needed, this person would notify the appropriate resources to obtain that equipment.

- Probably the greatest tool of all was the rescue workers' ingenuity. In the early stages of the incident, I saw many circumstances in which rescue workers adapted standard tools to complete tasks for which the tools were not originally designed. This expedited the rescues of dozens of people in the early stages of the incident.
- Another great asset was the demolition companies. Their experience and equipment proved invaluable.
- Last but not least was the ability to locate specialized equipment. Every rescue team should compile a call list of every conceivable company and technical support person in its area to assist in disasters that may strike within that area.

OCFD Logistics

The logistics operation in the response to the April 19 bombing in Oklahoma City was extremely complicated and fragmented. While successful in that almost all equipment needs were met during the sixteen-day emergency operation, there were a number of lessons learned through trial and error that could have produced more efficiency.

The biggest asset of the logistics section was the enthusiasm of the individuals who worked in that area. A large number of individuals were working in the logistics section at various times. These included firefighting units from Oklahoma City and the surrounding area, as well as firefighters from as far away as Oregon. Civilian volunteers from the local companies and agencies such as the Red Cross also took part. The diverse backgrounds of the people working logistics and their lack of logistics experience made their task difficult but not impossible. Almost without exception, those assigned to logistics worked extremely hard and very innovatively in an unglamorous but critical part of the emergency scene.

Getting the necessary equipment for the rescue operation was not the problem; rescue personnel, after the operation, confirmed that when they asked for equipment, it was almost always provided. However, tracking the equipment already there and prioritizing orders for more were difficult.

The amount of equipment flowing into the logistics section in the first few days of the operation was phenomenal. Truckload after truckload of tools, first-aid supplies, and soft goods were delivered, the bulk of it donated (no invoice, no charge) from businesses and individuals. The news media would announce that gloves were needed, and instantly great quantities of gloves would arrive. While the donations were greatly appreciated, a large number of unneeded supplies arrived at the site.

Logistics fragmentation was the biggest obstacle during the operation. The Oklahoma City Fire Department (OCFD), as the lead agency, had a logistics center in operation. Most of the goods, purchased and donated, were delivered there, especially in the early days of the operation. However, a number of other entities also had logistics centers, including the Red Cross, Feed the Children, the Salvation Army, the Federal Emergency Management Agency, U.S. Postal Service volunteers, and the Multi-Agency Coordination Center (MACC).

This fragmentation created enormous problems, many of which were never resolved. Inventory control became impossible because, when requests for equipment came in, it could not be verified whether the equipment was already on the scene or at another location. Equipment was arriving in such enormous quantities and with such speed that none of the logistics areas could verify what they had at any one time. The OCFD logistics center supplied not only its own rescue workers but also the volunteers from other departments; the initial USAR teams on the scene; as well as other agencies involved in the incident, such as the FBI and the ATF. The lack of just a single logistics operation was a major glitch.

There was a secured perimeter area around the bombed Murrah Building. The scene was a rescue operation and also a crime scene, and the law enforcement agencies treated it as such. The perimeter stretched for several blocks, and the OCFD Command Post and logistics center were located within the secured perimeter. In hindsight, the logistics center would probably have worked more efficiently if it had been located just outside the secured area. This would have allowed goods to be moved quickly, without law enforcement obstruction, to the central logistics area, inventoried, and then distributed at the emergency scene in an orderly manner — probably through only one entry point. Locating logistics outside the secured perimeter also would have allowed many of the donated goods, intended for emergency workers but delivered instead to other agencies, to arrive where rescue workers could have used them.

Documentation was another major failing. Inventory tracking was primitive at best, done manually by personnel unfamiliar with inventory-control problems. The fact that some of the goods were purchased, some donated, and some loaned added to the confusion. Even after improvising some kind of workable system at the OCFD logistics area, none of the other entities receiving goods could ever give an accurate inventory list. A laptop computer, complete with an inventory-control program and staffed 24 hours a day by an experienced operator, would have helped immensely in accurately tracking the equipment received and distributed.

Logistics staffing consisted of a supervisor with at least one assistant and various personnel maintaining inventory lists, unloading trucks, stacking goods, moving items to various places on the scene with small vehicles, and ordering equipment by telephone. The OCFD maintenance shop kept people at logistics and at the maintenance facility 24 hours a day. Although vendors that could supply many of the needs were available, many items ordered were so specialized that vendors had to be found on the spot. The staffing remained on shift work, rotating every 12 hours after the first day. Because the OCFD had three separate shifts, six different supervisors were working the incident. Frankly, there were too many fingers in the pie. Each person was doing his best to perform the best job possible, but it was impossible to maintain a uniform system with so many different people and personalities involved. Logistics would have operated much better if no more than three people were involved and if they had been taken off shift work and worked eight-hour increments for the duration of the incident. Other key personnel on eight-hour shifts and logistics should have done the same thing. With only a few key players, a uniform operation should have been the goal.

The overall logistics staffing was not a high enough priority early in the incident. The fire service is not used to long-term incidents. Virtually all the incidents in which we are involved can be stabilized the same day. Sixteen-day incidents with massive equipment needs are not the norm. Setting up logistics early and adequately with sufficient personnel is crucial for bringing a long-term incident to a successful conclusion.

The equipment ordered from the OCFD logistics area was varied, to say the least. Heavy equipment such as cranes, heavy trucks to move debris and trash, Bobcats, front-end loaders, forklifts, and fuel trucks to supply the fire service and other agencies all had to be brought to the scene. Other equipment needs included cribbing and shoring supplies, fencing for perimeter control, lighting, generators, extrication equipment, hydraulic rebar cutters, air hammers, boots, fatigues, filter masks, gloves, hard hats, eye protection, rain gear, large quantities of first-aid supplies, and restroom facilities. An example of the thousands of small items needed included boots and food for the USAR teams' rescue dogs.

Lessons Learned and Reinforced

A number of lessons for running an efficient logistics operation at a large scene were learned and reinforced; among the most important are the following:

- Constantly gather information. Get copies of any resource status and situation status reports from the scene. Logistics must be aware of the situations elsewhere and not operate in a vacuum. Along these same lines, the overall situation should be continually passed along from command to the various divisions on the scene. For example, on this particular scene, it was imperative to let everyone know when the situation changed from a rescue operation to a body recovery. That type of change has an impact on everything, from safety concerns to equipment orders.
- Set up communications quickly. Set up telephone hard lines immediately. We did this early in the operation, and it helped the operation immensely. Do not rely on the radio system.
- Limit supervisory staffing. Keep as few people as possible supervising the major areas such as logistics. Set up one uniform system as early in the incident as possible. Staff with adequate numbers of personnel to perform the multitude of logistics tasks required at a major scene (minimum of 12 in the Oklahoma City incident).
- Have inventory control ready. Set up an adequate inventory system before the incident occurs — not during the incident. Use a computer with an inventory program, if possible, and trained personnel. The record keeping should be simple and designed for speed. Have the goods delivered to logistics separated and stored in three major categories: tools and equipment, first-aid supplies, and soft goods. Color code if possible. Above all, set up a sys-

tem immediately and stick to it. Stay organized, and make every effort to track inventory and invoices. Lease equipment instead of purchasing it when possible.

- Centralize logistics. Have only one logistics center with a representative from the various agencies involved. This will help prioritize needs, keep agencies from ordering duplicate supplies, and facilitate coordination among the many agencies involved in a response of this magnitude. Locate the center at a central point just outside the secured perimeter and then have logistics move the equipment and supplies through one entry point into the perimeter to the end user.
- Determine length of incident. Recognize how vital the logistics function is in a long-term operation. As soon as it is realized that the scene will require more time and equipment than normal to stabilize, set up a logistics area and adequately staff it.

Many things could have been improved logistically in the Oklahoma City Bombing. Hopefully, you can take these ideas and incorporate them into your department's procedures for major incidents.

Many things also went right logistically during the incident. It was one of the largest operations in the history of the United States; and when equipment and supplies were needed, they arrived — usually in an extraordinarily short period of time.

Working with the Media

Working with the media in a large-scale disaster can be a real challenge. The local news media were on the scene of the bombing almost as soon as some of the rescuers. The Oklahoma City Police Department and Oklahoma Highway Patrol were first to establish the media area. The Oklahoma City Fire Department was involved in command control, setting up the Incident Command System, and rescue operations.

The City of Oklahoma City has worked long and hard to develop a professional working relationship with local media, which paid off during the bombing disaster. The working relationship was such that the print and electronic media were very helpful in assisting us to locate and obtain goods and services and informing people to stay out of the downtown area and off the phones. The key to such professionalism is establishing a good working relationship prior to an incident. The good working relationship with the local media caused a sort of ripple effect when affiliates from across the country and the national news media arrived.

The Oklahoma City Police Department set up a media command area when the incident began. About an hour and half later (after rescue operations were underway), Chief Jon Hansen, serving as the Fire Department's Public Information Officer, took over the media command function. Six or seven people worked as media liaisons. Fire Chief Gary Marrs, the police chief, and senior agents from the Federal Bureau of Investigation and the Bureau of Alcohol, Tobacco, and Firearms briefed the national news media at formal news conferences. Chief Hansen handled the on-scene information from what was called the "Satellite City." Some veteran journalists commented that they had never before seen so many news representatives in one location, either at other catastrophes or at sporting events such as the Super Bowl or the Olympics. One journalist said there had not been media attention like this in this country since President Kennedy was assassinated in 1963.

