System Assessment and Validation for Emergency Responders (SAVER)

Portable Ambulance Decontamination Systems Market Survey Report

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FOREWORD

The U.S. Department of Homeland Security (DHS) established the System Assessment and Validation for Emergency Responders (SAVER) Program to assist emergency responders making procurement decisions. Located within the Science and Technology Directorate (S&T) of DHS, the SAVER Program conducts objective assessments and validations on commercially available equipment and systems, and develops knowledge products that provide relevant equipment information to the emergency responder community. The SAVER Program mission includes:

- Conducting impartial, practitioner-relevant, operationally oriented assessments and validations of emergency response equipment
- Providing information, in the form of knowledge products, that enables decision-makers and responders to better select, procure, use, and maintain emergency response equipment.

SAVER Program knowledge products provide information on equipment that falls under the categories listed in the DHS Authorized Equipment List (AEL), focusing primarily on two main questions for the responder community: "What equipment is available?" and "How does it perform?" These knowledge products are shared nationally with the responder community, providing a life- and cost-saving asset to DHS, as well as to Federal, state, and local responders.

The SAVER Program is supported by a network of Technical Agents who perform assessment and validation activities. As a SAVER Program Technical Agent, the Space and Naval Warfare Systems Center (SPAWARSYSCEN) Atlantic has been tasked to provide expertise and analysis on key subject areas, including communications, sensors, security, weapon detection, and surveillance, among others. In support of this tasking SPAWARSYSCEN Atlantic developed this report to provide emergency responders with information gathered during a market survey of commercially available portable ambulance decontamination systems, which fall under AEL reference numbers 08D2-03-TDEW titled Equipment, Technical Decontamination Wet and 08D2-04-SOLN titled Solution, Decontamination, Site (Not for Personnel).

For more information on the SAVER Program or to view additional reports on other technologies, visit www.firstresponder.gov/SAVER.

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TABLE OF CONTENTS

LIST OF TABLES

1. INTRODUCTION

Portable ambulance decontamination systems are used by emergency medical services (EMS), fire departments, and private ambulance providers to disinfect ambulance cabins. To provide emergency responders with information on portable ambulance decontamination systems, the System Assessment and Validation for Emergency Responders (SAVER) Program conducted a market survey.

This market survey report is based on information gathered from January through July 2015 from vendors, Internet research, and a government issued Request for Information (RFI) that was posted on the Federal Business Opportunities website. For inclusion in this report, portable ambulance decontamination systems had to be commercially available, capable of decontaminating an area between 400 and 800 cubic feet, and compatible with a disinfectant or sterilant registered with the Environmental Protection Agency (EPA). Fixed systems, such as those affixed to a wall or other structure, are not included in this report.

Due diligence was performed to develop a report that is representative of products in the marketplace.

2. PORTABLE AMBULANCE DECONTAMINATION SYSTEMS

The use of portable ambulance decontamination systems may be most helpful following the transport of a patient with a virus or bacteria that is highly contagious and/or life threatening, as well as resistant to antimicrobial products. Common microorganisms of concern include Clostridium difficile bacteria, methicillin-resistant Staphylococcus aureus (MRSA), Human Immunodeficiency Virus (HIV), tuberculosis (TB), and Hepatitis B and C, among others.

2.1 Current Technology

Portable ambulance decontamination systems disperse a disinfectant or sterilant into an ambulance cabin and onto surfaces through automated or manual operation to kill microorganisms that could cause illness and disease. Systems can be classified as vapor, fog, or mist based on how they disperse a disinfectant/sterilant. Automated systems operate unattended, whereas manual systems require an operator to disperse the disinfectant/sterilant using a handheld wand.

2.1.1 Vapor Systems

Vapor systems use a proprietary, hydrogen peroxide-based sterilant that is emitted as a vapor for decontamination. Since these systems emit a vapor, surfaces remain dry during application.

A vapor system consists of a decontamination unit (e.g., vaporizer or generator) that disperses the sterilant and also calculates the appropriate sterilant concentration and dispersal time. The decontamination unit also conditions the environment in which it is being operated to ensure the target environmental conditions (e.g., humidity level) are reached. Vapor systems require AC power for operation.

