AD NUMBER

AD857600

NEW LIMITATION CHANGE

TO

Approved for public release, distribution unlimited

FROM

Distribution authorized to U.S. Gov't. agencies only; Administrative/Operational Use; MAR 1969. Other requests shall be referred to Office of Civil Defense, Washington, DC 20310.

AUTHORITY

DCPA ltr dtd 27 Sep 1972

URS 697-6
5N-11101-2522H-03

DAMAGE TO AND ANALYSIS OF FIRE DEPARTMENT CAPABILITIES, CITY OF NEW ORLEANS

Final Report

March 1969

Contract No. N00228-68-C-1793
OCD Work Unit 2522H

URS RESEARCH COMPANY

A URS Systems Affiliate

URS 697-6
5X-11101-2522H-03

DAMAGE TO AND ANALYSIS OF FIRE DEPARTMENT CAPABILITIES, CITY OF NEW ORLEANS

Final Report
March 1969

by

Milton Staackmann
URS RESEARCH COMPANY
1811 Trousdale Drive, Burlingame, Calif. 94010

for

OFFICE OF CIVIL DEFENSE
Office of the Secretary of the Army
Washington, D.C. 20310

through

U.S. Naval Radiological Defense Laboratory
San Francisco, California 94135

Contract N00228-68-C-1793
Work Unit 2522H
Five-City Study

OCD REVIEW NOTICE

This report has been reviewed in the Office of Civil Defense and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Office of Civil Defense.

ACKNOWLEDGEMENTS

The author gratefully acknowledges the assistance received during the course of the research effort reported here. URS Research Company employees who contributed include: Stanley B. Martin, who initiated, managed, and gave much aid to the project; and James E. Edmunds, Carl R. Foget, and Carolee A. Start. Fire Superintendent Arthur J. Heyd of the New Orleans Fire Department was very helpful in providing information concerning his department. Dr. Mathew G. Gibbons of the U.S. Naval Radiological Defense Laboratory was the Technical Monitor and provided much appreciated understanding and patience.

CONTENTS

ILLUSTRATIONS

TABLES

ABSTRACT

This study examines damage to the New Orleans Fire Department resulting from the Five-City-Study attack and analyzes the capabilities of that fire department in dealing with the postattack fire situation. After a review of the damage incurred by personnel, facilities, and equipment, the remaining fire-service resources were evaluated with respect to the magnitude of the demand situation and obstacles preventing the satisfaction of those demands.

SUMMARY

The role of the Five-City-Study fire services in dealing with situations following nuclear attack will depend on how well the fire-service resources survive the attack, and the magnitude and kinds of demands placed upon them. The demands facing the fire services are being analyzed in other research efforts. The study reported here evaluated damage to the fire departments of each city as a result of the Five-City-Study attack. The evaluation proceeded through consideration of the following:

1. Strength and location of the fire services prior to the attack
2. Casualties and damage incurred in the fire services as a result of the attack
3. Analysis of the remaining capabilities in the postattack period

Briefly summarized, the research reported here is for the city of New Orleans under conditions of the current plan, which calls for all personnel and equipment to be located at the fire stations. The research yielded the following findings:

1. Firefighting personnel would experience fatalities on the order of 85% of their number. Of the remaining personnel, only 31 (approximately 3% of the total force) are uninjured.
2. None of the fire stations would be completely usable after the attack and only one station could be restored to operation with limited repairs. The Fire Department Headquarters, Training School, Maintenance Garage, and Communications Center would be completely inoperable.
3. None of the fire-service trucks would be completely usable after the attack, but three trucks could be restored to operation within half an hour with light repairs.
4. Survival of the fire-service trucks would have been significantly improved if they had been stationed in open areas rather than inside the firehouses. If this strategy had been employed, three trucks would be completely usable after the attack, in addition to the three available for use within half an hour.
5. Damage to the water supply system would be quite severe with a general loss of water pressure over most of the city.

6. Since the city would experience about 150 residential fires, the degraded fire services would be completely incapable of dealing successfully with the total postattack fire situation. Due to the damaged fire-service resources and the constraints on mobility imposed by debris-laden streets, orthodox firefighting should be abandoned in favor of the following:

   a. Augmenting self-help firefighting

   b. Some limited exposure-control activities at crucial locations

   c. Aiding evacuation from areas where uncontrolled fires threaten population survival

   At best, however, the accomplishments of the surviving remnant of the professional fire service would be of small consequence.

Section 1
INTRODUCTION

This report is one of five similar reports which are submitted under the provisions of Contract Number N00228-68-C-1793 between U.S. Naval Radiological Defense Laboratory and URS Research Company. The purpose of this report is to calculate the damage to the New Orleans Fire Department due to a postulated nuclear weapon detonation (Ref. 1). The research effort of all five reports represents a component study (Work Unit 2522H) of the Five-City Study being conducted by the Office of Civil Defense.

BACKGROUND

Previous research concerning fire-service capabilities was performed by URS under Contract N00228-67-C-0694 (OCD Work Units 2512A and 2522E). Work under this contract was primarily devoted to developing a generalized analytic scheme for evaluating the probable effectiveness of the fire services in handling requirements for damage control and rescue after nuclear attack (Ref. 2). In addition, the preattack distribution of fire-service resources for the five cities was determined and a preliminary analysis of the damage to the fire services for downtown San Jose was performed (Ref. 3). Other research work concerning fire-service capabilities was performed under Contract N00228-67-C-0710 (OCD Work Unit 2538C, Ref. 4). Under this contract, effort was directed at the development of an interim general model for calculation of the buildup and spread of fire in selected cities as a result of the nuclear attack specified in the Five-City Study. The results of all of the above efforts have been utilized as appropriate in the preparation of this report.

