THE FIRE DEPARTMENT IN DISASTER OPERATIONS

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THE FIRE DEPARTMENT IN DISASTER OPERATIONS

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FOREWORD

This document is one of a series of publications prepared by the staff of the Disaster Research Center, The Ohio State University. This aspect of the work of the Center has been sponsored by the Office of Civil Defense under Contract OCD-PS-64-46, Work Unit 2651-A. Below is a listing of the materials which have been included in the monograph and the report series.

Monograph Series

Thomas E. Drabek, Disaster in Aisle 13: A Case Study of the Coliseum Explosion at the Indiana State Fairgrounds, October 31, 1963

Russell R. Dynes, Organized Behavior in Disaster: Analysis and Conceptualization

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Report Series

(Authored by various members of the Disaster Research Center staff)

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The Police Department in Natural Disaster Operations

The Fire Department in Disaster Operations

The Local Civil Defense in Natural Disaster: From Office to Organization

The Warning Process in Natural Disaster Situations

The Salvation Army: Its Structure, Operations, and Problems in Disasters

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PREFACE

In August 1963, a Disaster Research Center (DRC) was established at The Ohio State University. As one of its major research activities, the Center initiated a study for the Office of Civil Defense on organizational functioning in community disasters. An attempt was to be made to arrive at an empirically grounded understanding of the involvement, operations, and problems of emergency organizations in major natural catastrophes and other extreme stress situations.[1]

This report brings together the findings of the Center as they relate to the functioning of fire departments in major emergencies. The data on which it relies comes principally from the Center's examination of fire department operations in a number of domestic and foreign disasters. During the period of research a number of civil disturbances occurred in the United States which involved a large number of fires and, consequently, high demands were made on the fire departments in the communities in which they occurred. In this period, several studies of fire departments were made and certain aspects of this material are included in this report. The inclusion of civil disturbance material does not characterize the other reports in the Disaster Research Center Report Series.

The report is based upon, but not limited to the following incidents where fire departments were the subject of specific DRC study.

Coliseum Explosion, Indianapolis, Indiana, October 31, 1963
Fitchville, Ohio Nursing Home Fire, November 23, 1963
Alaska Earthquake, March 27, 1964
Santa Barbara Forest Fires, California, September 22, 1964
Crescent City Seismic Wave, California, March 27, 1964
Los Angeles, California Watts Fires, August 11, 1965
Topeka, Kansas Tornado, June 8, 1966
Cleveland, Ohio Hough Fires, July 21, 1966
Tasmanian Fires, Australia, February 7, 1967
Cincinnati, Ohio Fires, June-July, 1967
Detroit Fires, Michigan, July 23, 1967

In addition to the data gathered by Disaster Research Center staff during field studies, and research by other disaster researchers, this report utilizes information drawn from a number of books, reports, and fire journals which deal with the structure and functioning of fire departments. These sources are listed in the bibliography.

This report is particularly concerned with analyzing fire departments in terms of: (1) their typical organizational patterns; (2) their disaster-related tasks and activities which are potential demands for them; (3) their organizational adaptation to demand situations, especially those of high intensity; (4) their interorganizational relationships; and (5) their

potential involvement and organizational adaptation to a post-nuclear attack environment.

Fire departments in the United States vary greatly, ranging from departments with a few volunteer personnel and one piece of apparatus to complex bureaucratic organizations with thousands of professional personnel and hundreds of pieces of emergency equipment. Although references are made from time to time to almost all types of fire fighting groups, the primary focus of this report is on departments located in urban settings. As such, most of the data utilized is from studies of fire organizations located in large American cities. Although the description, analysis, and findings in this report rely heavily on information gained from studying complex urban fire departments, it is felt that they will be applicable to a wide range of fire fighting groups since practically all of them possess certain fundamental goals and common organizational characteristics.

No specific identification of the event or the department will be made throughout the report with one major exception. The pattern of fire department organization is sufficiently different in societies outside the United States to require specific identification here of material which is drawn, for the purpose of contrast, from the study of Tasmanian fires. With this exception, specific identification would not add to the content or validity of the report.

FOOTNOTES: Preface

1. See Russell R. Dynes, Organized Behavior in Disaster: Analysis and Conceptualization, Disaster Research Center Monograph Series (Columbus: Disaster Research Center, The Ohio State University, 1969), which provides a general overview of the findings of the Center up to the middle of 1967.

CHAPTER I

INTRODUCTION

Since primitive man first experienced the awe and mystery of fire, he has sought to understand and control it. He has been only partially successful in achieving these goals. Man's ability to control fires can be documented by analyzing fire losses in the United States and by reviewing their costs. The annual cost of destructive fires in the United States is estimated to be $5 billion, including the cost of actual physical damage and the maintenance of the nation's fire departments. Forest fires account for 5 percent of this total.[1] The annual loss of life is about 12,000 persons, while non-fatal burn injuries total about 2 million a year.[2] Fire departments, relative to the research efforts of other professional groups, spend little on scientific studies; other funding is also scarce. In the United States at present, only about $20 million is spent annually on research and development -- of which approximately $1 million is spent for fundamental research on the nature, causes, and spread of fires.[3]

The ever-present possibility of fires and the loss of life and property they cause has led almost every political subdivision in the United States to provide some means of fire prevention and protection. A pattern of providing separate fire organizations was characteristic of much of colonial America; there was organized fire protection in New Amsterdam in 1650 and in Boston in 1679, but incorporation into the governmental framework and professionalization has been slow in evolving. The first fire-fighting group in the United States, The Union Fire Company, was independently organized and incorporated in Philadelphia in 1736. By 1770 there were several fire companies in Philadelphia which were receiving financial support from the city government, although they continued to operate independently as extragovernmental organizations. It was not until 1871 that the city of Philadelphia had a paid fire department consisting of city employees. Today, there are four major types of community fire organizations: (1) departments with paid employees only; (2) departments with a predominance of paid members; (3) departments with a predominance of volunteers; and (4) departments with volunteer staffs only.

Departments of only paid members constitute a minority of all fire-fighting groups in the United States; and conversely, those with volunteer staffs constitute the overwhelming majority of all fire organizations. A study conducted in 1965 by the National Fire Protection Association revealed that there were 1,500 fully paid fire departments ranging in size from a few to more than 12,000 men. The study also indicated that there were at least 20,000 auxiliary and volunteer fire departments.[4] This would suggest that a reasonable estimate would be 250,000 federal, state, local, and industrial firemen employed full time in the United States plus more than 80,000 volunteer and auxiliary firemen, many of whom are paid only when fighting fires. These personnel would be organized into more than 22,000 departments, companies, and allied fire-fighting agencies. However, the huge majority of organizations consist of local volunteer groups.

There can be considerable variation within a given state. In Pennsylvania, for example, in 1957 there were only 20 full time departments with 5,388 employees. At the same time there were 12 departments with a predominance of paid members and 1,965 active volunteer fire organizations located in all types of communities, from small villages to Reading, the state's fifth largest city. In 1958 the volunteer fire companies in Pennsylvania had over 432,000 members, of whom 102,000 were active fire fighters.[5]

While a state of the size and residential distribution of Pennsylvania had only 12 full paid fire departments in 1957, these organizations protected approximately 35 percent of the state's total population since they were located mainly in the large urban centers. In most states today, the predominant pattern is a few large professional organizations coupled with a large number of volunteer groups and a small number of mixed departments. The consequence is that a majority of the population is protected from fire by nonprofessional personnel.

Although some private fire departments are still operating (most of them are associated with industrial complexes), the term "fire department" is usually limited to fire control forces under the management of a local governmental unit, a municipality, town, township, or incorporated place. Moreover, each state controls and defines the local government's management of fire-fighting groups. Even volunteer fire departments, which are administered by their own board of directors, are subject to control by state laws. Table 1 shows the number of independent fire departments in cities and towns in 1961.

TABLE 1

FIRE DEPARTMENTS BY SIZE OF MUNICIPALITY

Population of Cities	Number of Departments	Percent
Over 100,000	128	0.6
25,000-100,000	545	2.6
10,000-25,000	724	3.5
Under 10,000	19,001	93.3
Total	20,398	100.0

NOTE: Count by the National Fire Protection Association, 1961.
SOURCE: A Study of Fire Problems, Publication 949 (Washington, D.C.: National Academy of Sciences-National Research Council, 1961), p. 12.

Since most fire departments are quite small they cannot maintain all of the staff services recommended by professional fire agencies. A 1964 report

on small fire-fighting groups in the United States revealed that there were approximately 10,000 departments serving a population of 1,000 or less. Of this number only a few received enough funds to operate their programs. A great many of these 10,000 departments reported being supported partly by taxes and partly by special fund-raising events. Some units indicated that they were financed entirely by special fund-raising efforts. Many of these departments have such limited fire-fighting resources that they are not rateable for insurance purposes under the standards established by the American Insurance Association (formerly the National Board of Fire Underwriters). A random sample of 100 of these small groups disclosed that their annual budgets ranged from a high of $9,730 to a low of $25. The average for the sample was $2,150.[6]

Departments in cities of over 100,000 population are usually well staffed in personnel, training, fire prevention, communications, arson investigation, fire suppression, maintenance, etc. For an example of such a department, see figure 1. In cities with populations between 10,000 and 100,000 these services are minimally provided. In cities of less than 10,000 some of these services, for example arson investigators, are practically nonexistent. Because of these limitations of the majority of existing fire departments, the states must furnish certain staff services.

A complicated relationship exists between state governments, governments of municipalities, and fire departments. The state government has the fundamental authority in fire department matters. Most fire departments are associated with local governmental units but these, in turn, are creatures of the state. Thus the specific legal provisions of the state can affect the structure of the department. In addition, state governments are performing more fire department staff functions, since only about one department in twenty is large enough to have more than a rudimentary headquarters staff. For example, in most states, authority for fire investigation and fire prevention functions is vested in a state official -- the state fire marshal. Most states also have a program for firemen's training. In several states, firemen's promotion examinations are handled by the state's civil service agency. In a number of states, fire hose and other equipment may be purchased through a state purchasing agency. A number of states have also begun to think and plan toward the development of a state fire staff which could come to play an important part in widespread emergencies. Such a staff development would look toward the coordination of men and equipment necessary in a large-scale emergency. Such organizational developments, however, will have to overcome problems of conflicting jurisdictions and the integration of many diverse governmental and private fire organizations in order to become effective.

The fire departments of large and small municipalities contrast markedly. At one extreme are those groups with one piece of apparatus and a dozen or so men which can deal with only limited fires in small structures. At the other end of the continuum are very large departments located in cities with populations of 500,000 or more. The fire departments in these cities are complex organizations containing several levels of line and staff personnel responsible for a host of duties.[7] An analysis of the resources of these departments is found in table 2.

