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RESEARCH TRIANGLE INSTITUTE

10 NOVEMBER 1967

Operations Research and Economics Division

OCD WORK UNIT 4631B

DEFINITION OF AN INFORMATION SYSTEM FOR CIVIL DEFENSE EMERGENCY OPERATIONS

PHASE II FINAL REPORT

BY

E. R. Brooks, J.G. Caldwell, T. Johnson, and
F. D. Kennedy

Prepared for

Stanford Research Institute
Menlo Park, California

under

SRI Subcontract B-70934(4949A-53)-US
RTI Number R-OU-222

RESEARCH TRIANGLE PARK, NORTH CAROLINA 27709

Final Report

R-OU-222

Definition of an Information System for Civil Defense Emergency Operations

Prepared for
Office of Civil Defense
United States Department of the Army

under
Office of Civil Defense Contract No. OCD-PS-64-201

Work Unit 4631 B
Subcontract B-70934(4949A-53)-US

by

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10 November 1967

for E. A. Parsons, Director
Operations Research and
Economics Division

Research Triangle Institute
Research Triangle Park
North Carolina

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. The report will provide researchers and others interested in civil defense information and communications matters with the needed initial approach to the nature and volume of information flows in a civil defense organization. It provides logical structures which are adaptable for additional examination and further research in the changing and dynamic aspects of information for civil defense emergency operations."

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FOREWORD

This report describes research accomplished under Phase 2 of research begun in Work Unit 4631A of the Office of Civil Defense. The work was subcontracted by Stanford Research Institute to the Research Triangle Institute under Subcontract Number B70934(4949A-53)-US. The project monitor was Mr. W. D. Tiffany of SRI.

Special recognition is due to Mr. John Devaney, Deputy Assistant Director for Research of the Office of Civil Defense, who recommended and supported the analytical approach to the definition of an emergency information system for civil defense operations. The authors are also especially indebted to the following for their cooperation in providing information and operational concepts: Mr. George Rich, Director of OCD Region 2, and Mr. John Huber, Mr. Robert Lane, and Mr. Holland of his staff; Maj. General Edward F. Griffin, Director of Civil Defense for the State of North Carolina and his staff; and General Van Brunt, Director, and Col. Still, Operations Officer, of the Maryland Civil Defense Headquarters.

Dr. Robert Titchen, Deputy Director of the Operations Research and Economics Division of Research Triangle Institute, offered many valuable suggestions in the preparation of the final report.

ABSTRACT

In this study, operational concepts are defined for emergency operations at local, state, and federal levels of civil defense. Types of actions to be taken by operations centers and the information for decisions about these actions are identified.

At the local level, an organization for emergency operations is assumed, and required types of messages and prestored data are determined. Probable message lengths are determined from sample messages, and the frequency of messages are estimated for various environmental conditions (such as after some blast or fire damage and prior to the arrival of fallout). A staff organization and procedures for decision making are described, and responsibilities for information processing, storage, and display within staff sections are given. Requirements for shelter-operations center communications in the assumed organization are determined, and the effect of additional factors on communication requirements for specific civil defense organizations are shown.

Types and estimates of the volumes of messages to be provided to state and regional emergency headquarters, and staff responsibilities for information processing at these headquarters are also given.

Major recommendations of the study are (1) that the message formats and reporting procedures developed in the study be made part of the Federal Civil Defense Guide; (2) that the methods for information system analysis described in the report be used in the development of prototype emergency information systems for specific local and state organizations; and (3) that the civil defense emergency information system at the national level be considered and designed as part of the overall national emergency information system.

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Detachable Summary

I. PURPOSE OF THE STUDY

For a number of years, there has been a civil defense program in the United States, the objective of which has been to minimize the effects of a nuclear attack or other major civil disaster. Under this program, shelters have been identified, marked, and stocked; warning systems developed; radiation monitoring instruments procured and deployed; personnel trained for various civil defense responsibilities; emergency operations centers established in some locations; communications and other types of equipment provided; and research conducted.

However, no system has been formulated for collecting, processing, and disseminating information that will increase the probability that these elements of civil defense are used effectively if a nuclear attack, or other civil disaster, seems imminent or occurs. It has been the purpose of this study to help formulate what this information system should be.

In Phase I of this study,[1/] the general procedures for defining an information system were identified, information requirements to be met by the Civil Defense Emergency Information System (CDEIS) were qualitatively stated, and existing concepts for exchange of information during an emergency were analyzed.

In this, the second phase of the study, the objective was to define more specifically the types of information required at local, state, and federal levels of emergency operations, and to define an information system to provide this information. The system was to be defined in terms of:

(1) Types, flow, and volume of messages;

(2) Flow of information in an operations center, and records and displays needed.

II. SUMMARY

A. Approach

It was assumed that the basic reason for the information system would be to supply information required for the conduct of emergency operations. Consequently, it was necessary to begin with a concept of the operations to be conducted in an emergency and the actions requiring decisions at local, state, and federal levels of civil defense. "Actions" were considered to include not only the coordination of organizational activities, but the provision of advice and information that would be of use in decentralized or individual decisions.

1/ E. R. Brooks, G. H. Otto, D. H. Fishman, and J. E. Walker, Jr. Analysis of a Civil Defense Information System, Phase I, Final Report R-CU-134. Durham, North Carolina, Research Triangle Institute, December 1964.

At the local level, actions to be taken at the emergency operations center (EOC) would depend, of course, on the specific capabilities of operational organizations (such as the police force) and on the defensive posture or condition of the population. Less obviously, actions to be taken would depend on the nature of the EOC staff and its capabilities for decision making.

Hence, in order to determine the actions for which information would be needed, it was necessary to make at least some general assumptions about the operational forces (such as the police); the posture of the population (for example, that the majority would be in shelters having organization and communication to the EOC); and the makeup and decision-making procedures of the EOC staff.

With these assumptions, it was possible to identify a considerable number of actions for which information would be needed. These actions could be grouped into three general categories:

(1) Those dealing with immediate threats to the population;

(2) Those dealing with indirect threats to the population;

(3) Those dealing with the maintenance of control, communications, and transportation routes.

Basic types of information needed for making decisions about these types of actions were then identified. Some of this information could be prestored at the EOC prior to an emergency. Other information would have to be transmitted to the EOC by messages. Probable sources of these messages were identified from among the assumed elements (shelters, police, institutions, etc.).

Information requirements were then allocated to various types of basic messages (e.g., unscheduled situation reports) to be submitted by these elements.

Other messages, such as requests from a shelter manager or instructions from the EOC to an operating element, were considered to be "special" messages. The volume of messages between two locations was estimated on the basis of lengths of sample messages of various types and estimates of the frequency with which such messages would be transmitted. Peak loads of messages between shelters and other elements of the assumed organization and the EOC were estimated for certain conditions (such as movement to shelter).

In attempting to identify the volume of messages to be transmitted, it became apparent that the availability of the Emergency Broadcast System (EBS) would be an important factor. Its availability could reduce the number of messages to elements from the EOC, and by using it to identify types of information needed or not needed, the EOC staff could influence the volume of incoming messages.

At the state level, a similar approach was used in determining the information to be provided from local ECC's, state agencies, and other sources. Types of messages and the formats for summary status reports for providing this information from local ECC's were identified. The responsibilities of staff sections for information processing and storage were also defined.

At the federal level, the actions to be taken in a civil defense emergency are less concerned with specific and immediate conditions than at local and state levels. It was assumed, however, that civil defense regions can assist in meeting civil defense objectives by estimating conditions and in advising states, and by participating with federal agencies in coordinating federal and state activities. Information requirements for regional headquarters were defined and types of unscheduled reports to be sent by state headquarters were identified.

The concept of operations and the procedures for defining the system are discussed in detail in Chapter 2.

B. Results

A systematic analysis is provided of the types of information that are most likely to be needed by civil defense organizations in a widespread disaster. The report specifies types and estimates volumes of "basic" messages that will need to be transmitted to ECC's at the local level and to state and regional emergency headquarters (EH's) in order to provide this information. It also specifies the data to be prestored.

The report describes other types of messages that can be expected to impose communication requirements, and the estimated loads of all messages between some specific elements of the civil defense organization under given conditions. The relative merits of teletype and telephone modes of transmission are compared.

In addition, procedures and staff responsibilities are suggested for the development of the required information from incoming messages and prestored data.

C. Conclusions

1. The Civil Defense Emergency Information System should be designed primarily to provide an information base for decisions that must be made to achieve civil defense objectives. Reporting requirements must be specified in advance of any emergency, and communications discipline exercised from the beginning of an emergency, in order to insure that the required information base can be developed at the emergency operations centers and emergency headquarters within the civil defense organization.

2. The volume of random or special messages, and the efficiency of communications, will be influenced by the efficiency with which this information base is established.

3. Peak loads of message traffic at the local and state level will probably occur during the relatively short period in which shelters are being occupied.

4. Requirements for communications must be determined on the basis of the organizational and geographic aspects within a specific area. The place of shelter complex headquarters and headquarters for areas within a state are also determined by geographic aspects of the area.

5. In view of the uncertainty of the effects of a nuclear war, the Civil Defense Emergency Information System must be designed to provide for flexibility in communications and staff procedures.

6. The requirements for information at the national level of the civil defense organization are influenced by the responsibilities of all government departments and agencies for emergency operations. Therefore, the Civil Defense Emergency Information System must be designed as part of a national emergency information system.

7. Preparation of written copies of telephone messages is an inefficient use of communications. A comprehensive study is necessary of decision-making procedures and information flow within emergency operations centers or emergency headquarters.

8. The availability and use of the Emergency Broadcast System has an important influence upon the information system requirements. Therefore, plans for this system must be consistent with the plans for the Civil Defense Emergency Information System.

9. The use of Nudet reports as a method for deriving information about the status of postattack population and resources is of questionable value, and its probable effectiveness should be systematically determined. Expanded conclusions are found in Chapter 7.

D. Recommendations

1. The procedures advanced in this report should be used under the direction of OCD to develop a prototype information system for existing civil defense organizations in one or more local areas. The performance of this system should then be evaluated in well-planned exercises in order to better define the methodology before it is recommended for use by civil defense planners at state and local levels.

2. If the total system is not defined and evaluated as recommended above, variations of the staff information processing and decision-making procedures contained in this report should be evaluated either by analytical methods or exercises.

3. Specific formats for unscheduled shelter situation reports and forms for recording information at EOC's should be developed and incorporated in the Federal Civil Defense Guide.

4. Specific procedures for the use of the Emergency Broadcast System should be developed in local civil defense planning so that prior to an emergency, local civil defense organizations will know approximately how much capability can be provided by the EBS in support of their operations.

5. The use of centers within areas or districts of large states as information collections points should be studied.

6. The Office of Civil Defense should recommend a study of the requirements for information at the emergency headquarters of all federal departments and agencies in keeping with their assigned responsibilities as a first step in determining how federal staffs and communications may be most efficiently used in a national emergency.

7. A study should be conducted to estimate the timeliness and accuracy achievable by a computer-based damage assessment system and the timeliness of accuracy obtainable by less sophisticated systems.

Chapter 1

Introduction and Summary

I. PURPOSE OF THE STUDY

For a number of years, there has been a civil defense program in the United States, the objective of which has been to minimize the effects of a nuclear attack or other major civil disaster. Under this program, shelters have been identified, marked, and stocked; warning systems developed; radiation monitoring instruments procured and deployed; personnel trained for various civil defense responsibilities; emergency operations centers established in some locations; communications and other types of equipment provided; and research conducted.

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4. Requirements for communications must be determined on the basis of the organizational and geographic aspects within a specific area. The place of shelter complex headquarters and headquarters for areas within a state are also determined by geographic aspects of the area.

5. In view of the uncertainty of the effects of a nuclear war, the Civil Defense Emergency Information System must be designed to provide for flexibility in communications and staff procedures.

6. The requirements for information at the national level of the civil defense organization are influenced by the responsibilities of all government departments and agencies for emergency operations. Therefore, the Civil Defense Emergency Information System must be designed as part of a national emergency information system.

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6. The Office of Civil Defense should recommend a study of the requirements for information at the emergency headquarters of all federal departments and agencies in keeping with their assigned responsibilities as a first step in determining how federal staffs and communications may be most efficiently used in a national emergency.

7. A study should be conducted to estimate the timeliness and accuracy achievable by a computer-based damage assessment system and the timeliness of accuracy obtainable by less sophisticated systems.

Chapter 2

Procedure in Defining the Civil Defense Emergency Information System

I. INTRODUCTION

In this chapter, general concepts of civil defense emergency operations and information systems to support these operations are first stated. Procedures are described that can be followed in defining the types and volume of messages to be transmitted and the information processing to be performed at an EOC or EH. Finally, limitations of the procedures in defining the system for specific organizations are noted.

II. GENERAL CONCEPT OF CIVIL DEFENSE EMERGENCY OPERATIONS

In the event that a nuclear attack upon the United States seems imminent, activities will be initiated that are identified here as civil defense emergency operations.* Some of these operations will be the acceleration of the present non-emergency activities, such as the placement of supplies in shelters. Other activities would be undertaken such as the broadcast of warning, the movement of people to shelter or other less vulnerable locations, and actions to reduce the vulnerability of utilities and supplies.

If an attack occurs, it is reasonable to expect that in some geographic areas, it will be possible to conduct firefighting, rescue, and other types of emergency operations to further limit the effects of the attack. In all areas, it will be desirable to supply advice and information to the population.

Civil defense plans provide that local emergency operations be cordinated or directed at pre-established emergency operations centers (EOC's) that have some fallout protection. The actions taken at EOC's will be under the control of peacetime government officials. Public services such as the police, fire, and highway departments, and volunteer organizations such as the Red Cross, will be used where available. Civil defense officials and workers will be used to assist in the coordination of operations and to perform special tasks for which they have been trained,

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* Civil defense emergency operations could also begin with the threat of, or the occurrence of, a natural disaster or a nuclear accident. These would impose less stringent requirements for decisions, but the same decision-making processes can be followed as would be followed in the event of a nuclear attack.

principally radiological monitoring and management of public fallout shelters. When available, military units may also be used for missions under the direction of the EOC.

The above concept of operations applies to an EOC at the local or county level of government. State civil defense emergency headquarters (EH's) would provide information and advice to--and coordinate the activities of--local EOC's, state operating agencies (such as police and highways), and assigned military units. For emergency operations, states may be divided into civil defense areas, each having its own headquarters.

Coordinating and supporting the activities of the state EOC's would be the headquarters of the eight federal civil defense regions and the National Civil Defense Headquarters. Thus, in accordance with the operational policies stated in the National Civil Defense Emergency Operations Plan, each level of government will support those at the next lower echelon.

More detailed descriptions of local, state, and regional organizations are given in Chapters 3, 4, and 5 respectively.

III. CONCEPT OF THE CIVIL DEFENSE EMERGENCY INFORMATION SYSTEM

The Civil Defense Emergency Information System (CDEIS) that is considered in this report is intended to provide:

(a) A means by which an emergency operations center (EOC) or other civil defense emergency headquarters (EH) can receive data and develop information necessary for decisions in keeping with the objectives of civil defense;

(b) A means by which directives, advisories, and information may be provided by an EOC or EH to elements in its area or to other EOC's and EH's.

In an emergency, the CDEIS will not be the only means of information exchange. At the local and state levels of government, operational units (such as the police) will also have operations centers and communication capabilities. At the federal level, departments and agencies with emergency responsibilities will have their own offices and have communication systems available for their use. In addition, at all levels, a broadcast capability will exist through the commercial radio nets and the local stations that constitute the Emergency Broadcast System (EBS).

These elements will be extremely important in the collection and dissemination of information, but will not be organic parts of the CDEIS. However, the CDEIS must provide for interfaces with these systems.

The CDEIS will operate from the time that operations centers or headquarters are occupied under emergency conditions until there is no need for emergency coordination of activities, or until normal means of control will be reestablished.

IV. GENERAL PROCEDURE FOR DEFINING THE CIVIL DEFENSE EMERGENCY INFORMATION SYSTEM

A. Determining Information Requirements

The information that the CDEIS is to collect or develop depends upon the actions for which decisions will be needed. The nature of these actions depends in turn upon:

(1) The general objectives of civil defense emergency operations;

(2) The types of environment in which operations will be conducted;

(3) The government level conducting the civil defense operations.

Three general objectives of civil defense emergency operations were assumed in this study:

(1) To reduce direct threats to life, including the blast and thermal effects of weapons, fallout, fire spread, floods, and exposure to extreme environmental conditions;

(2) To reduce indirect threats to life resulting from lack of food, water, housing, electrical power, medical and sanitation facilities and services, and from failure to replace inventories or to restore services. Breakdowns of morale and order could be other indirect threats to life;

(3) To maintain government or control, and communications and transportation links that will be necessary to accomplish (1) and (2).

The types of environments in which civil defense emergency operations will be conducted are usually described by time with respect to nuclear attack; that is--preattack, transattack, and postattack.

These "time-environments" are sufficient to determine the types of actions to be taken at state and higher government levels; but at the local level, it is necessary to define time-environments more precisely. In this report, we use the following four time-environments:

(1) From the occupancy of the EOC to the occurrence of direct effects or fallout;

(2) After direct effects, but prior to fallout;

(3) During the occupancy of shelters;

(4) When short sorties from shelters are permissible for the beginning of recovery operations.

Required actions are finally determined by the level of government at which emergency operations are being conducted. The information system was considered for three levels of government: local, state, and federal.

A local civil defense organization might serve a city, a county, or some small geographic area such as a district within a county. In the analysis of the local civil defense information system in Chapter 3, it was assumed that the local organization would serve a city of about 100,000 population.

At the federal level, the eight regional headquarters are staffed in peacetime, and all are expected eventually to occupy hardened sites. Consequently, regional headquarters are considered to be of more concern than the national headquarters in defining the information system at the federal level, and the place of the information system at the national is only briefly considered.

Actions at each level of the three levels of government were tabulated, and are found in the following chapters. Actions included the provision of information and advice as well as the coordination and direction of operations, such as movement to shelter. Types of information necessary for decisions about each of these actions were listed. For some actions, thirty or more differing types of required information are listed.

B. Basic Message Requirements

1. Types

Much of the "information base" that is needed for actions that can be anticipated must be created from data that are contained in

prespecified types of messages, which will be designated in this report as "basic" messages. These messages may be of the following types:

Unscheduled situation reports about a particular type of event that has occurred (such as the arrival of fallout) or a situation that has been identified (e.g., the location of a traffic blockage);

On-call situation reports in response to a request from the operations center for information about a capability or a condition;

Scheduled summary status reports in accordance with an established schedule and containing a summary of capabilities and conditions;

Scheduled Radef reports in accordance with an established schedule for radiological monitoring reporting.

Unscheduled situation reports were further categorized by their subject, such as an "initial shelter situation report" or "out-of-shelter population report".

Finally, messages are categorized by their urgency of transmission. A "flash" message is to be sent as soon as possible and is given precedence over all other communications. A "priority" message is considered to have the next highest transmission precedence. All other messages are considered to be "routine".

In the analysis, each type of information that could not be prestored was identified by at least one type of message by which it could be provided.

2. Lengths

The lengths of unscheduled situation reports were determined by the preparation and word count of sample messages of specific types.

The lengths of scheduled status summary reports were determined by preparation of detailed formats of messages and the estimation of the number of words in each section of the report. The lengths of abbreviated forms of summary status reports, such as might be transmitted when complete information could not be provided, or when some conditions are unchanged since the last summary report, were also determined.

Lengths of Radef reports were determined from sample messages in the reporting procedures described in the Federal Civil Defense Guide.

3. Number and Frequency of Basic Messages

The number of unscheduled situation reports to be sent in a given period of time by any element of a civil defense organization will depend upon the type of reporting element, the number of changes in the situations to be reported, and the number of messages about a particular change in situation.

Estimates of the number of unscheduled messages from a shelter were determined from estimates of upper and lower bounds of the probability of the occurrence of conditions at a shelter requiring the reports and estimates of the maximum and minimum number of reports concerning a particular condition.

For other parts of the local civil defense organization, such as police, hourly maximum and minimum numbers of messages of various types were estimated directly.

Numbers of messages of various types in a period of high message traffic from a local EOC to the state headquarters were also estimated. No attempt was made to define the numbers of messages from other possible elements of state civil defense organizations, since states vary greatly in size and population.

C. Requirements for Other Messages

Provision must be made in the CDEIS for requests and inquiries to the operations center or headquarters from organic elements and for requests, information, or instructions from the operations center to these elements. Such transmissions were considered to be "special" messages.

The number of special messages and their length depend on a number of factors. Obviously they are influenced by the effectiveness with which basic messages are provided. For example, if basic messages have been received that enable the staff of a local operations center to determine the situation with respect to fire, decisions can be made and announced that may forestall a shelter manager's request for firefighting equipment or inquiry as to whether the fires are of such a nature that the shelter should be abandoned.

The number of special messages is also affected by:

(1) The availability of the Emergency Broadcast System (EBS) for messages that apply to more than one element. Obviously if information can be broadcast over a separate system, the communication load on the CDEIS will be reduced.

(2) The capability within these elements for decision making. The greater this capability for decision making, the less direction that will have to be provided by the CDEIS.

In general, however, since the basic messages include information about situations that require actions concerned with immediate threats to life or resources, the greatest number of incoming special messages will not have a high message transmission precedence, and may be transmitted at times when the system has a low volume of flash and priority basic messages.

D. Determination of Peak Message Loads

In order to determine communication requirements, it is necessary to know as accurately as possible the greatest density of basic and special messages with transmission precedence, and in what time period this maximum will occur. Estimates of these "peak loads" of traffic for some elements of civil defense organizations were made, based on estimates of the length of time during which certain conditions would occur and the numbers and lengths of messages to be exchanged during this time.

The principal part of this load was judged to be basic messages, since as noted earlier, special messages will tend to be of low precedence and can be delayed in transmission or can be excluded from the information system altogether by broadcast instructions, such as "Send no more inquiries about missing persons until further announcement over this station". Obviously, the effective use of message precedence will be important in preventing overloading of communications in peak periods.

E. Requirements for Messages Between EOC's or EH's and Other Elements

The CDEIS must also provide for exchange of information with non-organic elements, such as EOC's in adjacent areas, military units, or higher headquarters.

The types and numbers of messages to higher headquarters are largerly set by the needs of the higher headquarters for information. Thus, the requirements for communication between a local EOC and a state EH are determined principally by the state's requirements for basic messages.

The messages between headquarters in adjacent areas are dependent upon geographic and economic factors and the degree to which joint operations are planned and possible.

Messages between EOC's or EH's and military units will depend upon the geographical location of those units and their operational capabilities.

F. Prestored Information

Prestored files, documents, and maps can be used in addition to messages to provide information for decisions. Specific items of information to be prestored at the operations centers or headquarters at the local, state, and regional level were summarized from the worksheets on which information requirements were listed. This prestored information then did not generate any communication requirement.

G. Information Processing and Display Requirements

Procedures to be used in information processing depend upon the makeup of the staff of the EOC or emergency headquarters and the general concept of decision making that is followed.

Assumptions were made as to how civil defense functions would be represented in the staff organization. At the local level, it was assumed that there would be staff sections with the responsibilities for:

(1) The protection and relocation of the population, whether in or out of shelters (designated as the Population-Shelter Section).

(2) The coordination of mobile operational units such as police, firefighting, and road maintenance (designated the Emergency Services Section).

(3) The protection of, and maintenance of records concerning, supplies and important facilities such as hospitals (designated the the Logistics Section).

(4) The collection and development of information on environmental conditions, particularly continuing threats and the effects of nuclear attack or natural disasters (designated the Intelligence Section).

(5) The control of the operations center and the making of decisions about coordinated actions (designated the Executive Section).

Some modifications of this staff organization were made as seemed desirable at the state and regional level.

It was also assumed that, while centralized control of operational decisions was necessary, the staff members should participate in the decision-making procedure by:

(1) Identifying situations for which actions on the part of the operations center might be necessary;
(2) Determining the feasibility of specific activities;
(3) Evaluating the relative effectiveness and cost (in terms of utilization of limited resources) for alternative activities.

In keeping with these assumptions as to staff organization and decision-making procedures, responsibilities were assigned to individual staff sections for developing and transmitting required information by keeping and analyzing files and displays.

H. Summary

In summary, the general procedure that was followed in defining the CDEIS was to:

(1) Identify probable actions to be taken by civil defense organizations at local, state, and regional levels of government;
(2) Identify the information required for decisions about these actions;
(3) Identify the types and subjects of basic messages by which this information could be provided to EOC's or EH's from their organic elements;
(4) Estimate the amount of communication traffic generated by these messages under particular conditions;
(5) Identify other types of messages (special messages) between the EOC's and EH's and their organic elements;
(6) Estimate the maximum or peak periods of message density between major organic elements and EOC's or EH's;
(7) Identify the types of messages to be exchanged between EOC's or EH's and nonorganic elements, such as military installations and higher headquarters;

(8) Identify, on the basis of assumed staff organizations and general procedures for decision making, responsibilities of staff sections for developing information and maintaining files and displays.

V. LIMITATIONS OF THE PROCEDURE

In the following chapter, the procedure described above is followed in analyzing requirements for the CDEIS at the local level. Similar procedures, though in less detail are used in defining an information system for state and regional levels in Chapters 4 and 5, respectively.

However, some factors influencing the development of the CDEIS are specific to the organization and location. Accordingly, results derived by this procedure are not completely generalizable. At the local and state level, factors such as geography, the dispersal and protection of the population, and the economy of the area will influence the types of actions to be taken. For example, if an industrialized area surrounded by other urban areas and an isolated residential community experience the same attack conditions, there could be significant differences in the actions requiring decisions. These factors will also affect the location of shelters and other operating elements, and consequently the routing of messages.

The requirements for the CDEIS are also influenced by the type of operational elements that may exist in a particular area and especially by their means of control. For example, all communities can be expected to have police forces, but these forces may be deployed and controlled in quite different ways. The means of control may vary from a hardened control center with sophisticated data transmission and processing capability to a series of substations in office buildings, where only minimal records are kept and communication is by unsophisticated links shared with other users. Obviously, the degree to which information gathering, decision making, and control can be accomplished by an operating force or element will influence both the types of actions requiring decisions at the EOC and the type and number of messages that will be exchanged with that element.

Methods for analysis of alternatives of information development and flow in a specific organization are to be found in the technical literature

of information systems. A number of methods were reviewed for their application to the CDEIS. Of these, a method by Langefors[1/] seemed to have some application. However, the detailed analysis of flow of information within the local organization that was assumed, could not be done in the time available for the study.

In the analysis of shelter-to-EOC communication requirements for the assumed organization, all shelters were required to report directly to the EOC. However, this is not necessarily the optimum procedure. An analysis of factors that determine whether a shelter complex headquarters should be used as an intermediate reporting point is provided in Appendix A.

The organization of the EOC or EH and the concept of decision making that is followed will influence the types of actions that will be taken and subsequently, information requirements. Under one concept, for example, the EOC would only inform the public and operational units that a bridge is blocked by disabled vehicles; under another concept, the staff action would be to organize a force to clear the bridge. The concept of staff organization and decision making will also determine the methods and equipment for information processing, storage, and display.

Finally, in the definition of a CDEIS for a particular location, there must be consideration of other specific elements that may be sources or recipients of information. Principal among these at the local level are headquarters of other civil defense organizations, military installations, and state agencies. At the state and federal level, there may also be headquarters of federal departments and agencies from which information can be obtained and to which it may be sent.

In brief, it is impossible to design the emergency information systems for any place without consideration of the organization of civil defense elements, the EOC or EH staff organization, and decision-making procedures. All must be considered as parts of a single system for meeting the objectives of civil defense emergency operations.

1/ B. Langefors, Some Approaches to the Theory of Information Systems, Nordish Tidskrift for Informations Behandling (Denmark), Vol. 3, No. 4 (1963), pp. 229-254.

Chapter 3

The Civil Defense Emergency Information System at the Local Level

I. INTRODUCTION

A. Scope of the Chapter

The objective of this chapter is to describe in detail the steps by which a local CDEIS is defined, using the general procedures identified in the preceding chapter.

In order to provide an organizational framework for the system, a fairly definite local organization was assumed. However, to have defined specific operational, control, and communication capabilities would have been extremely time-consuming and would not have increased the applicability of the system so defined to other possible organizations.

No specific attack environments were used as a basis for determining specific situations that would require a transfer of information. Instead, for four emergency time-environments, estimates were made of the upper and lower limits of numbers of messages of particular types between an element (such as a police headquarters or a shelter) and the EOC. Even had specific attack environments been considered, the number of occurrences of a specific situation to be reported (such as a traffic blockage) would still have to be estimated.

Consequently, only approximate limits on the quantity of various types of information to be exchanged during given time periods can be established.

However, the process of analyzing the system requirements even in this manner resulted in defining:

(1) Specific types and formats of messages and prestored information that should be provided to local EOC's;

(2) Reasonable peak loads of messages between the EOC and shelters;

(3) Activities that should be accomplished by staff sections at EOC's in developing an information base upon which to base decisions.

B. Organization of Local Civil Defense

There are many ways in which local civil defense may be organized in the political subdivisions of a state. A civil defense organization may be provided for a single city or town, for a part of a city, for a group of communities, for a county, or for a part of a county. Since all of these organizations may deal with similar situations and take similar actions, there has been no attempt to consider each possible type of organization separately; each may be considered as a "local" civil defense organization.

In order to provide a framework for defining a local system, a fairly definite local organization was visualized. The organization was assumed to serve a city of about 100,000 population, having the following operational elements:

Occupied shelters;

Units and control centers for mobile emergency services, including
- police,
- fire,
- ambulance and rescue,
- road maintenance,
- water,
- electricity and gas,
- telephone;

Hospitals and medical centers;

Other occupied institutions (e.g., jails);

Transportation control centers and terminals;

Specified industrial plants, warehouses, and storage areas (e.g., for earth-moving equipment);

Radef monitoring stations not co-located with any of the above.

The following related elements were also assumed, although not organic parts of the system:

A commercial radio station of the Emergency Broadcast System (EBS),

Military units,

EOC's in adjacent areas and the state civil defense headquarters,

Terminals of the National Warning System.

The principal element for coordination and control of emergency operations at the local level will be the Emergency Operations Center (EOC). It will be under the direction of local government officials, assisted by their civil defense staffs.

At the EOC, information from the elements of the civil defense organization will be collected and evaluated, and through these elements actions will be coordinated, and advice and information provided.

The operating staff at the EOC is considered to be grouped into the following sections:

1. An Executive Section, headed by the chief of the local government or his representative. He may be assisted in matters of policy by an advisory staff composed of representatives of the local government and the community. This section will include the civil defense director and may exercise supervision over communications.
2. An Intelligence Section, with the responsibility for identifying and evaluating the general conditions existing in the emergency--damage, fires, radiation, and other threats.
3. A Population-Shelter Section, which will be concerned with conditions of the population, whether in public shelters or not.
4. An Emergency Services Section, concerned with maintaining and employing mobile services of various types. This section will contain representatives of fire, police, and other emergency services.
5. The Logistics Section, concerned with supplies of important resources, hospitals and other institutions, and transportation.

II. DEFINITION OF THE SYSTEM

A. Purpose of the System

The information system for local civil defense emergency operations must provide procedures and equipment for:

(1) Providing necessary information to the EOC from elements of the organization and external related elements, such as EOC's of adjacent areas;

(2) Storing, processing, and displaying information for decisions at the EOC;

(3) Providing necessary information from the EOC to the elements of the organization and to related external elements.

B. Information Requirements

The basic information that the information system is to provide to the EOC is determined by the types of actions that the EOC can be expected to perform in meeting the three objectives of civil defense operations:

(1) to reduce direct threats to life;

(2) to reduce indirect threats to life;

(3) to maintain government or control and communications and transportation links that will be necessary to achieve (1) and (2).

Information requirements will vary according to the four fairly definite time-environments described in Chapter 2:

Time-environment A: from the time of occupancy of EOC to the time of the first weapon detonation of concern to the EOC;

Time-environment B: from the weapon detonation to the arrival of fallout;

Time-environment C: from the arrival of fallout until limited operations become possible;

Time-environment D: from the time that brief sorties from shelters first will be possible for emergency missions to the time that non emergency means for control and direction are established.

The worksheets contained in Table 3-I, indicate the information requirements for decisions about possible actions to be taken by a local EOC in meeting the three objectives in these four time-environments.

