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(Continued on back cover)

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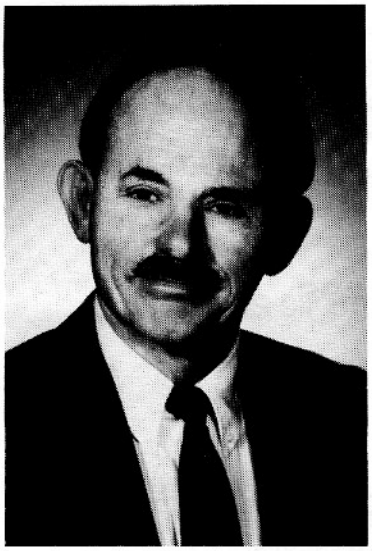

Editor's Comments

My thanks to all of you who are providing inputs to the newsletter. Special thanks to Ed Early for keeping us informed on OES Chapter activities in Seattle. We want to increase our coverage of Chapter and Professional Activities and also build a better business and professional network, so I'm reserving another page for you, the membership, for material. A revision to the Winter '95 schedule of OES Newsletter inputs follows on another page.

It was a pleasure working with the IMS Newsletter editor, Tom Carver, and Jean Vicariot, Directeur du Technopole de Brest-Iroise in putting together the articles on "The French Cable Station Museum" in Orleans, Cape Cod, Massachusetts, followed by "A Short History of French Trans-Atlantic Telegraphs Cables from the French Viewpoint," by Rene Salvador published in the Winter '94 and Spring '95 issues. The following is a letter received from Jean Vicariot which includes additional comments and human interest:

Dear Fred,

I read with a great interest the Paper by René Salvador, and your editor's comment in the last issue of IEEE/OES Newsletter.

I would like to make two additional comments:

1. Deolen, the landing site of the old transatlantic cable, is still in the «marine family» : the manager's house at Deolen was bought some ten years ago to France Cable Radio by Jean and Martha Francheteau.
   Jean, a distinguished marine geophysicist, is now a Professor at Université de Bretagne Occidentale in Brest, after having spent a number of years at IFREMER Brest Centre. Jean is well known on both sides of the Atlantic ; he holds an american PhD which was the beginning of his research work at Scripps on plate tectonics.
   Martha, his wife, is american ; they met in California. Both of them are extremely friendly people ; don't miss a call at Deolen if you go to Brest you will be impressed by the wild beauty of the site and the warm welcome of its inhabitants.

2. The tradition of «cables sous-marins» is still alive in Brest: the «LEON THEVENIN», a modern cable ship commissioned in 1983 is stationed in the harbour. The «LEON THEVENIN» was one of the ships open to the participants to OCEANS 94 as part of the technical visits. (see page 5)

A number of captains, officers, engineers, sailors, still active or retired, who sail or have sailed on the french cableship are living in the Brest area. If you talk to them about René Salvador, they will tell you that he was respected as a «grand patron» (big boss).

Yours friendly,

Jean VICARIOT,
Directeur du Technopôle de Brest-Iroise

Fred Maltz
Newsletter Editor

Success Across the Oceans

Looking Forward to Future International Oceans Conferences

The International series of Oceans conferences were off to an excellent start when OCEANS'94 OSATES was held in Brest on the Brittany coast of France during September 1994. The location made it accessible to a greater number of our membership, in particular Europeans. It signaled a partnership of the OCEANS and OSATES conferences with the theme "Ocean Engineering for today's technology and tomorrow's preservation." The conference took three years to prepare, and has proven to be one of the largest Oceans conferences with a 30% increase in attendance over the previous years. This is a culmination of considerable time and effort devoted to nurture the concept of a series of Oceans Conferences that extend our reach beyond the boundaries of North America.

Encouraged by the success of 1994, as part of my activities as Vice President International Affairs of your Society I had a site visit to Norway in May 1995. My visit include both the capital Oslo and Trondheim, the home of the World-renowned Norwegian Institute of Technology. A number of meetings were held with leading industry figures as well as higher educational institutes, to explore the possibility of their Country hosting the next International Oceans conference to be held in 1998. There is enthusiasm for the ideas discussed and it is expected that a proposal for the conference will be submitted soon. Also, I am pleased to report that as a result, a Norwegian Chapter of OES is in the process of being formed to foster the planning activities for the Conference.

Oslo — the capital of Norway — is situated in the heart of Scandinavia, surrounded by magnificent scenery from the fjord to the forested hills. Oslo is a cosmopolitan city — but it less crowded than most other capitals. Only half a million inhabitants share an area about the size of cities like Los Angeles or Paris. The city enjoys an ideal inland climate. Oslo has become a popular destination for international conventions and an increasing number of meetings show Oslo's competitiveness within this field. There is easy access to Oslo by air, sea, railway or by car. The city offers up-to-date accommodation in all categories, with a total of 49 hotels, with a total of 6,000 rooms. Oslo is the home of cultural giants like Edvard Munch, Gustav Vigeland, Thor Heyerdahl and Henrick Ibsen. Each of them has his own museum of collections of art or discoveries. I look forward to report to you on further progress in this regard.

Our readers will be delighted to know that the application to establish an IEEE Oceanic Engineering Society Chapter in Tokyo has been approved by IEEE. Congratulations are due to Professor Tamaki Ura of the University of Tokyo, and Dr. Joseph Vadus whose efforts lead to this success. I look forward to exploring the possibilities for an International Oceans Conference in Japan, with the Tokyo Chapter.

It is pleasing to report that my home town, the City of Halifax, Nova Scotia, Canada has been selected as the site of Oceans'97. This will mark the tenth anniversary of our successful Oceans'87. I invite all of you to mark you calendars for October 1997 to partake of our maritime hospitality, in the home of the tall ship the Blue Nose, and the host of the 1995 G-7 Summit.

