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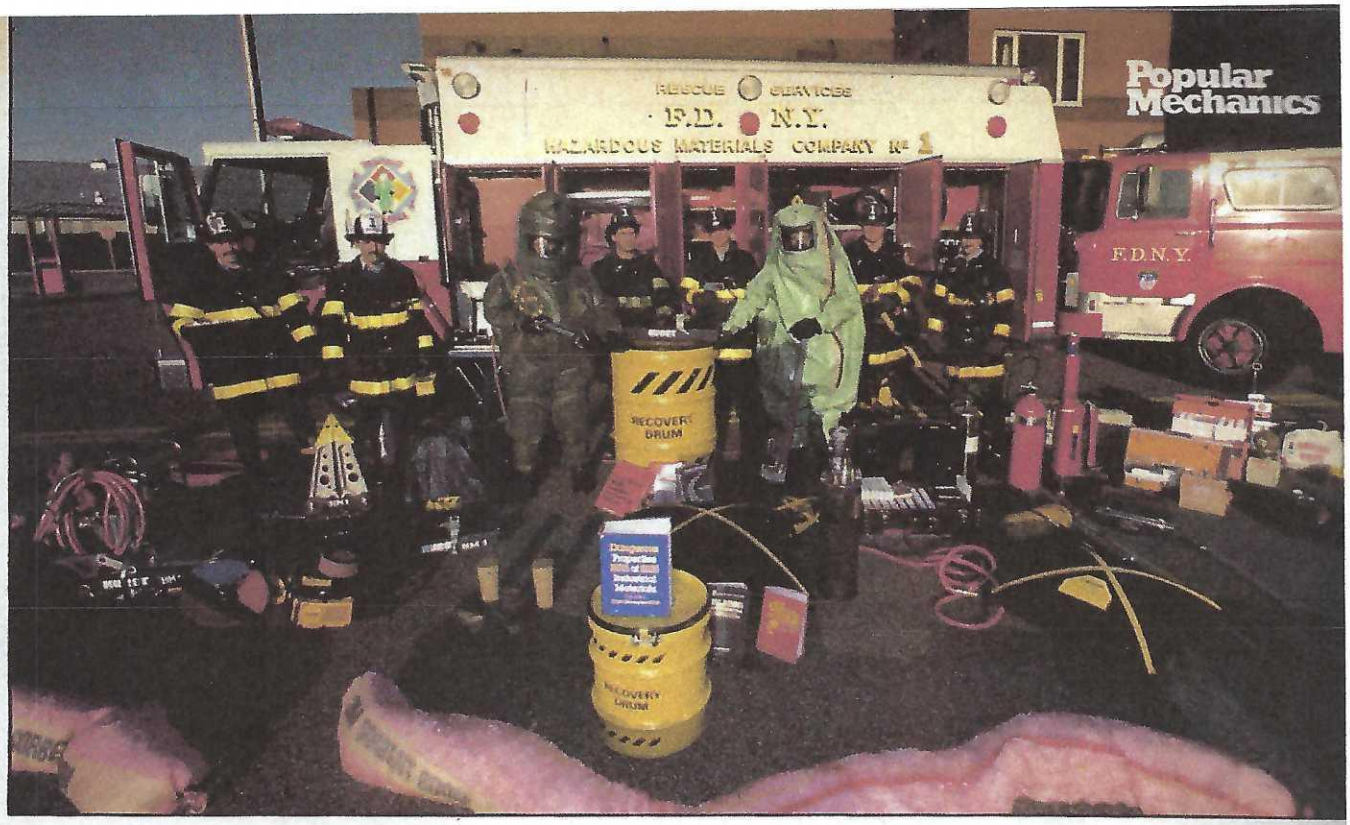


HOT NEW GEAR FOR FIREFIGHTERS

It takes more than courage to fight a fire in the 1980s. It takes a full array of high-tech equipment.

