit rather than having to be triggered from the surface for each shot.

This is accomplished as follows:

a) A fixed length command block is sent from the surface to the towfish through the 2-wire telemetry system. This block includes parameters to specify the frequency (120 kHz or 330 kHz) and the desired shot interval time.

b) The towfish will continuously repeat a cycle of sending a sync tone to the surface, firing the transmitter, receiving the echoed signals, and simultaneously sending a TVG corrected and frequently shifted replica to the surface.

c) A new command block is sent only if one of the operating conditions has changed.

The towfish is fitted with sensors to measure pitch, roll, depth, speed through the water, and optionally, magnetic heading. The information from these sensors is sent to the surface in fixed length data blocks through the telemetry system. This occurs approximately every 2 seconds.

SUB BOTTOM PROFILER SYSTEM

The sub bottom profiler system uses a technique known as parametric mixing to generate a directional low frequency pulse. A relatively low frequency is required to achieve penetration into the bottom material. The higher frequencies used by the side scan system are reflected from the bottom surface.

The sub bottom system consists of two transmitters, each with its own transducer, and a receiver with a third transducer. One transmitter/transducer operates at 200 kHz while the second one operates at 210 kHz.

The two frequencies mix in the water producing two more frequencies, the sum and difference frequencies. The sum frequency of 410 kHz is quickly absorbed, but the difference frequency of 10 kHz is able to penetrate the typical bottom for a few meters. The receiver is tuned to 10 kHz and receives the reflected 10 kHz signals from the bottom and layers below the bottom

The method is very inefficient electrically, but relatively little energy is required. A 10 kHz transmit transducer with the same directional characteristics would be prohibitively large for a towfish.

TELEMETRY SYSTEM

The telemetry system between the Surface Processor and the Towfish Module uses a full duplex 300 baud modem system for the down-link command block and up-link data block. Frequency division multiplexing is used to send the side scan, sync, and sub bottom signals to the surface. Frequencies used are as follows:

Digital Down Link	:1170Hz
Digital Up Link	:2125Hz
Right Side Scan (Up)	: 80kHz
Left Side Scan (Up)	: 50kHz
Sub Bottom (Up)	: 65kHz
Sync (Up)	: 100kHz

The telemetry system signals are superimposed on the 48 volt DC power supplied from the surface to the towfish, thus requiring a total of only two conductors in the tow cable.

SURFACE PROCESSOR

The basic function of the Surface Processor is to convert the sonar signals from the Towfish Module into an image on the color display. Several processes are involved in this function:

a) The panel controls are sensed to determine the desired operation mode.

b) Appropriate commands are sent to the Towfish Module to establish the correct data collection rate.

c) When the sonar data is received at the surface, a second level of TVG correction is applied to compensate for absorption loss.

d) The sonar and sync signals are converted to the audio range to allow them to be recorded on the external recording system.

e) The sonar signals, now in the audio range, are amplitude detected, digitized, and stored in a buffer memory.

f) The digitized data is copied from the buffer memory to the video display controller by the main CPU.

g) The video display controller converts its memory to analog RGB video signals which drive the color display.

h) Sensor data from the Towfish Module is received and displayed numerically on video screen.

i) If the Speed Correction Mode is enabled, the firing rate and display scrolling rate are modified as required.

j) If the Water Column Removal or Slant Range Correction mode is enabled, the digitizing rates are adjusted as required.

In addition to its basic function of displaying the realtime sonar data from the Towfish Module, the Surface Processor will also display data from the tape recording system.

RECORDING SYSTEM

The recording system is basically a 5 channel audio recorder using standard VHS video tapes as the recording media.

A Sony PCM encoder is used to digitize two channels and record them on the video track. Two more channels use the stereo HI FI tracks on the tape. The fifth channel uses the linear tracks recorded in mono. Normally, a standard video recorder will allow use of either the HI FI track or the linear tracks for the audio, but not both at the same time. The recorder must be modified to allow their simultaneous use.

On playback, the PCM encoder converts the digitized data on the video track back to two analog channels.

The 5 channels are assigned to the sonar data as follows:

Left Side Scan	: Left PCM
Right Side Scan	: Right PCM
Sub Bottom	: Left HI FI
Sync	: Right HI FI
Serial Data	: Linear

The serial data consists of digital sensor data, Surface Processor control settings, and externally input RS-232 navigation data.

DISPLAY CORRECTIONS

Speed Correction

The purpose of the speed correction mode is to control the scrolling rate of the display such that the vertical and horizontal scales are equal. This means that the scrolling rate (and the 'shot' rate) must change with the selected range scale and also with the speed of the towfish over the bottom.

In a system using a paper recorder, it is possible, at least theoretically, to vary the paper advance speed continuously to compensate for towing speed variation. With a video system, however, it is only possible to increment the display by an integer number of pixels. Even with a high resolution display such as is used here, increments of one pixel do not provide fine enough control over the advance speed to make an accurate speed correction with a fixed 'shot' rate. The solution used in this system is to vary the 'shot' rate in very small increments while adjusting the display advance by replicating an entire row of pixels where necessary.

