

TECHNICAL MANUAL

MAINTENANCE MANUAL  
ORGANIZATIONAL AND INTERMEDIATE LEVELS

SUPPLIED AIR RESPIRATOR (SAR) WITH  
SELF-CONTAINED BREATHING APPARATUS (SCBA)  
0910-LP-708-0000

OPERATION AND MAINTENANCE INSTRUCTIONS



DISTRIBUTION STATEMENT A: APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED.

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## FOREWORD

This technical manual contains procedures for operation and maintenance of the Supplied Air Respirator (SAR) with Self-Contained Breathing Apparatus (SCBA). The information in this manual is presented in eight chapters and two appendices: general information and safety precautions are provided in Chapter 1; operational procedures in Chapter 2; functional description in Chapter 3; maintenance and troubleshooting procedures in Chapters 4, 5, and 6; the parts lists in Chapter 7; and inventory, storage, and shipping data in Chapter 8. Appendix A is a pre-operational checklist. Appendix B contains Department of Transportation (DOT) exemptions for air cylinders and cylinder shipping information.

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## ACKNOWLEDGMENT

This manual contains copyrighted photographs that were reprinted with permission from the Compressed Gas Association, Inc., publication no. CGA C-6.2, 1988, *Guidelines for Visual Inspection & Requalification of Fiber Reinforced High Pressure Cylinders*.

The information on the PremAire® CADET 15M Respirator was supplied by the manufacturer, Mine Safety Appliances Company (MSA). Much of the information about this respirator also appears in MSA's technical manual, the PremAire® CADET 15M Air-Line Respirator Operation and Maintenance Manual. Though the formats differ between this manual and MSA's, every effort has been made to ensure that the information on the PremAire® CADET 15M Respirator is consistent in both documents. **In the event of contradictions, this manual takes precedence over the manufacturer's manual.**

## ACRONYMS/ABBREVIATIONS

## A

ANSI ..... American National Standards Institute, Inc.

## C

CAGE ..... Commercial and Government Entity  
 CASREP ..... Casualty Report  
 CCW ..... Counterclockwise  
 CD-ROM ..... Compact Disc Read-Only Memory  
 CFR ..... Code of Federal Regulations  
 CGA ..... Compressed Gas Association  
 COTS ..... Commercial Off-the-Shelf  
 CPA ..... Control Panel Assembly  
 CW ..... Clockwise

## D

DOT ..... Department of Transportation

## E

EGL ..... Equipment Guide List

## G

GFE ..... Gas-Free Engineer  
 GFEP ..... Gas-Free Engineering Personnel

## H

Hg ..... Mercury  
 HP ..... High Pressure

## I

IAW ..... In Accordance With  
 IDLH ..... Immediately Dangerous to Life or Health  
 IPB ..... Illustrated Parts Breakdown  
 ISEA ..... In-Service Engineering Agent

## L

LP ..... Low Pressure  
 LPM ..... Liter Per Minute

## M

MDS ..... Maintenance Data System  
 MIP ..... Maintenance Index Page  
 MMR ..... Mask-Mounted Regulator  
 MR ..... Maintenance Requirement  
 MRC ..... Maintenance Requirement Card  
 MSA ..... Mine Safety Appliances Company  
 MSHA ..... Mine Safety and Health Administration

## N

NAVOSH ..... Navy Occupational Safety and Health  
 NAVSEA ..... Naval Sea Systems Command  
 NID ..... Nonionic Detergent  
 NIOSH ..... National Institute for Occupational  
 Safety and Health  
 NSN ..... National Stock Number  
 NSTM ..... Naval Ships' Technical Manual

## O

OBA ..... Oxygen Breathing Apparatus  
 OPREP ..... Operational Report  
 OPNAV ..... Office of the Chief of Naval Operations  
 OSHA .. Occupational Safety and Health Administration

## P

PASP ..... Primary Air Supply Pack  
 PLAD ..... Plain Language Address Directory  
 PMS ..... Planned Maintenance System  
 PPM ..... Parts per million  
 PSIG ..... Pounds per square inch, gauge

## Q

QD ..... Quick Disconnect

## R

RASP ..... Reserve Air Supply Pack

## S

SAR ..... Supplied Air Respirator  
 SCBA ..... Self-Contained Breathing Apparatus  
 SCF ..... Standard Cubic Feet  
 SFR ..... Semiannual Force Revision  
 SPMIG ... Standard PMS Materials Identification Guide  
 SYSCOM ..... Systems Command

## SAFETY SUMMARY

The following safety guidelines apply to operation and maintenance procedures in general. Personnel must understand and comply with these guidelines during operation and maintenance of the SAR/SCBA.