SCOPE OF WORK

The five reports submitted under the current contract encompass the calculation and analysis of the damage to the fire departments in the cities of

San Jose, Albuquerque, New Orleans, Providence, and Detroit as a result of the Five-City-Study attack (Ref. 1). The output includes the following items for each city:

1. An analysis of the damage to and remaining capabilities of each fire department in the area
2. A map overlay showing surviving usable facilities and the nature of damage to unusable facilities
3. Tabulations of surviving usable equipment (trucks) and of the unusable equipment with the nature of damage indicated

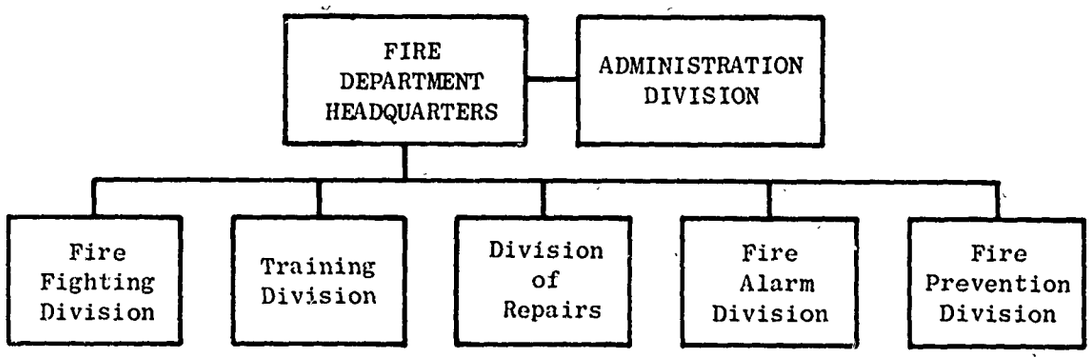
Results for each of the five cities are bound separately. This report gives the results for the city of New Orleans.

Section 2
PREATTACK DISTRIBUTION OF RESOURCES

The actual location of the various fire department resources at the time of the postulated attack is determined by the situation established in the New Orleans attack preparation scenario (Ref. 5), the latest emergency plans for the fire department (Ref. 6), and the current roster of resources of the New Orleans Fire Department.

According to the attack preparation scenario, New Orleans has been brought up to the highest level of preparedness. No general evacuation has been ordered or has taken place, but it is estimated that about 5 percent of the population has evacuated the city. An estimated 80 percent of the remaining population is sheltered according to plan. The Civil Defense Emergency Operating Center has been placed on a 24-hour alert basis. The fire department has engaged in intensive recruitment and training which has resulted in maintaining its normal strength of approximately 1000 members in spite of loss of employees to the National Guard and military reserve units.

Given the crisis build-up period as described in the above scenario, fire department responses to the situation have been identified (Ref. 6). The New Orleans department is organized basically as depicted below.



In accordance with the fire department emergency plans, all personnel would be located at their normal duty stations at the time of the postulated attack. This procedure corresponds to that used during the most recent hurricane incident in New Orleans. Administration Division personnel would be at the Central Fire Station, Training Division personnel at the Training School, Fire Fighting Division personnel at their respective stations, Division of Repairs personnel at the Maintenance Garage, and Fire Alarm and Fire Prevention Division personnel at City Hall.

The locations of all fire department facilities are shown in Fig. 1, which also indicates ground zero for the attack and corresponding overpressure contours of interest.

The locations of all personnel, trucks, and facilities at the time of the postulated attack are given in Table 1. It should be noted that approximately 50 motor-driven boats owned by fire department personnel have been officially volunteered to form a fleet to be used by the New Orleans Civil Defense organization in times of emergency, such as hurricanes. Emergency plans call for assembly of these boats in the New Orleans City Park. They have been assumed to be in position at the park, in the stadium parking lot.

