AD NUMBER
AD004617
CLASSIFICATION CHANGES
TO: unclassified
FROM: restricted
LIMITATION CHANGES
TO: Approved for public release, distribution unlimited
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E.O. 10501 5 Nov 1953; RADC ltr, 26 Nov 1969

TECHNICAL MEMORANDUM
ORO-T-203

THE KANSAS CITY FLOOD AND FIRE OF 1951

by

University of Oklahoma Research Institute

Received: 25 August 1952

Operating Under Contract with the
DEPARTMENT OF THE ARMY

SECURITY **RESTRICTED** INFORMATION

DEPARTMENT OF THE ARMY
OFFICE, ASSISTANT CHIEF OF STAFF, G-3, OPERATIONS
WASHINGTON 25, D. C.

G-3 040 ORO (2 Mar 53) 11 March 1953

SUBJECT: Technical Memorandum ORO-T-203

TO: Armed Services Technical Information Agy
Document Service Center
U. S. Building
Dayton 2, Ohio
ATTN: DSC-SD

1. Transmitted herewith for your advance information is a copy of Technical Memorandum ORO-T-203, "The Kansas City Flood and Fire of 1951."

2. This publication is a working paper of the Operations Research Office (Project ATTACK), in which the conclusions made confirm the soundness of doctrinal and training literature previously published by the Department of the Army, stressing the importance of adequate warning systems, troop indoctrination, and aggressive exploitation in the employment of atomic weapons.

3. Request that appropriate comments on this Memorandum be submitted to ACofS, G-3 (RR&SW) for consideration by the Director, ORO in the preparation of the final report.

FOR THE ASSISTANT CHIEF OF STAFF, G-3:

for H. McK. ROPER
Brigadier General, GS
Deputy ACofS, G-3 for
Research, Requirements & Special Wpns.

1 Incl
ORO-T-203

SECURITY **RESTRICTED** INFORMATION

THIS IS A WORKING PAPER

Presenting the considered results of study by the ORO staff members responsible for its preparation. The findings and analysis are subject to revision as may be required by new facts or by modification of basic assumptions. Comments and criticism of the contents are invited. Remarks should be addressed to:

The Director
Operations Research Office
The Johns Hopkins University
6410 Connecticut Avenue
Chevy Chase, Maryland

ORO abstract

THE KANSAS CITY FLOOD AND FIRE OF 1951

by

University of Oklahoma Research Institute

As part of a larger survey of all types of disaster, the Kansas City flood and fire of 1951 was investigated. This disaster was typical of that in which there is a long warning period before the catastrophe. The behavior of civilians, and of such trained disaster fighters as firemen, before and during the unprecedented event was analyzed to determine whether behavior patterns exist which might apply to troop behavior under atomic attack. Among the conclusions:

- In a long-threatened disaster, continued warnings may minimize the sense of threat.
- Soldiers should be taught what to expect from an atomic bomb, and what defense or follow-up measures to institute.
- Since the initial impact will cause temporary disorganization, an immediate follow-up by the attacker will increase the effect of a bomb.
- *Esprit de corps* and loyalty to commanding officer will enable individuals to withstand unusual stresses.

abstract taken by _____ date _____

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Project ATTACK

OPERATIONS RESEARCH OFFICE — The Johns Hopkins University
OPERATING UNDER CONTRACT WITH THE DEPARTMENT OF THE ARMY

Technical Memorandum ORO-T-203

ORO

THE KANSAS CITY FLOOD AND FIRE OF 1951

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Project
ATTACK

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OPERATIONS RESEARCH OFFICE
The Johns Hopkins University Chevy Chase, Maryland

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SUMMARY

PROBLEM

To study the behavior of civilians and trained disaster fighters under disaster conditions of unprecedented proportions during the Kansas City flood and fire of 1951 in order to determine whether patterns exist which apply to troop behavior under atomic attack.

FACTS

This is part of a larger study which includes investigations of all types of disaster — both precipitant (without warning) and crescive (long-threatened) — to determine whether behavior patterns in such situations can be found which may be extrapolated to military behavior.

The method of investigation consisted of personal interviews made soon after the disaster. A sample questionnaire appears in the Appendix.

DISCUSSION

Two aspects of the problem were selected for intensive study: (a) the problem of civilian adaptation to prolonged threat of the disaster -- warning and evacuation, and (b) the reactions of such trained and experienced disaster fighters as firemen to a new and unusually severe disaster. The latter may be extrapolated almost directly to the military problem.

The gradual adaptation to approaching danger made warnings less effective and evacuation more difficult, though no signs of acute fear or panic were evident. When firemen were ordered to report for duty, there were few signs of fear or resentment.

CONCLUSIONS

Although adequate time for repeated warnings exists in a long-threatened disaster, certain factors may impede the development of both adequate apprehension and subsequent positive action:

1. Past experience and established expectations may render warnings less credible.
2. Conflicting reports may make the situation ambiguous and confront the individual with choice of alternative definitions of the situation.
3. Motivations may color perception of the situation in such a way as to minimize the sense of threat.
4. Subjects may be unable to interpret correctly the evidence at hand.

Among the firemen, the following factors seemed the most significant:

5. Uncertainty about the threat and helplessness to combat it were major anxiety-producing factors.
6. Esprit de corps and loyalty to chief established and enforced group standards which supported and sustained the individual in stresses he would otherwise not have been able to withstand.

RECOMMENDATIONS

Since soldiers in all future wars will expect use of atomic weapons, therefore:

1. Individuals and units must maintain constant and rigid security measures to prevent the enemy from achieving the advantage of surprise in use of the weapon.
2. Soldiers should carry with them a pattern of expectations about the atomic bomb -- its effects, defense against it, when and how it might be used.
3. Because the initial impact may cause temporary disorganization and demoralization, a follow-up is essential to achieve maximum exploitation.

THE KANSAS CITY FLOOD AND FIRE OF 1951

INTRODUCTION

The flood which inundated five industrial and residential districts of Greater Kansas City between 12 and 17 July, 1951, constituted one of the major civilian disasters in the history of the United States. Although only three lives were lost, thousands of people were rendered homeless and property damage neared the million-dollar level. The flood waters, breaching or topping the dikes designed to contain them, forced the evacuation of nearly 20,000 residents from their homes in the lowlands along the Kaw (or Kansas) River. As though the flood were not enough, one of the largest, most destructive fires in the history of the city burned intermittently for five days, imposing a severe strain on the men and equipment of the Kansas City, Missouri, Fire Department.

While a flood in a civilian community is, in many respects, very remote from an atomic attack on a military force, the Kansas City disaster affords an opportunity to investigate certain relevant disaster problems. One of these is the problem of evacuation of large numbers of people in the face of imminent danger. Even more pertinent to the military problem is the adjustment of a trained force of disaster fighters (the fire department) to a disaster of unprecedented proportions.

METHODOLOGY

Two Types of Disaster

Regardless of how many temporal stages are set up for the analysis of disasters, every disaster situation includes two major phases separated by the moment of impact of the disaster-producing force. The pre-impact, or threat, phase exists only in truncated form, psychologically, in many disasters. In disasters of a precipitant nature, such as explosions, tornadoes, earthquakes, and some types of bombings, danger signals may appear only seconds before the destructive force is unleashed. These may be called precipitant disasters.

