DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
2000 NAVY PENTAGON
WASHINGTON, D.C. 20350-2000

IN REPLY REFER TO

1500
Ser N889H7/OU662190
15 Mar 00

From: Chief of Naval Operations

HYDRAULIC TUBE BENDING MACHINE, N88-NTSP-A-50-8602B/A

(a) OPNAVINST 1500.76

Subject NTSP is approved and forwarded per reference (a).

2. Subsequent NTSP review will examine both the effectiveness and efficiency of training outlined in this document.

3. OPNAV point of contact is AZC (AW) M. S. Dean (N889H7), DSN 664-7714, Comm: (703) 604-7714.

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Distribution: (one copy unless otherwise indicated)

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APPROVED

NAVY TRAINING SYSTEM PLAN

FOR THE

HYDRAULIC TUBE BENDING MACHINES

N88-NTSP-A-50-8602B/A

MARCH 2000

HYDRAULIC TUBE BENDING MACHINES

EXECUTIVE SUMMARY

Hydraulic Tube Bending Machines (HTBMs) provide Aviation Navy and Marine Corps intermediate maintenance facilities with the capability of bending tubing of various diameters to precise angles required for aircraft system being repaired. This tubing may be composed of ferrous and non-ferrous materials. Thirty-four Land-Based HTBMs and eighty-six Table-Mounted Shipboard HTBMs were procured. The Initial Operation Capability date for the Land-Based HTBMs was June 1987 and January 1988 for the Table-Mounted Shipboard HTBMs. The Land-Based HTBMs are only positioned at shore activities, while the Table-Mounted Shipboard HTBMs are positioned at some shore activities, aboard ships, and at mobile aviation maintenance facilities. A follow-on contract for procurement of additional HTBMs was awarded to the Eaton Leonard Corporation in 1997. These units were ordered with the same capabilities as the Table-Mounted Shipboard HTBMs, to be used for shipboard support. However, they were manufactured with an integrated stand making the unit too large for installation aboard ships. HTBMs are in Phase III (Production, Deployment, and Operational Support) of the Weapons System Acquisition Process.

HTBMs are operated and maintained by Navy Aviation Structural Mechanic (Structural and Hydraulic) personnel and by Marine Corps Hydraulic Mechanic personnel. Existing skill levels and manpower are sufficient to support the HTBMs, and no changes to current manpower requirements are identified.

Naval Air Technical Data and Engineering Service Command (NATEC) Engineering Services Division personnel conduct training of fleet personnel on an “as required” basis. There is no formal follow-on training required for HTBMs.

HYDRAULIC TUBE BENDING MACHINES

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HYDRAULIC TUBE BENDING MACHINES

LIST OF ACRONYMS

AIMD	Aircraft Intermediate Maintenance Department
AMH	Aviation Structural Mechanic, Hydraulic
AMS	Aviation Structural Mechanic, Structures
AMTCS	Aviation Maintenance Training Continuum System
ASL	Aviation Support Logistics
CMC	Commandant of the Marine Corps
CNO	Chief of Naval Operations
COMNAVAIRESFOR	Commander Naval Air Reserve Force
FMS	Foreign Military Sales
HTBM	Hydraulic Tube Bending Machine
ILSP	Integrated Logistics Support Plan
MALS	Marine Aviation Logistics Squadron
MATMEP	Maintenance Training Management and Evaluation Program
MOS	Military Occupational Specialty
MRC	Maintenance Requirements Card
MTIP	Maintenance Training Improvement Program
NA	Not Applicable
NAS	Naval Air Station
NATEC	Naval Air Technical Data and Engineering Service Command
NAVAIRSYSCOM	Naval Air System Command
NAVPERSCOM	Naval Personnel Command
NS	Naval Station
NTSP	Navy Training System Plan
O.D.	Outside Diameter
OPO	OPNAV Principal Official
PERS	Bureau of Naval Personnel
PMA	Program Manager, Air
TECHEVAL	Technical Evaluation

HYDRAULIC TUBE BENDING MACHINES

LIST OF ACRONYMS

TFS	Total Force Structure
VAC	Volts Alternating Current

HYDRAULIC TUBE BENDING MACHINES

PREFACE

This Approved Navy Training System Plan (NTSP) updates the Approved Navy Training Plan for Hydraulic Tube Bending Machines CL-215 and A/E 27M-9, NTP A-50-8602A, dated January 1991. This NTSP has been updated to comply with the guidelines set forth in the Navy Training Requirements Documentation Manual, Office of the Chief of Naval Operations (OPNAV) Publication P-751-1-9-97.

