I-0618-276-1710

1-71

THE MINE AND DEPTH CHARGE

TROUBLESHOOTER

AN OFFICIAL *NAVORD* PUBLICATION

AN OFFICIAL NAVORD PUBLICATION

RADM MARK H. WOODS, USN
Commander, Naval Ordnance Systems Command

The Troubleshooter is an official NAVORD publication which disseminates informative articles pertaining to assembly, testing, safety, configuration, maintenance, and delivery of U.S. Naval mines and depth charges. When the word DIRECTIVE appears as a part of the mine heading of the article, the content that follows contains information requiring action that is mandatory and shall be acted upon promptly. The Troubleshooter issue is your authority for such action.

Troubleshooter is also the journal for the Rudminde Program, a world-wide defect-reporting system, which promotes a high level of readiness in U.S. Naval mines and depth charges. Problems with these weapons are to be reported via NAVORD Form 8500/1 (2-68) to the Naval Mine Engineering Facility as directed by NAVORDINST 8500.3.

CDR ROLAND H. ALMONRODE, USN
OIC Naval Mine Engineering Facility

HAINES A. MILLER
Technical Director

STAFF

THOMAS R. NEVITT
Editor

LCDR LYAL M. STRYKER
Associate Editor

CWO P.E. DECHENE
Assistant Editor

THE MINE AND DEPTH CHARGE

TROUBLESHOOTER

ISSUE 1-71 1 APRIL 1971

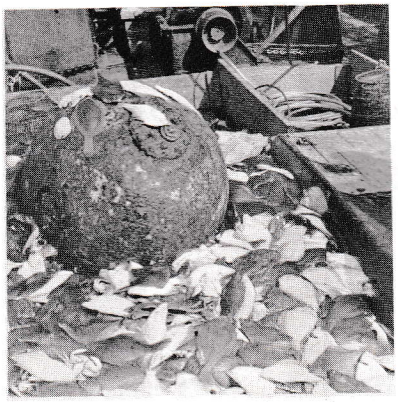
CONTENTS

REGULAR FEATURES

ARTICLES

COVER

It is a strange fish that appears among the catch of flounder on this fishing boat off the New England coast. A Mk 6 mine that got caught in fishing gear is hoisted aboard by the crew after an ordnance disposal expert determines that it is harmless.



PUBLISHED BY THE NAVAL MINE ENGINEERING FACILITY, YORKTOWN, VIRGINIA, 23491

Troubleshooter is published quarterly and printed by NPPSO–5ND, in accordance with NAVEXOS P–35. Contributions, address changes, and matters concerning distribution should be addressed to: Editor, The Troubleshooter, Naval Mine Engineering Facility, Yorktown, Virginia 23491, USA. Requisition additional copies from the Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, Pennsylvania 19120, in accordance with NAVSUP 2002. Distribution outside the Department of Defense must have prior approval of the Naval Mine Engineering Facility.

FLEET LIAISON SHOPTALK

A COLUMN OF OBSERVATIONS

MINES CLEARED IN NORTH SEA

The U.S. Naval Institute Proceedings, January 1971, printed this item of interest to minemen as it was reported in the columns of The Christian Science Monitor 29 October 1970:

"Six years' work by an international fleet of minesweepers has opened up a new shipping route across the North Sea.

"It lies through thick mine fields planted during World War II, which still make part of the sea north of Holland dangerous for travel.

"The new channel--cleared by 80 minesweepers of the Dutch, Belgian, West German, French, British, and Norwegian navies-- is 250 miles long, eight miles wide, and is being marked by a row of giant illuminated buoys.

"When put into use shortly, ships traveling to and from northern Germany, Scandinavia, and the Baltic will no longer need a special pilot for that risky stretch.

"Very large vessels, including tankers and bulk carriers, will also be able to use this northern route. Until now they have been banned because of the insufficient depth and maneuvering space available for such large vessels."

AIR-OPERATED HOIST AUTHORIZED

When the gantry A-frames were procured to facilitate the vertical marriage of Mines Mk 56 and 57 they were equipped with hand-operated chain hoists. This was done so that any mine site could operate the equipment upon receiving it regardless of the power available, electric or air. At the same time there was a requirement to procure the A-frames quickly so the decision to buy them with two readily-available hand-operated chain hoists was the answer. Hand-operated hoists can accomplish the job under any circumstances without awaiting power hook-up. But they are slower and more cumbersome than power hoists. The result is that mine sites have found that the hand-operated chain hoist makes it difficult to meet maintenance schedules and readiness requirements, and requested authority to use pneumatic hoists to speed the mine-marriage procedure.

