AB2K MMADs™

User and Safety Manual

Third Edition

Revised 2.15.16

AB2K MMADS User and Safety Manual
Third Edition (February 1, 2016)

Changes are periodically made to the information contained in this publication; these changes will be issued as new pages for this manual, and incorporated into new editions.

MSI Delivery Systems Inc. – a Major Steps company.

Introduction

MSI Delivery Systems Inc. designs, manufactures and sells the AB2K MMADS™ -- the fastest, fully self-contained, portable, multi-mission aerosol delivery system in the world.

The AB2K MMADS™ is a robust multi-mission, multi-purpose smoke generator capable of rapidly blanketing large areas with dense smoke. The non-toxic training smoke solution is ideal for providing realistic training to first responders, firefighters, law enforcement, emergency medical technicians, military, entertainment and special effects, etc.

By mixing other additives with the non-toxic training smoke solution, mission capabilities can be upgraded to include crowd control, prison riots, prisoner extraction, drug busts and other tactical incursions, urban warfare (MOUT), decontamination, fumigation, etc.

This AB2K MMADS User and Safety Manual provides detailed information and instructions about how to safely use the AB2K MMADS™, as well as providing additional information such as its technical aspects.

For the proper and safe operation of the AB2K MMADS™, it is necessary to read this guide completely and carefully, and to observe all of the contained instructions

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Section 1 - Using This Manual

The *AB2K MMADS User and Safety Manual* (from this point on referred to as "manual") is a valuable source of information about the AB2K MMADS™. Tasks associated with this system is presented in a step-by-step format so that someone who is new to the using the AB2K MMADS™ (or new to a particular feature) can learn most functions, independently, without assistance from an experienced user. Additionally, general information about each is provided to help users better understand how the system works in support of the task they are using it for.

To learn more about the general capabilities and technical aspects of the AB2K MMADS™, refer to the Section 2, *About the AB2K MMADS*.

Setup and How to Find Information

Section Headings

To facilitate locating the different sections, each section has its' title listed in the top outer corner of all section pages. For example, all pages in the section *Using This Manual* has this title listed in the top outer corner as the example below shows.

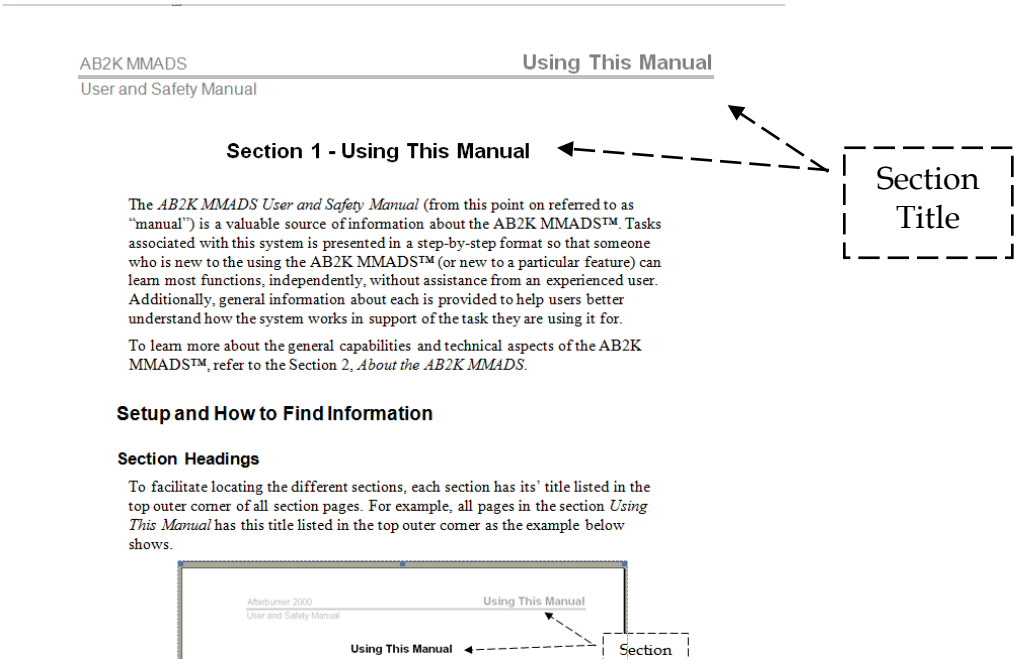

Table of Contents

The *Table of Contents*, located in the front, lists the location of sections in this manual. For example, if you are looking for information to do with the safe handling of the AB2K handling of the AB2K MMADS™, as opposed to the

manual, review the sub-tasks listed in the *Table of Contents* under Section 4, *Safety Information*.

Index

The *Index*, located in the back, contains an alphabetical listing of alternate references to material in this manual. Some users prefer using this type of locator to find information because it specifically cross-references various key terms, in different ways, and pinpoints the various page locations of them.

Glossary

The *Glossary*, located in the back, has explanations of key terms, abbreviations, and acronyms associated with the AB2K MMADS™ and this manual.

Appendixes

Appendixes provide additional information without being an integral part of the main body of the manual. For example, Appendix 1 lists information about the various equipment specifications.

Styles and Safety Symbols

Manual Styles and Symbols

Different items in this manual are visually formatted and standardized to help users more readily identify them while using this manual. The following table lists these and it provides an example of how each appears and is applied.

If the item mentioned is…	**…then you would see it formatted like:**
A button or control,	…click the [trigger]
Reference to a section in this manual,	…refer to the *Glossary* section.
Name of control position	… turn to the “OFF” position.
A label on the equipment,	

Safety Symbols

This manual displays various safety symbols to provide special attention to certain types of safety information.

NOTE

Tells the reader the text has information of value or that failure to pay close attention to the text provided in this manual could have negative consequences.

CERTIFIED USER ONLY!

This symbol indicates **only certified** users are qualified to use this product or its accessories.

FIRST AID

This symbol alerts to readers to key information about first aid for a given situation.

WARNING

This symbol indicates a potentially hazardous situation, which if not avoided, could result in death or serious (irreversible) injury.

CAUTION

This symbol indicates a potentially hazardous situation, which if not avoided, may result in personal injury or may result in damage of the equipment and/or its functions or of a property in its ambiance.

HOT

This symbol indicates a potentially hazardous situation, which if not avoided, may result in personal injury or may result in serious burns or scarring. Symbol also indicates to take extreme caution while in use.

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Section 2 - About the AB2K MMADS

The AB2K MMADS™ product is the fastest, fully self-contained, man-portable, multi-mission aerosol delivery system in the world capable of rapidly blanketing large areas with dense smoke.

The AB2K MMADS™ can be used for fire departments and first responders for training simulations, the military for battlefield obscuration, entertainment and special effects, disaster preparedness training, etc. The non-toxic training smoke can be upgraded for use in urban warfare (MOUT), tactical incursions, civil unrest, riot control, in neutralizing chemical attacks, decontamination, etc. For additional details, please visit http://www.MSI-DeliverySystems.com

The AB2K MMADS™ is available in two basic configurations: a “standalone version” (model AB2K-SA) and a high-capacity “dependent version” (model AB2K-DV). A basic overview of each is provided below.

Standalone Version (AB2K-SA)

The Standalone Version is a fully self-contained smoke generator weighing approximately 18.5 pounds (8.39 kilograms). All components required for aerosol dispersion are contained within the standalone variant. This includes a 16-ounce (448 milliliter) fluid media reservoir, nitrogen pressure source, LPG (Propane) gas source and high performance heat exchanger. The standalone unit is capable of dispensing over 50,000 cubic feet of smoke on a single charge, which is approximately a two-minute deployment. It can also be stored fully loaded and ready for the next deployment. See Figure 1.

Figure 1 – Standalone Version

Dependent Version (AB2K-DV)

The dependent version weighs approximately 16.5 pounds (7.48 kilograms) and requires the backpack unit in order to generate smoke. The high capacity backpack weighs approximately 22 pounds (9.9 kilograms) and is equipped with a 64-ounce (1. milliliter) fluid reservoir and compressed nitrogen cylinder. This system provides a six-fold increase in volume of available materials for aerosol production. The principle difference between the standalone and dependent system variants is that the hand-held generator portion of the dependent system does not have an integrated fluid media reservoir and nitrogen source. The dependent version (with high capacity backpack) is capable of dispensing over 320,000 cubic feet of smoke on a single charge, which is approximately a 20-minute charge. It can also be stored fully loaded and ready for the next deployment. See Figure 2.

Figure 2 – Dependent Version

High-Capacity Backpack

Both the standalone and dependent system variants can be used in conjunction with the backpack. The backpack is an optional accessory for the standalone variants, which increases mission flexibility. The high capacity backpack weighs approximately 22 pounds (9.9 kilograms) and is equipped with a 64-ounce (1.9 liter) fluid reservoir and compressed nitrogen cylinder. It can also be stored fully loaded and ready for the next deployment. Beneath The Cover: The backpack is protected by ballistic shielding of NIJ .05 Cert. Level II Armor.

Backpack Ballistic Shield Cover

Backpack Ballistic Shield

Stealth-Mode Capability

The AB2K MMADS™ incorporates a high performance heat exchanger as an integral part of its design. The proprietary technology used in the high performance heat exchanger results in 90% of the heat generated by the heat source being retained within the barrel of the generator, thus enabling a unique stealth-mode capability unavailable on other devices.

The stealth-mode capability allows enforcement personnel to fully heat the chamber and when approaching a building for a drug bust or other type of tactical incursion, can engage the stealth mode to completely eliminate all noise from the generator. The high performance heat exchanger continues to maintain a working temperature for 10 minutes providing enough energy reserve for 3 trigger bursts before re-engaging the heat source

The 10-minute energy reserve is approximate and based on experimental data using standard temperature, pressure and humidity. Users are responsible for determining the effective stealth times based on local conditions.

Safety Features

The AB2K MMADS™ is made of a combination of aluminum alloy and stainless steel. This product was designed with many protective features to ensure safety while in operation. These features include:

- Pressure release valves to limit the operator from over filling the cylinders.
- Safety interlocks on the positive shut off valve for the LPG (Propane) source.
- Check valves to ensure the chemicals flow in one direction and eliminate backpressure.
- Quick couplers for rapid recharging with minimal gas escaping.
- Proprietary insulating technology that retains over 90% of the heat energy in the combustion chamber.

Mission-Specific Smoke Formulations

MSI Delivery Systems Inc. non-toxic camouflage training smoke solution is a proprietary and trade-secret formulation developed exclusively for use in the AB2K MMADS™ delivery systems. MSDS sheets available upon request.

MSI Delivery Systems Inc. high performance liquid smoke solution is the ONLY smoke solution certified for use in the AB2K MMADS™. This smoke solution has been specially formulated for the product line. Other commercially available smoke solutions contain different chemical properties that will greatly degrade system performance or could cause serious injury to the operator and create an explosive hazard. Never use any third party smoke solution in the AB2K MMADS™ system.

The AB2K MMADS™ is capable of dispensing many less-than-lethal formulations in a high-density aerosol form. These include the following:

Training Smoke

Standard non-toxic training smoke can be used as follows:

- First Responder Training (fire, police, emergency services, civil defense)
- Realistic Training Drills on Ships, Aircraft, Factories, etc.
- Entertainment Industries and Special Effects
- Leak Testing
- Urban Warfare (MOUT)
- Battlefield Obscuration
- Realistic Battlefield Simulations
- Obscuration for Water Landings

The chemical make-up of the non-toxic training smoke solution has been independently reviewed by the North Carolina Department of Environment, Health, & Natural Resources and NONE of the chemicals are on the toxic list of air pollutants.

Irritants

MSI Delivery System's standard non-toxic training smoke solution can be mixed with specific irritants, such as Capsaicin Irritant (OC), to upgrade the capabilities to include:

- Crowd Control and Civil Unrest

- SWAT Teams and Tactical Incursions
- Corrections Departments (Riots / Prisoner Extraction)
- Non-lethal Terrorist Suppression
- Urban Warfare (MOUT)

MSI Delivery Systems Inc. does not provide irritants. The purchase, formulation and usage of irritants are the exclusive responsibility of the customer.

Specialized Deployments

Standard non-toxic training smoke can be mixed with mission-specific chemical agents to upgrades the capabilities to include:

- Neutralizing Chemical Attacks
- Decontamination / Fumigation
- Infestation Control

Specialized deployment formulations are proprietary and not provided by MSI Delivery System Inc.

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Section 3 – Critical Safety Information

This section contains detailed warnings, cautions and rules of safe operation. This critical safety information is necessary for safe operation of the AB2K MMADS™ for its intended use, correct installation, start-up and operation.

Understanding and observing all instructions in this manual is critical. MSI Delivery Systems Inc. expressly disclaims any liability for injury to persons or damage to property, which results from operator neglect or failure to understand and follow the precautions and procedures contained in this manual.

This manual cannot cover all conceivable applications for field deployment. If additional information, or if special problems arise that are not sufficiently addressed in this manual, please seek assistance from your field training officer or instructor, particularly regarding mission-specific deployments. See the *Getting Help* section for additional details.

Read and understand this section in its entirety before using the AB2K MMADS™.

This manual should always accompany the AB2K MMADS™ and be transferred with it upon change of ownership.

Safety Symbols

This manual displays various safety symbols to provide special attention to certain types of safety information. Pay particular attention to the following:

- Always observe the safety symbols in this manual.
- Ensure that the safety-relevant decals on the equipment are legible.
- Replace damaged or illegible information signs and decals as required.

SAFETY FEATURES

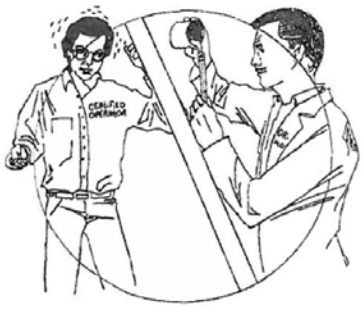
- The AB2K-MMADS™ was designed with safety in mind. The safety features are as follows:
- Pressure release valves to prevent over pressurizing the cylinders
- Safety interlocks for the trigger to prevent accidental firing.
- Check valves to ensure the chemicals flow in one direction eliminating back pressure
- Quick couplers for rapid recharging without gasses escaping

- Specialized insulating technology to minimize the possibility of burns
- Temperature Controller Box prevents overheating.
- Solenoid Valve equipped with explosion-proof mechanism.
- Solenoid and Temperature Controller Box powered by a 12-Volt battery.

General Safety Considerations

- The AB2K MMADS™ has been designed and manufactured reflecting the utmost care for operator safety. However, improper use or bypassing safety protocols may cause serious injury to the operator or third parties or may damage the equipment or other property.
- The AB2K MMADS™ should only be used in accordance to the procedures in this manual. A sound knowledge of all basic operating instructions and safety regulations is the basis for safe handling and operation of the equipment.
- Never operate or attempt to load a damaged AB2K MMADS™ system. Equipment malfunctions, particularly impacting safety features, must be repaired immediately.
- **DO NOT** use or handle the AB2K MMADS™ if taking any medications.

- Never drink alcoholic beverages or take medications that can impair vision, balance, or judgment before or during the use of the AB2K MMADS™



LPG (Propane) Safety

LPG gas, commonly referred to as propane in many countries, is a pressurized and high flammable substance that is used as a fuel to generate the combustion in order to create the heat necessary to atomize the smoke solution into a gas. As such, every person handling the equipment must be thoroughly familiar with the safety protocols for handling LPG.

Because LPG (propane) gas is a HIGHLY FLAMMABLE commodity, the refiners add an additive to it during manufacturing that gives it a distinctive odor similar to "rotten eggs". The purpose of this additive is to provide a method to alerted users to potential LPG leaks in equipment or fittings.

If gas is **SMELLED, or LEAKING GAS IS HEARD** do the following:

- **SHUT OFF THE GAS.** If the gas leak is suspected on the AB2K MMADS™, turn off the gas supply valve on the AB2K MMADS™ to the OFF position by rotating the gas valve 90 degrees clockwise (move the valve to a vertical position).
- **DISCONTINUE OPERATION…**and do not resume operation until the source of the gas leak has been located and corrected. If necessary, leave the area! Get everyone out of the building or area where the suspected gas is leaking.

