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AIRCRAFT SKIN PENETRATOR AND AGENT APPLICATOR VOLUME 2

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TEST AND EVALUATION (U) AMETEK INC SANTA BARBARA CA

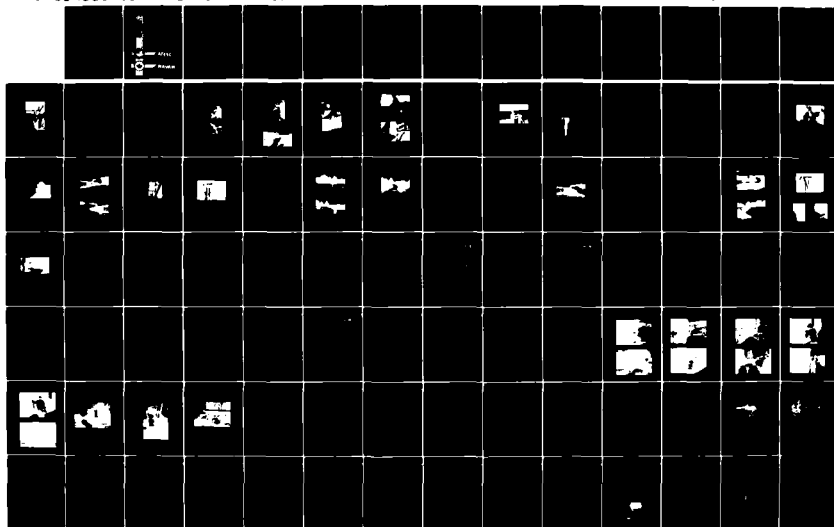
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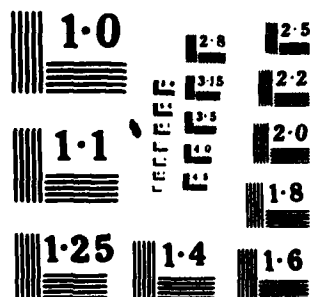
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**Aircraft Skin Penetrator and Agent
Applicator, Volume II, Test and
Evaluation (Volume II of II)**

R.H. CUTHBERTSON

**AMETEK, INC./OFFSHORE RESEARCH & ENGINEERING DIV.
1224 COAST VILLAGE CIRCLE
SANTA BARBARA, CA 93108**

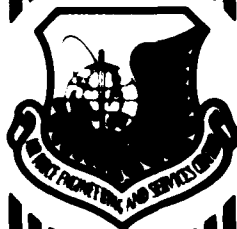
NOVEMBER 1984

FINAL REPORT

MARCH 1983 - DECEMBER 1983

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DEPARTMENT OF NAVY,
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13	12		Halon 1211, Functional, Mechanical Drawings	
19 ABSTRACT (Continue on reverse if necessary and identify by block number) This report covers development and construction of an aircraft skin penetrator device to provide rapid penetration and allow placement of a suitable fire suppressing agent onto the base of an aircraft fire. Volume I discusses in detail the research conducted on the development of the proposed working model of the Aircraft Skin Penetrator/Agent Applicator. The report contains photographs of the different concepts considered. Volume II has detailed drawings showing the construction of the working model Penetrator and sketches which show how the Penetrator may be used to fight aircraft fires. <i>8 figures - supplied by us who included.</i>				
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PREFACE

This report was prepared by AMETEK Inc., 1224 Coast Village Circle, Santa Barbara, California 93108, under contract number F08635-82-C-0472, for the Air Force Engineering and Services Center, Engineering and Services Laboratory (AFESC/RDCS), Tyndall Air Force Base, Florida 32403, and the Naval Air Systems Command (NAVAIR), Washington, D.C. 20361.

This report summarizes work done between 17 September 1982 and 15 December 1983. HQ AFESC/RDCS program manager was Joseph L. Walker, and NAVAIR Fire Protection Technical Manager was James L. Calfee.

This report has been reviewed by the Public Affairs Office (PA) and is releasable to the National Technical Information Service (NTIS). At NTIS it will be available to the general public including foreign nationals.

This technical report has been reviewed and is approved for publication.

Joseph L. Walker
JOSEPH L. WALKER
Program Manager

Robert E. Boyer
ROBERT E. BOYER, Colonel, USAF
Director, Engineering and Services Laboratory

Everett L. Mabry
EVERETT L. MABRY, Lt Col, USAF
Chief, Engineering Research Division

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SECTION I

INTRODUCTION

A. BACKGROUND

The Air Force Engineering and Services Center (AFESC) contracted AMETEK, Inc./Offshore Research and Engineering Division (ORED) to design, build, and test a tool for the penetration of aircraft skin and application of agent.

The need for development of the tool evolved from the fact that current USAF firefighting equipment does not provide rapid access to aircraft fires occurring in airframe voids where access ports are either limited or not provided. → 1473 Various aircraft sizes, configurations, and the use of high-strength metal alloys make forced entry to these areas time-consuming and difficult. To correct this deficiency, a lightweight, hand-held, self-powered device is needed, which will penetrate aircraft skin and serve as a discharge outlet to dispense fire-extinguishing agent.

AMETEK, Inc./ORED designed a tool to meet the requirements identified by the Air Force and submitted ORED Report No. 14.46 defining the design in February 1983. This report describes the tests conducted to qualify the AMETEK design to meet Air Force requirements of the contract.

B. USAF REQUIREMENTS

The USAF identified requirements for the Aircraft Skin Penetrator/Agent Applicator as follows:

1. Penetration Requirements

The tool shall penetrate USAF aircraft skin materials and any internal thermal or acoustical insulation materials and cabin panels. The penetrator device shall be capable of penetrating a minimum of 14 inches.

2. Mechanical Actuation

The tool shall be mechanically actuated and safe to operate in any explosive or flammable environment. The device shall not incorporate ballistic or explosive propellant material.

3. Operation by One Person

The tool shall be operated by one person from a variety of positions, from hip-level to overhead at arm's length and from various footings, including the ground, aircraft surfaces, and from a ladder.

4. Halon 1211 Delivery

The tool shall be suitable for delivery of Halon 1211 fire suppression agents.

5. P-13 Vehicle Base

The tool shall be designed to be fully functional from a P-13 vehicle as the operational base.

6. Quick-Disconnect

The tool shall have quick-disconnect capability for both input connection and nozzle output connection.

7. Halon 1211 Discharge Rate

The tool shall be able to discharge Halon 1211 at 5 to 5.5 pounds/second.

8. Throw Range

The tool shall be designed to have an effective agent throw range of not less than 30 feet.

9. "Trigger" Type Turn-on

The tool shall have a "trigger" type of actuation turn-on with a lock on dispensing capability.

10. Retention

The tool shall have suitable retention means to prevent penetrator from falling out during use if unattended. (Note: Mechanical or nonmechanical means are acceptable.)

11. "Human-Engineered"

The tool shall be "human-engineered" for operational cause by a single Air Force firefighter wearing full protective proximity clothing, including gloves, as required for a realistic fire environment.

C. SKIN PENETRATOR/AGENT APPLICATOR

The AMETEK tool was designed to penetrate aircraft skins and to permit rapid turn-on of agent within confined spaces of aircraft. (See Figure 1)

1. Skin Penetrator/Agent Applicator Description

The Skin Penetrator/Agent Applicator employs a small precharged pneumatic cylinder for energy storage, a standard

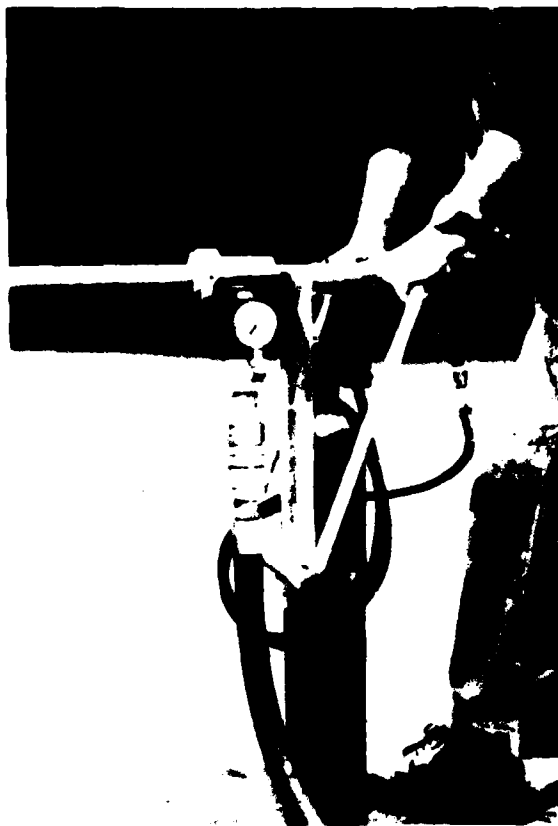


Figure 1. AMETEK Penetrator/
Agent Applicator.

commercially available pneumatic drill for energy transfer, and a small compact human-engineered assembly package of all the components.

The energy storage is sufficient to penetrate 6-8 holes in the heaviest wall aircraft airframe constructed.

A small gauge is provided to verify the fully charged readiness of the tool.

Charging may be accomplished using standard breathing bottle equipment presently in place at most firefighting facilities.

A quick-connect/disconnect fitting is provided for the agent supply line with a standard firefighting type of quarter-turn ball shutoff valve.

The compressed air storage bottle is secured with quick-acting overcenter toggle clamps for ease of assembly and periodic interchange of bottles, if desired.

The bottle is charged for 2200 psig on the compressed air facilities used for breathing bottle charging. A regulator controls pressure to the energy transfer system at 100 psig, with flow initiated by an index finger-actuated trigger.

2. Systems and Subsystems Organization

The Skin Penetrator/Agent Applicator System is organized into the following systems and subsystems:

<u>System/ Subsystem Number</u>	<u>Title</u>
1.0	Complete Tool Assembly
2.0	Penetrator
2.1	Tip
2.2	Drive
2.3	Energy Storage
2.4	Energy Release
2.5	Assembly Clamps
2.6	Energy Connection
3.0	Agent Transfer
3.1	Agent Connection
3.2	Shut Off/On Valve
3.3	Conduit
3.4	Discharge Nozzle
4.0	Tool Retention
4.1	Retention Features

SECTION II

TEST PROCEDURE AND RESULTS

A. TEST PROCEDURE

Tests were organized and conducted to evaluate capabilities of the tool to the USAF requirements of Section I of this report.

The test plan was based on the following:

1. Government-Furnished Equipment

Government-furnished equipment included:

- a. Halon Tanks. Shipped from Tyndall AFB for Halon charging at Vandenberg AFB.
- b. Skin Panel. Section of B-52 skin panel for penetration trials. (See Figures 2 and 3)
- c. Halon 1211. Supplied by Vandenberg AFB to fill tanks (A.I.A.).

2. Use of Government Facilities

The following Government facilities were used for the tests:

- a. Pacific Missile Test Range, Point Mugu. Use of surplus fire-training aircraft for penetration trials. (See Figures 4 through 7)
- b. Vandenberg AFB. Halon 1211 flow tests and penetration trials in mock-up fire training aircraft. (See Figures 8 and 9)

3. Test Sequence

Tests were conducted in the general sequence of flow tests with water, penetration tests, and flow tests with Halon 1211.

B. TEST RESULTS

Tests were conducted by personnel from AMETEK/ORED, the Air Force, and the Navy in evaluation of the Skin Penetrator/Agent Applicator to the Air Force requirements. The test results and illustrating photographs follow.



Figure 2. Penetrator Presented
to B-52 Skin Panel.



Figure 3. Penetration of B-52 Skin
Panel Completed in 5
Seconds.



Figure 4. View of Test Aircraft, Pt. Mugu.



Figure 5. Skin is Penetrated and Penetrator is Retained in Skin Ready for Agent Dispersal, Pt. Muqu.



Figure 6. Four Penetrations, Upper Left - Double-Skin, Center Upper - Single-Skin, Two Right-Hand Holes Achieved by Hand Penetration Without Drilling, Pt. Muqu.

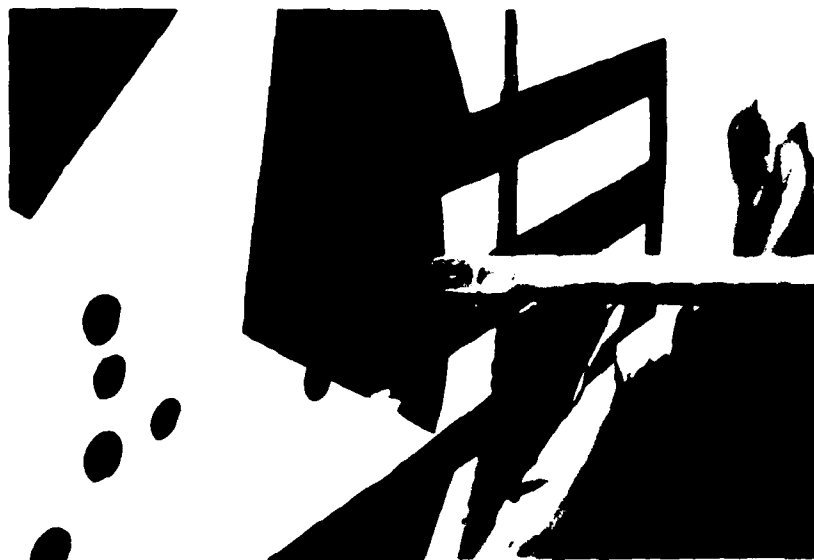


Figure 7. Several Penetrations, Pt. Muqu.

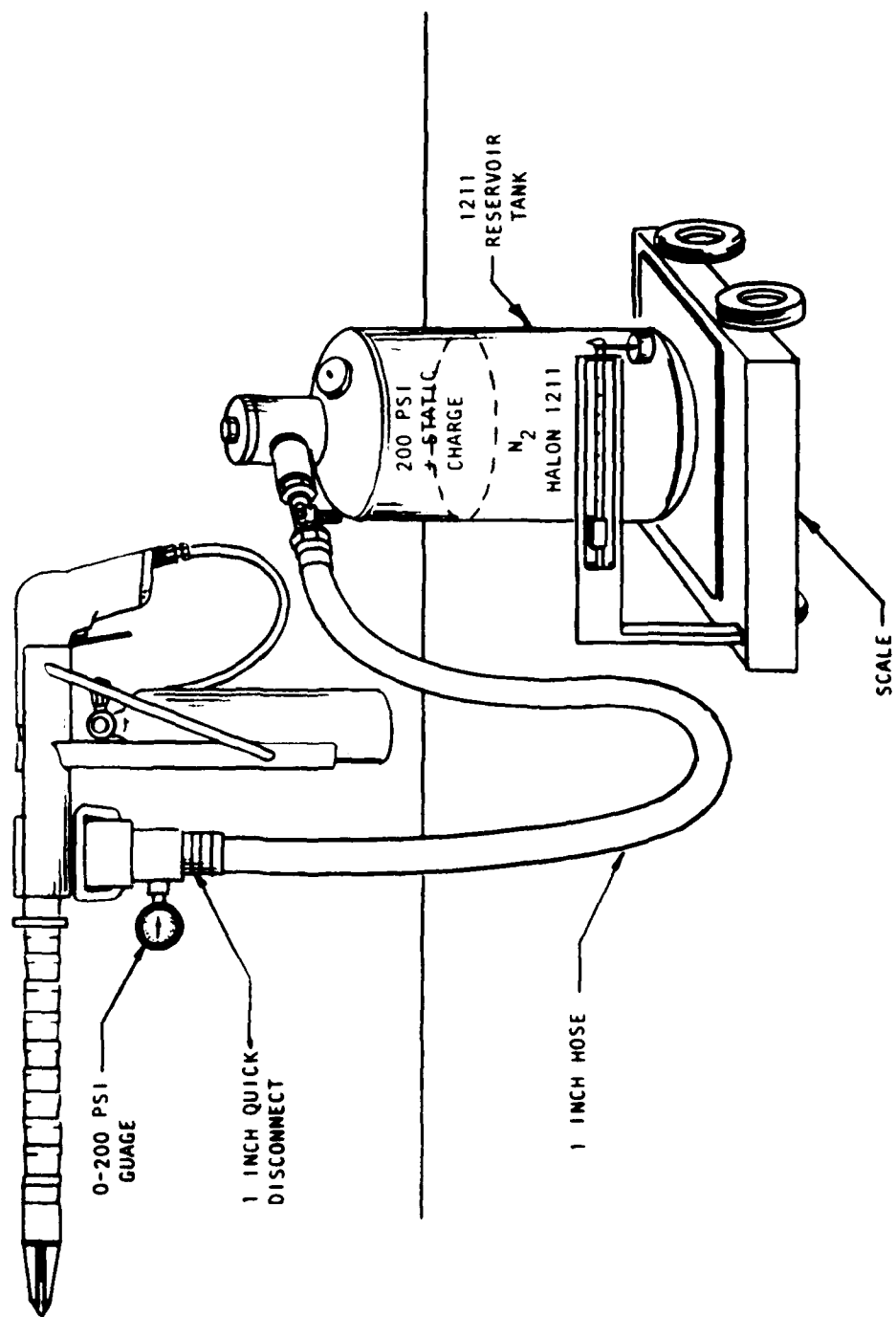


Figure 8. Halon 1211 Flow Test Setup.

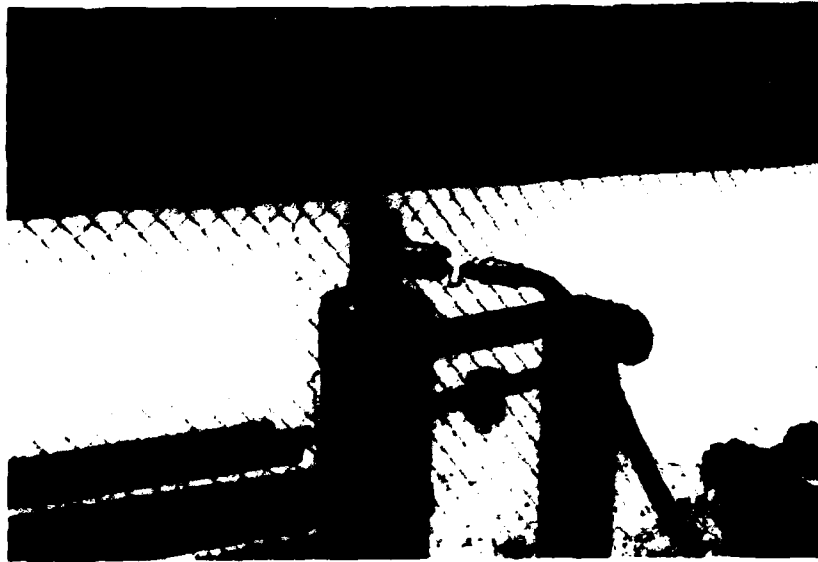


Figure 9. Halon 1211 Supply Cylinder Mounted on Scale and Connected to the Agent Penetrator Tool.

1. Penetration Requirements

A variety of penetration tests were conducted through test panels of aluminum alloys of various thicknesses and through aircraft fuselage and wing panel sections.

2. Mechanical Actuation

The tool is actuated mechanically by hand-trigger-controlled pneumatic power from a self-contained air bottle. (See Figure 10)

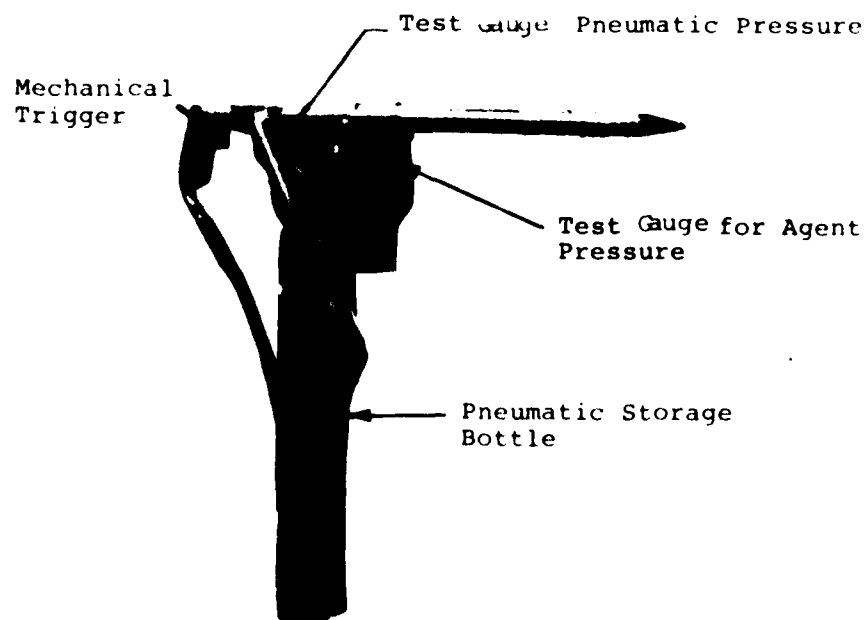
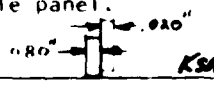


Figure 10. Elevation, Penetrator.

BY K.S.A. DATE 6/23/83 SUBJECT TEST ON AIRCRAFT AT SHEET NO 1 OF 1
POINT MUGU NAVAL AIR STATION

TEST AIRCRAFT: S-2

AIRCRAFT PENETRATOR/AGENT APPLICATOR TOOL PENETRATION TEST					
TEST NO	ELAPSED TIME (SEC)	BOTTLE PRESSURE (PSI)		LOCATION ON FUSELAGE	COMMENTS
		INITIAL	POST		
1	27.7 Sec.	2000	1300	Side	Double panel. Hung up on beam, inside panel. Cutter loose because of loose set screw. <i>KSA</i>
2	8.0 Sec.	1250	1010	Side	Went through side panel rapidly and pushed to maximum penetration. Had to work out of hole to remove. <i>KSA</i>
3	3.2 Sec.	1000	780	Side	Through single panel; all the way. <i>KSA</i>
4	17.0 Sec.	780	150	Side	Pressure too low to complete hole. <i>KSA</i>
5	22.0 Sec.	1950	--	Side	Hit rib; bit loosened. <i>KSA</i>
6	7.2 Sec.	1000	800	Side	Chuck loose going thru double panel.  <i>KSA</i>
7		1800		Side and engine nacelle.	Fire personnel at Mugu operated tool. Penetrated single panel 3 times. Punched thru <i>KSA</i>
					single panel. Punched thru engine nacelle without ruining tool; approx. .020" thick. Final drilling penetrated thru panel and rib. Tool bit loosened up. <i>KSA</i>
					END TESTING

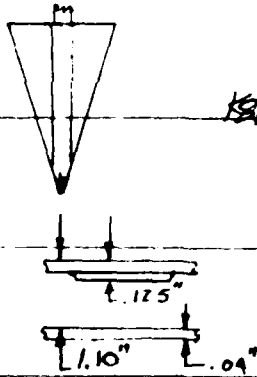
INSPECTOR *[Signature]*

SHEET NO. 1 OF 1

INSPECTOR

BY RUSA DATE 7/1/83 SUBJECT TEST ON AIRPANEL AT SHEET NO 1 OF 1
POINT MUGG NAVAL AIR STATION

TEST AIRCRAFT N-2

AIRCRAFT PENETRATOR/AGENT APPLICATOR TOOL PENETRATION TEST					
TEST NO	ELAPSED TIME (SEC)	BOTTLE PRESSURE (PSI)		LOCATION ON FUSELAGE	COMMENTS
		INITIAL	POST		
1	3.1 Sec.	2100	1890	SIDE	Clean cut. <i>KSA</i>
2	2.0 Sec.	1890	1750	SIDE	Clean cut. <i>KSA</i>
3	28.0 Sec.	1750	850	Top of wing	Tool bit snapped off directly behind at shaft interface.
					

INSPECTOR

15

WITNESS: L. L. Evans

3. Operated by One Person

The tool may be operated by one person from angle or aspect position. (See Figure 11)



Figure 11. Firefighter, Running Penetrator Through Skin with Halon 1211 Protection Envelope, Vandenberg AFB.

4. Halon 1211 Delivery

The tool delivers the required amount of Halon 1211.
(See Figures 12 through 14)



Figure 12. Halon 1211 Delivery Plume.



Figure 13. Halon 1211 Plume, Pointed Upwind,
Vandenberg AFB.



Figure 14. Halon 1211 Plume, Pointed Downwind,
Vandenberg AFB.

5. P-13 Vehicle Base

The tool is fully operational from a P-13 vehicle base. (See Figure 15)



Figure 15. Vehicle Hose is Adaptable to Penetrator for Fighting Aircraft Fires.

6. Quick-Disconnect

A quick-disconnect is provided for connection of the agent supply. (See Figure 16)

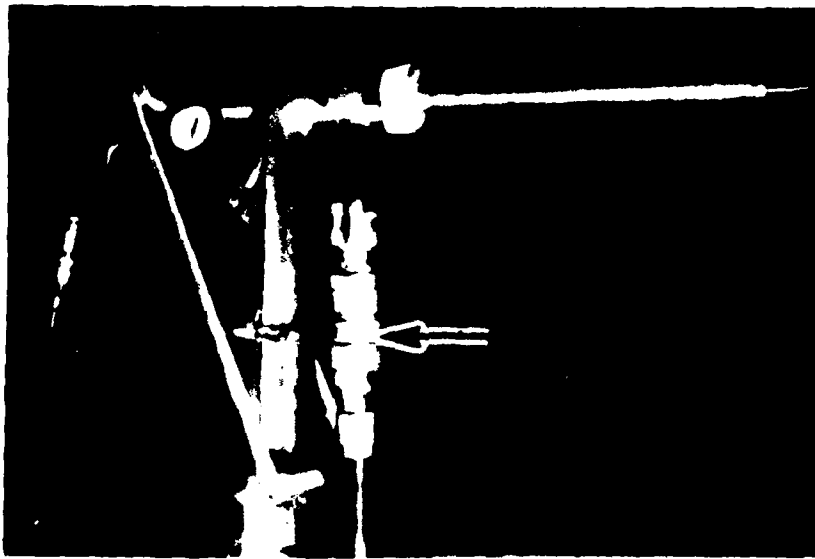


Figure 16. A Quick-Disconnect is Provided for Agent Supply.

7. Halon 1211 Discharge Rate

a. Test Narrative

A comparative test was performed on the agent applicator tool with respect to a known 5 pounds/second Halon 1211 nozzle to determine the tool's volume flow rate.

A simulated P-13 Halon truck system was assembled using a 1211 storage tank filled with 1211 and pressurized with nitrogen to at least 200 psi. The tank was fitted with a 1-inch ball valve and attached to the 100-foot long P-13 hose. The discharge end was then attached to a metered-flow fitting to measure the nozzle pressure. The P-13 nozzle was then attached to the metered fitting. The Halon tank and 1211 were weighed and then a discharge stream was allowed through the system. Nozzle pressures were recorded before and after discharge to determine the dynamic reservoir pressure range during the test. The time for discharge and the weight of 1211 used were recorded.

A second identical tank was fitted to the hose system and the Penetrator/Agent Applicator tool was attached to the P-13 hose. Agent was allowed through the tool, and weights, times, and nozzle pressures were recorded.

Two test points with similar nozzle pressure ranges were compared. Test 1 with the P-13 nozzle computed to be 1 pound per second of 1211.

b. Conclusion

Assuming the P-13 nozzle to have a discharge characteristic of 5 pounds per second when used with the P-13 system, the Agent Applicator tool would have an additional 20 percent or 6 pounds per second when used with the P-13 system.

