HAZMAT HQ

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CHATROOM SPECIAL

Harnessing Innovation for Hazardous Materials Response: Brevard County Fire Rescue's New HazMat 1

By Lt Kelly & Dist. Ch Neidert

Brevard County Fire Rescue (BCFR) is at the forefront of emergency response, particularly in hazardous materials (HazMat) management. As the Special Operations Officer, I am proud to introduce the latest addition to our arsenal: the new HazMat 1 unit. This article will explore the significance of this upgrade, the capabilities of our HazMat team, and the impact this will have on our community and beyond.

The Importance of HazMat Response in Brevard County

Brevard County, with its diverse landscape and growing population, presents unique challenges in hazardous materials management. Our county is home to over 600,000 residents, the iconic Kennedy Space Center, the bustling Port Canaveral, and 72 miles of active railway lines, including the newly added Brightline train route. Additionally, the stretch of Interstate-95 running through the county is a critical transportation corridor, frequently traversed by vehicles carrying hazardous substances.

These factors create a potential for HazMat incidents that could have severe consequences if not managed effectively. The role of BCFR's HazMat team is to mitigate these risks, ensuring the safety and security of our community. With the introduction of our new HazMat 1 unit, we are better equipped than ever to handle these challenges.

The Evolution of BCFR's HazMat Capabilities

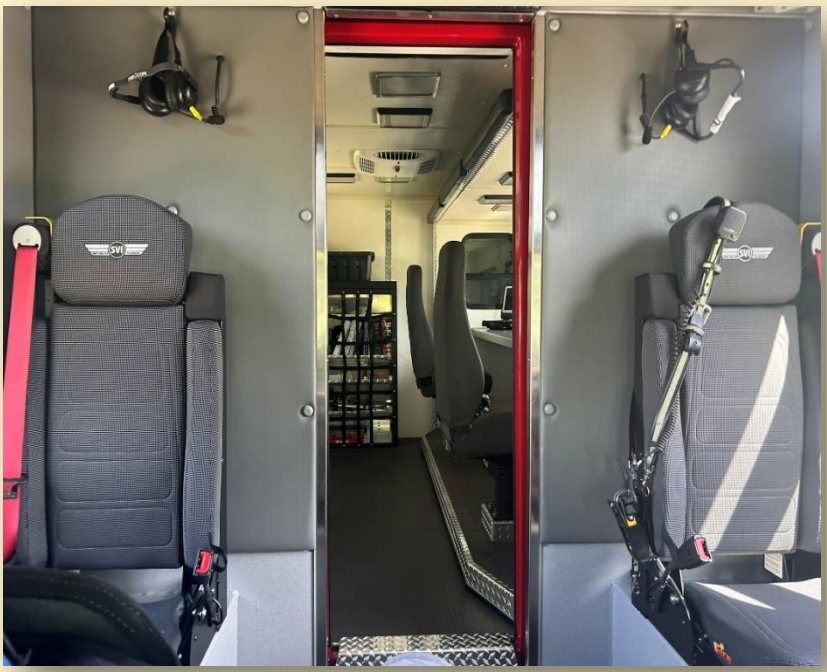
Our HazMat team is recognized as a Type I state asset, a designation that reflects our extensive capabilities. We are the only HazMat team within Brevard County, and our

responsibilities include responding to incidents involving Immediate Danger to Life and Health (IDLH) environments, extremely hazardous substance releases, air monitoring, liquid and vapor leak mitigation, hydrocarbon transfers, chemical research, and more.

In addition to these core responsibilities, our team is proficient in specialized operations such as propane burn-offs, natural gas leak mitigation, extensive foam operations, and unknown chemical identification. We are also involved in evidentiary sampling and pre-planning for target hazards. This comprehensive skill set positions us as a critical resource for both our county and the state of Florida.

The New HazMat 1: A Technological Marvel

BCFR's new HazMat 1 unit represents a significant upgrade from its predecessor, a 2008 American LaFrance HazMat unit. This new vehicle, a 22-foot SVI aluminum body mounted on a Spartan Metro Star LFD chassis, is a



testament to our commitment to staying at the cutting edge of HazMat response technology.

The HazMat 1 is powered by a Cummins L9 engine, providing the reliability and power needed for rapid response. Inside, the vehicle features a mobile command center with a 10-foot-wide slide-out and a pass-thru compartment-body connection, allowing for seamless communication and coordination during incidents.

Key features of the new HazMat 1 include:

- Flow Science FS2010FD Containment Enclosure: This state-of-the-art containment system allows for the safe and efficient handling of hazardous materials on-site.

- Command Light CL Series Light Tower with Safety Vision 620A Camera: Enhances visibility and situational awareness during nighttime or low-visibility operations.
- Norcold DE-0041R 120V AC Galley Refrigerator and Coleman Mach 3 PS Air Conditioner/Heating Unit: Ensures that the team can maintain optimal working conditions, regardless of the environment.

- Weldon V-MUX Vista IV Multiplex Interface System: Provides a user-friendly control interface for the vehicle's various systems, streamlining operations and reducing the potential for human error.
- On Scene Access PRO Compartment LED Lighting and Roof Access Stairway: Improves accessibility and safety for team members during operations.

The new HazMat 1 also features Hannay electric cable reels and Slide master steel slide-out trays, further enhancing its operational efficiency. These upgrades make the HazMat 1 not only a powerful tool for our team but also a model for HazMat response units across the country.

Training and Collaboration: The Pillars of Our Success

While the technology we employ is critical, the success of our HazMat team is ultimately rooted in the skills and dedication of our members. Each member of the team is cross trained as both a hazardous materials technician and a Florida Urban Search and Rescue (FLUSAR) Rescue Specialist. This dual expertise ensures that our team is not only capable of handling HazMat incidents but also proficient in technical rescue operations, including rope rescue, confined space rescue, vehicle and machinery rescue, trench rescue, and structural collapse rescue.

