

Product Specification for the FireHawk™ M7 Air Mask (3000 psig Air Masks)

Prepared for:

Prepared by:

I. Purpose:

To establish minimum standards for self-contained breathing apparatus, specifically, MSA SCBA equipped with one or more of the following options: M7 carrier and harness, M7 Accountability System, M7 Integrated PASS, M7 HUD System, M7 Ultra Elite® facepiece, Quick-Fill®, ExtendAire™, cylinder, Rescue Belt, and CBRN protection.

II. Approvals:

The apparatus shall be approved by the National Institute for Occupational Safety and Health (NIOSH), under 42 CFR, Part 84 for chemical, biological, radiological, and nuclear protection (CBRN) with a 30 minute-rated service life and compliant with all requirements of the National Fire Protection Association's 2007 Edition of NFPA-1981 Standard on Open-Circuit Self-Contained Breathing Apparatus. Units equipped with an integrated PASS must meet the requirements of NFPA 1982, 2007 edition. Units equipped with a Rescue Belt, shall also comply with the NFPA 1983 Standard on Fire Service Life Safety Rope and System Components, 2006 Edition; Type: Escape. Units equipped with the Accountability System must meet the minimum requirements for FCC parts 15 & part 90.

III. Specific Requirements:

1. Facepiece:

1. The facepiece shall be available in three sizes in Hycar rubber.
2. The lens shall be field-replaceable and of a non-shatter type and shall fit all three sizes of the facepiece
3. The facepiece shall have an inhalation check valve and exhalation valve to prevent exhaled air from entering and contaminating the mask-mounted regulator.
4. The facepiece head harness shall be a flame and heat-resistant Kevlar assembly featuring a suspension with five-points of attachment and four points of adjustment.
5. The facepiece shall have a speaking diaphragm with aluminum-coated membrane suitably protected, and located centrally on the facepiece for optimal voice projection.
6. Two sizes of removable nose cups. The nose cup shall contain a voice collector system which enhances unamplified speech transmission.
7. An optional flame and heat-resistant PBI neck strap shall be offered, to carry the facepiece in a ready position for quick donning.
8. The facepiece shall be M7 HUD ready, incorporating a mounting bracket for an M7 HUD Receiver.



2. HUD System

1. The HUD System, Heads-Up-Display, shall be wireless to eliminate snag hazards and provide modularity for easy maintenance. It shall be comprised of two primary components 1) M7 Control Module and 2) M7 HUD Receiver.
2. The M7 HUD shall provide the user with the remaining volume of air in their cylinder in 25% increments through a series of 4 colored LEDs.
3. The light logic used to convey remaining cylinder volume shall be as follows:

Four Green Lights	-	76 to 100% Cylinder Volume
Three Green Lights	-	51 to 75% Cylinder Volume
Two Flashing Amber Lights	-	26 to 50% Cylinder Volume
Flashing Red Light	-	0 to 25% Cylinder Volume
4. The HUD System shall allow the user to select between two modes of operation, a 1) Continuous lights on mode or 2) an Intermittent lights on mode for power conservation.
5. The M7 HUD shall incorporate a photoelectric sensor that senses ambient light conditions automatically adjusting the display to one of 16 pre-programmed light intensities.
6. The M7 HUD shall provide the user and their partner (by means of a buddy light) with a visual alarm indication of a low air cylinder.
7. The M7 HUD shall indicate to the user of PASS pre-alarms with a blinking orange light seen inside the facepiece.
8. The Control Module shall incorporate a refresh button that permits a user to update their display or change the receiver's mode of operation.
9. The receiver shall use three AAA alkaline batteries. The batteries shall be contained in removable cartridge for easy replacement. The radial-sealed battery compartment shall incorporate an o-ring seal.
10. The HUD System shall be immune to radio frequency interference (RFI), and must function properly in the close proximity of fire service hand-held radios.
11. The M7 HUD shall incorporate a sonically welded seal to provide the highest level of protection against water ingress.
12. The M7 HUD shall provide the user with a low-battery indicator.
13. The M7 HUD shall be field removable and replaceable without the use of tools.

