Emergency Passenger Oxygen System (EPOS)

TECHNICAL DATA PACKAGE
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## Revision Record Sheet

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<th>Rev #</th>
<th>Date</th>
<th>Description of Revision</th>
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<tr>
<td>1</td>
<td>12/14/04</td>
<td>Added Revision Sheet, page 3 to manual; revised Figure 3, Donning Illustration &amp; Donning Steps on page 17 to accessing EPOS unit without first removing barrier pouch from stowage pouch; added Operating Steps to Training Unit section on page 15; added Statement of Warranty; and re-numbered all pages accordingly.</td>
</tr>
<tr>
<td>2</td>
<td>8/04/06</td>
<td>Revision includes: changed all address and phone number references to the new, St. Louis, Mo. location; adding new AS9100B &amp; ISO9001-200 Certified logo; and revised Statement of Warranty that changed the warranty period from 10 years to 10 years 6 months and added an additional “foregoing warranty statement”.</td>
</tr>
<tr>
<td>3</td>
<td>8/01/11</td>
<td>Revisions Include: changed all address references to new facility location;</td>
</tr>
<tr>
<td>4</td>
<td>01/01/12</td>
<td>Changed Company Name from Essex PB&amp;R Corporation to Essex Industries dba Essex PB&amp;R Corporation.</td>
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GENERAL INFORMATION

Intended Use: The Essex Emergency Passenger Oxygen System (EPOS) is a self contained protective breathing device intended for trained individuals in military aircraft emergencies such as decompressions, fire, evacuation, rescue, smoke filled cabins, toxic fumes, and hazardous cargo spills.

Duration of Use: All emergency rescue and escape situations are different, and it is not possible to provide an exact duration time for all situations. Also, the size of the EPOS user will affect usable life, with heavier individuals consuming oxygen more rapidly. However, for an average male, the following typical escape situations are useful in predicting how long the EPOS will last:

* Sitting, waiting to be rescued: Up to 60 minutes
* Waiting 17 minutes to be rescued, then rapid evacuation: Up to 21 minutes
* Moderate walking (3 mph): Up to 18 minutes
* Rapidly walking, on a flat, out of a building: Up to 8 minutes
* Rapidly walking up 15 flights of stairs: Up to 3 minutes

Figure 1 - is a graphical representation of actual interior hood conditions while a victim, with the EPOS on, is sitting, waiting to evacuate. After help has arrived to assist the victim, or the aircraft has landed, the victim has ample protection remaining to quickly flee from the scene of the emergency. In this situation, carbon dioxide has built up to 5.5%. High levels of carbon dioxide will be detected by the body’s natural aversion, producing a feeling of high anxiety. This is an automatic signal it is time to remove the EPOS.
Figure 2 - depicts the same person, seated with the EPOS on, possibly trapped in a contaminated environment. Note the duration of protection is approximately one hour. The oxygen concentration has fallen to near 20%, the same as found in ambient air, and is continuing to decrease. Whereas high levels of carbon dioxide will be detected by the body’s natural aversion, low levels of oxygen will be easily recognized because the hood will no longer be inflated, and the hood film will be begin to press around the face of the user. In this situation, the EPOS will provide ample time for a trapped user to sustain breathing until he or she can be reached.

![EPOS Sitting Waiting to be Rescued](image)

**Figure 2: EPOS Performance Sitting, Waiting for Rescue**

**MODEL NUMBERS**

**MR-10093AF** - Emergency Passenger Oxygen System, Training Unit

**MR-10095AF** - Emergency Passenger Oxygen System Packaged in Cloth Soft Pack

**MR-10096AF** - Emergency Passenger Oxygen System Packaged in Cloth Soft Pack, with Clear Inspection Window

**MR-10097AF** - Emergency Passenger Oxygen System Packaged in Cloth Soft Pack, with Clear Inspection Window & Carrying Strap
EPOS Training Unit

Model # MR-10093AF

EPOS in Cloth Soft Pack

Model # MR-10095AF
EPOS in Cloth Soft Pack with Clear Inspection Window

Model # MR-10096AF

EPOS in Cloth Soft Pack with Clear Inspection Window and Carry Strap

Model # MR-10097AF
SIZE

7 1/2 in. x 9 1/2 in. x 2 in.