C. Requirements for Basic Messages Between Shelters and the EOC

1. Types

In Table 3-I the types of information to be contained in basic messages from shelters are identified. This information may be transmitted by one or more of the following message types:

(1) Unscheduled situation reports to be forwarded when certain events or conditions occur or are observed;

(2) On-call situation reports to be provided when requested by the EOC;

Table 3-I

INFORMATION REQUIREMENTS WORKING TABLE

A. Maintain Control, Communications, and Transportation Links

Time Pd.*	Action	Information Required	Probable Data Sources	Staff Actions to Develop Information	Possible Results of Decisions
ALL	1. Maintain and/or reestablish comm. links in area of responsibility.	a. Emergency communications plan defining procedures, modes, and primary and alternate links to shelters, em.serv., EBS, key persons, install'ns. and other hq.	a. Prest. emerg. comm. plan;	a. Ex. Sect. (Comm.) updates comm. plan	Change comm. plan and inform staff and affected elements; dispatch repair crews or request mission from utilities or military; inform elements of location of spare equipment; create and equip repair crews, and assign missions.
		b. Status of wire links	b. Line checks and incoming rpts.	b. Msg. center and Pop-Sh. Sect. maintain in-out logs	
		c. Status of 2-way radio links	c. Radio checks and incoming rpts.	c. Msg. center maintains in-out log	
		d. Ability of EBS to accept and broadcast msgs.	d. Msgs. from EBS	d. Ex. Sect. maintains current status of EBS	
		e. Status of EBS and shortwave receivers in shelters and key install'ns.	e. Msg. - all elements	e. Sects. maintain current status of standard broadcast receivers in assigned elements	
		f. Blast and fire damage areas	f. Msg. - all elements	f. Reports analyzed by Int. Sect. and indicated on sit. map(s)	
		g. Major transp. routes - normal conds.	g. Prestored maps	g. Shown on sit. map(s), all sects.	
		h. Damage and interruptions to major transp. routes	h. Msg. - all elements	h. Reports analyzed by Int. Sect. and indicated on sit. map(s)	
		i. Areas without primary power	i. Msg. - shelters and em.serv., install'ns.	i. Reports analyzed by Int. Sect. and indicated on sit. map(s); Pop-Sh., Log. and Em.Serv. Sects. indicate in sit. files	
		j. Overall radiological cond.- dose rate and unshielded dose	j. Radef msgs.	j. Reports analyzed by Int. Sect. (Radef) and indicated on sit. map(s)	
	(continued)	k. Radiological conds. at specific locns.	k. Radef msgs.	k. Reports analyzed by Int. Sect. (Radef) and indicated on sit. map(s)	

* Time Periods

A. Pre-damage and fallout
B. Post damage, pre-fallout
C. In-shelter
D. Early recovery operations

List of Abbreviations Used

bldg. - building
capab. - capability
comm. - communication
cond'n. - condition
emerg. - emergency
EBS - Emergency Broadcast System
govt. - government
hq. - headquarters
indl. - individual
init. - initial
installn. - installation
Int. - Intelligence
locn. - location
Log. - Logistics
mgt. - management
msg. - message
mil. - military center
orgn. - organization
PDH - Packaged Disaster Hospital
Pop-Sh - Population-Shelter
PF - protection factor
prest. - prestored
prior. - priority
prodn. - production
rpt. - report
sch. - scheduled
sect. - section
sit. - situation
stat. - status
transp. - transportation
unsch. - unscheduled

(continued)

Table 3-I (Continued)

A. Maintain Control, Communications, and Transportation Links (Cont.)

Time Pd.*	Action	Information Required	Probable Data Sources	Staff Actions to Develop Information	Possible Results of Decisions
ALL	1. Maintain and/or reestablish comm. links in area of responsibility (continued).	l. Estimates of biological effects of radiation	l. Prest. Civil Defense Guide	l. Ex. and Int. Sect. (Radef) maintain general guides for decisions	
		m. Routes of wire lines	m. Prest. telephone circuit map	m. Em. Serv. Sect. maintains comm. map	
		n. Comm. repair personnel locn.	n. Prest. rosters, msg. from shelters	n. Em. Serv. Sect. maintains and updates rosters	
		o. Spare equipt. locn.	o. Prest. records; msgs. from utilities, installns., mil.	o. Log. Sect. maintains and updates files	
		p. Availability of vehicles for use of repair personnel	p. Msgs. from utilities, installns., mil.	p. Log. Sect. maintains and updates files	
ALL	2. Maintain and/or reestablish govt. or direction in area of responsibility.	a. Al-a through Al-l	a. _____	a. _____	Messages and broadcasts to elements (1) to designate leaders and clarify responsibility; (2) to assist in establishing or modifying organization; (3) to restore confidence in leadership. Requests to em.serv., mil., or other hq. for assistance in maintaining direction and control.
		b. Names and normal locns. of persons in govt., business, institutions, etc. with emergency responsibility, civil defense personnel (incl. Radef monitors), and persons assigned to shelter mgt.	b. Prest. rosters	b. Rosters stored by sects. for assigned elements	
		c. Locn. during emergency of above persons	c. Msgs. from shelters, em. serv., and key installns.; msgs. from indls...; on-call reports	c. Rosters updated	
		d. Capacity of elements of civil defense organization for providing direction and control.	d. Msgs. from shelters, em. serv., and installns.	d. Sects. maintain current status of direction and control capability in assigned elements	
		e. Situations requiring assistance in maintaining or reestablishing direction and control of emergency actions	e. Msgs. from shelters, em. serv., and key installns.	e. Rpts. analyzed by sect. responsible; advice provided; if coordinated action necessary, referred to Ex. Sect.; stat. rpts. requested	
		f. Capab. of police and mil. units in area for providing direction and control	f. Sch. and on-call stat. rpts from police and mil. units	f. Rpts. summarized and feasible actions determined by Em.Serv. and Ex. Sects.	
		g. Capab. of adjacent or higher hq. for assistance in reestablishing govt. or direction and control	g. On-call rpts.	g. Rpts. summarized and feasible actions determined by Ex. Sect.	
		h. Availability of vehicles for use of key personnel	h. Msgs. from shelters installns., mil.	h. File of available vehicles maintained and updated by Log. Sect.	

(continued)

Table 3-I (Continued)

A. Maintain Control, Communications, and Transportation Links (Cont.)

Time Pd.	Action	Information Required	Probable Data Sources	Staff Actions to Develop Information	Possible Results of Decisions
ALL	3. Assist in maintenance and restoration of transportation links.	a. A1-a thru A1-1, A2-d	a. _____	a. _____	Condition of primary roads and alternate routes broadcast; traffic control assignments made to police and auxiliaries; assignments for road repair made to units; mission requests for road repair to mil.
		b. Requirements for restoration of links of specific locns.	b. Msgs. from shelters, em. serv.	b. Priority rpts. of breaks in traffic links and on-call rpts. of requirements to restore summarized and analyzed Em. Serv. Sect.	
		c. Existing capability for control of traffic	c. Msgs. from police, mil.	c. Rpts. analyzed and feasibility of actions determined by Em. Serv. Sect.	
		d. Existing capability for removal of blocks or repair of roads	d. Msgs. from roads department, mil.	d. Rpts. analyzed and feasibility of actions determined by Em. Serv. Sect.	
		e. Location of road repair equipt. and personnel	e. Prest. lists; msgs. from installns. mil. and shelters	e. Files of available road repair equipt. updated	
		f. Major pools of vehicles	f. Prest. lists, msgs. from installns. mil. and shelters	f. Files of available vehicles summarized location of major transportation pools indicated on sit. map(s)	
		g. General status of fuel for vehicles	g. Prest. lists; msgs. from installns., mil., and shelter	g. Files of vehicle fuel updated; locn. of available fuel stocks indicated on sit. map(s)	

B. Meet Direct Threats

Time Pd.	Action	Information Required	Probable Data Sources	Staff Actions to Develop Information	Possible Results of Decisions
A	1. Provide attack warning	a. Warning procedures, locn. of attack warning points and local warning plan	a. Prest. Civil Defense Guides	a. Ex. Sect. (Comm.) maintains file	Provide equipt. and assign personnel where necessary to keep warning points ready; supplement signals with broadcasts and messages to shelters and other elements
		b. Status of warning system	b. Msgs. from warning points	b. Ex. Sect. (Comm.) maintains in-out log	
		c. General locn. and shelter status of population	c. Msgs. - em.serv. and shelters, if occupied	c. Pop-Sh. Sect. maintains and updates maps showing unsheltered pop. density, type of construction by area; maintains files and maps showing shelter locn., capacity, and occupancy	
		d. Estimated time of weapon arrival	d. National Warning System thru state hq.	d. Ex. Sect. (Comm.) informs all sects. of predicted time of arrival	
B, C	2. Provide warning of fallout approach	a. A1-a thru A1-c, B1-c	a. _____	a. _____	Method of warning established or revised. Use available comm. means to provide expected time of fallout arrival at easily identifiable points.

(Continued)

(continued)

Table 3-I (Continued)

B. Meet Direct Threats (Cont.)

Time Pd.	Action	Information Required	Probable Data Sources	Staff Actions To Develop Information	Possible Results of Decisions
B, C	2. Provide warning of fallout approach. (Continued)	b. Procedures for radiological warning	b. Prest. in local plan	b. Ex. Sect. (Comm.) and Int. Sect. (Radef) maintain files	
		c. Status of EBS and other possible warning means	c. Msgs. from warning points and EBS	c. Ex. Sect. (Comm.) identifies sources for warning, including EBS	
		d. Rpts. of nuclear detonations or Nudet rpts.	d. Msgs. - all elements and adjacent and higher hq.	d. Int. Sect. analyzes reports, plots locn., estimates radius of effects	
		e. Distant fallout arrival by time and locn.	e. Msgs. - Radef monitoring stations, em.serv., adjacent hq.	e. Int. Sect. (Radef) plots reports; estimates time of fallout arrival for other points	
		f. Upper wind speed and direction (when arrival cannot be reported by observers)	f. Msg. from Weather Service	f. Int. Sect. (Radef) estimates future fallout from nuclear destruction points	
ALL	3. Provide fire warning.	a. A1-a thru A1-e; B1-c	a. _____	a. _____	Warn affected elements by broadcast and special msgs.
		b. Locn. and direction of spread of mass fires	b. Msgs. - em. serv., shelters (if occupied), adjacent hq., installns.	b. Em. Serv. Sect. (Fire) plots occurrence of fire on sit. map; based on vulnerability of buildings and surface wind direction, predicts rate of spread	
		c. Fire vulnerability of areas in path of fire	c. Prest. fire underwriters maps	c. Em. Serv. Sect (Fire) plots prestored data on sit. map	
ALL	4. Provide flood warning.	a. A1-a thru A1-e; B1-c	a. _____	a. _____	Affected sites and elements warned by broadcast and special msgs.
		b. Elevation of sites occupied by population and important installns.	b. Prest. relief maps of local area	b. Int. Sect. summarizes rpts. and plots on relief map; identifies threatened locns.	
		c. Locn. and direction of spread of flood	c. Msgs. - em. serv. shelters (if occupied), adjacent and higher hq.	c. Int. Sect. maintains relief map of flood - threatened areas	
ALL	5. Provide extreme weather conditions warning.	a. A1-a thru A1-e; B1-c	a. _____	a. _____	Sites and elements informed by broadcast and special msgs.
		b. Approach of high winds, unusual precipitation or cold	b. Msgs. from Weather Service	b. Weather rpts. analyzed by Int. Sect. and unusual conds. reported to staff	
A, B,C	6. Advise and direct movement to shelters.	a. B1-c, B2-b thru B2-f, B3-b, B3-c, A1-f thru A1-h, A3-b, A3-c, A3-d	a. _____	a. _____	Time and plan of movement announced; traffic control provided; shelters opened; shelter data updated; population redirected to shelters as necessary
	(Continued)	b. Specific locn., PF, and estimated capacities of shelters	b. Prest. local emergency plan	b. Pop-Sh. Sect. maintains and updates file of shelter spaces	

(continued)

Table 3-I (Continued)

B. Meet Direct Threats (Cont.)

Time Pd.	Action	Information Required	Probable Data Sources	Staff Actions to Develop Information	Possible Results of Decisions
A,B,C	6. Advise and Direct movement to shelters. (Continued)	c. Method(s) for assigning shelter	c. Prest. - local emergency plan	c. Pop-Sh. Sect. maintains and updates plan(s) for shelter assignment	
		d. Method(s) for moving to shelter	d. Prest. - local emergency plan	d. Pop-Sh. Sect. maintains and updates plan(s) for movement to shelter	
		e. Available control for execution of movement	e. Msgs. - police, mil.	e. Em. Serv. Sect. summarizes and analyzes rpts. of capability along designated routes	
		f. Progress in accomplishment of movement	f. Msgs. from shelters, em. serv.	f. Pop-Sh. Sect. summarizes occupancy rpts., identifies remaining shelter spaces	
		g. Habitability (including supplies) of specific shelters	g. Msgs. from shelters	g. Pop-Sh. Sect. informs Log. and Em. Serv. Sects. of required actions to make shelters habitable; modifies files of available shelter, if necessary	
		h. Numbers and locations of persons in transit	h. Msgs. from shelter, em. serv., installns., adjacent hq.	h. Pop-Sh. Sect. summarizes and analyzes remaining requirements for shelter	
A,B,C	7. Advise and assist in shelter improvement.	a. B2-d, B2-e, B2-f, A1-a thru A1-l	a. _____	a. _____	Broadcast of information (may be prerecorded) on actions to improve shelter; Log. Sect. coordinates use of earth-moving equipt. and distribution of sandbags and other materials.
		b. Estimated protection of public and home shelters against radiation and blast	b. Prest. - NFSS records, and Civil Defense Guide	b. Pop-Sh. Sect. maintains file of shelter spaces and PF; data on inherent protection by building types	
		c. Expedient methods for increased protection against radiation and blast	c. Prest. - civil defense documents; higher hq.	c. Pop-Sh. Sect. maintains file of expedient methods; requests information from high hq.	
		d. Normal locn. of equipt. and materials for increasing protection	d. Prest. - lists of local and nearby installns. with earth-moving equipt. and building materials; classified telephone directory	d. Log. Sect. maintains files	
		e. Availability of equipt. and materials for increasing protection	e. Msgs. from em. serv., installns., and mil.	e. Log. Sect. coordinates rpts. and updates files	
ALL	8. Advise and assist in maintaining health, order, and morale. (Continued)	a. A1-a thru A1-l; A2-b thru A2-h; B3-b, B3-c, B4-b, B4-c, B5-b	a. _____	a. _____	Advice to shelter managers and unsheltered population on actions to improve conditions; broadcast of names and locns. of persons separated from immediate families; broadcast of messages to improve morale.
		b. Changes in temperature, ventilation, and general health conditions in shelter; sanitation problems	b. Msgs. from shelters	b. Pop-Sh. Sec. analyzes rpts.	

(continued)

Table 3-I (Continued)

B. Meet Direct Threats (Cont.)

Time Pd.*	Action	Information Required	Probable Data Sources	Staff Actions to Develop Information	Possible Results of Decisions
ALL	8. Advise and assist in maintaining health, order, and morale (continued).	c. Possible actions to reduce above problems	c. Prest. documents, EOC staff member	c. Pop-Sh. Sect. analyzes documents and sits.	
		d. Locn., quantity, and availability of undistributed shelter supplies	d. Msgs. from em.serv. and installns.	d. Log. Sect. maintains and updates files	
		e. Names and locns. of persons unable to determine locs. of immediate families	e. Msgs. from shelters	e. Pop-Sh. Sect. prepares alphabetized rosters	
		f. General status of state and nation	f. Rpt. from state hq.; FBS	f. Ex. Sect. requests and analyzes reports on conditions of state and nation	
ALL	9. Coordinate effort to meet threat of fire.	a. A1-a thru A1-i; A2-d, A3-c, A3-d, A3-g; B1-c, B2-a, B3-b, B3-c, B5-b	a. _____	a. _____	Modification of ...re fighting policies and plans; creation of new units; dispatch and control of existing or newly created units.
		b. Condition of water distribution system	b. Msgs. from shelters, em. serv., water utility	b. Int. Sect. and Em. Serv. Sect. indicate on sit. map(s)	
		c. Locn. and availability of fire fighting units, equipt., and supplies	c. Prest. maps of fire stations, inventory lists, msgs. from fire dept., installns., mil.	c. Em. Serv. Sect. (Fire) updates equipt. lists and sit. map(s)	
		d. Locn. and availability of trained fire fighting personnel not with units	d. Msgs. from shelters and mil.	d. Em. Serv. Sect. (Fire) compiles roster by name and locn.	
B,C,D	10. Coordinate effort to rescue trapped persons.	a. A1-a thru A1-i; A2-d, A3-c, A3-d, A3-f, A3-g; B2-i; B3-b, B4-c, B5-b	a. _____	a. _____	Modification of rescue policies and plans; creation of rescue teams; dispatch and control of rescue teams.
		b. Specific situations requiring rescue effort	b. Msgs. from shelters, em. serv.	b. Em. Serv. Sect. (Rescue) summarizes and analyzes msgs. for sits. requiring rescue effort	
		c. Locn. of units and volunteers available for rescue tasks	c. Msgs. from shelter, mil.	c. Em. Serv. Sect. (Rescue) compiles and maintains roster of units and individuals for rescue service	
ALL	11. Coordinate effort to maintain order (outside of shelter).	a. A1-a thru A1-k, A2-d, A2-f, A2-g, A3-c, A3-d, A3-f, A3-g, B2-c, B3-b, B4-c, B5-b	a. _____	a. _____	Modification of police policies and plans; creation of auxiliary forces; dispatch and control of police teams.
		b. Locns. size and nature of specific disorders threatening life or essential resources	b. Msgs. from em. serv., shelters, installns.	b. Em. Serv. Sect. (Police) summarizes and analyzes msgs. for sits. requiring police effort	
		c. Locn. of units and volunteers for restoring order	c. Msgs. from mil., shelters	c. Em. Serv. Sect. (Police) compiles and maintains roster of units and individuals for police service	

(continued)

Table 3-I (Continued)

B. Meet Direct Threats (Cont.)

Time Pd.*	Action	Information Required	Probable Data Sources	Staff Actions to Develop Information	Possible Results of Decisions
ALL	12. Advise and assist in movement of population (other than movement to shelter).	a. A1-a thru A1-1, A2-d, A3-b, A3-c, A3-d, A3-f, A3-g, B2-e, B3-b, B3-c, B4-c, B5-b, B6-b, B6-e, B7-b, B8-b	a. _____	a. _____	Coordinate and control movements; inform population needing relocation of available relocation sites, radiological and other hazards along routes by msgs. to shelters and em. serv. units; inform shelter managers or officials in area of relocation and rest sites of movement plans.
		b. Shelters available after initial occupancy in area	b. Shelter sch. rpts.	b. Pop-Sh. Sect. updates shelter status file; indicates available shelter space or relocation sites on sit. map(s)	
		c. Shelters available in adjacent areas	c. Msgs. from adjacent or state hq.	c. Pop-Sh. Sect. prepares and updates files; indicates on sit. map(s)	
		d. Vehicle availability and type of specific locn.	d. Msgs. from shelters or installns.	d. Log. Sect. maintains and updates files and maps showing transp. sit.	
		e. Fuel supplies available	e. Msgs. from em. serv., installns.	e. Log. Sect. maintains and updates files	
		f. Radiological intensity along routes to be used	f. Radef rpts.	f. Int. (Radef) Sect. analyzes rpts. from fixed and mobile units; uses estimated time and duration of movement for unshielded dose estimates along routes	
		g. Food and other supplies at relocation sites	g. Presc. lists of resources; on-call rpts.	g. Log. Sect. maintains and updates files	

C. Meet Indirect Threats (Cont.)

Time Pd.*	Action	Information Required	Probable Data Sources	Staff Actions to Develop Information	Possible Results of Decisions
ALL	1. Protect and conserve inventories necessary for survival.	a. A1-a thru A1-1, A2-d, B2-e, B3-b, B3-c, B4-c, B5-b, B9-b, B9-c, B11-b, B11-c, B12-d, B12-e, B12-f	a. _____	a. _____	Advice and information broadcast of shelter and individual actions to be taken to protect and conserve resources; police and fire units dispatched to protect from looting, fire; movement of inventories to safer locns. coordinated; requests transmitted to mil. for assistance in protecting or moving.
		b. Locn., quantities, and condition of inventories necessary for survival	b. Presc. inventory lists; msgs. from shelters and installns., adjacent and higher hqs.	b. Log. Sect. maintains and updates prestored files of essential item location, quantity, condition	
ALL	2. Maintain and/or restore water, gas, and electric power (Continued)	a. A1-a thru A1-1, A2-d, B2-e, B3-b, B3-c, B4-c, B5-b, B7-c, B7-d, B9-b, B12-d, B12-e, B12-f	a. _____	a. _____	Coordinate actions to operate and repair water and electric systems; request support from mil. or state hqs.; provide instructions for decontamination; create and dispatch decontamination teams; units dispatched to repair distribution lines.
		b. Status of water, gas, and electric power systems and operating and repair crews	b. Msgs. from em. serv., presc. charts or maps of distribution systems	b. Em. Serv. Sect. (Util.) integrates Radef and damage information and updates distribution charts or maps	

(continued)

Table 3-1 (Continued)

C. Meet Indirect Threats (Cont.)

Time Pd.	Action	Information Required	Probable Data Sources	Staff Actions to Develop Information	Possible Results of Decisions
ALL	2. Maintain and/or restore water, gas, and electric power. (Continued)	c. Availability of alternate power sources	c. Prest. - lists of generators, etc.	c. Log. Sect. maintains list of types, locns. of available generators; Em. Serv. Sect. (Util.) coordinates with state for exchange of power	
		d. Fallout decontamination requirements for power and water systems	d. Msgs. from water and power installns.; Radef rpts; Prest. documents on decontamination procedures	d. Em. Serv. Sect. estimates manpower and other requirements for decontaminating specific facilities	
		e. Forces and equipt. available for decontamination	e. Msgs. from shelters, em. serv., mil.	e. Em. Serv. Sect. maintains and updates lists of units, equipt., and personnel available for decontamination mission	
ALL	3. Allocate inventories of resources needed for survival.	a. A1-a thru A1-i, A2-b, A2-c, A2-d, B2-e, B3-b, B5-b - B9-b, B12-d thru B12-g, C1-b, C1-c, C2-e	a. _____	a. _____	Plans revised, if necessary; forces located and created, and directed to proceed with allocation plan.
		b. Radiation decontamination requirements for specific stocks of inventories	b. Msgs. from installns.; Radef rpts.; prest. documents on decontamination procedures	b. Em. Serv. Sect. estimates from available information the effects on inventories and decontamination requirements	
		c. Numbers of survivors, locns. and physical cond.	c. Msgs. from shelters, em. serv.	c. Pop-Sh. Sect. tabulates survivors by categories from reports and from estimates for non-reporting areas	
		d. Probable consumption rates of resources per individual of specified physical cond.	d. Prest. estimates	d. Log. Sect. uses and modifies Civil Defense Guide	
		e. Means available for allocation of resources	e. Prest. plans; msgs. from em. serv., mil.	e. Log. Sect. coordinates: (1) plans for resource allocation; (2) updated information on resources, transp. management and control; (3) intelligence sit.	
ALL	4. Coordinate medical assistance. (Continued)	a. A1-a thru A1-i, A2-b, A2-c, A2-d, B2-e, B5-b, B4-c, B5-b, B6-b, B9-b, B10-b, B12-d thru B12-g, C1-b, C2-e, C3-c	a. _____	a. _____	Information provided through broadcast and direct messages of locn. of medical services; mobile medical teams organized and dispatched; PDH's set up or assigned and moved to other locns.
		b. Locn. and capabilities of hospitals, PDH, medical aid stations, and medical supply points	b. Msgs. from hospitals and other medical facilities	b. Em. Serv. Sect. (Med.) maintains list of medical facilities; prepares situation map(s) indicating radiological situation	

(continued)

C. Most Indirect Threats (Cont.)

Table 3-1 (Continued

Time Pd.*	Action	Information Required	Probable Data Sources	Staff Actions to Develop Information	Possible Results of Decisions
ALL	4. Coordinate medical assistance. (Continued)	c. Decontamination requirements for above	c. Msgs. from facilities; Radef rpts.; prest. documents on decontamination procedures	c. Em. Serv. Sect. estimates manpower and equipment required from available information	
		d. Locn. and physical cond. of medical personnel	d. Msgs. from shelters, em. serv. and medical facilities	d. Em. Serv. Sect. (Med.) maintains lists of available medical personnel	
		e. Locn. and capability of ambulance and other mobile medical service units	e. Msgs. from dispatch centers	e. Em. Serv. Sect. (Med.; maintains lists of available mobile units; updates situation map(s)	
ALL	5. Assist in maintenance of sanitation.	a. A1-a thru A1-1, A2-b, A2-c, A2-d, B2-e, B9-b, B12-d thru B12-g, C1-b, C2-e, C3-b thru C3-c	a. _____	a. _____	Population advised of actions to reduce sanitation problems; combined sanitation and decontamination units created and dispatched to clean up critical points, to restore sewer lines.
		b. Normal sanitation system and emergency plans	b. Prest. msgs. from sanitation officials	b. Em. Serv. Sect. maintains plans, maps, and rosters of sanitation services	
		c. Locn. of sanitation units and supervisors	c. Prest. msgs. from sanitation facilities and shelters	c. Em. Serv. Sect. maintains and updates files of sanitation equipt. and key personnel	
		d. Sanitation problems, including removal of dead, at specific locns.	d. Msgs. from shelters, em. serv., installns.	d. Int. Sect. integrates msgs.; analyses sits.; refers critical sits. to Em. Serv. Sect.	
		e. Radiation decontamination requirements for sanitary facilities	e. Msgs. from facilities; Radef rpts.; prest. documents on decontamination procedures	e. Em. Serv. Sect. estimates manpower and equipt. requirements on basis of available information	
B,D	6. Restore inventories of resources necessary for survival.	a. A1-a thru A1-1, A2-b, A2-c, A2-d, B9-b, B12-d, B12-e, B12-f, C1-b, C2-c, C2-f, C3-b, C3-c	a. _____	a. _____	Priorities in restoring facilities announced to staff and by broadcast; decontamination teams formed and dispatched on priority basis; broadcasts issued to have production and management personnel report to designated facilities; coordination of transportation to obtain materials from other areas; power priorities announced and followed.
		b. Run-out prodn. capacity of facilities producing survival items	b. Msgs. from managers of prodn. facilities	b. Log. Sect. tabulates potential immediate production of emergency items	
		c. Types of personnel required for production	c. Msgs. from business official	c. Log. Sect. compiles lists of numbers and types of important skills	
		d. Availability of required types of personnel	d. Msgs. from shelters, prodn. facilities	d. Log. Sect. compiles information from msgs. from production facilities and shelters	
		e. Power required for production	e. Prest.; msgs. from business official	e. Log. Sect. updates prestored files on production facilities	
	(Continued)	f. Radiological decontamination necessary at specific facilities	f. Msgs. from installns; Radef reports; prestored procedures for decontamination	f. Em. Serv. Sect. estimates from available information, requirements for decontamination of specific facilities	

(Continued)

C. Meet Indirect Threats (Cont.)

Table 3-I (Continued)

Time Pd.*	Action	Information Required	Probable Data Sources	Staff Actions to Develop Information	Possible Results of Decisions
B,D	6. Restore inventories of resources necessary for survival. (Continued)	g. Availability of resources necessary for survival in adjacent areas	g. Msgs. from adjacent hq., state hq.	g. Log. Sect. maintains and updates files of resource availability	
		h. Materials needed for continued production	h. Msg. from prodn. facilities	h. Log. Sect. compiles lists of materials required	
		i. Availability of materials for production	i. Msgs. from sources in area, adjacent hq., state hq.	i. Log. Sect. compiles lists of quantities available and locn.	
		j. Available substitutes for scarce materials needed to restore inventories	j. Prest.; msgs. from prodn. facilities, adj. hq., state hq.	j. Log. Sect. maintains and updates files of items essential for survival	
		k. Alternative facilities or methods for producing resources necessary for survival	k. Prest. msgs. from business officials	k. Log. Sect. updates plan for emergency production	
ALL	7. Provide assistance to special institutions (e.g., schools for handicapped).	a. A1-a thru A1-l, A2-b thru A2-f, B4-c, B6-e, B6-f, B7-c, B7-d, B7-e, B12-b thru B17-g, C1-b, C2-c, C2-e	a. _____	a. _____	Specific advice provided to managers of institutions; units created to supply institutions or remove inhabitants.
		b. Radiation decontamination requirements for specific structures	b. Radef rpts.; msgs. from institutions; prest. documents on decontamination procedures	b. Em. Serv. Sect. (decontamination) estimates manpower and equip. requirements on basis of available information	
		c. Other specific problems of institutions	c. Msgs. from institutions	c. Em. Serv. or Pop-Sh. Sect. maintains file on reported condns. at individual institutions, analyzes with respect to threat	
		d. Plans for emerg. actions to support institutions	d. Prest. plans	d. Em. Serv. or Pop-Sh. Sect. maintains and updates emergency plans of all institutions	

(3) scheduled status summary reports and Radef reports to be transmitted at pre established times.

Unscheduled and on-call situation reports may be further categorized by the following subjects:

Shelter open - reporting the fact that the shelter is open and ready for occupants.

Shelter occupancy level - indicating when the shelter is full or when movement into shelter has ceased at least temporarily.

Initial habitability - providing an initial estimate of adequacy of space, supplies, and ventilation.

Change in habitability - reporting significant changes that affect the probability of continuing occupancy of the shelter.

Relocation - plans for, or accomplishment of, move from a particular shelter.

Condition of occupants - indicating important change in physical or psychological condition of significant numbers of occupants.

Area environment - reporting major obstacles to traffic movement, occurrence of major damage, appearance of fire or other threat in area.

Out-of-shelter population - reporting outside population in need of direction, control, or rescue.

Out-of-shelter resources - reporting damage or threats to important resources outside the shelter.

All of the above message categories contain information of immediate importance, and are considered to be "priority" messages in transmission.

Two categories of situation reports that are already designated in civil defense plans as FLASH messages are:

Fallout arrival - sent according to Federal Civil Defense Guide.

Nudet report - reporting observation of nuclear detonation.

It can also be anticipated that some types of information will not be needed immediately and can be provided by on-call routine* messages of the following types:

Space or population conditions - noncritical conditions that can be useful in subsequent relocation decisions.

In-shelter supplies - amounts of designated items of supply on hand.

Manpower types - availability of designated types of manpower.

Area conditions - status of area roads, transportation and other resources not needed for immediate operations.

Summary status reports should also be submitted by each shelter. The time and frequency at which such reports are submitted should be specified by the EOC, depending upon the particular situation. These summary reports will generally not provide critical information that has not already been reported by some other type of message.

Radef messages will also be submitted according to the preplanned schedule.

The information to be supplied by shelters to provide an information base are related to message types in Table 3-II.

2. Message Length

In order to determine probable lengths of basic messages, sample messages were prepared and word-counts made. These sample messages are found in Appendix B.

The samples of various types of unscheduled priority messages and on-call routine messages do not vary greatly in their lengths, and average about 40 words. The sample initial status summary report contains approximately 160 words, and subsequent situation reports contain about 80 words.

Radef reports from shelters also are basic messages. It is assumed that the messages will be in the form prescribed in the Federal Civil Defense Guide. About 10 words will be required to

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* Lowest transmission precedence is routine.

Table 3-II

IDENTIFICATION OF INFORMATION REQUIREMENTS WITH SHELTER MESSAGE TYPES

Information Requirement	Message Type
Status of radio receivers (EBS, RACES)	PS1, PS2, PS4, SS
Special communication links (to other shelters, RACES, etc.)	PS1, PS3, PS4, SS
Nuclear detonation observation	FS2
New blast, fire damage in area	PS7, RS4, SS
Traffic and road conditions	PS7, RS4
Electric power status	PS4, SS
Water system status	PS4, PS7, SS
Shelter management status	PS1, PS2, PS4, SS
Area control and order	PS8
Shelter opening	PS1
Shelter occupancy conditions	PS2, RS1, SS
Relocation of shelter occupants	PS5
Shelter protection	PS3, PS4, SR
Shelter habitability, including sanitation	PS3, PS4, RS1, SS
Shelter supplies	PS3, PS4, RS2, SS
Shelter population - physical condition, morale	PS6, RS1, SS
Out-of-shelter pop'n. - shelter status, movement, rescue needs	PS8, SS
Fallout arrival	FS1
Radiological condns.	PS7, SS, SR
Fire spread, flood	PS7
Transportation availability	RS4
Survival supply inventories in area	PS9, RS4
Special types of manpower	RS3
Names of separated persons	RS1

Key to Message Types

Unscheduled and On-Call Priority Situation Reports

PS1 - Shelter open
PS2 - Occupancy level
PS3 - Initial habitability
PS4 - Change in habitability
PS5 - Relocation
PS6 - Condition of occupants
PS7 - Area environment
PS8 - Out-of-shelter population
PS9 - Out-of-shelter resource status

Flash Messages

FS1 - Fallout arrival
FS2 - Nudet observation

On-call Routine Situation Report

RS1 - Space or population
RS2 - In-shelter supply
RS3 - Manpower type
RS4 - Area conditions

Scheduled Messages

SS - Status Summary
SR - Radef Rate

report radiological dose rate, and about 15 words to report total dose as well as rate.

The sample messages provide for no redundancy in content and no inefficiency on the part of the transmitter. To compensate for this, it is assumed that the actual messages will be 20% greater in length than the sample messages. An additional 10 words are considered necessary for acknowledgement by the receiver of the message.

3. Number of Messages

Some messages, such as a shelter open message or report, will occur only once from any shelter. Summary status reports will be provided at regular intervals. (Present plans specify once every 24 hours, but it may be desirable to have such summary reports more frequently in the first day or two of shelter occupancy.)

The number of most unscheduled or on-call priority messages will depend upon the frequency of occurrence of the particular situation which they report. In order to obtain some approximations to the number of messages of these types from shelters, upper and lower bounds on probabilities that the situation would occur at least once were estimated. Upper and lower bounds on numbers of messages that might occur concerning such a situation were also estimated.

The lower probability bound was then multiplied by the lower bound on number of messages, and the upper probability bound by the upper bound on number of messages of each type in order to provide an upper and lower limit on the numbers of each specified type of unscheduled priority message from one shelter during each of the four time-environments. It is assumed that on-call priority messages would occur about one-third as often as the unscheduled priority situation reports.

The probability of occurrence and the numbers of on-call routine situation reports were estimated, as were the upper and lower bounds on the numbers of these messages.

Table 3-III summarizes the estimates of numbers of unscheduled basic messages from a shelter for each of the four time-environments considered.