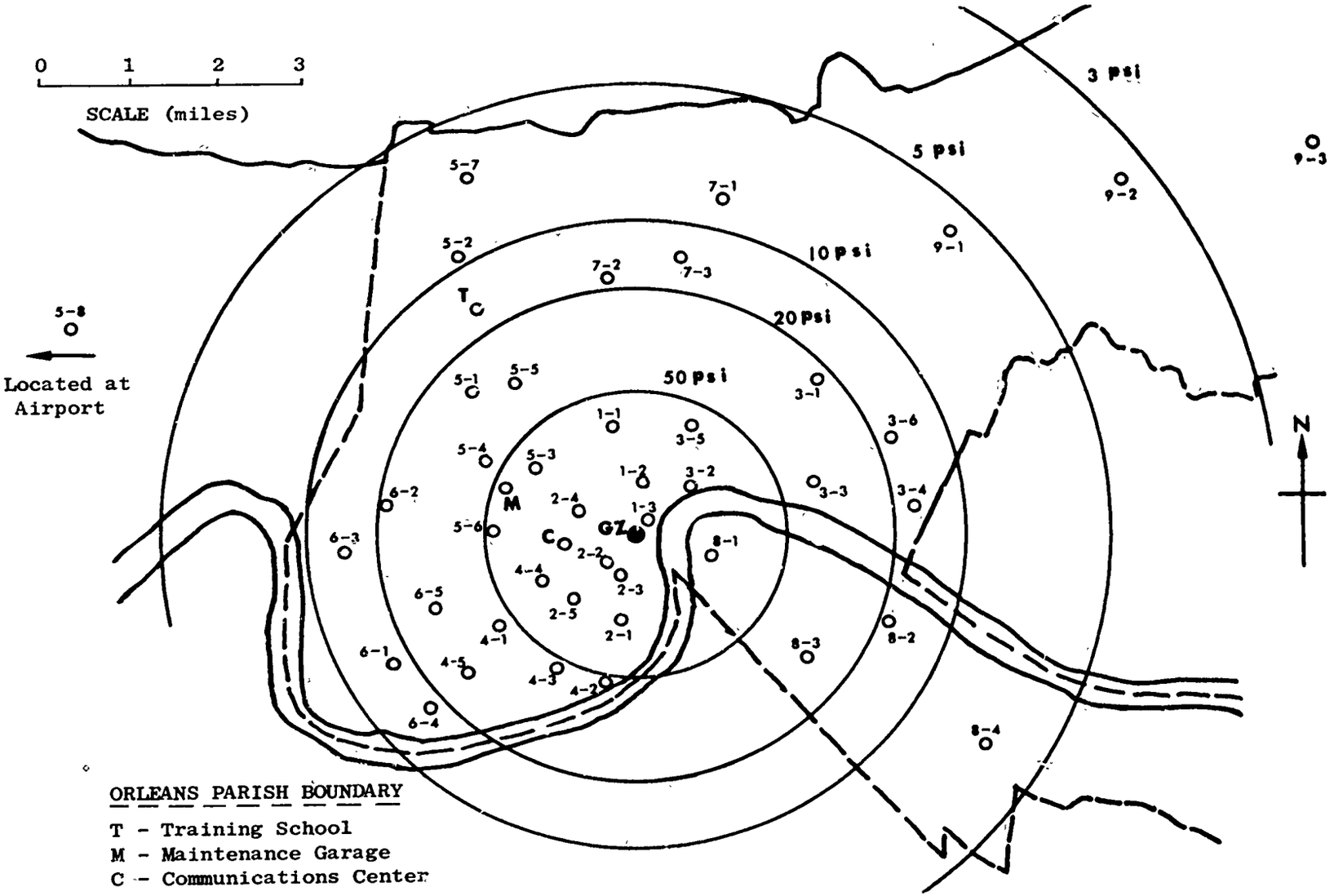


Fig. 1. Location of New Orleans Fire Department Facilities

Table 1

LOCATIONS OF NEW ORLEANS FIRE DEPARTMENT PERSONNEL, TRUCKS, AND FACILITIES AT POSTULATED ATTACK TIME

FACILITY LOCATION	ADDRESS	PERSONNEL	TRUCKS
City Hall	S. Rampart & Poydras	20 from Fire Alarm Division, 17 from Fire Prevention Division	-
Maintenance Garage	Gravier & White Streets	21 from Division of Repairs	-
Training School	5301 General Diaz	3 from Training Division	2 pumpers
1ST FIRE DISTRICT: Station No.:			
1	2201 Barracks St.	6 Officers 11 Firefighters	1 pumper 1 salvage unit
2	1131 Dumaine	7 Officers 35 Firefighters	2 pumpers 1 ladder truck
3 (Central Fire Station)	317 Decatur	10 from Administration Division Firefighting Division: 13 Officers 43 Firefighters	1 pumper 1 snorkle 1 ladder truck 1 rescue unit

Table 1, cont.

FACILITY LOCATION	ADDRESS	PERSONNEL	TRUCKS
2ND FIRE DISTRICT: Station No.:			
1	1377 Annunciation	7 Officers 21 Firefighters	2 pumpers
2	801 Girod St.	8 Officers 21 Firefighters	2 pumpers
3	821 Magazine St.	6 Officers 23 Firefighters	1 pumper 1 ladder truck
4	200 S. Robertson St.	6 Officers 11 Firefighters	1 pumper 1 ladder truck
5	1832 Thalia St.	6 Officers 23 Firefighters	1 pumper 1 ladder truck
3RD FIRE DISTRICT Station No.:			
1	3330 Florida Ave.	7 Officers 11 Firefighters	1 pumper 1 ladder truck
2	449 Esplanade Ave.	6 Officers 12 Firefighters	2 pumpers
3	1042 Poland Ave.	7 Officers 11 Firefighters	2 pumpers
4	6038 St. Claude Ave.	6 Officers 11 Firefighters	2 pumpers
5	1531 Elysian Fields	8 Officers 23 Firefighters	1 pumper 1 ladder truck
6	2041 Egania St.	6 Officers 12 Firefighters	2 pumpers

Table 1, cont.

FACILITY LOCATION	ADDRESS	PERSONNEL	TRUCKS
4TH FIRE DISTRICT: Station No.:			
1	2312 Louisiana	9 Officers 23 Firefighters	1 pumper 1 ladder truck
2	514 Jackson	6 Officers 23 Firefighters	1 pumper 1 ladder truck
3	1135 Washington Ave.	8 Officers 12 Firefighters	2 pumpers
4	1814 Magnolia St.	7 Officers 12 Firefighters	2 pumpers
5	1503 Napoleon Ave.	6 Officers 12 Firefighters	2 pumpers
5TH FIRE DISTRICT: Station No.:			
1	200 N. Alexander St.	8 Officers 11 Firefighters	1 pumper 1 hose tender
2	778 Harrison Ave.	7 Officers 11 Firefighters	2 pumpers
3	231 Broad Ave.	6 Officers 11 Firefighters	2 pumpers
4	436 S. Jefferson Davis	9 Officers 23 Firefighters	1 pumper 1 ladder truck
5	965 N. Carrollton Ave.	6 Officers 11 Firefighters	1 pumper 1 ladder truck
6	1400 S. Broad Ave.	6 Officers 11 Firefighters	1 pumper 1 ladder truck

Table 1, cont.

FACILITY LOCATION	ADDRESS	PERSONNEL	TRUCKS
5TH FIRE DISTRICT: Station No.:			
7	987 Robert E. Lee	6 Officers 11 Firefighters	3 pumpers
8	International Airport	7 Officers 11 Firefighters	1 pumper
6TH FIRE DISTRICT: Station No.:			
1	1211 Arabella	6 Officers 23 Firefighters	1 pumper 1 ladder truck
2	2430 S. Carrollton Ave.	7 Officers 33 Firefighters	2 pumpers 1 ladder truck
3	1435 Fern St.	6 Officers 11 Firefighters	2 pumpers
4	4877 Laurel St.	6 Officers 11 Firefighters	2 pumpers
5	4940 Clara St.	10 Officers 11 Firefighters	2 pumpers
7TH FIRE DISTRICT: Station No.:			
1	5600 Franklin Ave.	8 Officers 12 Firefighters	2 pumpers
2	3940 Paris Ave.	6 Officers 24 Firefighters	1 pumper 1 ladder truck
3	4131 Elysian Fields	6 Officers 11 Firefighters	1 pumper 1 hose tender

Table 1, cont.

