

NBS Tests Buses, Subway Cars for Fire Safety

BEGINNING last December, residents of the Washington, D.C., metropolitan area became increasingly concerned when a series of suspicious fires rapidly destroyed transit buses, most of which were new. A total of four fires consumed five buses (including one old model). In most of these cases, unoccupied buses went up in flames at the end of a run in the evening or while parked in a storage garage. In one case, however, a 13-year-old boy—an apparent runaway—was asleep in the rear portion of a bus that ignited. He was killed.

Even before public pressure built up, the Washington Metropolitan Area Transit Authority (WMATA), which operates the buses, asked the Center for Fire Research at the National Bureau of Standards to under-

take flammability tests of the new buses and their interior furnishings. WMATA had already signed a contract with NBS fire researchers to begin fire-safety studies of cars for the new Washington subway system set to open this fall. It seemed natural for NBS to undertake the bus work as well, and researchers saw it as a valuable opportunity to develop procedures for testing the subway cars.

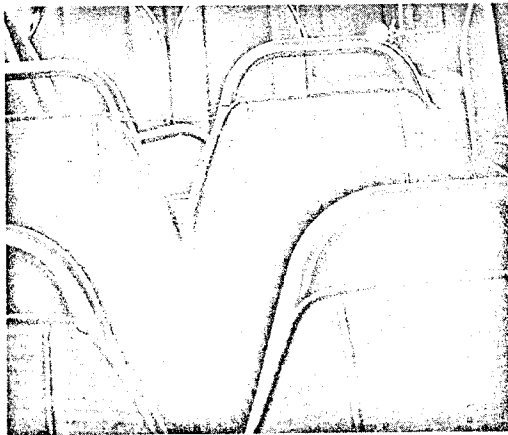
Public officials were extremely concerned about the fires because the blazes appeared to be acts of arson and because the buses reportedly took a relatively short time to ignite, with extensive damage resulting. John P. Breen, fire marshal for the District of Columbia, even raised the possibility of ordering all 620 of the new buses off the streets until the fire

hazard could be fully assessed.

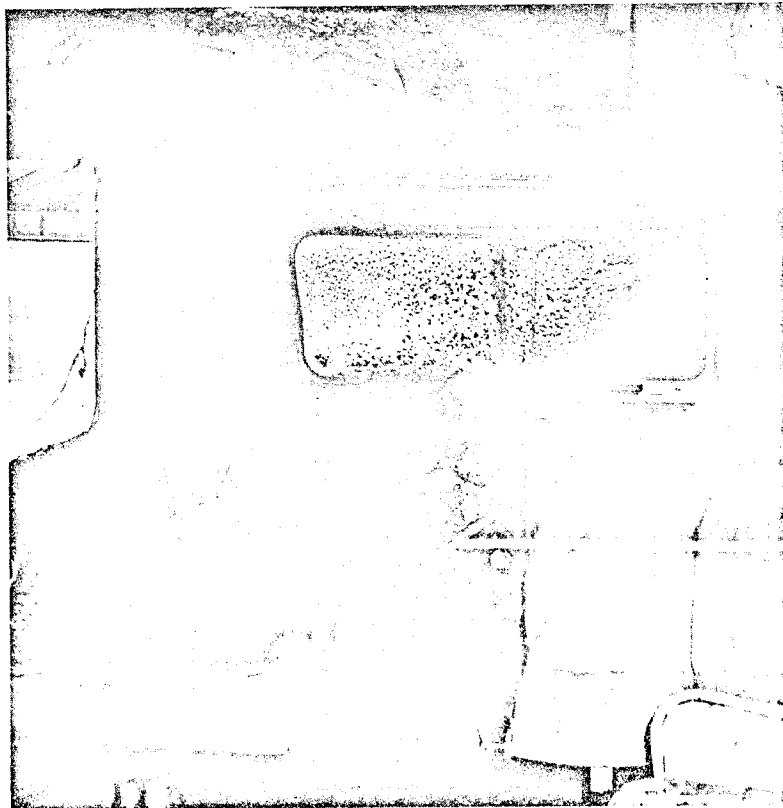
The rash of fires and the death of the young boy caused considerable news media interest. Local television stations and newspapers gave up-to-the-minute accounts of developments in the Metro bus story.

It was against this backdrop that NBS received one of the new buses from WMATA on March 26. The test bus had been involved in a non-fire-related accident, had sustained severe damage to the front end and was inoperable. It was towed by WMATA to the NBS Fire Research Facility where NBS technicians cut away much of the damaged forward body and created a platform for testing purposes. The rear, undamaged part of the bus was used for the flammability tests.