Table 3-III

ESTIMATES FOR NUMBERS OF UNSCHEDULED BASIC MESSAGES FROM SHELTERS

	Average Message Length (Words)	Time Environments A* Prob.	A* No.	B* Prob.	B* No.	C* Prob.	C* No.	D* Prob.	D* No.
1. Unscheduled Priority									
Shelter Open	80	1.0	1	———		———		———	
Occupancy	60	1.0	1-3	———		———		———	
Initial Habitability	90	1.0	1	———		———		———	
Change in Habitability	60	0.0-0.1	2-4	0.1-0.5	2-4	0.1-0.2	2-4	0.2-0.3	2-4
Relocation	70	0.0-0.1	2-3	0.0-0.2	2-3	0.0-0.1	2-3	0.1-0.2	2-3
Cond'n. of Occupants	60	0.0-0.1	2-3	0.1-0.4	2-3	0.1-0.3	1-3	0.1-0.3	1-3
Area Environment	50	0.2-0.5	1-3	0.1-0.9	2-3	0.1-0.5	2-3	0.1-0.5	1-3
Out-of-Shelter Population	50	0.2-0.6	2-3	0.1-0.9	2-3	0.0-0.3	1-2	0.0-0.2	2-4
Out-of-Shelter Resources	60	0.2-0.5	1-3	0.1-0.9	1-3	0.0-0.2	1-2	0.1-0.7	2-5
Shelter - Total			4-11		1-12		1-5		1-9
Av. Words/Msg.			60		60		60		60
2. On-Call Priority (1/3 of Unscheduled Priority)			2-4		1-4		1-2		1-3
3. On-Call Routine									
Shelter or Population Conditions	70	0.1-0.5	1-3	0.1-0.5	2-3	0.4-0.8	2-4	0.1-0.3	1-2
In Shelter Supply	50	0.3-1.0	1-3	0.1-0.5	1-2	0.3-0.7	1-4	0.3-0.9	2-4
Manpower Types	50	0.0-0.1	1-2	0.0-0.1	1-2	0.3-1.0	1-2	0.2-0.8	3-4
Area Conditions	70	0.5-1.0	1-2	0.3-1.0	2-3	0.1-0.2	2-3	0.3-1.0	3-4
Shelter - Total			1-7		2-8		2-9		3-12
Av. Words/Msg.			60		60		60		60

* A - from the time of occupancy of EOC to the time of the first weapon detonation of concern to the EOC
B - from the weapon detonation to the arrival of fallout
C - from the arrival of fallout until limited operations become possible
D - from the time that brief sorties from shelters first will be possible for emergency missions to the time that non emergency means for control and direction are established

4. Message Density

To be meaningful in defining system requirements, message requirements must be represented as message density during intervals of time. Maximum density cannot be determined solely on the basis of the four time-environments considered, for they are indefinite in length. The time from occupancy of the EOC to the occurrence of a weapon detonation of concern to the EOC may be extremely short, or it may be several days if there is such an occurence at all. The time from the occurrence of a weapon detonation to the arrival of fallout may vary from about an hour to six hours or more. The other type of environments - continuous shelter occupancy and sortie from shelter - may each last for an indefinite number of days.

Consequently, message density must be estimated for more definite time intervals. The three time intervals during which a peak load of traffic from shelters are most likely to occur are:

(1) In movement to shelter;

(2) Immediately after direct effects have been experienced;

(3) In the period after fallout has subsided to the point where brief sorties from shelter are possible.

Of these, the movement to shelter period is considered to result in maximum basic message density. In every community, there is a high probability that there would be a somewhat simultaneous movement to shelter. In this period, an appreciable number of messages must and can be transmitted from each shelter to the EOC to insure that the movement is accomplished as efficiently as possible.

On the other hand, following direct weapon effects, only when there is damage to some fraction of the shelters will the EOC need to be informed so that it can take action. When all shelters have sustained important effects, the EOC would be likely to know this without individual messages. It is also unlikely that all shelters in an area will be reporting the beginning of out-of-shelter operations at the same time.

For the movement to shelter period, both the time and the number of messages from each shelter can be reasonably well established.

Community shelter plans are presently based on travel times of one-half hour in urban areas, and one hour seems to be a reasonable time limit in which the initial messages from shelters will be received. The initial messages can be expected to consist of the following:

Shelter open report, 1;

Shelter occupancy level, 1 to 3;

Initial habitability, 1;

Out-of-shelter population, 0 or 1;

Area environment, 0 or 1;

Out-of-shelter resources, 0 or 1.

Thus three to eight basic messages might be expected during the movement to shelter period and this period might be expected to last about one hour.

D. Requirements for Basic Messages Between Emergency Services and the EOC

1. Types of Messages

Because of the mobility of their operating units, an important source of information at the local level will be the emergency services, including police, fire, utilities, and road repair. Units of such services will have radio equipment for communicating to their emergency control centers. These control centers may be located at the EOC, but it is assumed that they are not, and that the civil defense information system will include communication to these centers, but not to individual units.

The information to be provided to the EOC by these centers can be allocated to the following types of unscheduled or on-call priority messages:

Initial status - describing the control, communication, and overall operating capability of the service. This message will be sent as soon as possible after the emergency plan for the service has been put into effect.

Change in status - reporting any significant change in the capability of the service; for example, loss of communication to operational units.

Area environment - reporting the occurrence of a condition that will influence operations or threaten population or important resources; for example, damage to roads or spread of fires.

Population status - reporting movement, disorder, or casualties involving significant numbers of people either in or out of designated shelters.

Critical resource status - reporting threats to, or change in condition of, an important resource; for example, trucks containing food abandoned in an area where there are fires.

Other civil defense element - reporting changes in the status of another part of the civil defense organization; for example, location of recently abandoned road repair equipment or inability of a shelter or other element to communicate directly with the EOC.

Periodic status summary messages and Radef reports from designated monitoring points may also be provided to the EOC from control centers of the emergency services. There will also be reports of mobile radiological monitoring from the emergency services, and these will be furnished on an on-call basis. In Table 3-IV, the information required from emergency services is related to the above types of basic messages.

2. Message Length

Sample basic messages of the above types are given in Appendix B.

While there is a somewhat greater variation in the length of these messages than in the messages from shelters, most messages would require about 50 words. As in the case of shelter messages, the messages from the emergency services as given do not provide for any inefficiency or redundancy in transmission. Consequently, the average length of a basic message is estimated to be about 70 words.

3. Number of Messages

The number of basic messages to be reported from an emergency service during a particular time-environment depends principally upon:

(1) The mission and coverage of the emergency service force (for example, under most conditions there will be more police cars than road repair crews deployed);

(2) The duration of the time environment.

In estimating the number of messages from emergency services, a city of 100,000 population was assumed. In an actual city of this size, it was determined that the following approximate numbers

Table 3-IV

IDENTIFICATION OF INFORMATION REQUIREMENTS WITH EMERGENCY SERVICE MESSAGE TYPES (POLICE, FIRE, UTILITY, ROAD REPAIR)

Status of radio receivers in center, units	PE1, PE2, ES
New blast, fire damage	PE3
Nuclear detonation observation	FE2
Traffic and road conditions	PE3, PE4
Utility break or restoration of service	PE5
Major sanitation problems	PE3
Location and status of operational units	PE1, PE2, ES
Location and status of unattended vehicles and equipment of other services	PE5
Need for direction and control - other services or shelters	PE6
Status of direction and control - own service	PE1, PE2, ES
Road maintenance requirements	RE2
Traffic control requirements	RE2
Capabilities for assigned missions	PE1, PE2, ES
Capabilities for special mission (including decontamination)	PE2
Status of population not in designated shelters	PE4
Radiological conditions	PE3, ER, ES
Arrival of fallout	FE1
Mass fire - rate, direction of spread	PE3
Flood - rate, direction	PE3
Significant movement of population - numbers, direction	PE4
Disorder, out of shelter population	PE5
Availability of supplies for shelter improvement	RE2
Availability of supplies of survival items	RE2
Equipment needed for restoring operating capability	PE2, RE2
Availability of manpower types	RE1

Key to Message Types

Unscheduled or On-Call Priority Situation Reports

PE1 - Initial mission capability
PE2 - Change in mission capability
PE3 - Area environment
PE4 - Population status
PE5 - Resource or installation status
PE6 - Other elements

Scheduled

ES - Status summary
ER - Radef report

Flash Messages

FE1 - Arrival of fallout
FE2 - Nudet observation

On-Call Routine Situation Reports

RE1 - Population Status
RE2 - Resource Status

of emergency units with two-way communication could operate in an emergency:

Fire - 15 to 20 units (fire companies and special vehicles);

Police - 30 to 50 units (primarily patrol cars);

Telephone repair - 80 to 120 units (cars and trucks);

Electric and gas repair - 40 to 50 units (cars and trucks);

Road repair or public works - 3 to 10 units (cars and trucks);

Ambulance service - 4 units.

Possible lengths of time-environments A (prior to damage or fallout), B (post damage but pre-fallout), and D (sorties from shelter) are used as the basis for estimating the numbers of basic messages orginating at the control center of the emergency services. These estimates are given in Table 3-V. Estimates are not made for the C (in-shelter) time-environment, since operations by mobile emergency service units will be unlikely during this period.

It will be noted that the estimated numbers of messages are not proportional to the length of the times assumed. This is because some reports will be sent regardless of the length of the period, and some situations (such as a change in status) will tend to occur less frequently while the same general condition or time-environment continues to exist.

4. Density

Table 3-V indicates the estimated numbers of situation reports when the time-environments A and B are as short as one hour. If messages originate within this one hour period in a particularly non uniform manner, the load at any one time period can be smoothed by the control center for the emergency service. Messages in time-environment D will be dispersed over a much longer period.

Consequently, a one-hour long time-environment B is found to be the period of greatest density of messages from each of the emergency services.

In determining communication requirements, in addition to these messages, it will be necessary to provide for special messages, such as directives or instruction to the emergency center from the EOC. These types of messages are treated later in this chapter.

Table 3-V

ESTIMATED NUMBER OF BASIC SITUATION REPORTS FROM EMERGENCY SERVICES

	Police	Fire	Water	Gas/ Electric	Telephone	Road Repair	Ambulance
Time-Environment A (1-6 hrs.)							
Mission Capability	2-5	2-4	1-2	1-2	1-2	1-3	1-3
Environment	5-15	2-5	0-1	1-4	1-4	2-5	1-3
Population	5-20	2-4	0-1	4-10	4-10	2-4	3-8
Resources	2-8	1-2	1-2	2-8	2-8	1-5	1-3
Other Services and Installations	2-10	1-3	0-1	2-5	2-5	1-3	1-3
Total	16-58	8-19	2-7	10-29	10-29	7-20	7-20
Time-Environment B (1-6 hrs.)							
Mission Capability	5-15	3-12	2-5	3-8	3-8	2-6	3-12
Environment	5-25	5-20	1-3	5-15	5-15	2-5	2-5
Population	3-15	2-5	1-3	3-10	3-10	2-5	3-10
Resources	3-10	2-5	1-3	3-10	3-10	3-10	2-5
Other Em. Services	2-5	2-5	1-3	2-5	2-5	1-3	1-3
Total	18-70	14-47	6-17	16-48	16-48	10-29	11-35
Time Environment D (1-5 days)							
Mission Capability	10-30	3-12	2-5	2-10	2-10	3-10	5-20
Environment	10-30	8-30	2-5	10-30	10-30	5-20	5-20
Population	10-30	5-20	2-5	10-30	10-30	5-20	5-20
Resources	15-40	5-20	2-5	10-40	10-40	5-20	2-10
Other Em. Services	5-15	2-5	1-3	5-15	5-15	2-5	2-5
Radef	10-30	5-15	2-10	5-20	5-20	5-15	2-10
Total	60-175	28-102	11-33	47-145	47-145	25-90	21-85

E. Requirements for Basic Messages Between Other Facilities and the EOC

1. Types of Messages

Hospitals and other occupied institutions, and designated warehouses, transportation centers, and industrial facilities will be responsible for contributing to the basic information at the EOC. The types of messages for providing this information will be the same as those of the emergency services.

Table 3-VI shows the allocation of the basic information requirements to message types.

2. Length of Messages

Sample messages from installations of the above types are given in Appendix B. The average lengths of unscheduled messages, as determined from the samples, will not differ significantly from those from emergency services. Summary status reports and Radef reports will be similar in length to those from shelters; that is, about 160 words for the initial summary status report, 100 words for subsequent reports, and 10-15 words for a Radef report.

3. Numbers of Messages

The number of unscheduled priority messages to be dispatched from any installation during a given time-environment will depend upon its location, its mission, the nature of the attack, and the length of the time-environment.

Estimated numbers of basic unscheduled messages from installations for time-environments A, B, C, and D are shown in Table 3-VII.

In addition, installations will submit scheduled summary status reports and Radef reports when they are designated as monitoring stations

4. Density

Maximum density of messages is, as in the case of messages from emergency services, determined from the estimates of messages during one-hour time-environments. From Table 3-VII, it is seen that the peak load of basic messages will occur in time-environment B.

F. Basic Messages From Sources Outside the Local Civil Defense Organization

Sources outside the local civil defense organization can provide messages containing basic information for decisions.

Table 3-VI

IDENTIFICATION OF INFORMATION REQUIREMENTS WITH MESSAGE TYPES FROM INSTALLATIONS (HOSPITALS AND OTHER OCCUPIED INSTITUTIONS, WAREHOUSES TRANSPORTATION CENTERS, DESIGNATED INDUSTRIAL FACILITIES)

Status of radio receivers	IS, PI1, PI2
Status of control and key officials	IS, PI1, PI2, RI1
Condition of occupants	PI1, PI2
New blast, fire damage	PI3
Nuclear detonation	FI2
Traffic, road conditions	PI3, RI2
Electrical power	IS, PI2
Fallout Arrival	FI1
Radiological conditions	IR, PI3
Capability for emergency mission	IS, PI1, PI2
Equipment and transport vehicles	IS, PI1, PI2, PI5, RI2
Survival supplies at installations	IS, PI1, PI2, RI2
Fire spread, flood, disorder in area	PI3
Sanitation conditions	PI2, PI3
Special manpower categories	PI1, PI2, RI1
Survival supplies in area	PI5, RI2
Population in area	PI4, RI1
Condition of other emergency services and installations	PI6

Unscheduled or On Call Priority Situation Reports

PI1 - Initial status
PI2 - Change in status
PI3 - Area environment
PI4 - Outside population status
PI5 - Critical resource status
PI6 - Other element

Scheduled Reports

IS - Summary Status
IR - Radef Rate

Flash Messages

FI1 - Arrival of fallout
FI2 - Nudet observation

On-call Routine Situation Reports

RI1 - Population status
RI2 - Resource status

Table 3-VII

ESTIMATED NUMBERS OF BASIC MESSAGES - HOSPITALS AND OTHER INSTITUTIONS

	Time Environment			
	A (1-6 hrs.)	B (1-6 hrs.)	C (1-10 days)	D (1-5 days)
Hospitals				
Operational Status	2-8	2-8	2-20	4-15
Area Environment	1-3	2-5	5-30	3-10
Population	2-10	3-8	3-15	5-20
Resources	2-8	3-8	3-15	5-20
Other Civil Defense Elements	1-3	1-3	3-20	2-5
Total	8-32	11-32	16-100	19-70
Other Institutions				
Operational Status	2-5	1-4	2-15	2-8
Area Environment	1-3	2-5	5-30	3-10
Population	2-5	2-5	3-15	5-20
Resources	2-10	3-10	3-15	10-30
Other Civil Defense Elements	1-3	1-3	2-10	2-5
Total	8-26	11-27	15-85	22-73

Military units in the area of a local civil defense organization will need to communicate to the EOC and report their availability for missions as designated in prearranged military support plans. Military units may also provide warning of fallout approach and information about major roads and movement of people.

EOC's in adjacent areas will provide radiological warning, movement of population, and information about their operational capabilities.

It will be necessary for the Emergency Broadcast System (EBS) station that is to provide service for a particular local organization to provide to the EOC of that organization reports of its availability and capability for broadcasting.

Finally, higher headquarters (such as the state civil defense headquarters or a state area headquarters) will be expected to provide warning of fallout approach and advice and information to assist the local EOC in its decision making.

Another possible source of basic information that may be available in some communities is the wire service of an organization such as the Associated Press. This link, if established, is a one-way link and is not considered part of the civil defense emergency information system.

The numbers and density of messages from the above sources will depend upon the specific organization and its operating capabilities. In any case, the number of basic messages will be small compared with the number that should be provided by elements of the local civil defense organization.

G. Other Messages

In addition to providing for basic messages supporting types of decisions that can be anticipated, the information system must also provide for the transmission of special messages from the EOC providing directives and special instructions. The availability of the EBS will be important in reducing the number of such messages.

However, the EBS may not always be available, and directives and special instructions will usually require transmission with a minimum of delay. Therefore, provision must be made for these messages in computations of peak traffic load.

Estimates of the number of urgent messages containing directives

or special instructions to be sent by the EOC to various organic elements are shown in Table 3-VIII. The numbers are shown for the one and six-hour durations of time-environments A and B, which were also used in estimating numbers of basic messages. Messages in time-environments C and D, because of the length of these periods, will not significantly influence peak load.

Table 3-VIII

ESTIMATED NUMBERS OF URGENT MESSAGES CONTAINING DIRECTIVES OR SPECIAL INSTRUCTIONS

	Time Environments	
	A (1-6 hours)	B (1-6 hours)
Organic Element		
Police	5-25	5-25
Fire	3-10	5-10
Water Service	1-3	2-3
Gas/Electric	2-3	5-10
Telephone	2-3	5-10
Road Repair	3-10	5-10
Ambulance	3-10	5-20
Hospitals	2-4	2-5
Other Installations	2-4	2-5

Other types of special messages to be considered in determining communication requirements are:

(1) Requests and inquiries to the EOC from elements of the local organization and other organizations for information, advice, and assistance;

(2) Messages between civil defense elements and the EOC regarding conditions or capabilities applying to specific non urgent situations.

The volume of these messages will be largely influenced by the quality of the information base that has been provided by the specified unscheduled and scheduled messages. Specifically, adequate basic information will enable the EOC staff to anticipate conditions and announce policies or provide information that will reduce the numbers of both inquiries to the EOC and other messages that are unimportant in influencing the emergency situation. For example, if the overall fire

situation is known at the EOC, then a general plan for use of firefighting capability can be determined and announced. Requests for assistance not in accordance with the plan can thus be forestalled. Even if such a request is sent to the EOC, the staff members know that they need not collect additional information to deal with the situation.

No additional communications need to be provided specifically for the miscellaneous requests and exchanges of information concerning non urgent situations if, after providing for basic messages and urgent special messages at peak periods, there will be significant communication capacity available at other times.

Such a significant capacity would be available in the case of EOC-shelter communications. The great variation that could exist in basic message traffic is apparent from the estimates earlier in the chapter. There will be brief periods of time, such as during movement to shelter and immediately after direct effects have been experienced, when most shelters may have changes of condition and capabilities to report; there will be much longer periods of time when conditions and capabilities of most shelters will not be changing and basic message traffic will be low. Unless shelters are completely incapable of dealing with their problems, the amount of low precedence traffic should not be so great as to use all of this capacity.

For other elements of a local civil defense organization, the proportion of capacity unused for basic messages or urgent directives may not be so high as for shelters. However, since these organizations will have more specialized concerns and are likely to have experienced persons in command, the occurrence of other types of messages can be expected to be low.

H. Information Processing at the EOC

1. Decision Making

It is not assumed that all decision making will be concentrated in one person or in the Executive Section of the EOC. Rather, it is assumed that the members of all sections will observe the information available, and evaluate the needs for action of some type, the feasibility of alternative actions, and the value of feasible alternatives. Upon making these decisions, the staff section (or its head) may proceed to implement the decision by:

(1) Informing or advising elements outside of the EOC;

(2) Modifying a plan;

(3) Directing or coordinating an action.

Other possible decisions are, of course, to take no action or to delay action while attempting to get additional information.

In many cases, more than a single section must be involved in the decisions before an action can be implemented. In these cases, the decisions of the staff section will be inputs to centralized decision making by the head of government and the Executive Section.

The decisions will then be made on the basis of the overall situation. One result of the decision may be to delegate the implementation of the decision to one or more staff sections.

2. General Concept of Information Processing

In keeping with the above concept of decision making, each section of the staff must review the information describing its own situation and the overall situation.

In developing this information, each section (Executive, Population-Shelter, Intelligence, Emergency Services, and Logistics) will maintain files, maps, forms, and displays. Prior to an emergency, these will contain required prestored information.

There is some advantage, in addition to lower equipment cost, in having telephone rather than teletype links with shelters. At the EOC, telephone equipment may be more easily used in the Population-Shelter Section, where verbal messages can be transferred directly to records or displays. In addition, unessential verbal transmissions may be screened out and urgent transmissions may be directed immediately to the proper staff individual without the printing out and transfer of hard-copy.

This flexibility is also important when the common-user circuits connect a number of organization elements to the EOC. It is not important when there is a single-user circuit, such as a terminal of the police communication net.

As telephone messages are received, if they are obviously of such a nature that they cannot be screened out immediately, they will be immediately switched to the appropriate staff section. Information contained in these messages will be entered immediately on the appropriate records of the staff section.

Radio and teletype messages in hard copy received over common-user circuits will be directed from the message center to the appropriate staff section or sections.

Each section will thus build up its specialized information base. Information pertinent to the overall situation will be transmitted to the Intelligence Section either verbally, by brief written message, or by means of an overlay on which information is plotted. The Intelligence Section will integrate Radef and damage reports and warning from other headquarters in a map readily available to all staff sections.

The Executive Section will continually observe and evaluate the operation of the information system.

An internal message format will be useful in efficiently presenting information about specific situations requiring decisions. Such a format for exchange of information within the EOC is contained in Figure 3-1.

Figure 3-2 is a schematic representation of the flow of incoming messages and the decision process in a local EOC. In the chart, messages are shown entering the EOC through the Message Center. However, telephone calls are not written out at the Message Center, but are transferred immediately to the appropriate staff section. Each staff section (including the Message Center) maintains files and displays on its own situation. The situation intelligence kept by the various sections is continually coordinated with that of other sections.

All sections, in view of the current situation will make decisions as to the need (N), feasibility (F), and value (V) of possible actions (including that of obtaining more information).

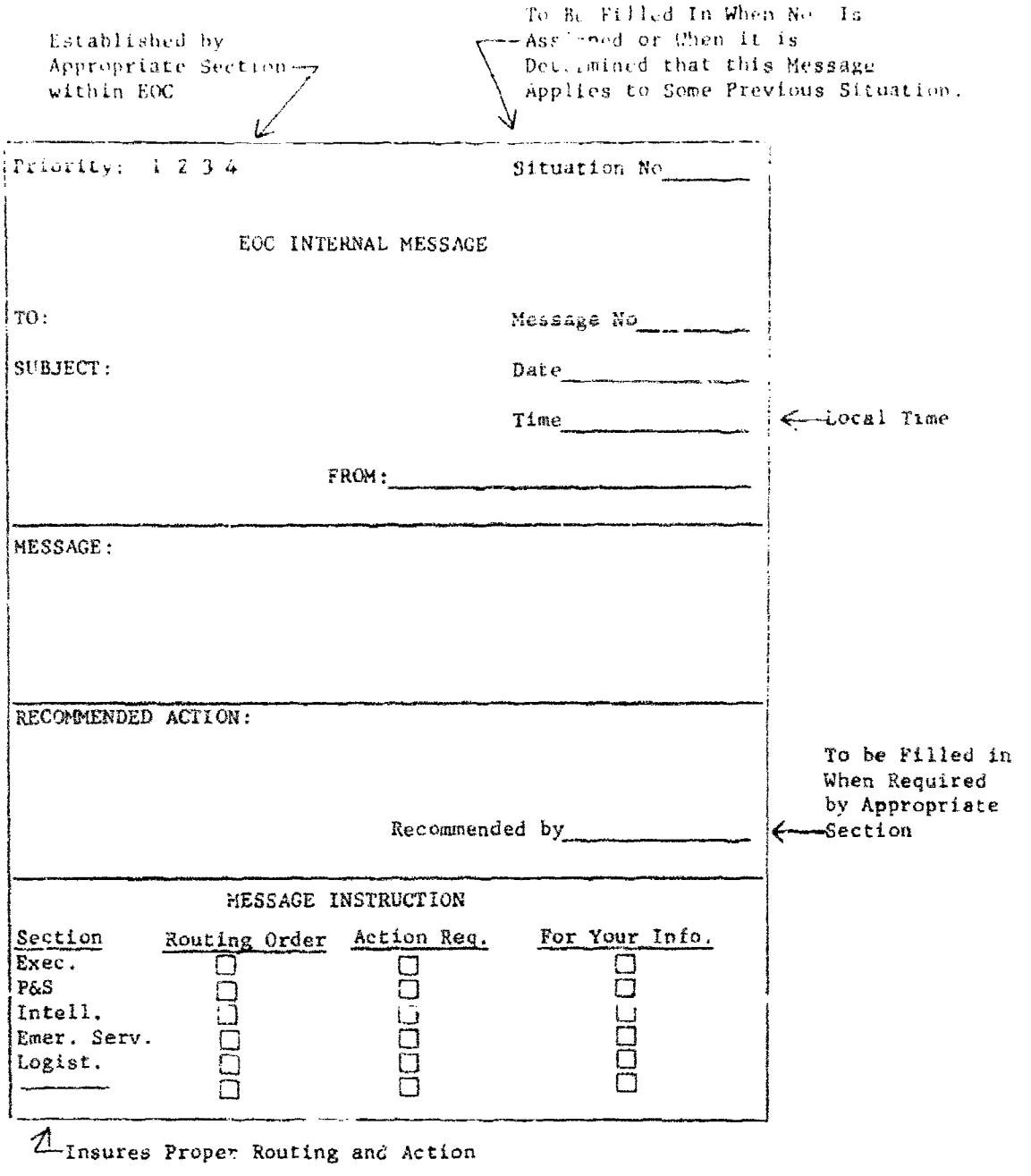

Fig. 3-1 Basic Message Form for Internal Messages in the Local EOC.

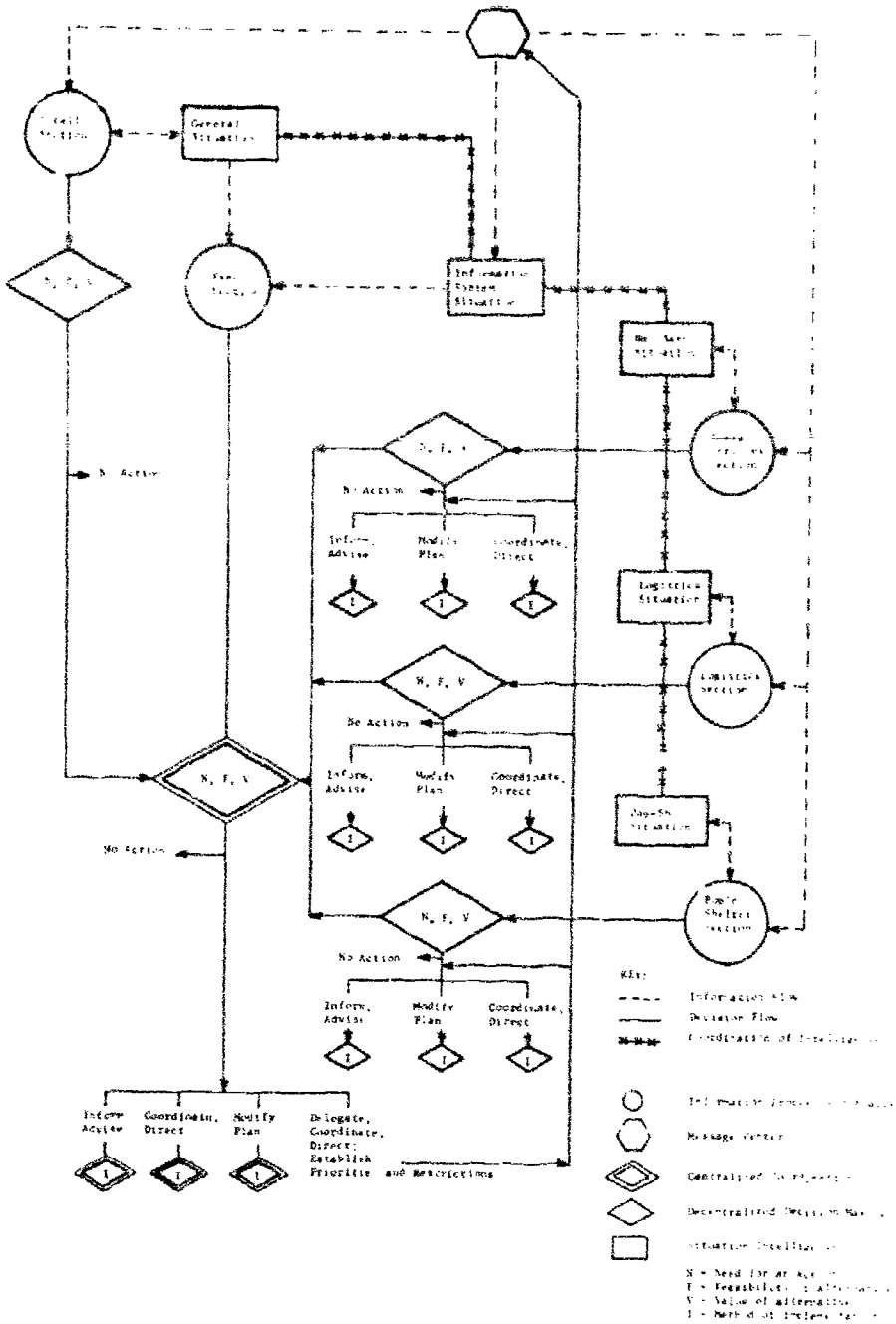

Fig. 3-2. Information Flow and Decision Process in a Local EOC.

If the decision is that some action should be taken, the action may be implemented by the Emergency Services, Logistics, or Population-Shelter Sections if it is in keeping with the overall priorities and restrictions that have been established and does not require central coordination. The decision may be to inform or advise, to modify a plan, or to coordinate or direct an action. If centralized coordination is necessary, the decision will be made by the Executive Section. The Executive Section may also delegate the necessary action to one or more of the staff sections. Among the necessary actions may be the attempt by the Message Center to collect more information.

It should be noted that a possible decision in every case is that no action be taken.

3. Responsibilities of Staff Sections for Information Processing

a. General

Each of the five major staff sections (Population-Shelter, Intelligence, Emergency Services, Logistics, and Executive) will have certain prestored basic information and will use information contained in messages to update continually the basic information upon which they will base their decisions.

In order that the most efficient use is made of available staff personnel, there should be flexibility in duty assignment. For example, a person assigned as a Radef analyst may help to record information on shelter status during movement to shelter and prior to the arrival of fallout.

b. Population-Shelter Section

Information to be prestored at the Population-Shelter Section will include:

The Community Shelter Plan

A tabular listing of data on each shelter, including location, spaces (by PF if available), level of stocking, telephone numbers and other means of communication, and monitoring equipment (Figure 3-3 provides a format for the recording of such information);

Names and methods of reaching those assigned as shelter managers and staff members;

Lists of non-NFSS shelters, providing estimated number of spaces and PF if available;

SHELTER SITUATION								
Shelter Designation	Location	Spaces by PF	Current Occupancy	Comm. Inf'n.	Radef Readings	Management Status	Days of Food, Water	Problems

Figure 3-3

Fig. 3-3. Example of a Tabular Display (Shelter Situation Display)

Maps showing the fire rating or some other indication of fire vulnerability of various sections of the community;

Documents containing methods for hasty shelter improvement;

Location and amounts of reserve or unallocated shelter stocks.

As messages are received from shelters, the tables listing their capabilities are updated. Information about threats to the population and movement of groups of people is plotted on maps that show the fire vulnerability.

The Population-Shelter Section will continually review information to determine actions that might be necessary to protect or to relocate the population. It will also estimate supply requirements and availability, and methods for meeting supply needs will be coordinated with the Logistics Section.

This section, when not otherwise engaged, may seek to determine the location of persons who are separated from their families by requesting reports from shelters.

c. Intelligence Section

The Intelligence Section will have prestored for emergency use the following:

Weapons effects tables and other documents that describe radiological effects;

Methods for estimating fallout intensity and dose over time;

Maps of the area showing major roads, facilities, and radiological monitoring stations;

Maps of the area adjacent to that under the control of the EOC;

Tabular forms for recording messages from Radef monitors.

The Intelligence Section will plot radiological monitoring readings and maintain maps as prescribed in the Federal Civil Defense Guide. Breaks or traffic interruptions on major transportation links will be plotted on large maps, as well as other damage and current threats (such as fire).

An important function of this section is to make detailed analyses of radiological effects that might be expected from movement in fallout during relocation of the population or in the performance of some emergency service.

The maps of areas surrounding that of the EOC will be used to show conditions that may influence future conditions in the area of the EOC.

d. Emergency Services Section

Included in the prestored information maintained at the Emergency Services Section will be:

Operational plan for each emergency service;

Operational plan for military support;

Operational plans for mutual support with adjacent civil defense organizations;

Special maps for each emergency service, showing control, supply, and service installations and other information, such as the distribution lines for electric power;

Tables indicating the operational elements for each emergency service and their normal locations, communication mode, and assigned emergency equipment (such as for Radef monitoring);

Manuals and other documents describing monitoring procedures and decontamination procedures.

