



Career Fire Fighter Dies and Captain is Injured During a Civilian Rescue Attempt at a Residential Structure Fire – Georgia

SUMMARY

On May 28, 2007, a 41-year-old male career fire fighter (the victim) died after becoming disoriented and falling down a set of stairs while searching for a missing male occupant at a residential structure fire. A fire captain also received second degree burns resulting in lost-time from work. Both the victim and the captain were members of the first-responding fast attack engine company. After becoming disoriented, they were trapped and missing for several minutes before being found. The fire was reported at approximately 0449 hours. The first arriving fire fighters, including the victim, arrived on the scene at 0459 hours and were on-scene 13 minutes when the first mayday was called. The male resident also perished in the fire.



Photo courtesy of fire department

Incident Site

The Fire Fighter Fatality Investigation and Prevention Program is conducted by the National Institute for Occupational Safety and Health (NIOSH). The purpose of the program is to determine factors that cause or contribute to fire fighter deaths suffered in the line of duty. Identification of causal and contributing factors enable researchers and safety specialists to develop strategies for preventing future similar incidents. The program does not seek to determine fault or place blame on fire departments or individual fire fighters. To request additional copies of this report (specify the case number shown in the shield above), other fatality investigation reports, or further information, visit the Program Website at www.cdc.gov/niosh/fire/ or call toll free 1-800-CDC-INFO (1-800-232-4636).



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NIOSH investigators concluded that, to minimize the risk of similar occurrences, fire departments should:

- *ensure that their response to structure fires provides adequate numbers of staff and apparatus to immediately respond to emergency incidents and is in accordance with recommended guidelines*
- *ensure that the first arriving fire unit conducts an initial size-up that includes as much information as possible to develop a quick initial plan for rescue and fire fighting strategy and tactics*
- *ensure that fire fighters are trained in SCBA emergency procedures and fire fighter emergency communications*
- *ensure that interior conditions are communicated to the Incident Commander (IC) on a regular and timely basis*
- *ensure that an Incident Safety Officer (ISO) is established at structure fires*
- *ensure that a Rapid Intervention Team (RIT) is established and available*
- *ensure that the Incident Commander does not become directly involved in fire fighting efforts*
- *ensure that the Incident Commander maintains close accountability for all personnel operating on the fireground and that procedures and training for the use of a personnel accountability report (PAR) are in place*
- *ensure that all fire fighters wear a full array of turnout clothing and personal protective equipment (PPE) appropriate for the assigned task while participating in fire suppression and overhaul activities*
- *ensure that department policies and procedures for proper inspection, use, and maintenance of self-contained breathing apparatus (SCBA) are followed to ensure they function properly when needed*



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Additionally, manufacturers, equipment designers, and researchers should:

- *continue to develop and refine durable, easy-to-use systems to enhance verbal and radio communication in conjunction with properly worn SCBA*
- *continue to pursue emerging technologies for evaluating and monitoring the stability of buildings exposed to fireground conditions*

Additionally, municipalities should:

- *take into consideration the impact community secession and annexation can have on emergency services response, and should ensure resources are provided to support an appropriate level of community service and responder safety*

INTRODUCTION

On May 28, 2007, a 41-year-old male career fire fighter (the victim) died when he became disoriented and fell down a set of stairs at a residential structure fire. A male career fire captain received second-degree burns to both his hands and left forearm, and first degree burns to his knees, elbows, and head, and was treated for smoke inhalation. Both the victim and the captain were members of the first-responding engine company that initiated a fast-attack search and rescue operation in a 2,900 square foot residential structure. On May 29, 2007, the U.S. Fire Administration (USFA) notified the National Institute for Occupational Safety and Health (NIOSH) of the fatality.

On June 25, 2007, a Safety Engineer and an Occupational Safety and Health Specialist from the NIOSH, Division of Safety Research, Fire Fighter Fatality Investigation and Prevention Program traveled to Georgia to investigate the incident. Meetings were conducted with the Fire Chief, Assistant Chief, Department Fire Marshal, and officers from the department. Interviews were conducted with officers and fire fighters who were at the incident scene. The NIOSH investigators discussed the incident with the Deputy State Fire Marshal in charge of the state investigation. The NIOSH investigators reviewed the victim's training records, the Incident Commander's (IC) training records, and floor plans and photographs of the structure. The incident site was visited and photographed. The NIOSH investigators also inspected the SCBA and personal protective clothing worn by the victim and the injured fire captain and reports of findings from tests of the SCBA, turnout gear and radios were reviewed. The department's SCBA test facilities, air cascade trucks, and logistics center were visited and operating procedures were documented.

Fire Department

At the time of this incident, the career fire department was comprised of approximately 400 fire service personnel who operated out of 14 stations. Fire fighters at this department are assigned to one



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of three rotating shifts and typically work 24 hours on and 48 hours off duty. The department serves approximately 200,000 people who reside in an area of around 300 square miles. However, the community where this structure fire occurred had been annexed into a newly zoned municipality five months earlier and no local fire department had as yet been established.

Training and Experience

The municipal career fire department involved in this incident requires that all fire fighters complete the State required basic fire fighter curriculum within one year of employment and maintain a minimum of 120 hours of training annually. The State Basic Fire Fighter Level I course is 60 hours in length. It includes the fundamentals of fire behavior and proceeds through water supplies, protective equipment and breathing apparatus, hose and nozzles, forcible entry, fire streams, suppression techniques, ventilation and other topics necessary to provide basic knowledge. Most objectives are skills oriented and require hands-on training. Fire fighters must have a valid state driver's license and obtain a class A or B non-commercial or commercial license within one year of employment.

The victim involved in this incident was a fire fighter and had been with the department for eight years. He held certifications for both NFPA Fire Fighter levels I and II. He had completed training in apparatus operation, first aid, cardiopulmonary resuscitation (CPR), and search and rescue. The victim was also employed by a neighboring fire department where he had worked the shift prior to the incident. The Incident Commander at the scene was a career fire officer with 25 years of experience. He was a paramedic and held all required State certifications including successful annual completion of 24 hours of department approved continuing education which included core competency skills as defined by the State Firefighting and Training Council.