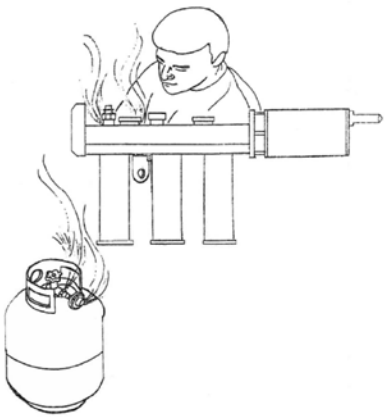
- **NO FLAMES OR SPARKS!** Immediately extinguish all smoking materials and other open flames. Do not operate lights, appliances, telephones, or cell phones. Flames, static electricity, or sparks from these sources can trigger an explosion or fire.

SHUT OFF THE GAS. If the gas leak is suspected at the recharge station or area, turn off the main gas supply valve on the tank, if it is safe to do so. To close the valve, turn the tank valve to the right (clockwise) until it is fully closed.

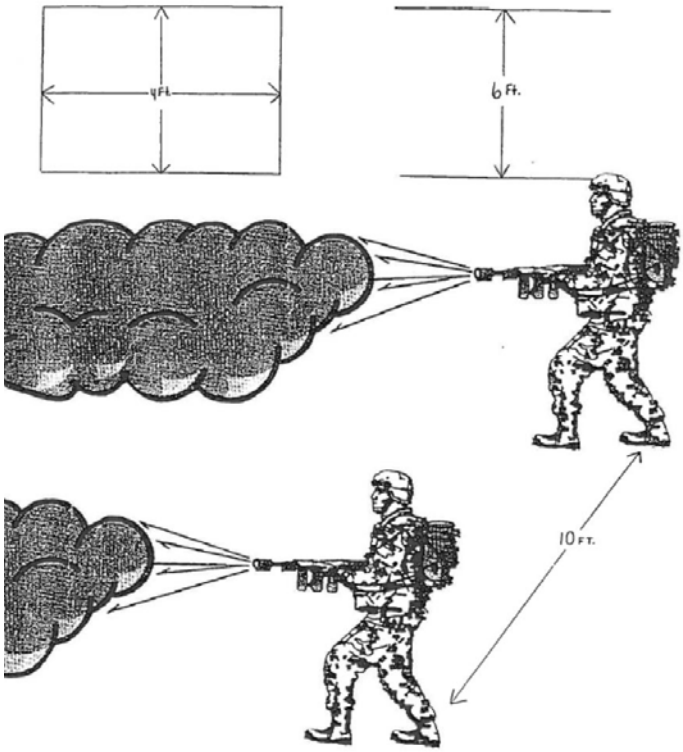
- **REPORT THE LEAK.** If the gas leak is somewhere on the recharge equipment, contact the appropriate personnel immediately and take the recharge unit out of service. Before using any phones, radios or other equipment, be sure you are away from the source of the gas leak. If the appropriate personnel cannot be reached and there is still a gas leak, contact your local emergency services (911) or the local fire department.
- **DO NOT RETURN TO THE BUILDING OR AREA** until the source of the leak as been determined, corrective action taken, and appropriate personnel have determined that it is safe to do so.
- **GET THE SYSTEM CHECKED.** Before attempting to reuse the equipment, the LPG (Propane) retailer or a qualified service technician must check the entire system to ensure it is leak-free.

Operating Safety

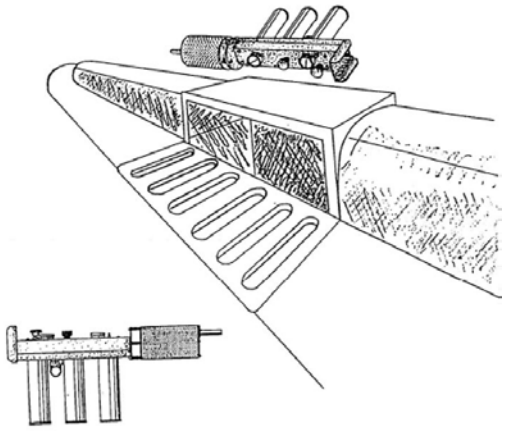
- The AB2K MMADS™ and associated support equipment should be surveyed for leaks on a periodic basis and all main valves inspected to ensure that they are operable.
- Be alert for the 'rotten egg' odor of LPG, which may indicate a potential leak.



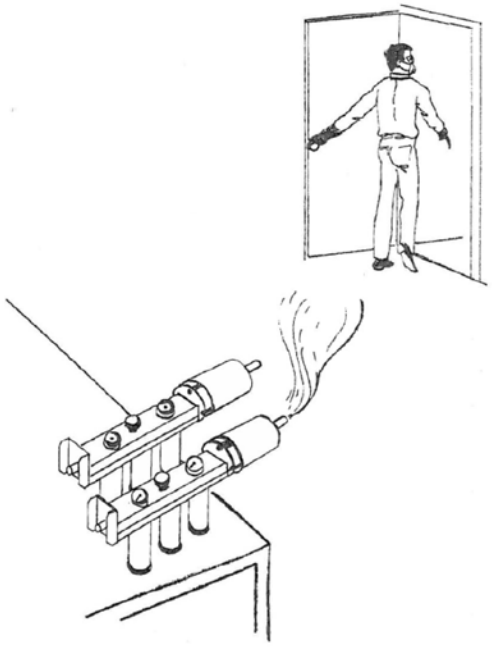
- Explosion and asphyxiation are the main risks with LPG. Asphyxiation means loss of consciousness and suffocation.
- LPG gas is heavier than air. If it leaks from equipment or cylinders, it can accumulate in low lying areas such as basements, pits, and trenches.
- If enough LPG gas collects in a low-lying area, it displaces air. Entering an area with a high concentration of LPG can cause loss of consciousness.
- Always use the AB2K MMADS™ in well-ventilated areas. LPG fired equipment releases carbon monoxide (CO_2) --- an odorless and tasteless gas byproduct that can be lethal. The first signs of CO_2 poisoning are headache and fatigue.
- Maintain minimum clearance from normal combustible materials as follows – sides 4 feet, top 6 feet. Locate 10 feet from other qualified operators while in use.



- Use only in accordance with local codes or in the absence of local codes, with the standard for the storage and handling of Liquefied Petroleum Gases ANSI/NFPA 58-1989.
- Do not allow the AB2K MMADS™ to lay or stand on hot asphalt or hot cement, or any heated surfaces, or any surfaces that may conduct heat. This may cause an increase of pressure inside the cylinders.



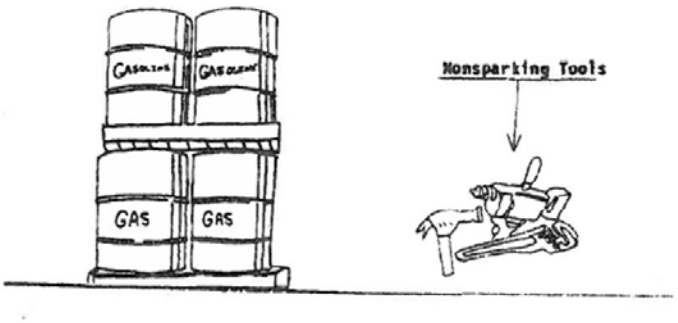
- The AB2K MMADS™ is to be used by trained personnel only.
- Always handle the AB2K MMADS™ as if it were loaded.
- DO NOT MODIFY the AB2K MMADS™.
- NEVER operate a modified AB2K MMADS™ system.
- Operators and bystanders must always wear an approved eye and breathing protection (as mandated by your field training officers or instructors).
- Never leave the AB2K MMADS™ unattended.



- Always take precautions to maintain proper balance while operating the AB2K MMADS™.

- Do not use the AB2K MMADS™ as a battering ram without the battering ram attachment properly installed on the device. Without the battering ram attachment, it may cause damage to the combustion chamber.

- Never use the AB2K MMADS™ in an explosive or in a flammable atmosphere/environment or when non-sparking tools are required.



Operator Training is required

The AB2K MMADS™ is designed for use by qualified operators only. For certification procedures, contact your field training instructor or purchasing agent. Additional information can be obtained from MSI Delivery System Inc. at http:///www.MSI-DeliverySystems.com.

Additional information

For additional safety information on LPG or Nitrogen gas, contact your local gas supplier. Also resources are available on web sites sponsored by the U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration (http://www.phmsa.dot.gov).

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Section 4 – Quick Step Operational Guide

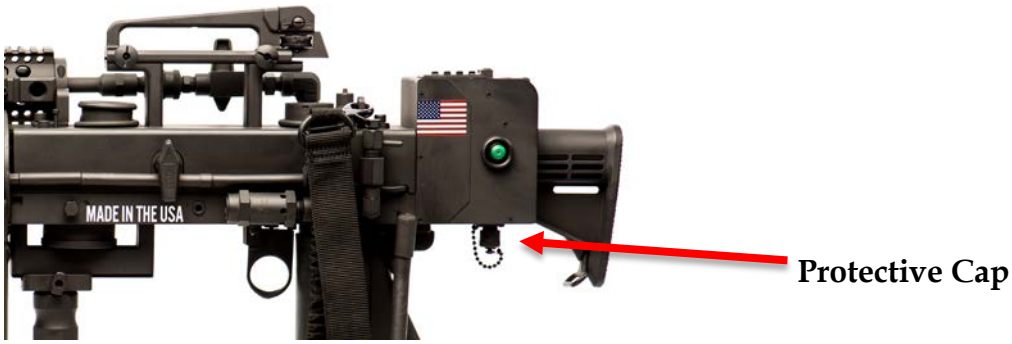
Basic Sequence of Operation for all Models – Easy Step Guide

The AB2K MMADS™ is placed into operation by deactivating the [safety], which is performed by turning the unit on by pressing the green on/off button, rotate the gas valve 90 degrees counter-clockwise to enable LPG gas flow, then depressing the [piezoelectric igniter] to start combustion. Typical warm up time, from standard temperature is approximately 2.45 to 3 minutes. This brings the heat exchanger to operating temperature. The operator then acquires the target area, and pulls the **[**trigger**]** to initiate the flow of aerosol.

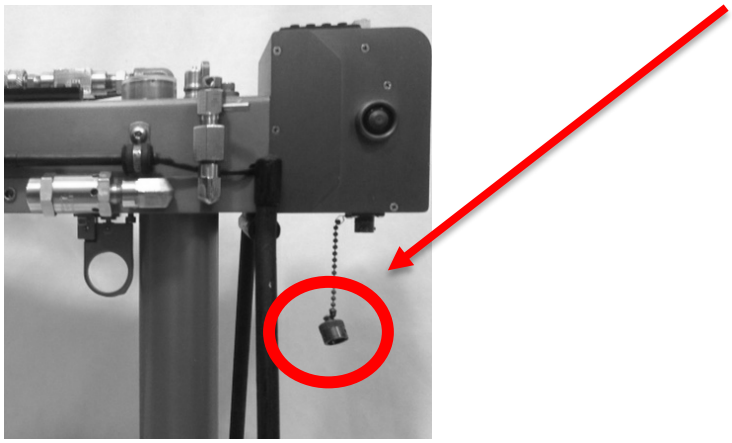
Step 1. Remove the AB2K-MMADS smoke generator from the carrying case and place on stand. *Note: The protective cap should always be kept closed unless AB2K-MMADS battery need charging or auxiliary battery pack is connected.*

AB2K-MMADS Support Stand

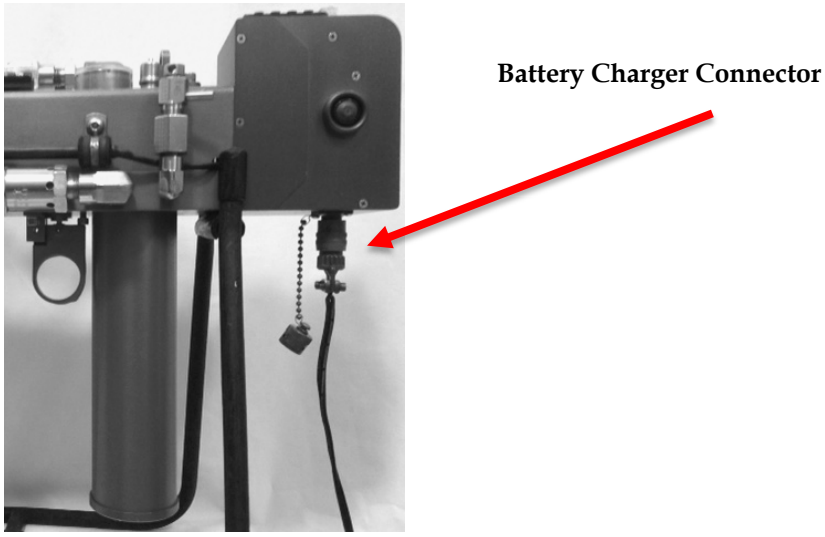
AB2K-MMADS Support Stand



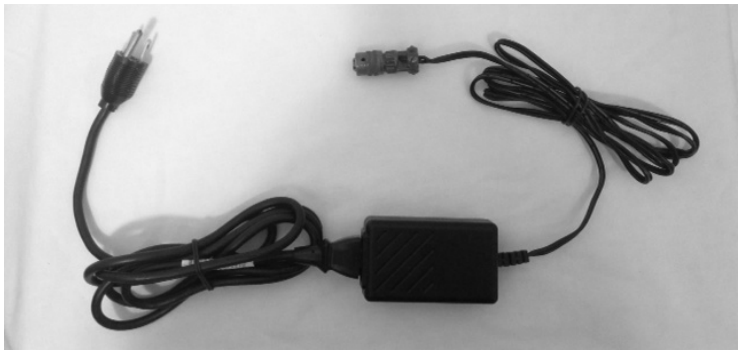
Step 2. Remove the protective cover cap from the battery charger connector.



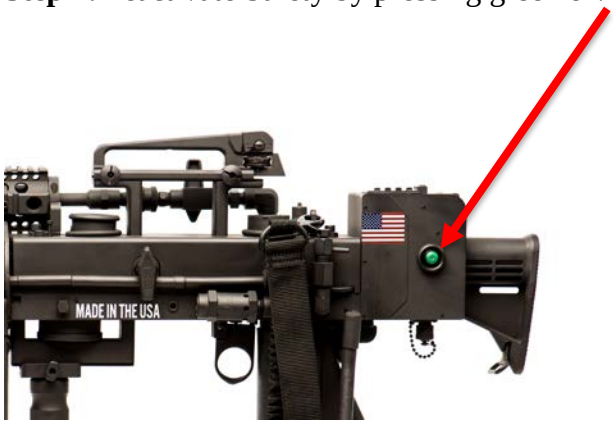
Step 3. Insert the battery charger connector to the AB2K-MMADS charger port beneath the butt plate controller box. Charging the battery should take no longer than 3 hours for a full charge.



Note: See battery pack charger cord and connector below. Operate using 110-240 VAC. Cord can convert to international standards.



Step 4. Deactivate Safety by pressing green on/off button



Step 5. Rotate Vertical Gas Valve to a Counter Clockwise position 90 degrees

Step 6. Depress Piezoelectric Igniter

Step 7. Monitor Butt Plate for standard operating temperature (1250 degrees)

Step 7. Pull Trigger to initiate aerosol when temperature reaches desired settings

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Section 5 – Features and Controls

Combustion Chamber

The LPG gas source is used to heat the high performance heat chamber. The heat chamber incorporates proprietary shielding and insulation technology that result in the heat chamber retaining over 90% of the heat energy generated inside the combustion chamber. This results in a highly efficient design providing the AB2K MMADS™ with a unique stealth-mode capability (refer to the subsection *Stealth-Mode Capability*). A single charge of the LPG source provides ample energy reserves to fully discharge a loaded high-capacity backpack resulting in over 320,000 cubic feet (9,061 cubic meters) of smoke.