The capabilities of each of the various services will be updated as messages are received. The section will determine the needs for control, repair, and restoration of capabilities. Plans for feasible actions, indicated by needs and capabilities, will be prepared cooperatively by representatives of individual emergency services.

e. Logistics Section

The Logistics Section will have prestored a copy of the Logistics Annex of the emergency operations plan and information as to the location and amounts of the following resources:

Shelter stocks not previously distributed;

Radio, radiological monitoring, and decontamination equipment not assigned to shelters or emergency services;

Mobile power generators;

Major food stockpiles;

Packaged Disaster Hospitals;

Medical stocks other than those in the Packaged Disaster Hospitals;

Major stocks of fuel;

Earth-moving equipment and construction materials;

Major transportation pools and dispatch centers.

During emergency operations, the Logistics Section will update the files of resources. Based on information from other sections, the section will determine how these resources can most effectively be allocated and the time that the requirements for particular resources are likely to exceed those available in the area controlled by the EOC. The section will prepare plans for use and replacement of resource inventories, and the use of transportation.

f. Executive Section

Prestored information within the Executive Section will include:

The local emergency operations plan;

The operations plan of the headquarters to which the EOC reports;

The operations plan for military support;

Mutual support plans with adjacent headquarters;

Names and peacetime locations of EOC staff members if not contained in the emergency operations plan;

The local telephone directory.

The Executive Section will continually review the local plan and policies and modify these in keeping with the existing situation, which will largely be determined from the Intelligence Section displays. It will, with the assistance of the message center staff, maintain a display indicating status of communication channels.

The Executive Section will evaluate actions that have been planned by other staff sections and assign priorities and responsibilities for their completion. This section will also evaluate the operation of the information system, and through direct messages or broadcasts, make modification in the flow of messages.

It will evaluate information and requests from higher and adjacent headquarters, and with staff advice, will coordinate actions with other headquarters.

The Executive Section will prepare the unscheduled and scheduled messages that are required by higher headquarters.

g. Staff Manning and EOC Layout

The number of personnel required for collecting, processing, and using information in an EOC will be influenced principally by the size of the area that the EOC serves and by the organization of operating elements for civil defense. Some general estimates of the staffing requirements can be made for the organization that was assumed earlier.

The Executive Section will include the head of government, the civil defense director, and two or more assistants.

The Emergency Services Section will include a coordinator or operations chief, one or more assistants, and representatives of police, fire, road maintenance, electric power, and telephone service.

The Logistics Section will have a logistics officer and possibly one or more assistants, and coordinators for transportation, medical services, and for food and other supplies.

The Intelligence Section will have a chief, at least three Radef personnel, and one or more persons responsible for display of the general situation.

The Shelter-Population Section will have a chief and one coordinator for each 8 to 12 shelters. During periods of peak message traffic between shelters and the EOC, personnel with other primary assignments may be needed for handling of in-coming calls.

The Message Center Section will be manned by a chief, an assistant, and one or more telephone switchboard operators.

There will also be a need for radio operators, and the number of these will depend largely upon which emergency services will have radio equipment at the center. Representatives of state and federal agencies (such as the Department of Agriculture), and officials of local organizations may also be at the EOC as advisors. These, however, are not considered to be necessary to the operation of the information system.

Estimated staff requirements for a city with about 100 shelters are as follows:

Executive Section	4
Emergency Services	7
Logistics	5
Intelligence	5
Population and Shelter	10
Message Center	3
	34 + radio operators

Operating staff requirements are for one shift only. However, between peak activities, full operational manning will not be necessary, and consequently the total operating staff will not need to be three times, or possibly even two times, the numbers indicated above. Flexibility in staff assignments will reduce staff numbers. However, only realistic staff exercises can provide reliable indicators of staff needs.

The arrangement of the EOC influences the efficiency with which the information can be exchanged and decisions made. The arrangement shown in Figure 3-4 has these advantages:

(1) The groups which rely principally upon radio communications are closest to the message center through which radio communications will be processed;

(2) The Emergency Services and Logistics Groups, which may have overlapping functions such as the repair and decontamination of a facility, are adjacent;

(3) The Executive Section occupies a central location;

(4) The overall situation display is visible from all groups.

I. Other Factors in Determining Communication Requirements

The previous discussion of message requirements provided a basis for determining the communication needed between single elements of the civil defense organization and the EOC. However, other factors need to be considered in order to have an effective system.

First there must be consideration of the statistical aspects of the messages and their sources. This can best be illustrated by a computation of the number of telephone circuits required for use by shelters.

The peak load of traffic from shelters was earlier reasoned to be during the movement to shelter period, and it was estimated that between three and eight basic messages per shelter would be required during that time.

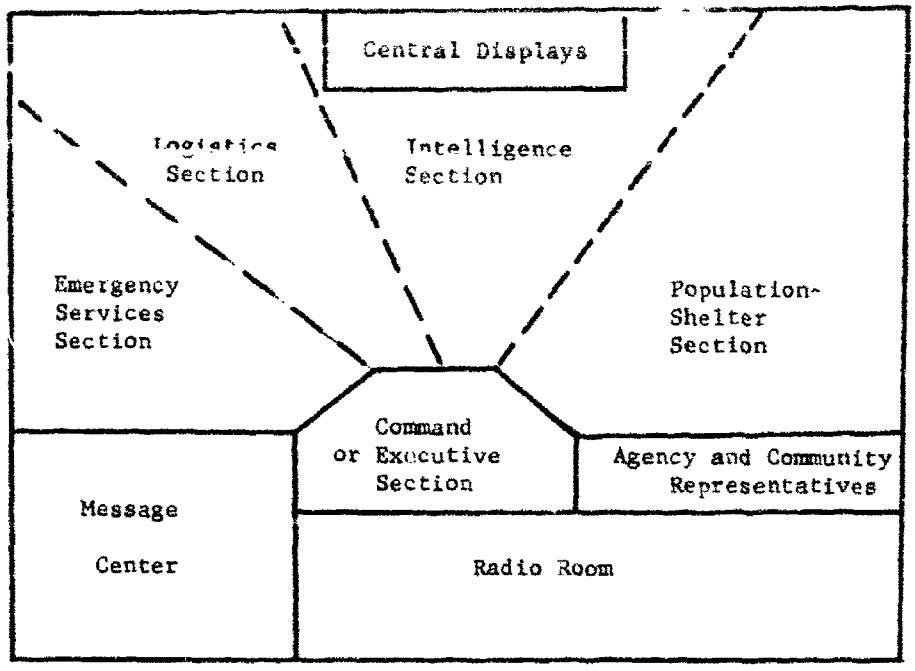

Fig. 3-4. Sample Physical Arrangement of a Local Emergency Operations Center

Seven messages would seem to be a reasonable average number on which to base communication needs. (This could be made up of five basic messages and two special messages.) Forty-five seconds is allocated to each message, providing 30 seconds for a 60-word message* and 15 seconds for ring and transfer of call at the EOC. A Poisson distribution of initiation of calls is assumed. Figure 3-5 shows the number of circuits required for a combination of numbers of shelters, time of the movement-to-shelter period, and the probability that a call results in a busy signal.

For 100 shelters, a one-hour movement-to-shelter period and a .1 probability of busy signal, there is a requirement for 13 telephone circuits.

This is based on the assumption that each shelter will communicate directly with the EOC. However, from the various elements of a civil defense system, messages could be routed in many different ways. In order to determine the most effective way, alternative organizations and procedures for collecting and combining data would have to be compared.

During the study, consideration was given to the use of the shelter complex headquarters as a node in the information system. It was found that the amount of redundancy of information in shelter messages, as well as the number of shelters, determines the effectiveness of using the shelter complex headquarters in the reporting system. The discussion of these factors is given in Appendix A.

In the design of communications for emergency operations, it is necessary to consider the vulnerability and the reliability of the routes and switching centers or exchanges that are to be used in communication. These can only be determined from evaluation of communication nets in specific communities.

Finally, communication requirements must not be established independently of the program for the training of operating and communication personnel in the procedures and priorities of message transmission.

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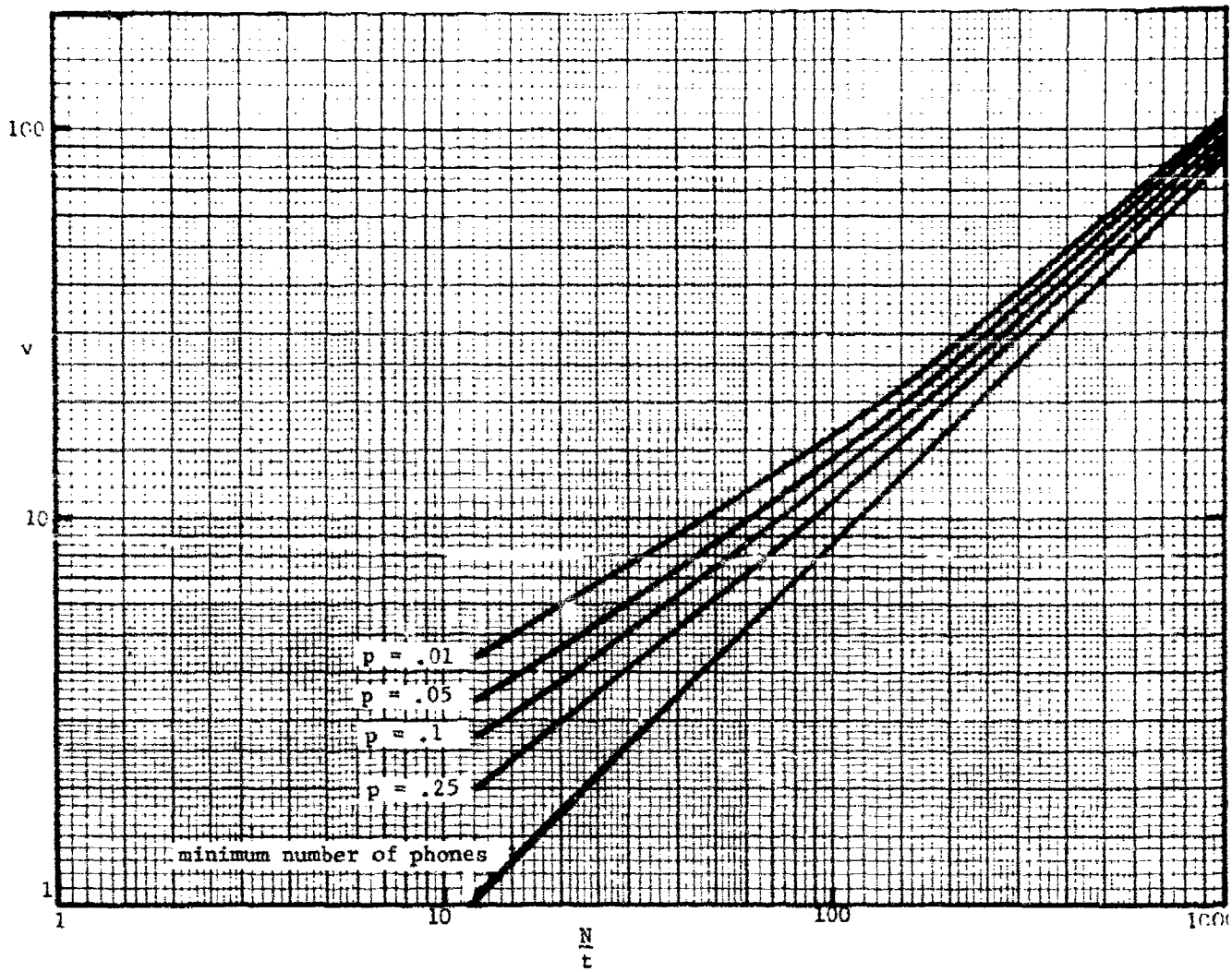
* As noted previously, it is not necessary to transcribe telephone messages. Data contained in prescribed messages may usually be entered directly on forms in the EOC.



N = number of shelters reporting to EOC
t = duration of movement-to-shelter period
v = number of telephones required in EOC, corresponding to specified probability, p, of busy signal when shelter calls EOC
Assumptions: seven 3/4-minute calls per shelter during the movement-to-shelter period (otherwise, replace N/t by $\ell\eta N/10t$, where η = number of calls per shelter, and individual calls are assumed to be ℓ minutes in length); Poisson initiation of calls.

Fig. 3-5.

NUMBER (v) OF TELEPHONES NEEDED IN THE EOC AS A FUNCTION OF NUMBER (N) OF SHELTERS, DURATION (t) OF MOVEMENT-TO-SHELTER PERIOD, AND PROBABILITY (p) OF BUSY SIGNAL

III. APPLICATION TO SPECIFIC LOCAL CIVIL DEFENSE ORGANIZATION

In summary, what has been provided in this chapter is as follows:

(1) Basic information for decision making in local civil defense emergency operations was identified;

(2) Types of basic messages to be transmitted between specified elements of a civil defense organization were identified and approximations were made of these message lengths;

(3) Ranges of numbers and maximum density of messages between elements and the EOC were estimated,

(4) Types of information to be prestored at the EOC were identified;

(5) Organization and methods for decision making at the EOC were assumed, and procedures for routing and processing information were derived;

(6) Estimates of numbers of staff personnel were made and a layout of the operations room suggested.

While what has been done will be helpful in defining an information system in a local community, it will not be sufficient.

Completely efficient routing and volume of messages can only be determined from:

(1) Complete definition of the information that is required; this complete definition depends upon the particular conditions with which the civil defense organization is to deal;

(2) Definition of the particular operating organization that will be employed, and specific control and information distribution capabilities within the elements of that operating organization;

(3) The geographical distribution of the elements of the organization, and its effects on message redundancy and system vulnerability and reliability.

Efficient methods of information processing can only be determined when considered together with the decision-making staff and decision-making procedures.

In this chapter, assumptions were made about the type and number of operational elements reporting to the EOC, and it was assumed that the staff would be divided into functional sections, each having some

information processing and decision-making responsibilities. However, geographic aspects were not considered, and no attempt was made to list specific conditions that might occur as a result of an attack.

Consequently it is desirable to analyze the applications of the principles given here in one or more specific communities in which operating and control capabilities, including communication modes, are defined exactly and the time sequence of likely emergency conditions are more clearly established than in this report.

In addition, it is desirable to investigate further the process of staff decision making. It is believed that the cooperative procedures briefly described here are realistic and will be effective, but more study of ways in which decisions may be reached in an emergency environment is important.

In the chapter, the importance to information system requirements of the availability of the Emergency Broadcast System was noted. However, there cannot be separate stations to serve every local civil defense organization. In addition, they will serve as part of the net to provide for state, region, or nationwide broadcasts. Consequently, directors of individual stations will be forced to make decisions about the precedence of messages that he is asked to broadcast for local EOC's. Another problem is that EBS-transmitted instructions may be heard and followed by those for whom they were not intended. Consequently, while the use of the EBS may be important and even essential for civil defense activities, clear working agreements need to be made and followed in order that it be used effectively.

Because of the uncertainty as to conditions that will exist and means for dealing with them, local plans for civil defense emergency operations should emphasize the need for flexibility in the information system. Over time, some categories of information will become more important and others less important. As a consequence, communications intended for one purpose may be diverted to another purpose. Information processing assignments and methods should also be subject to modification to meet the needs of the particular situation at the EOC.

In conclusion, while this chapter advances certain concepts (such as requirements for message types to provide basic information) that will

be important in an efficient information system, more research and analysis remain to be done in order to define an information system for local civil defense operations. Even then, the system will need to be used in a flexible manner in order to meet the needs for information in a changing situation.

Chapter 4

The Civil Defense Emergency Information System at the State Level

I. INTRODUCTION

A. Scope of the Chapter

This chapter identifies:

(1) The information that must be provided to a state civil defense headquarters to enable it to perform its mission of supporting local civil defense operations;

(2) The form and length of messages to be used in reporting the required information from subunits (a county or a city);

(3) Estimates of the volume of traffic to be anticipated between a local EOC and the state headquarters;

(4) Types of information to be submitted by state agency field establishments (SAFE's) such as a state police headquarters and by military units.

A staff organization is assumed and the responsibilities of various sections of this organization for developing information are stated.

No attempt is made to state the communication or data processing equipment needed in a state of a given size. As in the case of local civil defense organizations, the information system must be designed to make use of the communications and control capabilities of its organic elements and to provide intermediate reporting or control points where they will improve the operation of the total system.

B. The State Civil Defense Organization

Each state will be responsible for the conduct of civil defense emergency operations within its boundaries. Some states will be divided into civil defense areas, each with a headquarters for emergency operations. Control of the civil defense organization will be under the governor or his designated representative.

The major elements of the state civil defense organization will be:

State agencies such as the state police, having emergency responsibilities. Operational control points of these agencies will be designated as state agency field establishments (SAFE's);

Local civil defense organizations, as identified in the previous chapter;

Military units under the command of the state adjutant general;*

Headquarters of state civil defense areas, if they are part of the state organizational plan.

State civil defense organizations can coordinate activities with other states in accordance with mutual assistance pacts and through the federal regions, the organization of which is given in the next chapter.

The preattack warning system and the Emergency Broadcast System will be important adjuncts to the civil defense operating capabilities of the state.

C. Operational Concept

The state civil defense organization will have the same major objectives as those of local civil defense; that is, to reduce the effects of both immediate and indirect threats to life and to maintain the necessary control, communication, and transportation links.

Obviously, local EOC's will be more able than state headquarters to direct emergency operations such as movement to shelter, firefighting, and rescue. However, the state organization can contribute significantly to the objectives of civil defense by:

(1) Coordinating activities of political subunits, state agencies, and federal representatives in meeting immediate threats to life. Examples: assisting in movement of groups from a community with inadequate shelter to a community with surplus shelter; assigning state units with mobile radiological monitoring capability to identify safest routes for remedial movement from an adjoining high-fallout area.

(2) Coordinating activities of political subdivisions, state agencies, and federal representatives in activities to sustain life. Example: joint efforts of communities to repair a water reservoir or harvest a crop.

(3) Warning and informing the population of hazards originating both outside of state and within the state.

(4) Assisting in reestablishing emergency control centers or EOC's and communications in areas where they have become inoperable.

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* The units that may be made available will be indicated in military support plans of the states.

(5) Establishing priorities in case of competing demands for an intrastate resource or facility (e.g., electric power, hospital services).

(6) Informing population of the strategic situation and availability of resources.

More specifically, actions to be taken by state emergency headquarters in fulfilling these functions are as follows:

1. For maintaining government and control

   a. Maintaining and reestablishing communications with state areas' headquarters (if any), subunits, State Agency Field Establishments (SAFE's), military, and OCD region;

   b. Assisting subunits to maintain and reestablish government and control;

   c. Maintaining and reestablishing designated transportation routes;

   d. Establishing priorities for actions by subunits and SAFE's;

   e. Providing on-call information as required by OCD region and neighboring states;

   f. Providing scheduled summary reports to OCD regions, and neighboring states.

2. For meeting direct threats to life

   a. Providing attack warning;

   b. Assisting in achieving maximum shelter utilization;

   c. Providing Radef warning to subdivisions;

   d. Providing warning against major fires and floods;

   e. Providing warning against chemical and biological hazards;

   f. Coordinating use of available forces for combating fire, or flood, decontaminating important facilities, and performing rescue operations;

   g. Assisting local organizations to maintain law and order by broadcasts and coordination of police and military units;

   h. Coordinating movement of population from one area to another.

3. For meeting indirect threats to life

   a. Coordinating forces for protection of essential resources and facilities;

b. Planning and coordinating the distribution of essential resources and inventories;

c. Planning and coordinating medical services;

d. Planning and coordinating restoration of essential facilities;

e. Assisting in maintenance of morale;

f. Coordinating with federal authorities regarding priorities and distribution of resources.

D. The State Civil Defense Headquarters

The control of emergency operations at the state level will be centered at the state civil defense headquarters. It is assumed that the following will be included in the operating staff at this headquarters:

(1) The governor or his representative and his immediate staff;

(2) The director of civil defense and his staff;

(3) The heads, or their representatives, of state agencies with emergency assignments;

(4) The state adjutant general and his staff.

Evidently there are wide differences in the ways in which the operational staffs of state civil defense headquarters can be organized. One state plan shows 32 separate representatives of agencies reporting to the civil defense director and through him to the governor. Another plan has the staff broken into essentially two units, operations and logistics, with public information and communications groups acting as internal services.

Since there is no "standard" organization, the organization shown in Figure 4-1 was assumed. This organization is similar to the organization assumed for the EOC at the local level, and such similarity can promote effective exchange of information.

II. SYSTEM DEFINITION

A. Purpose of the System

The information system at the state level is primarily:

(1) To provide information to the state headquarters from local EOC's and from state agencies not having their own communications to the state headquarters;

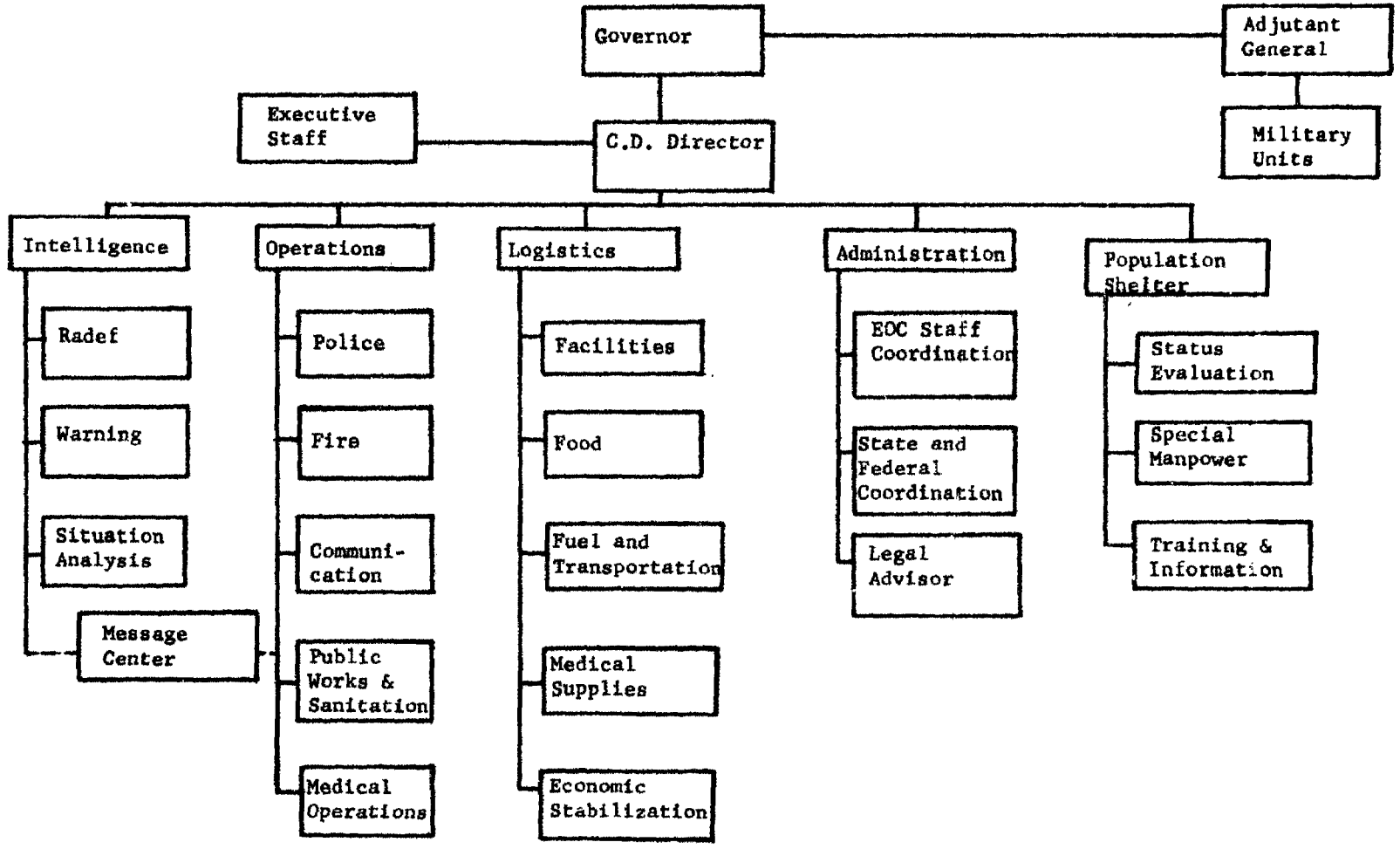

Fig. 4-1. State Civil Defense Organization Assumed for This Study.

(2) To combine prestored information and information obtained by messages from within the organization and from interfaces with other systems in order to present a comprehensive description of situations and capabilities for dealing with these situations;

(3) To provide information and direction to operational units and other headquarters.

B. Information Requirements

As in the case of local civil defense, it is important to distinguish between requirements for basic information and requirements for special information. Basic information is information required for initial decisions about foreseeable actions, but not all information that may be eventually required to perform a particular action. Thus, a civil defense headquarters will need to know the status of control, communication, roads, the population and resources to be protected, threats to the survival of the population and resources, and the availability of manpower, resources, and organizational units for dealing with these threats.

Much information that might be transmitted to a civil defense headquarters in an emergency situation may be of interest, but will not be of use in decision making. Facts such as the death of a local official, the rescue of some scores of people from damaged buildings, or the failure of a shelter manager to report to his assigned place will not assist in decision making at the state level. On the other hand, the following types of information will be useful in deciding actions to be taken:

(1) The inability of a county EOC to receive reports from radiological monitoring stations (if the gap in knowledge of the radiological situation is important for operations, the state must attempt to provide mobile monitoring capabilities, possibly by aircraft);

(2) Inability of an EOC to communicate with the EBS when it is important to provide the population with general information for increasing protection against fallout (in this case, the state may be able to establish communications with the EBS and provide the necessary instructions for broadcast);

(3) Uncontrolled movement of numbers of persons out of a city into other areas.

Table 4-I provides a list of possible actions to be taken by state civil defense headquarters and the basic information needed for these decisions. It will be noted that the time-environments for which the requirements are stated differ from those used in the analysis of information requirements at the local level. This is because, except in very small states, environmental conditions will be variable in space and time throughout the state. For example, for only some communities will there be a period of recovery from direct effects prior to the arrival of fallout; some communities may be conducting out-of-shelter activities for recovery at the same time others in the same state cannot emerge even briefly from shelters.

Therefore, for the state level, three general time-environments are sufficient to distinguish information requirements: preattack, or the time before any effects of an attack are experienced; transattack, or the time when damage and fallout conditions are changing rapidly throughout the state; and postattack, or the time after weapons no longer are arriving and most early fallout is down.

C. Message Requirements for Subunits

1. Basic Messages

a. Types

Subunits of the state civil defense organization that are to report to the state civil defense headquarters (whether directly or through an area headquarters) will utilize the same types of basic messages as those used by elements of the local civil defense organization in reporting to the local EOC. Thus there will be:

Unscheduled and on-call priority situation reports,

Scheduled summary status reports,

Radef reports,

Routine situation reports.

As for the local information system, unscheduled situation messages may be further identified by their subject, such as control and communication, environment,* and population.

* A Nudet report (giving the approximate location, yield, and height of burst of a nuclear detonation) is considered as a form of an environmental message.

Table 4-I

INFORMATION REQUIREMENTS WORKING TABLE

A. Maintain Control, Communications, and Transportation Links

Time Pd.*	Action	Information Required	Probable Data Sources	Staff Actions to Develop Information	Possible Results of Decisions
ALL	1. Maintain and/or reestablish comm. links in state.	a. Emergency communications plan defining procedures, modes, and primary and alternate links to subunits, SAFE's, EBS, mil.	a. Prest. emerg. comm. plan	a. Ops.Sect. updates comm. plan	Change comm. plan and inform staff and affected elements; request repair missions from subunits or mil.; inform subunits of locn. of spare equipt.
		b. Status of wire links	b. Line checks and incoming rpts.	b. Msg. center maintains in-out log.	
		c. Status of 2-way radio links	c. Radio checks and incoming rpts.	c. Msg. center maintains in-out log.	
		d. Ability of EBS to accept and broadcast msgs.	d. On-call rpts. from EBS	d. Ops. Sect. maintains current status of EBS	
		e. EBS reception and availability for important broadcasts	e. Sch. and unsch. status rpts., all elements	e. Ops. Sect. maintains file of EBS coverage	
		f. Blast and fire damage areas	f. Unsch. prior. rpts. - all elements	f. Reports correlated by Int. Sect. and indicated on sit. map(s)	
		g. Major transp. routes - normal conds.	g. Prestored maps	g. Shown on sit. map(s), Int. Sect.	
		h. Damage and interruptions to major transp. routes	h. Unsch. prior. rpts. - all elements	h. Reports correlated by Int. Sect. and indicated on sit. map(s)	
		i. Areas without primary power	i. Unsch. and sch. status rpts all elements	i. Reports correlated by Int. Sect. and indicated on sit. map(s)	
		j. Overall radiological cond. - rate and unshielded dose	j. Sch. Radef rpts.	j. Reports correlated by Int. Sect. (Radef) and indicated on sit. map(s)	
	(Continued)	k. Radiological conds. at specific locns.	k. Sch. and unsch. Radef rpts.	k. Reports analyzed by Int. Sect. (Radef) and indicated on sit. map(s)	

* Time Periods

Pre - Prior to any attack effects

Trans - While important changes resulting directly from the attack are occurring

Post - When recovery operations are beginning

List of Abbreviations Used

bldg.	- building	govt.	- government	mgt.	- management	prior.	- priority				
capab.	- capability	hq.	- headquarters	msg.	- message	prodn.	- production				
comm.	- communication	indl.	- individual	mil.	- military center	rpt.	- report				
condn.	- condition	init.	- initial	Ops.	- Operations	sch.	- scheduled				
emerg.	- emergency	installn.	- installation	orgn.	- organization	sect.	- section				
EBS	- Emergency Broadcast System	Int.	- Intelligence	PDH	- Packaged Disaster Hospital	sit.	- situation				
		locn.	- location			stat.	- status				
em.serv.	- emergency service	Log.	- Logistics	Pop-Sh.	- Population-Shelter	transp.	- transportation				
equipt.	- equipment	MC	- message center	PF	- protection factor	unsch.	- unscheduled				
Ex.	- Executive	medl.	- medical	prest.	- prestored						

(continued)

Table 4-1 (Continued)

A. Maintain Control, Communications, and Transportation Links (Cont.)

Time Pd.*	Action	Information Required	Probable Data Sources	Staff Actions to Develop Information	Possible Results of Decisions
ALL	1. Maintain and/or reestablish comm. links in state.	l. Estimates of biological effects of radiation	l. Prest. Civil Defense Guide	l. Ex. and Int. Sect. (Radef) maintain general guides for decisions	
		m. Routes of telephone trunk lines	m. Prest. telephone circuit map	m. Ops. Sect. maintains comm. map	
		n. Comm. repair capabilities	n. On-call rpts. from subunits, mil.	n. Ops. Sect. maintains file	
		o. Spare equipt. locn.	o. Rpts. from subunits, mil.	o. Log. Sect. maintains files	
ALL	2. Maintain and/or reestablish govt. or direction in area of responsibility.	a. Al-a through Al-l	a. _____	a. _____	Messages and broadcasts to elements (1) to designate leaders and clarify responsibility; (2) to assist in establishing or modifying organization; (3) to restore confidence in leadership. Requests to SAFE's, mil., or other hq. for assistance in maintaining direction and control.
		b. Names and normal locns. of persons in govt., business, institutions, etc. with emergency responsibility.	b. Prest. rosters	b. Rosters maintained by Ex. Staff	
		c. Locn. during emergency of above persons	c. On-call rpts.	c. Rosters updated	
		d. Capability in subunits for providing direction and control	d. Unsch. and sch. msgs. from subunits, SAFE's, mil.	d. Ops. Sect. maintains file of capability	
		e. Situations requiring assistance in maintaining or reestablishing direction and control	e. Unsch. rpts. from all elements	e. Ops. Sect. maintains file and evaluates needs for control	
		f. Capab. of subunits and mil. for providing mobile control units	f. On-call rpts. from all elements	f. Ops. Sect. maintains and updates file; evaluate capabilities and costs to other missions	
		g. Capab. of other states or federal agencies for assisting in maintaining control	g. On-call rpts.	g. Reports summarized by Ops. Sect.	

