

SCBA Replacement Report

The Contra Costa County Fire Protection District's Respiratory Protection Program presents this SCBA Replacement Report to justify the need for replacement, explain the evaluation process, and recommend a replacement for the current self-contained breathing apparatus (SCBA) units.

The majority of the District's approximately 450 SCBAs are Scott Air-Pak 75 4.5 2007 NFPA edition models. Two hundred seventy-five of these units were acquired in 2013 through a regional federal grant, coinciding with a period of 23 stations and companies operating at their lowest staffing levels. In 2018, an additional 25 new AP 75 (2013 NFPA) packs were purchased to equip newly reopened stations and additional companies. Consolidations with other fire districts and the recent acquisition of 60 refurbished AP-75 units have contributed approximately 150 more SCBAs to accommodate the increased number of apparatus.

The predominant age of these packs is 13 years, with 50 units exceeding 15 years in age and the remainder being approximately 8 to 10 years old. All units undergo annual servicing and inspection in accordance with OSHA and NFPA recommendations, with repairs conducted as needed. While the hard components and air systems have demonstrated reliability, they are increasingly necessitating repairs and service, which reduces their in-service availability. This is an expected consequence of age and the demanding usage inherent in a busy fire department. The straps and harnesses exhibit the most significant wear and have deteriorated notably in recent years. Replacement of these components is costly, requires a certified Scott repair technician, and mandates flow testing with specialized equipment before units can be returned to service.

The mechanical air system has proven highly reliable, with only a few isolated failures that compromised air supply to a degree that could cause serious injury or fatality to personnel. Fortunately, all documented failures occurred during daily testing, training exercises, or, in a few instances, immediately prior to entry into Immediately Dangerous to Life or Health (IDLH) environments. Continued use of aged and worn equipment is projected to lead to an increase in serious failures, with a higher probability of

occurrence during critical, life-threatening situations.



Eighty percent of the District's equipment is 13 years old; however, some firefighters utilize SCBAs that are 18 years old on any given day. Limited inventory, annual service requirements, and frequent repair needs preclude the retirement of the oldest units. Complete replacement of all SCBA equipment is necessary. A limited or phased replacement over several years is strongly discouraged due to significant compatibility issues. New SCBA equipment, regardless of manufacturer, is not compatible with existing buddy breathing systems, a critical safety feature utilized for mutual aid during fireground emergencies. Compatibility is fundamental to firefighter safety and security, ensuring that any fellow firefighter can provide life-saving air in the event of equipment failure.

NFPA recommends SCBA replacement after 15 years but permits continued use provided units pass manufacturer testing and parts and service remain available from the manufacturer. Currently, Scott continues to service and produce parts for 2007 edition SCBAs; however, support for this edition is expected to cease in the near future.

All personnel are issued a personal facemask, and each apparatus carries a spare mask for use when a personal mask is unavailable or requires repair or replacement. In 2013, all personnel received new AV 3000 model masks. In 2018, all personnel were upgraded to the AV 3000 HT mask, which offered significantly improved heat resistance and enhanced safety.

Over 600 of the 1100 SCBA cylinders in the District's inventory will reach their 15-year DOT-mandated end-of-life in May, June, and July of 2026. The inventory of 1100 cylinders appears substantial for 450 SCBAs; however, crews limit air usage during training due to the limited availability of full replacement cylinders. Cylinders are refilled at one of the nine fill compressors located within the district's stations, and most stations rely on supply logistics runs twice weekly to maintain spare cylinder inventory. The District possesses a mobile breathing support unit that refills cylinders for incidents but is not available for company-level training.



SCBA Equipment Deployment

- **SCBA:** 435 for Fire Operations, 16 for HazMat
 - 355 on apparatus, including Apparatus, Chief Officers, Shift Training Captains (Safety Officers), Training Captains, and Fire Investigators
 - 16 HazMat SCBA
 - 30 assigned for use by Training Academies
 - 50 service spares

- **Masks and Mask Mounted Regulators:**

- 500 Personal Issue
- 160 on apparatus
- 90 Replacement stock/spares

- **Cylinders:** 1100

- Approximately 800 cylinders are carried on apparatus. Remaining cylinders are available on racks for incidents, supply, or filling and rotation.

Evaluation Committee

- Captain Brent Boling, Respiratory Protection Program Functional Supervisor
- Engineer Karl Taugher, SCBA Lead Academy Instructor/SME
- Captain Ron Davis, Lead Safety and Survival Academy Instructor/SME
- Captain Jon Taormina
- Captain Skye Johnson
- Captain Nick Vandenburg
- Engineer Rich Bryan

Evaluation Process

The technical replacement committee attended presentations from Scott, Draeger, and MSA SCBA manufacturers. All three companies demonstrated their top models, encompassing all available features and the latest technology. All models are manufactured in accordance with and meet current OSHA and NFPA standards. All companies agreed to provide at least four of each model, with all available features, for evaluation by the committee and department members.

