UNIVERSITY - NATIONAL OCEANOGRAPHIC LABORATORY SYSTEM

RESEARCH VESSEL OPERATORS COUNCIL

Summary Report
of the
1986 Annual Meeting

Sessions held at
Veracruz, Mexico
8-10 October 1986

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Summary Report of the 1986 Annual RVOC Meeting
Veracruz, Mexico
8-10 October, 1986

WELCOMING REMARKS

Admiral Miguel Angel Gomez Ortega, Representative of the Secretary of the Navy welcomed the RVOC to Mexico and specifically to the Naval facilities at Veracruz, Mexico.

The Meeting was called to order by Chairperson E.R. "Dolly" Dieter, University of Alaska. The meeting followed the agenda (Appendix I). Registered attendees are listed in Appendix II.

OLD BUSINESS

A motion was made, seconded and passed to accept the minutes of the 1985 meeting. The following items of old business were discussed.

Fire Fighting Update. Bill Barbee will survey the RVOC to determine all those interested in receiving copies of these tapes. Distribution will follow.

Winch Manual Update. Al Driscoll has been funded to develop a new edition to the Winch Manual. Writers of the papers in the original manual will be given an opportunity to update their section. In addition, new chapters will be added on subjects such as KEVLAR.

RVOC Newsletter. Sam Gerard volunteered to be the East coast correspondent for the RVOC newsletter. More input was solicited for the newsletter.

Radio Licenses for NSF owned vessels. No further problems were noted with radio licenses for NSF owned vessels.

Foreign Clearance Manual. The new Foreign Clearance Manual by Lee Stevens has been distributed to each institution. It should be made available to scientists that are planning research in foreign waters.

Navy Clearance. The Navy continues to request that they be informed when instruments are placed over the side or moored on the bottom. The notice should be sent to Mr. Steven Hall, Chief, Notice to Mariners Branch, MCM, 6500 Brooks Lane, Washington, DC, 20315. A sample form letter is appended as Appendix III.

NEW BUSINESS

Marine Safety Reporting System. The RVOC members were surveyed as to the extent of their use of the Marine Safety Reporting System. Copies of the form were made available and attached as Appendix IV.

Decupad Thermal Recovery Capsule (TRC). The use of a Decupad Thermal Recovery Capsule was discussed and literature made available to the members. It was recommended that ships working in cold water areas purchase a TRC for treatment of a hypothermia victim. See Appendix V.

Ocean Science News Article of Offshore Safety. A discussion was held on the article in the Ocean Science News concerning Alan Berman's comment about the bad safety record of academic research ships. It was concluded that no action was needed by the RVOC community.

Cruise Departures from Troubled Countries. The RVOC was alerted to problems that different scientists have had with respect to transferring scientific equipment including reagents and other chemicals through foreign customs. It was strongly recommended that whenever possible scientific equipment and reagents should be loaded in U.S. ports and not air shipped or hand carried to the ship.

Video Tech. Video tapes are available through Video Tech that walk new seaman through the ship for orientation. More information on the subject can be received by writing Video Tech Ltd., PO Box 3175, Halifax, Nova Scotia B3J. Sam Gerard has a proposal in for a video camera to be used to produce orientation tapes aboard Conrad as well as tapes of fire and boat drills and scientific operations. Next year Sam should be able to report on his progress.

Accident Reporting System. The need for an accident reporting system was brought up by Jack Bash. This system should alert operators about accidents and near accidents that occur on RVOC vessels. Further discussion suggested that equipment failures should also be included in such a reporting system. The Medical Advisory System (MAS) presently has a contract with NSF to analyze the illnesses reported through their system. It was suggested that this could be expanded to include a reporting system. The members felt that the envisioned accident reporting system would need to be broadened in scope and include incidents not reported to MAS. It was concluded that each RVOC member is charged with reporting accidents, near accidents or equipment failures that they believe would be useful to the community at large or target a smaller segment of the community if that seemed appropriate. The vehicle for dissemination of the information would be telemail or the RVOC newsletter which ever appeared appropriate and timely.

Bill Barbee suggested that he could disseminate the information with a UNOLS telemail address to help sanitize the material if the reporting would be embarrassing to a particular institution.

AGENCY REPORTS

UNOLS Chairman George Keller. The new chairman of UNOLS discussed the work of the Ship Replacement Committee. The original committee has completed a report on ship replacement but this is only the beginning of the process. A new Ship Replacement Committee is being appointed and will address how the fleet should be constituted. The chairman discussed the problems in the scheduling of ships and that a change in this process is necessary.

UNOLS Executive Secretary Bill Barbee advised the RVOC that the UNOLS Advisory Council will be addressing the policies and strategies of oceanographic research in the 1990's including the world wide oceanographic programs that are about to start up. In addition, he reviewed the NSF Oceanographic Facilities Report.

Commander Ralph Jacobs, Commander Naval Oceanographic Command, (CNOC) described the function of his command and their role in oceanographic surveys. He explained the Navy's need to know what instruments the oceanographic fleet is hanging over the side of their ships and moorings on the bottom for submarine safety program. Commander Jacobs discussed the Navy's Optimum Ship Track Routing (OSTR) and their ability to provide weather forecasting information outside NOAA weather coverage.

Wes Lovaas, ONR reviewed with RVOC the Navy's planned procedure for acquisition and operator selection for AGOR-23. ONR is seeking competitive bid proposals from potential UNOLS/academic operators. They expect to issue an operations RFP in November 1986. Proposals are due February 1987 with selection scheduled for April 1987. Bids may be from a single institution or consortium. Proposals must include removal of one (1) or more AGOR-3 class ships from the fleet. Selection criteria will include:

1. *Successful history of operating academic research vessels.*
2. *Profile of past and proposed scientific programs.*
3. *Rationale why the academic oceanographic community would best benefit by that institution being selected as the vessel operator.*

The new vessel can be a new mono hull, new SWATH or recent construction conversion. The design specifications and RFP are being finalized. Shipyard construction bids are due February-March 1987. The bid evaluation period will be April-June 1987. The contract will be awarded September 1987 with a completed construction date of late 1988 and an operational date of late 1989/early 1990.

The departing AGOR-3 class vessel will be removed from service sometime after selection of the operator and actual delivery of the new ship. A several month period will be required to remove selected major equipments, refurbishment and re-installation on AGOR-23.

Wes reviewed the status of reengineering the Knorr and Melville. This will be done over a two year period (1988-89). He also discussed the Navy's intent to build a SWATH vessel in the mid 1990's.

John McMillan, NSF reviewed the anticipated funding status for 1987. John further advised the RVOC that NSF has two large ships in their budget planning for the 1990's.

Tom Cocke, U.S. State Department discussed the progress he was making with computerizing his work. When on line he should be more responsive in the clearance process. Tom reminded the RVOC of the need to be prompt in submitting clearance requests and to follow up on reports.

Dolly Dieter briefly reviewed Harris Stewart's report on foreign clearance problems.

SPECIAL REPORTS

Safety Standards. Tex Treadwell reported that the only significant change forthcoming to the Safety Standards was in the Stability section. This change would be drafted by Gene Allmendinger.

PT. SUR Update. Mike Prince gave an update of the PT. SUR (ex CAPE FLORIDA). He reviewed the CENCAL consortium organization and their support for this vessel. This year the PT. SUR operations are well supported by the Naval Post Graduate School at Monterey.

Medical Advisory System. David Monaghan provided a report to the RVOC on the fleet activities of the MAS. He advised us of a new contract with NSF to review the statistics of the cases to date and to provide an analysis of those statistics. His report indicated that not all UNOLS ships were taking full advantage of the MAS service.

Computer Stability Program. Bill Hurley of the Glosten Associates has been developing a computer stability program for R/V ALPHA HELIX. The program will provide computer programs for the Captain of ALPHA HELIX to calculate the ship's stability with various actual loading conditions. A summary of the programs is attached as Appendix VI.

WINCHES AND CRANES WORKSHOP

A workshop on winches and cranes was held on 9 October 1986 during the second day of the annual meeting. This workshop was conducted at the Mexican Naval Academy. Jack Bash was chairman for this session and gave a broad overview of winches in the academic fleet and some of the forthcoming changes in winch design.

Ron Hutchinson of the University of Miami described a new traction winch manufactured by Lindgren Pitman, Inc. of Pompano Beach, Florida recently delivered for COLUMBUS ISELIN. The winch is of aluminum construction and to be used as a hydrographic winch. Appendix VII gives specifications of the Miami winch.

Jack Bash of the University of Rhode Island discussed the KEVLAR rope being purchased for R/V ENDEAVOR'S SMATCO traction winch. This rope will be 10,000 meters of JETSTRAN I-A 5/8" diameter with a Zytel extruded jacket. It will be manufactured by Whitehill Manufacturing Corporation for delivery in December 1986. Attached as Appendix VIII are specifications for this rope.

Sam Gerard of Lamont Doherty Geological Observatory gave a presentation on the three new winches built by LeBus for the CONRAD. The winches were built in the U.S. then shipped to Singapore for installation. The winches feature an elastic system that takes the shock loads off the wire and acts as an accumulator. Appendix IX provides more detail on these winches.

John Lund of NOAA provided details on the new NOAA motion compensated winch. This single drum winch operates with several cables, including KEVLAR EM, and will, when fully operational, take the ship's movement out of the cable in a moderate sea. The winch has been delivered, however, the motion compensation is not yet completed.

Mike Slattery of Slattery Equipment Co. discussed marine cranes. He outlined the difference between a marine crane and a mobile truck crane. He also provided information on the complete line of marine cranes handled by Slattery Equipment Co.

Mike Markey of Markey Machinery Co., Inc. presented remarks on "Research Winch Instrumentation". A copy of these remarks is attached as Appendix X.

MARINE LIABILITY WORKSHOP

A workshop on marine liability was chaired by Jim Williams on 10 October 1986 at the Hotel Emporio, Veracruz, Mexico. **Dennis Nixon of the University of Rhode Island** discussed liability aboard research vessels. He explained Maintenance and Cure, the Jones Act and Unseaworthiness, citing a myriad of court cases involving these principles. He provided advice concerning risk management for Marine Superintendents.

Tom Jozwiak of the Medical Advisory Systems provided the RVOC with information on applying physical standards in maritime employment. Tom suggested that MAS can assist in defining these standards and gave statistical guidelines for physical factors. The MAS is developing a clinic network to tie their sea going work with follow up action ashore.

David Williams representing Perspective Inc. provided information on anti/counter terrorism programs designed for the maritime environment. Dave outlined a program his company provides to assist in preparing for these dangers. Attached as Appendix XI is literature on his programs.

BUSINESS MEETING

The business meeting was conducted by Chairperson Dolly Dieter.

1987 Meeting Location. New Hampshire was selected as the location for the 1987 RVOC meeting. Gene Allmendinger and the UNH would be host.

Agenda for the 1987 Meeting. The following agenda items were suggested for the 1987 meeting.

a. *Group Insurance (A committee of D. Dieter, J. Bash, B. Mitchell, and B. Coste was set up to develop this item).*

b. *Computer programs for ship management.*

c. *Update on winch development.*

d. *Update safety standards.*

e. *Shared use equipment.*

Election of Officers. Jack Bash was elected the new Chairman of RVOC and Jim Williams was elected to fill the remaining year of the secretary position vacated by Jack Bash.