Aerosol Generation

Once the barrel is heated (approximately 2.5-3.0 minutes), aerosol generation is accomplished through high-pressure injection of a fluid media into the heat exchanger. Nitrogen is used as an inert gas to pressurize the solution from 500 to 2000 PSI. The pressurized fluid is atomized by the heat exchanger creating a vapor that is exhausted in excess of 100 feet (30 meters) from an outlet nozzle. At 500 PSI, the output of the fluid media is approximately 5 ounces (148 milliliters) over a twenty second period.

Smoke Characteristics

Typical aerosol particle size generated by the system is in the 0.2 to 0.4 micron range.

The major difference between the AB2K MMADS™ and smoke generated by other type's products is the buoyancy. Combustion byproducts have a tendency to rise rather than settle. This is a result of energy, in the form of heat, being imparted to the smoke plume from fuel combustion. Aerosol generated using the

AB2K MMADS™ has a lower level of energy being imparted to the vapor, and therefore tends to settle rather than rise.

These smoke-like characteristics, combined with low buoyancy, result in a versatile system that can be used for applications ranging from generation of a battlefield obscurant to localized delivery of irritants. One fully charged standalone product effectively expels over 50,000 cubic feet of fine particulate aerosol and one fully charged dependent unit with backpack expels over 320,000 cubic feet of fine particulate aerosol.

AB2K MMADS Cylinders

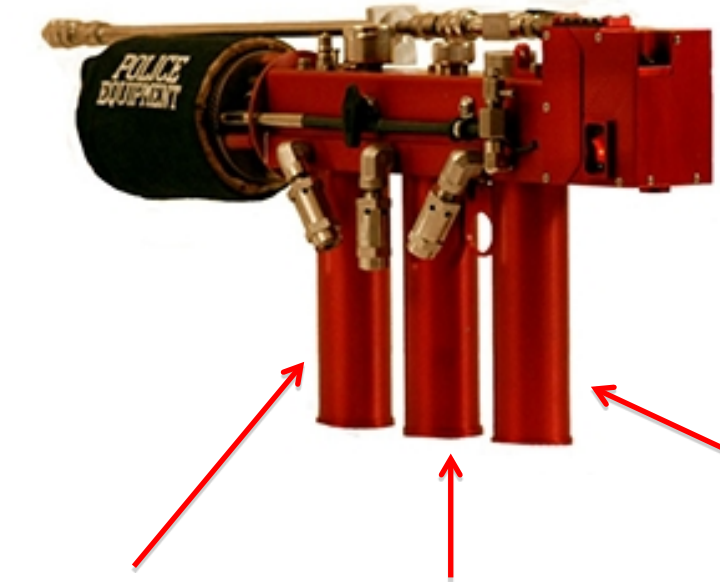
The AB2K MMADS™ standalone delivery system (AB2K-SA) was designed with three (3) cylinders attached to its base (see Figure 4). The AB2K-DV MMADS contains only 1 cylinder which is the reservoir for containing Propane only! (See Figure 5) These cylinders interact as follows:

- The front cylinder is filled with nitrogen, the propellant that forces the chemicals through the heater coils.
- The nitrogen travels through the manifold to the center cylinder where the smoke solution is located. The nitrogen pressurizes the solution cylinder.
- The third cylinder is filled with LPG (Propane) and is used for the heat source.

Never use any chemical or solution in the AB2K MMADS™ other than the solutions recommended by MSI Delivery Systems Inc.

The Nitrogen and LPG (Propane) cylinders are under high pressure - DO NOT HANDLE the cylinders roughly.

AB2K-STAND ALONE 450 PSI MAXIMUM PRESSURE



Nitrogen Cylinder **Smoke Solution Cylinder** **Propane Cylinder**

Figure 4

AB2K-DEPENDENT 2000 PSI MAXIMUM PRESSURE

Maximum PSI for liquid dispenser (Cannon) 2000 PSI

Propane Cylinder

Figure 5

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Section 6 – Preparing for Use

This section provides detailed instructions to prepare the AB2K MMADS™ for use.

Before beginning this procedure, read and understand in its entirety the safety information detailed in the section *Safety Information*.

CALL 911 AND ADVISE OPERATOR OF BURN AND SEEK MEDICAL ATTENTION IMMEDIATELY OR FOLLOW COMPANY POLICY REGARDING FIRST AID.

CHARGING THE LPG CYLINDER

Applies to both versions

Visually inspect the AB2K MMADS™ for any signs of damage. If damaged, repair before using.

NEVER OPERATE a damaged AB2K MMADS™. If a unit appears damaged in any way, remove from service and tag as DEFECTIVE.

1) Make sure the ball valve is in the closed position and the safety to the ball valve is locked in place.

This procedure should be performed in a well-ventilated area, free from any sparks and flame, or high heat elements, or anything that will cause a spontaneous combustion.

Never smoke when filling the AB2K MMADS™ with LPG (Propane).

Do not fill the AB2K MMADS™ with LPG while the combustion chamber is “HOT”.

2) Make sure the work area is clean and free from loose debris or from any other material that may cause a spark.

3) Check the LPG (Propane) tank for leaks with a soap and water solution.

Never use fire to check for leaks.

If a leak is found in the LPG (Propane) tank or hose, remove from service and tag as DEFECTIVE.

DO NOT USE the LPG (Propane) tank or hose until it is properly repaired by a certified technical service department.

4) Check the area for bystanders that may be intending to smoke or attempt to operate a machine that may cause a spark.

Stop all potentially unsafe procedures and turn off the liquid level gauge.

Do not proceed until the area is free from all hazards.

5) Make sure the adapter on the quick connect LPG hose is turned off and the LPG (Propane) tank is turned off.

6) Remove the protective yellow dusk cover from the quick coupler nipple on the top of the AB2K MMADS™.

7) Connect the LPG (Propane) adapter to the quick coupler nipple on top of the AB2K MMADS™.

8) On the left side of the base of the AB2K MMADS™, remove the protective yellow dusk cover from the liquid level gauge.

9) Open the liquid level gauge about ½ of a turn.

10) Completely open the LPG (Propane) valve on the recharging station and then turn the valve 1/4 of a turn back to the closed position. This will ensure that the valve is open completely.

11) Open the LPG (Propane) adapter valve, which is connected to the top of the AB2K MMADS™. At this time, watch for the first sign of liquid LPG (Propane) coming from the liquid level gauge.

If liquid LPG (Propane) is seen coming from the liquid level gauge, IMMEDIATELLY turn the liquid level gauge off (hand tight), then replace the protective yellow dusk cover over the liquid level gauge.

12) Turn off the LPG (Propane) adapter valve, which is connected to the AB2K MMADS™.

13) Turn off the LPG (Propane) valve at the LPG (Propane) tank on the recharging station.

14) Disconnect the LPG (Propane) adapter valve from the top of the AB2K MMADS™ then replace the protective yellow dusk cover.

LOADING THE SOLUTION CYLINDER

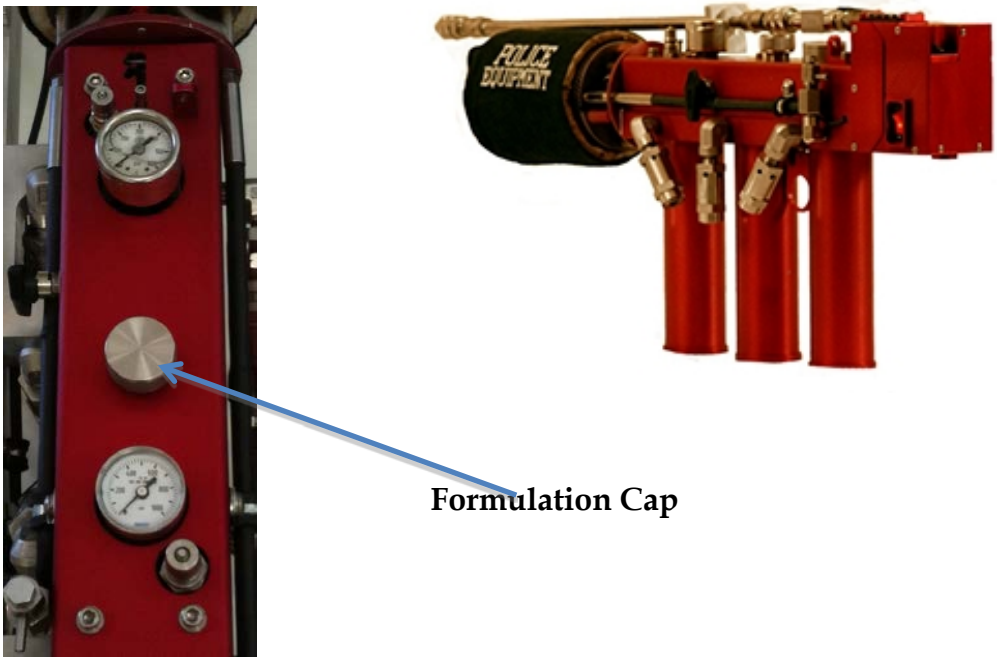
Applies to Standalone Version Only

1) Visually inspect the AB2K-SA MMADS™ for any signs of damage. If damaged, repair before using.

DO NOT OPERATE a damaged AB2K MMADS™.

2) Place the AB2K-SA MMADS™ on a flat, stable surface and make sure that the [safety] at the [trigger] is in the Lock position.

3) Remove the [formulation cap] slowly and place to one side of the flat surface.



4) Put 8 to 16 ounces of formulation into the solution cylinder and replace the [formulation cap] with hand-tight pressure.

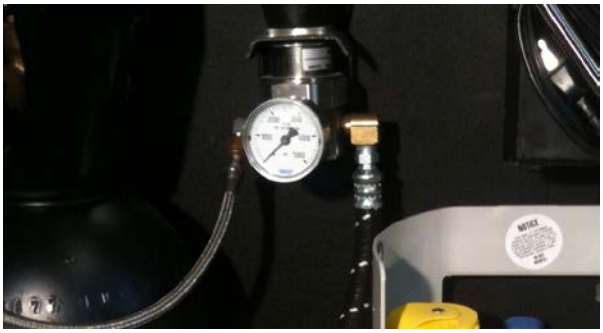
CHARGING THE NITROGEN CYLINDER

Applies to Standalone Version Only

Visually inspect the AB2K-SA MMADS™ for any signs of damage. If damaged, repair before using.

DO NOT OPERATE a damaged AB2K MMADS™.

5) Make sure the Nitrogen Regulator is set at 450 before attempting to charge the AB2K-SA MMADS™ with Nitrogen.



Set the Nitrogen Regulator to 500 up to 1000 PSI before attempting to charge the nitrogen cylinders on the AB2K MMADS™.

DO NOT OVER charge the Nitrogen or LPG (Propane) Cylinders.

Watch the gauges at all times.

6) From the Nitrogen Regulator, attach the Nitrogen quick coupler body to the Nitrogen quick coupler nipple on the top of the AB2K-SA MMADS™.

7) While watching the nitrogen pressure gauge on the top of AB2K-SA MMADS, slowly turn on the shut off valve from the nitrogen hose to allow nitrogen to fill up the nitrogen cylinder and the solution cylinder on the AB2K-SA MMADS.

8) At this point the nitrogen pressure gauge will begin to move towards the desired regulated pressure that is preset by the regulator from the recharging station, once it meets that desired pressure, cut off the shut off valve from the hose and from the recharging station nitrogen tank.

9) Remove the nitrogen quick coupler body from the nitrogen quick coupler nipple on top of the AB2K-SA MMADS

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Section 7 - Activating the AB2K MMADS

This section provides detailed instructions to turn on the AB2K MMADS™.

Before beginning this procedure, read and understand in its entirety the safety information detailed in the section *Safety Information*.

DO NOT PUT face, hands, clothing or any other body parts near the combustion chamber or shroud. It becomes very hot while in operation (up to 1800° inside the chamber).

Ignition Sequence

1) Holding the AB2K-SA MMADS with your right hand, use your left hand to release the gas valve safety lock.

2) To engage the heat source, the following sequence must be done in rapid succession:
   - Rotate the gas valve 90 degrees counter-clockwise (to a horizontal position) to initiate LPG gas flow.
   - Allow the gas to run for a maximum of 2 seconds to clear the lines of any air.
   - Place thumb on the igniter button and push rapidly.
   - If the unit does not ignite immediately, press rapidly 2 more times.
   - If the unit fails to ignite, rotate the gas valve 90 degrees clockwise (to a vertical position) to turn off the gas, then refer to the instructions below:

If the AB2K-SA MMADS™ does not ignite, do the following:

1. After turning off the LPG gas source, wait 30 seconds.
2. Ensure the [safety] is engaged at the [trigger].
3. Move the air flow adjuster to position Number 1 or position Number 2.
4. Rotate the LPG valve to a horizontal position to initiate the gas flow and push the igniter button once or twice.
5. Once ignition is achieved, return air flow adjuster back to position Number 0.

3) After ignition is successfully achieved, allow the combustion chamber to reach operating temperature. This takes about 2 ½ - 3 minutes.

Targeting & Aerosol Dispersion

- BEFORE pulling the [trigger] to initiate, aerosol flow, ensure that any personnel are at least ten (10) feet away from the front side of the nozzle.

- Never place finger on the [trigger] until ready to initiate aerosol flow and discharge the smoke solution.

- Unlock the [safety] from the [trigger] and prepare to fire.

- Acquire your target and squeeze the [trigger] to initiate aerosol flow.

- Never place hand over the nozzle. Accidental discharge can cause serious injury, resulting from serious burns.

For each [trigger] burst, approximately five (5) ounces which is equal to (148 milliliters) of smoke is dispensed. Please note that the solution cylinder on the standalone version holds up to sixteen (16) ounces of liquid.

The smoke will project in excess of 100 feet (30 meters) or more from the device using 2000 PSI of pressure.

- The smoke will disperse based on how the operator stands and positions the product.
- For a low-laying dispersion, point the product 20 degrees downward and initiate the aerosol flow. To cover a wide area, slowly pan the product left and right of the center position.
- For a wide and uniform dispersion, keep the product level and initiate the aerosol flow. Slowly pan left to right to create a wider dispersion zone.
- To smoke an area going uphill or up a staircase, point the product upward in the general direction of the target area and initiate the aerosol flow.

Charging the High Capacity Backpack with Nitrogen and Liquid Solutions

Step 1) Remove the high-capacity AB2K-MMADS backpack from its carrying case, then extend the *telescopic handle* on the *recharging station*, then secure handle with carter pen. Then mount the backpack upside down on the backside of the recharging station between the tray and the telescopic handle and secure tightly.



Step 2) Connect the *auxiliary pressure gauge* / *relief valve* to the solution line from the backpack, this procedure will ensure you that there is no pressure on the solution cylinder before removing it from the backpack. **NOTE:** If the *pressure gauge* indicates that there is pressure on the *solution cylinder*, open the release valve from the auxiliary gauge / pressure release valve and remove all excess pressure from the *solution cylinder*.



Step 3) Remove the Velcro strips from the solution cylinder on the backpack, then disconnect the quick connectors from the backpack to the solution cylinder.

Step 4) In order to put your formulations of solutions in the solution cylinder you must remove the valve from the top of the solution cylinder with an open end non sparking wrench. The non sparking open end wrench will be found in your auxiliary tool pack.

Step 5) Fill the solution cylinder with 64 ounces of formulation solution that is recommended in this manual for this type of apparatus.

Step 6) With your non sparking open end wrench re-attach your solution valve to the top of your solution cylinder. Do not over tighten!

Step 7) Re-connect your solution cylinder to the frame of the backpack by connecting the quick couplers tightly together. Once you hear the click from the quick coupler nipple and the quick coupler body coming together, at that point you have reconnected the solution cylinder correctly. Now reattach the Velcro strips.

Step 8) the regulator on the backpack and the recharging station will be preset from the manufacturer for maximum pressure of 2000 PSI.

Step 9) Connect the nitrogen hose to the quick connect auxiliary connection coming from the nitrogen tank on the back pack.

Step 10) Open the valve on the nitrogen tank, turn it clockwise until it comes to a full stop, now rotate the valve a half turn counterclockwise and leave it in that position until the next procedure is completed.

Step 11) Turn on the safety valve from the recharging station hose to the auxiliary connection beneath the backpack nitrogen cylinder.