2.1.2 Fog Systems

Fog systems can be characterized as dry fog systems or wet fog systems. Dry fog systems use a hydrogen peroxide-based disinfectant/sterilant for decontamination. Some systems require a specific hydrogen peroxide-based disinfectant/sterilant (e.g., Sanosil HaloMist™ Disinfectant Fogging Solution), while other systems are compatible with various hydrogen peroxide-based disinfectants/sterilants. Surfaces remain dry during dispersal; however, condensation can accumulate if the system is not used as directed and over-fogging occurs. Wet fog systems use various disinfectants for decontamination. Surfaces will become wet during dispersal.

Fog systems typically consist of a decontamination unit that disperses the disinfectant. The amount of disinfectant to use and its associated dispersal time must be calculated by the user. A reference sheet is typically included to assist the user in these calculations. Some fog systems allow the user to select the form (i.e., dry fog, wet fog, mist) in which the disinfectant will be dispensed. The majority of these systems run on AC power; however, some systems can be powered by a battery or compressed air.

2.1.3 Mist Systems

Mist systems use various disinfectants for decontamination. Surfaces will become wet during dispersal.

Mist systems can be comprised of a manual sprayer connected to a decontamination unit and/or automated misting devices integrated into the decontamination unit. Some systems have electrostatic sprayers that produce electrically charged droplets. These droplets attach to grounded surfaces to provide greater coverage. Mist systems require AC power and/or a battery.

2.1.4 Accessories/Options

The majority of ambulance decontamination system vendors offer the sterilant(s) or disinfectant(s) used by the system. Vendors may also offer monitoring systems and/or chemical indicator test strips to validate the dispensing of the disinfectant/sterilant throughout the ambulance cabin and the efficacy of the decontamination cycle.

Vapor systems may have the following components included or optionally available:

- Circulators to move the dispersed sterilant throughout the ambulance cabin
- Aeration unit to help breakdown the vapor and reduce the overall decontamination cycle time
- Desiccant cartridges/dryer tanks to contain water vapor produced during vaporization of the sterilant and regenerators to remove the water from the cartridges and dryer tank
- Chemical detectors/sensors to monitor the level of hydrogen peroxide in the air
- Control unit to operate and monitor the system remotely.

Fogging systems may include or have available as options an extended nozzle, a spray bottle nozzle, a turntable, and/or a timer. A turntable may be used to disperse the disinfectant more uniformly in larger spaces, and a timer allows automated dispersal of the disinfectant.

Misting systems may include or have a back-up battery as an optional accessory. Automated misting systems may have a handheld applicator or vehicle integration port available as options.

2.2 Decontamination Cycle

Before a system can be used for decontamination, the ambulance must first be manually cleaned. The amount of time it takes for manual cleaning and for the portable ambulance decontamination system to complete a decontamination cycle determines the amount of time an ambulance is out of service. The length of time for a system to complete a decontamination cycle depends on factors such as: environmental conditions (e.g., temperature, humidity), ambulance cabin size, decontamination level (e.g., disinfection or sterilization), target microorganisms, and materials (e.g., porous and non-porous) in the ambulance cabin.

The decontamination cycle for portable ambulance decontamination systems includes, at a minimum, two phases: disinfectant/sterilant dispersal time and disinfectant/sterilant dwell time. Vapor systems also include an environmental conditioning phase and an aeration phase. During the environmental conditioning phase, target humidity levels are reached. During the aeration phase, the sterilant is removed from the air, ensuring it is safe to occupy the treated space. Fog and mist systems may also include an aeration phase. While fog and mist systems do not include an environmental conditioning phase, dehumidification of the ambulance cabin may be needed prior to operating these systems.

2.3 Standards/Regulations

Portable ambulance decontamination systems may be subject to EPA regulations and Occupational Safety and Health Administration (OSHA) standards. In addition, OSHA and the Centers for Disease Control and Prevention (CDC), as well as local and state public health entities, may provide guidance and recommendations for decontamination procedures for particular microorganisms (e.g., Ebola).

2.3.1 EPA Regulations

Portable ambulance decontamination systems packaged with a specific disinfectant are regulated by the EPA. In addition, disinfectants/sterilants used by systems but purchased separately are regulated by the EPA. This authority is given by the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) of 1947 as amended in 1996. Each EPA-registered disinfectant/sterilant is assigned a registration number and bears a label that indicates system compatibility (i.e., vapor, fogging, misting). For systems that are packaged with a disinfectant/sterilant, the label on the disinfectant/sterilant will name the specific system it is compatible with. For systems compatible with various disinfectants, which are purchased separately, agencies need to review the label carefully to determine if the disinfectant they intend to use with the system is actually compatible with that specific system or type of system. In addition, a label may also provide: efficacy data, approved marketing claims, application instructions including disinfectant/sterilant dwell time on a surface, safety information, appropriate uses, and material compatibility.