Maintaining proficiency in these diverse disciplines requires rigorous and ongoing training. Our team members are constantly honing their skills, both individually and as a unit, to ensure that we are prepared for any scenario that may arise.

In addition to our internal training efforts, BCFR's HazMat team is actively involved with region 5 East Central Florida's Local Emergency Planning Committee (LEPC) and other local teams. This collaboration allows us to stay up to date on the latest mitigation tactics and strategies, access cutting-edge resources, and trial new hazardous materials equipment. It also fosters strong working relationships with other teams, ensuring that we can work seamlessly together in the event of a large-scale incident.

The Impact of HazMat 1 on Our Community

The introduction of the new HazMat 1 unit has already begun to make a positive impact on our community. Since going into service on August 14, 2024, HazMat 1 has been deployed to several incidents, each time demonstrating its value and effectiveness.

For the residents of Brevard County, the presence of this advanced HazMat unit provides an added layer of security. They can rest assured that, in the event of a hazardous materials incident, our team has the tools and expertise needed to respond swiftly and effectively.

For our team members, the new HazMat 1 offers enhanced capabilities that make our jobs safer and more efficient. The ability to respond to incidents with confidence, knowing that we have the best equipment at our disposal, is invaluable.

Conclusion: A Commitment to Excellence

The introduction of the new HazMat 1 unit marks a significant milestone for Brevard County Fire Rescue. It is a reflection of our ongoing commitment to excellence in hazardous materials response and our dedication to protecting the community we serve.

As we continue to face new challenges in HazMat management, we remain focused on innovation, training, and collaboration. With the HazMat 1 at the heart of our operations, we are well-equipped to meet these challenges head-on, ensuring the safety and security of Brevard County for years to come.

Thomas Neidert- District Chief of Special Operations for Brevard County Fire Rescue

Chief Neidert has been in the Fire service for 32 years and in the Hazmat world for 25 years of his career. He has a Bachelor's degree in Public Administration. His time started in the HAZMAT in

the mid-90s and admired the growth in technology that this field has seen.

Lieutenant Fergus Kelly- Training Lieutenant for Brevard County Fire Rescue Special Operations

Lt Kelly is working in his 19th year in the fire service with 15 of the last years spent on the special operations team. Lt Kelly takes pride in being the lead instructor for Brevard County's HazMat 160 program as well as teaching all the FLUSAR technical rescue disciplines. Additionally, Lt Kelly organizes all the training for his departments Special Operations Team. In his free time Lt Kelly enjoys spending time with his family and friends, fishing, surfing and traveling.

Chemical Suicide

By: Todd Burton (Retired San Diego County Hazmat)

Recently I was told there was a Detergent Suicide on the East Coast. It has been a while since we have been responding to these calls. Good chance there has been a lot of turnover on your Hazmat Team and it's a good opportunity to review the types of chemical suicide and take a closer look at the method called "Detergent Suicide." When I worked for San Diego County Hazmat, we did a Detergent Suicide study and learned a lot and I want to share some of that information with you. There is also a video on YouTube showing the reactions in a vehicle with plumbed monitors and real time readings. You may know a lot of

this, but you just might pick up a nugget or two that can make your response smoother.

There has been a lot written about Chemical Suicides over the years. There is plenty of guidance on the internet for first responders now a days. The methods for Chemical Suicide have not changed too much over the years. There are quite a few methods, and we could do an article on each one of these, but I am sure it's already been done. We all know the list, except the newbies on the teams.

1. Inert Gas. Most of the time Hazmat Teams don't even get called out to the inert gas suicides as it is a straightforward response. Maybe a phone consultation with the crew. Conduct a little air monitoring for oxygen displacement. Usually using Helium

or Nitrogen. Sometimes it's propane, that's a bit different.

2. Carbon Monoxide, the BBQ in the bathroom or generators. Like inert gas but it may require a little more expertise from the hazmat team to monitor adjacent units in all directions to ensure its safe for the neighbors to return to their homes. Also, will need to ensure it's safe for investigators to come in and do their job once it's all ventilated. Remember CO is a flammable gas in high concentrations.

3. Carbon Monoxide via Formic Acid and Sulfuric acid. Not very common. Mixing these generates a lot of CO gas, not

generally flammable but you have acids to deal with to stop the reaction via dilution and neutralization. Remember sulfuric can get really hot with water so overpower it in a larger container with correct PPE.

4. A newer method is ingesting Sodium Nitrite with anti-vomiting agents. No off gassing from the victim that I am aware of. These are the suicide kits that have been purchased off Amazon.

5. Detergent Suicides. Hydrogen Sulfide generation from mixing acids and pesticides. Key here is the yellow liquids in a bucket. We will focus on this one and talk about

some of the nuances of this method. Also, a flammable gas at high concentrations.

6. Drinking pesticides, usually Malathion. This one is messy. Usually vomit all over the place. Be prepared for this if you transport the victim, you will need PPE! Need a negative pressure room at the ER or outside area to treat them as they will keep vomiting and this may cause an evacuation of the ER.

7. Ingesting Cyanide Salts

This one is rare and usually occurs with students or professors. You will pick up <10 ppm Hydrogen Cyanide gas around the mouth. If the medics try to revive the victim, they may expel more Hydrogen Cyanide gas out the

mouth. Upon autopsy the levels will be greater than the IDLH. Help your Medical Examiner as they usually only have Air Purifying Respirators (APRs or Powered APRs) for respiratory protection. And the Hazmat Team can provide monitoring during autopsy to keep the doctors safe.

8. Ingesting Aluminum or Zinc Phosphides. Not common but very toxic when ingested. Makes Phosphine Gas. Flammable gas LEL 1.79% but the ingestion of this will only produce gas in the ppm range. In the stomach it reacts with hydrochloric acid and water to make Phosphine. Phosphine will continue to come out of the mouth area at concentrations that will cause symptoms for those not wearing respiratory protection. Keep these patients outside the ER in a tent

or in a negative pressure room that can be monitored with phosphine sensors from the hazmat team.