The Naval Mine Engineering Facility has granted this authority and has no objection to the use of a pneumatic hoist of proper design to supplement the use of the hand-operated chain hoist. Should a mine activity decide that a power hoist is needed they can buy it but its funding, maintenance, and certification in accordance with on-site safety regulations will be the responsibility of the activity. Its purchase would be through supply channels by procedures used in making any open purchase. One pneumatic hoist should be all that is needed for each A-frame as the hand-operated hoist can be just as efficient for handling the anchor end of the mine which requires much shorter lifts during the marriage operation. Also keep that other hand-operated hoist available for use if your power supply fails or power hoist breaks down--or if you are ever in a situation where air is not available.

A pneumatic hoist that meets the requirements of NAVMINENGRFAC has been used by NWS, Yorktown, and is approved by NAVORD for explosive handling. This hoist Ingersoll-Rand Model No. HLA30A, has demonstrated its reliability and comes with standard equipment that can be ordered with variations to meet the particular needs of the customer. Accessories that will be required are also available. What mine shops will need is a hoist of 1-1/2 ton capacity, 8 ft of pull cord throttle, 18 ft of link chain, chain storage bucket, safety top hooks, safety bottom hook and a maximum lift speed of 20 ft/min. The extra 8 ft of link chain, the chain bucket and the safety top hook will cost extra. The total amount for the outfit as described is about $900.00. There is no modification of the A-frame trolley required when installing the pneumatic hoist. Merely remove the chain hoist and use the top safety hook to install the pneumatic hoist.

You can write the main office of the Ingersoll-Rand Company, 11 Broadway, New York, New York 10004 to obtain the information needed for determining your requirements before ordering. Some features incorporated in the Ingersoll-Rand hoist that should have counterparts in any hoist used with the A-frame include:

- Multiple-disc load brake--The brake is self-locking under all loads; will not slip under overloads. It is automatically applied in case the air supply is shut off. It also assures precise spotting. The hoist may be manually operated to raise or lower a load if the air is shut off.
- Built-in oil chamber--oil level gauge permits instant visual check of oil level.
- Efficient muffler--muffler eliminates harsh, irritating noise frequencies.
- Lift speed control--the lift speed can be controlled from near zero to 20 ft/min.

To power the hoist the air system must be capable of delivering 12 cubic ft/min at 90 PSI. Also the system must be clean and dry. If there are no air filters and condensation traps in the existing

Continued on page 2

The FLEET LIAISON STAFF

Naval Mine Engineering Facility, Yorktown, Virginia 23491

The FL Desk responsible for this Shoptalk column stands ready to assist minemen everywhere with their problems, large and small.

Lt. Paul W. Hanks, Department Head
CWO B. E. Wharton
CWO O. G. Smith
CWO P. E. Dechene
CWO R. W. Padgett

COMMERCIAL (703) 887-7336 / 887-7337
AUTOVON 953-7336 / 953-7337

SHOPTALK

Continued from page 1

air system, it is recommended that condensation traps with air filters such as the 300 psi mac, model no 603-8, Watts Mfg. Co., Ronceverte, West Virginia, or equal, be installed. The cost for such an installation should approximate $25.00.

HANDLE WITH CARE

Does your mine shop have a tool board for its handling equipment?

If not you should make one.

Is it being used?

If not supervisors should see that it is.

Most shops have such a tool board but even those that have may not be using them as they should. If equipment is not in place it is "lost." Carriers, slings and allied equipment are by necessity rugged; designed to lift heavy loads, but they are not indestructible. A carrier carelessly left on the deck when not in use is not improved when a truck operator fails to see it and drives over it. A nylon sling such as the Mk 101 may survive such treatment but is not made better by ground in dirt and by being accidentally splashed by grease or solvent. None of these things would happen with the gear on a tool board.

There are other benefits. When it is on a board you would always know where to look for a needed piece of equipment. Also at the end of a work day a glance at the board will quickly tell a supervisor if all equipment was properly stowed or identify pieces that had been misplaced for somebody to fall over.

Taking care of your handling equipment is not only good housekeeping but also it is being cost and safety conscious.

ABOUT ELECTROLYTIC CAPACITORS

MINES MK 25-0, 2/27-3,5/36-3

Believe it or not, two questions about electrolytic capacitors continue to be asked:

Are they stored in or out of firing mechanisms?

Do they benefit from refrigerated storage?

To those who know their OPs pertinent to Firing Mechanisms A-6, A-8, M-11, and the mines they are used in, also know that the firing mechanisms are not issued with capacitors installed. So the answer to the first question is that the capacitors are stored out of the mechanisms when the mechanisms are stored out of the mines.

As for the temperature at which the capacitors are stored, the advice has been to store them in a "cool, dry place". Some say this allows too much room for interpretation, but the fact is that storage temperatures are not critical for these capacitors. While refrigeration may well extend the useful life of a capacitor, such benefit is marginal and such use of refrigerated storage should be provided accordingly.

Because the capacitors are hermetically sealed, humidity control is not a consideration.

And that, we think, covers the problem.