In such disasters, the major portion of the adjustive behavior occurs during the post-impact, or reaction, phase. While some adjustive behavior may take place during even a few seconds of threat, adjustment to a precipant disaster, for many people, consists of efforts to recover, or to help others recover, from the effects of an already experienced catastrophe. A fairly common exception is found in multiphase precipitant disasters in which the initial impact is followed by threats of new blows. Here recovery from impact and adjustment to threat may occur simultaneously.

The nonprecipitant, or better, the crescive disaster is distinguished by the fact that a relatively long period of development and threat precedes the catastrophe. When the events of this period of development are subjectively perceived by the threatened group as signs of danger, adaptive behavior serving to minimize the disastrous effects may take place. The salient feature of this phase is, of course, that this pre-impact behavior may be either adaptive or maladaptive. In the latter case, destruction may be increased rather than lessened.

In warfare, defensive operations include as a major function making every disaster a crescive one, in the hope that adaptive behavior may render it no disaster at all. Ground and aerial reconnaissance, intelligence estimates of the situation, and aircraft detection devices serve this purpose. The surprise attack and the sneak air raid constitute difficult-to-achieve precipitant military disasters.

The Flood as a Crescive Disaster

A fairly common crescive disaster in the civilian arena is the flood. While flash floods, especially those caused by dam breaks, may be of the precipitant type, many of the major floods in United States history have been of a crescive nature, characterized by gradually rising water levels and mensurable, slowly moving crests. The Kansas flood in July, 1951, was of this type. It included not only a relatively long period of warning but recurrent crises over a prolonged period — sequential inundation of various inhabited areas, fires, and explosions.

Disaster Victims and Disaster Fighters

In the study of human reactions to a disaster, one major axis along which the population involved must be divided is based on their mission. The basic dichotomy, not always a clear-cut one, is between disaster fighters and disaster victims. In the usual

civilian disaster, it may be anticipated that the latter, people whose reactions are primarily in terms of minimizing the effects of the disaster on themselves and their primary groups, will predominate numerically. While disaster fighters in a civilian community may also be victims, they have an expected role of minimizing the effects for any and all who may be exposed, even at the expense of their own interests. Disaster fighters may include policemen, firemen, members of relief agencies, and military or naval personnel.

In the military disaster, the situation is such that the majority of the personnel involved are primarily disaster fighters, although they are also victims. The mission of the soldier is not to save himself and his own, but to prevent disaster from striking the unit of which he is a part or, if it does strike, to contribute to the recovery of the unit. The only people who might be found in a military disaster area who are primarily victims are civilians in a combat zone. It may be assumed, therefore, that in the study of civilian and military disasters, the civilian groups most comparable to military groups are the disaster fighters. This is particularly true of fire fighters for, while they fight no flesh and blood enemy, it is their mission to destroy a dangerous physical foe which may overpower them and the people whom they protect.

Objectives of This Study

The first aspect of the Kansas City flood disaster selected for study in this project was the problem of adaptation to threat in the pre-impact phase of a crescive disaster. The problems were primarily those of warning and evacuation. Data were obtained by interviews with police and fire department personnel in charge of the evacuation and with a few of the victims forced to flee their homes.

The second, but more important, aspect studied was the reactions of firemen -- organized, trained, and experienced disaster fighters -- to a novel and unusually severe disaster. This aspect is said to be more important than the preceding one because of its greater relevance to the situation of military forces in disaster. Data were obtained by interviews with a representative sample of 63 members of the Kansas City, Missouri, Fire Department. In addition to the data on their reactions to this particular situation, much information about the psychology of the professional fire fighter was obtained in these interviews.

NARRATIVE HISTORY

High water is nothing unusual to the people of Greater Kansas City. Every spring the water runs high in the Missouri and Kaw Rivers, which join in the very heart of the metropolitan district and divide Kansas City, Missouri, from Kansas City, Kansas, and from North Kansas City, Missouri. In 1844 and again in 1903, there had been great, devastating floods. During the years after the 1903 flood, however, a system of dikes had been built, designed to cope with a flood level five feet higher than the one of 1903. Confident in the protection afforded by these dikes, manufacturers had built a great industrial district in the lowlands along the rivers, and thousands of workmen had made their homes near the factories. Two districts on the Kansas side contained densely populated residential areas -- Argentine, an area with a high proportion of Mexicans, and Armourdale.

Abnormally heavy rains during June and the early days of July, 1951, filled many small eastern Kansas rivers, which in turn emptied their waters into the Kaw River. Early in July, the Kaw flooded Manhattan, Kansas, but this was a remote 130 miles west of Kansas City. A few days later, the Kaw flood drove 20,000 people from their homes in and around Topeka, 70 miles from Kansas City. The flood then moved closer yet and struck Lawrence, only 48 miles away. In the meantime, the Kaw was flowing bankfull at Kansas City. By 11 July, as the crest of the flood moved closer, farmlands only 15 miles west of Kansas City were under water. Yet, according to a Kansas City reporter, the people of the city were not alarmed:

> But even with the bad actions of the Kaw at Manhattan, Topeka, and Lawrence, most Kansas Citians weren't too worried. The dikes had held back the flooding rivers more than forty years and many millions had gone into them.[1]

By 12 July, however, measurements of the volume of water descending on the city indicated that the biggest flood in history, larger even than the record deluge of 1844, was to be expected. Now a great debate began over the crucial question: Will the dikes hold? On the morning of 12 July, the Department of the Army engineers in charge of flood control believed they would; the city engineer of Kansas City, Kansas, predicted they would not. The Acting Mayor of the city accepted the verdict of the city

[1] Kansas City Star, 22 July, 1951, p. 12A.

engineer and ordered the evacuation of Argentine, the district most likely to be flooded first. Residents of Armourdale, the next district downstream, were advised that the sounding of sirens would be a signal for them to move to higher ground.

During the afternoon of 12 July, firemen and policemen urged the residents of Argentine to evacuate. Yet, when the water did break through at approximately 2330 hours, many residents were forced to flee with the water at their heels; others were trapped in the upper floors of buildings.

At 2200 hours, 12 July, the sirens were sounded by police cars in Armourdale, to signal the evacuation order for that district. All night long, officers went from door to door ordering people to get out. Again, as in Argentine, when the water swept over the dikes at 0530 hours, 13 July, many people still remained to flee in haste or to be trapped. As the water flowed over the dikes, sirens were again sounded, and the police used mobile loud-speakers to warn the people of the imminent danger.

As the water rose to cover the roofs of two-story buildings in Argentine and Armourdale, rescue boats operated by firemen, police, navy and army reservists, and civilian volunteers battled the terrific current to reach trapped survivors stranded on roof tops, on telephone poles, and on floating debris. During the day of 13 July, as on the preceding day, thousands of sightseers lined the banks of the river to watch the terrifying spectacle.

Next to go under was the part of Kansas City, Missouri, known as the Central Industrial District. It contained relatively few inhabitants, but some of these and many workmen fled pell-mell before the flood waters rushed in at about 1130 hours, Friday, 13 July. Only 45 minutes before the water came over the dikes Army engineers had declared the district safe!

The fourth district to go under was Fairfax, on the Kansas side. It was evacuated during the day, Saturday, 14 July; few people other than disaster workers remained when the water came in at 1800 hours Saturday. North Kansas City was also emptied of its 5,000 inhabitants before the water flooded a small portion of that city Saturday night.

On the fateful Friday, another disaster started in Kansas City, Missouri -- a disaster within a disaster. Shortly after noon, a 6,000-gallon oil tank floating on the flood waters on the Missouri side caught fire and exploded in the midst of the Phillips Petroleum Company storage ground. The floating oil and embers spread the fire to other tanks, to the exposed portions of partly submerged buildings, and to a huge lumber yard. From 1324

until 1515 hours, firemen fought a huge conflagration marked by intermittent explosions. The firemen worked in neck-deep water and often had to swim to advance their hose. With fire hydrants covered by water and the water pressure depleted, it was necessary to use flood waters to pour on the fire.