Other Business. A discussion was held concerning the use of alcohol aboard our ships and the written or unwritten policies relating to its use.

Several members cited their experiences with reverse osmosis (RO water desalinators). It was agreed that more information should be exchanged on this type equipment.

It was agreed that accident reports should include accidents, near accidents and failures. Members should use telemail for quick dissemination of this information.

A request was made that ship operational proposals be sent to all members.

Bill Coste was requested to make a presentation of his pay survey at the next RVOC meeting.

A discussion was held as to when scientists were permitted aboard and required to depart, in addition, what hotel services are provided in port. Each institution seemed to have a different policy.

It was suggested that information on new equipment be included in the RVOC Newsletter; of particular interest is information on performance and maintenance.

A discussion was held concerning the need for a second RVOC meeting during the year. The consensus was that those Marine Superintendents attending the spring UNOLS meeting should get together on an ad hoc basis during their stay in Washington.

The Marine Tech/shared use equipment issue came up again. Dolly Dieter will follow up on this problem trying to collect more information from those that write the Marine Tech proposal and recommend to NSF that a meeting be held with these people to resolve the many unanswered questions. It was concluded this is not business for the RVOC.

The RVOC was adjourned at approximately 1630 10 October 1986.

RESEARCH VESSEL OPERATORS' COUNCIL

1986 Annual Meeting
Oceanografia - Veracruz
C. Colon #43 Fracc. Reforma
Veracruz, Ver. C-91910
MEXICO

FINAL AGENDA

8 OCTOBER 1986 - 0830

Naval Hospital Auditorium
Veracruz, Mexico
(adjacent to hotel)

Registration/Coffee/Pastries

Welcoming Remarks

- Admiral Miguel Angel Gomez Ortega, Minister of Navy

Old Business

- Minutes of 1985 Annual RVOC Meeting - Dolly Dieter, Chairperson
- Fire fighting tapes
- Winch manual update - Wes Lovaas
- RVOC newsletter - Jack Bash, Secretary
- Status of radio license for NSF owned vessels
- New foreign clearance manual
- Navy clearance in restricted areas

New Business

- 1987 RVOC meeting agenda items/location
- Election of RVOC chairman
- Marine safety reporting program - J. Bash
- Decupad thermal recovery capsule (TRC)
- Ocean Science News article on offshore safety
- Cruise departures for troubled countries

- Video Tech
- Accident reporting information
- Other

Agency Representatives' Reports

- National Science Foundation - Budget Outlook; John McMillan
- Office of Naval Research - Budget Outlook; Keith Kaulum/Wes Lovaas
- University National Oceanographic Laboratory System - Report from UNOLS; Capt. Bill Barbee
- U.S. State Department - Update on Foreign Clearance; Tom Cocke
- UNOLS Report by Harris Stewart - Problems with Foreign Clearance; Dolly Dieter
- Commander Naval Oceanography Command - CNOC Report; Commander Ralph Jacobs

Lunch - 1230-1400

Special Reports

- Safety Standards - Update; Tex Treadwell - Texas A & M University
- Stability Standards - Update with particular attention to new U.S.C.G. rules for small vessels; Gene Allmendinger - University of New Hampshire
- Shared Use Equipment - Special report for N.S.F. on use charges; E.R. Dieter - University of Alaska
- Point Sur - Update on transfer/conversion; Mike Prince - Moss Landing Marine Laboratory
- Computer Stability Program for R/V ALPHA HELIX; Bill Hurley, The Glosten Associates
- Medical Advisory System - Report on fleet activities to date; Dave Monaghan - M.A.S.

9 OCTOBER 1986 - 0815

Naval Academy
Heroica Escuela
Anton Lizard, Mexico
(pick up by bus at hotel)

Coffee/Pastries

Welcoming Remarks

0900 - Rear Admiral Jose Orozco Peralta - Director of Naval Academy

Workshop - Winches and Cranes

- Introduction; Jack Bash, Chairman - University of Rhode Island
- Duel Drum Traction Winch; Peter Lindgren - Lindgren Pitman, Inc./ Ron Hutchinson - University of Miami
- Kevlar Cable and Winch; Jack Bash - University of Rhode Island
- Elastic Drum Winch; Sam Gerard - Lamont-Doherty Laboratory

Lunch at Naval Academy - 1245-1430 - hosted by Heroica Escuela

- Single Drum Motion Compensated Winch; Ralph Clements - Remote Systems Technology/John Lund - NOAA
- Marine Cranes; Reid Okawa/Mike Slattery - Slattery Equipment Co.
- Winch Electronic Instrumentation; Mike Markey - Markey Machinery Co.
- Question and Answer Session; Jack Bash - University of Rhode Island

Tour of Naval Academy

10 OCTOBER 1986 - 0830

Hotel Emporio
Executive Salon
Paseo De La Reforma No. 124

Coffee/Pastries

Workshop - Marine Liability

- Introduction; Jim Williams, Chairman - Scripps Institution of Oceanography

- Liability Involved with Operating a Research Vessel; Dennis Nixon - University of Rhode Island

- Application of Physical Standards in Maritime Employment; Tom Jozwiak - Medical Advisory Systems

- Security and Antiterrorism; Dave Williams - Perspective, Inc.

Lunch - 1230-1400

Wrap-up of Business Meeting

- Suggestions for 1987 annual meeting: location and agenda items. Please have suggestions ready

- Election of chairman - two year term.

Tour of Naval Oceanographic Laboratory

Social Activities

- 7 October 1986 (Tuesday)

  1800 No host get together in the main lounge at Hotel Emporio.

- 8 October 1986 (Wednesday)

  1930 Cedros Restaurant - No host cocktail hour followed by dinner. Approximate cost of no host dinner is $8.00/person.

- 9 October 1986 (Thursday)

  1930 Las Brisas - No host cocktail hour followed by dinner. Approximate cost of no host dinner is $8.00/person.

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J.F. Bash
Marine Supt'd.

J. Ralph Metz
Port Engineer

A.D. Fleet
Admin. Ass't.

UNIVERSITY OF RHODE ISLAND
KINGSTON • R.I. 02881

Graduate School of Oceanography • Narragansett Bay Campus
Marine Office • P.O. Box 145, Saunderstown, R.I. 02874
Tel. 401-792-6203 401-789-1926

Mr. Steven Hall
Chief, Notice to Mariners Branch
MCN
6500 Brooks Lane
Washington, DC 20315

Dear Mr. Hall,

The University of Rhode Island's Research Vessel ENDEAVOR will be:
a. Installing moored underwater instrumentation
b. Towing a device
c. Using sonic emmitters
d. Using explosives
e. Other ______________________

on its cruise EN ______. The cruise dates are ______________ through ______________. The area of operations will be ______________ ______________.

More detailed information is attached.

Remarks: ______________________________
____
____

Sincerely,

John F. Bash
Marine Superintendent

U.S. Department
of Transportation
Research and Special Programs Administration
Transportation Systems Center
Kendall Square
Cambridge, Massachusetts 02142

Appendix IV

Marine Safety Reporting Program
Transportation Systems Center
Kendall Square
Cambridge, Massachusetts 02142

Postage and Fees Paid
Research and Special Programs Administration
DOT 513

Official Business
Penalty for Private Use $300

NOTE: MARINE ACCIDENTS AND CRIMINAL ACTS SHOULD NOT BE REPORTED ON THIS FORM. ACCIDENT REPORTS (ACCIDENTS INCLUDE: LOSS OF PROPULSION OR STEERING, ANY NON-NEGLIGIBLE DAMAGE TO VESSELS, ALL GROUNDINGS AND INJURIES OR DEATHS) SHOULD BE FILED WITH THE UNITED STATES COAST GUARD AS REQUIRED BY 46 CFR Part 4. REPORTER AND OTHER IDENTITIES WILL NOT BE PROTECTED IF CRIMINAL ACTS ARE INVOLVED.

MARINE SAFETY REPORTING PROGRAM

The United States Department of Transportation (Office of the Secretary) has established a Marine Safety Reporting Program (MSRP) in which persons may *voluntarily* and *anonymously* report problems, potential problems or /incidents in marine safety. The purpose of this program is to identify hazards related in some way to vessel navigation and piloting for which some preventive measures might be taken *before* an accident occurs.

The Coast Guard will continue on its own to identify safety violations involving the navigation and piloting of commercial vessels (and other aspects of their operation). When such violation/offense is identified, the Coast Guard has agreed *not* to impose fines or other penalties on a *first-time violator* if he/she mailed a report of the incident to the MSRP before Coast Guard notification of an enforcement action being taken and within 15 days of the incident. (The form's identification strip, which the MSRP staff mails back to the reporter, serves as the necessary evidence.) However, the agreement with the Coast Guard to stop short of imposing penalties *would not* apply in the circumstances listed below:

1. The reported incident was a violation/offense and was *deliberate or criminal* in nature;
2. The reported incident was one that is ***required to be reported*** (marine casualties, hazardous or polluting materials spills, collisions with aids to navigation, and certain navigational system failures are examples) or one that triggers penalties or sanctions ***required to be imposed*** by law;
3. The reported incident was one that disclosed a ***lack of competency*** on the part of a licensed/documented individual.

The name and phone numbers you provide on the identity strip may be used upon receipt of your report to contact you for further information. Often, additional insights can be obtained if our safety analysts can talk with you directly by telephone. Whether such a phone call needs to be made or not, *THE IDENTITY STRIP WILL BE PROMPTLY RETURNED TO YOU* at the mailing address you provided. Thereafter, no record will be kept of your identity or those of other individuals or vessels mentioned.

Please be assured that your assistance in informing us about problems, potential problems or incidents in the marine mode is essential to the success of this program. With your help, we will be able to identify real hazards and have something done about them. Fill out this postage-free form as soon as possible, fold and staple or tape it, and send it directly to us. If you have any questions regarding this program, write us at the above address. Additional forms may be obtained by calling the Transportation System Center, Office of Technology Sharing's toll free number 1-800-225-1612, or in Massachusetts 1-800-842-1151.

DESCRIBE PROBLEM/INCIDENT *(continued from other side)*:

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(Please use additional sheets as necessary)

FORM APPROVED / OMB No : 21050512 / Expiration Date: 9-30-86

IDENTIFICATION STRIP: Please fill in all blanks

All identities, including those of persons and vessels, contained in this report will be removed to assure complete reporter anonymity. (Reports of marine accidents and criminal activities should not be submitted, and no protection of identities can be offered with respect to criminal activities). See Program details on the other side.

TELEPHONE NUMBERS where we may reach you for further details of this occurrence before this section is returned to you.

Home #: (___) ___-____ *Time*______

Work #: (___) ___-____ *Time*______

NAME: __________

ADDRESS: __________

(city) (state) (zip code)

DATE OF OCCURRENCE: ________

LOCAL TIME *(24 hour clock)*: ________

YOUR VESSEL'S NAME: ________

HAILING PORT: ________

RADIO CALL SIGN: ________

PLEASE FILL IN APPROPRIATE SPACES AND CHECK ALL ITEMS WHICH APPLY TO THIS PROBLEM/INCIDENT.
This section will be returned to you promptly and NO RECORD will be kept of your identity.