(Continued)

Table 4-1 (Continued)

A. Maintain Control, Communications, and Transportation Links (Cont.)

Time Pd.*	Action	Information Required	Probable Data Sources	Staff Actions to Develop Information	Possible Results of Decisions
ALL	3. Assist in maintenance and restoration of transportation links.	a. Al-a thru Al-l, A2-d	a. _____	a. _____	Priorities announced for repair of roads and other transp. links; state police dispatched to assist in movement of traffic; requests for repair or control units sent to subunits and mil., advisories sent to coordinate effort.
		b. Requirements for restoration of links at specific locns.	b. Unsch. and on-call rpts. from mil. and subunits	b. Int. Sect. updates transp. maps; Ops. Sect. maintains file of requirements for repair and traffic control	
		c. Existing capability for removal of blocks or repair of roads	c. On-call rpts. from mil., subunits, state highway units	c. Ops. Sect. maintains file of capabilities; evaluates relative capabilities	

B. Meet Direct Threats

Time Pd.*	Action	Information Required	Probable Data Sources	Staff Actions to Develop Information	Possible Results of Decisions
Pre	1. Provide attack warning.	a. Warning procedures, locn. of attack warning points	a. Prest. C.D. Guides and state warning plan	a. Int. Sect. maintains file	Provide equipt. and assign personnel where necessary to keep warning points ready, supplement signals with broadcasts and messages to subunits and other elements.
		b. Status of warning system	b. On-call rpts. from warning points	b. Int. Sect. maintains file	
		c. General locn. and shelter status of population	c. Unsch. rpts. from subunits, RAPE's	c. Pop. Shelter Sect. maintains file by subunits; summarizes periodically	
		d. Estimated time of weapon arrival	d. National Warning Net	d. Warning provided by N.C.	
Trans. Post	2. Provide warning of radiological approach or additional fallout	a. Al-a thru Al-c, Bl-c	a. _____	a. _____	Method of warning established or revised. Use available comm. means to provide expected time of fallout arrival at easily identifiable points
		b. Procedures for radiological warning	b. Prest. in state plan	b. Ex. Staff and Int. Sect. maintain plan	
		c. Status of EBS and other possible warning means	c. Init. stat. rpt., unsch. prior. rprs. of changes in status	c. Int. Sect. identifies sources for warning, including EBS	
		d. Rpts. of nuclear detonations or Nudet rpts.	d. Unsch. prior. msg. - all elements and adjacent and higher hq.	d. Int. Sect. analyzes reports, plots locn., estimation radius of effects	
		e. Distant fallout arrival by time and locn.	e. Rpts. from adjacent shelter	e. Int. Sect. (Radef) plots reports, estimates time of fallout arrival for other points	
		f. Upper wind speed and direction (when arrival cannot be reported by observers)	f. Sch. rpts. from Weather Service	f. Int. Sect. (Radef) estimates future fallout from nuclear detonation points	

(continued)

Table 4-I (Continued)

B. Meet Direct Threats (Cont.)

Time Pd.*	Action	Information Required	Probable Data Sources	Staff Actions to Develop Information	Possible Results of Decisions
ALL	3. Provide warning against fire.	a. Al-a thru Al-e; Bl-c	a. _____	a. _____	Warn subunits by broadcast and special message; advise if no action being taken.
		b. Locn. and direction of spread of mass fires	b. Unsch. rpts. from subunits, adjacent states, SAFE's	b. Ops. and Int. Sects. plot movement of mass fires	
		c. Actions being taken to move pop'n. and resources from path of fire	c. On-call rpts. from subunits	c. Ops. and Pop-Sh. Sects. record shift in pop'n.	
		d. Actions being taken to combat fires	d. On-call rpts. from subunits, mil.	d. Ops. Sect. records actions and estimates effects	
ALL	4. Provide warning against flood.	a. Al-a thru Al-e; Bl-c	a. _____	a. _____	Affected sites and elements warned by broadcast and special msgs.
		b. Height of sites occupied by population and important installns.	b. Prest. relief maps	b. Int. Sect. summarizes rpts. and plots on relief map; identifies threatened locns.	
		c. Locn. and direction of spread of flood	c. Unsch. rpts. from subunits, adjacent states, mil.	c. Int. Sect. maintains relief map (where threat of flood)	
ALL	5. Provide warning against extreme weather conditions.	a. Al-a thru Al-e; Bl-c	a. _____	a. _____	Sites and elements informed by broadcast and special msgs
		b. Approach of high winds, unusual precipitation or cold	b. Prior. rpts. from Weather Service	b. Weather rpts. analyzed by Int. Sect. and unusual reads. reported to staff	
Pre Trans.	6. Advise subunits of actions for protection against fallout.	a. Bl-c, B2-d-f	a. _____	a. _____	Messages to local areas, advising of shelter available in other areas, time to move, and factors to be considered.
		b. Survey of shelter spaces	b. Prestored	b. Maintained by Pop-Sh. Sect	
		c. Large capacity shelters not included in shelter survey	c. Prestored; on-call rpt. from subunits	c. Maintained and updated by Pop-Sh. Sect.	
Pre Trans.	7. Advise subunits to broadcast shelter improvement instructions.	a. B2-d - f	a. _____	a. _____	Broadcast of actions to be taken to improve shelter. messages to subunits, advising of special measures to be taken
		b. Estimated protection of public and home shelters	b. Prest.-NPSS records, and Civil Defense Guide	b. Pop-Sh. Sect. maintains file of shelter spaces and PF, data on inherent protection by building types	
		c. Expedient methods for increased protection	c. Prest.- civil defense documents; higher hq.	c. Pop-Sh. Sect. maintains document file	

(continued)

Table 4-1 (Continued)

B. Meet Direct Threats (Cont.)

Time Pd.*	Action	Information Required	Probable Data Sources	Staff Actions to Develop Information	Possible Results of Decisions
Trans. Post	8. Coordinate efforts to meet threat of fire.	a. A1-a thru A1-1, A2-d, B2-d, B2-f, B3-b, B3-d	a. _____	a. _____	Requests to subunits, mil. Coordination instructions sent.
		b. Availability of firefighting equipment	b. On-call rpts. from subunits, SAFE's, mil.	b. Ops. Sect. summarizes and analyzes capability	
Trans. Post	9. Coordinate activities to reduce large-scale disorder.	a. A1-a thru 1, A2-d, A2-f	a. _____	a. _____	Requests to subunits, mil. Coordination instructions sent.
		b. Location of uncontrolled, large-scale disorder	b. Unsch. rpts. from subunits	b. Ops. Sect. summarizes and analyzes need	
		c. Police and mil. unit availability	c. On-call rpts to mil., subunits in area of disorder	c. Ops. Sect. summarizes and analyzes capability	
ALL	10. Advise and assist in movement of population (other than movement to shelter).	a. A1-a thru A1-1; A2-d, A3-b, A2-c, B2-e,f; B3-b, B4-c, B5-b	a. _____	a. _____	Directives and requests to SAFE's, subunits, and mil. to establish direction and control; advise to subunits to contain movement; broadcast of advice.
		b. Available shelter and housing	b. Sch. and on-call rpts. from subunits, SAFE's	b. Pop-Sh. Sect. tabulates, analyzes	
		c. Food and other supplies in areas into which people are moving	c. Sch. and on-call rpts. from subunits, SAFE's	c. Files maintained by Log. Sect.	
		d. Transportation available for augmenting movement	d. Sch. and on-call rpts. from subunits, SAFE's	d. Files maintained by Log. Sect.	

C. Meet Indirect Threats

Time Pd.*	Action	Information Required	Probable Data Sources	Staff Actions to Develop Information	Possible Results of Decisions
ALL	1. Conserve inventories necessary for survival.	a. A1-a thru A1-1, A2-d, A2-g, B1-d, B3-b, B4-c, B5-b	a. _____	a. _____	Broadcast of need for conservation of supplies and action to protect; announcement of rationing plans; subunits and mil. requested to protect or move inventories.
		b. Locn. and amounts of major stocks of inventories necessary for survival	b. Prestored files; on-call rpts. from subunits, SAFE's, mil.	b. Log. Sect. updates file	
		c. Nos. and condition of survivors	c. Sch. status rpts. from subunits	c. Pop-Sh. Sect. summarizes reports by area	
		d. Consumption factors and plans for allocating inventories	d. Prestored plans	d. _____	

(continued)

Table 4-I (Continued)

C. Meet Indirect Threats (Cont.)

Time Pd.*	Action	Information Required	Probable Data Source	Staff Actions to Develop Information	Possible Results of Decisions
Post	2. Assist in restoring water and other services.	a. A1-c thru A1-1, A2-d, B3-b, B3-d, B4 c, B5-b	a. _____	a. _____	Request missions and coordinate actions of subunits and mil. to operate or repair services.
		b. Maps showing service areas of electric plants, water storage points, trunk telephone lines	b. Prestored	b. Maps maintainnd by Ops. Sect.	
		c. Damage to major services	c. Unsch. rpts. from SAFE's, subunits on pre-designated installations	c. Ops. Sect. updates maps	
		d. Needs for restoring services	d. Unsch. rpts. from subunits	d. Ops. Sect. updates file and evaluates relative needs by areas of statu	
		e. Status of work forces for operating or restoring installations	e. On-call rpts. from subunits and SAFE's	e. Ops. Sect. summarizes and evaluates capability for specific tests	
Trans, Post	3. Coordinate medical support.	a. A1-a thru A1-1, A2-d, B1-c, B3-b, B4-c, B5-b, B9-b, B10-d, C1-c	a. _____	a. _____	Messages to subunits and mil. requesting mobile medl. support in designated areas; broadcast of conditions at hospitals; directives to move and set up PDH's.
		b. Availability of mobile medical support units	b. On-call rpts. from subunits, mil., other states	b. Ops. Sect. summarizes rpts.	
		c. Availability of hospitals, including PDH's	c. On-call and sch. status rpts. from subunits; prestored	c. Files updated by Ops. Sect.	
		d. Location and condition of medical stockpile	d. Prestored; on-call rpts. from subunits, other states	d. Files updated by Log. Sect.	
Trans, Post	4. Assist in maintenance of sanitation.	a. A1-a thru A1-1, A2-d, B1-c, B3-b, B4-c, B5-b, B9-b, B10-d, C1-c	a. _____	a. _____	Mission requests made to subunits and mil. Broadcasts of instructions for actions to be taken by individual.
		b. Sanitation problems, including removal of dead beyond capability of local organizations	b. Sch. and on-call rpts. from subunits, mil.	b. Ops. Sect. summarites, evaluates needs as rptd.	
		c. Emergency plans for maintenance of sanitation	c. Prestored - Ops. Sect.	c. Ops. Sect. modifies plans as necessary	
		d. Available units for sanitation missions	d. On-call rpts. from mil., subunits	d. Ops. Sect. summarizes and evaluates rpts.	

(continued)

Table 4-1 (Continued)

C. Meet Indirect Threats (Cont.)

Time Pd.*	Action	Information Required	Probable Data Sources	Staff Actions to Develop Information	Possible Results of Decisions
Trans, Post	5. Coordinate plans and activities for restoring inventories of resources necessary for survival.	a. A1-a-1; A2-d,e; B1-c; B3-c,d; B9-b; C1-b,c,d	a. _____	a. _____	Advisories sent to subunits and SAFE's about estimated needs for inventories; priorities established for use of resources, manpower; mission requests to subunits, mil.; requests sent to adjacent states and regions for resources needed for replacement of inventories.
		b. State plan for restoration of survival items in an emergency	b. Prest.	b. Log. Sect. updates plan	
		c. Major needs for inventories and probable capabilities of subunits for restoring inventories	c. Status and on-call rpts. from subunits, SAFE's	c. Log. Sect. summarizes and evaluates reports	
		d. Resources and manpower needed for restoring specific inventory items	d. Status and on-call rpts. from subunits, SAFE's	d. Log. Sect. and Pop-Sh. Sect. (manpower) summarize rpts. and evaluate requirements	
		e. Locn. of resources needed for restoring specific inventory items	e. On-call rpts. from mil., subunits, other states	e. Log. Sect. summarizes rpts. and determines most feasible means for obtaining resources	

A description of the types of material to be included in various unscheduled and on-call situation messages is given in Table 4-II.

b. Lengths of Messages

The initial EOC status report will be brief, principally informing the state headquarters that the local EOC is staffed and taking initial actions to establish an operating capability. A message of about 75-100 words is sufficient for providing this information.

Other unscheduled and on-call situation messages would be limited to a specific subject, and messages of 30-50 words can describe such situations. As in the case of messages to the local EOC, some allowance in communication capability must be made for redundancy within these messages and for acknowledgement by the receiver.

It is desirable that the summary status messages be submitted according to a prearranged format. This will insure not only that the required information is transmitted by the local EOC, but will simplify the procedures for distributing the information in the message to the state headquarters staff. A suggested format for the summary status messages is given in Table 4-III. On this sample format are indicated probable word lengths of various parts of the report. However, it is apparent that complete information about each of these subjects may not be useful at all times to the state civil defense organization, even if it is available for transmission. Therefore, items to be included in an abbreviated (or Type B) summary status report are indicated by asterisks in Table 4-III. When all items are included, it is a Type A report.*

* State plans may specify the normal form of a summary status report, and exceptions in reporting may be announced by EBS or by messages to the local EOC's.

Table 4-II

UNSCHEDULED PRIORITY OR ON-CALL MESSAGES - LOCAL EOC TO STATE HEADQUARTERS

Initial EOC Status Report

(Submitted when staff members are present and have begun assigned tasks in emergency plan)

Person in charge

Communication links established

Operation capabilities being established (e.g., all police are being called to duty, etc.)

Actions being taken with regard to population (e.g., population is being urged to stay in homes and prepare for movement to shelter)

Control and Communication Status Report

(Submitted to report a significant change in any of the following)

Location of EOC

Communication link to state

Capability of EOC to operate

Capability for communications to operating elements

EBS performance or availability

Threats to significant numbers of people or critical resources that cannot be met by capabilities under control of local EOC.

Environment Report

(Submitted to report any of the following)

Observation of nuclear detonation (Nudet report)

Occurrence of damage from weapons to at least some specified percent of structures or area

Outbreak of mass fires

Fires or floods that can spread to other areas

Breaks in predesignated major transportation links

Sanitation problem threatening large area

(Continued)

Table 4-II (Continued)

Population Report

(Submitted to report any of the following)

Major change in shelter status (e.g., persons assigned to shelters are moving to shelter)

Movement of large groups into or out of area

Breakdown of order or morale

Operational Capabilities Report

(Submitted to report any of the following)

Significant change in operational capabilities (e.g., creation of auxiliary police force to control disorders)

Capabilities for restoring specified facility (on-call only)

Capability for conducting specified operation (on-call only)

Resource Report

(Submitted to report any of the following)

Loss of electric power, water, gas

Change in conditions or capabilities of hospitals or other important installations

Damage to installation or resource predesignated by state plan

Table 4-III

SAMPLE FORMAT

LOCAL EOC SUMMARY STATUS MESSAGE

(Words)

(5) * Message Source

I. Control and Communication

EOC Staff

(10) * Head of government is (present) (not present but in communication) (not available)

(0-10) * Name and nonemergency assignment of person in charge if not head of government

Operating Staff Potential

(5) * For present tasks: (adequate) (not adequate)

(5) * For expected tasks: (adequate) (not adequate)

(0-5) * If necessary, can staff be augmented by persons available in area? (yes) (no)

(0-15) Staff skills needed, but not available

EBS Performance

(5) * Able to receive EBS broadcast at EOC? _____

(5) * Percent of operating shelters able to receive EBS broadcast _____

(5) * Can you communicate with EBS station? _____

(5) * Availability of EBS for message broadcast? (never) (sometimes) (always)

Other Area Communication

(10-20) * Overall status: (e.g., major breakdown in telephone system)

(continued)

* Include only these items in a Type B message.

Table 4-III (Continued)

(10) Percent of operational shelters with no 2-way communication to EOC _____

(5-15) Other emergency elements with no 2-way communication to EOC_____ _____, _____

(15-20) * Radio nets now operating in area

_____, _____, _____

(0-20) For communication links not operating:

Link	Estimated time to restore

Other Area Control

(10-30) Status of other control centers:

Police _____
Fire _____
Public Works _____

II. Environment

(10-20) * Overall status (e.g., heavy damage, but no fallout yet)

(20-40) Blast and fire damage summary

	% of area	Specific Major Installations
Heavy damage		
Moderate damage		
Light damage		

(5-20) * Status of predesignated roads known to be blocked

Location	Cause	Estimated time out
_____	_____	_____
_____	_____	_____
_____	_____	_____

(0-40) Remaining major fire threat, probable effects, and ability to meet.

Radiological conditions

(10-25) * Overall status:

	% of area	Designated Installations
High level		
Moderate level		
Low level		

(10-20) Weather conditions affecting operations (extreme cold, heat, winds)

(continued)

Table 4-III (Continued)

III. Population

(10-20) * Overall status: (e.g., all sheltered and no problems)

(20) Shelter status: Approximate numbers in

NFSS shelters _____

Basements and secondary shelters _____

Homes with no shelter _____

(0-40) Population in transit (groups of 500 or more)

Numbers	Direction or destination	Mode

(0-15) Expected available shelter for persons outside community (spaces) _____

Casualties

(10-20) (approximate)

Dead _____

Serious injury _____

Light injury _____

Probable numbers of new casualties due to fallout _____

Morale and order

(10-30) * Present general situation

_____

_____

Situation expected within next 24 hours

(10-20) (unknown) (will improve) (major disorders) (major morale problems) etc.

IV. Operational Capability

(10-20) * Overall status - (e.g., no outside operations possible due to fallout)

Specific status (fire, police, utility repair, mobile medical units, etc.)

	Fire	Police	etc.
(40-60) Adequate for present missions?	_____	_____	_____
Adequate for anticipated missions?	_____	_____	_____
Can additional capability be created in area?	_____	_____	_____
Can assistance be provided for other areas?	_____	_____	_____

(continued)

Table 4-III (Continued)

(0-40) Specific missions for which outside assistance is needed _____

V. Resources

(10-30) * Overall status (e.g., no problems foreseen for 30 days)

(10-30) Food inventories - days of supply remaining _____

capabilities in area for restoring capabilities _____

(10-20) Medical - types of resources for which shortages exist or are anticipated _____

(0-20) types of resources in excess available for transfer to other areas _____

(15-50) Water supply - status of storage system _____

status of distribution system _____

Missions required to restore water system _____

Will outside assistance be needed?_____

(20-30) Hospitals - General status: (e.g., skeleton staffs at all hospitals)

Facilities are (adequate) (inadequate) for (existing) (anticipated) numbers of casualties.

(10-30) Utility plants - Status of predesignated plants

(10-30) Manufacturing plants- Status of predesignated plants

(20-50) Transportation - Numbers and types needed but not attainable for (specify type of mission)

Numbers and types available for missions outside of area.

(10) Motor fuel - Estimate of days until supply is exhausted by anticipated needs.

(10) Heating fuel - Estimate of days until supply is exhausted by anticipated needs.

(15) Housing - Estimated needs for housing (units) _____

Does area have capability area for creating new units? _____

Available housing for persons from outside area (spaces) _____

VI. General

(0-40) * Problems requiring assistance not covered in above.

(20-50) Actions being coordinated directly with other communities.

In order to conserve communication capacity, information should not be repeated in succeeding summary status messages. Where there has been no change, this fact alone should be reported. Consequently, Type A summary status reports may also vary in length, depending upon the degree to which the situation has changed since the last message of this type.

Requirements for Radef reports from local organizations to the state headquarters are defined in the Federal Civil Defense Guide. In general, the EOC in each subunit is to transmit a flash message upon the arrival of fallout in the area of its responsibility and messages every twelve hours for the first 48 hours giving dose rate by sections of that area. A report of fallout arrival can be transmitted in a message of 10 words, and the prescribed dose rate report can be transmitted in a message of about 30 words.

The types of messages from local EOC's to state, and their word lengths, can be summarized as follows:

Initial EOC Status	75-100 words
Other unscheduled or on-call priority situation reports	30-50 words
Type A summary status message (trans- and postattack situations)	500-1100 words
Subsequent Type A summary status messages (relatively stable situations)	250-650 words
Type B summary status messages (trans- and postattack situations)	200-400 words
Radef - fallout arrival	10 words
Radef - dose rate in local area	30 words

As noted before, in translating message requirements into communication requirements, some allowance must be made in addition for redundancy in messages, for inefficiency in transmission, and for acknowledgement by the receiver of the message.

2. Special Messages

Special messages between state headquarters and local EOC's will consist of:

(1) Inquiries and requests to and from local EOC's;

(2) Reports from local EOC's regarding unforeseen conditions or providing additional information;

(3) Information, advice and directions to local EOC's from the state headquarters.

As in the local information system, the subject, length, and number of special messages into or out of the state headquarters will be greatly influenced by the amount and quality of the information provided by basic messages. The potential capability of the state civil defense headquarters for taking actions to assist local units will also affect the exchange of information between it and local EOC's. It can be expected that, if the state civil defense organization is effective, there will be many special messages regarding the distribution and replacement of particular stocks of resources for survival. Such messages will necessarily be much longer than situation messages in which the status of resources only is reported.

After some point, however, as state government operations are restored, there will be less and less need for actions by the state civil defense emergency headquarters, and consequently less and less need for special messages.

3. Density of Message Traffic

In the preattack period, the greatest density of messages from local EOC's to the state headquarters will probably occur soon after the EOC's are manned. At this time, an EOC would be expected to transmit its initial status report and soon after this, changes in the status of communication and control, operational capabilities, and the population, all of which require priority messages. Requests and inquiries and other special messages are highly likely soon after the EOC is manned.

Since the local EOC's will probably be occupied at approximately the same time according to a state wide readiness plan, a high volume of traffic could be generated during a relatively short time. In a period of one hour, each local EOC in a state may have for reporting an initial status report, two or more unscheduled or on-call priority reports, and several priority special messages. During the same period, the state headquarters could have for transmission to an EOC one or more priority special messages. These messages would range from 30 words to more than 100 words in length.

Following the occurrence of direct weapo ffects, a local EOC can be expected to generate a number of unsche d priority situation messages, reporting changes in environment, popula on, and operational capabilities. The density of traffic to state headquarters will be influenced by the length of time during which weapons effects are experienced by the various communities.

Another period in which high message density could occur is that in which scheduled summary reports are being transmitted. Some messages of other types would also be generated during the same time period.

Finally, a high message density can be expected as local EOC's determine their supplies of and requirements for resources necessary for survival. These reports,as noted earlier, would be made by special messages.

4. Other Considerations in the Design of Local-State Communications

In design of communications for an information system, there must be consideration of alternative equipment, routing, and control, as well as the density of originating messages.

Teletype has some important advantages over voice transmission in communication between state and local EOC's. A considerable number of the messages from the local EOC are likely to be special messages involving more than one staff section. Such messages will not follow a specified format and cannot be recorded efficiently manually. Messages to local EOC's from state headquarters may arrive at a time of stress and concern with local problems, and some verbal messages are likely to be inaccurately recorded.

Teletype also uses available circuits more efficiently than does voice transmission because of their duplex (simultaneously send and receive) and automatic transmit (when lines are open) capabilities.

The flexibility of the telephone which permits direct transfer of information to the appropriate staff section, is not so important at state level as at local level, since the state will have less capability for immediate actions to influence situations.

In determining local-state communication requirements, it is important to consider the use of intermediate centers for aggregating information. In large states, even if area headquarters have no operating capability, they could perform a necessary service in filtering the large

number of messages that might originate and otherwise saturate the communication capabilities of the state civil defense headquarters.

Finally, intelligent control of reporting must be exercised, or almost any amount of equipment may prove inadequate for communication between local and state civil defense headquarters. One type of control that has been noted earlier is the specification of abbreviated forms of summary status messages. Another important form of control is the establishment and observance of message precedence and times for submitting summary status reports, for in this way some leveling of the total traffic load could be achieved.

D. Messages From Other Sources

Units of state agencies throughout the state can be important sources of information. Some agencies, such as the state police and the state highways department, have their own communication nets. Others may utilize a combined communication net.

Consequently the state civil defense emergency information system can receive necessary information by messages from a control center, such as the state police headquarters that is separated from the civil defense headquarters or from an interface with the system at the civil defense headquarters.

Whether by transmitted messages or by internal messages at the state headquarters, the following types of information should be reported by state agencies:

Status of major operational units and installations;

Status of predesignated resources of these agencies;

Nudet reports;

Significant changes in the environment at designated installations (e.g., arrival of fallout, fire);

Changes in status of significant groups of the population (mass casualties, breakdown of authority, mass movement);

Significant changes in the capability or the condition of operating forces or control centers of subunits or of other agencies.

To the state agencies will be transmitted information that will be important for their planning or coordination of operations.

Military units within the state under the control of the state Adjutant General will have their own military communication net, and the state civil defense headquarters must provide for an interface with this net.

The types of information to be provided from military units are the same as those that are to be provided by the state agencies.

Neighboring states will provide messages of the following type:

Priority messages giving information on approach of fallout, fire, or flood;

Priority messages on interstate movement of large population groups;

Summary reports of the condition of the state (The summary report may be transmitted over the regional communication net to regional headquarters and adjoining states simultaneously.)

E. Information Processing at State Headquarters

1. Prestored Information

Principal types of information to be prestored at state civil defense headquarters are:

The state emergency operations plan, including the plan for a military support; plans of major subunits;

If not included in the operations plan, a file of locations of state agency and military installations and their communication links; and locations of the EOC's of subunits of the state;

The amounts and locations of federal and state stockpiles; other important inventories of items necessary for survival;

Maps of power distribution and telephone lines;

Maps showing major roads, rail lines, and airfields;

A file giving the location and capacities of hospitals, including PDH's, and other major state institutions;

Files giving the location and capacity of NFSS shelters;

EBS stations and methods of communication with them;

Instruction manuals for shelter improvement, decontamination, distribution of food, and other probable operations in an emergency;

Names and normal locations of key personnel of state agencies assigned emergency responsibilities;

Names and normal locations of local government and civil defense officials.

2. Staff Responsibilities in Information Development

a. Population-Shelter Section

The Population-Shelter Section will be responsible for developing and evaluating information about the general status of the population and for estimating needs for resources and manpower. Among the specific activities of this section will be the following:

Maintain and update file of shelter availability and utilization by city or county;

Estimate major areas of shelter deficiency;

Maintain file of population status (relative numbers of casualties, unsheltered, etc.);

Prepare estimates of requirements for food, medical, housing by area of state;

Tabulate information on availability and requirements for special manpower skills.

b. Intelligence Section

The Intelligence Section will be responsible for determining and displaying the overall situation in the state. It will perform the following activities:

Maintain map of state, showing areas of damage, mass fires, and boundaries of levels of fallout;

Maintain map of status of major transportation links and airports in the state;

Maintain map showing status of local control, communication and electric power;

Maintain display of present and predicted weather in state areas;

Maintain file of radiological monitoring stations and capabilities;

Maintain file of mobile radiological monitoring capabilities;

Evaluate specific threats to population groups and inform other sections;

c. Operations Section

The Operations Section will include in its activities the following:

Maintain and update the warning and communication plans;

Maintain file of the status of state operating units and their control capabilities;

Maintain a plan for military support and a file of the status of military units and their control;

Maintain a file of major operations in progress (e.g., relocation of population groups, firefighting, medical assistance);

Maintain file of deficiencies and surpluses in operational forces of subunits;

Analyze method for effective use of operational forces in coordinated actions.

d. Logistics Section

Responsibilities of the Logistics Section in developing information will include the following:

Maintain files of the location and status of stockpiles under federal and state control;

Maintain files of the location and status of other major inventories of items necessary for survival;

Maintain file of predesignated equipment for emergency use (e.g., power generators);

Maintain files of the status and capabilities of designated emergency production facilities.

e. Administrative Section

The Administrative Section will be responsible for the following:

Evaluate internal flow of information at the state headquarters;

Prepare requests for assistance from region;

Prepare status reports to region;

Recommend reassignment of personnel to facilitate information development.

III. APPLICATION TO SPECIFIC STATE CIVIL DEFENSE ORGANIZATIONS

The preceding description of a state civil defense information system has been largely conceptual.In any particular state, the civil defense information system must be integrated with existing information systems of state agencies that would also be used in an emergency. Consequently, no specific definition of the flow of information can be given without defining a complete state operating system. To do this would be fruitless, since there are many ways in which state information systems will in actuality be organized.

The size of the state and the existing operational structure of the state agencies will also influence the makeup of the state civil defense headquarters staff and the methods used there for decision making.

The effect of dividing the state into civil defense areas for either control or information gathering and the preferred geographic limits of those areas should also be considered concurrently with the consideration of the civil defense information system.

Each state therefore should examine its own peacetime organizational and communication system, and its geographic, political, and economic structure, and on the basis of these develop the organization for emergency operations and its accompanying information system.

In the definition of this information system, the message types and formats, and the information processing responsibilities defined in this report should be included.

Chapter 5

Information for Civil Defense Emergency Operations at the Regional Level

I. INTRODUCTION

A. The Role of the Region in Civil Defense Emergency Operations

The eight regional headquarters provide the means by which the federal government can most directly influence the conduct of civil defense emergency operations. At these headquarters on a full-time basis are representatives of the Office of Civil Defense and representatives of other federal departments and agencies, and liaison is maintained there with the six armies of the continental United States.*

The missions of civil defense at the federal level, as stated in both regional emergency operations plans and the National Emergency Operations Plan, are to "assist state and local governments in preparing for and conducting emergency operations designed to:

(1) "Make maximum effective use of available shelter against radiation;"

(2) "Execute appropriate countermeasures and actions to save lives and protect property...;

(3) "Repair and restore utilities and facilities essential to life saving operations."

These missions are in keeping with the general objectives of civil defense that have been assumed for the local and state levels; that is,

(1) To reduce direct threats to life;

(2) To reduce indirect threats to life;

(3) To maintain government or control and communications and transportation links.

Because regions have no legal authority over states and because, unlike local and state organizations, they have no operational units, they will not be concerned with directing emergency activities. However because regional headquarters, through field representatives assigned to individual states may have knowledge of existing civil defense capabilities and have

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* Civil Defense Regions 5 and 6 correspond to the Fifth Army; Regions 7 and 8 to the Sixth Army; each other region corresponds to a single army.

means for emergency communication to the states, these headquarters can have an important role in coordinating the activities of state civil defense organizations and military units assigned civil defense responsibilities.

Figure 5-1 shows the place of the region in the organization of civil defense.

B. The Regional Headquarters Staff

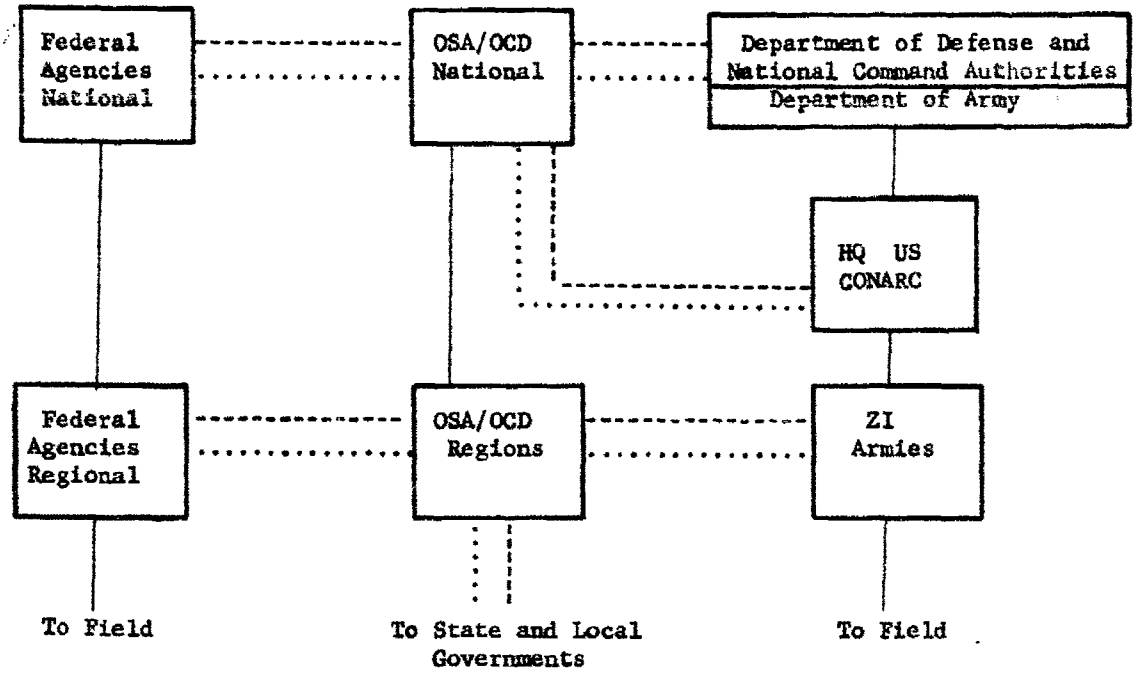
The normal staffs of regional civil defense headquarters include personnel assigned to field operations, communications, training, finance, and other administrative duties. Within the field operations section are persons assigned as representatives to individual states. All of the above personnel will have responsibilities for serving as members of the staff for conducting emergency operations.

In addition, representatives of the various federal government departments and agencies are assigned to civil defense headquarters. Among these are representatives of the Department of Commerce, the Department of Labor, the Department of Agriculture, the Atomic Energy Commission, the Federal Aviation Agency and the General Services Administration. These representatives constitute the Regional Civil Defense Coordination Board (RCDCB) that will assist the civil defense director of the region to develop policies and implement actions in support of the emergency operations centers within the states. In addition, one or more representatives of the Army will be present at the headquarters.

Various ways are given in the plans of the eight regions in which the staffs are organized for emergency operations. The organization that was assumed for this study is similar to those found in all of the regional plans, but is identical with none. The staff assumed is as follows:

An Executive Section consisting of the Regional Director, his deputy, and other assigned personnel.

An Operations Section consisting of the Director of Field Operations, field representatives to the states of the region, and other personnel. This section will analyze incoming reports and establish operational priorities and coordinate military support to the states and mutual support between states.



Ref: Federal Civil Defense Guide, Part A, Chapter 2

Key:
- Command
- Coordination
- Advice and Assistance

Fig. 5-1. Organizational Relationships, Region.

An Intelligence Section to maintain information about the overall situation, particularly weapon damage, radiological conditions, and conditions of transportation links. The Intelligence Section will also have responsibility for warning and maintenance of the War Room.

A Logistics Section that will summarize supplies of and requirements for essential resources. This section will coordinate with the RCDCB in recommending actions with regard to scarce resources for maintaining life.

A Communications Section that will have responsibility for the message center, for communications, and for the operation of the internal information system.

An Emergency Information Section with responsibility for preparing information for broadcast and for preparing reports to the national headquarters.

In addition, there will be administrative and support personnel who are not directly participating in emergency decision making.

II. DEFINITION OF THE INFORMATION SYSTEM

A. Purpose

The purpose of the information system for emergency operations at the regional level is (1) to provide to the regional headquarters from state civil defense organizations information required for planning and coordinating actions to be conducted by federal government representatives; (2) to provide a means for consolidating, evaluating, and distributing information received at the regional headquarters from states and other sources; and (3) to provide a means for transmitting to states information and advice that will be useful in their emergency operations.