FACILITY LOCATION	ADDRESS	PERSONNEL	TRUCKS
8TH FIRE DISTRICT: Station No.:			
1 (Algiers Central Station)	425 Opelcusas Ave.	9 Officers 34 Firefighters	2 pumpers 1 ladder truck
2	3340 General Meyer	6 Officers 11 Firefighters	1 pumper
3	2500 General DeGaulle	7 Officers 11 Firefighters	1 pumper
4	4115 Woodland Hwy.	6 Officers 11 Firefighters	2 pumpers
9TH FIRE DISTRICT: Station No.:			
1	7313 Chef Menteur	7 Officers 23 Firefighters	3 pumpers
2	5401 Read Blvd.	8 Officers 11 Firefighters	1 pumper 2 emergency units
3	13400 Chef Menteur	6 Officers 11 Firefighters	2 pumpers
City Park	-	-	50 motor boats

Section 3
POSTATTACK CONDITION OF ALL FIRE-SERVICE PERSONNEL

Casualty curves have been developed for various building types by several investigators (Refs. 2, 7, and 8). By means of these curves, the number of survivors and their condition may be estimated for the shelter buildings of interest. It has been assumed that fire department personnel suffer casualties in the same ratio as the general population. Wherever necessary, specific mortalities and casualties in a group of personnel were assigned randomly. Overpressure levels associated with specific locations may be seen in Fig. 1.

It has generally been assumed that the only personnel available for duty after the hypothetical attack are those in the uninjured category. A complete listing of the various casualty categories has been given, however, since some of the injured personnel could be available for duty after a short period of medical treatment. In some cases even firemen with untreated injuries may be capable of performing normally.

Table 2 presents the location and condition of all fire-service personnel after the attack. A summary of the condition of personnel for the various fire department divisions is given in Table 3.

The casualty numbers given in Tables 2 and 3 are for blast effects only. These casualty figures are analogous to those of the Dikewood report for New Orleans (Ref. 9) wherein no consideration has been given to possible casualties resulting from fire, residual nuclear radiation, or flooding.

Table 2

CONDITION AND LOCATION OF NEW ORLEANS FIRE DEPARTMENT PERSONNEL AFTER POSTULATED ATTACK

FACILITY LOCATION	CONDITION					
	KILLED	NON-AMBULATORY SERIOUSLY INJURED	AMBULATORY SERIOUSLY INJURED	LIGHTLY INJURED	TRAPPED	UNINJURED
CITY HALL:						
Fire Alarm Division Personnel	20	-	-	-	-	-
Fire Prevention Division Personnel	17	-	-	-	-	-
MAINTENANCE GARAGE:						
Division of Repairs Personnel	21	-	-	-	-	-
TRAINING SCHOOL:						
Training Division Personnel	2	-	-	-	1	-
NUMBERED FIRE STATIONS*						
1 - 1						
Officers	6	-	-	-	-	-
Firefighters	11	-	-	-	-	-
1 - 2						
Officers	7	-	-	-	-	-
Firefighters	35	-	-	-	-	-
1 - 3						
Administration Division Personnel	10	-	-	-	-	-
Firefighting Division:						
Officers	13	-	-	-	-	-
Firefighters	43	-	-	-	-	-
2 - 1						
Officers	7	-	-	-	-	-
Firefighters	21	-	-	-	-	-

*First number is the fire district, the second number is the station number.

Table 2, cont.

FACILITY LOCATION	CONDITION					
	KILLED	NON-AMBULATORY SERIOUSLY INJURED	AMBULATORY SERIOUSLY INJURED	LIGHTLY INJURED	TRAPPED	UNINJURED
2 - 2						
Officers	8	-	-	-	-	-
Firefighters	21	-	-	-	-	-
2 - 3						
Officers	6	-	-	-	-	-
Firefighters	23	-	-	-	-	-
2 - 4						
Officers	6	-	-	-	-	-
Firefighters	11	-	-	-	-	-
2 - 5						
Officers	6	-	-	-	-	-
Firefighters	23	-	-	-	-	-
3 - 1						
Officers	6	-	-	-	1	-
Firefighters	11	-	-	-	-	-
3 - 2						
Officers	6	-	-	-	-	-
Firefighters	12	-	-	-	-	-
3 - 3						
Officers	6	-	-	1	-	-
Firefighters	11	-	-	-	-	-
3 - 4						
Officers	5	-	-	1	-	-
Firefighters	11	-	-	-	-	-

Table 2, cont.

FACILITY LOCATION	CONDITION					
	KILLED	NON-AMBULATORY SERIOUSLY INJURED	AMBULATORY SERIOUSLY INJURED	LIGHTLY INJURED	TRAPPED	UNINJURED
3 - 5						
Officers	6	1	1	-	-	-
Firefighters	17	1	1	2	2	-
3 - 6						
Officers	6	-	-	-	-	-
Firefighters	9	1	-	1	1	-
4 - 1						
Officers	9	-	-	-	-	-
Firefighters	23	-	-	-	-	-
4 - 2						
Officers	6	-	-	-	-	-
Firefighters	23	-	-	-	-	-
4 - 3						
Officers	8	-	-	-	-	-
Firefighters	12	-	-	-	-	-
4 - 4						
Officers	7	-	-	-	-	-
Firefighters	12	-	-	-	-	-
4 - 5						
Officers	6	-	-		-	-
Firefighters	11	1	-	-	-	-
5 - 1						
Officers	5	1	-	-	-	-
Firefighters	11	-	-	-	-	-

Table 2, cont.

FACILITY LOCATION	CONDITION					
	KILLED	NON-AMBULATORY SERIOUSLY INJURED	AMBULATORY SERIOUSLY INJURED	LIGHTLY INJURED	TRAPPED	UNINJURED
5 - 2						
Officers	5	-	1	-	-	-
Firefighters	7	1	-	1	2	-
5 - 3						
Officers	7	-	-	-	-	-
Firefighters	11	-	-	-	-	-
5 - 4						
Officers	6	-	-	-	-	-
Firefighters	11	-	-	-	-	-
5 - 5						
Officers	8	1	-	-	-	-
Firefighters	23	-	-	-	-	-
5 - 6						
Officers	6	-	-	-	-	-
Firefighters	11	-	-	-	-	-
5 - 7						
Officers	1	1	1	1	2	-
Firefighters	7	1	1	1	1	-
5 - 8						
Officers	-	-	-	3	-	4
Firefighters	-	-	1	2	-	8
6 - 1						
Officers	4	-	-	1	1	-
Firefighters	19	1	1	1	1	-

Table 2, cont.