Self Contained Breathing Apparatus, Personal Protective and Communication Equipment

Turnout gear, self contained breathing apparatus (SCBA) and radios were recovered from the scene with the victims. The victim's and the officer's gloves, protective hoods, and helmets were missing. The officer's gloves and helmet were located during the origin and cause investigation. Testing was conducted on both SCBA by an outside testing company and both were found to be functional. The victim's and officer's masks were also evaluated after the incident. According to the third-party test report, "the victim's mask could not be tested because the female end of the buckle is cut off." The report noted deficiencies in the lens and purge knob of the officer's mask. Structural firefighting clothing that was worn by both the officer and the victim was shipped to an outside company for evaluation. Testing revealed that although the victim was wearing mismatched bunker gear, neither his nor the officer's structural firefighting gear failed in this incident. The radios that were carried by the officer and the victim were tested by the department's contract communication's company. Testing showed that both radios were functional.

Apparatus and Personnel

The following apparatus responded on the first alarm that was dispatched at 0450 hours, and were present prior to, or shortly following, the mayday call:



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On scene at 0459 hours:

Engine 8 (E8) with an officer (who was injured during the incident), driver, and fire fighter (the victim)

On scene at 0500 hours:

Truck 8 (T8) with an officer and a driver/operator
Battalion 4 (BC4) with an officer (Incident Command [IC])
Mobile Air 8 (MA8) with a fire fighter/driver

On scene at 0507 hours:

Engine 12 (E12) with an officer, fire fighter, and driver/operator
Truck 12 (T12) with an officer/engineer and two fire fighters

Approximately 13 fire personnel were on the scene when the incident occurred at about 0512 hours. A second alarm was called following the mayday.

Structure

The structure was a 2,900 square foot, two-story, wood-frame platform construction residence with a partially finished full basement with a walkout access at the rear. The exterior walls were wood covered by brick veneer. The roof was a standard residential pitched roof with 2' x 8' wooden rafters connected by nailed aluminum gusset plates and covered by plywood and asphalt shingles. The interior plywood floors were carpeted, tiled, or covered by hardwood, and were supported by 2' x 10' wooden floor joists. The structure was not equipped with sprinklers but smoke detectors were installed. It was located on a cul-de-sac street. It was built in 1985 with renovations completed in 1999 and had passed inspections meeting all current building codes on both occasions.

Weather

At the time of the incident the skies were clear and the wind was reported as calm. The ambient air temperature was 59°F with humidity reported at 87%.

INVESTIGATION

On May 28, 2007, a 41-year-old male career fire fighter (the victim) died, and an officer was seriously burned after becoming disoriented and falling down stairs while searching for a missing male occupant at a residential structure fire.

At 0449 hours county central dispatch received a call of a residential structure fire and dispatched the first units at 0450 hours. At 0453 hours a second call came into dispatch and the caller reported that a person was trapped in the house and they could hear screaming from the second floor. Prior to the arrival of the fire department, the homeowner, who was one of two occupants, escaped through a



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window and onto the deck at the C side of the house. (Photo 1; Diagram 1) The owner told investigators that she was awakened by the civilian victim who was alarmed when he heard the dogs, that were in a room on the first floor of the house, barking. She went to her bedroom door and could hear the dogs barking and the smoke alarm sounding. She opened her bedroom door and saw dark smoke in the hallway. She closed the door and tried to wet a towel to place under the door but there was no water. She then tried to call 911 from the bedroom phone, and was unable because the phone line was dead. She went to the back of the house (C side) to exit from a bathroom window next to the master bedroom where she could get onto the roof of a screened porch and then onto a deck. She found herself in an adjacent bedroom where she exited from the window onto the roof of a first floor box-bay window then onto the deck. She believed that she saw the other occupant as he leaned out of the bathroom window that was adjacent to the master bedroom. She called to him, he disappeared from the window and she thought he was following her. After jumping onto the deck, she realized that he was not behind her so she ran to a neighbor's house to call 911. While the neighbor called 911 the owner and another neighbor returned to the deck area where they believed they would find the trapped occupant trying to exit. However, they could not see him and did not hear any response when they called his name. The neighbor then attempted to use a garden hose to extinguish a small flame that was showing adjacent to the house near the corner of the deck, but there was no water.^a The owner and neighbor then went to the front (A side) of the house. A bystander told them that he had seen the other occupant in the master bedroom window near the A/D corner and called for him to jump; but he did not jump out of the window and disappeared from view. Bystanders used a sledge hammer to break open the front door and a ladder to break open an upstairs window in the master bedroom. The homeowner and the neighbor tried to enter through the front door but were forced back by thick smoke. They then went to the garage on the B side where the owner was able to open the garage door by using the outside keypad. They took a ladder from the garage to the A side of the house and used it to break out a window above the front entrance. They were able to break out the front bay window near the door and rescue the family pets that were in a room directly behind the window. Once again she and the neighbors called out to the trapped civilian. It was later reported that bystanders heard the trapped civilian call out from above the garage area, but this information was never relayed to the fire fighters.

At 0459 hours Engine 8 (E8) with an officer, driver, and the victim arrived on the scene, parked at the A side of the house (Diagram 1) and reported to dispatch that there was heavy smoke coming from the structure. Truck 8 (T8) with an officer and driver/operator, and Battalion 4 (BC4), arrived at 0500 hours. BC4 assumed incident command. Bystanders told the first arriving fire fighters that the trapped civilian was last seen in the master bedroom window located at the A/D corner of the second floor. They said that they tried to encourage him to jump but he seemed disoriented and had disappeared from view.

^a Heat from the fire caused the main water supply line, which ran along the C side wall, to fail early in the fire.



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The victim and the officer from E8 stretched a 200 foot 1¾” cross-lay pre-connect from E8 and entered the structure through the front door to search for the trapped civilian. The driver/operator of E8 hooked up to the hydrant located near the northwest corner of the roadway and cul-de-sac intersection and then assisted pulling the line. He then pulled a second line off of the truck from the back skid load and began pump operations. The victim and officer ascended the stairs from the first floor foyer reaching a landing then making a sharp left turn followed by several additional steps before reaching the second floor. (Diagram 2) There was heavy smoke but no fire. They decided to do a quick search for the civilian since the truck crew had not yet entered the structure. Since they were told he was last seen in the master bedroom at the A/D corner, the victim and officer made a right turn at the top of the stairs and began to search a room which they believed to be the master bedroom. They had actually entered a smaller bedroom that was next to the master bathroom. The victim who was on the nozzle began a right hand search. The officer went to the left and quickly realized that the room was too small to be a master bedroom. He called out to the victim to return to the door.