9. Ingesting Sodium Azide. Also, very toxic and can twist the call based on Tech Ref research as it's used in airbags and is listed as an explosive. Not normally a problem in a lab bottle. It requires electrical stimulus to set it off. The off gassing from the mouth can be Hydrazoic acid. Acetic Acid Drager's can pick this up allegedly. Could also use an FID like the AP4C to look for Nitrogen.

When you stop to think about it there are probably more methods, I have not listed above but these are the most common ones we run into. You will probably also see overdoses with narcotics, like Fentanyl.

Let’s talk about Detergent Suicide as I was told this occurred in New York state a couple of weeks ago. This is the famous method that was going strong around 2013. They put up signs in the car stating it’s a toxic gas and you can die with one breath and not to enter the vehicle. Sometimes this is done in a small room in a house or apartment complex. The gas has a very low odor threshold in the parts per billion. You will smell it before your 4-gas picks it up. That’s a clue for good monitoring and respiratory protection at that point. Keep an eye on that meter! When I worked for San Diego County Hazmat, we took some time to take a close look at this method as it was new, dangerous and we needed to come up with some answers.

Most responders know that acid and pesticide are used to make this gas. The acid source is normally Muriatic acid, and the pesticide is a sulfur-based fungicide or sulfur product. When mixed the product that is produced is Hydrogen Sulfide gas, in copious amounts! Hydrogen Sulfide is the stinky rotten egg odor we associate with organic decomposition in sewers/storm drains or confined spaces. This gas will kill a person around 800-1000 ppm. Our 4-gas can read Hydrogen Sulfide but normally only up to the IDLH, which is 100 ppm. It can also knock out your sense of smell around this level. Lets look at some key items for response on this method.

TOXICITY

Very toxic via inhalation. Not a skin issue. You can decon via fan. Peel off your turnouts after fan decon, put in a plastic drum liner and let them sit for a while. Then poke a small hole in the bag and push on the bag to expel the air and see if you get readings on your 4-gas H2S sensor, if you do they need a better airing out. Should be reading very low depending on how clean your turnouts are.

REACTION RATE

FAST! This reaction is immediate and can fill a normal sedan with 15,000 ppm of toxic Hydrogen Sulfide gas in 3-4 min. This is a body recovery. Gas can remain at lethal levels for 30-60 minutes inside a small space (See YouTube video).

PPE

Wear turnouts/BA as it is a flammable gas at high concentrations and not a skin issue. Acid is a skin issue and for that mitigation we need Level B PPE.

Chemical and Physical Properties

Smel it in the 0.5 PPB range	OSHA PEL C 20 ppm	IDLH 100 ppm
Kills you 800-1000 ppm		
Flammable Range: 4-44% (LEL is 40,000 ppm)	IP 10.46	It's a heavier than air gas 17 ATM Relative Gas Density 1.19
Solubility is low 0.4%	Colorless gas	Rotten egg odor

As for the flammability issue, LEL 40,000 ppm or 4%. We did address this issue in a study with different volumes of reactants, and we could not get the Hydrogen Sulfide gas to exceed 38% LEL (15,200 ppm H2S Gas) even with large volumes of reactants (1 gal of each reactant).

INSTRUMENTATION

4-Gas (H2S sensor tops out normally at 100 ppm). You will also pick up air borne acid gases with PH paper that may affect your 4-gas. It may be worth while to test for this first in cracks and crevices of small spaces as you start to use your 4-gas (See PH paper in the attached document)

PID can ionize the gas, if using RAE/Honeywell PID the TN-107 CF for a 10.6 lamp is 3.3.

Example: if you are monitoring with your 4-gas and it is over range you may want to use your PID and if is reading 300 ppm. Multiply that by 3.3 = 990 ppm, you are in the lethal range. One note on extended use of a PID in monitoring this gas is that it will coat the lamp, and your readings will start to be lower than initial readings giving you a false sense of security that the readings are lower when the PID is just not able to ionize the gas due to the coating of the bulb. Just my experience during our study. Most normal use should be fine.

HOW FAR DOES THE GAS TRAVEL

Well, that's going to depend on your environmental conditions. In the study we used an open space that did have a slight breeze. H2S gas readings around the car were greater than >100-300 ppm at 25' (See

attached document). In the study we used 1gal of each reactant and opened the doors to a lethal level and it vented to 0 ppm in 15 minutes. At 75' away, downwind our monitor was reading less than 10 ppm.

This is a true knock down gas. There were reports of law enforcement in Florida being knocked down by the gas at close range. I believe in Canada also when they removed the bucket from the vehicle.

DECONTAMINATION

Fresh air. Use fans, air out turnouts. Use the bag procedure mentioned above to check turnouts for contamination. If contaminated with acids that's a different story. Follow your agency's procedure but they will need to be neutralized. And checked with PH paper and assessed if they can still be used. In the study

we used an inflatable dummy in each trial. Bagged the dummy in a body bag and tested for H2S the following day. They did have a rotten egg odor but were not above any H2S PEL.

WHAT DO YOU DO WITH THE MIXTURE IN THE BUCKET?

The reactants need to be neutralized to stop generating the H2S gas. This should be done in Level B. Even moving the bucket in street clothing can generate lethal levels of gas due to reactants recirculating in the bucket coming in contact with each other producing H2S gas again. If the mixture is neutralized with soda ash, it is still considered hazardous waste by California standards as it fails the fish kill test. Therefore, it needs to be disposed of as a hazardous waste. If you use fast set concrete, it

neutralizes the mix, solidifies it and it passes the hazardous waste test. It does not produce further H2S gas when more acid is added. But follow your local regulations for disposing of said mixtures.

By doing the study and having responded to many Detergent Suicides, we have come up with a Standard Operating Guidance (SOG) for this type of response.

Action Plan Considerations:

Isolate the area out to 150'

1) Set up perimeters and zones
2) Deny entry to unauthorized personnel
3) Eliminate any ignition sources

Begin Site Safety / Incident Action Plan.