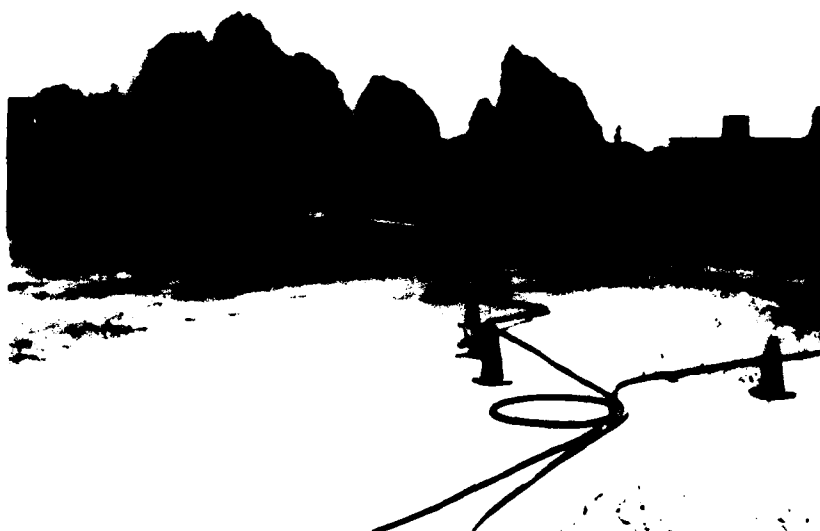


Figure 17. P-13 System Hose and 5 Pound/Second Nozzle Operating From Heat Cylinder.



Figure 18. Tool Operated From P-13 Hose and Test Cylinders.



Figure 19. Halon 1211 Flowing at Five (5) PPS.
Ambient Temperature at 100°F.

TEST #	ELAPSED TIME (Sec)	TANK & HALON WEIGHT		GAUGE READING AT NOZZLE	COMMENTS
		INITIAL	POST		
1	10 sec.	106 lbs	96 lbs	125 psi DYNAMIC DURING FLOW 105 psi STATIC AFTER TEST.	1st BOTTLE OF 1211 WITH P-13 NOZZLE. $\Delta W = 10$ lbs $\Delta P = 20$ psi
2	5 sec.	147 lbs	136 lbs	180 psi START 155 psi FINISH (STATIC PRESSURE)	2nd BOTTLE WITH TOOL. $\Delta W = 11$ lbs $\Delta P = 25$ psi
3	5 sec.	135 lbs	124 lbs	155 psi START 130 psi FINISH	2nd BOTTLE WITH TOOL. $\Delta W = 11$ lbs $\Delta P = 25$ psi
4	5 sec.	124 lbs	118 lbs	131 psi START 115 psi FINISH	2nd BOTTLE WITH TOOL $\Delta W = 6$ lbs $\Delta P = 16$ psi
5	5 sec.	118 lbs	112 lbs	115 psi START 100 psi FINISH	2nd BOTTLE WITH TOOL $\Delta W = 6$ lbs $\Delta P = 15$ psi

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Figure 20. Test at Vandenberg Air Force Base
with Halon 1211; Simulated P-13
Truck.

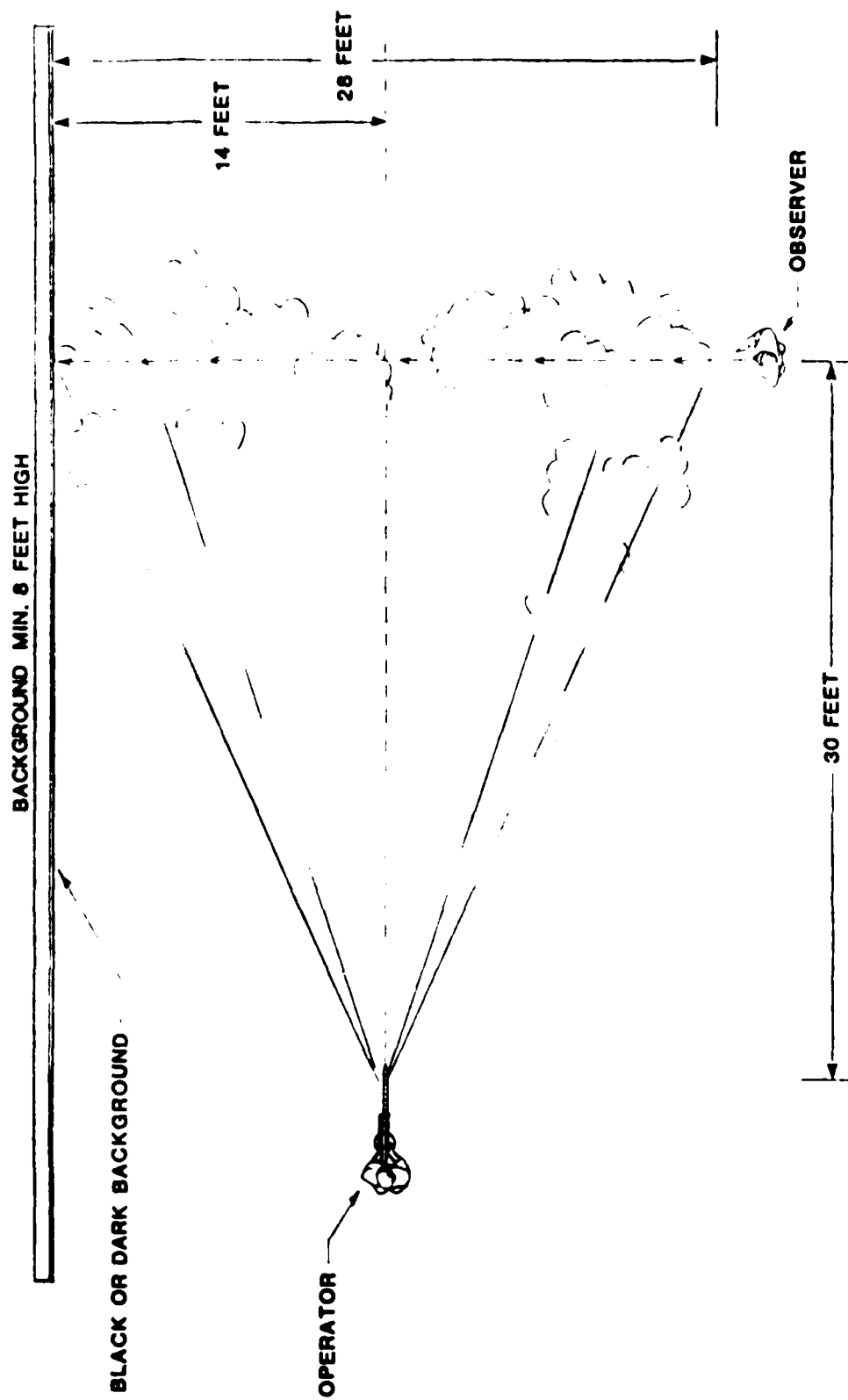


Figure 21. Top View of Halon Throw Distance Test.



Figure 22. Halon 1211 Plume, Pointed Upwind,
Vandenberg AFB.

8. Throw Range

Contract: F08635-82-C-0472
Department of the Air Force
AD/PMR Eglin Air Force Base
Florida 32542

Test Description: Effective Agent Throw Distance
Statement of Work Par. #: 4.2.1.8
Date Performed: 22 June 1983
Location Performed: Vandenberg Air Force Base
Operator Name:

Test Requirements: The Penetrator/Agent Applicator shall have an effective agent throw range of not less than 30 feet. (Effective agent throw distance will be considered the point at which the agent's white vapor cloud extinguishes.)

Test Set Up:

Establish a black background of at least 35 feet in length by 8 feet in height.

Connect the penetrator to a P-13 Halon truck-reservoir via a 100-foot, 1-inch hose.

Position tool operator a minimum of 14 feet from the black wall and direct the end of the tool parallel to the wall.

Position observer at least 30 feet from the tool and at least 30 feet from the wall.
(See Figure 21)

Operator will activate the tool's Halon valve and the observer will photograph the Halon discharge cloud and record the distance to the end of the cloud.

The operator will read the Halon pressure gauge prior to and during the Halon discharge and record the data.

Test Equipment Required:

One P-13 Halon 1211 tanker with Halon and 100 feet of feeder hose; one black background 35 feet long by 8 feet high; one 35 mm camera with B&W film.

Personnel Required: One firefighter in protection suit.
One observer to measure throw distance and photograph test.

Observations: Halon was expelled from the tool in good conical pattern and agent's white cloud extinguished at least 30 feet from the operator.

Test Data:	Run #	Gauge (Prior)	Gauge (During)	Observed Distance	By/Date
	1	200 psi	130 psi	30 feet	<i>KSH</i> 22 Jul '83

Acceptance: Inspector: *[Signature]* Date: 22 Jul, 1983



Figure 23. Required 30-Foot Throw and Fully Developed Plume Demonstrated with Water Tests.

Firefighting personnel, assisting in tests at P. Muqu, commented on shape of plume as being particularly good for filling an internal space, compartment, or room.



Figure 24. Plume Development in 30-Foot Throw Demonstration.

9. "Trigger" Type Turn-On

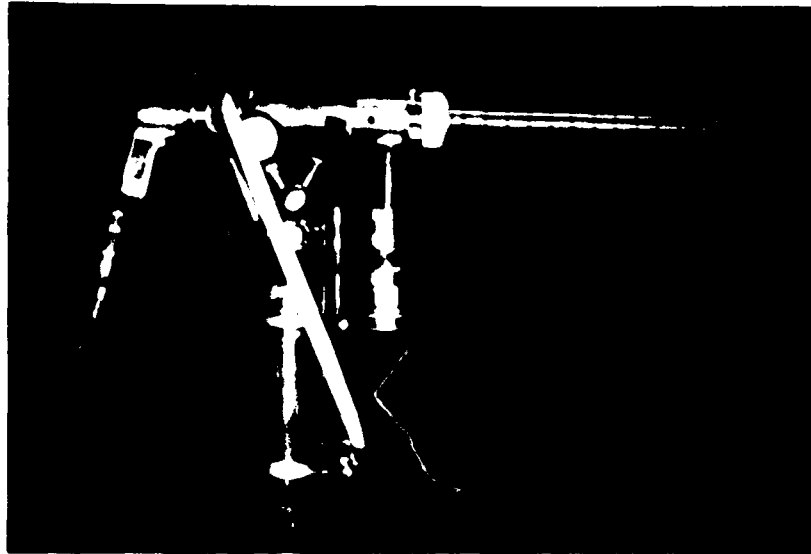


Figure 25. Tool with Spring-Loaded Trigger for Hand Operation of Rotary Cutter.

10. Retention

The tool is capable of retention in both vertical and overhead positions.



Figure 26. Retention in Overhead Test Panel, Partial Penetration.



Figure 27. Retention in Overhead Test Panel, Maximum Penetration.

11. "Human Engineered"

Favorable comments were received from Air Force and Navy firefighting personnel on the feel and handling of the tool. Favorable human factors comments were also received from firefighters on the ability to turn on agent before contact with the aircraft, and on the ability to drill through a protective envelope. Figure 28 illustrates a firefighter, gloved and dressed in a fire protective suit, operating the tool and demonstrating his ability to use the tool when clothed in this manner.

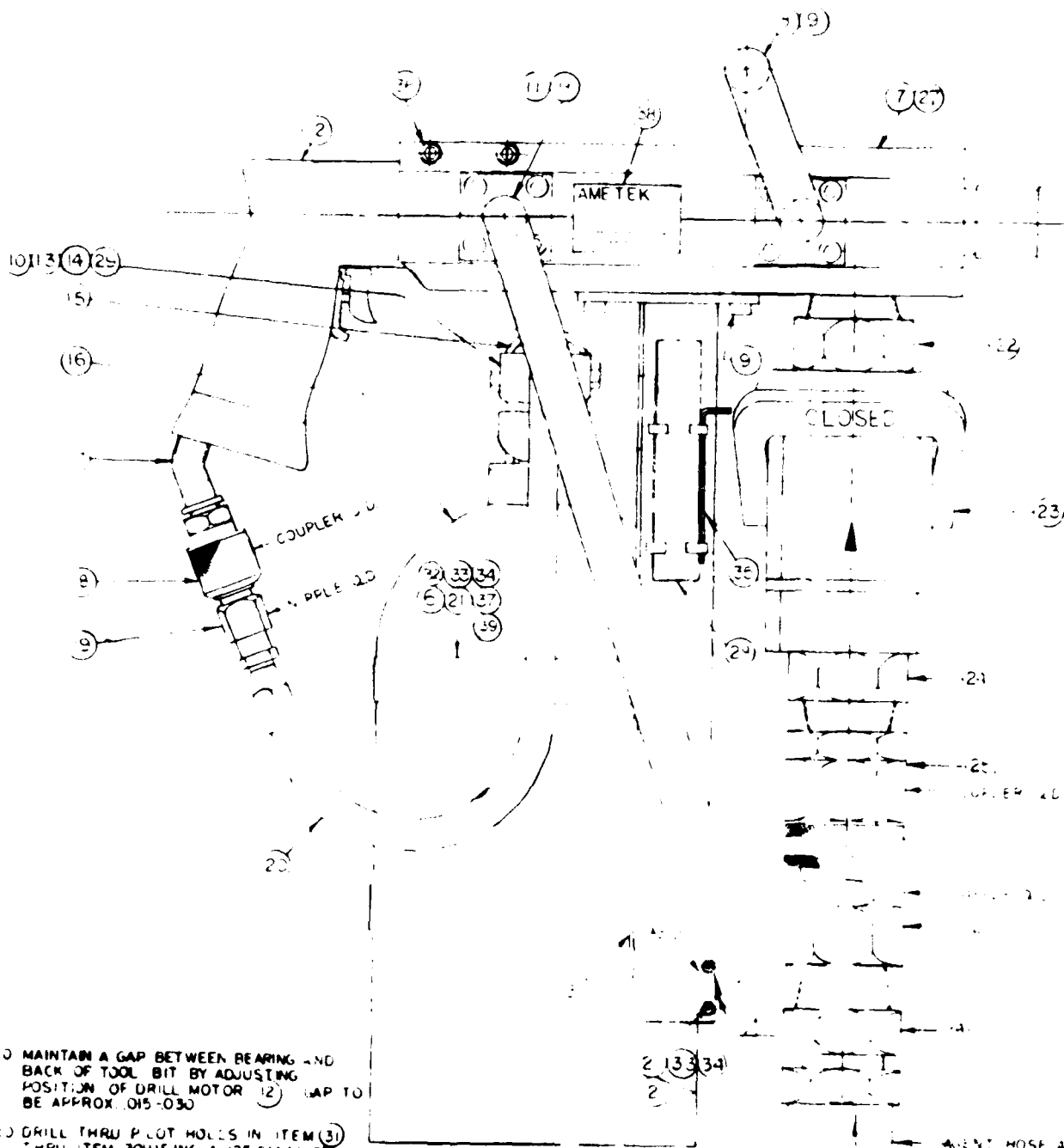


Figure 28. Drilling Through Halon 1211 Envelope.

SECTION III

SKIN PENETRATOR/AGENT APPLICATOR CONSTRUCTION

The Skin Penetrator/Agent Applicator tool was constructed using drawings shown as Figures 29 through 37.

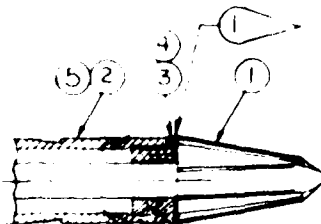


NOTES

- 1) MAINTAIN A GAP BETWEEN BEARING AND BACK OF TOOL BIT BY ADJUSTING POSITION OF DRILL MOTOR (12) GAP TO BE APPROX .015-.030
- 2) DRILL THRU PILOT HOLES IN ITEM (31) THRU ITEM (30) USING A .125 DIA PILOT DRILL. OPEN UP PILOT HOLES IN ITEM (31) TO .213 DIA. DRILL .213 DIA THRU 4 PILOT HOLES IN ITEM (30) CSK .387 DIA X .100" 4 HOLES IN ITEM (31) INSIDE SPOTFACE BACK SIDE OF ITEM (31) .50 DIA FOR 100% CLEANUP

ARENT HOSE ASSEMBLY

ENT SUPPLY —



42					
41					
40					
39	75WIDE X.01	AR	NEOPRENE		
38		1	NAME TAG		
37	LNK LOCK# 3	2	LATCH (SIMMONS) SPRG. LOAD		
36	10-24 X 1.25 LG	2	SOCKET HEAD SCREW - CAD. PL.		
35	5/32	1	ALLEN WRENCH		
34	10-32	8	HEX NUT - CRES		
33	10	8	LOCK WASHER - CRES		
32	DT83A153	1	RELIEF VALVE ADAPTER		
31	DT83D526-7	1	HANDLE ADAPTER		
30	DT83D526-8	1	BOTTLE CARRIER ASSY.		
29	DT83A154	1	REGULATOR ADAPTER		
28	DT83D527-4	1	BIT REMOVAL TOOL		
27	2.014-C 55-70	1	O RING		
26	SNAP-TITE APRIL-15F	1	Q.D. NIPPLE		
25	SNAP-TITE APRIL-15F	1	Q.D. COUPLER		
24	1/2" M.F. TO 1/2" M.F.	2	ADAPTER - WESTERN FIRE	NO 30003	
23	1/2" M.F. TO 1/2" M.F.	1	BALL VALVE		
22	1/2" M.F. TO 1/2" M.F.	1	ADAPTER - WESTERN FIRE	NO 77	
21	10-32 X .37 LG	8	MACHINE SCREW, FLAT HD	100 CRES	
20	AEROQUIP	1	HOSE ADAPTER 1/2" NPTM	250 PSI	
19	5601-4-45	1	Q.D. NIPPLE AEROQUIP		
18	5601-4-45	1	Q.D. COUPLER AEROQUIP		
17	1/4" PIPE - 45	1	ELBOW - STREET - BRASS		
16	CURTIS 307	1	PRESSURE CYLINDER		
15	SHERWOOD WEST	1	BOTTLE VALVE/GAGE		
14	SHERWOOD WEST	1	ADAPTER CGA-347		
13	USOVERT CONVERT. KIT	1	REGULATOR - 3000PSI-WP		
12	DRILL MOTOR HAND KIT	1	DRILL MOTOR, PNEUMATIC	WITHOUT CHUCK	
11	DT83D526-6	1	HANDLE, REAR		
10	CHUDNOW RFG CO	1	RELIEF VALVE - 150 PSI		
9	10-24 X .56 LG	20	SCREW, SOCKET HEAD		
8	DT83D526-8	1	HANDLE, TOP		
7	DT83D526-7	1	CARRIER FRAME		
6	DT83D526-9	2	AIR BOTTLE STRAP	316 CRES	
5	1.01 X 1.37 LG X 1.25 LG	1	GASKET - NEOPRENE	300 PSI	
4	1/4-20 X .19 LG	1	SET SCREW - CUP POINT		
3	DT83D526-4	1	OUTER BEARING		
2	DT83D526-2	1	PENETRATOR FLOW BARREL		
1	DT83D527-3	1	PENETRATOR CUTTER ASSY		
PART NO		DESCRIPTION		QTY	

Figure 29. Elevation View, Penetrator/Agent Applicator Assembly.

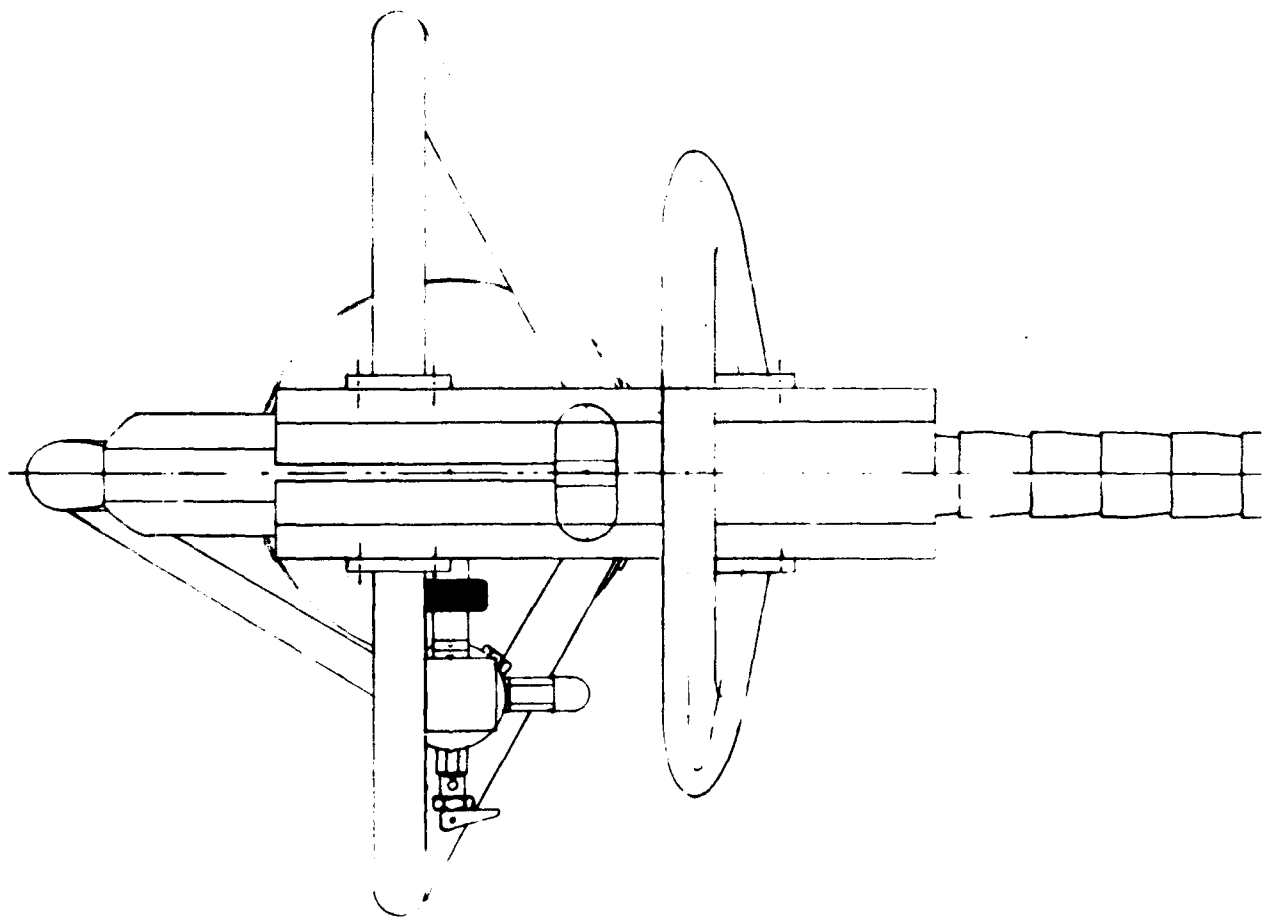
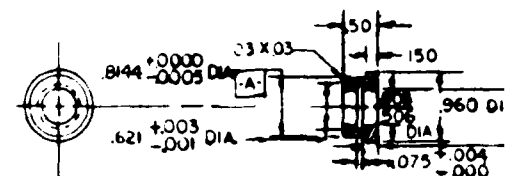


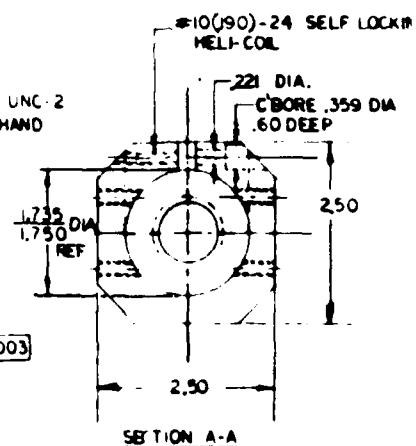
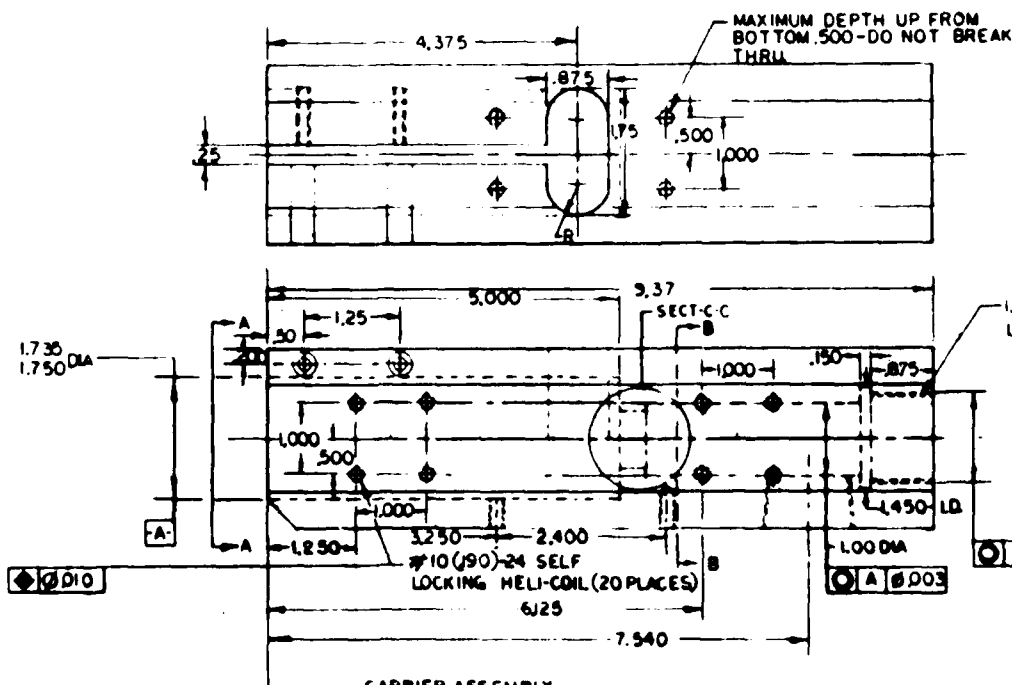


Figure 30. Plan View, Penetrator/
Agent Applicator Assembly.