Dr. Ferial El-Hawary
Vice President International

OCEANS 94 OSATES

LEON THEVENIN

Cable Ship

FRANCE TELECOM

Commissioned in 1983

MAIN SPECIFICATIONS

Length over all	107 meters
Breadth over all	17,80 meters
Draft	6,25 meters
Displacement	6800 tons
Dead weight	3200 tons
Power	3800 H.P. (Electrical diesel)
2 propellers	
1 bow thruster	150 H.P.
1 aft thruster	150 H.P.
Maximum speed	15 knots

MAIN EQUIPMENTS

2 main tanks - capacity, 700 cubic meters each,
- able to load 2600 kms optical fiber cable

3 wheel linear cable engine - 2 forward to lay the cable
- 1 aft

2 forward cable drums to heave cable
2 cranes on the fore deck
1 crane on the aft deck
Radio navigation systems - LORAN - SYLEDIS - GPS differentiel
2 radars 10 cm and 3 cm
Shallow water depth echo sounder - deep water depth echo sounder
Data processing system ESPADON
Satellite communication system INMARSAT
The ship can operate the SCARAB* to bury cables or to repair buried cables

*SCARAB: Submarine Craft for Assisting Repair and Burial

This Page Reserved for Your Inputs

OES CHAPTERS

Seattle:

Seattle has continued its joint meetings with the Puget Sound Section of MTS and has had a very successful year. A factor helping to this success was the switch to a low cost restaurant (The Old Spaghetti Factory) from a higher cost restaurant for the pre-meeting dinners. Meetings this year were:

January 19, 1995 — Tim McInnis of Williamson and Associates talked on "The Search for the SS Central America."

March 16, 1995 — We participated in the Seattle Section IEEE Milwaukee Night were several societies come together and present a talk twice in the evening. This was presented at Seattle Pacific University. Our speaker was Dr. James McFarlane President of International Submarine, Ltd. of Vancouver, B.C. on "Past, Present & Future Subsea Work and Recreational Systems." Dr. McFarlane is an IEEE distinguished speaker.

April 20, 1995 — Captain Lawson W. Brigham, U.S. Coast Guard talked on "Recent Voyages of the Polar Sea across the Arctic Ocean and to the Antarctic."

June 15, 1995 — Field trip and Barbecue at the NOAA Northwest Regional Calibration Center (NRCC). Frank Smith, director, was host and gourmet chef.

OTHER CHAPTERS: As an officer or member of another chapter please send me a brief message or telephone me if you have read the above.

Ed Early
Chapter Coordinator

Upcoming Conferences

OCEANS 95 MTS/IEEE
San Diego, California 9-12 October 1995
Contact: Bob Wernli, (619) 553-1948, Fax: (619) 553-1915, wernli@nosc.mil

OCEAN CITIES
Monaco 20-23 November 1995
Contact: Ocean Cities '95 General Secretariat, SEE*48, rue de Procession, F-75724 PARIS Cedex 15, FRANCE

1996 IEEE INTERNATIONAL CONFERENCE ON ROBOTICS AND AUTOMATION
Minneapolis, Minnesota 22-28 April 1996
Contact: Norman Caplan, General Chair,
Tel: (703) 306-1318; Fax: (703) 306-0312;
Email: ncaplan@note.nsf.gov

OFFSHORE TECHNOLOGY CONFERENCE
Houston, Texas 6-9 May 1996
Contact: OTC, (214) 952-9494, Fax: (214) 952-9435

AUV '96
Monterey, California 3-6 June 1996
Contact: Don Brutzman, (408) 656-2149,
Fax: (408) 656-3679, brutzman@nps.navy.mil

PACON '96
Honolulu, HI June 16-20, 1996
Contact: Pacon International
P.O. Box 11568, Honolulu, HI 96828

1995 Schedule of OES Newsletter Inputs

I. DUE DATES TO THE EDITOR

Spring - March 10
Summer - June 9
Fall - September 8
Winter - December 15

II. INPUTS

A. Editorials

Spring Issue - President's Message & Editor's Comments.

Summer Issue - Messages from vice-president for Technical Activities, Jim Collins, and from vice-president for Professional Activities, Norm Miller.

Fall Issue - Message from vice-president for International Activities, Ferial El-Hawary.

Winter Issue -

B. Features

Spring Issue - Paper reprinted from Oceans '94, Fred Maltz

Summer Issue - Paper from AUV'94 Conference.

Fall Issue - Paper from Oceans'94 Conference, Jim Collins.

Winter Issue - Student Paper from Oceans '95 Conference, Norm Miller.

C. Chapters

Summer Issue - Washington/N. Virginia, James Barbera.

Fall Issue - New Orleans, Lloyd Breslau and Paris, France, Jean-Yves Jourdain, Seattle, Ed Early.

Winter Issue - Honolulu, Bobbin Talbalno and San Diego, Brett Castile.

D. Technology

Summer Issue - Current Measurement, Gerald F. Appell Modeling, Simulation & Data Bases, George Dworski.

Fall Issue - Autonomous Unmanned Underwater Vehicles, Claude P. Brancart.

Winter Issue - Remote Sensing, David E. Weissman

E. Membership Development

Summer Issue - Status, Jim Barbera.

F. Professional Activities

Summer Issue - Nominations, Dan Alspach.

Fall Issue - Activities in the Field, Norm Miller.

Winter Issue - Awards & Fellows, Glen Williams.

G. International Activities

Fall Issue - Oceans 'XX Conference planning update.