### **STANDARD SAFETY PRECAUTIONS**

Operating and maintenance personnel must observe all applicable safety regulations and standard precautions. Only approved replacement parts, lubricants, and cleaning solutions specified in this technical manual shall be used with this equipment. Substitution of parts or materials, and omission or alteration of procedures stated herein are not authorized.

### **FORCES AFLOAT**

Forces afloat must also comply with the Navy Occupational Safety and Health (NAVOSH) Program Manual, OPNAVINST 5100.19 series.

### **SHORE ACTIVITIES**

Shore activities must also comply with the Navy Occupational Safety and Health (NAVOSH) Program Manual, OPNAVINST 5100.23 series.

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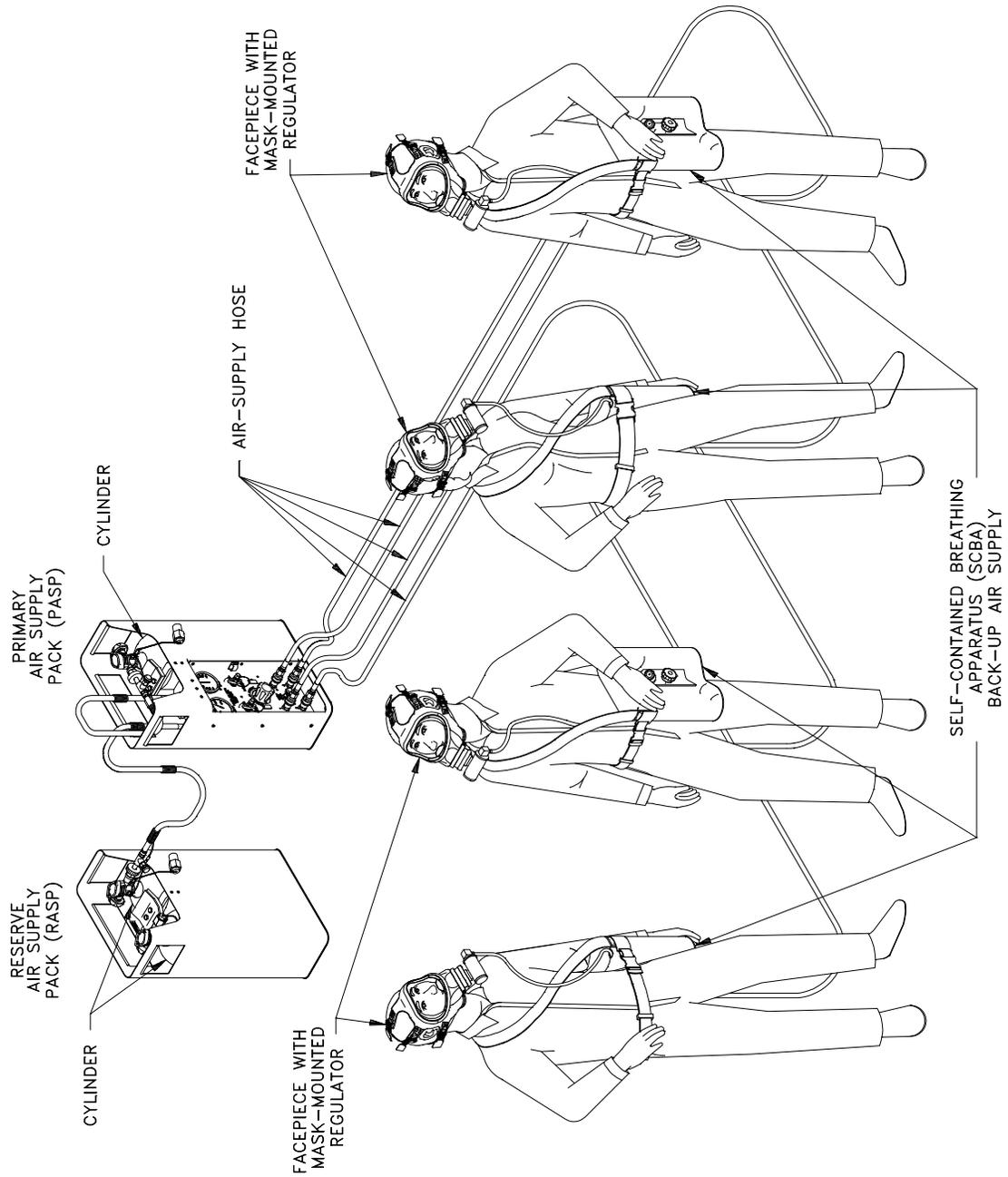