Of interest to readers of Publications Report is Troubleshooter Bulletin No. 240 which explains why 1971's second quarter revision of OP 3504 VOL 7 has not been released as scheduled. Speaking of bulletins note that Bulletin No. 239 on the subject of pub obsoletions, cited in the 4-70 issue Report, has been superseded by Bulletin No. 243.

Recently Distributed

- OP 1860 VOL 1 REV 3 CH 1: Alters Set 456 Calibration procedure
- OP 2572 VOL 2 REV 3: Drill Mine Mk 56 Assembly
- OP 2608 VOL 1 PT 2 REV 1 CH 1: Update standard mine-operational setting
- OP 2718 VOL 2 REV 2: Mine Mk 57 Assembly
- OP 3504 VOL 4 REV 4 CH 1: Update battery and spacer requirements

Released to Print

- OP 1452 VOL 2 REV 4 CH 3: Adds B-test for Arming Device Mk 10, 11, and Depth Control Unit Mk 78
- OP 3232 REV 0 CH 1: Adds operational assembly chart and restricts use of arming wire to Mk 4 Mod 1 only
- OP 1935 VOL 1 REV 2 CH 3; OP 1935 VOL 2 REV 1 CH 1; OP 1935 VOL 3 REV 1 CH 1: Adds Assembly configuration instructions and maintenance requirements for Mine Mk 27 Mods 2 and 3
- OP 2363 VOL 1 REV 1 CH 3; OP 2363 VOL 2 REV 1 CH 1; OP 2363 VOL 3 REV 1 CH 1: Adds assembly configuration instructions and maintenance requirements for Mine Mk 27 Mods 4 and 5
- OP 1892 REV 3 CH 1: Shifts the requirement for visual-clock inspection to extender-installation job sheet.

In Final Preparation

- OP 1452 VOL 2 REV 4 CH 4: Adds B-test for Anchor Mk 56 Safety Device
- OP 1452 VOL 4 REV 4 CH 1: Alters B-test for CD-8, CD-10, CD-14, and CD-17
- OP 1765 REV 4 CH 1: Shifts the requirement for visual-clock inspection to extender-installation job sheet
- OP 3504 VOL 5 REV 2 CH 1: Add test equipment allowance

In the Works (in order of intended release)

- OP 3379 VOL 1 REV 1: Maintenance Guide
- OP 1860 VOL 6 REV 0 (Secret): Adds Sets Mk 435-0, Mk 436-0, and Mk 450-0
- OP 1452 VOL 3 REV 4 CH 2: Updates color code, and stenciling requirements
- OP 3388 VOL 1 REV 1 CH 2: Add leakage test apparatus qualification procedures

* *This report is designed to keep readers abreast of what is going on behind the scenes concerning technical manual projects. It is not designed to compete with OP 3504 VOL 7, which is the only list of technical manuals, revisions, and changes authorized for fleet use.*

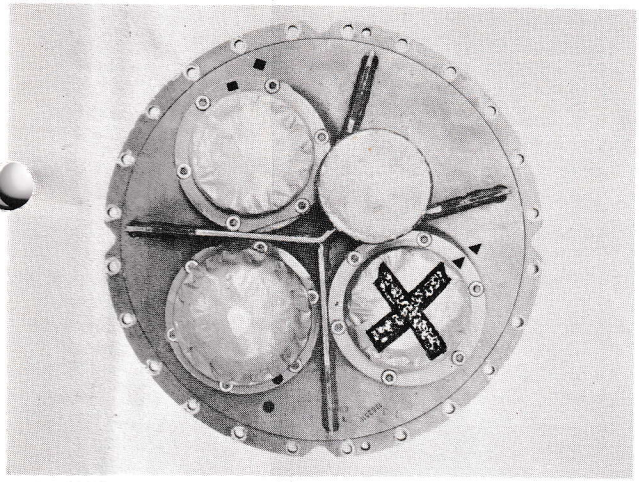
MOISTURE BARRIERS- NO LONGER MANDATORY

L MINES:

SECOND thoughts on covering case openings of stored mines with moisture barriers have resulted in revised requirements. Specifically, barriers are now mandatory only to protect rubber or synthetic diaphragms from direct exposure to light and air (oxygen and ozone), rather than for protection from moisture as was formerly the case.

The earlier "all-openings" policy was the outgrowth of reports from the Fleet of situations peculiar to individual sites, requiring protection from such hazards as trash, water, rodents, etc. The result: What was a must for one site could be wasted effort at another.

Items on which barriers are now mandatory for all ABCD-Configured mines include the A-6 firing mechanism (diaphragm exposed on the tail of Mines Mk 25 Mod 2), and the A-8 diaphragm on Mine Mk 36 Mod 3. Firing Mechanism A-8 also requires a barrier when installed on the tail of the explosive section of the Mine Mk 27 Mod 3 and the war-battery section of the Mk 27 Mod 5, though the barriers must be removed when the mine sections are married to convert the mine to an assembly configuration higher than D.