The heat and fire were intensifying on the lower level by the time the officer and victim exited the bedroom. With the victim going first on the line and the officer behind him, they turned to the right into a hallway and began to crawl toward an open walkway above the first floor family room that led to the B side of the structure near a room above the garage. (Diagram 2) They had just begun to crawl through the hallway when the victim discharged a short burst of water from the line and suddenly stood up. He appeared to be in some sort of distress, pulled his face mask loose and started to run toward the walkway. The officer ran after the victim and while trying to grab hold of him, they both fell down stairs that they were unable to see due to the thick smoke and possibly debris from the partial collapse of the first floor that was occurring at approximately the same time. The stairs they fell down led to a first floor family room. The victim fell unconscious onto the stair landing. (Photo 2) The officer could not find his radio so he removed his gloves to find and key his mic to call “man down.” He radioed that they were in the basement because he believed that the stairs they had just fallen down went to the basement level. He crawled around trying to find a way out, but when he felt his hand go through the floor he returned to the victim who’s Personal Alert Safety System (PASS) had activated. At that point, the officer’s SCBA low air alarm began to vibrate so he activated his own PASS alarm, stayed close to the victim, and waited for rescue.

T8 with an officer and driver arrived seconds behind E8 followed by MA8 with a fire fighter/driver. Soon after the crew from E8 entered the house and began searching the smaller bedroom, the T8 officer suited-up and went to the front door. He was told by neighbors and by-standers that the trapped civilian was last seen in the master bedroom window. The T8 driver and fire fighter from MA8 donned SCBAs at the truck and headed toward the structure. The T8 officer called to them to bring a thermal imaging camera (TIC). The MA8 fire fighter returned to T8 to get the TIC. The officer and driver from T8 entered the structure together through the front door and followed E8’s hoseline up the stairs. Upon reaching the second floor, the driver from T8 reported experiencing intense heat and trouble breathing. He thought he might be having a problem with his SCBA so he



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quickly retreated down the stairs toward the front door. As he descended the stairs, he passed the fire fighter from MA8 who was heading to the second floor with the TIC. As the fire fighter from MA8 reached the top of the stairs, he reported feeling a shift in the floor and a burst of intense heat. He immediately turned around and lunged down the stairs receiving minor injuries as he fell to the foyer area where fire fighters pulled him out the front door. The officer from T8 who was attempting to do a quick search of the master bedroom for the civilian victim felt the floor move under him and reported that it got extremely hot and conditions deteriorated quickly. He found his way to the stairs and jumped down to the foyer area. His face piece was knocked off when he hit the landing. He reported that there was a lot of fire to his right and he ran into a wall while trying to get out of the front door. He heard the driver from T8 saying “there he is” as he reached in through the door opening and pulled him outside. The officer from T8 later complained of chest pains and was transported to a local hospital where he was treated and released. The MA8 fire fighter was treated at the scene. Just as the crew exited the structure they heard the officer from E8 transmit a mayday over the radio.

E12 arrived on the scene at 0507 hours with a driver/operator, officer and fire fighter. The IC told the E12 crew to ladder the front of the house and break out the second floor window at the A/D corner. The E12 fire fighter and driver witnessed the search and rescue team from T8 bail out the front door. The E12 officer went to E8, grabbed a line and took it to the front door, but had to go back to E8 to get the line charged. Several fire fighters on the scene reported that flames were shooting about fifteen feet out of the front door just as they heard the mayday call over the radio. Upon arrival the E12 officer started on a 360 walk-around and as he reached the C side he heard the mayday call from the E8 officer that they were in the basement. He ran to the C/D corner basement door and tried to kick it open. Three other fire fighters came and assisted. They broke out the basement windows on the C side and could see floor to ceiling flames toward side B. The E12 officer and driver headed back to the engine to grab a hoseline. While en-route, the call came over the radio from the T12 officer that they had found the downed fire fighters, and they needed help in the garage. The E12 fire fighter grabbed the handline off of E12 and headed to the garage where he was told to direct the spray into the game room to cool the area for rescue.

T12 with an officer, driver and fire fighter arrived at 0507 hours and parked on the D side of the structure. They got their SCBA off of the truck and the driver and fire fighter headed toward the front door. The officer grabbed a ceiling hook and headed toward the A side of the house. He reported seeing flames shooting out of the front door about four feet down from the top. Just as they passed the door, they heard the radio transmission “fire fighter down, we’re in the basement.” The fire fighter from T12 headed around the D side toward the basement entrance at the back of the house. The officer and driver went toward the driveway on the B side.

The garage door was open so the officer from T12 entered. (Diagram 3) He opened the interior door on the left side of the garage after feeling the door to check for heat. The door led into the family room. There were no flames in the immediate area but visibility was zero due to heavy smoke. Just



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then he heard a second mayday transmission both over the radio and audibly. He entered through the door toward the direction where he believed he heard the voice of the E8 officer calling for help. The officer from T12 entered the area and went to the left. He quickly located the E8 officer along the wall that adjoined the garage and family room. He found him upright on his knees but when the officer tried to help him out of the area he said that the victim was right beside him and he would not leave without him. The T12 officer could feel the E8 officer's low air alarm sounding and the area was starting to heat up due to the flames that were showing in the kitchen area toward the D side. He went back to the garage and told a fire fighter from E12 that he needed a hoseline brought into the family room and to direct the stream toward the D side to cool the area and keep the flames off of him while he tried to extricate the E8 officer.

The T12 driver entered the family room right behind the T12 officer, but lost sight of him in the smoke. The area began to heat up quickly and he started to backtrack toward the garage. Just as he reached the door, he saw his officer coming through the smoke with the injured officer from E8 and he helped get the officer into the garage. The T12 officer told a fire fighter from E12 who was in the garage to take care of the injured officer. He and the driver from T12 returned to the family room. The T12 officer took the ceiling hook, went to a window near the fireplace on the C side exterior wall, and used the hook to break out the window. The T12 driver began to search for the victim. Once the window was broken the smoke began to clear out quickly. The T12 driver could hear a PASS going off behind him. He followed the sound which led him to the victim. He grabbed onto the victim's SCBA harness and tried to pull him to safety but was having difficulty so he radioed for help. BC4 entered through the garage and helped pull the victim from the family room into the garage. The victim was unresponsive and not breathing. Fire fighters began cardiopulmonary resuscitation immediately and were relieved by on scene emergency medical personnel. An evacuation and personal accountability report (PAR) were called. The order to go to defensive operations was made. The T8 ladder pipe was raised from the A side of the structure and put into operation flowing 2000 gallons per minute to completely extinguish the fire.