Figure 1-1. Supplied Air Respirator (SAR) with Self-Contained Breathing Apparatus (SCBA) Component Interrelationship Diagram

# CHAPTER 1

## GENERAL INFORMATION AND SAFETY PRECAUTIONS

### 1.1 SAFETY PRECAUTIONS.

Personnel using the Supplied Air Respirator (SAR) with the Self-Contained Breathing Apparatus (SCBA) shall observe all safety precautions and procedures. Precautions and procedures appear in this technical manual and in the SCBA manual, the PremAire® CADET 15M Air-Line Respirator Operation and Maintenance Manual. A safety summary at the front of this manual lists all warnings and cautions that appear throughout this document.

The requirements for a safe and effective respirator program are set forth in the Occupational Safety and Health Administration (OSHA) Regulations, Title 29 Code of Federal Regulations (CFR) 1910.134. An effective program must include a knowledge of hazards, accurate hazard assessment, proper selection and use of equipment, operational training, inspection and maintenance of equipment, and medical surveillance. The SAR/SCBA may only be used after personnel have been properly instructed in its operation. Personnel must use the equipment in accordance with (IAW) instructions, labels, and limitations. Personnel must be thoroughly familiar with all safety practices and understand the potential hazards associated with the SAR/SCBA before using or performing maintenance on the equipment.

1.1.1 Standard Safety Precautions. Standard operational and maintenance safety precautions in the following documents apply to the SAR/SCBA:

- Forces afloat must comply with the Navy Occupational Safety and Health (NAVOSH) Program Manual, OPNAVINST 5100.19 series.
- Shore activities must comply with the Navy Occupational Safety and Health (NAVOSH) Program Manual, OPNAVINST 5100.23 series.

1.1.2 Special Notations. Warnings, cautions, and notes appearing throughout this technical manual must be followed in order to prevent hazards to personnel and damage to equipment.

The following notations define warnings, cautions, and notes as used in the text:

#### WARNING

Highlights an essential operating or maintenance procedure, practice, condition, statement, etc., which if not strictly observed, could result in injury to, or death of, personnel, or long-term health hazards.

#### CAUTION

Highlights an essential operating or maintenance procedure, practice, condition, statement, etc., which if not strictly observed, could result in damage to, or destruction of, equipment or loss of operational effectiveness.

#### NOTE

Highlights an essential operating or maintenance procedure, condition, or statement.

### 1.2 INTRODUCTION.

1.2.1 Purpose. The purpose of this manual is to provide information and procedures necessary to operate, maintain, troubleshoot, and repair the SAR/SCBA (Figure 1-1). The maintenance information provided will support planned maintenance and repair of the SAR/SCBA at the Organizational and Intermediate levels.

1.2.2 Scope. The information in this manual is presented in eight chapters with two appendices. This manual is organized as follows:

- Chapter 1: "General Information and Safety Precautions" introduces safety considerations and presents an overview of the equipment in addition to its physical and functional characteristics and operational capabilities.
- Chapter 2: "Operation" provides operating instructions necessary to enable operating personnel to efficiently and effectively use the equipment in accomplishing its designated task.
- Chapter 3: "Functional Description" presents the principles of operation of the overall equipment and its functions.
- Chapter 4: "Scheduled Maintenance" consists of general information on scheduled maintenance.
- Chapter 5: "Troubleshooting" contains data and procedures for locating a malfunction or potential fault in an assembly or part, and identifies possible corrective measures.
- Chapter 6: "Corrective Maintenance" provides instructions required to inspect, adjust, remove, repair, and reinstall all parts that are repairable by the user at the Organizational and Intermediate levels. Safety precautions, tools, parts, and test equipment are also identified.
- Chapter 7: "Parts List" contains parts lists and illustrations that display the location of all repair parts. A list of part manufacturers is also provided.
- Chapter 8: "Installation" provides initial inventory, inspection, check-out, storage, and shipping procedures.
- Appendix A: "SAR/SCBA Pre-Operational Checklist" provides a reproducible copy of the checklist that sets forth the procedures to be performed prior to using the SAR/SCBA.
- Appendix B: "Department of Transportation (DOT) Air Cylinder Exemptions and Shipping Requirements" provides copies of DOT exemptions and shipping information.