FACILITY LOCATION	CONDITION					
	KILLED	NON-AMBULATORY SERIOUSLY INJURED	AMBULATORY SERIOUSLY INJURED	LIGHTLY INJURED	TRAPPED	UNINJURED
6 - 2						
Officers	6	-	1	-	-	-
Firefighters	30	1	-	1	1	-
6 - 3						
Officers	6	-	-	-	-	-
Firefighters	8	-	1	1	1	-
6 - 4						
Officers	5	-	-	-	1	-
Firefighters	10	-	-	1	-	-
6 - 5						
Officers	10	-	-	-	-	-
Firefighters	11	-	-	-	-	-
7 - 1						
Officers	3	1	1	1	2	-
Firefighters	7	1	1	1	2	-
7 - 2						
Officers	5	-	-	-	1	-
Firefighters	22	-	1	1	-	-
7 - 3						
Officers	4	1	-	1	-	-
Firefighters	9	-	1	-	1	-
8 - 1						
Officers	9	-	-	-	-	-
Firefighters	34	-	-	-	-	-

Table 2, cont.

FACILITY LOCATION	CONDITION					
	KILLED	NON-AMBULATORY SERIOUSLY INJURED	AMBULATORY SERIOUSLY INJURED	LIGHTLY INJURED	TRAPPED	UNINJURED
8 - 2						
Officers	6	-	-	-	-	-
Firefighters	10	-	-	-	1	-
8 - 3						
Officers	7	-	-	-	-	-
Firefighters	4	1	1	3	1	1
8 - 4						
Officers	1	-	2	1	-	-
Firefighters	4	2	-	3	2	2
9 - 1						
Officers	2	-	1	3	-	1
Firefighters	5	3	3	6	3	3
9 - 2						
Officers	-	-	-	4	-	4
Firefighters	1	2	2	3	1	2
9 - 3						
Officers	-	-	-	1	-	5
Firefighters	1	1	1	6	1	1

Table 3

SUMMARY OF POSTATTACK CONDITION OF NEW ORLEANS FIRE DEPARTMENT PERSONNEL

FIRE DEPARTMENT DIVISION	CONDITION					
	KILLED	NON-AMBULATORY SERIOUSLY INJURED	AMBULATORY SERIOUSLY INJURED	LIGHTLY INJURED	TRAPPED	UNINJURED
Fire Alarm	20	-	-	-	-	-
Fire Prevention	17	-	-	-	-	-
Repairs	21	-	-	-	-	-
Training	2	-	-	-	1	-
Administration	10	-	-	-	-	-
Firefighting:						
Officers	236	6	8	18	8	14
Firefighters	620	17	13	34	21	17
TOTALS	926	23	21	52	30	31

Section 4

DAMAGE ESTIMATES FOR FIRE-SERVICE FACILITIES

Facilities of the New Orleans Fire Department include Fire Department Headquarters, Fire Stations, Maintenance Garage, the Training School, Central Communications, and the water supply system.

The Maintenance Garage, Communications, and the water supply system are actually shared facilities under the jurisdiction of other city departments but are vital to effective fire department operations and are therefore included. A preliminary evaluation indicates that damage to the water supply system would be quite severe. A major portion of the city experiences more than 10 psi overpressure. This results in general loss of water pressure because of extensive piping damage due to the weapon crater, ground motion, and collapsed structures. Drafting from open bodies of water such as canals and bayous would be difficult due to access problems and would have very limited usefulness.

Damage estimates for the various fire department facilities have been made utilizing the URS building damage prediction methods (Ref. 10). The facilities are primarily brick load-bearing buildings with similar response characteristics. On a gross basis, buildings experiencing less that 1-1/2 psi are considered completely operable since the only damage would be some broken windows. Buildings which are exposed to 4 - 5 psi are considered completely inoperable (although some of these buildings would still be standing, they would be too hazardous for use by the fire department). The intermediate range of overpressure conditions (1-1/2 — 5 psi) would yield buildings only partially usable; appropriate overpressure ranges have been identified with corresponding damage levels.

The Maintenance Garage, Training School, Communications Center and almost all the Fire Stations would be completely inoperable since they experience 5 psi overpressure or more. The fire department facilities are indicated in Fig. 2, which also gives the postattack condition of each in terms of usable

facilities and the nature of damage to the unusable facilities. Not shown in Fig. 2 is Fire Station 5-8 which is located at New Orleans International Airport. The damage symbols used in Fig. 2 are identified as follows:

- ○ Completely operable (except some broken windows)
- ⊙ Firehouse doors jammed or otherwise inoperable plus some light damage such as loss of windows and light interior partitions
- ◐ Exterior walls cracked and partially blown out
- ◒ Roof disrupted and partially removed
- ● Completely inoperable

The damage descriptions shown above are additive with increasing overpressure; for example, where a fire station has experienced exterior wall cracking, the lower overpressure damage to doors, etc., would also be present.