Covering depth compensator no longer a mandatory requirement.

On the Mines Mk 52/55 Mods 1, 3, 4, 5, 6 barriers are required on the hydrophones and pressure detectors. This change in policy does not prohibit covering other openings if needs peculiar to your site demand it in the opinion of the site supervisor, including protection of flight gear on Configuration-A mines. Parapacks undoubtably should be bagged when exposed to moisture or subject to rodent or insect damage, but they don't actually require it otherwise. Small mine-case openings such as those for scuttling can be protected from debris by application of tape alone if not otherwise sealed off.

In recent months there has been some dissatisfaction with barrier materials and tapes that have been substituted for the older items in the supply system, but help is on the way. First result is a tape now identified as 5T00038 which is the best available for the purpose. Shortly this will be followed by barrier material now being standardized under MMC 5B00501, primarily to maintain stockpile consistency and uniform heat-sealing characteristics. Until you are notified by NAVMINENGRFAC that the material is available, however, it will be necessary to continue use of the barrier material you have on hand (formerly 3B00004).

Using this material, the method of application remains unchanged. Obviously, all tape and barriers must be stripped off mines before delivery to the planting agent.

STERILIZER SETTINGS FIXED

DRILL MINES MK 36-3/52/55:

New changes to manuals for the assembly of drill mines using Drill Float Mk 17 will restrict sterilizer settings to the use of two electrolytic timing elements: Resistor F (the black one) that is supplied installed in SD-4 sterilizers, or Resistor Plug D (the red one) in Sterilizer Mk 10. Both delay sterilization beyond the maximum operating period of Delay Switch Mk 64 which controls the release of float.

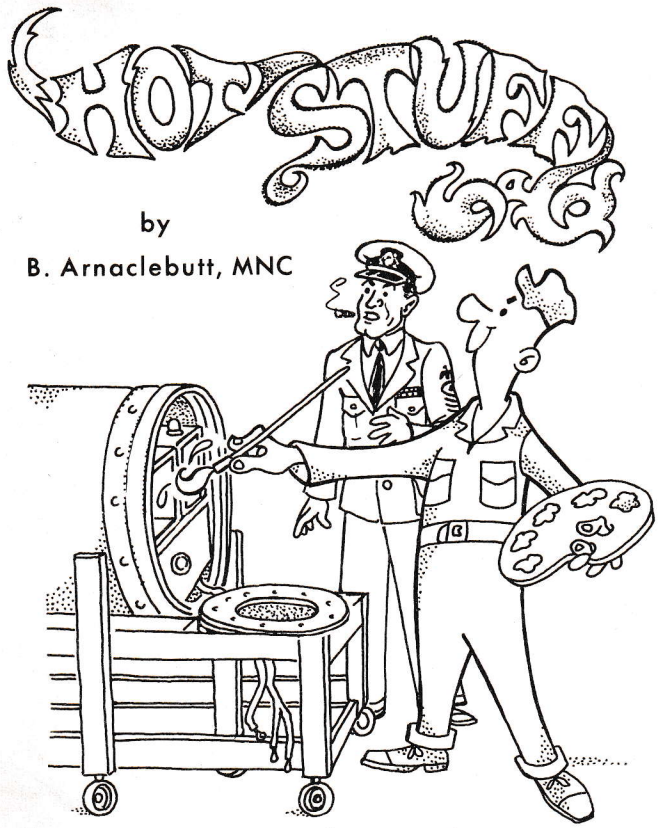
This is in conflict with OP 2637 VOL 2, which states sterilization time must always be less than recovery time, a holdover from the days of Drill Float Mk 15 which is no longer valid now that OAs using that float have been cancelled. In those drill OAs the act of "sterilization" was employed in the process of signalling actuation rather than for self-destruction, whereas current drill OAs, with the newer drill gear, provide for actuation signalling via the delay switch. Thus NOL, now updating OP 2637, will delete the "sterilize-before-recovery" operational requirement.

In the current OAs, sterilization setting less than a recovery setting is objectional because post-recovery analysis after sterilization would be of limited value, and any leakage of battery electrolyte will damage components. Actually, recognizing that these conditions exist, the mines have generally been recovered before they have sterilized regardless of what resistor plug was used.

TAKE CARE, SAVE KNOB

MINES MK 52/55:

Mine Readiness Inspection teams report a number of the larger knobs on test-set panels have been falling off while being handled. Many of them are being needlessly broken or lost as a result. The mechanism and battery test selectors on the Test Set Mk 263 appear to suffer the most. To insure against such damage keep these knobs tight on their shaft at all times. A turn of a screwdriver on a set screw will do it and save $1.30, the cost of a replacement knob, FSN 9Z5355-619-4669.



by

B. Arnaclebutt, MNC

Interior decorating

ALL MINES:

Dear Hot Stuff:

When the paint job on a mine interior deteriorates, is scraped, or develops rust spots, is it necessary to repaint or will a touch-up be enough? When the maintenance cycle rolls around this question finds backers on both sides.