REPORTER:

LICENSE/POSITION
- ☐ MASTER
- ☐ PILOT
- ☐ MATE
- ☐ ENGINEER
- ☐ RADIO OFFICER
- ☐ STAFF OFFICER
- ☐ SEAMAN
  - ☐ ABLEBODIED
  - ☐ ORDINARY
- ☐ NONE
- ☐ OTHER: ______

WATERS ENDORSEMENT
- ☐ OCEANS
- ☐ COASTWISE
- ☐ INLAND

TONNAGE ENDORSEMENT
- ☐ ANY TONNAGE
- ☐ 1000 or MORE
- ☐ 500 to 1000 TONS
- ☐ 300 to 500 TONS
- ☐ 100 to 300 TONS
- ☐ 5 to 100 TONS
- ☐ LESS THAN 5 TONS

MARINE EXPERIENCE
- ☐ OVER 20 YRS.
- ☐ 10 to 20 YRS
- ☐ 5 to 10 YRS
- ☐ 2 to 5 YRS
- ☐ LESS THAN 2 YRS

VESSEL: SEVERAL VESSELS MAY HAVE BEEN INVOLVED. PLEASE DESCRIBE YOUR VESSEL, IF INVOLVED, IN THIS SECTION.

DESCRIBE ALL OTHER VESSELS IN THE "DESCRIBE PROBLEM/INCIDENT" SECTION BELOW.

TYPE
- ☐ FISHING
- ☐ PASSENGER
- ☐ FERRY
- ☐ FREIGHTER
- ☐ TANKER
- ☐ TOW BOAT
- ☐ SAIL BOAT
- ☐ PUBLIC VESSEL
- ☐ OFF-SHORE SUPPLY VESSEL
- ☐ OTHER *(Describe)*: ______

GROSS TONNAGE
- ☐ OVER 40,000 TONS
- ☐ 20,000 to 40,000 TONS
- ☐ 10,000 to 20,000 TONS
- ☐ 1,000 to 10,000 TONS
- ☐ 500 to 1,000 TONS
- ☐ 300 to 500 TONS
- ☐ 100 to 300 TONS
- ☐ 5 to 100 TONS
- ☐ UNDER 5 TONS

DRAFT
- ☐ FWD *(Feet)*: ______
- ☐ AFT *(Feet)*: ______

LENGTH
- ☐ OVER 900 FT
- ☐ 600 to 900 FT
- ☐ 300 to 600 FT
- ☐ 100 to 300 FT
- ☐ 65 to 100 FT
- ☐ UNDER 65 FT

FLAG
- ☐ U.S.
- ☐ FOREIGN *(Country)*: ______

PROPULSION
- ☐ TURBINE
  - ☐ STEAM
  - ☐ GAS
- ☐ ENGINE
- ☐ THRUSTERS
  - ☐ FORWARD
  - ☐ AFT
- ☐ SAIL

OPERATION AT THE TIME
- ☐ UNDERWAY
- ☐ ANCHORED
- ☐ DOCKING
- ☐ UNDOCKING
- ☐ FISHING
- ☐ SAILING
- ☐ ADRIFT
- ☐ AT DOCK
- ☐ OTHER *(Describe)*: ______

HAZARDOUS CARGO
- ☐ NO
- ☐ YES *(Type)*: ______

IF VESSEL WAS UNDERWAY - GIVE COURSE *(True)* ______, AND SPEED *(Knots)* ______

OPERATING FACTORS: IF KNOWN, GIVE VESSEL LOCATION BY REFERENCE TO LATITUDE/LONGITUDE, LORAN COORDINATES, RIVER MILE POST, OR GEOGRAPHICAL FEATURES USING RANGE AND BEARING *(True)*. ______

IF A NEAR COLLISION: WAS EVASIVE MANEUVERING TAKEN? - ☐ YES - ☐ NO - ☐ UNKNOWN. ESTIMATED MISS DISTANCE *(Feet)*: ______

SEA CONDITIONS (IF KNOWN)
- TIDE: ☐ EBB; ☐ FLOOD; ☐ SLACK
- ☐ WAVE HEIGHT *(Feet)*: ____
  - ☐ DIRECTION *(True)*: ____
- ☐ CURRENT *(Knots)*: ____
  - ☐ DIRECTION *(True)*: ____
- ☐ DEPTH *(Feet)*: ____

WEATHER/VISIBILITY
- ☐ CLEAR; ☐ SNOW; ☐ FOG; ☐ RAIN
- ☐ WIND FORCE *(Knots)*: ____
- ☐ DIRECTION *(True)*: ____
- ☐ OTHER: ____

LIGHT CONDITIONS
- ☐ DAWN
- ☐ DAYLIGHT
- ☐ DUSK
- ☐ NIGHT
- ☐ OTHER: ____

NAVIGATIONAL AIDS
- ☐ CHARTS
- ☐ RANGE MARKING
- ☐ RADIO
- ☐ RADAR
- ☐ OTHER: ____
- ☐ LORAN
- ☐ ADF
- ☐ BUOYS
- ☐ BEACONS

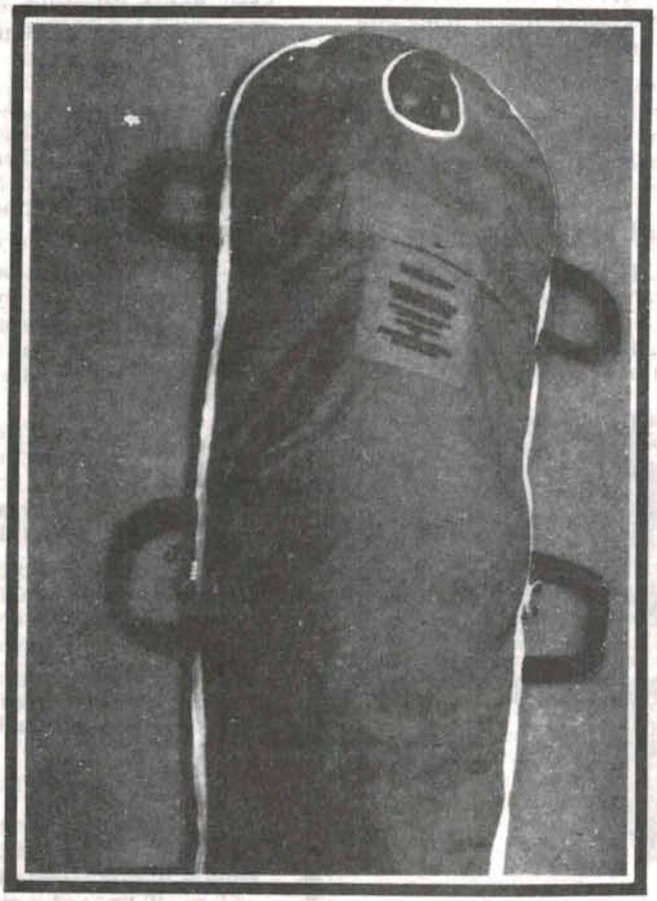
DESCRIBE PROBLEM/INCIDENT:

Tell the story in your own words. Give important details and insights not covered by the items checked above. Describe what led up to the situation; how you discovered or noticed it; the chain of events thereafter; and any action taken to correct the situation. Identify anything that made it more difficult for you or someone else to do your job(s); why people did what they did; and the way they responded to the situation. Many human errors may be aggravated by something else such as, difficult working conditions, outdated charts, faulty procedures, equipment, or communications. Suggestions about the causes of a problem/incident and possible solutions would be very welcome. *(Continue on the other side)*

FORM TSC F7050 1 (11-14-85)

Captain Survival & Rescue Systems, Inc.

T.R.C. DECUPAD® THERMAL RECOVERY CAPSULE



Currently saving lives:

- in offshore rescue
- in mountain rescue
- in cave rescue
- in natural disaster casualties
- in industrial accident casualties
- in road accident casualties
- in fire accident casualties
- in the armed forces
- in mines and underground resue
- in civil defense

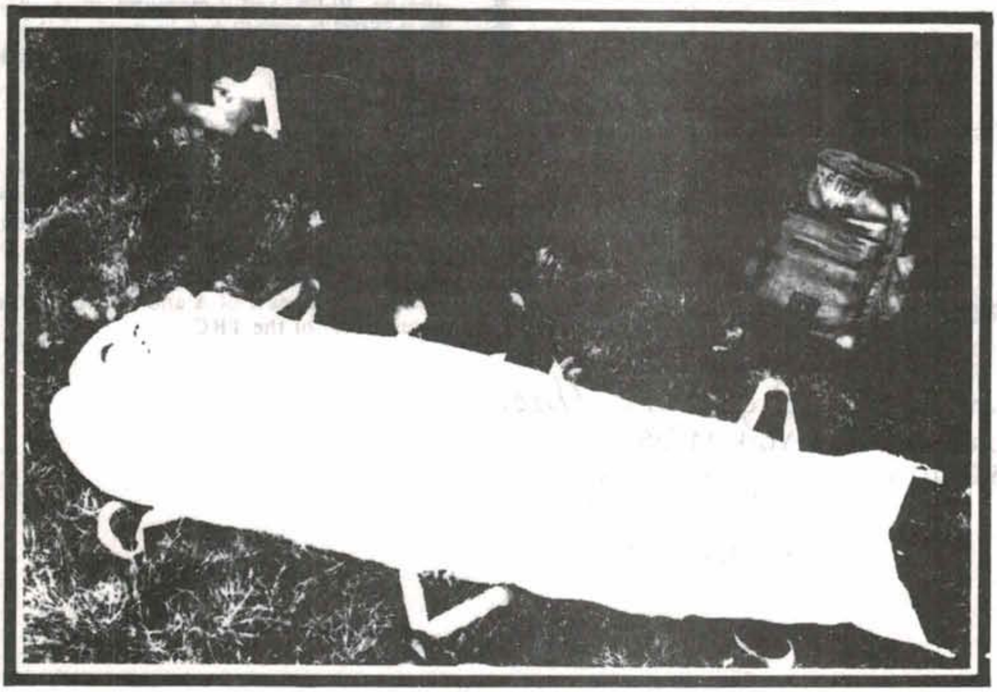
The TRC was designed for the prevention and treatment of hypothermia in a cold or wet environment. It is being used in the arctic, both off and on shore, by mountain rescue teams, the armed forces and emergency services throughout North America and Europe.

It is the single piece of equipment most likely to ensure the survival of a hypothermia patient in an isolated situation, and it is the most convenient to use.

The principal behind the TRC is that if the heat being produced by the metabolism of the body, even in hypothermic patients, can be retained, rewarming will occur. This is known as passive rewarming, and is effective in all but the very severest cases of hypothermia. Many severe cases will appear dead, however the TRC plays a role in the emergency care of even these patients because it can be used to transport them to a hospital where active rewarming can be started under medical supervision.

The elderly, who are subject to 'chronic hypothmia' developing over a longer length of time, have to be rewarmed slowly. The TRC is ideal for use before and during hospitalization for this condition.