BY DENNIS ESKOW
Science Editor

Photos by Brian Wolff

The lead truck for New York City's Hazardous Materials team (right) carries a specialized crew and a wide range of suits, equipment and books (above).

An acrid cloud of smoke wafts down the hospital corridor as squads of nurses and orderlies wheel patients to an emergency elevator. There is little panic, but the tension is even thicker than the building smoke. A shorted electrical wire has started a fire in the hospital's X-ray clinic.

Already firemen are climbing the stairs, connecting hoses to standpipes or bringing along hand-held chemical fire extinguishers. Everything about the fire is well within the firefighters' control, but as they enter the fire scene, a doctor calls out: "That's radioactive! Hazmat's on the way up."

Hazmat is the buzz word of firefighting in the 1980s. It stands for Hazardous Materials. In New York, where the hospital fire was put out within 20 minutes—and in Los Angeles, London and Tokyo—Hazmat squads have become the SWAT team of fire.

"The hospital fire was an all-hands alarm—three engine companies and two ladder companies responded—and they had the situation fully under control," New York Fire Lt. John Calderone recalls. "But it takes special training to handle radioactive material. So they called us in, too."

The New York Hazmat team was created out of the chaos that plagues all traditional fire departments. It happened on a muggy August day in 1980. "A propane truck was crossing the George Washington Bridge from New Jersey at about 10 a.m.," says Calderone. "Rush hour was over, so when the truck sprung a leak, there wasn't much of a panic." But within an hour, the busiest bridge in the United States had

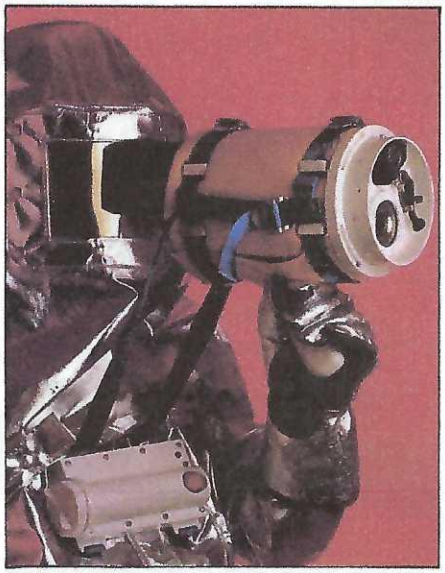
to be shut down. Port Authority police and fire officials, who patrol the bridge, contacted a plumbing supply house and a truck was dispatched. The hole was stopped up with a makeshift tank plug. But now authorities had to contend with liquid propane that had spilled all over the road.

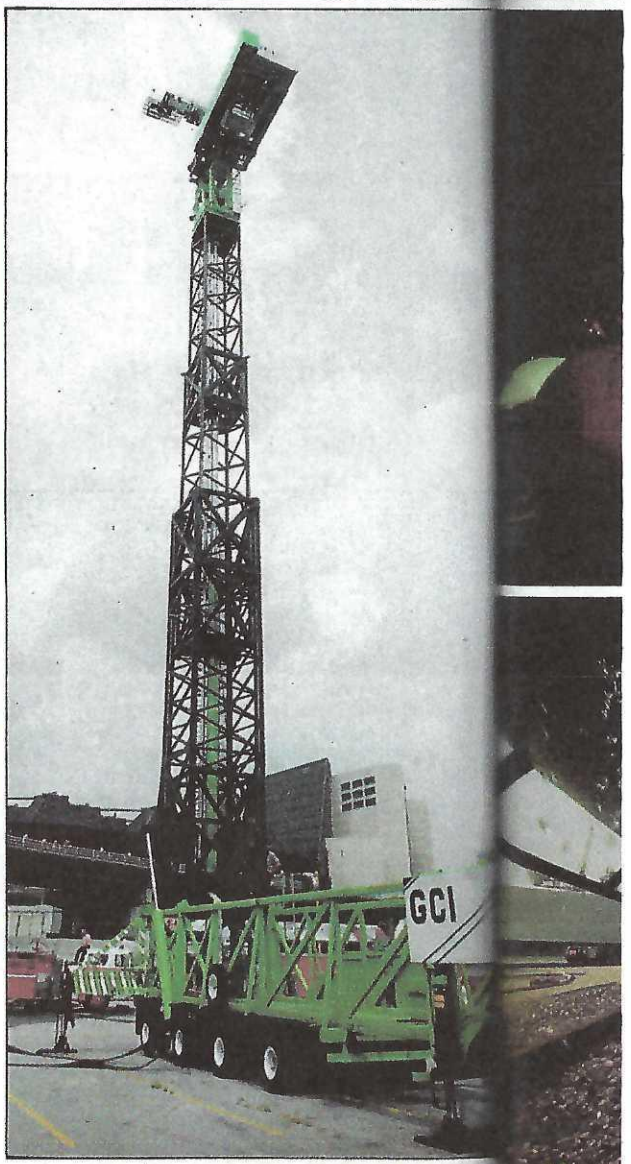
"No one knew exactly how to clean it up, or exactly who to call," Calderone notes. "The New York Fire Department was called in and so were a couple of other agencies. It took all the experts until after 6 that night to clean up the propane. The cleanup went smoothly, but there was a traffic jam on the New Jersey Turnpike all the way to Philadelphia. We're trying to get it into the *Guinness Book of Records* as the world's longest traffic jam."