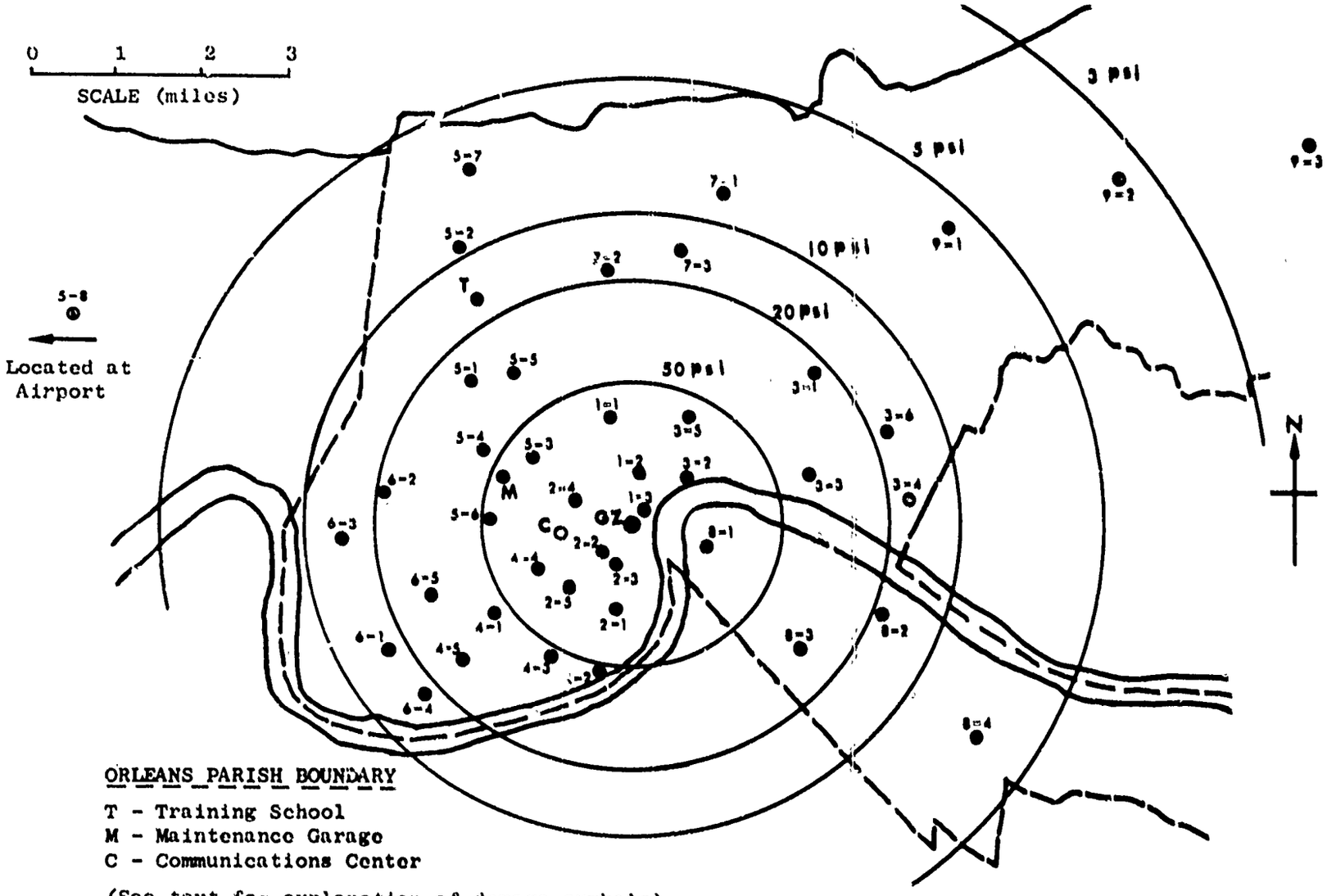


Fig. 2. Postattack Condition of New Orleans Fire Department and Facilities

Section 5
DAMAGE ESTIMATES FOR FIRE-SERVICE TRUCKS

Damage to fire-service mobile equipment must be estimated for two distinct categories. First, for mobile equipment located inside (or immediately adjacent to) the fire department facilities, damage depends almost totally on damage to the facility itself. Second, for mobile equipment located outside (and sufficiently separated from surrounding structures to be unaffected by damage to the structures), a separate damage function related to overpressure is used (Ref. 2).

For vehicles located inside facilities, the following damage levels apply:

OVERPRESSURE (psi)	DAMAGE DESCRIPTION
0 — 1-1/2	Completely operable except some windows broken
1-1/2 — 2-1/2	Light damage such as broken windows, bent and dented hood, fenders and compartment doors (up to half an hour may be needed to restore operability)
2-1/2 — 4	Moderate damage such as wheels and/or engine damaged (1 to 2 hours required to restore operability)
4 — 5	Destroyed (or at least trapped in damaged buildings)

All the trucks of the New Orleans Fire Department are assumed to be stationed inside their normal facilities. The exact location and condition of all these trucks after the postulated attack are given in Table 4.

A summary of the condition of the trucks is given in Table 5. The last item in Table 5 summarizes the damage if all trucks had been stationed outside the facilities.

Table 4

POSTATTACK LOCATION AND CONDITION OF FIRE-SERVICE TRUCKS

LOCATION	COMPLETELY USABLE	LIGHT DAMAGE	MODERATE DAMAGE	INOPERABLE
Training School				2 pumpers
City Park				50 motor boats
Fire-Stations*				
1 - 1				1 pumper 1 salvage unit
1 - 2				2 pumpers 1 ladder truck
1 - 3				1 pumper 1 snorkle 1 ladder truck 1 rescue unit
2 - 1				2 pumpers
2 - 2				2 pumpers
2 - 3				1 pumper 1 ladder truck
2 - 4				1 pumper 1 ladder truck
2 - 5				1 pumper 1 ladder truck
3 - 1				1 pumper 1 ladder truck
3 - 2				2 pumpers
3 - 3				2 pumpers
3 - 4				2 pumpers
3 - 5				1 pumper 1 ladder truck
3 - 6				2 pumpers
4 - 1				1 pumper 1 ladder truck

*District and station number.

Table 4, cont.