HTBMs have been in the fleet since 1987. There have been no major changes to the configuration since they were introduced. Special purpose bending kits have been added to allow for the bending of titanium and stainless steel metals.

PART I - TECHNICAL PROGRAM DATA

A. NOMENCLATURE-TITLE-PROGRAM

1. **Nomenclature-Title-Acronym.** Hydraulic Tube Bending Machines (HTBM)

2. **Program Element.** PE84743N

B. SECURITY CLASSIFICATION

1. **System Characteristics** ..... Unclassified
2. **Capabilities** ..... Unclassified
3. **Functions**..... Unclassified

C. MANPOWER, PERSONNEL, AND TRAINING PRINCIPALS

OPNAV Principal Official (OPO) Program Sponsor..... CNO (N881B)

OPO Resource Sponsor ..... CNO (N881C)

Marine Corps Program Sponsor..... CMC (ASL-33)

Developing Agency..... NAVAIRSYSCOM (PMA260)

Training Agency ..... NATEC

Training Support Agency……... NAVAIRSYSCOM (PMA205)
COMNAVAIRESFOR

Manpower and Personnel Mission Sponsor ..... CNO (N12)
NAVPERSCOM (PERS-4, PERS-404)

Director of Naval Training..... CNO (N7)

Commander, Reserve Program Manager..... COMNAVAIRESFOR
(N-711)

Marine Corps Force Structure (TFS) ..... MCCDC (C53)

D. SYSTEM DESCRIPTION

1. Operational Uses. The land-based and shipboard HTBMs are dedicated support equipment used for making accurate horizontal rotary draw bends of tight radii in standard and thin wall aircraft quality tubing of both ferrous and non-ferrous materials. The "land-based" HTBMs are positioned only at shore installations. The "shipboard" HTBMs may be positioned aboard ships, ashore, or at mobile maintenance activities.

2. Foreign Military Sales. Foreign Military Sales (FMS) of the shore based HTBMs (A/E 27M-9) have been processed. For additional information concerning FMS contact the Program Manager, Air (PMA)260.

E. DEVELOPMENTAL TEST AND OPERATIONAL TEST. A Technical Evaluation (TECHEVAL) was conducted on the land-based HTBM (A/E 27M-9) from August 1983 to April 1984 at the Aircraft Intermediate Maintenance Department (AIMD), Naval Air Station (NAS) Lemoore, California. A supplemental TECHEVAL to determine the correction of deficiencies identified during the original TECHEVAL was conducted at AIMD NAS Oceana, Virginia, from March to June 1987. The results of the supplemental TECHEVAL were published in SY50-87-043, dated 23 September 1987. A TECHEVAL on the shipboard HTBM was not conducted. An Operational Evaluation was not conducted on either the land-based or shipboard HTBM.

F. AIRCRAFT AND/OR EQUIPMENT/SYSTEM/SUBSYSTEM REPLACED. Not Applicable (NA)

G. DESCRIPTION OF NEW DEVELOPMENT

1. Functional Description. The land-based HTBM (A/E 27M-9) is capable of bending the following materials and tubing sizes:

TYPE OF TUBING	MINIMUM	MAXIMUM
Stainless Steel (304-1/8 Hard)	3/16 inch O.D. x 0.020 inch wall	1-1/2 inches O.D.
Aluminum (6061T-6)	3/16 inch O.D. x 0.020 inch wall	x 0.065 inch wall
Titanium (3AL 2.5V)	1/4 inch O.D. x 0.016 inch wall	1-1/4 inch O.D. x 0.065 inch wall

The A/E 27M-9 is operated from a movable console, and controlled from either a numerically programmable microprocessor or a secondary manual controller operated by switches. The microprocessor is capable of accepting data in absolute or incremental format. The bending machine is designed for installation in land-based facilities. It may be mounted in a

mobile facility, and is air transportable. The land-based HTBM (A/E 27M-9) is capable of the following types of bends.