OFFICER INJURY REPORT AND VICTIM CAUSE OF DEATH

The officer suffered severe second degree burns which resulted in hospitalization and lost time from work. The victim was transferred to a local hospital where he was pronounced dead from soot and smoke inhalation.

RECOMMENDATIONS AND DISCUSSION

Recommendation #1: Fire departments should ensure that their response to structure fires provides adequate numbers of staff and apparatus to immediately respond to emergency incidents and is in accordance with recommended guidelines.



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Discussion: NFPA 1710 *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments*, section 5.2.2 states the following: “On-duty fire suppression personnel shall be comprised of the numbers necessary for fire-fighting performance relative to the expected fire-fighting conditions.¹ These numbers shall be determined through task analyses that take the following factors into consideration:

- Life hazard to the populace protected.
- Provisions of safe and effective fire fighting performance conditions for the fire fighters.
- Potential property loss.
- Nature, configuration, hazards, and internal protection of the properties involved.
- Types of fireground tactics and evolutions employed as standard procedure, type of apparatus used, and results expected to be obtained at the fire scene.

The NFPA standard states that both engine and truck companies should be staffed with a minimum of four on-duty personnel. The standard also states that in jurisdictions with tactical hazards, high hazard occupancies, high incident frequencies, geographical restrictions, or other pertinent factors identified by the authority having jurisdiction, these companies should be staffed with a minimum of five or six on-duty members. NFPA 1710 also states that the fire department’s initial full alarm assignment should provide for the following:

- Establishment of incident command outside of the hazard area for the overall coordination and direction of the initial full alarm assignment. A minimum of one individual should be dedicated to this task.
- Establishment of an uninterrupted water supply of a minimum 1520 L/min (400 gpm) for 30 minutes. Supply line(s) shall be maintained by an operator who should ensure uninterrupted water flow application.
- Establishment of an effective water flow application rate of 1140 L/min (300 gpm) from two handlines, each of which should have a minimum of 380 L/min (100 gpm). Each attack and backup line should be operated by a minimum of two individuals to effectively and safely maintain the line.
- Provision of one support person for each attack and backup line deployed to provide hydrant hookup and to assist in line lays, utility control, and forcible entry.
- A minimum of one victim search and rescue team should be part of the initial full alarm assignment. Each search and rescue team shall consist of a minimum of two individuals.
- A minimum of one ventilation team shall be part of the initial full alarm assignment. Each ventilation team shall consist of a minimum of two individuals.
- If an aerial device is used in operations, one person shall function as an aerial operator who should maintain primary control of the aerial device at all times.



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- Establishment of a Rapid Intervention Team (RIT) that should consist of a minimum of two properly equipped and trained individuals.¹

The initial arriving engine had three personnel on the apparatus. In response to reports of a trapped civilian, crews went into the structure before conducting a complete size-up and before a rapid intervention team (RIT) or sufficient manpower was available on the scene. Limited staffing impacted fireground operations that should have been attempted before the initial attack operations began.

Recommendation #2: Fire departments should ensure that the first arriving fire unit conducts an initial size-up that includes as much information as possible to develop a quick initial plan for rescue and fire fighting strategy and tactics.

Discussion: According to Chief Alan Brunacini, “a functional incident-evaluation system evaluates and considers current conditions to develop quick initial action. The system also forecasts conditions and outcomes to prevent surprises and provide the information necessary to stay ahead of the incident power curve. A fast, initial size-up gives the IC a snapshot of the existing conditions at the beginning of operations and allows the IC to locate the fire and determine its severity and potential to spread. The size-up can also determine what immediate resources are needed, first line attack specifics, method(s) of suppression, building type, structure type and construction, and potential hazards.

The objective of fast initial command assumption is for the first arriver who shows up on the fire scene (emphasis on arriver) to evaluate conditions, develop an incident action plan, and then assign, place and support arriving resources within that plan and decide if the dispatched resources will be adequate.”² An initial action plan frequently is based only on the critical factor information that is available at the beginning stage of operations. Therefore the IC must be informed and react to changing conditions. Critical fireground factors include building, fire, occupancy, life hazard, arrangement, resources, action, and special circumstances.²

During this incident a great deal of focus was placed on rescuing the male resident, and a complete 360° size-up was not done. A quick initial size-up could have offered a better understanding of the fire location, intensity, forecasted fire-spread probability, and possibly have provided updated information on the civilian victim’s location. This could have determined a better fire attack for what turned out to be a basement fire.

Recommendation #3: Fire departments should ensure that fire fighters are trained in SCBA emergency procedures and fire fighter emergency communications.

Discussion: In this incident, the officer and the victim were advancing the hoseline and searching for the civilian occupant in high heat and heavy smoke conditions. The officer who was second on the hoseline reported that the victim suddenly stood up. A fire fighter suddenly standing up while



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searching off of a hoseline is not a trained response and could indicate a reaction to a facepiece or SCBA malfunction, panic, or another unknown emergency situation. Emergencies created by, or associated with, SCBA can be overcome in several ways. Fire departments should develop and implement a comprehensive respiratory protection program that includes fire fighter fitness, training, competency, and skill in SCBA and emergency procedures. Fire fighters should follow their department's SOPs regarding emergency SCBA procedures and emergency communications. Fire fighters should remember the first rule in any emergency situation, and that is not to panic. Panic causes increased breathing air consumption and inability to focus on emergency procedures.

The victim stood up, grabbed at his face piece and started to run in response to an unknown situation or malfunction. A "fight or flight" defense mechanism is often initiated by panic. Repetitive skills training can instill knowledge necessary to encourage fight versus flight as the better choice when appropriate, and provide direction in support of a more composed, self-controlled response to a potentially life-threatening situation.³

Recommendation #4: Fire departments should ensure that interior conditions are communicated to the Incident Commander on a regular and timely basis.

Discussion: Sizing up interior conditions is just as important as exterior size-up. The Incident Commander is only able to monitor exterior conditions within his view, while the interior conditions should be monitored and communicated to the IC from fire fighters who are working on the inside as soon as possible.⁴ The interior attack crew needs to be the eyes and ears of the IC while they are working on the inside. Knowing the location and the size of the fire inside the building lays the foundation for all subsequent operational decisions. Interior conditions could change the IC's strategy or tactics.⁵ In this incident the interior crew was in fast attack and rescue mode due to report of a trapped civilian. Conditions showed heavy smoke but quickly changed from little fire to heavy fire within minutes. The fire, which was first thought to be in a first floor room, was actually in the basement. The IC knowing this information could have assigned a basement attack crew, or could have removed crews before collapse conditions were reached.

