Program Activity No. 18-443, Fire Survivability Criteria

An Overall Review of the Cabin Interior Materials Program

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May 4, 1973

The study of the flammability, smoke, and toxic characteristics of airplane cabin materials was first initiated at NAFEC in 1963 following the introduction of large jet air transports to commercial aviation. Since much of the interior construction and furnishings of airplane cabins are not only combustible but contained in the same closed environment with passengers, concern over the possibility of fire led as early as 1947 to enactment of federal regulations limiting the burn rate of such materials designated as "flame resistant" to 4 inches per minute or less. Major fires occurring inside a number of unoccupied large jet transports on the ground made it apparent that the existing "flame resistant" requirements were not adequate. However, it was not until after the occurrence in November 1965, of a cabin fire with a loss of 45 lives resulting from a survivable crash landing of a B-727 transport, that attention was focused on the possibility that cabin materials contributed significantly to the crash-fire hazards involving passenger escape. Since 1966 extensive test programs on the cabin materials fire hazards were conducted by FAA both in-house at NAFEC and by contract with the National Bureau of Standards, University of Utah, and the Lockheed-California Company. Standard laboratory-scale tests were conducted at NAFEC on several hundred materials representative of materials in current use or considered for future use. The results of these tests and new developments in plastics have made it possible to revise the Federal Airworthiness Regulations (FAR 25) in May 1972 to require that cabin materials be self-extinguishing rather than slow burning as in the past. In addition to the series of laboratory tests, large scale up to and including tests on a full-size furnished DC-7 were conducted to demonstrate the effectiveness of new materials, in particular on the seats for reducing the fire hazards to passenger and damage to the cabin interior.

The emphasis on the study of the three fire related characteristics of cabin materials has shifted since the inception of the program from first flammability, then smoke about 3 years ago, and more recently toxic gas emission. The activities of FAA supported by the National Bureau of Standards have been successful in the adoption of its test method to measure smoke by some 80 laboratories throughout the world. A Notice for Proposed Rule Making (NPRM) based on the recommendations furnished by NAFEC setting smoke levels for materials is expected to be issued by July 1973.

Now that flammability and smoke standards have been adopted, the major effort will be devoted to developing a suitable test method for measuring the emission of toxic gases by burning materials for use in rule making. News account that victims of two recent crash fires last December in Chicago may have succumbed from cyanide gas from burning cabin materials have led to an accelerated test program at NAFEC to develop as

rapidly as possible the technical data needed for rule making on toxic gas. As with the recently completed test program on smoke, large-scale tests will also be conducted on materials to seek a correlation with the laboratory-scale tests.

Although most of the effort directed toward reducing the cabin fire hazard involved the use of improved cabin materials as required by new regulations, some attention has been given toward protecting the cabin enclosure from fire, by means of a firewall to prevent penetration by flames and heat from an external fuel fire that may develop from a crash landing. Also, since it is impossible to provide cabin materials that are not to some extent combustible, a test program is presently being conducted to develop an onboard cabin fire suppression system using Halon 1301 agent.

The aviation industry to which FAA is responsible for its safety has continued to exercise leadership in the rapidly growing field of fire technology by its test programs which have led to new regulations as conditions change and new materials become available.