By September 1980, the New York Hazmat team was formed on paper. And four years later, after extensive research and training, the first Hazmat team went on duty. It took four years to put all the pieces together because of the complexity of working with hazardous material. The equipment is specialized and the knowledge required to do the job right is extensive. Even today, when the Hazmat team responds to a call, it moves slowly—just the opposite of traditional fire companies. There are too many chances for mistakes.

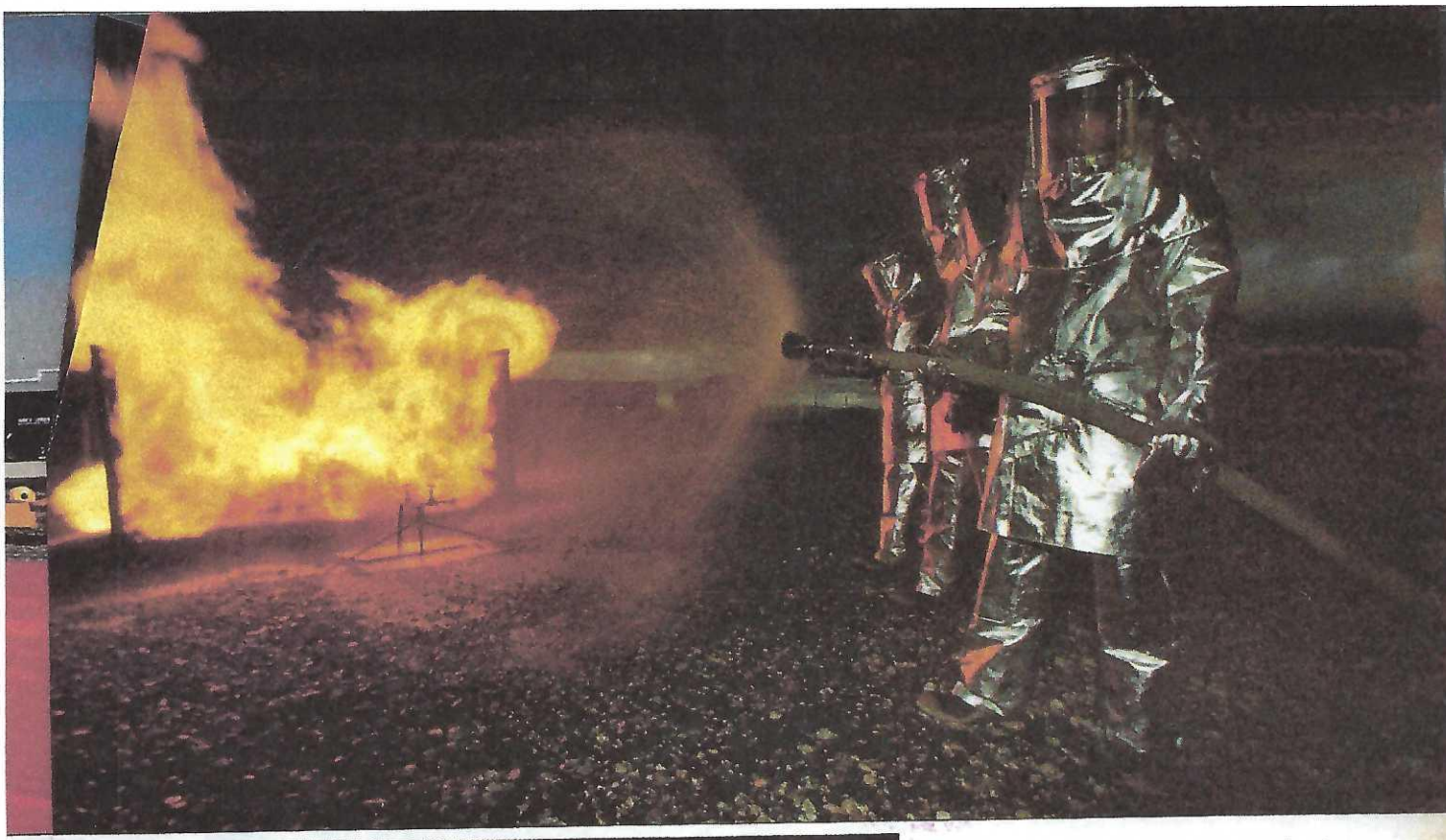
The classic mistake was made in England in 1982. A suburban fire department was called to a blaze at a laboratory outside London. The firefighters had the flames out in 45 minutes and damage to the building was slight. Two firemen were overcome by smoke and were rushed to a hospital.