Bureau researchers, under the



*Interior of test bus was instrumented to monitor three full-scale fire tests:
(1) A trash bag was ignited on a seat.
(2) A rolled newspaper was lighted and placed under a seat.
(3) 240 milliliters (8 ounces) of lighter fluid was poured on a seat and ignited. The fire tests left the bus interior badly charred.*



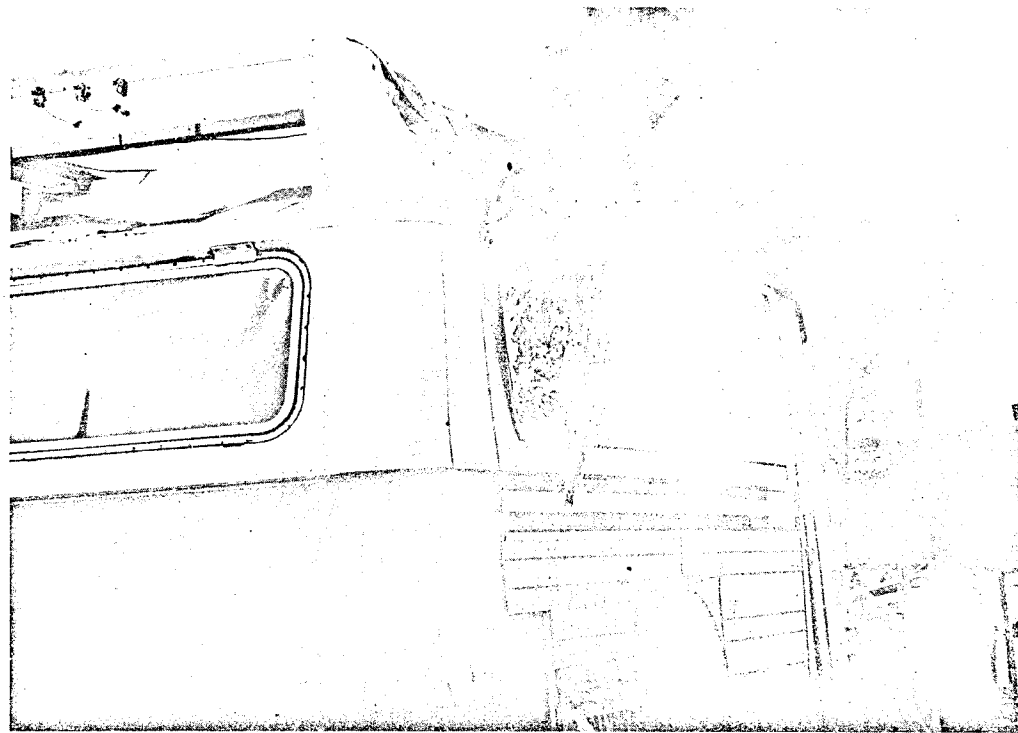
direction of Emil Braun, a physicist on the staff of the Center for Fire Research, went to work on the studies. A series of six laboratory tests were performed on samples of the seats, carpeting and other interior materials. Test results demonstrated that the materials met current Federal standards for flammability.

Three full-scale tests were then conducted on the bus. In the first, a trash bag was ignited on a seat—it took 4 minutes for the seating material to ignite. The second test involved a rolled newspaper placed under a seat—it took 2½ minutes for the seat material to ignite. The third and final test involved pouring 240 milliliters (8 ounces) of lighter fluid on a seat. It took just 5 seconds for the seating material to ignite.

In general, NBS found that urethane padding beneath the nylon fabric covering on the seats posed a potential fire problem when ignited. The NBS report to WMATA and Chief Breen states: "The seats are the most probable source of hazard, given an ignition. Once the urethane seat padding catches fire, a serious hazard develops quickly." The initial hazard arose primarily from smoke, although the fire itself was also a threat to occupants, the report noted.

NBS told WMATA that if it wished to protect its buses against arson, it should consider removing the urethane padding, using a highly fire-resistant covering fabric, or placing a barrier beneath the presently used nylon fabric.

To guard against passenger death or injury from accidental ignition, NBS suggested that WMATA compare the time needed to evacuate a bus with the time it takes for a seat to ignite and for the bus to fill with



Flames spill over window frame of test bus 6 1/2 minutes into final fire test—the one involving 240 milliliters of lighter fluid.

smoke. (The full-scale tests showed it took between 1 and 2 minutes for the bus to fill with smoke once the padding had been ignited).

"Clearly, the level of fire safety, in terms of passenger protection, will be improved in any case by removing or protecting the urethane padding," NBS stated.

The report was released at a news briefing on May 15. A WMATA spokesman at the briefing said his agency would consider carefully the NBS suggestions. Chief Breen said Washington-area fire chiefs would study the NBS report before making their recommendations.

Attention in the Center for Fire

Research is now focused on the WMATA subway cars and their interior furnishings. Plans for proposed subway car seats include the use of polyurethane foam, the same synthetic material in the padding of the bus seats.

To test the subway cars for flammability, NBS has constructed a mock-up of part of a car in a large burn room within the Fire Research Facility. The mock-up consists of several rows of seats, windows and wall assembly. Tests similar to those performed on the bus will be conducted on the interior furnishings of the car mock-up. The tests will be completed in August. □