3. Rapid Intervention Crew (RIC) System

1. The RIC connection shall use the Quick Fill[®] URC (universal rescue connection)
2. The system shall be capable of:
 - Quickly refilling (less than one minute) an SCBA cylinder from a mobile compressor or cascade system.
 - Extending the users air supply over longer duration when a remote cascade system or other compressed gas source is located in a remote area.
 - Refill in immediately dangerous to life or health (IDLH) atmospheres from a secondary air source.

4. First-Stage Regulator:

1. Reduces the cylinder pressure to an outlet pressure not to exceed 100 psi. Regulator outlet pressure must be adjustable.
2. There shall not be more than 14 replacement parts on the regulator.
3. Regulator redundancy shall be achieved by two inter-nested long-life springs.
4. The regulator body shall be constructed of a high strength heat treated aluminum alloy, and plated with a Teflon hard coat anodize to minimize corrosion and wear of internal components.
5. The regulator must not require any special tools for disassembly.
6. The pressure reducer shall incorporate a down stream flow to ensure fail-safe in an open position.
7. The regulator shall be mounted on a slide bracket to facilitate wasy cylinder attachment and top prevent binding of high-pressure hose.



5. Mask-Mounted Regulator: (Firehawk Slide to Connect or Push to Connect)

The mask-mounted pressure-demand regulator shall consist of the following:

1. An over-the-shoulder air-supply hose routed through a shoulder strap tunnel to the first-stage regulator. For durability, the air-supply hose must be made of neoprene from the second stage regulator attachment to an inline swivel or quick-connect.
2. As an option, the detachable regulator must have a push-to-connect attachment to the facepiece. This option of the regulator shall feature a non-indexing design, capable of mounting to the facepiece in any orientation. In this configuration, the regulator must rotate freely when connected to the facepiece, maximizing the user's freedom of head movement.
3. As an option, the detachable regulator must have a slide-to-connect attachment to the facepiece, with an audible click. The regulator's forked upper attachment slides down a track that is molded into the inhalation assembly cover of the facepiece. This provides an ambient air stand-by mode for the regulator, allowing the user to go on air quickly with a simple push of the regulator into the facepiece. In this configuration, the regulator must be restricted from rotation after attachment to maintain a consistent location of the regulator controls with respect to the user.
4. The second stage regulator shall not obstruct or reduce the field of vision of the wearer when installed on the facepiece.
5. When doffing the regulator, the disengagement of the regulator from the facepiece must simultaneously stop the flow of air.
6. The second stage regulator must not require any tools for disassembly. Number of parts in the second stage regulator is not to exceed a count of 28 parts.
7. The second stage regulator must be equipped with Positive Protection Tetraplex Shield membrane that covers the diaphragm, preventing against the permeation of CBRN agents.
8. The second stage regulator must be labeled with a CBRN notation.
9. The regulator must be equipped with a variable flow by-pass.

6. Primary Low Pressure Warning Device:

1. An audible alarm shall be an air-actuated, self-cocking, continuous ringing audible warning bell automatically operating when air pressure in the supply cylinder reaches approximately 25% of the rated service life.

7. Cylinders:

1. The cylinder shall be constructed of a deep-drawn, seamless aluminum liner that is fully wound over its entire surface (except for the thick neck area) with high-strength carbon fiber filaments impregnated with epoxy resin.
2. The cylinder shall have a minimum 2-inch wide luminescent band to enhance visibility of the wearer.
3. The cylinder shall contain a closing valve which shall incorporate a pressure gauge to indicate the pressure in the cylinder at all times. The pressure gauge face shall be luminescent. The hand wheel shall be at a 90° angle from the longitudinal plane of the cylinder.
4. The valve shall incorporate a flow control insert to limit the airflow over the first half-rotation of the hand wheel, minimizing propulsion thrust in the event the cylinder is mishandled.
5. The operating pressure shall be 3000psi.