Recommendation #5: Fire departments should ensure that an Incident Safety Officer (ISO) is established at structure fires.

Discussion: The incident commander (IC) is in overall command at the scene, but certain functions must be delegated to ensure that adequate scene management is accomplished, especially concerning fire fighter health and safety. The IC relies upon fire fighters and the Incident Safety Officer (ISO) to relay information on fireground conditions in order to make timely, informed decisions regarding risk versus gain and offensive versus defensive operations. The safety of all personnel on the fireground is directly impacted by clear, concise, and timely communications among on-scene fire departments, sector command, the ISO, and IC.



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NFPA 1521 *Standard for Fire Department Safety Officer* defines the role of the ISO at an incident scene and identifies duties such as reporting pertinent fireground information to the IC; ensuring the department's accountability system is in place and operational; monitoring radio transmissions and identifying barriers to effective communications; and ensuring that established safety zones, collapse zones and other designated hazard areas are communicated to all members on scene.⁶ Although the presence of a safety officer does not diminish the responsibility of individual fire fighters and fire officers for safety, the ISO adds a higher level of attention and expertise to help the individuals. The ISO must have particular expertise in analyzing safety hazards and must know the particular uses and limitations of protective equipment.⁷

During this incident a safety officer was not formally established. Having an ISO at this incident would have assisted the IC in conducting a better size-up of the incident, proper PAR request, and better radio control when “man down” was broadcast.

Recommendation #6: Fire departments should ensure that a Rapid Intervention Team (RIT) is established and available.

Discussion: A trained rapid intervention team (RIT) should be designated and available to respond before interior attack operations begin. The team should report to the incident commander (IC) and be available within the incident's staging area. The rapid intervention team should have all tools necessary to complete the job, e.g., search and rescue ropes, Halligan bar and flat-head axe combo, first-aid kit, and resuscitation equipment.⁸ These teams can intervene quickly to rescue a fire fighter who is running out of breathing air, becomes disoriented, lost in smoke filled environments, trapped by fire, or involved in structural collapse.⁹

During this incident there was no RIT established and the initial responding crew made entry without a RIT available due to reports of a trapped civilian. The victim's crew reported on-scene at 0459 hours and thirteen minutes later the report of a “man down” was broadcast over the radio. At that point all available fire fighters assisted with the rescue efforts.

Recommendation #7: Fire departments should ensure that the Incident Commander does not become involved in fire fighting efforts.

Discussion: Fire fighter safety starts with a strong command presence. According to NFPA 1561 *Standard on Emergency Services Incident Management System*, section 4.1.1, “the Incident Commander shall be responsible for the overall coordination and direction of all activities at an incident.” In addition to conducting an initial size-up, the IC should maintain a command post outside of the structure to assign companies and delegate functions, and continually evaluate the risk versus gain of continued fire fighting efforts.⁷ According to the International Fire Service Training Association (IFSTA) publication, *Fire Department Company Officer*, there are three modes of operation for the first-arriving officer assuming IC: nothing showing, fast attack, and command.¹⁰



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“Nothing-showing mode. When the problem generating the response is not obvious to the first-in unit, the company officer should assume command of the incident and announce that nothing is showing. He should direct the other responding units to stage at Level I, accompany the crew on an investigation of the situation, and maintain command using a portable radio.”

“Fast-attack mode. When the company officer’s direct involvement is necessary for the crew to take immediate action to save a life or stabilize the situation, the officer should take command and announce that the company is in the fast-attack mode.”

“Command mode. Because of the nature of some incidents, immediate and strong overall command is needed. In these incidents, the first-in officer should assume command by naming the incident and designating the command post, give an initial report on conditions, and request the additional resources needed.”

In this incident, heavy black smoke showing was confirmed en-route and fire confirmed on the first floor of the structure upon arrival. Command was established with a command post placed at one corner of the structure, however the IC left the command post several times to check on fireground operations, perform ventilation of lower floor windows, and assist in the extrication of fire fighters from the structure. It is essential that the IC establish command and not become involved in fire fighting efforts to ensure uninterrupted control of the incident scene.

Recommendation #8: Fire departments should ensure that the Incident Commander maintains close accountability for all personnel operating on the fireground and that procedures and training for the use of a personnel accountability report (PAR) are in place.

Discussion: An important aspect of an accountability system is the personnel accountability report (PAR). A PAR is an organized on-scene roll call in which each supervisor reports the status of his crew when requested by the incident commander or emergency dispatcher.⁸ The use of an accountability system is required by NFPA 1500, *Fire Department Occupational Safety and Health Program*,⁹ and NFPA 1561, *Standard on Emergency Services Incident Management System*.⁷ A properly operating Personnel Accountability System requires the following:

- Development of a departmental SOP
- Training all personnel
- Strict enforcement during emergency incidents

This fire department has a standard operating procedure to initialize a PAR when a fire fighter is presumed missing, upon switching from offensive to defensive attack, a catastrophic event occurs, every twenty minutes, or as needed by the IC.¹¹ A PAR was not ordered by the on-scene IC until an off-duty Battalion Chief, who had responded to the scene to assist in the rescue of the trapped fire



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fighters, advised the IC to call a PAR check. A properly initiated and enforced accountability system that is consistently integrated into fireground command and control enhances fire fighter safety and survival by helping to ensure a more timely and successful rescue of a disoriented or downed fire fighter.

Recommendation #9: Fire departments should ensure that fire fighters wear a full array of turnout clothing and personal protective equipment (PPE) appropriate for the assigned task while participating in fire suppression and overhaul activities.

Discussion: NFPA 1500, *Fire Department Safety and Health Program*⁹ states “the fire department shall provide each member with protective clothing and protective equipment that is designed to provide protection from the hazards to which the member is likely to be exposed and is suitable for the tasks that the member is expected to perform.” NFPA 1500 goes on to say “protective clothing and protective equipment shall be used whenever a member is exposed or potentially exposed to the hazards for which the protective clothing (and equipment) is provided.”⁹

During this incident, the trapped officer’s hand was seriously burned when he had to remove his glove in order to key the mic on his radio to call for help. Also, it appeared to the officer who was second on the line, that when the victim stood and started to run, he removed his facepiece. According to maintenance records prior to the fire, and SCBA testing reports following the incident, the facepiece may have been in disrepair and unable to be secured. Also the victim and injured fire fighter were wearing mismatched structural bunker gear which, because of different material composition and/or fire-resistant treatments, can be dangerous. Their helmets were found among the collapse debris which indicates they were not properly secured. It is extremely important that fire fighter’s last line of defense is uncompromised. Fire fighters’ personal protective equipment must be appropriate for the task, in good repair, properly fitted and its use must be consistently enforced.

