



LNG AND MARINE FIREFIGHTING FOR LAND BASED FIREFIGHTERS



SCOPE AND PURPOSE

- ▶ Why this training is vital to firefighter survival
 - ▶ US Coast Guard is not equipped or authorized to fight fire
 - ▶ FWC is not equipped or trained to fight fire
 - ▶ Conventional fire tactics can cause further fire spread
- ▶ GOAL
 - ▶ To obtain approval and continuing education for fire service personnel
 - ▶ To properly educate supervisory personnel in the safe practices of LNG and Maritime Firefighting



LIQUEFIED NATURAL GAS



HISTORY OF LNG

- ▶ First commodity transport was 1959
- ▶ First ships to use as a marine fuel- 2015
- ▶ Florida East Coast Railway- November 2017
 - ▶ 24 locomotives
 - ▶ 12 fuel tenders
- ▶ Current users in Florida
 - ▶ Harvey Gulf, Tote, Crowley, Florida East Coast Railway, United Parcel Service, SpaceX, United Launch Alliance, Blue Origin
 - ▶ Direct injection into natural gas pipelines during system outages due to repair and maintenance



TRANSPORTATION AND STORAGE OF LNG IN FLORIDA



TRANSPORTATION AND STORAGE OF LNG

- ▶ Currently 3 facilities in Jacksonville Florida
 - ▶ Each provides liquefaction, transportation and storage facilities
 - ▶ Transported from Jacksonville Florida to Puerto Rico, weekly, to provide fuel for power generation on the island.
 - ▶ Provide truck and rail transportation throughout Florida and the southeastern United States
 - ▶ Provide barge transportation for commercial shipping industry (cruise ships and cargo ships)
- ▶ Currently 1 facility in Miami
 - ▶ provides liquefaction, transportation and storage facilities
 - ▶ Transporting fuel to Bahamas, Jamaica, and South America to provide power generation and industrial manufacturing.
- ▶ Proposed LNG facility in Florida
 - ▶ Pt. St. Joe- Proposed facility





12,700 gallons



30,600 gallons



10,000 gallons



1,453,100 gallons



11,400 gallons



150-200 gallons

TRANSPORTATION AND STORAGE IN FLORIDA



APPROXIMATELY
70 million gallons



- ▶ Approved export facilities as of January 08, 2020
 - ▶ Eagle LNG Jacksonville
 - ▶ Floridian Natural Gas Storage- Martin County
 - ▶ Carib Energy- Martin County
 - ▶ American LNG Marketing- Hialeah
 - ▶ Strom Inc. Crystal River

TRANSPORTATION AND STORAGE



- ▶ Florida LNG transport by barge
 - ▶ Q-LNG Elba Island Georgia- 4000 Cubic Meters= 1,056,800 gallons
 - ▶ Clean Jacksonville- 4000 cubic meters= 1,056,800 gallons
 - ▶ Clean Canaveral- 5500 cubic meters = 1,453,100 gallons
 - ▶ Clean Everglades – 5500 Cubic meters= 1,453,100 gallons
 - ▶ Clean Miami- In the future
- ▶ Florida LNG transport, over the road,
 - ▶ Jacksonville only- 1002 deliveries in 2023
 - ▶ Miami- unable to provide data

CURRENT USES OF LNG



CURRENT USE OF LNG



- ▶ 39 cruise ships to enter service utilizing LNG between now and 2025
 - ▶ NOT ALL FLORIDA BASED
- ▶ Cruise lines
 - ▶ Aida
 - ▶ Costa
 - ▶ Ponent
 - ▶ Carnival
 - ▶ P&O
 - ▶ Disney
 - ▶ MSC
 - ▶ Silversea
 - ▶ Royal Caribbean
 - ▶ Princess
 - ▶ TUI

- ▶ As of 2022, over 1000 cargo ships were on the global orderbook that utilize alternative fuels- 534 utilizing LNG



FUELING CARNIVAL MARDI GRAS



CURRENT USES OF LNG

- ▶ SpaceX
- ▶ Blue Origin
- ▶ Relativity Space
- ▶ United Launch Alliance





10,000 gallons



150-200 gallons



DIRECT INJECTION INTO SYSTEM



FIREFIGHTER CONCERNS AND CHALLENGES

- ▶ Cryogenic fuel
 - ▶ -260 degrees
 - ▶ Cryogenic burns to firefighters
 - ▶ Cryogenic fractures of materials causing loss of containment
- ▶ Water application accelerates vaporization
 - ▶ Increases flame spread
 - ▶ Increases thermal signature
- ▶ Vapor dispersion and control