When the stricken firemen arrived at





Los Angeles Hazmat team (top of page) turns out in full gear. A Long Island firefighter looks through smoke with a thermal imaging camera (top center). At a chemical fire scene, a firefighter is washed down. Water carries contaminants to a tiny inflatable pool. The 140-foot tower ladder (right) is for skyscraper fires.



the hospital, emergency room physicians questioned them about the nature of the fire. They had worked in a classified area loaded with highly radioactive chemicals. When doctors took Geiger counter readings of the two firemen, they promptly shut down the emergency room and cordoned off the roadways leading from the fire scene to the hospital. Over the next 24 hours, a British Army team scrubbed down the emergency room and hospital corridors and dropped a gritty tar-like substance along the roadways to mop up any residual radioactive material. The suits worn by the firemen were burned and the two men remained hospitalized under observation for two days before being released.

Scenarios like that have prompted New York and Los Angeles to arm their Hazmat team with a rolling library of chemistry books, an amazing array of firefighting suits and a range of tools and equipment that staggers the imagination. The New York unit carries a computer on its lead truck, and the Los Angeles squad has one on order.

"The toughest assignment we face is identifying chemicals when we get to a scene," says Capt. Mike Conti of the Los Angeles Fire Department's Hazmat unit. "We carry a number of analyzers that help us figure out what chemical is involved. So many times, it's a mystery

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Firefighters (top of page) try new positive pressure suits at Los Angeles Fire Academy. The L.A. scuba diving team (center) uses a Styrofoam floating dock connected to a fireboat to battle a wharf blaze. And an L.A. Hazmat team member shuts a leaking valve on a tanker car using a new Hurst spreader tool.

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either because a spill has happened and the truck that caused it has left the scene, or because the labs involved just don't know what leaked."

Tofu factory fumes

On a recent call at a tofu factory in Los Angeles, the Hazmat team responded to a report of noxious fumes. A restaurant next to the plant that manufactures Japanese delicacies had complaints from patrons and workers about a strong chemical smell and burning sensation to their skin and eyes. Hazmat traced the odor to the tofu factory, but the owner had no idea what could have caused it.