Recommendation #10: Fire departments should ensure that department policies and procedures for proper inspection, use, and maintenance of self-contained breathing apparatus (SCBA) are followed to ensure they function properly when needed.

Discussion: The standards NFPA 1981 *Standard on Open-Circuit Self-Contained Breathing Apparatus for Emergency Services*¹² and NFPA 1852 *Standard on Selection, Care, and Maintenance of Open-Circuit Self-Contained Breathing Apparatus*¹³ speak directly to maintenance and use of self-contained breathing apparatus.

This fire department had established standard operating procedures for proper use, care, maintenance, and inspection of personal protective clothing and equipment (PPE).¹¹ During this incident there were several instances where SCBA masks came off or loose during interior fire attacks. The victim’s and officer’s masks were sent by the department to be evaluated after the incident. The victim’s mask could not be tested because, according to the third-party test report, “the female end of the buckle is



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cut off.” It is not known when the damage to the facepiece strap occurred or if the damage contributed to the fatality, however, if the mask was being used in this condition at the time of the incident, it is likely that the victim could not obtain a proper seal. One possibility is that the strap broke while the victim was inside the structure fighting the fire which would have affected the facepiece fit, possibly have caused the mask to come loose, and may have been what caused the initial distress and resulting panic behavior. The captain may have observed this and thought the victim was pulling off his mask. Another possibility is that the strap was damaged when the victim fell down the steps.

Inspection of the captain’s mask by the third-party following the incident, also noted deficiencies in the strap, as well as the lens and purge knob. The captain’s mask had a repair form filled out and faxed to their logistics division for a broken strap thirteen days prior. He received a confirmation of the requested work order, but no paperwork is currently available to show that the mask had been fixed. The captain also had requested repair on an SCBA mask one week before the incident. This mask needed replacement straps, would not seal properly, and it was too long. However according to the records NIOSH obtained, this mask was not involved with the victim’s death.

The SCBA is an integral part of fire fighters protective clothing and without it they cannot safely enter hazardous environments requiring respiratory protection. Fire departments need to ensure that all PPE is appropriate for the task and is in proper working order with no defects. All needed repairs must be completed thoroughly or proper replacements be provided. Fire fighters need to make sure they are instructed in proper use, care and inspection of personal fire fighting gear, and that they should never enter hazardous environments without proper personal protection. Department standard operating procedures need to emphasize, and officers need to enforce, the rule that no fire fighter should ever enter a danger zone without donning all appropriate personal protective equipment.

Recommendation #11: Manufacturers, equipment designers, and researchers should continue to develop and refine durable, easy-to-use systems to enhance verbal and radio communication in conjunction with properly worn SCBA.

Discussion: The use of Personal Protective Equipment (PPE) and a SCBA make it difficult to communicate, with or without a radio. Faced with the difficult task of communicating while wearing an SCBA, fire fighters sometimes momentarily remove their face pieces to verbally communicate or to transmit directly over a portable radio. Considering the toxic and oxygen-deficient hazards posed by a fire and the resulting products of combustion, removing the SCBA face piece, even briefly, is a dangerous practice that should be prohibited. Even small exposures to carbon monoxide and other toxic agents present during a fire can affect judgment and decision making abilities. To facilitate communication, equipment manufacturers have designed face piece-integrated microphones, intercom systems, throat mikes and bone mikes worn in the ear or on the forehead. ^{14,15}

During this incident fire fighters experienced intermittent radio communication problems and



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interruptions. The interior attack crew had difficulty communicating with the IC and other fire fighters within visual contact while in the structure. Fire fighters could be heard yelling but were not understood. “Man down” was communicated twice by an interior fire fighter before it was understood.

Recent testing of portable radios in simulated fire fighting environments by the National Institute for Standards and Technology (NIST) has identified that radios can be vulnerable to exposures to elevated temperatures. Some degradation of radio performance was measured at elevated temperatures ranging from 100°C to 260°C, with the radios returning to normal function after cooling down. Additional research is needed in this area.¹⁶

Recommendation #12: Researchers should continue to pursue emerging technologies for evaluating and monitoring the stability of buildings exposed to fireground conditions.

Discussion: The National Institute of Standards and Technology has been researching different technologies that offer the potential for evaluating structural stability of fire buildings.¹⁷⁻¹⁹ This research may lead to more accurate and reliable means of predicting building collapse. Much of this research has focused on field-based monitoring techniques that utilize measurements of fire-induced vibration within the fire building. Such devices should be further researched, refined, and hardened for possible use in the fire service with the ultimate goal of having low-cost, reliable and more accurate methods for predicting building collapse available to all fire departments and fire fighters across the country.

Recommendation #13: Municipalities should take into consideration the impact community secession and annexation can have on emergency services response, and should ensure resources are provided to support an appropriate level of community service and responder safety.

Discussion: NFPA 1141, *Fire Protection Infrastructure for Land Development in Suburban and Rural Areas*, provides guidance for fire protection services regarding the development of community infrastructure to eliminate fire protection problems that result from rapid growth and change. NFPA 1141 Section 11.1.1 states that *an assessment shall be conducted to determine the impact of the land use change^b on the fire protection services offered by the fire department*. NFPA 1141 Section 11.1.2 further states that *the assessment shall include, dispatching capabilities, fire station locations, and fire department resources such as adequate staffing and apparatus.*²⁰

Two situations that impact community infrastructure are annexation and secession. Community annexation occurs when a neighborhood is incorporated into an existing community. Community secession occurs when a neighborhood breaks from an existing community and forms its own

^b Community annexation and/or secession are examples of “land use change.”



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community. Both annexation and secession create unique challenges for fire departments as they try to maintain safe and optimum service levels.

When annexation occurs, if the newly introduced area does not have a fire department, the existing community department is often required to expand their response zone to incorporate the added coverage areas. Often these newly formed communities are experiencing a population increase due to new housing developments and the creation of new businesses. If there is no increase in funding for additional personnel, apparatus, and facilities, the existing fire department may be unable to provide adequate coverage due to increased response times, insufficient staffing and lack of sufficient numbers of apparatus.