All trial packs were distributed among numerous department members by the committee. Personnel were encouraged to try on all packs for fit, comfort, and ergonomics, and to provide feedback. Packs were utilized in physical training scenarios, simulated firefighting operations, including hose operations, search and rescue situations, and firefighter safety and survival scenarios. Live fire testing was planned but ultimately not conducted, as it became evident that it would not alter the outcome of the ultimately selected model.

NOTE: Following the presentations, it was decided that the evaluation would encompass only the MSA and Scott models. Draeger, while a proven leading provider of SCBA in Europe, lacks the market share and logistics to support the repair, service, and warranty of 450+ SCBAs in the District's inventory. Draeger has one technician capable of warranty service repair in Northern California, with the closest warranty shop located in Oregon. Although Draeger stated an intention to hire more technicians and fully support the District's needs, the decision was made that established, proven product service must exist within the immediate area. Both Scott and MSA have multiple warranty/service repair providers in the immediate vicinity, several of whom already provide SCBA and other services to the CCCFPD.

Models evaluated:

- Mine Safety Association G1
- Scott Safety X3 Pro
- Scott Safety XD Wireframe

Evaluation Findings

All models evaluated are NFPA compliant and meet or exceed all current standards. They share very similar weight, features, and functions. The MSA G1 and Scott X3 models have been in service for many years with proven reliability. The XD model is new but is nearly identical to the Scott AP 75 model currently in service. The primary difference is that the frame is based on an older, proven "wireframe" platform. The XD frame is constructed from stainless steel to be narrower, more compact, and possess a closer center of gravity. Although very similar in weight, most users reported it felt lighter than the other models. This "return" to an older design was requested by many fire service professionals and has become very popular. Stainless steel resists corrosion and is easy to clean and decontaminate.

Both the Scott XD and X3 utilize the same air system with a dual-piston redundant first-stage air regulator. Scott's first-stage regulator features two pressure-reducing piston systems. If the primary system fails, the secondary system activates, continuing to supply air and alerting the user with a vibratory function. The MSA reducer is designed to fail in the open position. Pressure reducer failures are very rare but do occur, often resulting from inadequate maintenance or age. Personnel reported that all models provided adequate air efficiently.



Differences in harnesses, straps, and ergonomics were minor, and none were significantly superior to the others. The most significant design difference between Scott and MSA lies in the frame and the first-stage pressure-reducing system. MSA's frame is entirely composed of heavy-duty plastic, while both Scott models feature a metal base frame, with the XD being primarily stainless steel. The X3 utilizes a metal alloy frame with an ergonomic plastic back frame structure overlay. All packs were worn comfortably, featuring articulating waist belts and adjustable straps. All straps are completely removable and can be washed by the end-user without tools. The MSA pack includes an adjustable belt for additional comfort. Facemasks were comfortable, available in three sizes, and exhibited very similar fit and feel.

Both Scott and MSA provided service technicians who completely deconstructed their packs, revealing all internal workings and designs. Serious concerns were raised regarding MSA's plastic frame, the method of component mounting, and the potential for plastic degradation later in the pack's lifespan. Discussions with other fire departments utilizing MSA G1 packs revealed an increased incidence of cracking and signs of wear as the packs aged. Most reported damage to framing components due to aggressive use during training and incidents. Frame repairs are costly and necessitate specialized tools and manufacturer technicians. Scott users and the District's experience indicate rare frame damage with metal frames. Scott frame failures are overwhelmingly attributed to improper, brute-force usage. Scott hose assemblies and

protections are more robust and durable. The District is unaware of catastrophic failures of hose or air supply components with its current Scott SCBAs. Other departments provided several photographs of failures in critical hose components with MSA packs.

Both Scott and MSA offer virtually identical features regarding visual and audible alerts and sounds. Scott's low air alert and reducer failure warnings include a vibration for tactile alerting in loud environments. MSA features an LED screen in the shoulder console that provides specific information, with an option for a thermal imaging camera. Bluetooth connectivity with radios is available with both models; however, Scott is the only one offering bone conduction technology for speakers and microphones. Both offer web-based real-time crew monitoring software that includes information on air level, air usage, and PASS alarm alerts. Both systems require separate modems/receivers on scene. The MSA system requires each individual pack to be within range of the modem. Scott utilizes a "mesh" design wherein information can be passed pack to pack, with at least one pack needing to be connected to the modem for all units to appear in the system. This is a constantly evolving and improving technology, with both systems capable of upgrades without hardware changes.