(Reprinted from Oceans'94 Conference)

MARVOR float present results from the SAMBA experiment

M. Ollitrault*, N. Cortès*, G. Loaëc†, J.P. Rannou§

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§CISI, Brest, France

Abstract — **MARVOR is a multicycle subsurface RAFOS type float developed by IFREMER, in partnership with TEKELEC. The first 20 serial MARVORs were launched in February 1994, in the Brazil Basin for 30 2-month cycles at 800 dbar depth, within the framework of the SAMBA experiment. The SAMBA experiment, a component of WOCE, will use a total of 100 MARVOR floats over a 5-year period with the objective to obtain a description and possibly an understanding of Antarctic Intermediate Water general circulation in the Brazil Basin. For their first 60-day cycle at 800 dbar the 20 MARVOR floats presently at sea have worked well. They show a general westward motion south of 21°S, weaker mean motions but stronger western boundary current along the coast north of Salvador da Bahia.**

Résumé — **MARVOR est un flotteur de subsurface multicycle et de type RAFOS, développé par l'IFREMER en partenariat avec TEKELEC. Les 20 premiers MARVOR de série ont été lâchés en février 1994, dans le bassin du Brésil, pour une mission de 30 cycles de 2 mois à 800 dbar d'immersion, dans le cadre de l'expérience SAMBA. L'expérience SAMBA, qui est une composante de WOCE, utilisera au total 100 flotteurs MARVOR sur une période de 5 ans, avec pour objectif de décrire et si possible comprendre la circulation générale de l'Eau Antarctique Intermédiaire dans le bassin du Brésil. Au cours de leur premier cycle de 60 jours à 800 dbar, les 20 flotteurs MARVOR actuellement en mer ont fonctionné correctement. Ils montrent un mouvement général vers l'ouest au sud de 21°S, des mouvements moyens plus faibles mais une turbulence plus forte au nord de 21°S, et un fort courant de bord ouest le long de la côte au nord de Salvador da Bahia.**

I. INTRODUCTION

In 1955, J.C. Swallow introduced a subsurface float, naturally stabilized at a given pressure owing to its compressibility less than that of sea water, and acoustically positioned while freely drifting [1]. A few Swallow floats soon revealed much unexpected motions in the ocean interior, that definitely established its restless state at any depth [2]. Whereas tracking of these early floats was limited to a few weeks because of the need of a ship, it soon became possible with a new version of the instrument, named SOFAR [3], to extend the acoustic tracking range and duration of experiments by using low frequency (260 Hz) signals propagating through the acoustic wave guide known as the SOFAR channel, and received at Autonomous Listening Stations (ALSs) of known positions [4]. If not for the floats prices and weights, together with the necessity to recover regularly the moored ALSs, this SOFAR system could have been used for the World Ocean Circulation Experiment (WOCE), which will conduct a worldwide study of the global ocean circulation during the 1990s [5].

Meanwhile in 1985, T. Rossby proposed the reverse concept, that is floats are listening and recording the Times Of Arrivals (TOAs) of signals sent by sources that are fixed. This new instrument called RAFOS (i.e. SOFAR spelled backward), much cheaper and lighter than the previous SOFAR float, surfaces at the end of its mission, by dropping a weight, and then transmits via the ARGOS satellite system all the TOAs recorded at depth [6].

At the end of the 1980s, a multicycle float named ALACE (for Autonomous LAgrangian Circulation Explorer) was designed by D. Webb. This float has no acoustic tracking but can surface regularly to be positioned by ARGOS system so that deep displacements between successive surfacings can be approximated. However knowledge of movements during a cycle is lost [7].

It seemed thus natural to match together this multicycle capability with the acoustic tracking of the RAFOS system. That has been done with the MARVOR float [8].

Developed by IFREMER through industrial partnership with TEKELEC between 1988 and 1993, MARVOR which means sea horse in the old celtic language of Brittany, has been thoroughly tested at sea before embarking for the 5-year long mission of the SAMBA experiment.

SAMBA (SubAntarctic Motions in the Brazil BAsin), a component of the WOCE float program, aims at describing the absolute general circulation of Antarctic Intermediate Water (AAIW) as it spreads northward, near 800 m depth, in the Brazil Basin.

In February 1994, 20 MARVOR floats were launched off the Brazil coasts during the SAMBA1 cruise for 30 2-month cycles at 800±30 dbar depth. Results from their first cycle are presented in this paper.

11. THE SAMBA EXPERIMENT

The rather recent recognition that oceanic currents transport as much heat as the atmosphere from the equatorial regions towards higher latitudes, thus contributing largely to the climatic balance of the earth fluid envelope, has prompted the planning and eventually the realisation of WOCE.

WOCE objectives are to obtain the most comprehensive description and understanding of the 3D general circulation of the World Ocean over a reasonably short period (of the order of 5 years) and with a sufficient spatial resolution. Results will be used later to design, improve and initialize climate-oriented coupled ocean-atmosphere models. Naturally, all the measurements done during WOCE (hydrographic and geochemical sections, eulerian and lagrangian current measurements, tide gauge and satellite altimetric sea surface heights) will sample various time and space scales and will be valuable in the study of all ocean processes [5].

An order of 1000 subsurface floats will be deployed during WOCE at various depths to estimate the absolute general circulation (RAFOS type floats will give the meso scales, ALACEs only the large scales). The absolute mean circulation at those depths will be used in turn as velocity reference levels for inversion of hydrographic data, enabling the absolute 3D deep circulation to be resolved [9].

For the SAMBA experiment, a total of 100 MARVOR floats will be launched before the beginning of 1996, at 800±30 dbar depth in the Brazil Basin for a 5-year mission. Acoustic tracking is made possible with 12 sound sources already moored at various locations covering the whole basin. These sources emit either daily (those from IFM Kiel, Germany) or every 2 days (those from WHOI, USA).

It is hoped that with 5 years of float data in each one of the 100 2° lat by 5° long boxes covering the entire Brazil Basin, the absolute mean general circulation of AAIW will be resolved at least for spatial scales greater than a few hundred of km with a few mm s^{-1} accuracy.

The first 20 MARVOR floats were launched from R/V Le Suroît between 18 and 24 of February 1994 at 5 main sites. At each of the first 4 sites, situated in the interior of the basin, 5 floats were launched in clusters to study mesoscale dispersion. Only 4 MARVORs were launched however at the fourth site, the twentieth float being launched at the fifth site near the Brazilian coast, in a presumed western boundary current (see Fig. 1).

Besides the 100 MARVOR of the SAMBA experiment, several tens of classical glass tube RAFOS floats have been and will be launched by IFM Kiel mainly to the south of the basin, still in the AAIW, to monitor motions of this water near the Rio Grande Rise region. WHOI has also begun putting an order of 100 classical RAFOS floats in the Brazil Basin but at 2500 m depth within the North Atlantic Deep Water (NADW), which is flowing southward, in the mean. A few US RAFOS floats have even been ballasted to sink to 4000 m depth to track Antarctic Bottom Water (AABW) inside the basin.