Briefings

Organizing the media was a challenge. Chief Hansen stood on CNN's platform and called the media together to determine what time they wanted to be briefed. The media took part in those decisions. The formal briefing times were set when a representative would be available. Everybody knew the times, being in a business driven by deadlines. Media from all over the world was present, which meant different people had different deadlines. They were briefed as often as possible. Situational briefings — for example, when a body was recovered or when recovery efforts slowed due to structural challenges, were also held. Representatives would always come to brief the news media.

The requests for interviews were unbelievable. Interviews started at 5:00 a.m. and ended at midnight or 1:00 a.m. the next morning. Interviews with national morning shows, local morning shows, updates throughout the day, local and national evening and late news, shows such as "Nightline," and other special shows. Chief Marrs and Chief Hansen tried to do most of the interviews. The command staff interviewed with these shows to lend credibility — people could hear the news from the source. This seemed to work well rather than having somebody represent the fire department, who would have had to check with two or three people prior to giving information.

Chief Hansen gave the majority of the updates after returning from the building and thus could tell the media exactly what was going on in the building and answer their questions, cutting down on hearsay and rumor. Five other people worked with the media twenty-four hours a day. Chief Hansen left anywhere from midnight to 2:00 a.m., at which time one of the company officers went to the media area to occasionally give an update, as would a police spokesperson. The media had access to emergency service workers twenty-four hours a day.

The Building

Were there problems with the news media? Occasionally, rumors would surface, but were quickly squelched. A couple of tabloid reporters tried to sneak into the building. Nevertheless, by and large it went very well. Much professionalism was shown.

The myth that public officials and media cannot work together in time of disaster was dispelled. Much of the credit must be given to the news media. They were very helpful. They also were very patient: Unlike other disasters, where media representatives can walk around and take pictures, this was the largest terrorism crime scene ever worked in our nation's history. Oklahoma City was dealing not only with a massive rescue and recovery effort but with a massive criminal investigation.

Eventually camera crews were taken into the building. Pools of national and local representatives were set up. The different media agencies choose who would be on the pool lists. Oklahoma City did not make that decision. One photojournalist, one journalist, a radio reporter, a print journalist and a still photographer were selected. That group would be taken in and the members would share their videotape, photos, and other materials with the rest of the media. The same thing was done with the local representatives. The local media were the priority throughout the incident — they would be around long after the incident was over.

When the national media came to cover the incident, they were not pushy. They did not ask for special treatment over anyone else. The news media formed a pretty strong bond with Oklahoma City and we formed a strong bond with them throughout the 16-day operation.

Lessons Learned

What lessons were learned? If a disaster like this happens in your community, be accessible to the media. Have someone available from the command staff 24 hours a day to brief the media, to be a resource person, and to get people what they need. If out-of-town rescue personnel are present, make them available to the out-of-town media. Oklahoma City tried to ensure that individual urban search and rescue team members from around the country had the opportunity to visit with their local media. This added a more personal touch.

Again, the key is to develop working relationships prior to an incident. The local media have supplied Oklahoma City with volumes of videotapes, photos, and documents, as have affiliates around the country. This helps tremendously with critiquing, further training and planning. Such cooperation comes from a trust that has developed over a long period of time.

Public safety officials and the news media can work together. They did in Oklahoma City. They worked very well together. They were able to let Americans across the country know what was going on in the building and what challenges we faced. The way to do this is through the news media.

Treating the Mind: CISD

The Oklahoma City Fire Department Critical Incident Stress Debriefing Team, in cooperation with the State Critical Incident Stress Management Team, set up and performed prebriefings, demobilizations, and defusings from April 19 through May 5, 1995. Both teams worked as one CISM system throughout the incident.

Because of the involvement of OCFD personnel in the rescue effort, a majority of the CISD team members could not be used because they had become an integral part of the incident. During the first eight hours of the rescue operations, some of the CISD team performed one-on-one crisis intervention (assessments) on the scene. After these team members moved from area to area, a permanent site was established later the first day in the Southwestern Bell Building. We used the second and third floors. Defusings took place on the second floor. An office was set up on the third floor to verify credentials of incoming CISD teams from across the country and to communicate with the incident commander and other organizations on site.

Defusings

Dr. Tom Jones, our volunteer on-board psychologist, developed a "point system" for those team members involved in the initial rescue operations. After visiting with him, if the team member scored more than five points, he recommended that the member not participate in any defusings.

OCFD personnel were broken up into teams of three members working 12-hour shifts, with teams throughout the state and country working with us. Any OCFD rescue personnel coming through would have at least one OCFD team member in the defusing, if possible. This was done to give our firefighters a familiar face and to help us recognize, if possible, any problems our personnel were having. All personnel were being seen (defused) regardless of with which organization they were involved.

Our objectives for defusings during the incident were the following:

- to reduce or eliminate as much as possible the effects of the incident on all personnel involved;
- to inform and educate rescuers on critical incident stress and its effects as well as ways to deal with it;
- to reduce cognitive, emotional, and physiological symptoms;
- to accelerate the "recovery process"; and
- to assess the need for postincident debriefings and other services.

Within hours of setting up in the Southwestern Bell Building, we were doing defusings on rescue companies leaving the scene. The first night these were performed by a few OCFD team members and other CISM volunteers from around the state. Defusings took 20 to 30 minutes per group on average. Operational changes for us began to take place on a daily basis for the next several days. Feedback given to use by rescue personnel was taken to Command with the permission of the personnel and while maintaining confidentiality. This was done in an attempt to reduce stress levels by adjusting hours worked and changing work conditions as much as possible.

After all shifts had been defused twice, the defusings were decreased, and we did more of a demobilization to cut down on repetition. The firefighters were getting frustrated with going through this process over and over. We began to see two types of groups coming through the defusing process: rock movers and body recoverers. For rock movers, we began to do just follow-ups, making sure they were doing okay and advising them to eat, rest, and call home to let their families know how they were doing. It was a refresher on stress reactions and what to look for as well. The personnel involved in body recoveries went through the same defusings as previously done, to monitor their condition and any stress reaction evident. It served as a reinforcement for them.

Defusings were done on all personnel who came to the CISD floor — military, mutual-aid fire companies, federal and local law enforcement agencies, and volunteers from all walks of life (welders, electricians, construction workers, and so on).

The stress management was given to all agencies that requested it if personnel were on hand to comply. In some cases, we traveled to sites where help was needed. Sometimes we could not help because of lack of personnel. CISM personnel from the FEMA USAR Task Forces assisted as well. Also available to all personnel going through our area were massage therapists, chiropractors, changes of clothes, and free phone service for calling home.

Prebriefings

Prebriefings originally were set up to deal with safety issues and to make rescuers aware of equipment available to them (such as gloves, masks, shoes, knee pads, etc.). At prebriefings we also told personnel of conditions on-site for that day, any changes, and what to expect on and near the site.

As the firefighters checked in to the Command Post, the command center would notify the CISD floor that a prebriefing was needed for personnel entering the scene. After several defusings, and with permission from defused personnel, we relayed information to other personnel during prebriefing about the conditions they would be facing at the bomb site (for example, procedures for body recovery and how to deal with the sights and smells they would encounter). On or around Day Four, we used company officers leaving the scene to assist in prebriefing companies entering, to give firsthand accounts of what they would face.

All Received CISD

Our quality-assurance system was set up to ensure that every one of our firefighters came through some sort of CISM after completing their shift at the bomb site. Their ID tags were left at the Command Post when they checked in. To check out and receive their ID tags, they had to present a signed form showing they had been through CISD. Our team workers filled out these forms after defusings.

On May 4, when rescue operations were concluded, all personnel assembled in front of the building. Chief Gary Marrs and Assistant Chief Jon Hansen let them know it was the end of the rescue operation. OCFD Fire Chaplain Teddy Wilson closed with prayer. Then the CISD teams and Dr. Jones gathered the OKC fire personnel for a 20- to 25-minute session. This was a very exhausting and emotional time. It allowed rapid ventilation of the stressful experience, provided information, affirmed the value of personnel, and developed expectations for the future. On May 5, a memorial service was held for rescue personnel and their families. The CISD teams began to plan and develop the postincident formal debriefing process.

Formal debriefings for OCFD were conducted May 6 through 15 in Oklahoma City by the State of Texas CISM Network. Paul Tabor, state coordinator, was assisted by Mike Pitts, clinical coordinator. A total of 16 teams of three were sent, which included 15 mental health professionals and 29 peers (firefighters). Debriefings were mandatory for all personnel on the OCFD, bringing the total number of debriefings to 59, with six makeups for personnel who were off-duty during that time. We currently are in the process of doing follow-ups and assessing our personnel. The Oklahoma State CISM Team used teams from across the country to assist them in postincident formal debriefings for all Oklahoma mutual-aid fire and police departments. They are in the follow-up phase as well.

Since this terrible tragedy, we have tried to emphasize to our firefighters that we are "normal people experiencing normal reactions to an abnormal event." We also are in the process of educating our department even more on stress and how to manage it. The spouses of our personnel are currently establishing a Family Foundation to support the families of our firefighters.

Supporting a Fractured Building

A tremendous amount of shoring was erected throughout the Murrah Building's fragile structure. Much of it was erected during the first days of the operation; however, shores were continually erected or improved throughout. They were used to protect members operating in dangerous areas and to stabilize the building's remaining structural elements. In some areas, debris had to be removed before shores could be erected. (The base on which the shoring is assembled must be able to support the load being shored, or disastrous results can occur.) The majority of the shoring was done in the interior; a few shores were constructed outside of the structure, mainly to support sections of debris during removal operations. Rescue personnel installed the wood shoring; construction contractors erected four- and six- inch pipe shoring, much of which was tied together with angle iron straps for additional rigidity.