35
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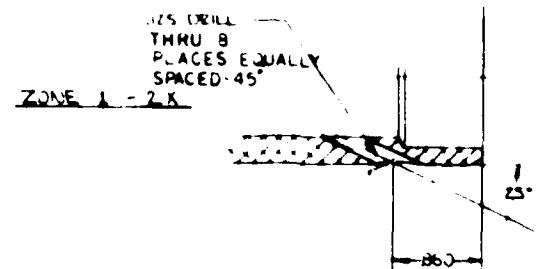
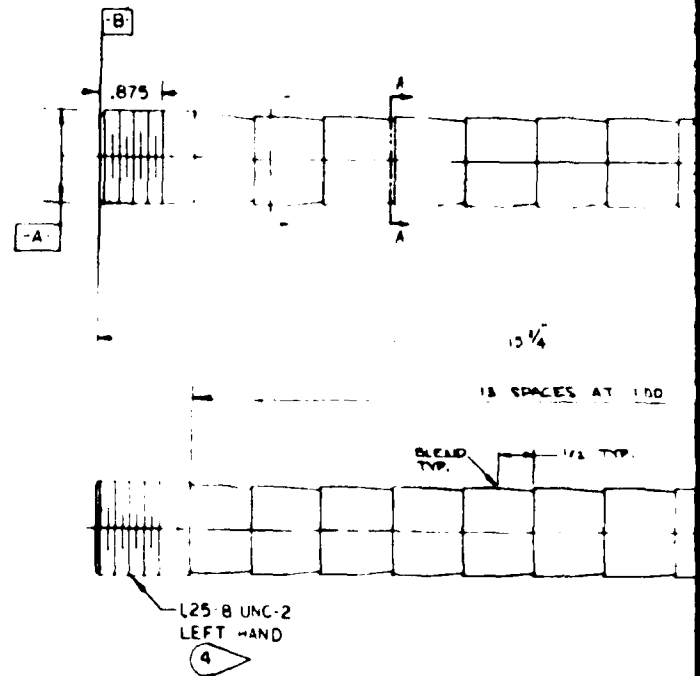
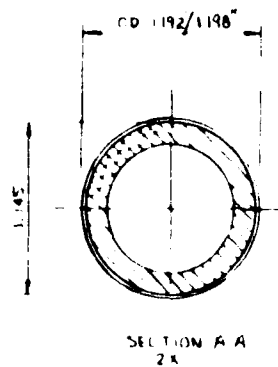
BEARING/SEAL
 MATL: OILITE BRONZE
 PART NO. DT 830526-9



CARRIER ASSEMBLY

PART NO. DT 830526-1

1. MATL- ALUM-6061-T6- 2.50 X 2.50 BAR
2. HARDCOAT PER MIL-A-8625 TYPE III CL-3-MAX.001 BUILD-UP
3. ANODIZE THREADS ONLY PER MIL-A-8625-TYPE-I
4. BREAK ALL EDGES
5. PRESS BEARING/SEAL INTO CARRIER AFTER STEP-3
6. DRILL GROOVE FOR A 2-016 O-RING

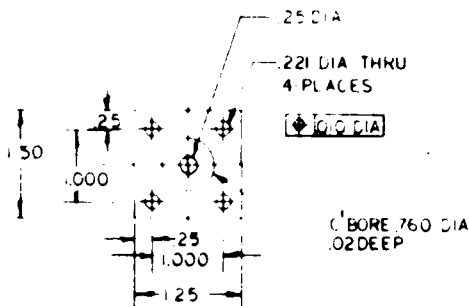


FLOW BARREL
PART NO. DT83D526-2

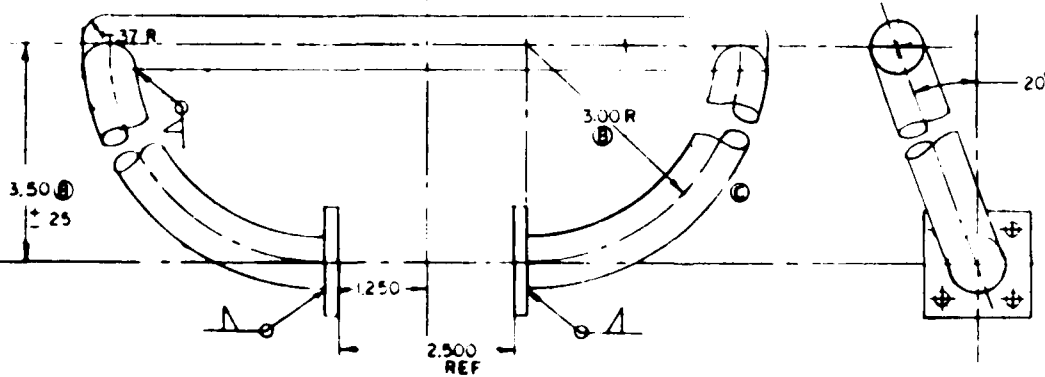
NOTES:

- 1.0 MATERIAL - ALUM ALLOY-6061-T6
- 2.0 MAKE FROM SEAMLESS TUBING 1/25 OD X 1.00 WALL
- 3.0 HARDCOAT PER MIL-A-8625, TYPE III, CL1 - MAX BUILD-UP .001 PER SURFACE
- 4.0 ALLOW FOR HARDCOAT BUILD UP ON THREADS

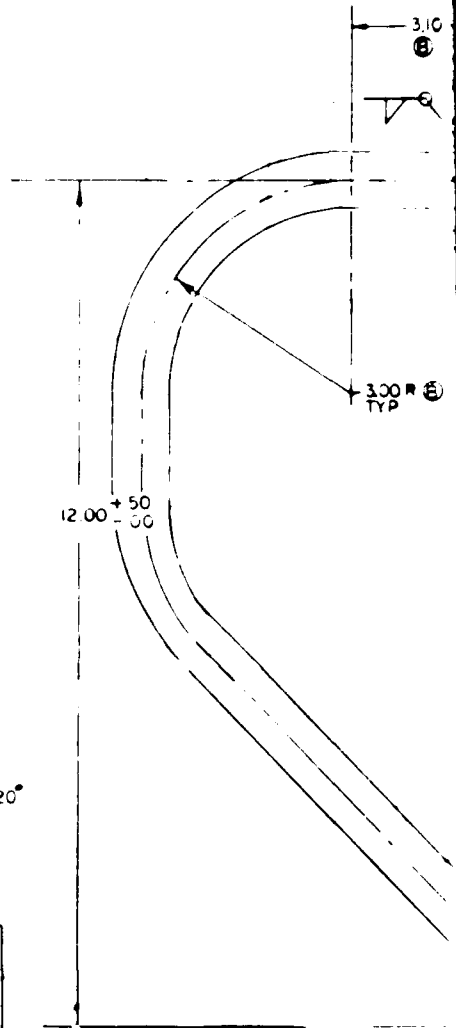
NOTE: DIMENSIONS IN INCHES
CENTERS PERMISSIBLE 1/16
CHAMFERS 30° X .015



188
 HANDLE FLANGE
 MATL-ALUM-6061-T6
 PART NO DT 83D526-4

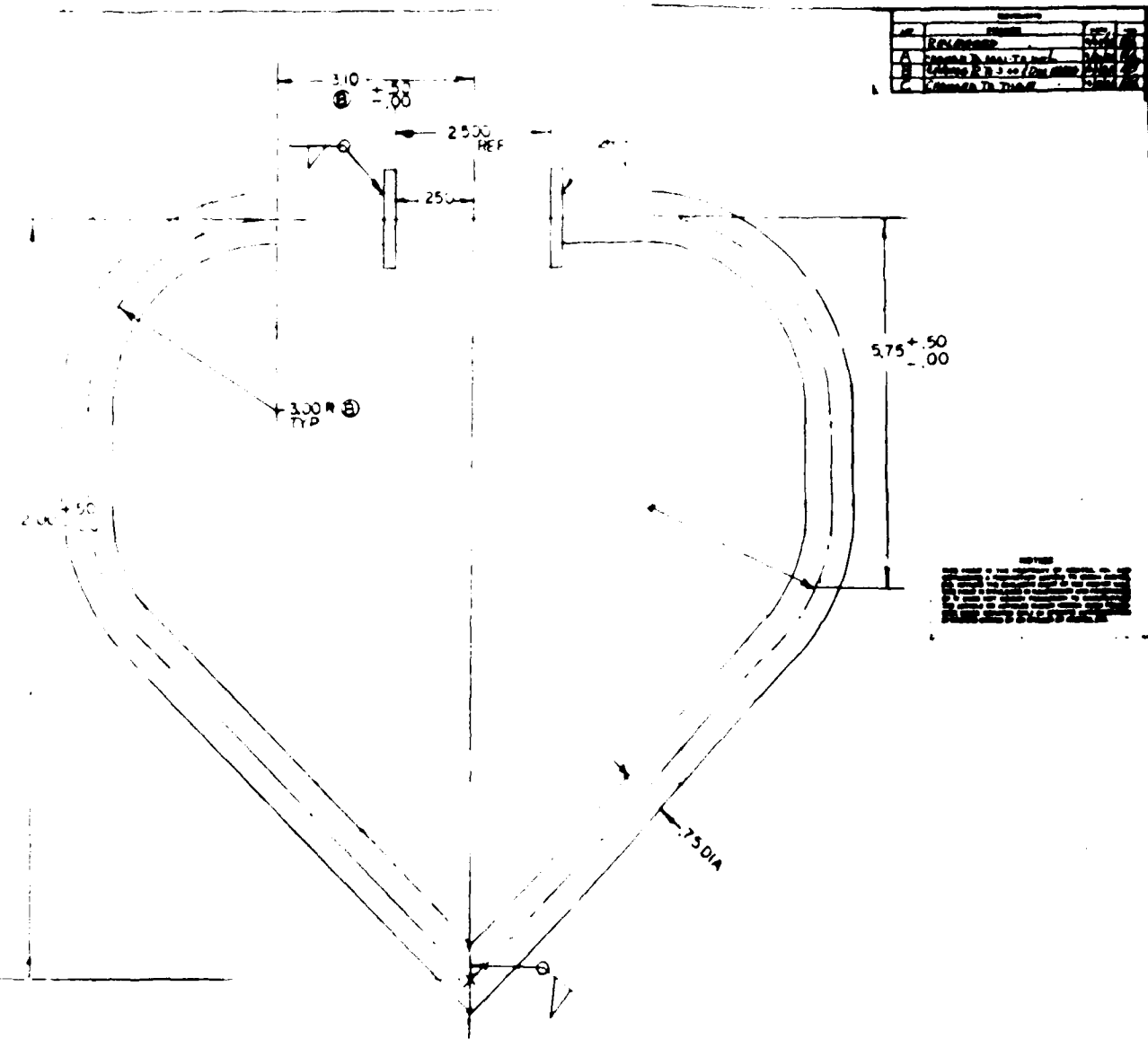


TOP HANDLE
 MATL-ALUM TUBE 6061-T6 - 75 OD X .085 WALL
 ALUM ROD 6061-T-6 [CROSS ROD ONLY]
 PART NO - DT 83D526-5



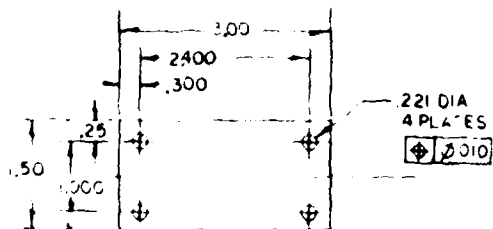
NOTES

- 1 ANODIZE IN ACCORDANCE WITH MIL-A-8625, TYPE-III - CL-1
 MAX BUILD UP .001
- 2 USE PART NUMBER DT83D526-1 (CARRIER ASSY) AS THE
 WELDING JIG.

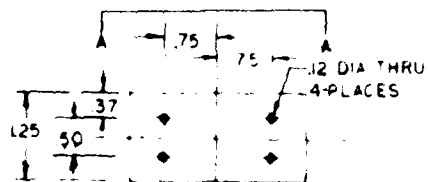


REAR HANDLE
 MATL - ALUM. TUBE 6061-T6 X .085 WALL
 PART NO. DT830526-6

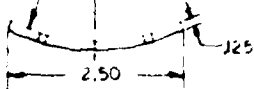
Figure 33. Handle Details.



MATERIAL MAY BE REMOVED
SURFACE TO REGAIN FLAT
WELDING



2.825 R



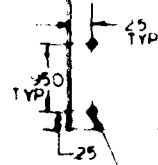
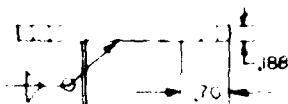
SECTION A-A

HANDLE ADAPTER

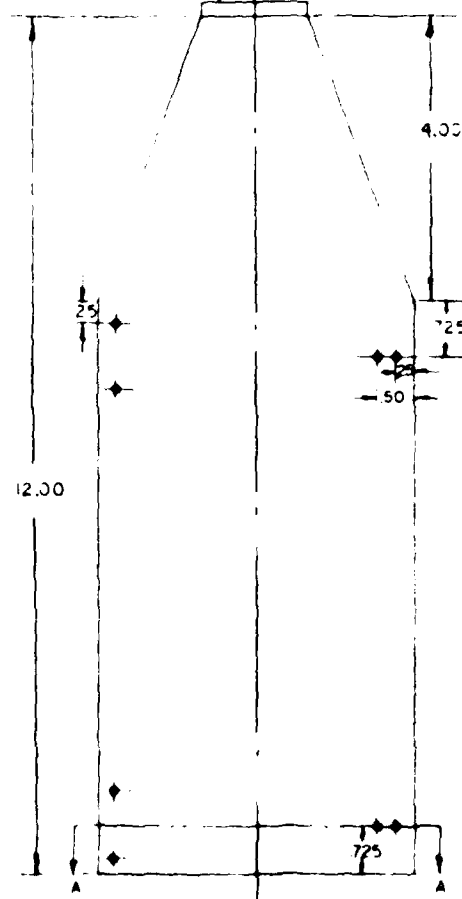
PART NO. DT83D526-7
MAT'L - ALUM. 6061-T6

NOTES

1. HARDCOAT PER MIL-A-8825 TYPE III - CL I - MAX BUILD UP .001
AFTER FITTING PARTS TO CARRIER



.125 $\pm$.003 DIA THRU
CSK 100° TO .225 $\pm$.02 DIA. BACK SIDE ONLY
8 PLACES (A)

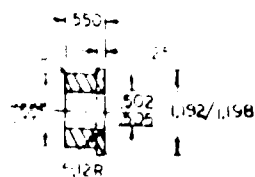


BOTTLE CARRIER ASSEMBLY

PART NO. DT83D526-8
MAT'L - ALUM. 6061-T6

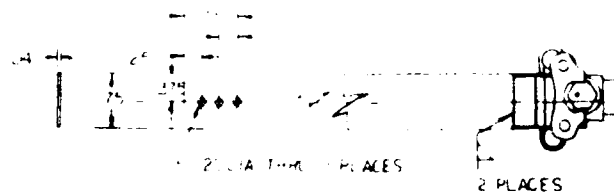
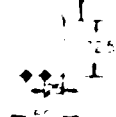
REV	DATE	BY	CHK
1	10/1/58	W. J. H.	W. J. H.
2	10/1/58	W. J. H.	W. J. H.

MATERIAL MAY BE REMOVED FROM THIS SURFACE TO REGAIN FLATNESS AFTER WELDING



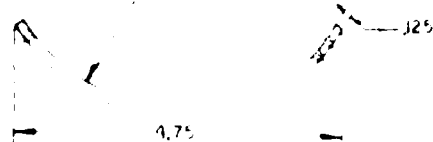
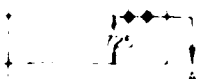
BEARING
PART NO. DT830526
MATERIAL: BRONZE

10/1/58
W. J. H.
W. J. H.



2.00A THIN PLATES
PART NO. DT830526
MATERIAL: BRONZE

2.00A

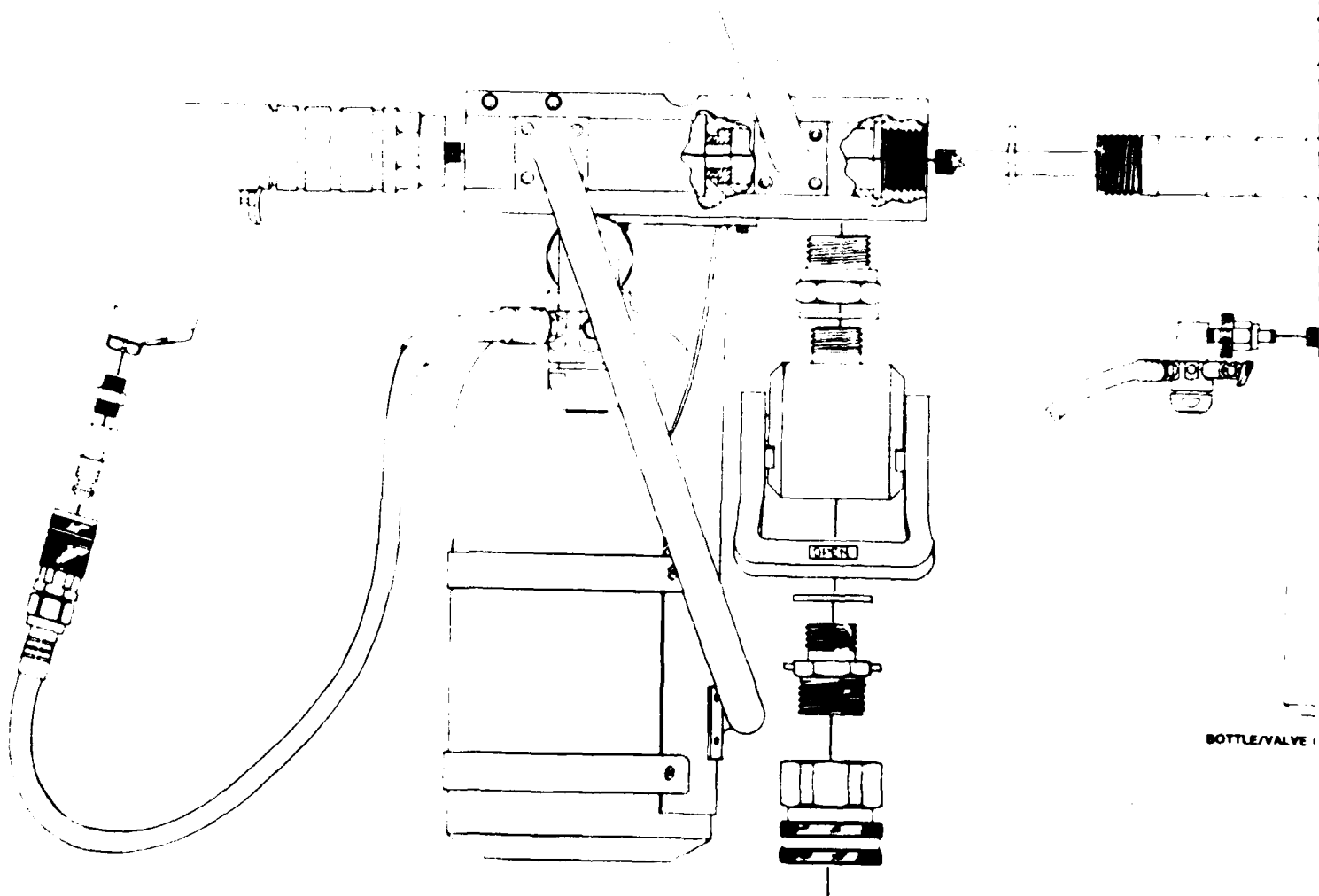


1.25
SECTION A-A

10/1/58
W. J. H.
W. J. H.

Figure 34. Carrier/Outer Bearing Assembly Details.

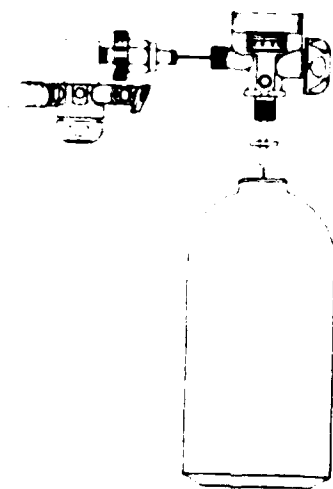
43
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BOTTLE/VALVE

EXPLODED VIEW - AIRCRAFT SKIN PENETRATOR APPLICATOR

EXPLODED VIEW

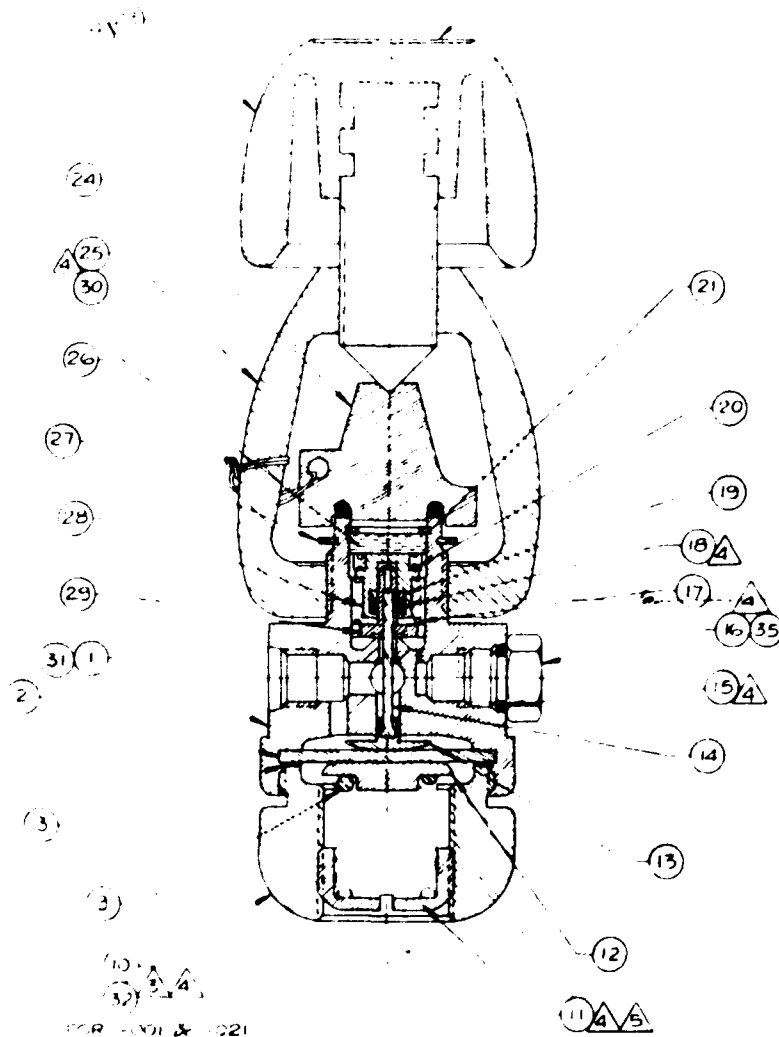
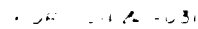


BOTTLE/VALVE CONFIGURATION

AIRCRAFT SKIN PENETRATOR APPLICATOR EXPLODED VIEW

Figure 35. Aircraft Skin Penetrator/
Applicator - Exploded View.

45
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- NOTES. UNLESS OTHERWISE SPECIFIED

			-01
-031	1088-00	108800	
	3901-84	390184	
-021	1087-00	108700	-001
	1081-00	108100	
DASH NO	PART NO.	DWG NO.	DASH NO.
	NEXT ASSY.		

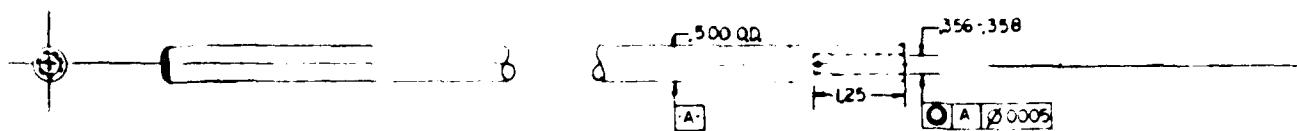
REVISIONS					
NO.	DATE	BY	DESCRIPTION	APPROVED	DATE
1	11/17/82	JANES			
2					
3					
4					

USD CORP
MAR 25 1983
ENGINEERING
DOCUMENT CENTER

QTY	PART NO.	DESCRIPTION	DWG. NO.	QTY
1	9109-12	PORT PLUG W/P	910912-003	35
1	1088-54	RING, PACKING	108854	34
1	1088-51	RETAINER, SPRING	108851	33
1	1053-26	RETAINER, SPRING	105326	32
1	1053-33	BODY, 1 ST STAGE	1053-33	31
1	7004-11	YOKE	700411	30
1	1053-21	DISC & RETAINER	105320-011	29
1	1053-24	BLOCK, SPRING	105324	28
1	8610-68	RETAINER, SNAP RING	8610XX	27
1	1051-06	FILTER	105106	26
1	1017-01	YOKE	101701	25
1	1010-12	CAP, INLET, ASSY	101012	24
1	1075-06	KNOB ASSY	107506	23
1	SEE PICK LIST	DECAL, LOGO		22
1	8630-51	RING RETAINING	863051	21
1	1046-13	SPRING	104613	20
1	8280-05	RING, BACK-UP	8280XX	19
1	8200-06	O-RING	8200XX	18
1	1015-04	SPRING	101504	17
1	1017-04	PORT PLUG W/P	910912-005	16
1	8200-11	O-RING 3-913	8200XX	15
1	1053-23	PIN	105323	14
1	1000-27	PIN SUPPORT	100027	13
1	1053-28	PAD SPRING	105328	12
1	1015-29	ADJUSTING SCREW	101529	11
1	1017-03	RETAINER, SPRING	101703	10
1	1053-27	SPRING	105327	9
1	1088-53	DIAPHRAGM	108853-003	8
1	1017-07	RING, PACKING	101707	7
1	8204-03	SILICONE FLUID	8204XX	6
1	1017-06	RETAINER, SPRING (CW)	101706	5
1	1000-40	SPRING	100040	4
1	8210-26	GASKET	8210XX	3
1	1000-29	MEMBRANE	100029	2
1	1017-02	BODY, 1 ST STAGE	101702	1
QTY	PART NO.	DESCRIPTION	DWG. NO.	QTY

QTY	PART NO.	DESCRIPTION	DWG. NO.	QTY
1	1017-20	101600-051		
1	1017-10	-041		
1	1017-00	-031		
1	1016-20	-021		
1	1016-10	011		
1	1016-00	101600-001		
1	1017-02	101702		
1	1017-03	101703		
1	1017-04	101704		
1	1017-05	101705		
1	1017-06	101706		
1	1017-07	101707		
1	1017-08	101708		
1	1017-09	101709		
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1	1017-95	101795		
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1	1017-98	101798		
1	1017-99	101799		
1	1017-00	101800		

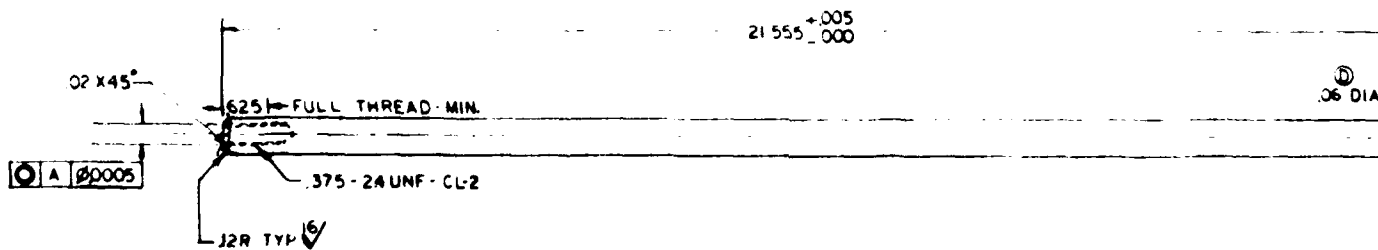
Figure 36. First-Stage Assembly
Conshelf - 20 & XIV
(Pressure Regulator).



BIT SHANK

PART NO. - DT83D527-2

MAT'L - DRILL ROD R_c-52-60



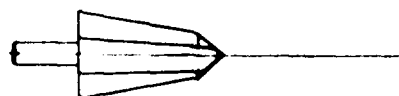
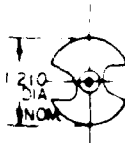
PENETRATOR BIT ASSY

PART NO - DT83D527-3

NOTE

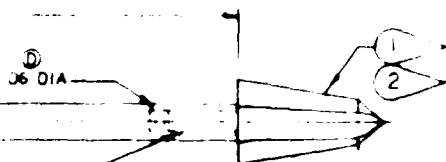
1. PURCHASE FROM G.L. ELECTRONICS CORP.,
ROCKFORD ILL.
2. REGROUND TIP POINT ANGLE ONLY AFTER BRAZING
BIT TO SHANK
3. USE BROKEN TOOL BIT AS A DRILL JIG FOR LOCATING PINS AND FOR WELDING ALIGNMENT
4. BREAK ALL EDGES

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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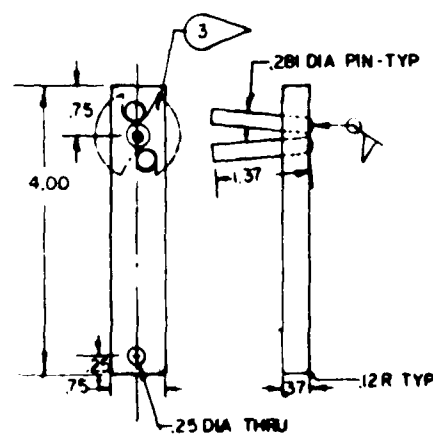


PENETRATOR
BIT TIP

PART NO - DT83D527-1



SILVER BRAZE PER MIL-B-7983
TYPE-I, GRADE-B USING FILLER
METAL MIL-S-15395, GRADE II



TOOL BIT REMOVAL TOOL
PART NO DT83D527-4
MATL: 316 ST STEEL

Figure 37. Penetrator Cutter.

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SECTION IV

CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

The Skin Penetrator/Agent Applicator meets Air Force requirements.

B. RECOMMENDATIONS

Proceed with procurement of the Skin Penetrator/Agent Applicator for deployment in Air Force firefighting operations.

APPENDIX A

ACCEPTANCE TEST PROCEDURE FOR THE AIRCRAFT FIRE- FIGHTING SKIN PENETRATOR/AGENT APPLICATOR MODEL ASP/AA-1

Purpose:

To evaluate the Aircraft Firefighting Skin Penetrator/Agent Applicator under actual field conditions by drilling holes through the fuselage of a B-52 aircraft and injecting Halon 1211 inside the fuselage.

Location:

Kirtland Air Force Base, Albuquerque, New Mexico.