Step 12) Turn on the nitrogen tank on the recharging station slowly, at that point you will begin to hear the nitrogen entering into the backpack cylinder and solutions cylinder, as the pressure continues to flow you will see the gauge on the Backpack Regulator indicating the amount of pressure that you desire to have in the backpack, maximum pressure 2000 PSI

Step 13) After you have reached your desire pressures, turn the valve off to the nitrogen tank on the recharging station, turn the valve off also on the nitrogen line that is connected to the auxiliary connection to the backpack nitrogen cylinder indicated as your safety shut off valve, turn off the backpack nitrogen valve on the nitrogen cylinder. **After completing this procedure the backpack nitrogen cylinder and solution cylinder should be completely full and ready for deployment.**

Step 14) Now bleed off your nitrogen pressure hose and disconnect it from your backpack auxiliary quick connect.

Step 15) you are now ready to remove the backpack from the recharging station. Pull the backpack up vertical and turn it right side up allowing the valves on the backpack solution cylinder and a backpack nitrogen cylinder to be pointing towards the ground. Now place the backpack on your back by inserting your arms in each loop, one on the right side and on the left side of your body, pull the straps down towards the ground to tighten the backpack frame to your body, now tighten the strap around your waist to a comfortable fit.

Step 16) Insert the nitrogen solution line from the backpack to the AB2K-MMADS. Slowly turn on the safety valve from the nitrogen/solution line from the backpack. You will now begin to see the pressure gauge on the smoke generator move towards your desire pressure. End of procedure for charging the high-capacity backpack.

AFTER USE:

Step 17) After use of the AB2K and you are ready to disconnect from the backpack, you will need to turn the Nitrogen valve off from the backpack. Please perform this step before disconnecting the AB2K from the backpack. If this procedure is not done, you will experience pressure on your gauge and your hose and there will be pressure on your quick connect which will may it very difficult to disconnect the AB2K from the backpack.

If this procedure is not preformed it may cause serious injury to the user. Shortcuts are not acceptable!

Step 18) To remove the nitrogen hose from the AB2K make sure all your safety hoses are turned off. Point the AB2K towards the ground and squeeze the trigger. This will release the pressure so you can remove the quick connect with ease. At this point you can remove the backpack. If cleaning is required before the unit is placed in the case, please use only the **recommended cleaning solutions in this manual** for the AB2K Smoke Generator and the AB2K Backpack.

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Section 8 – Stealth Mode Operations

This section provides detailed instructions to enter Stealth Mode on the AB2K MMADS™. The Stealth Mode is a function of the efficiency of the AB2K MMADS™ design whereby once the combustion chamber has been heated to full operating temperature, the heat source can be disengaged (turned-off) and the combustion chamber retains enough heat energy for up to 10 minutes (see Note 1) and is capable of 2 successive trigger bursts before the heat source must be reengaged.

Stealth Mode is particularly useful for tactical incursions, such as a drug bust or non-lethal terrorist suppression, where a covert approach is essential. **DO NOT enter into explosive or volatile environments to locate the source of gas leaks where an open flame is prohibited and could contribute to an explosion.**

Another benefit of Stealth Mode operations is during extended deployments whereby law enforcement personnel may be deployed on a line for hours (4-6 hours before recharging is necessary) at a time. The Stealth Mode allows enforcement personnel to conserve the LPG source (instead of running it continuously) and still have the unit fully operational at all times.

Stealth Mode

1. Once the AB2K MMADS™ has achieved full operating temperature (1 to 2 minutes after engaging the heat source), rotate the gas valve 90 degrees clockwise (to the vertical position) to disable the LPG gas flow and disable the flame within the heat source. This is Stealth Mode --- the unit remains fully operational and capable of deploying aerosol, yet the heat source is disengaged and no noise emanating from the equipment.

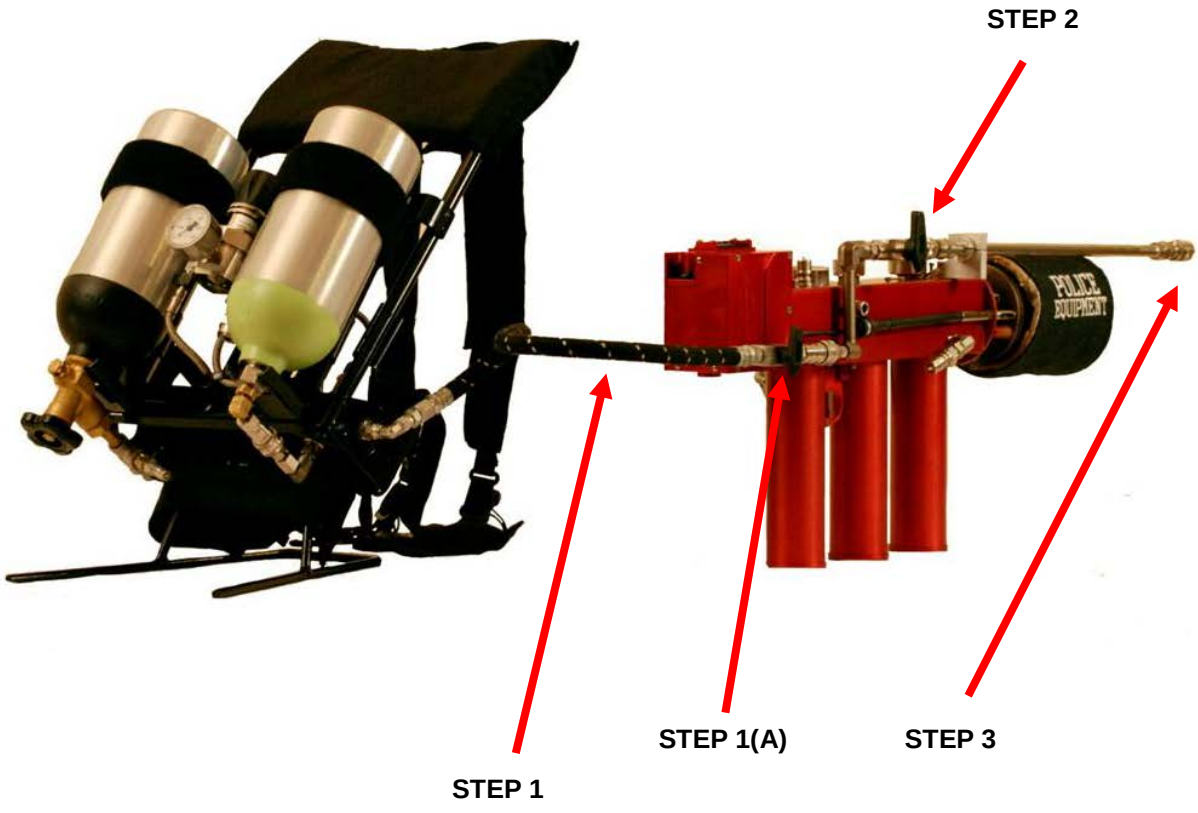
2. Stealth Mode energy reserves can be maintained approximately 10-minutes (see Note 1)

Preparing the Cannon for Deployment for Deployment of Liquid Solutions

Step 1. Insert the nitrogen solution line from the backpack to the AB2K-MMADS. 1(A) Slowly turn on the safety valve from the nitrogen/solution line from the backpack, you will now begin to see the pressure gauge on the smoke generator move towards your desire pressure.

Step 2. Turn on the auxiliary safety valve from the liquid dispenser

Step 3. Point the AB2K-MMADS in the direction of deployment, then pull handle down on the liquid dispenser trigger valve. At this point liquid will be deployed from the nozzle tip of the liquid dispenser. This phase will allow you to deploy short trigger pulls or empty the liquid solutions in the back pack.



Extended Deployments

1. Once the AB2K MMADS™ has achieved full operating temperature (1 to 2 minutes after engaging the heat source), rotate the gas valve 90 degrees clockwise (to the vertical position) to disable the LPG gas flow and disable the flame within the heat source. This is Stealth Mode --- the unit remains fully operational and capable of deploying aerosol, yet the heat source is disengaged and no noise emanating from the equipment.

2. Stealth Mode energy reserves can be maintained approximately 10-minutes (see Note 1)

3. After 10-minutes (see Note 1) in Stealth Mode, rotate the gas valve 90 degrees counterclockwise (to the horizontal position) and press the igniter to engage the heat source. Allow the unit to heat to full operating temperature (1 to 2 minutes after engaging the heat source), then rotate the gas valve 90 degrees clockwise (to the vertical position) to disable the LPG gas flow and disable the flame within the heat source.

4. Performing this procedure repeatedly during the deployment will significantly extend the amount of time a single unit can be deployed without requiring a recharge.

(Note 1) The 10-minute energy reserve is an estimate based on standard temperature, pressure, humidity, elevation, etc. It is the operator's responsibility (or their qualified field training officer) to experimentally determine the effectiveness of Stealth Mode operations based on the local environment and to determine the time constraints for incorporation into their training methods.

Section 9 – Shutdown Sequence

This section provides detailed instructions to shut down the AB2K MMADS™.

System Shutdown

1. Rotate the gas valve 90 degrees clockwise (to the vertical position) to disable the LPG gas flow and turn off the heat source.

Make sure the valve is in the locked position and held by the valve safety lock.

2. If the deployment is complete, then engage the [safety lock] on the [trigger].

3. Allow the unit to cool completely before clean up or placing the unit into the storage and transport case.

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Section 10 - Post Operation and Care

Overview

This section provides important information in the after operation care of the AB2K MMADS™

Before beginning this procedure, read and understand in its entirety the safety information detailed in the section *Safety Information*.

For technical problems or issues refer to *Technical Support* sub-section found in the section *Getting Help*.

Never store the AB2K MMADS™ when the combustion chamber is HOT. Allow it to cool down for one (1) hour or longer to avoid burns, fire or injury.

Do not service the AB2K MMADS™ while it is HOT.

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Do not submerge the AB2K MMADS™ into hot water or hot liquid while LPG or Nitrogen is inside the cylinders. This may cause an increase of pressure inside the cylinders.

After each use always replenish the Nitrogen and Propane or other recommended solutions. This step is **highly** recommended to ready the AB2K-MMADS for next use.

Always recharge the battery before replacing the unit fully charged back into the storage case. *See section on recharging battery.*

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Section 11 - Purge Operations

This section provides detailed instructions to purge the LPG and Nitrogen from the AB2K MMADS™...

Before beginning this procedure, read and understand in its entirety the safety information detailed in the section *Safety Information*.

LPG Purging Procedure

The LPG purge operation applies to both AB2K MMADS™ variants.

1. Allow the AB2K MMADS™ to cool down for one (1) hour or longer.

2. Select a well-ventilated area free from all hazards.

3. Check the area for bystanders that may be intending to smoke or attempt to operate a machine that may cause a spark.

Advise bystanders that there is LPG (Propane) gas and they cannot smoke or work on a machine or operate a machine that may cause a spark or spontaneous combustion until all procedures have been completed.

4. After any potential hazards are resolved, remove the yellow protective cover from the liquid level gauge.

5. Open the liquid level one-half (1/2) turn to release the unused LPG (Propane) gas.

6. After the LPG cylinder is emptied, turn the liquid level gauge to the “OFF” position and replace the protective yellow cover.

Nitrogen Purging Procedure

The Nitrogen purge operation only applies to the AB2K MMADS™ Standalone version.

To release the nitrogen, do the following:

1. Point the nozzle toward the ground.
2. Disengage the [safety] on the [trigger] lock.
3. Pull the [trigger] and watch the nitrogen gauge return to zero (0). Continue to hold for five (5) seconds after the gauge has returned to zero. This will assure that all the nitrogen has been disbursed from the nitrogen cylinder.

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Glossary

This section lists terms, phrases, abbreviations, and acronyms associated with the AB2K MMADS™ and this manual.

AB2K-DV	AB2K MMADS™ – Dependent Version
AB2K-SA	AB2K MMADS™ – Standalone Version
CS	CS gas is an aerosol of a volatile solvent (a substance that dissolves other active substances and that easily evaporates); CS gas, which is used as a riot control agent. Exposure causes a burning sensation and tearing of the eyes to the extent that the subject cannot keep their eyes open, and a burning irritation of the nose, mouth and throat mucous membranes causing profuse coughing, mucous nasal discharge, disorientation, and difficulty breathing, partially incapacitating the subject.
FAQ	Frequently asked question
HAZMAT	Hazardous materials
LPG	Liquefied Petroleum Gas (also called LPG, GPL, LP Gas, or auto gas). Also known as propane. LPG gas produces a flame temperature of 3595° F (1980° C)
MICRON	Particle size, one thousandth of a milliliter. All measurements taken in micron must be converted to a thousandths of an inch.
MOUT	Military Operations on Urbanized Terrain
MMADS	Multi-Mission Aerosol Delivery System
MSDS	Material Safety Data Sheet – 2 to 4 page technical document which serves as a primary vehicle giving information about the potential hazards of a substance. The MSDS provides information to handle chemical substances safely.
OC	Oleoresin Capsicum, another term for Pepper Spray
PEPPER SPRAY	OC gas, and capsicum spray, is a lachrymatory agent (a chemical compound that irritates the eyes to cause tears, pain, and temporary blindness) used in policing, riot control, crowd control, and personal self-defense, including defense against dogs and bears.[1][2] Its inflammatory effects cause the eyes to close, taking away vision.
PSI	Pound per square inch

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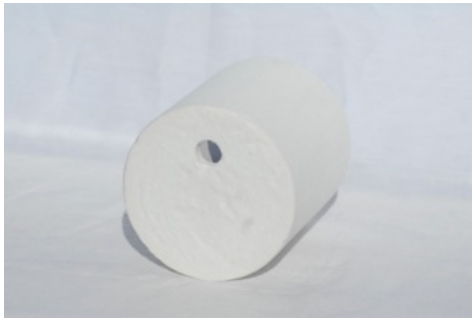
Consumable Accessories and Parts List

MSI-4000192
Outside Jacket with Logo (BA)



MSI-4000097
Outside Insulator Sleeve (BA)

MSI- 4000067-A
MMADS Gun Shoulder Strap

MSI-0000000-14

Backpack Ballistic Shield

MSI-3400053
12 Volt Battery

MSI-3800209
Aluminum Hand Grip Handle

MSI-3600066

Solution Cylinder

MSI-3600026

Nitrogen Tank

MSI-0000000-1

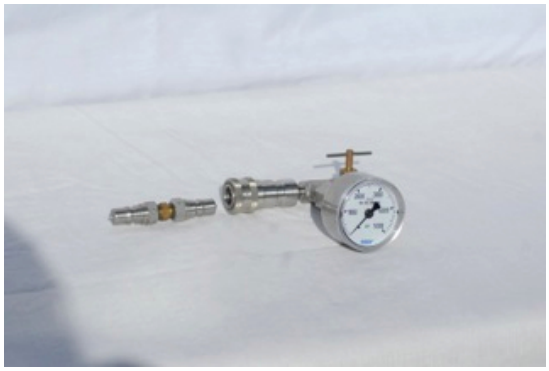
Auxiliary Propane Transfer Line (SS/Brass)

MSI-0000000-2

Solution Containers (Quart, 1/2 Gallon, Gallon)

MSI-3400052

N-1020 Temperature Control Box



MSI-3600143A

Auxiliary Pressure Relief System

MSI-0000000-3

Solution Measuring Bottle

MSI-0000000-4

MSI Specially Cleaning Solution

MSI-0000000-5

Non-Sparking Wrench

MSI-3600200-A

Nitrogen SS Woven Hose with Shutoff and liquid level gauge 5/8 Dia.x54

MSI-SE1530

AB2K Single Protective Smoke generator Case

MSI-0000000-7

MMADS Operators Manual

MSI-3600178

Support Stand

MSI-36000908-A
Liquid Dispenser Canon

MSI-3600098-B
Liquid Dispenser Auxiliary Accessories

MSI-3400180
Military Battery Charger

MSI-0000000-8
AB2K Cooling System

MSI-0000000-9

Propane Cold Shrink for Propane Cylinder

MSI-0000000-10

AB2K Dual Protective Smoke generator Case

MSI-0000000-11

Rubber Hand Grip

MSI-0000000-12

Telescopic Lens (Bulb available in Red, Blue, Amber)

COMPLETE PRODUCT LINE

- AB2K-SA Stand Alone Version
- AB2K-SABP Stand Alone with Back Pack
- AB2K-DVBP Dependent Version and Back Pack
- AB2K-RSG Remotec Robot F6B
- AB2K-RS Recharge Station
- UAF Technology

AB2K RSG Robot Smoke Generator

Superdroid Custom HD2-S Doberman with MSI AB2K Smoke Generator

Another excellent application of our HD2 platform is an order commissioned by MSI Delivery Systems. The HD2 is used as a delivery system for MSI's AB2K Smoke Generator. The AB2K is a smoke and irritant delivery system intended for crowd control and SWAT Teams. Item 1, 2 & 3 are custom HD2-S Doberman models.