Types of Shores Erected

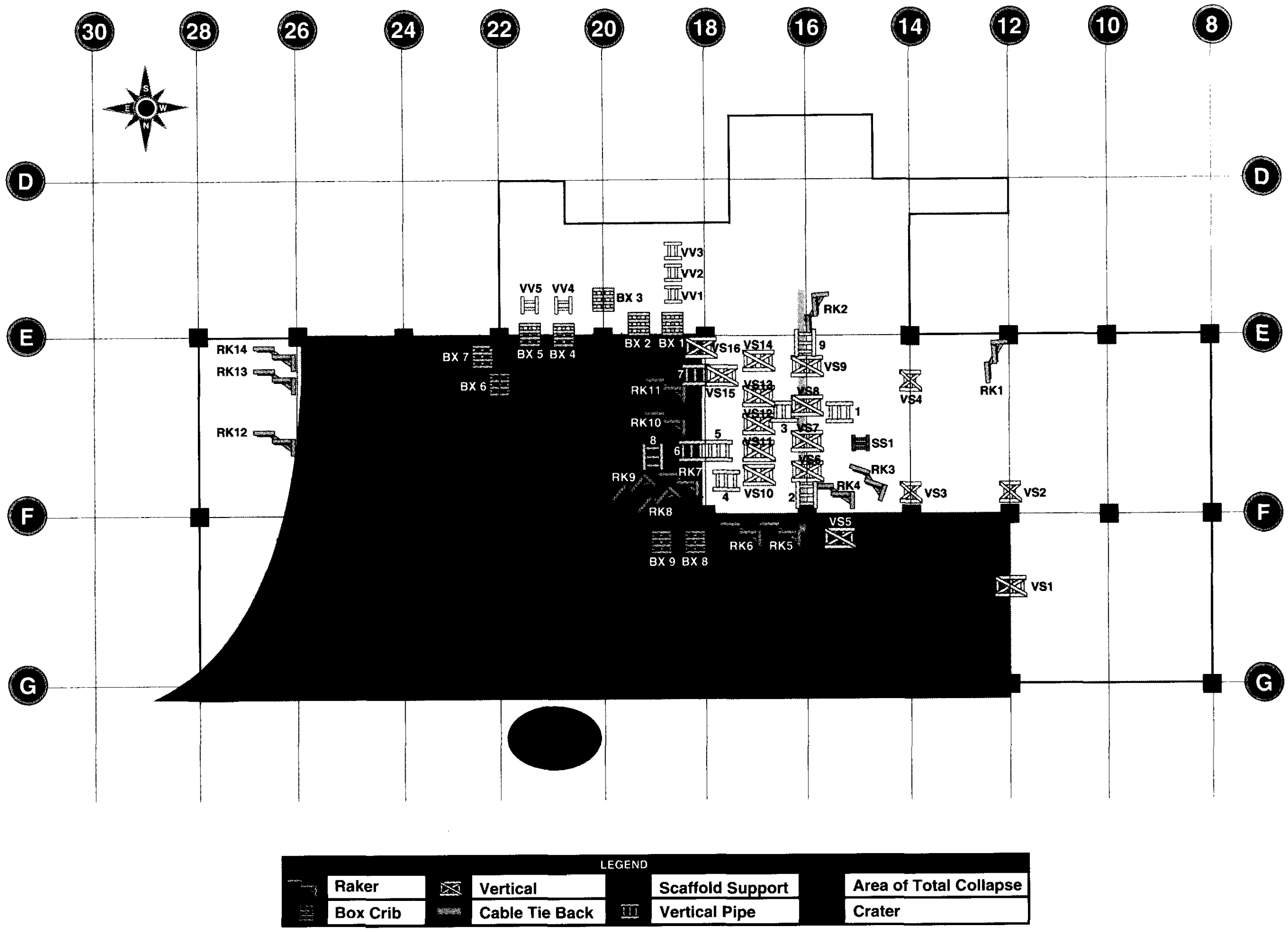
- **Flying raker.** Numerous shores of this type were erected at this operation almost up until the last day of operations. They were used primarily to stabilize sections of concrete, generally pieces of broken floor slabs, while search and rescue operations were conducted in the area. The shores were constructed of one 4 x 4 propped under the concrete slab or anchored to it in a variety of ways. This type of shore was used as an initial safety shore to stabilize the leaning slabs while the areas around the piece were being cleared to the floor, making room to erect more substantial shores if necessary. In many cases, several of the flying rakers were assembled together; this made an excellent and stable shore that enabled workers to operate safely while searching for additional victims. A friction-type of shore, the flying raker is supported solely by the pressure applied to it from the concrete. A short wall plate of two-inch dimensional lumber should be anchored to the slab. Attaching the raker to this plate provides additional stability.

- **Solid-sole raker.** Two solid-sole raker shores were erected on the first floor. They were used to support damaged and leaning sections of interior walls in the corridor used as a main accessway by all personnel. The wall plates, sole plates, and rakes of both shores were constructed of 4 x 4 lumber. The diagonal braces were constructed of 2 x 6 lumber.

- **Vertical shores.** Vertical shores-the most common type used by rescue teams in any collapse situation-were widely used throughout the Murrah Building. Sixteen were erected in various locations on the first floor and two on the second floor. All were constructed of wood; 11 had 6 x 6 headers, sole plates, and posts; the elements of one were constructed of 4 x 6 lumber. The main components of the remaining vertical shores were erected with 4 x 4 lumber. The diagonal cross braces of all shores were of 2 x 6 lumber. The 4 x 4 shores were erected to support structurally unstable and damaged floor slabs. The 6 x 6 shores were used to support the much heavier beams that had been damaged in several places.

- **Laced posts.** This type of shore is actually two vertical shores properly tied together to make an integral shore. It is very strong and extremely stable. Laced posts were erected in several areas where stability was a factor and not enough room was available to erect a series of shores. This type of shore can be constructed with 4 x 4 or 6 x 6 lumber; the latter was more prevalent at this operation. These posts are especially effective when stability is a factor and heavy loads must be supported-two problems experienced in several areas of the Murrah Building. Several of the laced posts were used under damaged floor slabs to prevent further collapse. The posts supported the slab's edge and also counteracted lateral forces against the slab caused by the great amount of debris resting against it. This type of shore was also used under a heavily damaged area of a beam.
- **Vertical void shores.** These shores are basically a smaller version of the vertical shore and usually are a little simpler to erect than the larger vertical shores; they generally serve a similar purpose. Several of these shores were erected at this rescue operation. Their advantages are that they can be erected quickly, are easy to maneuver, and use up quite a bit less lumber than box cribbing. Their wall plates, sole plates, and posts normally are constructed of 4 x 4 lumber; wedges are used to tighten the shore to its proper firmness-just enough to fully support the weight but not enough to move it.
- **Box cribbing.** This is one of the stronger and more stable types of shores. The more material used for each tier, the stronger the crib. The height of the crib usually can be three times its width. Generally "4-by" multitier cribs were erected in this incident. They were consistently used to support sections of broken, cracked, or heavily damaged columns and beams. These cribs are extremely stable and can support extensive amounts of weight safely.
- **Pipe shores.** Several of the first-responding task forces had installed some initial shoring using mechanical pipe shores and 4 x 4s and 4 x 6s. These pipe shores are commonly used in the construction industry, generally for supporting "green" concrete. A local contractor was able to supply several of these supports, erected during the initial stages of the operation. These shores, used strictly as vertical supports, were placed on 4 x 4s. Installing a 4 x 4 or 4 x 6 as a header made them effective full-length "dead" or vertical shores. Their one drawback was that they could not be diagonally braced, which made them less stable than the wooden dead shores.
- **Column bracing.** The majority of this work was conducted over "the Pit" and was designed to stabilize compromised unsupported columns identified by the engineers. Construction contractors erected systems, designed by the structural engineers assigned to the FEMA incident support teams (ISTs), consisting of 4 x 6 pipe shoring tied together with angle iron straps for additional rigidity. The pipes were welded, erected, and bolted into the columns by contractor crews. Several of these column trusses were installed and tied together for additional stability. Truss braces were installed at Columns F20 and F22 at the second- and third-floor levels. Pipe knee braces were installed on the second floor at Columns F14, F16, and F18.
- **Wedges.** Wedges play an extremely important role in any structural collapse operation. They have a variety of uses-all of which make the erection of rescue shoring that much faster and easier for the rescue workers in potentially hazardous situations. When used in conjunction with box cribbing, a wedge can quickly bring a crib into solid contact with an object that is on a different angle than the box crib itself. This will happen quite often when the support base of the cribbing is on the ground or a level floor underneath the object to be supported. Nor-