To determine if a disinfectant/sterilant is registered with the EPA, visit the National Particle Information Retrieval System at http://ppis.ceris.purdue.edu.

To review disinfectant/sterilant labels to determine the types of systems the disinfectant/sterilant are compatible with, visit http://iaspub.epa.gov/apex/pesticides/f?p=PPLS:1.

2.3.2 OSHA Standards

The disinfectants and sterilants used by portable ambulance decontamination systems may be classified as hazardous materials, and as such, an agency and/or operator may need to be compliant with OSHA standards relating to toxic and hazardous substances, personal protective equipment, and hazardous materials communications. In addition, the disinfectants/sterilants may also need to be compliant with OSHA's bloodborne pathogens standard.

3. PORTABLE AMBULANCE DECONTAMINATION SYSTEMS– VENDOR PROVIDED

This section provides information on 21 portable ambulance decontamination systems that range in price from $127 to $55,000. All systems include a 1-year warranty, except the Fogmaster Corporation Micro-Jet® ULV 7401, which includes a 5-year warranty.

Table 3-1 provides general product specifications and the following sections provide product specific information. Product information presented in this section was obtained directly from vendors. The information has not been independently verified by the SAVER Program. Clarification on certain specifications in Table 3-1 is provided below, listed in alphabetical order:

Decontamination Cycle Time refers to the time it takes for an automated system to decontaminate an ambulance cabin after manual cleaning is performed and includes disinfectant/sterilant dispersal, disinfectant/sterilant dwell time, and aeration. Systems that require manual dispersal of the disinfectant/sterilant will have an NA (not applicable) for decontamination cycle time.

Disinfectant/Sterilant identifies the specific disinfectant or sterilant the system uses for decontamination as well as its EPA registration number.

Power refers to the system's primary power source. Options include AC, rechargeable battery, compressed air, and proprietary single-use battery pack. If the system is powered by a rechargeable battery, the average time the system will operate before the battery needs to be charged is listed. If the system is powered by compressed air, pounds per square inch (psi) is listed. If the system is powered by a proprietary single-use battery pack, battery runtime is listed.

Table 3-1. Portable Ambulance Decontamination System Specifications

Vendor	Product	MSRP	Weight (pounds)	Dimensions (inches) (LxWxH)	Power	Application of Disinfectant/Sterilant	Decontamination Cycle Time (minutes)	Dispersed Form	Disinfectant/Serilant
AeroClave LLC	RDS 3110 series (Standard and Trident Models)	$13,999	48	19x12x18	AC	Automated[1]	20	Mist	Vital Oxide (82972-1)
Bioquell Inc.	Bioquell BQ-EMS	$53,000	46 (vaporizer) 22 (aeration unit)	17.7x18.1x22.0 (vaporizer) 18.9x13.4x13.0 (aeration unit)	AC	Automated	60 or less[2]	Vapor	B-Cap 35 Antimicrobial Agent (72372-1)
Curtis Dyna-Fog Ltd.	Hurricane ES 62150-3	$650	8	12x12x14	AC	Manual	NA	Dry Fog to Mist (Electrostatic)	Various
	Sani-Tizer 62175-1	$343	7	12x12x14	AC	Manual	NA	Dry Fog to Mist	Various
DevMar-GS3 Healthcare Alliance (DGHA)[3] LLC	Steriplex 360° ProMister	$4,995	32	19.0x13.5x39.5	Rechargeable battery (24 hours)	Manual	NA	Mist	Various and Steriplex SD[4] (84545-10 & 84545-11)
E-Mist Innovations Inc.	E-Mist Surface Management System (SMS)	$3,900 or $395 per month to lease	18	11x7x17	Rechargeable battery (1 hour)	Manual	NA	Mist (Electrostatic)	Various