Applications: Riot and Crowd Control, AB2K Smoke Generator, Remote Surveillance
Features of this robot include: Tilting 27 x Zom Nose Camera, Gun Mounting Camerra, AB2K Smoke Genertator, Pan ands Tilt Aiming System, Custom Built Digitial Tactical Robot Controller, Extended Duty Trailer Option

Item #1

Item #2

Item #3

AB2K-RSG Remotec Robot

LandShark by Black-i Robotics

PHOTOS OF THE AB2K-MMADS™ SYSTEM IN USE:

Federal Bureau of Prisons SORT team using AB2K-DV at Mock Prison Riot event.

Mock Prison Riot attendees demo the AB2K-MMADS™ Dependent Version.

AB2K-MMADS™ is an effective tool for Fire & Rescue and first Response training.

AB2K-MMADS™ for decon/fumigation, import/export, shipping containers & cargo.

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This section provides an alphabetical cross-reference listing of various functions and key terms within this manual, and it pinpoints the page locations of them.

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Appendix 1 - Specifications

The following specifications are subject to change without notice.

Standalone Delivery System (AB2K-SA)

Area	Unit	Imperial	Metric
Overall Dimensions	Length	24 inches	60.9 cm
	Width	4 inches	10.16 cm
	Height	12 inches	30.48 cm
	Weight	18.5 pounds	8.39 kg
Typical Warm-up Time	Time	30 seconds	30 seconds
Smoke Capacity	Liquid	10 ounces	283.5 g
	Aerosol	50,000 ft^3	1,416 m^3

Dependent Delivery System (AB2K-DV)

Area	Unit	Imperial	Metric
Overall Dimensions	Length	24 inches	60.9 cm
	Width	4 inches	10.16 cm
	Height	12 inches	30.48 cm
	Weight	16.3 pounds	7.39 kg
Typical Warm-up Time	Time	30 seconds	30 seconds
Smoke Capacity	Liquid	64 ounces	1,814.3 g
	Aerosol	320,000 ft^3	9,061m^3

High-Capacity Backpack

The High-Capacity Back Pack is required with the AB2K-DV and is an optional accessory with the AB2K-SA. Depleted units can be recharged "off-line" to ensure optimum field availability

Area	Unit	Imperial	Metric
Overall Dimensions	Length	26 inches	66.04 cm
	Width	12 inches	30.48 cm
	Height	9 inches	22.86 cm
	Weight	22 pounds	9.97 kg
Smoke Capacity	Liquid	64 ounces	1,814.3 g
	Aerosol	320,000 ft^3	9,061m^3

Portable Recharge Station

Area	Unit	Imperial	Metric
Overall Dimensions	Length	29 inches	73.66 cm
	Width	15 inches	38.10 cm
	Height	26 inches	66.04 cm
	Weight	105 pounds	47.62 kg
Average Recharge Time: * AB2K-SA * AB2K-BP	 Time Time	 60 seconds 180 seconds	 60 seconds 180 seconds

High Performance Liquid Smoke Solution

* MSI-Delivery Systems currently sells three types of Training Solutions. **EX Series**- water based, extreme density, **QB Series**-water based, quick evaporation, **SF (specially formulated) series**-pepper irritants and counter strike smoke. The smoke solution can be mixed with specific chemicals to upgrade the mission requirements to include neutralizing chemical attacks, decontamination, urban warfare (MOUT/COIN), tactical incursions, civil unrest and riots, infestation control, etc. See detailed information on Appendix 1.

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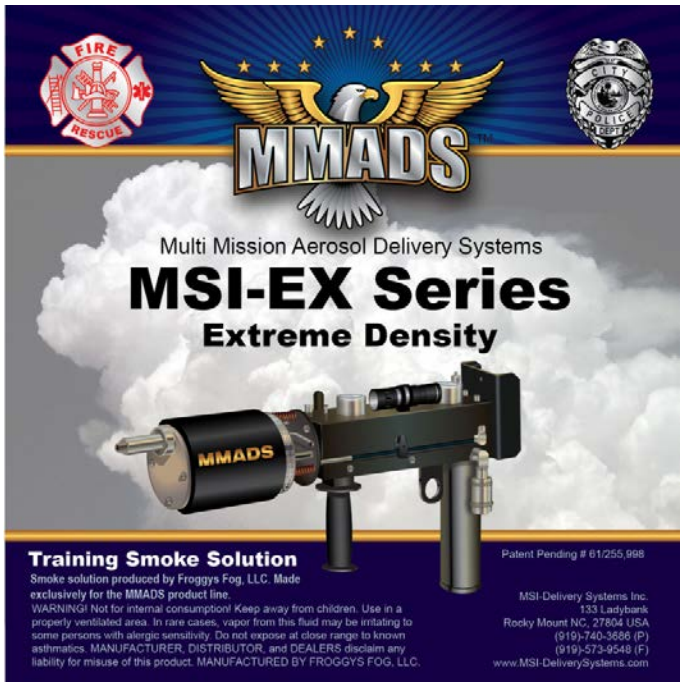
Appendix 2 – Smoke Solution Types

B2K- MMADS Smoke Solution Types



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MATERIAL SAFETY DATA SHEET

MSI DELIVERY SYSTEMS INC.
A DIVISION OF MAJOR STEPS™

1. PRODUCT AND COMPANY IDENTIFICATION:

Product Name: **MMADS- QB**
Product Use: Theatrical Effects Liquids
WHMIS/OSHA Class: Not controlled
T.D.G./DOT Classification: NMFC – 084460; HTS - 152000000
Company Name: Froggys Fog LLC
Company Address: 302 Rutherford Lane, Columbia, TN 38401
Company Phone: 615-469-4906

2. COMPOSITION / INFORMATION ON INGREDIENTS:

CAS #: Mixture of some or all: 7732-18-5, 57-55-6, 112-27-6, 107-88-0
(See Section 8, "Exposure Controls/Personal Protection", for exposure guidelines.)

3. HAZARDS IDENTIFICATION:

NFPA Code: Health-0, Flammability-1, Reactivity-0
HMIS Code: Health-0, Flammability-1, Reactivity-0
Emergency overview: Contact with liquid may cause eye and skin irritation.
Potential short term health effects:
Routes of exposure: Eye, Skin contact, Inhalation, Ingestion.
Eyes: May cause irritation.
Skin: May cause irritation.
Inhalation: May cause respiratory tract irritation.
Ingestion: May cause stomach distress, nausea or vomiting.
Target organs: Eyes. Respiratory system. Skin.
Chronic effects: Prolonged or repeated exposure can cause drying, defatting and dermatitis.
Signs and symptoms: Symptoms may include redness, edema, drying, defatting and cracking of the skin. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting.

4. FIRST AID MEASURES:

Eye contact: Immediately flush with cool water. Remove contact lenses, if applicable, and continue flushing for 15 minutes. Obtain medical attention if irritation develops or persists.
Skin contact: Flush with cool water. Wash with soap and water. Obtain medical attention if irritation develops or persists.
Inhalation: If symptoms develop move victim to fresh air. If symptoms persist, obtain medical attention.
Ingestion: Do not induce vomiting. Rinse mouth with water, and then drink one or two glasses of water. Obtain medical attention. Never give anything by mouth if victim is unconscious, or is convulsing.
General advice: If you feel unwell, seek medical advice (show the label where possible). Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Show this safety data sheet to the doctor in attendance.

5. FIRE FIGHTING MEASURES:

Flammable properties: Not flammable by WHMIS/OSHA criteria.
Extinguishing media
Suitable extinguishing media: Dry chemical. Alcohol foam. Carbon dioxide.
Unsuitable extinguishing media: Not available
Protection of firefighter's specific hazards arising from the chemical: Not available
Protective equipment for firefighters: Firefighters should wear full protective clothing including self contained breathing apparatus.
Hazardous combustion products: May include and are not limited to: Oxides of carbon.
Explosion data Sensitivity to mechanical impact: Not available
Sensitivity to static discharge: Not available

6. ACCIDENTAL RELEASE MEASURES:

Personal precautions: Keep unnecessary personnel away. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
Methods for containment: Stop leak if you can do so without risk. Prevent entry into waterways, sewers, basements or confined areas.
Methods for cleaning up: Before attempting clean up, refer to hazard data given above. Small spills may be absorbed with non-reactive absorbent and placed in suitable, covered, labeled containers. Prevent large spills from entering sewers or waterways. Contact emergency services and supplier for advice.

7. HANDLING AND STORAGE:

Handling Use good industrial hygiene practices in handling this material.
Storage Keep out of reach of children. Store in a closed container away from incompatible materials.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION:

Exposure limits:

Ingredient(s)	Exposure	Limit
57-55-6	**ACGIH-TLV**	Not established
	OSHA-PEL	Not established
7732-18-5	**ACGIH-TLV**	Not established
	OSHA-PEL:	Not established
112-27-6	**ACGIH-TLV**	Not established
	OSHA-PEL:	Not established

Engineering controls: General ventilation normally adequate.
Personal protective equipment

Eye / face protection Safety glasses recommended.
Hand protection If there is constant skin contact, rubber gloves are recommended.
Skin and body protection As required by employer code.
Respiratory protection Not normally required if good ventilation is maintained.
General hygiene considerations Handle in accordance with good industrial hygiene and safety practice. When using do not eat or drink. Wash hands before breaks and immediately after handling the product.

9. CHEMICAL AND PHYSICAL PROPERTIES:

Appearance: Clear.
Color: Colorless
Form: Liquid
Odor: No Odor
Odor threshold: Not available
Physical state: Liquid
pH: Neutral
Melting point: Not available
Freezing point: < -22.00 °C
Boiling point: ~103.89 °C
Flash point: > 121 °C (> 249.80 °F) Tag Closed Cup
Evaporation rate: Not available
Flammability limits in air, lower, % by volume: Not available
Flammability limits in air, upper, % by volume: Not available
Vapor pressure: Not available
Vapor density: > 1 (Air = 1)
Specific gravity: ~1.034 (H2O = 1)
Octanol/water coefficient: Not available
Solubility (H2O): Complete
Auto-ignition temperature: Not available
Viscosity: Not available
Percent volatile: Not available

10. STABILITY AND REACTIVITY:

Chemical stability: Stable.
Conditions to avoid: Do not mix with other chemicals.
Incompatible materials: Caustics. Acids. Oxidizers.
Hazardous decomposition products: May include and are not limited to: Oxides of carbon when heated to decomposition.
Possibility of hazardous reactions: Hazardous polymerization does not occur.

11. TOXICOLOGICAL INFORMATION:

Component analysis – 48-hour LC50 (Daphnia)

Ingredient(s) LC50

7732-18-5	Not available
57-55-6	Above 10,000 mg/L
112-27-6	Above 10,000 mg/L

Component analysis - Oral LD50

Ingredient(s) LD50

7732-18-5	90 mL/kg rat
57-55-6	22,000 mg/kg rat
112-27-6	17,000 mg/kg rat

Effects of acute exposure

Eye: May cause irritation.
Skin: May cause irritation.
Inhalation: May cause respiratory tract irritation.
Ingestion: May cause stomach distress, nausea or vomiting.
Sensitization: Non-hazardous by WHMIS/OSHA criteria.
Chronic effects: Non-hazardous by WHMIS/OSHA criteria.
Carcinogenicity: Non-hazardous by WHMIS/OSHA criteria.
Mutagenicity: Non-hazardous by WHMIS/OSHA criteria.
Reproductive effects: Non-hazardous by WHMIS/OSHA criteria.
Teratogenicity: Non-hazardous by WHMIS/OSHA criteria.

12. ECOLOGICAL INFORMATION:

Ecological testing has not been conducted on this product.

13. DISPOSAL INFORMATION:

Disposal must be in accordance with applicable federal, state, or local regulations.

14. TRANSPORTATION INFORMATION:

U.S. Department of Transportation: Not regulated.
International Information:
Canadian Transportation of Dangerous Goods: Not regulated.

15. REGULATORY INFORMATION:

US Federal regulations This product is not known to be a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
Occupational Safety and Health Administration (OSHA)
29 CFR 1910.1200 hazardous chemical: No **CERCLA (Superfund) reportable quantity:** None
Superfund Amendments and Reauthorization Act of 1986 (SARA)
Hazard categories:
Immediate Hazard - No
Delayed Hazard - No
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

Section 302 extremely hazardous substance: No
Section 311 hazardous chemical: No
Clean Air Act (CAA): Not available
Clean Water Act (CWA): Not available
Safe Drinking Water Act (SDWA): Not available
Drug Enforcement Agency (DEA): Not available
Food and Drug Administration (FDA): Not available
WHMIS status: Not Controlled
State regulations: This product does not contain a chemical known to the State of California to cause cancer, birth defects or other reproductive harm.
U.S. - Massachusetts - Right To Know List: 56-81-5 Present (mist)
U.S. - Minnesota - Hazardous Substance List: 56-81-5 Present
U.S. - Pennsylvania - RTK (Right to Know) List: 56-81-5 Present
U.S. - Rhode Island - Hazardous Substance List: 56-81-5 Toxic; Flammable
Inventory name:
Country(s) or region Inventory name on inventory (yes/no)*
United States & Puerto Rico
Non-Domestic Substances List (NDSL): No
Toxic Substances Control Act (TSCA) Inventory: Yes
Canada Domestic Substances List (DSL): Yes

16. PREPERATION INFORMATION
DATE: January 25, 2008
PREPARED BY: Froggys Fog LLC
CONTACT: 615-469-4906

Disclaimer
This material safety data sheet and the information it contains is offered to you in good faith as accurate. We have reviewed any information contained in this data sheet which we received from sources outside our company. We believe that information to be correct but cannot guarantee its accuracy or completeness. Health and safety precautions in this data sheet may not be adequate for all individuals and/or situations. It is the user's obligation to evaluate and use this product safely and to comply with all applicable laws and regulations. No statement made in this data sheet shall be construed as a permission or recommendation for the use of any product in a manner that might infringe existing patents. No warranty is made, either expressed or implied.

MATERIAL SAFETY DATA SHEET

MSI DELIVERY SYSTEMS INC.
A DIVISION OF MAJOR STEPS™

1. PRODUCT AND COMPANY IDENTIFICATION:

Product Name: **MMADS-EX**
Product Use: Theatrical Effects Liquids
WHMIS/OSHA Class: Not controlled
T.D.G./DOT Classification: Not regulated
Company Name: Froggys Fog LLC
Company Address: 302 Rutherford Lane, Columbia, TN 38401
Company Phone: 615-469-4906

2. COMPOSITION / INFORMATION ON INGREDIENTS:

CAS #: Mixture of 56-81-5, 57-55-6, 7732-18-5, 8042-47-5
(See Section 8, "Exposure Controls/Personal Protection", for exposure guidelines.)

3. HAZARDS IDENTIFICATION:

NFPA Code: Health-0, Flammability-1, Reactivity-0
HMIS Code: Health-0, Flammability-1, Reactivity-0
Emergency overview: Contact with liquid may cause eye and skin irritation.
Potential short term health effects:
Routes of exposure: Eye, Skin contact, Inhalation, Ingestion.
Eyes: May cause irritation.
Skin: May cause irritation.
Inhalation: May cause respiratory tract irritation.
Ingestion: May cause stomach distress, nausea or vomiting.
Target organs: Eyes. Respiratory system. Skin.
Chronic effects: Prolonged or repeated exposure can cause drying, defatting and dermatitis.
Signs and symptoms: Symptoms may include redness, edema, drying, defatting and cracking of the skin. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting.