Towfish speed through the water is measured by a paddle wheel sensor in the nose of the towfish. Alternatively, speed can be entered by means of a front panel control, or through the RS-232 interface.

Speed Correction Limitations

The towfish sensor measures speed through the water, not the desired speed over the bottom. Using speed through the water, however, will tend to compensate for speed changes due to winching in or out. Speed set from the front panel or externally could be set to match an average speed over the ground, if known, but it would not compensate for winching. The speed correction is thus only a good approximation.

A second consideration is the fact that the transmitting rate is varied along with the scrolling rate to match the speed. The transmitting rate can only be decreased from the maximum rate for a given range. This means there will be fewer 'hits' on a target with speed correction enabled. Un-corrected speed will always give a maximum transmitting rate, and thus maximum 'hits' on a target for any speed.

Water Column Removal

In an un-corrected display, the data plotting is started synchronously with the transmit pulse. This means that the first section of the display will be showing returns only from the water column. If the start of data plotting is delayed by an amount equal to the height of the towfish above the bottom (altitude), the water column will not be displayed. This is the water column correction mode. It can be enabled for the side scan display and independently for the sub bottom display. There is one small difference with the water column removal in sub bottom: one meter of water column is deliberately left in the sub bottom display. This allows the water-bottom interface to be clearly visible.

Water column removal requires the altitude of the towfish to be known. This can be taken automatically from the towfish echo sounder or it can be entered manually with a front panel control.

Water Column Removal Limitations

With water column correction enabled, the water column *and any targets in the water column* will be removed from the display. They can be recovered by playing the tape back in the *un-corrected* mode.

A second limitation occurs when the towfish altitude changes rapidly. This can be caused by a change in towfish depth or bottom depth. The altitude data from the towfish has a four second update rate due to telemetry. This means that the display can have jagged edges near the bottom due to instantaneous errors in altitude.

Similarly, water column correction using altitude from the panel control can easily have an altitude error. The effect will be to remove too much or not enough water column. This can be used to advantage in some cases if it is desired to simply remove *most* of the water column and still see the water-bottom interface.

Slant Range Correction

The side scan image plotted in the un-corrected mode is an image created by plotting each point at its slant range distance from the towfish. This can result in considerable distortion in the plotted size of objects very close to the towfish relative to those further away. The slant range correction mode applies a geometric correction in an attempt to minimize this distortion. The slant range correction takes place in two stages: First, the water column is removed as described above. Second, the sample rate of the side scan is varied within each 'shot' as a function of altitude and range. The result is a side scan image with the horizontal scale representing true horizontal distance on the bottom.

Slant Range Correction Limitations

The basic assumption of the slant range correction is that the bottom is flat and level. Since this is not always the case, the correction can only be considered an approximation.

The slant range correction is also dependent on an accurate and up-to-date altitude from the towfish. This is needed for both phases of the correction: water column removal and sample interval control. Furthermore, the altitude must be less than 50% of the range setting for the correction to work properly. This is seldom a limitation except on extremely short ranges.

DISPLAY FORMAT

The display can be set to any one of seven different formats showing any combination of left side scan, right side scan and sub bottom data. The full width of the display is used in each case. All displays are in the 'waterfall' form whereby new data is plotted at the top of the display and the older data is scrolled down. Scaled range markers can be automatically written over the data. In addition, a movable cursor can be placed anywhere on the display area and used to mark targets with a unique target number.

The bottom area of the display is used for the menu control system and to show the towfish sensor data. The current settings of most of the menu controlled parameters are also shown continuously in this area, even if the menu for that parameter is 'buried'.

MASTER/SLAVE MODES

It is possible to connect two Model 972 processor units and two displays together in a master/slave arrangement with a single towfish. In this configuration, the master system is the processor connected to the towfish. The second system is set to the slave mode (by means of a front panel switch) and is connected to the master by means of a master/slave connector on the rear panel. The slave system can then be set independently to a different display mode or even to a different range.

The master/slave configuration thus allows many more display combinations. For example, the master can be set to show left side scan data while the slave shows right side scan data, each using the full display width.

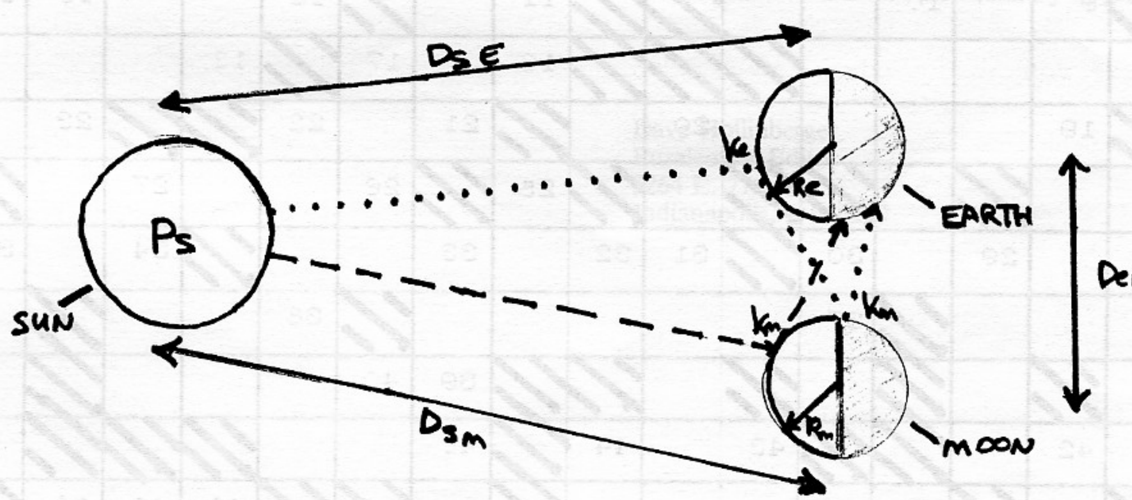
T:e master/slave arrangement can also be used in the tape play back mode.