Just as the fire came under control, a new explosion spread it again. Many small explosions and the large explosion of a 12,000-gallon tank kept the fire burning out of control over a seven-square-block area until 2330 hours Friday. At 0200 hours, 14 July, a small ember drifted into the oil slick in the lumber yard and started the conflagration again. This fire raged until 0700 hours Saturday morning. At 1015 hours, fire broke out again in the warehouses of an oil and grease company; the battle was resumed, to continue until 1700 hours.

At 2230 hours Saturday night, another floating tank exploded starting a new fire which burned out of control until 1400 hours, Sunday, 15 July. Only 20 minutes later, new fires sprang up following another explosion. Just as these fires were about to come under control at 1810 hours Sunday, a 500,000-gallon tank exploded, endangering the lives of the fire fighters and starting a conflagration that kept them busy throughout the night and until 1100 hours, Monday, 16 July.

After this time, the fire was kept from spreading, but intensive and often dangerous work was required throughout Monday to keep it under control. This included two applications of foam to the largest of the exploded tanks, which was still burning as late as 1700 hours, Monday, 16 July. Patrolling to prevent the outbreak of new fires was continued throughout the following day, Tuesday, 17 July.

The task of fire-fighting on Monday, the fifth day of the flood, was complicated by the fact that the waters were receding, leaving pumpers high and dry. By Tuesday, the 18th, as the raging rivers became peaceful once more, the full extent of the damage caused by flood and fire stood revealed. The clean-up and rehabilitation phase began. An inkling of the immensity of these tasks is found in the fact,that over a month after the waters receded, residents of the flooded areas were still barred from entering by rigid police cordons.

EVACUATION

This analysis of the evacuation of the lowland areas of the flood-stricken cities is based on interviews with 20 persons who took part in it and is supplemented by newspaper accounts. Of these 20, 10 actually lived in the flooded area and 10 were firemen or policemen who helped in the evacuation. All were actually in some part of the area after the evacuation was ordered; some had remained to assist in rescue work after the area was flooded.

TYPES OF WARNING SIGNALS

A variety of signals was used to warn the residents of the threatened areas to move to higher ground. First, announcements were broadcast over the commercial radio stations. Two types were made: (a) warnings that an area was in imminent danger and that immediate evacuation had been ordered by city officials, and (b) announcements that an area might be endangered and that the blowing of sirens would signify imminent danger and the need for immediate flight.

Second, actual blowing of the sirens constituted a type of signal, of course. Third, evacuation orders were announced over loud-speakers mounted on police cars cruising the threatened areas. Fourth, word-of-mouth warnings were issued by police officers who went from house to house, particularly during the night, rousing people and warning them to leave the area.

REACTIONS TO THE WARNINGS

In spite of the number and variety of warning signals that were given, there was widespread reluctance to evacuate on the part of perhaps a majority of the residents, and the evacuation was a slow process. According to evacuation officials, many people did not leave the stricken areas until the water was

actually coming in; some lingered until they had to be removed by boat. This was particularly true in Argentine, Armourdale, and the Central Industrial District. Fairfax, the last district to be flooded, was evacuated more promptly. The tardiness of evacuation can be laid to two major causes: (a) failure of the inhabitants to heed evacuation orders, and (b) traffic congestion. It is the first which is most significant from the psychological viewpoint.

In general, the reaction of the people in the threatened districts of the two cities to the warnings was one of skepticism and overconfidence. In the Argentine and Armourdale districts, this was particularly evident; a large part of the population did not evacuate until the water was at their feet. Part of this disregard of a genuine threat was obviously the result of the memory or tradition of an earlier great flood, the flood of 1903. Some old-timers had experienced this great flood, and younger residents had heard many stories of it. Both young and old had seen, over the years, great dikes constructed, designed to hold back waters five feet higher than those of 1903. A volume of water which would not only equal but would greatly exceed this was simply unthinkable to many people. For example, one young man, a resident of Armourdale, said:

> My folks went through the 1903 flood. The water was five feet deep then, but there were no dikes. But we had dikes this time; I wasn't worried about its coming over them.

This skepticism of the flood waters' power to overcome a mighty system of dikes was not confined to the general public; it extended into the ranks of officials responsible for issuing evacuation orders. As a result, conflicting reports of the amount of danger reached the inhabitants of the various districts. Reports that the dikes would hold were generally ascribed to the Army engineers. Whatever the source and the prevalence of these optimistic predictions, they were an important factor in causing people to disregard early evacuation warnings.

A factor reinforcing the belief in the optimistic predictions, as opposed to the unpleasant warnings, was the visual evidence available to any inhabitant who chose to see for himself. While he could see the water rising, and rapidly at that, it was, nevertheless, rising by degrees. Each new level could be the highest. Furthermore, he could see workers heightening and strengthening the dikes with sandbags. Hence there was a tendency to think, "It can't go any higher." Even though a person might accept the

possibility of the water's going over the dikes, he might still feel that the danger would be small. Hence some said, "We'll stay and see what happens; if it does come over, then we'll move to higher ground." Others felt safe in moving to the second floor of two-story homes, confident that the water could not possibly reach so high.

Another obstacle to the effectiveness of the warnings was the large Spanish-speaking population in the Argentine district. Broadcasts in English were not understood by many Mexicans; it was necessary to reach them through the medium of bilingual members of the group. The process was necessarily slow.

Another factor which must be regarded as important in causing people to underestimate the threat was the inconvenience of evacuation. Evacuation meant leaving a home and treasured possessions to an uncertain fate. The alternatives were to move a whole house full of furnishings with whatever transportation was available, or simply not to evacuate. While a few people were able to obtain trucks and move their household goods, many others preferred to stay and hope that the warnings would prove false. After all, if worst came to worst, they themselves could escape by automobile or even on foot. Some did pack extra clothing in bags which they could carry with them in a hasty flight.

This wait-and-see attitude proved costly to hundreds of people. When the water did come over or through the dikes into the residential areas it came with a rapidity which left no time for flight preparations. People who planned to move to high ground when the water came in found that they were lucky to escape with the clothes they had on. Those who had moved to second floors found themselves driven to the roof tops, where they were trapped by still-rising waters.

The statements of some of the evacuees exemplify the attitude of skepticism which was prevalent:

A man from Central Industrial District

> The night before, they said on the radio that the water might get into the District, but I didn't see how it could. The next morning they kept saying the area was safe. About 10 o'clock a waitress called me from my restaurant and said the police had ordered an evacuation in an hour. She was worried. I thought they were talking about the Kansas side. In fact, I knew the levee had broken there, and I thought we were all right.

A woman from Argentine

None of the people were scared. They never thought that the water would rise as high as it did. They didn't even think it would come over the dikes. The first warning was given two or three days before the water came in, and nobody paid much attention to it. Even when they were broadcasting warnings to evacuate on Thursday morning people said, "We'll wait -- we have cars." They thought, "If I see the water then I'll run up to the high ground."

A man from Armourdale

The people all felt pretty safe until it came through. When it did, we just had a blank look. The dikes were supposed to hold! But even after the water started coming in, some people still felt safe. The people who got trapped weren't scared. I remember one restaurant owner standing in the water and telling us it wouldn't go any higher -- to come back for a cup of coffee in a little while!