MN1 PON

Dear PON:

The interiors of the mechanism compartments for older mines were painted white by the manufacturer to improve visibility and not for beauty. For the Mine Mk 56 it is the interior of the mechanism section that is painted and the Mine Mk 57 is not painted at all.

When rust spots or bare areas are discovered on the interior paint job in the course of maintenance of an older mine all that is required is a touch-up, but not with white paint. Instead use an authorized zinc chromate primer after using an abrasive to take off rust and loose paint, and a solvent cleaner. Apply with a brush and not by aerosol spray which causes objectional paint dust. Your paint brush should not be full to the point of dripping and the paint coat should be well brushed out to avoid runs.

Exceptions are the Mine Mk 56 (stainless steel) which should need no touch up, and the Mine Mk 57 (fiberglass) which needs no interior paint at all.

B. Arnaclebutt

Extra cables ready

MINES MK 52/55-3, 4, 6

Dear B. Butt:

Back in Troubleshooter 4–68 we were told that additional cables, CA–34 and CA–35, would be added to the Accessory Set Mk 17 to speed up the testing of Pressure Detector Mk 1 using Test Set Mk 266. We know these things don't happen overnight but how about a progress report?

MNC PDT

Dear PDT:

It is happy we are to make a progress report when it is progress we are reporting, and the fact that those cables will be ready for issue by the time you read this is progress!

The purpose of these cables is explained on page 4 of Troubleshooter 4-68 and their use is authorized in OP 2567 for testing Firing Mechanism Mk 22. What you need to know now is that the planned allocation of 12 of each cable for each Accessory Set Mk 17 is no longer valid. The best we could do was make it up to 12 of each cable for each Test Set Mk 266.

Distribution will not be automatic so you'll have to order what you need--please, order no more than you need--based on the number of pressure detectors you know you'll need to process at any one time. The identification data will be added to OP 3504. Meanwhile Cable Assembly CA-34 has been assigned MMC 4C00001 and FSN 1A1350-873-2738 and CA-35 has been assigned MMC 4C00004 and FSN 1A1350-873-2739.

Remember, please, order no more than you need. Procurement dollars are not what they were when that 4-68 Troubleshooter was written!

B. Arnaclebutt

Tool for hydrostat test

MINE MK 56:

Dear Chief:

Some arming tools, for use in cocking the Hydrostat Mk 4, which are supplied with Test Sets Mk 347, have been deformed and otherwise damaged by repeated use. The stress of the cocking operation appears to be too much for this tool. Provisions for replacement of damaged tools should be considered.

TRN

Dear TRN:

Tool replacements for which you are looking are not only being considered but are in process of being procured. The tools started out being made of carbon steel which was subject to corrosive action. The present tool is made of aluminum which solved the problem of corrosion but sacrificed ruggedness. The replacement tool will be made of stainless steel which is noncorrosive, nonmagnetic, and strong enough to stand abuse. If your present arming tool is so beat up that is doesn't function properly write the Facility requesting a new Arming Tool Assembly, DWG 3014498, supplied with Test Set Mk 347, MMC 4T27248. Request one for each test set. When the new tool is available it will be sent you

without further correspondence. If your present tool is satisfactory make no request for replacement but keep on using it.

B. Arnaclebutt

Seeing eye to eye

DRILL MINES 25-0,2/36-1,3/52/55:

Dear Chief Butt:

While overhauling eighteen Mk 17 drill floats it was found that the mooring-line eye 9F12069 of the replacement lines would not mate with the threaded hole intended for it in the float bodies. The mooring cable was manufactured by the James Walker Company and the float bears the contract number N600-19-58854. Either the floats are not manufactured to specifications or two different mooring lines are in the system although only one stock number is listed.

MNC MMH

Dear MMH:

Your trouble is caused by having floats of original design and replacement mooring lines of newer design. The older Mk 17 drill float had a 7/8-inch threaded hole to receive a matching threaded eye on the original mooring lines. The newer float has a 1-inch hole in its body with a corresponding 1-inch screw eye on its mooring line. The only mooring line stocked is the newer one so replacements 9F12069 will not fit the older float with its 7/8-inch hole. These older floats are being reworked with 1-inch holes but some are still around that occasionally the fit problem occurs.

Mk 17 floats with serial numbers 1 through 290 should be checked to determine if they will accept the eye on the new mooring line. If they do not, tag them to that effect, report as Code F, requisition replacements, and await disposition instructions.

B. Arnaclebutt

Instrument rack rails

MINE MK 57:

Dear Barnacles:

Mechanism Sections Mk 2 are still being found with loose instrument rack rails. When discovered during the course of maintenance the instructions in OP 3379 VOL 15 take care of the problem but when pressed to fill an OP order during a mine readiness inspection or a load-out we need to cut corners. Advice!