These float experiments are part of the Deep Basin Experiment (DBE) which comprises also hydrographic sections and currentmeter arrays and whose aim is to describe and understand the dynamical mechanisms at work in an entire ocean basin. Such an understanding should bc useful to interpret the probably scarcer time and space resolution of WOCE measurements elsewhere, and be a first choice data base to test model capacity to reproduce the real ocean.

III. THE MARVOR FLOAT

MARVOR is a multicycle subsurface RAFOS type float of 1.8 m length and 39 kg weight. By transferring oil from an external ballast into an internal reservoir MARVOR can dive to a prescribed depth comprised between 500 and 2500 dbar, where it stabilizes and is then entrained by surrounding water motions [8] [10].

After a given number of recording phases at depth, MARVOR will transfer oil back into its external inflatable ballast, thus creating buoyancy, enabling the float to surface. Once at the surface, MARVOR sends the data recorded at depth via the ARGOS satellite system. After a few days at surface, it will dive again for a new cycle, and so on. When drifting at its prescribed pressure (an excursion of ±30 dbar is allowed generally), MARVOR records the TOAs of sound signals received from the moored sources and "in-situ" temperature and pressure averaged over an integral number of hourly values.

Generally, sources emit at slightly different times (at 0 h 30, 1 h 00 or 1 h 30 UT for the present Brazil Basin sources). Consequently, during recording phases, whose period is matched to that of source emissions, acoustic windows are opened only for a few tens of minutes. For example, for SAMBA1 floats, during each of the 60 daily recording phases, 3 acoustic windows 27-min long are opened at 0 h 29, 0 h 59 and 1 h 29 UT and within each window the 3 TOAs with the strongest correlation heights are finally preserved.

Accuracy of tracking relies primarily on a good time base in sources and floats. Both use the same clock, temperature compensated (manufactured by SEASCAN, Falmouth, USA) which should exhibit a drift of less than 3 s per year. Moreover, a few of the 32 bytes long messages sent to ARGOS by MARVOR when at surface, comprise the float internal time which can be compared with UTC (Universal Time Coordinated) available to a ±15 ms accuracy, on request to CLS/ARGOS.

MARVOR hydraulic system (designed and manufactured by HYDRO R. LEDUC, Nancy, France) comprises a motor driven micropump which transfers oil to the external ballast and 2 valves used to let oil flow from the ballast to the reservoir, under the effect of hydrostatic pressure. This system adjusts, if necessary, the volume of the external ballast as a function of the external pressure, so that the float stays within its nominal pressure interval. Because of its depth control MARVOR does not need any ballasting before operating at sea.

5 MARVOR prototype floats tested at sea, west of Portugal, between May 1992 and August 1993 during the SAMBA0 experiment, allowed the detection and rectification of several malfunctions [8] [10] [11]. Laboratory checks (vibrations and high pressure tank tests, swimming pool missions and ARGOS