Even those people who did heed the early warnings found that evacuation was no easy matter. The spectacle of the unprecedented flood attracted thousands of sightseers, unmindful of the problems of the inhabitants of the threatened areas. As a result, the streets and viaducts leading out of the lowlands were crowded with vehicles which impeded the vital flow of evacuation traffic. Many automobiles were abandoned to destruction because of the traffic congestion; the drivers found they could move faster on foot.

Despite the reluctance of many victims to evacuate, the great majority did flee, sooner or later, in time to avoid receiving personal injury or being trapped. The forces causing these people to make the final important decision are as significant as the ones causing initial reluctance to evacuate.

STIMULI TO FLIGHT

In view of the large number of people involved in this evacuation and the small number of subjects interviewed, it is impossible to assess the relative importance of different stimuli in evoking the evacuation response. On the basis of the observations of evacuation officials and the reports of a few evacuees, we may, however, identify certain types of stimuli which caused

individuals to decide to flee. The important result of this analysis is the indication that, even when confronted with a well-defined physical threat, people do not respond directly and automatically to simple, discrete stimuli. Rather, they respond to their interpretations of a complex configuration which includes, among other things, the reactions of other people.

Undoubtedly many people did evacuate in response to the various warnings given by evacuation officials. The fact that, according to officials, the first warnings went largely unheeded indicates that these warnings, alone, were not sufficient to cause flight. As has been shown above, they were weighed in relation to past experience, a pre-established set of expectations concerning the effectiveness of the dikes, conflicting predictions, visual evidence of the water level, and the inconvenience which evacuation would cause. That the reactions of other people also affected individual decisions is shown in the following statement made by an inhabitant of the Central Industrial District:

> I heard the night before that when the whistles blew three times it meant to evacuate. At 6 o'clock in the morning I heard the whistles blow, but nobody left so I didn't either. I was kind of worried but nobody seemed to be leaving.

We may also speculate that the absence, in a civilian population, of discipline and training for such an emergency reduced the effectiveness of such warning orders as were given initially, particularly orders given through mass communication media. The indirect nature of these warnings may also account, in part, for their relative ineffectiveness.

Evacuation officials felt that more direct and personal warnings were more effective. They felt that police cars with loudspeakers, cruising in the very areas in which they were ordering evacuation, were more effective than sirens and radio announcements. It may be noted that, in other disasters, mobile speakers have proven effective as a means of communication and control.

Warnings delivered personally by officers, used as the need for evacuation became more urgent, were also effective. It is obvious that, in this case, more detailed arguments to allay doubts as to the validity of the warning could be presented. Here also, opportunities for individual decisions as to whether to heed the warning would be minimized.

Yet even these direct warnings evoked a variety of reactions and were not always sufficient to arouse a genuine sense of threat in the evacuees. A police sergeant said:

> The night before the water came into Armourdale we started about 10 o'clock warning people. We went up and down the streets knocking on doors and telling people to leave. We got all sorts of reactions. A lot of them had this "I'm from Missouri" attitude. They'd say, "I was here in 1903 -- we'll be all right." Damn few people really appreciated what we were trying to do. People didn't realize what actually had happened until it was all over and the water went down.

Apparently the two factors which were crucial in causing evacuation on a large scale were (a) the example of a few community leaders, and (b) the actual sight of the water flowing into the districts. No comment is required on the fact that the conquest of the allegedly impregnable dikes by the flood waters could be expected to convince many doubters. As has been pointed out, however, some people still were not convinced that they were in real danger. These were the people who later had to be rescued, sometimes against their will.

A clear example of the influence of indigenous group leaders in causing other people to evacuate was found in the Mexican group in the Argentine district. In this case, the decision of a young, bilingual woman, well-known and respected in the area, was influential in causing her neighbors to evacuate. Her story is as follows:

> Even after we were warned to leave, nobody believed that the water would really come in. No one who lived around me was leaving. Then a good friend of mine, a deputy sheriff who has been very kind to me and my husband, came to my house. He said, "I'm going to take you out of here -- get your family into my car." I still didn't believe the water would rush in, but I went with him. When the other people saw us leave they began to leave too. They knew that this man was a good friend.

The deputy sheriff said of the Argentine evacuation:

> Most of the people there were out by the time the water came in. We had a lot of trouble getting them to go out at first, though. They just didn't believe the water was coming in. But when we finally got a few of them to leave, the others did too. They just needed leadership.

Once the movement of people from a district was started, there was evidently a cumulative effect. The fact that other

people seemed to be reacting to the situation as if it were a dangerous one caused some individuals to perceive the warnings as valid signs of threat; this is shown in the statement of an Armourdale woman:

> Thursday afternoon we had heard that water might come into Armourdale. We didn't really believe it but I had packed a few things. My husband went to work in the afternoon like he usually does. Then about 5:30 I saw other people leaving and I got scared. I called the plant but my husband had already decided to come home. When he got back, we got some of our things together and left.

ORDER DURING EVACUATION

All observers interviewed commented on the orderly nature of the evacuation and the absence of gross fear-reactions and panic. Aside from the difficulties encountered in convincing people that they should evacuate, the chief problem was that of traffic congestion. In spite of this, police officers reported that the cars moved in orderly, though slow, processions. People escaping on foot were reported to have shown no signs of fear; only a few cases of evident fright among people who were trapped in the flooded areas were reported. A common remark in Kansas City, Kansas, was that people did not really grasp the extent of the disaster until after it was over, and that the strongest emotional reactions were manifest after the flood waters had receded. The crescive nature of this disaster, permitting constant redefinition of the situation and gradual adaptation to it on the part of the individual, seems the most likely explanation of this absence of marked fear-reactions. Apparently many people did not feel, even while fleeing, a real sense of danger.

LESSONS FROM A CRESCIVE DISASTER

Despite the usual emphasis on fear and panic in descriptions of disasters, the reactions of people to this flood illustrate the difficulty that may be encountered in evoking fear even in the face of real danger. Peacetime disasters, such as this one, and the reactions of civilians to wartime bombings suggest that the creation of a sense of threat sufficient to cause adaptive behavior

may be as much of a problem as the control of fear. This investigation reveals some of the important variables involved in this problem.

It has been seen that the effectiveness of a warning signal depends not only upon the nature of the warning itself, but upon the context in which it is presented. Factors which were found to decrease the effectiveness of warning signals include:

(a) Past experience and established expectations of the subjects, which may render the warning less credible.
(b) Conflicting reports, which may render the situation ambiguous and confront the individual with a choice of alternative definitions of the situation.
(c) Motivation, which may color perception of the situation.
(d) Inability of the subjects to correctly interpret the evidence at hand, as in the case of people who went to the dikes to look at the slowly rising water and decided that they were safe.

The relatively great effectiveness of more direct and personal means of warning originating in the immediate area affected indicates that such warnings are more likely to be perceived as valid than signals originating at some distant point and disseminated through mass media. The value of influencing and utilizing indigenous leaders as an effective means of influencing larger numbers of people is shown by the collective nature of the evacuation of some of the areas.

The absence of signs of panic and acute fear seems to be directly related to the crescive nature of this disaster. The very fact that it was possible to issue warnings long before the danger was immediate made possible a gradual, easy adaption to the approaching danger, but, at the same time, rendered the warnings less effective. Furthermore, during the long period of threat preceding the impact of the disaster, escape always seemed possible to many of the potential victims. While wild, frantic flight was prevented, the result was that appropriate adaptive behavior was often postponed until it was too late to be effective.