FIREFIGHTER CONCERNS AND CHALLENGES

Water application accelerates vaporization

- ▶ Increases flame spread
- ▶ Increases thermal signature
- ▶ Vapor dispersion and control



LNG TRAINING FOCUS

- ▶ Developed for Florida Firefighters to ensure proper knowledge on LNG and its hazards
- ▶ Course programs are based on Texas A&M curriculum
- ▶ Course were developed from Fortis BC Energy.
- ▶ Course is accepted by the United States Coast Guard



SCOPE OF TRAINING FOR LAND BASED FIREFIGHTERS WITH LNG FUEL

- ▶ Effects on Firefighters
 - ▶ Thermal
 - ▶ Cryogenic
 - ▶ Asphyxiant
- ▶ Flame spread comparison
 - ▶ LNG
 - ▶ CNG
 - ▶ Gasoline
- ▶ Heat produced
 - ▶ LNG
 - ▶ Diesel
 - ▶ Propane
 - ▶ Gasoline
- ▶ Leak behavior
 - ▶ Heavier than air
 - ▶ Lighter than air
- ▶ Gas detection
 - ▶ Explosive meter
 - ▶ Oxygen Sensor
- ▶ LNG use in Florida
 - ▶ Transportation
 - ▶ Storage
 - ▶ industries
- ▶ Transportation methods
 - ▶ Rail
 - ▶ Truck
 - ▶ Ship
- ▶ Firefighting hazards
 - ▶ Pooled fires
 - ▶ Pressurized fires
 - ▶ Rapid Phase transition



AGENCIES THAT HAVE ATTENDED

- ▶ Fire Department of New York
- ▶ Brevard County Fire Rescue
- ▶ Palm Bay Fire
- ▶ Canaveral Fire Rescue
- ▶ Cocoa Beach Fire Department
- ▶ Cape Canaveral Space Force Station
- ▶ United Launch Alliance
- ▶ McAllister Towing and Recovery
- ▶ Disney Cruise Lines



MARINE FIREFIGHTING FOR LAND BASED FIREFIGHTERS



HISTORY AND NECESSITY

- ▶ Jacksonville Fire Department provided much needed marine firefighting for land-based firefighters, in the late 1980's and early 1990's.
 - ▶ Chief Napoli was Training Chief, at Jacksonville, at the time.
- ▶ Much has changed within the maritime industry since that training was introduced
 - ▶ Changes in vessels
 - ▶ Changes in fuels
 - ▶ Changes in suppression systems
 - ▶ Changes in cargo
 - ▶ Changes in ships personnel and their readiness



RECENT EVENTS



- ▶ June 05, 2020
 - ▶ Jacksonville Fire Department
 - ▶ **9 firefighters injured on car carrier fire**
 - ▶ **8 injured in explosion**
 - ▶ **1 injured from heat exhaustion**
 - ▶ NTSB report related used car battery causing the fire



- ▶ June 27, 2022
 - ▶ Fernandina Beach Fire Department/ Nassau County Fire Rescue
 - ▶ Fire aboard 600 foot cargo ship
 - ▶ 5 hours to extinguish
 - ▶ **1 firefighter injured**

RECENT EVENTS

- ▶ Since July 2022
 - ▶ US Naval Station Mayport Florida
 - ▶ Fire onboard Destroyer USS Carney
 - ▶ Fire onboard Littoral combat ship USS Milwaukee
 - ▶ Fire onboard destroyer USS Winston S. Churchill
 - ▶ All 3 fires, Jacksonville Fire Department was requested
- ▶ March 26, 2022
 - ▶ Carnival Freedom stack fire
 - ▶ Left Port Canaveral and had fire before returning

Third Shipboard Fire in a Year at Naval Station Mayport



USS Winston S. Churchill (U.S. Navy file image)
PUBLISHED AUG 14, 2023 10:55 PM BY THE MARITIME EXECUTIVE