Where the patient has been recovered from water he may be placed in the TRC immediately, fully clothed. Because of the special properties of the Decupad® material and the capillary action of the fibre, most of the water will be drawn into the base of the fabric and there it will warm as the body warms. The depth of the pile in the fabric is such that the insulative properties of the capsule will only be minimally reduced by such a quantity of water. The thermal properties of the TRC far exceed those of the equivalent thickness of duck down or other



Decupad® has been awarded The Certificate of the Royal Institute of Public Health & Hygiene.

MOD & NATO APPROVED

FOR SHOCK, HYPOTHEMIA & BURN VICTIMS

synthetic material used in sleeping bags. The depth of the Decupad® pile serves another purpose, the weight of the patients body lying on it will not crush it. No additional insulation is needed to protect a patient in a TRC from heat loss on the ground or to a ship's steel deck beneath him.

Mountain or cave rescues are often conducted in adverse weather conditions involving long rescue periods and difficult terrain. The TRC has six carrying straps, or alternatively can be strapped into any litter, rescue stretcher or cradle for easier carrying or hoisting into a helicopter.

The TRC is robustly manufactured to exceptionally high standards of quality control. The outer cover is made of water resistant bright orange fabric. Each TRC can be vacuum packed in a plastic bag for storage and is ideally suited to the prevention and treatment of hypothermia when mass casualties are encountered.

Should a diving bell become detached from its umbilical, consequently placing underwater operators at risk, the divers inside the bell can seal themselves within the capsule and wait for assistance maintaining themsleves in a warm, stable condition.

How the Decupad TRC is so effective.

- The TRC can be used even if a patient has open wounds because Decupad® is non-allergenic, non-toxic, non-irritant, non-flammable, machine washable and autoclavable, permanent stain and soiling resistant, air permeable, allows free drainage and will not support bacterial growth.

Strong durable zips allow the capsule to be closed from the inside as well as from the outside. Furthermore, it allows a doctor or a paramedic to open the capsule at any given point to reach a specific part of the body, without exposing the rest of the patient's body.

The carrying straps are also positioned as to support the head, shoulders, middle of back, small of back and legs. The TRC with patient enclosed can be easily lifted and carried by four people using the carrying straps, or alternatively by inserting poles through the straps. Although this method of transportation should only be used if a cradle/stretcher is not available.

The face opening allows oxygen or mouth to mouth resuscitation to be given, furthermore, it allows the patient in a coma to awake without becoming claustrophobic. Immediately below the face opening there is access to the patient to allow CPR should this be necessary.

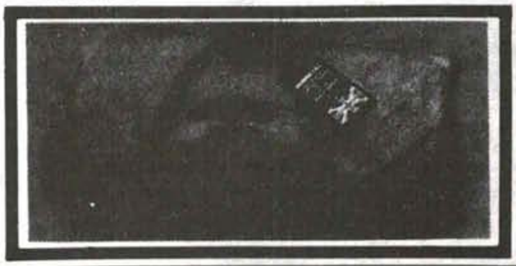
The internal safety harness centrally locates the patient securely inside the capsule when in transit.

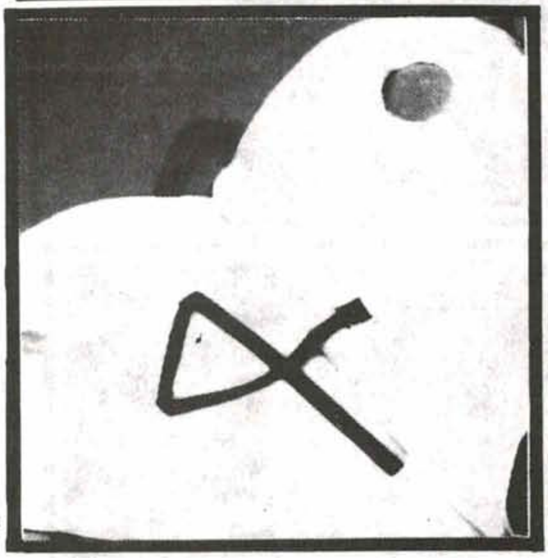
The water resistant cover has a document pocket where a record card and low reading rectal thermometer is kept to enable rescuers to record injuries and treatment along with other vital information.

A weather resistant hypothermia treatment chart is also supplied with each TRC, and these can be purchased separately if required. TRC's are packed four per carton.

More Decupad TRC facts.

1. The Decupad TRC was developed in conjunction with safety and medical officers from virtually all major offshore companies, air/sea rescue, diving companies, and other interested parties working out of Aberdeen, Scotland.





2. The Decupad TRC is Home Office tested. All of the original tests on the TRC were performed in the cold chamber at Leeds University Texile Department under the supervision of Dr. J. Keighley, MSC, PhD, C. Chem, MRIC, and his assistant Mr. D. Brooks, BSC.

3. The following is a selection of organizations who have purchased TRC's: Conoco, Total, Marathon, Texaco, Mobil, Shell, British Petroleum, etc., R.N.L.I., Police, and the U.K. Ministry of Defense, U.S.A. Coastguard, etc.

4. TRC's are currently in use by oil companies and on standby by boats etc. in Alaska, Nova Scotia, Newfoundland, and in the UK. They are also being supplied to Australia, New Zealand, N. America and S America in large quantities.

5. Dr. A.C.H. Hammer, M.D. of Halifax, Canada, a specialist in offshore medicine generally and hypothermia recovery specifically, is on record as saying that the TRC is "the most effective means of stabilising a hypothermia victim's body temperature."

6. TRC's are used with police diving teams, ambulances, mountain and cave rescue organizations, R.A.F., R.N.L.I. boats in the UK and with similar organizations in many other countries around the world.

7. The recommended offshore compliment of Thermal Recovery Capsules is: 3 TRC's in each sick bay, 5 TRC's on every standby boat, 2 TRC's on every recovery boat.

8. All documentation relating to the Decupad TRC fabric, tests and benefits have been seen and approved by Lloyds Register of Shipping.

9. Each TRC is re-usable after cleaning.

10. The Decupad Thermal Recovery Capsule can be back-packed or carried by hand with ease. Total packed weight is approx. 10 lbs. and it measures 30" x 12". Each TRC is supplied in its own weather resistant, bright orange, carrying case which is clearly marked.

Military Use

Conventional thermal recovery capsules have an international orange outer cover for ease of identification but military TRC's are available in either (A) Drab Olive Green, or, (B) standard disruptive fabric. Both A and B are to M.O.D. specification. The outer carrying case of A and B matches the outer fabric of the TRC.

Captain Survival & Rescue Systems, Inc.
11 Crooked Hill Road, Commack, New York 11725
(516) 499-4018

DISTIBUTED BY:

*** ALPHA HELIX LIQUIDS AND SOLIDS FILES ***

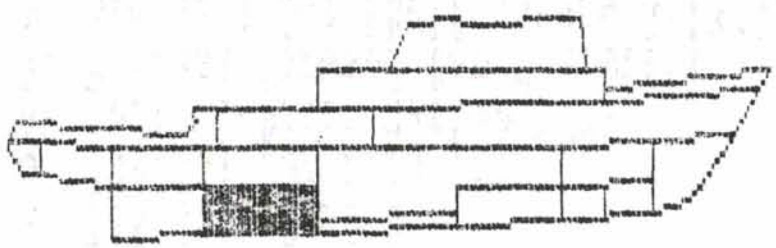
LIQUIDS FILES	SOLIDS FILES
4. T&S Book Case 3	1. Full Load Crew & Stores Only
5. Typical 10% Burn Out	2. 4/20/86 Full Load Sci.Equip.
6. Arrival Dutch Harbor 5/93	3. Departure Spring '85 Cruise
7. Ballast Forward for Min.Draft	4. Return Spring '85 Cruise
8. Midpoint Ice Shelf Survey 3/13/83	5. Projected Load Spring '87 Cruise
9. Full Load Depart Anchorage 4/20/86	6.
10. Test Case - by DLG - 9/30/86	

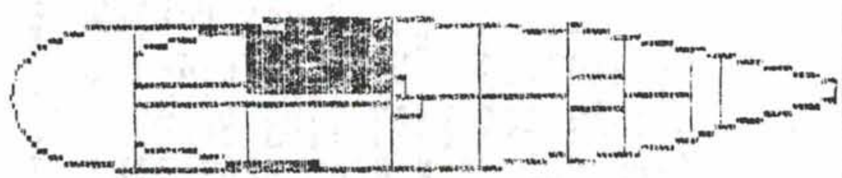
Use Arrow keys to select an existing liquids or solids file for editing.
Use CTRL-INS keys to name a new solids or liquids file for editing.
If you make changes to an existing file you must give the file a new name.

PRESS THE DOWN-ARROW KEY FOR MORE INFORMATION -- PRESS ANY F-KEY TO CONTINUE

ALPHA HELIX LIQUIDS FILE No.5 - FULL LOAD DEPARTURE ANCHORAGE APRIL 20,1984

TANK DESCRIPTION - ALL TANKS	LIQUID TYPE	SOUNDING (Inches)	%FULL	GALLONS	WEIGHT (LT)
DB Tank #1	D.O.	0.00	0	0	0.00
DB Tank #2 Port	D.O.	0.00	0	0	0.00
DB Tank #2 Stbd	D.O.	0.00	0	0	0.00
DB Tank #5 Port	D.O.	62.13	95	4275	13.85
DB Tank #5 Stbd	D.O.	62.13	95	4275	13.85
DB Tank #6 Port	D.O.	60.63	95	9368	30.36
DB Tank #6 Stbd	D.O.	60.63	95	9368	30.36
Deep Tank #4A	L.O.	74.13	95	146	.47
Deep Tank #4B	L.O.	74.13	95	315	1.02
Deep Tank #4 Port	D.O.	94.60	95	1659	5.69
Deep Tank #4 Stbd	D.O.	94.60	95	1659	5.69
TOTAL					101.29

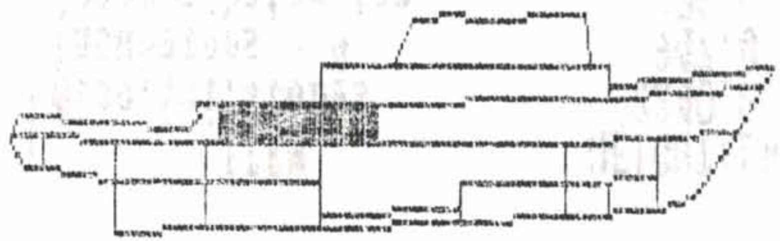




PRESS THE DOWN-ARROW KEY FOR MORE INFORMATION -- PRESS ANY F-KEY TO CONTINUE

ALPHA HELIX SOLIDS FILE No.5 - DEPARTURE CONDITION SPRING '86 CRUISE

ITEM	REFERENCE AREA NAME	WEIGHT (Pounds)	DISTANCES (Feet) FROM DECK	FWDBHD	LONG'L REF
Piston Core	Main Deck (AFT)	400.0	3.5	8.5	4.5
CTD Rosette	Main Deck (AFT)	120.0	8.5	15.0	10.5
Gas Cans 2 @ 55 gals	Main Deck (AFT)	667.0	2.5	5.0	6.0
Nets & Weights	Main Deck (AFT)	1120.0	1.5	25.0	15.0
17' Zodiac	Main Deck (FWD)	1573.0	1.0	15.0	0.5
VAX 11/50	Dry Lab	275.5	3.5	15.5	-24.5
Misc.Sci.Stores	Dry Lab	2240.0	2.2	25.0	-24.0
Incubators - 3	Dry Lab	9467.5	3.8	20.0	-2.5
Spectraphotometer	Dry Lab	306.0	3.0	10.0	-5.5
Frozen Bait	Freezer Lab	500.0	6.5	5.0	4.5
Dry Stores	Stowage Room	9744.5	4.3	3.0	3.0
TOTALS		41843.5	VCG=17.5	LCG=31	TCG=1.8