B. Information Requirements

The information to be provided to regional headquarters is determined by the actions that might be taken at that headquarters. As for the local and state organizations, these actions can be divided into three major types. The actions to be taken at regional level within these types are:

1. For maintaining government and control

   a. Maintain and reestablish communications with states, federal agency field establishments (FAFE's), and the military;

b. Assist the states to maintain or reestablish government and control;

c. Assist the states to maintain and or reestablish important transportation links.

2. For meeting direct threats

a. Assist in providing attack warning;

b. Assist in insuring maximum shelter utilization;

c. Assist in providing radiological warning;

d. Assist in providing warning against major fires and floods;

e. Coordinate interstate movement of major population groups;

f. Coordinate interstate flood or fire control activity;

g. Establish priorities for allocation of resources and assist in obtaining support from federal agencies, military, or other states.

3. For meeting indirect threats

a. Advise on actions to protect essential inventories and facilities;

b. Advise and assist in distribution of essential inventories;

c. Assist in or coordinate the provision of medical and welfare services;

d. Assist and coordinate actions to restore important facilities;

e. Advise and assist in maintaining morale and order;

f. Establish priorities or supplies and coordinate assistance from federal agencies, military groups, or other states.

The information requirements for these actions and sources from which they may be supplied are stated in the work sheets given in Table 5-I.

C. Message Requirements

1. From State to Region

a. Types of Messages

As at the state and local level, certain basic types of information should be received at the regional level through unscheduled priority situation messages. There are four general subjects that these messages may cover:

Government and control,

Environment (including Nudet reports),

Population,

Supplies services and facilities.

Table 5-1

WORKING TABLE FOR PERFORMANCE REQUIREMENTS

A. Maintain Control, Communications, and Transportation Links

Time Pd.*	Action	Information Required	Probable Data Source	Staff Action to Develop Information	Possible Results of Decision
ALL	1. Maintain and/or reestablish communications with states, FAFE's, military.	a. Condition of primary and alternate comm. links	a. Msg. center observation	a. Msg. center conducts comm. checks; maintains In-Out log and display	Changes in comm. procedures; establishment of new links; requests to states, mil., FAFE for capab., equipt., and repair of specific links.
		b. SOI (Communication procedures)	b. Prestored	b. Updated by Comm. Sect. as procedures change	
		c. Areas of heavy, moderate, light damage	c. Nudet rpts., PSR's for states, FAFE's, mil., summary rpts. from states, FAFE's; NS	c. Int. and Opns. Sects. develop from analysis of rpts.; post on situation display	
		d. Areas of heavy, moderate, light radiation intensity	d. Radef rpts.; PSR's from states, FAFE's, mil., summary rpts. from states, FAFE's; NS	d. Int. and Opns. Sects. develop from analysis of rpts.; maintain current situation display	
		e. Requirements for repair of specific links	e. OC rpts. from states, FAFE's	e. Comm. summarizes and analyzes rpts.	
		f. Location of reserve comm. units	f. Prestored file of mil. and other comm. units; OC rpts. from mil., states and FAFE's	f. Comm. and Opns. Sects. maintain and update file	
		g. Location of reserve comm. equipt.	g. Prestored file of types of location of equipt; OC reports from mil., states, FAFE's	g. Comm. Sect. and RCDCB maintain and update file	
		h. Major areas without electric power	h. Nudet rpts. PSR's from states, FAFE's, mil.; summary rpts. from states, FAFE's; NS	h. Int. and Opns. Sects. develop from analysis of rpts.; maintain display and file	
ALL	2. Assist states to maintain and/or reestablish government and control.	a. Ala, Alc, Ald, Ali, Alg, Alh	a. _____	a. _____	Modification of areas of control; designation of authorities; inform states, mil., FAFE's; advise states on actions to restore government.
		b. Capab. for government and control at state hqs.	b. PSR's from states, FAFE's, mil.; summary rpts. from states; NS	b. Int. and Opns. Sects. develop from analysis of rpts., maintain display and file and operations	
		c. Capab. for government and control in major areas of states	c. PSR's from states, FAFE's, mil.; summary rpts. from states; NS	c. Int. and Opns. Sects. develop from analysis of rpts.; maintains display and file	
		d. Actions being taken by states to reestablish government and control in areas of states	d. PSR's from states; summary rpts. from states	d. Opns. Sect. maintains files	

(Continued)

* Time Periods

Pre - Prior to any attack effects
Trans - While important changes resulting directly from the attack are occurring
Post - When recovery operations are beginning

(continued)

Abbreviations:

capab. - capability
comm. - communication
equipt. - equipment
FAFE - Federal Agency Field Establishment
hq. - headquarters
Int. - Intelligence
mil. - military organization
msg. - message
NS - Commercial News Services
NAWAS - National Warning System
OC - On-Call Report
Opns. - Field Operations
PSR - Priority Situation Report
RCDCB - Regional Civil Defense Coordination Board
REDCON - Readiness Conditions
rpts. - reports
SOI - Signal Operating Instruction

Table 5-I (Continued)

A. Maintain Control, Communications, and Transportation Links (Cont.)

Time Pd.	Action	Information Required	Probable Data Source	Staff Action to Develop Information	Possible Results of Decision
ALL	2. Assist states to maintain and/or reestablish government and control. (Continued)	e. Location of alternate sites for government	e. Prestored; OC msgs. from states	e. Opns. maintains and updates file	
		f. Capability of FAFE's and mil. for assisting in establishing control	f. OC msgs. from mil. and FAFE's	f. Opns. summarizes and analyzes, maintains file	
ALL	3. Assist states to maintain and/or reestablish designated transportation links.	a. Ala, Alc, Ald, A2b, A2c	a. _____	a. _____	Priorities set for transportation link repair; requests to states, FAFE's, mil.; possible coordination by Opns. of actions taken.
		b. Location of designated links	b. Prestored	b. Int. and Opns. Sects. maintain displays and file	
		c. Nature and location of major breaks or traffic delays in areas without heavy or moderate damage	c. PSR's from states, FAFE's, mil.; summary rpts. from states; NS	c. Int. and Opns. Sects. develop from reports; update displays and files	
		d. Anticipated requests for specific links	d. Nudet; PSR's and requests from states, FAFE;s, mil.; summary reports from states; observations by EOC staff	d. EOC staff sections and RCDCB prepare estimates of requirements; Opns. Section coordinates with external reports and requests	
		e. Capab. for restoring links	e. PSR's from states; OC rpts. from states, FAFE's, mil.	e. Opns. Sect. analyzes rpts.; maintains file	

B. Meet Direct Threats

Time	Action	Information Required	Probable Data Source	Staff Action to Develop Information	Possible Results of Decision
Pre	1. Assist in providing attack warning.	a. Ala, A2b, A2c	a. _____	a. _____	Relay strategic situation information and warning to states and FAFE's; advise specific states on steps to alert population.
		b. Strategic situation; National REDCON	b. National Center; NS	b. None; all staff sects. informed	
		c. Readiness conditions in states and FAFE's	c. Summary and OC rpts. from states, FAFE's; NS	c. Int. and Opns. Sects. maincain files, request rpts. if uncertain	
		d. Approach of weapons	d. NAWAS	d. None; staff sects. informed	
Pre/Trans	2. Assist in insuring maximum shelter utilization.	a. Ala, A2b, A2c, A1c	a. _____	a. _____	Messages to states and FAFE's advisory actions to improve shelters and shelter utilization
		b. Preattack shelter capability	b. Prestored	b. Opns. Sect. - update file until time of attack	
		c. Shelter occupancy status in major population centers	c. Summary and OC rpts. from states; NS	c. Opns. Sect. - coordinates rpts., maintains files, requests rpts.	
		d. Methods for improving shelter	d. Prestored information on shelter improvement	d. Opns. Sect. maintains file	
Trans/Post	3. Assist in providing Radef warning.	a. Ala, Ald, A2b, A2c	a. _____	a. _____	Messages to states and FAFE's to inform of fallout approach from adjacent states; summary of Radef conditions sent to states, FAFE's.
		b. Observed rate and direction of fallout spread	b. Radef rpts. from states, FAFE's	b. Int. Sect. plots fallout location and arrival times	
		c. Estimated rate and direction of fallout spread	c. Nudet rpts.; upper wind data from Weather Service	c. Int. Sect. plots Nudets, estimates arrival times of fallout from surface bursts from wind data	

(continued)

Table 5-I (Continued)

B. Meet Direct Threats (Cont.)

Time Pd.	Action	Information Required	Probable Data Source	Staff Action to Develop Information	Possible Results of Decision
ALL	4. Assist in providing warning against major fires, floods, windstorms.	a. A1a, A2b, A2c	a. _____	a. _____	Messages to states and FAFE's advising of threats.
		b. Location of fires, windstorms, floods affecting more than ** miles or ** people	b. PSR's from states, FAFE's, mil.; NS; all staff sects. informed	b. Int. Sect. coordinates rpts. analyzes, maintains, display	
		c. Weather forecasts	c. Weather Report	c. Int. Sect. maintains file	
ALL	5. Coordinate fire and flood control activities	a. A1a, A1c, A1d, A2b, A2c, A3c	a. _____	a. _____	Mission requests to states, mil.; advice to states.
		b. B1b, B1d, B2c, B3b, B3c, B4b, B4c	b. _____	b. _____	
		c. Available resources for fire or flood control	c. OC rpts. from states, mil., FAFE's	c. Opns. Sect. issues requests for rpts.; analyzes rpts.	
ALL	6. Coordinate interstate movement of major population groups.	a. A1a, A1c, A1d, A2b, A2c, A3c, A5c	a. _____	a. _____	Mission requests to states, mil.; advice to states.
		b. B1b, B1d, B2c, B3b, B3b, B4c	b. _____	b. _____	
		c. Location of major population groups in transit	c. PSR's from states, mil., FAFE's; NS; all staff sects. informed	c. Opns. Sect. maintains file and display	
		d. Location of major available capab. for housing or shelter	d. RCDCB estimates, summary and OC rpts. from states, FAFE's, mil.	d. RCDCB maintains file; Opns. Sect. updated information in areas of interest	
		e. Location of major available capab. for transportation (including crews)	e. RCDCB estimates; summary and OC rpts. from states, FAFE's, mil.	e. RCDCB maintains file; Opns. Sect. updated information in areas of interest	

C. Meet Indirect Threats

Time	Action	Information Required	Probable Data Source	Staff Action to Develop Information	Possible Results of Decision
ALL	1. Advise and assist states to conserve and protect inventories critical to survival.	a. A1a, A1c, A2d, A2b, A2c	a. _____	a. _____	States advised of critical inventories and actions to be taken; mission requests to mil. and states to protect specific inventories.
		b. B1b, B1d, B3b, B3c, B4b	b. _____	b. _____	
		c. Types of inventories critical for population survival	c. RCDCB preattack estimates; requests from state; summary rpts. from sites and FAFE's	c. Opns. Sect. and RCDCB compile and analyze rpts.	
		d. Location of major inventories and vulnerability to fire, flood contamination	d. RCDCB preattack information	d. Opns. Sect. compares locations to existing threats; Opns. Sect. and RCDCB maintaining map display and files	
		e. Actions being taken to conserve and protect specific inventories	e. Summary rpts. from states, FAFE's	e. Opns. Sect. and RCDCB maintain files	

** Will depend upon established policy of region of time of action.

(continued)

C. Meet Indirect Threats (Cont.)

Table 5-I (Continued)

Time Pd.	Action	Information Required	Probable Data Source	Staff Action to Develop Information	Possible Results of Decision
Trans/Post	2. Advise and assist states to protect or restore major utilities and production facilities.	a. A1a, A1c, A1d, A1g, A2b, A2c, A3b, A3c	a. _____	a. _____	Priorities for protection and restoration of facilities announced; advice to states; mission requests to states and mil. to restore production or utilities.
		b. B3b, B3c, B4b, B4c, B5c	b. _____	b. _____	
		c. C1c	c. _____	c. _____	
		d. Location and capabilities of major utilities and production facilities	d. RCDCB preattack information; PSR's on predesignated utilities and facilities	d. RCDCB and Opns. Sect. maintain files; request information on capabilities	
		e. Requirements for restoring utilities or production	e. Requests and OC rpts. from states, FAFE's	e. RCDCB and Opns. Sect. maintain files; request information from states, prepare summaries	
		f. Availability of special manpower, and equipment, and materials for restoring utilities and production	f. RCDCB preattack information; OC rpts. from states, FAFE's	f. RCDCB and Opns. Sect. maintain files; analyze, prepare summaries	
ALL	3. Advise and assist states in distribution of inventories critical for survival.	a. A1a, A1c, A1d, A1g, A2b, A2c, A3b, A3c, A3d, A3c	a. _____	a. _____	Priorities and plans for distribution of inventories; advice to states; mission requests to states and mil. to distribute inventories.
		b. B1b, B1d, B3b, B3c, B4b, B4c, B6e	b. _____	b. _____	
		c. C1c, C1d	c. _____	c. _____	
		d. Inventory levels by days of supply in major economic areas	d. RCDCB preattack estimates; summary reports and casualty summaries from states; PSR's on predesignated locations of inventories	d. RCDCB and Opns. Sect. analyze reports and general damage situation; maintain files on inventory levels by economic areas	
		e. Estimated capabilities for replacement of inventories	e. RCDCB preattack of estimates; PSR's on predesignated production facilities; summary rpts. from states and FAFE's	e. RCDCB and Opns. analyze rpts. and general damage situation; maintain files on production capabilities for critical resources	
Trans/Post	4. Assist in provision of medical services.	a. A1a, A1c, A1d, A1g, A2b, A2c, A3b, A3c	a. _____	a. _____	Priorities set; mission requests to states, mil. to provide medical service.
		b. B3b, B3c, B4b, B4c, B5e	b. _____	b. _____	
		c. Specific areas needing medical services	c. PSR's, summary rpts. and requests from states	c. Opns. Sect. maintains file	
		d. Available medical services	d. OC rpts. from states, FAFE's, mil.	d. Opns. Sect. requests rpts., summarizes analyzes	
ALL	5. Advise and assist states to maintain morale.	a. A1a, A1c, A1d, A1g, A2b, A2c, A2d, A2f, A3c	a. _____	a. _____	Region-wide broadcasts; requests for nationwide broadcasts; advice to states about specific situations.
		b. B1b	b. _____	b. _____	
		c. C1c, C2f, C3d, C3c, C4d	c. _____	c. _____	
		d. Major concerns of population	d. Summary and PSR's from states	d. Opns. Sect. maintains file; analyses	
		e. Available means for maintaining morale	e. Prestored information; rpts. from national hq.	e. Opns. Sect. analyzes	

Conditions that should be reported under each of these subjects by unscheduled situation reports are shown in Table 5-II.

States will also submit scheduled summary status reports containing information in the same four subject areas. Table 5-III provides a suggested format for such messages. Table 5-IV is a sample of such a report.

It will be noted that the format of the summary report differs from that which is now specified in regional plans in several respects. First, there is no separate format for preattack and postattack situations. Certain elements of the report may be omitted, however, in the preattack condition.

Next, the format suggested in this report is much more structured than that given in civil defense regional plans. This will assist those preparing the report at state level and facilitate distribution of the report to the appropriate sections of regional headquarters. Obviously, detailed specification of what is to be included also tends to reduce message length.

Finally, the suggested format provides for flexibility in reporting by allowing the region to provide direction as to the detail that is desired under differing conditions. General estimates of surviving resources may be all that are necessary or possible to obtain early after an attack. As more information becomes available, the states can be advised of the detail to be provided in the summary report.

On-call messages or reports will also be required from states. Types of basic information that can be supplied by on-call reports are as follows:

Radef condition at specific locations;

Casualty estimates;

Table 5-II

UNSCHEDULED PRIORITY SITUATION REPORTS - STATE TO REGION

I. Government and Control

When state EOC becomes operational, moves, or terminates operations.

When communications are lost or restored to an adjacent state or to a large area of a state.

When government or control is terminated in a major population center or restored.

Threat to government or control in major population center or in a wide area.

II. Environment

Nudet report.

Arrival of fallout at a major population center or at _____*.

Flood condition affecting another state.

Extreme conditions threatening large umbers of lives, not previously reported (including chemical and biological agents).

When a major interstate traffic link is broken and will require more than ____* hours to restore.

When a major interstate traffic link is restored

III. Population

Movement to shelter ordered or advised in state or in major areas of state.

Interstate movement of large numbers of people, not previously reported.

Evidence of widespread problems of morale.

People leaving shelter in state or in major area of state.

IV. Supplies, Services and Facilities

Loss of major stocks of food or medical items or significant change in days-of-supply estimates.

Damage to facilities predesignated by region as critical.

Need for medical facilities, supplies, or mobile medical units.

When electrical power is lost or restored in a major population center or over a wide area.

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* Place can be specified by regional headquarters.

Table 5-III

FORMAT FOR SCHEDULED SUMMARY STATUS REPORT - STATE TO REGION

Word Range		
	Part I. Government and Control	
20-50	A.	State Headquarters or EOC.
		1. EOC: present manning, expected changes.
		2. Other elements of government: present location, expected changes.
50-150	B.	General Communications and Control Capability (by area of state).
20-150	C.	Specific problems in maintaining government, control, or communications and assistance needed.
	Part II. Environment	
50-150	*A.	Damage (other than radiation).
		Areas or counties, and major cities with heavy, moderate, or light damage** to structures.
50-150	*B.	Radioactivity.
		Areas or counties, and major cities with heavy, moderate or light radiation.**
50-150	C.	Fires, floods (by area).
		1. Affecting other states: location, direction of spread.
		2. Specific problems and assistance needed.
20-50	D.	Extreme weather conditions (by area).
		Specific problems and assistance needed.
100-200	E.	Transportation Links.
		1. Interstate links.
		a. Breaks or traffic conditions causing delays of more than ____hours.
		b. Expected change on situation.
		2. Other specific operational problems and assistance needed.
	F.	Electrical Power.
50-100		1. Interstate (by area).
		a. Existing conditions.
		b. Expected changes.
0-100		2. Other specific operational problems and assistance needed.

(continued)

* Post disaster only.

** Basis for rating to be supplied by region.

Table 5-III (continued)

Word Range		
	Part III. Population (by area)	
100-200	A.	Status of major*** population groups threatened.
		Present situation:
		Expected situation:
		Actions being taken:
		Specific assistance needed:
50-100	B.	Major*** population groups in transit.
		Present numbers and locations:
		Expected situation:
		Actions being taken:
		Specific assistance needed:
150-200	C.	Major** housing and shelter availability and needs.
50-200	D.	Morale.
		Present situation:
		Expected situation:
		Actions being taken:
		Specific assistance needed:
100	*E.	Casualties*** (by area).
	Part IV. Supplies, Services and Facilities.	
100	A.	Status of food (by area)
		In average days of supply:
		Replenishment potential:
		Actions being taken:
		Specific problems and assistance needed:
100	B.	Status of Water (by area).
		In average days of supply:
		Replenishment potential:
		Actions being taken:
		Specific problems and assistance needed:

(continued)

* Post disaster only.

** Basis for rating to be supplied by region.

*** Numbers to guide reporting to be determined by situation and specified by region.

Table 5-III (continued)

Word Range		
150-250	C.	Status of medical supplies.
		Items in greatest demand:
		Items with critical shortages:
		Steps being taken to meet shortages:
150	D.	Status of heating fuel.
		In average days of supply:
		Replenishment potential:
		Actions being taken:
		Specific problems and assistance needed:
100-200	E.	Status of medical services.
		Specific problems and assistance needed (by areas).
50-100	F.	Status of Vehicle Fuel.
	Part V.	General
0-200	A.	Problems of state government not covered in above.
0-200	B.	Actions being taken in coordination with other states.

Table 5-IV

SAMPLE STATE SUMMARY REPORT

State_____

For time period ending _____

I. A. 1. EOC fully manned; no change expected.

2. Governor at ___; cannot move to EOC.

B. Area 1. Most of area under control of local govts.; some breakdown of wire communication.

Area 2. Little operational capability; communications to north part of area by radio only.

Area 3. No capability for control in city of ___; communications intact.

Area 4. etc.

C. Request reps. of Fed. gov't. at _____be sent to City of _____to assist in reorganizing government.

II. A. Heavy Damage: ____, ____, ____, ____, ____ counties and cities of ____, ____, ____.

Moderate: ____, ____, ____, ____, counties and cities of ____, ____.

Light: ____, ____, ____, ____, ____, ____ counties and cities of ____, _____.

B. Heavy Fallout: ____, ____, ____ counties and city of ____.

Moderate ____, ____, ____, ____, ____ counties and cities of ____, ____, ____, ____.

C. Area 1. Fire, 5 mi. front at ____, ____, moving northeast at 2 mph.

Area 3. Flood, on ____ River 5 mile below ____Dam; moving 25 mph.

D. Extreme cold conditions in Areas 3, 4, 5.

E. 1. Interstate ____blocked by downed overpasses at ____ and ____; will be cleared in 12 hours.

2. All bridges across _____River at _____down; no military bridge units in state.

F. Power out in areas 2 & 4 due to transmission line damage; 4 days or more to restore fully.

(continued)

Table 5-IV (Continued)

III. A. Area 1. 70% of survivors have adequate shelter; must move about ____ people now in shelter because of uncontrolled fires; assistance needed in obtaining agreement of _____ of _____ (state) to accept these people.

Area 2 - (similar)

B. Area 5. 15,000 people moving north along interstate Route _____, approaching _____ (state). All will be casualties to fallout.

C. Area 4. Housing for ____refugees available in military barracks at _____.

D. Area 1. No problem.

Area 2. Many feel that it is no use remaining in shelter, since instruments indicate low radioactivity levels; broadcasts by governor being made to explain situation.

Area 3. (similar)

E. (% of Preattack)

	Deaths	Prob. Add'l. Radiological	Injured
Area 1	10	25	20
Area 2	20	20	30
Area 3	5	5	10
Area 4	2	10	15
Area 5	2	5	10
State	10	20	25

IV. A.

	Food Level	Replenishment Potential
Area 1	42 days	No immediate
Area 2	36 days	5 days at food processing plant
Area 3	80 days	2 days from surviving cattle; dairies have limited production
Area 4	20 days	No immediate
Area 5	30 days	No immediate

B. Water (similar to A).

C. Medical Supplies (similar to A).

D. Fuel (similar to A).

(continued)

Table 5-IV (Continued)

E. Area 1. All facilities and services overloaded.

Area 2. All facilities and services overloaded.

Area 3. Some mobile units being sent to Area 2.

Area 4. No units or services available.

Area 5. Some mobile units being created to go to _____(state).

F. Area 1. One-fourth of motor vehicles have need for fuel.

Area 2. Diesel fuel needed for trucks and _____.

Area 3, 4, 5. same as Area 2.

V. A. Have inadequate staff to enforce rationing if it is ordered.

B. None yet.

Population status in vicinity of installation or reporting point, i.e., shelter conditions, morale, immediate needs;

Progress in restoring facility or transportation link;

Location of major uncommitted capabilities (e.g., housing, transportation, with or without crews, medical services and equipment).

Radef messages will also be submitted to region from stations of the Federal Monitoring Network in accordance with the Federal Civil Defense Guide.

b. Message Volume

Estimated average word length of the priority situation messages as given in Table 5-II is 50 words.

The ranges of message lengths in various sections of the summary status report for a state with five areas are shown on the format in Table 5-III. Total message lengths for status messages based on these word ranges would be

preattack - 1100-2300 words

initial postattack - 1400-3000 words

subsequent postattack - 600-1500 words

The volume of priority and on-call messages to be transmitted during any one period between a state and a region will depend, of course, upon the size of the state, the extent of attack effects, and the rapidity with which changes are taking place.

Due to the limited capability of regions for taking immediate actions, most messages from states (with the exception of Nudet reports) can tolerate some delay in transmission. Consequently, it will not be necessary to provide for very high traffic densities.

It is estimated that the maximum number of messages per day from each state to a region during the transattack and postattack periods will be:

one summary status report - 1400 to 3000 words;

fifty unscheduled priority situation reports - 50 words each;

twenty special messages - 50-200 words each.

2. Military Headquarters and Federal Agency Field Establishments to Region

Priority messages will also be sent from military headquarters and federal agency field establishments. These include:

report of fallout arrival;
Nudet or major damage report;
flood or windstorm not previously broadcast;
absence of civil government or control;
break in designated transportation link, estimated time to repair;
traffic delay in designated transportation link (delays anticipated of more than H hours).

On-call messages from military headquarters and FAFE's would contain the same types of information as provided by on-call messages from states.

3. Region to Region

Messages will also be expected from adjacent regions. These would include the following types of basic information:

fallout approach warning;
flood, fire warning;
major breaks in interregional transportation links;
requests for supplies and resources;
response to requests for supplies and resources.

4. National Civil Defense Headquarters to Region

Types of information to be received from the national headquarters are:

strategic situation reports, indicating the probability of the start or termination of a nuclear exchange;
tactical warning to supplement National Warning System;
warning against fallout, flood, or other conditions when receipt of warning from another region is doubtful;
damage assessment summaries.

The strategic situation report would, in a preattack period, provide an indication of the types of actions to be taken and their urgency. In the postattack period, it would reduce uncertainty about the overall recovery problems.

Damage assessment summaries should provide the following information about states adjacent to the region:

general radiological environment;
status of government and control in major centers;
major needs for support;
capability for providing support.

Detailed estimates of losses of population and other resources in more distant regions are not important.

The desirability of the national headquarters furnishing a region with machine-computed estimates of the condition of population and resources, based on Nudet reports, has never been proved. Nudet reports may be used by the regional headquarters staff for making quick estimates of the status of resources, and it is difficult to see how estimates from the national headquarters will be significantly more reliable to improve the making of decisions. Therefore, in considering information processing at regional headquarters, such an input is not included.

D. Staff Information Processing and Arrangement

The column "staff action to develop information" in Table 5-I, is the basis for determining the responsibilities of various staff sections for developing information.

In compiling these responsibilities, it soon became apparent that it would be desirable to have the Operations Section divided into elements, each representing a single state. Needs for operations in each state could be more clearly determined on the basis of that particular state's situation. Region-wide planning of operations may not be possible, and most decisions (at least in the early emergency period) may apply only to a limited part of the region.

Since these state elements at the regional headquarters will process all types of information pertaining to their assigned state, the processing requirements can probably be best identified if they are divided into the same categories as previously used for messages; that is, government and control, environment, population, and supplies, services, and facilities. Table 5-V gives the responsibility of state field representatives. The Intelligence Section will process and display much of the same information that is handled by the state elements of the operations center. However, by displaying the information on a region-wide scale, conditions that require coordination between states or direction by the region are more readily apparent. Table 5-VI summarizes duties of this section.

The responsibilities of other sections of the EOC are more specialized.

Table 5-V

STATE FIELD REPRESENTATIVES'
RESPONSIBILITIES FOR INFORMATION DEVELOPMENT
(Attached to Operations Section)

Government	Maintain and Update File	Maintain and Update Display	Analyze and Summarize Situations
State Hq. or EOC Capability	X		
Government or Control in Major Areas of State	X		X
Alternate Sites for Gov't. or Control	X		
Alternate Capabilities for Gov't. or Control (Personnel, Units)	X		
Readiness Conditions in State		X	
Communications			
Available Communications Links to State	X		
Alternate Communications Capability	X		X
Environment			
Damage (amount and location)	X	X	X
Radioactivity Intensity and Area	X	X	
Major Transportation Links			
Condition and requirements to restore	X		X
Actions being taken to restore	X		
Fire, floods			
Loc'n., extent, direction	X	X	
Countermeasures available	X		X
Countermeasures being taken	X		
Weather Conditions	X		X
Population (by area of state)			
Movement of Major Groups		X	X
General Status of Population	X	X	X
Shelter Utilization:			
excess	X		X
requirements	X		
Housing			
availability	X		X
requirements	X		
Morale	X		X

(continued)

Table 5-V (Continued)

	Maintain and Update File	Maintain and Update Display	Analyze and Summarize Situations
Supplies, Services and Facilities			
Electric Power			
Condition of major elements	X	X	X
Actions to restore, estimated time	X		
Critical Supplies			
Identification (types)	X		
Requirements (by type)			
Location and cond'n. of major stocks	X	X	X
Actions taken to protect or conserve	X		
Transportation Service (by area)			
Availability	X		
Requirements			X
Critical Facilities			
Location and condition	X	X	
Actions taken to protect and restore	X		X
Other			
Military Units (by type)			
Location and availability	X		

Table 5-VI

INTELLIGENCE SECTION
RESPONSIBILITIES FOR INFORMATION DEVELOPMENT

	Maintain and Update File	Maintain and Update Display	Analyze and Summarize Situations
Readiness Conditions by State		X	
Damage - by area and severity		X	
Radioactivity - by area and intensity		X	X
Fire-Floods by area and severity		X	X
Transportation Links			
Location of breaks in critical links		X	X
Actions being taken to restore	X		
Electric Power			
Areas out	X	X	X
Actions being taken to restore	X		
Weather - by areas	X	X	

The Logistics Section will coordinate information about supplies, services, and facilities obtained from the state field representatives and the representatives of the federal agencies who are part of the Regional Civil Defense Coordinating Board. The Communications Section will maintain and evaluate information on the condition of communication links and the operation of the information system itself. A subsection of the Operations Section will have the responsibility for maintaining information on mutual support operations being conducted by the states and by the military and support of the various states.

Members of the Regional Civil Defense Coordinating Board will maintain files on the resources for which their respective agencies are responsible, and will periodically provide estimates of requirements for transportation and other services necessary for their operations.

It should be noted that it is impossible to determine in advance all of the information that may be of sufficient importance to require a central display. However, the use of overlay techniques gives the display system the flexibility that will be required.

The overlay method has been mentioned earlier in the chapter on the local system. It envisions the recording of many kinds of information on transparent overlays for a map used throughout the center. The overlays can then be superimposed to provide a display combining any desired types of information.

A format for internal exchange of information at the regional headquarters is shown in Figure 5-2.

E. Outgoing Messages

Messages to states, FAFE's, military commands and other regions will principally consist of:

Relay of strategic information from the national headquarters or warning system;

Advisories or answers to requests;

Requests for missions or resources;

Requests for reports on specific resources or capabilities.

To: No. of msg._____ Time_____

Originator: Situation No. (if any)_____

For your information _____ Priority: 1 2 3

Response to your message (if any) _____ Priority: 1 2 3

Request for information or action _____

Information concerns: Government and control _____; Communications _____; Transportation Links _____; Population and Shelter _____; Supplies, Services and Facilities _____; General Situation _____; Other _____.

Message:

Figure 5-2. Sample Format for Exchange of Information within Regional Headquarters.

Regional summary status messages will also be transmitted to the national civil defense headquarters and to headquarters of adjacent regions.

F. Other Factors Influencing the Information System at Regional Level

A regional civil defense headquarters has communication links with all or nearly all federal departments and agencies with emergency responsibilities. Table 5-VII shows the links that exist at one regional headquarters and their capacities. If these capacities are only partially used, they could easily overload the capability of a regional headquarters for processing the information received. There will be a great amount of redundancy in the information received and requested unless communication plans for all users of these communication channels are carefully developed and followed.

Essential to such a development of plans is a delineation of definite responsibilities of each department and agency for developing and providing information, followed by exercises in which all users of the system participate.

Table 5-VII

LISTING OF REGION 2 COMMUNICATION CAPABILITIES

Title	Transmission Mode*	Characteristic			Connects Region To					Capacity			Comments
		Voice	TTY	Duplex	States	Other Regions	Nat'l. HQ	Mil	PAFE's	WPM	Effective Channels	Maximum Total	
NAWOM 1	Carrier	X	X	X	X					100	8	800	
Nawom 2	Radio	X	X		X	X				100	2	200	
Autovon	Carrier	X	X			X	X	X		100	1	100	Has data mode (Kineplex) with capacity of 5000 WPM
[illegible]	Carrier		X	X		X	X	X	X	100	2	200	
Fed. Telcom. System (GSA)	Telephone	X			X	X	X	X	X				
RACES	Radio	X	X		X					60	1		Not widely used at region level
GSA-ARS***	Wire		X			X		X	X		1	100	
Autodin Mode V	Carrier		X	X		X	X	X		100	2		Presently not in operation
AP News Service	Carrier		X							60	1		Receive only
Weather-Local	Carrier		X							60	1		Receive only
Weather-A	Carrier		X							100	1		Receive only
Weather-C	Carrier		X							100	1		Receive only

* From or to regional communication center, not total system

** Will be replaced by Autodin Mode V

*** Advanced Record System

Chapter 6

The Civil Defense Information System at the National Level

1. CONCEPT OF EMERGENCY OPERATIONS AT THE NATIONAL HEADQUARTERS*

While at the regional level, persons with responsibilities for the emergency operations of other departments and agencies will be co-located with civil defense offices; the national civil defense headquarters will probably remain physically separated from the heads of federal departments and agencies. While the regional civil defense information system will probably be the center of all information gathering activities in the region, the national headquarters will be only one of a number of national information gathering agencies.

In an emergency, communications will be established at least to each region, to the Office of Defense Resources (ODR)** and to the National Military Command Systems Support Center (NMCSSC). The staff will assist in maintaining, or if necessary reestablishing, a civil defense operational headquarters in each region, and will work with these regional headquarters, the military, and the headquarters of appropriate federal departments and agencies in order to maintain government at, and communications with the states.

The function of "damage assessment" is assigned by executive order to the Office of Civil Defense. Flash Nudet reports will be the first information received. These will be used in making an early assessment of the effects of nuclear attack or other national disaster. As new information is received, either through unscheduled reports from regions or other sources and from summary status reports from regions, the assessment will be revised. In keeping with the objectives of civil defense, the national headquarters will give priority to evaluating the effects of the disaster on the population and resources necessary for their immediate survival.