"We took a sample of the factory's air in our Hazcat kit," Conti explains. "It's a series of tubes that lead to an electronic analyzer. It doesn't tell you exactly which chemical is involved, but it puts the chemicals in the air into categories like solvent or peroxide or some other general heading."

Once the general substance is determined, the Hazmat team hits the books, checking for all the common denominators that will identify the chemical involved. Then the air is swept again with another analyzer that identifies the chemical precisely.

"In this case, it turned out to be a Chinese herb the factory was cooking," Conti notes. "It had a high sulfur content." The tofu factory was shut down and the owner changed the ventilating system to prevent further problems.

Chemical fires and spills are only half the battle for today's firefighters. The other half is fire in any building constructed within the last 20 years. Plastic building and finishing materials, which pose no threat under ordinary circumstances, become extremely dangerous under fire. Put 700° flames into a modern office and the PVC conduit behind the walls begins to vaporize and give off a hydrogen chloride gas. When inhaled, the gas turns to hydrochloric acid. It can burn—or even destroy—lung tissue. Other glasses and plastics are highly carcinogenic at high temperatures. Exposure to them even for an hour may cause tumors to form in humans.

"Fires are getting hotter and there are more chemicals involved than ever before," says Jim Gauerke, vice president of Fyrepel Products of Newark, Ohio. His company is one of the main suppliers of high-tech suits that make firefighters look like men from outer space. There are about 20 different firefighting suits on the market today to handle specific fire situations.

Most of them break down into two classes: proximity uniforms and approach suits. On the cover of this issue,

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the firefighter in the middle is wearing an aluminized glass proximity suit that allows him to just about walk through flames. The men on either side of him are wearing approach suits, designed to let a firefighter stand for long periods in front of a blaze putting out 2,000° of radiant heat.

Radiant heat is like the energy produced by the Sun. If you can get out of its path, it won't affect you. The proximity suit in the middle is also designed to take 500° ambient heat. That's the heat carried in the air, the kind you can't duck away from. A good proximity suit also lets a firefighter touch extremely hot objects without getting scalded.

The silver on the suit, really an aluminized glass fiber, reflects 90 percent of radiant heat. And the gold/mylar visor reflects 100 percent of the radiant heat.

That takes care of the outside of the suit. The insides vary with the duty involved. Many high-tech firefighting suits are positive pressure. They use an air bottle to create slightly more pressure inside the suit than the outside air. This is the first step toward keeping hazardous chemicals away from a firefighter's body.

All Hazmat units, and some traditional firefighting batallions, are arming their people with three different suits, each made of a specialized material and each worn by itself or under an approach or proximity suit, with very different uses. Viton suits are highly resistant to a class of chemicals called PCBs. But they have no resistance to acetone and several other chemicals. Butyl suits, while they provide no protection against PCBs, do block out acetone and a range of substances irritating to the skin and lungs. Polyvinylchloride (PVC) suits protect the firefighter from a range of chemicals the other two types can't handle, but they can't be used in extremely high ambient heat.

Lifesaving tools

The special hazards of current-day fires have also brought special tools. One of the most important is the Hurst Model 32 Spreader. The giant spreader, also called the Jaws of Life, can exert up to 32,000 pounds of force to pry open stuck industrial doors or act as a huge monkey wrench capable of opening or closing stuck valves. Stuck valves led to explosions and deaths at a dozen oil refinery and chemical plant fires in the decade before the new tools.

While Hazmat is the newest way to fight specialized fires, several other techniques are rapidly changing the profession. The Los Angeles Fire Department is leading the way in the area of waterfront fires.

"We have 28 miles of waterfront," says Donald Manning, chief engineer with the L.A. Fire Department. "About 40 percent of the Los Angeles harbor is creosoted wood wharfing. Once those wharfs get going, it's almost impossible to stop."