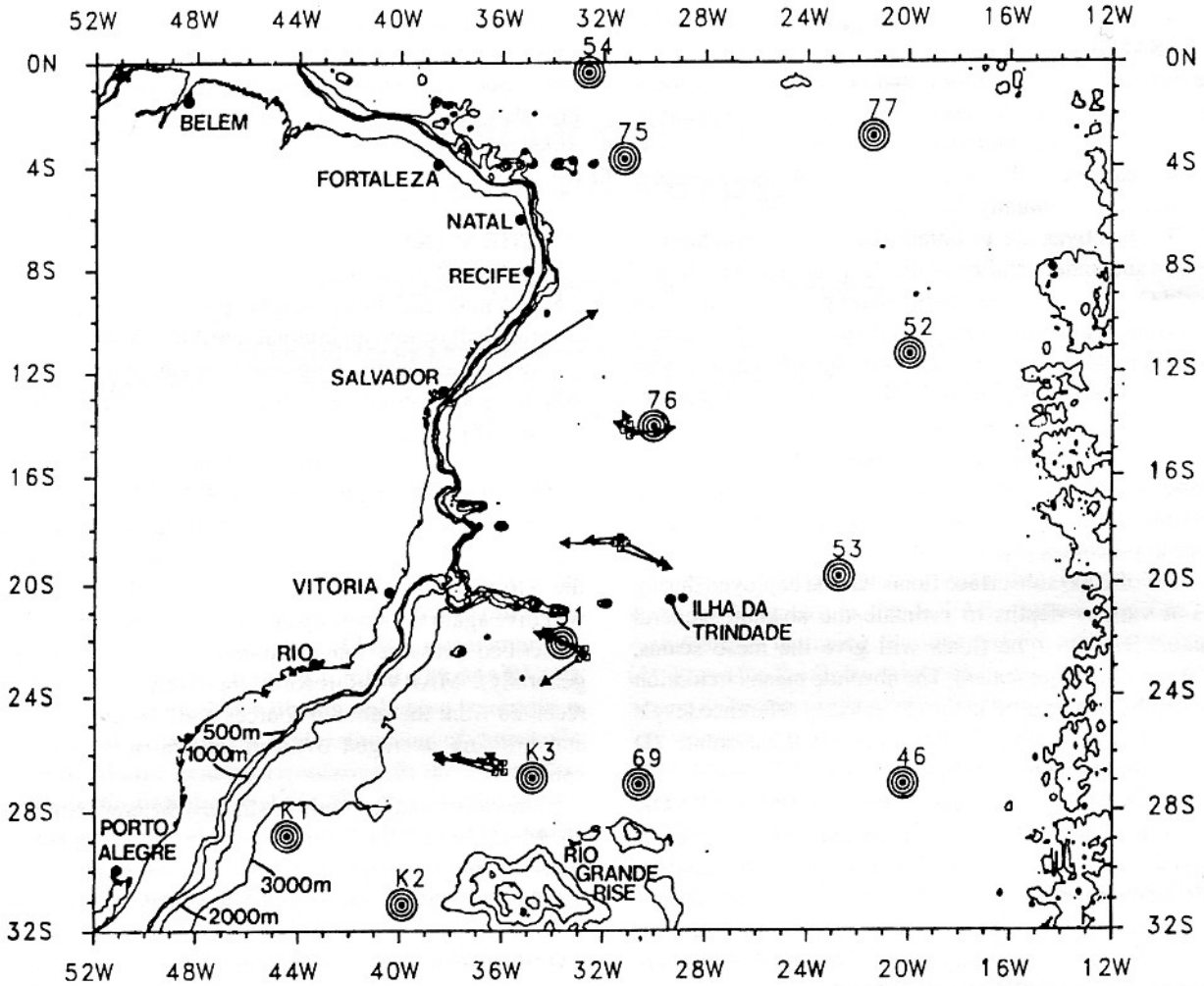

Figure 1. 2-month overall displacements (between launch and first ARGOS surface positions) for the 20 MARVOR floats of the SAMBA1 experiment. Sound sources K1, K2 and K3 (moored by IFM Kiel) emit daily. Sound sources 46, 51, 52, 53, 54, 69, 75, 76 and 77 (moored by WHOI) emit every 2 days.

emissions) were made for the 20 SAMBA1 MARVOR floats prior to their use.

IV. RESULTS FROM THE FIRST CYCLE

Near the end of April 1994, the 20 MARVOR floats have surfaced on time after 60 days at depth and have transmitted their data via system ARGOS for ~45 h. An average number of 18±1.2 (1 σ) satellite passes over the 45 h of emission allowed the recovery of an average of 256±16 (1 σ) messages. That is a mean redundancy of 4 for each of the original 60 messages sent by one float. In fact, between 58 and 60 of the original messages were recovered for each float, that is a data return of 97 to 100 %.

The 20 floats reached their target depth quite well since the first pressures average to 804±9 dbar (1 σ). Pressure and temperature values recorded by floats are themselves averaged over 24 consecutive hourly values.

Pressure and temperature sensors, calibrated for each float, are given by SEASCAN for a ±10 dbar and ±0.03 °C accuracy. Four SEASCAN boards chosen at random among the first 20 and checked in IFREMER metrology lab showed differences with references less than 0.05 °C and 6 dbar, at various temperatures and pressures covering the ranges 2-20 °C and 0 - 2400 dbar respectively.

Another check on T and P accuracies can be made by comparison with CTD casts done at the center location of each of the 4 clusters. Points never deviate by more than 0.10 °C and 10 dbar of the CTD T-P curves, which simply reflects the non synopticity (5 days at most) and differing positions (30 km at most) of the float and CTD measurements (see Fig.2).

All the floats, except n°18 (which was launched above the continental slope near Salvador da Bahia) show a gradual sinking of the order of +15 dbar over 60 days (see Fig.3) which is probably due to a slight creeping of the aluminum pressure case and leakage of the valves (of the order of a few $mm^3 h^{-1}$). Only one float (n°5) needed to come back inside the 800±30 dbar pressure interval, after overshooting 830 dbar during 10 days consecutively (see Fig.4).

The 9 WHOI sound sources (at 2000 m depth) and 3 IFM ones (at 1000 m depth) have permitted an adequate tracking

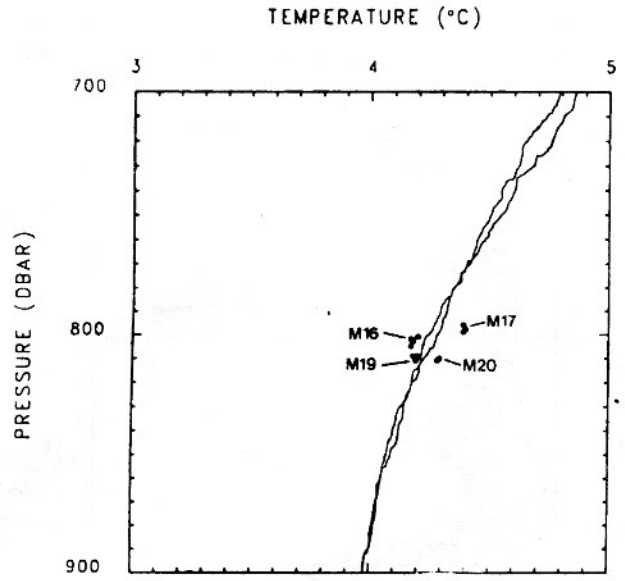

Figure 2. Up and Down T-P Curves from SAMBA1 CTD station nº4 (at 14°14.5'S, 31°00.0'W on February 22 1994 around 10 h 30 UT), and 24 h averaged T and P values from MARVORs nº16, 17, 19 and 20 (obtained after float stabilization at depth and within 5 days after CTD cast).

for 19 of the float trajectories, averaging to 25 position estimates per float for a possible maximum of 30 (recall that US sound sources emit only every 2 days). Of the 3 best correlated signals received in each of the 3 listening windows of each daily listening, almost always 2 were SOFAR signals. Thus, on average, 6 sound sources were heard at a time by the MARVOR floats. A well recognizable signal has been received from a sound source at a 2250 km distance. However acoustic hearing of float n°15 has not been so good since only 18 positions over the 30 possible ones have been obtained. We have no good explanation for that yet.

Tracking is done by a least square minimization over the times of propagation between the float and the sound sources. To obtain a good position accuracy, one needs to know precisely the times of emission and of reception of the acoustic signals but also the mean sound speeds to convert times to distances. One uses a ray tracing program and the Levitus climatological atlas [12] to estimate the mean sound speeds between float estimated position and source known positions. Sound speeds for the source array deployed in the Brazil Basin vary between 1480 and 1490 m s^{-1} . Assumed accuracy is better than 5 m s^{-1}, implying error of ±2 s at a 1000 km distance, which is notable.