Vendor	Product	MSRP	Weight (pounds)	Dimensions (inches) (LxWxH)	Power	Application of Disinfectant/Sterilant	Decontamination Cycle		
Electrostatic Spraying Systems Inc.	BP2	$5,000	30	13.5x9.5x20.0	Rechargeable battery (2 hours)	Manual	NA	Mist (Electrostatic)	Various
	SC-EB	$2,800	45	10x16x22	AC	Manual	NA	Mist (Electrostatic)	Various
	SC-ET-HD	$3,000	43	10x22x16	AC	Manual	NA	Mist (Electrostatic)	Various
	XT-3	$3,200	105	24x18x42	AC	Manual	NA	Mist (Electrostatic)	Various
Emergency Products & Research Inc.	Ambu-Stat	$1,509	13	15.4x10.4x8.6[5]	AC	Automated	25[2]	Dry Fog	Actril Cold Sterilant (52252-7)
Fogmaster Corporation	Fogmaster Jr. 5330	$127	5	11.0x4.5x10.0	AC	Manual	NA	Dry Fog to Mist	Various
	Micro-Jet ULV 7401	$516	12	12.5x15.4x8.6[5]	AC	Manual[6]	NA	Dry Fog to Wet Fog	Various
	Vectra-Jet ULV 7505	$660	13	12.5x15.4x8.6[5]	AC	Manual[6]	NA	Dry Fog to Wet Fog	Various
Mar Cor Purification	Actril Fog System	$1,692	15	8x8x16	Compressed air (75 psi)	Automated	30-90[2]	Dry Fog	Actril Cold Sterilant (52252-7)

Vendor	Product	MSRP	Weight (pounds)	Dimensions (inches) (LxWxH)	Power	Application of Disinfectant/Sterilant	Decontamination Cycle Time (minutes)	Dispersed Form	Disinfectant/Serilant
Marketing Assessment Inc.[7]	ByoPlanet BP-515	$7,495	30[8]	13x14x24	AC and proprietary single-use battery pack[9] (72 hours)	Manual	NA	Mist (Electrostatic)	Various
Med Effect Inc.[10]	Sanosil HaloFogger	$7,315	50	13.3x8.5x40.0	AC	Automated	55[2]	Dry Fog	Sanosil Halomist Disinfectant Fogging Solution (84526-6)
SixLog Corporation[11]	Phileas Model 20I	$6,500	13	13.8x6.7x9.4	AC or rechargeable battery (1.5 hours)	Automated	30-75[2]	Dry Fog	Various hydrogen peroxide-based disinfectants
	Phileas Model 50I				AC				
STERIS Corporation	VHP ARD Biodecontamination System	$55,000	150	24.8x37.3x40.3	AC	Automated	120-240[2]	Vapor	Vaprox Hydrogen Peroxide Sterilant (58779-4)

Notes:
NA—not applicable
[1]System allows for manual application of disinfectant with the purchase of a handheld applicator.
[2]Decontamination cycle time varies based on a number of factors which could include any of the following: microorganisms present, decontamination level, disinfectant dwell time, aeration requirements, ambulance cabin size, ambulance cabin materials, temperature, and relative humidity.
[3]Distributor of the Steriplex 360° ProMister. The system is manufactured by Windsor Karcher Group.
[4]System designed for use specifically with Steriplex SD; however, it can be used with various disinfectants.

[5]Dimensions are height x length x diameter.
[6]System allows for automated application of disinfectant with the purchase of a timer.
[7]Distributor of the ByoPlanet BP-515. The system is manufactured by ByoPlanet International LLC.
[8]With tank filled with disinfectant.
[9]Decontamination unit requires AC power and the sprayer requires a proprietary single-use battery pack for operation.
[10]Distributor of the Sansosil HaloFogger. The system is manufactured by Sanosil International LLC.
[11]Distributor of the Phileas Model 20I and Model 50I. The systems are manufactured by Devea SAS.

Information in the table is based on data gathered from vendors from January to July 2015.

3.1 AeroClave™ LLC RDS 3110 Series

The RDS 3110 is available in two models and costs $13,999, which includes training and a 1-year warranty. The RDS 3110 Standard model includes two fixed heads (i.e., misting devices) and one smart port. The RDS 3110 Trident model includes three smart ports. Smart ports are compatible with an AeroClave Portable Applicator (APA) for handheld application or an AeroClave Distribution Port (ADP), which allows the decontamination system to be connected to the outside of an ambulance for dispersal of the disinfectant. An APA includes a remote head, handheld applicator, and remote control.