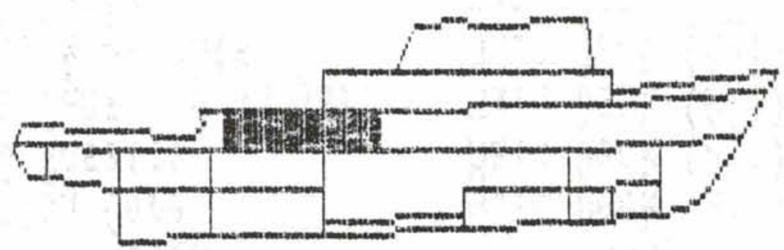
PRESS DOWN-ARROW KEY TO EDIT ITEMS IN A REF.AREA -- ANY F-KEY TO CONTINUE

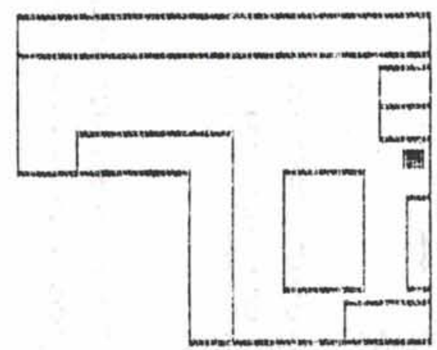
ALPHA HELIX SOLIDS FILE No.5 - DEPARTURE CONDITION SPRING '86 CRUISE

REFERENCE AREA: Dry Lab

Ref.Pt.: Long'l BHD: CENTERLINE
Trans. BHD: FWDBHD, Fr.31
Deck: MAIN DECK

ITEM	WEIGHT(Lbs)	ABV DECK	Trans.BHD	Long'l BHD
Misc.Sci.Stores	2240.0	2.2	25.0	-24.0
Incubators - 4	947.0	3.8	20.0	-2.5
Spectraphotometer	306.0	3.0	10.0	-5.5
VAX 11/50	275.5	3.5	15.5	-24.5
File Cabinets/Files	400.0	2.5	1.5	6.0
A/D Current Profiler	1100.0	4.0	20.0	-4.5
Current Meters	100.0	1.5	.5	-2.5
Mag.Tape System	240.0	2.3	2.5	5.5
Piston Core Samples	1040.0	.5	8.0	-34.5
TOTALS	5843.5			





PRESS UP-ARROW KEY TO CHANGE REF.AREA -- DOWN-ARROW KEY FOR MORE INFORMATION

*** ALPHA HELIX SUMMARY OF CONDITION SOLVED ***

using: LIQUIDS FILE No.5: Full Load Departure Anchorage April 20,1984
SOLIDS FILE No.3: Departure Spring 84 Mission

ITEM	Weight (L.Tons)	VCG (Ft) Baseline	LCG (Ft) at Frame	TCG (Ft) Centerline	F.S.M. (Ft-Lt)
LIGHT SHIP	426.5	15.26	29.0	0.00	0.00
TOTAL OF TANKS	121.0	6.69	33.0	0.00	201.40
TOTAL OF SOLIDS	18.7	17.00	31.0	1.80	0.00
TOTALS	566.2	13.49	29.9	.06	201.40

GM (Uncorrected):	3.56 Ft	Draft at FWD Marks:	10'-11.24"
F.S.C.	.35	Draft at Aft Marks:	13'-6.125"
**** GM (Actual):	3.21 ****	Trim:	-.93' (FWD)
**** GM (Required Min.):	2.59 ****	Heel:	0.00

STABILITY COMMENTS: Calculated Stability is acceptable
DRAFT CHECK IS RECOMMENDED: PRESS F5 KEY

PRESS THE DOWN-ARROW KEY FOR MORE INFORMATION -- PRESS ANY F-KEY TO CONTINUE

*** ALPHA HELIX DRAFT CHECK ***

Type in Foreward Port Draft Readings :	11'-1.0"
Type in Foreward Stbd Draft Readings :	11'-0.5"
Type in Aft Port Draft Readings :	13'-6.0"
Type in Aft Stbd Draft Readings :	13'-5.5"
Type in Water Density (1.00=Fresh, 1.025=Salt):	1.025

Use Cursor Keys to Type in Actual Draft Readings.
Press the Return Key when ALL Entries are Correct.

Comparison of Draft Readings and Solved Condition

	From Draft Readings	From Solved Condition	Differences
Displacement:	575.0 L.T.	566.2 L.T.	8.8 L.T.
LCG at Frame:	29.5	29.92	2.5

This check implies a 2% tolerance on the calculated stability values.
GM maybe as low as 2.94 Ft. This would still be an accepabe GM.

PRESS THE DOWN-ARROW KEY FOR MORE INFORMATION -- PRESS ANY F-KEY TO CONTINUE

Rosenstiel School of Marine & Atmospheric Science

Marine Department

1620 Port Boulevard

Miami, Fl 33132

The following are the specs on our traction/storage winch. The traction drive motors are sundstrand F 11-58, 40 degree fixed displacement piston motors. These motors have a fixed displacement of 3.55 cubic inches. The theoretical torque rating of these motors is 564 inch lbs. per 1000 PSI. These motors are direct coupled to rotating case planetary gearboxes with a gear ratio of 58:1. A series parallel valve is installed to provide high speed/low torque or low speed/high torque operation. The drive sheaves have 6 grooves and are bolted to a hub which is direct driven by the gearbox. This allows for easy replacement of the drive sheaves to accomodate different size wires. Using a system pressure of 2500 PSI at 38 GPM the traction drive will provide a line pull, in series operation, of 6800 ft. lbs. and a maximum line speed of 85 m/m.

The storage reel is direct coupled to a DOWTY model MHA5000C rotating shaft motor. The dowty motor displacement is 31.03 cubic inches and produces 411 ft. lbs. of torque per 1000 PSI. The storage reel is fitted with a chain driven level wind and drum grooves for .322 conductor wire. The spool can accomodate 10,000 meters of .322 wire.

The traction winch and the storage reel are of aluminum construction, except for the traction sheaves which are steel with surface hardened grooves. The units are separate assemblies and may be mounted in a variety of arrangements depending on the fairlead desired or space requirements.

SPECIFICATIONS FOR

URI KEVLAR ROPE

1. MATERIAL

a. Strength Member - The strength member of the cable shall be composed of strands of KEVLAR-29 with Dupont type 960 KEVLAR.

b. Jacket - The strength member shall be enclosed in a protective jacket of International orange, thermo plastic material. It shall be impervious to water, moisture, dust and grit. It shall be round in cross section and of uniform thickness through entire length of rope. The jacket shall be unaffected by indefinite exposure to air and sunlight over the environmental regime specified by the following limits:

Temperature - 30^{o}F to 110^{o}F
Humidity - 0% to 100% RH
Water (salt and fresh) indefinite emersion
Bio-agents mold, fungus and marine bio

The jacket shall be free of voids, splits, bubbles and other imperfections throughout its length.

The jacket should be abrasive resistant, with Shore Durometer of 58.

The jacket to strength member interface shall be designed to transfer the forces generated by a traction sheave from the jacket surface to the strength member without damage to either. A braided jacket may be added to the cable in addition to the strength member and jacket to achieve this requirement. This interface must be effective over the full range of cable tensions from 0 to rated breaking strength.

The cable, including jacket, shall be chemically stable.

2. Dimension

The cable should be a continuous length of 10000 meters of a nominal 5/8" diameter including extruded jacket. The diameter variation shall not exceed 5%.

3. Rated Breaking Strength and Elastic Limit

The cable shall have a minimum actual breaking strength of 35,000 pounds including termination, as measured by Cordage Institute methods. The cable shall exhibit no significant degradation of strength when used at normal working loads of 10,000 pounds over a useful life of 2000 cycles or 5 years. A cycle is one outhaul and one inhaul over a traction winch and three fairlead sheaves. The elasticity of the cable should not exceed 4%. It should withstand occasional loading of 70% rated breaking strength without a reduction in strength or life expectency.

4. Torque Balance

The cable shall be free of systematic or inherent torque under tension load, or if not, must, by virtue of its design, be compensated so that residual torque shall not rotate about its axis more than 5° per foot at 45% rated breaking strength also a change in tensile loading equal to 10% of rated breaking strength shall not produce axial rotation greater than 1° per foot.

5. Flexible Tolerance

This cable shall withstand 50,000 flexure cycles over sheaves 40 times wire OD at 35% rated break strength without failure. Degradation in strength shall not exceed 5% of rated break strength.

6. Tension Cycling

This cable shall withstand 50,000 cycles in tension from 0% to 50% of rated breaking strength at an 8 second period without failure. Degradation of strength shall not exceed 5% of rated breaking strength.

7. Termination

This cable must be terminable with an eye splice termination and in line fitting that meets the following requirements:

a. Termination must be capable of fabrication in the field.
b. Termination must be performable by field personnel with reasonable training.
c. Termination must not degrade the cable rated breaking strength.
d. All tools and material required to make the termination must be specified and readily available.
e. Termination must be performed within a normal 8 hour work shift.

8. Delivery

This cable is to be delivered within ~~60~~ 90 days of order to - Marine Office, University of Rhode Island, South Ferry Road, Narragansett, RI, 02882.

Whitehill Manufacturing Corporation

P.O. BOX 356
LIMA, PENNSYLVANIA 19037
Telephone (215) 494-2378

January 10, 1986

University of Rhode Island
Narragansett Bay Campus
Narragansett, Rhode Island 02882

Attn: Mr. Jack Bash

Ref: My letter of August 2, 1985

Dear Jack:

This letter is to confirm our phone conversation of January 10, 1986. We are pleased to quote on one continuous length of 33,000 feet of JETSTRAN I-A - 5/8" diameter rope with a Zytel extruded jacket at $2.68 per foot or $88,440.00 total.

Our terms are less 1% 10 days, net 30 days, F.O.B. Chester.

Delivery time shall be 6 to 8 weeks.

This quotation will be held firm for 30 days.

We hope this information is satisfactory and look forward to working with you on this project.

Sincerely,

A. Simeon Whitehill
President

ASW:spb

R/V CONRAD Winches

R/V Conrad was in the Keppel Shipyard in Singapore between January 1 and March 14, during which time we installed 3 winches that were designed by ourselves and LeBus International and fabricated by LeBus.