WEIGHT

1 1/2 pounds

PACKAGING

The EPOS is folded and sealed inside a multi-laminate barrier pouch. There are two versions of the barrier pouch: one is a clear multi-laminate pouch and the second is an opaque multi-laminate pouch (as shown below). Both pouches have the same form fit and function. The barrier pouch is then packaged inside a rugged fabric carrying case. The case has accommodations for belt mounting as well as a carry strap, and a clear window for inspecting pertinent information.

SHELF LIFE

10-years 6-months from the Date of Manufacture

DONNING

Less than 15 seconds, from retrieval through donning. For Detailed Donning Procedures see page 19 and Figure 3, on page 18 of this manual.
OXYGEN

The EPOS is a closed circuit rebreather system. Oxygen flows into the hood, is breathed and rebreathed by the user. The oxygen concentration inside the hood may reach 60%, depending on workload, and will then decrease for the duration of use. Oxygen flow is initiated by semi-automatic activation (see Oxygen System on page 13).

Oxygen was selected as the breathable atmosphere because of weight and volume considerations. During respiration, oxygen is removed from the air and converted to carbon dioxide, then exhaled back into the air. If compressed air were used instead of oxygen, the air inside the hood would need to be constantly replenished to maintain the oxygen content at a life-supporting level. Because the EPOS uses Aviator’s Grade Oxygen, the exhaled air can be rebreathed once the carbon dioxide is removed. The EPOS contains 18 L of oxygen at 3,000 psig.

CARBON DIOXIDE

Carbon dioxide is a natural byproduct of respiration. Because the EPOS is a closed circuit system, it is necessary to remove the carbon dioxide that builds up inside the hood. This is accomplished with a unique, patented passive scrubber. The average carbon dioxide concentration will be kept below 4% for the duration of use, but may reach a momentary peak of 7%.

PROTECTION FACTOR

Users of the EPOS are not affected by carbon monoxide and the other toxic gases produced in a fire, nor do chemical fumes from the spill of hazardous materials affect them. Unlike a filter mask, which must clean the poisonous outside air to make it fit to breathe, the EPOS provides its own source of clean breathable air.

The measure of cleanliness of the breathable air is called Protection Factor. A Protection Factor of 20, for example, means that the air inside the hood is 20 times cleaner than the air outside the hood. NIOSH requires a minimum Protection Factor of 20. The Protection Factor for the Essex line of products, using the same hood/neck seal design, is at least 260, or 13 times better than required by NIOSH.

SIZING/FITTING

One size fits all adults with an 11 to 19 inch neck without adjustment.

VISIBILITY

360 degrees
STATEMENT OF WARRANTY FOR EMERGENCY PASSENGER OXYGEN SYSTEM (EPOS)

Essex Industries dba Essex PB&R Corporation warrants that: (1) The Essex Emergency Passenger Oxygen System (EPOS) (hereinafter referred to as the “unit”) will remain free from defects in material and workmanship, whether patent or latent, for up to the replace by date which is a period of ten (10) years and six (6) months from the date of manufacture when properly stowed in containers supplied or approved by Essex Industries dba Essex PB&R Corporation.

For those units equipped with a humidity indicator, the loss of vacuum in the inner packaging does not render the unit unserviceable. Units with barrier pouches that have lost vacuum remain serviceable as long as the humidity indicator remains blue. Although if a unit is found to have a damaged barrier pouch, e.g. cut, puncture or other damage, the unit should be pulled from service and sent back for repair at the customer’s expense.

The liability of Essex Industries dba Essex PB&R Corporation for any defect in any unit, and the sole and exclusive remedy of the buyer, shall be limited to the repair or replacement of the defective unit, or a refund of the original purchase price (pro-rated in proportion to the ten (10) year and six (6) month warranty) at the sole discretion of Essex Industries dba Essex PB&R Corporation. The obligation to repair, replace, or provide a pro-rated refund shall terminate ten (10) years and six (6) months after the date of manufacture of the unit.

