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THE BURNING

When a jumbo jet went up in flames in Saudi Arabia, an FAA fire expert from Pomona was rushed over to search for clues. The agency is discovering, and correcting, some distressing conditions aboard commercial airplanes.

OF FLIGHT 163

August 19, 1980

The sun, just rising on the horizon beyond Atlantic City's Boardwalk, was setting in the deserts of Saudi Arabia. There, muezzins presiding from minarets had just finished the day's fourth call to prayer. Across the sprawling grounds of Riyadh's ultra-modern international airport, workers rolled up their prayer rugs and returned to the business of the evening's flights.

At the end of the main runway, a white jumbo jet emblazoned with the crossed swords and palm tree logo of Saudia Airlines revved its engines. The giant Lockheed-built L1011 had arrived earlier from Karachi, Pakistan. On board were large numbers of Islamic pilgrims bound for Mecca. After a brief stop at the Saudi capital of Riyadh, the craft lifted off on the final 500-mile leg of its journey to Jeddah. That industrial port on the Red Sea is the site of the world's largest airport and also serves as the traveler's traditional entranceway to Islam's most sacred city, 40 miles inland.

Saudia Flight 163 was 50 miles out of Riyadh when flashing lights and cockpit alarm sirens indicated there was smoke in the cargo holds at the rear of the plane. Calmly, while turning the plane around, the pilot radioed Riyadh control tower that he was returning for an emergency landing. Fire trucks raced out to line the runway. All other planes in the area were ordered to clear a path for the L1011.

IN THE HOT SEAT: For Richard G. Hill, investigator of the desert airplane blaze and chief of the FAA Tech Center's fire test facility, this is just another day at the office.

In the wide-bodied cabin, passengers who had been sipping small cups of thick coffee or mint tea and watching the trackless dunescapes pass below suddenly smelled smoke. Deep in the belly of the aluminum leviathan, small tendrils of flame had climbed up the sides of travel bags and suitcases, feeding greedily on the melting plastic and dry canvas and turning the cargo hold into a cauldron. Like a welder's arc, the fire cut through the walls of the cargo bay at the rear of the plane. Then, like so much silver-colored wax, part of the aluminum floor of the passenger cabin melted away, leaving a small hole. Oily black smoke curled toward the ceiling. Flames licked toward

By Hoag Levins

ILLUSTRATION BY RUSSELL FARRELL. PHOTOGRAPHS BY HOAG LEVINS a row of seats.

Gear down, flaps down, Saudia 163 entered its final approach. The pilot executed a flawless touchdown, and reversed engines. Like a 100–mph, two-mile-long parade, corps of fire trucks screamed onto the concrete, trailing the decelerating jumbo.

Gathering all fire extinguishers in the plane, flight attendants struggled through the crowded aisles. Leaping over the seats, they sprayed extinguisher after extinguisher at the widening, flame-spewing hole. Fire touched the nearby seats, which burst alight like large lamp tapers. The first burning seats touched off all surrounding seats—like rows of book matches blazing each other off.

Coffee cups, food trays, thumbed Korans, magazines, briefcases, prayer rugs, suitcoats were heaved aside in frenzy. A roiling cloud of black smoke descended from the ceiling to engulf the aisles. Passengers lurched, screamed, cried, clawed air, ran forward, jostled one another, climbed seats and began collapsing as the roaring flames sucked off increasing amounts of oxygen in the air-tight compartment.

Jersey-based photojournalist Levins writes frequently about aviation, technology and the Middle East. His latest book, Arab Reach, *was published this spring.*

The pilot rolled Saudia 163 to the end of the runway, turned onto a taxiway and radioed the tower, "We are shutting down the engines now and evacuating."