8. Carrier & Harness:

1. An adjustable double-pull Kevlar waist belt.
2. A metal push-button seat belt-type buckle.
3. Two padded Nomex shoulder straps, each having a Kevlar strap reinforcement that provides retention if the Nomex fibers are weakened. The shoulder straps shall have retroreflective markings and shall have anti-rotation-style buckles for ease of adjustment.
4. The friction buckles of the shoulder straps and waist strap shall be constructed of forged stainless steel for maximum strength and resistance to wear.
5. An optional mid-connect Kevlar-blend chest strap with snap-type fastener that properly positions the shoulder straps allowing full arm movement.
6. An optional lumbar pad shall also be available with a swivel feature to maximize the range of motion and comfort of the user.
7. The backplate shall be constructed of a glass reinforced composite material that conforms to the user's back and provides spine relief for wearers with protruding vertebrae.
8. The backplate shall be equipped with large side handles for pulling and dragging a firefighter to safety. Each handle shall be capable of holding a 400 lb load in the vertical and horizontal direction, with a combined load of 800 lbs.
9. The backplate shall be equipped with a centrally located carabiner attachment point for the purpose of dragging a downed firefighter. The attachment point shall be capable of holding a 1000lb load.
10. The backplate shall be equipped with a first stage regulator slide for ease of cylinder connection.
11. An adjustable, stainless steel cylinder band having a quick-opening device at one end to properly retain various size cylinders. The cylinder band must retain its open shape for easy cylinder change-out.
12. All harness components shall be affixed with tri-bar slides for easy field replacement.
13. The left shoulder strap shall be equipped with a retaining clip to stow the facepiece while not in use.
14. The belt assembly shall be equipped with a regulator retainer for safe storage of the Firehawk regulator while not in use.
15. The shoulder straps shall incorporate high visibility reflective panels.

9. Optional Emergency Egress Rescue Belt

1. Shall be available in three waist belt lengths, to fit waist sizes 33-54 inches, 33 – 66 inches and 33-74 inches.
2. Shall be available with two Kevlar rescue rope lengths, 50 ft and 75 ft.
3. The Kevlar rescue line shall be rated at 3000 lbs static load.
4. The complete system shall be capable of a 1000 lb static load, exceeding the NFPA 300lb requirement.
5. The belt system shall incorporate a shock absorbing rip-stitch feature on the descender strap, to help protect the Kevlar rescue line from impact loads.
6. The system shall include a carabiner and descender (brake) for rappelling in an emergency egress situation.
7. The belt shall be made of Kevlar, with an outer cover made of FHR Advance material.
8. As a safety feature, the Kevlar rope shall be detachable under load by the user, with a “pull to release” knot at the end of the Kevlar rope.
9. As a safety feature, the rope assembly shall have a tamper evident label to ensure the proper packing of the rope by trained personnel.
10. The rope assembly shall be available as a replacement part.
11. In addition to meeting the NFPA 1983 standard, the Rescue Belt must be NIOSH certified and NFPA 1981-2007 edition compliant as a component of the SCBA.

10. Carrying Case:

If specified, a carrying case shall be provided to retain the complete apparatus and the instructional manual. The carrying case shall be either the hard type with replaceable front latches or the soft, duffel bag type.



11. Control Module and Power Module

1. The M7 Control Module is a combination integrated PASS and HUD Transmitter that shall be contained in a single enclosure and shall be easily replaced in the event of fire ground damage.
2. The M7 Control Module unit must be immune to radio frequency interference (RFI), and must function properly in the close proximity of fire service hand-held radios.
3. The M7 Control Module must be equipped with time remaining display and an optional thermal sensor. The time remaining must update calculations every 30 seconds, based on the user's previous 3 minutes of air consumption. The initial calculation will appear after 3 minutes.
4. If equipped with the M7 Accountability System, the unit shall have the capability of electronically storing the user's name into memory through an ID Tag.
5. The unit shall be capable of storing up to 25 hours of use information, in the form of sessions that are generated each time the SCBA is pressurized. The sessions must indicate the day, time, user's name, cylinder pressure, duration of use, and time of alarm (PASS and thermal), for each pressurization of the SCBA stored on a minute-by-minute basis.
6. The sessions must provide the option of being downloaded to a personal computer for addition to maintenance records, or for use in incident investigations.
7. The M7 Control Module must utilize a dual perimeter seal (sonic weld and o-ring) to provide the highest level of protection against water ingress.
8. The M7 Control Module and M7 Power Module must be equipped with "buddy lights" on the front and back of the firefighter. The purpose of the "buddy lights" is to easily identify firefighters that are in immediate need of assistance.
9. The M7 Power Module shall be equipped with dual sound emitters. The sound emitters shall perform at a minimum of 95 dBA after heat emersion of five minutes at 500 Degrees Fahrenheit.
10. The M7 Control Module and M7 Power Module shall be powered by four C-cell batteries.