Figure Ten: Murrah Building Shoring



FIRST FLOOR SHORING: VERTICAL SHORES (VS)			
	LOCATION	SIZE	MATERIAL
1	Col. Line 12, running W-E	12 ft. H x 5 ft. W	Header (H), post (P), sole plate (SP), 6 x 6; braces 2 x 6
2	Col. Line 12, behind F, W-E	12 ft. H x 5 ft. W	Same as 1
3	Col. Line 14, directly behind F, W-E	12 ft. H x 5 ft. W	Same as 1
4	Col. Line 14, center of Col. E and F, W-E	12 ft. H x 5 ft. W	Same as 1
5	Under debris, Col. Line 14, W of Col. F	4 ft. H x 4 ft. W	H, P, SP, 4 x 4
6	Col. Line 16, 6 ft. S of Col F	12 ft. H x 5 ft. W	Same as 1
7	Col. Line 16, 6 ft. S of VS 6	12 ft. H x 5 ft. W	Same as 1
8	Col. Line 16, 6 ft. S of VS 7	12 ft. H x 5 ft. W	Same as 1
9	Col. Line 16, 6 ft. S of VS 8	12 ft. H x 5 ft. W	Same as 1
10	Center of Slab, Col. F between Col. Lines 16-18	12 ft. H x 12 ft. W	H, P, SP, 4 x 4; braces 2 x 6
11	Center of Slab, 6 ft. S of VS 10	12 ft. H x 12 ft. W	Same as 10
12	6 ft. S of VS 11	12 ft. H x 12 ft. W	Same as 10
13	6 ft. S of VS 12	12 ft. H x 12 ft. W	Same as 10
14	6 ft. S of VS 13	12 ft. H x 12 ft. W	Same as 10
15	Under beam lip Col. Line 18, halfway between Cols. E and F, N-S	12 ft. H x 6 ft. W	6 x 6
16	Same as 15	12 ft. H x 8 ft. W	4 x 6

FIRST FLOOR SHORING: VERTICAL VOID SHORES (VV)			
	LOCATION	SIZE	MATERIAL
1	10 ft. N of Col. Line E, halfway between Cols. 18-20	4 ft. H x 4 ft. W	4 x 4
2	4 ft. behind VVS 1	5 ft. H x 6 ft. W	4 x 4
3	4 ft. behind VVS 2	8 ft. H x 9 ft. W	4 x 4
4	5 ft. N of Col. Line E, center of Cols. 20-22	3 ft. H x 3 ft. W	4 x 4
5	5 ft. E of VVS 4	3 ft. H x 3 ft. W	4 x 4

mally, the cribbing should be erected as level as possible for better stability. At some point, the crib must have full contact with the item being supported. If it is on an angle, this can easily be accomplished by using one wedge or a series of wedges.

When erecting vertical or dead shoring, wedges are an important part of the shore's makeup. A set of wedges must be placed under each post, primarily to make sure the shore's contact with the object to be stabilized is sufficient. The shore should be tight enough to take the full weight of the compromised object. The shore should not be used to lift the object in question. Wedges also will compensate for any differences in post lengths. Another advantage of wedges is they allow the shore to be continually adjusted, if necessary. Often, as debris is removed from above, the floor being stabilized starts to return to its original position. Continual adjustment of the wedges will ensure that the shore will continue to function properly.

Lumber Used in the Incident

Dozens of truckloads of lumber and materials were delivered to the scene. Evidence of the need for extensive shoring operations was apparent early in the operation. The call went out to all local lumber and construction suppliers, who promptly responded. Literally hundreds and hundreds of pieces of lumber in several sizes and shapes were brought to the site. Some of the most extensively used lumber sizes were 2 x 4, 2 x 6, 4 x 4, 4 x 6, 6 x 6, and ¾-inch-thick plywood.

USAR Task Force Logistics

Prior to the Oklahoma City incident, logistics as it relates to the response of Urban Search and Rescue (USAR) Task Forces had received a great deal of attention specific to each individual task force. Task force logisticians had spent a great deal of time on load planning and equipment packaging for air transportation and hazardous-materials certification for military transport.

Until last year, the Department of Defense (DOD) was responsible for resupplying USAR task forces after the first 72 hours of deployment. Last year, the task force resupply and maintenance system became a FEMA responsibility. Prior to April 19, little had been done to develop an appropriate resupply system at the task force level.

Task force equipment caches, personnel needs, food, water, fuel, and shelter were designed to provide all of the components necessary to sustain the task forces for the first 72 hours. This design ensured that a task force entering a devastated community would not place a burden on the already taxed local infrastructure. In addition, it ensured that a task force would be able to operate from the moment it hit the ground.

Arrival

We arrived in Oklahoma City at approximately 11 p.m. on April 19 and proceeded to a GSA facility to pick up several vehicles. It's interesting to note that immediately after the disaster occurred, every available rental car was committed to resources, responders, and media coming into the city, making it impossible for us to rent any vehicles locally.

We arrived at the site at approximately 12:30 and connected with local fire/rescue personnel. After we had been briefed by Oklahoma City Fire Department (OCFD) personnel, the five members of the IST sat down in the loading dock area of the Murrah Building and established our immediate objectives. We already had realized that we lacked adequate resources to properly assist Oklahoma City with the incident both from IST and task force perspectives.

Certainly, leaving home several hours after the blast occurred, we had little understanding of the magnitude of the event. As an example, I fully expected to be home within several days at the most, as evidenced by my packing three pairs of underwear and a greatly reduced "go" bag. Whoops! Lesson learned!

That first night, as we assigned responsibilities, I agreed to take on logistics. My background is as a task force leader and not as a logistician, although I had a good understanding of task force requirements and, as a rescue person, had acquired over the years a knowledge of the tools of the trade and the vendors. That first night, I wasn't really sure how the system was going to work since I didn't have any guidance on how to actually make a purchase-How soon can we get the item? Where does the money come from? Can we buy from any vendor? How do we document what we're doing?

As the first night became the second day, additional personnel began to arrive to support the IST operations. An additional logistician arrived from San Diego, and together we quickly discussed our priorities as we envisioned them and established a plan.

Realizing that we were limited in what we could accomplish with two personnel, our number-one priority was to stay ahead of the task force needs and to anticipate what those needs would be in the environment in which we were working. The fact that logistics was responsible for all transportation, communications, personnel housing and feeding, as well as resupply put us in a position that necessitated our acknowledging that we would not immediately meet all the objectives in each of these areas.

Setting Up

To stay ahead of the task force, we needed immediate contact with the normal USAR vendors as well as a number of vendors specific to this event. It was also immediately apparent that the vendors could not report to the "hot" zone, so we would need to establish an area outside the hot zone with adequate space to allow storage of supplies, maintenance areas, and close proximity to the responding task force.

As we considered these issues, we were notified that additional task forces were en route and that the Myriad Convention Center had been secured to provide housing for the incoming task forces. The convention center became the base of operations (BOO) for the task forces, except for the two initially deployed task forces, based in the Southwestern Bell Building, a block from the Murrah Building.

We established that there would be plenty of room to secure a logistics area within the Myriad and that vendors would be able to receive deliveries because the area was not fully restricted. We notified vendors that we required their 24-hour-a-day presence and knowledgeable personnel and supplies to meet the task force needs in the most harsh rescue environment they could envision. Major USAR vendors rose to the occasion and met our needs in an incredible manner.

Once additional logistics personnel arrived, we established full-time staffing at the Myriad Center. This allowed the individual task force logisticians to have direct contact with our logisticians as well as the primary vendors, which helped facilitate our objective to rapidly meet the task forces' needs. The task forces could place orders to meet their logistical needs face to face with the logisticians, who in turn would rapidly complete the order and the purchase.

What we lacked, initially, was a mechanism for actually making each purchase-again, Where does the money come from? Do we just tell the vendors, "Trust us; you'll get a check from the government"? Will they believe us?

On the second day, we received an additional person to help us solve this issue. The Mobile Emergency Response System (MERS) from Denton, Texas, provided us with a federal logistician who was a wizard in making the financial end of the system work. He also taught us the proper system for documenting and justifying purchases. The relationship worked well; the MERS logistician worked the financial end of purchasing while we worked the USAR-specific end of purchasing. Later, as our staffing increased, we added additional MERS personnel at the BOO to refine the system even further.

Community Support

In many ways, we can consider this a "luxury" USAR response. The BOO setup was outstanding from a logistical standpoint. It allowed the task forces to be located with logistics; it provided a large area for feeding task force personnel, as well as separate sleeping areas for each task force. The community support during this catastrophic event was incredible, and it was very much focused on the BOO. While this event deeply affected every member of the community, it did not have the major impact on the existing infrastructure that a large-scale disaster would. Outside of the blocks surrounding the Murrah Building, the roads were open; the electricity, water, sewer, and other utilities were in place; and the community did not have to worry about its own food and shelter. Consequently, the community was in a position to respond and had a personal need to assist in the rescue efforts as a part of their personal coping/healing mechanism.

While they did not have access to the hot zone, they had access to the Myriad Center. The community outpouring was incredible! The people provided for our every need and greatly reduced our logistical issues. We had home-cooked food provided by the Oklahoma Restaurant Association and other groups. Members of the community took our laundry home with them and returned it clean. They installed whirlpool baths in the convention center and provided professional massage therapy as needed. Eye care, including contact lenses and the repair of eyeglasses, was available. Podiatrists worked on tired rescuers' feet to ensure rescuers would be prepared to go back to work the next operational period. The community set up a "Wal-Mart" where fresh clothing and other personal needs were met (this is how I solved my underwear problem).

These "luxuries," however, did not dilute the harshness of the environment in which all rescuers worked 12 hours a day.

Challenges

The weather was an issue throughout the incident. Temperatures varied from the low 40's to the high 80's. The direction and strength of the wind were always issues. The wind was strong enough to have an impact on our handling of hanging debris on the site. Rain and thunderstorms were threats; high winds and lightning caused operations to be stopped several times.