FIRE FIGHTERS IN BATTLE

Kansas City's extensive and prolonged fire must certainly be regarded as a disaster in view of the tremendous physical destruction it caused. Yet there was no loss of life involved; the flood had already driven all the potential victims to places of safety. Furthermore, no single moment of impact marking the critical point in the disaster can be identified. Rather, the fire was a prolonged crescive disaster characterized by recurring crises, each of which was successfully met by the firemen without loss of life or serious physical injury. It is of interest as part of the disaster-reaction study because of the constant threat which it posed to the firemen combatting it and the repeated situations of actual danger in which they were involved. There was always the threat of being injured by the explosion of petroleum tanks or trapped by the fire or flood. Dangerous tasks had to be performed — such as wading through water coated with oil or approaching tanks which might explode at any minute. In many respects, the fire was analogous to a battle made up of many small engagements. Indeed, it was a battle; though the foe was not a human one and the troops were firemen, not soldiers.

Concerning the reactions of the firemen to their difficult and dangerous task, two questions may be asked: (a) What, from the standpoint of the professional disaster fighters themselves, were the most dangerous aspects of the situation? (b) From a psychological standpoint, how did the firemen cope with the dangers they faced? Before considering the answers to these questions and how they were obtained, a brief look at the structure and normal functioning of the Kansas City Fire Department is in order.

THE KANSAS CITY, MISSOURI, FIRE DEPARTMENT

Much like a military organization, a metropolitan fire department has a hierarchical structure and a definite division of labor. At the top, in Kansas City, are a fire director and a fire chief.

The director functions in an administrative and executive capacity and normally takes no part in the direction of actual fire-fighting operations. The fire chief is the field commander. In large fires, such as the one of 13-17 July, he personally directs operations at the scene of the fire. He is assisted in his duties by two deputy chiefs. On the next level of the hierarchy are 10 battalion chiefs, stationed in various districts of the city. A battalion chief is always in charge of operations at any fire within his district, directing the work of his companies.

The fire companies are the front line units of the fire department. Every company has two shifts, each headed by a captain and composed of four to six members. Each member has specific duties which he performs in any operation. The captain is not only in command of his company's operations but takes an active part as a member of the small, closely knit team which each company constitutes.

Although the fire department has a hierarchical chain of command similar to that of a military unit, interviews with the firemen indicated that the organization functions in a somewhat less authoritarian manner than the Army. This stems from the fact that the fire department is, in the last analysis, a civilian organization; the sanctions for the officers' authority are accordingly weaker. A fireman is free to quit his job at any time, and discharge is the most stringent penalty that can be applied for disobedience. In addition, there is not such a formal status-system as prevails in the military. Officers always come up through the ranks, and battalion chiefs and captains live informally in the station houses with the men.

The two shifts composing each company alternate every 24 hours. Every man knows, however, that even when his shift is off duty he may be called in case of an unusually large fire.

THE METHOD OF STUDY

At the time this study was made, the Kansas City Fire Department had 483 members with the rank of battalion chief or below: 10 battalion chiefs, 62 captains, and 411 motor drivers, motor driver-engineers, fire fighters, and fire fighter subs. These men were distributed throughout the city at 29 fire stations(each with one or two companies). There was a pumper company at each station; the larger stations also had a hook-and-ladder or a turret company.

During the big fire, 15 of these 29 stations sent out one or more companies. In many cases, the off shift of a company went to the fire as an extra company. In obtaining the sample for this study, 14 of the 15 stations involved were visited; the 15th station was closed at the time because of flood damage. At each station, all men present who had worked at the fire were interviewed. There was a random representation of the two shifts, since the shift interviewed depended upon the day the station was visited. At two of the stations visited, battalion chiefs were present.

By this method of selection, a sample of 63 firemen was obtained. This constituted approximately 13 percent of the entire fire-fighting force and a much larger proportion of all those firemen who actually worked at the fire of 13-17 July. The sample consisted of 2 battalion chiefs, 10 captains, and 51 firemen below the rank of captain.

The great majority of the sample were experienced firemen. Twenty-four were veterans of 10 or more years; 33, of 1-10 years; and 6 of less than 1 year.

Excellent cooperation was obtained from the officers and men of the fire department. While the sanction of the Director was secured for the interviews, no headquarters personnel accompanied the interviewers to the various stations; the subjects were assured that their statements would be held confidential. Since firemen spend a large portion of their time on a standby status at the station, the interviews constituted no annoying interference with their work or leisure. In all but a few cases, individual interviews were conducted in private. A schedule was followed in each interview, but many of the questions were open-ended, and subjects were encouraged to recount their experiences in narrative fashion. The interviews lasted 30 to 90 minutes. In the opinion of the field team, the most likely source of bias in the answers was the reluctance of the subjects, because of both personal and professional pride, to admit fear or to ascribe it to other firemen.

SITUATIONS DEFINED AS DANGEROUS

The first objective of the interviews was to ascertain which of the many aspects of this mammoth fire-fighting operation these experienced disaster fighters defined as dangerous or, at

least, most disquieting. Questions 8-13 and 15-21 were designed to elicit answers to this general question.[2]

The answers to Questions 8-11, pertaining to the attitudes of the men towards going to the fire and their expectations of what the job would be like, reveal that the prospect of beginning the task was not fear-inspiring. This was true even though most of the men knew that it was an unusually large fire. Most of them could tell this from the volume of smoke billowing above the flames; many saw close-ups of the fire on television before reporting to the scene.

"How did you feel about being called back to duty for this fire?" It was thought that the reactions of the 24 men who were off duty and away from their station houses to Question 9 would be a more sensitive index of reluctance to undertake the task than would be the attitudes of those men who were on duty.

10 considered it part of their duty and didn't mind.
4 considered it part of their duty, didn't like it, but reported immediately.
3 were anxious to work at the fire.
1 was working in the area before he was called back.
1 did not report before his normal shift.
5 did not list a reaction.

It was evident that extra duty is expected at any time by these firemen, and that there is little reluctance to report or resentment when the call comes.

"What did you expect this fire to be like before you actually got to the scene?" Only about half the subjects answered Question 10.

35 expected an unusually big job involving oil and gasoline fires and the handicap of flood waters.

"Was it about like you expected it to be?" Only 33 men answered Question 11.

27 said the fire proved even worse.
1 said the fire was not as bad.

Apparently the great majority of the men approached the fire with no exaggerated fears and without a full realization of the magnitude of the task.

"What do you feel was the worst thing about this fire?" It was found that the answers to this open-ended Question 12 showed two different types of orientation to the fire; a professional attitude towards the task and a personal concern for physical safety.

[2] See Appendix.

31 (50 % of the sample) considered the difficulty in reaching the fire as the worst thing.

47 (75 %) mentioned as one of the worst things the difficulty they had reaching the fire to fight it effectively.

26 (41.3%) gave various sources of threat to their own personal safety.

37 (58.7%) mentioned threats to personal safety as one of the worst things. Of these 28 listed anticipated or threatened explosions, the uncertainty as to when one might occur, as the most unpleasant aspect; and 5 listed actual explosions.

These answers indicate that the task was not defined by the firemen as a safe one, and that they were aware of the threat to themselves as individuals. At the same time, it may be seen that the task and the problems involved in accomplishing it constituted their main preoccupation, and that the great majority maintained a predominantly professional attitude towards the situation. Even in retrospect, they viewed the situation with the attitude of a professional disaster fighter.