When a large community begins to lose population, and therefore tax dollars, due to community secession, they are forced to operate with less funding for their fire department staffing, equipment/facility upkeep, and apparatus maintenance. The seceded community may not have the resources to form a fully operational fire department and will continue to rely on the ability of the existing fire department to provide the same level of service as existed before the secession. Even with a “fee for service” structure, this may prove difficult for the original department. The need for on-going fire department realignment is another negative result of community secession. Emergency personnel are constantly being re-assigned to fill vacant positions created by those who have transferred when the newly formed community establishes its own department. In addition to staffing concerns, the constant shifting of personnel makes individual team continuity a real challenge, and fatigue may create a safety/health concern for those who work or volunteer at more than one department.

In this incident, the emergency call was responded to by the original county fire department since the community where the structure fire occurred had seceded from the county only five months earlier and had not as yet established a fire department. The number of available emergency personnel may have been negatively impacted by the fact that several communities had seceded from the county governance recently and some of the newly formed communities had established their own fire departments which drained staffing resources, and funding dollars, from the original fire department.

To ensure that citizens receive the highest quality response to emergencies, municipalities must make certain that adequate funding is a priority for emergency services staffing, dispatching capabilities, equipment and apparatus purchasing and maintenance. Pre-incident planning visits to newly created areas of the community, and subsequent development of master plans which address the existing hazards, specific dynamics and potential for growth, are valuable tools municipalities and departments can use to ensure sufficient funding for emergency resources. These areas should be re-visited on a regular basis and plans should be updated accordingly.



Fatality Assessment and Control Evaluation
Investigation Report # F2007-16

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INVESTIGATOR INFORMATION

This incident was investigated by Tim Merinar, Safety Engineer and Virginia Lutz, Safety and Occupational Health Specialist, with the Fire Fighter Fatality Investigation and Prevention Program, Division of Safety Research, NIOSH. An expert technical review was provided by Dr. Harry Carter. The report was authored by Virginia Lutz with recommendation review and assistance provided by Stephen Miles and Stacy C. Wertman, Occupational Safety and Health Specialists, NIOSH.



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PHOTOS AND DIAGRAMS



Photo 1. C/D Corner of the House



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Photo courtesy of fire department

Photo 2. Stairway to landing where victim and officer fell



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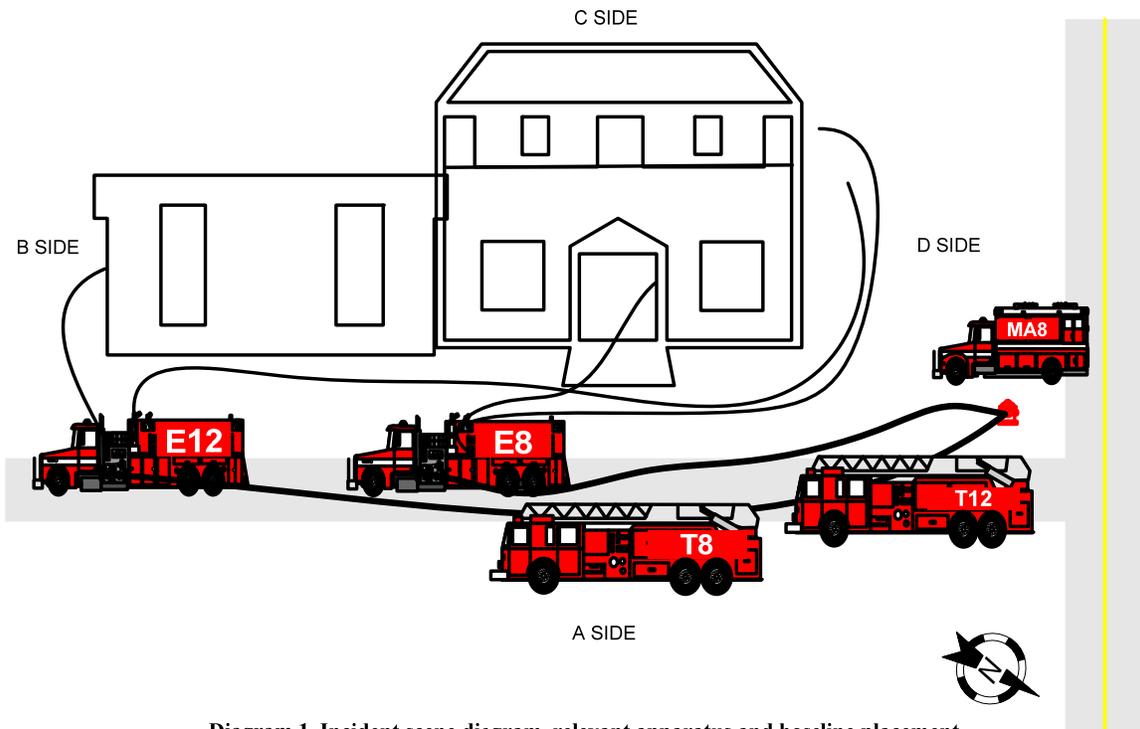


Diagram 1. Incident scene diagram, relevant apparatus and hoseline placement.