TYPE OF BENDS	**TOLERANCES**
Plane of bend	3-axis digital control
Radius of bend	Minimum 2 x diameter, maximum 8 inches
Maximum bend angles	180 degrees plus overbend for springback
Tubing wrinkles	Not to exceed 1% of tube O.D.
Tubing flatness	Not to exceed 5 % of tube O.D.
***** Distance between bends	$\pm$ 0.01 inch
***** Plane of bend	$\pm$ 0.1 degree
Degree of bend	$\pm$ 0.1 degree

***** Resolution and repeatability for each machine axis for HTBM (A/E 27M-9).

The tabletop shipboard bending machine (CL-215-2/EL-215-2) is a smaller, semi-portable, hydraulically powered bender, capable of bench mounting. This bending machine will bend tubing from 3/8 inch O.D. to 1 inches O.D. with 0.20 inch wall thickness of copper, aluminum alloy, steel, and stainless steel to MIL-T-6845 and MIL-T-8504. Capabilities of these HTBMs are listed below:

TYPE OF BENDS	**TOLERANCES**
Radius of bend	Minimum 2 x diameter, maximum10 inches
Maximum bend angles	195 degrees including springback compensation
Bending speed	4 revolutions per minute (7-1/2 seconds for 180 degrees)
Maximum tube length	10 feet from centerline of bend to mandrel extractor (table extension optional)

Two adapter kits are currently available for use with these tabletop shipboard HTBMs:

- Kit H60, with special Ampco Bronze mandrels and wiper dies and special size bend dies for bending 21-6-9, stainless steel

- Kit F/A-18 and AV-8 (same part number) containing special mandrels and wiper dies for bending titanium

a. Major Components, Land-Based. The land-based HTBMs consists of the following components.

(1) Tooling. Tooling consists of bending dies, clamping dies, pressure dies, follower dies, wiper dies, mandrels, mandrel rods (quick disconnect type), collets, collet pads or inserts, and mounting adapters. All tooling is self-aligning and interlocking.

(2) Nose. The nose assembly is steel casting bored to accommodate precision tapered roller bearings, top and bottom.

(3) Spindle. The spindle is made of precision ground alloy steel sufficient in size and strength to withstand the forces applied when the machine is operated at maximum rated capacity.

(4) Bending Machine. The stationary and swing arms are steel castings sufficient in strength to withstand the forces applied when the machine is operated at maximum rated capacity. The arms are accurately machined and fitted with tool holding slides. The mounting boss of the swing arm is fitted with keys and a locating ring for accurately locating the bending dies.

(5) Pressure Die Assembly. A pressure die assembly is provided to apply pressure during the bending cycle. The pressure die holder is mounted at right angles to the tube to be bent and is operated by means of a direct acting hydraulic cylinder. A gauge for reading the pressure and a control for setting the pressure is provided. A pressure die assist is provided to minimize required clamp lengths.

(6) Clamping Assembly. The clamping die assembly is mounted on the side of the swing arm and operates by means of a direct acting hydraulic cylinder. A gauge for reading the pressure and a control for setting the pressure are provided. The clamping die assembly is designed to provide easy alignment and uniform clamping pressure over the entire area.

(7) Mandrel Extractor. A hydraulically operated mandrel extractor assembly is furnished. The assembly is sufficient in stroke to extract the entire ball assembly of a three-ball mandrel from the bent section of the tube. The extractor provides the lateral adjustment to allow alignment of the mandrel with the centerline of the bend radii. Longitudinal adjustment is provided for mandrel tangent positioning. Quick-disconnect type mandrel rods are supplied.

(8) Wiper Die Holder. A wiper die holder is provided to use wiper dies to produce wrinkle-free bends with minimum distortion. It provides for horizontal, longitudinal, and vertical adjustment.

(9) Tube Positioning Device. A tube-positioning device is provided. It consists of a data input keyboard, automatic collet equipped carriage, and all necessary electrical controls. Distance between bends, degree of bend, and planes of bend are input through the keyboard along with springback factors. The control includes a display feature and full editing capabilities. The system is capable of displaying operating and programming instructions in an easily understandable form.

(10) Base. The base structure has adequate strength and rigidity to support the components mounted thereon and has the stability required to maintain tool alignment when used at full capacity. The base and oil reservoirs are integral.

(11) Electrical System. The HTBM requires a three phase, 220-Volt Alternating Current (VAC), 60-hertz electrical power source and draws no more than 33 amperes of current. The unit is designed to withstand voltage fluctuations of $\pm$10 percent and frequency fluctuations of $\pm$5 percent without damage.

