

Killeen Fire Department: Proposal for SCBA Acquisition

The Killeen Fire Department (KFD) seeks to replace its current fleet of Self-Contained Breathing Apparatus (SCBA) with advanced models that meet the operational demands of our personnel. To ensure a thorough and impartial selection process, KFD established a diverse evaluation committee comprising personnel with varied expertise to assess SCBA products from three manufacturers, referred to as SCBA A, B, and C. The evaluation was conducted in multiple phases, including educational sessions, field testing, and in-depth technical analysis, to identify the SCBA best suited to the department's needs.

Phase 1: Educational Sessions and Product Overviews

The evaluation process commenced with comprehensive briefings from representatives of each manufacturer, who presented their latest SCBA models. These sessions covered critical aspects such as operational instructions, user features, safety mechanisms, customization options, service protocols, and warranty terms. The interactive format facilitated a dynamic exchange of information, allowing committee members to pose questions and gain insights into how each SCBA could be tailored to KFD's operational requirements. This bidirectional dialogue enabled manufacturers to highlight features most relevant to our department's needs.

Phase 2: Field Evaluation

In the second phase, the committee conducted hands-on field evaluations to assess the practical performance of each SCBA. A physical agility course was designed to simulate the demanding conditions encountered at emergency scenes. Committee members tested each SCBA model through the course, evaluating key factors such as comfort, communication clarity, usability, and durability. Manufacturer representatives were present to provide support and address questions. Following the field tests, each committee member documented at least five strengths and five weaknesses for each SCBA model. These have been summarized below.

SCBA A: Strengths and Weaknesses

Strengths:

- Integrated speaker enhances communication clarity.
- Adjustable back frame prevents helmet interference with the air cylinder.
- Regulator design allows easy attachment and detachment in various positions.
- Lightweight facepiece with excellent field of vision and comfort.
- Single rechargeable battery simplifies power management.
- Some members reported improved air delivery on demand.
- Remote gauge features a digital display with an estimated time-to-low-air-alarm function.
- Overall comfort during extended use.
- One-way valve in the facepiece reduces cross-contamination risks.

Weaknesses:

- Permeable materials make cleaning and decontamination less than ideal.
- Alarm bell may be difficult to hear in high-noise environments.
- Purge valve operation is difficult to manipulate.
- Stiff regulator hose obstructs movement.
- Construction feels less robust, raising durability concerns.
- Lack of redundancy in the pressure reducer (safety concern).
- Low-air alarm discharges air into the atmosphere, wasting usable air.
- Limited 15-year warranty excludes straps and soft goods.

SCBA B: Strengths and Weaknesses

Strengths:

- Adjustable back frame with swivel hip piece enhances comfort.
- Non-permeable materials facilitate easy cleaning and drying.
- Regulator with swivel mechanism prevents hose binding.
- User-friendly purge valve.
- Wide field of vision through the facepiece.
- Heads-up display (HUD) with periodic activation draws attention effectively.
- Clear display on the remote gauge.
- 15-year warranty.
- Voice amplifier is effective.
- Stable shoulder straps and lightweight back frame.

Weaknesses:

- Heavier facepiece compared to competitors.
- Bulky remote gauge with digital-only display, inoperable if the battery fails.
- Untested new design, lacking real-world validation from other departments.
- Difficulty securing the air cylinder.
- Restricted range of motion with mask when looking downward.
- Multiple batteries are challenging to replace.
- No redundancy in the pressure reducer (safety concern).
- Cumbersome communication cords.
- Low-air alarm wastes breathable air into the atmosphere.
- Long low-pressure hose and wide shoulder straps impede movement.
- Waist strap loosens during activity.
- Shoulder strap movements are not easily made when adjusting or doffing.