Procedure:

- 1.0 The Skin Penetrator/Agent Applicator's air storage bottle will be charged with N₂ using the N₂ storage bottles on the Halon 1211 fire truck. Maximum pressure of N₂ bottles on Halon 1211 fire truck is 2200 psig.
- 2.0 The Skin Penetrator/Agent Applicator will be hooked up to the fire truck's Halon 1211 supply system. The Halon 1211 supply tank will be charged to 220 psig.
- 3.0 Once the Skin Penetrator/Agent Applicator drills through the skin of the B-52 Fuselage and penetrates into the fuselage the maximum distance, the Halon 1211 valve on the Agent Applicator will be opened to inject Halon 1211 into the fuselage.
- 4.0 All operations of the Skin Penetrator/Agent Applicator will be documented by a video camera and 35 mm cameras.
- 5.0 Air Force safety standards will be observed when charging the air storage bottle with high-pressure nitrogen.
- 6.0 A 200 psi gauge will be installed in the air regulator's secondary discharge port for monitoring regulator control pressure.

Conclusions:

- 1.0 The Skin Penetrator/Agent Applicator can pierce the fuselage of a B-52 aircraft by drilling or piercing and can pierce the wing of a B-52 by drilling.

Conclusions (Cont.):

- 2.0 The B-52 test aircraft fuselage did not have a wing section, therefore, drilling tests were conducted at the AMETEK, Inc./Offshore Research and Engineering Division facility in Santa Barbara, California, on a B-52 wing section. The average length of time to drill through the B-52 wing section was 15-18 seconds.
- 3.0 Approximately three holes can be drilled through a B-52 wing section with a 3000 psi charge in the air supply bottle.
- 4.0 When the Skin Penetrator/Agent Applicator drilled through the B-52 fuselage and was pushed to its maximum penetration depth into the fuselage, it did not move as the Halon 1211 valve was opened and the Halon 1211 was injected into the fuselage.

Recommendations:

- 1.0 Replace the Chudnow air regulator with an Aqua-Lung, Conshelf XIV air regulator. The same model was used on the Preliminary Agent Penetrator Model but with a standard CGA bottle adapter.
- 2.0 Make the removal of the tool bit assembly easier for the operator in the field.

TEST RESULTS *

Hole No.	Time to Drill Hole (seconds)	Pressure in Bottle (psi) After Drilling Hole	Remarks
1	1½	2000	Clean hole
2	2½	1500	Clean hole
3	2	1200	Clean hole; recharge bottle
4	2½	1900	Clean hole; Halon on
5	1½	1500	Clean hole; Halon on
6	1½	1200	Clean hole; recharge bottle
7 (1)	6	1500	Clean hole; Halon on; recharge bottle
8 (2)	11	250	Clean hole; Halon on; recharge bottle
9 (3)	0	--	--
10 (3)	0	--	--

Note: After bottle charging, regulator secondary pressure had to be readjusted.

Special Conditions:

- 1) Hole angled to have tool bit hit part of rib.
- 2) Hole angled to go through a "Z" rib and a 1 1/2-inch diameter bundle of electrical wires.
- 3) The Skin Penetrator/Agent Applicator was used as a ram to pierce the skin of the B-52 fuselage. Two holes were done this way with instant penetration.
- 4) The Skin Penetrator/Agent Applicator was placed approximately 25 feet from the B-52 fuselage. The Halon 1211 valve on the Agent Applicator was opened to get the spray pattern documented on video tape and 35 mm slides. The spray pattern reached the fuselage from top to bottom. Because the ambient temperature was approximately 75°F, a good dense spray pattern was observed.
- 5) Additional holes were drilled by members of the inspection team.

*Test results of tests conducted using the Skin Penetrator/Agent Applicator on a B-52 aircraft at Kirtland AFB on November 1, 1983.



Figure A-1. Drilling Through the Fuselage of a B-52 Aircraft.



Figure A-2. Penetration into the Fuselage Completed, and Halon 1211 Being Discharged into the Fuselage.



Figure A-3. Penetration Completed, Tool is Captivated in Fuselage (Side View).



Figure A-4. Penetration Completed, Tool is Captivated in Fuselage (Full View).

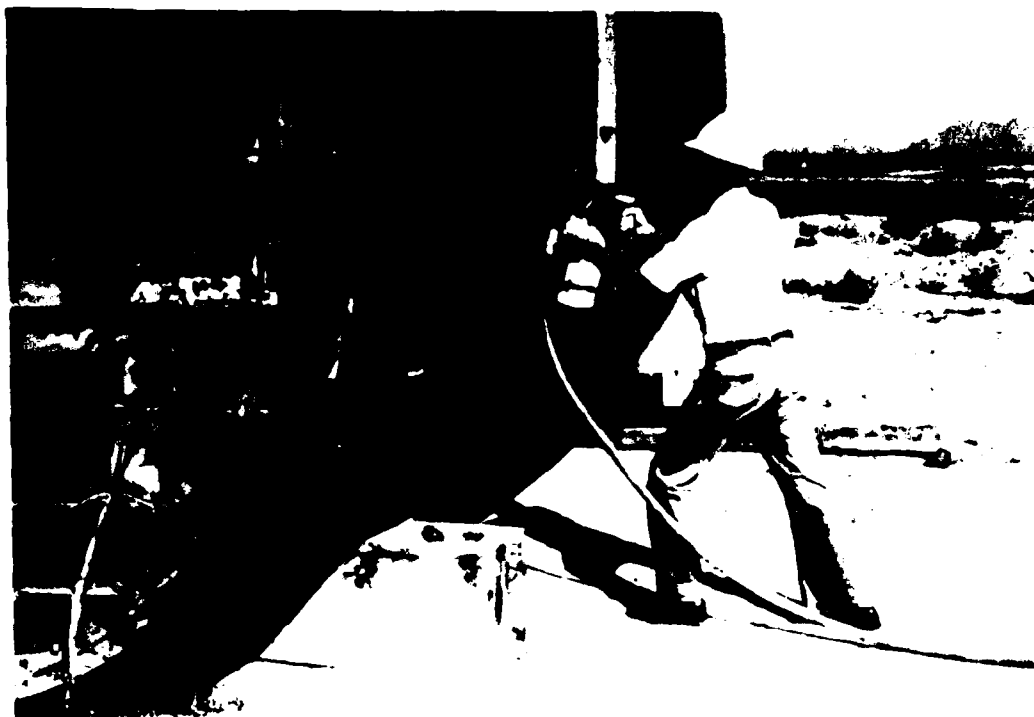


Figure A-5. Penetration of Fuselage Completed.

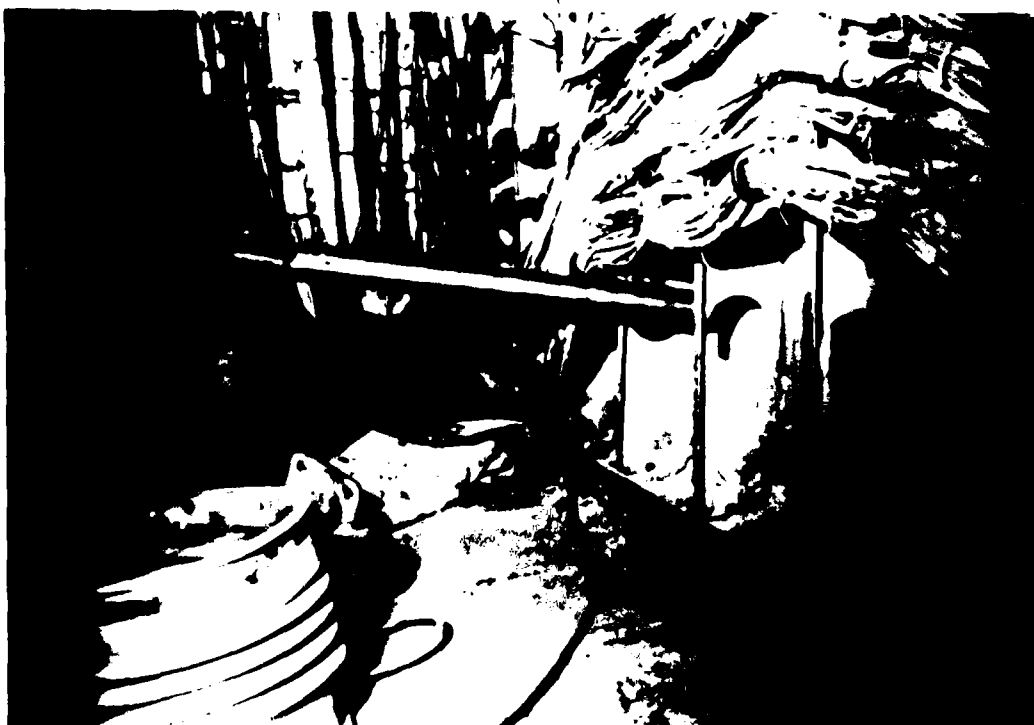


Figure A-6. Tool-Bit Has Penetrated Skin of Fuselage and Fuselage Rib.



Figure A-7. Drilling Through the Fuselage of a B-52.

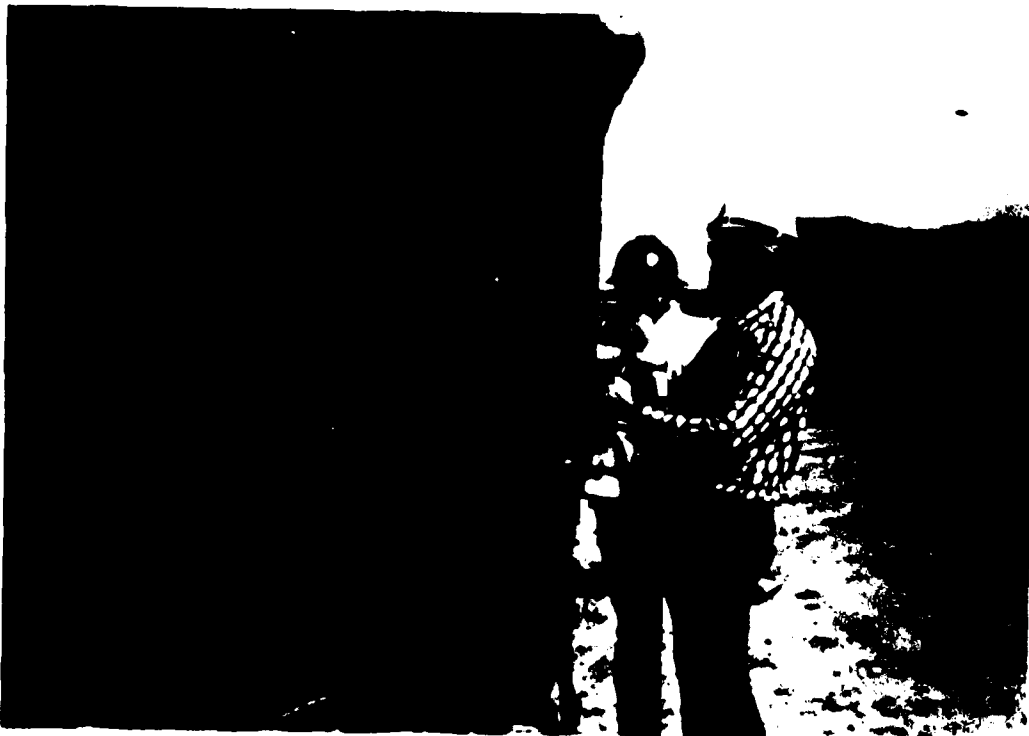


Figure A-8. Penetration of the Fuselage Completed and Halon 1211 Being Discharged into the Fuselage.



Figure A-9. Drilling Through the Fuselage of a B-52.



Figure A-10. Ragged Holes Caused by Using the Tool as a Spear Instead of Drilling the Hole.

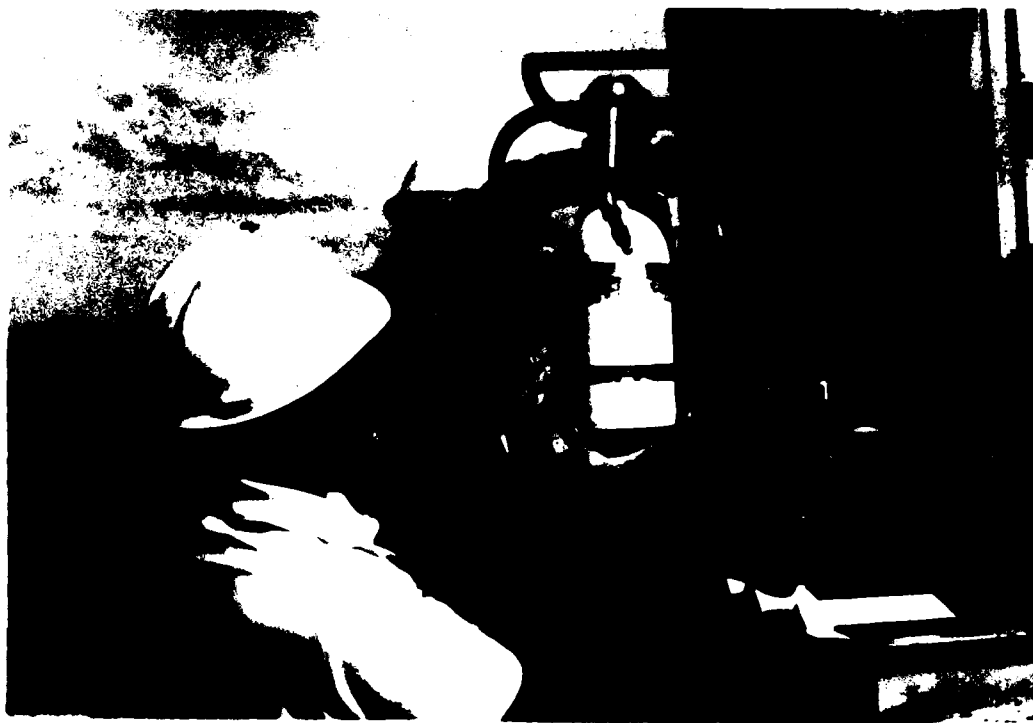


Figure A-11. Air Supply Bottle Being Hooked up to the
N₂ Bottle on the P-13 Rescue Truck.



Figure A-12. Air Supply Bottle Being Charged from the N₂ Bottle on the P-13 Rescue Truck.

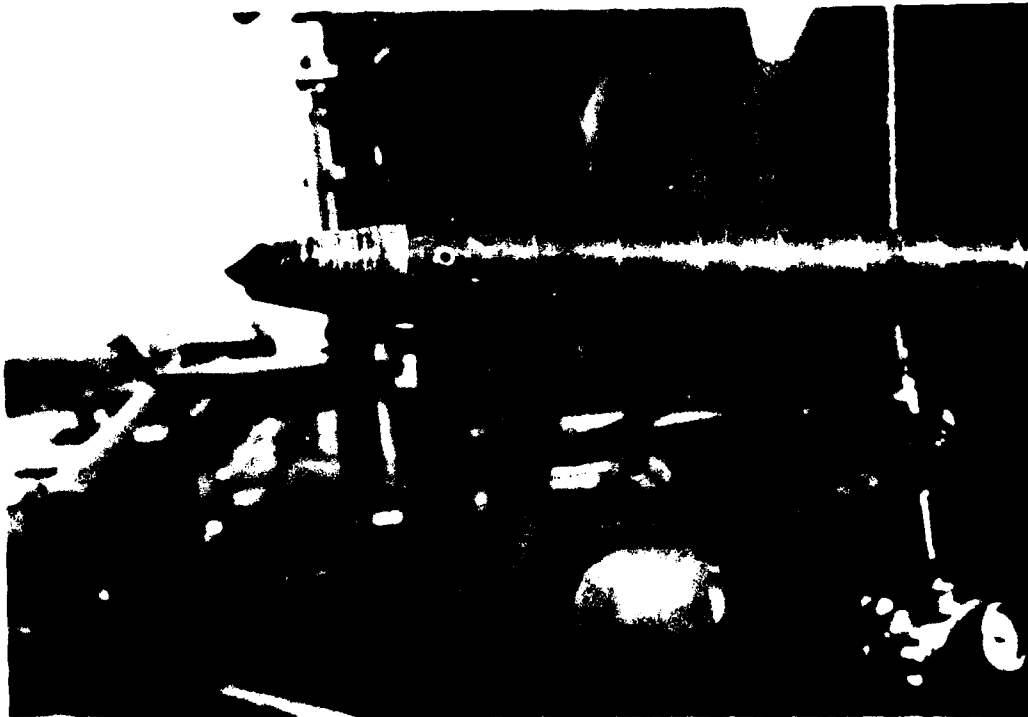


Figure A-13. Tool Bit and Barrel Assembly.

APPENDIX B

OPERATING INSTRUCTIONS FOR THE AIRCRAFT FIRE- FIGHTING SKIN PENETRATOR/AGENT APPLICATOR MODEL ASP/AA-1

A. DAILY USE OF TOOL FOR TRAINING

When tool is used daily for training, proceed as follows every six holes:

1. Disconnect quick-disconnect from drill motor.
2. Fill coupler quick-disconnect with SAE 10 oil (6 cc) and recouple with nipple quick-disconnect on drill motor. This will lubricate drill motor internally.
3. During operations observe if there are any air leaks, slowing down of the drill motor, excessive time to drill a hole, wobble of the tool bit, hard-starting a hole, excessive air consumption, noise or vibration.
4. Safety Precautions
 - a. Wear safety glasses when drilling the hole.
 - b. Never touch the drill bit when it is turning.
 - c. Disconnect the air supply to the drill motor if work is to be done on the tool.
 - d. Never start the tool bit turning before making contact with the aircraft skin.
 - e. Do not rapidly close the drill motor trigger, except when drilling a hole. Excessive wear of the air regulator components will result.
 - f. Do not adjust the air regulator discharge pressure more than 128-132 psi.
 - g. Do not lay the tool in the dirt as dirt will cause scoring of the forward bearing and tool bit drive shaft.

B. CHARGING AIR BOTTLE

Note: Maximum bottle pressure is 3000 psig.

- Caution:
- 1) Use ONLY nitrogen or breathing air to charge air bottle.
 - 2) If a flex hose is used to charge the air bottle, ensure that it is secured. A broken flex hose's whiplash can be very dangerous.
 - 3) The charging system pressure gauge should be a calibrated gage and be accurate to at least 1 percent full scale.

1. Ensure that the air bottle valve is CLOSED and relief valve has been lifted to vent off any trapped pressure.
2. Unscrew the regulator from the air bottle and disconnect air hose from the drill motor.
3. Screw the charging adapter onto the air bottle and tighten hand tight.
4. Slowly open the air bottle valve.
5. Crack the N₂ or air supply open and SLOWLY charge the air bottle.

Note: It should take a minimum of ten (10) minutes to charge the air bottle.

WARNING: NEVER charge the bottle rapidly as overheating of the air bottle will result. The air bottle should be constantly felt with the hand to see if it is becoming warm. If it becomes warm, the charging rate is too fast. Slow down the charging rate.

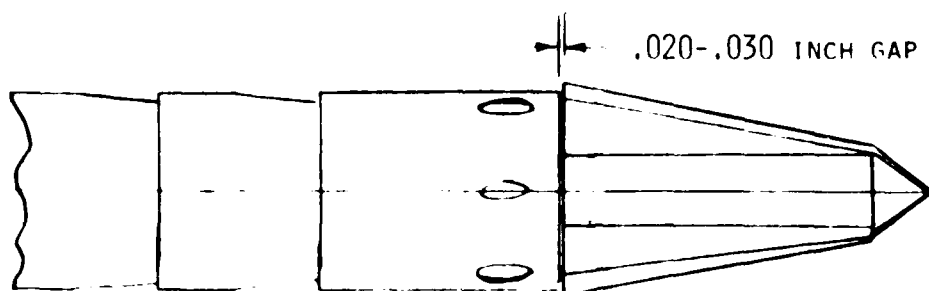
6. When the pressure gauge on the charging system reaches 3000 psig, discontinue charging. Close the valve on the air bottle being charged and also close the charging system valve.
7. Slowly vent the pressure off from the charging system.
8. Remove the charging adapter from the air bottle.
9. Install the air regulator onto the air bottle and make hand tight.

Caution: NEVER use a wrench to tighten the adapter to the air bottle.

B. CHARGING AIR BOTTLE (Continued)

10. Hook up the hose QD to the air motor.
11. Unit is now ready for use.

C. INSTRUCTIONS FOR REPLACING A TOOL BIT ASSEMBLY



Caution: Wear gloves to protect hands from sharp edges of tool bit.

1. Lay tool on its side.
2. Install tool bit removal wrench onto the tool bit.
3. Hit end of tool bit removal tool with a ball-peen hammer (counter clockwise) to loosen tool bit from drill motor.

Note: If shaft does not break loose from drill motor, unscrew back of drill motor and jam drill motor's planetary gear train with a wide blade screwdriver. Keep dirt out of drill motor internals.

4. Unscrew tool bit shaft from drill motor.
5. Grease shaft of new tool bit assembly. Insert through forward-flow barrel bearing and firmly push through bearing/seal in carrier assembly.
6. Tighten onto air motor threaded drive.
7. Check gap between back of tool bit and front of barrel bearing. Should be .020-.030 inch.

Note: If there is no gap, or the gap is in excess of .030 inch, loosen the two drill motor clamping screws and move the drill motor accordingly to give .020-.030 inch gap between the back of the tool bit and the front of the barrel bearing. Tighten the two motor clamping screws.

D. INSTRUCTIONS FOR CHANGING THE CONFIGURATION OF THE
PENETRATOR/AGENT APPLICATOR

The configuration of the Penetrator/Agent Applicator
may be changed to the following:

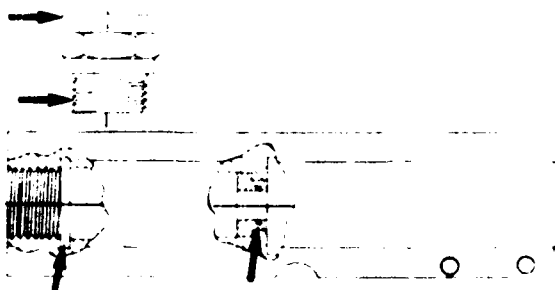
1. The drill motor may be disconnected from its air bottle and supplied from one of the N₂ supply bottles on the P-13 rescue truck. The N₂ bottle MUST have a precision regulator mounted on it to furnish at least 15 cfm at 128-132 psi. This will allow the operator to drill many holes without having to replenish the air bottle on the Penetrator after every few holes.
2. The air bottle, regulator, hose and quick-disconnect assembly may be removed from the Penetrator assembly, if the external air supply is going to be a permanent installation.
3. If air is going to be delivered to the Penetrator from the P-13 truck on a permanent basis, the air bottle, regulator, hose and quick-disconnect can be permanently removed and stored. The Halon ON/OFF valve can then be repositioned parallel to the carrier instead of being perpendicular by removing the Halon valve assembly from the carrier. Secure a 1-inch street elbow, coat the male threads with pipe compound and thread into the carrier. Tighten until the female section of the elbow faces to the left of the carrier. Coat the male threads of the Halon valve adapter with pipe compound. Thread the Halon valve adapter (with the valve and quick-disconnect attached) into the street valve. Orient the Halon valve so that the handle is on the right side. Then continue tightening the street elbow into the carrier until the Halon valve assembly is directly underneath the carrier.

Note: Do not store the air bottle empty. Make sure there is some N₂ under at least 100 psi in the bottle at all times.

APPENDIX C

ASSEMBLY INSTRUCTIONS FOR THE AIRCRAFT FIRE- FIGHTING SKIN PENETRATOR/AGENT APPLICATOR MODEL ASP/AA-1

A. CARRIER ASSEMBLY



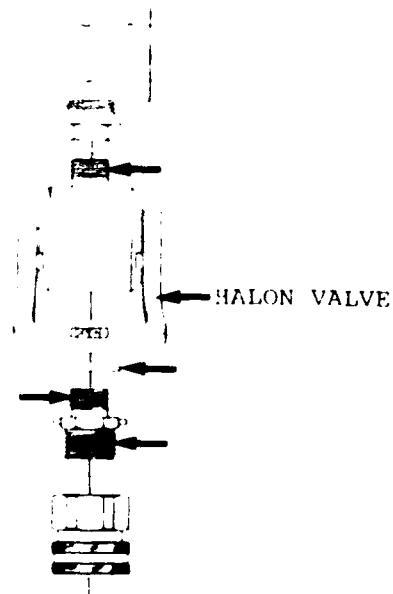
"O" Ring - P/N 2-112 - C557-70 (neoprene - 70 durometer);
Gasket - P/N G4 - 1" ID X 1.537 OD X .125 thick (1 inch chemical) -
Supplier - Halprin Supply Co.
1 inch Chemical Female to 1 inch NPTM Adapter - Supplier - Western
Fire Co. - P/N 77

1. Grease "O" Ring with Dow Corning DC-10® grease (or equivalent) and install into bearing seal, P/N DT83D526-9.
2. Grease gasket with Dow Corning DC-10® grease (or equivalent) and install into front of carrier assembly (barrel seal).
3. Coat pipe threads of 1 inch chemical female to 1 inch NPTM adapter with thread sealing compound and grease gasket.

Caution: Do not use Teflon® tape.

4. Install loosely into carrier assembly. Reference item B on Halon valve assembly.

B. HALON VALVE ASSEMBLY



1. Coat gasket of 1 inch chemical male to 1 inch NPTM adapter with Dow Corning DC-10® (or equivalent) and install into adapter..
2. Coat threads of ball valve threaded end with compound.
3. Coat the pipe threads of the 1 inch chemical male to 1 inch NPTM adapter with thread sealing compound and thread tightly into the quick disconnect coupler.
4. Screw the assembled adapter/quick-disconnect coupler into the ball valve and wrench tight.
5. Screw the ball valve into the 1 inch chemical female to 1 inch NPTM adapter on the carrier assembly and make up hand tight.
6. Tighten the adapter into the carrier assembly with light wrench pressure.

Caution: Do not overtighten into the carrier assembly at this time.

7. Tighten the ball valve into the carrier adapter until the handle is orientated on the right side.

Note: If the handle does not quite make its proper orientation, tighten the adapter into the carrier assembly.

Caution: Do not overtighten, as cracking of the carrier assembly around the pipe thread could result.

8. If the ball valve handle still does not make its proper orientation, tighten the ball valve into its adapter.

C. HANDLES BOTTLE CARRIER ASSEMBLY

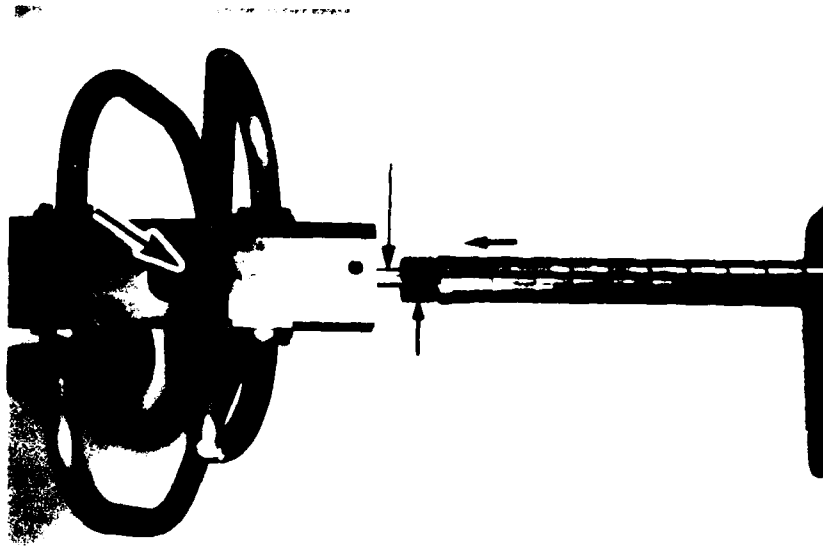


1. Grease 10-24 socket-head screws with Never-Seez[®] (or equivalent) and install handles onto carrier assembly.

Note: Never-Seez[®] is a product of Never-Seez Compound Corp., Broadview, IL.