4. FIRST AID MEASURES:

Eye contact: Immediately flush with cool water. Remove contact lenses, if applicable, and continue flushing for 15 minutes. Obtain medical attention if irritation develops or persists.
Skin contact: Flush with cool water. Wash with soap and water. Obtain medical attention if irritation develops or persists.
Inhalation: If symptoms develop move victim to fresh air. If symptoms persist, obtain medical attention.
Ingestion: Do not induce vomiting. Rinse mouth with water, and then drink one or two glasses of water. Obtain medical attention. Never give anything by mouth if victim is unconscious, or is convulsing.
General advice: If you feel unwell, seek medical advice (show the label where possible). Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Show this safety data sheet to the doctor in attendance.

5. FIRE FIGHTING MEASURES:

Flammable properties: Not flammable by WHMIS/OSHA criteria.
Extinguishing media
Suitable extinguishing media: Dry chemical. Alcohol foam. Carbon dioxide.
Unsuitable extinguishing media: Not available
Protection of firefighter's specific hazards arising from the chemical: Not available
Protective equipment for firefighters: Firefighters should wear full protective clothing including self contained breathing apparatus.
Hazardous combustion products: May include and are not limited to: Oxides of carbon.
Explosion data Sensitivity to mechanical impact: Not available
Sensitivity to static discharge: Not available

6. ACCIDENTAL RELEASE MEASURES:

Personal precautions: Keep unnecessary personnel away. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
Methods for containment: Stop leak if you can do so without risk. Prevent entry into waterways, sewers, basements or confined areas.
Methods for cleaning up: Before attempting clean up, refer to hazard data given above. Small spills may be absorbed with non-reactive absorbent and placed in suitable, covered, labeled containers. Prevent large spills from entering sewers or waterways. Contact emergency services and supplier for advice.

7. HANDLING AND STORAGE:

Handling Use good industrial hygiene practices in handling this material.
Storage Keep out of reach of children. Store in a closed container away from incompatible materials.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION:

Exposure limits:

Ingredient(s)	Exposure	Limit
56-81-5	**ACGIH-TLV:**	TWA: 10 mg/m3, Mist: 10 mg/m3
	OSHA-PEL	TWA: 15 mg/m3
57-55-6	**ACGIH-TLV**	Not established
	OSHA-PEL	Not established
7732-18-5	**ACGIH-TLV**	Not established
	OSHA-PEL:	Not established

Engineering controls: General ventilation normally adequate.
Personal protective equipment

Eye / face protection Safety glasses recommended.
Hand protection If there is constant skin contact, rubber gloves are recommended.
Skin and body protection As required by employer code.
Respiratory protection Not normally required if good ventilation is maintained.
General hygiene considerations Handle in accordance with good industrial hygiene and safety practice. When using do not eat or drink. Wash hands before breaks and immediately after handling the product.

9. CHEMICAL AND PHYSICAL PROPERTIES:

Appearance: Clear.
Color: Colorless
Form: Liquid
Odor: No Odor
Odor threshold: Not available
Physical state: Liquid
pH: Neutral
Melting point: Not available
Freezing point: Not available
Boiling point: Not available
Flash point: > 121 °C (> 249.80 °F) Tag Closed Cup
Evaporation rate: Not available
Flammability limits in air, lower, % by volume: Not available
Flammability limits in air, upper, % by volume: Not available
Vapor pressure: Not available
Vapor density: > 1 (Air = 1)
Specific gravity: ~1.083 (H2O = 1)
Octanol/water coefficient: Not available
Solubility (H2O): Complete
Auto-ignition temperature: Not available
Viscosity: Not available
Percent volatile: Not available

10. STABILITY AND REACTIVITY:

Chemical stability: Stable.
Conditions to avoid: Do not mix with other chemicals.
Incompatible materials: Caustics. Acids. Oxidizers.
Hazardous decomposition products: May include and are not limited to: Oxides of carbon when heated to decomposition.
Possibility of hazardous reactions: Hazardous polymerization does not occur.

11. TOXICOLOGICAL INFORMATION:

Component analysis - LC50

Ingredient(s) LC50

56-81-5	> 2.28 mg/L rat
57-55-6	Above 10,000 mg/L
7732-18-5	Above 10,000 mg/L

Component analysis - Oral LD50

Ingredient(s) LD50

56-81-5	12,600 mg/kg rat
57-55-6	22,000 mg/kg rat
7732-18-5	14,500 mg/kg rat

Effects of acute exposure

Eye: May cause irritation.
Skin: May cause irritation.
Inhalation: May cause respiratory tract irritation.
Ingestion: May cause stomach distress, nausea or vomiting.
Sensitization: Non-hazardous by WHMIS/OSHA criteria.
Chronic effects: Non-hazardous by WHMIS/OSHA criteria.
Carcinogenicity: Non-hazardous by WHMIS/OSHA criteria.
Mutagenicity: Non-hazardous by WHMIS/OSHA criteria.
Reproductive effects: Non-hazardous by WHMIS/OSHA criteria.
Teratogenicity: Non-hazardous by WHMIS/OSHA criteria.

12. ECOLOGICAL INFORMATION:

Ecological testing has not been conducted on this product.

13. DISPOSAL INFORMATION:

Disposal must be in accordance with applicable federal, state, or local regulations.

14. TRANSPORTATION INFORMATION:

U.S. Department of Transportation: Not regulated.
International Information:
Canadian Transportation of Dangerous Goods: Not regulated.

15. REGULATORY INFORMATION:

US Federal regulations This product is not known to be a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
Occupational Safety and Health Administration (OSHA)
29 CFR 1910.1200 hazardous chemical: No **CERCLA (Superfund) reportable quantity:** None
Superfund Amendments and Reauthorization Act of 1986 (SARA)
Hazard categories:
Immediate Hazard - No
Delayed Hazard - No
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

Section 302 extremely hazardous substance: No
Section 311 hazardous chemical: No
Clean Air Act (CAA): Not available
Clean Water Act (CWA): Not available
Safe Drinking Water Act (SDWA): Not available
Drug Enforcement Agency (DEA): Not available
Food and Drug Administration (FDA): Not available
WHMIS status: Not Controlled
State regulations: This product does not contain a chemical known to the State of California to cause cancer, birth defects or other reproductive harm.
U.S. - Massachusetts - Right To Know List: 56-81-5 Present (mist)
U.S. - Minnesota - Hazardous Substance List: 56-81-5 Present
U.S. - Pennsylvania - RTK (Right to Know) List: 56-81-5 Present
U.S. - Rhode Island - Hazardous Substance List: 56-81-5 Toxic; Flammable
Inventory name:
Country(s) or region Inventory name on inventory (yes/no)*
United States & Puerto Rico
Non-Domestic Substances List (NDSL): No
Toxic Substances Control Act (TSCA) Inventory: Yes
Canada Domestic Substances List (DSL): Yes

16. PREPERATION INFORMATION
DATE: January 25, 2008
PREPARED BY: Froggys Fog LLC
CONTACT: 615-469-4906

Disclaimer
This material safety data sheet and the information it contains is offered to you in good faith as accurate. We have reviewed any information contained in this data sheet which we received from sources outside our company. We believe that information to be correct but cannot guarantee its accuracy or completeness. Health and safety precautions in this data sheet may not be adequate for all individuals and/or situations. It is the user's obligation to evaluate and use this product safely and to comply with all applicable laws and regulations. No statement made in this data sheet shall be construed as a permission or recommendation for the use of any product in a manner that might infringe existing patents. No warranty is made, either expressed or implied.

MATERIAL SAFETY DATA SHEET

1. PRODUCT AND COMPANY IDENTIFICATION:

Product Name: MMADS-SF
Product Use: Theatrical Effects Liquids
WHMIS/OSHA Class: Not controlled
T.D.G./DOT Classification: Not regulated
Company Name: Froggys Fog LLC
Company Address: 302 Rutherford Lane, Columbia, TN 38401
Company Phone: 615-469-4906

2. COMPOSITION / INFORMATION ON INGREDIENTS:

CAS #: Mixture of 56-81-5, 57-55-6, 7732-18-5
(See Section 8, "Exposure Controls/Personal Protection", for exposure guidelines.)

3. HAZARDS IDENTIFICATION:

NFPA Code: Health-0, Flammability-1, Reactivity-0
HMIS Code: Health-0, Flammability-1, Reactivity-0
Emergency overview: Contact with liquid may cause eye and skin irritation.
Potential short term health effects:
Routes of exposure: Eye, Skin contact, Inhalation, Ingestion.
Eyes: May cause irritation.
Skin: May cause irritation.
Inhalation: May cause respiratory tract irritation.
Ingestion: May cause stomach distress, nausea or vomiting.
Target organs: Eyes. Respiratory system. Skin.
Chronic effects: Prolonged or repeated exposure can cause drying, defatting and dermatitis.
Signs and symptoms: Symptoms may include redness, edema, drying, defatting and cracking of the skin. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting.

4. FIRST AID MEASURES:

Eye contact: Immediately flush with cool water. Remove contact lenses, if applicable, and continue flushing for 15 minutes. Obtain medical attention if irritation develops or persists.
Skin contact: Flush with cool water. Wash with soap and water. Obtain medical attention if irritation develops or persists.
Inhalation: If symptoms develop move victim to fresh air. If symptoms persist, obtain medical attention.
Ingestion: Do not induce vomiting. Rinse mouth with water, and then drink one or two glasses of water. Obtain medical attention. Never give anything by mouth if victim is unconscious, or is convulsing.
General advice: If you feel unwell, seek medical advice (show the label where possible). Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Show this safety data sheet to the doctor in attendance.

5. FIRE FIGHTING MEASURES:

Flammable properties: Not flammable by WHMIS/OSHA criteria.
Extinguishing media
Suitable extinguishing media: Dry chemical. Alcohol foam. Carbon dioxide.
Unsuitable extinguishing media: Not available
Protection of firefighter's specific hazards arising from the chemical: Not available
Protective equipment for firefighters: Firefighters should wear full protective clothing including self contained breathing apparatus.
Hazardous combustion products: May include and are not limited to: Oxides of carbon.
Explosion data Sensitivity to mechanical impact: Not available
Sensitivity to static discharge: Not available

6. ACCIDENTAL RELEASE MEASURES:

Personal precautions: Keep unnecessary personnel away. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
Methods for containment: Stop leak if you can do so without risk. Prevent entry into waterways, sewers, basements or confined areas.
Methods for cleaning up: Before attempting clean up, refer to hazard data given above. Small spills may be absorbed with non-reactive absorbent and placed in suitable, covered, labeled containers. Prevent large spills from entering sewers or waterways. Contact emergency services and supplier for advice.

7. HANDLING AND STORAGE:

Handling Use good industrial hygiene practices in handling this material.
Storage Keep out of reach of children. Store in a closed container away from incompatible materials.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION:

Exposure limits:

Ingredient(s)	Exposure	Limit
56-81-5	ACGIH-TLV:	TWA: 10 mg/m3, Mist: 10 mg/m3
	OSHA-PEL	TWA: 15 mg/m3
57-55-6	ACGIH-TLV	Not established
	OSHA-PEL	Not established
7732-18-5	ACGIH-TLV	Not established
	OSHA-PEL:	Not established

Engineering controls: General ventilation normally adequate.
Personal protective equipment

Eye / face protection Safety glasses recommended.
Hand protection If there is constant skin contact, rubber gloves are recommended.
Skin and body protection As required by employer code.
Respiratory protection Not normally required if good ventilation is maintained.
General hygiene considerations Handle in accordance with good industrial hygiene and safety practice. When using do not eat or drink. Wash hands before breaks and immediately after handling the product.

9. CHEMICAL AND PHYSICAL PROPERTIES:

Appearance: Clear.
Color: Colorless
Form: Liquid
Odor: No Odor
Odor threshold: Not available
Physical state: Liquid
pH: Neutral
Melting point: Not available
Freezing point: Not available
Boiling point: Not available
Flash point: > 121 °C (> 249.80 °F) Tag Closed Cup
Evaporation rate: Not available
Flammability limits in air, lower, % by volume: Not available
Flammability limits in air, upper, % by volume: Not available
Vapor pressure: Not available
Vapor density: > 1 (Air = 1)
Specific gravity: ~1.083 (H2O = 1)
Octanol/water coefficient: Not available
Solubility (H2O): Complete
Auto-ignition temperature: Not available
Viscosity: Not available
Percent volatile: Not available

10. STABILITY AND REACTIVITY:

Chemical stability: Stable.
Conditions to avoid: Do not mix with other chemicals.
Incompatible materials: Caustics. Acids. Oxidizers.
Hazardous decomposition products: May include and are not limited to: Oxides of carbon when heated to decomposition.
Possibility of hazardous reactions: Hazardous polymerization does not occur.

11. TOXICOLOGICAL INFORMATION:

Component analysis - LC50

Ingredient(s) LC50

56-81-5	> 2.28 mg/L rat
57-55-6	Above 10,000 mg/L
7732-18-5	Above 10,000 mg/L

Component analysis - Oral LD50

Ingredient(s) LD50

56-81-5	12,600 mg/kg rat
57-55-6	22,000 mg/kg rat
7732-18-5	14,500 mg/kg rat

Effects of acute exposure

Eye: May cause irritation.
Skin: May cause irritation.
Inhalation: May cause respiratory tract irritation.
Ingestion: May cause stomach distress, nausea or vomiting.
Sensitization: Non-hazardous by WHMIS/OSHA criteria.
Chronic effects: Non-hazardous by WHMIS/OSHA criteria.
Carcinogenicity: Non-hazardous by WHMIS/OSHA criteria.
Mutagenicity: Non-hazardous by WHMIS/OSHA criteria.
Reproductive effects: Non-hazardous by WHMIS/OSHA criteria.
Teratogenicity: Non-hazardous by WHMIS/OSHA criteria.

12. ECOLOGICAL INFORMATION:

Ecological testing has not been conducted on this product.

13. DISPOSAL INFORMATION:

Disposal must be in accordance with applicable federal, state, or local regulations.

14. TRANSPORTATION INFORMATION:

U.S. Department of Transportation: Not regulated.
International Information:
Canadian Transportation of Dangerous Goods: Not regulated.

15. REGULATORY INFORMATION:

US Federal regulations This product is not known to be a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
Occupational Safety and Health Administration (OSHA)
29 CFR 1910.1200 hazardous chemical: No **CERCLA (Superfund) reportable quantity:** None
Superfund Amendments and Reauthorization Act of 1986 (SARA)
Hazard categories:
Immediate Hazard - No
Delayed Hazard - No
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

Section 302 extremely hazardous substance: No
Section 311 hazardous chemical: No
Clean Air Act (CAA): Not available
Clean Water Act (CWA): Not available
Safe Drinking Water Act (SDWA): Not available
Drug Enforcement Agency (DEA): Not available
Food and Drug Administration (FDA): Not available
WHMIS status: Not Controlled
State regulations: This product does not contain a chemical known to the State of California to cause cancer, birth defects or other reproductive harm.
U.S. - Massachusetts - Right To Know List: 56-81-5 Present (mist)
U.S. - Minnesota - Hazardous Substance List: 56-81-5 Present
U.S. - Pennsylvania - RTK (Right to Know) List: 56-81-5 Present
U.S. - Rhode Island - Hazardous Substance List: 56-81-5 Toxic; Flammable
Inventory name:
Country(s) or region Inventory name on inventory (yes/no)*
United States & Puerto Rico
Non-Domestic Substances List (NDSL): No
Toxic Substances Control Act (TSCA) Inventory: Yes
Canada Domestic Substances List (DSL): Yes

16. PREPERATION INFORMATION
DATE: January 25, 2008
PREPARED BY: Froggys Fog LLC
CONTACT: 615-469-4906

Disclaimer
This material safety data sheet and the information it contains is offered to you in good faith as accurate. We have reviewed any information contained in this data sheet which we received from sources outside our company. We believe that information to be correct but cannot guarantee its accuracy or completeness. Health and safety precautions in this data sheet may not be adequate for all individuals and/or situations. It is the user's obligation to evaluate and use this product safely and to comply with all applicable laws and regulations. No statement made in this data sheet shall be construed as a permission or recommendation for the use of any product in a manner that might infringe existing patents. No warranty is made, either expressed or implied.