### 1.3 TECHNICAL DESCRIPTION.

1.3.1 System Description. In this manual, the Supplied Air Respirator with Self-Contained Breathing

Apparatus is referred to as the SAR/SCBA. The SAR/SCBA system was designed to enhance the capability of Gas-Free Engineers (GFE) by increasing the available air supply, thus expanding operational capability and duration.

The SAR/SCBA provides breathing air, Grade D or higher, to shipboard personnel for access to spaces presumed to contain hazardous atmospheres. A hazardous atmosphere is defined as: (1) any atmosphere containing a toxic or disease-producing gas, vapor, dust, fumes, mist, or pesticide, either immediately or not Immediately Dangerous to Life or Health (IDLH); or (2) any oxygen-deficient atmosphere.

The SAR/SCBA can also be used when conditions are presumed to be IDLH. This means that: (1) conditions pose an immediate threat to life or health; or (2) conditions pose an immediate threat of severe exposure to contaminants. These contaminants may also have adverse cumulative or delayed effects on health.

A ship set consists of two PAsPs, five RAsPs, and eight SCBAs. During IDLH space entry, one PAsP is placed into service, and one PAsP is on standby for rescue operations. The number of RAsPs and SCBAs used for space entry is determined by the GFE IAW the Naval Ships' Technical Manual (NSTM) 074-18. Rescuers and the remaining equipment are placed on standby near the potentially hazardous space.

Procedures for entering IDLH spaces are outlined in NSTM 075-18. Rescue procedures for IDLH are outlined in NSTM 074-20.2.

1.3.1.1 Primary Air Supply Pack (PASP). The PASP is a lightweight assembly with one HP air cylinder and a control panel assembly (CPA) contained within an aluminum case. The air cylinder contains 87 standard cubic feet (scf) of air at 4,500 pounds per square inch, gauge (psig). Cylinders marked "LUXFER X X 97 (or later year date)" are the same model as previously required, but are shorter in length and require a cylinder pad to allow the securing of the cylinder in the case (Figure 7-1, Item 62). The cylinder has an aluminum liner with a fiberglass and epoxy-wrapped exterior. The cylinder valve is an integral assembly consisting of a valve pressure indicator, rupture disk, and CGA-347 air hose connection. Two HP air hoses with hand-operated couplings connect the PASP or RASP cylinder(s) to the CPA. The hoses can be vented for safe connection and disconnection of air cylinders. Two RASP cylinders serve as an additional air source for the PASP. The HP air hose(s) connect RASP cylinder(s) to the PASP. Airflow is controlled by the operator who places charged cylinders on-line as the ones in service are depleted.

The PASP CPA houses valves, fittings, and indicators. A three-way ball valve selects either a PASP or RASP cylinder to be on-line with the CPA. Each cylinder can support one SCBA user up to 55 minutes. Air pressure is monitored by two gauges and by an audible alarm. Each gauge has an isolation valve for gauge calibration and isolation, should the gauge fail. A regulator reduces the HP air to 60-80 psig (nominal) for delivery to the air distribution system. The manifold has four quick disconnects (QDs) to allow up to four SCBA users to simultaneously connect to the PASP. A manifold bleed valve provides a means to depressurize the system.

Air hoses are an integral part of the SAR/SCBA system. Each PASP is equipped with two HP hose assemblies that include a bleed valve, strength member, and handwheel connectors. The rated service pressure for these hoses is 4,500 psig. Each hose is 3 feet long and connects the HP air cylinders (PASP or RASP) to the three-way ball valve on top of the PASP CPA.