NOT TO SCALE



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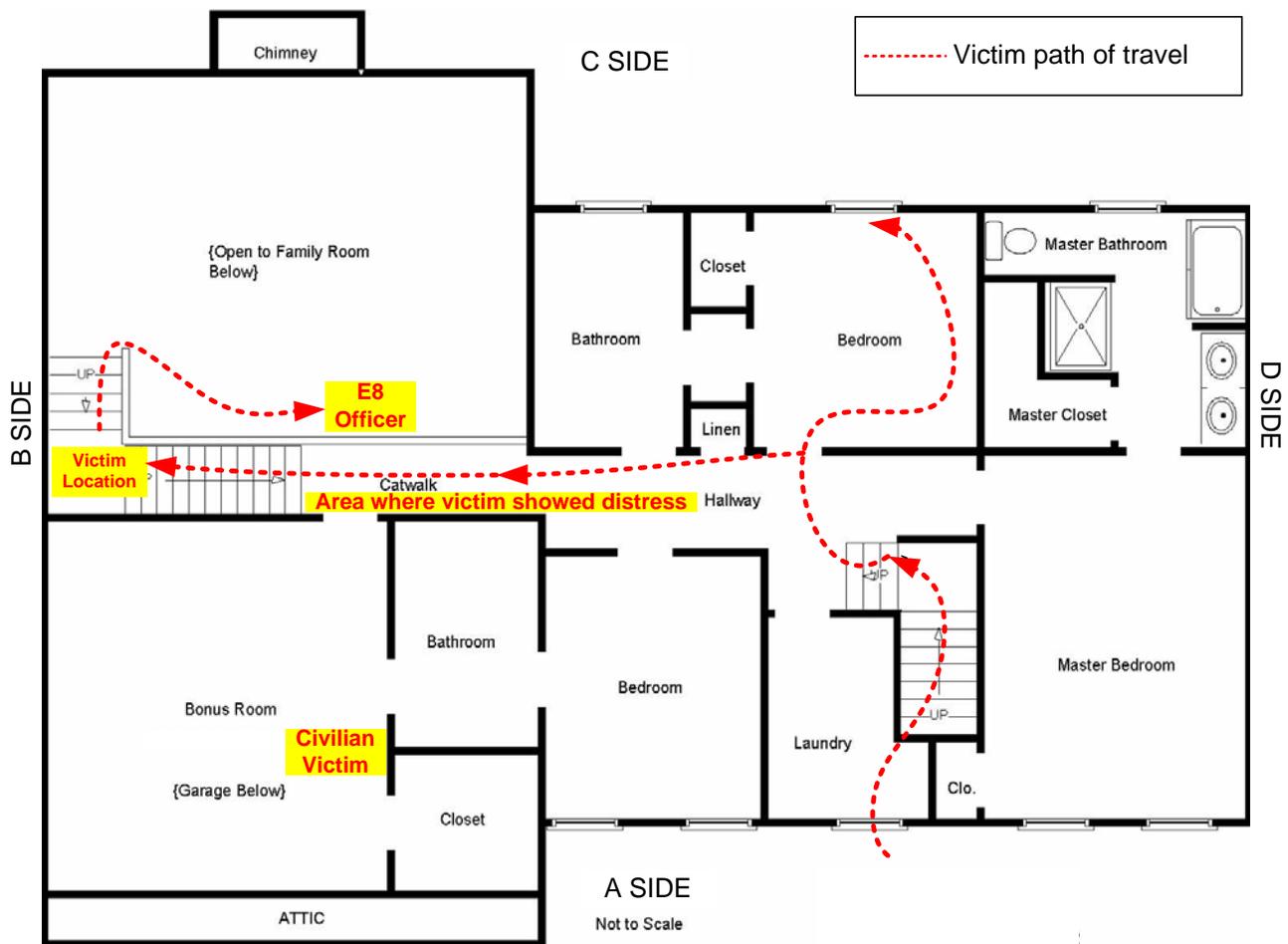


Diagram 2. Victim path of travel and civilian victim location.
Second Floor





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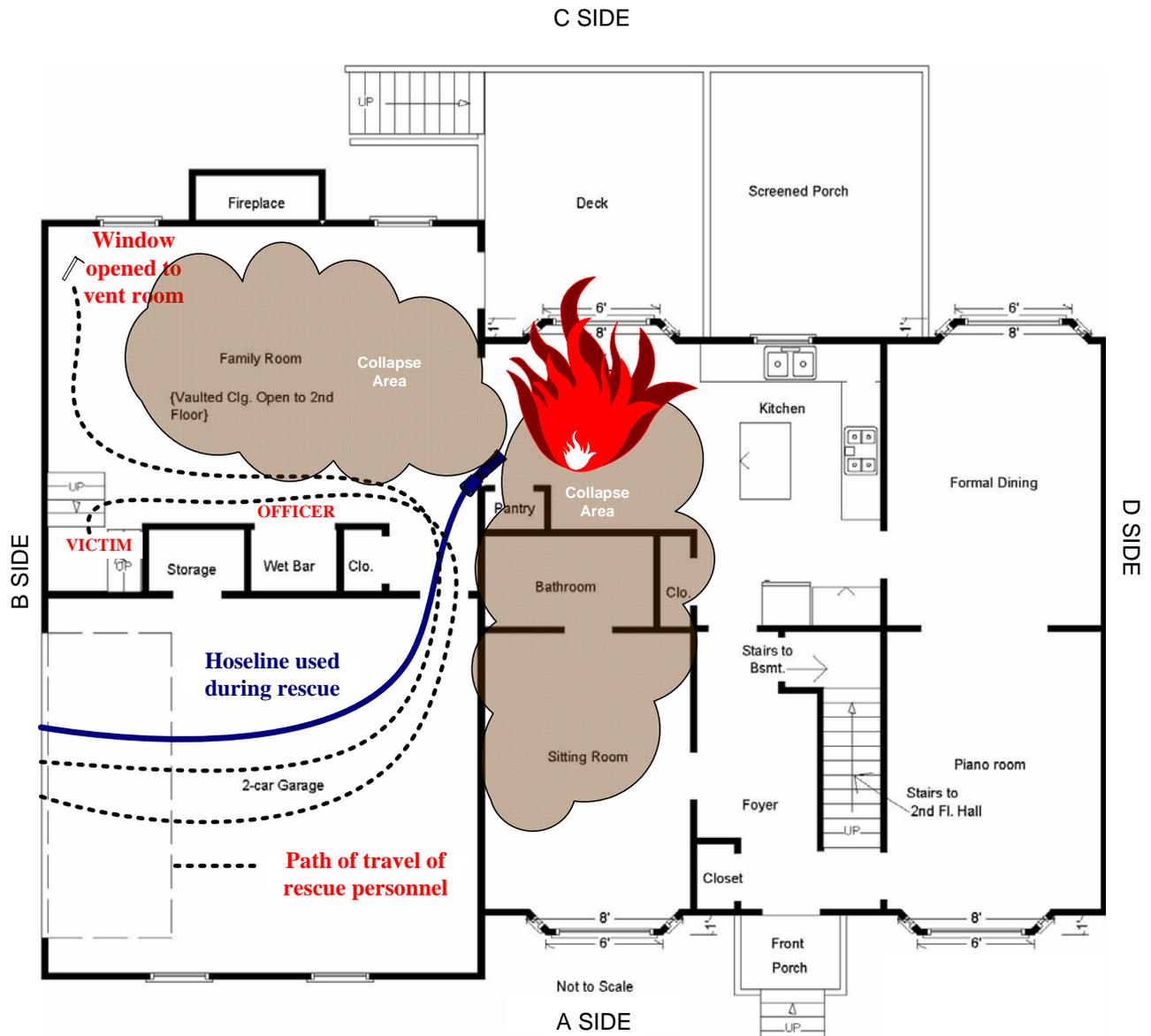


Diagram 3. Victim rescue efforts.
First Floor



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