The new CTD winches come with a hollow rubber bar that was made up by Murdock Engineering which they call an Elastomer Spring. This is the only feature that is really different about this winch (and all of the winches that we built). The purpose of this is to serve as a shock absorber to take out some of the shock loading that may occur from ship motions. The winch is driven by a McTaggart Scott hydraulic motor. This is a low-speed, high-torque motor that requires no gear train and secures directly into the elastomer drive unit. The drum is fairly easily removed by removing the motor (the shaft of which serves as a bearing on the motor side of the drum) and by removing the stub shaft on the opposite side and lifting the drum straight up. We are driving both the CTD winch and the camera winch (which is identical except for having a driven diamond thread level wind) from a single 50 H.P. Rexroth hydraulic piston pump in a closed loop circuit. We simply turn on and off a couple of ball valves to shoot the power to one winch or the other as needed (since we will never use both winches at the same time). The monitoring system consists of a Nylatron hanging block on the end of the small crane which has targets attached at every 1/10 meter around the circumference. A proximity pick-up is used to count wire and give the wire speed. This is a University of Washington rig that is quite inexpensive, rugged and usable for any number of winches. We're using one readout and one remote for all of our winches since they all have targets on the metering sheaves at 1/10 meter intervals. We put a small Alaska Crane on the 01 deck between the camera winch and the CTD winch to handle both wires. This was hardly anymore expensive than an A-frame and has a lot more versatility in handling delicate gear over the side.

On a rolling ship, if the load varies plus or minus 500 lbs. and the torque reaches about 3700 foot pounds the drum will follow this change by rotating plus or minus 50^{o} "absorbing" a total of about 3 feet of the motion. This should keep the wire in the sheaves from going slack and will take the snap load off the instrument. We started the design considering elastomer springs that were softer and provided a total of about 750^{o} of rotation from 0 to full torque, but we became concerned that the natural period of the winch was getting very close to the roll period of the ship, so we had to stiffen the springs considerably to avoid any tendency for the winch to oscillate with the roll period.

We still have a little more work to do in the control booth to get all of the metering gear on-line. For the CTD winch we have a torque meter built into the drum which puts the signal out through the slip ring assembly and shows on a meter (or a chart record) the torque on the shaft. This can be interpreted roughly in terms of tension and can be used to show bottom contact of the instrument package. Our trawl winch is exactly like the CTD winch but bigger. It has a built in tension measurement system (as well as a torque sensor). This is done by installing 2 load cells, one relates to line tension regardless of wire angle over the side. The other metering signals are wire-out and line speed from the University of Washington meter. The speed and direction control is a joy stick in the booth and there is a remote "walk around" joy stick that the operator can use while standing at the rail or wherever he wishes to observe the operation.

The core winch holds 30,000 feet of 9/16" wire rope and also has a separate LeBus grooved sleeve for the use of .680" dia. deep tow cable. Consequently, we call it a multipurpose winch. All of the winches are fast. The shock absorber allows fast payout without slack wire and inhaul speeds are expected to be 200 M/min.

I don't know what I can say about prices for these three LeBus built winches, but I think that they are relatively low cost compared to most that I have seen. LeBus charged us about $48,000 for the CTD winch and we supplied our own power pack which cost us about $11,000. The LeBus quote goes back to 1975 and may have been a special deal because we were building 3 winches at the same time. The installation cost in Singapore were very modest and should not be used for estimating installation cost anywhere else. We did the entire 3 winch installation with A-frame, crane, all electricals and piping for $30,000 U.S. Considering the scope of this work it would probably have cost about 8 times as much in a U.S. yard.

All of the winches have a provision for by passing the Elastomer spring and driving direct by simply inserting plug for positive drive and thereby eliminating the Elastomer. So if we goofed with our goofy rubber drive we still have an ordinary winch.

Appendix X

RESEARCH WINCH INSTRUMENTATION

remarks by

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Vera Cruz, Mexico

October 9, 1986

WINCH INSTRUMENTATION

October 9, 1986

I. Introduction

Several marine winch types OTHER than the Oceanographic need the display of the three primary cable parameters -- LINE TENSION, LINE SPEED, and AMOUNT OF WIRE PAYED OUT. (or "Scope"). Pipe laying barges lowering sewer outfall pipe sections have need for accurate scope count on two separate lines, to confirm the slope or levelness of the pipe. Cranes of all types utilize angle-compensated load displays. Fishing vessels have been using increasingly sophisticated electronic displays for trawl warp tension meters and scope counters.

The interest here can be focused on the types you've all used since Day 1 - the RESEARCH WINCH and its sensors and displays.

II. Basic Types of Sensor and Display

A) Mechanical and Fluid

Sheaves nicely facilitate the passage of wire rope, and have almost always been necessary. (See Appendix I for remarks on the changing preferences for sheave proportions...)

If the sheave throat is shaped properly for the particular wire, and if there is enough contact length, it will develop enough "drive" to permit a mechanical take-off in the form of a light duty stainless roller chain. The other end of the chain can drive small gears and sprockets which operate a mechanical counter such as the Veeder-Root. With the right ratios, this will neatly show the Meters Payed Out. If the counter is kept WD-40'd, it will reverse, and mostly return to nearly the starting point, at the end of the cast.

Another sprocket in the same chain can be bevel-geared to a centrifugal tachometer such as those made by Jones-Motrola. Dial faces are better engraved or etched rather than Xeroxed, since they don't fade away to a shadow after a few years. These tachs, being centrifugal, will show line speed with the wire running in either direction, and their ratio and face numbers can be selected to suit. Whereas zero-to-300 Meters Per Minute was a "standard" for many years. there is a present feeling that Zero-To-200 Meters/Minute is a realistic range which provides improved resolution.

A spring-loaded chain tensioner will allow the measuring sheave to flex slightly on its load cell, and make the gap between the cell halves less critical.

Working with these chain-driven beauties, a fluid load cell with its short hose and a bourdon-tube pressure gage was the classic way to show cable tension. To accomplish that, the wire rope had to be bent around the measuring sheave to develop a measurable force vector axial to the cell.

Designer ingenuity has run rampant on wire routing over measuring sheaves. Mr. Goldberg would have been proud! Our standard was a 30 degree entry and exit angle UNDER the sheave -- the only magic to this angle is that the measured vector EQUALS the wire's tension. This is handy for the thinking process, both in design and in service. A good sheave layout allows the wire to be side "loaded" or "cleared" anywhere along its length, rather than requiring threading from the end.

Presently we are considering changing over to a nominal 14 degree angle which gives a vector equalling HALF the wire tension, and is still easy to envision. Less wrap has to be beneficial for wire life, (although an interesting theoretical question arises concerning whether the cable "cares" how many degrees of arc it remains flexed between entry and exit tangents...). The use of a smaller load cell can save the odd dollar, which is no minor matter in these wild times...)

We've all cursed the fluid-filled tension dial sitting there corroding, leaking, and gulping air on the end of its hose. Attempts to use multiple fluid dials from a common cell with extended hose lengths have generally been frustrating.

But one thing CAN be said for this primordial form of 3-way display equipment -- there were no electrons running around to worry about. A can of spray-lube and a new gasket could work wonders for a recalcitrant system. And if you hadn't misplaced your charge pump, you could get most of the air out of the Martin-Decker.

B) Electro-Mechanical

The need for display at locations other than directly on the winch's level-wind forced the electron into the picture -- particularly to accomodate the scientist who preferred to work from a dry cab rather than do the Capt. AHAB bit at the winch. People forward or below in the lab decided THEY should know the status of the wire connecting the vessel to their payload. And occassionally even the master or mate was permitted to know the status of the the string using up so much ocean beneath him or behind him. , Thus the remote, and thus the advent of electrical hardware.

You could still keep your stainless roller chain, but in addition to the Veeder-Root counter and the Jones tach, you could drive a Selsyn or Autosyn, and a small Tachometer Generator as well.

The remote displays then needed a receiving Selsyn, and a electrical tachometer. The tach could show line speed directly, but the Selsyn had to be chained or geared to drive another Veeder-Root counter.

With only a little imagination, the mechanical tach in the winch's local display could be replaced by a "local" electrical tach.

With this approach there was need for a remote tension meter that did NOT use the fluid column reaching to the dial. Two approaches here --

1) Screw a Pressure-Potentiometer into the same M-D hydraulic load cell. (only make the cell Stainless this time, to avoid the "ball of rust" syndrome.) The Pot makes a voltage and the remote display can use that voltage to run an analog meter with a properly anotated dial face. Use a pot with a resistance element made with conductive plastic and having a large area, to get reasonable life. "Bourne" has been one decent supplier of this device.

or, 2) Change the sheave support design to utilize a carefully stressed axle into which are encapsulated strain-gages. Bring the tiny little wires out the end of the axle in a protective hose to a J-Box, and then wire the minute signals to proper amplifcation modules and analog meters at the display units.

We have favored the fluid-filled compression cell and directly-coupled pot for several reasons. Retrofitting is feasible in a subsantial number of existing winch fairlead heads. (not scientific, but a factor...). The rubber diaphram and the fluid respond to the motions of the wire passing over the sheave, and provide a damping or a buffer to the electric wiper in the pot. These cable "strumming" motions directly exercise a strain-gaged axle. The third reason involves the delicacy of the gage wires themselves, and the need for the amplification stages.

Both systems will work well, but the cell & pot approach retains a bit more of the old "fix it on site" capacity.

Before moving along, one arrangement variation should be touched upon. While most of the measuring sheaves and senders have been installed directly onto the winch level-wind fairleaders, there have been installations where the fairlead carries simple guide rollers (the larger, the better, of course...), and the sensing is accomplished by independent and separate assemblies. Given an overboard boom which requires sheaves anyway, there is good motivation to instrument THOSE sheaves. The fewer sheaves the wire has to struggle through, the better.

WHOI are presently contemplating a boom-mounted measurment assembly for the "Oceanus" -- the winch fairlead is greatly simplified with its 8" rollers, and the traveling head doesn't have loops of signal and power cable lazing back and forth as the wire spools.

ALL THIS IS BY WAY OF HISTORY -- WHAT HAVE WE DONE FOR YOU LATELY?

C) ELECTRONIC SENDERS AND DISPLAY UNITS

Circuit boards can be more reliable than hard wiring, when care is taken with burn-in and initial testing. This factor pales however in comparison to HOW MUCH MORE CAN BE ACCOMPLISHED, once there is some form of microprocessor involved in the display system.

Start at the sensing end of the system -- generally at the winch, but perhaps at a separate sheave unit. Speed and Counter signals are superbly created by a pair of stainless or brass PROXIMITY SENSORS, (digital ON-OFF type) properly mounted and housed, watching the passage of edges machined into a target ring which is bolted to the measuring sheave. (or watching gaps in a disc secured to the end of the sheave shaft.) This is a direct and elegant conversion of mechanical motion into electrical signal, and eliminates sprockets, chains, tighteners, shafts, counters, selsyns, tach-generators, their supports, housings and incidentals.

Presently we are enclosing the proximity sensors in gasketed bronze J-boxes, even if they ARE rated non-corrosive and waterproof. We've seen exposed sensors screwed thru thin bent stainless brackets, with the sensor leads looped away directly. A bronze enclosure box will be an altogether "tougher" installation.