1) Interview any witnesses or first responders as to the following

i) Any posted warning signs

ii) Buckets/containers with liquids? Powders? What color?

iii) Names on the chemical containers

iv) Any exposed wires at or near door handles or obvious secondary devices

PPE: 1. SCBA & turnouts for recon.

2. Level B for any acid neutralization actions.

Monitoring: Look for secondary devices prior to opening any door (Wires, packages, ect)

1. CGI with H2S sensor.

2. PID, IP is 10.46 and will be ionized by a 10.6 lamp. Correction factor is 3.3 for RAE/Honeywell

3. TIC for chemicals reacting
4. pH paper for acid fumes

Monitoring strategy

1. Monitor lower openings in the small space used for H2S gas. Do this around the perimeter of space. If high readings are detected prepare for ventilation operations.
2. No H2S detected, continue to assess for secondary devices and start to open rear doors to assess the inside areas. If no gas was detected it may have naturally vented out. If gas is detected prepare for ventilation operations.

Mitigation/Ventilation

1. Approach from upwind (DO NOT MOVE THE BODY!)

2. The vehicle will need to be ventilated for 15 min. to remove any gas present. This will have to be done in coordination with Law Enforcement to ensure a sufficient perimeter is enforced to prevent exposure to the public. Consider the current weather conditions during the venting process.
3. Look again for secondary devices and then open all doors and trunks to ventilate the vehicle.
4. Do not remove any signs or evidence from the scene until the medical examiner has allowed you to do so as this is a crime scene.
5. Remove the container to a location where it can be neutralized or solidified with concrete in level B.

6. Neutralize the acid residue with baking soda, not soda ash as it can clog the Hudson sprayer. Spray all acid residual inside the car/small space to ensure it is neutralized and declared safe. The ph should be between 6-10 ph. Be careful as this process can generate hydrogen sulfide gas by just mixing the residual acid and calcium polysulfide. The acid must be neutralized to stop the chemicals from reacting. Keeping the reaction bucket inside a drum liner will allow capture of any overflows and monitoring of head space for vapors.
7. When the acid mixture has been neutralized and the liquids removed and mitigated. The area should be re-monitored to ensure it is safe for the

medical examiner staff to enter without PPE.

Medical examiner considerations:

1. Decontamination of deceased prior to transport. Verify with ME first.
2. Provide copy of Hydrogen Sulfide MSDS to ME
3. Hazmat can monitor the head space of the body bag to ensure the gas has dissipated to safe levels for transport and autopsy.
4. In past autopsies the interior of the body has not expelled any H2S gas from the lungs.

Contaminated clothing: First Responders

1. Gas contamination - Turnouts/Clothing should be aired out, bagged and monitored for H2S gas.

2. Liquid contamination – Neutralize with base and verify its neutral or dispose of as hazardous waste.

3. Level B PPE should be properly disposed of.

Hopefully you picked up a nugget you can use on your next Detergent Suicide call, hopefully you won't have one! But with the Holiday's on the way these kinds of calls seem to have an uptick. Feel free to reach out to me for any questions on the study or other methods not covered in detail above.

Todd Burton – Industrial Emergency Council
www.iectraining.org Retired San Diego County for 29 years.