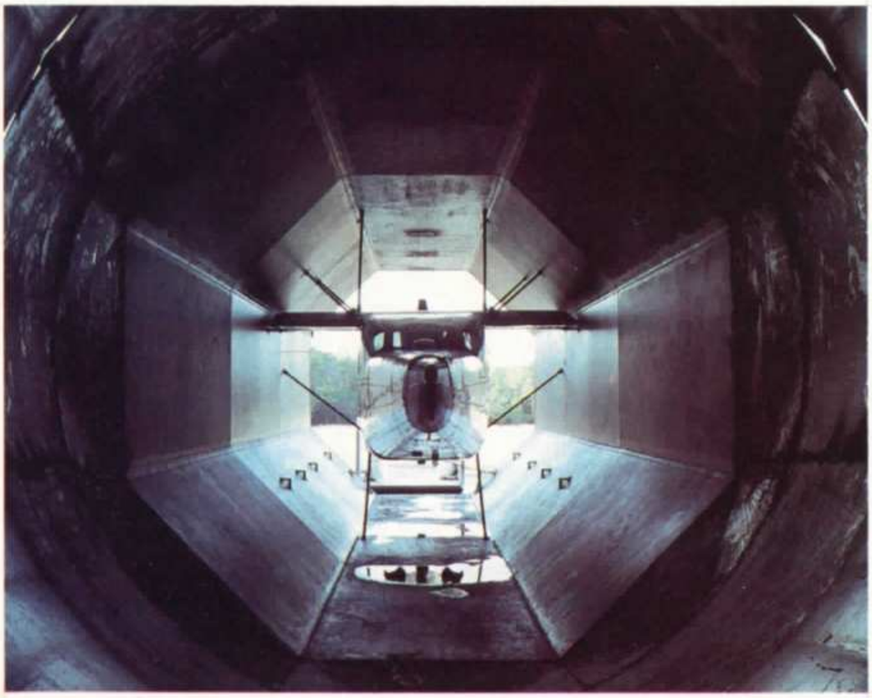
Radio communications abruptly stopped. Air controllers in the tower saw a puff of smoke come out of the bottom of the plane. Fire crews converged on the craft from every direction, ripping open the doors. Flames roared out every opening and consumed the entire top of the plane.

No one survived. Seconds before the door could be opened, the heat and gases reached critical mass. Everything in the cabin burst spontaneously into flames: 301 people were incinerated. It was the second worst accident involving a single plane in aviation history.

The Saudi Arabian government immediately began organizing the crisis task force required to deal with the complex human, technical, financial and legal ramifications of such a catastrophic disaster. Telephone alerts and calls for assistance beamed out across the continents. One of the first communications bounced off a satellite above the Atlantic Ocean and came down to the east coast of North America. The call was routed to a small cluster of buildings hidden in a thick grove of pine trees near Pomona, New Jersey, 12 miles west of Atlantic City.

After hanging up the phone, Richard G. Hill scurried about his office throwing papers into a briefcase and conferring with assistants. Jumping into a car, he sped the short distance of road that ended at the main runway of Atlantic City Airport. There, a Federal Aviation Administration jet was waiting, door open, engines running. Hill was whisked to Dulles International in Washington where he changed planes for Paris. There, he changed planes a final time and continued his journey down the far curve of the planet into Asia.

ABOVE: The burned-out interior of a C-133 is rebuilt for use in fire testing by engineering technician Jim Leach, left, and Chris Young. They will reconstruct the plane down to the carpets—and then burn it to a cinder in less than six minutes. BELOW: Inside a wind tunnel sits a de-winged plane, used to test in-flight firefighting methods.



August 20, 1980

Hill, who had began his day quietly at a cluttered desk in South Jersey, ended it on a crowded taxiway in Saudi Arabia. In front of him loomed the gutted hulk of an L1011 jumbo jet: its upper portions melted away, its fuselage still cooling, its makeshift scaffolding of ramps and lifts busy with somber workmen carrying stiff, charred corpses.

Hill performed an autopsy on a dead sky machine, recording the life-cycle of the fire: where it started, how it spread, what it burned.

The remains of Flight 163, a Lockheed L1011 where 301 people died.