'TIS A PUZZLEMENT

Last Quarter's Puzzle — Moonlighting

Last quarter's puzzle was to determine the darkness of the dark side of the Moon. One plausible explanation for the dark side not being completely dark is that it is illuminated by light reflected from the Earth in the same way that the Earth is lighted by moonlight.

The figure below illustrates the problem:



Ps = Power output of Sun		3.9 (EE26) Watts
Dse = Distance from the Sun to Earth		1.5 (EE11) Meters
Dsm = Distance from the Sun to Moon		1.5 (EE11) Meters
Dem = Distance from the Earth to Moon		3.8 (EE8) Meters
Re = Radius of the Earth		6.4 (EE6) Meters
Rm = Radius of the Moon		1.7 (EE6) Meters
Ke = Reflectance of the Earth		.35
Km = Reflectance of the Moon		.70

For the bright side of the Moon, the light originates from the Sun, intersects the quarter of the Moon's surface that is pointed towards both the Sun and the Earth and then travels to the Earth. This path is shown as - - - - - -. The light intensity reaching Earth from the bright side of the Moon is

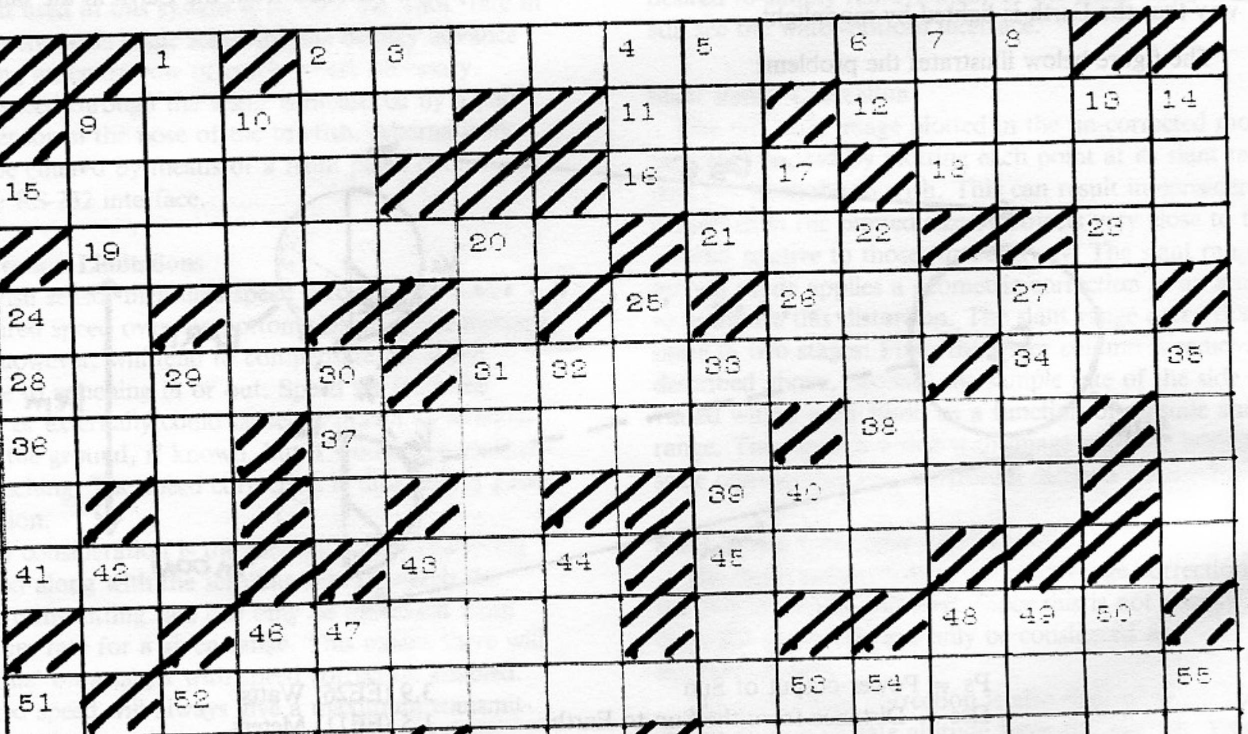
$$I_b = \frac{(P_s/4\pi D_{sm}^2)}{(4\pi D_{me}^2/2)}(0.5\pi R_m^2 K_m) = 9.86 \times 10^{-3} \text{ W/M}^2$$