(12) Hydraulic System. The hydraulic system is a manifold type to minimize maintenance and facilities repair. An electric motor driven pump provides hydraulic pressure. All lines, fittings, valves, and other parts of the hydraulic system, including the manifold, are designed to withstand all pressures, surges, and stresses imposed by 200 percent of the rated pressure of the system. A filtration system is provided to prevent particles larger than 25 microns from entering the valves. Gages are installed to show hydraulic fluid level and hydraulic pressures.

(13) Numerical Control System. The numerical control system includes memory storage, program data edit, and display capability. The control directs the machine functions from stored part number program data entered by using the Manual Data Input Keyboard.

(14) Operating Controls. The operating control provides the ability to store bend programs for future use. When the angle of bend, plane of bend, and distance between bends data is input into the machine and a good part is made, the control has the capability to store that data, plus the springback factors, under an assigned numerical part number. When that part number is encountered again by the operator, it can be recalled. This data is retained in the programmable electronic control. The solid state, non-volatile storage module can store up to 50 different part programs. The control is on a movable stand to optimize operator efficiency and provide the greatest mobility for safe positioning of the control. The control includes diagnostics to verify proper operation of the electronic controller and the output and input functions of the machine. It also has the ability for solid state, non-volatile storage of up to 50 part programs.

(15) Manual Controls. In the event that the programmable electronic control or any of the electronic components are malfunctioning, the machine is capable of making parts in the manual mode. Dials and scales are provided to accurately position each axis. These are entirely separate from the programmable electronic control to provide totally independent operating capability from the electronic control.

b. Major Components, Shipboard. The shipboard bending machine consists of a base and cover subassembly, angle indicator assembly, hydraulic cylinder subassembly, adjusting screw and handle subassembly, and the clamp arm subassembly. The shipboard bending machine consists of the following components.

(1) Powered drive. A chain and sprocket are powered by a separate hydraulic unit.

(2) Hydraulic Unit. A separate stand-alone pump provides 10,000 pounds per square inch of adjustable hydraulic pressure. The Hydraulic Unit is driven by a 1-1/2 horsepower electric motor (120 VAC, 60 hertz, single phase) and provides 45 cubic inches of hydraulic pressure per minute delivery maximum.

(3) Maximum Bend Angle. The maximum bend angle is 180 degrees with standard dies. (The bend arm will actually bend to 195 degrees to provide springback compensation.)

(4) Degree of Bend Control. The degree of bend control is adjustable in one-degree increments from 0 to 195 degrees.

(5) Bend Arm Return. The bend arm return will position the bending machine spring return to zero after the completion of a bend.

(6) Clamping. The clamp die and pressure die use speed screws to adjust the clamping pressure.

2. Physical Description

a. Land-Based Hydraulic Tube Bending Machine. This HTBM is 10 feet 3 inches long with arms folded and 11 feet 10 inches long with arms open. The width, including sweep of arms, does not exceed 48 inches. The working height of the machine is 37 inches and overall height does not exceed 45 inches. The shipping weight is 3700 pounds plus tooling.

b. Table-Mounted Shipboard Hydraulic Tube Bending Machine. The HTBM model CL-215-2 unit is 42 inches long, 9-1/2 inches wide, and 15-3/4 inches high. The shipping weight is 164 pounds without accessories.

c. Hydraulic Tube Bending Machine with Stand. This unit has the same capability as the Table-Mounted Shipboard Hydraulic Tube Bending Machine. The assembly is mounted on an integrated 10 foot long stand with hydraulic mandrel extractor for tube bending. This unit is 12 feet long with the mandrel arms extended, has a working surface 37 inches high, and a maximum with of 48 inches. The unit's bulky size makes it unsuitable for shipboard installation.

3. New Development Introduction. Both the land-based and the shipboard HTBMs were introduced through new production.

4. Significant Interfaces. NA

5. New Features, Configurations, or Material. NA

H. CONCEPTS

1. Operational Concept

a. Navy. The HTBM is operated and maintained by personnel in the Aviation Structural Mechanics, Hydraulic (AMH) and Aviation Structural Mechanics, Structural (AMS) ratings.

b. Marine Corps. The HTBM is operated and maintained by personnel in the Hydraulic Mechanic discipline.

2. Maintenance Concept

a. Organizational. NA

b. Intermediate

1. Preventive Maintenance

(a) Land-Based Hydraulic Tube Bending Machine. Preventive maintenance of the land-based HTBM consists of servicing and testing the unit in accordance with the approved maintenance plan as described in Periodic Maintenance Requirement Cards, NAVAIR 17-600-158-6-2.