CHEMICAL SUICIDE GUIDANCE

DISPATCHERS FIRST RESPONDERS HAZ-MAT TEAMS MEDICAL PROFESSIONALS

	DETERGENT (HYDROGEN SULFIDE)	HABICHI (CARBON MONOXIDE)	PESTICIDE (BASED ON MALATHION)	CYANIDE (SODIUM & POTASSIUM CYANIDE SALTS INGESTED)	PHOSPHIDE (ALUMINUM OR ZINC PHOSPHIDE INGESTED)	AZIDES (SODIUM AZIDE INGESTED)
Dispatch Triage	Q:Do you feel ok? Q:Warning signs Q:Suicide note Q:Do you smell rotten eggs? Q:Did you see any buckets or containers in the car with yellow liquids? Q:Were you able to read the container labels? Q: Do you see tape over vents, windows, door cracks Q: Wearing goggles or gloves?	Q:Do you feel ok? Q:Warning signs Q:Suicide note Q:Did you see a small BBQ or Hibachi? Q: Formic or sulfuric acid containers? Q:Chemical burns around the mouth? Q:Where is this occurring? Bathroom? Bedroom? Small space? Q:Gas cylinders in the area?	Q:Do you feel ok? Q:Warning signs Q:Suicide note Q:Do you smell a pesticide odor? Q:Skunky or garlic? Q: Pesticide containers? Q: Amber jars? Q: Words "Malathion" Q: Victim shaking, twitching, runny nose, vomiting	Q:Do you feel ok? Q:Warning signs Q:Suicide note Q: Odors? Q:Did you see any white powders Q:Sodium or potassium cyanide containers *Recent trend of CN suicide in courtrooms post guilty verdict	Q:Do you feel ok? Q:Do you have any eye irritation? Q:Warning signs Q:Suicide note Q: Smell of dead fish Q:Did you see any gray tablets Q:Rodent control containers Q:Pictures of gophers on containers Q:Name Phostoxin	Q:Do you feel ok? Eye irritation? Q:Warning signs Q:Suicide note Q: Pungent smell Q:Did you see any white powders Q:Sodium azide?
First Responder	-Approach from uphill/upwind -Set a 150' perimeter -Eliminate ignition sources -Interview all witnesses -Secure HVAC at building -If H2S is suspected do no open the vehicle doors, initiate a hazmat call -Use a public address system to - communicate with victim/sirens -If odors are being detected down wind issue a shelter in place order. -Notify area hospitals of possible self transports-dorm rooms/hotel	- Approach from uphill/upwind -Evacuate building in FFTO -Set a 150' perimeter -Eliminate ignition sources -Secure HVAC -Interview all witnesses -If CO suicide is suspected initiate a hazmat call	- Approach from uphill/upwind -Evacuate building in FFTO -Set a 150' perimeter -Eliminate ignition sources -Secure HVAC -Interview all witnesses -Be careful of spilled pesticides and contaminated vomit -These victims are often alive on arrival -If transported: Emergency decon, transport in open vehicle, if possible, wear tyvek with APR, be prepared for contaminated vomit. See below.	- Approach from uphill/upwind -Evacuate building in FFTO -Set a 300' perimeter -Eliminate ignition sources -Secure HVAC -Interview all witnesses -If CN suicide is suspected initiate a hazmat call -Notify area hospitals of possible self-transports-College rooms/hotel	- Approach from uphill/upwind -Evacuate building in FFTO -Set a 300' perimeter -Eliminate ignition sources -Secure HVAC -Interview all witnesses -If aluminum/zinc phosphide suicide is suspected initiate a hazmat call	- Approach from uphill/upwind -Evacuate building in FFTO -Set a 75' perimeter -Eliminate ignition sources -Secure HVAC -Interview all witnesses -If sodium azide suicide is suspected initiate a hazmat.
Haz-Mat Teams	-Recon in FFTO & SCBA -Look for secondary devices -Monitor with 4-gas/H2S sensor, PID -Ensure perimeter is suitable for wind conditions -Ventilate vehicle for 15 min. -Ensure the vented gases are not impacting other populated areas -Re-monitor vehicle to ensure safe levels of H2S -Wait for medical examiner to document scene if deceased -Decon body at ME request only -Remove containers in level "B" CPC -Neutralize with fast set concrete -Decontaminate the vehicle -Neutralized acids with concrete can be treated as solid waste according to study data.	-Recon in FFTO & SCBA -Look for secondary devices -Monitor with 4-gas/CO sensor -If high levels of CO still present begin ventilation -Do not use gas powered fans as they will generate more CO -Ensure the vented gases are not impacting other populated areas -Mitigate BBQ/Hibachi -If acids present: check area for spilled acids using pH paper -Wait for medical examiner to document scene if deceased -Neutralize any spilled acids with soda ash -Containerize remaining acids for disposal	-Recon in FFTO & SCBA -Look for secondary devices -Monitor with 4-gas & PID -Begin ventilation if needed -Do not use gas powered fans as they will generate CO -Ensure the vented gases are not impacting other populated areas -Mitigate any spilled pesticides with absorbent and containerize, you may need Level B PPE depending on work mission. -Ensure the scene is safe for other personnel to enter in street clothes -Wait for medical examiner to document scene if deceased -If the victim is transported ensure they are treated outside or in negative pressure room. DO NOT bring the container into the ER.	-Recon in FFTO & SCBA -Look for secondary devices -Monitor with 4-gas, colorimetric tubes/chips, CN specific sensor -Monitor deceased mouth for continued CN gas production, isolate if off gassing. -Begin ventilation if needed -Do not use gas powered fans as they will generate CO -Ensure the vented gases are not impacting other populated areas -Ensure the scene is safe for other personnel to enter in street clothes -Wait for medical examiner to document scene if deceased -If victim is transported ensure they are treated outside or in negative pressure room. DO NOT bring the container into the ER.	-Recon in FFTO & SCBA -Look for secondary devices -Monitor with phosphine sensor, 4-gas, PID, colormetrics -Monitor deceased for continued phosphine production -If high levels of phosphine still present begin ventilation and isolate victim -Do not use gas powered fans as they will generate more CO -Ensure the vented gases are not impacting other populated areas -Containerize aluminum/zinc phosphide to prevent moisture absorption -Wait for medical examiner to document scene if deceased -If the victim is transported ensure they are treated outside or in negative pressure room. DO NOT bring the container to the ER.	-Recon in FFTO & SCBA -Look for secondary devices -Monitor with standard equip but pH paper will be key for acids generated -Monitor deceased for continued hydrazoic acid production. You can use an AP4C for nitrogen detection. -If acid is present begin ventilation and isolate victim -Do not use gas powered fans as they will generate more CO -Ensure the vented gases are not impacting other populated areas -Containerize sodium azide -Wait for medical examiner to document scene if deceased -If victim is transported ensure they are treated outside or in negative pressure room. DO NOT bring the container to the ER.

Resources utilized: NIOSH Pocket Guide, ATSDR, TOXNET. IDLH = Immediately Dangerous to Life & Health, FFTO = Firefighter Turnouts, OSHA C= Ceiling, SCBA=Self Contained Breathing Apparatus, *08.22.24*

Industrial Emergency Council Todd Burton (650) 508-9008 www.iectraining.org

Case Study: Fire Department responds to high levels of Hydrogen Cyanide post residential air conditioning installation.

By Mike Bloski

Hazmat Captain-Southern Manatee Fire Rescue District

Introduction

Recently, our hazardous material response team was asked to provide mutual aid to another department related to a carbon monoxide fire alarm activation after a commercial company was replacing or installing a new air conditioner unit. The location was a typical Florida high-rise unit with several units and the occupant was replacing their unit that was installed in 1997.

Upon the fire department's arrival, they deployed their air monitoring detection to check the unit for hazards. They found elevated levels of both carbon monoxide (CO) and hydrogen cyanide (HCN) on two detector units being used. The CO level was 5–10 ppm and the HCN levels were topped at 49.5 ppm. These readings were taken 25-minutes post alarm and after the installation by a local air conditioning company that conducted soldering operations on an entire new AC unit. They began an aggressive ventilation plan and rechecked after 15–20 minutes. They returned for a recheck and found that elevated readings of CO and HCN remained. In addition, adjoining units were checked, and no atmospheric hazards found. They contacted our district to

