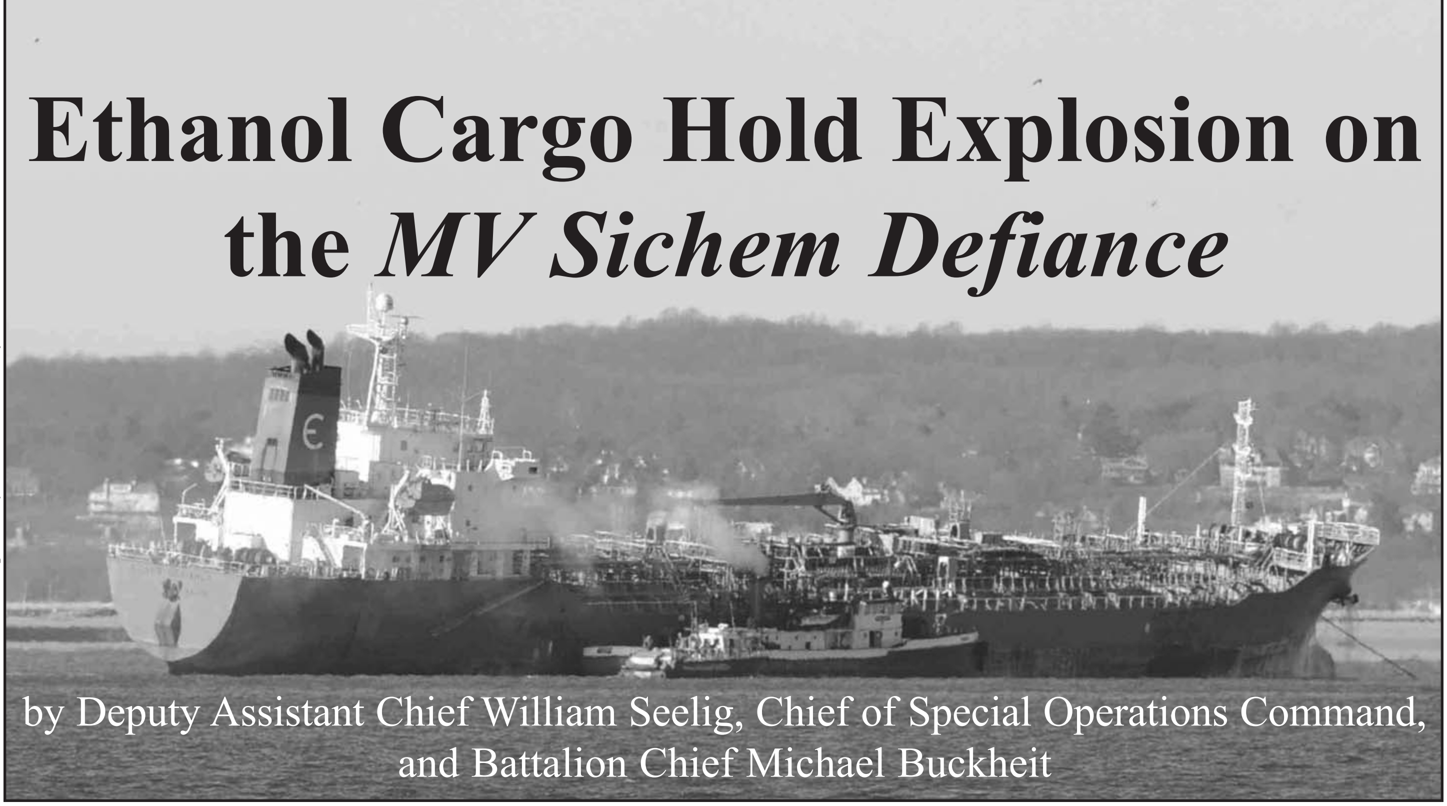
Ethanol Cargo Hold Explosion on the *MV Sichem Defiance*

by Deputy Assistant Chief William Seelig, Chief of Special Operations Command, and Battalion Chief Michael Buckheit

all photos by Todd Maisel, Daily News



Rendering assistance, the *Fire Fighter* is alongside the distressed *MV Sichem Defiance*.