For the dark side of the Moon, the light originates from the Sun, intersects the quarter of the Earth's surface that is pointed towards both the sun and the Moon and then travels to the Moon. The light is reflected by the dark side of the Moon and returns to Earth. This path is shown as . . . . The light intensity reaching the Earth from the dark side of the Moon is

$$I_d = \frac{(P_s/4\pi D_{se}^2)}{(4\pi D_{me}^2/2)}(0.5\pi R_e^2 K_e)\frac{(0.5\pi R_m^2 K_m)}{(4\pi D_{me}^2/2)} = 2.45 \times 10^{-7} \text{ W/M}^2$$

This Quarter's Puzzle — Across the Sea

This quarter's puzzle is a crossword with a nautical twist.



ACROSS

2. Home of the Merchant Marine Academy
9. Captain's Quarters
11. Third largest ocean (abbr.)
12. ----- Christopher, sailor's patron
15. Construct a ship
16. ---easter; Maritime Provinces' Gale
18. A mast, boom or yard
19. Ohio Class Submarine
21. Navy program and budget document (abbr.)
23. U.S. territory in Caribbean
24. "Victory -- Sea"
26. Gulf bounded by "Line of Death"
28. Diver's malady
31. Alaskan mess
34. Newest sub communication frequency band
36. Sub rescue vessel (abbr.)
37. Rig for towing a ship
38. Netherlands sea
39. Shallow water near shore
41. --- Map; plots ship threats
43. Aussie Navy (abbr.)
45. Measure of ship size
46. Flora and fauna of sea
48. American Canoe Association (abbr.)
51. South African prominence
54. Ship's inport transportation
58. Home of Naval War College
60. Main home of FFGs
61. WWII air threat
62. What becalmed sail does
63. British, New Zealand, Australian and Canadian Navies

DOWN

1. "---- winds and following sea"
2. Pirate Captain
3. "-- the lee"
4. ---bad the Sailor
5. ----deck
6. Island (abbr.)
7. Naval Air Station (abbr.)
8. Top of mast
9. Coast Guard vessel
10. Sailing in fog without a radar
13. Sailor's bellybutton
14. --color; British or French flag
17. Shows North on nautical chart
20. Henry, Magellan and Columbus
22. Aft mast on ketch or yawl
24. To the rear of
25. "An --- wind blows no good"
27. Coral condo
29. Navy lab in White Oak, MD
30. Southeast (abbr.)
32. Destroyer Tender (abbr.)
33. Convoy's protector
35. Admiral's symbol
42. Submarine Tender (abbr.)
43. Caviar
44. Naval Avionics Center's previous name
46. ----sphere; Beebe's vessel
47. Mag tape speed measure
48. Opposite of astern (abbr.)
49. After sail and before oil
50. Reinforces ship's stem
51. Flood and --- tides
52. " --- Nine Tails"; Sailors scourge
53. Rower's tool
54. Release anchor
55. Primary nuclear effect on electronics
57. This and 50 DOWN are necessary to get any where

Dave Hollinberger
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THE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC.

IEEE

UNITED STATES ACTIVITIES

Announces the 18th Annual Competition for

1990-1991

IEEE-USA Congressional Fellowships

A CONGRESSIONAL INTERNSHIP FOR MEMBERS OF IEEE

PROGRAM: Electrical and Electronics Engineers and Allied Scientists are competitively selected to serve a one-year term on the personal staff of individual Senators or Representatives or on the professional staff of Congressional Committees. The program includes an orientation session with other Science-Engineering Fellows sponsored by the American Association for the Advancement of Science (AAAS).

PURPOSE: To make practical contributions to more effective use of scientific and technical knowledge in government, to educate the scientific communities regarding the public policy process, and to broaden the perspective of both the scientific and governmental communities regarding the value of such science-government interaction.

CRITERIA: Fellows shall be selected based on technical competence, on ability to serve in a public environment and on evidence of service to the Institute and the profession. Specifically *excluded* as selection criteria shall be age, sex, creed, race, ethnic background, and partisan political affiliations. However, the Fellow must be a U.S. citizen at the time of selection and must have been in the IEEE at Member grade or higher for at least four years. Additional criteria may be established by the selection committee.

AWARDS: IEEE-USA plans to award at least two Congressional Fellowships for the 1990-1991 term. Additional funding sources may permit expansion of awards.

APPLICATION: Further information and application forms can be obtained by calling W. Thomas Suttle (202) 785-0017 at the IEEE-USA Office in Washington, D.C. or by writing:

Before October 1:
Secretary, Congressional Fellows Program
The Institute of Electrical and Electronics Engineers, Inc.
United States Activities
1111 Nineteenth St., N.W.
Suite 608
Washington, D.C. 20036

After October 1:
Secretary, Congressional Fellows Program
The Institute of Electrical and Electronics Engineers, Inc.
United States Activities
1828 L Street, N.W.
Suite 1202
Washington, D.C. 20036

Applications must be postmarked no later than March 30, 1990 to be eligible for consideration.