MNC PRT

Dear PRT:

When time permits no other course go with loose or no rails. The rails are simply an assist in instrument rack installation; the clamps hold the rack in place. It will be more difficult to assemble your weapon but it will function just as well when planted. Remember however that it is to your benefit to repair the rails per OP 3379 whenever time allows.

B. Arnaclebutt

The mine crew at NAF Sigonella poses for a recent group photo that includes members of MOMAULANT Detachments Golf, Hotel and Mike. Those in the picture, from the left, are:

Kneeling: MNC G. W. Oxendine, MNC F. X. Martin, LT R. F. Ruhland (Officer-in-Charge), MNC R. L. Koeller, MNC S. D. Radke. First Row: MN3 A. S. Hansen, MN3 D. L. Baldauf, MN3 J. E. Jones, MNSN D. J. Smith, MN1 E. Gillespie, MN3 S. L. Blackwell, MN3 M. D. Thoma, MNSN L. L. Haller, MNSN W. M. Pollock. Second Row: MNSN J. H. Myers, MNSA M. P. Hubnik, MNSN W. H. Ritchie, MN3 J. O. Miller, MN3 W. T. Roach, MN3 R. C. Worth, MN2 H. H. Busby, MN1 J. H. Higdon, MN1 B. Martinez, MNSN D. S. Trayes, MN3 W. D. Collett. Third Row: MNSN W. R. Paris, MN3 P.A. Fitzgerald, MNSN W. J. Larned, MNSN C. W. Weber, MN2 W. E. Dixon, MNSN C. E. Thom, MN1 H. B. Steen, MNSA K. E. Cooper, MNSN J. E. Shaw, MNSN M. F. Bennett, MN3 J. D. Oliver.

Those not present when the picture was taken are MN3 J. B. Olbert, MN3 M. C. Traver, and MNSA D. E. Ditzler.

THE MICROMETER

From an article by Jack Rutledge, Chief Inspector, McDonnell Douglas Corporation, in that corporation's Product Support Digest.

THE principle of the micrometer caliper-- using a screw thread for precision measurement--was discovered in 1637 by William Gascoigne, a young astronomer of Yorkshire, England. The inventor could hardly have foreseen the future possibilities of his discovery for he was not concerned with the measurement of mechanical elements, and it took more than two centuries to translate his idea into a machinist's tool.

Henry Maudslay, one of the founders of the machine tool industry, recognized the need for precision in any machine designed to make elements for other machines. It was he who built the first screw-cutting lathe entirely of metal in 1800. The critical element of this lathe was a satisfactory master lead screw the production of which required ten years of diligent work on his part.

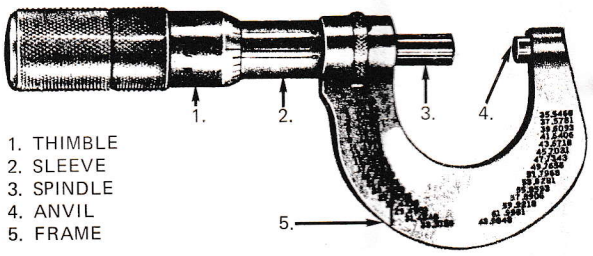
Although Maudslay did not invent it, he did build a screw micrometer caliper in 1805 for use in his own shop which was probably the most accurate instrument of that day. It was a bench-type instrument, not a hand micrometer.

In 1883, after his apprenticeship in and about London, a Joseph Whitworth set up his own tool shop in Manchester. At this time the form of screw threads was still pretty much a matter of personal preference, and it was only by chance that a bolt made in one place would mate with a nut made somewhere else. Thus a bolt and its mating nut, once made, were kept tied together until they could be used. In 1841, Whitworth started a personal campaign to bring order out of this chaotic condition by promoting a thread form which he had designed and which is still known as the Whitworth thread.

Another significant contribution by Whitworth was a measuring machine: the most precise instrument of its kind up to that time, sensitive to a millionth of an inch! Its principal elements were a frame of great rigidity, a precision lead screw, and a graduated micrometer disc. All of these had previously been known and used, but Whitworth realized that in dealing with measurements of such unheard-of accuracy, the amount of gaging pressure was extremely important and must be controlled. The result was his addition of a "feeling piece"--a small disc of steel with parallel polished faces. With the feeling piece between the gage jaw and the work part, measurement was only made when pressure just sufficient to keep the feeling piece from dropping out was exerted.

THE MICROMETER TODAY

Today the term micrometer, or "mike," is almost invariably applied to the standard, conventional one-inch micrometer caliper (Fig. 10) although there are many other types and sizes, all based on the same principle--that a screw turning in a nut, with the point or end of the screw advancing toward or receding from the opposite anvil of a "C" frame. Technically, the anvil is the fixed measuring surface. Usually it is clamped in the frame of the instrument's reference surface. The movable measuring surface, which fixes the measured point, is called the spindle.