In addition to the weather, the site itself had an impact on our work environment. The debris from the blast created a mesh of electrical wire, HVAC conduit, hot and cold water and sprinkler piping, telephone and other communications wiring, rebar from the concrete structure, furniture and pieces of furniture, carpet, concrete pieces, and anything else you might find in a structure. This mesh of material created a unique work environment that was not only harsh on the rescuers but extremely harsh on their protective clothing.

We established that personnel working in the interior of the structure would go through a pair of steel-toed and steel-shanked boots in two to three operational periods! This was a result not only of the materials in the structure but also of the wet environment that invited concerns regarding fluid contamination when working around victims and whatever other substances may have been released in the structure.

Obviously, if rescuers are not comfortable and confident in their protective gear, their ability to sustain work could be diminished. From a logistics perspective, the type of wear we experienced on the boots had not been anticipated. We quickly established an ad hoc general boot specification and worked with the military to find a supplier of a lightweight, steel-toed, steel-shanked, fabric (waterproof) leather boot. The manufacturer, located in Pennsylvania, immediately shipped a tractor-trailer load of the boots overnight!

Other protective clothing was equally as adversely affected by the work environment. Wet clothing had an impact on the rescuers' ability to work. Fluid contamination was also an issue, although, later in the incident, a decon process was established for personnel handling victims. Clothing frequently was torn in the debris.

Once again, logistics personnel worked with the military to establish a mechanism for immediately providing replacement clothing. Large quantities of uniforms and boot socks were procured through Tinker Air Force Base (Oklahoma City). These uniforms were provided to the rescuers as their gear became damaged or wet.

Large numbers of leather work gloves and gloves for victim handling were purchased. It was established that personnel working in the harshest areas of the structure would go through three sets of leather work gloves per operational period. Good-quality knee and elbow pads were necessities for anyone working inside the structure.

Rain gear was shredded each time it was worn in the work environment; therefore, it also was purchased in bulk. A local eye-care company provided eye protection anti-fog in a lipstick-type tube, which worked very well.

We also learned that personnel spent a great part of their day bending over or kneeling down. In addition, the more gear rescuers had on, the more they all looked alike. For better rescuer identification, the idea evolved to have the rescuer's last name affixed to the clothing's "butt" area and across the top of the helmet. We used a commercial label-making system, and it worked extremely well. The labeling was also used to mark issues and identify personnel's clothing, areas, hazards, and equipment.

A lesson learned was that better attention should be paid to the impact of the environment on long-term rescue operations. We are used to working in harsh environments for relatively short periods of time. Eight consecutive 12-hour shifts had a significant impact on all aspects of our operations, specifically our protective gear.

We unscientifically tested recently developed protective gear designed specifically for rescue work. It provides the protection of PBI with Kevlar and is waterproof and able to protect against bloodborne pathogens. Rescuers who work in the harsh urban search and rescue environment should evaluate this type of protective gear to lessen the impact of the environment on rescuers' ability to function.

Rescue Equipment

As you can imagine, breaching, breaking, cutting, lifting, and rigging-as well as moving all types of materials-were the major operations needed to gain access and to disentangle the victims. The task forces used every tool in their FEMA USAR equipment caches. In addition, vendors approached us with a number of new tools or other tools they thought might be useful in our efforts to conquer the large volume of debris.

Rigging. Rope and rigging gear were used a great deal, most typically to make the environment safer. Personnel in harnesses rigged systems to secure all types of materials from building components to precariously perched loaded file cabinets. They devised systems to remove or secure the hazards. In some cases, this included working suspended on a rope with a gasoline-powered drill to drill through a concrete slab to allow the placement of nylon slings or cable to secure it or placing a "diaper" under a slab so that debris would not fall on rescue operations 100 feet below.

The environment was as harsh on the rigging equipment as it was on the personal gear. Sharp edges, concrete dust, fluids, and glass all affected rigging gear, as did unknown stresses placed on the gear by material movement and other factors. In many cases, the gear was left in place and marked with red fluorescent paint for destruction after use. Retrieved rope was cut into small pieces and discarded.

We weren't using only traditional rope-rigging gear. Two heavy-rigging specialists, members of the USAR Task Force, were used in a number of ways throughout this incident. Local crane personnel worked in front of the building with very large cranes while task force specialists worked in the structure using the mechanical advantage of Bobcats in confined-work areas. They used rated chain, nylon slings, chain-coffing hoists (come-a-longs), and the knowledge and finesse necessitated by knowing that under building components could and did lie victims.

Light material cutting. We had to cut everything from carpet to sheet steel. Miles and miles of wire created a spider web throughout the structure. Rebar created an environment similar to a prison. Filing cabinets had to be cut to get through to victims. Wood was cut to build a "forest" of shoring to support the structure.

Over the years, the rescue community has placed greater and greater reliance on "power" tools and has lessened the "good ole days" emphasis (by necessity) on hand tools. For a number of reasons, this incident reintroduced the importance of hand-tool operations. Everywhere you walked, something needed to be cut. "Heavy hydraulics"-or a more manageable reciprocating saw-were not always at hand; even if they were, they would require a great deal of effort to operate in the structure.

As an example of our constant adaptation to the environment, personnel from the Menlo Park (CA) Task Force put together a simple hand tool pouch designed to deal with the spider-web environment. The pouch included a lineman's pliers, a 10-inch crescent wrench, a torch striker, a four-in-one screwdriver, channel locks, and aviation snips. Personnel added a razor knife and trauma shears. This small kit didn't weigh down or confine rescuers but provided the tools they needed to deal with most of the light debris they encountered.

The task force used every cutting method available. The incident provided an incredible opportunity to perform on-the-job tool evaluation and test tools' effectiveness in this harsh environment. In many cases, a tool was not used for just one or two operations but received a lifetime's worth of exercise in a week's time. While this was far from a scientific evaluation, those tools that held up and were effective continued to be used while tools that didn't were tossed aside.

The traditional cutoff saw with an aluminum oxide blade was the best all-around tool for cutting rebar and for other metal-cutting operations, such as those involving the mass of ever-present sprinkler pipe.

A Los Angeles County (CA) Task Force member recommended a set of electric rebar cutters. These units worked extremely well for cutting rebar up to one inch in diameter, although they were heavy for over-the-head use and all-day operations. New York City (NY) Task Force personnel recommended ratcheting cable cutters, which also worked well when dealing specifically with the miles of ever-present cable.

The FEMA equipment cache list includes handheld hydraulic rebar cutters. Personnel were using these units and experiencing a high blade failure rate. We contacted the manufacturer. After some research, it was determined that the problem units had been equipped with after-market blades. Overnight shipments of replacement blades solved the majority of these problems, although we continued to have some problems with heat dissipation, which caused metal to shatter. This difficulty was established as a problem related to repeated back-to-back use of the cutter without allowing the blade to cool over a long period of time.

Another useful metal-cutting tool was the traditional reciprocating saw. This worked extremely well on conduit and sprinkler pipe. Additionally, the gasoline-powered reciprocating saw worked extremely well.

Probably the best all-around cutting tool on sprinkler pipe was the traditional oxyacetylene torch. These large construction-size units worked better than backpack or other small units due to the volume of material to be cut.

It should be noted that all of the cutting tools used had inherent safety concerns related to their use in this or any rescue incident. Caution must be observed when using cutting tools. Users must be properly trained in a given tool's use and limitations. They also must be aware of safety concerns-including proper protection for the eyes, arm, and body-and environmental protection factors such as fire protection and atmospheric monitoring.

Breaching Concrete

A reinforced concrete structure is considered the most difficult victim entombment scenario. The USAR program was designed around this worst-case scenario, to ensure that we are prepared (training and equipment) to deal with any situation.

The hydraulic gas-powered pump uses a four-cycle motor to power an 8-gpm hydraulic pump to power a variety of rescue tools. Task forces found a 45-pound hydraulic breaker extremely effective for breaking or breaching concrete. The system includes several diamond segmented tools for cutting concrete, including a chain saw and a cutoff saw. These tools have proven to be extremely effective in training, especially when working close to a victim.

Also used were pneumatic jackhammers with a construction-type air compressor. Unsure footing and uncertainty as to what was underneath the floor made the traditional 90-pound jackhammer difficult to handle in the structure. The 45-pound tool worked better since rescuers had more control and could "chip" into void spaces with some control.

A chipping hammer in the equipment cache was set up to be used with regulated SCBA bottles on the rescuer's back. It did not work well because the bottles provided only a 10- to 12-minute air supply. The tool itself worked well, especially considering its light weight and ease of handling in tight spaces; but an unlimited air supply was needed.

Another new and extremely effective tool for dealing with concrete was a gasoline-powered chain saw modified to drill through concrete. This unit is very easily operated without "kick" and very rapidly drills through concrete and whatever rebar it may strike. Personnel in harnesses eight stories up used it to drill holes to secure slabs in place on the side of the structure. With a two- to four-inch (or smaller) bit range, it can effectively be used to establish an opening for a victim-locating device to assist in the search effort.

Shoring

A great deal of shoring was required to ensure that the structure remained safe for rescue operations. The situation was constantly changing as building components and rubble were moved. Areas in need of shoring were identified in a number of ways, including recommendations by structural engineers and rescue squad personnel. Shoring systems were generally designed by the structural engineers and implemented by task force rescue personnel or the local construction company. We were fortunate to have on-site John O'Connell, of the City of New York (NY) Fire Department, who was assigned as the shoring monitor throughout the incident. He, in concert with the structural engineers, helped all on site personnel feel more comfortable with the site's stability.