"What was the worst personal experience you had on this job?" Answers to Question 13 reflected the general feeling that this was not a safe or easy job.

34 mentioned explosions or anticipation of them.

4 listed "being on a building which was threatened with collapse."

10 stated "they had no bad experiences."

A variety of other situations, reflecting differences in individual activities during the job, were mentioned including swimming in the oil-covered waters, having a boat turn over, being trapped momentarily in water covered with flames, and receiving minor personal injuries.

"What would you say worried you most while you were on this job?" In considering the answers to Question 15: it may be noted that a rumor was current during the fire that a chemical company warehouse was filled with highly explosive liquids and would go up with a tremendous blast if it caught fire; some answers reflect professional viewpoints.

21 indicated the possibility of explosions worried them most.

5 said "I worried most about the fire getting into the chemical company warehouse."

13 mentioned such things as access to fire, possibility fire would not be brought under control, and deficiency of water pressure during the operation.

While these statistics indicate the prevalence of concern over the frequent explosions which occurred all during the fire, typical quotations from some of the interviews reveal in more detail the firemen's reactions to their tasks:

> The worst experience was when that biggest tank blew. We all looked up, and there was a big ball of fire up in the air, over our heads. We all started running up the hill to get out from under it; then we saw it was getting ahead of us, and started running back. It was totally unexpected to me.
>
> Another bad time was when we had a street pipe that was shut down near another tank, after that big explosion. There were a lot of little tanks around that were liable to explode. The bad thing, the thing that made us feel in danger, was that we couldn't do anything about it if they did.
>
> The worst things about that fire were the explosions and not being able to get to the fire to fight it. The bad thing about the explosions was that I didn't know what to expect. It was my first experience with an oil fire.
>
> Those explosions were the worst thing about that fire. They caught you unexpectedly. That not knowing what to expect was bad. The thing that worried me most was the rumor about that chemical warehouse. I didn't know what to expect if it caught fire.
>
> The worst thing was when that big tank blew. The fire shot up 150 feet and came right toward us. We threw ourselves flat on the roof. That was the only really bad experience. Nobody was much afraid of the lumber fire. It was duck soup after those exploding oil tanks. You never knew when they were going to go. For a few seconds after one would blow would be the worst time, but after each one there was a certain amount of anxiety about others.
>
> I had no great worry. All I had on my mind was that I hoped we could keep it from getting into other tanks and I just wanted to get it over with. I had had some experience with oil fires, but never anything so big. I felt some insecurity about those tanks. I know now that they blow straight up, not out, so I wouldn't mind so much if I had to work another fire like that.

Other statements indicated that the rumor that a large chemical company warehouse contained explosives was a source of concern to the firemen:

We were all worried about its getting into that chemical company. There was a rumor that it had explosives in it. That really kept the guys on their toes.

The only thing that really worried me was when they told us to keep the fire away from the chemical company. It was supposed to have guncotton in it. I was working within a half block of it. It gives you a funny feeling just to have to watch something like that.

Another source of concern for many of the firemen, although not as important as the explosions, was the oil slick. It constituted both a personal threat and an obstacle to effective fire fighting. At any time, a man might find himself suddenly surrounded by flames if an ember floated into the oil slick around him. A few men who worked in the lumber yard, advancing their lines over rafts hastily thrown together, reported that they feared falling into the water and being trapped under the floating lumber.

In summary, the analysis of these answers indicates that the things the firemen feared most were, in order of importance, (a) unexpected explosions, and (b) being trapped. Actually, these two types of threats are not mutually exclusive, for both involve situations of helplessness. Many statements indicated that, when a nearby tank did explode, the fireman felt that he was trapped and helpless before the billowing fireball that shot up. At the same time, uncertainty as to when and where the next explosion would be was a constant source of concern. One fire captain went so far as to say, "We wanted the tanks to explode. When they were not exploding, it worried you!"

It is impossible, particularly in a post facto, nonexperimental study, to break these experiences down into their discrete, component parts and ascertain exactly what aspects were most disquieting. Evidently the firemen, or most of them at any rate, were not afraid of physical danger per se. Their aggressive fight against the fire for four days, and their many complaints that "they couldn't get close enough to it," are evidence of this. It appears that the fear-producing aspect of this fire was the constant presence of danger of a type that could not be specifically located in both space and time and which, if it materialized, could not be combatted in a positive fashion. Further substantiation of this conclusion is found in the remarks of several of the firemen to the effect that this was not the worst fire they had ever dealt with, because most of the time they were working in the open, around the periphery of the fire. Most of these men went on to say that the worst type of fire was the interior fire, in

which they had to work in a smoke-filled room, with restricted means of escape and the threat of sudden draughts. In both instances, it was the unknown danger, the threatening but undefined situation, which constituted the source of fear.

REACTIONS TO DANGEROUS SITUATIONS

The discovery of what types of situations the firemen defined as dangerous does not reveal how they reacted to these situations, either emotionally or in their overt behavior. Data concerning their reactions to danger were obtained in part from the descriptions of the worst experiences given in answer to Question 12, and in part from the answers to Questions 14 and 22-26. These questions concerned the emotional reactions to being in danger, as the subject recalled them; the things that he believed kept him going in spite of danger; and his reactions to returning to the fire after being relieved once.

The firemen in this sample were, almost without exception, extremely proud of their own and their fellow firemen's performance during this test of their fire-fighting skill. They did not hesitate to admit, however, that in some situations they had fled from danger. In most of these instances, evacuation had been ordered by responsible officers; in no case could it be established that the flight constituted an unauthorized retreat, a breach of discipline. Nevertheless, in several cases the flight was viewed in retrospect as being, in some respects, a maladaptive reaction. One such instance was the case cited earlier in which men fled pell-mell from a fireball which they soon realized they could not possibly outrun. The men's own statements indicated that their reactions to the first of the large tank explosions, which shot clouds of flaming vapor high in the air, was wild flight. They pointed out that after they learned that the fire always seemed to burn itself out before settling to ground level they no longer ran.

Another instance of precipitant flight was described by one fireman as panic. He described the situation as follows:

> I was working on a building just across from a large tank. The large tank was directly in front of us. They started calling for more pressure -- a small fire on the water was spreading to this tank. Then the chief said "Evacuate." Now we had gotten on that building by building a ramp of crisscrossed two by fours. The order to evacuate came over the walkie-talkie, and the captain

who received it said, "It's going -- evacuate!" There was a mad scramble off of that roof. It was a drop of three or four feet to the ramp, and it's a wonder someone didn't get drowned. It was a definite instance of panic.

Another type of maladaptive action, one more serious in its consequences, was to be found in instances where one or two men were left to handle lines carrying water under tremendous pressure. In one such case, a heavy line whipped about and broke a fireman's leg. It would be difficult to place blame for this accident; an evacuation order had been given, but if so many of the men involved had not been so quick to respond to the order, thereby leaving an inadequate rear guard to shut off the lines, the mishap might have been avoided.

Such instances as these, in which some precipitating event led to hasty, somewhat reckless flight, serve to emphasize the constant tension under which the fire fighters must have worked. The two types of events which served as triggers for such flight were (a) large, unexpected explosions, and (b) threats of explosions accompanied by orders to evacuate which seemed to confirm the reality of the danger and to legitimatize flight. Only three men out of the sample admitted that they fled from a threatened area without having been ordered to do so; in these cases flight seems to have been the only appropriate action.