IEEE UNITED STATES ACTIVITIES

IEEE

OCEANIC ENGINEERING SOCIETY

OES

CALL FOR PAPERS

SYMPOSIUM ON AUTONOMOUS UNDERWATER VEHICLE TECHNOLOGY

JUNE 4-6, 1990

The IEEE Oceanic Engineering Society is sponsoring a Symposium on Autonomous Underwater Vehicle Technology, to be held in the Washington, D.C. metropolitan area on June 4-6, 1990.

TECHNOLOGIES

The Symposium will focus on the technologies that are related to the AUTONOMOUS OPERATION of UNDERWATER VEHICLES, such as:

- Mission Planning, Control and Management
- Communication and Telemetry
- Sensors
- Navigation
- Simulation
- Reliability
- Energy Systems
- Control Systems

Abstracts should be limited to 300 words and must include the title of the paper and be accompanied by full names of the author(s), with affiliation(s), complete address(es), telephone number(s), and telecopier number(s), if any. Relevance to the general topic of *autonomous underwater vehicles* must be made clear in the abstract.

DEADLINES

The Proceedings will be distributed at the Symposium. Material must be received by the following dates in order to make advance printing possible. Papers that do not meet these deadlines will be dropped from the program.

- 15 October 1989 : 300 word abstract due.
- 15 November 1989 : Corresponding author receives acceptance notice.
- 01 March 1990 : Final manuscript due.

CONFERENCE STEERING COMMITTEE

- General Chairperson : Charles Stuart, DARPA
- Technical Program Chairperson : Glen N. Williams, Texas A&M University

INFORMATION

For further information, call:

- Gordon Raisbeck, (207) 773-6243
- Dan Steiger, (202) 767-3265

THE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC.

IEEE Oceanic Engineering Society

SYMPOSIUM ON AUTONOMOUS UNDERWATER VEHICLE TECHNOLOGY

June 4-6, 1990

Title of Paper: ____________________

Corresponding Author: ____________________ **Telephone:** ____________

Affiliation: ____________________ **Telecopier:** ____________

Mailing Address: ____________________

____

City, State, Zip: ____________________ **Country:** ____________

Authors: ____________________

(List Names, affiliations and addresses of authors in the order in which they are to be printed on the paper.)

Has this work been published before? ____ **yes** ____ **no**

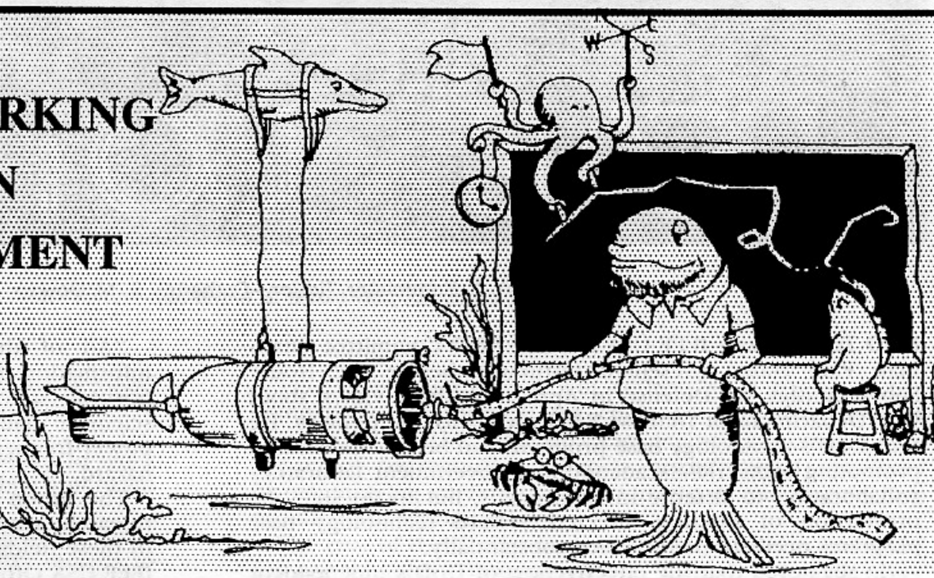
If yes, indicate where and when: ____________________

Abstract

(Use an additional sheet if necessary, but please do not exceed the word limit.)

Mail to: Gordon Raisbeck, 40 Deering Street, Portland, Maine 04101-2212, U.S.A.

THE FOURTH IEEE WORKING CONFERENCE ON CURRENT MEASUREMENT



APRIL 3-5, 1990

to be held in the Washington, D.C. area

Sponsored by the Current Measurement Technology Committee of the IEEE Oceanic Engineering Society

CALL FOR PAPERS !

Papers are invited from interested authors on all aspects of current measurement technology. Abstracts should be submitted by October 1, 1989.

Major topics are:

1. Point source technology (Rotor, EM, acoustic, etc.)

2. Advanced technology & Lagrangian (Radar, satellite, etc.)

3. Acoustic Doppler & related technologies (Correlation, scintillation, etc.)

Authors of papers chosen for presentation and publication in the Conference Proceedings will be notified by January 1, 1990. Select authors will be invited to prepare manuscripts for a special edition of the IEEE Journal of Oceanic Engineering.

