SUPPRESSION OF SHIPBOARD FIRES IN LARGE VOLUME SPACES USiNG MONITORS - FINAL REPORT
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Report Authors:

GERARD G. BACK   HUNG V. PHAM
RYAN GRANTHAM   LT TIMOTHY POLYARD
Jensen Hughes   JOHN P. FARLEY
Baltimore, MD   Navy Technology Center for
                        Safety and Survivability
                        Washington, DC

I. Table of Primary Results:

Table 3: Large Fire Suppression Test Results

Four large fire suppression tests were conducted to assess the ability of the monitor system to suppress/extinguish large Class A fires for a range of operating conditions.

The large fires consisted of two stacks of 16 standard size oak pallets placed side-by-side. The pallets were elevated 20.3 cm (8.0 in) above the deck to allow for ignition by heptane pan fire located under each pallet stack.

The results of the large fire suppression tests are summarized in Table 3. A series of video snapshots showing the suppression sequence for each test are provided as Figures 21-24.

In short, all of the fires were quickly suppressed and controlled within a few seconds of the stream reaching the fire/fuel package. A short time later (seconds), both stacks of wood pallets were completely extinguished. In a few tests, this occurred before the heptane pan fires used to
ignite the pallet stacks self-extinguished (i.e., burned out of fuel). A detailed description of each test is provided in the following sections.

Table 3 – Large Fire Suppression Test Results

Test #	Description	Activation Time	Control min:sec	Extinguishment min:sec	Total Water (gal)
FS-7	Large Fire Suppression (Manual Control)	3:00 pre-burn	0:10	0:20	<100
FS-8	Large Fire Suppression (Pre-programmed Targeting)	3:00 pre-burn	0:15	0:30	125
FS-9	Large Fire Prevention (Automatic Activation and Targeting)	0:10 act.	instant	instant	<25
FS-10	Large Fire Suppression (Delayed Automatic Activation and Targeting)	3:00 pre-burn	0:10	0:15 wood 1:00 pans	~65 wood 250 pans

II. Test Results:

7.3.2.1 Test FS-7: Large Fire Suppression (Manual Control)

The first large fire suppression test assessed the ability of a novice operator to combat a large Class A fire. After the three minute preburn, the monitor was manually activated using the joystick (by a novice) and the fire was extinguished. The novice operator was able to apply water to the fire within a few seconds of system activation. Within seconds, the fire was quickly suppressed with the residual burning located low, on the backside of the two stacks. By 20 seconds into the discharge, there was no visible flaming inside of the stack of pallets and the fire was determined to be extinguished.

7.3.2.2 Test FS-8: Large Fire Suppression (Pre-programmed Targeting)

The second large fire suppression test assessed the ability of a preprogrammed manually operated monitor to suppress/extinguish a large Class A fire.

During the test, the two stacks of wood pallets were ignited and allowed to burn until fully involved (i.e., ~ 3 minute preburn time). After the three minute preburn, the monitor was manually activated using the "Play Back" function to allow the monitor to automatically suppress/extinguish the fire.

The monitor was able to apply water to the fire within a few seconds of system activation. By 10-15 seconds into the discharge, the bottom of the array had been extinguished with only a limited amount of burning observed near the top of the two stacks. By 30 seconds into the discharge, there was no visible flaming inside of the stack of pallets and the fire was determined to be extinguished.

7.3.2.3 Test FS-9: Large Fire Prevention (Automatic Activation and Targeting)

The third large fire suppression test assessed the ability of a fully automatic system (detection and automatic targeting) to detect and suppress/extinguish a fire in a large stack of Class A materials.

The system detected the fire so quickly, that the firefighting party igniting the heptane pan fires below the stacks of pallets, had to run out of the hangar after ignition. The system applied water to the fuel package within 5 seconds of ignition. The applied water prevented the pallets from igniting but the heptane pans located below the stacks continued to burn until all of the fuel (heptane) in the pan had been consumed. The continued burning of the pans was expected since the monitor was discharging water during this test. If the monitor had been discharging AFFF, the heptane pans would have been immediately extinguished.

7.3.2.4 Test FS10: Large Fire Suppression (Delayed Automatic Activation and Targeting)

During this test, the two stacks of wood pallets were ignited and allowed to burn until fully involved (i.e., ~ 3 minute preburn time).

The system detected and aimed the monitor at the fire within five seconds of ignition but the water supply was not activated until three minutes later. Within seconds of water application, the fire was

quickly suppressed with the residual burning located low, on the backside of the two stacks. By 15 seconds into the discharge, there was no visible flaming inside of the stack of pallets

7.3.3 Multiple Small Fires

[A] test was conducted at the end of the test series to assess the systems' capabilities against multiple fires. The cribs were ignited (using small pans of heptane) and allowed to burn for one minute prior to activating the monitor system.

According to the manufacturer, the detection system records the location of the three fires and attacked the fires in the order in which they were detected. The system initially applied water to the fire located in Grid Sector 2. Within a few seconds of water application, the fire was completely extinguished.

The system then applied water to the fire located in Grid Sector 7. Within a few seconds of water application, the fire at this location was also completely extinguished.

The system then applied water to the remaining fire located in Grid Sector 5. Within a few seconds of water application, the fire at this location was also completely extinguished.

III. Report Conclusion:

The results of this investigation demonstrate the potential for using automated monitors for protecting LVS on USN Ships/Platforms. Additional testing is recommended to assess the capabilities of this technology in fully loaded, highly clutter spaces representative of actual LVS.