Float clock advances were linearly interpolated between values at launch and values at the end of the cycle (the later obtain with UTC). Clock drifts over 2 months are comprised between 0.1 and 0.7 s, thus necessitating only a slight correction to the TOAs. For the next cycles the corrections may become more important, but MARVOR ability to transmit its time to be compared with ARCOS satellite UTC will help maintain a precise monitoring of its clock, probably within 0.1 s.

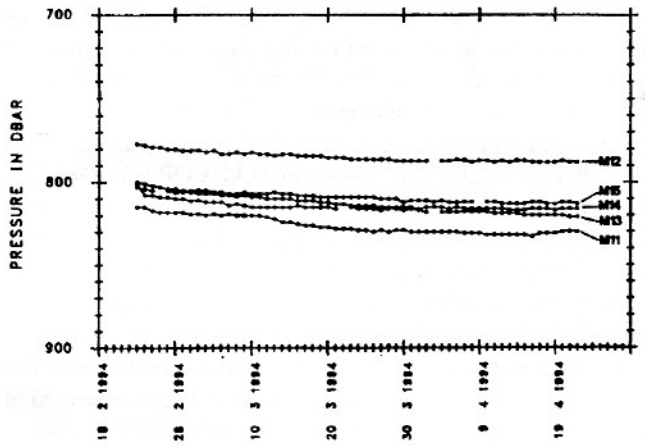

Figure 3. Pressure time series for MARVOR floats nº11 to 15. Corresponding trajectories are given on figure 5.

A check on acoustic position accuracy can be made with the last position at depth (corresponding in our case to the 60th recording phase), since MARVOR takes an order of 2 hours to surface, where it is then located by system ARGOS within a few hours and with generally a 500 m accuracy. Thus, extrapolating back if necessary (surface currents may be estimated with the 15 to 16 ARGOS positions obtained over 45 h), last position at depth must be within a few km of the first ARGOS positions.

Similarly, taking the first ARGOS position (back extrapolated) as the true last deep float position can give us information about the behaviour of the sound source clocks, if we can trust the mean sound speeds. This has been done with our 20 floats and the 11 sound sources heard. Residuals are of a few seconds but systematically biaised indicating either that all the sources are late or all the speeds of sound used too large. Both effects may probably combine, although a bias with on board signal processing cannot be precluded. We will try to solve this problem using the best float position estimates at depth

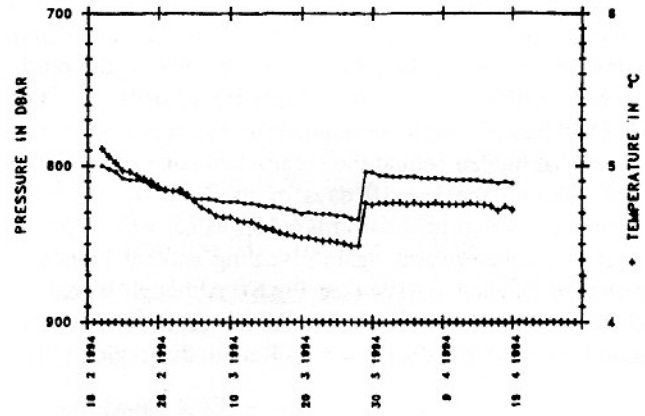

Figure 4. MARVOR nº5 pump was activated furing 3 s at 1 h 56 UT on March 28 1994. 3 cm^3 of oil were transferred to inflate the external ballast, bringing back the float near 800 dbar. Pump action took place after 10 consecutive overshooting of 830 dbar, the maximum admissible pressure.

(they can be qualified with least squares) to "triangulate" back the sources, but this time estimating their clock advances (if floats are not far, e.g. a few hundred of km, sound speed uncertainty is not very relevant).

Launching positions generally GPS estimated could also give us clues, in principle. However MARVOR takes an order of 10 h to reach its prescribed pressure and does not begin listening before being stabilized. Thus, for our 20 MARVORs, there was approximately a one day interval between time of launching and time of the first deep position estimate. This is too large to be of much use.

Briefly, absolute position accuracy is assumed to be better than 5 km for the 20 MARVOR float trajectories presented in this paper.

Global float displacements after 2 months in the core of AAIW near 800 dbar depth (see Fig.1) show an overall westward motion (mean velocity of a few cm s^{-1}) for the 10 floats launched to the south of the Vitoria-Trindade seamount chain (situated along } 20°S) in agreement with geostrophic circulation scheme estimated from historical hydrography [13]. A little more south, above the Rio Grande Rise near 30 °S, a similar mean westward motion has been obtained with 10 RAFOS float trajectories of 3 to 6 month duration (W. Zenk, personal communication). Wether the 4 floats n°7 to 10 will manage to go equatorwards by crossing the Vitoria-Trindade chain or turn south mimicking float n°6 is an open question to be answered during the next cycles.

The 9 floats launched in the 2 clusters north of the Vitoria-Trindade chain, show much weaker overall motion after 2 months, but a dispersion of the floats around their barycenter reflecting stronger eddy variability than for the 10 southernmost floats (sec Fig.5).

Float n°18 was launched on February 24 1994 over the continental slope, at a ~ 40 km distance off the coast near Salvador. This float has been advected northward by AAIW, flowing along the isobaths of the steep continental slope for almost one month.

Float n°18 bird's-flight excursion in 611 km over 27.7 days, that is a mean current speed of 26 cm s^{-1} (0.5 knot).

Thereafter its trajectory left the coast, meeting with warmer water coming from the North (the temperature increases from its lowest recorded value, 3.97 °C at 805 dbar at the northernmost position on day 83 to its highest recorded value, 4.45 °C at 808 dbar, 22 days later), unfelt for the previous 28 days by the float hidden behind the escarpment situated at 8°30'S 34°W. During the last 10 days of its 2-month trajectory, temperature swings back towards colder values while the float is heading equatorwards again revealing another branch of northward flowing AAIW (see Fig.6). Although it may be coincidental and has to be confirmed, it is precisely the circulation scheme at 800 dbar given by Reid in that region [13].