Abstracts should be sent to:

Dr. Henry R. Frey
Technical Program Coordinator
NOAA Code N/OMA13
6001 Executive Blvd.
Rockville, MD 20852
(301) 443-8510

OMNET H.FREY.NOS

THE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC

IEEE USAB HOT LINES

Joseph A. Edminister, Editor—Catherine S. McGowan, Associate Editor

DoD Testimony—IEEE-USA Defense R&D Committee Chairman Paul Hazan presented testimony before the House Subcommittee on Defense in April to address views about U.S. Department of Defense R&D programs and policies. He said DoD's technology base programs can be instrumental in promoting industrial, academic and government laboratory collaboration to defense mission needs, but to do so, "the proportion of funding directed toward technology base programs needs to be increased substantially."

He suggested that the effectiveness of DoD's Independent R&D reimbursement program could be improved further by switching to a two-year review and negotiation cycle. He also said that earmarking funds for colleges and universities can be controlled without adversely affecting smaller colleges or the flexibility DoD needs to obtain services cost-effectively.

Copies of Mr. Hazan's testimony are available from the IEEE-USA Office in Washington, D.C.

Salary Survey—The 1989 *IEEE U.S. Membership Salary and Fringe Benefit Survey* is now available. This year's *Survey* explores more than 50 variables that affect engineers' salaries and fringe benefits. Highlighted are retirement planning, pension practices, early retirement issues, and salary progression. *Survey* findings include:

- The 1988 mean, pre-tax income of non-student U.S. IEEE members was $54,700. Survey respondents who were working fulltime in their primary area of technical competence in 1988 earned an average of $56,000.
- Mean salaries in cities with the highest concentration of electrical and electronics engineers include $59,000 (San Francisco); $58,000 (New York City); and $56,100 (Washington, D.C.).

According to IEEE-USA Salary Survey Committee Chairman James H. Beall, "electrical, electronics, and computer engineers may fare well in comparison with other professionals when considering inflation, salary compression, and unemployment. Despite large increases in mean nominal income, electrical engineers are staying even with inflation."

The *Survey* measures income by highest academic degree, experience, age, sex, primary area of technical competence, employment sector, job function, company size, and Metropolitan Statistical Areas. A section on fringe benefits covered employer and employee participation in life, health, and accident insurance, as well as medical plans, pensions, supplementary retirement plans, continuing education, and vacation allowances.

The 1989 *Survey* is available from the IEEE Service Center for $59.95 (member) and $79.95 (nonmember). Shipping and handling charges are additional, and New Jersey residents should add six percent sales tax. To order your copy, call the Service Center at (201) 981-1393. Please specify IEEE Catalog Number UH0183-4.

New Position—The United States Activities Board recently approved an IEEE-USA Position Statement on "Biological Effects of Power-Frequency Electric and Magnetic Fields." In preparing the position, IEEE analyzed six scientific committee reports related to power-frequency electric and magnetic fields in reponse to growing public interest in this issue.

"All of these reports concluded there is insufficient information to define safe and unsafe field levels," the position states. "In general, there is not enough relevent scientific data to establish whether common exposure to power-frequency fields should be considered a health hazard."

The group that prepared the position agreed that more research is needed to define safe limits of human exposure to these fields. Copies of this position are available from the IEEE-USA Office in Washington, D.C.

HDTV—United States Activities Board Chairman Edward C. Bertnolli sent a letter to Federal Aviation Administration (FAA) Acting Administrator Robert E. Whittington and to U.S. Secretary of Commerce Robert A. Mosbacher to express IEEE-USA's concern about recently publicized FAA plans to award a $1 billion contract to a Japanese television manufacturer for advanced radar screens, or high-resolution displays, for U.S. air traffic control systems.

"The U.S. electronics technology base is in a crisis situation," Dr. Bertnolli wrote. "The advent of high-definition television presents both an opportunity and a challenge for this country to regain a competitive edge in consumer electronics, an industry the United States has lost to foreign competitors."

He said the magnitude of the proposed FAA purchase of foreign-owned HDTV technology "could create serious disincentives for U.S. industry." The fact that the foreign-owned manufacturer being considered is subcontracted by an American-owned firm is immaterial, according to Bertnolli, since the technology involved is foreign.

"In order to give U.S. industries the opportunity to develop a competitive technology, the rapid delivery requirements of the FAA should be reconsidered," he said, adding that U.S. technology should be available in the proper timeframe for FAA's upgrading plans.

Supercomputers—USAB Chairman Edward C. Bertnolli, IEEE-USA Committee on Communications and Information Policy (CCIP) Chairman John M. Richardson, CCIP Members John Riganati and Alan McAdams, and IEEE-USA staff member Heidi F. James briefed Rep. Richard A. Gephardt (D-Missouri) recently on issues related to supercomputers, semiconductors, and high-definition television, and on the relation of these issues to the competitive stance of the United States.