Purchase Recommendation

Based on input from the committee and department members, it is recommended that all SCBAs be replaced with Scott XD 4.5 SCBA, C5 masks, E-Z Flo C5 Regulator, and SEMS 3 monitoring systems to ensure the highest level of safety for personnel and optimal service to the communities. The XD model will not necessitate extensive in-service training due to its overwhelming similarities with the current model.

Key benefits of acquiring the Scott XD model include:

- Modernization of inventory with current and PA compliant equipment.
- Functional and mechanical operation identical to the current AP 75 models, a proven reliable platform.
- Enhanced comfort and balance through an ergonomic, compact back frame.
- A closer center of gravity, resulting in greater comfort and improved balance.
- Packs are more compact, fit closer to the body, and reduce profile and enhance maneuverability in confined situations, thereby increasing firefighter safety.
- All components are readily accessible and easily cleaned/decontaminated.

- All harness components are completely removable and easily washable in the District's extractors.
- Current remaining inventory of SCBA cylinders can be utilized until their end-of-life.
- Electronic monitoring features will significantly improve fireground safety and provide valuable information for training purposes.
- The C5 mask is narrower with a significantly wider field of vision and offers substantial improvements in voice transmission, bone conduction technology, and eliminates the need for a voice amplifier.
- Improved breathability with increased flow in the regulator, decreasing firefighter fatigue.
- Heads-up display technology fully integrated into the mask-mounted regulator and forward-facing remaining air level lights visible to all.
- Introduction and in-service training will be straightforward due to overwhelming similarities with the previous model.



See more.

3M™ Scott™ Vision C5 Facepiece



3M™ Scott™ SEMS 3.0 Wireless SCBA Telemetry System

The 3M™ Scott™ SEMS 3.0 Wireless SCBA Telemetry System provides a robust connection in commercial and residential structures, enabling bi-directional communication between responder and incident command, using 3M™ Scott™ Monitor Pro Telemetry Software Solution.

Electronic Personnel Accountability Report (ePAR)

Helps reduce excess radio traffic by allowing incident command to send a PAR request electronically using an audible and visual alert notification, to which firefighters can respond with a simple click of a button on the console.

System Integrity Alarm

Provides visual and audible alerts to notify SCBA wearer and incident command of possible impending electronics degradation due to sustained elevated temperature.

High-Flow Alarm

Provides visual and audible alerts to notify incident command of a high-flow condition from a firefighter's SCBA during a full-alarm PASS activation (i.e. flow of air through the regulator exceeding normal breathing rates).

No-Flow Alarm

Visual and audible alert to notify incident command of a no-flow condition from a firefighter's SCBA regulator during a full-alarm PASS activation, (i.e., limited or no air flow detected through the regulator)



Breathe easier.

3M™ Scott™ E-Z Flo C5 Regulator



Recessed Heads-Up Display
Helps improve downward view through facepiece



Key Features

- Enhanced Breathability**
Helps reduce user burden and improve operational efficiencies.
- Enhanced Communications**
Reduced frequency Vibralert EOISTI helps improve two-way radio communications.
- Expanded Heads-Up Display**
Additional status icons provide visual alerts to SCBA wearer for electronic personnel accountability report (ePAR), EVAC and System Integrity Alarm (when using 3M™ Scott™ Air-Pak™ XD SCBA configured with 3M™ Scott™ SEMS 3.0 Wireless SCBA Telemetry System or 3M™ Scott™ Air-Pak™ X3 Pro SCBA configured with 3M™ Scott™ SEMS II Pro Wireless SCBA Telemetry System)
- Auto Air-Saver**
Simplifies operation when doffing the regulator and helps to prevent inadvertent air loss during removal from the facepiece.
- External "Buddy" Lights**
Assist with remote identification of a user's SCBA air remaining.

Proven Design

- Quarter-Turn Design**
Provides secure connection to the facepiece.
- Vibralert End-of-Service-Time Indicator (EOISTI)**
Audible and tactile low air warning for immediate recognition on the fireground.
- Air Spray Bar**
Provides separate inhalation air path and helps to reduce fogging during use.

In addition to replacing the 600 expiring cylinders in 2026, an additional 200 cylinders are needed to augment the inventory, for a total of 800 45-minute cylinders. This will provide three additional spare cylinders per company, increase the supply capacity for replacement, and equip the new breathing support unit. The current inventory of cylinders is fully compatible with the XD SCBA and will be utilized until their end-of-life. In 2028, an additional 300 cylinders will reach their end-of-life and require replacement. Remaining cylinders will expire in subsequent years and will be replaced as needed. All new cylinders will feature custom banding with CCCFPD branding.