FIGURE 1

FIRE DEPARTMENT ORGANIZATION OF A HYPOTHETICAL CITY OF OVER 100,000 POPULATION

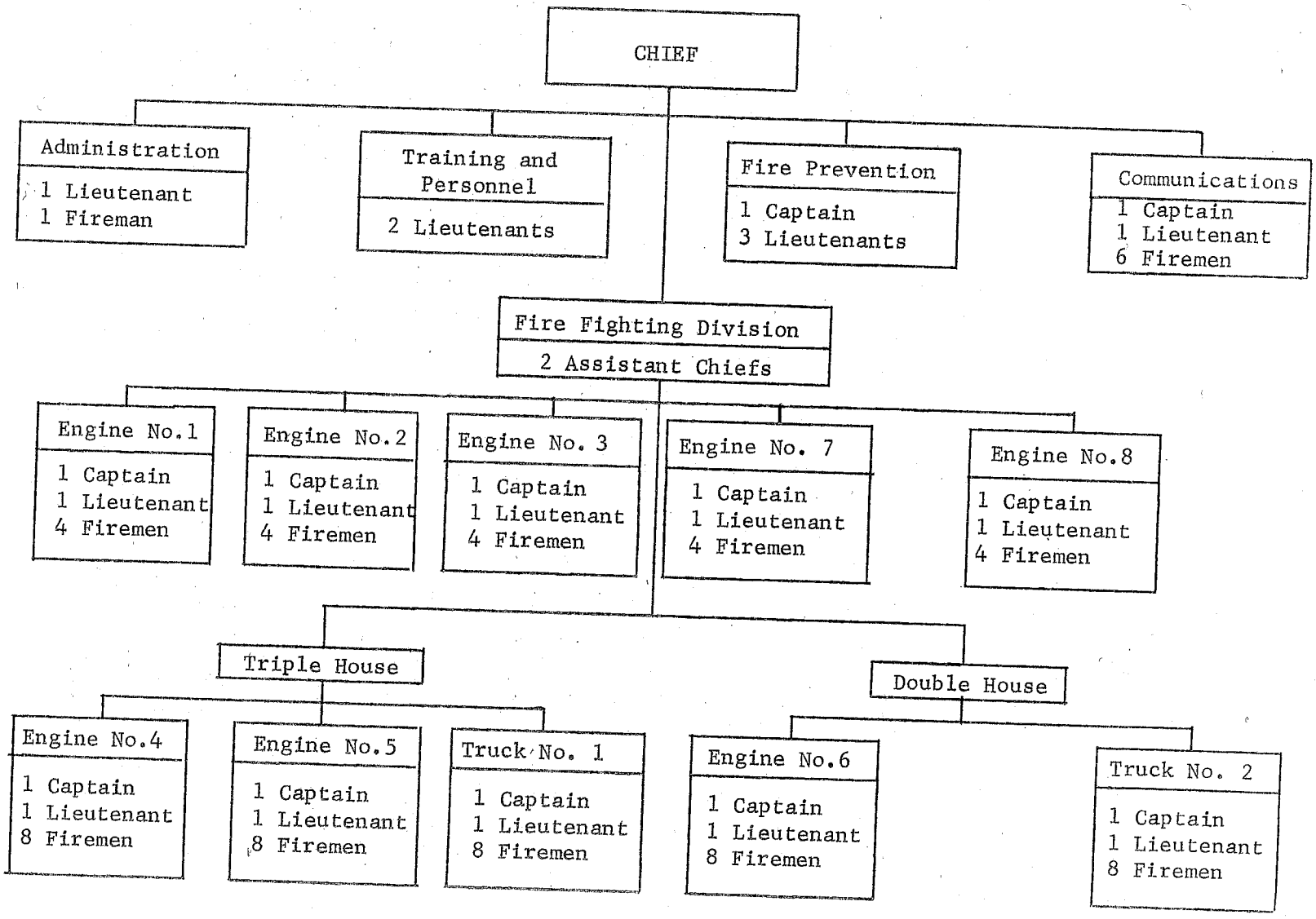


TABLE 2

TWENTY LARGEST US FIRE DEPARTMENTS, 1965 BY TOTAL EMPLOYEES

	Total Employees	Fire Fighters	Total Stations	Total Companies	Engine Companies	Ladder Companies	Squad-Rescue Companies	Total Vehicles	Total Feet of Fire Hose	Number of Alarm Boxes
1. New York City	14,102	13,307	282	369	215	131	13	781	1048,300	15,147
2. Chicago	4,691	4,252	138	131	119	61	11	450	364,500	3,670
3. L. A. City	3,563	3,146	112	184	109	42	17	640	947,900	2,255
4. Philadelphia	2,911	2,808	70	112	67	32	10	262	286,050	3,750
5. Baltimore	2,176	1,888	-	97	58	30	1	258	259,850	2,068
6. L. A. County	2,148	1,727	105	-	115	7	22	570	954,100	324
7. Boston	2,010	1,665	43	77	45	29	1	231	215,650	2,220
8. Detroit	1,874	1,690	55	90	50	30	7	196	200,900	4,173
9. San Francisco	1,710	1,556	48	81	47	20	2	208	251,200	2,018
10. Washington D.C.	1,476	1,326	33	53	32	17	3	159	355,300	1,882
11. Cleveland	1,349	1,138	38	60	36	16	4	126	160,250	1,512
12. Dallas	1,266	1,155	43	64	45	16	1	-	215,506	707
13. St. Louis	1,259	1,144	37	66	42	21	1	125	169,650	2,135
14. Houston	1,254	1,164	53	72	53	18	-	188	221,125	850
15. Buffalo	1,247	1,145	36	48	32	14	7	108	198,106	1,409
16. Milwaukee	1,116	1,005	32	60	33	20	6	134	155,350	2,076
17. Pittsburgh	1,097	1,094	50	52	51	22	-	105	259,000	2,021
18. Newark	1,067	902	27	41	25	11	1	-	125,650	1,059
19. New Orleans	1,019	922	42	65	50	12	1	133	133,600	750
20. Memphis	982	849	34	64	33	17	1	138	175,400	984

SOURCE: Fire Service Directory (Boston: National Fire Protection Association, 1966-67), pp. 94-157.

Since numerous fire department calls are for very simple emergencies, many not involving actual fires, the limitations imposed on small groups are not as serious as might appear at first glance. In contrast are the demands faced by large departments. This is illustrated by the fire department calls and classification of fires in the city of Los Angeles for the year ending June 30, 1959, as listed in tables 3 and 4.

TABLE 3

CITY OF LOS ANGELES FIRE DEPARTMENT CALLS, 1959

	Calls	Percent
Fires	13,933	38.0
Emergencies other than fires	8,631	23.6
Rescue calls	3,480	9.5
Ambulance calls	7,705	21.0
False alarms	2,918	7.9
Total	36,667	100.0

SOURCE: A Study of Fire Problems, Publication 949 (Washington, D.C.: National Academy of Sciences-National Research Council, 1961), p. 13.

At the time, the city of Los Angeles covered 457 square miles and contained a population of 2,424,000 persons. Only 38 percent of the fire department calls were actually for fires and only slightly more than a third involved dwellings. Although the statistics are relatively dated, they do indicate something of the range of the demands made on metropolitan fire-fighting organizations.

Many communities have fire departments which are capable of handling fires in residences and other small structures, but not capable of dealing with anything approaching a major conflagration. Presently, for this reason, mutual aid pacts among fire departments of several political subdivisions are common, providing for mutual assistance in times of major emergencies. Although the pacts often do not call for the involvement of extra community personnel in fire suppression duties, they do enable a locality to maintain a minimum of coverage in the event of numerous and/or widespread fires. When one community has committed much of its fire resources to a particular fire or fires, it will ask a neighboring department to move some of its men and apparatus into the latter's vacated quarters to assure at least a minimum of protection for all of the area it is supposed to cover.

TABLE 4

CITY OF LOS ANGELES CLASSIFICATION OF FIRES, 1959

	Fires	Percent
Dwellings	4,902	35.2
Other buildings	1,421	10.2
Rubbish outdoors	1,503	10.8
Trees, brush, grass	2,937	21.0
Miscellaneous	695	5.0
Vehicles	2,433	17.5
Aircraft	30	0.2
Ships and boats	12	0.1
Total	13,933	100.0

SOURCE: A Study of Fire Problems, Publication 949 (Washington,D.C.: National Academy of Sciences-National Research Council, 1961), p. 14.

Most cities with a population of 10,000 or more have at least two pumper companies, a ladder company, and enough personnel to make a two-position attack on residential fires, in the front and rear for example. (These three pieces of apparatus, i.e., two engines or pumpers and one hook and ladder, serve as the basic response unit for most fire organizations. Large departments consist chiefly of multiples of this basic response unit.) Fire-fighting groups in cities of over 25,000 have more response capabilities. When needed, they can mobilize an average of four pumper companies and two ladder companies. They usually have enough personnel at their disposal to make strong multiple-position attacks on structural fires. Usually they have enough resources to extinguish fires well established in buildings somewhat larger than private residences, on the order of size of four-family apartments or blocks of small retail stores about three stories high.

The procedure of most fire departments is to extinguish or control fires by putting fire suppressants on flammable materials. This is largely a manual operation and inefficient at best. Moreover, the performance of individual fire departments differs widely, depending greatly on the skill with which the apparatus is used and the degree of advance planning for fire operations. Fires in large warehouses, lumber yards, or chemical plants and similar occupancies require multiples of the basic force described. Only about 3 percent of the fire departments in this country have such multiples. As a result, the majority of fire departments usually have difficulty in extinguishing well established fires in the larger structures in their communities. Thus, much of the effort of these departments is directed towards saving lives and preventing the fire from spreading. Large industrial and

military complexes frequently maintain their own fire departments, and business establishments, warehouses, churches, etc., maintain automatic sprinkling devices. These additional private resources, along with mutual aid pacts, tend to strengthen the capabilities of most contemporary fire departments. Moreover, many large fire-fighting organizations possess at least a few pieces of reserve apparatus which can be used during periods of high demand by manning them with recalled off-duty personnel. These reserve apparatus are usually older pieces of equipment which could not be used continually. It is unclear how extensively these obsolete apparatus could be used and still be operative.

Larger cities usually employ fire personnel for forty-eight to fifty-six hours a week. Fire suppression and ambulance-rescue personnel usually work twenty-four-hour shifts followed by forty-eight hours off duty. Departments which have only a small core of professional, full-time employees must rely on some auxiliary firemen who are paid per call when they work. Because these men must commit themselves to at least a minimum amount of drill and practice and because they are obliged to perform some maintenance functions, they work about ten hours a week (although the figure varies widely). An increasing number of fire organizations which once relied totally on volunteers are providing at least a token force of full-time personnel to handle communications and the maintenance of stations and apparatus. In these departments the paid personnel receive incoming calls for service and drive the fire apparatus to the scene of the emergency. A larger number of volunteers then joins the full-time personnel to aid in the operational duties of the department at the scene.

Usually fire officials recommend that each engine or ladder company include at least four men, for it takes this number to put the apparatus in service. The desired figure for each company is more likely to be five or six. Thus, a basic response unit of two engine companies and one truck company includes from twelve to eighteen firemen and company officers plus at least one battalion chief or his equivalent. Since these men are likely to be on duty 56 hours during a 168-hour week, two additional shifts of similar size must be maintained. In order to operate a basic response unit of two engine companies and one truck company around the clock, seven days a week, a fire department must have anywhere from thirty-six to fifty-four men plus three chief officers. Most fire departments in the United States do not approach this level; rather, they are likely to utilize three-man companies with one of the company officers, a captain or lieutenant, in charge. Officers with rank above captain are usually summoned when needed or respond as their other duties permit.[8]

The typical city fire department with all paid personnel is usually dispersed in a number of stations located throughout the city convenient to all areas of the community. The size of the city and the nature of the department in addition to existing laws and fire regulations determine the number and placement of fire stations. Usually fire companies are assigned to specific districts for which they are primarily responsible. The establishment of districts enables departments to fix responsibility for fire responses in every possible location; to put the relatively slow and cumbersome fire apparatus within reasonable distance of the lives and property being

protected; and to operate apparatus around barriers such as rivers, railroad tracks, and so on.

Each station customarily houses one or more pieces of apparatus and the men necessary to man them. The men live in the station during their on-duty hours which usually consist of a twenty-four-hour shift. Eating and lodging facilities are provided for company personnel in most large stations at present, although some departments have begun twelve-hour shifts which permit personnel to return to their homes after each working day. The stations in these departments serve chiefly as storage garages and as liaisons with the department's communications center.

The American Insurance Association (AIA) determines to a large extent the degree of dispersion of fire companies and also recommends the running distances for apparatus. At reasonable running speeds, the standards classify a two to five minute response as good to excellent. The AIA also establishes other standards including many of the fire department's administrative policies. Professional fire department personnel frequently resent the imposition of standards on their organization by the AIA, feeling that many of the association's standards are outdated and that many of them have introduced an undesirable degree of rigidity into the distribution of fire-fighting resources. Further, professional fire personnel know that over the past forty years fire organizations have rarely been faced with the major catastrophic conflagrations which once threatened American cities.[9] Yet, most fire-fighting resources are still distributed to cope with potential hazards which have been mitigated in recent years by modern devices requiring considerably less fire department attention than they once did.

Generally, fire departments in urban centers seem to be organized around several basic criteria which are designed to prevent and to combat fires successfully. These criteria include the following:

1. Fire departments take the view that fire prevention rather than fire suppression should be their primary task. However, in terms of actual operations and organizational structure, it is the latter which takes precedence.

2. Fire departments usually carry on routine inspections with police and other officials to prevent fires and arson investigations to bring due legal processes to bear on willful violations of fire laws. However, there seems to be considerable variation from one fire jurisdiction to another in the seriousness with which inspections are conducted.

3. Fire departments also distribute personnel and equipment considering anticipated needs for service. As noted, the placement of stations, equipment, and personnel is made largely on the basis of AIA standards and not always in accord with the view of fire officials.

4. Large fire departments often have operational plans for large-scale emergencies. These plans include provisions for the recall of off-duty personnel, the activation of reserve equipment, the allocation of services on the basis of pre-established priorities, and the dependence on mutual aid pacts.

5. Fire departments try to have built-in flexibility so that routine protective services can be maintained at all times and any combination of requirements successfully met. For example, most departments have a routine "move-up" operation to reassign quarters for fire units during fire fighting to provide at least minimum protection for all areas within the city at all times.

