

# Analysis of SCSR Problems

Marriott Key Bridge, Arlington, VA

April 10, 2003



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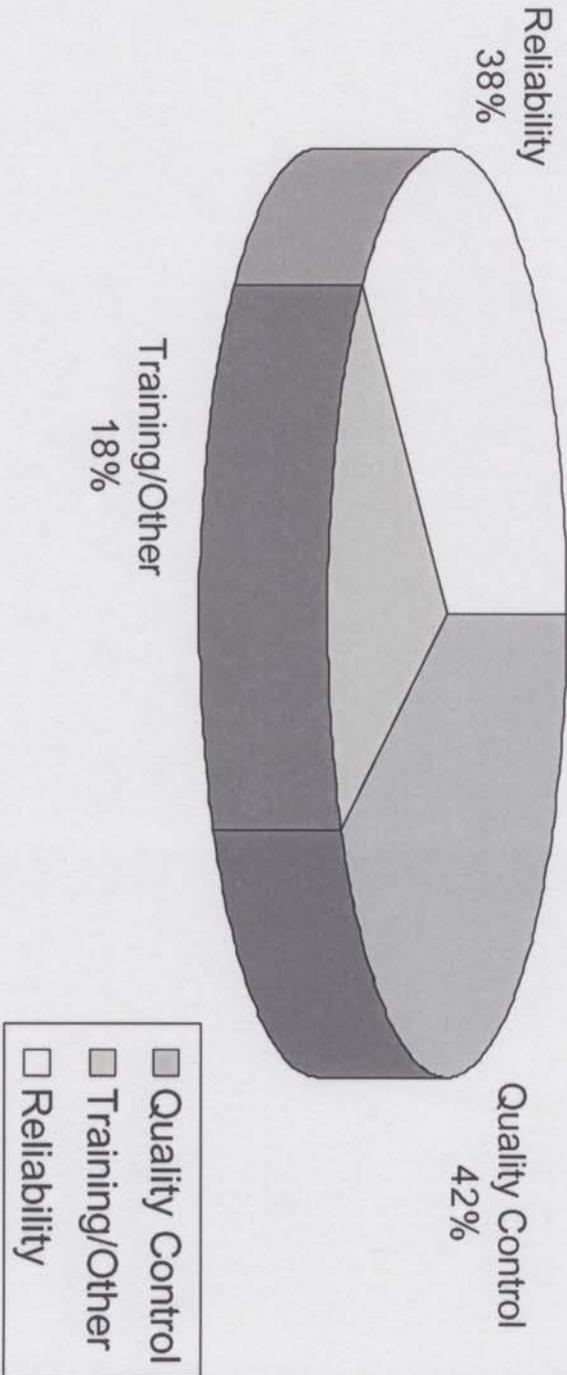


**CDC**

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**NIOSH**

### Causes of Problems (Since 1992)



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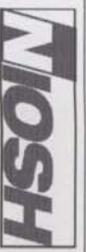


# Long term objectives

...to identify a comprehensive, effective strategy resulting in long-term improvements in SCSR performance and reliability through policy changes and rulemaking.



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# Philosophy

- ◆ We want to be able to approve the simplest of designs that meet appropriate performance requirements.
  - Scientific validity
  - Ease and confidence in use
  - Greater reliability
- ◆ Early problem discovery and effective reaction
  - Assure that any intervention confers a material benefit
  - Take into account human error by building-in redundancy



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# Solution: Shared Responsibility

- Quality Assurance Module
  - ◆ Manufacturing process
- SCSR Module
  - ◆ Ruggedness/ Hazards Evaluation
  - ◆ BMS Testing
  - ◆ Training
    - Effective Inspection
    - Expectations
  - ◆ Self Reporting SCSR's/ Non-Destructive Testing
  - ◆ Expanded Long Term Field Evaluation
    - MSHA Partnership
- ◆ Registration



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Shared Responsibility		Discovery and Response	
Simple Design		Deployment	
Pre-Deployment		Effective Reaction	
Approval	Manufacturing	Training	Audits: Early Detection
Ruggedness/ Hazard Testing	BMS Testing	QC Module	Self-Reporting/ NDT
Training: Proper Handling		Training: Effective Use	LTFE
Registration		Registration	



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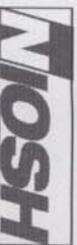