Rep. Gephardt, who requested the briefing after reading CCIP's report on "U.S. Supercomputer Vulnerability," found the briefing "very informative" and invited the IEEE-USA group to brief the House Democratic Task Force on Trade Competitiveness in early May. The Task Force has since asked the group to return for the June meeting.

The group, along with IEEE-USA Congressional Fellow Denis King, also met with Rep. Robert A. Roe (D-New Jersey) to discuss these issues. Rep. Roe asked the group to keep him informed of progress made in these areas and urged them to seek opportunities with other Members of Congress. The group has since arranged a briefing with Rep. Don Ritter (R-Pennsylvania).

IEEE-USA telephone hotline recording: (202) 785-2180

IEEE USA HOT LINES

Joseph A. Edminister, Editor—Catherine S. McGowan, Associate Editor

Congressional Fellows—The United States Activities Board recently approved recommendations for two 1989–1990 Congressional Fellowships. Mr. Philip M. Paterno and Dr. Alfred E. Victor will take one-year leaves of absence to work in selected staff assignments on Capitol Hill. They will begin their Fellowships on January 1, 1990.

Mr. Paterno has been a district manager at AT&T since 1978. He is responsible for developing computer models to estimate and verify access expense from local exchange companies and for developing methods, computer tools, training and guidance for Bell System service costs groups.

Dr. Victor is program manager of the Joint Service Airborne Self-Protection Jammer at the Naval Air Systems Command in Washington, D.C. He manages the joint Navy-Air Force service's development, test and production of the Department of Defense's largest electronic warfare jammer for common application on tactical aircraft. He received his bachelor's degree in Naval Science from the U.S. Naval Academy, and his Master's and Ph.D. in Physics from Brown University.

Applications will be accepted until March 30, 1990 for the 1990–1991 IEEE-USA Congressional Fellowships. For more information on the program or for an application kit, contact the IEEE-USA Office in Washington, D.C.

Electronics—Seventy representatives of industry, government, academia and professional societies participated in a workshop in June to discuss the role of a U.S. dynamic random access memory (DRAM) initiative in revitalizing the U.S. electronics base. The attendees focused on the announcement of the formation of U.S. Memories, Inc. (USM). They endorsed the broad outlines of USM's DRAM initiative, endorsed establishment and support of similar ventures, and called on the U.S. government to respond affirmatively.

The workshop, convened by IEEE-USA, was the second held to discuss a national initiative for electronics industries. According to a consensus statement delivered to Capitol Hill after the workshop, the USM initiative is required, "if the United States is to reestablish a strong technology and manufacturing base." USM's and other initiatives can provide significant American-owned, controlled and secure sources of supply of DRAMs; can provide additional markets for the semiconductor manufacturing equipment sector; and can complement the overall efforts and contributions of SEMATECH, the semiconductor manufacturing industry consortium.

The group called on government to support industry-led initiatives for dual-use (civilian and military) technologies by providing an environment and incentives that are economically attractive and reduce risks to U.S. participants.

Careers Conference—"Engineers and Engineering Managers—Career Challenges of the 1990s" is the theme of the sixth biennial IEEE-USA Careers Conference, to be held at the TradeWinds Hotel in St. Petersburg, Florida, from November 1 through November 3. This two-and-a-half-day Conference will be sponsored by IEEE-USA's Career Maintenance and Development Committee.

This year's Conference will address such topics as the competitive environment for engineering in the 1990s; a comparison of U.S. and Japanese engineering careers; the impact of restructuring and new organizational structures on engineering careers; career transitions; and engineering productivity, among others.

The cost of the Conference is $225 for members and $300 for nonmembers. However, if you register before October 2, the cost will be $175 for members and $250 for nonmembers. The registration fee includes admission to all sessions, an opening reception, two lunches, all breaks, and a *Conference Record.* For more information or to register, contact the IEEE-USA Office in Washington, D.C.

Awards—The United States Activities Board recently announced the recipients of 1989 IEEE-USA achievement awards:

- Distinguished Public Service—Erich Bloch, Director of the National Science Foundation, for his efforts to enhance the understanding and status of engineering and technology on a Federal level.
- IEEE-USA Citation of Honor—William W. Middleton, for enhancing the IEEE-USA Awards program; John J. Miller, for originating, developing and documenting leadership in Section organizations, and training initiatives; and Ralph W. Russell, II, for attracting member support for state legislative programs and precollege math and science education programs.
- Regional Professional Leadership Award—Michael R. Andrews (Region 6), for developing precollege math and science education programs for students and teachers in the Phoenix, Arizona, area; Mark H. Arndt (Region 6), for his ongoing efforts in Washington state to increase the public's awareness of nuclear energy; Peter Bergsneider (Region 6), for developing a coalition of city government, local industry, local schools, parents and children to operate a Young Scientists and Engineers program in Fort Huachuca, Arizona; Carl K. Kintzel (Region 4), for his dedication to local and Regional congressional activities in Region 4; and Wallace A. Skelton (Region 2), for planning, publicizing and supporting career development workshops and presentations in Region 2.
- Professional Achievement—Walter Bury, for providing IEEE leadership in the Missouri Science Olympiad and for his efforts to establish an intersociety legislative group in the Kansas City area; Bernard H. Manheimer, for his activities related to environmental quality, energy and man-machine systems; and John E. Spencer, Jr., for promoting engineering awareness at Alabama's local political level.