This warranty is in lieu of all other warranties and representations, expressed or implied, and all other obligations and liabilities of Essex Industries dba Essex PB&R Corporation. Correction of defects, in the manner and for the period of time provided above, shall constitute fulfillment of all liabilities of Essex Industries dba Essex PB&R Corporation whether based on warranty, tort, contract or otherwise. Under no circumstances shall Essex Industries dba Essex PB&R Corporation be liable for any punitive, special, incidental or consequential damages.

This warranty shall not apply to any unit that has been stowed in an unauthorized container, which has been repaired or altered by anyone other than Essex Industries dba Essex PB&R Corporation, or which has been subject to misuse due to negligence or accident, or the failure to use the unit in accordance with the Product’s Manual supplied by Essex Industries dba Essex PB&R Corporation.

THE FOREGOING WARRANTIES ARE IN LIEU OF ALL WARRANTIES, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY, NON-INFRINGEMENT, OR FITNESS FOR A PARTICULAR PURPOSE, AND OF ANY OTHER OBLIGATION ON THE PART OF ESSEX INDUSTRIES DBA ESSEX PB&R CORPORATION.
INSIDE HOOD TEMPERATURE

Temperature inside the EPOS may increase to 40°C (104°F) during the duration of use, when the outside temperature is 20°C (68°F). The harder the person works of course, the quicker the temperature increases. When sitting, then escaping from the emergency situation as shown in Figure 1, the temperature rose from 23°C (73°F) to 33°C (91°F) during the sitting portion of the test, then increased to 38°C (100°F) during the escape phase.

OPERATING TEMPERATURE RANGE

The EPOS may be used with temperatures between 50°C (122°F) and -15°C (+5°F).

STOWAGE TEMPERATURE RANGE

The EPOS may be stored at temperatures between 85°C (185°F) and -30°C (-20°F).

INSPECTION

Inspection of the EPOS is essential for proper safety.

For Model Number MR-10095AF – Open the top flap of the cloth Soft Pack and slightly pull the Barrier Pouch from the Soft Pack. The Humidity Indicator Dot and Replace By Date Label are located on the upper portion of the Barrier Pouch. The first step is to inspect the Replace By Date Label. If the Replace By Date has not been exceeded proceed to the next inspection step. If the Replace By Date has been exceeded, the EPOS Unit must be immediately replaced. The next step is to visually inspect the color of the Humidity Indicator. If the Humidity Indicator is Blue the Unit is serviceable. If the Humidity Indicator is Pink, the Unit is to be replaced.
For Model Numbers MR-10096F and MR-10097AF – These models provide for a hands-free inspection. The Humidity Indicator Dot and Replace By Date Label can be easily inspected through the clear inspection window located on the front of the Soft Pack. The first step is to inspect the Replace By Date Label. If the Replace By Date has not been exceeded proceed to the next inspection step. If the Replace By Date has been exceeded, the EPOS Unit must be immediately replaced. The next step is to visually inspect the color of the Humidity Indicator. If the Humidity Indicator is Blue the Unit is serviceable. If the Humidity Indicator is Pink, the Unit is to be replaced. It is neither necessary nor advisable to remove the EPOS from the outer fabric package for inspection.
THERMAL PROPERTIES

Fire Resistance

The EPOS hoodshell can withstand a 1000°C (1,832°F) flame for five seconds without burning through.

Dripping Plastic and Tar

Plastics and tar dripping onto the EPOS hoodshell will have no adverse effects below 200°C (392°F).

Radiant Heat Flux

The EPOS hoodshell can withstand radiant heat of 1.0 BTU/sq. ft. for up to 60 seconds.

MATERIALS OF CONSTRUCTION

Hood

The hood is a multi-layer design of polyimide film and PFA film, which provides excellent resistance to most chemicals. It measures 13 inches at its circular base, and is 19 inches high, with an internal volume of approximately 23 liters (slightly less than 1 cubic foot).

Neck Seal

The neck seal is a high strength, highly elastic silicone rubber design that fits all adult sizes with an 11 to 19 inch neck without adjustment.

Oxygen System

One cylinder of compressed Aviator’s Grade Oxygen at 3,000 psig, with an equivalent ambient volume of approximately 18 liters, is mounted on the bottom side of the neck seal.