6. Communication between the various stations and units in the field and central headquarters is an extremely crucial factor in providing adequate fire protection in urban areas. Therefore, fire departments try to maintain a communications network which coordinates nearly all fire department operations during emergency periods.

7. Fire departments are typically organized to activate sufficient manpower for all phases of their operation. Moreover, these organizations are structured so that manpower can be used quickly and so that a superior officer can always supervise the responding force at the scene. Therefore, fire departments are usually organized so that the chain of command and responsibility is clearly established and understood. Fire officials generally feel that there should be a clear demarcation of departmental authority. They believe that the ultimate authority at all times and immediate authority most of the time ought to be vested in the department's chief officers, especially in matters related to emergency operations such as fire suppression.

8. Fire departments try to keep accurate records on all emergency-related activities. These records include the time an emergency call is received, the equipment and personnel dispatched, the location of the emergency, cause and approximate damage (if the emergency is a fire), along with any other pertinent information. Large departments usually tape record communications between units in the field and communications centers. They are frequently required by law to record all incoming telephone calls and to preserve these records at least twelve months.

9. Fire departments try to maintain coordination with other organizations in the community such as the police and public works departments, the safety director, the utility companies, etc., with whom they function in community emergencies. However, fire organizations are probably more independent of other groups than most community emergency agencies. This probably stems from the fact that fire groups deal primarily with fire-related problems, unlike such organizations as police departments which may be involved with a wider range of problems.

The operation of a typical large urban fire department can be understood by tracing its activities throughout a fire emergency. (As noted, there are emergencies met by fire departments which are not related to fire prevention and suppression; for example, life-saving squads operate in many large and small fire departments. The major activity of most departments is, nonetheless, that of fire prevention and fire suppression.) The first stage of a fire department's response occurs when an alarm is received at the communications center. The emergency can be reported in any or all of the following ways: (1) by an automatic alarm system located in a warehouse, factory, store, etc., (2) by an alarm box located on one of the streets or in one of the buildings of the city, (3) by telephone. After the communications operator receives the alarm, he completes a ticket or small form, records the time, and passes the ticket to a dispatcher. The dispatcher notes the address and consults if necessary a master card file to locate the street. The street card sometimes indicates the type of structures on the street, especially if it has the potential for major fire and life hazards. Each of these cards also includes instructions on which companies are to be dispatched and which ones are to be sent in case additional men and equipment are needed. The availability of the apparatus indicated on the file card is cross-checked against a current status list indicating which apparatus are in the repair shops or out of service. The dispatcher, discovering that a company is not at full strength for any reason, may direct a neighboring company to respond to the emergency although it would not normally do so on a first alarm fire. The dispatcher then alerts the companies involved in one of several ways. He may call the individual station on the phone, he may use a radio, a public address system, and/or a telegraph. Frequently the initial alarm will be sounded in the station by one of these methods and then will be confirmed by another means.

The nature and location of the fire largely determines the amount of equipment and personnel to be dispatched. In cases of high life and property hazards such as a store in the central business district, a hotel fire, or one in a sizable industrial plant, a large complement of men and apparatus is dispatched immediately. On the other hand, an automobile or rubbish fire would occasion a much smaller dispatch, perhaps only one engine company. Many departments automatically dispatch a life-and-rescue squad to all fires where possible injury or life hazards exist.

As soon as the responding companies reach the scene, the situation is appraised. The officer in charge, usually a captain or lieutenant, then notifies the communication center. If it is a "working fire," i.e., one which will demand all of the resources initially dispatched, the communications center is notified so that the dispatchers there know that certain companies are out of the quarters and unavailable for additional duty. If the officer in charge at the fire requests additional equipment and manpower, the communications center sounds a second alarm and dispatches the appropriate companies. If the original dispatch is more than needed, excess companies are returned to quarters and the communications center notified.

Multi- or general alarm fires which demand a great response of men and equipment could conceivably deprive one or more areas of the city of the protection normally afforded it. In order to avoid this, the dispatcher may relocate nonactivated companies, moving some of them into quarters vacated by companies in service. If the fire becomes a major conflagration, mutual aid pacts with neighboring departments may be employed. Communities such as Los Angeles with a civil defense organization which possesses apparatus and limited personnel can, when necessary, rely on these resources as well.

The officer in charge at the scene releases the companies under his command as the situation warrants. The various companies return to their stations and the company officer completes a company run report and then enters it in the station's log book. If the fire has been large enough to warrant the presence of a battalion or division chief, he may also prepare a preliminary report which constitutes the nucleus of the file on a particular fire. His report notes the time, date, place, and nature of the fire, the companies responding, an account of the damage caused, and any other relevant information. After the officer in charge receives the report sheets from the various company officers, he prepares a final file on the fire by using summary sheets. These sheets may include any or all of the available material: month, date, day of week, hour of day, number of engine companies used, number of ladder companies used, number and length of hose lines used, number and length of ladders raised, number of persons injured or killed, occupancies involved, number of fires, dollars of damage (estimated), how the alarm was transmitted, insurance on building, methods of extinguishing the fire, etc. These summary sheets are usually submitted to one of the department chiefs, and then filed for future reference. In some states copies must be submitted to the office of the state fire marshal.

Summary

Fire departments in the United States vary greatly from city to city. Most cities under 10,000 population have predominantly "volunteer" departments; those over 100,000 almost always have "all paid" departments. In all cases, the standards under which fire-fighting organizations operate are directly related to those established by the American Insurance Association and the laws of the state. The chief tasks of fire departments in the United States are usually defined as including: (1) the preservation of human life, and (2) the protection of property.

The "typical" urban fire department is organized along paramilitary lines with a sharply defined authority structure. There is a clearly visible chain of command which is rather rigorously followed, especially in emergency situations. The resources of large fire departments, including personnel and equipment, tend to be dispersed throughout a geographic area to provide maximum protection for all life and property. Areas of high life and property hazard tend to be well protected, while sparsely settled areas lacking in property development receive much less attention.

Fire departments tend to be organized to provide at least a minimum of protection against major conflagrations such as those which occurred in a number of American cities at the turn of the century. Most fire departments in the United States have mutual aid agreements with neighboring departments. Through mutual aid agreements the various fire groups in a geographic area can bring their collective resources to bear upon major conflagrations and/or other large-scale emergencies.

Modern fire departments in urban centers are both centrally controlled and geographically dispersed. They must be directly accessible to the general public and maintain close communication with certain community organizations such as police and water departments, and utility companies as well as with their own units operating in the field. Thus, the communications center of most large fire departments serves vital and indispensable functions.

FOOTNOTES: Chapter I

1. A Study of Fire Problems, Publication 949 (Washington: National Academy of Sciences-National Research Council, 1961), p. 1.

2. Municipal Fire Administration (Washington: International City Managers' Association, 1967), p. 2.

3. For a more detailed account of technical problems, see A Study of Fire Problems.

4. Fire Service Directory (Boston: National Fire Protection Association, 1966-67), p. 1.

5. Elizabeth Smedley, Local Fire Administration in Pennsylvania (University Park: Pennsylvania State University, Institute of Public Administration, 1960).

6. James F. Casey, "Small Departments Report Through Time Financing," Fire Engineering (October 1964): 848-49.

7. Fire Service Directory, p. 2.

8. Much of the above description has relied heavily on A Study of Fire Problems, pp. 11-25.

9. For graphic description of large conflagrations in American cities, see Charles F. Haywood, General Alarm: A Dramatic Account of Fires and Fire-Fighting in America (New York: Dodd, Mead and Company, 1967).

CHAPTER II

DISASTER-RELATED TASKS OF FIRE DEPARTMENTS

Along with the police department, the fire department is considered one of the organizations to be called upon if any difficulties arise for individual citizens or for any segment of the community. In disasters, it is usually one of the first organizations to be alerted and to be on the scene. In addition, it tends to symbolize the involvement and the authority of the community through its use of uniforms and identifiable equipment. Its involvement in disaster activities is based on its pre-disaster responsibilities in preserving life and property but, under certain disaster conditions, it may also become involved in many other activities which the department sees as being related to the purpose of "service to the community."

Pre-Disaster Organization and Tasks

The previous chapter indicates that fire departments are largely the creation of local communities and are organized, equipped, and manned in anticipation of hazards to human life and property. While the specific organizational patterns of fire departments in the United States may vary, their task assignments are largely uniform. Fire codes and state laws produce much of this uniformity. The overwhelming majority of fire department charters clearly enumerate responsibilities related to the preservation of human life and property. The public frequently identify these tasks as being almost exclusively associated with routine fires as well as major conflagrations. However, most fire departments in urban centers respond to many kinds of emergencies, a large number of which are not associated even indirectly with fire suppression, e.g., drownings, electrocutions, asphyxiations, home and industrial accidents, and even occasionally the delivery of babies. While fire department personnel specialize primarily in fire-related skills, many departments also have specialists in communications, in mechanics, in the techniques of handling hot electrical lines, in rescue operations, as well as other emergency skills. Because they possess personnel with a rather wide assortment of skills and have the special equipment necessary to implement these skills, it is easily understood why fire departments become involved in many different kinds of community emergencies.

Although fire departments have the personnel and technological resources to deal with many diversified emergency situations, in most instances their tasks fall into one of the two broad categories associated with their establishment: the preservation of human life and the protection of property. Thus, even when the personnel of a fire department become involved in search-and-rescue operations, they are engaging in tasks related to the "lifesaving" normally carried on by them. Moreover, while the emergency situations in which fire departments function frequently change, the tasks they perform remain, for the most part, the same.

In addition to the consistency of tasks, the vast majority of fire departments, regardless of size, tend to share certain organizational patterns. This similarity of organizational features, in part reflecting the recommendations of fire officials in national prevention and regulatory agencies, has been described in chapter one. The most prevalent pattern conforms to the traditional bureaucratic model of organization with clearly defined staff and line positions. The line positions are arranged in hierarchical fashion with a sharply delineated paramilitary authority structure; the ranking officer at a fire or other emergency is automatically in charge of operations until he is superseded by an officer of higher rank. Fire personnel respond to emergencies in groups and are rarely, if ever, without the direct supervision of departmental officers.[1]

Another integral factor in the organization of fire departments is their adaptation to fluctuations in demands. Studies of fire departments indicate that there are both daily and seasonal fluctuations in the number and kind of demands made on them. For example, more alarms are recorded during the hours of 8:00 a.m. and 4:00 p.m. than during any other eight hour period of the average day. The number of alarms are fewest between midnight and 8:00 a.m.; however, more building fires are reported during the night than during the day because of a large number of relatively unattended buildings in the business districts after 5:00 p.m., and because persons retiring for the night are not likely to detect a fire until it gets enough of a start to require department attention. Rubbish, brush, and vehicle fires are much more numerous during the daylight hours than they are at night and the high incidence of these alarms accounts for the fact that more alarms are recorded during the day than the night.

Most of the nation's residential fires occur during the winter months when furnaces and other heating devices are in operation, while brush, grass, and forest fires are largely confined to periods of drought in the late summer and fall. The summer season also increases demands on fire departments through boat fires, drownings, and other accidents associated with outdoor activity.[2]

These daily and seasonal fluctuations cause few organizational problems for today's urban fire departments since most take them into account. For example, most fire departments have their greatest complement of personnel on duty during the daylight hours. The highest ranking officers -- those above the rank of battalion chief -- customarily work an eight-hour-a-day shift. This shift arrangement permits the chief administrative officers to conduct the department's business during that period of the day when most of their counterparts in other organizations are also on duty. It also enables them to be on duty during the department's peak emergency hours when they are most likely to be needed for consultation regarding fires or other situations. Usually, the communications center operates with a somewhat reduced staff after midnight. A number of fire departments, such as those in areas subjected to recurrent forest and brush fires, frequently increase the number of auxiliary fire personnel during periods of extended drought. In short, fire departments as emergency-oriented organizations attempt to provide

sufficient personnel and resources in keeping with the potential threat to life and property. Regardless of how adequately staffed and equipped a fire department might be, there are occasions when the usual complement of personnel and apparatus are not adequate to their needs. Many departments recognize the possibility of extreme demands and attempt to prepare for it in advance: (1) by structuring their available resources to have a back-up force of apparatus and personnel; (2) by preparing emergency operating plans; and (3) by developing mutual aid pacts with neighboring departments and with civil defense organizations when the latter have personnel and apparatus. Because of these adaptations to demand fluctuations, the fire department is well prepared, compared with most other community emergency organizations, to cope with the increased demands which are likely to characterize a disaster situation.