On Sunday, January 10, 2010, at 0920 hours, Brooklyn Box 1199 was transmitted for a report of a boat in distress in Gravesend Bay, near the Verrazano Bridge. Additional information indicated that the boat in question was a large tanker-type vessel that had experienced an explosion onboard and was listing to starboard. At 0921 hours, the Brooklyn dispatcher announced that the Coast Guard was reporting an explosion onboard the 400-foot tanker *Sichem Defiance*, with a possible deck collapse. Reports also stated that the tanker was carrying a cargo of ethanol. It later was learned that the ship was carrying a total of 55,000 gallons of ethanol. Witnesses reported seeing product thrown 60 feet into the air.

Initial assignments

The initial FDNY response assignment included Engines 242, and 284, Ladders 109 and 149, Battalion 42, Marine 6 and 9 (with Engine 153, Ladder 77 and Battalion 21 onboard), Haz-Mat 1, Haz-Mat Battalion, Squad 1 and Rescue 5. At 0922 hours, Safety Battalion 1, Marine Battalion, Tactical Support 2 and Ladder 168 were added to the response assignment, with the Rescue Battalion and Division 8 assigned shortly thereafter.

FDNY initial actions

Battalion Chief Michael McAndrew, Battalion 42, the Incident Commander (IC), arrived at the Box at 0927 hours and ordered a staging area established off of Eastbound Exit 5 of the Belt Parkway. Due to the report of ethanol onboard, he transmitted a *10-86* (*fluoroprotein foam incident*), in preparation for a possible foam operation. The 10-86 response included:

- Two Foam Coordinators (Battalions 43 and 33)
- Two Foam Carriers (Engine 321/Foam 321 and Engine 152/Foam 152)
- One Foam Tender (Engine 238/Foam Tender 01)
- One Satellite (Engine 207/Satellite 6)
- Two Purple K units (Engine 228/Purple K 228 and Engine 229/Purple K 229)

Deputy Chief William Tanzosh, Division 8, arrived at the scene at 0945 hours, collaborated with Chief McAndrew and took over as the IC. At 1004 hours, Chief Tanzosh transmitted a progress report, confirming an explosion onboard a 400-foot tanker carrying ethanol. The ship was listing at $3\frac{1}{2}$ degrees to starboard. The crew of 18 aboard the tanker was reported as accounted for. The staging area was moved to the sanitation pier off Eastbound Exit 5 of the Belt Parkway.

At 1012 hours, Chief Tanzosh and Battalion Chief Dominic DeRubbio, Safety Battalion, boarded Marine 6 to respond to the vessel and size up the situation. Arriving at the vessel, Chief Tanzosh reported that Marine 9 members and Battalion Chief William Reilly, Battalion 21, were in the process of boarding the tanker, which now was listing at five degrees to starboard.

At 1022 hours, Assistant Chief Thomas Jensen, Command Chief for the tour, was assigned to the Box and arrived at about 1040 hours. At 1035 hours, Chief McAndrew, realizing that units responding on the initial 10-86 carried only fluoroprotein foam, requested the response of Engines 206 and 95 with their foam carriers for a supply of alcohol-resistant foam, which would be required if an ethanol fire should occur. Chief McAndrew also requested the response of the Office of Emergency Management (OEM) and a marine chemist.

At 1100 hours, FieldComm 1 (FC01) reported that the Coast Guard had established a one-nautical-mile safety zone around the vessel. Chief James Yakomovich, Rescue Battalion, was transported out to board the ship.

Deputy Assistant Chief William Seelig, Chief of Special Operations Command, Battalion Chief Donald Hayde, acting Chief of Rescue Operations, Battalion Chief Michael Buckheit, Marine Battalion, and Battalion Chief Steven San Filippo, Foam Coordinator, were contacted at home by FDOC and responded, arriving at the scene between 1109 and 1118 hours. On arrival, Chief Seelig conferred with Chief Jensen and was briefed. Chief Seelig recommended that Chief Buckheit be transported to the ship to assess current conditions and offer any assistance required.

Chief Jensen, realizing that this could be an extended operation, requested that Engine 262, with the Planning vehicle and a Planning Section Chief, respond to the Coast Guard Operations Center at Fort Wadsworth on Staten Island. Battalion Chief Anthony Orlandi, Battalion 22, was assigned as the Planning Section Chief and arrived at the Coast Guard Operations center at 1145 hours. With an FDNY Planning Chief present at the Coast Guard Operations Center, Chief Jensen would be kept updated on developments as they occurred.