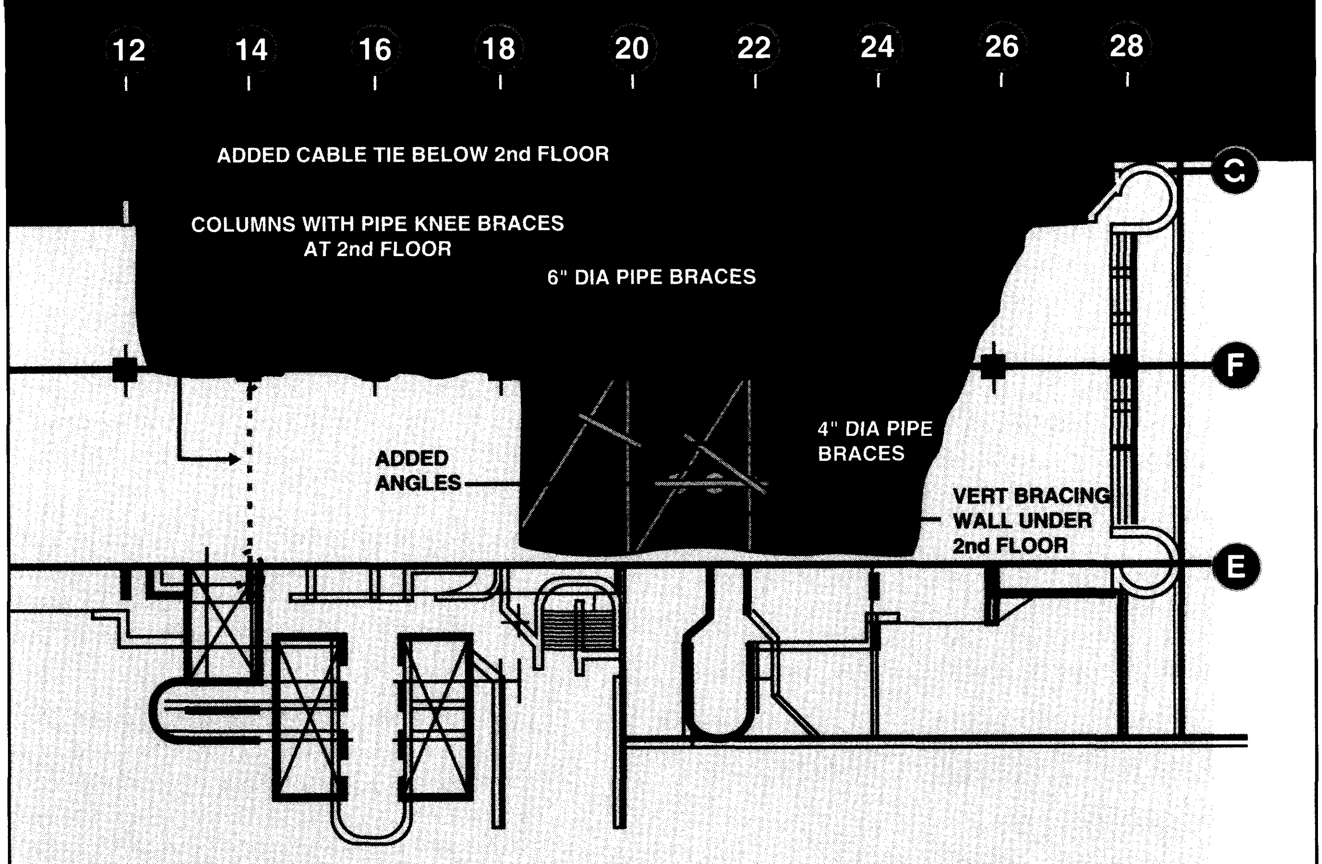
Task force personnel used a great deal of wood to construct shoring. Pneumatic air nailers worked extremely well for shoring operations; 12 and 16 penny nails were used. In fact, these systems were used for the manual carpentry projects assembled, including debris chutes and protective structures. Other types of shoring materials used were box cribbing, ellis clamps, pipe shores, and screw jacks.

Structural Engineers

The structural engineers used a number of devices to help ensure the structures were safe for occupancy. Readily available Smart Levels (with the five-minute shutoff feature overridden) were duct-taped to the building and viewed periodically to show movement in a given area. Theodolites (electronic transits) allowed documentation of movement from a number of sites with a single unit, and they did not have to be placed in the structure. Strain gauges or calibrated crack monitors were bolted or epoxied over a suspect crack or around a corner to document movement in a given area very effectively.

Another tool that proved extremely effective was a common laser pointer normally used in the classroom. This tool originally was purchased for the structural engineers, but it was quickly recognized that a great

Figure Eight: Pipe Braces



Bracing of columns F20 and F22 at 2nd and 3rd floors plus bracing of column F14, F16, and F18 at 2nd floor.

deal of "telling" could be accomplished with a laser pointer. Management at every level used it to "describe" an area that needed shoring or other action. Instead of saying, "Do you see the third piece of rebar on the fifth slab? I need you to shore from the underside to the top, etc.," a laser beacon was placed exactly where the work was to be done, and the "dot" spoke a thousand words. We'll be using this tool in rescue training and other activities in the future. A probe was used to detect energized electrical equipment early in the operation, until it became well established that the utilities were shut off.

Search

The public provided dog boots because there had been reports that search dogs' paws were being cut in the rubble. This was true, but dogs need their pads and claws to maintain their footing in rubble. We ended up providing a great deal of "super glue" to repair the canine pads so they could go back to work. Also, canine decontamination was an issue addressed early on. It was a little shaky having canines that had not been deconned in the sleeping and eating areas.

A video search camera and fiber-optic system were used a great deal. They generally worked well, but the dusty environment made everything look the same. It was generally agreed that a color view find would help identify exactly what the search personnel were viewing.

The USAR Task Force equipment cache includes more than 48,000 pounds of equipment, which is transported to the catastrophic incident site. This equipment fills seven military pallets, which are 108 inches x 96 inches x 96 inches tall. Additionally, during the Murrah Building incident, a number of new tools were field-tested and probably will be considered by the FEMA Logistics Committee for future task force use.

One of the most important concepts in developing a good rescue team is to keep an open mind and constantly evaluate whether a tool that is in your toolbox (or could be there) would do the job better than your current approach. With 11 USAR Task Forces and the OCFD operating together during this operation, we were able to put many tools to the test.

In addition to the two logisticians inherent to each of the deployed task forces, we used more than 20 logisticians from across the country to support the logistics mission. Logistics personnel in Sacramento and Maryland accomplished research objectives off-site while personnel on-site from California, Indiana, Virginia, Colorado, New Mexico, Nevada, Florida, Maryland, and FEMA MERS from across the country met the 24-hour operational requirements. These personnel worked to form a team that anticipated and met the task force needs in an incredible manner.

FEMA's support of the USAR program and its willingness to listen and respond to the "grassroots" rescue efforts have allowed the USAR program to develop into the most comprehensive rescue program anywhere.

Centers for Disease Control and Prevention Recommendations

The Centers for Disease Control (CDC) was asked on Day Five to visit the Alfred P. Murrah Federal Building and immediate environs to advise on biological and chemical hazards, appropriate use of personal protective equipment, and related safety issues. The site visit was made on Day Six.

General Observations

1. On-site personnel have established excellent procedures for all aspects of health and safety.
2. The personal protective equipment/clothing used during rescue operations are certainly adequate for the minimal biohazardous risk associated with this operation.
3. Given the nature of disaster rescue operations, general sanitation is good. We are recommending that all personnel wash their hands before entering canteen food service areas. Portable handwashing stations may need to be provided at several locations.

Biohazards

1. There are no known biohazards that pose a public health concern or individual concerns to rescue workers.
2. Bodies in this collapsed building do not pose specific infectious disease risk to rescue workers. Bodies will begin to decompose, and in that process any infectious diseases that may have been in the living person will also decompose. Although the decomposition process will begin to smell bad, no infectious agents are associated with that process.
3. Rescue personnel who handle bodies (or body parts) are wearing disposable Tyvek jumpsuits, rubber gloves, respirators, and hard hats. Disposable covers may be worn over boots.
4. Rescue personnel involved with activities like rubble removal are wearing firefighter's bunker gear or military fatigues. Both groups are wearing hard hats, respirators, boots, and leather work gloves.
5. Personnel who have been involved with rescue operations have been out-processing through decon stations. Respirator cartridges and gloves are discarded; boots are sprayed with Lysol (1:50 dilution with water), and appropriate uniform parts are also decontaminated. There have been staffing difficulties at the decon stations; these difficulties are being addressed, and control will remain with the Oklahoma City Fire Department. We recommend that control "chutes" or other measures be instituted to ensure that all exiting personnel be properly processed.

Dogs

1. Dogs are being used in rescue operations. These operations require the dogs to move in very dusty/dirty areas, and they may have occasional contact with bodies.
2. Showers have been established for shampooing the dogs after their tours of duty. This is appropriate and adequate for the dogs and for humans they may contact later.

Asbestos

The main concern was the presence of asbestos in the building prior to the explosion and therefore what level of respiratory protection was needed to protect against asbestos exposure. Since it was not known how much asbestos was present, rescue workers were using half-face, air-purifying respirators with HEPA filters.

Conversations, on April 24, with Steve Allen, of the State Department of Labor, and Bob Porter, with General Services Administration (GSA), revealed that very little asbestos-containing materials (ACM) remained in the building. Remaining asbestos included floor tiles and small amounts of insulation around pipe elbows in the basement. This amount of ACM is deemed to pose little or no risk to worker health. Therefore, air-purifying HEPA respirators are not required. However, dust respirators are recommended for general dust exposure inside the building. Disposable dust respirators (paper masks) are acceptable.