The performance of emergency duties, however important, does not constitute the sum total of a fire department's activity. Like all complex organizations, fire departments must perform certain tasks of an intra-departmental nature in order to maintain their long-term operational efficiency: the recruitment and training of personnel, the purchase and repair of equipment, the construction and maintenance of buildings, the provision of staff services (including hospitalization and pension plans), etc. The performance of some of these tasks of organizational maintenance may be temporarily disrupted during periods of heavy organizational demand. However, their continued neglect over an extended period of time would ultimately result in a considerable lessening or complete breakdown of the organization's capability. Fire officials are aware of this and generally attempt to restore their departments to "normal" procedures as quickly as possible following large-scale emergencies.

Since fire departments are important to the maintenance of community well-being and because the responsibilities assigned them are usually of a high priority nature, maximum efforts are made to keep lines of communication open not only internally but also with the public and with the other organizations in the community on whom they are dependent, e.g., the various utility companies, the police and public works departments.

A 1965 survey conducted by the National Fire Protection Association of fire departments serving communities of 20,000 population and over obtained the following information on fire alarm service: Of 685 fire chiefs responding to the question on alarm service (approximately 750 were contacted), 398, or 58 percent, reported using telegraph type boxes; 90 chiefs, or 13 percent, reported telephone type boxes; 23 had both types; one had radio operated boxes; and 173, or 25 percent, had no fire alarm boxes. A number of chiefs reported protection by American District Telegraph boxes and other sprinkler supervisory alarm systems protecting schools and private property. Four hundred and forty-one of 547 chiefs (81 percent) responding to the question on alarm service supervision indicated that the fire alarm system was under their direct jurisdiction.[3] Through these alarm services, fire departments attempt to remain accessible to the general public. Moreover, in a great many cities, the local telephone company has arranged that telephone operators automatically transfer incoming calls for fire department assistance directly to the fire department communications center.

In addition to these extensive alarm systems by which the general public can communicate their needs to local fire departments, many departments have direct-line telephone service to a number of other organizations. Many urban fire departments have direct-line telephones to police, street, water, and utility companies. Through these facilities, fire communications personnel are apprised of certain potential impediments to their operation. If a street is closed or water main out of operation, fire communications personnel contact the various fire stations in the area so that responding companies will know in advance of possible delays, etc. Frequently these linkages are crucial.

Intradepartmental communications are especially important during periods of high organizational demand. All major fire departments have a rather complex communications network which links a central communications center with the various stations in the department. Additionally, the communications center can maintain contact with operating units in the field by using two-way radios. The same National Fire Protection Association study cited above reveals that of the 697 communities with a population over 20,000 reporting, 91.5 percent have 100 percent of their vehicles equipped with radio. Of the 60 cities not having complete radio, 17 had all but one vehicle equipped and 13 had all but 2 vehicles equipped, leaving only 30 cities, or 4.3 percent with more than 2 radioless vehicles. Only one fire department reported having no radio equipment.[4] When, for any reason, the communications system which integrates the department's supervisory, logistical, decision-making, and operational efforts ceases to function adequately, the department's effectiveness is likely to be reduced.

In sum, fire departments in the United States are largely creations of the communities within which they operate. (There are some departments which are organized and maintained by civil defense agencies, but these represent a very small percentage of the total number.) The vast majority of the fire departments in this country have two overriding purposes: (1) the preservation of human life, and (2) the protection of property. While there are many situations in which fire departments carry out other tasks indirectly associated with these purposes, they try to confine their activities almost entirely to the above purposes. The communications systems of most city fire departments are quite complex and technologically sophisticated. These systems include facilities by which they can maintain extensive intradepartmental communications through telephones, public address systems, telegraphs, and two-way radios. A disruption of a fire department's communications network, especially during periods of high demand, would pose a serious problem for the department; therefore, most large departments have a number of alternative or "back-up" systems at their disposal.

The Disaster Involvement of Fire Departments

Because of its status as one of the two major emergency organizations, along with the police department, the fire department is likely to be one of the

first community organizations to be aware of the impact of a community disaster. This is less likely to come about through the reporting of an organizational member than by the fact that the communications network of the fire department allows it access to emergency calls to other organizations -- notably the police. Police department personnel are much more likely to monitor the environment within the community and to be alert to disaster cues; but their reporting and the reporting of others is generally monitored by the fire department. The department, of course, may be notified itself since there is general knowledge that it constantly maintains personnel and equipment which might be of value in an emergency. Once notified, the degree of involvement of fire departments in community emergencies depends on a number of factors: (1) the nature of the precipitating event, i.e., whether the event is a hurricane, flood, explosion, etc.; (2) the magnitude and duration of the emergency; (3) the resources possessed by the department; and (4) the availability of other community and extracommunity resources.

Disaster agents can be classified on a number of dimensions, e.g., amount of warning, scope of impact, suddenness of impact, the nature of the agent. Disasters in which fire is the major threat rather than a secondary one are currently relatively rare in the United States. This is somewhat in contrast to the historical importance of fire-related disasters and the vividness with which these events are remembered. For example, fires have played an important part in the following classes of events in the past:[5]

1. Fires involving the burning of large portions of cities

   London, 1666. Estimates placed two-thirds of the city in rubble (13,200 buildings destroyed), but official figures indicated only 6 killed out of a population estimated at 600,000.

   Chicago, 1871. In 24 hours, 250 people were killed and 17,000 buildings burned. Most of the business section was wiped out; damage was valued at $168 million. The area destroyed extended over 3½ square miles.

   San Francisco, 1906. In 48 hours, fire devastated 4 square miles of the city, burned 28,000 buildings, and killed 452 people. Damage was estimated at $1 billion. At that time the city population was about 400,000.

2. Fires involving structures and concentrations of people

   Iroquois Theatre, Chicago, 1903: 602 killed

   Lakeview School, Collingwood, Ohio, 1908: 175 killed

   Triangle Shirtwaist Comapny, New York, 1911: 146 killed, 70 injured

   Cocoanut Grove Nightclub, Boston, 1942: 492 killed

Ringling Brothers, Barnum and Bailey Circus, Hartford, 1944: 163 killed, 261 seriously injured

Hotel Winecoff, Atlanta, 1946: 119 killed, 163 injured

3. Ship fires

S.S. Morro Castle, off the coast of New Jersey, 1934: 134 killed

S.S. Grandcamp, Texas City, Texas, 1947: Fire started in the hold and the ship exploded, killing 400. A nearby plant caught on fire as well as other ships. The fire burned two days, 1,000 were killed, 4,000 were injured, and the loss was estimated at $67 million.

4. Forest fires

Peshtigo Forest Fire, Wisconsin and Michigan, 1871: 1,500 killed

Minnesota Forest Fire, 1918: 500 killed

Maine and New Hampshire Forest Fires, 1947: 16 killed, 1,200 homes destroyed

5. Wartime fires related to bombing[6]

Germany, World War II: Approximately 80 percent of all destruction in Germany was caused by fire.

Rotterdam, 1940: After the initial bombing, fires developed and in a four-day period, the fire area spread to approximately one square mile. Some 11,000 houses with 25,000 living quarters were destroyed, 1,147 persons killed.

Hamburg, 1943: Fire destroyed an area of about one square kilometer, 30,000 killed, 37,000 injured. Of 450,000 houses, 253,000 were destroyed, and 45,000 were damaged.

Tokyo, March 1945: The fire area covered about 15 square miles, 84,000 died and 40,000 injured. Over 267,000 buildings were destroyed.

While most of the preceding examples have been historically important, they are also relatively unique and historically conditioned. Most of the fires which destroyed large portions of cities occurred at a time when construction methods permitted such a spreading fire, and also occurred before the development of professional fire departments. Many of the fires involving structures and large concentrations of people led to the development of building safety standards and legal standards involving fire protection measures. Ship fires led to the development of standards and safety precautions including measures for the loading and storage of volatile materials. Wartime fires

caused by bombing are also historically specific. In other words, the recurrence of such disasters in more modern times, while possible, is unlikely. Changes in technology, the establishment of standards and safety measures, and the development of improved fire-fighting methods and techniques have lowered the risk considerably.

Since our primary focus is on the fire department in disasters, this also precludes major concern here with forest fires. While forest fires still occur with regularity in some sections of the United States, the response to such fires usually involves a form different than one would find in most community disasters. The techniques used -- water and chemical bombing, back-burning, etc. -- are seldom used in fires in more heavily populated communities. In addition, the organization to fight such forest fires in the United States usually involves a relatively unique coalition of forces, including the U.S. Forest Service, a number of small fire departments, and a large number of volunteers.

The major focus here will be on fire department operations in communities which have experienced major disasters involving fire or the threat of fire and which place extensive demands on the fire organization. These can occur in a variety of situations, although many specific disasters do not involve a high fire threat and subsequently do not present demands on the fire department. In recent years, a new type of "disaster" in the United States, civil disturbances, has provided situations with high threat of fires. During the 1965 Watts disturbance in Los Angeles, over 600 buildings were damaged by fire, 200 of which were totally destroyed. Approximately 750 structures were damaged or destroyed during the Detroit disturbance in 1967, one-third of which were residences. Other disturbances, which were not as severe, have also produced extensive fire damage. Because of the recent importance of these situations and because they have been situations in which high demands were made on the fire department, we have included observations about them here with the more traditional types of disaster agents.

As a beginning to understanding the operations of fire departments in disaster, it is important to place them in the context of involvement in disaster activities by all of the organizations within the community. Seeing how the fire department relates to other involved organizations provides the beginning to understanding some of the problems of the department.

The Context of Organizational Involvement

To clarify the discussion of fire department activities in disasters let us look first at the role of the fire department in relation to other organizations in the community which also become involved in disaster work. To illustrate this involvement, organizations performing disaster-related

tasks can be seen as constituting four different types. These can be derived by cross-classifying two variables: (1) the nature of the disaster tasks which are undertaken by the various groups, and (2) the nature of the emergency period structure of these groups.

In a disaster, a group's tasks may be those which are everyday, routine, assigned responsibilities; or, instead, the tasks may be new, novel, assumed, or unusual for the groups involved. If a police department controls traffic, a fire department fights fires, a radio station transmits news, or a hospital treats the injured, these are regular or traditional tasks for such groups. On the other hand, the nonregular or newly created nature of tasks are seen in situations where a National Guard battalion has the responsibility of providing water for a community, an American Legion post shelters evacuees, or firemen sort and distribute clothing from a relief center. Thus, it is possible initially to divide organizations into those having regular and those having nonregular tasks.

It is also possible to differentiate between groups with an old or existing structure, and those with a new or crisis-developed structure. The former is one in which members have definite pre-disaster social relationships with one another, especially in their work activities, and exist as an entity prior to the disaster event. During a disaster, the members of such groups work in somewhat the same work relationships they had prior to the emergency. Thus, the members of a city fire department activated in a disaster maintain their normal pre-disaster work relationships while they engage in tasks during the emergency.

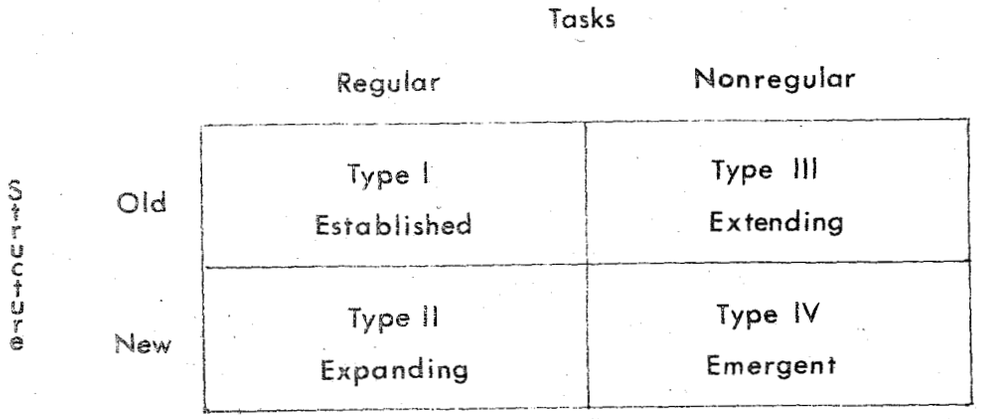
On the other hand, new structures may come into being during the emergency. Such groups may either mushroom from a small pre-disaster core or they may involve the crystallization of some totally new entity. The crucial feature is that such groups have no actual pre-emergency existence, at least in the form which they take during the emergency. An example would be a local Red Cross chapter whose handful of full-time paid personnel provides the nucleus for the volunteers who undertake most of the expanded group's work. An example of an emergent group would be the search-and-rescue teams which develop in the immediate post-disaster emergency period.

The particular types which occur in the immediate post-disaster period are depicted in figure 2.

