



TRAINING NOTEBOOK

THE WHITE GHOST BY FRANK C. MONTAGNA

The call was for a basement fire in a three-story brick multiple dwelling. The first-in engine transmitted the signal for a working fire. Two additional engines and a truck were dispatched. Engine 8 arrived third. The intense heat prevented the first two engines from moving into the basement. Engulfed in the hot, black, billowing smoke, they applied water into the opened exterior cellar door.

Bill, Engine 8's lieutenant, thought, "It's an oil burner and a hot one." He told his firefighters to stretch a 2½-inch line. "If the first two engines couldn't advance with their 1½-inch lines, perhaps the added reach and higher flow of the 2½-inch line would help."

As Bill's team stretched the cumbersome 2½-inch hose, the smoke turned white. "Good," thought Bill. "They are hitting the fire, and the water is turning to steam. It won't be long before we have this one under control."

The odor of fuel oil was suddenly heavy in the air.

Bill's pump operator, half a block away, was hooking up to a hydrant to supply his company's line. As he bent over the hydrant, his back to the fire building, he heard a whoosh and the night sky turned orange. Turning, he saw flames rising 20 feet into the air from all of the basement openings. The firefighters in front of the building by the open cellar door were lying on the ground, blown down by the force of the explosion.

The first-in truck officer, initially pre-

vented from entering the basement by the intense heat, entered the first-floor hallway with his inside team. He planned to search for victims in the various apartments. As they were forcing an apartment door, a fireball blew up the basement stairs and forced open the flimsy door to the first-floor hall. All of the truck's interior team made it out into the street, but not without burns. Another truckie was climbing from a ground ladder into a second-floor window. He stepped into the apartment window just in time to avoid the flames that engulfed his ladder. He wondered why he had been so fortunate. The force of the blast knocked Bill and the firefighters in front of the building to the ground. Quickly, they did the spider crawl away from the heat. The chief immediately called for a second alarm and began a roll call. Luckily, he accounted for all of his firefighters. Sure, there were burns and bruises—but no fatalities.

WHAT HAPPENED?

Just when things looked so good, they went so bad. At the post-fire critique, the chief listened to each firefighter give his perspective of the night's events and concluded, "It must have been the White Ghost."

"A white what?" asked Bill. He had studied hard for his promotion to lieutenant and thought he had read everything about oil burner fires; but this ghost thing was news to him.

The chief explained that somehow a large amount of oil had become vaporized, and the vapor spread throughout the basement with the smoke. That was when the smoke turned white. It was also the reason for the sudden pervasive odor of fuel oil. The chief said, "If only someone had noticed these signs and pointed them out to me, I would have pulled everyone out of the building."

"I noticed them," said Bill. "But, I thought it was steam and that we had extinguished the fire. How come I never heard of this White Ghost?"

During the next couple of days, Bill researched the White Ghost. He found men-

tion of it in the *Fire Chief's Handbook*, something he had discounted when studying *The Handbook* explained that if the combustion chamber of an oil burner is not preheated and the oil continues to be atomized, a cloud of oil vapor can fill the chamber and vent pipe. If a source of ignition is found, the resulting explosion can blow down the flue pipe and blow the door off the boiler. *The Handbook* further stated that the vapor will look white, like condensed steam, and will have an oily taste and smell. It recommends treating the incident as a gas leak: by venting, removing sources of ignition, and entering the area only behind the protection of a fog stream.

Bill discovered more information in John Norman's *Fire Officer's Handbook of Tactics*,² in which he read that the White Ghost is a cloud of a vaporized oil-and-air mixture heated above its flash point and out of its container, looking for a source of ignition.

What causes this phenomenon? Norman attributes it to a burner's shutting down after a long period of delivering heat. Then, when a subsequent call for heat is received and is accompanied by a delayed ignition, the White Ghost can appear. As the oil enters the heated fire box, it is atomized, but not ignited. He, too, suggests treating it as a gas leak.

Not yet satisfied, Bill called his local oil burner repair service and spoke to a seasoned technician. Not surprised that the term White Ghost was unknown to the technician, Bill told him what he knew about it. The technician had never experienced such a thing. Sure, inside the burner or in the vent pipe it was possible, but not to fill a whole basement and to send flames out of basement windows. He did not think it was possible, certainly not in a residential burner. The amount of oil delivered and atomized was just not large enough to create such a cloud. On the other hand, he added, a large commercial burner pumps a lot of fuel and if atomized and not ignited, it could create such a cloud. If that cloud ignites, well... Yes, it was possible.