(b) Table-Mounted Shipboard Hydraulic Tube Bending Machine and Hydraulic Tube Bending Machine with Stand. Preventive maintenance of the HTBMs consists of servicing and testing in accordance with the maintenance plan identified in the factory manual.

2. Corrective Maintenance

(a) Land-Based Hydraulic Tube Bending Machine. Corrective maintenance of the land-based HTBM consists of fault isolation, removal, repair, replacement of defective components, and testing the tube bender in accordance with the Operation and Maintenance Instructions with Illustrated Parts Breakdown, NAVAIR 17-5-4.

(b) Table-Mounted Shipboard Hydraulic Tube Bending Machine and Hydraulic Tube Bending Machine with Stand. Corrective maintenance of the HTBMs consists of fault isolation, removal, repair, replacement of defective components, and testing the tube bender as described in the factory manual.

c. Depot. Depot level maintenance on the HTBMs includes repair, rework, and overhaul of the bending machine, repair of components beyond the capability of the intermediate level of maintenance, and the manufacture of items coded as depot level. The manufacturer will perform depot level maintenance, if required.

d. Technical Assistance. NATEC personnel provide technical assistance, including on-site training.

e. Interim Maintenance. NA

f. Life Cycle Maintenance Plan. NA

3. Manning Concept. No changes to current AIMD manpower or Marine Aviation Logistics Squadron (MALS) manpower are required.

4. Training Concept

a. Initial Training. The contractor (Teledyne Pines) provided initial training for the Land-Based HTBM in May 1988. No initial training was conducted for the table-mounted shipboard HTBM or the HTBM with Stand.

b. Follow-on Training. NATEC Engineering Services Division provides follow-on training for the Land-Based HTBM on an as requested basis. The command requesting training must submit a request for technical assistance to NATEC Engineering Services Division.

Title	**Land-Based Hydraulic Tube Bending Machine**
CIN	NA
Model Manager ...	NATEC Engineering Services Division
Description	This course provides Operator-Maintenance personnel with the information necessary to safely operate and maintain the Land-Based Hydraulic Tube Bending Machine (A/E 27M-9). Upon completion the student will be able to safely operate and maintain the A/E 27M-9 in an intermediate maintenance shop under limited supervision.
Location	On-site
Length	10 days
RFT date	Currently available, as requested
Skill identifier	AMH, AMS, (No Navy Enlisted Classification code)
TTE/TD	A/E 27M-9, Hydraulic Tube Bending Machine
Prerequisite	None

c. Student Profiles. HTBM training is usually for AMH personnel. They are responsible for aviation flex hose and rigid tubing fabrication. 'A' school completion is not a prerequisite for attending HTBM training.

d. Training Pipelines. There are no formal training tracks that include HTBM operator-maintainer training, and none have been identified for future development.

I. ONBOARD (IN-SERVICE) TRAINING

1. Proficiency or Other Training Organic to the New Development

a. Maintenance Training Improvement Program. Training associated with this system is not covered by the Maintenance Training Improvement Program (MTIP) criteria.

b. Aviation Maintenance Training Continuum System. The Aviation Maintenance Training Continuum System (AMTCS) will provide career path training to the Sailor or Marine from their initial service entry to the end of their military career. AMTCS is planned to be an integrated system that will satisfy the training and administrative requirements of both the individual and the organization. The benefits will be manifested in the increased effectiveness of the technicians and the increased efficiencies of the management of the training business process. By capitalizing on technological advances and integrating systems and processes where appropriate, the right amount of training can be provided at the right time, thus meeting the Chief of Naval Operation's mandated "just-in-time" training approach.

Included in the AMTCS development effort is the Aviation Maintenance Training Continuum System - Software Module that provides recording of training [Electronic Training Jacket], and a Feedback system. The core functionality of these AMTCS tools are based and designed around the actual maintenance-related tasks the technicians perform, and the tasks are stored and maintained in a Master Task List data bank. These tools are procured and fielded with appropriate Commercial Off-The-Shelf hardware and software, i.e. Fleet Training Devices - Laptops, PCs, Electronic Classrooms Learning Resource Centers, operating software, and network software and hardware.