It was a typical day for the 35-year-old Somers Point man who is project manager of the FAA's Pomona Fire Test Facility and an internationally recognized authority in the arcane science of airplane fires. He has raced out of Pomona chasing fire-wrecked airliners in places as diverse as the jungles of South Korea, the grassy plains of Spain and the concrete wastes of Los Angeles.

On this trip to the Arabian deserts, Hill spent nearly two weeks virtually living inside the devastated plane during the day: trudging through the ashes and tangles of blackened pipe and wire, climbing into the cargo holds, contemplating the marks on the floor left by the piles of bodies crammed at each exit door. Photographing, measuring, sketching, noting all details, Hill performed what amounted to an engineering autopsy on a dead sky machine. Meticulously, he traced and recorded the life cycle of the fire: where it started, where it spread, what it burned, how it burned. In the evening, in the Riyadh Intercontinental, he compared notes and theories with other teams of engineers, analysts, government and aircraft industry officials who were also pouring through the plane's remains.

Back in Pomona, Hill and other FAA fire technicians constructed a replica of the Saudi plane's cargo bay and conducted a series of complicated tests to verify the field findings. Such exhaustive research occurs after every major fire involving an American-built plane. The findings are distributed to governments around the world and often result in the updating of international standards of aircraft design and operation.

At the same time, such FAA investigations can also affect hundreds of millions of dollars in law suits that routinely result from major airliner crashes and fires. For instance, the L1011 Saudia fire is currently the focus of at least $100 million in suits of various sorts. The FAA's findings are at odds with those of British insurance companies, which are liable for damages if the fire started in the baggage holds as opposed to some mechanical system, such as the hydraulics.

The porticos of such exotic world capitals as Riyadh would seem to be a long way from the Pleasantville High School where, in the early 1960s, Hill first indulged his mechanical curiosities on the engine of a '37 Ford and dreamed of designing cars in Detroit.

Son of a race car driver, Hill spent several years driving stock cars at the now defunct Pleasantville Speedway. In 1969, after returning home from Farleigh Dickenson University with a degree in mechanical engineering, he decided he didn't want to move away from the Atlantic County shore. At the time, only a single local employer was hiring mechanical engineers: the FAA at Pomona. And so, turning his attentions from the blacktop to the skyways, Hill began his unique career in aviation by accident.

He is now one of several dozen specialists who operate the world's largest aircraft fire research facility at the FAA Technical Center. The fire facility is only one part of a sprawling city of aviation research in the pines which, until 1980, was known as the National Aviation Facilities Experimental Center (NAFEC).

The FAA came to Pomona in 1958—at a time when the new era of jet travel caused the U.S. Congress to launch a crash program for developing the new airport guidance and control systems required by such large, high-speed planes. The site was selected because a Naval Air Station was being closed there and its buildings offered instant working quarters. At the same time, it was situated in the center of the country's densest air routes between New York, Philadelphia and Washington, D.C.

Soon, it expanded and became the world's largest research center for all aspects of airport and airplane safety. Here, the FAA's fire wizards maintain a unique data central on every conceivable aspect of airplane flammability. Field work and experiments done by FAA technicians at Pomona's unique labs are constantly adding to the growing body of knowledge about the peculiar behavior of fire in space-age flying machines.

"We're often accused of being tombstone engineers, but we're really much more than that," explained one of Hill's colleagues, 36-year-old Dr. Thor Eklund. As a student of aeronautical engineering at Princeton, Eklund wrote a thesis about flame formation on fuel surfaces and has been hooked ever since. "The study of combustion as it pertains to aircraft accidents is not your mainstream sort of work," he says, "but I find it very complex and very interesting."

A tweedy man of professorial manner, Eklund commutes 45 miles from Haddonfield to an office whose every surface is awash in paper and whose blackboard is filled with calculations so dense they resemble hung lace. Forever pondering the myriad chemical and physical dynamics of flames moving through airplanes, he is in charge of a program that is seeking to translate the properties of fuel, combustion and fuselage materials into mathematical form. The idea of this mind-bogglingly complicated task is to create an enormous computer program that can behave like a fire in an airplane.