MATERIAL SAFETY DATA SHEET

SECTION I - PRODUCT IDENTIFICATION

Product Name: MMADS Oil-Based Smoke Fluid
Product Use: Theatrical Fog
Chemical Family: Petroleum Hydrocarbon Oil
Molecular Weight: Variable.
Molecular Formula: CH3[CH2]CH3

SECTION II – INGREDIENTS

Common Name	Light Mineral Oil, NF
CAS #	8042-47-5

(See Section VIII, "Exposure Controls/Personal Protection", for exposure guidelines.)

SECTION III – HAZARDS IDENTIFICATION

NFPA Code: Health-0, Flammability-1, Reactivity-0 HMIS Code: Health-0, Flammability-1, Reactivity-0

Emergency Overview: This product has been evaluated and does not require any hazard warning on the label under OSHA criteria

Potential Health Effects:

EYE CONTACT: No significant health hazards identified. **SKIN CONTACT:** No significant health hazards identified. **INGESTION:** Negligible effect; may act as a laxative. **INHALATION:** No significant health hazards identified

SECTION IV – FIRST AID MEASURE

EYE: Flush immediately with large amounts of water. If irritation occurs, call a physician.
SKIN: Wash exposed area of skin with soap and water. If skin irritation or an allergic reaction occurs, get medical attention.
INGESTION: If symptomatic, call a physician or poison control center promptly.
INHALATION: If adverse effects occur, remove to uncontaminated area. Get medical attention if symptoms persist.

SECTION V - FIRE AND EXPLOSION DATA

FLASH POINT: 280°F (138°C) minimum
METHOD USED: Cleveland Open Cup
FLAMMABLE LIMITS:
LEL (% vol. in air): Not determined.
UEL (% vol. in air): Not determined.
AUTOIGNITION TEMPERATURE: Not determined.
FLAMMABILITY CLASSIFICATION: Slight hazard. Material must be preheated before ignition will occur (OSHA Class IIIB).
EXTINGUISHING MEDIA: Agents approved for Class B hazards (e.g., dry chemical, carbon dioxide, foam, steam) or water fog. Do not use streams of water as this will scatter the liquid and spread the fire. A water spray may be used to keep fire-exposed containers and surroundings cool. **UNUSUAL FIRE AND EXPLOSION HAZARDS:** May create dense smoke during combustion.

Mild fire hazard when heated above its flash point.
FIREFIGHTING EQUIPMENT: Firefighters should wear full bunker gear, including a positive pressure self-contained breathing apparatus.
HAZARDOUS COMBUSTION PRODUCTS: Incomplete burning can produce carbon monoxide and/or carbon dioxide and other toxic gases.

SECTION VI – ACCIDENTAL RELEASE MEASURES

Remove mechanically or contain on an absorbent material such as dry sand or earth. Remove all sources of ignition. Dike around spilled material.

SECTION VII – HANDLING AND STORAGE

HANDLING: No special requirements.
STORAGE: Store in a cool, well-ventilated area in sealed containers. Do not store in open or unlabelled containers. Store away from strong oxidizing agents or combustible material.

SECTION VIII - EXPOSURE CONTROLS / PERSONAL PROTECTION

EYE: None required; however, use of eye protection is good industrial practice.
SKIN: None required; however, use of protective gloves/clothing is good industrial practice.
INHALATION: Avoid breathing mist. If ventilation is inadequate, use an NIOSH/MSHA certified respirator that will protect against dust/mist.
ENGINEERING CONTROLS: Control airborne concentrations below the exposure guidelines.
EXPOSURE GUIDELINES:
Limits:

OSHA PEL: 5 mg/m^3 (oil mist) (1989) (1971)
ACGIH TLV-TWA: 5 mg/m^3 (oil mist)
ACGIH TLV-STEL: 10 mg/m 3 (oil mist)

SECTION IX – CHEMICAL AND PHYSICAL PROPERTIES

APPEARANCE AND ODOR: Colorless, oily liquid. Odorless. pH: Not determined.
VAPOR PRESSURE: < 1.0 mmHg @ 20°C (68°F)
VAPOR DENSITY (Air=1): >1
BOILING POINT: Not determined.
MELTING POINT: Not determined.
SOLUBILITY: Negligible in water (below 0.1%); soluble in hydrocarbons. **SPECIFIC GRAVITY:** 0.818 - 0.880 @ 25°C/25°C (77°F)
POUR POINT: 20°F (-7°C) maximum

SECTION X – STABILITY AND REACTIVITY

STABILITY: Stable.
CONDITIONS TO AVOID: Avoid excessive heat and open flames. **MATERIALS TO AVOID:** Avoid chlorine, fluorine, and other strong oxidizers. **HAZARDOUS DECOMPOSITION:** None identified.
HAZARDOUS POLYMERIZATION: Will not occur.

SECTION XI – TOXICOLOGICAL INFORMATION

Acute Toxicity Data:

EYE IRRITATION: Testing not conducted. See Other Toxicity Data. **SKIN IRRITATION:** Testing not conducted. See Other Toxicity Data. **DERMAL** $_{LD50:}$ Testing not conducted. See Other Toxicity Data. **ORAL** $_{LD50:}$ Testing not conducted. See Other Toxicity Data. **INHALATION** $_{LC50:}$ Testing not conducted. See Other Toxicity Data.

Other Toxicity Data:

Specific toxicity tests have not been conducted on this product. Our hazard evaluation is based on information from similar products, the ingredients, technical literature, and/or professional experience.

A similar product produced a primary eye irritation score (PEIS) of less than 10/110.0 (rabbits), a primary skin irritation score (PDIS) of less than 4.0/8.0 (rabbits), a dermal L1350 greater than 2000 mg/kg (rabbits), and an oral LD50 score greater than 5000 mg/kg (rats). Also, a similar product was not a skin sensitizer when tested.

Oil mist: Repeated exposure to levels of oil mists in excess of the exposure limits may result in accumulation of oil droplets in pulmonary tissue and may lead to irritation of the nose and throat. No adverse health effect is expected to occur at or below the exposure limits.

No component of this product present at levels greater than 0.1% is identified as a carcinogen by the U.S. National Toxicology Program, the

U.S. Occupational Safety and Health Act, or the International Agency on Research on Cancer (IARC).

SECTION XII – ECOLOGICAL INFORMATION

Ecological testing has not been conducted on this product.

SECTION XIII – DISPOSAL INFORMATION

Disposal must be in accordance with applicable federal, state, or local regulations.

SECTION XIV – TRANSPORTATION INFORMATION

U.S. Department of Transportation: Not regulated.

International Information:

Canadian Transportation of Dangerous Goods: Not regulated.

SECTION XV – REGULATORY INFORMATION

CERCLA Sections 102A/103 Hazardous Substances (40 CFR Part 302.4): Not reportable.

SARA Title III Section 302 Extremely Hazardous Substances (40 CFR Part 355): Not regulated.

SARA Title III Sections 311/312 Hazardous Categorization (40 CFR Part 370): This product is defined as hazardous by OSHA under 29 CFR Part 1910.1200(d).

SARA Title III Section 313 (40 CFR Part 372): Not regulated.

U.S. Inventory (TSCA): Listed on inventory. All components comply with TSCA.

OSHA Hazard Communication Standard: Listed by ACGIH. Listed by OSHA.

FOOD CONTACT STATUS:

FDA:

This product is approved for use by the FDA under the following sections of 21 CFR:

Part 172.878 as a direct, multipurpose food additive when used in accordance with the specifications of this subpart..

Part 178.3620 as a component of nonfood articles in contact with food when used in accordance with the specifications of this subpart. -Part 573.680 in animal feed, subject to the provisions of this subpart.

USDA:

H1 Status: This product is acceptable to the USDA as a lubricant with incidental food contact for use in official meat and poultry establishments.

3H Status: This product is acceptable to the USDA for use as a releasing agent on grills, loaf pans, boning blocks or other hard surfaces to help prevent food from adhering during processing.

SECTION IX - PREPARATION INFORMATION

Date: December 18, 2002 **MSDS Prepared by:** Avatar Corporation

Disclaimer

Information for this material safety data sheet was obtained from sources considered technically accurate and reliable. While every effort has been made to ensure full disclosure of product hazards, in some cases data is not applicable and is so stated. Since conditions of actual product use are beyond control of the supplier, it is assumed that users of this material have been fully trained according to the mandatory requirements of WHMIS. No warranty, expressed or implied, is made and supplier will not be liable for any losses, injuries or consequential damages which may result from the use of or reliance on any information contained in this form.

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Appendix 3 - Frequently Asked Questions

The purpose of this section is to provide answers to many of the most frequently asked questions (FAQ) about the AB2K -MMADS™.

Q: FAQ question #1- **Is there a propane tank on the backpack?**

A: No, the backpack consist of one (1) nitrogen cylinder (used as a propellant), (1) solution cylinder, a high pressure regulator and other safety features and stainless steel valves.

Q: FAQ question #2- **Can the AB2K be used for other uses not listed in the manual?**

A: No, the AB2K was designed for a specific use in mind and was solely designed for training purposes, firefighters, law enforcement for riot control, military applications

Q: FAQ question #3-**Can it be used for decontamination purposes?**

A: Yes, Our smoke solution contains Triethylene Glycol. Based on the final Federal Aviation Administration report in April 2009, using Triethylene Glycol or Hydrogen Peroxide on surfaces at low vapor concentrations will inactivate influenza viruses.

Q: FAQ question #4-**Can other solutions be used in the AB2K?**

A: It is not recommended that other solutions be utilized in this product. Only solutions that are listed in ***Appendix 2*** should be used. We cannot guarantee the effects of any other solutions other than those recommended in this manual. *Any other solutions that are not listed in this manual will automatically VOID your warranty!*

Q: FAQ question #5- **If there is a defect in the product, can I return or ship the item?**

A: Yes, however certain preparations must be in place prior to shipping. First report the issue to your maintenance department to validate the warranty. If the system is under warranty, please contact, *www.msi-deliverysystems.com* for assistance.

Q: FAQ question #6- **Can the product be purchased in different colors?**

A: Yes, the colors are red, black, military camouflage, military green.

Q: FAQ question #7- **What is the estimated shipping time for domestic and international orders?**

A: The shipping time will vary depending on the size of the order and shipping destination. For all domestic and international orders, shipping time is 90 to120 days from receipt of purchase order.

Q: FAQ question #8 - **What does AB2K MMADS stand for?**

A: The name of the product has evolved. The previous name of the product was the Afterburner 2000. This was shortened to AB2K. MMADS is an acronym for Multi Mission Aerosol Delivery System. The company is currently developing uses for the product outside the purview of the application for Law Enforcement.

Q: FAQ question #9 -**Where is the MMADS manufactured?**

A: The product is manufactured in North Carolina, U.S.A.

Q: FAQ question #10- **Where is the company located?**

A: The company is located in Rocky Mount, North Carolina.

Q: FAQ question #11- **How many configurations are available?**

A: Three Configurations are available. 1) The AB2K-DVBP (Dependent Version with Back Pack) is designed primarily for Law Enforcement and Military applications (320,000 cubic feet of smoke on a single charge). 2) The AB2K-SA (Stand Alone Version) works independently of the Back Pack and is designed for Fire Departments as well as applications noted in above section one. It produces 50,000 cubic feet of smoke on a single charge. Quick connect feature enables the Stand Alone to operate with Back Pack for an additional 320,000 cubic feet of smoke. 2) The AB2K-RSG (Robotic Version) this version specifically designed for the Andros F6B Robot sold by Remotec (Division of Northrop Grumman) will deploy 370,000 cubic feet of smoke.

Q: FAQ question #12- **What are the main differences between the AB2K-DVBP and the AB2K-SA?**

A: The main differences are pressure and capacity. The DVBP version is a high pressure/capacity unit and the SA version is a low pressure/capacity unit. As noted in section 4. Item B the SA version's capacity can easily be increased with quick connect feature.

Q: FAQ question #13- **How many feet is the smoke dispersed from the AB2K SA?**

A: The SA at maximum pressure is 1,000 PSI a recommended operated pressure for fire fighter training use is 450 PSI, however that pressure could be regulated up to 1,000 PSI. Disperses approximately 50-70 feet and the DVBP at maximum pressure disperses at approximately 70-90 feet in controlled environment.

Q: FAQ question #14-**How long does it take to warm up the AB2K SA, AB2K DV or Robot AB2K?**

A: To reach the maximum temperature it take approximately 3 minutes, however you can deploy smoke in 90 seconds.

Q: FAQ question #15- **What are the gases and Aerosol Smoke Solutions used to make the AB2K operate?**

A: Compressed Gas (Nitrogen), Liquid Propane, Liquid Smoke Solution

Q: FAQ question #16- **In respect to AB2K-RS (Recharge Station), how many times will it fill the Dependent/Back Pack and Stand Alone Versions?**

A: (1) The AB2K-RS has two cylinders, one for compressed nitrogen (2216 PSI fully charged), and one for Liquid Propane (14lbs). (2) The Liquid Propane Cylinder on the Recharge Station will fill the cylinders on the Dependent and the Stand Alone Versions 28-30 times. The propane cylinder on each of these versions holds ½ pounds of propane. (3) The Compressed Gas Cylinder on the Recharge Station will fill the DVBP 8-10 times and the Stand Alone 35-38 times. The Compressed Gas (Nitrogen) cylinder on the DVBP holds (2216 PSI) for the first 5-6 fill ups and will decrease approximately 150-200 PSI for the remaining 2-4 fill ups. The unit will continue to operate at lower PSI levels but distance will be affected. The Stand Alone cylinder holds 450 -1,000 PSI and is a lower pressure unit compared to the Dependent Version / Back Pack. * It is important to note here that the aerosol delivery capacity is much greater with the DVBP Version as the Back Pack cylinder is larger than the cylinder on the Stand Alone Version. (See Pictures of Units) The Recharge Station should be refilled once the 500-PSI level is reached in order to maintain the maximum pressure and performance of the unit. The Recharge Station Regulator will denote this.

Q: FAQ question #17- **How many variations of Aerosol/Smoke Solution are available?**

A: Three, each one is specially formulated and mission specific. A) Quick Evaporation for Structural Use (Indoor Use) B) Light and Quick Evaporation C) Mid Grade Camouflage Use (Thermal Imaging Technology) Please note that a fourth Aerosol/Smoke Solution called Maximum Camouflage Formulation will be available second quarter of 2012. This formulation will be Ideal for both indoor and outdoor use with Thermal Imaging Technology.

Q: FAQ question #18- **Is the product shipped with propane, compressed gas, and smoke solution?**

A: No, products are shipped “dry”. The propane and compressed gas (Nitrogen) are obtained from end-user local suppliers. The aerosol/smoke solution is obtained from MSI-Delivery System and Irritant Solution from Zarc International.

Q: FAQ question #19- **Are there any notable or special features for the AB2K DV?**

A: Yes. There are three. A) Compatible with Thermal Imaging Technology B) Stealth Mode Feature - Once the AB2K barrel assembly reaches optimum temperature the unit can be shut down and operated in silence. Once in Stealth Mode, the barrel assembly will remain hot for approx. 15-20 minutes. Once the trigger releases solution the barrel assembly cools off and the controller box will turn on the burner assembly to reheat the coils for another dispersement of smoke. C) Another feature is the liquid dispenser (Canon). The Cannon is designed for liquid dispersement. The nozzle tip is interchangeable to deploy a straight stream of liquid or mist. Attachment Quick Connect Tips for stream or mist. The Maximum Pressure of 2216-PSI disperses 80-100 feet and minimum 300-PSI disperses 40 feet. Also, the liquid dispenser can be connected to a pressure washer for the AB2K DV at a maximum pressure of 4,000 PSI. At 4,000 PSI the AB2K DV can be hooked up to a55 gallon drum of liquid irritants for riot control or a55 gallon drum of decontamination liquids. .

