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TECHNICAL INFORMATION SHEET NO. 5

Summary of Hi-Ex Foam Demonstration  
Conducted at NAFEC on November 5, 1965  
by Walter Kidde Company

The characteristics and effectiveness of Hi-Ex Foam were shown in the NAFEC 300 test area by the Walter Kidde Company on November 5, 1965. There were three parts to the demonstration. The first was to show the process of generating the Hi-Ex Foam and its physical characteristics. The second was to demonstrate its ability to extinguish a cargo fire in the C-130 fuselage and the third, a seat fire in the DC-7 fuselage. The procedures and observations were as follows:

1. The Hi-Ex Foam equipment was set up and attached to Building 3009 by a canvas duct. The foam generator was started and in less than a minute the building was filled with foam. Mr. William Jamison of Walter Kidde Company entered the back door, groped his way through the foam filled building and emerged from the front door. Thus he demonstrated the ability of humans to breathe in this foam filled atmosphere. However, he was not able to see at all. In his words, it is better to have your vision obscured than to be overcome by smoke and fumes from a fire. The foam settled to some degree but generally stayed intact for several hours.

2. A cargo compartment fire test was conducted in the C-130 fuselage to show the feasibility of controlling and extinguishing a cargo fire with Hi-Ex Foam.

The fire load consisted of 200 lbs. of excelsior in 40 lbs. of cardboard cartons providing a stack approximately seven feet wide, four feet deep and three one-half feet high. A ventilation rate of 2000 CFM was provided throughout the test. The fire was ignited near the bottom center edge of the stack. The fire was allowed to progress naturally for the time normally required for detection, about three minutes, or until the temperature at the ceiling above the fire location reached 400°F. At this time, the extinguishing equipment was started. For some undetermined reason, the equipment, an early experimental model, failed to produce foam so the fire had to be brought under control and extinguished with the Carbox System.

3. A demonstration by the Walter Kidde Company to show the effectiveness of Mi-Ex Foam for extinguishing a DC-7 seat fire was conducted in a DC-7 fire test fuselage.

Mi-Ex is a liquid that when mixed with the proper amount of water produces a foam very much like that of detergent suds. This foam is forced to the fire area through a flexible canvas duct by a fan which is part of the mixing equipment. As described by the representative of the Kidde Company, each of the small bubbles of the foam contain very small particles of water which can soak into the material that is burning. This is especially the case with upholstered material such as a chair or aircraft seat where penetration of water may be more effective than spraying large quantities of water from a hose. The Mi-Ex Foam also was reported to have more of a cooling effect on burning materials than a water spray.

The DC-7 fuselage was equipped with one double seat of the type originally installed in the aircraft. The seat was located approximately halfway down the length and on the left hand side of the main passenger compartment.

The only instrumentation used in the test consisted of two thermocouples, one located on the armrest of the seat and one on the headrest of the seat back.

The Kidde Co. equipment was set up on the outside of the DC-7 fuselage and connected through a canvas duct to the crew members entrance at the front of the fuselage. The escape exit at the rear of fuselage was opened so that the foam could enter the front of the fuselage and exit out the rear completely filling the entire aircraft fuselage with foam.

A small quantity of Hexamethylenamine crystals on the front edge of the window seat was ignited to start the fire.

Temperatures recorded on a Minneapolis Honeywell two pen recorder showed a very slow temperature rise for the first eleven minutes. During this time, the temperature of the armrest thermocouple had reached 215°F and the temperature of the headrest thermocouple had reached 360°F when the seat suddenly burst into a complete flame and both thermocouples recorded temperatures of 1500°F within less than fifteen seconds. When the increased flame was observed, the Mi-Ex Foam was introduced into the fuselage which was about half filled within thirty seconds when difficulty was experienced with the mixing equipment. However, this was enough foam to knock the flame down so that the fire could be controlled for approximately four minutes while the equipment was being repaired. After repair, more foam was introduced into the fuselage to fill it completely.

The seat remained in the foam filled fuselage for approximately 45 minutes at which time it was necessary to remove it for safety reasons before closing down for the day. Examination of the seat immediately after it had been removed showed that open flaming had probably stopped soon after being enveloped by the foam and that most of the smoldering fire was out. There were two places still found to be smoldering; (1) on the top corner of the seat back and (2) at the lower edge of the back where the back and the bottom seat cushion came together. These areas were covered with foam and left overnight. Inspection the next morning showed that the smoldering had soon stopped. Therefore, it is believed that if the seat had been allowed to soak in the foam for a while longer before being removed all fire and smoldering would have been completely extinguished.