This would allow FAA scientists to do preliminary research of a new sort. For instance, if they wanted to understand how a change in rug or wall materials might alter the overall flammability patterns of a plane, they could mathematically "install" the new materials into the computerized jetliner and watch as the computer simulated results of a fire in the craft's interior.

Eklund also runs one of the several test programs, which employ real airplanes to study such subjects as smoke evacuation and fire extinguishing systems. Often, the tests at Pomona result in new discoveries in fire safety that are passed on to Washington to be translated into new FAA regulations altering the shape and substance of America's jetliners. For instance, aircraft companies are currently modifying the inflatable escape chutes used to evacuate airliners in time of fire. Pomona researchers found that the old-

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BURNING

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style rubberized chutes burst like overheated balloons when they were near flames. Now, new aluminized chutes resistant to such heat are being installed.

However, despite such improvements, fire still remains the single greatest danger faced by passengers who survive the impact of an airplane accident. About 25 percent of all deaths in aviation mishaps are caused by fire, and fire research continues as one of the FAA's top priorities.

Today's airliners, which use superlight plastic materials throughout their structure and furnishings, tend to be super-flammable. Astonishingly, the seats of jetliners are made of urethane—an ultra-light petrochemical foam that appears solid, but liquifies and burns as readily as raw jet fuel when touched by an open fire. It is this extraordinary fire potential which has made it possible for persons armed with nothing more than a jelly jar of gasoline and a Bic lighter to hijack airliners.

And because of this same fire potential, the federal government requires airplane manufacturers to prove that even their new 400-passenger jumbo jet designs can theoretically be completely evacuated in 90 seconds. *Tests performed at Pomona and extensive analysis of past aviation fires have found that once a blaze has taken hold in even a small section of seats, a jet airliner's cabin remains "survivable" for only two minutes.*

The tests—done behind a curtain of barbed wire and thick forests at Pomona—have imparted a certain macabre, museum-of-horrors-like quality to sections of the grounds. Littered across the eight square miles of federal reserve are the remains of various planes. In one place, a dirt road through the pines suddenly opens onto a clearing where an F-111 Air Force jet is pinioned on a concrete pad like an animal lashed down for torture. The plane's engines are run, set afire and studied as they burn.

In another spot, a weathered, blue-and-white former Israeli 707 stands forlornly in a parking lot, like a mother hen overseeing a brood of Datsuns, Toyotas and Chevys. The plane's interior is rigged with pipe for pumping in smoke—part of the test systems that have already made important discoveries about the exit and emergency lights in today's jetliners—they're in the wrong place:

In the event of even small fires, smoke rapidly rises to obscure cabin lights that are high in the ceiling and walls. This happens at the same time that the passengers' only hope of escape lies in crawling on hands and knees on the floor toward an exit. Tests have found that lights on the floor level are the only ones that matter during such an emergency.

Perhaps the strangest building at Pomona is one affixed at the front with a giant steel horn resembling nothing so much as a two-story-high Victrola speaker. From the mouth of the horn sticks the propeller and front end of a small Cesna. The plane was obtained from federal drug agents who confiscated it after it was used for smuggling drugs into the U.S. It is now suspended inside the building's unusual-looking wind tunnel. In-flight wind conditions are created for tests of the potentially lethal characteristics of fire extinguishers in small airplanes. This little-publicized problem is of great concern to private pilots who now face the possibility of smothering both a fire and themselves with the same discharge of extinguishing gases in the sealed cabin of a small plane.

The sort of experimentation that goes on throughout this aviation boneyard also tends to breed odd sorts of job enthusiasms, to which outsiders may at first have difficulty relating. Imagine, for instance, what it must be like to roll out of bed in Pleasantville or Absecon, gobble the morning's toast and coffee, kiss the wife goodbye and then rush toward the office and the task of setting fire to a multimillion dollar airliner before lunch.

January 20, 1983

Shortly after dawn, the cars began arriving at building 275 in Pomona for the big burn.