SCBA C: Strengths and Weaknesses

Strengths:

- Familiar design, similar to KFD's current SCBA, easing transition.
- Lifetime warranty covering ALL components.
- Vibralert low-air alarm provides both audible and tactile feedback.
- Low-air alarm directs air to the facepiece instead of wasting it to the atmosphere.
- Improved comfort over current equipment.
- Bone mic communication system is user-friendly and effective.
- Epoxy-encased motherboard enhances durability and moisture resistance.
- Waist belt adjusts easily and remains secure during movement.
- Waist belt attaches to the back frame at one point to allow straps to stay tight around hips.
- Analog remote gauge ensures reliability and compactness.
- Proven design with positive feedback from other departments.
- Responsive customer support for repairs and warranty claims.
- Dual-redundant pressure reducer enhances safety (this is a major safety benefit).
- One way CGA fitting on the main valve simplifies and expedites cylinder refilling.
- Secure twist-lock regulator attachment ensures connection to face piece.

Weaknesses:

- Non-adjustable back frame, relying solely on shoulder and waist strap adjustments.
- Field of vision comparable to current equipment, offering no improvement.
- Regulator connection limited to one direction.
- Permeable materials pose cleaning challenges.
- Shoulder straps occasionally slide (optional chest strap not tested).
- Perceived as heavier and top-heavy.
- Reluctance to adopt Bluetooth communication features.
- Low-pressure line may obstruct movement.
- Facepiece less comfortable than SCBA A.

Initial Ranking Post-Field Testing

Following the field evaluation, the committee's preliminary ranking was:

1. SCBA B
2. SCBA A (close second)
3. SCBA C

Phase 3: Technical Analysis and Additional Research

The third phase involved a meticulous technical review, with KFD's SCBA technician and support division joining the committee to scrutinize each model. Communication systems underwent rigorous testing, with SCBA A and C demonstrating superior clarity in transmitting and receiving communications, while SCBA B underperformed. The committee also consulted other fire departments using these SCBA models to gather real-world insights. This phase revealed critical safety and operational concerns for each model.

SCBA A: Concerns

- The regulator bypass function is difficult to lock and easily unlocks, undermining its safety purpose.
- The air cylinder relies solely on a friction-based metal strap, allowing slippage during activities like dragging, which stresses high-pressure lines and fittings.
- Worn metal straps may damage cylinders, producing scrapes and gouges.
- Other departments reported metal shavings in regulators, potentially from the bypass mechanism.
- Customer service challenges, including delays in parts availability (up to one year).
- No mechanism to lock the main valve in the open position, risking accidental closure.

SCBA B: Concerns

- Intermittent regulator latch sticking creates a false sense of security, posing a significant risk in Immediately Dangerous to Life and Health (IDLH) environments if the regulator becomes dislodged.
- The adjustable back frame's keeper broke under approximately 100 lbs of force, causing the frame to collapse and stress the low-pressure hose, risking catastrophic air loss. These back frames will see pulling forces over 300 LBS.
- When collapsing back frame rails, the low-pressure hose gets pinched, accelerating wear.
- Facepiece electronics module detaches with minimal force.
- Flimsy back frame construction raises durability concerns.
- Insecure CGA-to-snap-change adapter, relying on hand-tight threading.
- No mechanism to lock the main valve in the open position, risking accidental closure.
- Poor communication clarity over radio systems.

SCBA C: Concerns

- Potential wear on the CGA fill fitting due to its location, though mitigated by a secure rubber cap and replaceable design.
- Hesitation regarding Bluetooth communication integration.

Final Recommendation

Following the comprehensive evaluation, the committee's preference shifted significantly due to the critical safety concerns identified, particularly with SCBA B. The final recommendation is as follows:

1. **SCBA C:** Preferred for its proven design, lifetime warranty, dual-redundant safety features, and superior reliability, despite minor drawbacks.
2. **SCBA A:** Retained as a viable second choice, though concerns about durability and customer service persist.
3. **SCBA B:** Eliminated due to unacceptable safety hazards, including regulator and back frame failures.

KFD recommends proceeding with SCBA C to ensure the safety, efficiency, and operational readiness of our firefighters. We are prepared to provide further details to support this proposal.