The RDS 3110 series uses Vital Oxide®, a chlorine dioxide-based disinfectant. The system holds 1 gallon of disinfectant, and each nozzle dispenses 30 milliliters (ml) of disinfectant per minute. A control panel is located on the system that allows the user to select options for automated dispersal of the disinfectant. The system may also be operated manually with purchase of an APA handheld applicator. Training via video conferencing is included with purchase and up to 6 hours of additional on-site training is available for $1,000. Technical support is available during normal business hours.

Accessories available for an additional cost are listed in the following table:

Accessory	MSRP
ADP (Vehicle Integration)	$949
APA (Handheld Applicator)	$1,249
Case[1] of Disinfectant	$140
12 Cases of Disinfectant	$1,584
36 Cases of Disinfectant	$4,320
1-Year Warranty Extension	$750

[1]A case includes four 1-gallon containers.

AeroClave LLC also offers the Ambulance Decontamination System (ADS), a fixed-mounted system that can be installed in an ambulance cabin for $7,499, as well as the Portable Asset Decontamination System (PADS), which is a customized, drive-thru decontamination chamber that disinfectants the inside and outside of an ambulance.

3.2 Bioquell™ Inc. Bioquell BQ-EMS

The Bioquell BQ-EMS costs $53,000, which includes: two aeration units, a wireless control unit, a hydrogen peroxide vapor detector, an accessories bag, a transport cart, four 950 ml bottles of sterilant, training, and a 1-year warranty.

The Bioquell BQ-EMS uses B-Cap™ 35 Antimicrobial Agent, a hydrogen peroxide-based sterilant. The system holds two 950 ml bottles of sterilant and dispenses the sterilant at a rate of 18 ml per minute. The system is programmed via the wireless control unit for automated dispersal of the sterilant. One day of onsite operator training as well as online training for up to five people are included with purchase. Technical support is available during normal business hours.

Accessories available for an additional cost are listed in the following table:

Accessory	MSRP
B-Cap 35 Antimicrobial Agent	Varies according to quantity ordered
Chemical Indicators (Box of 20)	$99
Chemical Indicators (Box of 100)	$325

3.3 Curtis Dyna-Fog Ltd. Hurricane ES™

The Hurricane ES costs $650, which includes a 1-year warranty and carrying bag.

The Hurricane ES uses disinfectants approved for use in fog and mist systems. The system applies an electrostatic charge to the disinfectant, holds 1 gallon of disinfectant, has an adjustable flow rate that dispenses up to 266 ml of disinfectant per minute, and requires manual operation for dispersal of the disinfectant. Training is not required, and technical support is available during normal business hours.

3.4 Curtis Dyna-Fog Ltd. Sani-Tizer™

The Sani-Tizer costs $343, which includes a 1-year warranty.

The Sani-Tizer uses disinfectants approved for use in fog and mist systems. The system holds 1 gallon of disinfectant, has an adjustable flow rate that dispenses up to 284 ml of disinfectant per minute, and requires manual operation for dispersal of the disinfectant. Training is not required, and technical support is available during normal business hours.

3.5 Devmar-GS3 Healthcare Alliance (DGHA) LLC Steriplex 360° ProMister

The Steriplex 360° ProMister costs $4,995, which includes: a battery charger, training, and a 1-year warranty.

The Steriplex 360° ProMister uses Steriplex SD, a hydrogen peroxide, silver, and peracetic acid-based disinfectant. The system can also be used with other disinfectants that are approved for use with mist systems. The system holds 1 gallon of disinfectant, dispenses 296 to 355 ml of disinfectant per 2,250 cubic feet, and requires manual operation for dispersal of the disinfectant. A training video is included with purchase, and technical support is available during normal business hours.

The Steriplex SD disinfectant is available for purchase from DGHA for $63 per gallon.

3.6 E-Mist Innovations™ Inc. E-Mist Surface Management System (SMS)

The E-Mist Surface Management System (SMS) costs $3,900 to purchase or $395 a month to lease. The system includes a battery charger and training. Purchase of the system also includes a 1-year warranty.

The E-Mist Surface Management System (SMS) uses disinfectants approved for use with mist systems. The system applies an electrostatic charge to the disinfectant, holds 1 gallon of disinfectant, dispenses 0.6 ml of disinfectant per square foot, and requires manual operation for dispersal of the disinfectant. Training options included with purchase include onsite training, video conferencing, computer-based training modules, and training videos. Technical support is available during normal business hours.