Hidden deep in the woods in a corner of the FAA Technical Center grounds, 275 is not hard to spot, even for first-time visitors. If the building's gargantuan size doesn't catch your eye, the nearby carcass of a de-winged Air Force cargo plane does. The bulbous-nosed C-133 airplane has a forlorn, beached-whale quality about it as it sits amidst pine boughs and spider webs, awaiting its fate beyond the huge blue doors.

Building 275, which is larger than a gymnasium and officially known as the Full Scale Fire Test Facility, is actually a gigantic fireplace whose floor space covers nearly one-third of an acre. Thick walls and complex venting systems contain and control internal fires of blast-furnace intensity. Overhead, 12-foot-square ceramic cement ceiling panels weighing 600 pounds each have been blackened by flames leaping 40 feet high.

On this particular day inside the cavernous and somewhat sooty space sits another C-133. The plane's wings have also been removed (and used in separate fuel tank rupture tests), but otherwise, the craft is intact. Despite its monstrous size, the plane takes up only about one-quarter of the available floor space. Technicians in protective white suits, face masks and eye goggles scurry up and down ladders and entrance steps making final preparations for the morning's event.

Inside, the C-133 is as wide as a commercial jumbo jet and has been rebuilt with the furnishings of such an airliner. It has also been festooned with networks of temperature sensors, gas collection lines and lights. Welded here and there about the interior are black steel boxes containing video, movie and time-lapse cameras. Each of the camera boxes has a compressed air and nitrogen cooling system, allowing it to survive the holocaust it will document.

Along the side of the plane, a 10-foot steel platform trough has been installed and filled with 100 gallons of the kerosene-based jet fuel. The huge burn bay is evacuated and sealed off from the control room bunker next door.

In the control room, Richard Hill is explaining what the day's tests will show. Scattered across his hopelessly cluttered desk are boxes overflowing with 8 × 10 photographic enlargements. With amazing consistency, at least one survivor in most plane crashes manages to have both the presence of mind and the camera necessary to take pictures of the burning plane. Often, these are cheap cameras and blurred photos, but they nevertheless document the scene and provide some of the most important information used by investigators analyzing how a fatal fire started and spread.

With the same consistency, the pictures also contain a sense of the human horror wrought by aircraft fires: In many shots there are tiny figures still leaping from the doors of jetliners engulfed in flames. Closer to the lens are running figures with mouths stretched open in frozen screams and clothes hung in disarray from exposed, bleeding shoulders.

One of the stacks of color photos is from a DC-10 accident, which happened in Malaga, Spain last year. The McDonnell-Douglas-built plane aborted its takeoff, was unable to stop and caromed off the runway into a field where its wing tanks ruptured. There were no impact injuries. But five dozen people were killed by the fire which erupted in the spilled fuel.

The photos show a small fuel fire near the tail of the plane, which rapidly expands to consume the entire rear section of the craft. The hull was not opened on impact and passengers remained alive and headed for the exits inside even as the fire raged outside. But the fire quickly burned through the aluminum skin of the plane, igniting the seats, carpets, wall and ceiling panels in the cabin and incinerated dozens of passengers before they could get out the forward escape hatches.

The FAA is now documenting and studying the precise second-by-second dynamics of such a "burn-through" of the outer skin of an airplane. This is the beginning of a project seeking to identify changes that should be made in materials or structural design that might slow this phenomenon.

The day's full-scale burn in building 275 is one of several tests that are to be run. In the control bunker, Richard Hill is making final checks through the two tiny windows—each thicker than that at an outdoor bank teller's—which look into the burn bay. Padding around in threadbare jogging shoes and rumpled corduroy pants, Hill confers with the gathered crowd of FAA engineers and executives from McDonnell-Douglas, and switches on a computer display terminal to begin the final countdown. At the control panels, Hill is surrounded by TV monitors, video recorders, computer consoles and a jungle of dials and switches.