RECENT EVENTS

- ▶ July 05, 2023
 - ▶ Fire onboard container/car carrier
 - ▶ Port Newark, New Jersey
 - ▶ **2 firefighter fatalities**
 - ▶ 5 days to extinguish
 - ▶ **Chief Jackson – Fire Chief Newark Fire Department**
 - ▶ *“Shipboard firefighting is a unique skill and Newark firefighters don’t commonly face this kind of fire. They were trained on ships before, but it was a vessel that had compartments and living quarters, not a ship like this.”*





Stuart Florida



Tampa Florida



Miami Florida



DSCN1758

Panama City

PB85-916403



NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

MARINE ACCIDENT REPORT

**FIRE ABOARD
THE BAHAMIAN PASSENGER VESSEL
M/V SCANDINAVIAN SEA
CAPE CANAVERAL, FLORIDA
MARCH 9, 1984**

NTSB/MAR-85/03



NTSB REPORT

- ▶ The Cape Canaveral Volunteer Fire Department which was under contract to the Canaveral Port Authority to provide fire protection to the port area, including the Cruise Terminal, **responded to the fire aboard the SCANDINAVIAN SEA in a similar manner to any house or building fire, using techniques that are well established for fighting such fires. Shipboard firefighting, however, requires different techniques, such as limiting the use of water because it can adversely affect the stability of a vessel and the possible use of foreign designed fire protection systems.**
- ▶ Design features that prevent the spread of fire with built in fire protection and firefighting systems that may be peculiar to vessels present a difficult challenge to the shoreside fireman. **If the fire department is to have responsibility for waterfront fires and assisting in fighting shipboard fires, it should train several of its personnel in shipboard firefighting techniques so that the port could be able to cope with such disasters.** This type of training and the enhancement of the local fire department's capabilities should be incorporated in port contingency planning. Port contingency plans also should provide for shipboard firefighting training for selected personnel among the local fire department's supervisory personnel so that catastrophies, such as the SCANDINAVIAN SEA fire, can be handled with the correct response and can be coordinated properly.



SCOPE OF NEED

- ▶ Ships are becoming much larger
- ▶ Changes in fuel
- ▶ Ships are becoming much more technical
- ▶ Ship crew are much less trained due to attrition
- ▶ Cargoes are burning much hotter due to synthetic content
- ▶ Firefighters are required to train on many different hazards leaving little room for added training and knowledge
- ▶ Command staffs have little experience with shipboard construction and fire suppression
- ▶ Fire departments utilize land-based tactics to battle shipboard fires providing unsafe operational approaches
- ▶ Florida needs to implement a training and validation process, much like wildland firefighting and Urban Search and Rescue





- ▶ Florida has 1350 miles of coastline
- ▶ Florida has more than 7,700 lakes covering approximately 1.67 million acres
- ▶ Yet, there is no requirement to prepare personnel to battle fire in this unique environment



U.S. COAST GUARD MARINE SAFETY ALERT 09-23



UNITED STATES COAST GUARD
U.S. Department of Homeland Security

MARINE SAFETY ALERT

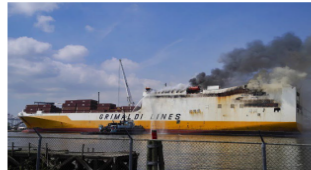
Inspections and Compliance Directorate

November 20, 2023
Washington D.C.

Safety Alert 09-23

BY LAND AND SEA – FIREFIGHTING PREPARATION IS KEY!

The purpose of this Marine Safety Alert is to raise awareness within the Marine Transportation System to the unique dangers of shipboard fires, particularly onboard multi-level freight vessels like vehicle carrying Roll-on, Roll-off or “Ro-Ros”.



In July 2023, a foreign flagged Ro-Ro experienced a fire on one of its vehicle decks while cargo was being loaded dockside. With over 1,200 vehicles on board, the fire quickly spread out of control to the point where most firefighting efforts became ineffective.

Tragically, during the response, two land-based firefighters lost their lives, and several others were injured. Preliminary findings of the ongoing investigation, led by the Coast Guard working with the National Institute for Occupational Safety and Health, indicated that the local fire department responding to the incident had little to no maritime firefighting training, experience, or familiarization with cargo ships of any type. Unfortunately, this is only one of several vessel fires occurring within the last five years where the lack of familiarity with commercial vessels and inexperience with shipboard firefighting techniques unduly endangered the safety of responding personnel.