The headquarters staff will cooperate with the staffs of regional headquarters and federal departments and agencies in establishing priorities

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* This concept expands somewhat that given in the National Emergency Plan, Federal Civil Defense Guide, Part G, Chapter 2, Appendix 2, September 1966.

** Under current plans, the Office of Emergency Planning is to form the nucleus of the ODR.

for actions, advising state governments, and in coordinating military or federal support for states in meeting direct threats to the population. It will also assist the ODR in identifying needs for resources and in establishing priorities for their use.

The national headquarters will also forward to the regions the strategic and tactical warning, as provided by the military and other national sources, and the nationwide estimates of conditions. It will assist in preparing nationwide broadcasts to maintain morale and inform the public of actions to be taken to save lives and property.

II. SYSTEM REQUIREMENTS

A. Information Requirements

The National Civil Defense Headquarters, in keeping with the National Plan and the concept of operations described above, will need information concerning:

(1) Significant changes in the capability of state governments and federal agency field establishments to deal with the effects of a disaster;

(2) Significant changes in the environment (particularly fallout) in large areas;

(3) Changes in the status of major population groups;

(4) Major civil/military operations proposed or underway and political or economic impediments to such operations;

(5) Significant changes in inventories and facilities important for maintaining life in the immediate future.

The number of resources for which information is required, and the detail of information depends upon the interpretation of the damage assessment responsibility of the Office of Civil Defense. Other federal departments and agencies have responsibilities for emergency planning and damage assessment of specified resources. It would therefore seem unnecessary for the national civil defense headquarters, and possibly beyond its capability, to attempt to analyze the status of a great variety of resources. However, as far as is known, there is no limitation on the damage assessment responsibility of the civil defense organization. Without such a limitation, it is impossible to be specific as to the information requirements at the national civil defense headquarters.

b. Prestored Information

It is desirable for the national headquarters to have, before the emergency, information concerning the following:

Emergency warning and communication procedures,

Emergency plans for coordination with other federal agencies,

Plans for restoration of government and control in large areas,

Alternative plans for nationwide redistribution of resources,

Location of installations of particular importance to population survival.

Information about population distribution and shelter space should also be prestored at the national headquarters in order to assist in pre-attack emergency decisions as to shelter needs, and postattack estimates of population status. Requirements for prestored information about other resources will depend upon the definition of the damage assessment responsibilities.

C. Incoming Messages

Regional headquarters will be the primary source of the information required at the national headquarters. This can be provided by unscheduled and on-call situation reports and by summary status reports. Nudet reports, as noted earlier, are considered a type of unscheduled situation report.

The formats of summary reports from state to region can be followed in the reports from region to national headquarters, with data summarized by states rather than by smaller areas. The messages to be received from the emergency headquarters of other federal departments and agencies will depend upon the capability of these headquarters for collecting information needed by the civil defense headquarters. As at the regional level, much redundant or unuseable information could be received by messages from other headquarters unless the information to be transmitted is specified in advance.

D. Information Processing

Present concepts of information processing at the national civil defense headquarters are evidently based upon the use of a computer for early determination of conditions of the population and resources. In this method, the computer, using prestored weapons effects tables, calculates the radii of varying levels of blast and thermal effects. For a surface burst, using available wind data, the computer determines the probable spread of fallout.

The location and vulnerability of the sheltered population and many resources are also stored in the computer and their status is computed using the weapons effects as derived from Nudet information. In this manner, the conditions of specific population groups and resources can be estimated and used in decision making.

The information resulting from this method of information development may contain major inaccuracies for the following reasons.

(1) The location and hardness of the population and other resources at the time of weapon detonation cannot be precisely represented, and may be inaccurately represented, in the computer file.

(2) Even with automated Nudet determination, which is possible only in a small part of the country, there will be inaccuracies in the computed weapons effects. Other types of Nudet determination will be more inaccurate.

(3) Even with perfect Nudet information, the effect of fire spread cannot be known accurately, and other secondary effects such as flood and secondary explosions cannot be determined at all.

(4) Nudet information will not be available to the computer in one convenient batch, and until all weapons are reported, analysis must either be delayed or it will provide an incomplete presentation of conditions.

Stanford Research Institute has been developing, under OCD Work Unit 4615A, a method of estimating surviving population and resources that does not depend solely on Nudet information. Direct reports of damage are consolidated and evaluated by automated means to provide a continual refinement of the estimates.

However, the method of information processing at the national headquarters must ultimately be determined on the basis of the required type and detail of information about resources. As noted above, this has yet to be established.

E. Staff Organization for Emergency Operations

In considering the staff requirements for developing information at the regional level, it was found desirable to have state coordinators to handle all information pertinent to their assigned states. It seems that such an arrangement of the staff would also be desirable at the national level, with coordinators assigned to each of the eight regions. These would constitute the Operations Section.

Other sections of the emergency staff that are consistent with the probable concerns of the national headquarters are:

An Intelligence Section, for maintaining information, and assessing the radiological environment and other general conditions affecting population.

A Logistics Section, for maintaining information on nationwide requirements for resources important for immediate survival. This section would maintain coordination with the appropriate federal departments and agencies.

A Communications Section.

An Executive Section, including elements for liaison with the NMCSSC and NREC.

F. Other System Considerations

A number of communication links between the National Civil Defense Headquarters and regional headquarters already exist (see Table 5-VII). These links, however, must be used by other federal agencies. Priorities for use of these communication means are already established. In other words, there already exists a structure for a national emergency information system, and the civil defense information system at the national level must be compatible with this system. Conversely, in the design of the overall national emergency information system, the information requirements for civil defense at the national level will need to be carefully defined in keeping with the assignment of emergency responsibilities among all government agencies.

Chapter 7

The Overall System, Conclusions, and Recommendations

I. OVERALL SYSTEM CHARACTERISTICS

A. Introduction

In the previous chapters, the characteristics of information systems to support civil defense emergency operations at the local, state, and federal levels were described. These systems must be coordinated to constitute an overall system that will be effective in serving the information needs at all levels of government.

B. External Flow of Information

Figure 7-1 shows the main flow of information occurring within the overall system. Headquarters of each level of the civil defense organization will aggregate and evaluate information on hand and that received by messages in order to create an information base to support its own decision making, and forward required information to the next higher headquarters and to other headquarters. Each headquarters will also supply advice and instructions to lower headquarters and, when necessary, to the public through the EBS. The capability of the EBS has not been evaluated in this study, but the substantial effect of this capability on the requirements for CDEIS communications has been noted.

The capabilities of the various information systems with which the CDEIS could interface at various levels will also be important considerations in further analysis of communication requirements.

Figure 7-1 does not show possible variations in the flow of information between headquarters. For example, some shelters may report through shelter complex headquarters, and local EOC's may report to county or state area headquarters, rather than directly to the state. The desired reporting routes, as noted earlier in this report, will depend upon specific geographic and organizational considerations.

C. Characteristics of Communications

Because of the many types of environments in which it must operate and the changing functions that it may be called upon to support, CDEIS communications must possess a flexibility beyond that of most information systems. It is possible to identify certain types of information that

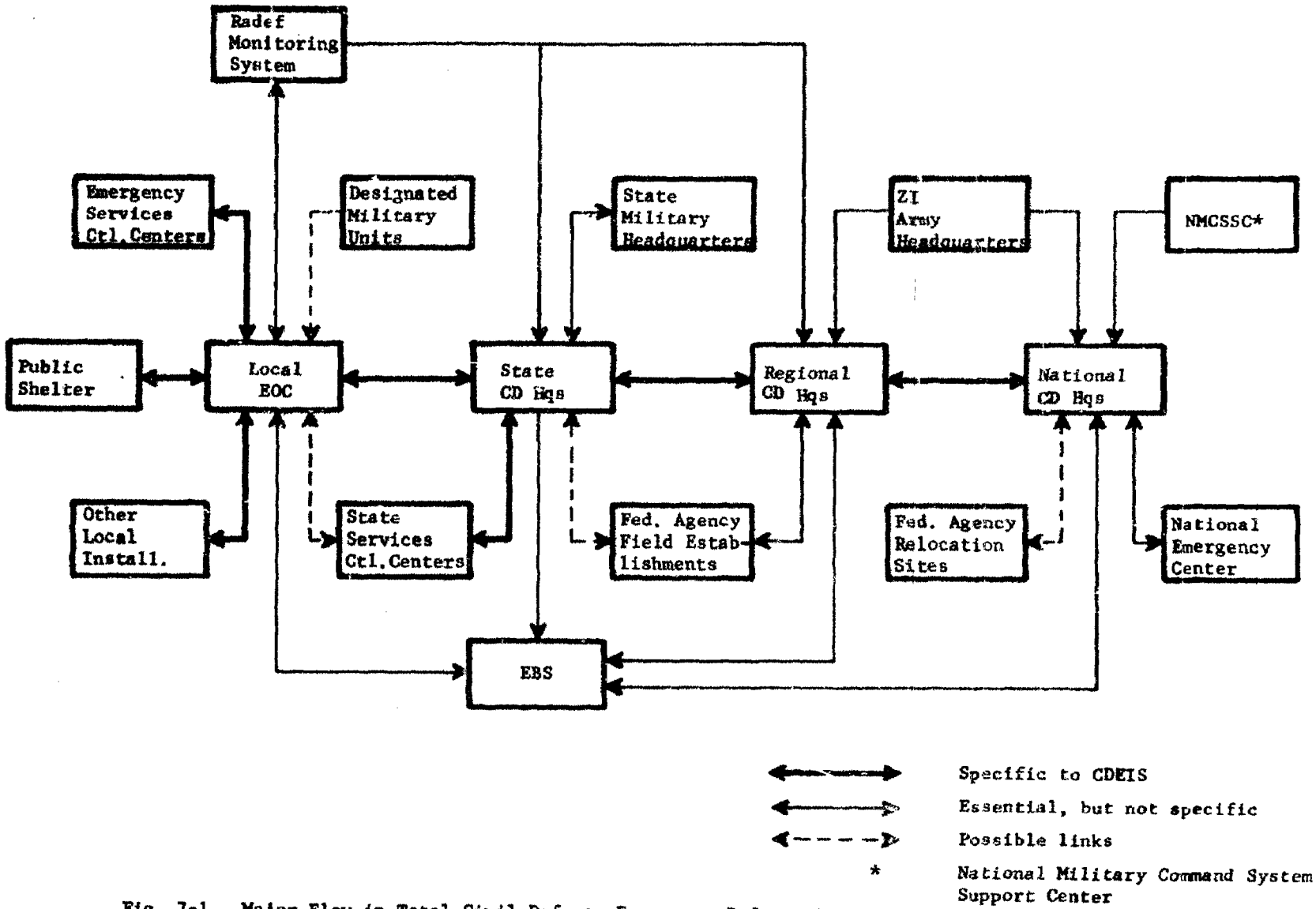


Fig. 7-1. Major Flow in Total Civil Defense Emergency Information

will be important in creating and in maintaining an information base for emergency operations. However, it is not possible to identify in advance the types and detail of information that will be most important at all times during the emergency.

Consequently, it is not desirable to attempt to design single purpose communication channels. For example, it may be important for a police radio net to provide shelter communications during some part of the emergency, but not at others. Flexibility in the use of existing communication capability will be necessary to effective operations.

For efficient use of communication channels, a strict communication discipline must be observed from the first so that the specified basic messages may enter the system. As an information base is created, the decision makers at EOC's or EH's can decide what situations are of most concern, and use available communication capacity for requesting and obtaining the necessary types of information. If communication capacity is overloaded with non essential information (no matter how interesting) the system may never be able to recover and operate effectively.

D. Information Processing and Decision Making

Because of the variability of decision situations, the system must depend largely upon human information processing at all levels. Staff members who will process data to develop the information base will also be part of the decision-making process. That is, they will be making estimates of conditions determining the need for action, and of the feasibility and value of specific actions. However, there will be centralized coordination of the decision-making process and central determination of priorities of actions.

The organization of the staff at the various levels will be consistent with the needs for decision making. At the local level, the staff will be organized into sections for emergency services or operations, logistics or supply, shelter and population, and intelligence. At the regional level, the decision making will be based upon the needs of individual states, since most conditions of the population or resources must be dealt with most often by smaller geographical areas than a region. At the state level, the organization will depend upon the size of the state and upon the potential capability of area or other sector headquarters for decision making and actions.

At every level, there will be a section concerned with developing intelligence about the general situation in the entire area of concern. This intelligence will be represented in tabular and map displays that can be quickly comprehended. Specific information that is developed by other sections of the staff will be compared with or integrated with the representations of the general situation periodically. Integrations of information can be facilitated by the use of transparent overlays.

II. CONCLUSIONS

The objectives of the study were to define the types of information required at local, state, and federal levels of civil defense emergency operations, and to define an information system in terms of

(1) types, flow, and volume of messages;

(2) the flow of information in an operations center and the records and displays needed.

In view of these objectives, the following conclusions were reached:

1. Specific types of messages must be provided to local emergency operations centers and emergency headquarters at other levels of government in order to provide and information base for decisions. Specific instructions must be provided prior to the emergency to insure that such reports are transmitted. Strict communication discipline is necessary at the beginning of an emergency to insure that these messages are sent and received.
2. Communication capacity must also be provided for other types of messages, such as inquiries and special instructions. The potential volume of such messages will be influenced by the effectiveness with which the information base is created and used in anticipating situations and needs for additional information.
3. The peak load of messages between shelters and the local EOC and between EOC's and state emergency headquarters, will probably occur during the movement to shelter period.
4. In determining the overall requirements for an information system in a particular location, there must be consideration of:
   (a) The organizations for support of emergency operations and their control and information systems;

(b) Geographic and economic aspects of the area under the control of the operations center, and the accompanying threats to and vulnerability of the operating civil defense system;

(c) Shelter status of the population, which affects not only the method of routing information, but the situations that might occur and about which information will need to be provided.

5. As shown in Appendix A, the value of shelter complex headquarters as components of the reporting system will depend largely upon the geographic distribution of shelters.

6. The use of area of district headquarters within a state as collecting points for information may be of considerable value in some states.

7. Because of the great number of environments in which it may be necessary to operate, a local or a state civil defense emergency information system must be flexible in communication and staff procedures in order to respond to unforseeable information requirements. Since this flexibility is obtained primarily through human information processing and control, training of staff personnel in information system concepts and procedures is essential.

8. Types of messages of use in decision making at regional and national civil defense headquarters can be defined. However, because the national civil defense headquarters will be only one of the locations at which national decisions will be made in an emergency, and because of the demands on common communication links, the civil defense emergency information system at the national level must be tailored to be a part of the total national emergency information system.

9. The flow of information, and data processing methods, must both be compatible with decision-making procedures and staff organization at civil defense emergency headquarters at all levels. However, there has evidently been no comprehensive study of alternative decision-making procedures and staff organizations.

10. If telephone is the principal source of messages, the preparation of hard copies at the message center will be inefficient compared with the switching of incoming calls to a section that can record the information directly on tabular forms or displays.

11. The Emergency Broadcast System can play an extremely important role in augmenting the civil defense emergency information system by providing both a means for disseminating information and advice and for providing instructions for reporting. Consequently, effective employment of the Emergency Broadcast System must be planned for in the design of an information system for any particular location.
12. Nudet reports and computer-based damage assessment alone will provide inaccurate information about postattack conditions, and there is no evidence of the level of accuracy to be anticipated. It is doubtful if estimates of resource status obtained in this way could be used in decisions at region.
13. In view of the many factors that influence the effectiveness of the civil defense emergency information system at the state and local level, it is infeasible to define communication requirements for one particular organization that could be readily "scaled" to define the requirements for other organizations.

III. RECOMMENDATIONS

Major recommendations of the study are that:

1. The procedures advanced in this report should be used under the direction of OCD to develop an information system for existing civil defense organizations in one or more local areas. The performance of this system should then be evaluated in well-planned exercises in order to better define the methodology before it is recommended for use by civil defense planners at state and local levels.
2. Specific formats for unscheduled shelter situation reports and forms for recording information at EOC's should be developed and incorporated in the Federal Civil Defense Guide.
3. The Office of Civil Defense should recommend a study of the requirements for information at the emergency headquarters of all federal departments and agencies in keeping with their assigned responsibilities as a first step in determining how federal staffs and communications may be more efficiently used in a national emergency.

Appendix A

Macroscopic Organizational Structure of the Local Civil Defense Emergency Information System

I. ALTERNATIVE COMMUNICATIONS CONFIGURATIONS - THE SHELTER COMPLEX CONCEPT

As the number of shelters in a local civil defense system increases, it becomes necessary to consider the effectiveness of routing messages from shelters through an intermediate control point, such as a shelter complex headquarters.

Basically, there are two reasons for routing messages through such a headquarters. First, a certain class of messages may be highly redundant, i.e., several messages in that class may include the same information. (Note that a message class can be highly redundant, and yet no individual message in the class would necessarily contain redundancy.) For example, a single fire may be reported by a number of different shelters. By routing calls from shelters located near each other through a shelter complex headquarters, superfluous messages can be eliminated, and the load on the EOC message center is thereby reduced. A second (and not unrelated) reason for routing messages through intermediate shelters is that the shelter complex headquarters may be able to deal with certain problems. Such a situation corresponds to a certain amount of decentralization of decision making.

We shall now present an analysis to illustrate the effect that a shelter complex structure has on the redundancy of message classes and on the extent to which shelter complex headquarters can handle certain situations.

Let us denote the total number of shelters under the EOC by N, and let us assume that the N shelters have been divided into S groups, or complexes, where each complex contains an approximately equal number of

geographically contiguous shelters. One shelter in each complex is designated the headquarters for the shelter complex, and messages from shelters in a complex are sent to the shelter complex headquarters. To simplify the analysis, we shall assume that each complex contains N/S shelters, that each complex covers the same area, and that the S complexes form a gridwork of S squares. Although these assumptions are unrealistic, the results obtained will apply even if they hold approximately. We shall assume that N is rather large, say $N \geq 100$. We shall refer to S, the number of shelter complexes, as the span. The results to be derived are valid for S not less than 4 and preferably S at least 9.

II. REDUCTION OF MESSAGE CLASS REDUNDANCY

We shall first consider the redundancy problem. We shall examine the situation in which messages from shelters in geographic proximity are likely to contain some of the same information. For example, if a number of fires are burning in the city, a given fire may be reported by more than one shelter in the same area. Shelters located far away are assumed to have little chance of reporting the same information.

We shall characterize this situation by a parameter r called the natural redundancy of the message class. The value of r is the expected proportion of all messages which would be superfluous if every message generated in a shelter were reported directly to the EOC. That is, if n messages (of a certain situation category) are prepared in shelters for transmission to the EOC, then (1-r)n of them are expected to contain non-redundant information, and rn of them are expected to be regarded as unnecessary by the EOC. Alternatively, we may describe this situation by the statement that on the average, 1/(1-r) shelters report each situation.

We suppose that whenever a shelter complex headquarters receives a message providing information which it knows has already been transmitted to the EOC, then that redundant message is not transmitted.

We shall now derive an expression for the redundancy of the message class (as received in the EOC) after the preceding message-screening procedure is employed. This redundancy will be referred to as the net redundancy, and will be denoted by R. That is, R is the expected proportion of redundant messages reaching the EOC from shelter complex headquarters when each shelter complex headquarters filters out all calls which it recognizes to be redundant.

We shall employ a geometrical argument to obtain an expression for R. In the model to be employed, we shall represent a situation as a square (of size to be determined later) whose sides are parallel to the sides of the gridwork of shelter complexes, and we shall represent the occurrence of a situation by a random placement (i.e., according to a two-dimensional uniform distribution) of this square on the grid. We represent shelters in the complex by grid squares of equal area. If we represent the length of the side of the situation square by $t (t \geq 0)$, then the probability distribution function of the number x of shelters touched by the situation square (i.e., of the number of shelters observing the situation) is given by

$$\Pr[x] = \begin{cases} (1-\alpha)^2 \text{ if } x = (\eta+1)^2; \\ 2\alpha(1-\alpha) \text{ if } x = (\eta+1)^2 + (\eta+1); \\ \alpha^2 \text{ if } x = (\eta+2)^2; \\ 0 \text{ otherwise;} \end{cases}$$

where $t = r + \alpha$, r is the integral part of t, and α is the fractional part of t. It can be shown that the expected number of shelters observing a situation is given by

$$E(x) = (1 + t)^2$$

and the natural redundancy, r, is thus given by

$$r = \frac{E(x) - 1}{E(x)} = \frac{(1+t)^2 - 1}{(1+t)^2} \quad .$$

Solving the preceding equation for t in terms of r, we have

$$t = \sqrt{\frac{1}{1-r}} - 1 \quad .$$

When calls are screened by shelter complex headquarters, the net redundancy R corresponding to a natural redundancy of r is given by

$$R = \frac{(1 + t\sqrt{S/N})^2 - 1}{(1 + t\sqrt{S/N})^2} = 1 - \frac{1}{(1 + t\sqrt{S/N})^2} \quad ;$$

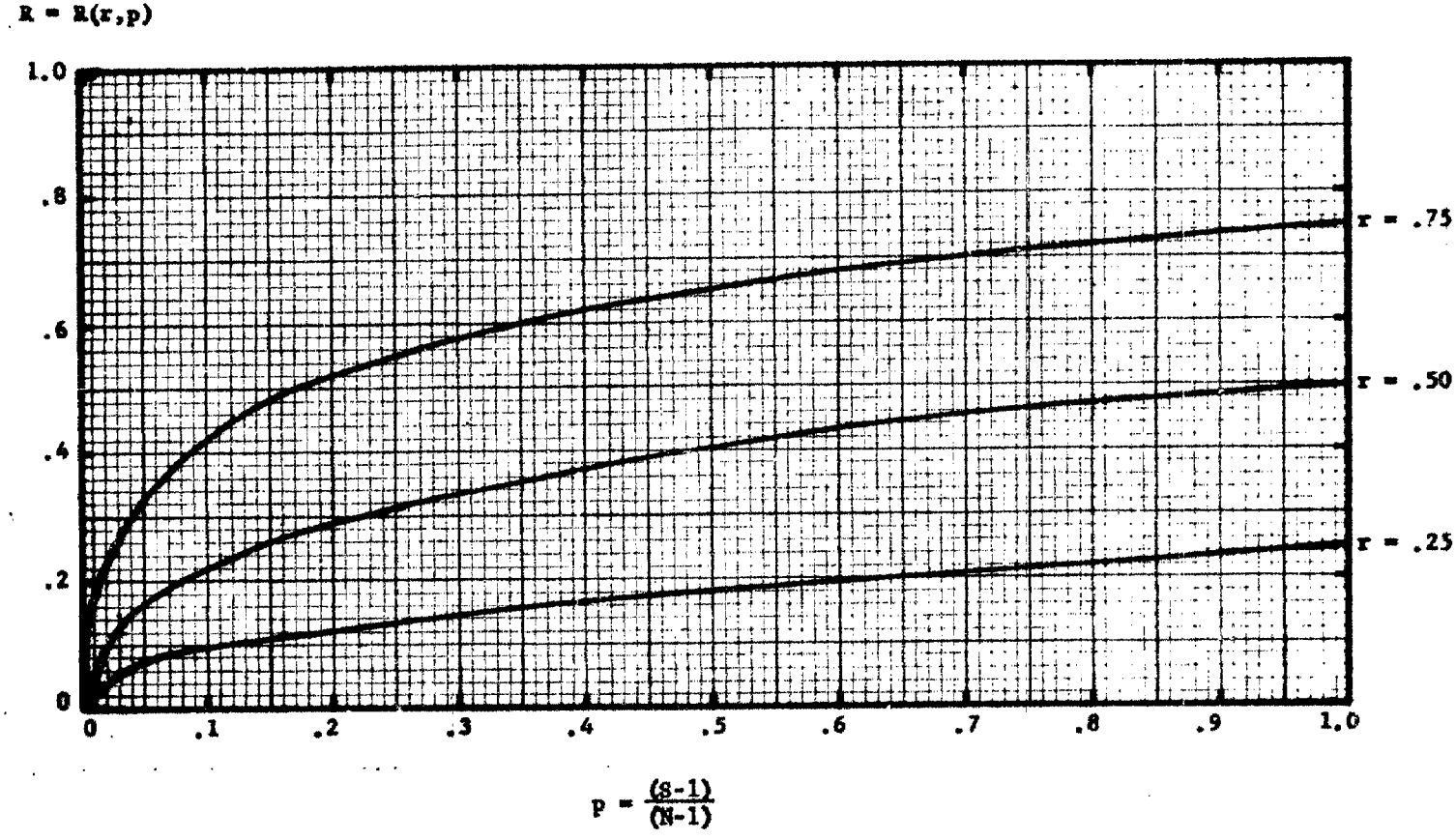
i.e., we have replaced t by $t/\sqrt{N/S}$ in the expression for r, since a shelter complex contain N/S shelters. Now when $S = 1$, R should be equal to 0, and when $S = N$, R should be equal to r. To satisfy these boundary conditions, it is convenient to replace S/N by $p = (S-1)/(N-1)$ in the expression for R. Thus we have

$$R = R(r,p) = 1 - \frac{1}{\left[1 + \sqrt{(S-1)/N-1)}\left(\sqrt{\frac{1}{1-r}} - 1\right)\right]^2} \quad .$$

The quantity p is approximately the proportion of all shelters which are shelter complex headquarters. We shall refer to p as the relative span. If we plot R versus r and p for selected values of p(.25, .5, and .75), we obtain Figure B-1. For small values of S(say $\leq$ 10) when N $\sim$ 100, the value of R given by the above formula tends to be too large, particularly if r is not very small (say r > .25).

One of the conclusions to be derived from Figure B-1 is the following: By employing a shelter complex system with relative span p = .1 (i.e., 10 percent of all shelters are shelter complex headquarters), then the redundancy of message classes is reduced by approximately a factor of 2 for .25 $\leq$ r $\leq$ .75. Thus for a city with 100 shelters, the preceding analysis indicates that we will reduce the redundancy by a factor of 2 if we have about 10 shelter complexes approximately of equal size if .25 $\leq$ r $\leq$ .75. For message classes with very small r, there is little benefit, and for such message classes, direct reporting from shelters to the EOC would be desirable.

Associated with the use of a shelter complex system, there are certain costs. First, messages reaching the EOC which originated in shelters other than shelter complex headquarters are delayed by routing through the shelter complex headquarters. This cost is not great if the shelter complex headquarters can quickly relay calls to the EOC from shelters. Second, there is an increase in the usage of the communications equipment. In fact, even though a number of calls may be screened out,



NOTE: N = number of shelters under EOC;
S = number of shelter complex headquarters.

Figure A-1

Net Redundancy, R, Versus Relative Span, p, and Natural Redundancy, r.

the total number of calls (from shelters to shelter complex headquarters, and from shelter complex headquarters to the EOC) using the shelter complex system will always exceed the number of calls if shelters report directly to the EOC. The expected total number of calls made per situation is

$$E = \left[\left(1-\frac{S}{N}\right)\left(\frac{1}{1-r}\right) + \frac{1}{1-R}\right] \quad .$$

The number of redundant calls is thus E-1, and the communications equipment usage redundancy is thus

$$R_e = \frac{E-1}{E}$$

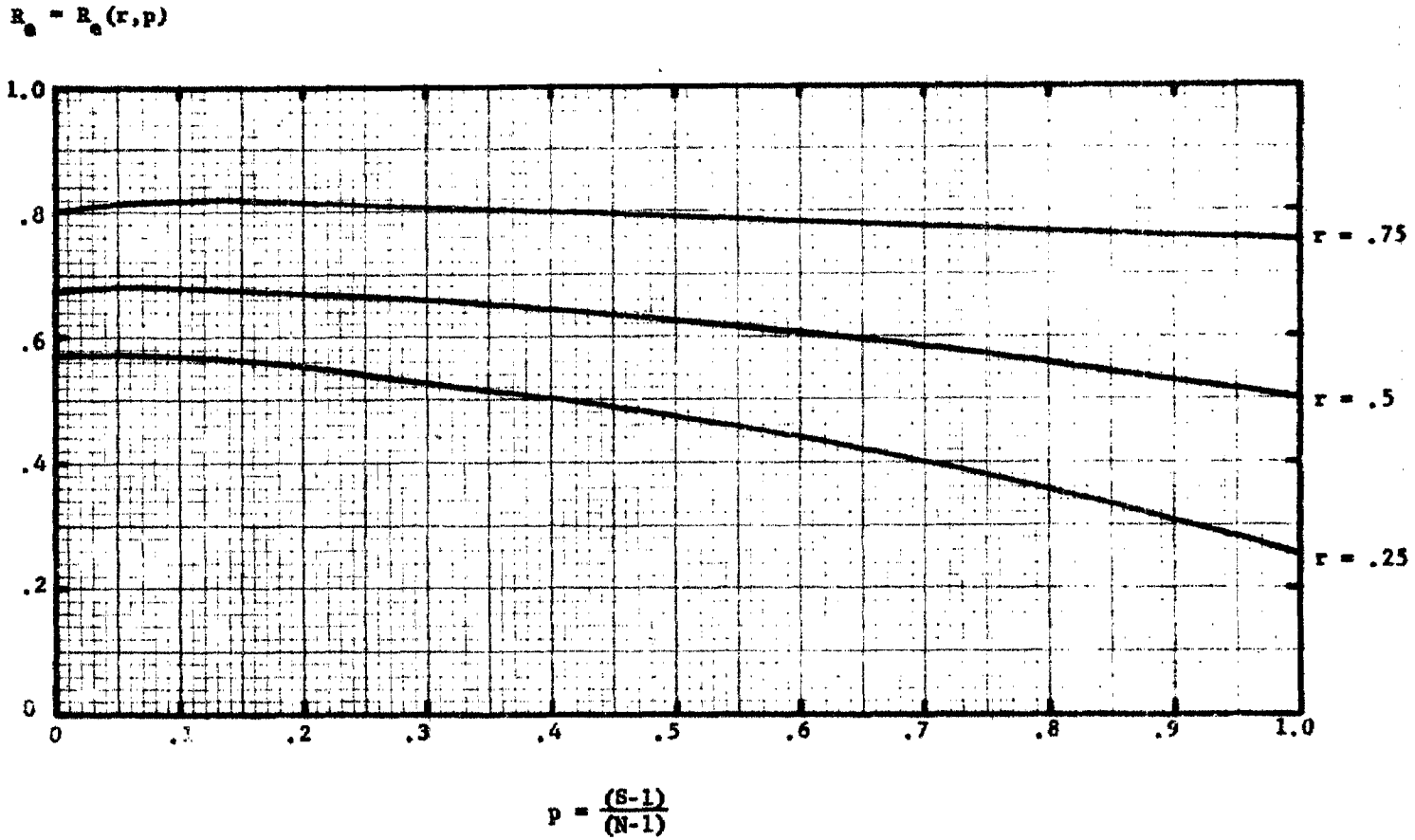
$$= 1 - \frac{1}{\left(1-\frac{S}{N}\right)\left(\frac{1}{1-r}\right) + \frac{1}{1-R}}$$

$$= 1 - \frac{1}{\left(1-\frac{S}{N}\right)\left(\frac{1}{1-r}\right) + \left[1 + \sqrt{\frac{S-1}{N-1}}\left(\sqrt{\frac{1}{1-r}} - 1\right)\right]^2} \quad .$$

To make R_e a function only of r and of $p = (S-1)/(N-1)$, we replace S/N by (S-1)/(N-1) in the first term in the denominator, to obtain

$$R_e = R_e(r,p) = 1 - \frac{1}{\left(1 - \frac{S-1}{N-1}\right)\left(\frac{1}{1-r}\right) + \left[1 + \sqrt{\frac{S-1}{N-1}}\left(\sqrt{\frac{1}{1-r}} - 1\right)\right]^2} \quad .$$

Figure B-2 contains a plot of R_e versus r and p. From that figure, we may conclude that if the redundancy is small, equipment usage redundancy increases substantially for p = .1, (e.g., for S = 11 and N = 101). If r is large, many calls are sorted out and relatively few calls are made in the shelter complex headquarters to the EOC, so that the increase in equipment redundancy is not great.



NOTE: N = number of shelters under EOC;
S = number of shelter complex headquarters.

Figure A-2

Equipment Usage Redundancy, R_e, Versus Relative Span, p, and Natural Redundancy, r.