Type I is an established group carrying out regular tasks. This is exemplified by a city fire department fighting a fire caused by a ruptured gas line after a tornado struck a community.

Type II is an expanding group with regular tasks. The group frequently exists "on paper" not as an ongoing organization prior to the disaster event, and would be illustrated by Salvation Army volunteers running a feeding operation after a hurricane.

FIGURE 2: TYPES OF ORGANIZED BEHAVIOR IN DISASTERS



Type III is an extending group which undertakes nonregular tasks. This is illustrated by a taxi company utilizing its men and equipment to transport casualties during rescue operations.

Type IV is an emergent group which becomes engaged in nonregular tasks. An example is an ad hoc group made up of the city engineer, the police chief, a local representative of the state health department, and a Red Cross official which coordinates the overall community response during a flood.

Type I organizations, such as fire departments, are operating entities prior to a disaster event. When they enter into disaster activities, they usually have specific tasks, fairly clear-cut lines of authority, designated channels of communication, and explicit roles for decision making. These organizations become quickly involved in any community emergency. Other organizations within the community and individuals within the specific organizations, on the basis of their past experiences, expect such organizations to enter immediately into emergency acitvities.

Personnel of Type I organizations have a decided advantage in operating in an emergency context since they can carry prior work relationships as well as knowledge of the previous functioning of the organization into their disaster activities. Because most of the tasks which such organizations perform during disasters are the same as the tasks performed during normal times, they have little or no problem dealing with unfamiliar tasks, a problem which Type III and IV organizations experience.

Fire Department Tasks

The fire department as an example of Type I organizations, is accustomed to performing practically all of the tasks it encounters in disasters. In fact, the tasks it does perform are in direct continuity to its pre-disaster responsibilities. For example, following a tornado which devastated parts of a midwestern city in June 1966, the fire department became heavily involved in search-and-rescue activities. To a lesser degree, a northwestern municipal fire department became similarly involved after a 1964 earthquake destroyed a large number of structures in that city. In each of these cases, fire personnel were carrying out tasks normally associated with their departments, that of saving lives. The disaster within which each functioned was different from the other and neither was directly associated with an actual fire. The common feature of the two situations is that each department had personnel and other resources which could be utilized in the saving of lives. Following the tornado in the midwestern city, the fire department took an active role in searching for fallen high voltage electric lines and broken gas mains for two primary reasons: (1) each posed a threat to human life, and (2) these conditions occurring together created a serious fire hazard. Thus, while fire personnel were engaged in duties not normally associated with fire department operations, when viewed from a narrow perspective, they were performing tasks related to the saving of human life and property.

The continuity of tasks from their "normal" activities into disaster situations means that fire departments are dealing with situations with which they are familiar. Also disasters which do not involve extensive search-and-rescue or fire problems tend to be defined as being peripheral to the skills and resources possessed by fire departments. Consequently, their response is usually confined to the immediate emergency period when the climate of the community necessitates the response of all of its emergency organizations. During this emergency period, fire personnel are likely to become involved not only in search and rescue but also become somewhat involved in traffic control, the restoration of vital communications services, the transporting of injured to hospitals, and the provision of equipment, personnel, and other resources to high priority tasks.

Usually fire department personnel actively resist the performance of tasks not clearly associated with their two major tasks. Thus, in three major cities observed, fire department officials, in conferences with governmental officials prior to civil disturbances which occurred in their cities, indicated their opposition to the use of department personnel and/or equipment for riot suppression duties. Although in one city all firemen were deputized and some "volunteers" were armed during the disturbances there, this was seen as self protection. Firemen were instructed not to attempt to apprehend looters or to engage in social control functions normally assigned to law enforcement personnel. In another city, the firemen were prohibited from carrying firearms during the disturbances and were instructed to use heavy streams of water against rioters only in situations of self defense.

In a third city, fire department officials were adamant in their refusal to use fire personnel or other department resources for riot control duties.

When fire department personnel and/or equipment are committed to non-regular tasks following community disasters, fire officials attempt to disengage departmental resources as quickly as possible. Whether intentional or not, this practice keeps the demands on fire departments within the limits of their capabilities; it also assists in maintaining their organizational boundaries; and, it keeps them relatively free in case they must respond to those emergency situations with which they regularly deal. One northwestern department, as noted above, became involved in search-and-rescue operations following an earthquake there in 1964. As quickly as the initial search was completed the fire department withdrew and engaged in preparations to combat any fire which happened to break out. A highly dangerous situation existed in the port area of the city where thousands of gallons of gasoline had been dumped into the water by the rupturing of several large storage tanks. The threat was defined as being so great that fire officials gave it higher priority than the on-going search-and-rescue effort. The search-and-rescue effort, however, had almost been completed and could be completed by the nonfire personnel.

The continuity of tasks, the reluctance of the fire department to become involved in other peripheral tasks, and the rapid disengagement of the department from initial emergency tasks enables the fire department to control the demands made upon it perhaps better than any other community emergency organization. By contrast, the police department has a much greater scope of responsibility (or perhaps a much more ambiguous role) so that it becomes involved initially in a wider scope of disaster responsibilities. The fire department is able to delimit its responsibilities on the grounds of the necessity of maintaining a stance of continual fire readiness.

The fire department, of course, also has the advantage of other Type I organizations in that its members are accustomed to working together as a unit and are familiar with the procedures and operations of the organization. Because of this, these types of organizations have fewer operational problems than do other types. Further, the fire department has a rather paradoxical advantage over most other organizations which become involved. In disasters, untrained volunteers are sometimes necessary as a temporary labor force, but they tend to create organizational problems in integrating them into the work force. Since the basic unit of the fire department is the company, the availability of equipment tends to place a limit on the amount of departmental expansion possible. In other words, efficiency is not necessarily increased by adding several men to each company. Therefore, there are technological and organizational limits to the use of volunteers. Of course, some fire departments depend on volunteers as a part of their regular operation. In these instances, fire departments are one of the few established organizations which have trained volunteers available and the organizational mechanisms ready to utilize them efficiently.

In effect, we have suggested that the fire department is most likely, among all of the community organizations which become involved in disaster activities, to continue to cope primarily with tasks which are similar -- in many cases identical -- with their pre-disaster responsibilities. It is also able to bring into its disaster activities a somewhat similar and intact organizational structure so that it does not have to cope with incorporating new members and new procedures during a time of high demand. By its insistence on its primary mission of maintaining a stance of fire readiness at all times, it is able to "avoid" being given added and unfamiliar responsibility for new and unique disaster tasks. Consequently, the fire department perhaps changes less than any other organization from its pre-disaster to its disaster operations. This does not mean, however, that its operations are without difficulties in disasters which produce high demands. Often the department does have to expand its capabilities to meet excessive demands. The next chapter deals with these adaptations.

FOOTNOTES: Chapter II

1. This organizational characteristic is in contrast to police departments where individual patrolmen are sometimes confronted with emergency situations which demand such an immediate response that they cannot consult with supervisors before acting. This may be one of the reasons that more of the acts of individual policemen are criticized by the public at large than are those of individual firemen. In addition, the range of tasks performed by individual policemen are less amenable to formal structuring than those performed by firemen. However, the more important difference between the operation of police and fire departments is that the former have traditionally responded to emergencies as closely supervised groups whereas the latter have been frequently required by the nature of their tasks to rely on the response of one or two patrolmen.

2. For a more complete analysis of fire demands see Charles S. James, A Frontier of Municipal Safety (Washington, D.C.: Public Administration Service, 1955), chap. 6.

3. Fire Service Directory (Boston: National Fire Protection Association, 1966-67), p. 19.

4. Fire Service Directory, p. 22.

5. See Charles F. Haywood, General Alarm: A Dramatic Account of Fires and Fire-fighting in America (New York: Dodd, Mead and Company, 1967) and Hugh Clevely, Famous Fires (New York: The John Day Company, 1958).

6. See Hans Brunswig, Practical Experiences of Fire Protection Services (Washington: Institute for Defense Analysis, 1966); Carl F. Miller and James W. Kerr, Field Notes on World War II German Fire Experience (Menlo Park, Cal.: Stanford Research Institute, 1965); and various reports of the U.S. Strategic Bombing Survey.

CHAPTER III

ADAPTATION TO DISASTER TASKS: OPERATIONAL PROBLEMS

As we have indicated in the previous chapters, every organization develops certain patterned ways of carrying out its tasks. For fire departments these are based on their day-to-day experience with routine emergencies as well as anticipated extraordinary demands. Anticipating functioning in widespread emergencies is different, however, from actually operating in them. There are certain dimensions of the emergency situation which provide an operating context for the fire department that is quite different from normal operations.

The Development of a New Context for Operations

Immediately after disaster impact, organizations such as the fire department, have to operate under conditions of great uncertainty. Initially a disaster event provides only tentative suggestions as to the scope of its impact and, therefore, emergency organizations have little accurate knowledge as to the magnitude of the demands that will be made upon them in the ensuing hours. A common tendency among individuals in all organizations is to "do something." With such motivations, organizational members sometimes become involved in activities which have little relationship to their pre-disaster activities or to the organization's anticipated role in such an emergency. Commitment of individual members often leads to the commitment of other organizational resources. Once involved in a particular endeavor, organizations may find it difficult to divest themselves of these newly acquired responsibilities. The fire department, because its structure is based on the company format, is not as likely to become involved in "extraneous" tasks as a result of members acting on their own as is, for example, the police department where the autonomous actions of patrolmen can claim other resources and capabilities of the department. The fire department, however, is more likely to confront another problem. Being a community organization with known capabilities, there is always the expectation that the fire department will become involved in an emergency. It generally has emergency plans which allow quick mobilization and it is likely to possess significant resources which are ready and waiting. During the early part of the emergency period, in the absence of a clear definition of the scope and nature of the tasks which have been created by the disaster event, there is "pressure" generated both internally and externally, to become involved.

The most persistent dilemma that the fire department faces in disaster is its ability to maintain what it sees as its major task, that of fire suppression, in the face of other demands which emerge in the post-impact situation. Post-impact develops an emergency consensus, that is, an implicit agreement among community members as to what tasks are important. While

"normal" community life is characterized by multiple and somewhat contradictory values, a disaster event tends to order values more explicitly. By and large, care for victims takes first priority, and other tasks which are not somehow related to this overriding concern tend to be given lower priority. In this context, if there have been no major fires created by the impact of the disaster agent, fire department members, feeling the collective expectations of the community to use their resources to help in some way, do become involved in other disaster-related tasks. Fire personnel often participate in search-and-rescue efforts. While this is initially justified on the grounds of protecting human life and therefore within the scope of the organizational charter of the department, officials often exhibit great ambivalence toward such involvement. They are concerned about what they see as their more central tasks of fire suppression and prevention. It has been our observation that they almost immediately attempt to withdraw to a fire readiness stance. Their immediate response fulfills community expectations about their role in emergencies; pulling back to fire readiness fulfills their prime organizational responsibility. Until the transition is made, however, there is considerable anxiety and ambivalence among fire department officials.

Even with the new operating context in the emergency period after a disaster event, fire departments usually have a number of adaptations which they can make to a rapid increase in demands.

Planned Adaptations to Excessive Demands

Fire departments are perhaps one of the best organized of the various community emergency organizations to cope with disaster tasks. To meet excessive demands which may be forthcoming in a disaster situation, fire departments sometimes have available reserve apparatus and/or have mutual aid pacts which can be invoked. This ability to increase the capabilities of a department is often an integral part of their own emergency operating plans. We will discuss these briefly before talking about other more direct internal adaptations which characterize departments.

A few large urban fire departments have at least a minimum number of reserve apparatus which can be mobilized for emergencies. These apparatus are most often manned by recalled off-duty personnel. For example, one fire department, the third largest in the United States, put twenty reserve companies into service during the fires related to a civil disturbance. These reserve companies were manned by some of the 875 men who were called to duty by fire officials. This was, however, an atypical adaptation to unusually heavy demands. Within most major fire departments, there is no such reservoir of reserve resources which can be tapped when demands begin to outstrip the department's normal operating capabilities. A fire department more typically handles large but nondisaster emergencies through assigning additional existing companies via second, third, fourth alarms, etc. These additional alarms rely on apparatus and personnel normally on duty. They are usually dispatched from stations near the ones from which the initial response was made.