**1.3.1.2 Reserve Air Supply Pack (RASP).** The RASP is a lightweight assembly with two HP air cylinders housed in an aluminum case. The cylinders are removable and identical to the PASP cylinders. Cylinders marked "LUXFER X X 97 (or later year date)" are the same model as previously required, but are shorter in length and require a cylinder pad to allow the securing of the cylinder in the case (Figure 7-3, Item 13). When placed on-line, air flows from the RASP cylinder through a hose that connects to the three-way ball valve on the PASP CPA.

**1.3.1.3 Self-Contained Breathing Apparatus (SCBA).** The SCBA provides a source of back-up air if the PASP/RASP airflow is depleted, interrupted, or fails. The SCBA equipment consists of two lightweight, escape air cylinders, a full facepiece with a mask-mounted pressure demand (second-stage) regulator (MMR), air-supply hoses, a cylinder valve pressure indicator, a first-stage regulator, and an alarm. A durable carry pouch is provided to protect the air cylinders and other components. The pouch is attached to a nylon shoulder strap and belt. A Navy-approved harness must be worn under the SCBA. The harness must meet the standards of the American National Standards Institute, Inc. (ANSI), ANSI Z359.1-92, Safety Requirements for Personnel Fall Arrest and Subsystem Components. The SCBA is a PremAire® CADET 15M Respirator manufactured by the

Mine Safety Appliances (MSA) Company. The two portable, back-up air cylinders are easily rechargeable and designed to utilize Grade D air or higher, as defined in the Compressed Gas Association's (CGA) publication ANSI/CGA G-7.1, Commodity Specification for Air. The SCBA is a Type C, pressure-demand respirator system with an emergency air supply of 15 minutes.

Each SCBA is provided with two, interconnecting LP air-supply hose sections, 75 feet in length. These attach to the QDs on the PASP and serve as the external air supply to the SCBA during normal operations.

**1.3.2 Applications and Constraints.** The SAR/SCBA was designed primarily to support planned, Gas-Free Engineering Personnel (GFEP) with shipboard inspections. It can be used to inspect fuel, ballast, sewage tanks, and other dry voids. The equipment can also be used in spaces that are suspected of containing flammable, explosive, or toxic atmospheres. The SAR/SCBA can be used for clean-up, rescue, and damage control work in non-IDLH environments as well. It is for respiratory use only.

The SAR/SCBA cannot be used nor was it designed to be a fire-fighting breathing apparatus. In addition, it cannot be used as a diving apparatus for investigating flooded or submerged spaces. Because the equipment was designed for planned GFE operations, it is not suitable for Rapid Response Operations.

#### **1.4 REFERENCE DATA.**

Reference data pertaining to the characteristics of the SAR/SCBA is summarized in Table 1-1.

#### **1.5 EQUIPMENT, ACCESSORIES, AND DOCUMENTS SUPPLIED.**

Equipment, accessories, and documents supplied with the SAR/SCBA are listed in Table 1-2.

#### **1.6 PUBLICATION REFERENCES.**

Table 1-3 provides a list of publications which are required for operation and maintenance but are not supplied with the SAR/SCBA.