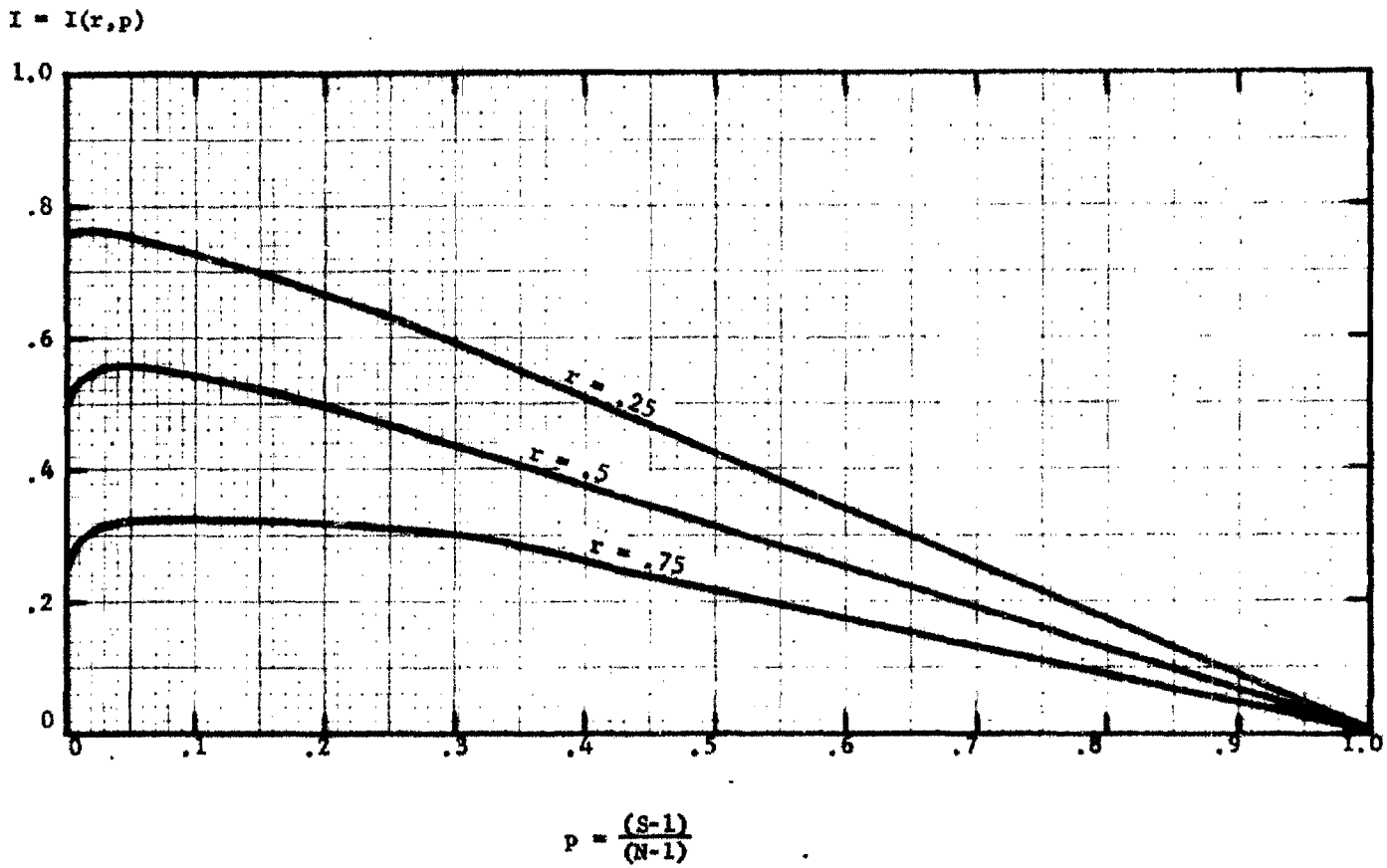
It is useful to express redundant communications equipment usage in terms of the fractional increase, I, of equipment usage, with respect to the usage if all shelters report directly to the EOC. Since the number of calls per situation if each shelter reports directly to the EOC is $1/(1-r)$, and the number of calls per situation if a shelter complex system with $p = .1$ is used is $(1-\frac{S}{N})\ (\frac{1}{1-r}) + \frac{1}{1-R}$, then I is given by

$$I = \frac{(1-\frac{S}{N})\ (\frac{1}{1-r}) + \frac{1}{1-R} - \frac{1}{1-r}}{\frac{1}{1-r}} - \frac{1-r}{1-R} - \frac{S}{N}$$

$$\doteq \frac{1-r}{1-R} - \frac{S-1}{N-1} \quad .$$

A plot of I versus r and $p = (S-1)/(n-1)$ appears in Figure B-3. For $p = .1$, the percentage increase in usage of equipment is approximately $(1-r)100$ for r small (say $< 3/4$). (For r close to zero, equipment usage would increase by 100 percent--i.e., would double.)

The benefit of a shelter complex system corresponding to redundancy reduction is that the EOC message center receives fewer calls corresponding to each situation. From the preceding graphs, it is seen that the benefits are small and the costs high (in terms of equipment usage) if r is small. The use of a shelter complex system is beneficial (with respect to redundancy reduction) only for message classes with high natural redundancy, r (say $r \geq 3/4$). Such high redundancy is most likely to occur for messages that report area conditions (area environment, population and resources outside of shelter) and the shelters are concentrated in a small area.



NOTE: N = number of shelters under EOC;
S = number of shelter complex headquarters.

Figure A-3

Fractional Increase, I, of Equipment Usage Versus Relative Span, p, and Natural Redundancy, r.

The next section will discuss the second purpose for which a shelter complex headquarters system can be used.

III. HANDLING OF PROBLEMS WITHIN SHELTER COMPLEXES BY THE SHELTER COMPLEX HEADQUARTERS

The second reason, mentioned above, for structuring shelter-to-EOC communications in a shelter complex configuration applies if it is desired to decrease the analytical burden of the EOC by allowing shelter complex headquarters to handle certain problems. For the purposes of the present analysis, we shall assume that a shelter complex headquarters can handle a certain problem if all the shelters involved in dealing effectively with the problem are contained in the complex. As above, we define a parameter ρ (corresponding to r), called the relative problem magnitude, such that the number of shelters contained in a square grid section containing all shelters involved in the determination and solution of the problem is $1/(1-\rho)$. The square grid section of $1/(1-\rho)$ shelters contains not only those shelters which report a particular situation to the shelter complex headquarters, but any other shelters involved in the problem and its solution.

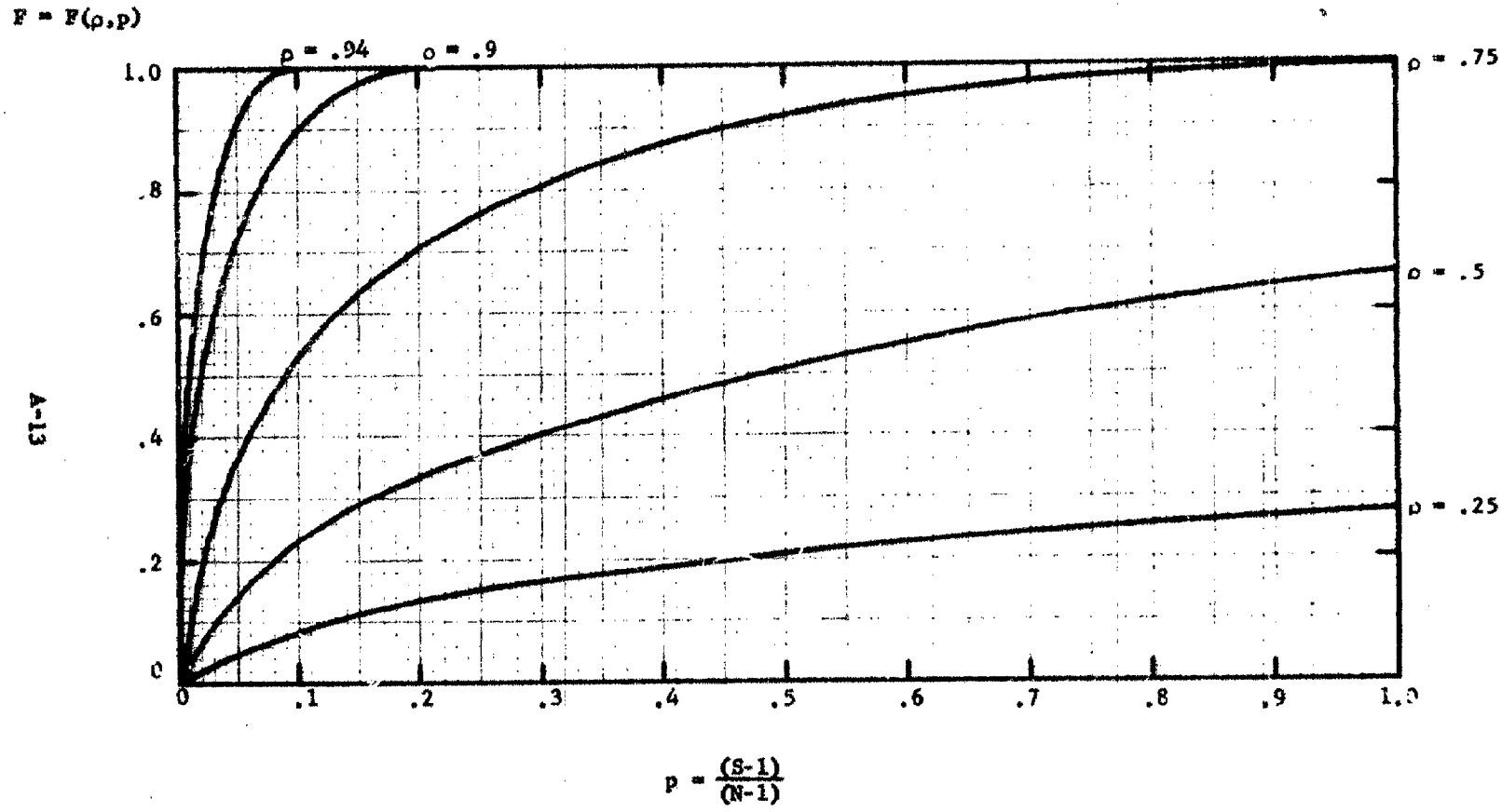
Employing the same stochastic model as before (i.e., problems occur randomly on the grid of shelters), then the fraction, F, of problems not falling wholly within the shelter complex is given by

$$F = 1 - (1-t\sqrt{S/N})^2$$

where $t = \sqrt{\frac{1}{1-\rho}} - 1$. Replacing S/N by $p = (S-1)/(N-1)$ as before, F becomes

$$F = F(\rho,p) = 1 - \left[1 - \left(\sqrt{\frac{1}{1-\rho}} - 1\right)\sqrt{\frac{S-1}{N-1}}\right]^2 .$$

Figure B-4 contains a plot of F versus ρ and p. Whereas reasonable values of r would probably be $\leq 3/4$, reasonable values for ρ are much larger, say as large as .9. Such is the case because relatively few shelters would be expected to observe the same situation, whereas ten shelters could easily be involved in the solution of a problem. Larger values of ρ are hence included in Figure B-4. For a relative span of p = 1, and ρ small (say $\leq 3/4$), the fraction of problems not falling wholly within the shelter complex is approximately one-third as large as if no shelter complex system is used. That is, two-thirds of the usual problem load of the EOC can be handled by shelter complex headquarters, in the sense that all the shelters involved in the problem and its solution fall within the shelter complex (by the term "usual", we mean that the EOC handles all problems other than those affecting only one shelter.) As ρ increases, a smaller and smaller fraction of problems fall wholly in the complex. (This last fact illustrates a shortcoming of the model used in the analyses presented above, namely that F achieves the value 1. Realistically, we should expect $F < 1$ no matter how large the value of ρ or how small the value of p. This shortcoming arises from the fact that we have used, for given ρ (or r), squares of fixed size to represent problems (or situations). A more realistic analysis, which would overcome this drawback, would employ a probability distribution of problem sizes (or situation sizes). For values of ρ (or r), that are somewhat less than 3/4, the results of either analysis are expected to be similar, however.)



NOTE: N = number of shelters under EOC;
S = number of shelter complex headquarters.

Figure A-4

Fraction, F, of Problems Not Falling Wholly Within Shelter Complex, Versus Relative Span, p, and Relative Problem Magnitude, ρ.

Since reasonable values for ρ for a city of 100,000 would likely be as large as .9, it appears on the basis of the present analysis, that for a city with 100 shelters and approximately 10 shelter complexes, the use of shelter complex headquarters for handling problems would be quite limited, if it is desired to achieve analysis of high caliber.

For sprawling cities, or for county EOC systems, the value of ρ could be small, and the value of the shelter complex headquarters for handling certain problems could be considerable.

IV. SUMMARY

The above analysis indicates that the value of a shelter complex headquarters as a mode in reporting procedures depends upon the probable redundency of shelter-originated messages; as a control center, its value depends upon the extensiveness of problems with regard to shelter location. This type of analysis may be applied in the design of the information system and in establishing operational procedures for a particular local area. It is possible that shelter complex headquarters in the same community would perform information filtering or control tasks at some times, but not at others, as announced by the local EOC.

Appendix B

I. Sample Messages - Shelter to EOC

Unscheduled Priority

PS1 - Shelter Open

SHELTER OPEN REPORT. SHELTER BRAVO SEVENTEEN AT MAIN AND BROAD NOW OPEN AND CAN RECEIVE OCCUPANTS. AM COMMUNICATING FROM 733-1331. CAN ALSO USE 733-1335. SHELTER MANAGER IS NOT PRESENT. STANDARD BROADCAST RECEIVER IS RECEIVING EBS BROADCAST. THIS IS PATROLMAN FOGARTY. WILL STAND BY UNTIL SHELTER OFFICIALS ARRIVE.

Approximate length - 60

PS2 - Shelter Occupancy

SHELTER OCCUPANCY REPORT. SHELTER BRAVO SEVENTEEN AT MAIN AND BROAD. 125 OF 400 SPACES OCCUPIED. NO NEW ARRIVALS IN LAST TEN MINUTES. THIS CALL FROM 733-1331. STEVEN SATTERFIELD NOW IN CHARGE AS SHELTER MANAGER.

Approximate length - 45

PS3 - Initial Habitability

SHELTER HABITABILITY REPORT. SHELTER BRAVO SEVENTEEN. SHELTER NOW HAS ABOUT 350 OCCUPANTS. CENTRAL SPACE ON SECOND FLOOR IS OCCUPIED BY HEAVY DATA PROCESSING EQUIPMENT. I AM LOOKING FOR OTHER SPACE WHICH CAN BE MADE INTO HIGH PF AREA. SUPPLIES APPARENTLY OKAY. WE CAN NOW COMMUNICATE BY CITIZEN'S BAND RADIO. MANAGEMENT STAFF IS PRESENT. OCCUPANTS ARE EXCITED BUT ARE WILLING TO TAKE INSTRUCTIONS. SATTERFIELD.

Approximate length - 65

(continued)

PS4 - Change in Habitability

(1) THIS IS BRAVO SEVENTEEN. POWER FAILURE HAS CUT OFF VENTILATION IN BASEMENT AREA. HAND OPERATED FANS ARE NOT KEEPING TEMPERATURE DOWN. CAN MOVE SOME OCCUPANTS TO AREAS ON UPPER FLOORS AND WILL DO SO AFTER RADIATION CHECK. SATTERFIELD.

Approximate length - 40

(2) THIS IS BRAVO SEVENTEEN. WALL OF BUILDING CRACKED BY BLAST. DO NOT KNOW OF ANY WAY TO DETERMINE IF IT WILL COLLAPSE. RADIATION LEVEL OUTSIDE IS ESTIMATED TO BE 10R PER HOUR. WATER IS ALSO SEEPING INTO BASEMENT AREA FROM BROKEN WATER MAIN. SATTERFIELD.

Approximate length - 45

PS5 - Relocation

THIS IS SHELTER BRAVO SEVENTEEN. DAMAGE TO BUILDING HAS MADE ALL BUT PART OF BASEMENT UNSATISFACTORY FOR SHELTER. I PLAN TO MOVE ALL 380 PERSONS TO BUILDING AT 120 BROAD STREET. OUTSIDE RADIATION LEVEL IS ESTIMATED AT 10RPH. WILL USE EXPEDIENT METHODS FOR PROTECTION IN NEW LOCATION. SATTERFIELD.

Approximate length - 50

PS6 - Condition of Occupants

(1) THIS IS BRAVO SEVENTEEN. SOME PERSONS IN SHELTER ARE BECOMING DROWSY AND SOME SEEM TO BE UNCONSCIOUS. TEMPERATURE READINGS IN MOST AREAS IS ABOUT 80 DEGREES AND VENTILATION SEEMS ADEQUATE. SATTERFIELD.

Approximate length - 30

(2) THIS IS BRAVO SEVENTEEN. PEOPLE ARE BECOMING RESTLESS AND NERVOUS. FEAR THAT THERE WILL BE DISORDER. AM TRYING TO GET SOME ACTIVITY STARTED AND AM INVESTIGATING THE POSSIBILITY OF SHORT STAYS IN LESS PROTECTED AREAS OF BUILDING WHERE THERE WILL BE LESS CROWDING. I BELIEVE ENCOURAGEMENT OVER EBS WILL BE HELPFUL. SATTERFIELD.

Approximate length - 50

(continued)

I. Sample Messages - Shelter to EOC (continued)

PS7 - Area Environment

(1) THIS IS SHELTER BRAVO SEVENTEEN. REPORTS OF NEW ARRIVALS ARE THAT TRAFFIC IS BLOCKED AT MAIN STREET AND CASTLE DRIVE BY DISABLED VEHICLES. PEOPLE ARE LEAVING VEHICLES IN STREET AND PROCEEDING TO SHELTER. SATTERFIELD.

Approximate length - 35

(2) THIS IS SHELTER BRAVO SEVENTEEN. SMOKE AND SOME FLAMES FROM FIRES CAN BE SEEN ABOUT ONE QUARTER MILE NORTH OF THIS SHELTER. WIND DIRECTION IS FROM EAST TO WEST. SATTERFIELD.

Approximate length - 30

PS8 - Out-of-shelter Population

THIS IS SHELTER BRAVO SEVENTEEN. PEOPLE THAT HAVE BEEN MOVING ON FOOT ALONG MAIN STREET ARE NOW SITTING DOWN IN STREET. SEEM TO BE ABLE TO MOVE BUT WAITING FOR THEIR INSTRUCTIONS. SATTERFIELD.

Approximate length - 35

PS9 - Out-of-shelter Resources

THIS IS BRAVO SEVENTEEN. ARRIVALS REPORT THAT THERE ARE A NUMBER OF TRUCKS STANDING OUTSIDE THE SUPERMARKET AT 17TH AND MAIN WITH VEGETABLES, MILK, AND OTHER SUPPLIES THAT WILL SPOIL UNLESS REFRIGERATED OR USED IMMEDIATELY. SATTERFIELD.

Approximate length - 40

(continued)

On-Call Routine

RS1 - Space or Population Conditions

(1) THIS IS BRAVO FOURTEEN. THE MAJORITY OF THE OCCUPANTS HAVE RECEIVED LESS THAN 30R. MANY HAVE LESS THAN 5R. MOST ARE ANXIOUS TO BE GETTING OUT OF SHELTER AND TO BEGIN DECONTAMINATION AND RECOVERY. WE ARE USING SPACE NOT MARKED FOR SHELTER. BROWN.

Approximate length - 45

(2) THIS IS BRAVO TWELVE. MOST HAVE RECEIVED NEARLY 100R, AND SOME SICKNESS HAS OCCURRED. THERE IS LITTLE SPACE AVAILABLE FOR MOVEMENT WITHIN THE SHELTER. AREA OUTSIDE OF THOSE MARKED ARE STILL RECEIVING AT LEAST 10R PER HOUR. DESIRABLE TO MOVE SOME OCCUPANTS TO OTHER SHELTERS. GOLDWATER.

Approximate length - 50

RS2 - Shelter Supplies

THIS IS BRAVO FOURTEEN. WE HAVE THE FOLLOWING FOOD STOCKS REMAINING FOR THE 620 PEOPLE IN SHELTER. 3,700 DAILY RATIONS, 3,000 GALLONS OF WATER IN CONTAINERS PLUS SOME TRAPPED WATER. BROWN.

Approximate length - 35

RS3 - Special Manpower

THIS IS BRAVO FOURTEEN. WE HAVE THE FOLLOWING NUMBERS OF REQUESTED TYPES OF MANPOWER. PHYSICIANS - 2. NURSES - 4. ELECTRICAL UTILITY REPAIR - 4. HEAVY TRUCK DRIVERS - 3. TELEPHONE REPAIR - 7. FIREFIGHTING - 4. POLICE - 1. BROWN.

Approximate length - 35

RS4 - Out-of-shelter Conditions

THIS IS BRAVO FOURTEEN. SURVEY OF IMMEDIATE NEIGHBORHOOD SHOWS THAT THERE ARE ABOUT 500 PERSONS APPARENTLY IN GOOD CONDITION, ABOUT 1,000 WITH INJURIES, AND ABOUT 500 DEAD OR DYING. MEDICAL ASSISTANCE COULD BE USED. OUTSIDE RADIATION LEVEL IS BELOW 1R PER HOUR IN MOST PLACES. BROWN.

Approximate length - 50

(continued)

Scheduled Shelter Summary Status Report (Initial)

THIS IS BRAVO 17. SUMMARY STATUS REPORT.
OCCUPANCY - SURVEYED SPACES - 630; OCCUPANTS - 648
CONDITION OF OCCUPANTS - QUIET AND ORDERLY. 31 SICK AND DISABLED
HABITABILITY - VENTILATION SYSTEM OPERATING ON EMERGENCY POWER GENERATOR;
SANITATION PROBLEMS INCREASING
INTERIOR DOSE RATE - TWO TO FIVE R PER HOUR
TOTAL DOSE - HIGH 25; LOW 5
SUPPLY: FOOD - ELEVEN DAYS WATER - NINE DAYS PLUS SOME TRAPPED WATER
MEDICAL 23 TYPE A KITS

AREA ENVIRONMENT - SMOKE STILL IN AREA NORTH OF SHELTER, NOT INCREASING.
MAIN STREET BLOCKED BY STALLED VEHICLES
AREA POPULATION - LARGE NUMBERS IN BUILDING ON MAIN STREET THAT ARE NOT
MARKED AS SHELTERS; SOME INJURED
AREA RESOURCES - NO ELECTRICAL POWER, GAS OR WATER SUPPLY. GROCERY
STORES IN AREA HAVE BEEN EMPTIED
VEHICLES AND FUEL FOR MOVEMENT OF ALL OCCUPANTS AVAILABLE
COMMUNICATIONS - STANDARD BROADCAST RECEIVERS OPERATING ON SCHEDULE TO
SAVE BATTERY LIFE: RACES TRANSCEIVER IS OPERATIONAL
AND ON STAND-BY
PROBLEMS - CONTINUING OPERATION OF POWER GENERATOR. FUEL FOR ABOUT
30 MORE HOURS OF OPERATION AVAILABLE IN BUILDING

Approximate length - 160

(continued)

Scheduled Shelter Summary Status Report (Subsequent)

THIS IS BRAVO 17. SUMMARY STATUS REPORT.

OCCUPANCY: NO CHANGE

CONDITION OF OCCUPANTS: GENERALLY QUIET - MINOR COMPLAINTS DUE TO CROWDING. SICK AND DISABLED 34

HABITABILITY: DIFFICULTY IN KEEPING TEMPERATURES DOWN AND ADEQUATE VENTILATION

DOSE RATE ONE-HALF TO TWO R PER HOUR

TOTAL DOSE ESTIMATED 10 TO 50 R

SUPPLY - FOOD: 9 DAYS WATER: 8 DAYS
NO OTHER CHANGES

AREA POPULATION: SOME MOVEMENT OUTSIDE: INDIVIDUALS SEEKING WATER

AREA ENVIRONMENT AND RESOURCES: NO CHANGE

COMMUNICATION: NO CHANGE

PROBLEMS: HAVE BEEN SHUTTING DOWN GENERATOR FOR SHORT PERIODS TO SAVE FUEL. ABOUT 12 HOURS OF FUEL REMAIN. WILL SEND OUT VOLUNTEER TEAMS TO GET FUEL FROM CARS BEFORE SUPPLY IS GONE.

Approximate length - 100

II. Sample Messages - Emergency Services to EOC

Unscheduled Priority

PE1 Initial Emergency Status.

THIS IS POLICE CONTROL. WE HAVE FULL OPERATING CREW. SUPPLIES ARE SUFFICIENT FOR TWO WEEKS. HAVE RADIO CONTACT WITH STATE POLICE HEADQUARTERS, THE COUNTY SHERIFF'S OFFICE, THE CITY TRAFFIC CONTROL CENTER, AND ALL PRECINCT HEADQUARTERS BUT 8TH STREET. 25 PATROL CAR UNITS ARE IN ASSIGNED AREAS. 5 UNITS AVAILABLE HERE. HENRY.

Approximate length - 55

PE2 Change in Status.

THIS IS POLICE CONTROL. HAVE LOST RADIO CONTACT WITH ALL SUBSTATIONS. OPERATORS BELIEVED TO BE SEEKING BETTER SHELTER. HENRY.

Approximate length - 20

ES Status Summary.

THIS IS POLICE CONTROL. WE HAVE ABOUT FORTY SQUAD CARS NOW OPERATING. MOST ARE IN THE NORTHEAST SECTION OF TOWN WORKING WITH FIRE SQUADS IN RESCUE AND DECONTAMINATION. HAVE SIX SQUAD CARS AND TWENTY POLICE IN RESERVE AT 8TH STREET PRECINCT. CAN COMMUNICATE WITH ALL CARS OVER POLICE NET. HENRY.

Approximate length - 50

PE3 Area Environment.

THIS IS POLICE CONTROL. FIRE HAS BROKEN OUT IN BUILDINGS IN OAK LANE SHOPPING AREA AND IS SPREADING NORTH TOWARD NEWGATE SCHOOL WHICH IS BEING USED AS A SHELTER. FOOD STORES IN AREA ARE ALSO THREATENED. HENRY.

Approximate length - 40

PE4 Population Conditions.

(1) THIS IS POLICE CONTROL. LONG LINE OF TRAFFIC MOVING OUT OF CITY IN BOTH LANES OF SOUTH BOULEVARD. MOVEMENT SPEED APPROXIMATELY 20 M.P.H. MOST CARS HEAVILY LOADED. HENRY.

Approximate length - 30

(continued)

II. Sample Messages - Emergency Services to EOC (Continued)

(2) THIS IS POLICE CONTROL. MANY PEOPLE TRAPPED BY COLLAPSE OF BUILDINGS IN 500 BLOCK JONES STREET. VOLUNTEERS DIGGING WITH HANDS AND SMALL TOOLS. EARTH-MOVING EQUIPMENT CAN BE USED IF IT CAN BE PROVIDED. ABOUT 50 SERIOUSLY INJURED ARE BEING TREATED BUT NOT BEING MOVED. HENRY.

Approximate length - 45

PE5 Area Resources.

(1) THIS IS POLICE CONTROL. PEOPLE HAVE BEEN FILLING WATER CONTAINERS FROM FIRE HYDRANTS IN BROOKLYN AREA. FLOW HAS DROPPED SERIOUSLY OR NEARLY STOPPED AT MOST PLACES. UNABLE TO FIND ANY BROKEN MAINS IN THIS AREA. HENRY.

Approximate length - 35

(2) THIS IS POLICE CONTROL. THERE ARE AT LEAST 5 LOADED REFRIGERATOR CARS PROBABLY CONTAINING MEAT, AT THE CROSS STREET STATION. NO EQUIPMENT AVAILABLE FOR FORCING CARS OPEN. NO TRUCKS OR PERSONNEL FOR MOVING FOOD. HENRY.

Approximate length - 35

PE6

THIS IS POLICE CONTROL. CREWS HAVE LEFT TELEPHONE REPAIR TRUCK AT HANES AND JONES STREET. TELEPHONE LINES DOWN IN THAT AREA. HENRY.

Approximate length - 25

III. Sample Messages - Installations to EOC

Unscheduled Priority

PI1 - Initial Status Report.

(1) THIS IS NORTHSIDE HOSPITAL. 32 NURSES, 12 DOCTORS, 10 OTHERS ON DUTY. 110 OF 300 BEDS ARE OCCUPIED BY PATIENTS. WE ARE MOVING OPERATIONS TO CENTER AREA OF BUILDING FOR FALLOUT PROTECTION. FDH AND SUPPLIES INTACT. HAVE RADEF EQUIPMENT READY FOR MONITORING. CAN COMMUNICATE BY RACES NET IF TELEPHONE IS OUT.

Approximate length - 55

(2) THIS IS THE AMCO PLANT. PLANS FOR EMERGENCY OPERATIONS ARE BEING IMPLEMENTED. SOME MAINTENANCE AND SUPERVISORY PERSONNEL ARE ON HAND AND OTHERS ARE EXPECTED. FAMILIES ARE MOVING INTO SHELTER AREAS. CAN COMMUNICATE BY RACES NET IF TELEPHONE IS OUT. HAVE SUPPLIES FOR 1,200 PERSONS FOR TWO WEEKS.

Approximate length - 50

PI2 - Change in Capability.

THIS IS NORTHSIDE HOSPITAL. WATER SUPPLIES AND ELECTRICAL POWER HAVE BEEN DISRUPTED. HAVE STARTED EMERGENCY GENERATORS. HAVE FUEL FOR 32 HOURS OF OPERATION. WATER SUPPLIES WILL ONLY LAST FOR 3 OR 4 DAYS. TWO OF DOCTORS HAVE LEFT TO JOIN FAMILIES AT SHELTERS.

Approximate length - 45

(Messages reporting change in area environment, population, resources, and other emergency services will be similar to those of Emergency Services.)

IV. Sample Messages - Special

Inquiry: Shelter to EOC.

THIS IS SHELTER BRAVO SEVENTEEN. THE NUMBER OF PERSONS WAITING OUTSIDE OUR SHELTER EXCEEDS THE NUMBER OF SPACES AVAILABLE BY SEVERAL HUNDRED. CAN YOU DO SOMETHING TO DIRECT THEM TO OTHER SHELTERS?

Directive: EOC to Shelter.

ANNOUNCE TO THOSE OUTSIDE SHELTER THAT ADDITIONAL SHELTER SPACE IS AVAILABLE AT THE FOLLOWING BUILDINGS: 200 DOMINION STREET, 310 EAST STREET, AND 348 EAST STREET. LISTEN TO EBS ANNOUNCEMENTS FOR ADVICE AS TO ARRANGEMENT OF SHELTER SPACE.

Inquiry: Shelter to EOC.

THIS IS SHELTER BRAVO SEVENTEEN. ARE BULLDOZERS AVAILABLE IN THIS AREA FOR USE IN LOOSENING DIRT FOR IMPROVING SHELTER?

Advisory: EOC to Shelter.

BULLDOZERS PROBABLY NOT AVAILABLE. IMPLEMENT OTHER EXPEDIENT MEASURES FOR SHELTER IMPROVEMENT AS DESCRIBED IN SHELTER MANAGER MANUAL. TIME AVAILABLE BEFORE FALLOUT ARRIVAL AT YOUR SHELTER ESTIMATED AS FORTY MINUTES.

Inquiry: Fire Headquarters to EOC.

THIS IS FIRE HEADQUARTERS. HAVE EQUIPMENT AT STATIONS 2 AND 8 IF CREWS CAN BE ASSEMBLED. HOW MANY REGULAR OR AUXILIARY FIREMEN ARE IN SHELTERS NEAR THESE STATIONS?

Inquiry: EOC to Specific Shelters.

REPORT NUMBER OF REGULAR AND AUXILIARY FIREMEN WHO CAN BE USED UNTIL FALLOUT ARRIVAL.

(continued)

Response to Inquiry: Shelter to EOC.

THIS IS BRAVO SEVENTEEN. FIVE FIREMEN HERE. FOUR WILLING TO REPORT FOR DUTY AT NEARBY STATIONS.

THE RESEARCH TRIANGLE INSTITUTE, Research Triangle Park, North Carolina
OCD Work Unit 4631 B - Final Report R-OU-222

Definition of an Information System for Civil Defense Emergency Operations
E. Robert Brooks, J. C. Caldwell, T. Johnson, and F. D. Kennedy
10 November 1967. (UNCLASSIFIED)

In this study, operational concepts are defined for emergency operations at local, state, and federal levels of civil defense. Types of actions to be taken by operations centers and the information for decisions about these actions are identified.

At the local level, an organization for emergency operations is assumed, and required types of messages and prestored data are determined. Probable message lengths are determined from sample messages, and the frequency of messages are estimated for various environmental conditions (such as after some blast or fire damage and prior to the arrival of fallout). A staff organization and procedures for decision making are described, and responsibilities for information processing, storage, and display within staff sections are given. Requirements for shelter-operations center communications in the assumed organization are determined, and the effect of additional factors on communication requirements for specific civil defense organizations are shown.

Types and estimates of the volumes of messages to be provided to state and regional emergency headquarters, and staff responsibilities for information processing at these headquarters are also given.

Major recommendations of the study are (1) that the message formats and reporting procedures developed in the study be made part of the Federal Civil Defense Guide; (2) that the methods for information system analysis described in the report be used in the development of prototype emergency information systems for specific local and state organizations; and (3) that the civil defense emergency information system at the national level be considered and designed as part of the overall national emergency information system.

CIVIL DEFENSE, EMERGENCY OPERATIONS, INFORMATION SYSTEM.

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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)
Research Triangle Institute
Post Office Box 12194
Research Triangle Park, North Carolina 27709

2a. REPORT SECURITY CLASSIFICATION
UNCLASSIFIED

2b. GROUP

3. REPORT TITLE
Definition of an Information System for Civil Defense Emergency Operations

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

5. AUTHOR(S) (Last name, first name, initial)
Brooks, E. Robert, J. G. Caldwell, T. Johnson, and F. D. Kennedy

6. REPORT DATE	7a. TOTAL NO. OF PAGES	7b. NO. OF REFS
10 November 1967	156	3

8a. CONTRACT OR GRANT NO.	9a. ORIGINATOR'S REPORT NUMBER(S)
OCD-PS-64-201	R-OU-222
8b. PROJECT NO. Work Unit 4631 B	
8c. SRI Subcontract B-70934(4949A-53)-US	9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report)
8d.	

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11. SUPPLEMENTARY NOTES	12. SPONSORING MILITARY ACTIVITY
	Office of Civil Defense (OCD) Department of the Army Washington, D. C. 20310

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DD FORM 1 JAN 64 1473

UNCLASSIFIED
Security Classification

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14 KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
CIVIL DEFENSE	5	3				
EMERGENCY OPERATIONS	9	3				
INFORMATION SYSTEM	8	4				

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