Furthermore, Tyvek suits are not needed to protect workers from asbestos nor is decontamination of clothes for asbestos required.

Carbon Monoxide

It was observed that numerous gas-powered generators and tools were in use around the disaster site. Gas-powered equipment poses a serious hazard from exposure to carbon monoxide (CO), particularly in enclosed or semienclosed spaces. It is recommended that CO be monitored in areas where gas-powered equipment is being operated.

Centers for Disease Control and Prevention Hazard Assessment Team April 24, 1995

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USAR Communications

As the communications officer for Florida Task Force 1 (FL-TF1), my first thought when I was notified of the Oklahoma City Bombing was that the task force could be mobilized. I called my office and had my assistant begin charging batteries and configuring the cache for a search and rescue mission.

It wasn't until Friday that I received a call from Oklahoma City. I was asked to respond but as a member of the incident support team (IST), FEMA's overhead team already on the ground coordinating the incoming task forces.

I arrived on Saturday along with Chief Cindy Sears from Metro Dade (FL) Fire Rescue. When we arrived, we found the IST working hard in the basement of the Alfred P. Murrah Federal Building.

I was to assist Mark Deputy from VA-TF2 in the role of communications officer, which was not an easy task based on the number of teams already on the ground and those en route. Deputy had been busy acting alone for three days. As soon as I arrived, he briefed me and we made plans for the next shift's work.

Deputy and I had worked together before at "Rescue 90," a drill in Montgomery County, Virginia. We both had been involved in the design of the task force communications cache, so our ideas on how to operate in this type of incident were very similar.

We had a very interesting mix of responsibilities in a job role that was still evolving. We were to provide the communication assets for the IST, act as spectrum manager for the incident, and try to provide additional equipment and supplies to the task forces to meet their communication needs.

Problems

The main problem that came up almost daily was nonstandard communication caches. All teams are supposed to operate on low UHF 403-420 MHZ, but for the most part this was not the case. Teams came to our desk daily to present us with their communication plan. There were VHF, high UHF, and 800 MHZ. One team had a frequency normally used for a UHF TV station. Only a few teams had equipment that would operate in the approved frequency range.

This made networking very difficult. Fortunately, in most cases, the frequencies the teams wanted to use were vacant and, in low-power applications, did not cause any interference with adjacent users. The Oklahoma City Fire Department was using 450 MHZ; the last thing we wanted to do was interfere with its operations.

We used a scanner and the spectrum analyzer from my cache to monitor the frequencies being used and to try to keep some order.

I had been asked to bring 30 handhelds from my cache to issue to the IST. Since my task force had been mobilized, however, I had to bring radios from our department's spare fleet. Again, we were able to use the service monitor and find two vacant frequencies.

The System

The IST used one channel; the other channel was used to coordinate the movement of slabs of concrete and debris between the teams and the heavy-equipment operators.

When my task force team arrived (FL-TF1), this gave the IST additional equipment from which to draw. I installed a base station from the IST to the Myriad, the convention center where the task forces were staging. My team also installed a repeater on the roof of the Myriad to cover the general operating area.

We used a 35-watt repeater, in the approved frequency band, with a 9.2-dB omni directional antenna. This worked so well that it served as a community repeater. I advised any team that could do so to tune to it and use it for team coordination.

Unlike other incidents in which I participated, telephones were not a problem in Oklahoma City. Southwestern Bell provided dial tone service wherever we wanted it.

Cellular telephones were also provided. A series of COWs (cells on wheels) were installed in the area around the site, so we always had service. In fact, the phone service was so reliable that I continually had to remind people that this was the exception to the rule. Normally, there is no phone service, especially cellular. Whatever surviving telephone plant there is will be blocked by anyone carrying a cell phone. The teams plan to use INMARSAT satellite systems and wireless tripsites in future incidents of this nature.

At the task force level, we learned several things:

1. A common frequency plan must be designed and adhered to.
2. A holster or radio harness is a must. The working area may be tight, and loose wires from speaker mics can be dangerous.
3. Use of phones in forward areas is beneficial, keeping radio traffic to a minimum.
4. Multiple channels on a single site can help reduce confusion with specialty teams.
5. Some type of headset or earpiece is necessary when working around heavy equipment.

Several of the task forces that responded were able to order components of their communications caches while in Oklahoma City. This was a benefit because task force communications officers had the opportunity to see equipment on-site that was working properly and were able to order identical equipment. The role of the IST communications officer was realized. We hope this position can be further developed along with a dedicated IST communication cache.

Creating a Road Map for Body Recovery

The first members of the Region 6 Disaster Mortuary Team (D-MORT) to be activated for response to Oklahoma City were funeral directors, who were needed to process the anticipated number of victims. I was later activated to assist in pinpointing the locations of the victims. Todd Ellis, also a D-MORT team member, and I were assigned to help establish the victims' approximate locations, using blueprints of the Alfred P. Murrah Federal Building as the basis for our master list of missing victims.

The process we followed was comprised of the following steps. I firmly believe that what we learned, using this process in Oklahoma City, can be effective in almost any structural collapse where recovery is a problem.

The system is predicated on carefully plotting the pre- and postblast locations of the missing victims and developing the recovery operation plan on the basis of that information. This approach, I believe, can shorten recovery operations at tragic incidents such as the Oklahoma City Bombing.

- Secure a blueprint of the incident site as soon as possible. Every building in this country should have a recent blueprint or floor plan that can be accessed should a disaster such as the Oklahoma City bombing occur. Make the acquisition of this document an early priority. The blueprint should be clean, without mechanical and electrical drawings, so that a non engineer will be able to read it easily. The Oklahoma City incident quietly slipped from a rescue operation to a recovery effort. When this transition became evident, the operation section was left with no "road map" for bringing the incident to a close. Oklahoma City Operations Chief Mike Shannon likened this to trying to locate 180 cities without a road map and without knowing the names of the cities or which city was located even if one was found.

- Designate office locations on the plans. Having a current blueprint of the building is only the first step. As offices evolve and work areas change, the concentrations of people also change. We contacted Don Rogers, the manager of the Murrah Building, for assistance in making interior office designations. He directed us to the building's maintenance personnel, who we found to be the most valuable source for accomplishing our objective. In general, through their frequent interactions with building occupants, maintenance personnel are aware of office layouts and work locations. A member of the maintenance staff drew office layouts on the blueprint. We discovered that the look of the building changed substantially with this additional information.
- Secure an accurate list of missing persons. Compile an initial list of the missing. In this type of disaster, the list changes substantially from day to day.
- Designate a team to update the list regularly. As part of the recovery effort, updating the list of missing victims is vitally important. Any questionable entries on the initial list should be vigorously investigated to determine their authenticity. The list will change daily as a result of individuals being found alive in hospitals or being away from the building at the time of the incident. We assigned a team to constantly update the list in an effort to identify accurately who was missing. Investigative personnel, who are proficient at casework, are best qualified for this assignment.
- Interview surviving employees. Survivors of a disaster such as the Oklahoma City bombing are usually willing to help in any way possible and can be helpful in establishing the preblast locations of missing victims. However, they should not be pressured to cooperate.
- Do not speculate! When interviewing survivors, try to ascertain if the information being supplied is based on actual knowledge or a guess. Place an item on the master floor plan only after you are relatively certain that the missing person was at a specific work station or other location. If a missing person was en route to another location in the building at the time of the incident, do not place anything on the blueprint until further investigation reveals the individual's actual location at the time of the blast.
- Use a master list and stick with it. Since most offices now use computers to manage the huge volume of information generated in a disaster, it is vital to understand the inherent problems in this approach. If, for example, the list of missing victims is generated on a spreadsheet, removing a name from the list without changing the numbers assigned to other names on the list will be difficult; deleting name number 9 on a list of 100 names would cause all names below number 9 to move up one number. This would create a monumental problem in tracking information. If a database were used to track the missing number 9, number 9 would be deleted, and the list would read numbers "7, 8, 10." The best solution is to stick with the original list of missing victims (the one generated at the time the blueprint is completed). Additional names can be handwritten at the bottom of the master list and numbered accordingly.
- Designate missing by number, not name. In Oklahoma City, missing victims were designated by number instead of name to ensure privacy for the families of the missing in case the media or anyone else were to view the blueprint.
- Update recoveries often. As positive identification is made, delete the corresponding victim number from the blueprint. Updating the list is a continual process, but it should be done formally at least four times a day. By continually updating the list, rescuers will be able to tell when recovery operations in specific areas have been completed and in which areas recoveries have been made. This information becomes very important in an incident such as that in Oklahoma City. Collapse was so complete that it was nearly impossible to determine even the floor on which rescuers were operating.
- Remove numbers only on the basis of positive identification. Remove names from the blueprint only after positive identification (finger-

prints or dental records, for example) has been made. Do not base an identification on personal effects. As a practical matter, tentative changes may be made in the plans based on identification through personal effects; permanent changes in operations, however, must not be made unless the identification is supported by forensic identification.