2. Install air bottle carrier onto carrier.

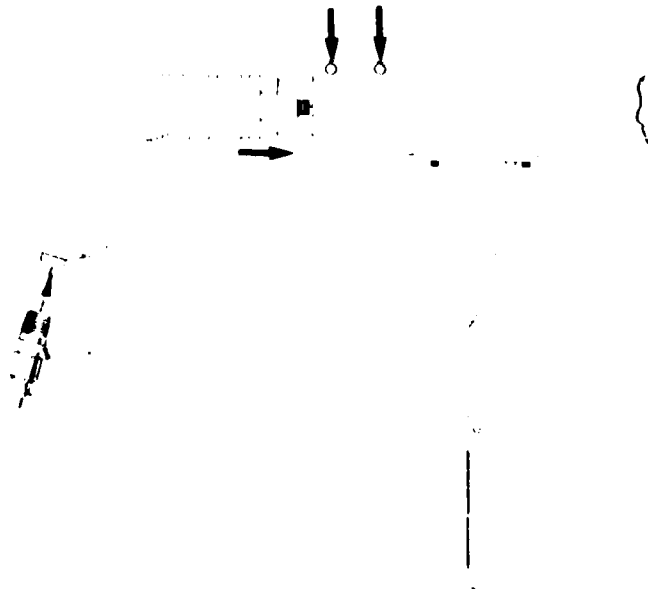
D. PENETRATOR FLOW BARREL AND TOOL BIT/SHAFT ASSEMBLY



1. Coat penetrator tool bit shaft and backside of tool bit with Dow Corning DC-10® grease (or equivalent) and push through flow barrel bearing until backside of tool bit hits front of barrel bearing.
2. Coat flow barrel threads with Never-Seez[®] (or equivalent).
3. Align the tool bit shaft with the bearing/seal in the carrier assembly and push slowly through when the flow barrel reaches the carrier assembly; thread into the carrier assembly (left-hand THREAD).

Caution: Tighten until hand tight. Do not use a wrench.

E. DRILL MOTOR

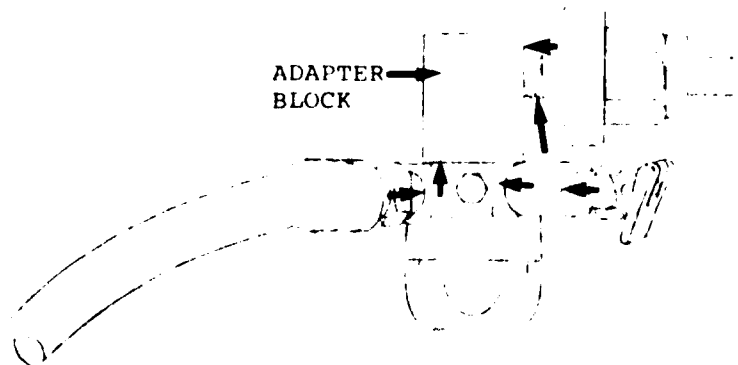


1. Coat the two socket-head screws for securing the drill motor into the carrier assembly with Never-Seez[®] and install into the carrier assembly.
2. Install drill motor into carrier assembly.
3. Thread tool bit shaft onto drill motor threaded drive shaft until tight.

Caution: Cutter edges are sharp. Wear glove when tightening cutter shaft onto drill motor or use tool bit removal tool.

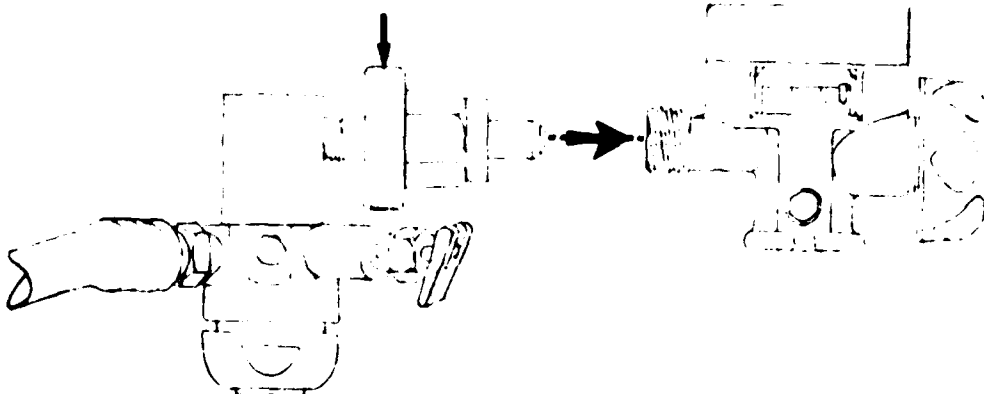
4. Adjust position of drill motor to give approximately .020-.030 inch of clearance between back of tool bit and front of flow barrel bearing.
5. Tighten two socket-head screws to secure drill motor to carrier assembly.
6. Install male quick disconnect into the bottom of the drill motor.

F. AIR REGULATOR ASSEMBLY



1. Coat the CGA Fitting pipe thread with pipe sealing compound only and install into the adapter block.
 2. Coat "O" Ring (P/N 2-022)(lightly) with Dow Corning DC-10[®] grease (or equivalent) and install "O" Ring into adapter block "O" Ring groove.
 3. Install regulator into adapter block and tighten securely.
 4. Install relief valve into the relief valve adapter.
 5. Remove two hex plugs from the air regulator.
- Caution: These plugs must be from the LOW PRESSURE SIDE ONLY.
6. Coat the "O" Ring on the relief valve adapter with grease.
 7. Install the relief valve assembly into the air regulator.
 8. Coat the hose adapter "O" Ring with Dow Corning DC-10[®] (or equivalent).
 9. Install the hose adapter into the air regulator.

G. AIR REGULATOR/BOTTLE ASSEMBLY

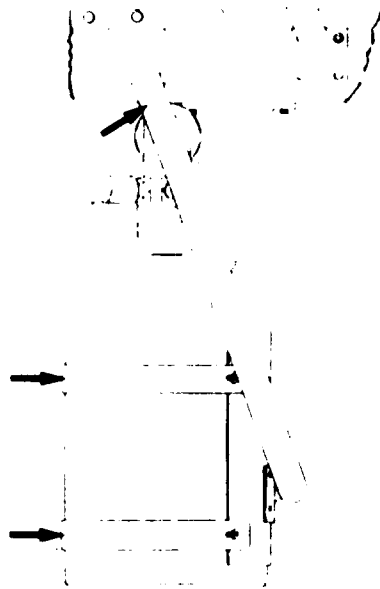


1. Install CGA cylinder adapter into air bottle valve fitting and tighten by hand until tight.

Caution: NEVER use a wrench to tighten the CGA cylinder adapter into the air bottle fitting. Hand tight is sufficient.

2. Install air regulator discharge hose quick-disconnect fitting into the drill motor-mating quick-disconnect fitting.

H. PRESSURE CYLINDER



1. Install pressure cylinder into the cylinder carrier. Top of gauge should touch bottle carrier bracket.
2. Insert the Simmons Link Lock Fastener into its mating latch and turn clockwise until it goes overcenter and stops.
3. Tighten the second bottle strap assembly.

Note: If bottle strap is loose because of variations in bottle diameter, unbolt strap and move one hole to shorten overall length. Rebolt strap to bottle carrier and tighten Simmons Link Lock Fastener.

APPENDIX D MAINTENANCE SYSTEM FOR THE AIRCRAFT FIRE- FIGHTING SKIN PENETRATOR/AGENT APPLICATOR MODEL ASP/AA-1			
COMPONENT:		REFERENCE PUBLICATIONS:	
Skin Penetrator/Agent Applicator ASP/AA-1		Assembly Procedure for the Air- craft Firefighting Skin Penetrator/Agent Applicator	
MTS CODE	MAINTENANCE TASK DESCRIPTION	SCHEDULE	REMARKS
APAl-1-3	Visually check unit for proper operation.	When operated	
APA2-1-2	Inspect entire tool.	After use on an actual air- craft fire	
APM1-2	Inspect regulator assembly for leaks and check relief valve for proper operation.	Every 3 months	
APM2-1-3	Inspect air bottle for condition, pres- sure gauge for bezil cracks and tight- ness on bottle carrier.	Every 3 months	
APM3-1-5	Inspect tool bit, shaft and bearings for damage.	Every 6 months	
APM4-1-3	Grease drill motor gear box.	Every 6 months	
APY1-1-7	Replace air bottle valve "O" ring	Every year	
APY2-1-5	Replace the "O" ring on the CGA bottle adapter fitting, and regulator fittings	Every year	
APY3-1-3	Replace bearing/seal "O" ring.	Every year	
APY4-1-3	Overhaul air drill motor.	Every year	
APY5-1	Hydro test and inspect air cylinder.	Every 3 years	
APY6-1-4	Overhaul air regulator	Every 3 Years	
APPENDIX	LUXFER U.S.A. Limited Guidelines For Inspection of High-Pressure Air cylinders. Air Regulator Drawing		

SYSTEM: Agent Applicator	COMPONENT: All Components	MTS CODE: APAl-1-3
SUB-SYSTEM: All	SCHEDULE: When operated	MANUFACTURER & P/N: AMETEK/ORED
SAFETY PRECAUTIONS: Wear safety glasses and hard hat when operating tool.		
TOOLS, MATERIALS, TEST EQUIPMENT, MANUALS: Safety Glasses India Stones, flat and round Hard Hat SAE 10 Lubricating Oil (nondetergent)		
TASK: - When unit is being used, visually check for any loose bolts, vibration, wobble of the tool bit, any pneumatic leaks, any Halon 1211 leaks from around the shaft bearing seal (if Halon 1211 is being used) or any noise from the drill motor. - After approximately every six holes, remove the quick-disconnect/hose assembly from the drill motor. Put approximately 6 cc of SAE 10 lubricating oil into the male coupler and reconnect. Drill motor is now lubricated for use. Note: Oil vapors will be visible coming out of the drill motor air vent port at the bottom of the handle during operation. Any slowing down of the drill motor RPM, or excessive air consumption indicates excessive wear of the drill motor internal components and will require an internal inspection. - Inspect the cutting edges of the tool bit for nicks and a build-up of metal. If found, use an India stone to dress out the nicks and remove metal from the cutting edges of the tool bit. If hand dressing is unsuccessful and the tool bit is too dull to cut properly, the tool bit must then be changed to a new one and the damaged one sent out for resharpening. Note: If the drill motor is using excessive amounts of air for operation, it must be serviced to determine if the internal seals are excessively worn and must be replaced.		

MAINTENANCE TASK SHEET

<u>SYSTEM:</u> Agent/Applicator	<u>COMPONENT:</u> All Components	<u>MTS CODE:</u> APA2-1-2
<u>SUB-SYSTEM:</u> All	<u>SCHEDULE:</u> After use on an actual aircraft fire	<u>MANUFACTURER & P/N:</u> Luxfer U.S.A. Limited 121W-30

SAFETY PRECAUTIONS:

Caution should be exercised because of the high-pressure involved.
Wear safety glasses.

TOOLS, MATERIALS, TEST EQUIPMENT, MANUALS:

Hydrostatic Pump
Safety Glasses

TASK:

- 1.0 Disassemble entire unit and inspect all components per Maintenance Task Sheets (APM1-1, APM2-1-3, APM3-1-5, APY1-1-7 through APY5-1).
 - 2.0 Return air bottle to the manufacturer (Luxfer) for hydrotest and inspection.
- Note: If base personnel are trained and certified to hydrotest air bottle, they may perform the bottle hydrotest and inspection.
- Reference Luxfer U.S.A. Limited Guidelines attached for hydrotest and inspection guidelines.

SYSTEM: Agent / Penetrator	COMPONENT: Regulator	MTS CODE: APM1-2
SUB-SYSTEM: Pneumatic	SCHEDULE: Every 3 months	MANUFACTURER & P/N: Aqua Lung Conshelf XIV
SAFETY PRECAUTIONS: Wear safety glasses.		
TOOLS, MATERIALS, TEST EQUIPMENT, MANUALS: "Snoop" Liquid Leak Detector (NUPRO Co.) (or equivalent) Safety Glasses; Aqua Lung Conshelf XIV Drawing		
TASK: 1.0 Inspect regulator for air leaks at the AGA adapter, regulator port plug's relief valve and pressure adjusting screw using a liquid leak detector. <u>Note:</u> If leaks are found they must be repaired. 2.0 Operate relief valve on regulator by lifting up the red handle and then closing. Air should come out and then zero leakage. <u>Caution:</u> Do not use tool with relief valve leaking.		

<u>SYSTEM:</u> Agent/Penetrator	<u>COMPONENT:</u> Air Bottle	<u>MTS CODE:</u> APM2-1-3
<u>SUB-SYSTEM:</u> Pneumatic	<u>SCHEDULE:</u> Every 3 months	<u>MANUFACTURER & P/N:</u> Luxfer U.S.A. Limited L21W-30

SAFETY PRECAUTIONS:

TOOLS, MATERIALS, TEST EQUIPMENT, MANUALS:

Luxfer U.S.A. Limited Guidelines for inspection of high-pressure air bottles

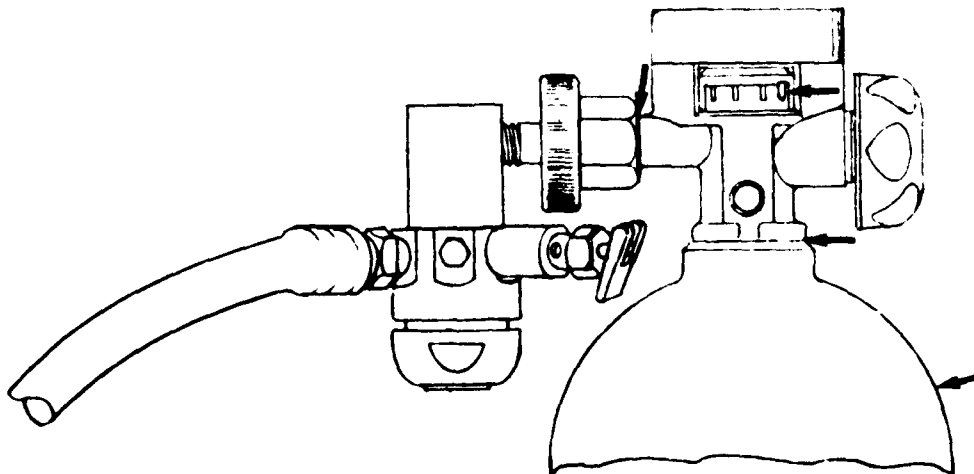
TASK:

- 1.0 Inspect bottle for dents, cracks in the fiberglass and air leaks at the valve/bottle interface, ("O" ring leak) and at the regulator adapter per the Luxfer Inspection Guidelines.

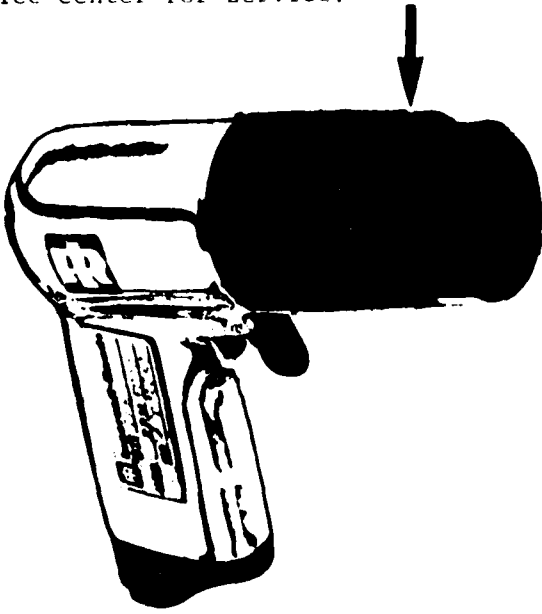
Note: If the bottle is found to be dented or other defects are noted, the bottle must be replaced.

- 2.0 Inspect pressure gauge for proper reading and glass bezil for cracks.

- 3.0 Check air bottle for tightness in bottle carrier.



SYSTEM: Agent Penetrator	COMPONENT: Tool Bit/Shaft Assembly	MTS CODE: APM3-1-5
SUB-SYSTEM: Drilling	SCHEDULE: Every 6 months	MANUFACTURER & P/N: AMETEK/ORED
<u>SAFETY PRECAUTIONS:</u> Wear gloves when removing the tool bit/shaft assembly from flow barrel		
<u>TOOLS, MATERIALS, TEST EQUIPMENT, MANUALS:</u> Gloves Tool Bit/shaft Assembly, P/N DT83D527-3; Dow Corning DC10 [®] Grease (or equivalent); Crocus Cloth; 400 Carborundum Paper; India Stone (Round&Flat)		
<u>TASK:</u> 1.0 Remove the tool bit/shaft assembly from the Agent/Penetrator. 2.0 Inspect tool bit for ragged cutting edges. If found, dress off rough spots from cutting edges using an India stone. Note: If found to have large nicks which cannot be dressed out, replace the tool bit/shaft assembly. 3.0 Inspect the tool bit/shaft assembly where the bearing/seal assembly and forward flow barrel bearing contacts in the shaft. Note: If found to show slight scoring, polish shaft area with crocus cloth. 4.0 Inspect forward bearing face on flow barrel for scoring. Note: If found to be scored, remove high spots with 400 Carborundum [®] paper. 5.0 Coat shaft and back of tool bit with Dow Corning DC-10 [®] grease. Reassemble back into assembly.		

SYSTEM: Agent/Penetrator	COMPONENT: Drill Motor	MTS CODE: APM 4-1-3
SUB-SYSTEM: Gear Box	SCHEDULE: Every 6 months	MANUFACTURER & P/N: Ingersoll-Rand 7AQ4
<u>SAFETY PRECAUTIONS:</u>		
<u>TOOLS, MATERIALS, TEST EQUIPMENT, MANUALS:</u> Ingersoll-Rand - 28 Soap Base Grease (or equivalent)		
<u>TASK:</u> 1.0 Remove drill motor from the carrier assembly. 2.0 Grease the drill motor gear box with I-R 28 Soap Base Grease (or equivalent) one stroke approximately 6 cc's. <u>Caution:</u> Do not overgrease. 3.0 Replace drill motor back into the carrier assembly. <u>Note:</u> If a grease gun is unavailable, take to a certified Ingersoll-Rand Service Center for service.		
		

SYSTEM: Agent Penetrator	COMPONENT: Air Bottle	MTS CODE: APY1-1-7
SUB-SYSTEM: Pneumatic	SCHEDULE: Every Year	MANUFACTURER & P/N: Luxfer U.S.A. Limited L21W-30
SAFETY PRECAUTIONS: Remove air regulator assembly from air bottle and store in a safe, dry place. Bleed all air slowly from air bottle. Leave valve open.		
TOOLS, MATERIALS, TEST EQUIPMENT, MANUALS: "O" Ring, P/N 2-210-Neoprene-70-80 Durometer; Torque Wrench; Valve Tool; Bottle Adapter; Strap Wrench; Dow Corning DC-10 Grease (or equivalent); Luxfer U.S.A. Limited Guidelines for Inspection of High-Pres. Air Bottle		
TASK: 1.1 Remove valve from air bottle and inspect interior of bottle per Luxfer Guidelines. Caution: Do not place air bottle in vise. Use a strap wrench. 1.2 Using proper valve wrench, remove "O" ring from valve. 1.3 Grease replacement "O" ring with Dow Corning DC-10*grease (or equivalent). 1.4 Install "O" ring onto valve. Caution: Do not overstretch the "O" ring when installing onto valve. 1.5 Install valve assembly into air bottle and tighten snug, using a strap wrench to hold the air bottle. Use torque wrench and tighten to 75 feet/pounds. Caution: Do not overtighten valve into air bottle. 1.6 Charge bottle to 3000 psi filtered dry air or N ₂ gas. Caution: Do not fast charge bottle, allow approximately 10 minutes to charge to 3000 psi. Do not overfill above 3000 psi at any time. 2.1 Read gauge after fill and after 24-hour period. Bottle temperature should be at same temperature for both readings. No pressure drop will indicate no leaks in valve or "O" ring.		

SYSTEM: Agent Penetrator	COMPONENT: CGA Fitting/Regulator Assy.	MTS CODE: APY2-1-5
SUB-SYSTEM: Pneumatic	SCHEDULE: Every Year	MANUFACTURER & P/N: Western Enterprises Amm, Ohio (216) 933- 2171

SAFETY PRECAUTIONS:

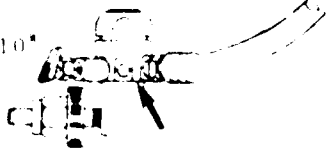
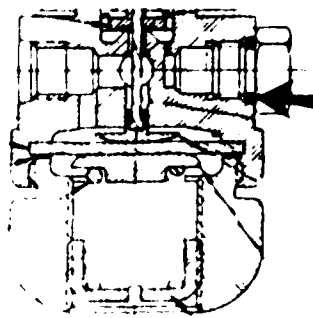
TOOLS, MATERIALS, TEST EQUIPMENT, MANUALS:

"O" Ring, 1/2" x 1/4" x 1/8" (Teflon) Dow Corning DC-16 Grease (or equivalent)
"O" Ring, 1/2" x 1/4" x 1/8" (NBR)

TASK:

1. Replace "O" ring on the CGA bottle adapter.

HAND-TIGHT NUT & NIPPLE	
	
HAND-TIGHT NUT NIPPLE WITH SECURED O-RING	
ITEM NO.	CGA-347
	THREAD - .630-14 NGO
	RIGHT HAND FEMALE
88-6347-2	Hand-Tight Nut - R.H. Female
HAND-TIGHT NIPPLE & REPLACEMENT PARTS	
88-6347-3	1/2" NPT - 3" Long Nipple
88-6347-3-2	Retaining Screw
8347-3-3	O Ring - Replacement

SYSTEM:	COMPONENT:	MTS CODE:
Aerob. Penetrator	CGA Fitting/Regulator	APY2-1-5
(Continuation Sheet)		
2.0 Replace "O" Ring (P/N 2-022-C557-70) between air regulator and adapter block.		
Note: Grease "O" Ring lightly with Dow Corning DC-10 grease. (or equivalent).		
		
3.0 Replace "O" rings (P/N 3-903-C557-70) under the two hex plugs, flex hose and relief valve adapter.		
Note: Grease "O" Rings lightly with Dow Corning DC-10 grease (or equivalent).		
		
4. Check air regulator for proper discharge pressure by adapting a 200 psi gauge to the quick-disconnect fitting at the hose end to the drill motor. Pressure should be 128-132 psi.		
5. If pressure is too low or too high, adjust the discharge pressure by unlocking the lock nut on the bottom of the air regulator and screw in or out the slotted screw until the desired setting is reached. Then tighten the lock nut. Remove the test gauge and hook the flex hose quick-disconnect to the drill motor.		
		

AD-A151 609

AIRCRAFT SKIN PENETRATOR AND AGENT APPLICATOR VOLUME 2
TEST AND EVALUATIO..(U) AMETEK INC SANTA BARBARA CA
OFFSHORE RESEARCH AND ENGINEERING.. R H CUTHBERTSON

22

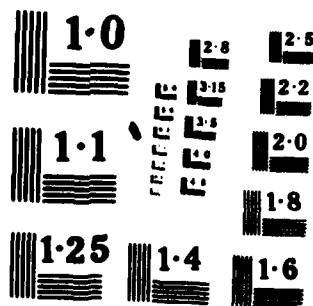
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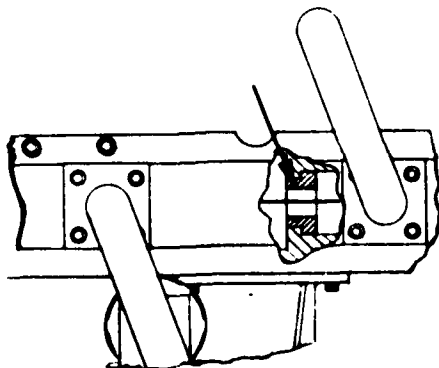
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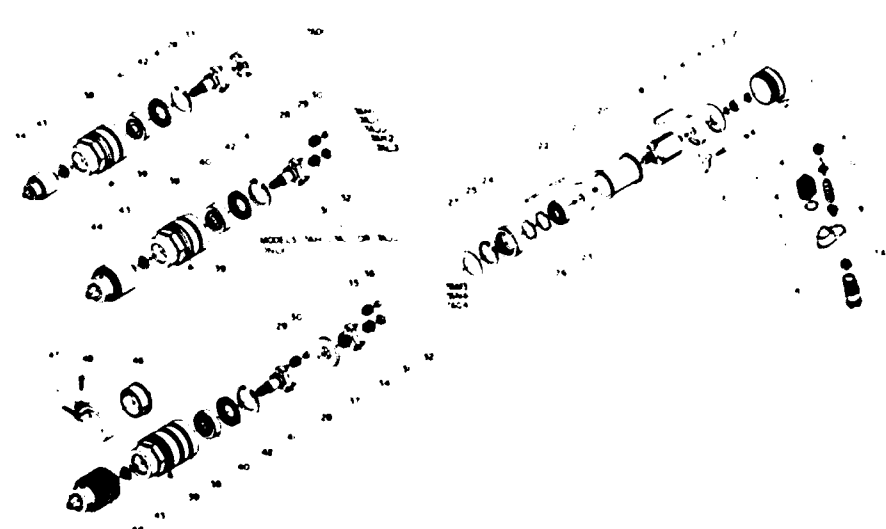


SYSTEM: Agent/Penetrator	COMPONENT: "O" Ring Bearing/Seal	MTS CODE: APY3-1-3
SUB-SYSTEM: Carrier Assembly	SCHEDULE: Every Year	MANUFACTURER & P/N: AMETEK/ORED
<u>SAFETY, PRECAUTIONS:</u>		
<u>TOOLS, MATERIALS, TEST EQUIPMENT, MANUALS:</u> "O" Ring, P/N 2-112-C557-70-Neoprene-70 Durometer Dow Corning DC-10*Grease (or equivalent)		
<u>TASK:</u> <u>Note:</u> To be done in conjunction with MTS #APM3-1-5, APY1-1-7, APY2-1 and APY3-1-3. 1.0 Remove old "O" ring from bearing/seal and discard. 2.0 Coat new "O" ring with Dow Corning DC-10*grease (or equivalent). 3.0 Install "O" ring into bearing/seal.		
		

<u>SYSTEM:</u> Agent/Penetrator	<u>COMPONENT:</u> Drill Motor	<u>MTS CODE:</u> APY4-1-3
<u>SUB-SYSTEM:</u> Pneumatic	<u>SCHEDULE:</u> Every Year	<u>MANUFACTURER & P/N:</u> Ingersoll Rand 7AQ4
<u>SAFETY PRECAUTIONS:</u> Disconnect the air supply hose quick-disconnect from the air drill motor and seal to keep all dirt out of the QD. Remove from carrier assembly.		
<u>TOOLS, MATERIALS, TEST EQUIPMENT, MANUALS:</u> Ingersoll Rand Air Drill Motor Overhaul Manual		
<u>TASK:</u> <u>Note:</u> The following check is only to be accomplished by a technician certified by Ingersoll Rand for Maintenance and overhaul of air drill motor. Otherwise deliver to an Ingersoll Rand Service Station for service. 1.0 Following the Ingersoll Rand Air Drill Motor Overhaul Manual, disassemble, inspect, replace any necessary parts as deemed necessary; grease, reassemble and install back into the carrier assembly. 2.0 Inspect flex hose for cracking and deterioration. 3.0 Test for proper operation.		