Three Tension signal options go along...

1) Strain gage sheave axle, discussed above. Not our favorite, but useful in some configuration problems.

2) Compression fluid cell and pressure-pot, also discussed above.

3) Compression Cell as developed by MARKEY/FATHOM, based on a sleeve, a piston, spring(s), and another PROXIMITY SENSOR. (this time of the linear volts-vs-gap type.) This mechanically rugged and very simple form of cell is working very well measuring trawl wire tension aboard two recently converted fishing trawlers out of Seattle. Not only are the tensions in both trawl wires displayed directly, but the DIFFERENCE between the two tension values is shown on a separate center-null scale to let the fisherman keep the lines equalized, or to be aware of the tension effects of turning the vessel.

The Proximity Type Compression Cell gives a wide load range and lends itself to flexible mechanical layout using selectable springs, adjustable lever ratios, etc. With an "all Proximity" meassurement system, replacement spares are inexpensive and easily installed.

The display end of the circuit takes two primary forms -- the "METER/COUNTER" format, which can utilze either electrical meters or electronic meters, and the "VIDEO" format.

METER/COUNTER FORMAT

Refer to a MMCo. typical drawing C-31,701 which shows one current layout for a cab or lab mounted display unit. This is based on serving up to four winches, and presumes that your traditional good reasons for overboarding only one wire at a time still hold. Therefore a "Winch Selector" switch is provided. Since these might cover cable sizes from 3/16" to 3/4", with commensurate loads, dials with three different tension ranges are provided.

Any of the tension ranges can be used with any winch, so that the scale resolution for the particular operation can be optimized. (A big wire might be used on a light task...)

These tension dials are electronic and show both an ANALOG pie-face, and a digital readout with the usual update cycles. The analog scale provides the scan and the trends, while the digital number defines the tension value at least as recently as a second ago. The analog scale divides into 30 increments, providing 33 lb. resolution on the 1000 lb. range.

The speed dial is of similar combination type. Our present thinking is that zero-to-200 Meters/minute is a more usable scale than zero-to-300 Meters/min.

Scope Count is shown by a five digit Black-On-Silver LCD display, which can use 1" high digits where the operator is close at hand, or 2" high digits if a longer view is needed. 2" digits could be overwhelming in a small cab.

The microprocessor which drives these displays is incorporated behind the LCD counter module, and receives the sensor's signals.

Any desired number of remote METER/COUNTER units can be provided, and additional units can be added later. They connect to the master display via serial twisted pair wiring, which is a major installation saving, compared to "many-conductor" cabling.

One additional choice is required. Shall ALL the units be outfitted as "Masters" with full switching capabilities, or shall all but one be configured as "Slaves", leaving the system switching to only one Master? Omitting the switch hardware saves initial dollars, and forces all system decisions to be be made at one location.

On the other hand, having all units duplicate means that any display can be installed in place of any other -- a logistics advantage, surely. External "blocking plates" could be screwed on to prevent switching at the "Standby Masters".

WEATHER EXPOSED DISPLAYS

Where the display doesn't live in the luxury of a cab or lab or pilot house, we continue to suggest that the housing should be of heavy gage galvanized steel, with a gasketed stainless cover. Crane hooks, peavy handles, and other loud objects will trash the type of electronic cabinetry we normally think of, to say nothing of sea water. With on-deck distances, the speed and tension dials should be the larger 4" diameter round dial meters, or the even larger square format type with the arched scales.

With this type, a single tension dial with multiple numerics and range switching can handle the multi-range provisions. This type of meter can be obtained with Nitrogen Gas filling, although if proper gasketing is used on the housing, and if thermostat controlled space heating is provided, normal meters should live.

Within this "Bank Vault" type unit, the same microprocessor-driven LCD scope counter is appropriate, and here, the 2" digit height makes sense. Wiring entry fittings should be the heaviest duty marine bronze that can be found, and switches should be large and glovable rather than fiddly. All exterior wiring should be enclosed inside teflon-lined and armored hoses with bronze or stainless end fittings.

VIDEO TYPE DISPLAYS

Excluding the winch-mounted or other weather-exposed remote locations, an exciting display alternative is coming along. MARKEY/FATHOM has one mid-sized trawler referred to earlier, with an owner who has heavily computerized his vessel. Following that owner's lead and enthusiasm, and with very few weeks in which to do the job, a "Commodore" monitor, keyboard computer, and tape reader were obtained from "Toys R Us" (truly) and programmed into what was, for those few weeks, the state-of-the-art trawl metering system. MMCo. proximity load cell assemblies were installed at each side of the aft gantry, supporting stock trawling sheaves.

The monitor is located at the fishing station aft in the wheel house, as is the keyboard, the cassette player, and MARKEY Computer No. 1. This last resides under the counter and accepts the signals from the load cells, and the signals from the counting proximity sensors which are installed on the winch drum pawl racks.

Up and down in the middle of the monitor screen are side-by-side bar scales, showing 0 to 80,000 lb. tension in each of the two trawl warps. These fill in or "drain away" very quickly as the load cells sense tension changes. A change from 300 Baud to 1200 Baud during development made an excellent upgrade in the display'sO responsiveness.

Across the top of the monitor screen is a double-ended scale with zero at the centerline. A red arrow moves left or right as a tension difference develops between the warps -- be it from wrong handed fish, hanging up one trawl door, or from turning the vessel.

At each side of the screen is a five digit counter, which shows the fathoms of wire payed out. At the base of the screen are menu clues which lead the operator into a considerable capability for counter zeroing, calibration, tare removal, etc. Not trivially, the entire "Basic" program can be called onto the screen for checking or for modification of the system constants.

During the initial Alaska trip, the owner came up with suggestions, and it was very practical to prepare a new program and tape, and fly the tape up to the vessel. In another case the tape was accidently "lunched", and again a replacement was readily furnished. We're told that the operators are thrilled silly with the way this system is helping them fish.

This successful sea story indicates to us that video monitors may well replace meters and dials and discreet counters. At least for the sheltered locations.

A west coast insitution is obtaining a video-based MMCo./Fathom system which will provide for up to four winches, with monitors at the aft pilot house windows overlooking the winch deck, and in two labs. Rather than using a Commodore (with the sole advantages of being cheap and quick), the plan is to utilize Macintosh Model 512E monitors -- which, incidently, many institutions can buy themselves at enormous savings compared to the cost to OEMs.

These black-on-white monitors use the floppy disc (greatly preferred over the cassette,) and although the winch display system does not require the use of the keyboard, it may be useful to include the keyboard so that the operator has a normal Mac at his fingertips for other functions.

The Instrumentation System Designer, at his factory, will be doing the programming on his own Mac 512E or equivalent, and will be generating the software directly onto the floppy that goes aboard the ship. One can reach only a little way into the far-out to imagine a vessel find a display glitch, and dialing up the factory over the modem and satellite, and having the designer cure the thing, on the spot.

Of course the format and style of the display is totally flexible, with only the operator's and programmer's imagination in the way. Bar charts are better than curved dials, to avoid the "zig zag" effect.

The cabling between the sensors and the MMCo System Computer, and between that and the one or more monitors is by single twisted pair wires, (plus ground) working in a high speed serial loop. The RS-422 electronic data transmission system is used. This system allows long distance wiring (up to thousands of feet), where another of the systems, the RS-232, is limited to runs in the order of 100 feet.

Rather than tackle the subject of the "SAIL" type data loop, which deserves its own presentation with infinitely more comprehension than I can provide, I'll say only that this form of "Querie-Response" is a useful way of moving information and instructions around a ship.

ISN'T ALL THIS A BIT MUCH, JUST TO READ OUT TENSION AND SPEED, AND COUNT?

Perhaps, but there's much more waiting in the wings.

The full S.A.I.L. interface and serial porting can be provided, to link the winch display system to the vessel's SAIL controller computer -- be it an HP-85, or whatever. With this linkup established, and with the MMCo./Fathom and Macintosh computers told to cooperate, data handling can fully enter the modern age. (Even without SAIL, the winch microprocessor with proper periferals can perform the similar functions.)

Al Driscol has long advocated the accumulation of research wire status and history data, as a means of developing cable retirement criteria. Properly developed, this should do wonders for the package loss insurance premiums. The MMCo/Fathom computer with its own upgraded floppy and printer, can do automatic logging of the working cable, operating independently, or tied into SAIL, and can record an amazing variety of wire facts. A typical printout for a lowering in progress might read as follows:

(see next page)

DATE: 4/25/85
GMT: 13:40
WINCH: DESH-3 30HP
S/N 8975
WIRE: 3/16 TB
DRUM: OSU xxxxx
YIELD,LBS: 3500

METERS OUT: 2,575
METERS/MIN: 123
TENSION: 2,674

A typical printout for a hypothetical vertical cast and recovery to 3000 meters would be, for example,

DATE: 5/03/84
GMT: 07:12
WINCH: DESH-6 40HP
S/N 9076
WIRE: 322 EM
DRUM: OSU xxxxxx
YIELD,LBS: 5500

LAST OPERATION

MAX SCOPE:
METERS 3002.00

SCOPE IN/OUT:
KILOMETERS 6.04

AVERAGE SPEED:
METERS/MIN 38.35

PEAK SPEED;
METERS/MIN 52.00

PEAK TENSION:
LBS 4410.00

SCOPE AT PEAK TENSION:
METERS 3001.00

AVERAGE TENSION:
LBS 2745.00

REGENERATED WORK
LOWERING:
HP-HRS 7.80

HOISTING WORK:
HP-HRS 17.50

FATIGUE DISTRIBUTION
PER 100 METERS

KMETERS	LB-HRS	# OF CYCLES	MAX LBS TENSION	MIN LBS TENSION
0.1	350	8 *	2520	0 *
0.2	145	2	2250 *	850
0.3	147	2	2578	874
0.4	147	2	2654	886
0.5	150	2	2723	890
0.6	133 *	2	2758	210 *
0.7	134	2	2843	350
0.8	138	2	2875	320
0.9	142	2	2956	410
1.0	146	2	3010	410
1.1	150	2	3070	450
1.2	154	2	3140	467
1.3	156	2	3210	480
1.4	158	2	3280	580
1.5	159	2	3356	650
1.6	163	2	3425	890
1.7	164	2	3495	940
1.8	166	2	3553	936
1.9	168	2	3625	970
2.0	171	2	3685	1020
2.1	175	2	3764	1050
2.2	178	2	3845	1035
2.3	181	2	3905	1124
2.4	183	2	3980	1236
2.5	188	2	3911	1268
2.6	191	2	3988	1297
2.7	193	2	4045	1345
2.8	197	2	4124	1378
2.9	198	2	4260	1389
3.0	215	4	4330	1456
3.1	723 *	6 *	4410 *	1845 *

The above data is added to a non-volatile file which stores the accumulated history of the cable from lowering to lowering. The data from the present lowering is overwritten by the next, and therefore must be stored on tape, using the MMCo. Winch Instrumentation Program, or printed out if hard copy is desired.

The accumulated wire history data can be printed out in the same format. New catagories can be added, as necessary.