Q: FAQ question #20- **Is Training available for the product?**

A: Yes, Training is currently being provided by two companies with Military and Law Enforcement backgrounds. Contact www.***msi-deliverysystems.com*** for a list of training locations.

Q: FAQ question #21- **What is the Cost of the Training?**

A: The cost of training is in addition to the cost of the product. Training quotes are available upon request.

Q: FAQ question #22- **How long does it take for Delivery?**

A: Once the contract has been signed with 50% deposit and based on the size of the order, the manufacturer guarantees 90-120 days delivery to end-user.

Q: FAQ question #23-**Are there minimum quantities for orders?**

A: No minimum quantities for Domestic orders. International orders need to be a minimum of 150 of the AB2K-SA (Stand Alone Version) or AB2K DVBP (Dependent Version with Back Pack). This quantity does not include nor reflect the AB2K-RS (Recharge Station). The reason is that the number of AB2K recharge stations needed will be determined by end-users deployment needs. For instance, if each of the AB2K aerosol generators is in a location by itself, it will need the AB2K Recharge Station to support its use. If the international order is below our minimum 150, the intended buyer should contact www.msi-delivery sytems.com for quote, but prices may increase.

Q: FAQ question #24-**Where do we purchase the Training Smoke/Aerosol solution?**

A: MSI-Delivery Systems currently sells four types of Training Solutions. **EX Series**- water based, extreme density, **BF Series**-water based, medium density, **SF specially formulated series**-pepper irritants and counter strike smoke, **OB series**-oil based. The smoke solution can be mixed with specific chemicals to upgrade the mission requirements to include neutralizing chemical attacks, decontamination, urban warfare (MOUT/COIN), tactical incursions, civil unrest and riots, infestation control, etc. See detailed information on Appendix 1.

Q: FAQ question #25- **Where do we purchase the Irritant Solutions for the MMADS?**

A: Zarc International Irritant solutions have been tested and approved by MSI Delivery Systems for use in the product. Zarc International is located in Illinois, U.S.A.

Q: FAQ question #26- **Is there a warranty?**

A: Yes, MSI-Delivery Systems stands by the product with a four year maintenance free warranty in the US. A one year warranty is for International use. This warranty does not cover mishandling of product (dropping it, falling out of a truck, etc…) The product is built to last and is primarily constructed of Aluminum Alloy and 316 Stainless Steel components.

Q: FAQ question #27- **How much maintenance is required?**

A: Very little maintenance is required. After use, it is recommended that the product's burner assembly (also known as exhaust area) is blown out with compressed air to rid it of any carbon particles. The second step is to wipe down with soap and water (external cleaning only, DO NOT submerge). It is important to keep battery charged. The battery powers the temperature gauge on the unit. (The temperature gauge lets the operator know when the product is deployable). Lastly, a flush is recommended for both the base system and liquid dispenser (Canon) if irritant is used and product is transitioned to training.

Q: FAQ question #28- **Is the product line safe?**

A: Yes, the product was designed by a former Police Officer and Firefighter with safety in mind. The Temperature Controller assists in preventing overheating of unit, Heat Shield for Burner Assembly, and High-Pressure relief valves on all components of product line. Caution is needed as heat gathers in exhaust area and nozzle of unit.

Q: FAQ question #29- **How long does it take the AB2K SA, AB2K DV or AB2K Robot product to cool down after use**?

A: After use place the unit in the bracket system on the back of the recharging station. The AB2K-RS (Recharge Station) comes with blower assembly. It takes approximately 15 minutes for cool down period; afterwards the product can be safely stored in its carrying case.

Q: FAQ question #30- **If assistance is needed, whom do I contact?**

A: Please call the corporate office at 919.740.3686 or through our website at www.msi-deliverysystems.com, or the distributor who consummated the sale to you.

Appendix 4 - Getting Help

About the Manual

For issues, concerns or general inquiries about this manual, contact ***www.MSI-DeliverySystems.com.***

Technical Assistance

For technical assistance, refer to the vendor where the system was obtained.

Warranty Issues

The AB2K MMADS™ has a 3-year maintenance free warranty in the US and a 1-year warranty for International end users. Extended warranties can be obtained for US and International. For warranty related issues, please contact the supplier at ***www.msi-deliverysystems.com.***

Requesting Further Information

To request further information, go to the MSI Delivery Systems Inc. website and complete an on-line form that is emailed to the company. Requests are typically responded to within two business days. You can also contact MSI Delivery Systems Inc. directly by calling (919) 740-3686.

Appendix 5 - Warranty

STANDARD INTERNATIONAL
TERMS AND CONDITIONS OF SALE/WARRANTY

1. **PRICES.** All prices are EX-Works / MSI DELIVERY SYSTEMS Inc.'s U.S. distribution facility. Prices are subject to change upon thirty (30) days' notice to Buyer. All prices are exclusive of any present or future sales, revenue, or excise tax, value added tax, turnover tax, import duty (including brokerage fees), or other tax applicable to the manufacture or sale of any product. Such taxes, where applicable, shall be paid by Buyer.

2. **PAYMENTS**. MSI requires full payment in advance of shipment, unless the parties agree otherwise in writing.

3. **DELIVERY / FORCE MAJEURE.** Delivery time is not of the essence. Delivery is accomplished when the merchandise is released to Buyer's freight agent. Shipment schedules are approximate, and MSI DELIVERY SYSTEMS Inc. will use its best efforts to deliver on the date specified or within a commercially reasonable period thereafter. Standard delivery dates for initial shipments are a minimum of 90 days from date of receipt for most orders. MSI DELIVERY SYSTEMS Inc. does not accept liability for any loss arising from delay in delivery. In addition, MSI DELIVERY SYSTEMS Inc. assumes no responsibility or liability for loss or damage by reason of delay caused by acts of God, fires, floods, wars, embargoes, labor disputes, acts of sabotage, riots, accidents, delays of carriers, subcontractors or supplies, voluntary or mandatory compliance with any governmental act, regulation or request or any cause or causes beyond MSI DELIVERY SYSTEMS Inc.'s reasonable control.

4. **INSTALLATION.** Installation (if required) is not included in the price of MSI DELIVERY SYSTEMS Inc.'s products and accessories unless shown as a separate item on the face thereof. Buyer will provide any necessary labor and equipment to transport and install the product.

5. **ACCESSORIES / SPARE / INSPECTION ON ARRIVAL**. Buyer shall inspect all shipments immediately upon receipt and shall within five (5) days thereafter give written notice to MSI DELIVERY SYSTEMS Inc. of any claim for shortage, any apparent defects, or any claim that such items do not conform to the items of the contract. Failure to provide such written notice within such time period shall be deemed an unqualified waiver of any rights to return products. Buyer shall afford MSI DELIVERY SYSTEMS Inc. or its authorized SALES AGENT prompt and reasonable opportunity to inspect all material prior to rejection.

6. **PARTS.** All parts sold are at the current published MSI DELIVERY SYSTEMS Inc. price, exclusive of taxes, and will be new or of equal quality.

7. **ACCEPTANCE TESTING – INDUSTRIAL / COMMERCIAL PRODUCTS ONLY.** Promptly upon receipt of shipment, industrial / commercial products will be tested by the Buyer's personnel by randomly inspecting the product delivered to ensure compliance with published specifications. This test, and Buyer's inspection to verify that the product is

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complete and without apparent defects, shall constitute the sole means of determining acceptability under this contract. The acceptance of the product shall not exceed ten (10) days following delivery through no fault of MSI DELIVERY SYSTEMS Inc. Buyer agrees to notify MSI DELIVERY SYSTEMS Inc. of the individual employee who will be responsible, on behalf of Buyer, for compliance testing of the product and to witness and certify acceptance testing at Buyer's facility. Unless notice is given as provided herein, Buyer shall be deemed to have accepted such products and to have waived all claims for shortages, effect or damage.

8. **TERMINATION FOR CONVENIENCE.** Buyer may terminate this agreement at its convenience by written notice to MSI DELIVERY SYSTEMS Inc. received by MSI DELIVERY SYSTEMS Inc. prior to the ninetieth (90th) day before the estimated shipment date shown on the face of this form. The termination charge will be computed as a percentage of the net purchase price: All termination charges listed below shall also be subject to any/all manufacturers costs, incurred by MSI, on behalf of the original order prior to receipt of termination notice, and subject to any/all costs incurred by MSI for Performance Bond, Performance Guarantee or other purchaser required manufacturer's delivery guarantees;
   (i) termination effective prior to the 90th day before estimated shipment – 20%
   (ii) termination effective on or after the 90th day but not later than the 60th day before estimated shipment – 40%
   (iii) termination effective on or after the 60th day but not later than the 30th day before estimated shipment – 55%
   (iv) termination effective on or after the 30th day but not later than the 1st day before estimated shipment – 70%
   (v) Buyer agrees that the aforesaid termination charges shall be MSI DELIVERY SYSTEMS Inc.'s liquidated damages in the event of breach, and that they are reasonable in amount in light of the anticipated harm and the difficulties of proof of loss.

9. LIMITED WARRANTY

a) Basic Warranty

MSI DELIVERY SYSTEMS Inc. warrants that all new products sold hereunder shall conform to MSI DELIVERY SYSTEMS Inc.'s published specifications and be free from defects in material or workmanship during the following warranty period;

(1) Smoke Generators - twelve (12) months from date of shipment.

b) Remedies

If notified of such a defect during the applicable warranty period, MSI DELIVERY SYSTEMS Inc. will replace or repair, at its sole option, defective components free of parts charge to Buyer. Labor to remove and replace defective products will be provided by the Buyer and at Buyer's expense. If, in MSI DELIVERY SYSTEMS Inc.'s analysis of the defect, MSI DELIVERY

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SYSTEMS Inc. determines that factory personnel are required to affect repairs, MSI DELIVERY SYSTEMS Inc. will either (a) dispatch said personnel, free of charge to the Buyer within the first 30 days of the warranty period or (b) issue an RMA number to accept the product return for factory repair. If, after expending its best efforts to correct a defect or replace a defective item with one meeting the foregoing warranty, MSI DELIVERY SYSTEMS Inc. is unable to do so, it may discharge its obligations under this warranty by exchanging the defective item with a conforming item.

c) Exceptions

(1) Excepted from the foregoing warranty are consumable parts which, due to their nature, may not function for the applicable warranty period specified above. Examples of such consumable parts are: seals, gaskets, lamps, 0-rings, fuses, batteries and tubes. If such consumable parts fail to function for a reasonable period of time, as determined by MSI DELIVERY SYSTEMS Inc., MSI DELIVERY SYSTEMS Inc. will replace them.

(2) This warranty does not extend to loss, damage or defects arising from improper or inadequate maintenance, training or use of the equipment by Buyer; Buyer-supplied parts, supplies, or interfaces; modification or misuse by Buyer; or operation outside MSI DELIVERY SYSTEMS Inc.'s published specifications for the product.

(3) This warranty shall not apply to material shipped by Buyer to locations outside the country of initial delivery.

With respect to used goods, which shall be so described on the face of this form or purchase order, MSI DELIVERY SYSTEMS Inc. makes no warranty and such goods are sold "AS IS".

THIS WARRANTY IS EXCLUSIVE AND MADE EXPRESSLY IN LIEU OF ALL OTHER EXPRESSED OR IMPLIED WARRANTIES, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. TO THE EXTENT THAT ANY IMPLIED WARRANTY EXCEEDS OR EXTENDS BEYOND THE EXPRESS WARRANTY GIVEN ABOVE, SUCH IMPLIED WARRANTY IS DISCLAIMED.

10. **LIMITATIONS.** THE REMEDIES PROVIDED HEREIN ARE BUYER'S SOLE AND EXCLUSIVE REMEDIES. MSI DELIVERY SYSTEMS INC. SHALL NOT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE SALE, INSTALLATION, SERVICE OR USE OF THE PRODUCTS SOLD HEREBY. IN NO EVENT SHALL MSI DELIVERY SYSTEMS INC.'S LIABILITY EXCEED THE PURCHASE PRICE OF THE PRODUCT WHICH IS THE SUBJECT OF THIS CONTRACT OF SALE. IN THE EVENT THE REMEDIES PROVIDED HEREIN SHALL BE FOUND TO HAVE FAILED OF THEIR ESSENTIAL PURPOSE BY A COURT OF COMPETENT JURISDICTION, THE LIMITATION ON INCIDENTAL AND CONSEQUENTIAL DAMAGES SHALL

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NEVERTHELESS APPLY, SUCH LIMITATION ON DAMAGES BEING INDEPENDENT OF BUYER'S EXCLUSIVE REMEDIES.

11. **CONFIDENTIAL INFORMATION.** All information claimed to be confidential or proprietary shall be reduced to writing and appropriately marked to so identify it ("Confidential Information"). MSI DELIVERY SYSTEMS Inc. agrees to hold such Confidential Information in confidence for Buyer and not to use it, except as authorized by Buyer or as ordered by a court of competent jurisdiction, for a period of two (2) years. In protecting the confidence of such Confidential Information, MSI DELIVERY SYSTEMS Inc. shall be held to the standard of care it uses in protecting its own such confidential and proprietary information. Notwithstanding Buyer's claim of confidential or proprietary status, the following information shall not be subject to the obligation of confidentiality or non-use: information which was or becomes known to MSI DELIVERY SYSTEMS Inc. from sources other than the Buyer; information which is independently developed by MSI DELIVERY SYSTEMS Inc., or by its consultants, without breach of these terms; and information which is or becomes part of the public domain without breach of these terms. This provision applies only to information which is reduced to writing and marked "Confidential" by Buyer.

12. **MODIFICATION/CONTROLLING TERMS OF CONTRACT**. The terms set forth herein may not be modified except in a writing signed by an authorized representative of MSI DELIVERY SYSTEMS Inc. and Buyer. The terms herein supersede all previous agreements, discussions, or understandings between the parties concerning the subject matter hereof, including but not limited to, any such terms and conditions contained on Buyer's purchase order conflicting with the terms herein.

13. **INTELLECTUAL PROPERTY.** All know-how, trade secrets, intellectual property, designs, logos, and other similar proprietary rights or markings (whether or not registered) relating to the products and any improvements thereto, or any equivalent modifications or related applications thereof ("Intellectual Property"), shall be the sole property of MSI DELIVERY SYSTEMS Inc. MSI DELIVERY SYSTEMS Inc. grants Buyer a limited right and license to utilize such Intellectual Property only for the purpose of using the products as contemplated herein. Buyer is granted limited right to reproduce MSI DELIVERY SYSTEMS Inc.'s copyrighted computer programming material (software and firmware) for backup or archive purposes only for use on the equipment sold hereunder, provided that all copyright notices are reproduced.

14. **EXPORT LICENSES.** Shipments outside the United States may be subject to issuance of a validated export license by the United States Department of Commerce. Buyer agrees to supply MSI DELIVERY SYSTEMS Inc. all end-user's certificates and other user-related documentation that may be needed in order to obtain such export license.

15. **LABOR.** MSI DELIVERY SYSTEMS Inc. certifies that all material of U.S. origin was produced and that services hereunder shall be rendered in compliance with the requirements of the Fair Labor Standards Act of 1938, as amended.

16. **CONTROLLING LAW**. All resulting contracts of sale shall be interpreted and rights and responsibilities of the parties shall be governed by the laws of North Carolina.

17. **RETURNS.** Buyer shall not make any return of material without the prior authorization of MSI DELIVERY SYSTEMS Inc. and a valid Return Material Authorization (RMA) number. All transportation charges for returns to MSI DELIVERY SYSTEMS Inc.'s facility shall be at the Buyer's expense.

18. **NO ASSIGNMENT/ NO GRANT OF RE-SALE RIGHTS.** Buyer may not assign its rights or obligations under this Agreement without the prior written consent of MSI DELIVERY SYSTEMS. Nothing in this Agreement shall be interpreted as granting Buyer any right to resell or convey in any manner the products to any third party without prior written authorization from MSI DELIVERY SYSTEMS Inc.