After the subjects had described their worst experiences, most of which constituted danger situations, they were asked Question 14, "Just how do you feel when you're in a dangerous situation?" Partly because this was an open-ended question, allowing for many subjective variations in the answers, there was no single, predominant response. Clusters of certain types of responses indicate, however, some of the significant effects of threat upon individual response.

18 emphasized fear reactions.

17 described reaction to fear itself — "It made me work harder."

7 were "too busy to think about the danger."

Of the men who emphasized fear reactions, saying "I was scared," "It made me feel nervous"(or worried), "It gave me cold chills," or "I wanted to get out of there," none described their fear as overpowering. Their actions were not different from those of men who answered differently. Firemen admit that almost everyone at some time or another experiences extreme fear, but none of the subjects in this sample described this reaction during the big fire.

The reactions to the apprehension itself -- "It made me work harder," "It made me start figuring what I'd do if things got any worse," and "It made me be more careful" -- do not exclude the fear reactions. While it might be expected that professionals in a dangerous occupation would experience less fear in performing their duties than would the novice, it would be ridiculous to assume that they experience no fear or apprehension. At the same time, it is important to recognize, as some social scientists are beginning to do, that fear may have an organizing rather than a disorganizing function at times, and that it may be a positive aid to successful adaptive behavior.[3] J. T. MacCurdy, a student of reactions to bombings during World War II, has pointed out:

> This kind of apprehension is certainly compatible with unimpaired efficiency; it may even be a prelude to exceptional performance.[4]

In general discussions of the problems of fear with the firemen, it was frequently remarked, "You don't think about those things until it's all over and you relax." This answer and "I was too busy to think about the danger," which suggest that apprehension leads to greater activity, plus those that indicate that activity reduces apprehension lead to the conclusion that being able to do something about a dangerous situation reduces the disorganizing, demoralizing effects of fear. Conversely, it has been seen above that those situations which tended to arouse the greatest apprehension were those in which the possibility of successful counteraction seemed doubtful. This same conclusion is suggested by MacCurdy when he says:

> A little reflection will probably convince anyone that what is terrifying about any danger is inability to cope with it.[5]

"As a result of this experience, do you have any suggestions for the improvement of the training of firemen?" At present the training of the professional fire fighter is designed, as it seems it should be, to enable him to cope with dangerous situations, not merely to avoid them. Answers to Question 33 indicated that these firemen were, without exception, well satisfied with the training they had received. Additional suggestions:

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[3]Robert W. Leeper, "A Motivational Theory of Emotion to Replace 'Emotions as Disorganized Response,'" Psychological Review, LV, 1948, pp. 5-21.

[4]J. T. MacCurdy, The Structure of Morale, New York: The MacMillan Co., 1943, p. 1.

[5]Ibid., p. 29.

Training in fighting oil fires.

Training in swimming.

These, offered by a few men, were clearly related to the major unknowns in this particular fire.

"When the going got tough during this fire, what do you think it was that kept you going, doing your best?" That Question 22 was not a meaningless question is clearly indicated by the answer of several experienced firemen, "There have been times when I've wanted to chuck this job." The ability to take counter-action in the face of danger was not the only factor sustaining these disaster fighters in their long, hazardous, fatiguing battle. The answers indicate three important sustaining forces:

24 (1/3 of sample) conceived a fireman as a man who expected to encounter hardship and danger.

27 stressed loyalty to the fire-fighting group.

29 answers suggested that a feeling of accomplishment minimized concern for personal safety.

The conception of the fireman as a man who, as a matter of course, expected to encounter hardship and danger was usually expressed in the words, "It was my job" or "It was my duty." A few men made explicit their conception of themselves as "protectors of the public."

Of the men who stressed loyalty to the fire-fighting group, one typical answer was, "I wouldn't want another fellow to quit and leave me holding the bag, and I wouldn't do it to anybody else." Another answer was, "I wouldn't want it to be said around the department that I had quit." Apparently paradoxical was the fact, however, that there was no evidence of a tendency to condemn men who did quit in situations of danger so long as they ceased to be firemen. In such cases, the reaction seemed to be, "Some fellows just haven't got what it takes to be a fireman and they ought to quit." There was, obviously, among these firemen a strong group definition of the role of the fire fighter, which was implicit in the self-conceptions of the individual members. In order to maintain his status in this group, indeed to remain in the group at all, the firemen felt it necessary to live up to this pattern of role-expectations. One important item in this pattern is loyalty to the group even in the face of personal danger.

The third type of answer may exemplify a dramatization by certain individuals of the heroic role-conception of the firemen, or it may reflect certain personality needs which are satisfied in this occupation. These answers reflect what may be designated

as ego-involvement in the task. A common answer under this rubric was, "Fire fighting gets in your blood." Another answer, in the fireman's vernacular, "When I see a fire, I just feel like I want to knock it," suggested that some men personified the fire as a personal enemy. At any rate, it was evident that many of the subjects felt that the excitement and the feeling of accomplishment attendant upon a successful operation minimized their concern for their personal safety in dangerous situations. Whether this would result in more or less efficiency in coping with a situation is, however, a matter requiring further research.

These motivating factors, identified through introspection by the firemen themselves, reveal the importance of the disaster-fighting group as a reference group in motivating and sustaining the individual member in the face of danger. A brief case-study of the Kansas City Fire Department shows that, as a reference group, it might be expected to produce a high standard of performance from its members. It has a long tradition of excellent achievement; it is still remembered that in 1911 this department won first place in an international exposition of fire fighters in Paris. To the pride of being a fireman is added pride in belonging to what is felt to be an unusually good fire department. Each company, in turn, has a unit esprit de corps, and there is friendly competition between the various companies in such matters as speed in reaching fires. The pride which the members of the companies represented in the sample felt in having worked at Kansas City's biggest fire was evident in remarks which were dropped about those companies that were not fortunate enough to have been called in. Finally, the influence of the example of the incumbent chief throughout the department was evident. While some criticisms of certain battalion chiefs and captains were voiced, not one word of criticism of the chief was heard. He was frequently referred to as a fire-eater, a term indicative of the highest order of bravery in fire-fighting operations. At the same time, he was regarded as a fair leader, considerate of his men, and willing to do anything himself that he might ask them to do. One fireman remarked, "You couldn't help but keep going when you could see Chief Baldwin right in the worst places every minute." Comparing this man's influence on his men with that of army officers on soldiers in combat, it appears that he was regarded by the firemen in a way "which would give him informal power to influence their behavior" — as a respected figure of

authority, and as a leader who set an example of bravery for his men by sharing their dangers and hardships.[6]

A similar parallel to the combat motivation of soldiers is found in the influence of the fire company and the fire department on the behavior of individual firemen. These civilian groups, like the army group "in its informal character... set and enforced group standards of behavior ... supported and sustained the individual in stresses he would otherwise not have been able to withstand."[7]

One important variable to be expected in combat and certain to have some effect on individual and group performance, which was not present in the fire-fighting operation, was the disruption of the organization and its small units by casualties. Although there were a few minor casualties, the firemen did not have the experience of seeing numbers of their fellows killed or critically injured, nor did they find their organization weakened and disrupted by decimation.

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[6]Samuel A. Stouffer et al., The American Soldier, Princeton: The Princeton University Press, 1949. Vol. II, pp. 123ff.

[7]Ibid., pp. 130ff.

EXTRAPOLATION TO MILITARY SITUATIONS

In this study, two major problems related indirectly to the reaction of troops to atomic attack were investigated. One was the problem of reaction to threat and, specifically, the problem of effective warning against danger that is not obviously and unmistakably imminent. The second was the problem of the definition of dangerous situations and the professional disaster fighters' reactions to such situations.