Los Angeles firefighters hit the waterfront three ways to bring most dock fires under control within three hours. A fireboat hits the dock from the water, standard units hit it from the street and a special scuba diving unit attacks the blaze from under the dock.

The L.A. divers use a special hose dock. The dock is floated under a burning wharf and shoots a stream of water upward to put out flames at the heart of a fire fed by creosote. The dock, which was designed by members of the L.A. Fire Department, is made of very dense Styrofoam covered with glass cloth and resins.

"It combines the strongest part of the fireboat with the strongest ability of the divers," explains Chief Gene Schmitz, whose jurisdiction includes the harbor. The fireboat, he explains, can pump harbor water at a fast enough rate to put out any blaze. But it can't get in close enough to a smoke-enshrouded wharf fire.

The divers hook up a hose to the fireboat's output nozzle and run the line to the bottom of the Styrofoam dock. They connect it to a pipe that runs to the water surface and an upward-pointing nozzle that fires a stream of water straight up. A team of divers pulls the dock along the water from the fireboat to under the burning wharf, then water is streamed upward. This cuts down on smoke and breaks up the blaze.

Camera cuts through smoke

Fires near water—on ships, oil platforms and waterfronts—are usually covered with very dense smoke. A British firm, English Electrical Valve (EEV), has come to the rescue with its new Thermal Imaging Camera.

The original camera, introduced in America in 1983, weighed just under 9 pounds. Its infrared sensors allow firemen to look through a viewfinder and see the source of the flames through smoke. If anyone is trapped in the fire, the rescuers can also see through the smoke to find him quickly. The camera leads firefighters to the source of a blaze to help them put it out faster.

The newest model EEV camera, introduced in America early this year, weighs under 5 pounds and has a handle for easier use. It also can be connected to a video cassette recorder so the blaze can be filmed in progress. That gives fire marshals a firsthand glimpse of the inside of the blaze in progress, something that is expected to lead to better arson investigations.

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About 90 percent of all the firefighters in America are volunteers. Can they stay abreast of the burgeoning technologies? "Yes. In fact, I think we're on the leading edge," says Chief Robert Lincoln of the Nassau County Fire Service Academy, where firefighters from suburban New York, Connecticut and New Jersey are trained.

Late last year, Lincoln's staff and members of the Alert Engine Co. No. 2 of Rockville Center, N.Y., tried on the latest proximity and approach suits just coming on the market. Lincoln says volunteers are eager to pick up new pieces of equipment and new firefighting techniques.

His words are echoed by L.A.'s Chief Schmitz. All 24 divers, and most other firefighters on his force, are also volunteers in their own communities. "Firefighting," he notes, "is a life work. We take home our work."

Future firefighting

The future of firefighting technology is practically at hand already. The major area still just barely explored is the skyscraper fire. Several pieces of equipment are just coming into use in an effort to revolutionize that firefighting arena. Three West German cities have installed a new "towering inferno" exit system on new office buildings. The system, made by the Wahlefeld Co., uses the motors and cables of automatic window-washing equipment to run a 2,200-pound rescue gondola from the roof to the ground in an office building fire (see *Safe Exit From A Towering Inferno,* page 156, Apr. '84). Several companies are working on super ladders to reach upper stories.

GCI Inc. of Canada, which makes industrial cranes, recently introduced a 140-foot tower ladder that carries a firefighting and rescue platform at the top. A pump relay system lets firefighters carry a hose to the top of the tower and shoot water at 1,000 gallons per minute. The ladder packs down to 65 feet for trips to and from its station. It is effective in open areas like office parks. A more compact version is in the planning stages.

Several chemical companies are working on fire retardents that can be sprayed on hot plastic to keep toxic fumes from spreading outward. And the software for Hazmat computers is constantly being upgraded.

"I couldn't say this 20 years ago," L.A.'s Schmitz notes, "but today, we're very confident that we can stop any fire that starts in this harbor before it can spread." Confidence. Along with Hazmat, you can put that word in the new firefighter's dictionary. PM

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