1. THIMBLE
2. SLEEVE
3. SPINDLE
4. ANVIL
5. FRAME

MICROMETER PARTS

The screw of the micrometer is cut 40 threads to the inch so that when it is turned one revolution, its point (spindle) has advanced 1/40 inch. The micrometer thimble (sleeve) surrounding the screw and fastened to it, has 25 graduations engraved on its periphery in such a manner that the eye can easily register 1/25 of a turn of the screw. One twenty-fifth of 1/40 equals 1/1000; therefore, if the screw is turned 1/25 of a revolution, its point has moved 1/1000 inch.

TIPS ON TECHNIQUE

It isn't necessary to explain how to read a micrometer, since everyone reading this will be familiar with its operation. Still, there are some precautions regarding the use and care of this instrument which should be heeded to assure more accurate results. We say "more" accurate since no measuring instrument is absolute. Each is accurate only within some tolerance, and the accuracy of the results obtained are only as reliable as the accuracy of the instrument itself, and that only when the manner in which it is used does not compromise that accuracy.

First, then, a micrometer must always be kept clean. If the instrument is not in continuous service, the measuring surfaces of its anvil and spindle should be cleaned everytime it is used.

The parallelism and flatness of the measuring surfaces of the micrometer should be frequently checked and the zero reading should be periodically checked as detailed by the manufacturer of the instrument. When the zero reading is checked, the micrometer must be set with the same finger pressure to be used when the instrument takes an actual measurement.

Obviously a micrometer should never be forced or sprung. When not in use, it should be wiped clean of oil, grit, and moisture, and stored in its case. Never leave a micrometer stored with the spindle clamped down on the empty anvil. Learn to hold the micrometer properly and always apply the correct, uniform pressure. A small variation from uniform finger pressure on the mike stem, or the slightest canting of the mike on the workpiece will introduce errors. The effect of hand temperature is also frequently forgotten.

Errors in reading micrometers are easy for both beginners and experienced technicians to make. With the mike, as with any other of the precision measurement tools available to us today, its "precision" will be only as good as the care and skill of the user.

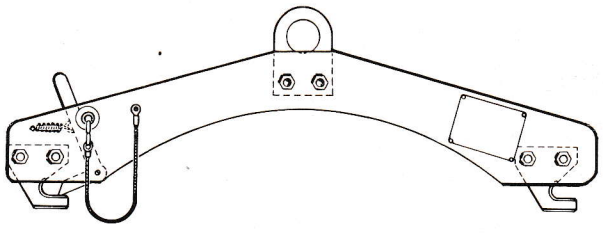
TROUBLESHOOTER INDEX - 1970

LIGHT AND LOWER

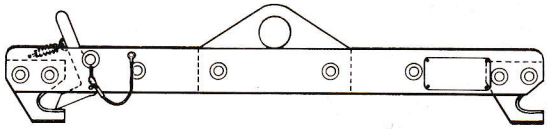
AIR LAID MINES:

A new Weapon Carrier Mk 55 Mod 0 is becoming available as a handling equipment for mines. It is designed to lift air-laid mines by their lugs (30-inch spacing) and can be used in place of the Mine Carrier Mk 46. Contrary to information that may be implied from a paragraph in the Naval Weapons Handling News Letter under "Recently Released Equipment" the new carrier is not available in quantities sufficient for across the board replacement of the Mk 46 Carrier. On the contrary initial procurement is small, so don't requisition one unless a Mk 46 becomes unserviceable, or you have a special situation where lack of head room makes the lower profile of the Mk 55 necessary.

The new carrier design is both less high and lighter than the Mk 46. When you do get a Mk 55, request disposition instructions for the Mk 46 from PCC. MMC for the Mk 55 is 1C00527. FSN is A1350-238-6169.