LOCATION	COMPLETELY USABLE	LIGHT DAMAGE	MODERATE DAMAGE	INOPERABLE
4 - 2				1 pumper 1 ladder truck
4 - 3				2 pumpers
4 - 4				2 pumpers
4 - 5				2 pumpers
5 - 1				1 pumper 1 hose tender
5 - 2				2 pumpers
5 - 3				2 pumpers
5 - 4				1 pumper 1 ladder truck
5 - 5				1 pumper 1 ladder truck
5 - 6				1 pumper 1 ladder truck
5 - 7				3 pumpers
5 - 8		1 pumper		
6 - 1				1 pumper 1 ladder truck
6 - 2				2 pumpers 1 ladder truck
6 - 3				2 pumpers
6 - 4				2 pumpers
6 - 5				2 pumpers
7 - 1				2 pumpers
7 - 2				1 pumper 1 ladder truck
7 - 3				1 pumper 1 hose tender
8 - 1				2 pumpers 1 ladder truck
8 - 2				1 pumper
8 - 3				1 pumper
8 - 4				2 pumpers

Table 4, cont.

LOCATION	COMPLETELY USABLE	LIGHT DAMAGE	MODERATE DAMAGE	INOPERABLE
9 - 1				3 pumpers
9 - 2			1 pumper 2 emergency units	
9 - 3		2 pumpers		

Table 5

SUMMARY OF DAMAGE TO FIRE-SERVICE TRUCKS

TYPE OF TRUCK	COMPLETELY USABLE	LIGHT DAMAGE	MODERATE DAMAGE	INOPERABLE
Pumpers	-	3	1	64
Ladder trucks	-	-	-	16
Emergency units	-	-	2	-
Snorkle	-	-	-	1
Salvage unit	-	-	-	1
Hose tender	-	-	-	2
Rescue unit	-	-	-	1
TOTAL TRUCKS (located inside)	-	3	3	85
TOTAL TRUCKS (if located outside in open areas)	3	3	12	73

Section 6

OTHER FIRE DEPARTMENTS IN THE NEW ORLEANS AREA

In addition to the City of New Orleans Fire Department, two other communities outside New Orleans have professional fire departments which should be considered. Only those cities within 10 miles of the New Orleans city limit are included since the fire departments of more distant cities would require excessive time to respond to a New Orleans need and/or would have more pressing local requirements.*

Table 6 presents a summary of the personnel, facilities, and trucks for the fire departments of each of the other communities (Ref. 6). Damage estimates for these fire departments have been made using the following assumptions in the absence of detailed information for the cities involved:

1. Fire stations are located randomly in the communities, but those of each community are assigned equal areas to protect.

2. Fire stations are all assumed to be of brick load-bearing construction.

3. All fire-service personnel are located at or near the fire stations and experience casualties similar to the New Orleans general population located at corresponding overpressure levels.

4. All fire department vehicles are located within the fire stations.

---

* This had been done in spite of any mutual-aid agreements with cities more than 10 miles distant.

Table 6

POSTATTACK LOCATION AND CONDITION OF RESOURCES
FOR OTHER FIRE DEPARTMENTS IN THE NEW ORLEANS AREA

	JEFFERSON PARISH	ST. BERNARD PARISH
Total Personnel	145	136
Casualties		
Killed	40	31
Injured	72	65
Fire Stations		
Total Number	5	5
Condition		
Lightly damaged	1	2
Moderately damaged	2	2
Inoperable	5	4

Section 7

ANALYSIS OF REMAINING FIRE DEPARTMENT CAPABILITIES

This section summarizes the results of previous sections and will attempt to analyze the remaining capabilities of the New Orleans Fire Department. This analysis will include considerations of the magnitude of the demands on the fire department, obstacles hampering fire-service performance, and alternative actions by the fire department.

PERSONNEL

Top management personnel of the fire department (including the entire Administration Division) would all be killed. Similarly, all personnel of the Repairs, Fire Alarm, and Fire Prevention Divisions would suffer 100% mortalities. Only one member of the Training Division would survive. The Firefighting Division would have about 85% of its members killed and only 31 (approximately 3% of the total force) of the survivors would be uninjured.

FACILITIES

The Fire Department Headquarters, Training School, Maintenance Garage, and Communications Center would all be completely inoperable. Of the 42 fire stations, 39 would be completely inoperable, 1 would have exterior walls cracked and partially blown out, 1 would have the roof disrupted and partially removed, and 1 would have the firehouse doors jammed or otherwise inoperable plus light damage such as loss of windows and light interior partitions.

Based on the above, none of the fire stations would be completely operable and only one would be operable after some repairs to firehouse doors, windows, and interior partitions. The remaining fire stations are inoperable and would probably require complete rebuilding to restore operations.

TRUCKS

On an overall basis, none of the fire-service trucks would be completely operable after the postulated attack. Only three trucks would be lightly damaged and capable of being restored to operability within half an hour.

Clearly there are some benefits to be derived from selecting the alternative posture of locating fire-service trucks outside the stations before the attack. Under such conditions, three trucks would be completely operable after the attack and three others would be capable of being restored to operability within half an hour.

DEMANDS ON THE FIRE SERVICES

An examination of the pertinent fire-behavior model study (Ref. 4) indicates that New Orleans would experience a very large number of structural fires in the region between 3 and 5 psi overpressure. The probability of significant fire per residential structure would be about 0.2 at 4 psi, dropping off rapidly to zero at about 3 psi. This region encompasses on the order of 300 blocks of residential structures in New Orleans. Assuming no more than five residences per block (conservative) and an average ignition probability of 0.1, this would result in approximately 150 residential fires in this area alone.* A demand situation of this magnitude might be handled by the entire undegraded New Orleans Fire Department but it is obvious that the fire services remaining after the hypothetical attack could not meet the emergency.

OBSTACLES TO FIRE-SERVICE ACTIVITIES

Fire-service activities performed in the postattack period would be hampered by the loss of resources as indicated above and by other factors such as radioactive fallout, structural debris, and flood waters.

---

*It is recognized that fire spread in the city could be affected by rising waters, which would enter soon after the attack. Such effects have been ignored for this study, however, since the blast and primary-fire damage suffered by New Orleans is so extensive.

An examination of overpressure contours for New Orleans (Fig. 1) reveals that nearly all of the city would be exposed to overpressure levels in excess of 5 psi. Such overpressure levels would surely result in greatly reduced mobility in these areas due to debris and would limit access to the wider streets.