■ FRANK C. MONTAGNA, a 24-year veteran of the fire service, is a battalion chief with the City of New York (NY) Fire Department. He has been an instructor at the FDNY Probationary Firefighters School, the officer in command of the FDNY Chauffeur Training School, and an adjunct lecturer at John Jay College in New York City. He is a member of the FDNY Fire Chief's Association. Montagna has a bachelor's degree in fire science and currently is lecturing on firefighting-related topics.

WHY DID IT HAPPEN?

Where did that leave Bill? The fire was in an apartment house that had a large oil burner. The conditions initially encountered were those of a common oil burner fire. High heat and a large volume of black smoke were emanating from the opened basement door and vented basement windows.

He had encountered these conditions dozens of times with no mishap, this time as water was being applied ineffectively—from the exterior. The smoke suddenly turned white and had the taste and smell of oil. The resulting explosion sent orange flames 20 feet in the air. It sure sounded like the White Ghost.

This incident, however, did not sound like the result of a delayed ignition. There was plenty of ignition prior to the explosion—and plenty of heat and black smoke, too. Perhaps it was as Norman said. Perhaps the oil burner had malfunctioned after a long period of delivering heat. Perhaps. But the truth was that he probably would never know what actually had happened.

"What is important here," thought Bill, "is that I recognize such a situation early enough and act quickly enough to prevent a tragedy." He decided to make sure that everyone he worked with would recognize the White Ghost and know how to react to it. When he brought it up at drill, most of his firefighters admitted they had never heard of it. Years later, as a captain in a different company with different firefighters, he would find this was still the case.

Bill recognized that the lessons learned by officers and other veteran firefighters are new to each new generation of firefighters and must be taught to each group. It cannot be assumed that all responder firefighters will be aware of all the hazards recognizable to the "veterans." Bill resolved that he and the members of his department would know what to do should they ever encounter the White Ghost in the future.

WHAT TO DO?

Following is the proposed action plan for White Ghost incidents that Bill submitted to his chief.

- *At oil burner fires, always stretch a handline. Stretch it, even if the fire can be controlled by an extinguisher. Vent the area and protect exposed firefighters with a fog nozzle.*
- *If the first line enters the basement, a backup line should be in position.*
- *Vent the basement. When basement openings are vented, fog can be used to assist in the ventilation. Norman suggests that fog be used to cool and saturate the vapor cloud.*

- *Shut off the supply of fuel at the storage tank and at the burner itself.*

- *If possible, remove sources of ignition. Bear in mind, however, that when an electrical switch or breaker is thrown, a spark is created. The temperature of the spark will be more than sufficient to ignite fuel oil vapor near its flash point. A fog stream may cool the vapor below its flash point such that removing all sources of ignition may be possible.*

- *If necessary to enter the cloud, do so under the protection of a fog stream. If firefighters are in the basement when the White Ghost appears, they must keep their line operating for protection and withdraw. Warn all on the scene of the danger and operate the backup line to protect the withdrawing firefighters.*

- *If in the street when encountering the White Ghost, immediately alert all to the condition, and be ready to protect those exiting the building. It would also be wise to stay clear of the windows and other openings, considering the intensity of the flame that will blow out of them should the vapor cloud ignite.*

The incident commander encountering the White Ghost should do the following:

- *Mobilize his forces to protect and assist in the quick evacuation of those exposed. Initially, this includes the firefighters in the basement and could include the firefighters and civilians on the first floor as well as in the public halls.*

- *Position and operate lines to cover the evacuation.*

- *Consider calling for additional units as well as EMS. Ignition of the vapor cloud could necessitate both.*

- *Conduct an immediate roll call if the vapor cloud ignites. Occupants must also be accounted for. Civilians and firefighters in apartments, behind closed doors and remote from the basement, may be safe from the fireball, but the explosion can cause*

structural damage and spread fire out of the basement. Consider evacuating the entire building.

It would be nice if Bill could predict the occurrence of the White Ghost and, even better, prevent it; but that is not likely. Being ready to react quickly and correctly is the best that Bill can hope for. By remaining alert, being aware that a simple oil burner fire can turn deadly, and preplanning, he and his firefighters might survive the hazards of the next White Ghost.

The incident described in this article actually occurred; I witnessed it. The atmosphere in the basement actually changed quickly from hot black smoke to white mist. My research has not yet yielded a sufficient technical explanation for this occurrence. I invite correspondence that would shed light on this type of incident. Write to "White Ghost" c/o Fire Engineering, Park 80 West, Plaza Two, 7th Floor, Saddle Brook, NJ 07663. ■

References

1. James F. Casey. *The Fire Chief's Handbook* (New York: Dun and Bradstreet Corporation, 1975), 277.
2. John Norman. *Fire Officer's Handbook of Tactics* (Saddle Brook, N.J.: Fire Engineering Books, 1991), 496.



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