# Matrix for Quality

Nature of Problem	Cause	Shared Responsibility				Discovery and Response			
		Pre-Deployment		Deployment		Training		Deployment	
		Approval	BMS Testing	QC Module	Training: Proper Handling	Training: Effective Use	Self-Reporting/ NDT	LTFE	Registration
Leakage thru cylinder burst disc assembly in cylinder	Quality			X				X	X
High leakage, low O2 flow, high resistance, low inhalation, vapor permeation	Quality		X	X			X	X	X
Seal at only one end of the case. Labels not documented.	Quality			X	X		X	X	X
Clamps at noseclip, breathing tube and breathing bag were broken	Quality	X		X				X	X
Incorrect assembly of exhalation system. Increase breathing resistance	Quality		X	X				X	X
Clamps at noseclip, breathing tube and breathing bag were broken	Quality			X	X		X	X	X
Unit is difficult to remove from belt carrying case	Quality	X		X	X			X	X
High breathing resistance and missing part # (regulator)	Quality			X				X	X
Oxygen cylinder failed. Failed to dispense oxygen	Quality		X	X		X		X	X
Light chemical canister fill (unit lasted 20 minutes)	Quality		X	X				X	X
Short duration, cylinder valve not firing & breathing bag not inflating properly	Quality		X	X				X	X
Pouch fit problem	Quality			X	X			X	X
Hole in breathing bag. Potential starting problem	Quality	X		X				X	X
Unapproved changes & manual does not match wording on instruction labels	Quality		X	X				X	X
Rubber flashing blocked O2 outlet from chlorate candle	Quality			X				X	X
Part #'s listed on approval label not found on hardware	Quality			X				X	X
Exhalation breathing resistance was 2.20 inches	Quality		X	X				X	X
Chlorate candle will not fire due to manufacturing process problem	Quality			X		X		X	X
Shorten duration due to high constant flow rate of O2	Quality		X	X				X	X
Chemical dusting, voice/trigger seal, & instruction manual discrepancies	Quality	X		X			X	X	X
Leakage at connection of breathing bag/canister (glue)	Quality	X		X				X	X
Improperly installed latch pin - hard to open	Quality	X		X				X	X
Arm slit in the breathing bag	Quality	X		X				X	X
Cracks in the dust covers	Quality	X		X	X			X	X
Small tear in hose by the canister	Quality	X		X				X	X
Inaccurate pressure gauge	Quality	X		X				X	X
High oxygen flow, low duration	Quality		X	X				X	X
Relief valve installed backwards	Quality			X				X	X
2 - small punctures in the breathing tube	Quality	X		X	X			X	X



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# Matrix for Reliability

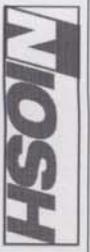
Nature of Problem	Cause	Shared Responsibility									
		Simple Design Pre-Deployment			Discovery and Response			Deployment			
		Approval	Manufacturing	Training: Proper Handling	Training: Effective Use	Audits: Early Detection	Self-Reporting/ NDT	LTFE	Effective Reaction	Registration	
Dented cases, abraded bag, broken cyl. straps, loose valve connection, etc.	Reliability	X			X			X	X	X	X
Lithium hydroxide powder inhaled by wearer	Reliability	X			X			X	X	X	X
Primer cap fired but O2 candle did not deliver O2 to the breathing bag	Reliability	X	X			X		X	X	X	X
Wearer was ill from inhalation of chemical	Reliability	X			X			X	X	X	X
Chemical in bag, scratches and dents in case, other internal damage	Reliability	X			X			X	X	X	X
Crimped breathing tube	Reliability	X			X			X	X	X	X
Breathing tube deformed and inhalation of irritant material	Reliability	X			X			X	X	X	X
High exhalation resistance	Reliability	X			X			X	X	X	X
Exhalation check valve deteriorated (user re-breaths exhaled air)	Reliability	X			X			X	X	X	X
Cracked demand valve and regulator housing	Reliability	X			X			X	X	X	X
Failed to function during fire	Reliability		X				X				
Dusting of LOH in breathing bag & oxygen cylinder leakage	Reliability			X						X	X
High breathing resistance on tread mill tests	Reliability	X			X			X	X	X	X
White dust - breathing tube, crack case, leak in breathing circuit, serial #'s	Reliability	X			X			X	X	X	X
High CO2 in field deployed units	Reliability	X			X			X	X	X	X
High CO2 level - working to verify acoustical sound level test procedures	Reliability	X	X		X			X	X	X	X
High O2 flow rate due to external damage of the case	Reliability	X		X				X	X	X	X
Brittle breathing tubes (deterioration)	Reliability	X			X			X	X	X	X
Hole in breathing tube, outer case damaged - hose clamp caused damage	Reliability	X			X			X	X	X	X
Lithium hydroxide dust in bag - low O2 concentration	Reliability	X			X			X	X	X	X
Chemical dust in mouthpiece and breathing tube.	Reliability	X			X			X	X	X	X
Visual indications of superoxide in mouthpiece and breathing bag	Reliability	X			X			X	X	X	X
Degraded breathing tube	Reliability	X			X			X	X	X	X
Crimped breathing hose	Reliability	X			X			X	X	X	X