V. CONCLUSION

Behaviour of the first 20 serial MARVOR floats during their first 60-day cycle is very satisfying (but one float experienced slight difficulties for hearing). 98 % of the original messages were recovered via ARGOS system, and more than

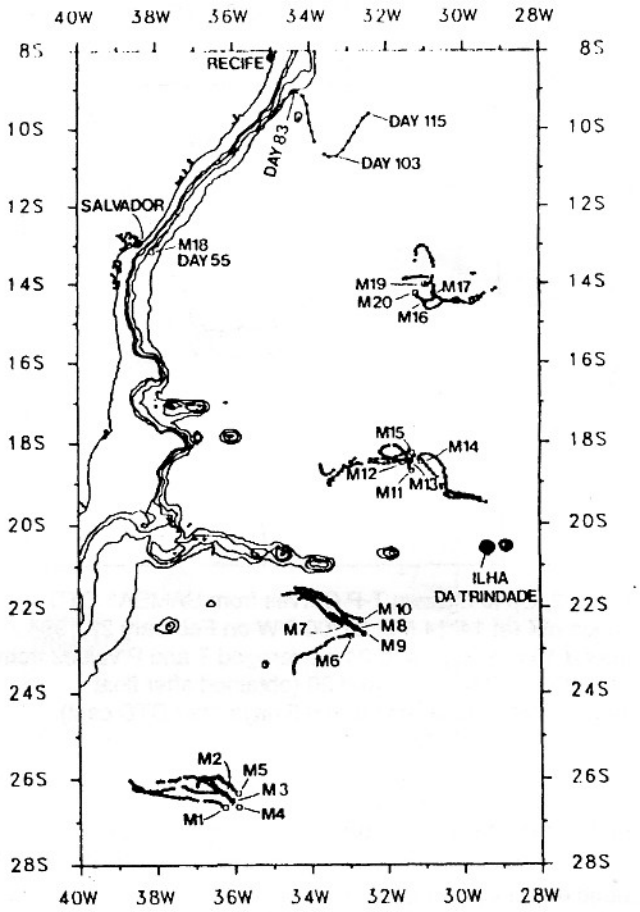

Figure 5. 2-month long trajectories at 800±30 dbar of the 20 MARVOR floats launched between February 18 and 24 1994. Open square, cross and full dots give launch position, first and subsequent deep positions respectively. No filtering has been done. Positions joined are 48 h apart.

80 % of the positions at depth have been estimated (one should do even better with a more careful tracking). Target pressure of 800±30 dbar was very neatly obtained for the 20 MARVORs and T and P accuracies of 0.05 °C and 10 dbar checked against CTD values. Clock drift (0.32 s on average after 2 months) is within specifications.

The 20 2-month 800 dbar depth trajectories obtained so far, seem to indicate three different dynamical regimes for AAIW: A westward mean motion weakly turbulent, south of Vitoria-Trindade chain; much less defined general motions but more turbulent north of Vitoria-Trindade chain; and a strong equatorward western boundary current between Salvador and Recife. Next cycles will shed more light on the reality.

In October and November of this year, 30 more MARVOR floats will be launched from R/V Polarstern. They will be joined in spring 1995 by 20 other MARVORs launched from R/V Oceanus.

Meanwhile, we shall have 4 new sound sources moored, to insonify the equatorial band between Africa and America. They will allow us to follow floats if they get trapped at the equator, or pass into the northern hemisphere. However, if some of our MARVORs happen to wander in regions where

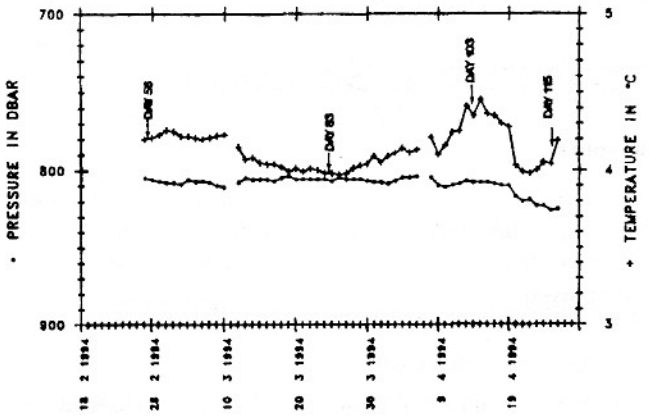

Figure 6. Temperature and pressure time series for MARVOR nº18, launched at 13°10.7'S 38°04.8'W on February 24 1994 (or day number 55) 13 h 15 UT. Corresponding trajectory is given on figure 5.

acoustic tracking is lost, the large scale motions will still be obtainable, owing to their periodic surfacings.

By the end of this century, we should have a picture of the general circulation of AAIW, at least in the Brazil Basin, as determined from the 5-year mission of the 100 MARVOR floats, dancing Samba at 800 dbar depth.

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Reprinted from FRONTLINE REPORT, May-June 1995

Skills Banks: A Local Job Network Solution

by Gary Johnson, EAC Resource Member

How do the members in your section feel about the employment situation locally? Do they want help finding a job? Are they actively networking with peers?

If you don't know the answers to these questions then you aren't spending enough time talking with members. Maybe it's time to start a local Skills Bank. Skills Banks aren't just for the unemployed, they should be actively guiding member careers by providing a picture of the local and national job market, skill sets in demand, and salary ranges. They should be a place to network with fellow engineers and stay prepared for the next job change.

Three or four years ago Skills Banks opened up in several of the larger Section hardest hit by the defense downsizing. They operated as some combination of resume database, job listing, networking and support group. Each was a little different, tailored to the Section needs and resources. Some have dedicated computer systems and rented office space, and others have a drawer in a filing cabinet at someone's house. Some have networking groups meeting regularly, some have taken advantage of local Consultants' Networks activities, and others are one-man shops.

Currently there are operating Skills Banks in Long Island, Boston, Cleveland, Fort Worth, San Diego, and two in the Los Angeles area. The trend, however, is to phase out the local Skills Banks in favor of the National Job Listing Service (JLS) and local Section BBS. IEEE-USA has hit the mark with the Internet listings and current Banks are telling members to use it.