12. Emergency Escape Breathing Support System (ExtendAire)

1. As an option, an emergency escape breathing support system must be accommodated by the SCBA.
2. The system must be available with a common airline quick-disconnect fitting.
3. The system shall connect to the intermediate pressure side of the SCBA, downstream of the first stage regulator.

13. Accountability System

Telemetry Requirements

1. The radio transmission shall operate license free in the 915 ± 13 MHz band.
2. The radio shall be spread spectrum to prevent interference in transmission.
3. The radio transmission distance shall be at least one mile line of site.
4. The Telemetry Module must be able to receive an evacuation signal from the incident command base station. The signal will result in an audible alarm as well as visual indications on the device and in the HUD Receiver. The Telemetry Module must transmit a confirmation that the unit has received the evacuation signal and an acknowledgement signal when the user recognizes the evacuation command.
5. The Telemetry Module shall transmit the following signals to the Incident Command Transceiver:
 - Cylinder pressure
 - PASS alarm (discerning between automatic activation and manual activation)
 - Low-pressure alarm
 - Battery status
 - Thermal alarm
 - Evacuation signal receipt and acknowledgement
 - Time remaining calculations
 - FireHawk M7 Air Mask user name, team assignment or serial number
6. The unit shall be powered by the M7 Power Module.



Product Specification for the MSA FireHawk Air Mask Continued

7. In the event that radio contact is lost with Incident Command, the radio icon will flash in the display to inform the user.

Incident Command Transceiver

Transceiver

1. Each Transceiver shall be capable of monitoring up to 50 firefighters
2. Multiple Transceivers may be used on a single PC, monitoring over 100 firefighters.
3. The Transceiver shall be powered by a 12 – 24v DC or 12v AC power supply.

PC Software

4. The Transceiver shall work in conjunction with a PC. The minimum system requirements for the PC are:
 - 1 GHz Pentium III processor or equivalent
 - 256 MB RAM
 - USB 1.1
 - 16 MB Graphics Card
 - 200 MB Free Disk Space
 - Windows XP Service Pack 1 or Windows 2000 Profession Service Pack 3 operating systems
5. The telemetry software must have the ability to view, print, save and retrieve a data log of a particular telemetry monitoring session. The data log will include device name, date and time of event and type of event.
6. The telemetry software must have the ability to evacuate a single firefighter, a team of firefighters or all firefighters logged onto the system.
7. The Incident Command display shall be interactive, allowing the IC to arrange firefighter teams and perform functions with a computer mouse.
8. Intuitive icons with color-coding schemes shall be used to enhance fire scene management.
9. A Personal Accountability Report (PAR) timer shall be incorporated into the telemetry software.
10. The system shall be capable of viewing 42 firefighters simultaneously, depending on monitor resolution.
11. In the event a firefighter would go into alarm (PASS or low-pressure), a “pop-up” window will appear to notify the IC.
12. In the event that radio contact is lost with a firefighter, an icon will appear to alert the IC of the loss of signal in conjunction with a timer to record the duration of signal loss.

Identification Tags

1. The Identification (ID) Tags shall be capable of storing 30 characters of information.
2. The stored information shall be transferred from the ID Tag to the Integrated PASS / Telemetry Device through RFID.
3. The ID Tag with Team / Truck name will enable the Telemetry Software to group firefighters automatically.
4. The ID Tag shall be equipped with a mechanism for attachment to a secondary accountability board.

14. Weight

1. The weight of a basic Air Mask (less cylinder) shall not exceed 13 lbs, 4 oz.
2. The weight of the cylinder and valve assemblies (empty) shall not exceed:

Cylinder Type	Weight
Carbon-Wrapped L30+	9 lbs, 8 oz.



15. Battery Life

1. The expected service life of the batteries with frequent use on the Control and Power Modules shall be greater than one year.
2. The expected service life of the batteries with frequent use on the M7 HUD shall be greater than one year.

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