# Matrix for Training/Other

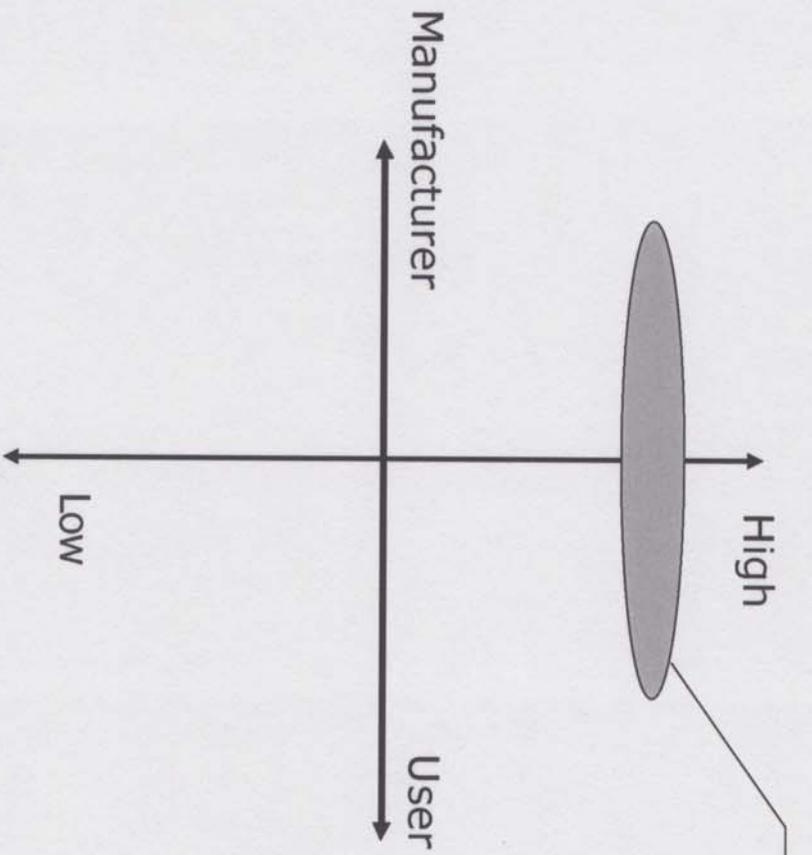
Nature of Problem	Cause	Shared Responsibility									
		Simple Design Pre-Deployment		Manufacturing		Training		Discovery and Response Deployment		Effective Reaction	
		Ruggedness/ Hazard Testing	BMS Testing	QC Module	Training: Proper Handling	Training: Effective Use	Audits: Early Detection/ Self-Reporting/ NDT	LTFE	Registration		
Demand valve failure. Unit had not been refurbished	Training		X		X				X	X	
Stuck end covers	Training	X		X	X				X	X	
High breathing resistance and difficulty opening unit	Training	X		X	X				X	X	
No instructions in case	Other			X					X	X	
Explosive separation of regulator parts	Other				X				X	X	
O2 candle did not fire. Started manually	Other					X			X	X	
Suspected ignition of KEL-F valve seat	Other	X							X	X	
Loss of O2 from cylinder when unit was activated	Other		X			X			X	X	
Loss of pressure in O2 cylinder. Case blew apart	Other	X			X				X	X	
Retrofit due to changes being made to lower end cover and sealing gasket	Other	X			X				X	X	
Smoke from chlorate candle contains barium salts & benzene	Other		X							X	
Ignition due to destruction of SCSR	Other	X			X					X	
Possible refurbishment of EBA6.5 after they reach end of Service Life	Other						X		X	X	



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Usefulness/Usability  
Is my SCSR reliable?  
Will it save my life?



New SCSR Standards

Accountability  
Who is responsible for safe-keeping?  
What does safe-keeping mean?



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