A multiple alarm fire may "strip" an area of its fire protection. When this occurs, the communications center may institute a "move-up" of other apparatus and personnel. Major conflagrations in a community may so drain a department's resources that it is forced to rely on mutual aid assistance. The activation of reserve units and recall of off-duty personnel,when available, usually apply only to major conflagrations or to fires which threaten to become such. Undoubtedly, one of the factors explaining the primary reliance on "active" personnel and apparatus is that only a small percentage of the fire departments in the United States have significant reserve equipment. Without reserve equipment, the value of increased personnel is limited to relief of those on duty. The fire department of one large city only recalled a few off-duty personnel during a major civil disturbance because they had only one piece of reserve apparatus and it had been pressed into service immediately because one of the "active" engines broke down. At the time of the disturbance, the department possessed thirty-six engine companies, sixteen hook and ladders, two snorkels, and four rescue squads; yet it had only one piece of reserve apparatus. Since it was one of the largest fire departments in the country, the limitations which could be imposed on many American fire departments during large disasters are apparent.

Fire departments can also respond to excessive or unique demands, of course, through the activation of mutual aid pacts or agreements. Many fire departments have mutual aid agreements with neighboring departments to draw on the resources of one another in unusual emergency situations. In many states, the governor activates certain mutual aid pacts between local fire departments and civil defense organizations with fire fighting resources. Such pacts, however, have certain limitations in a widespread disaster.

Of course, fire departments prepare for unusually heavy demands by developing emergency operating plans which may arrange for the use of such resources as have been mentioned. Although these plans vary a great deal from one city to another, they generally provide for the notification of a department's chief officers, the mobilization of reserve equipment and the recall of personnel, the establishment of command posts and control centers, the allocation of departmental resources, and the activation of mutual aid pacts. Data indicate, however, that disaster plans or emergency operating procedures are not always used by organizations experiencing heavy demands. Often the plans are altered during the course of the organization's response, and in some instances are ignored entirely. Disaster plans appear to have been used most effectively in those instances (1) when there is considerable congruity between the anticipated and actual disaster, and (2) when the organization has prepared its personnel for disaster activities via numerous simulations. For example, one fire department experienced a number of unanticipated organizational problems as a result of fires during a civil disturbance. Although the department had a rather exhaustive set of emergency operating procedures embodied in an emergency plan, many of these grew out of the department's experience with widespread brush fires and were not applicable to the conditions which existed during the disturbance. As a result, many of the adaptations made by the department were spontaneous -- the existing disaster plan as such was never officially put into operation. By contrast, the fire departments in two other cities made only minor changes in their

riot-fire plans since they had consciously structured them in the light of what had occurred in other cities with disturbance experience. The departments in both cities had prepared their officers and men for the possibility of combating a large number of incendiary fires in areas made all but untenable by hostile crowds. The department in one city had conducted a great many training services for its fire suppression personnel prior to the disturbance and every member of the department possessed and was expected to be familiar with the emergency plan. In the first city, the large number of incendiary fires and the actions of the citizens in the area were unanticipated and as a result little preparation had been made for dealing with them. The fire departments in the other two cities, on the other hand, had anticipated both of these conditions and had planned accordingly. While the fire departments, the rioting and fires, and the cities themselves are different in each of these instances, the point seems valid, nonetheless, that when there is considerable congruity between the anticipated and actual experience and when the organization has prepared its personnel via numerous drills and simulations, predisaster planning is much more effecitve. Since no preestablished plan can provide for every possible emergency contingency, those plans which offer alternative courses of action and flexibility at the same time would seem to be the most useful in disaster settings.

To reiterate, fire departments prepare for periods of unusually heavy demand primarily by relying on those resources within their own department which can be mobilized with relatively little effort; by developing certain formal plans which alert and allocate its resources; and by relying on organizational resources of an external character. When these resources are either limited or unavailable, as frequently occurs, fire departments may adopt certain other procedures which are ad hoc.

Unplanned Adaptations to Excessive Demands

One of the adjustments which many organizations make when confronted with demands which exceed their capacity to respond is to alter their methods of operation. These alterations include changes in task performance, in the authority and decision-making patterns, in the processes of both inter- and intra- organizational communications, and in the mobilization and distribution of resources. What is generally true for organizational adjustment to excessive demands is also true for fire departments specifically. The response of the one fire department to the fires created by civil disturbance will be used as an example of how one department attempted to adjust its operational procedures during a period of high demand.

This fire department, when confronted with more fires than they could combat in the normally prescribed ways, made several adjustments by which their efficiency was increased, including changes in fire suppression techniques, decision-making, etc. While the department had mutual aid agreements with approximately twenty fire departments adjacent to them, they activated only two or three of these briefly. Because the rioting and fires were not confined

to the city, city fire officials did not feel they could request aid from neighboring departments which were faced with the possibility of heavy demands from within their own districts. The "State" Defense Organization, in reality a local civil defense organization, was not activated until Saturday afternoon about 2:00 p.m., so that its additional resources were not available during the height of the fires which occurred on Friday evening and early Saturday morning. Thus, the department faced extremely heavy demands more or less on their own. They did mobilize all of their reserve apparatus and manned it with recalled personnel. Even with these additional resources, however, they were not able to suppress in normal fashion the many fires burning in the city partly because of their number and partly because of harassment from the rioters. Faced with unusual and heavy demands at a time when mutual aid and other extraorganizational resources were unavailable, the department spontaneously developed a set of emergency operating procedures. Although the department did have an official emergency plan, it was followed only in some instances and never was declared officially in force.

One of the first major adjustments made by the department concerned authority and decision making. On the first evening of the rioting, and on successive days and nights as well, the chief officer in the department personally supervised the field operations of the department. When one of the battalion chiefs ordered his companies not to enter an area made dangerous by hostile crowds, the acting chief of the department was summoned at his home and immediately proceeded to the battalion headquarters of the companies involved. He consulted briefly with the battalion chief and other officers at the scene. Although he agreed with the decision which had been made by the battalion chief, he decided that the companies involved ought to make a strong effort to suppress all fires in the area. The acting chief then communicated with the police department and arranged for more systematic protection by which fire personnel could carry out their tasks. At this point, he assumed partial command of the department's field operations -- a position he and his successors did not relinquish until the heavy demands were past.

Another major adjustment made during the early stages of the rioting affected apparatus response. Normally, responding apparatus frequently report to a fire as individual units, often using different streets. Due to crowd harassment, all units were to be dispatched in task forces comprised of two engines and a ladder truck plus a chief officer. These apparatus and personnel were to be dispatched jointly and proceed to and from fire calls as a unit.

A third and very important operational adjustment concerned actual fire suppression techniques. During the rioting, the responding personnel were instructed to go in, "knock the fires down" by using extremely heavy streams of water, and then leave. Little or no attention was to be given those procedures designed to limit water damage or to those duties usually associated with the prevention of rekindling. This adjustment freed both men and equipment much sooner than usual and increased the department's overall capabilities. As far as fire suppression was concerned, the focus of the department at this time was on the prevention of fire spread more than on any other single factor.

In spite of these important adjustments in the decision-making process and in fire suppression techniques, the department was still unable at times to meet all of the demands made on it, which led to the establishment and formalization of a priority list by which the department's resources were allocated. The priorities established from highest to lowest were:

1. Occupancies where a life hazard was believed to exist;
2. Large valuable properties;
3. Structures in areas not previously having fires;
4. Structures already extinguished several times;
5. Structures isolated from other buildings;
6. Automobile fires;
7. Alarms received from areas made untenable by the rioters.

The priorities established by the list were largely determined by the two basic organizing principles: (1) preservation of life and (2) protection of property, of most fire departments in the United States today.

In addition to adopting this set of priorities, the department sought to conserve its resources further by discontinuing many of the perfunctory duties associated with their operations. Routing calls to various city agencies, e.g., the street and water departments, were discontinued as were the alarm checks made with the department's 109 station houses at 7:00 a.m. each day. Significantly, during the peak fire period, communications personnel discontinued keeping records. Routing drills and fire inspection duties also ceased during the emergency.

In addition to the adjustments listed above, fire department officials made several additional changes in their communications procedures. The extremely heavy load placed on the department's main alarm center forced one early adjustment. The center received approximately 1,000 alarms in a 24-hour period. Since many alarms turned out to be false, the department decided not to dispatch units on the basis of street alarms from the riot area. Other adaptations included the assigning of fire personnel to the police command post to facilitate coordination between the two departments, and the assuming of dispatching duties by communications officers who would not normally perform these tasks. This latter adjustment served two useful purposes for the department: (1) highly experienced persons were placed in crucial positions; and (2) those making important decisions, some of which were highly unusual, were able to do so without following the usual chain of command. Those who would have normally been consulted before basic alterations were made were frequently those making the alterations.

While the organizational adaptations outlined do not exhaust the changes made by the department during the rioting and fires, they do cover in a general way the major adaptations made. Significantly, many of these adaptations made in this department on an ad hoc basis have become structured and more or less institutionalized in the emergency operating procedures of other large urban fire departments. Field investigations at a later date in two other cities following riots and fires reveal that fire and other officials adopted and formalized many of the adaptations made by the department.

Reluctance to Receive Outside Aid

In general, large American fire departments are quite reluctant to enlist the aid of organizations and/or individuals not usually used during pre-disaster times. For instance, one department rejected an offer to rent large water fans from a private organization in their city for use during the rioting. Furthermore, no evidence indicates that large American fire departments in recent years have permitted "volunteers" to man their apparatus. However, small volunteer departments conceivably do accept assistance from outside the department, especially from individuals who offer their services at the scene of a large fire.

While large fire departments in the United States are most reluctant to accept "outside" assistance, such is not the case everywhere. For example, the Hobart Fire Department in Tasmania, Australia, when confronted with extremely heavy demands during the destructive fires which swept that island in February 1967, permitted a large number of volunteers to enter their organization. An extended period of hot dry weather accompanied by a preceding drought made much of Tasmania susceptible to the kind of conflagration most feared by residents of that island. Fires which had been smoldering in some of the outlying areas of the island were whipped by winds which at times reached a speed of 65 knots. Not only did these winds make existing fires more intense, they also carried embers and burning brands which set off additional blazes wherever they landed. To combat these many fires, the island had limited resources by American standards.

Most of the island's fire fighting resources were centered in Hobart, the capital city of Tasmania. In February 1967, the city had a population of approximately 53,000. At the time of the disaster, a total of 74 men, including 6 officers, were in the fire brigade. Fifty-two men were in Hobart proper; the remaining personnel and equipment were housed in three nearby substations. A fourth substation was manned entirely by volunteers. Since the area assigned the Hobart fire brigade is extremely large and since resources, including personnel and equipment, are quite limited, it normally depends on many citizen volunteers. In Ferntree, about 6 miles from Hobart, 102 of 350 residents were registered as auxiliary fire brigade members. This auxiliary was considered an extension of Hobart's all-paid fire brigade. In addition to a number of these official auxiliaries, some private citizens engage, although less frequently, in fire fighting activities. At the time of the 1967 fires, the island's fire fighting resources consisted of a small number of professionals coupled with unpaid auxiliaries who respond regularly to certain fires, and citizen volunteers who respond irregularly to emergency situations.

At the most critical stage of the fires, only one fire official was on duty at Hobart's downtown headquarters. Among other things, he had to assume responsibility for sorting hundreds of citizen volunteers into small crews, giving them what equipment was still available, and dispatching them to fires. Most of these crews, armed in many instances only with wet sacks, responded to fires <u>unaccompanied</u> by a trained officer or fireman because none were available.[1]

To reiterate, there is no evidence to indicate that recruitment of nondepartmental personnel by large urban fire departments in the United States has ever taken place, although it would offer an additional resource by which fire departments could expand their organizational capabilities. By contrast, some disaster-oriented organizations rely heavily on nonprofessionals during large-scale emergencies. Local Red Cross chapters, for example, are most often staffed by a few core personnel during nonemergency periods. While they carry on certain traditional tasks, their normal time activities are not directly related to existing or current emergencies. It is clearly expected, however, that they will become active in a different way during a disaster. In one sense, they can be seen as a nucleus with standby functions to be activated for anticipated needs in large-scale disasters. When the disaster occurs, the small, central, permanent cadre of workers provide a name and a core around which a great many volunteers are mobilized for emergency tasks. After the disaster effects have been dissipated, the volunteer members "retire" from their duties and the organization returns to its normal, pre-disaster structure. The chief adaptations which fire departments make in post-disaster environments when the demands made of them exceed their capacity to respond include alterations in the following areas: in an organization's operational procedures, in its authority and decision-making structures, in its allocation of resources, in its communications processes, and in its recruitment of large numbers of volunteers and/or other extraorganizational resources.

However, fire departments maintain a high degree of organizational readiness at all times and part of that readiness includes a number of adaptive procedures which make ad hoc or extemporaneous alterations unnecessary. The first part of this chapter outlined briefly some of the "built in" adaptive techniques followed by most large urban fire departments today. Only in extreme cases -- when demands on the organization wholly outstrip its resources; when the demands are highly unusual or unexpected, such as those associated with widespread rioting and harassment; or when an organization loses, through one cause or another, much of its response capability -- is the fire department likely to make major, unplanned changes in its organizational structures.