Upon receipt of direction from OPNAV (N889H), AMTCS is to be implemented and the new tools integrated into the daily training environment of all participating aviation activities and supporting elements. AMTCS will serve as the standard training system for aviation maintenance training within the Navy and Marine Corps, and is planned to supersede the existing MTIP and Maintenance Training Management and Evaluation Program (MATMEP) programs.

2. Personnel Qualification Standards. NA

3. Other Onboard or In-Service Training Packages.

Marine Corps onboard training is based on the current series of Marine Corps Order P4790.12, Individual Training Standards System and MATMEP. This program is designed to meet Marine Corps, as well as Navy OPNAVINST 4790.2 series, maintenance training requirements. It is a performance-based, standardized, level-progressive, documentable, training management and evaluation program.

While HTBM training is recorded as part of intermediate level maintenance training qualifications it does not result in the assignment of a Military Occupational Specialty (MOS) for Marine Corps personnel.

J. LOGISTICS SUPPORT

1. Manufacturer and Contract Numbers

CONTRACT NUMBER	MANUFACTURER	ADDRESS
N00140-86-C-9121	Teledyne Pines	601 West New York Street Aurora, IL 60506
N00383-86-C-9696	Clarke & Lewis Inc.	12107 E. Philadelphia Street Whittier, CA 90610
SPO490-97-C-6030	Eaton Leonard Corporation	6030 Avenida Encinitas Carlsbad, CA 92009

2. Program Documentation

a. Land-Based Hydraulic Tube Bending Machine. The Land-Based HTBM ILSP, ILSP-CSE-0525-AA, was prepared by the Naval Air Engineering Center and approved in June 1987.

b. Table-Mounted Shipboard Hydraulic Tube Bending Machine. The contract for 86 table-mounted shipboard HTBMs was approved in 1986 with delivery starting in late 1987. No ILSP was developed for the table-mounted shipboard HTBM.

c. Hydraulic Tube Bending Machine with Stand. The contract for the ten HTBMs with Stand was awarded in 1997 and were designated EL-215. No ILSP was developed for the HTBM with Stand.

3. Technical Data Plan

a. Land-Based Hydraulic Tube Bending Machine. The contractor provided all technical manuals required for support of the Land-Based HTBM. Technical manuals are in work package format, and both the technical manuals and the Maintenance Requirement Cards (MRCs) support the approved maintenance plan. Technical Manuals are listed below:

NAVAIR 17-5-4..... Operation and Maintenance Instruction with Illustrated Parts Breakdown, dated November 1989

NAVAIR 17-600-158-6-1 ... Pre-operational Checklist, dated August 1989

NAVAIR 17-600-158-6-2 ... Periodic MRCs, dated August 1989

b. Table-Mounted Shipboard Hydraulic Tube Bending Machine. The contractor provided all technical manuals required for support of the Table-Mounted Shipboard HTBM.

NAVAIR 17-5AB-54 ..... Operation and Maintenance Instruction Manual with Illustrated Parts Breakdown, dated September 1988

c. Hydraulic Tube Bending Machine with Stand. The factory manual provided by the manufacturer is the only manual available for the HTBM with Stand.

4. Test Sets, Tools, and Test Equipment. NA

5. Repair Parts

a. Land-Based Hydraulic Tube Bending Machine. The Navy Inventory Control Point has been designated as the Program Support Inventory Control Point for the Land-Based HTBM. To provide for optimum and timely government spares and repair parts availability, the contractor provided provisioning information for procurement of spares and repair parts to support fleet activities. The Material Support Date for the Land-Based HTBMs was June 1991.

b. Table-Mounted Shipboard Hydraulic Tube Bending Machine. This is a commercial unit and repair parts are procured through open purchase from Eaton Leonard Corporation.

c. Hydraulic Tube Bending Machine with Stand. This is a commercial unit and repair parts are procured through open purchase from Eaton Leonard Corporation.