Accessories available for an additional cost are listed in the following table:

Accessory	MSRP
Spare Rechargeable Battery	$275
Spare Battery Charger	$85

3.7 Electrostatic Spraying Systems Inc. BP2

The BP2 costs $5,000, which includes training and a 1-year warranty.

The BP2 uses disinfectants approved for use in misting systems. The system applies an electrostatic charge to the disinfectant, holds 1 liter of disinfectant, dispenses 80 ml of disinfectant per minute, and requires manual operation for dispersal of the disinfectant. Operator training at Electrostatic Spraying Systems is included with purchase (travel not included), and training at a customer location is available for an additional cost. Technical support is available during normal business hours.

Electrostatic Spraying Systems offers additional or replacement l-liter bottles for holding the disinfectant for $20 per bottle.

3.8 Electrostatic Spraying Systems Inc. SC-EB

The SC-EB costs $2,800, which includes training and a 1-year warranty.

The SC-EB uses disinfectants approved for use in misting systems. The system applies an electrostatic charge to the disinfectant, holds 2 liters of disinfectant, dispenses 62 ml of disinfectant per minute, and requires manual operation for dispersal of the disinfectant. Operator training at Electrostatic Spraying Systems is included with purchase (travel not included), and training at a customer location is available for an additional cost. Technical support is available during normal business hours.

Accessories available for an additional cost are listed in the following table:

Accessory	MSRP
1-liter Bottle	$20
Additional Hose	$1.50 per foot

3.9 Electrostatic Spraying Systems Inc. SC-ET-HD

The SC-ET-HD costs $3,000, which includes training and a 1-year warranty.

The SC-ET-HD uses disinfectants approved for use in misting systems. The system applies an electrostatic charge to the disinfectant, holds 1.25 gallons of disinfectant, dispenses 62 ml of disinfectant per minute, and requires manual operation for dispersal of the disinfectant. Operator training at Electrostatic Spraying Systems is included with purchase (travel not included), and training at a customer location is available for an additional cost. Technical support is available during normal business hours.

Electrostatic Spraying Systems offers additional hose for $3 per foot.

3.10 Electrostatic Spraying Systems Inc. XT-3

The XT-3 costs $3,200, which includes training and a 1-year warranty.

The XT-3 uses disinfectants approved for use in misting systems. The system applies an electrostatic charge to the disinfectant, holds 3 gallons of disinfectant, dispenses 127 ml of disinfectant per minute, and requires manual operation for dispersal of the disinfectant. Operator training at Electrostatic Spraying Systems is included with purchase (travel not included), and training at a customer location is available for an additional cost. Technical support is available during normal business hours.

Electrostatic Spraying Systems offers additional hose for $3 per foot.

3.11 Emergency Products & Research Inc. Ambu-Stat

The Ambu-Stat costs $1,509, which includes a digital timer, a case of Actril® Cold Sterilant, chemical indicator test strips, a spray bottle nozzle, training, and a 1-year warranty.

The Ambu-Stat uses Actril Cold Sterilant, a hydrogen peroxide and peracetic acid-based sterilant. The system holds 1 gallon of sterilant, and dispenses 15 ml of disinfectant per minute. The system requires activation of a timer to automatically disperse the sterilant. Remote training via video conferencing and online training videos are included with purchase, and on-site training is available for an additional cost. Technical support is available 24/7.

Accessories available for an additional cost are listed in the following table:

Accessory	MSRP
Case[1] of Actril Cold Sterilant	$250
Turntable	$489
Chemical Indicator Test Strips	$62
Adenosine Triphosphate (ATP) Surface Monitoring System	$3,000

[1]A case includes six 1-quart containers.

3.12 Fogmaster Corporation Fogmaster Jr® 5330

The Fogmaster Jr 5330 costs $127, which includes a 1-year warranty.

The Fogmaster Jr 5330 uses disinfectants approved for use in fog and mist systems. The system holds 1 quart of disinfectant, has an adjustable flow rate that can dispense up to 89 ml of disinfectant per minute, and requires manual operation for dispersal of the disinfectant. Training is not required, and technical support is available during normal business hours.

3.13 Fogmaster Corporation Micro-Jet ULV 7401

The Micro-Jet ULV 7401 costs $516, which includes a 5-year warranty.