Since fire departments are organized along paramilitary lines, they tend to maintain rather rigorously their organizational boundaries. Fire departments, when pressed into duties not identified as their regular responsibility, tend to free themselves of nonregular tasks as quickly as possible. This characteristic applies also to departmental adjustments resulting from excessive demands. Rarely, if ever, do emergency adjustments become a part of the normal operating procedures of the department. For example, the department mentioned earlier had returned to near normal operations a full day before the emergency period was declared ended. While the departments have altered existing emergency plans or written new ones as a result of the rioting and fires, the basic organizational structures and operational procedures of these departments have remained constant. When changes in normal procedures are made, they tend to be relatively minor.

Perhaps this rigidity can best be explained by noting again that fire departments and their operations are regulated by state laws and by the codes established by the American Insurance Association. This alone mitigates the possibility of radical changes occurring in fire department procedures. Also, it explains the adamant position taken by fire officials on the penetration of their organizational boundaries by "civilian" groups or individuals. Since these officials are both legally and professionally responsible for the performance of their departments during emergencies, they are acutely sensitive to the potential loss of control represented by the presence of extraorganizational resources or personnel.

Summary

This chapter has described the adaptation of fire departments to high demand situations. Fire departments are organized to deal with relatively large emergency situations: (1) by structuring their resources to have a reserve force on call at all times; (2) by preparing emergency operating plans in anticipation of major emergencies; and (3) by developing mutual aid pacts with neighboring departments and civil defense organizations when possible. Faced with demands which exceed or negate these back-up resources, fire departments, like other complex organizations, usually make certain ad hoc adaptations in an effort to keep some balance between demands and capabilities. These adaptations have included changes: (1) in methods of operation; (2) in authority and decision-making processes; (3) in allocation of resources; (4) in nonperformance of certain low priority functions; (5) in communications procedures; and (6) in permitting nonorganizational resources, chiefly in the form of personnel, to become involved in organizational tasks.

Finally, most of the changes adopted on an ad hoc basis by fire departments are rarely structured into their daily performance patterns, possibly because fire departments are regulated by state laws and by the codes established by certain agencies such as the American Insurance Association. These guides tend to mitigate against significant changes in fire suppression procedures.

FOOTNOTES: Chapter III

1. For a detailed account of the Tasmanian fires see William Anderson and Robert Whitman, "A Few Preliminary Observations on 'Black Tuesday': The February 7, 1967, Fires in Tasmania, Australia," Disaster Research Center Research Report, no. 19, mimeographed (Columbus: Disaster Research Center. The Ohio State University, 1967).

CHAPTER IV

RELATIONSHIPS OF THE FIRE DEPARTMENT WITH OTHER ORGANIZATIONS

A disaster by its very nature affects all parts of a community, each part affected in varying degrees. Because of this, many organizations of different types and performing different tasks become involved. Thus interaction and interdependence among these groups is inevitable. The fire department is drawn into this emergency web. The purpose of this chapter is to outline briefly which organizations are most likely to interact with the fire department but, first, the more general problem of interdependence among organizations is discussed.

General Background

The interdependence which develops in any disaster situation can lead to both cooperative relationships and to those characterized by conflict. In any given situation, both tend to be found. However, the nature of disaster tasks encourages the growth of cooperative interaction around the shared goals created by the need to overcome the effects of the disaster.

Cooperation is facilitated, of course, if the organizations involved have had prior contact with each other. Every organization is forced to depend on other sources for supplies and aid as it performs its daily tasks. Such dependency relationships usually are built on a cooperative basis, and when they exist in this form the disaster activities of a given organization are greatly aided. Cooperative relationships can also emerge from preplanning. This is usually initiated by such agencies as civil defense or through other emergency plans of local government. Organizations which will become heavily involved in disaster activities are usually represented in the plans, and each is given certain duties and responsibilities. Commonly a central location is designated where liaison representatives of all of these organizations and perhaps others can meet and coordinate the disaster activities in the event the need arises. Where these plans are well developed and rehearsed, they tend to work well and conflict is minimized. In many other places which are not as "disaster prone," however, plans are often superficial and "dust gatherers." When disaster does strike in such places these plans often are ineffective and interorganizational coordination must be developed on the spot, a fact which heightens the potential for conflict.

In light of the above it can be said that no static plan is ever perfect. Even in disaster-prone areas, plans are constantly under study and revision. If plans are weak or nonexistent, conflict is more likely. Attempts to develop coordination out of such conflict often serve only to increase the conflict. This is especially so if there is a scarcity, either real or perceived, of resources, if new organizations emerge whose functions

overlap with existing ones, or if there is a similarity in goals among existing organizations. The need for planning, coordination, and cooperation is evident in any disaster situation. Conflict, wherever it develops, only serves to emphasize this need. For whatever reasons, however, this need often comes to light only after a disaster event.

Interorganizational relationships, whether eventuating in cooperation or conflict, can best be seen in the context of the necessity for the development of new mechanisms of coordination within a disaster impacted community. While some of the relationships established among organizations in their pre-disaster contacts can be carried over into their disaster operations, others have to be reworked and some have to be established since organizations find "new" elements in the disaster environment with which they have had little experience. For example, the fire department carried into disaster activity considerable experience with the police department but considerably less experience with other organizations such as the Red Cross, and perhaps no previous experience with a National Guard company which has been called in to assist in security tasks. Adapting to this new organizational environment is almost as critical a disaster task for many departments as is meeting the demands of the more familiar fire-related tasks. Below are several comments about the specific problems of fire departments in reworking these relationships.

Interorganizational Relationships of Fire Departments

1. Fire departments are more autonomous than most other community organizations in disaster situations. Most organizations lose autonomy in widespread disaster because they become crucially dependent upon the efforts and actions of other organizations within the community. Fire departments, however, are able to maintain a greater degree of autonomy than most other organizations. This is true for several reasons. First, such departments tend to carry over a great deal of autonomy from their pre-disaster setting in the community. This pre-disaster autonomy is based on the fact that departments, particularly the large ones with full-time, paid personnel, exhibit a high degree of professionalism. That is, it is assumed by others that fire department members are the best judges of what performance standards should govern their activities. This professionalism is reinforced by laws and performance codes which limit the nature of change which can be effected in the performance of the department. Insurance rates which are imposed on a community are based in part on the performance and capabilities of the fire department. In pre-disaster situations, any action which would reduce the efficiency of a department tends to be resisted not only by departmental representatives but by property owners as well. The department also has performance standards which it can use as a model, either in resisting change or in seeking improvements.

This autonomy, based in the pre-disaster structure, is carried over in disaster activities. If disaster impact results in fires, there is no doubt

as to the location of organizational responsibility for fire suppression. The fire department has clear legitimacy in these tasks. Since fires involve high risks to persons and property, the efforts of the fire department have high priority on the scale of values which emerges in the emergency consensus. In such a situation, the fire department becomes the focal organization in this effort and other community organizations are expected to play a supportive role. If disaster impact creates no widespread fires, the impact itself, with its potential for creating the conditions for future fires and for reducing the capabilities of the department (through loss of water pressure, increased difficulty of access, etc.) provides sufficient justification for the fire department to maintain its autonomy and not to be diverted to new and unfamiliar tasks.

2. The more extensive an emergency is, the greater the number of interorganizational consultations a fire department must make before a decision is reached about possible courses of action in the allocation of community resources. This simply points to the fact that a fire department does lose, along with all other community organizations, some autonomy in disasters, particularly those which are wide in scope. The fire department cannot be as certain that it will be able to count on the support of other organizations in the accomplishment of departmental tasks. Since the early phases of the emergency period are characterized by a lack of knowledge of the consequences of impact, this necessitates an attempt to ascertain the status of available resources in other organizations. These can no longer be taken for granted.

3. The more extensive an emergency is the higher the rank of fire department members involved in joint consultations. While much of the day-to-day interorganizational contacts involving the fire department in their "normal" pre-disaster relationships is carried on routinely by persons in lower ranks, the post-impact situation is one which requires the attention and decision making of the highest fire department officials.

4. A major focus of fire department contact with other organizations is through the structure which is developed to facilitate community coordination. In those disasters which have widespread impact, the need emerges for the development of some structure to facilitate community coordination. In certain instances, the basic structure may be anticipated and its development outlined in previous disaster planning. Regardless of its basis in planning, in almost every large-scale emergency, a group does emerge which assumes the role of community coordination. Such groups are usually composed of formal heads of local governmental agencies and of those other community organizations equipped to assist in threats to the well-being of the community. Such groups invariably include many of the highest ranking officials of the various organizations represented, e.g., the mayor, the safety director, city councilmen, fire and police chiefs, and local civil defense director, ranking officials from the Red Cross and other welfare agencies, state representatives, National Guard commanders, etc. The fire department's participation in such a group inevitably involves the chief and/or assistant chiefs because the decisions made there are critical for the department. Too, the department has much to contribute in the form of emergency resources as well as knowledge about disaster impact.

5. Among the various community organizations, the fire department depends primarily on the activities and cooperation of the police department. There are several related reasons for the close relationship between the police and fire departments. A major factor is, of course, that the two organizations deal with emergency tasks, even in "normal" times. Therefore, over time they develop a close dependency and they bring to disaster activities considerable previous experience in cooperation. Too, both are likely to be mobilized at the time of disaster impact. Therefore, they are likely to become involved early in the immediate disaster tasks. It has been indicated previously that fire departments often become involved in search-and-rescue operations and these tasks are often shared with members of the police department. Common tasks necessitate close cooperation.

The relationship between the fire and police departments is facilitated in those American communities which have developed common communications facilities. In these communities, the two departments use facilities located in the same place and therefore share the same information inputs. In other communities, while they may not use the same facilities, the location of the communication facilities of both departments is in close proximity so that the exchange of information is accomplished easily.

6. In spite of its relative autonomy, the fire department is dependent on a number of other communities for inputs necessary for effective disaster operations. The relative autonomy of fire departments sometimes marks certain significant dependencies which are often not appreciated. Fire departments, for example, depend on other governmental agencies for legitimacy and legality. They also depend on political jurisdictions for economic resources to purchase and maintain equipment and to employ personnel. They also depend on a large number of other community agencies for goods and services. The lack of these in a situation of high demand can create a major loss in effectiveness for such departments.

For example, the inability of the utility companies to provide electricity or water would seriously impede a fire department's effectiveness. While most large fire departments have auxiliary generating equipment which could be used in the event of a power failure, this equipment has serious limitations for long-term operations. Most departments do not possess sufficient supplies of water or chemicals to combat a major fire. Following an earthquake, one city was without water in the mains to supply the city's fire hydrants for an extended period of time. The total water available for fire suppression was in the fire department pumpers. Each pumper had approximately 300 gallons. Had there been a large number of fires in the city, the fire department would have been extremely limited in its ability to suppress them.

Other organizations in the community are equally indispensable to fire department operations. Both in a civil disturbance and in an earthquake, fire departments experienced potentially significant organizational problems resulting from a possible lack of gasoline at crucial stages in their respective emergencies. In the disturbance, the private company which normally provided petroleum products for the fire department refused to take its vehicles into the riot area. This necessitated certain internal adjustments

on the part of the fire department. In the earthquake, the fire department's gasoline supplies were inaccessible because of damage. This loss was particularly crucial, for the department was using its fire engines to run auxiliary generators which were pressed into service due to the lack of regularly supplied electricity. Since each engine consumed an average of 25 gallons per hour, at one point it appeared that available supplies would last only about 2 hours. The crisis was potentially severe enough for fire officials to consider commandeering gasoline supplies from a nearby station. This proved unnecessary since a major oil company brought a large tank truck filled with gasoline to fire headquarters for fire department use. Other illustrations could be offered almost ad infinitum, but the point is clear: fire departments are integral parts of the communities within which they operate and thus are dependent on those communities for a great many vital resources. When these resources are not forthcoming, the effectiveness of the fire department as an emergency organization is seriously affected.

7. Interorganizational relationships are most effective when communication links among the organizations are operative. Previous comment has been made on the fact that common or closely related communications systems facilitate close interorganizational relationships between the fire and police departments. The same would hold true for communication links between the fire department and other emergency-related organizations. A further illustration will underscore the point. Following a midwestern tornado, much of the city was without electricity or telephone service. As fire personnel began search-and-rescue activities immediately following the tornado, they discovered many ruptured gas lines. The gas escaping from them was likely to ignite since there were also many high voltage lines "down" throughout the area. Fire personnel, wishing to have the feeder mains shut off to prevent the onset of many fires, were unable to communicate with gas company officials since the latter's telephones were inoperable. This prompted the fire department to establish a radio outpost at the gas company and to use fire department equipment to establish an ad hoc system permitting firemen in the field to relay information to the gas company through the fire communications center. The decision to establish this communications link with the gas company appears to have been prudent since there was not a single fire necessitating fire department action in the tornado's aftermath.