- Restrict dissemination of the list of names. Copy the master list and give it only to individuals directly involved in the operation. You want to avoid having people on-site speculating on the identification of victims as they are recovered and having family members hear that a recovery had been made when it hasn't or when identification will be delayed.
- Continually monitor locations of recoveries. Track every recovery made and compare the location of the recovery with the known location of the victim prior to the incident. This information will assist in directing future recovery efforts.
- Carefully document recovery locations. Exact recovery locations must be given to relatives during postevent briefings. In incidents such as the Oklahoma City Bombing, documentation of information was not only advisable, it was mandatory because the incident involved a criminal investigation. To ensure accuracy, documentation should be assigned to a law enforcement officer experienced in criminal investigation.
- Revise search areas as needed, based on known prior blast locations and recovery coordinates. Cross-reference victim recovery sites with the known preblast locations. Such an analysis will reveal exactly what occurred if the building collapsed "pancake" style, for example, or if the floors fell unevenly, resulting in the "big-slide" effect. This information is important in determining the final resting place of the debris and the bodies within it.
- Be aware of recovery trends. When dealing with incidents of this nature, it is very important to note anything out of the ordinary. In Oklahoma City, for example, victims on the first floor were actually blown approximately 50 feet back toward the southeast corner of the building. This information was ascertained early in the incident when a victim was recovered from "the Pit" area; the victim was known to have been in the waiting area of the Social Security office. After a positive identification was made, the entire recovery operation was adjusted accordingly.
- Push for quick identification. A positive identification should be made as quickly as possible. As soon as a positive forensic identification is made, adjust the blueprint accordingly for example, if the preblast interview placed several persons in close proximity, subtle changes can be made in the recovery effort once one of those recovered victims has been positively identified. Identification is only the first part of this phase. Someone in the area at which identifications are being made must track the individual recovery and notify personnel at the recovery site of the findings as soon as possible.
- Provide a list of probable victims based on the location of recovery. As the operation progresses, you will be able to narrow the list of possible identifications before the body is sent to the morgue for processing. It is advisable to attempt to send a short list of possible identifications based on location of recovery, age of victim, race, and sex. This information, as well as the victim's height and weight, is included on the master list.
- Be positive on recommendations. If you have done your homework and placed names on the master list based on known locations, you should be able to present your recommendations in a positive manner. No one expects you to have a crystal ball. This is not an exact science, only a means by which to create a "road map." Do not be afraid to fail on occasion. More times than not, the information will be extremely helpful in the eventual outcome of the operation.
- Know when to stop. In Oklahoma City, the operation was halted while two bodies were still buried in the rubble. The decision was based on the recommendations of the technical personnel involved in the operation. Although it was hard to do at the time, we now realize this was the correct decision. No one wants a rescuer to be seriously injured or killed in an unnecessarily dangerous attempt to recover a body.

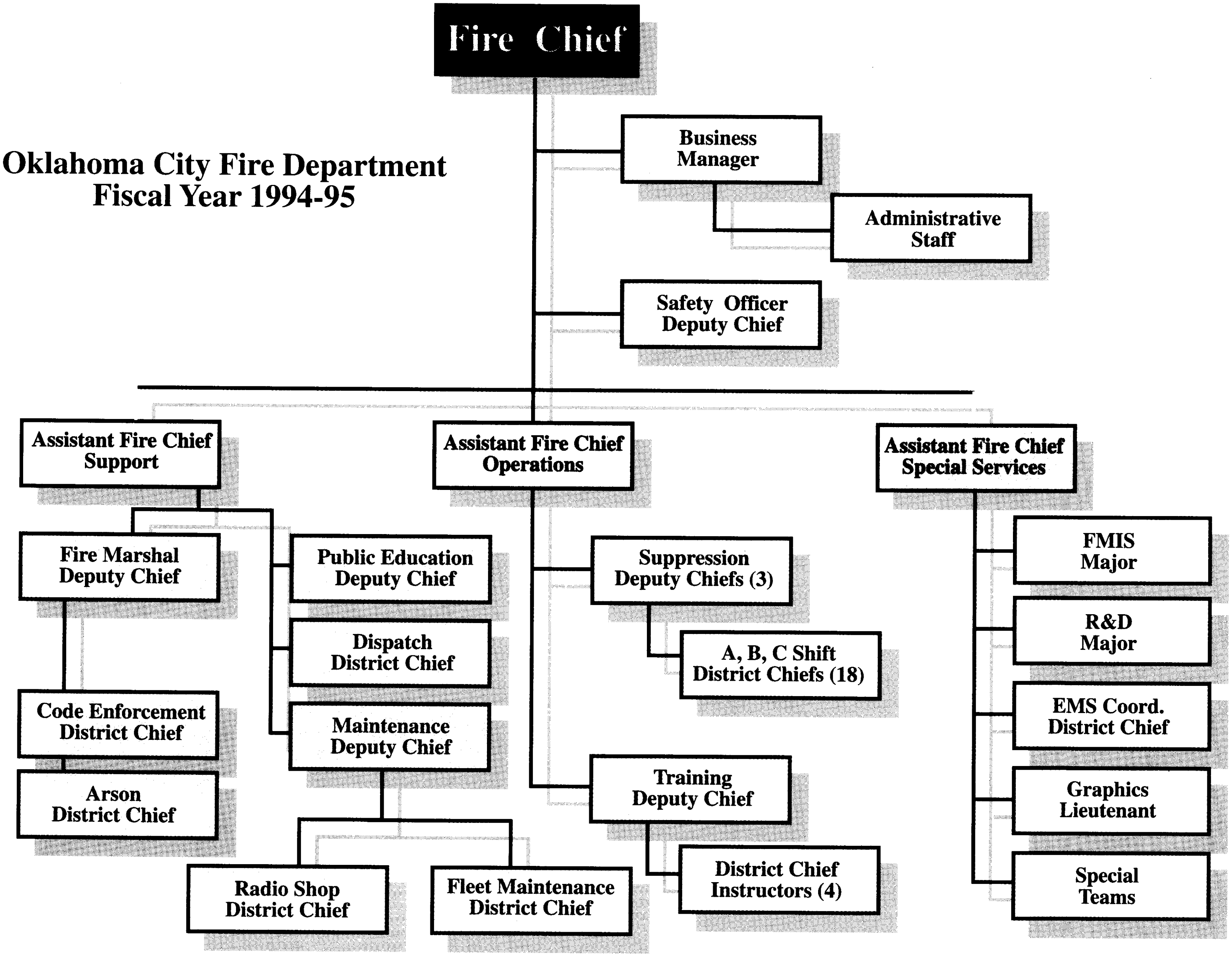
The above system will not necessarily guarantee an operation's success, but during the 15 days, 15 hours, and four minutes of the Oklahoma City operation, it worked well. Almost without fail, the victims were located exactly where our road map said they would be. The Murrah Building collapsed in classic "pancake" fashion, and, because of this, victims were recovered in the rubble directly below where they had been located on the upper floors.

D-MORT Teams

D-MORT teams were formed several years ago to satisfy Emergency Support Function 8 in the National Response Plan. The plan tasked the National Disaster Medical System (NDMS) with the responsibility of recovery, identification, and processing of fatalities of a disaster. NDMS entered into a memorandum of agreement with the National Foundation for Mortuary Care for the development of D-MORT teams. D-MORT regions correspond to the 10 FEMA regions of the country. The teams can be activated in part or as an entire team.

A D-MORT team is composed of 25 members, each with a particular area of expertise. Areas of expertise include medical examiners, coroners, pathologists, anthropologists, medical records experts, fingerprint experts, forensic odontologists, dental assistants, X-ray technicians, security personnel, computer experts, and funeral directors.

Oklahoma City Fire Department
Fiscal Year 1994-95



April '94

OKLAHOMA CITY FIRE DEPARTMENT FIRE STATIONS AS OF APRIL 19, 1995

No.	1	Station	820 N.W. 5th	73106
No.	2	Station	2917 E. Britton Road	73111
No.	3	Station	11601 N. MacArthur	73162
No.	4	Station	100 S. W. 4th	73109
No.	5	Station	22nd & N. Broadway	73103
No.	6	Station	620 N. E. 8th	73104
No.	7	Station	218 S.W. 23rd	73109
No.	8	Station	1934 W. Exchange	73108
No.	9	Station	1415 S.W. 89th	73159
No.	10	Station	2039 N. W. 16th	73106
No.	11	Station	900 N. W. 50th	73118
No.	12	Station	2121 M. L. K. Av.	73111
No.	13	Station	6901 S. E. 74th	73115
No.	14	Station	3129 N. W. 23rd	73107
No.	15	Station	2817 N. W. 122nd	73120
No.	16	Station	405 S. E. 66th	73149
No.	17	Station	2716 N. W. 50th	73112
No.	18	Station	4016 N. Prospect	73105
No.	19	Station	940 S. W. 44th	73109
No.	20	Station	7929 S. W. 29th	73108
No.	21	Station	3240 S. W. 29th	73119
No.	22	Station	333 N. W. 92nd	73114
No.	23	Station	2812 S. Eastern Ave.	73129
No.	24	Station	1500 N. Meridian	73107
No.	25	Station	2701 S. W. 59th	73119
No.	27	Station	6400 N. Westminister	73084
No.	28	Station	7101 S. Anderson Rd.	73150
No.	30	Station	4343 S. Lake Hefner Dr.	73114
No.	31	Station	618 N. Rockwell	73127
No.	32	Station	12233 N. Mustang Rd.	73099
No.	33	Station	11630 S. W. 15th	73099
No.	34	Station	8617 N. Council	73132
No.	35	Station	13017 S. May	73170
No.	36	Station	17700 S. E. 104th (*)	74857
No.	37	Station	16820 N. Pennsylvania (*)	73003

(*) Under Construction
Stations 26 and 29 are private