The Micro-Jet ULV 7401 uses disinfectants approved for use in a fog system. The system holds 1 gallon of disinfectant, has an adjustable flow rate that can dispense up to 237 ml of disinfectant per minute, and requires manual operation for dispersal of the disinfectant. Training is not required, and technical support is available during normal business hours.

Accessories available for an additional cost are listed in the following table:

Accessory	MSRP
Timer, 0-60 Minutes, Wind-up (model 7304)	$85
Turntable, 3 rpm, 120V (model 610010)	$290

3.14 Fogmaster Corporation Vectra-Jet® ULV 7505

The Vectra-Jet ULV 7505 costs $660, which includes a 1-year warranty.

The Vectra-Jet ULV 7505 uses disinfectants approved for use in a fog system. The system holds 1 gallon of disinfectant, has an adjustable flow rate that can dispense up to 296 ml of disinfectant per minute, and requires manual operation for dispersal of the disinfectant. Training is not required, and technical support is available during normal business hours.

Accessories available for an additional cost are listed in the following table:

Accessory	MSRP
Timer, 0-60 Minutes, Wind-up (model 7304)	$85
Turntable, 3 rpm, 120V (model 610010)	$290

3.15 Mar Cor Purification Actril® Fog System

The Actril Fog System costs $1,692, which includes a 1-year warranty.

The Actril Fog System uses Actril Cold Sterilant, a hydrogen peroxide and peracetic acid-based sterilant. The fogging dispenser attaches to a 1-gallon container of sterilant that dispenses 13 ml of sterilant per minute. The system requires manual activation and deactivation, but does not require manual operation for dispersal of the sterilant. Training is not required for system operation. Technical support is available during normal business hours.

A case of four 1-gallon containers of Actril Cold Sterilant is available to purchase from Mar Cor Purification for $168.

3.16 Marketing Assessment Inc. ByoPlanet® BP-515™

The ByoPlanet BP-515 costs $7,495, which includes training and a 1-year warranty.

The ByoPlanet BP-515 uses disinfectants approved for use with a mist system. The system applies an electrostatic charge to the disinfectant, holds 0.63 gallons of disinfectant, dispenses 118 ml of disinfectant per minute, and requires manual operation for dispersal of the disinfectant. A training video is included with purchase, and technical support is available during normal business hours.

A 90-degree swivel head for use with the sprayer is available to purchase from Marketing Assessment Inc. for $295.

3.17 Med Effect Inc. Sanosil HaloFogger®

The Sanosil HaloFogger costs $7,315, which includes one case (four 1-gallon containers) of Sanosil HaloMist Disinfectant Fogging Solution and a 1-year warranty.

The Sanosil HaloFogger uses Sanosil HaloMist Disinfectant Fogging Solution, a hydrogen peroxide and silver-based disinfectant that is diluted with distilled water prior to use. The system holds 2 gallons of disinfectant, dispenses 30 ml of disinfectant per minute, and has a low fluid indicator. User setup via controls on the system is required for automated dispersal of the disinfectant. Training is not required; however, onsite training is available for an additional cost. Technical support is available during normal business hours.

Accessories available for an additional cost are listed in the following table:

Accessory	MSRP
50 Hydrogen Peroxide Chemical Test Strips	$30
Halo Extended Nozzle	$850

3.18 SixLog Corporation Phileas Model 20I and 50I

The Phileas Model 20I and 50I each cost $6,500, which includes a 1-year warranty. The Phileas Model 20I also includes a rechargeable battery and battery charger.

The Phileas Model 20I and 50I use any hydrogen peroxide-based disinfectant approved for use with a fog system. The systems hold 1 liter of disinfectant. Phileas Model 20I dispenses 13 ml of disinfectant per minute and Phileas Model 50I dispenses 25 ml of disinfectant per minute. Phileas Model 20I has a low battery indicator. The system is programmed via a touchscreen for automated dispersal of the disinfectant. Training is not required for system operation; however, one-day of on-site training is available for $2,500. Technical support is available during normal business hours.

Accessories available for an additional cost are listed in the following table:

Accessory	MSRP
Case[1] of Steri-Perox Disinfectant	$375
Case[1] of Minncare Cold Sterilant or Decon-Spore200 Disinfectant (dilute with water prior to use)	$750

[1]A case includes four 1-gallon containers.