Table 1-1. SAR/SCBA Equipment Characteristics

Equipment	Characteristics and Components	Dimensions/Weight (Uncrated)
PASP	<p style="text-align: center;"><u>Characteristics</u></p> <ul style="list-style-type: none"> <li>• HP primary air supply</li> <li>• Portable aluminum case</li> <li>• HP air cylinder, aluminum case, controls and indicators</li> <li>• Supports 1-4 users simultaneously</li> <li>• Reduces HP air to 60-80 psig</li> <li>• Grade D compressed air as defined in ANSI/CGA G-7.1</li> <li>• 2 HP air hose assemblies</li> </ul> <p style="text-align: center;"><u>Components</u></p> <ul style="list-style-type: none"> <li>• 1 HP air cylinder (PASP/RASP) <ul style="list-style-type: none"> <li>- Volume: 87 scf</li> <li>- Service pressure: 4,500 psig</li> <li>- Duration: 55 minutes - one user</li> <li>- Material: S-2 glass with epoxy/resin exterior, aluminum liner</li> </ul> </li> <li>• Control panel assembly <ul style="list-style-type: none"> <li>- Three-way ball valve</li> <li>- HP gauge - 0-5,000 psi</li> <li>- LP gauge - 0-200 psi</li> <li>- Alarm - sounds at 500 psig</li> <li>- HP gauge isolation valve, 0 - 5,000 psi</li> <li>- LP gauge isolation valve, 0 - 200 psi</li> <li>- Regulator - reduces HP air to 60-80 psig</li> <li>- LP manifold bleed valve</li> <li>- 4 quick disconnects</li> <li>- relief valve set pressure 135 psi</li> </ul> </li> </ul>	<p>16.5 in. × 7.5 in. × 27 in., 65 lbs.</p> <p>3 ft.</p> <p>18.25 lbs.</p>
RASP	<p style="text-align: center;"><u>Characteristics</u></p> <ul style="list-style-type: none"> <li>• HP reserve air supply</li> <li>• Portable aluminum case</li> <li>• 2 HP air cylinders, aluminum case</li> <li>• On-line cylinder connects to PASP three-way ball valve via HP hose assembly</li> </ul> <p style="text-align: center;"><u>Components</u></p> <ul style="list-style-type: none"> <li>• 2 HP air cylinders - identical to PASP cylinders</li> </ul>	<p>16.5 in. × 7.5 in. × 27 in., 65 lbs.</p>
SCBA	<p style="text-align: center;"><u>Characteristics</u></p> <ul style="list-style-type: none"> <li>• Type C, pressure-demand, positive pressure, back-up air supply</li> <li>• PremAire® CADET 15M Respirator manufactured by MSA Company</li> <li>• Approved by NIOSH and Mine Safety and Health Administration (MSHA)</li> <li>• Interconnecting air-supply hose connects to PASP QDs</li> <li>• Grade D compressed air as defined in ANSI/CGA G-7.1</li> </ul>	<p>15 lbs. (operator worn equipment)</p>



**Table 1-2. Equipment, Accessories, and Documents Supplied**

Qty.	Item Name	Reference Number
2	Primary Air Supply Pack (PASP)	53711ASSY6314751
4	• HP Air Hose Assemblies (2 per PASP)	53711ASSY6314756
5	Reserve Air Supply Pack (RASP)	53711ASSY6314752
8	Self-Contained Breathing Apparatus (SCBA)	PremAire® CADET 15M Respirator, MSA ASSY812600
16	• Interconnecting Air-Supply Hoses	MSA ASSY812625, Model No. 5-1002-1
8	• SCBA Spare Parts Kit	
1	SAR/SCBA Tool Kit - specialty tools only. (Common tools are Command's responsibility.)	
1	Compact Disc Read-Only Memory (CD-ROM)	1 November 1995 SS600-AN-MMA-010
	• Maintenance Manual, Organization and Intermediate Levels	
	• Planned Maintenance System (PMS) - Maintenance Index Page (MIP) - Maintenance Requirement Cards (MRCs)	
	• Interim Parts List	
	• Ordering Information	
1	Maintenance Manual, Organizational and Intermediate Levels (Hard Copy)	November 2002 SS600-AN-MMA-010
8	PremAire® CADET 15M Air-Line Respirator Operation and Maintenance Manual	1 November 1995
1	SAR/SCBA Orientation Video	27 July 1995

**Table 1-3. Publication References (Not Supplied with the SAR/SCBA)**

Publication Title	Publication Number	Application
Navy Occupational Safety and Health (NAVOSH) Program Manual (Forces Afloat)	OPNAVINST 5100.19 Series	Operation and Maintenance Safety Precautions (Afloat)
Navy Occupational Safety and Health (NAVOSH) Program Manual (Shore Activities)	OPNAVINST 5100.23 Series	Operation and Maintenance Safety Precautions (Shore)
Naval Ships' Technical Manual	NSTM S9086-CL-STM-010 Chapters 074-18, 074.20.2, and 077	Personnel Protection Procedures and Equipment
National Institute for Occupational Safety and Health (NIOSH) Publication	Publication 94-104	Certified Equipment List for Combined SAR/SCBA
Occupational Safety and Health Administration (OSHA) Standards	Title 29, CFR 1910.34 Title 29, CFR 1910.1025	Respiratory Protection
Commodity Specification for Air	ANSI/CGA G-7.1 - 1989	Air quality classifications, verification tests, sampling, and analytical procedures
Guidelines for Visual Inspection & Requalification of Fiber Reinforced High Pressure Cylinders	CGA C-6.2 - 1988	Inspecting and testing fiberglass cylinders