Nominations are open until March 15 for IEEE-USA Awards for 1990. Other awards presented by IEEE-USA include awards for Distinguished Contributions to Engineering Professionalism and Divisional Professional Leadership, as well as two literary contributions awards. For information, award descriptions and nomination forms, contact the IEEE-USA Office in Washington, D.C.

IEEE USAB HOT LINES

Joseph A. Edminister, Editor—Catherine S. McGowan, Associate Editor

New Positions—The United States Activities Board approved the following IEEE-USA entity position statements at its August meeting in Pittsburgh:
• *National Medical Technology Institute* recommends establishing of a National Medical Technology Institute at the National Institutes of Health to promote the application of engineering and physical sciences to health research.
• *Federal Government Support for Technological Competitiveness* replaces IEEE-USA's 1983 position on a National Technology Foundation. The new position supplements IEEE-USA positions on Industrial Competitiveness and U.S. Engineering Research and Development.
• *Precollege Education in Mathematics, Science and Technology in the United States* calls for improvements in precollege math, science and technology education so that the United States will advance technologically and retain its leadership in scientific research and development.

Copies of the new positions are available from the IEEE-USA Office in Washington, D.C. The United States Activities Board withdrew a June 1983 position statement on a National Technology Foundation and a November 1984 position statement on Breeder Reactors in the United States.

New Brochure—IEEE-USA has released *How to Communicate With Members of Congress,* a brochure designed to help engineers make a difference in resolving issues affecting the profession by communicating their views to their Senators and Representatives. The brochure outlines who to contact; effective ways to voice your concerns; and when to use the different methods, which include meetings, mail, telegrams, and telephone calls. It also provides guidelines to help make your communications more effective.

Copies of this brochure are available from the IEEE-USA Office in Washington, D.C.

Electromagnetics—IEEE-USA Technology Activities Council Chairman William R. Tackaberry appeared recently on ABC television's "Good Morning America" to comment on recent press reports about the possible health effects of high-voltage transmission lines and other electromagnetic fields. "It's going to take time to get answers," Mr. Tackaberry said. "In the meantime, I don't see any real reason for people to overreact."

Mr. Tackaberry's comments supported IEEE-USA's recently approved position statement on "Biological Effects of Power-Frequency Electric and Magnetic Fields," which found insufficient information to define safe and unsafe field levels. "In general, there is not enough relevant scientific data to establish whether common exposure to power-frequency fields should be considered a health hazard," according to the position. It recommends that more research be conducted before safe limits of human exposure to these fields can be defined. Copies of the position are available from the IEEE-USA Office in Washington, D.C.

Defense Acquisition—USAB Chairman Edward C. Bertnolli attended a meeting with U.S. Secretary of Defense Dick Cheney and Assistant Secretary of Defense Donald Atwood in July to discuss the DoD Defense Management report Cheney submitted to President Bush. The report presents a plan to implement the Packard Commission recommendations, which would result in improved performance in the defense aquisition system. It would also provide for more effective management of the Department of Defense and our national defense resources.

The meeting indicated that Secretary Cheney is trying to build a broad constituency base for his plan by promoting an understanding of the plan's goals. Gloria Aukland, staff manager of IEEE-USA Communications, participated in a follow-up press briefing and question-and-answer session with Paul Stevens, Executive Assistant to Secretary Cheney. Stevens was the principal author of the report. This July 31 briefing brought together a small group of representatives of associations with a defense interest, as well as national military organization representatives.

Computer Viruses—John M. Richardson, Chairman of IEEE-USA's Committee on Communications and Information Policy (CCIP), sent a letter to Rep. Wally Herger (R-California) expressing interest in legislation "to reduce losses from harmful code in computing systems." Dr. Richardson's letter responded to Rep. Herger's invitation to IEEE to provide support for H.R. 55, the *Computer Virus Act of 1989*.

"IEEE-USA is not able to endorse H.R. 55 formally at this time," Richardson wrote, "but is happy to support your efforts toward the goals of the bill." He pointed out Committee observations for Rep. Herger's consideration. The so-called "viruses" that have attracted interest lately are only one of several types of computer code that can damage computer systems or databases. Others, he said, are known by such names as "worms" and "Trojan horses."

"We believe H.R. 55 is broad enough to cover harmful code other than that which is known as virus code," Richardson commented. "The bill is also clear in addressing harm to computer users. It may not be clear, however, that the provider of a computer facility should also be protected." He suggested that the bill be broadened to include providers of computer services as well as users.

IEEE-USA Office Move—On or about November 15, 1989, the IEEE United States Activities Office will relocate to 1828 L Street, N.W., Suite 1202, Washington, D.C., 20036-5104. The telephone numbers will remain the same: Office (202) 785-0017; Fax (202) 785-0835; and Information Line (202) 785-2180. Check with the office for the specific move date.

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