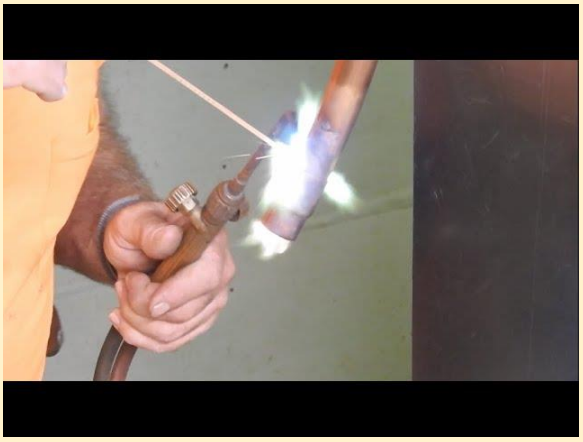
respond and verify the readings as correct. Upon our dispatch, I spoke with the on-scene Incident Commander (IC) and asked him to stop ventilation and close the unit to recreate or trace the elevated units with our photoionization detector (PID) upon our arrival. Upon our arrival on scene, the IC stated that upon closing the door to reseal the unit, the levels of CO and HCN had dropped but were still present. We made an entry 1.5 hours after the alarm and walked through, finding CO at 1.5 ppm and HCN at 3 ppm. An interview was conducted with the on-scene representative with the air conditioning, and they stated that their work was conducted by company policy to install the unit, confirming they had conducted soldering work in the unit.

There were no health-related problems from the occupant or workers. The question was what caused the high readings? Research from common sources conducted on scene and former responses stated the by-products of the soldering operations caused the elevated CO and HCN readings but why? During the research phase, I ran across an article in Fire Engineering Training Community blog by Timothy Gaffney. He noted that he ran a similar incident where there were elevated readings and after investigation, it was found a water heater was installed using soldering for the pipes but unsure why his crew found the elevated readings ruling out common sources (Gaffney, 2011). The purpose of this article is to

give a better explanation of why these elevated readings are encountered.

Soldering or Fluxing (which is it?)

Soldering is the act of joining two metals together; flux is the bond that brings the two



metals together to ensure clean, crack-free adhesion. When joining metals, an acid is typically used to remove oxidation; it makes the solder "wetter," causing better flow over surfaces. There are several types of flux based upon the metals that are being joined (Chemtronics, 2024). The composition of flux wiring is determined by the metals fused

together. Fluxes for soft soldering are typically organic in nature, usually based on halogenides or acids. When soldering using flux, the user produces a high amount of temperature; therefore, the production of heavy vapors and medal oxidizing formation takes place (Humpston & Jacobsen, 2002). There is no acute health hazards associated with soldering, as long as the space is well ventilated. When heated during soldering operations, these products may generate irritating and toxic fumes of lead oxide, tin oxides, hydrogen chloride, zinc oxides, and ammonium compounds. Hydrogen Chloride (HCl) may be the link to why our detectors behave the way they do.

By-Product Examination

Knowing that one of the byproducts of soldering is the production of HCl we can dive into how the interaction works with detectors. HCl is a colorless gas at room temperature that can be found as a large component of soldering materials. This is a large part of the acid fluxes. The danger of chronic exposure can be explained with this ATSDR document, that explains that this non-flammable gas is used in industry for electro plating metals, when off-gassed by soldering and coming in contact with water vapor (humidity), we get the formation of hydrochloric acid (Agency for Toxic Substances and Disease Registry, 2002). This is

why some industry workers report a metallic taste in the mouth after soldering or brazing.

Our Response to Incidents

As we examine our response, it is typical to bring in a fire service 4-gas detector to examine the atmosphere in volume for hazards. Typically, the fire service brings a 4-gas detector that has a HCN sensor as we examine the atmosphere in post-fire extinguishment inside an enclosed structure. The myth common in the fire service is to prove it is not there and it is safe to remove your SCBA. This is

false, as we have to understand the long-term exposure to HCN and maintain vigilance while wearing our SCBA at all times in post-fire situations. As stated, we dive into the HCN sensor and understand it is one of our most temperamental sensors in existence. Most manufacturer-installed HCN sensors have a range of 1–50 ppm. They work via an electronic cell sensor with an accuracy of +/- 5%. However, we should understand that typical response times of these sensors is greater than 30 seconds. Understanding the chemistry of HCN, we should note that it remains a liquid at <78 F degrees and then converts to vapor at greater temperatures. It has a vapor pressure of 630 mm Hg to explain the temperature conversion (Department of Health and Human

Services, 2010). HCN is widely used in a variety of applications, including fumigation and metal plating. It is manufactured from the combination of ammonia and natural gas and is a precursor to many chemical compounds. It is noted as an effective chemical warfare agent. With its low exposure, HCN is immediately dangerous to life and health (IDLH) at 50 ppm. In addition, it is worthy to note that HCN is a Class IA Flammable liquid with lower explosive limit at 56,000 p.m., or 5.6% by volume. It is also considered at times anhydrous in nature and would seek water or humidity in associated signs and symptoms to patients. HCN exposure of the last decade has

been identified as a significant chemical in post-structural air monitoring as many of the modern components of home construction (e.g., polyurethane foams used in furniture) can release large amounts (Blackline Safety, 2024). The toxicity to humans' results from metal-containing enzymes being blocked by HCN to prevent oxygen for cell respiration. Over toxicity is usually fatal. One of the major hazmat concerns with the sensor is cross-sensitivity, the main component being Hydrogen gas-related (RAE HCN sensors are x 200 to true readings). This would explain the attraction to HCl as a by-product of soldering operations and why abnormal HCN sensor levels occurred. Why the high CO readings? This can be associated with the heat source

(brazing gas) used in the soldering operations, which was confirmed with the company on site.

Conclusion

Our responses to unknown atmospheres are challenging in the fire service. Understanding the reason requires some detective work and past experiences. In addition, awareness that built in sensors in -4-gas detectors are well designed but are known to have cross-sensitivity issues that must be accounted for. Elevated levels of CO and HCN were detected due to soldering during air conditioning unit replacement, emphasizing the importance of proper ventilation and air monitoring by the installing company. By recognizing the by-products of soldering and their potential health

risks, we can better prepare and respond to similar situations, ensuring the safety of both first responders and occupants.