Mine Carrier Mk 46 Mod 1



Weapon Carrier Mk 55 Mod 0

MINES, MINEMEN & MEMORABILIA

HISTORICAL SERIES No. 7

MINE DESIGN AND DEVELOPMENT

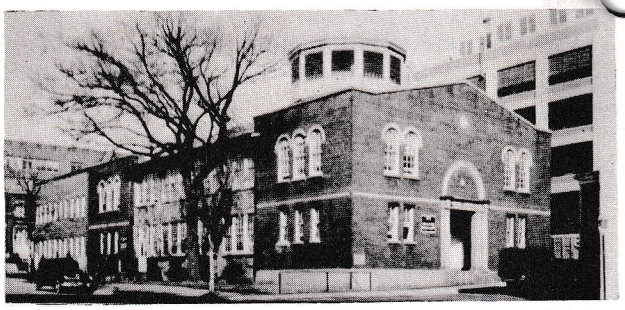
PART I: The Years Until World War II

Early development of mines was in the hands of Army engineers with activities limited to controlled mines. These were defensive systems, mines planted manually and detonated from shore-based casemates to guard harbors and river channels. "Submarine mining" was added to the duties of Army engineers by Congress in 1871. General H. L. Abbot and his engineering troops spent two years of study of controlled mines systems, and in 1878 General Abbot tried out the techniques developed by blowing underwater charges that destroyed a schooner, The Olive Branch. An experimental minefield was first put down in the Potomac in 1881. In 1902, and again in 1912; the Army's mine manual was brought up to date, but mining know-how was lost, and mine material was old and unserviceable by 1917. No controlled fields were laid in World War I. Following World War I, more attention was paid to the art and in World War II, 3569 defensive mines were planted around the U.S. and possessions. By 1950, responsibility for controlled mines had passed to the Navy. They are now obsolete.

The Navy's interest in mines on its own account is first recognized in an Ordnance Report of 1887 which reported "defense mines" had been designed. No details were given, but the report no doubt referred to the work being done at The Naval Torpedo Station at Newport, R.I. Meanwhile Great Britain's H.M.S. Vernon, the Torpedo School at Portsmouth, England, had done considerable early experimental work that included two important inventions contributing to mine design. One was the "automatic depth-fixing anchor." Before, mooring cables were cut to a fixed length to establish case depth. The other was an electromechanical-type firing device that consisted of an inertia-type contact maker with firing circuit power supplied by a battery in the mine itself. On these two principles were based the design of moored, independent, automatic mines.

When the United States Navy entered the mine business seriously at the outbreak of World War I, it had Mines Mk 2 and Mk 3, based on French and English design. When manufacture of our own mines was reported in 1915 royalties were being paid Vickers, a British firm. The mine based on the Vickers' design was not satisfactory for its purpose. Meanwhile an inventor had proposed a galvanic firing mechanism based on the action of a steel hull in contact with copper. Ordnance married this invention with the depth-fixing anchor and so the Mine Mk 6 was born. It was a pick-up development team consisting of a civilian inventor and ordnance engineers assisted by a naval officer from Great Britain. This team got the job done, but ordnance needed an activity of its own for mine research and development.

A Lt. S. P. Fullinwinder, USN, came up with a proposal to fill this need in 1915. It was to create a laboratory to give "proper consideration and development of mining material and anti-submarine devices." Action was prompt so that a building was erected and partially occupied by the end of the war. Because of some unexplained objections to the name "laboratory," the new building was known simply as "The Mine Building." The building underwent some early expansion but post-war economy left little funds for



The first home for an organization responsible for the experimental development and design of Navy mines was The Mine Building shown here as it still stands today in the Washington Navy Yard. The first three sections of the two-story structure was the original building. Construction began late in 1917. A mine-testing tank, whose top projects above the roof, was erected several years later. *(Photo: U. S. Naval Ordnance Laboratory)*

research and development except on a modest scale. With limited funds, a skeleton staff carried on the work of perfecting the type of mines already in existence and developing new ones on a small scale. By 1930 it became the Naval Ordnance Laboratory but remained in the old mine building from which it operated until World War II. At one time in this period funds were so scarce that the staff was reduced to one physicist working on mines and one engineer working on projectiles, fuzes, and pyrotechnics. There was a time when $25 a month was all that could be spent on depth charge research. Activity increased somewhat through the 1930's, but as late as 1939 the number of workers at NOL was less than 100, scarcely 20 of whom were professionally trained.

In spite of these handicaps new ideas were developed including the use of the hydrostat in the depth-fixing automatic anchor. It allowed the anchor and mine to sink and moor without the mine coming to the surface to reveal its position to enemy observers. The plummet method allowed the mine to float on the surface for a time before the anchor pulled it down. When the Mk 10 sub-laid mine anchor was designed the loose-bight principle with the hydrostat was used so the mines would not come bobbing to the surface to reveal the location of the field as well as the submarine. Another sub-laid mine was the Mk 11 designed for the 40-inch tube on the USS Argonaut which was never used as a mine layer. The Mk 12 was also designed and produced before World War II. It was the first U.S. magnetic mine to see service. The United States entered World War II better equipped than it had been in World War I. Approximate mines in stock on 7 December 1941 were:

Army Controlled Mine	5,000
Mk 5, moored, Hertz Horn	2,000
Mk 6, moored, antenna	59,000
Mk 10, moored, Hertz Horn (21-inch tube)	1,200
Mk 11, moored, antenna (40-inch tube)	200
Mk 12, Ground, magnetic (21-inch tube)	600
Mk 12, ground, magnetic (planted by aircraft)	200

Defensive mining projects were underway even before Pearl Harbor and by 1940 the old mine building, despite new construction, was bursting at the seams. In 1944 land was purchased for the laboratory at White Oak, Maryland. The cornerstone for the main building was laid in 1945 and within three years the major part of the laboratory was constructed. As the facilities expanded so did the mission which still includes mines.