SYSTEM: Agent/Penetrator	COMPONENT: Drill Motor	MTS CODE: APY4-1-3
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(Continuation Sheet)



(Orig. TPA 708 2)

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MAINTENANCE TASK SHEET

SYSTEM:

Agent Penetrator

COMPONENT:

Drill Motor

MTS CODE:

APY4-1-3

(Continuation Sheet)

PART NUMBER FOR ORDERING REFERENCE POUR COMMANDE DE LA PIÈCE BESTELNUMMER NUMERO DEL PEZZO PER L'ORDINAZIONE SIMBOLO DE LA PIEZA PARA PEDIDOS		PART NUMBER FOR ORDERING REFERENCE POUR COMMANDE DE LA PIÈCE BESTELNUMMER NUMERO DEL PEZZO PER L'ORDINAZIONE SIMBOLO DE LA PIEZA PARA PEDIDOS	
Motor Housing Assembly	*AH-A40A	31. Rotor Pinion	*AH-17
Bearing Nut	*AH-105	for M, M or N ratio (22 teeth)	*AJ-17
Rear Rotor Bearing	*AH-24	for J ratio (18 teeth)	*AJJ-17
Trigger Bushing	*AH-91	for JJ ratio (13 teeth)	*AJJ-17
Throttle Valve Seat	*AH-303		
Trigger Assembly	*AH-A93	32. Rotor Pinion Spacer	*AH-18
Trigger Pin	*AH-44	for M, J, M or N ratio	*AJJ-18
Inner Bushing Assembly	*AH-A365	for JJ ratio	*AD-17
Air Strainer Screen	ROA-141		
Throttle Valve	*AH-302	33. Drive Plate (for D ratio)	
Throttle Valve Spring	*AH-51	34. Gear Head	
Muffler Assembly	SRA-A123	for M ratio (18 teeth)	*AM-216
Muffler O-Ring	SRA-167	for N ratio (10 teeth)	*AN-216
Inner Bushing Spacer	*AH-65	for Q ratio (13 teeth)	*AQ-216
Exhaust Silencer	*RA-311	35. Gear Head Planer Gear Assembly (3)	*AH-A10
Rear End Plate Gasket	*AH-739	for M or N ratio (15 teeth)	*AP-A10
Rear End Plate	*AH-12	for Q ratio (21 teeth)	
Rear End Plate Retainer	*AH-118	36. Gear Head Planer Gear Bearing (1 for each Gear) (for M, N or Q ratio)	*AH-500
Rotor		37. Gear Head Spacer (for M, N or Q ratio)	*AN-80
for D, H, J, J, M or N ratio	*AH-53	for D, H, J, JJ, K or L ratio	*AH-A37A
for JJ ratio	*AJJ-53	for M, N or Q ratio	*AH-A37A
for K or Q ratio	*AK-53		
Vane Pack (set of 4 Vanes)	*AH-A3A-4	38. Gear Case	*AH-B37A
Cylinder	*AH-3A	for D, H, J, JJ, K or L ratio	*AN-B37A
Front End Plate	*AH-11	for M, N or Q ratio	DOP-479
Cylinder Down	*AH-46	39. Grease Fitting	SA-510
Front Rotor Bearing	B1-32	40. Spindle Bearing	SA-28
Front Rotor Bearing Housing	*AH-13	41. Spindle Bearing Retainer	*AH-701
Front Rotor Bearing Retainer	W32-118	42. Grease Shield	SA-40
Bearing Spring Washer (2)	*AH-278	43. Check Spacer	
Bearing Housing Spacer	*AH-61	44. Drill Chucks	
Spindle		0 to 1/4" capacity	RODA-99
for D or J ratio	*AJ-6	0 to 5/16" capacity	ROJ-99
for M ratio	*AM-6	0 to 3/8" capacity	RIM-99
for K or N ratio	*AK-6	5/8" to 1-1/2" capacity	ROE-99
for L ratio	*AL-6		
for M ratio	*AM-6	* Check Key	
for JJ or Q ratio	*AQ-6	for RODA-99 Check	RODA-J253
Spindle Planer Gear Assembly (3)		for RIM-99 Check	RIM-J253
for N ratio (15 teeth)	*AH-A10	for RIM-99 Check	RIM-J253
for J or M ratio (18 teeth)	*AJA-10	for ROE-99 Check	ROE-J253
for K or N ratio (21 teeth)	*AKA-10		
for L ratio (22 teeth)	*ALA-10	46. Dead Handle Adapter (2)	SA-46
for JJ or Q ratio (19 teeth)	*AQ-10	47. Dead Handle	B1A-448
Spindle Planer Gear Bearing (1 for each Gear)		48. Pinch Bolt	510-638
for M ratio	*AM-500	* Check Shield Kit (for D, H, J, JJ or K ratio)	*AH-E309
for J, JJ, M or Q ratio	*AJJ-500	* Nameplate	SRA-301
for K, L or N ratio	*AK-500	* Warning Label (for N or Q ratio)	*AQ-345
		* Grease Gun	RODA-J228
		* Turn-up Kit (includes illustrated parts 15, 9, 10, 11, 13, 13A, 15, 17, 19, 22, 26, 27 and 32)	*AH-TE1

* Not Illustrated

* To keep downtime to a minimum, it is desirable to have on hand certain repair parts. We recommend that you stock one (pair or set) of each part indicated by a bullet (•) for every four tools in service.

* When ordering a Dead Handle (47), also order two Dead Handle Adapters (46).

MAINTENANCE TASK SHEET

SYSTEM:
Agent/Penetrator

COMPONENT:
Drill Motor

MTS CODE:
APY4-1-3

(Continuation Sheet)

03632801

Form 8847
Edition 2
December, 1982

**POWER TOOL DIVISION
AUTHORIZED SERVICENTERS
for
INDUSTRIAL AIR TOOLS, HOISTS AND WINCHES**

Alabama

Star Hardware & Supply Co., Inc.
1318 Second Ave. North
Birmingham, AL 35202
205 252-8183

Tool Smith Co., Inc.
1108 Fourth Ave. South
Birmingham, AL 35219
205 323-1030

Arizona

Glendale Industrial Supply
4524 Grand Ave.
Glendale, AZ 85301
602 919-9751

California

Northwestern Equipment & Supply Co.
635 641 Colman St.
Berkeley, CA 94710
415 527-4080

Continental Air Tools
11447 Beach St.
Carrollton, CA 90701
714 996-1412

Allied Tool & Hoist
2218 North Seaman Ave.
South El Monte, CA 91733
714 448-7621

Colorado

Centurion Tool & Supply Co.
2511 West 16th Avenue
Denver, CO 80204
303 534-4959

Delaware

Fishel's Industrial Services, Inc.
7 Meek Circle
Wilmington, DE 19804
w2 994-2534

Georgia

Mid South Tool & Equipment, Inc.
620 First St.
Albany, GA 31701
912 435-0084

Air Specialists, Inc.
120 Interstate No. Pky. E. Suite 208
Atlanta, GA 30139
404 955-3310

Illinois

Boiler Supply Company
1935 South Wabash Avenue
Chicago, IL 60616
312 642-6800

S & K Rigging Corp.
East Route 316
Moline, IL 61918
217 258-8500

Industrial Tool Products, Inc.
3901 25th St.
Moline, IL 61265
309 797-0587

Industrial Supply Company
203 Poplar Place
No. Aurora, IL 60542
312 859-2300
(A wholly-owned subsidiary of
Boiler Supply Company)

Portable Tool Sales & Service, Inc.
13401 S. Halsted St.
Riverside, IL 60627
312 841-2600

Industrial Tool Products, Inc.
9697 Bryn Mawr Avenue
Romeoville, IL 60018
312 471-7730

Indiana

Air Power Equipment Co., Inc.
5709 W. 85th St.
Indianapolis, IN 46278
317 872-6766

Kansas

Powerflow Systems, Inc.
1401 Fairfax Trafficway
Kansas City, KS 66115
913 342-7024

Kentucky

Air Equipment Sales & Service, Inc.
Route 3, Box 131
Auburn, KY 41101
606 928-9531

Advanced Material Handling Co., Inc.
1734 Mulholland Ave.
Louisville, KY 40206
502 896-2166

Louisiana

Tool Sales and Rentals, Inc.
11134 Indus Park Ave.
Baton Rouge, LA 70810
504 292-4800

Audyne Lafayette
118 North Maple Avenue
Broussard, LA 70518
504 337-1351

Vandae Corp.
2111 West Aquine Highway
Kenner, LA 70082
504 347-1575

Black Gold Rental & Supply, Inc.
101 Henderson Rd.
Lafayette, LA 70501
504 233-7137

Thornion Industrial Supply
5901 Courtesee Lane
Shreveport, LA 71108
504 636-7450

Massachusetts

Tool Servicenter (Norwood)
1014 Turnpike Street
Canton, MA 02021
617 828-0078

Norwood Tool & Ind'l Supply Co., Inc.
935 Washington Street
Norwood, MA 02062
617 769-2800

Michigan

Air Components & E n g n e e r s, Inc.
1057 Madison S. E.
Grand Rapids, MI 49509
616 452-3188

Redford Air Tool, Inc.
17250 Plymouth Road
Livonia, MI 48150
313 591-6303

Tool & Accessory Co.
1678 W. Hamlin Road
Rochester, MI 48063
313 852-4900

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**INGERSOLL-RAND.
PROFESSIONAL TOOLS**

MAINTENANCE TASK SHEET

SYSTEM:

Agent Penetrator

COMPONENT:

Drill Motor

MTS CODE:

APY4-1-3

(Continuation Sheet)**Minnesota**

Waco Industrial Supply, Inc.
1221 East Hennepin Avenue
Minneapolis, MN 55411
612/379-7100

Missouri

Thurco Tools & Engineering, Inc.
One Lexington Rd.
Hickory, MO 64602
314/793-4444

Montana

Industrial Tool & Repair, Inc.
911 1/2 Ave. North
Billings, MT 59101
406/228-1114

New Jersey

Northland Equipment Co.
1000 Central Ave.
East Hanover, NJ 07936
201/387-1114

Lock Pneumatic, Inc.
27 Monroe Ave.
Kearnsville, NJ 07033
201/272-0000

New Mexico

Imperial Rand Equipment Corp.
101 Andelara St., N.W.
Albuquerque, NM 87107
505/245-7811

New York

Frontier Industrial & Marine Supply
100 Hopkirk St.
Buffalo, NY 14220
716/826-1200

Mid State Contractors Equip. Co., Inc.
1811 Jefferson Avenue
Syracuse, NY 13220
315/455-5903

Mid State Contractors Servisator
700 E. Erie Avenue
Syracuse, NY 13208
315/455-1184

North Carolina

Whitaker Tools, Inc.
4840 W. Bessant Rd.
Charlotte, NC 28208
704/523-8801

Ohio

Robison, Inc.
11990 Cleveland Madison Road
Lorain, OH 44130
313/683-8700

ALL MAIL
P.O. Box 42001
Cincinnati, OH 45202

Industrial Tool Service
2567 Truitt Road
Hartmann, OH 43019
619/461-9823

Ohio (Continued)

Ohio Tool Systems, Inc.
18611 Longview Parkway
Richfield, OH 44286
216/659-4181

Oklahoma

Emmett Compressor, Inc.
4511 E. Pine St.
Tulsa, OK 74117
918/818-2955

Oregon

Industrial Tool & Supply Co.
600 N. E. Belmont St.
Portland, OR 97202
503/287-2686

Pennsylvania

Metal Welding & Supply Co., Inc.
5551 Tugman St.
Allentown, PA 18104
215/398-2211

Tool Sales & Service Co.
1137 Electric Ave.
East Pittsburgh, PA 15112
412/824-0021

M. Glosier & Sons
72 Messenger St.
Johnstown, PA 15902
814/535-7521

Plant Service Co.
Aish & Beigham Sts.
Pittsburgh, PA 15220
412/381-4644

Tennessee

Chattanooga Saw & Supply Co., Inc.
1208 East 23rd
Chattanooga, TN 37407
615/266-1265

Richman Crosby Hays Co., Inc.
1150 Darter St.
Memphis, TN 37407
901/345-2200

Auto & Mill Supply Co., Inc.
DBA Motor Parts & Bearing Co.
Highway 70 East
New Johnsonville, TN 37134
615/535-2091

Texas

Corpus Christi Equipment Co., Inc.
4444 Baldwin
Corpus Christi, TX 78408
512/684-2981

Air Power Tools & Hoses, Inc.
4435 Main Way
Dallas, TX 75236
214/333-4241

Sears Machinery, Inc.
939 Hartline St.
El Paso, TX 79915
915/772-4613

Texas (Continued)

American Maintenance & Rental, Inc.
918 North Gail Blvd.
Frisco, TX 75441
714/233-3281

Audyne, Inc.
15402 East Vantage Parkway, Suite 326
Houston, TX 77057
713/987-0000

Houston Tool & Host Co.
1401 Boyles
Houston, TX 77020
713/674-0912

Associated Tool Specialties, Inc.
1711 N. Twin City Highway
Nederland, TX 77627
713/727-2166

Engine Service & Supply
1902 N. Grant
Odessa, TX 79760
915/337-2386

Industrial Air Tool Pasadena, Inc.
1304 West Jackson
Pasadena, TX 77501
713/477-3144

Air Power South Texas, Inc.
4850 Whitford
San Antonio, TX 78217
512/656-9481

Air Power Tools & Hoses, Inc.
Gladewater Highway inside Loop 323
Tyler, TX 75711
214/593-7303

Utah

Abraue & Tool Specialties, Inc.
2400 Directors Row
Salt Lake City, UT 84125
801/972-3182

Virginia

James McGraw, Inc.
2900 Deepwater Terminal Road
Richmond, VA 23234
804/233-3071

Washington

B & J Industrial Supply
3601 First Avenue, South
Seattle, WA 98108
206/762-4430

Pacific American Commercial Co.
7420 2nd Ave. South
Seattle, WA 98124
206/762-3550

Wisconsin

Vulvard, Inc.
2626 W. Wisconsin Ave.
Appleton, WI 54911
414/734-7173

Tools & Abrasives, Inc.
1508 W. Pierce Street
P.O. Box 480 (53201)
Milwaukee, WI 53206
414/671-3051

SYSTEM: Agent/Penetrator	COMPONENT: Air Bottle	MTS CODE: APY5-1-7
SUB-SYSTEM: Pneumatic	SCHEDULE: Every 3 Years	MANUFACTURER & P/N: Luxfer U.S.A. Limited L21W-30

SAFETY PRECAUTIONS:

Remove air regulator assembly from air bottle and store in a safe, dry place. Bleed all air slowly from air bottle. Leave valve open.

TOOLS, MATERIALS, TEST EQUIPMENT, MANUALS:

"O" Ring, P/N 2-210-Neoprene-70-80 Durometer; Torque Wrench; Valve Tool Bottle Adapter; Strap Wrench; Dow Corning DC-10 Grease (or equivalent) Luxfer U.S.A. Limited Guidelines for Inspection of High Pres.-Air Bottle

TASK:

Note: To be done in conjunction with MTS #APM3-1-5, APY1-1-7, APY2-1, APY3-1-3 and APY 4-1-3.

1.0 Remove valve from air bottle and inspect interior of bottle per Luxfer Guidelines.

Caution: Do not place air bottle in vice. Use a strap wrench and use proper valve wrench.

2.0 Remove "O" ring from valve.

3.0 Grease replacement "O" with Dow Corning DC-10 grease (or equivalent).

4.0 Install "O" ring onto valve.

5.0 Install valve assembly into air bottle and tighten snug using a strap wrench to hold the air bottle. Use a torque wrench and tighten to 75 feet/pounds.

Caution: Do not overtighten valve into air bottle.

6.0 Charge bottle to 3000 psi filtered dry air or N₂ gas.

Caution: Do not fast charge bottle, allow approximately 10 minutes to charge to 3000 psi. Do not overfill above 3000 psi at any time.

7.0 Read gauge after fill and after 24-hour period. Bottle temperature should be at same temperature for both readings. No pressure drop will indicate no leaks in valve or "O" ring.

SYSTEM: Agent Applicator	COMPONENT: Air Regulator	MTS CODE: APY6-1-4
SUB-SYSTEM: Regulator Components	SCHEDULE: Every 3 Years	MANUFACTURER & P/N: U.S.Divers Conshelf XIV
<u>SAFETY PRECAUTIONS:</u> COMPANY SAFETY REGULATIONS		
<u>TOOLS, MATERIALS, TEST EQUIPMENT, MANUALS:</u> Drawing No. 101711 (U.S.Divers)		
<u>TASK:</u> Note: A qualified technician must do the air regulator overhaul only 1.0 Disassemble regulator and inspect all components for wear and damage. Replace any part not passing inspection. Replace all " " Pins. 1.1 Reassemble air regulator and hook up to the tools air cylinder. 2.0 Install a 200 psi gauge to the end of the flex hose quick disconnect. 3.0 Open the cylinder valve and observe the air regulators discharge pressure. If the pressure is not between 128-132 psi adjust the pressure setting by adjusting the screw at the bottom of the regulator in or out. CAUTION: NEVER set the air regulators discharge pressure more than 132 psi. Note: If a qualified technician is not available to overhaul the air regulator it may be sent to any U.S. Diver's qualified repair station.		

SYSTEM: Agent Applicator	COMPONENT: Air Regulator	MTS CODE: APY6-1-4
(Continuation Sheet)		

SYSTEM: Agent Applicator	COMPONENT: Air Regulator	MTS CODE: APY6-1-4
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(Continuation Sheet)

1088-10 CONSHLF-XIV SUP	1077-01 CONSHLF-XIV	1077-21 CONSHLF-20-SUP	1017-11 CONSHLF-F-20	QUANTITY	PART NUMBER	DESCRIPTION	DWG. NO.	ITEM NO.
3	3	-	-		9109-12	PORT PLUG H.P.	910912-003	39
1	-	-	-		1088-54	RING, PACKING	108854	34
1	-	-	-		1088-51	RETAINER, SPRING	108851	33
-	1	-	-		1053-26	RETAINER, SPRING	105326	32
1	1	-	-		1053-33	BODY, 1 ST STAGE	105333	31
1	1	-	-		7004-11	YOKE	700411	30
1	1	1	1		1053-21	DISC & RETAINER	105320-011	29
1	1	1	1		1053-24	BLOCK, SPRING	105324	28
1	1	1	1		8610-68	RETAINER, SNAP RING	8610XX	27
1	1	1	1		1051-06	FILTER	105106	26
-	-	1	1		1017-01	YOKE	101701	25
1	1	1	1		1010-12	CAP. INLET ASSY	101012	24
1	1	1	1		1075-06	KNOB ASSY	107506	23
1	1	1	1		SEE PICK LIST	DECAL, LOGO		22
1	1	1	1		8630-51	RING RETAINING	863051	21
1	1	1	1		1046-13	SPRING	104613	20
1	1	1	1		8280-05	RING, BACK-UP	8280XX	19
1	1	1	1		8200-06	O-RING	8200XX	18
1	1	1	1		1015-04	SPRING	101504	17
-	-	3	3		1017-04	PORT PLUG H.P.	910912-003	16
3	3	3	3		8200-11	O-RING 3-913	8200XX	15
1	1	1	1		1053-23	PIN	105323	14
1	1	1	1		1000-27	PIN SUPPORT	100027	13
1	1	1	1		1053-28	PAD SPRING	105328	12
1	1	1	1		1015-29	ADJUSTING SCREW	101529	11
-	-	-	-		1017-03	RETAINER, SPRING	101703	10
-	1	-	1		1053-27	SPRING	105327	9
1	-	1	-		1088-53	DIAPHRAGM	108853-003	8
-	-	1	-		1017-07	RING, PACKING	101707	7
AR	-	AR	-		8204-03	SILICONE FLUID	8204XX	6
1	-	1	-		1017-06	RETAINER, SPRING (CW)	101706	5
1	-	1	-		1000-40	SPRING	100040	4
1	1	1	1		8210-26	GASKET	8210XX	3
1	1	1	1		1000-29	MEMBRANE	100029	2
-	-	1	1		1017-02	BODY, 1 ST STAGE	101702	1
031-021	011-001				PART NUMBER	DESCRIPTION	DWG. NO.	ITEM NO.

17-20	101600-051	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES DECIMALS .01 .02 .03 .04 .05 FRACTIONS 1/16 1/8 3/16 1/2 5/8 3/4 7/8 SURFACE FINISH ALL SURFACES UNLESS OTHERWISE SPECIFIED REMOVED ALL BURRS AND SHARP EDGES AND NOT SCALE DIMS. DIMENSIONS & TOLERANCES PER ANSI Y14.5 UNLESS OTHERWISE SPECIFIED	ORIGINAL DATE OF DRAWING 8-18-82	U.S. DIVERS CO. 1375 W. WARDEN AVE. SANTA ANA, CALIFORNIA 92705	
17-10	-041		DRAWN SANG-N		
17-00	-031		CHECKED JOHN M. MUNN	FIRST-STAGE ASSY, CONSHLF-20 & XIV	
16-20	-021		REDRAWN		
16-10	-011		CHECKED		
16-00	101600-001	MATERIAL	ENGR JOHN M. MUNN	SIZE	FROM NO.
PRT NO.	DWG NO.	FINAL PROTECTIVE FINISH	PROJ NO.	D	94120
NEXT ASSY			APPROVAL	101711	☆
				SCALE 2 = 1	SHEET 1 OF 1

MAINTENANCE TASK SHEET

APPENDIX E
HYDROSTATIC RETEST AND GENERAL INFORMATION
PACKAGE (LUXFER USA LIMITED)

Luxfer USA Limited

1995 Third Street, Riverside, California 92507
Mail: P.O. Box 5300 — 92517
Telephone 714-684-5110 TWX 910-332-1755

HYDROSTATIC RETEST AND GENERAL INFORMATION PACKAGE

March 1983

GENTLEMEN:

There are millions of Luxfer aluminum cylinders in service throughout the world in all major gas markets, and more than three million aluminum cylinders have been produced by Luxfer USA since 1971. We have prepared this package to provide basic information for retesting Luxfer cylinders.

Luxfer aluminum cylinders have been produced under DOT S.P. 6498, DOT-E 6498, and CTC S.P. 922. Fiber reinforced (composite) cylinders are produced under DOT Exemption 7235 and CTC S.P. 1116. Inspection and repair procedures for composite cylinders are included in this package. The DOT 3AL Specification for non-wrapped aluminum cylinders was issued in December 1981. Inspection and hydrotest procedures remain the same as those listed in the Exemptions.

To assist you in hydrotesting Luxfer cylinders, we have put together the following information:

1. Supplemental guidelines for inspecting and testing aluminum cylinders.
2. Inspection and requalification of Luxfer composite cylinders.
3. Composite cylinder repair procedure.
4. Cylinder I.D. cleaning procedure.
5. Cylinder O.D. cleaning procedure.
6. Paint strippers for aluminum cylinders.
7. Hydrostatic expansion data.
8. Recommended valve insertion procedures.
9. Drawings for retest adaptor and valve wrench.

The supplemental guidelines should be used in conjunction with CGA Pamphlets C-1, C-6, C-6.1, and C-6.2 for inspection and testing of compressed gas cylinders. If we can provide any further information or be of any further assistance, please give us a call.



James R. Ament
Vice President - Sales

SUPPLEMENTAL GUIDELINE FOR INSPECTING AND TESTING ALUMINUM CYLINDERS

The majority of aluminum cylinders in the field today have straight threads (.125-12 and .750-16 UNF). Scuba cylinders have 3/4-14 NGS (straight pipe). All straight threads require an "O" ring seal.

In addition to standard CGA Inspection and Hydrostatic Test Procedures (CGA pamphlets C-1, C-6, C-6.1, and C-6.2), the following guidelines should be observed.

1. Provide protection against chain gouging before placing an aluminum cylinder in a chain vise.
2. In order to loosen or tighten valves, use a proper open-end wrench or manufacture a special valve wrench (drawing enclosed). These special wrenches are also available from Luxfer.
3. Ensure that the threads of the cylinder, test adaptor, and valve are free of dirt, chips and burrs. Adaptors and valves should turn freely (adaptor drawing enclosed). Use of incorrect adaptor may damage threads or result in invalid hydrotest.
4. Do not lubricate adaptor.
5. Cylinders bearing DOT identification S.P. 6498, E6498, S.P. 922, or 3AL are to be inspected and hydrotested at least every five years at five-thirds (5/3) the marked service pressure per Hazardous Materials Regulation 173.34 (E).
6. Do not stamp "plus" (+) rating on aluminum cylinders.
7. Replace complete safety assemblies only. Be sure to use the proper safety and pressure rating to match the cylinder's service pressure per CGA Pamphlet S-1.1. Safety assemblies are available from the appropriate valve manufacturer.
8. Always use new "O" rings when reinstalling valves, and follow the enclosed valve insertion procedures for straight and taper threaded valves. Incorrect "O" ring material or improper "O" ring placement may result in leakage. "O" rings are available from Luxfer USA Limited, P. O. Box 5300, Riverside, California 92517-5300.



Luxfer USA Limited

Aluminum Compressed Gas Cylinders

TECHNICAL BULLETIN

SUBJECT: INSPECTION AND REQUALIFICATION OF
LUXFER COMPOSITE CYLINDERS

DATE: March 1983

1. DEVALVE:

- A) Safely vent cylinder. Refer to CGA Pamphlet C-2, "Recommendations for Disposition of Unserviceable Compressed Gas Cylinders", for venting procedures.
- B) Remove valve using proper tools and holding fixture so that cylinder fiber windings and valve are not damaged.
- C) Inspect threads of valve and cylinder for damage. Clean "O" ring gland.

2. EXTERIOR INSPECTION:

- A) Cylinder should be clean and all attachments should be removed that will interfere with visual inspection.
- B) Inspect for damage. Refer to CGA Pamphlet C-6.2, "Requalification of Composite Cylinders", and Luxfer Technical Bulletin, "Composite Cylinder Repair Procedures".
 - (1) L43.5W-45 and L45W-45: A longitudinal cut in excess of 1" long and .015" deep through the fibers is cause for rejection.
 - (2) L45W-22: A longitudinal cut in excess of 1" long and .010" deep through the fibers is cause for rejection.
 - (3) Unraveling of a strand 1/8" wide, by .010" thick, by 2" long is cause for rejection.
 - (4) A few loose strands less than 1/8" wide, by .010" thick, by 2" long is not detrimental to the cylinder. These strands may be repaired with an epoxy resin or epoxy spray.
- C) If there is any question of cylinder safety, the cylinder should be hydrotested to verify compliance with DOT E-7235.

3. INTERIOR INSPECTION:

- A) Interior should be free of dirt and other foreign material prior to inspection.
- B) Interior should be inspected according to CGA Pamphlet C-6.1, "Standards for Visual Inspection of High Pressure Aluminum Compressed Gas Cylinders".

INSPECTION AND REQUALIFICATION
OF LUXFER COMPOSITE CYLINDERS

March 1983

Page 2

4. HYDROSTATIC TESTING:

- A) Fiber reinforced cylinders are to be hydrostatically tested in accordance with their exemption, see DOT-E 7235, in Canada CTC-SP 1116. To remove elasticity, pressurize cylinder to 90% of test pressure, hold for 15 seconds, zero burette, and then conduct rehydrotest. This procedure helps to stabilize the cylinder and test equipment prior to hydrostatic testing.
- B) Composite cylinders manufactured in accordance with Exemption 7235 and CTC-SP 1116 are to be hydrostatically tested every three years. A permanent volumetric expansion of 5% of total expansion is allowed, except for cylinders manufactured before July 1, 1981, which are allowed 10% permanent expansion.
- C) Criteria for rejection elastic expansion does not apply to composite cylinders.
- D) Elastic expansion data stamped on cylinders or imprinted on the label is used to determine only the size of burette to be used for hydrotesting.
- E) Hydrostatic retest (rehydro) date and inspector's mark may be stamped on the shoulder of the cylinder.

5. TYPICAL EXPANSION DATA: (New cylinders -- See attached chart)

6. REVALVING:

- A) Use a new "O" ring.
- B) Make sure "O" ring and cylinder gland are clean.
- C) Make sure valve and cylinder threads are clean.
- D) Recommended torque valves:

<u>THREAD</u>	<u>MAXIMUM TORQUE</u>
.750-16 UNF	75 ft. lbs.
.875-14 UNF	75 ft. lbs.
1.125-12 UNF	100 ft. lbs.

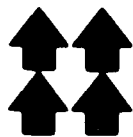
Use of a manual torque wrench is recommended.