To facilitate semi-automatic activation - the oxygen cylinder is activated in the process of donning the hood. Prior to donning the unit, the user grabs the oxygen cylinder in one hand and the red ball, which is tethered thru the opposite side of the hood, with the other hand and pulls apart.
The force required to activate the flow of oxygen is approximately 12 pounds. Even though the flow of oxygen stops after five minutes, there is sufficient oxygen inside the hood for the escape situations shown in the “Duration of Use” section on page 4. The oxygen bottle is protected from over pressurization by a unique rupture disk design.

**Carbon Dioxide Scrubber**

Three rectangular panels of dustless lithium hydroxide are arranged around the interior base of the hood to maintain the carbon dioxide inside the hood to below an average of 4% for the duration of use.

**PERFORMANCE**

The EPOS is intended to be used by trained individuals in military aircraft emergencies such as decompressions, fire, evacuation, rescue, smoke filled cabins, toxic fumes, and hazardous cargo spills.

The duration of use is based on an average size male. Oxygen consumption and carbon dioxide production vary by body size, the duration of use will be somewhat less for large persons and somewhat longer for smaller persons.

Duration of the EPOS is defined as when the oxygen inside the hood drops below 18% or the carbon dioxide level exceeds 7%. The user will know when the oxygen concentration has dropped below 18% because the hood will collapse and press on the user’s face. A high concentration of carbon dioxide creates a feeling of high anxiety in the user, warning that CO\textsubscript{2} is building up to potentially dangerous levels.
CAUTION: FAILURE TO REMOVE THE HOOD WHEN OXYGEN LEVELS DROP BELOW 18% MAY RESULT IN SUFFOCATION AND DEATH.

The EPOS is an excellent aide in escape or rescue from a chemical spill (it is not meant as a replacement for HAZMAT suits for cleaning spills) because of the self contained breathable clean air, and because of the high resistance of the hood to most chemicals.

**EPOS DONNING PROCEDURE**

See Figure 3, on page 18 and the Donning Steps detailed on page 19 of this manual.

**EPOS TRAINING UNIT**

The EPOS Training Unit is designed specifically for training purposes. It looks, feels, is made of the same material, and operates like the standard EPOS. However, the EPOS training unit can be used more than once, and does not need to be vacuum-packed. The differences in the EPOS training unit are as follows:

1) The EPOS training unit is easily identified as it is stored in a bright yellow pouch with black lettering. In place of the vacuum sealed barrier pouch the EPOS training unit is in a reusable yellow pouch with a red hook and loop closure flap.

2) The oxygen cylinder does not contain oxygen and is marked “EMPTY”.

3) The outside of the metallized film of the hood shell is labeled “TRAINING UNIT”.

4) The hood shell has ventilation holes to prevent suffocation.

5) The activation valve is specifically designed to simulate the required pull force and activation of the live unit, and can be reused. Since the oxygen cylinder is empty, there will be no sound of oxygen flowing when the valve is activated.
6) The carbon dioxide scrubber panels in the training unit have been replaced with non-functional scrubbers (no chemicals).

Operating Steps

1) For sanitary purposes, prior to donning the EPOS Training Unit, an optional Disposable Training Liner may be worn. These Disposable Training Liners, P/N CP3205 can be ordered from Essex PB&R Corporation.

A) The Disposable Training Liner, if used, is placed over the trainee's head. Adjust the liner so that its top filter paper edge is horizontal and positioned over the tip of the nose, and the crease is centered vertically in the middle of the face.

B) Pull the liner lightly against the nose and face, and fold over a pleat onto the back of the head, then secure with cellophane tape.

2) General Sequence of Steps

A) Grasp the end of the tab on the stowage pouch and sharply pull the hook and loop closure open.

B) Hold the stowage pouch with one hand, pinching the internal barrier pouch and stowage pouch. With the other hand, grasp and sharply pull off the red strip, in the direction of the arrows.

C) Remove EPOS Training Unit from both the barrier pouch and the stowage pouch and unfold.

D) Hold hood with neck seal (silver end) facing you. Pull red ball with one hand while holding the empty oxygen cylinder with the other hand. The red ball and
lever must pull free of the oxygen bottle. This simulates activating the oxygen system for the hood.