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Mike Bloski

Captain Mike Bloski (BLAH-SKI) has been in the fire service for 26 years starting his career as a volunteer firefighter in Escambia County Florida in 1992. In 1997, he moved to the Bradenton area and was hired by the Southern Manatee Fire Rescue district. Rising through the ranks, he has served as fire suppression lieutenant and an emergency medical technician responding to thousands of incidents in our region that have included train derailments, natural disasters and major hazmat responses. Having served 17 years on the Manatee County hazmat team and

as part of the Operations Division is responsible for providing and managing the operational readiness, regulatory compliance, and training activities for the members of the Special Operations Team. In addition, he serves on the regional domestic security taskforce planning & awareness committee that has included training responders for the recent BCS championship game that took place in Tampa Florida in 2017 and state exercises to test readiness capabilities. He had been an instructor at the Manatee Technical College for the last 20 years training future firefighters in fire ground operations and hazmat response. He holds a Bachelor of Science in Public Safety Administration and a two-time graduate of the National Fire Academy. He is a Co-founder of HazMat HQ Digital Magazine

The Biological Weapon Threat- (Part 2) Recognizing the problem

By Kevin Ryan

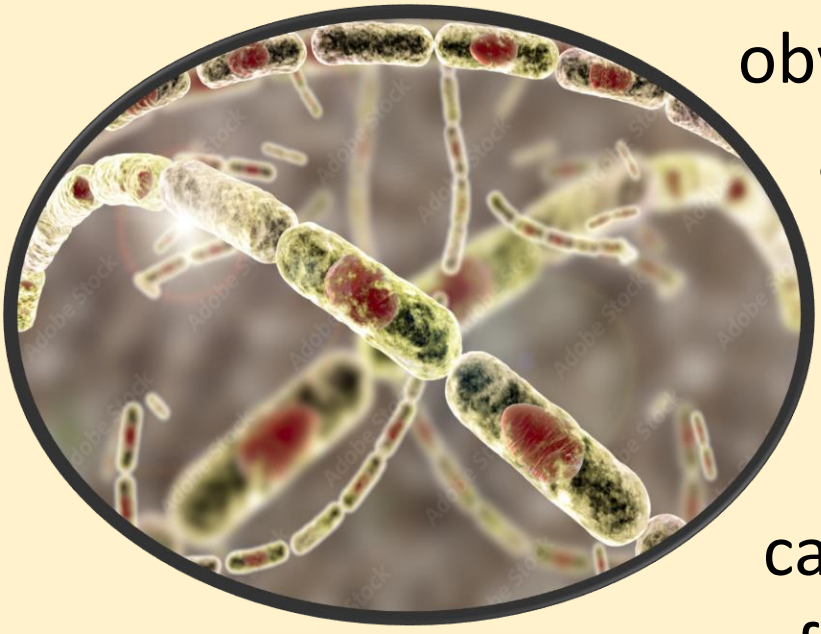
Part I of this series focused on defining, understanding threat levels, lab safety as well as some quick history of these weapons. Part II will cover recognizing an attack is occurring.

The most difficult part of a bioweapons attack is recognizing the threat. Establishing the scope of an attack will allow you to get the necessary resources needed to mitigate the situation with minimal loss of life. Bio attacks can be obvious such as a threat letter with a substance in the letter. On the other hand, these incidents may not be as defined until treatment is rendered by the health care system.

The key agency involved for any scenario is your local health department. Your health department can monitor the health care system to track patients, determine the extent of the problem, provide treatments, and alleviate stress on the health care system. The CDC is a major player in this process. The CDC Electronic Case Reporting (ECR) system is a key piece of patient tracking. Here is the link for the CDC fact sheet on ECR, https://www.cdc.gov/ecr/docs/eCR-Fact-Sheet-508.pdf. Close coordination with the

emergency response is necessary for a successful outcome.

Recognition of a bio incident is usually delayed unless symptoms are obvious. Some Bio agents have several days to weeks for incubation periods. Transmissive agents can be transferred from person to person in those time frames. Undetected transmissions only increase the scope and size of the attack. It can take days or weeks to fully recognize the extent of the attack. Common factors among the patients may be your best clue to determine the source of the



contamination. Investigation needs to consider the medical findings, patient tracking, and detailed interviews from possible victims.

Once all available information is collected, it can then be evaluated for criminal intent. Criminal intent can be localized, widespread or large scale. Various bio agents work well for each level of intent.

Category A agents would be well suited for a threat of national or international proportions. Anthrax, plague, or smallpox if disseminated correctly can create high mortality rates with major public health impacts. Disease outbreaks can be tracked at this website: https://metabiota.com/epidemic-tracker.

Category B agents would be best suited for targeted, individual attacks. A toxin such as Ricin would be able to be discreetly given to an

unsuspecting victim. The assassination of Georgi Markov in Sept. 1978 is the perfect example of this. Here is a summary of the incident at PubMed.gov. https://pubmed.ncbi.nlm.nih.gov/19137875/.

You can see from the summary that the cause was not known until the autopsy several days later. Several factors determine how effective these attacks would be. Expertise, equipment, facilities, and access to agents are some of these factors.

Large scale attacks need more of all these so it's more likely state sponsored terrorism is the actor. Targeted attacks such as the Markov assassination can require the necessary expertise to be successful. A review of the Shelburne VT ricin attack is in direct contrast to the Markov assassination. The lady in VT had

very little knowledge of using the internet for a crude ricin weapon that did not complete the job. The undetermined actor in the Markov hit used a sophisticated weapon made from an umbrella that had a very effective outcome.

Large scale disseminations can be very complicated and difficult to perform. Aerosolization of the biological would be the biggest obstacle. A method to apply the correct particle size that would infect the human respiratory system is necessary.

The respiratory system has a series of filters that perform very well. These filters prevent many biologicals from infecting our bodies. Consider this quick information bit from WebMD.com on these filters. Your respiratory system has built-in methods to keep harmful things in the air from entering your lungs. Hair

in your nose help filter out large particles. Tiny hairs, called cilia, along your air passages move in a sweeping motion to keep the passages clean. Cells in your trachea and bronchial tubes make mucus that keeps air passages moist and helps keep things like dust, bacteria, and viruses out of your lungs. A particle size of 1 to 5 micrometers allows the biological to be inhaled deeply into the lungs. Your skin is also an effective protective mechanism against biological agents. Open cuts and sores are typically the only way an agent can penetrate the skin. Unprotected civilians do have some defense against a bio attack even without PPE.