After cable logging, the matter of ALARMS arises. With the data stream constantly flowing, lamps and buzzers or deck horns can be taught to respond to a wide variety of conditions it would be useful to know... such as ...

NEAR SURFACE ALARM I've been wondering about this for years since watching Max Silverman pull a 10 inch lead ball up through the head sheave aboard the old ARGO off the California coast, while exercising a new MMCo. electric winch. Made rather a mess! The alarm's set point is easily selected, either in the floppy disc, via a keyboard, or by button sequencing as you would manipulate your digital watch.

AT-DEPTH ALARM A simple advisory that the desired scope had been payed out. Wire scope and pinger depth are NOT synonymous, but the alarm could be triggered either way.

HIGH TENSION ALARM A tension peak reaching a set value could be most useful in evaluating the working conditions.

LOW TENSION ALARM A tension "valley" less than a set value could warn of excessive payout speed and the possible development of the dreaded slack loops.

BITTER END ALARM A suggestion that the cast has gone deep enough, thank you very much...

This type of alarm signal has a similarity to idiot lights on your car -- not really a replacement for an alert operator with good readable instruments. But they could be particularly useful where the winch was not in an operator's line of sight.

The next logical and available step is to hook up the ALARMS, so that THEY DO SOMETHING!

AUTOMATIC NEAR-SURFACE SLOW DOWN. With proper winch drive design, the instruments and computer could reduce the winch hoisting speed to a an adjustable creep value for the last 50 meters (or whatever), to provide more time before pulling the basket through the sheave, or to give a mechanical anti-two-block device a better chance to do its thing. Manual override would allow the operator to return to his own preferred speed, at once.

SCOPE STOP The winch could decelerate (at a suitable rate) and stop at a selected scope (or depth.)

CONSTANT SPEED Given reasonable water, and within a positive tension envelope, a "Cruise Control" setting could be dialed up to allow the winch to hoist or payout at a fixed speed.

NOTE that the speed control feature can easily be "LAYER COMPENSATED" so that the winch drive adjusts its speed slightly at each layer change. This feature permits the basic single drum machine to emulate one of the best features of a traction winch -- (speed independent of scope) -- but that's another subject.

TENSION LIMIT CONTROL The winch can respond by slowing down the hoist if the tension reaches a set value. The change in payload drag and cable drag with speed provides a good band of response for this feature.

PLANNED CAST PROTOCOL A sequence of directions, speeds, depths, time delays, and loads could be written to define any repeatable pattern that the scientist might devise.

IMPORTANT CAVEAT
A great deal of effort and treasure is being "expended" in the search for a total "smart winch" which will allow science to proceed in the midst of a typhoon. Accelerometers and a good instrument and computer system certainly are capable of DITHERING a minimum-inertia winch drum in harmony with the motions of the ship. Ideally, it should be possible to keep the payload speed constant relative to the world. (which implies an unchanging value for line tension.)

Exaggeration and a few hard-earned sour grapes aside, if you need full "smart winch" capability you'll be working with a Naval Architect to analyze your ship, as well as with a winch builder. You'll perhaps be using Kevlar cable, (maybe yes, maybe no...) and you'll be providing LOTS of winch drive horsepower. This is not my assigned subject for today, and we watch with fascination the work that is proceeding.

The ALARMS and SERVO WINCH CONTROLS which we ARE suggesting are available NOW, and they are available for use in realistic sea conditions. They should allow work to proceed in tougher seas than have traditionally been convenient, but HOW MUCH TOUGHER is a highly developmental question.

(MMCo. will work with any interested and realistic customer in the development of new winch features, and will provide its usual "Hell For Stout" machinery that does at least what it's sold to do.)

This is one reasonable place to end this discussion. We were hoping to have Barry Griffin of Fathom Corporation here with us, to work with you on the Bauds and the Milliamps and the Eproms. As a winch man, I'm excited by the opportunities which are opening up, and I vastly appreciate the opportunity to bend your ears...

APPENDIX I -- Sheave Diameters

Repeating the "Green Book's" truism, MORE IS BETTER! There has been an increasing interest in actually USING larger sheaves - since any reasonable step to improve cable life and reduce the number of cable failures is worth taking.

A number of proposals are outstanding which include physical replacement of 1/2 meter wheels with 3/4 meter or 1 meter, and replacement of 3/4 meter and 1 meter wheels with 1-1/2 meter.

No one has seriously suggested using 2 meter sheaves (YET), since the volume of the assembly becomes hard to countenance. Stacking the entire level-wind and sheave assembly ON TOP of the winch is a do-able means of minimizing the deck shadow. The recent "Gyre" DESH-5 is a good example of this layout.

A rewriting of the 1982 Green Book's suggested sheave tabulation might look something like the following:

Wire Diam.	Sheave Pitch Circ.	Pitch Diam.	Root Diam.	Root over Cable
1/8	1/2 Meter	6.266	6.14"	49x
3/16"	3/4 Meter	9.4"	9.21"	49x
1/4"	3/4 Meter	9.4"	9.15"	36.6x
5/16 & 0.322"	1 Meter	12.53"	12.21"	37.9x
3/8"	1 Meter	12.53"	12.16	32.4
7/16"	1-1/2 Meter	18.8"	18.36"	42x
1/2"	1-1/2 Meter	18.8"	18.3"	36.6x
9/16"	1-1/2 Meter	18.8"	18.24"	32.4x
5/8"	1-1/2 Meter	18.8"	18.18"	29.1x
0.680"	2 Meter	25.06"	24.38"	35.8x
3/4"	2 Meter	25.06"	24.31"	32.4x

If an arbitrary minimum of 30 diameters is established, the only "shortage" is with the 5/8" cable on the 1-1/2 meter sheave. A ratio of 35/1 creates several problems, and if a diameter ratio of 40/1 is selected as a desirable target the problem and the cost are obvious. The sheaves just have to get larger!

Once the decision has been taken that the sheaves on an existing winch are smaller than current "druthers" dictate, the practical approach is to obtain a larger replacement head assembly. You'll also need the extender dutchmen and modified drive which relocate it so that the drum-side guide sheave clears the drum and wire.

And with that retrofit in hand, the opportunity presents itself to design the replacement head to incorporate the proximity sensors and upgraded tension cell, and to change over to electronic displays of either the Meter Type or the Video Type.

With new equipment, the opportunity awaits the touch of the designer's pencil.

Which ties this digression back into my subject of "Instrumentation."

Thank you...

APPENDIX II -- Why the Mac 512 E ??

With such a variety of computer equipment available, and with apologies for the apparent sales pitch, a summary of the reasons behind Fathom's recommendation of the 512E might be useful.

1) The RS422 port and protocol are built in. The two ports are industrial high-speed and low-noise types.

2) The graphics are present within the chips, and are not added via external floppy or memory.

3) Single floppy disc drive built in. (It does know how to copy).

4) The floppy is the small and ruggedized type.

5) The 512E is relatively inexpensive.

6) The Mac's symbolic method of communicating with its oprator may be easier to learn than the IBM type.

7) Universities and institutions have many Apple machines in place.

8) Other Macs can be upgraded to do this same job, but when compared to the 512+, the 512E has a better mechanical grade of connectors.

Appendix XI

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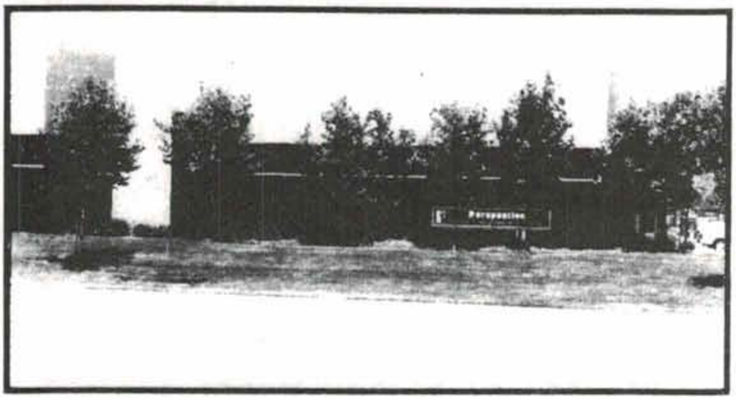
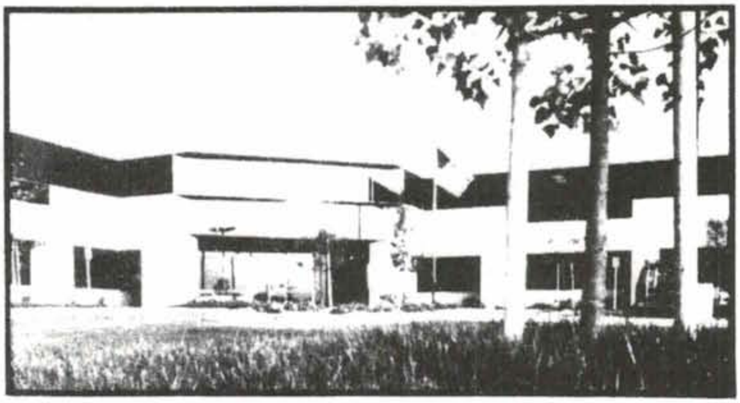
PERSPECTIVE
A COMARCO Company



- **F**ounded in 1976, Based in San Diego, CA.
- **P**rovides a wide-range of training analysis, design and implementation services to government and commerce.
- **S**elected by the U.S. Navy to train its forces afloat in anti/counter-terrorism security measures.
- **M**aintains two full-time security training teams in San Diego and in Norfolk, VA.
- **T**he following is a list of organizations who have utilized the excellence of **Perspective:**

U.S. Navy, U.S. Naval Reserve, U.S. Army, Naval Security Investigative Command, U.S. Air Force, Federal Bureau of Investigation, U.S. Coast Guard, Veterans Administration, Department of Labor, Marine Transport Line, Military Sealift Command, Wickes International Corporate Headquarters, Central Federal Savings, and U.S. Postal Service.

COMARCO



- **F**ounded in 1960
- **C**orporate headquarters Anaheim, CA
- **C**alifornia "500" Company
- **1400** employees
- **O**ffices nationwide devoted to providing government and commerce with: *Effective Training Services, Weapons Systems Analysis, Engineering and Technical Services, and Automated Information Systems.*

PERSPECTIVE'S
MARITIME SECURITY PROGRAM

- ☐ Security Survey
- ☐ Ship Security Plan
- ☐ Security Training

TRAINING TOPICS
(Day One)

Threat Awareness

- *Pirates*
- *Terrorists*
- *Deranged Individuals*
- *Criminals*

Bomb Threat Handling

Recognition of:

Explosives
Weapons
Hazardous Materials

Practical Application

- *Bomb Search*

Restraint Techniques for Violent Persons

TRAINING TOPICS
(Day Two)

Recovery and Processing of Refugees at Sea

Special Measures for Defense Against:

› *Pirates*
› *Underwater Swimmers*
› *Small Boats*

Emergency/Duress Communications

Hostage Situation Management

› *Negotiating Techniques*
› *Survival Techniques*

Using the Ship's Security Plan

Assessing the Threat During Your Cruise

› *Sources of Information*