It has been estimated that rising water would start filling into the city immediately after the detonation and would continue for the next 24 hours, at which time much of the city would be covered. Mobility in much of the city would, therefore, be greatly reduced.

POTENTIAL FIRE-SERVICE ACTIVITIES

Orthodox firefighting would require normal fire-reporting methods, full water pressure and supply, completely operable trucks with full crews and supporting officers, and completely free access to any part of the city. It is obvious that all of the above requirements are missing in the postattack situation and, therefore, orthodox firefighting cannot be carried out. In view of the overwhelming demands existing, the orthodox approach of fighting one fire at a time with large forces of firefighters should not be followed anyway. An examination of alternative actions for the fire services is appropriate (Refs. 2 and 11) even though so few firemen remain.

The remaining fire-service personnel would probably achieve the most good by supporting self-help firefighting activities in the shelters near where firemen are located. Beyond this it is possible that some limited exposure-control activities could be performed at crucial locations. Finally, the fire services could assist in evacuation. It is obvious, however, that with the small number of fire-service personnel remaining very little could be accomplished in relation to the magnitude of the demands.

Section 8
REFERENCES

1. Specifications for Damaged Target Model, 5X-11101-4009-1, Five-City Study, Office of Civil Defense, November 1965

2. Martin, S.B., M. Staackmann, and R.W. Ramstad, Fire-Service Capabilities for Damage Control and Rescue, OCD Work Unit 2512A, URS 673-3, URS Research Company, Burlingame, California, March 1968

3. Martin, S.B., M. Staackmann, and R.W. Ramstad, Supplementary Analysis of Fire-Service Capabilities for Damage Control and Rescue, OCD Work Unit 2522E, 5S-11101-2522E-01, URS 673-4, URS Research Company, Burlingame, California, March 1968

4. Martin, S.B., R.W. Ramstad, and C. Colvin, Development and Application of an Interim Fire-Behavior Model, URS 674-3, URS Research Company, Burlingame, California, Final Report Draft, April 1968

5. Harker, R.A., City of New Orleans Attack Preparation Scenario, 5N-11101-4123B-03, Stanford Research Institute, February 1966

6. Verbal communication with New Orleans Fire Superintendent, Arthur J. Heyd

7. Crain, J.L., R.K. Meister, L.G. Thomas, and E.M. Spurlock, Supplemental Analysis – Civil Defense Rescue, Phase 1b Analytical (Draft) Report, Stanford Research Institute, August 1965

8. Davis, et al., Prediction of Urban Casualties from Immediate Effects of Nuclear Attack (U), Dikewood Corporation, April 1963 (C)

9. Jenkins, M.E., S.G. Vandevender, and A. Rockman, Preliminary Estimate of Initial Damage to Population, New Orleans, Louisiana, and Adjacent Parishes, Dikewood Corporation, January 31, 1968

10. Edmunds, J.E., Structural Debris and Building Damage Prediction Methods, URS 686-5, URS Research Company, Burlingame, California, June 1968

11. Ramstad, R.W., and S.B. Martin, Fire-Service Capabilities for Damage Control, URS 696-5, URS Research Company, Burlingame, California, Final Report (in preparation)

UNCLASSIFIED

Security Classification

DOCUMENT CONTROL DATA - R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY *(Corporate author)*

URS Research Company, 1811 Trousdale Drive, Burlingame, California 94010

2a. REPORT SECURITY CLASSIFICATION

UNCLASSIFIED

2b. GROUP

3. REPORT TITLE

DAMAGE TO AND ANALYSIS OF FIRE DEPARTMENT CAPABILITIES, CITY OF NEW ORLEANS

4. DESCRIPTIVE NOTES *(Type of report and inclusive dates)*

Final Report

5. AUTHOR(S) *(First name, middle initial, last name)*

Milton Staackmann

6. REPORT DATE	7a. TOTAL NO. OF PAGES	7b. NO. OF REFS
March 1969	49	11

8a. CONTRACT OR GRANT NO.	9a. ORIGINATOR'S REPORT NUMBER(S)
N00228-68-C-1793 b. PROJECT NO. c. Work Unit 2522H d.	URS 697-6 9b. OTHER REPORT NO(S) *(Any other numbers that may be assigned this report)* 5N-11101-2522H-03

10. DISTRIBUTION STATEMENT

Each transmittal of this document outside the agencies of the U.S. Government must have prior approval of OSA/OCD.

11. SUPPLEMENTARY NOTES	12. SPONSORING MILITARY ACTIVITY
	U.S. Naval Radiological Defense Lab San Francisco, California 94135

13. ABSTRACT

This study examines damage to the New Orleans Fire Department as a result of the Five-City-Study attack and analyzes the fire department capabilities in dealing with the postattack fire situation. After reviewing damage incurred by personnel, facilities, and equipment, the remaining fire-service resources were evaluated with respect to the magnitude of the demand situation and obstacles preventing the satisfaction of these demands.

The evaluation considered strength and location of the fire services prior to the attack, casualties and damage incurred to the fire services as a result of the attack, and analysis of the remaining capabilities in the postattack period.

The research yielded the following findings: (1) Firefighting personnel would experience fatalities on the order of 85% of their number; only about 3% would be uninjured. (2) None of the fire stations would be completely usable after attack. The headquarters, training school, maintenance garage, and communications center would all be inoperable. The water supply system would suffer severe damage. (3) No fire-service trucks survive undamaged, three trucks would need only minor repair. (4) Survival of the fire trucks would have been enhanced by stationing in open areas, away from falling debris. (5) In view of the inability of the fire-service personnel and equipment to deal with the postattack demands, it is recommended that orthodox fire-fighting be abandoned in favor of more limited, self-help-type activities stressing population survival and protection of critical areas.

DD FORM 1 NOV 65 1473 REPLACES DD FORM 1473, 1 JAN 64, WHICH IS OBSOLETE FOR ARMY USE.

UNCLASSIFIED

Security Classification

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Fire department capabilities						
Postattack fire situation						
Fire-service resources						
Population survival						
Protection of critical areas						