E) Place both hands inside the neck seal opening, palms facing each other, and spread the neck seal open.

F) Pull the hood over your head and neck with the neck seal stretched open. Breathe normally.

G) Remove the hood and discard liner when the training session is complete.

Cleaning and Disinfecting

Clean and disinfect the EPOS training unit periodically so it will continue to work effectively.

1) Moisten a cotton cloth with 50-50 mixture of alcohol and water.
2) Wipe all inside and outside surfaces of both the hood shell and the neck seal. Let dry.

Handling and Storage

The EPOS training unit is to be re-packed after it has been cleaned and disinfected.

1) Lay the unit down on a clean, flat surface with the neck seal closest to you. The oxygen cylinder should be closest to the flat surface and the red activation ball facing up.
2) Snap the spring clip, which is tethered to the red ball, back onto the oxygen cylinder’s dummy valve.
3) Fold the hood from right to left in half. The red ball should be located in between the oxygen cylinder and the top layer of the hood shell.
4) Fold the hood into approximate thirds, using an “S” fold pattern.
5) Place the folded training unit in the yellow internal stowage pouch, with the oxygen cylinder to one side.
6) Seal the internal stowage pouch with the hook and loop tear strip.
7) Place the internal stowage pouch into the external yellow stowage pouch.
8) Close the top flap of the external stowage pouch and secure the hook and loop closure.
9) The EPOS training unit is now ready for reuse and/or stowage.
EPOS DONNING ILLUSTRATIONS

1. OPEN CLOSURE FLAP OF STOWAGE POUCH.

2. GRASP STOWAGE POUCH W/ ONE HAND AND WITH OTHER HAND PULL RED TAPE STRIP OF BARRIER POUCH.

3. REMOVE THE EPOS UNIT FROM BOTH POUCHES.

4. PULL THE RED BALL WITH ONE HAND WHILE HOLDING THE OXYGEN CYLINDER WITH THE OTHER HAND.

5. SPREAD NECK SEAL OPEN WITH HANDS. PALMS ARE TO BE FACING EACH OTHER.

6. PULL THE EPOS OVER THE HEAD.

7. REMOVE HOOD AFTER YOU ARE CLEAR OF HAZARD OR WHEN INSTRUCTED BY AIRCREW PERSONNEL.

Figure 3: Donning Illustration
Essex Semi-Automatic EPOS Donning Steps

1. Grasp the end of the tab on the stowage pouch and sharply pull the hook and loop closure open.

2. Hold the stowage pouch with one hand, pinching the internal barrier pouch and stowage pouch. With the other hand, grasp and sharply pull off the red tape strip, in the direction of the arrows.

   Note: The internal barrier pouch can be opened from either side.

3. Remove EPOS Unit from both the barrier pouch and the stowage pouch and unfold.

4. Hold hood with neck seal (silver end) facing you. Pull red ball with one hand while holding the oxygen cylinder with the other hand. The red ball and lever must pull free of the oxygen bottle.

5. Place both hands inside the neck seal opening, palms facing each other, and spread the neck seal open.

6. Pull the hood over your head and neck with the neck seal stretched open. Breathe normally.

   **CAUTION:** IF YOU DON'T HEAR A HISSING SOUND AFTER THE RED BALL HAS BEEN PULLED AND/OR THE HOOD DOES NOT START TO INFLATE, IMMEDIATELY REMOVE THE EPOS FROM YOUR HEAD.

7. Remove hood after you are clear of the hazard, when instructed, or when the hood collapses and touches your face (indicating that the oxygen concentration is low).

   **WARNING:** THE ESSEX EPOS IS INTENDED TO BE USED ONLY BY, OR UNDER THE SUPERVISION OF, AN INDIVIDUAL TRAINED AND QUALIFIED IN THEIR USE. IMPROPER USE OF THIS EQUIPMENT MAY RESULT IN SERIOUS PERSONAL INJURY OR DEATH. IMPROPER USE INCLUDES, BUT IS NOT LIMITED TO, USE OTHER THAN IN ACCORDANCE WITH THE INSTRUCTIONS AND LABELS PROVIDED.