At 1224 hours, Chief Jensen reported that FDNY Chiefs were meeting onboard the ship with the ship's crew and Coast Guard. The response of one SOC Support Ladder (SSL) and one Squad was requested for air monitoring on the vessel.

FieldComm reported at 1257 hours that a three-member Haz-Mat team had boarded the vessel to monitor air quality and that four FDNY Chiefs and four Coast Guard personnel remained onboard the vessel. Conditions remain unchanged. Just about an hour later (1352 hours), FieldComm reported that the Mobile Command Unit and Marine 1 would be remaining on-scene. Air monitoring continued, with all readings within the acceptable range.

At 1806 hours, the Mobile Command Unit reported that a Command Post was established in the ship's wheelhouse, the shipping company had a marine chemist en route and operations would continue throughout the night, with Coast Guard inter-agency meetings held every two hours. A log was kept by FDNY Marine Operations, detailing results of all operations and meetings.

At 2301 hours, Chief Buckheit reported to the Mobile Command Unit that as of the 2200 hours meeting, conditions remained unchanged and the off-load plan was waiting for Coast Guard approval. Product off-load was expected to begin in the morning. Chief Buckheit remained on the vessel and rotated Marine units, maintaining a constant presence throughout the night.

On Monday, January 11th, salvage operations were begun by a private contractor, Resolve Marine Group, whose personnel made temporary repairs to seal the deck openings and control the flow of vapors from the affected tanks. In conjunction with FDNY and the Coast Guard, Resolve developed a plan to transfer product away from the damaged tanks in order to gain access to the area for visual inspection and repair. This product transfer included internal transfers using the ship's pumps, as well as over-the-top transfers of ethanol using Resolve's portable hydraulic chemical transfer pumps. This was a very sensitive operation with a highly flammable cargo.

Throughout the process, Resolve staff--working with FDNY members--conducted continuous air monitoring throughout the vessel, while FDNY Marine units stood by should a fire occur. FDNY Marine units maintained a presence for 10 days until all product had been removed from the vessel on Tuesday, January 19th. Fortunately, there was no fire associated with this event and after initial size-up and investigations, the FDNY role became basically a standby operation.

Some of the major areas of concern to the FDNY were:

Ship's stability--The vessel was listing at 3 1/2 degrees to starboard when FDNY arrived and the list continued to increase during the operation. The Captain of the vessel stated that based on the tank damage and amount of product that was leaking into the ship's ballast tanks, he expected the list to increase to six degrees before stabilizing. This proved to be fairly accurate and the vessel finally stabilized at a 6 1/2-degree list. In conversations with the Captain and Coast Guard, it was decided that had the list of the vessel continued to increase, that an *abandon ship* order would have been given at 10 degrees. It was predicted that the vessel would have capsized if the list had reached 15 degrees. Fortunately, this did not occur, but FDNY fireboats were standing by, ready to evacuate the ship's crew if necessary.

Air monitoring --FDNY units provided continuous air monitoring onboard the vessel to ensure the atmospheric conditions were not in the explosive range. Readings taken from the main deck ballast tank vents did approach the lower explosive limit (LEL), which caused immediate concern. However, on further investigation and analysis by FDNY Haz-Mat and Marine Operations, it was determined that the readings--while elevated--were to be expected from the ballast tank vent adjoining the cargo hold that suffered the over-pressurization explosion. The ballast tank now contained product (ethanol) and essentially had become another storage tank. The presence of ignition sources within this space was ruled out by the Captain of the vessel.

AR-AFFF (Alcohol-Resistant Aqueous Film-Forming Foam)

At the time of this incident, FDNY Marine units carried fluoroprotein foam concentrate and a very limited supply of fluoropolydol (alcohol-resistant) foam concentrate onboard. For an ethanol fire, alcohol-resistant foam would be required. A request was made by Battalion 42 for Engines 206 and 95 to respond with their foam carriers, each loaded with 1000 gallons of fluoropolydol concentrate. Had an ethanol fire occurred, it would have been necessary to re-supply Marine units with fluoropolydol, a time-consuming operation.

While en route to the scene, the Marine Battalion also contacted New Jersey Fire, to request that they stage foam supplies for FDNY's potential use. (New Jersey uses AR-AFFF foam as a standard for the State. They have reserve quantities in excess of 60,000 gallons available.) This was agreed to by Deputy Chief Lathey Wirkus of the Elizabeth Fire Department.