In sum, the fire department is caught up in the changing context of interorganizational relationships during the emergency period. It tends to carry over its close relationship with the police department, the other major municipal emergency organization. Compared to most other community organizations, the fire department has a greater degree of autonomy since its emergency tasks can seldom be preempted by any other organization. Its autonomy, however, is increasingly limited in disasters of wide scope since many new and unfamiliar organizations become involved in the increased demands and this necessitates the development of a new basis of community coordination and the reworking of old relationships. Previously established routines are no longer applicable and this changing context becomes the focus of attention of the highest levels in the department.

CHAPTER V

IMPLICATIONS FOR ORGANIZATIONAL FUNCTIONING IN A NUCLEAR CATASTROPHE

In these concluding pages, the implications of the operations of fire departments in natural disasters will be projected into a more inclusive context of events which might occur in a nuclear catastrophe. The basic assumption is that the problems encountered subsequent to a major natural disaster are relatively similar to those which would be faced in a nuclear situation. Where there are differences, they can be visualized primarily as differences of degree. With the exception of the specific form of secondary threat, i.e., radiation, and the probability that a wider geographical area will be involved, a nuclear explosion would not create essentially different problems for community response.

It is assumed here that the delivery of a nuclear agent would come about by some type of military attack. Such attacks typically serve to activate and unify the civilian population in a collective effort to maintain community life, paralleling similar efforts observed after the impact of a disaster agent. The problem-solving units which would respond after nuclear impact would probably be based in the local community. The burden of such a response would be assumed by the traditional emergency organizations, supplemented by others which might have additional relevant resources. In general, then, one might expect the pattern of response which would develop after a nuclear impact would not be radically different from that which is seen subsequent to large-scale disaster impact.

Organizational Resources

In mobilizing an emergency response to a potential nuclear attack, the fire department has both physical and personnel resources which are more extensive than most community agencies likely to become involved. The possible exception would be the numerically greater manpower and sometimes greater material resources available through departments of public works and the police department.

It is useful here to indicate some of these potential resources. Fire departments are always dependent upon extensive communication networks. Such networks are used to coordinate normal activities within the department. These communication networks would become vital in the initial damage assessment subsequent to a nuclear attack. Such an assessment is crucial since it establishes the initial parameters of the problems which a community must face. Routine organizational reports provide the beginnings of an overall assessment of community damage. Initial reports generally are given by police and fire personnel who are familiar with the pre-impact status of the community. The mobility of fire units equipped with radio provides a flexibility and mobility

to the process of community reconnaissance which is only exceeded by the police. In addition to this mobility in community reconnaissance, such vehicles can also be used for a variety of other emergency tasks.

Aside from the communication and transportation resources which fire departments can provide, they also offer extensive personnel resources -- persons who are trained in a variety of emergency skills. These skills, the intimate acquaintance of these personnel with the community, and the previous experience of most of these personnel in other emergency situations provide an important core of emergency workers for a possible nuclear situation.

Relative Effectiveness

Based on observations made in a disaster context, fire departments generally operate with a high degree of effectiveness. In most situations, organizational stress is minimal. Effectiveness has to be measured by the ability of such departments to accomplish tasks in the context of extremely high demands. The major reason for their effective functioning is that such organizations are likely to be able to maintain their capabilities and resources in such situations and, in part, are often able to limit the demands made upon them.

The ability of fire departments to maintain a high level of capability is related to the following:

1. Fire departments usually continue tasks in the emergency period which are similar to their pre-emergency operations.

2. Fire departments maintain expectations of becoming involved in emergency activity. Emergencies of all kinds are considered to be a part of organizational responsibility. Such expectations also become part of the expectations of individual members.

3. Fire departments normally have "excess" trained personnel since they require several shifts for continuous operation. This means that the operation of the organization is hampered less by the loss of specific persons.

4. Fire departments usually have greater interchangeability of personnel than many other types of organizations. In other words, the personnel have familiarity with the range of tasks which need to be performed. This means that loss of personnel would not have negative consequences for the continuous operation of the organization.

5. The organizational expectation of involvement produces a rapid and self-generating mobilization of personnel in emergencies.

6. Fire departments usually possess extensive material resources, in the form of transportation and communications equipment. They also have personnel resources which are numerically larger than most other community organizations. These personnel, because of their daily contact with the community, become aware of sources of additional resources which can be utilized in emergencies.

7. Fire departments are more likely than other community organizations to have developed plans for emergencies or are able to adapt routine procedures to large-scale emergencies.

8. Since they operate as an ongoing unit in the pre-emergency period, fire departments develop experience as a work group. This provides a greater degree of security in the work relations in the emergency period than would characterize most other organizations.

9. Because of their pre-emergency functioning, fire departments generally have considerable experience in adapting to and coordinating with other related organizations within the community. Such experience provides a basis for the development of coordinated activities among the various community organizations which do become involved in widespread emergencies.

Persistent Problems

While the overall evaluation of the potential effectiveness of fire departments is positive, based on their performance in disaster situations, there are also certain persistent problems which would be aggravated in a nuclear context.

Possibly the most significant difference for the fire department in a nuclear context as compared with the more "usual" disaster context would be the great increase in demands which would be made upon it. In chapter 2, certain comments were made about the decrease in overtime in the fire-related effects of disasters. Modern construction methods, improvements in materials and fire suppression techniques have reduced the importance of the fire-related consequences in most disaster situations. Estimates of the blast effects of nuclear weapons would indicate, however, the high probability of widespread fires in the target areas. This would create a high demand situation for fire departments. In large part, the earlier judgement of effective functioning of the fire department has been based, in part, upon relatively modest demands being made upon it in most disaster situations which have been studied here. Only in certain widespread civil disturbances has the fire department been pushed to the limits of its capability. Based on observations in these situations, certain major difficulties could be anticipated in a nuclear context.

A fire department has only a narrow range of alternatives available to cope with situations of excessive demands. The first alternative is, of course, to increase the capabilities of the department by the activation of reserve apparatus and the mobilization of additional personnel drawn from the departmental reserves. As has already been indicated, most departments, even the largest ones, have a limited supply of reserve equipment which can be activated. In some communities, civil defense units can provide additional equipment but the aggregate amount which is available is still quite limited.

A second method of increasing capabilities is to activate mutual aid agreements. In situations of widespread impact likely to follow a nuclear explosion, the utility of these mutual aid pacts would be minimal. Since fires are likely to be distributed over a wide area, equipment and the men to operate it could not be drawn in to concentrate on any one jurisdiction.

The ability of fire departments to expand would not only be limited by the availability of reserve equipment and mutual assistance but there are indications that increased manpower reserves could not be absorbed easily even if equipment were available. While some fire departments do depend upon volunteers, in most instances these "volunteers" are trained and have had considerable previous experience. These volunteers also have, in many instances, developed a high degree of cohesiveness through working together. Such "volunteers" are quite different than the "walk-in" volunteer that might provide a potential source of manpower for departments to meet increased demands. Most "professional" fire departments, because of their previous experience in working together and because of their professional identification, seem only reluctantly to accept "outside" volunteers. While the development of such esprit de corps and internal cohesiveness has its positive side, it does tend to limit the ability of the organization to add personnel to meet demands. (The reluctance to incorporate "outsiders" is shown in another way in the slow pace of racial integration in fire departments in the United States.) The strength of organizational boundaries is also seen in the conscious design of mutual aid pacts. Most of these agreements insist on the organizational autonomy of the assisting departments even though all of the cooperating departments may be under the nominal control of an overall commander.

If there are limits on the abilities of departments to increase their capabilities through equipment and manpower, this would suggest that the most likely adaptation to increased demands in a nuclear context would be significant modifications in fire suppression techniques. Taking certain clues from situations where civil disturbances have created peak demands, one might suggest that the most likely response would be to attempt to "knock fires down" and also to concentrate on the prevention of fire spread.

Even with these limited goals, a widespread nuclear blast would still create conditions which are likely to exceed the capabilities of existing fire departments. As a consequence, attention should be given within departments to the development of techniques to prevent fire spread which could be handled by volunteers under the supervision and instruction of "professional" firemen. Models of such a plan might be found in the fire fighting

activities of the U.S. Forest Service. The implementation of such a plan would necessitate the stockpiling of certain types of equipment as well as an inventory of available community resources, such as bulldozers, digging machinery, and water tankers. While most current innovations in fire fighting depend on increases in technological sophistication, the direction suggested here might necessitate the utilization of a simple technology which can be handled by supervised volunteers. This would require a significant modification in the orientation of current fire fighting organizations and techniques; these current practices are not likely to be able to handle the potential scope of the increased demands which would be a by-product of a nuclear blast.

One could realistically anticipate strong resistance to the adaptations necessary in a nuclear situation. The emphasis on a low level of technological sophistication would run counter to the emphasis on professionalism and on performance standards in fire departments. The potential use of volunteers would be seen as a threat to professionalism and would be difficult to achieve, given the cohesiveness of most departmental structures. Such potential resistance suggests that such a task force might be trained and maintained independent of existing fire departments. On the other hand, a greater acceptance of volunteer help in specialized situations, such as a nuclear one, might be achieved and incorporated into existing structures as an element of future planning.

In addition to the previously mentioned problem of adaptation to the high demands which would be created by a nuclear situation, there are other problems which are evidenced in disaster situations that would be increasingly aggravated in a more widespread impact.

Since police and fire departments consider themselves as the major emergency arms of communities, the patterns of coordination which develop in "small" emergencies become routinized. As the scope of community emergencies increases, the involvement of many other community organizations introduces new relationships. In a nuclear situation, the creation of new tasks (such as radiation detection) or changes in the legal definitions of responsibility may include organizational personnel not previously involved in coordination in the smaller emergencies. Because of the centrality of the more traditional emergency organizations in established patterns of coordination, one could anticipate that they might find it difficult to incorporate these new groups into an overall pattern of coordination and that they might resist sharing authority and responsibility. Problems of coordination are, of course, not inherent in fire departments per se. Most problems of coordination arise in situations of widespread impact and the resultant difficulties of coordinating the involvement of a variety of different community organizations. Problems of coordination, however, would be accentuated in the wide impact which could be anticipated subsequent to a nuclear catastrophe.

More specifically related to the operations of fire departments is the fact that intraorganizational coordination is very dependent on the availability of an operative communication network. Major departments develop

elaborate communications facilities which often include emergency sources of power, etc. Emergency planning within such organizations generally centers on alternative procedures and back-up support. With the possibility of vast blast-affected areas subsequent to a nuclear attack, it is likely that the central communication facilities of many departments might be completely destroyed. Much current emergency planning does not entertain the possible consequences of a community emergency which also destroyed the communication facilities of the operating organization. Such "double" disasters are a much more realistic possibility subsequent to a nuclear attack and consequently, greater attention should be given in planning to the development of substitute communication facilities. One alternative would seem to point toward the development of mobile communications centers which have the capacity (and the location) to survive nuclear attack and also be adequate to handle demands within the range of performance required of the permanent installation.

In spite of the problems mentioned above, the overall conclusion, based on the observations of fire departments in disaster situations, is that they function effectively. Such departments complete tasks within their organizational domain with a high degree of efficiency since they possess established procedures, sufficient personnel, and accessible resources. Their performance underscores the potential payoff which results from continuous organizational planning as well as from training individual personnel to react to emergency situations.

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13. ABSTRACT

Along with the police department, the fire department is considered one of the organizations to be called on in an emergency. This report analyzes fire departments in terms of: (1) their typical organizational patterns; (2) their disaster-related tasks and activities which are potential demands for them; (3) their organizational adaptation to demand situations, especially those of high intensity; (4) their interorganizational relationships; and (5) their potential involvement and organizational adaptation to a post-nuclear attack environment.

The fire department perhaps changes less than any other organization from pre-disaster to disaster operations. Fire departments are likely to continue to cope with tasks similar to their pre-disaster responsibilities. Fire departments retain a great deal of autonomy in disaster since their tasks can seldom be preempted by other organizations. They are organized to deal with emergencies, for example by having a reserve force on call at all times, or by having mutual aid pacts with other departments. The extent to which fire departments change is limited by state laws and regulatory codes of agencies such as the American Insurance Association.

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