The study of the evacuation of the lowlands before the flood emphasizes, not the disruptive effects of threat and fear, but the difficulty that may be encountered in arousing sufficient apprehension, or subjectively felt threat, to cause timely adaptive action. It was concluded that factors which may decrease the effectiveness of timely warnings, and hence impede the development of apprehension and subsequent adaptive action, include:

(a) The past experience and the established expectations of the subjects, which may render warnings less credible.
(b) Conflicting reports, which may render the situation ambiguous and confront the individual with a choice of alternative definitions of the situation.
(c) Motivations, which may color perception of the situation in such a way as to minimize the sense of threat.
(d) Inability of the subjects to correctly interpret the evidence at hand.

In order to generalize to hypothetical military situations involving the tactical use of the atomic bomb, it is necessary to surmise what aspects of such situations might operate to lessen apprehension and even lead to overconfidence and carelessness. It might be assumed that in the case of so terrible a weapon as the atomic bomb there would be no problem of arousing apprehension but only one of reducing fear. Yet, it may be argued that both problems will confront commanders in an atomic war.

While the A-bomb will, no doubt, be used as a weapon of surprise whenever possible, it will never again, after Hiroshima, be a secret weapon. Every soldier who enters combat in a future major war will do so with the reasonable expectation that, at one

time or another, he may be subjected to tactical A-bombing. Yet he cannot expect that he will receive timely, unquestionable warning of exactly when the A-bomb will be used, either against him or in his support. Two significant conclusions follow from these premises:

(a) To prevent the enemy from achieving the advantage of surprise in the use of the weapon, constant and rigid security measures, individual and unit, will have to be maintained.

(b) Soldiers will carry with them a pattern of expectations about the atomic bomb, its effects, and when and how it might be used.

There is a potential conflict between the need for unceasing security measures and the existence of patterns of expectations about the A-bomb which might be of great significance in determining the outcome of an atomic battle.

In the United States, a wave of horror literature followed the detonation of A-bombs at Hiroshima, Nagasaki, and Bikini. The tremendous destructive power of the bomb and the absolute helplessness of the individual against it were emphasized. Now a reaction to this horror propaganda has set in; both official and semi-official sources disseminate facts obviously designed to reduce disproportionate fear of the A-bomb. Witness, for example, an article by an army captain appearing in a popular magazine and dramatically entitled, "I'm Not Afraid of the A-bomb."[8] This writer concludes:

> The atom bomb will not put the foot soldier on the shelf. Rather, it adds another weapon to his stockpile.[9]

To the extent that the mystery and the awe associated with the A-bomb are diminished, and it comes to be regarded as just another weapon, confidence and overconfidence may be expected to develop. Soldiers may develop their own folklore as to when they are likely to be subject to atomic attack. Furthermore, the need for unremitting security measures, such as the construction of foxholes (not slit trenches), would be in competition with tendencies to neglect such arduous tasks when danger was not clearly immiment. Unless A-bombs were used with far more frequency and regularity than seems likely in view of their great cost, the possibility of their being used might become a source of prolonged,

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[8] Captain Richard P. Taffe, "I'm Not Afraid of the A-Bomb," Colliers, 26 January 1952.

[9] Ibid., p. 41.

invisible threat which might, in turn, become first familiar and then unreal to troops exposed to it.

A force intending to use the A-bomb tactically might exploit this resistance to constant vigilance by crying wolf. The dissemination of false warnings of atomic attacks through psychological warfare methods should serve to increase the impatience of opposing troops with constant security measures and to render less effective legitimate warnings issued by their own commanders.

The problem of how to achieve the type of discipline necessary for maximum security in the face of an ever-present but vague threat is one generic to all types of military operations, not merely those involving atomic weapons. The important conclusion suggested by the experience of evacuation officials in Kansas City is that indoctrination and training in defense against atomic attack may not be enough to prevent disaster. As awe-inspiring as the A-bomb may seem, constant, thorough discipline in the field will be requisite for maximum security against atomic attack.

The study of the firemen's reactions to danger as professional disaster fighters only corroborates previous studies of reaction to dangerous situations.[10,11,12] The ability to take counteraction against the source of danger, and established role-conceptions, sustained and enforced by reference-group norms, enabled the firemen to keep going in the face of threat and danger. The findings as to what sort of situations the firemen found to be the source of greatest apprehension have important implications, however.

Viewed in its entirety, this fire was a crescive disaster, with no single, great, initial impact such as the detonation of an A-bomb would create. It was characterized throughout, however, by many small crises in the form of explosions of oil tanks. These explosions were a source of threat, threat which was constant but vague and not easy to localize in time and space. Furthermore, when this threat did eventuate in specific dangerous situations, the dangers were of a type which gave the individual a feeling of being trapped and helpless. It was the constant, vague,

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[10] Stouffer, op. cit.

[11] S.L.A. Marshall, Men Against Fire, New York: William Morrow and Company, 1947.

[12] University of Oklahoma Research Institute, A Study of the Effect of Catastrophe on Social Disorganization, ORO-T-194.

and overpowering nature of the danger in this operation that seemed to arouse the most apprehension and strain in the firemen.

This suggests that, for the maximum exploitation of the advantage created by an atomic attack, as much attention should be given to the follow-up as to the bombardment. The initial impact would, undoubtedly, cause temporary disorganization and perhaps demoralization of an enemy force. The maximum advantage should be gained, however, by any measure which would keep the enemy off-balance and prevent his reorganization. This might include continued bombardment, with either atomic or conventional weapons; rapid infiltration of enemy lines at many points in blitz fashion; and, of course, prompt follow-up of the atomic barrage by the ground assault.

APPENDIX

SCHEDULE FOR INTERVIEWS WITH FIREMEN, KANSAS CITY, MISSOURI

APPENDIX

Schedule for Interviews with Firemen, Kansas City, Missouri

1. Name
2. Rank
3. Age
4. Marital status
5. Number of years on fire department
6. Veteran or non-veteran?
7. Combat experience?
8. Where were you at the time of the alarm which sent your company to the fire?
9. (If off duty) How did you feel about being called back to duty for this fire?
10. What did you expect this fire to be like before you actually got to the scene?
11. Was it about like you expected it to be?
12. What do you feel was the worst thing about this fire?
13. What was the worst personal experience you had on this job?
14. (If this experience involved danger) Just how do you feel when you're in a dangerous situation?
15. What would you say worried you most while you were on this job?
16. While working on this fire, did you ever think about your family?
17. (If yes) How do you believe these thoughts of your family affected your work at the fire?
18. Did you see anyone injured during this fire?
19. (If yes) How badly was he injured?
20. Did you know the man as a personal friend, or just as a member of the department?
21. How did seeing this man injured make you feel? Did it have any effect on your work?
22. When the going got tough during this fire, what do you think it was that kept you going, doing your best?

23. Were you relieved while the fire was still going on?
24. (If yes) How did you feel about leaving the fire at that time?
25. Did you return to the fire again?
26. (If yes) How did you feel about going back the second time?
27. At any time during this job did you feel mad about anything, or at anybody?
28. (If yes) Just what was it that made you mad?
29. During this operation, do you remember any instances in which you think things might have been done differently? (If yes, probe for explanation.)
30. Did you hear any reports during this fire which you found later to be untrue?
31. (If yes) Do you recall where you heard them?
32. Was this the biggest fire you have ever worked?
33. As a result of this experience, do you have any suggestions for the improvement of the training of firemen?