3.19 STERIS® Corporation VHP® ARD Biodecontamination System

The VHP ARD Biodecontamination System costs $55,000, which includes a 1-year warranty.

The VHP ARD Biodecontamination System uses Vaprox® Hydrogen Peroxide Sterilant. The system holds 950 ml of sterilant and dispenses 2 to 12 ml of disinfectant per minute, depending on the desired decontamination level, ambulance cabin size, and the cabin materials. The system is setup via a touch panel for automated dispersal of the sterilant. Training is required for operating the system, and systems operator and safety training are offered at a negotiated rate. Technical support is available 24/7.

Accessories available for an additional cost are listed in the following table:

Accessory	MSRP
Case[1] of Vaprox Sterilant	$495
VHP ARD Sensor Bundle	$7,995
VHP ARD Circulator	$8,995
VHP ARD Aerator	$4,295
VHP ARD Contactor	$3,595
VHP Desiccant Dryer	$11,995
Desiccant Installation Kit, Reusable	$1,295
Desiccant Cartridge, Reusable	$130 to $995
Desiccant Adapter, Disposable	$2,500
Desiccant Cartridge, Disposable	$995

[1]A case includes six 950-ml containers.

4. VENDOR CONTACT INFORMATION

Additional information on the portable ambulance decontamination systems included in this market survey report can be obtained from the vendors listed in Table 4-1. Additional vendors of portable ambulance decontamination systems are also included, as designated by an asterisk (*).

Table 4-1. Vendor Contact Information

Vendor	Phone Number	Website
AeroClave LLC	(800) 788-9119	www.aeroclave.com
Bioquell Inc.	(215) 682-0225	www.bioquell.com
ByoPlanet International LLC	(855) 211-1518	www.byoplanet.com
Curtis Dyna-Fog Ltd	(317) 896-2561	www.dynafog.com
Devea SAS[1]	+33 2 40 79 59 60	www.devea-environnement.com
DevMar-GS3 Healthcare Alliance (DGHA)[2] LLC	(855) 313-1169	www.dghaglobal.com
E-Mist Innovations Inc.	(817) 231-5107 ext. 310	www.touchpointhealthy.com
Electrostatic Spraying Systems Inc.	(706) 769-0025	www.maxcharge.com
Emergency Products & Research Inc.	(800) 322-5725	www.epandr.com www.facebook.com/spacedecon
Fogmaster Corporation	(954) 481-9975	www.fogmaster.com

Vendor	Phone Number	Website
Klenitise North America*	(404) 414-6495	www.klenitise.com
Mar Cor Purification	(800) 633-3080	www.mcpur.com
Marketing Assessment Inc. [3]	(800) 827-9344	www.marketingassessment.com
Med Effect Inc.[4]	(800) 472-5605	www.medeffect360.com
Sanosil International LLC[5]	(877) 726-6745	www.sanosilinternational.com
SixLog Corporation[6]	(877) 474-9564	www.sixlog.com
STERIS Corporation	(440) 354-2600	www.steris.com
Windsor Karcher Group[7]	(800) 444-7654	www.windsorkarchergroup.com

[1]Phileas 20I and 50I manufacturer
[2]Steriplex 360° ProMister distributor
[3]ByoPlanet BP-515 distributor
[4]Sanosil HaloFogger distributor
[5]Sanosil HaloFogger manufacturer
[6]Phileas Models 20I and 50I distributor
[7]Steriplex 360° ProMister manufacturer

5. SUMMARY

This market survey report provides information on 21 portable ambulance decontamination systems. The products differ in cost, system type (e.g., vapor, mist, fog), decontamination cycle time, and the method of operation (e.g., manual, automated). All products include a 1-year warranty, except the Fogmaster Corporation Micro-Jet ULV 7401, which includes a 5-year warranty.

An important consideration in the selection of portable ambulance decontamination systems is the compatible disinfectants/sterilants. It is essential that only disinfectants/sterilants approved for use in the specific system or type of system being deployed are used for the efficacy and safety claims of the disinfectant to apply. An additional consideration is the decontamination cycle time, as this will dictate how long an ambulance is out of service.

Emergency responder agencies that consider purchasing portable ambulance decontamination systems should carefully research each product's overall capabilities and limitations in relation to their agency's operational needs. In addition, agencies should be aware that pricing and volume discounts may be available.