All new FDNY boats will carry AR-AFFF Universal Gold as follows, providing a more appropriate use in a maritime environment and to match that of FDNY's New Jersey Port Partners (fuel refineries, tank farms, etc.):

- Marine 1--Fireboat *Three Forty Three*, 3300 gallons onboard
- Marine 9--Fireboat *Fire Fighter II*, 3300 gallons onboard
- Marine 6--Fireboat *Bravest*, 200 gallons onboard
- Ten 33-foot Fireboats, 25 gallons per vessel

Note: In addition to the above, both Marine Company 1 and Marine Company 9 will have six foam totes of 275 gallons each (1650 gallons per unit), stored at their quarters, which can be lifted aboard using the onboard ship crane of these new vessels and transported for *mission-specific* responses.

Lessons learned

- Communications with Port Partners, including the USCG, NYPD and NJ Fire and responding FDNY units, require better

Strategy and tactics are determined at the Command Post.

The *Kevin C. Kane* heads out to *MV Sichem Defiance*.

coordination. Original misinformation led FDNY to believe that the *list* of the vessel was intentional when, in fact, it was caused by *free surface effect* of product, a major operational concern. Free surface effect refers to the free movement of liquids or small objects, such as gravel, from one side of a ship to the other side. This movement can change the center of mass of the vessel, affecting the ship's stability.

- Ethanol is miscible (readily mixes with water) and does not leave a visible sheen on the water, like hydrocarbon fuels, which float on water.
- Ships entering US waters are required to have an English-speaking crew aboard. The level of that competency varies greatly; communications with the ship's crew can be difficult.
- When transmitting a 10-86 signal, if alcohol-resistant foam is required, this must be specified by the Incident Commander.

Future capabilities

Marine Company 6's new 64-foot fireboat, *Bravest*, will have a 100-lb. Purple K skid-mounted unit located below decks, with a hose reel to facilitate quick extinguishment of hydrocarbon fuel fires, without the inherent issue of stability concerns that accompany putting water onboard a vessel. Marine Operations is acquiring--via Port Security Grant monies--an additional three skid-mounted units that will be kept at Marine 1, Marine 6 and Marine 9. When needed, these skid-mounted Purple K units can be loaded onto either of FDNY's 140-foot boats, using the boat's crane.

Vessels *Three Forty Three* and *Fire Fighter II* have cameras aboard (standard and FLIR), which allow these feeds to be sent back to FDOC and soon to Marine Operations as well. This will allow FDNY Staff Chiefs to get a *global* view of incidents as they unfold in the Harbor. Additionally, these vessels have Command Posts aboard with the ability to *patch* radio frequencies, receive data feeds and coordinate events from a *forward* position.

A Marine-specific Command Board, similar to those carried by all Divisions, was constructed (by Con-Ed) to assist the Incident Commander onboard a vessel with accountability of Marine assets. The board is kept at Marine Operations and will be carried by the Marine Battalion when responding to an incident. When completed, the electronic Command Board may prove to be an even more valuable asset for use onboard vessels.

Finally, again via Port Security Grant monies, the Special Operations Command will be hosting a Shipboard Firefighting for Land-Based Firefighters training course. This course, previously given at SUNY Maritime in 2005/2006, will be back by popular demand.

About the Authors...

Deputy Assistant Chief William Seelig *(top) is a 32-year veteran of the FDNY. He is the Chief of the Special Operations Command. Before becoming a Staff Chief, prior assignments included Chief of Rescue Operations and Division 6. He was an original member of the FDNY Incident Management Team, serving as an Operations Section Chief. He holds a bachelor's degree in civil engineering from Manhattan College. This is his third article for* WNYF. ***Battalion Chief Michael Buckheit*** *(bottom) is a 22-year veteran of the FDNY. He is assigned to the Marine Battalion. Prior assignments include Engine 72 and Ladder 19 as a Firefighter, Engine 37 as a Lieutenant and Engine 63 as a Captain. He attended the initial West Point Counterterrorism collaborative effort with Harbor Security as the focus group's project. He is a Level 2 Fire Instructor and had been an Instructor with the Fire Academy's Annual Education Day Program and a PADI SCUBA Instructor. This is his second article for* WNYF.