The computer screen poses a countdown of questions such as "Vacuum pumps on?" "Smoke vents open?" and "Smoke meters on?" as the webs of systems go through pre-burn finals.

At the end—a final touch of whimsy programmed into the computer—the machine announces to the assembled group, "All Systems Go. Blast off!"

Hill flips an "Arm" switch and then "Ignition."

Out in the burn bay, two electrodes send a spark across the shimmering vapors hovering above the 100 gallons of jet fuel. Flames rise and sweep across the liquid, leaping 20 feet high and engulfing the side of the C-133's fuselage.

The control room's color video monitors are also showing the scene inside the cabin. At first there are quiet rows of seats and pleasant colored rugs and tastefully textured wall panels. It looks like any airliner you've ever been on—except for the two windows. Both glow brilliant orange from flames outside.

Before three minutes elapse, a curl of smoke enters the cabin. Then a tongue of flame. The aluminum wall panels sag suddenly, like warmed taffy. Flames explode through the opening, touching the rows of seats that immediately ignite. Before four minutes elapse, flaming globules of ceiling materials are raining down and torching off whatever seats they hit. By five minutes, the entire cabin is flashed with flame from end-to-end. The plane is incinerated.

At six minutes, the test—which took weeks of preparation—is over. Hill hits the toggle switches and a series of fire extinguishing systems course clouds of gas and thunderstorms of water through the burn bay. The flames die and reveal a gaping hole in the side of the plane. The surrounding metal is so hot it still glows red—translucent enough to clearly show the metal struts beneath its surface. The entire burn bay is filled with smoke and toxic gases and workmen will vent the space for a full day before they attempt to reenter.

One important finding of this test involved the wall panels against which passengers sit. The panels that form the interior skin of the plane can play a major role in slowing down the rate at which an outside fire breaks through to the inside. The test found that the aluminum wall panels, which are currently used in most commercial airliners, are far less resistant to flame breakthrough than fiber glass panels. Earlier tests found that while the intense heat of a fuel fire rapidly melts away the resins of interior fiber glass panels, the weft of spun-glass fabric remains intact and acts in an asbestos-like manner to hold back flames for a significant period of time.

The test also provided further clues to the window problem—the tendency of plastic aircraft windows to melt almost immediately in a fire, letting exterior flames into the cabin. New acrylic window materials that could hold off a fire breakthrough for several minutes longer are currently undergoing FAA tests.

While Pomona's FAA fire wizards have overturned conventional assumptions about what actually traps and kills human beings during aircraft fires, Pomona's discoveries also indicate that throughout the jet age, both the U.S. government and aircraft industry have inadvertently ignored the single most lethal aspect of combustion inside passenger planes.

Since the early 1960s, nearly 6,000 people have died around the world as a direct result of fires in airplanes.

Pomona's researchers have discovered a method for reducing this peculiar fire threat and for extending the time passengers have to get out of a burning plane before lethal interior conditions occur. But the last several presidential administration officials in Washington have not yet translated these life-saving discoveries into federal regulations, and the aircraft industry has so far declined to make such fire safety changes in currently flying jets because of the cost.

For the last 25 years researchers assumed that the single greatest danger to jetliner passengers attempting to exit a burning plane was toxic gas. They thought that the passenger cabin rapidly became a sort of gas chamber fed by the poisonous vapors released by burning plastics, synthetics and other petrochemical materials inside the craft.

They also thought that because of this rapid accumulation of gases, passengers were often smothered or immobilized and unable to get out of the plane before fire consumed it—and them.

These long-held assumptions caused both the Federal Aviation Administration's regulators and the aircraft industry to focus their fire safety attentions almost exclusively on the gaseous properties of any given material in aircraft construction.

Usually, these materials were burned in small laboratory tests. The material that produced the lowest amount of toxic gas was approved for installation in airliners. This single narrow consideration—gaseous toxicity—governed the thrust of virtually all the federal government's aviation fire safety regulations.

However, the staff of the FAA test facilities at Pomona, which has been burning whole airplanes for three years, has proven that these assumptions, thoughts and procedures are wrong.