Vessel fires require more firefighting resources and different technical skills than many land-based firefighting agencies traditionally possess. While shipboard fires may occur less frequently than other types, when they do, they can present significant risk to untrained first responders. Additionally, large foreign flagged vessels are typically operated by international crewmembers, for many of whom English is not their first language. While English is often the ship’s working language, the stress of an emergency and unexpectedly engaging with U.S. authorities can break down the ability for effective communication. It is critical that fire departments with commercial ports in their area of responsibility ensure their personnel understand the common vessel types and the unique hazards posed by each.

The Coast Guard **strongly recommends** that local fire departments, and port stakeholders:

- Engage with each other and their local Captain of the Port, as part of their Area Contingency Plan, to establish regular shipboard firefighting education and training in conjunction with the drills and exercises required for certain vessels under Title 33, Code of Federal Regulations, Section 155.4052.



U.S. COAST GUARD MARINE SAFETY ALERT

- ▶ **Strongly recommends fire departments to initiate marine firefighting training**
- ▶ Engage with each other and their local Captain of the Port, as part of their Area Contingency Plan, to establish regular shipboard firefighting education and training in conjunction with the drills and exercises required for certain vessels under Title 33, Code of Federal Regulations, Section 155.4052.
- ▶ **Develop training, qualification, and response doctrine utilizing guidance from the National Fire Protection Association's (NFPA) standards:**
 - ▶ **1005: Standards for Professional Qualifications for Marine Fire Fighting for Land-Based Fire Fighters**
 - ▶ **1405: Guide for Land-Based Fire Departments that Respond to Marine Vessel Fires.**
 - ▶ **This should include addressing topics such as unified command, shore to ship equipment interoperability, suppression systems, air management, and communications.**



U.S. COAST GUARD ROLE

- ▶ The U.S. Coast Guard does not fight fires aboard any vessel that is not their own.
- ▶ Subject to location, U.S. Coast Guard will provide expertise to the Command Staff
- ▶ Local agencies are tasked with maritime firefighting



NEED FOR TRAINING

- ▶ Propose that the state fire marshal adopt and validate curriculum, and to provide CEU's for fire service personnel.
- ▶ We cannot afford to injure and kill firefighters in unfamiliar environments
- ▶ We cannot afford to subject fire officers, agencies and municipalities to the legal liability of improper or non-existent training for the hazards that they face.

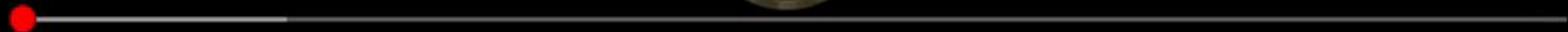


USS Midway Shipboard Drill >

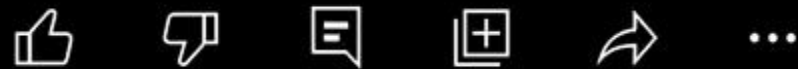
SanDiegoFireRescue



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SCOPE OF PROPOSED TRAINING

- ▶ Utilizing NFPA 1005, Standards for Professional Qualifications for Marine Fire Fighting for Land-Based Firefighters, and 1405: Guide for Land-Based Fire Departments that Respond to Marine Vessel Fires
 - ▶ Provide land-based firefighters with knowledge to:
 - ▶ Understand shipboard construction and layout
 - ▶ Understand the shipboard organizational structure
 - ▶ Understand international laws and requirements
 - ▶ Understand language barriers with crew members
 - ▶ Learn shipboard terminology
 - ▶ Understand weather factors in shipboard approach
 - ▶ Recognize sound tactics to shipboard fire incidents
 - ▶ Recognize process hazards to cargoes on vessels
 - ▶ Provide sound firefighting tactics for a multitude of vessel types and sizes



CONCLUSION

▶ LNG FIREFIGHTING

- ▶ Liquefied natural gas is rapidly becoming the transition fuel for industry and transportation.
- ▶ LNG has many different hazards and concerns from conventional fuels
- ▶ Conventional firefighting methods can become extremely volatile with a product that reacts negatively with conventional firefighting methods.



CONCLUSION

▶ **MARINE FIREFIGHTING**

- ▶ Consider providing maritime firefighting training to your personnel.
- ▶ The maritime environment is very different and unforgiving of critical errors.
- ▶ The Florida Fire Service cannot afford to lose firefighters because of utilizing inappropriate tactics in an unfamiliar environment.
- ▶ This applies to smaller pleasure crafts that frequent most lakes and rivers