While the JLS can replace much of the job lisitng function provided by the local Skills Bank, it cannot replace the job networking and support function. It cannot replace the personal contact and local network you build with area industry. Rather than completely phasing out the Skills Banks, we need to adapt to the changing employemnt situation. Companies are not downsizing as dramatically asin the past few years. Hiring is up almost everywhere in the USA but the job skills are much different than in the tpast. The successful engineer today and in the future must constantly update their skills. The days of lifetime employment are gone forever.

With your guidance more Skills Banks could be started by a few local volunteers. IEEE-USA has plenty of material available and will assist you in starting and continuing successful Skills Bank activities.

To Start a Skills Bank in your Section:

1. Discuss the need to form a Skills Bank at your local section EXCOM meeting. Find volunteers to work together to continue the process. Contact other Skills Banks for information and ideas.

2. Discuss the need to form a Skills Bank at section meetings and recruit more volunteers.

3. Schedule an initial meeting of the Skills Bank. Announce the meeting in the Section Newsletter.

4. Get the message out to an many members as possible. This is the first step in building a peer network. Remind members that this group is for all members, not just the unemployed.

5. At the first meeting:

- Determine the needs and interests of the membership
- Bring a print out of the jobs from the IEEE-USA Internet listing. Bring copies of the literature that describes how the auto-response and ftp listings can be retrieved by the members themselves.
- Agree to meet on a regular basis. Even if it is only before or after regular section meetings.
- Get names, addresses, and phone numbers of attendees and distribute to each attendee.
- Get volunteers to form an ad hoc commitee to determine the organizational structure.

6. Advertise the following meetings in the Section Newsletter.

7. Consider the following activities for your new Skills Bank. These activities both help find employment and improve networking skills.

- Find speakers who are hiring managers or contract recruiters to talk about the skills they look for.
- Find speakers who can help with resume writing and interviewing skills.
- Set up a means for distributing the Internet job listings weekly. IEEE-USA updates the listing every Friday.
- Use members who are currently employed to find positions that are open in their companies. Inside information is always beneficial for the applicant. Remember that most jobs are not advertised but are filled ;by recommendation from within the company.
- Work on computer skills. The majority of unemployed members don't own or use computers or modems. Computer skills are paramount in today's engineering workplace.
- Skills Banks become support groups of sorts. It keeps unemployed members in contact with each other. Encourage members to apply for jobs they are interested in even if they don't qualify 100%. Remember job descriptions are often wish lists.

Students may be interested in joining your Skills Bank. Try to set up a relationship with local university placement offices. This may be a great way to increase IEEE membership as well.

Once an organization has been formed, think about getting an answering and fax machine. Then you can advertise your service to the engineering community. You provide a free service to companies looking to fill positions.

Continued on page 13

******* CALL FOR VIDEOS *******

IEEE Oceanic Engineering Society

Symposium on Autonomous Underwater Vehicle Technology

AUV 96

June 3-6, 1996 * Hyatt Regency Hotel * Monterey, California, USA

The IEEE Oceanic Engineering Society is sponsoring the next Symposium on Autonomous Underwater Vehicle Technology (AUV 96) on June 3-6, 1996. The Symposium will be held at the Hyatt Regency Hotel in Monterey California USA.

The Symposium will focus on topics that are related to the

AUTONOMOUS OPERATION OF UNDERWATER VEHICLES

These include but are not limited to:

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- Oceanographic Sampling Networks
- Mission Scenarios

Current and archival footage of events significant to the development of autonomous underwater vehicle technology and applications are welcome. Video segments demonstrating results described in the conference proceedings are particularly appropriate.

Video clips from one to five minutes length are suggested. Early electronic submission of an abstract describing the video is most strongly encouraged and will directly impact inclusion of the clip if space becomes an issue. Written abstracts describing the video should accompany each clip. Abstracts should not exceed 100 words, and should also include title, author names, organizational affiliation, address and phone/ fax/e-mail as appropriate. If email is not possible, inclusion of an additional abstract copy in electronic form (ASCII or WordPerfect diskette) with the film clip is appreciated.

Clarity and technical content of the video submissions are essential. Narration and audio are critical components. Entries must be edited to provide a high quality, quickly-paced presentation of general interest to symposium attendees.We can accommodate standard play (SP) VHS, Super VHS and 8mm camcorder tape. Extended play (EP/LP) format VHS is unacceptable due to poor video quality. Please label your videotape mailer "Magnetic Media Enclosed."

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Call for Papers

The primary theme of the 1996 Conference is Technical Innovations in Robotics and Automation for Increased Utility and Prosperity. As we are beginning to enter the 21st century, advanced technology will be the key factor influencing competitiveness in areas such as manufacturing, medical instruments and systems, health care, agriculture, and space and undersea explorations. Robotics and automation technology will continue to play an increasing role in these areas if appropriate research, development, and education activities are pursued. The 1996 Conference will bring together researchers, engineers and practitioners to present the latest accomplishments and future directions. Presentations will address and explore the innovative advances in technology that will impact on the increased use of robotics and automation in the 21st century. Special emphasis will be placed on innovative instrumentations, practical experiences and case studies. Technical papers presented on Wednesday, Thursday, and Friday, April 24-26, will appear in the bound proceedings.

Topics include but are not limited to:

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1. The name, fax number and email address of the corresponding author.
2. The abstract of the paper.
3. A brief paragraph summarizing the contributions of the paper and its potential applications.

Authors will be notified about the disposition of their papers by January 5, 1996. Final papers, reflecting any minor changes recommended by the reviewers, will be due by January 31, 1996.

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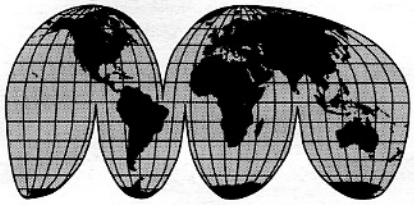

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