Their voluminous files of video tapes, time-lapse photos and banks of computer-collected data show that the level of toxic gas in the cabin is survivable. They discovered that a burning plane does not kill as a gas chamber, but rather as a flash fryer.

The vehicle of death is not toxic vapor, but incredible heat: heat rising so unbelievably fast that it reaches 2,000° Fahrenheit and exceeds the burning temperatures of every petrochemical substance in the cabin in two minutes. At that point, a previously unknown phenomenon called "flash over" occurs.

Much like gasoline torched off inside a closed thermos bottle, every petrochemical surface in the cabin takes flame spontaneously. Even the air itself appears to burn, as a supernova of fire flashes through the craft, instantly incinerating everything from the cockpit to the rear lavatories. Human beings still scrambling up the aisles are charred and dead before they keel over on the floor.

This remarkable discovery is revolutionizing the way the FAA evaluates every part of the passenger compartment for fire safety.

Now, the single most important consideration for any material is its rate of combustion, not the amount of gas it gives off. In fact, FAA researchers have found that many materials which exude large amounts of toxic gas when burned also burn much more slowly—delaying the onset of flash over and, thus, saving lives.

Because an average of about four people-per-second can get out of an airliner in an emergency, even a few seconds delay of flash over can significantly alter the casualty rate.

Tests at Pomona have found that changing from highly flammable urethane seats to flame-resistant neoprene seats would greatly reduce the potential for fire flash over in all jetliners.

But airline companies have resisted such a change because neoprene is heavier than urethane and added weight cuts into profits.

In other tests, FAA researchers have found a method for "blocking" urethane seats—covering them with a thin layer of nonflammable fire shielding. In repeated full-scale tests, this single change resulted in delaying flash-over in a burning jumbo jet compartment by as much as 60 seconds—potentially allowing more than 200 additional passengers to escape from a burning airplane.

However, airline companies have showed little enthusiasm for this discovery.

FAA Full Scale Fire Test Facility Project Manager Richard Hill explains:

"Say in a 747 there are 400 seats. Neoprene adds 12 pounds per seat. That's 5,000 pounds you've added to the plane, and that's money: It takes $20 a year just to fly each of those extra pounds around, so you're talking $100,000 per aircraft. You have an airline with 50 to 80 planes, so you're talking $5 to $8 million a year for that one company to have fire-resistant seats.

"Then, there is seat blocking, which adds only about two-to-three pounds per seat. And *that* was thought (by airline companies) to be excessive. So, now we're looking for lighter materials which will do the same thing."

Constantine P. Sarkos, technical project manager of the FAA Cabin Fire Safety Program at Pomona explains:

"To be frank, when we embarked on this seat blocking experiment two years ago, I personally did not believe that something like a layer over the urethane would make that much difference because of the intensity of the fire in a burning airplane. But tests show it's very effective. It's very difficult, however, to be able to put an exact figure on how many lives you're going to save. And that's the dilemma we face.

"It's clear that urethane is the most flammable material inside the airplane and that the blocking layer will minimize the fire danger. I think it *will* be implemented eventually."

Sarkos speaks this word, "eventually," with an air of resignation. His hand makes a vague gesture toward the corner of his officer where tables and shelves are piled high with various sorts of fire-retardent foams, flameproof seat covers and new chemical and metallic-coated fabrics developed by NASA to replace asbestos. None of these tested and proven materials have yet been installed in airliners.

If you are a frequent air traveler, a visit to Pomona can have quite an effect on you the next time you find yourself flashing a boarding pass and moving down the narrow aisle to squeeze into your seat. Somewhere out along the taxiways, just before the plane makes the final turn onto the runway and begins revving to full throttle, you find your eyes marking all the exit signs. You find your hand creeping down to pinch the soft urethane cushion of the bomb that cradles you. And you find yourself staring out into infinity through the small oval window as you begin to appreciate, as never before, the full meaning of the word, "eventually." ■