COMPOSITE CYLINDER
TYPICAL EXPANSION DATA *

CYLINDER CAPACITY	SERVICE PRESSURE	TEST PRESSURE	CYLINDER VOLUME	WATER CAPACITY	AVERAGE TARE WEIGHT	CYLINDER DIMENSIONS	TYPICAL TOTAL EXPANSION	TYPICAL PERMANENT EXPANSION
21.0 cu. ft.	3000 psi	5000 psi	166 cu. in.	6.2 lbs.	5.4 lbs.	5.40" x 11.375"	56-58cc	0.0cc
43.5 cu. ft.	4500 psi	7500 psi	275 cu. in.	10.0 lbs.	11.3 lbs.	5.45" x 18.625"	48-56cc	0.5cc
45 cu. ft.	4500 psi	7500 psi	284 cu. in.	10.2 lbs.	11.5 lbs.	5.45" x 19.5"	48-56cc	0.5cc
45.5 cu. ft.	2216 psi	3700 psi	523 cu. in.	19.0 lbs.	11.9 lbs.	6.758" x 19.875"	80-88cc	0.5cc
70.0 cu. ft.	4000 psi	6670 psi	483 cu. in.	17.4 lbs.	21.7 lbs.	7.10" x 20.25"	80-86cc	0.5cc

* Expansion data represents new cylinders -- some differences can be expected in cylinders after service.

NOTE: Hydrostatic retest (rehydro) date and inspector's symbol may be stamped on the shoulder of the hoop-wrapped cylinder.



Luxfer USA Limited

Aluminum Compressed Gas Cylinders

TECHNICAL BULLETIN

SUBJECT: COMPOSITE CYLINDER REPAIR PROCEDURE

DATE: March 1983

1. INSPECTION:

Composite cylinders should be periodically inspected for exterior damage to the composite material. Prompt identification of damage and repair will maintain cylinders in a serviceable condition.

2. DAMAGE REPAIR:

Slight damage (less than .005" deep) due to normal handling is acceptable without repair, however, a thin coat of adhesive (white glue) or paint will seal the surface and hold any loose fibers. Damage that is more extensive, up to and including the allowable limits on the attached chart, should be repaired to prevent further deterioration. Repairs of minor cuts, dings, and gouges which can lead to unraveling can be made with any commercially available epoxy adhesive. Cylinders with extensive unraveling should be removed from service. Unraveling is defined as a separation of a group of fibers 1/8" wide, by .010" thick, by 2" long.

3. CONTINUED SERVICE:

Cylinders that have been repaired should be inspected after filling to verify satisfactory repair.

CAUTION: If there is any doubt about cylinder safety, have the cylinder hydrostatically tested.

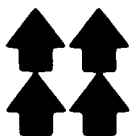
**HOOP-WRAPPED
ALLOWABLE REPAIR LIMITS**

CYLINDER IDENTIFICATION	SERVICE PRESSURE	TEST PRESSURE	MAXIMUM LIMITS FOR REPAIR		SERVICE USE
			HOOP	LONGITUDINAL DEPTH WIDTH	
DOT-E 7235 L21W-30 5.4 O.D. x 11	3000 psi	5000 psi	2"	1" .010" .125"	Breathing Apparatus
DOT-E 7235 L43.5W-45 L45W-45 5.4 O.D. x 18.6 5.4 O.D. x 19.5	4500 psi	7500 psi	2"	1" .015" .125"	Breathing Apparatus
DOT-E 7235 L45W-22 6.75 O.D. x 19.875	2216 psi	3700 psi	2"	1" .010" .125"	Breathing Apparatus
DOT-E 8258 S70W-40	4000 psi	6670	2"	1" .020" .125"	Scuba

NOTE:

HOOP: In the same direction of the wrap. Parallel to the base of the cylinder.

LONGITUDINAL: Perpendicular to the direction of the wrap and the base of the cylinder.



Luxfer USA Limited

Aluminum Compressed Gas Cylinders

TECHNICAL BULLETIN

SUBJECT: CYLINDER I.D. CLEANING

DATE: January 1982

High pressure cylinders in normal traffic can accumulate I.D. contamination which may detrimentally affect end use. The following procedures are recommended for I.D. cleaning of aluminum cylinders:

PROBLEM

CLEANING METHOD

- | | |
|--------------------------|--|
| 1. Moisture & light soil | Steam clean and blow dry. |
| 2. Oil or grease | Degrease with 1,1,1-Trichloroethane, steam clean and blow dry. |
| 3. Odor | Rinse with solution of baking soda (sodium bicarbonate) then rinse with solution of vinegar (acetic acid), steam clean and blow dry. |
| 4. Corrosion | Tumble with aluminum oxide chips or pellets, steam clean and blow dry. |

For any problems other than the above, please contact Luxfer USA Limited for assistance.



Luxfer USA Limited

Aluminum Compressed Gas Cylinders

TECHNICAL BULLETIN

SUBJECT: CYLINDER O.D. CLEANING PROCEDURE

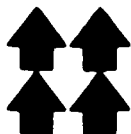
DATE: December 1981

Aluminum cylinders in normal traffic, particularly those having a brushed finish, can pick up soil and scuffing which mar appearance. There are a variety of commercial aluminum cleaners available which can be used to clean and improve this appearance. Please make certain that the product used is specifically marked "suitable for aluminum". Otherwise, serious damage could occur resulting in reduction in wall thickness and inherent strength.

The following methods of cleaning, or combinations thereof, are also acceptable:

- 1) Soap and water;
- 2) Solvent wipe;
- 3) "Scotch-brite" scrubbing*.

* "Scotch-brite" is a product of 3M Corporation.



Luxfer USA Limited

Aluminum Compressed Gas Cylinders

TECHNICAL BULLETIN

SUBJECT: PAINT STRIPPERS FOR ALUMINUM CYLINDERS

DATE: January 1982

IMPORTANT: DO NOT USE CAUSTIC PAINT STRIPPERS FOR ALUMINUM CYLINDERS

We recommend two types of cold paint strippers:

IMMERSION STRIPPERS:

With immersion strippers, the cylinder is immersed completely in the solution. Depending upon the paint system, the immersion time necessary for complete paint removal may vary from 5 to 15 minutes. The immersion strippers will require tanks for the treatment, but once an installation is completed, the procedure will be more efficient for large numbers of cylinders. We recommend four types of immersion strippers: (1) Parco #2874, a product of the Parker Chemical Company, (2) SnoFlake 100, produced by Amchem, (3) Oakite Stripper 156, produced by Oakite, and (4) Cal-Star Stripper 823, produced by Cal-Star Chemicals.

GEL STRIPPERS:

Gel strippers are brushed on the cylinder, allowed to stand, and then removed by a water wash, typically under high pressure. Cyl-strip, produced by Spatz Paint Company and Zip Strip, produced by Star Bronze Company, seem to be satisfactory gel strippers.

Cal-Star Chemicals, Inc.
P.O. Box 117
San Gabriel, California 91778
Phone: (213) 284-4303

Parker Chemical Company
5460 Knott Avenue
Buena Park, California 90620
Phone: (714) 994-4141

Spatz Paint Company
1601 North Broadway
St. Louis, Missouri 63102
Phone: (800) 325-2661

Oakite
544 South 6th Avenue
City of Industry, California 91749
Phone: (213) 968-1551

Amchem Products, Inc.
P.O. Box 829
Los Alamitos, California 90720
Phone: (714) 826-4990

Star Bronze Company
803 South Mahoning
Alliance, Ohio 44601
Phone: (216) 823-1550

ALUMINUM COMPRESSED GAS CYLINDERS

TYPICAL HYDROSTATIC EXPANSION DATA

INDUSTRIAL

Cylinder Capacity (scf)	Service Pressure (psi)	Test Pressure (psi)	Cylinder Volume (cu.in.)	Water Capacity (min.-lbs.)	Dimensions (inches)	Average Tare Weight (lbs.)	Typical Total Expansion (cc)	Typical Permanent Expansion (cc)
22	2,216	3,694	240	8.6	5-1/4 x 16-7/8	9.1	20 - 28	0.1 - 1.5
33	2,216	3,694	360	13.0	6-7/8 x 15-3/4	15.2	30 - 40	0.2 - 2.0
60	2,216	3,694	660	23.8	7-1/4 x 23-7/8	23.9	60 - 80	0.2 - 2.5
88	2,216	3,694	960	34.6	7-1/4 x 33-1/8	31.6	90 - 110	1.0 - 4.0
122	2,216	3,694	1,320	47.6	7-1/4 x 44	40.6	130 - 160	1.0 - 5.0
107 122 (*)	2,216	3,694	1,320	47.6	8 x 36-3/4	40.4	130 - 160	1.0 - 5.0
150	2,015	3,360	1,800	64.9	8 x 48-1/8	50.0	170 - 210	1.0 - 6.0

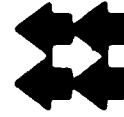
This information is to be used as a guide in the hydrostatic retesting of aluminum compressed gas cylinders produced under the Department of Transportation Special Permit or Exemption Number 6498 (CTC S.P. 922) and Specification 3AL. The hydrostatic retest requirements are:

"Each cylinder must be retested at least every five years in accordance with 49 CFR 173.34(e) (1), (3), (4), (5), and (6) except that a cylinder condemned for excessive permanent expansion may not be reheat-treated." Any cylinder exposed to the action of fire must not again be placed in service.

The hydrostatic test pressure required is five-thirds (5/3) times the marked service pressure with the maximum allowable permanent expansion of ten percent (10%).

(+) Includes aluminum neck collar except for 22scf cylinder
 (*) New design (June 1980)

1/82



Luxfer USA Limited

1885 Third Street • P.O. Box 8300
 Riverside, California 9251 Telephone 714/884-5110

ALUMINUM COMPRESSED GAS CYLINDERS

TYPICAL HYDROSTATIC EXPANSION DATA

MEDICAL

Cylinder Type	Service Pressure (psi)	Test Pressure (psi)	Cylinder Volume (cu. in.)	Water Capacity (min.-lbs.)	Dimensions (Inches)	Average Tare Weight (lbs.)	Typical Total Expansion (cc)	Typical Permanent Expansion (cc)
B	2,015	3,360	84	3.0	4-3/8 x 9-1/4	3.6	6.0 - 9.0	0.1 - 0.7
9	2,015	3,360	103	3.7	4-3/8 x 10-7/8	3.9	9 - 12	0.1 - 0.7
D	2,015	3,360	172	6.2	4-3/8 x 16-5/8	5.7	16 - 20	0.1 - 1.0
E	2,015	3,360	283	10.2	4-3/8 x 25-3/4	8.2	27 - 33	0.2 - 2.0
M	2,216	3,694	1,320	47.6	7-1/4 x 44	40.6 (+)	130 - 160	1.0 - 5.0
10 M (+)	2,216	3,694	1,320	47.6	8 x 36-3/4	40.4 (+)	130 - 160	1.0 - 5.0

This information is to be used as a guide in the hydrostatic retesting of aluminum compressed gas cylinders produced under the Department of Transportation Special Permit or Exemption Number 6498 (CIC SP 922) and Specification 3AL. The hydrostatic retest requirements are:

"Each cylinder must be retested at least every five years in accordance with 49 CFR 173.34 (e) (1), (3), (4), (5), and (6), except that a cylinder condemned for excessive permanent expansion may not be reheat-treated." Any cylinder exposed to the action of fire must not again be placed in service.

The hydrostatic test pressure required is five-thirds (5/3) times the marked service pressure with the maximum allowable permanent expansion of ten percent (10%).

(+) Includes aluminum neck collar

(*) New design (June 1980)

1/82



Luxfer USA Limited

1983 Third Street P.O. Box 5300

Riverside, California 92517 Telephone 714/984-6110

ALUMINUM COMPRESSED GAS CYLINDERS

TYPICAL HYDROSTATIC EXPANSION DATA

LIFE SUPPORT

Cylinder Capacity (acf)	Service Pressure (psi)	Test Pressure (psi)	Cylinder Volume (cu.in.)	Water Capacity (min.-lbs.)	Dimensions (inches)	Average Tare Weight (lbs.)	Typical Total Expansion (cc)	Typical Permanent Expansion (cc)
7	2,216	3,694	80	2.9	4-3/8 x 9-3/8	3.8	6 - 10	0.1 - 0.8
26	2,216	3,694	298	10.7	5-1/4 x 20-1/16	10.2	25 - 35	0.2 - 2.0
* 45	2,216	3,694	516	18.6	6-3/4 x 21-1/16	17.7	45 - 60	0.2 - 2.5

This information is to be used as a guide in the hydrostatic retesting of aluminum compressed gas cylinders produced under the Department of Transportation Special Permit or Exemption Number 6498 (CFC SP 922) and Specification 3AL. The hydrostatic retest requirements are:

"Each cylinder must be retested at least every five years in accordance with 49 CFR 173.34 (e) (1), (3), (4), (5), and (6), except that a cylinder condemned for excessive permanent expansion may not be reheat-treated." Any cylinder exposed to the action of fire must not again be placed in service.

The hydrostatic test pressure required is five-thirds (5/3) times the marked service pressure with the maximum allowable permanent expansion of ten percent (10%).

* For composite Life Support cylinders, see Inspection Procedures for Composite Cylinders.



Luxfer USA Limited

1803 Third Street • P.O. Box 5300
 EL PASO, TEXAS 79917 • Telephone 754-6661

ALUMINUM COMPRESSED GAS CYLINDERS
TYPICAL HYDROSTATIC EXPANSION DATA

CARBON DIOXIDE

Cylinder Capacity (lbs. CO ₂)	Service Pressure (psf)	Test Pressure (psf)	Cylinder Volume (cu.in.)	Water Capacity (min.-lbs.)	Dimensions (inches)	Average Tare Weight (+) (lbs.)	Typical Total Expansion (cc)	Typical Permanent Expansion (cc)
2 (*)	2,015	3,360	84	3.0	4-3/8 x 9-1/4	3.6	6.0 - 9.0	0.1 - 0.5
2.5 (*)	1,800	3,000	102	3.7	4-1/4 x 11-3/8	4.0	7.0 - 10.0	0.1 - 0.6
2.5 (E)	2,015	3,360	103	3.7	4-3/8 x 10-7/8	3.9	7.0 - 10.0	0.1 - 0.6
5	1,800	3,000	205	7.4	5-1/4 x 14-3/4	6.5	18 - 23	0.1 - 2.0
10	1,800	3,000	408	14.7	6-7/8 x 16-3/4	13.4	35 - 45	0.5 - 3.0
15	1,800	3,000	612	22.1	6-7/8 x 23-3/8	17.4	50 - 70	0.5 - 3.0
20	1,800	3,000	816	29.4	8 x 23-5/8	23.8	70 - 95	0.5 - 4.0
35	1,800	3,000	1,429	51.5	8 x 30-3/8	36.4	140 - 170	1.0 - 6.0
50	1,800	3,000	2,040	73.5	8-5/8 x 46-5/8	50.6	200 - 240	1.0 - 8.0

This information is to be used as a guide in the hydrostatic retesting of aluminum compressed gas cylinders produced under the Department of Transportation Special Permit or Exemption Number 6498 (CTC SP 922) and Specification 3AL. The hydrostatic retest requirements are:

"Each cylinder must be retested at least every five years in accordance with 49 CFR 173.34 (e) (1), (3), (4), (5), and (6), except that a cylinder condemned for excessive permanent expansion may not be reheat-treated." Any cylinder exposed to the action of fire must not again be placed in service.

The hydrostatic test pressure required is five-thirds (5/3) times the marked service pressure with the maximum allowable permanent expansion of ten percent (10%).

(*) Non standard product

(+) Cylinder only

(E) New design (1979)

1/82



Luxfer USA Limited

1905 Third Street P O Box 5300

ALUMINUM COMPRESSED GAS CYLINDERS

TYPICAL HYDROSTATIC EXPANSION DATA

SCUBA

Cylinder Capacity (scf)	Service Pressure (psi)	Test Pressure (psi)	Cylinder Volume (cu. in.)	Water Capacity (min.-lbs.)	Dimensions (inches)	Average Tare Weight (lbs.)	Typical Total Expansion (cc)	Typical Permanent Expansion (cc)
14 (*)	2,015	3,360	172	6.2 ¹	4-3/8 x 16-5/8	5.7	16 - 20	0.1 - 1.0
34	3,000	5,000	290	10.4	5-1/4 x 21-1/16	13.3	30 - 35	0.2 - 3.0
50	3,000	5,000	425	15.3	6-7/8 x 19-1/16	21.8	40 - 50	0.2 - 3.0
71	2,475	4,125	720	26.0	6-7/8 x 28-1/4	26.5	70 - 85	0.2 - 3.0
72	3,000	5,000	610	22.0	6-7/8 x 26	28.5	60 - 75	0.2 - 3.0
80	3,000	5,000	678	24.5	7-1/4 x 26-1/8	32.0	65 - 80	0.2 - 3.0

This information is to be used as a guide in the hydrostatic retesting of aluminum compressed gas cylinders produced under the Department of Transportation Special Permit or Exemption Number 6498 (CTC SP 922) and Specification 3AL. The hydrostatic retest requirements are:

"Each cylinder must be retested at least every five years in accordance with 49 CFR 173.34 (e)(1), (3), (4), (5), and (6), except that a cylinder condemned for excessive permanent expansion may not be reheat-treated." Any cylinder exposed to the action of fire must not again be placed in service.

The hydrostatic test pressure required is five-thirds (5/3) times the marked service pressure with the maximum allowable permanent expansion of ten percent (10%).

(*) Pony bottle

1/82



Luxfer USA Limited

1908 Third Street . P. O. Box 5300
Riverside, California 92517 Telephone 714/684-5110



Luxfer USA Limited

Aluminum Compressed Gas Cylinders

TECHNICAL BULLETIN

SUBJECT: VALVE INSERTION PROCEDURE FOR CO₂ SERVICE USING
STRAIGHT THREADED VALVES WITH "O" RING SEALS

DATE: December 1981

1. Inspect valve and cylinder for damaged threads and "O" ring seating surfaces which must be free of visible defects such as burrs, dings, and gouges.
2. Install a new "O" ring. Lubrication is not necessary, but if used, use sparingly. Excessive lubrication may interfere with proper seating of the "O" ring and promote subsequent leakage problems. A 90-shore Buna N "O" ring has been approved for this service.
3. Carefully slip "O" ring over valve threads and fully seat against the bottom of the valve flange.
4. Prior to valving and where applicable, assemble the Valve Protector/Carrying Handle to the cylinder using the retainer ring and snap ring pliers. The handle must turn freely.
5. Apply Dow III lubricant (or equivalent) to the first 5 threads of the valve. Avoid excessive lubricant which may be pushed back to the "O" ring preventing proper seating and potential leakage. Lubricant accidentally applied to the bottom of the valve should be removed for the same reason.
6. Assemble valve to cylinder and tighten by hand. If the valve fails to start easily, reinspect for damaged threads.
7. Place cylinder in a holding fixture suitable for aluminum and tighten valve as follows:

THREAD SIZE	"O" RING SIZE	VALVE WRENCH NUMBER	MAXIMUM TORQUE
.750-16 UNF	210	1T2479	75 ft. lbs.
1.125-12 UNF	216	1T2475-3	100 ft. lbs.

8. Lightly close the valve handwheel.
9. Assembly of the safety relief nut is normally controlled by the valve manufacturer. Should a leak develop at this point, torque nut to not more than 40 ft. lbs. Excessive tightening may damage the internal burst disc assembly.
10. Make certain that valve safety disc corresponds to cylinder service pressure. Where necessary, replace safety relief devices only with complete assemblies as supplied by the appropriate valve manufacturers.
11. Caution - Do Not Overfill - Fill only by weight to the rated capacity normally stamped on the shoulder of the cylinder.
12. Should problems develop in your assembly of cylinder valves, please contact Luxfer USA Limited for assistance.



Luxfer USA Limited

Aluminum Compressed Gas Cylinders

TECHNICAL BULLETIN

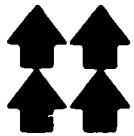
SUBJECT: VALVE INSERTION PROCEDURE FOR OXYGEN SERVICE USING
STRAIGHT THREADED BRASS VALVES WITH "O" RING SEALS

DATE: January 1982

1. Inspect valve and cylinder for damaged threads and "O" ring seating surfaces which must be free of visible defects such as burrs, dings, and gouges.
2. Check for Luxfer ② symbol on crown of cylinder which signifies cleaned for oxygen or nitrous oxide service.
3. Install a new "O" ring making certain that it is clean, dry, and free from physical damage. Do not lubricate since it is not necessary, and unless specifically qualified, may not be compatible in high pressure gaseous oxygen environment. Either a 70-80 shore neoprene compound or teflon, as supplied by Luxfer, is approved for this service.
4. Carefully slip "O" ring over valve threads and fully seat against the bottom of the valve flange.
5. Assemble valve to cylinder and tighten by hand. If the valve fails to start easily, reinspect for damaged threads.
6. Place cylinder in a holding fixture suitable for aluminum and tighten valve as follows:

<u>THREAD SIZE</u>	<u>"O" RING SIZE</u>	<u>VALVE WRENCH NUMBER</u>	<u>MAXIMUM TORQUE</u>
.750-16 UNF	210	1T2479	75 ft. lbs.
1.125-12 UNF	216	1T2475-3	100 ft. lbs.

7. Lightly close the valve handwheel.
8. Assembly of the safety relief nut is normally controlled by the valve manufacturer. Should a leak develop at this point, torque nut or screw to not more than 40 ft. lbs. on industrial valves, and 80 in. lbs. on medical valves. Excessive tightening may damage the internal burst disc assembly.
9. Make certain that valve safety disc corresponds to cylinder service pressure. Where necessary, replace safety relief devices only with complete assemblies as supplied by the appropriate valve manufacturers.
10. Caution - Do Not Overfill - fill only to the stamped service pressure at 70 degrees F.
11. Should problems develop in your assembly of cylinder valves, please contact Luxfer USA Limited for assistance.



Luxfer USA Limited

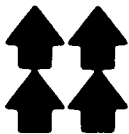
Aluminum Compressed Gas Cylinders

TECHNICAL BULLETIN

**SUBJECT: VALVE INSERTION AND REMOVAL PROCEDURE FOR SCUBA
SERVICE EMPLOYING 3/4-14 NCS THREADS**

DATE: June 1982

1. Inspect valve and cylinder for damaged threads and "O" ring seating surfaces which must be free of visible defects such as burrs, dings, or gouges. Inspect valve per manufacturers recommendations.
2. Install a new "O" ring.
3. Make certain that "O" ring and its cylinder seating surfaces are clean and dry.
4. Lubrication of the "O" ring is not necessary but, if used, use sparingly. Excessive lubrication may interfere with proper seating of the "O" ring and promote subsequent leakage problems.
5. Carefully slip "O" ring over valve threads and fully seat against the bottom of the valve flange.
6. Apply Dow III lubricant or equivalent to the first five threads of the valve. Avoid excessive lubricant which may be pushed back to the "O" ring preventing proper seating and promoting potential leakage.
7. Assemble valve to cylinder and tighten by hand. If the valve fails to start easily, reinspect for damaged threads.
8. Place cylinder in a holding fixture suitable for aluminum and tighten valve to a maximum of 100 ft. lbs.
9. If difficulty is encountered in removing a valve after service, apply a generous amount of Molykote 557 or equivalent to the threaded joint and allow time for penetration into the joint.
10. Carefully apply torque to the valve back and forth until the joint loosens. Carefully back the valve out of the cylinder neck. Should further resistance be encountered, repeat application of the penetrating lubricant and again carefully work the valve back and forth until it loosens. After removal of valve, the inside of the cylinder should be washed with a mild detergent followed by a warm water rinse and air dry.



Luxfer USA Limited

Aluminum Compressed Gas Cylinders

TECHNICAL BULLETIN

SUBJECT: VALVE INSERTION PROCEDURE FOR TAPERED THREADS

DATE: December 1981

1. Use NEW valves only. Used valves which have been previously inserted into steel cylinders will have threads distorted beyond gauging tolerance and will not produce a proper seal.
2. Examine valve and cylinder for damaged threads and reject or repair those containing visible defects (burrs, dings, gouges, etc.); if damaged, re-thread with a tap or chasing die prior to inserting valve in cylinder.
3. Where applicable, attach the Valve Protector/Carrying Handle to the cylinder using the retainer ring and snap ring pliers prior to valve installation. Be sure handle turns freely before installing the valve.
4. Make certain that valve safety disc corresponds to the cylinder service pressure. Where necessary, replace safety relief devices only with complete assemblies as supplied by the appropriate valve manufacturers.
5. Check thread surfaces of both valve and cylinder for cleanliness.
6. Apply 1½ wraps of teflon tape on the valve threads, leaving the lead thread exposed; apply Formula 8 Teflon Paste (Huntley Engineering Sales, South El Monte, California) evenly, but sparingly, over the tape and the exposed lead thread.
7. Assemble lubricated valve to cylinder by inserting and hand tightening to engage a minimum of 3 threads. If the valve fails to start easily or fails to obtain 3 threads engagement, recheck the valve to make sure it is to gauge. Also, check the valve and cylinder for damaged threads.
8. Place valved cylinder in an adequate holding fixture. Place protective material around the cylinder to prevent gouging sidewalls with vice holding jaws. Using a torque wrench with adaptor to fit wrench flats on valve, tighten valve as follows:

1/2" NGT threads torque 35 to 50 ft. lbs. maximum

3/4" NGT threads torque 75 to 100 ft. lbs. maximum

This torque should yield another 2-3 threads engagement, giving a total engagement of 5-6 threads. If problems develop in your assembly of taper threaded cylinder valves, please contact Luxfer USA Limited or the valve supplier for assistance.

CAUTION

Aluminum cylinders require care in assembling valves with tapered threads. The aluminum cylinder is of the same relative hardness as the brass valve, and does not reshape or rethread the valve during insertion as does the steel cylinder. Therefore, an interface problem could be created by damaged threads or excessive valve torque preventing a gas-tight connection.

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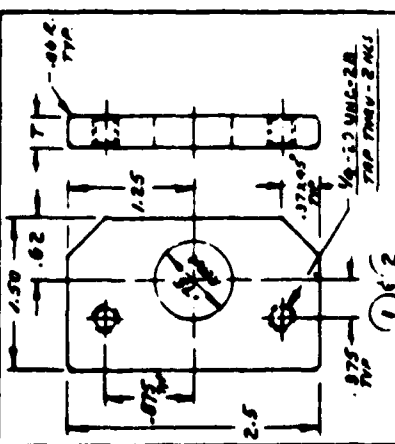
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4	1	113	SP2	30 x 0.6mm x 1/8
3	1	WICK	AN	0.6-0.20 (BLACK PAPER) 1/8 INCHES WIDE
2	1	CR5		1/2 x 1 1/2 x 2 1/2 NET
1	1	CR5		1/4 x 1 1/2 x 2 1/2 NET
				RESCUED

SENT <i>FULL</i>	LEADS ON THE WALKER INVESTIGATION SERVICE COMMUNALITY	SEARCHED ☒ INDEXED ☒ SERIALIZED ☒ FILED ☒	FEB 28 1976	FBI ALBANY
DATE <i>25 FEB 76</i>	PROCESSED BY <i>WJ</i>	SEARCHED ☒ INDEXED ☒ SERIALIZED ☒ FILED ☒	FEB 28 1976	FBI ALBANY
CLASSIFIED BY <i>5806R/ML</i>	UNLTD FOR OR PART OR INFO-AGENCY NAME & NUMBER			
APPROVED	NAME <i>CO-OP 565 CYL</i>	NUMBER <i>B-17-2475</i>	DATE <i>7/8/76</i>	BY <i>9</i>
WELL OF	VALVE WRENCH			

4	0	2.70	6.55	4%	2.875	8.655	—
3	2	0.50	5.65	5%	2.10	9.437	—
2	0.5	2.00	4	WIM	1.00	3.167	9.5
1	0.5	2.00	3	WIM	1.00	3.167	9.5
100	0.5	2.00	3	C	2	5	2.5

APPENDIX F
INGERSOLL-RAND PROFESSIONAL TOOLS, SERIES 7
AIR DRILLS

Form P6532
Edition 3
June, 1983

SERIES 7 AIR DRILLS
PERCEUSE PNEUMATIQUE SERIE 7
DRUCKLUFTBOHRMASCHINEN BAUREIHE 7
TRAPANI PNEUMATICI SERIE 7
TALADROS NEUMATICOS SERIE 7

Always operate, inspect and maintain this tool in accordance with American National Standards Institute Safety Code for Portable Air Tools (ANSI B186.1) and any other applicable safety codes and regulations.

WARNING

Always use a Dead Handle (47) with Models T4N4 and T4Q4.