6. Human Systems Integration. NA

K. SCHEDULES

1. Schedule of Events

a. Installation and Delivery Schedules. Thirty-four Land-Based HTBM units were delivered in 1987 to Navy AIMD, Marine Corps MALS, and Naval Aviation Depot facilities throughout the world. In late 1987 the Navy and Marine Corps started taking delivery of 86 Table-Mounted Shipboard HTBMs at shore, shipboard, and mobile maintenance van aviation activities. Ten HTBMs with stand were received in 1997 and were found to be unsuitable for

shipboard installation. They have been assigned to shore activities and Mobile Maintenance Facilities.

b. Ready For Operational Use Schedule. All HTBM units have been delivered and are currently in use at the following locations:

LAND-BASED HYDRAULIC TUBE BENDING MACHINE	
ACTIVITY ASSIGNED	**ACTIVITY ASSIGNED**
AIMD Sigonella, Italy (2)	AIMD Rota, Spain
AIMD Pensacola	AIMD Fallon
AIMD Atlanta	AIMD Lemoore
AIMD Miramar	AIMD Oceana
AIMD Patuxent River	AIMD North Island
AIMD Whidbey Island	AIMD Jacksonville
AIMD Keflavik, Iceland	Naval Station (NS) Norfolk
NS Mayport	NAF Diego Garcia
Naval Aviation Depot, Cherry Point	MALS-39, Camp Pendleton
MALS-13, Yuma	MALS-16, Miramar
MALS-31, Beaufort	MALS-14, Cherry Point
MALS-12, Iwakuni, Japan	MALS-29, New River
MALS-11, MCAS Miramar	MALS-36, Okinawa, Japan
MALSE (RW), Kaneohe, Hawaii	

TABLE-MOUNTED SHIPBOARD HTBM	
ACTIVITY ASSIGNED	**ACTIVITY ASSIGNED**
AIMD Key West	AIMD Corpus Christi
AIMD Brunswick	AIMD Point Mugu
NS Roosevelt Roads, Puerto Rico	CV 63, USS Kitty Hawk
CV 64, USS Constellation	CV 67, USS John F. Kennedy
CVN 65, USS Enterprise	CVN 69, USS Dwight D. Eisenhower
CVN 70, USS Carl Vinson	CVN 71, USS Theodore Roosevelt

TABLE-MOUNTED SHIPBOARD HTBM	
ACTIVITY ASSIGNED	**ACTIVITY ASSIGNED**
CVN 72, USS Abraham Lincoln	CVN 73, George Washington
CVN 74, USS John C. Stennis	CVN 75, USS Harry S. Truman
LHA 1, USS Tarawa	LHA 2, USS Saipan
LHA 3, USS Belleau Wood	LHA 4, USS Nassau
LHA 5, USS Peleliu	LHD 1, USS Wasp
LHD 2, USS Essex	LHD 3, USS Kearsarge
LHD 4, USS Boxer	LHD 5, USS Guam
MALS-11, Miramar (2)	MALS-12, Iwakuni, Japan
MALS-16, Miramar	MALS-26, New River
MALS-29, New River (2)	MALS-36, Okinawa
MALS-31, Beaufort	MALSE, Kaneohe

HTBM WITH STAND	
ACTIVITY ASSIGNED	**ACTIVITY ASSIGNED**
AIMD Jacksonville	AIMD Keflavik, Iceland
AIMD Fallon	AIMD Atsugi, Japan
AIMD Lemoore	MALS-13, Yuma
HMX-1, Quantico	MALS-36, Okinawa
MALS-14, Cherry Point	

c. Time Required to Install at Operational Sites. NA

d. Foreign Military Sales and Other Source Delivery Schedule. FMS of the shore based HTBMs (A/E 27M-9) have been processed. For additional information concerning FMS contact the PMA260.

e. Training Device and Delivery Schedule. NA

L. GOVERNMENT FURNISHED EQUIPMENT AND CONTRACTOR FURNISHED EQUIPMENT TRAINING REQUIREMENTS. NA

M. RELATED NTSPs AND OTHER APPLICABLE DOCUMENTS

DOCUMENT OR NTSP TITLE	DOCUMENT OR NTSP NUMBER	PDA CODE	STATUS
A/E 27M-9 Integrated Logistics Support Plan	ILSP-CSE-0525-AA	AIR-552	Completed Jun 87
A/E 27M-9 Maintenance Plan	MAPL-CSE-0525:AA	AIR-552	Completed Mar 88

PART II - BILLET AND PERSONNEL REQUIREMENTS

The following elements are not affected by the HTBM and, therefore, are not included in Part II of this NTSP:

II.A. Billet Requirements

- II.A.1.a. Operational and Fleet Support Activity Activation Schedule
- II.A.1.b. Billets Required for Operational and Fleet Support Activities
- II.A.1.c. Total Billets Required for Operational and Fleet Support Activities
- II.A.2.a. Operational and Fleet Support Activity Deactivation Schedule
- II.A.2.b. Billets to be Deleted in Operational and Fleet Support Activities
- II.A.2.c. Total Billets to be Deleted in Operational and Fleet Support Activities
- II.A.3. Training Activities Instructor and Support Billet Requirements
- II.A.4. Chargeable Student Billet Requirements
- II.A.5. Annual Incremental and Cumulative Billets

II.B. Personnel Requirements

- II.B.1. Annual Training Input Requirements

PART III - TRAINING REQUIREMENTS

The following elements are not affected by the HTBM and, therefore, are not included in Part III of this NTSP:

III.A.1. Initial Training Requirements

III.A.2. Follow-on Training

III.A.2.b. Planned Courses

III.A.2.c. Unique Courses

III.A.3. Existing Training Phased Out

III.A.2. FOLLOW-ON TRAINING

III.A.2.a. EXISTING COURSES

CIN, COURSE TITLE: NA (No CIN number), Land Based Hydraulic Tube Bending Machine
TRAINING ACTIVITY: NATEC Engineering Services Division
LOCATION, UIC: On-site, as requested

Note: NATEC Engineering Services Division personnel conduct Fleet training of personnel on an "as required" basis. The course Land Based Hydraulic Tube Bending Machine is taught on-site with the fleet asset and technical publications.

PART IV - TRAINING LOGISTICS SUPPORT REQUIREMENTS

The following elements are not affected by the HTBM and, therefore, are not included in Part IV of this NTSP:

IV.A. Training Hardware

IV.A.1. TTE / GPTE / SPTE / ST / GPETE / SPETE

IV.A.2. Training Devices

IV.B. Courseware Requirements

IV.B.1. Training Services

IV.B.2. Curricula Materials and Training Aids

IV.B.3. Technical Manuals

IV.C. Facility Requirements

IV.C.1. Facility Requirements Summary (Space/Support) by Activity

IV.C.2. Facility Requirements Detailed by Activity and Course

IV.C.3. Facility Project Summary by Program

Note: Fleet training of personnel is conducted by Naval Air Technical Data and Engineering Services Command (NATEC). The course Land Based Hydraulic Tube Bending Machine requires none of the above elements. The course is taught on-site with the fleet asset and technical publications.

PART V - MPT MILESTONES

COG CODE	MPT MILESTONES	DATE	STATUS
PDA	Conducted TECHEVAL (Land-Based HTBM)	Aug 83	Completed
PDA	Awarded contract (Land-Based HTBM)	Feb 86	Completed
PDA	Awarded contract (Shipboard HTBM)	Sep 86	Completed
PDA	Submitted Preliminary Manuals (Land-Based HTBM)	Oct 86	Completed
PDA	Conducted Supplemental TECHEVAL (Land-Based HTBM)	Mar 87	Completed
PDA	Conducted Final Validation of Manuals (Land-Based HTBM)	Jun 87	Completed
PDA	Initial Fleet Delivery (Land-Based HTBM)	Jun 87	Completed
PDA	Initial Fleet Delivery (Shipboard HTBM)	Jan 88	Completed
PDA	Submitted Preliminary Manuals (Shipboard HTBM)	Feb 88	Completed
PDA	Promulgated Maintenance Plan (Land-Based HTBM)	Mar 88	Completed
PDA	Conducted Factory Training (Land-Based HTBM)	May 88	Completed
PDA	Conducted Final Validation of Manuals (Shipboard HTBM)	Jun 88	Completed
PDA	Promulgated Maintenance Plan (Shipboard HTBM)	Aug 88	Completed
PDA	Promulgated Approved NTP	Jan 91	Completed
PDA	Achieved Material Support Date (Land-Based (HTBM)	Jun 91	Completed
PDA	Achieved Navy Support Date (Land-Based HTBM)	Jun 92	Completed
PDA	Awarded Follow-on contract (Shipboard HTBM)	FY97	Completed
PDA	Developed Preliminary Draft NTSP	Dec 99	Completed
PDA	Developed Draft NTSP	Feb 00	Completed
PDA	Developed Proposed NTSP	Mar 00	Completed

PART VI - DECISION ITEMS/ACTION REQUIRED

DECISION ITEM OR ACTION REQUIRED	COMMAND ACTION	DUE DATE	STATUS
None			

PART VII - POINTS OF CONTACT

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