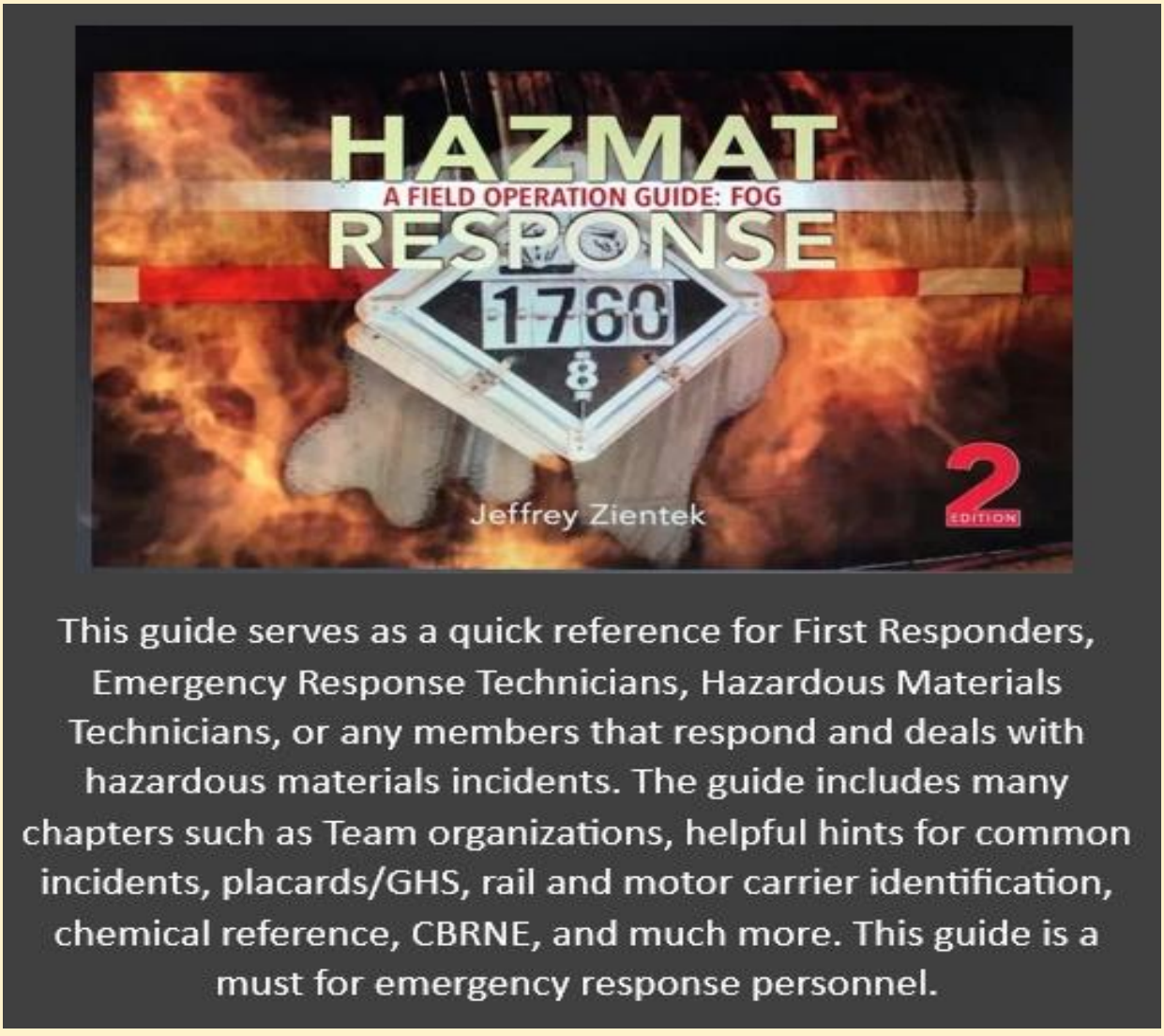
History has shown that programs capable of these actions have been state sponsored. Japan's Unit 731 is good example of this. As many as 300,000 deaths are attributed to

research from Unit 731 during WW II. Information from the experiments were destroyed when the camp was lost although several scientists were given immunity for exchange of information that they possessed on the testing at Unit 731. The Japanese cult Aum Shinrikyo provides an interesting case study in the contrast of chemical vs biological weapons. The group attempted 17 CBW attacks from 1990-1995. The details of these attacks and the failures of the biological

ones are detailed here by the Monterey International Institute of Studies: https://www.nonproliferation.org/wp-content/uploads/2016/06/aum_chrn.pdf. All of their botox, ebola, and anthrax attempts failed for different reasons owing to the difficulties of a successful bio attack.

Part II of this series examined the recognition of a biological attack. We looked at size, scope and the difficulties in being successful. Your local health department is one of the most important agencies with recognition and response to an incident. Part III will highlight how the BCFD responds to a suspected biological.

Kevin Ryan leads the Baltimore City FD Hazmat Operations Office. A 31-year veteran of the fire service with 26 years of experience in the world of hazmat response. He is a Level III instructor and adjunct at the BCFD Fire Academy.



This guide serves as a quick reference for First Responders, Emergency Response Technicians, Hazardous Materials Technicians, or any members that respond and deals with hazardous materials incidents. The guide includes many chapters such as Team organizations, helpful hints for common incidents, placards/GHS, rail and motor carrier identification, chemical reference, CBRNE, and much more. This guide is a must for emergency response personnel.

CONFERENCE DATES

Virginia Hazardous Materials Conference

Sept 17 – 20 2024

HOTZONE

Oct 17th – 20th 2024

Florida Hazmat Symposium

Jan 14 – 17 2025