Always turn off the air supply before installing, removing or adjusting any accessories on this tool, or before performing any maintenance on this tool. Failure to do so could result in injury.

FOR TOP PERFORMANCE AND MAXIMUM DURABILITY OF PARTS, OPERATE THIS TOOL AT 90 psig (6.2 bar 620 kPa) AIR PRESSURE WITH 1/4" (10 mm) DIAMETER HOSE.

LUBRICATION

Oil: Ingersoll-Rand Light Grease* Light Oil No. 10 or a good quality high speed spindle oil.
Grease: Ingersoll-Rand Light Grease No. 1 or No. 2 oil pump grease.

*Always lubricate this tool must be used with these fluids. We recommend using an Ingersoll-Rand No. SEERU-8 Lubrication Regulator Unit. A test for oil leakage is there is a slight oil mist on the exhaust.

Adequate lubrication is imperative for satisfactory gear life. Inject approximately 1 cc of the recommended grease into the Grease Fitting (47) on D.H. 1, D.H. 2, D.H. 3 and D.H. 4, and into the M.N. and T. ports after each 5000 cycles of operation, or each month, whichever occurs first.

TOUJOURS UTILISER CONTROLER ET MAINTENIR CET OUTIL EN CONFORMITE
AVEC LES REGLEMENTATIONS DE SECURITE APPLICABLES AUX OUTILS
PNEUMATIQUES PORTATIFS.

POUR OBTENIR UN RENDEMENT OPTIMAL ET UNE LONGEVITE MAXIMALE DES PIECES, UTILISER CET OUTIL A UNE PRESSION D'AIR DE 6.2
BAR (620 kPa (90 Psig) AVEC UN FLEXIBLE D'ALIMENTATION DE 10 mm (1/4") DE DIAMETRE

(Continued on Page 4)

Notice: The use of other than genuine Ingersoll-Rand replacement parts may result in decreased tool performance and increased maintenance, and may, at the Company's option, invalidate all warranties.

Remarque: L'emploi de pièces de rechange non d'origine Ingersoll-Rand peut entraîner une diminution du rendement, et un surcoût d'entretien et peut même, à la discrétion de la compagnie, annuler toutes les garanties.

Achtung: Bei Verwendung von nicht-original Ingersoll-Rand Ersatzteilen kann die Werkzeugleistung darunter leiden und der Wartungsaufwand zunehmen. Die Firma behält sich vor, dann etwaige Garantieansprüche abzulehnen.

Attenzione: L'uso di pezzi di ricambio non originali Ingersoll-Rand può dare luogo a ridotte prestazioni dell'attrezzo, maggiori spese di manutenzione e a disdetta della Ingersoll-Rand può essere annullata ogni garanzia.

Aviso: El uso de piezas de repuesto distintas de las auténticas de Ingersoll-Rand puede dar como resultado una disminución en el rendimiento y un aumento del mantenimiento de la herramienta, y puede, a opción de la Compañía, invalidar toda garantía.

For additional repair service information, request Service Bulletin S6532 from your Ingersoll-Rand Distributor or Sales Office.

Pour toute information complémentaire concernant l'entretien, demander le Bulletin d'Entretien S6532.

For weitere Reparatur- oder Wartungsinformationen fordern Sie bitte Wartungsinformationsblatt (S6532) von Ihrem Ingersoll-Rand fachhändler an.

Per ulteriori informazioni richiedere il bollettino S6532 al più vicino ufficio o rivenditore autorizzato Ingersoll-Rand.

Para información adicional de servicio de reparación, solicitar el Boletín de Servicio S6532 a su distribuidor Ingersoll-Rand o oficina de ventas.

Refer All Communications to the Nearest
Ingersoll-Rand Office or Distributor
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Printed in U.S.A.

INGERSOLL-RAND.
PROFESSIONAL TOOLS

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ATTENTION

Toujours utiliser les Modèles "AN4 et "AQ4 avec la Poignée Auxiliaire (47)

Toujours couper l'air d'alimentation avant de procéder à l'installation à la dépose ou au réglage de tous dispositifs ou outillage, ou avant d'entreprendre une opération d'entretien sur cette machine. Le non respect de ces instructions pourrait être cause d'accidents

GRAISSAGE

Huile: Ingersoll Rand Pneulube® N° 10 ou une huile légère de bonne qualité pour moteur grande vitesse

Graisse: Ingersoll Rand graisse légère N° 28 ou N° 2 graisse à engrenage de bonne qualité

L'air d'alimentation doit être graissé. Nous recommandons le graisseur Ingersoll Rand N° NFLRU-8. Régler le graisseur pour produire une légère brouillard d'huile à la prise d'air.

Une lubrification correcte est indispensable pour une bonne longévité du réducteur. Injecter dans le graisseur (39) 6 cc environ de graisse pour les réducteurs D, H, J, JJ, K et L et 9 cc pour les réducteurs M, N et Q, après 50 000 serrages ou tous les mois selon l'utilisation.

DIESE MASCHINE IST STETS IN ÜBEREINSTIMMUNG MIT DEN JEWELSGÜLTIGEN SICHERHEITSBESTIMMUNGEN FÜR HANDGEHALTENE DRUCKLUFTWERKZEUGE ZU BETREIBEN UND ZU WARTEN.

UM HOCHSTE LEISTUNG UND MAXIMALE LEBENSDAUER DER MASCHINE ZU ERREICHEN, IST SIE MIT EINEM BETRIEBSDRUCK VON 90 psig (6.2 bar/620 kPa) ZU BETREIBEN. DER LUFTZUFÜHRSCHAUCH SOLLTE (3/8") NW 10 mm NICHT UNTERSCHREITEN.

ACHTUNG

Bei Modellen "AN4 und "AQ4 immer den mitgelieferten Hilfsgriff (47) benutzen.

Vor Anschluß oder Abnahme der Werkzeuge vom Betriebsnetz sowie bei Zuberhorwechsel oder Wartungsarbeiten am Werkzeug stets die Luftzufuhr zum Werkzeug absperrn. Bei Nichtbeachtung besteht Verletzungsgefahr.

SCHMIERUNG

Öl: Ingersoll Rand Pneulube® Light Oil N° 10 oder ein qualitativ Hochleistungsspindelöl.

Fett: Ingersoll Rand Fett N° 28 oder ein qualitativ gutes Stauffett N° 2.

Dieses Bohrerwerkzeug ist nur mit Luftunterstützung zu betreiben. Wir empfehlen Ingersoll Rand Nr. NFLRU-8 Filter-Regler und Ölter. Bei richtiger Einstellung der Ölter tritt kein Öl aus dem Ölbehälter aus.

Angemessene Schmierung ist die Voraussetzung für maximale Leistung und Haltbarkeit der Getriebe in diesen Geräten. Injektionen in der Schmiernippel (39) für Getriebe D, H, J, JJ, K und L 6 cc (109 cc für M, N und Q) zu drücken jeweils nach 50 000 Einschaltungen oder monatlich, je nach Erfahrung.

USARE SEMPRE, CONTROLLARE E MANTENERE IN EFFICIENZA QUESTO ATTREZZO IN ACCORDO CON AMERICAN STANDARD INSTITUTE SAFETY CODE FOR PORTABLE AIR TOOLS (ANSI B186.1) E CON OGNI ALTRA NORMA E REGOLAMENTAZIONE DI SICUREZZA APPLICABILE AGLI UTENSILI PNEUMATICI.

Per ottenere il miglior rendimento e la massima durata delle parti, alimentare questo attrezzo con aria compressa a 90 psig (6.2 bar/620 kPa) e tubo flessibile di 3/8" (10 mm) diametro interno.

ATTENZIONE

Con i Modelli "AN4 e "AQ4 usare sempre l'Impugnatura Ausiliaria (47).

Staccare sempre il tubo di alimentazione dell'aria prima di installare, togliere o regolare qualsiasi accessorio sull'utensile, o prima di effettuare qualsiasi intervento di manutenzione sullo stesso. Non attenersi a tale istruzione, potrebbe risultare pericoloso.

LUBRIFICAZIONE

Olio: Usare olio leggero Pneulube® N° 10 o una buona qualità di olio per mandrini ad alta velocità.

Graasso: Usare grasso leggero Ingersoll Rand N° 28 o un buon grasso per motori N° 2.

Non trascuriamo l'uso di un gruppo filtro-regolatore lubrificatore Ingersoll Rand da 3/8" da installare il più vicino possibile all'attrezzo. Riempire il lubrificatore con olio raccomandato e regolarlo in modo che nello scarico dell'aria sia presente una leggera nebbia di olio.

Per il miglior rendimento e la massima durata degli ingranaggi di questi cacciaviti, è indispensabile effettuare una adeguata lubrificazione degli stessi. Iniettare nell'ingrassatore R000A2-228 nei modelli velocità D, H, J, JJ, K e L circa 6 cc di grasso e nell'ingrassatore (39), nei modelli velocità M, N, e Q, circa 9 cc di grasso una volta al mese o ogni 50 000 cicli.

UTILICESE, INSPECCIONESE Y MANTENGASE SIEMPRE ESTA HERRAMIENTA DE ACUERDO CON LAS NORMAS DE SEGURIDAD APLICABLES A LAS HERRAMIENTAS PNEUMATICAS PORTATILES.

PARA EL MAS ALTO RENDIMIENTO Y LA MAXIMA DURACION DE LAS PIEZAS OPERAR CON ESTA HERRAMIENTA A UNA PRESION DE AIRE DE 90 psig (6.2 bares/620 kPa) Y CON UNA MANGUERA DE SUMINISTRO DE AIRE DE 3/8" (10 mm) DE DIAMETRO INTERIOR.

ATENCIÓN

En los modelos "AN4 y "AQ4 usar siempre el Mango Auxiliar (47).

Cortar siempre el suministro de aire a esta herramienta antes de proceder a instalar, remover o ajustar cualquier accesorio sobre la misma o bien antes de efectuar mantenimiento alguno en esta herramienta. El incumplimiento de esta norma de seguridad podría acarrear lesiones.

ENGRASE

Aceite: Utilicese aceite ligero Ingersoll Rand Pneulube® N° 10 o un aceite para husillos a alta velocidad, de buena calidad.

Grasa: Utilicese grasa ligera Ingersoll Rand N° 28 o grasa de copa N° 2.

Un lubricador de línea es imperativo para estos taladros. Recomendamos el empleo de una unidad Filtro-Regulador-Lubricador Ingersoll-Rand NFLRU-8. Gradue el lubricador de tal manera que exista un vapor de aceite liviano en el escape.

Un engrase adecuado es imperativo para un máximo rendimiento y duración de los engranajes de estos taladros. Introduzcanse 6 cc de grasa recomendada con la pistola de engrase R000A2-228 para los modelos de velocidad D, H, J, JJ, K y L y 9 cc para los modelos de velocidad de M, N, y Q, a través del engrasador (39), después de cada 50 000 ciclos, o cada mes, lo que se produzca primero.

PART NUMBER FOR ORDERING
REFERENCE POUR COMMANDE DE LA PIECE
BESTELNUMBER
NUMERO DEL PEZZO PER L'ORDINAZIONE
SIMBOLO DE LA PIEZA PARA PEDIDOS

PART NUMBER FOR ORDERING
REFERENCE POUR COMMANDE DE LA PIECE
BESTELNUMBER
NUMERO DEL PEZZO PER L'ORDINAZIONE
SIMBOLO DE LA PIEZA PARA PEDIDOS

1	Motor Housing Assembly	7AH-A40A	31	Rotor Pinion	7AH-17
2	Bearing Nut	7AH-105		for H, M or N ratio (22 teeth)	7AJ-17
3	Rear Rotor Bearing	7AH-24		for J ratio (16 teeth)	7AJJ-17
4	Trigger Bushing	7AH-91		for JJ ratio (13 teeth)	
5	Throttle Valve Seat	7AH-303	32	Rotor Pinion Spacer	7AH-18
6	Trigger Assembly	7AH-A93		for H, J, M or N ratio	7AJJ-18
7	Trigger Pin	7AH-94		for JJ ratio	7AD-171
8	Inlet Bushing Assembly	7AH-A565	33	Drive Plate (for D ratio)	
9	Air Strainer Screen	ROA-261	34	Gear Head	
10	Throttle Valve	7AH-302		for M ratio (16 teeth)	7AM-216
11	Throttle Valve Spring	7AH-51		for N ratio (10 teeth)	7AN-216
12	Muffler Assembly	3RA-A123		for Q ratio (13 teeth)	7AQ-216
13	Muffler O-ring	85H-167	35	Gear Head Planet Gear Assembly (3)	
13A	Inlet Bushing Spacer	7AH-65		for M or N ratio (15 teeth)	7AH-A10
14	Exhaust Silencer	7RA-311		for Q ratio (21 teeth)	7AP-A10
15	Rear End Plate Gasket	7AH-739	36	Gear Head Planet Gear Bearing (1 for each Gear) (for M, N or Q ratio)	7AH-500
16	Rear End Plate	7AH-12	37	Gear Head Spacer (for M, N or Q ratio)	7AN-80
17	Rear End Plate Retainer	7AH-118		Gear Case Assembly	
18	Rotor			for D, H, J, JJ, K or L ratio	7AH-A37A
	for D, H, J, L, M or N ratio	7AH-53		for M, N or Q ratio	7AN-A37A
	for JJ ratio	7AJJ-53	38	Gear Case	
	for K or Q ratio	7AK-53		for D, H, J, JJ, K or L ratio	7AH-B37A
19	Vane Packet (set of 4 Vanes)	7AH-42A-4		for M, N or Q ratio	7AN-B37A
20	Cylinder	7AH-3A	39	Grease Fitting	DOF-9K79
21	Front End Plate	7AH-11	40	Spindle Bearing	SA-510
22	Cylinder Dowel	7AH-98	41	Spindle Bearing Retainer	7AH-28
23	Front Rotor Bearing	R1-22	42	Grease Shield	7AH-701
24	Front Rotor Bearing Housing	7AH-13	43	Chuck Spacer	SA-90
25	Front Rotor Bearing Retainer	W22-118	44	Drill Chuck	
26	Bearing Spring Washer (2)	7AH-278		0 to 1.4" capacity	ROOA-99
27	Bearing Housing Spacer	7AH-81		0 to 5.16" capacity	ROJ-99
28	Spindle			0 to 3.8" capacity	RIM-99
	for D or J ratio	7AJ-8		5.64" to 1.2" capacity	ROK-99
	for H ratio	7AH-8		Chuck Key	
	for K or N ratio	7AK-8		for ROOA-99 Chuck	ROOA-J253
	for L ratio	7AL-8		for ROJ-99 Chuck	ROJ-J253
	for M ratio	7AM-8		for RIM-99 Chuck	RIM-J253
	for JJ or Q ratio	7AQ-8		for ROK-99 Chuck	RIT-J253
29	Spindle Planet Gear Assembly (3)		46	Dead Handle Adapter (2)	7A-49
	for H ratio (15 teeth)	7AH-A10	47	Dead Handle	R1A-A48
	for J or M ratio (18 teeth)	7AJ-A10	48	Pinch Bolt	510-638
	for K or N ratio (21 teeth)	7AK-A10		Chuck Shield Kit (for D, H, J, JJ or K ratio)	7AH-K309
	for L ratio (22 teeth)	7AL-A10		Nameplate	5RA-301
	for JJ or Q ratio (19 teeth)	7AQ-A10		Warning Label (for N or Q ratio)	7AQ-245
30	Spindle Planet Gear Bearing (1 for each Gear)			Grease Gun	R000A2-228
	for H ratio	7AH-500		Tune-up Kit (includes illustrated parts 5, 9, 10, 11, 13, 13A, 15, 17, 19, 22, 26, 27 and 32)	7AH-TK1
	for J, JJ, M or Q ratio	7AJ-500			
	for K, L or N ratio	7AK-500			

* Not illustrated

• To keep downtime to a minimum, it is desirable to have on hand certain repair parts. We recommend that you stock one (pair or set) of each part indicated by a bullet (•) for every four tools in service.

† When ordering a Dead Handle (47), also order two Dead Handle Adapters (46).

03532801

POWER TOOL DIVISION AUTHORIZED SERVICENTERS for

INDUSTRIAL AIR TOOLS, HOISTS AND WINCHES

Form 0647
Edition 2
December, 1982

Alabama

Star Hardware & Supply Co., Inc.
1318 Second Ave., North
Birmingham, AL 35202
205-252-8183

Tool Smith Co., Inc.
1308 Fourth Ave., South
Birmingham, AL 35233
205-423-1030

Arizona

Glendale Industrial Supply
4524 Grand Ave.
Glendale, AZ 85301
602-939-9751

California

Northwestern Equipment & Supply Co.
635-641 Gilman St.
Berkeley, CA 94710
415-527-4080

Continental Air Tools
11447 Beach St.
Cerritos, CA 90701
714-994-1412

Allied Tool & Hoist
2218 North Seaman Ave.
South El Monte, CA 91733
213-448-7623

Colorado

Centurion Tool & Supply Co.
2531 West 16th Avenue
Denver, CO 80204
303-534-4959

Delaware

Induk's Industrial Services, Inc.
7 Mecca Circle
Wilmington, DE 19804
302-994-2534

Georgia

Mid-South Tool & Equipment, Inc.
620 Flint St.
Albany, GA 31701
912-435-0084

Air Specialists, Inc.
120 Interstate No. Hwy E, Suite 208
Athens, GA 30339
404-955-3310

Illinois

Boiler Supply Company
1935 South Wabash Avenue
Chicago, IL 60016
312-842-6800

S & K Rigging Corp.
East Route 316
Matteson, IL 61938
217-258-8500

Industrial Tool Products, Inc.
3901 25th St.
Moline, IL 61265
309-797-0587

Industrial Supply Company
203 Poplar Place
No. Aurora, IL 60542
312-859-2300
(A wholly-owned subsidiary of
Boiler Supply Company)

Portable Tool Sales & Service, Inc.
13401 S. Halsted St.
Riverdale, IL 60627
312-841-2600

Industrial Tool Products, Inc.
9697 Bryn Mawr Avenue
Rosemont, IL 60018
312-671-7730

Indiana

Air Power Equipment Co., Inc.
5709 W. 85th St.
Indianapolis, IN 46278
317-872-6766

Kansas

Powerflow Systems, Inc.
1401 Fairfax Trafficway
Kansas City, KS 66115
913-342-7024

Kentucky

Air Equipment Sales & Service, Inc.
Route 3, Box 131
Ashland, KY 41101
606-928-9531

Advanced Material Handling Co., Inc.
1734 Melwood Ave.
Louisville, KY 40206
502-896-2166

Louisiana

Tools, Sales and Rentals, Inc.
11134 Cedar Park Ave.
Baton Rouge, LA 70810
504-292-4000

Airayne-Lafayette
108 North Cruise Avenue
Breauxard, LA 70518
318-837-3251

Sandair Corp.
2101 West Airline Highway
Kenner, LA 70087
504-347-1575

Black Gold Rental & Supply, Inc.
101 Henderson Rd.
Lafayette, LA 70501
318-233-7137

Thornton Industrial Supply
5901 Courtesy Lane
Shreveport, LA 71108
318-636-7450

Massachusetts

Tool Servicer (Norwood)
1014 Turnpike Street
Canton, MA 02021
617-828-0078

Norwood Tool & Ind'l Supply Co., Inc.
935 Washington Street
Norwood, MA 02062
617-769-2800

Michigan

Air Components & Engr'g, Inc.
3057 Madison, S. E.
Grand Rapids, MI 49509
616-452-3188

Redford Air Tool, Inc.
37250 Plymouth Road
Livonia, MI 48150
313-591-6303

Tool & Accessory Co.
1679 W. Hamlin Road
Rochester, MI 48063
313-852-0900

Minnesota

Warner Industrial Supply, Inc.
2211 East Hennepin Avenue
Minneapolis, MN 55413
612-378-7300

Missouri

House of Tools & Engineering, Inc.
436 Anglum Rd.
Hazelwood, MO 63042
314-731-4444

Montana

Industrial Tool & Repair, Inc.
917 3rd Ave. North
Billings, MT 59101
406-252-8114

New Jersey

Northland Equipment Co.
6 DeForest Ave.
East Hanover, NJ 07936
201-386-1725

Clark Pneumatics, Inc.
270 Monroe Ave.
Kensworth, NJ 07033
201-272-6060

New Mexico

Ingersoll Rand Equipment Corp.
107 Candelaria St., N.W.
Albuquerque, NM 87107
505-345-7811

New York

Frontier Industrial & Marine Supply
133 Hopkins St.
Buffalo, NY 14220
716-826-7200

Mid-State Contractor's Equip. Co., Inc.
1811 LeMoine Avenue
Syracuse, NY 13220
315-455-5903

Mid-State Contractor's Servicenter
505 Factory Avenue
Syracuse, NY 13208
315-455-7384

North Carolina

Williams Tools, Inc.
4840 Wilmont Rd.
Charlotte, NC 28208
704-523-8801

Ohio

Ridemco, Inc.
10900 Loveland-Madison Road
Loveland, OH 45140
513-683-8000

(ALL MAIL)
P. O. Box 42001
Cincinnati, OH 45242

Industrial Tool Service
2567 Tracy Road
Northwood, OH 43619
419-461-9423

Ohio (Continued)

Ohio Tool Systems, Inc.
1863 Congress Parkway
Richfield, OH 44286
216-659-4181

Oklahoma

Finnell Compressor, Inc.
4515 E. Pine St.
Tulsa, OK 74115
918-838-9955

Oregon

Industrial Tool & Supply Co.
600 S. I. Belmont St.
Portland, OR 97202
503-287-2686

Pennsylvania

Metal Welding & Supply Co., Inc.
5555 Tughman St.
Allentown, PA 18104
215-398-2211

Tool Sales & Service Co.
1137 Electric Ave.
East Pittsburgh, PA 15112
412-824-0021

M. Glosser & Sons
72 Messenger St.
Johnstown, PA 15902
814-535-7521

Plant Service Co.
6th & Bingham Sts.
Pittsburgh, PA 15220
412-381-4664

Tennessee

Chattanooga Saw & Supply Co., Inc.
1208 East 23rd
Chattanooga, TN 37407
615-266-1265

Riechman Crosby Hays Co., Inc.
3150 Durrer St.
Memphis, TN 37407
901-345-2200

Auto & Mill Supply Co., Inc.
DBA Motor Parts & Bearing Co.
Highway 70 East
New Johnsonville, TN 37134
615-535-2891

Texas

Corpus Christi Equipment Co., Inc.
4444 Baldwin
Corpus Christi, TX 78408
512-884-2981

Air Power Tools & Hoists, Inc.
4435 Mint Way
Dallas, TX 75236
214-333-4241

Sierra Machinery, Inc.
939 Hawkins St.
El Paso, TX 79915
915-772-0613

Texas (Continued)

American Maintenance & Rental, Inc.
918 North Gult Blvd.
Freeport, TX 77541
713-233-3281

Airdyne, Inc.
15402 East Vantage Parkway Suite 326
Houston, TX 77032
713-987-0000

Houston Tool & Host Co.
1401 Boyles
Houston, TX 77020
713-674-0912

Associated Tool Specialties, Inc.
3711 N. Twin City Highway
Nederland, TX 77627
713-727-2166

Engine Service & Supply
1902 N. Grant
Odessa, TX 79760
915-337-2386

Industrial Air Tool Pasadena, Inc.
1305 West Jackson
Pasadena, TX 77501
713-477-3144

Air Power South Texas, Inc.
4850 Whirlwind
San Antonio, TX 78217
512-656-9481

Air Power Tools & Hoists, Inc.
Gladewater Highway inside Loop 323
Tyler, TX 75711
214-593-7303

Utah

Abrasive & Tool Specialties, Inc.
2400 Directors Row
Salt Lake City, UT 84125
801-972-3182

Virginia

James McGraw, Inc.
2900 Deepwater Terminal Road
Richmond, VA 23234
804-233-3071

Washington

B & J Industrial Supply
5601 First Avenue, South
Seattle, WA 98108
206-762-4430

Pacific American Commercial Co.
7420 2nd Ave. South
Seattle, WA 98124
206-762-3550

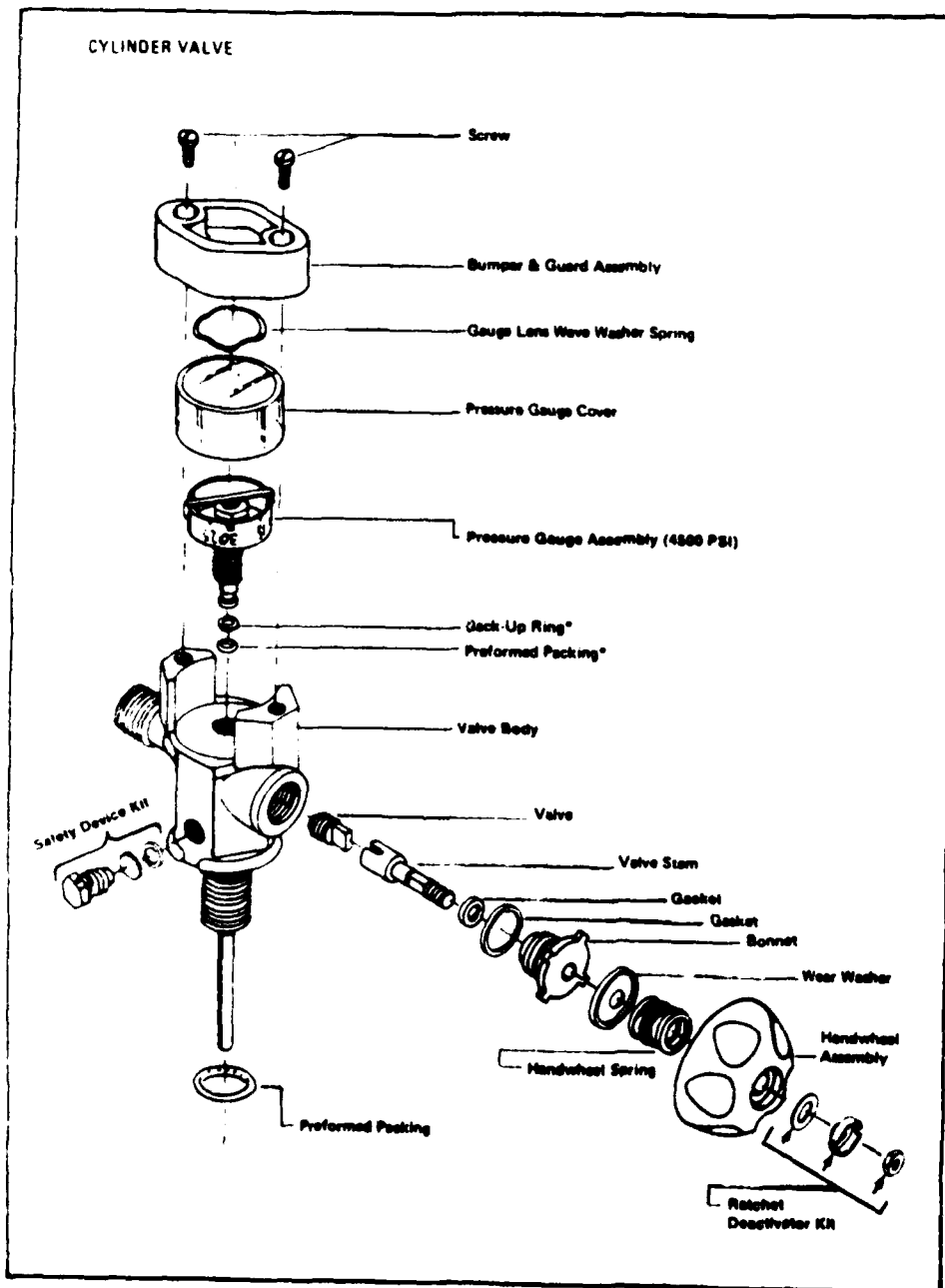
Wisconsin

Valwold, Inc.
2626 W. Wisconsin Ave.
Appleton, WI 54911
414-734-7173

Tools & Abrasives, Inc.
1506 W. Pierce Street
P. O. Box 480 (53201)
Milwaukee, WI 53206
414-671-3051

APPENDIX G

SHERWOOD BOTTLE VALVE/GAUGE ASSEMBLY



END

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