

Working Paper 12

LESSONS OF THE ALASKAN EARTHQUAKE

FOR

COPING WITH DISASTER

by

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LESSONS OF THE ALASKAN EARTHQUAKE FOR COPING WITH DISASTER:

Improving National and Local Response to Disaster

Introduction

1. COMMUNICATION

A. Warning

(1) Ascertaining the Nature and Probability of the Threat -

The problems of predicting the occurrence and intensity of earthquakes per se and the mechanisms by which tsunamis are generated will not be considered here. (See _____ in Vol. ____ for such discussions.) There are two types of earthquake hazard; ground movement involving fissures, slides and falling debris and tsunamis which may produce injury and death for persons in boats and in low lying coastal areas. The Good Friday earthquake included all of these.

At the present time it appears that no warning system regarding land movement hazard is feasible. The movement of the ground in quakes of moderate or severe intensity appears to be sufficiently obvious to almost everyone that the event provides its own warning signs. Persons who are ambulatory can take protective measures provided that they understand what the most effective measures are. The Alaskan experience suggests that the following actions will minimize the probability of injury and death:

At the first indication of an earthquake:

a) Move as quickly as possible to locations where falling objects (light fixtures, ceiling plaster, bricks, stones, signs and utility lines) can not hit you. Preferred locations are in a doorway, under a heavy table or desk, or in a closet.

If you are at a gathering where congestion may be a problem (e.g. - at church, in a theater) the rules does not apply. In that event you should remain seated or standing where you are since any quick movement by you may lead to panic behavior by others which will only increase the probability of injury.

The injury and death which resulted from falling debris at Penny's store in Anchorage could probably have been avoided if the persons had moved quickly to a doorway or had gone inside the building.

b) Move away from low lying coastal areas.

In Valdez the docks apparently collapsed very quickly and were submerged in the bay. Buildings in the same or similar locations would probably have fared no better. While it is usually safer to stay inside buildings this situation is an exception. The same is true for buildings located on a bluff.

c) If you are in a building situated on a bluff or are outside on a bluff area you should move away from the bluff as rapidly as possible. Some persons were injured and killed while still in their houses in the Turnagain bluff area.

d) If you can't get into a safe building or are moving away from coastal or bluff areas you should try to stay away from buildings, utility lines and any structure which might collapse; e.g. - steel towers, large bill boards.

By far the largest number of deaths and injuries in the Good Friday earthquake resulted from unusual water movement -- tsunamis generated by the major quake activity and more localized submarine slides. In many of the affected communities in Alaska the only warning provided the residents prior to the initial wave action was the ground vibration of the earthquake itself. In most of these cases the community was so close to the epicenter or source of wave action that no man-devised warning

system could have appreciably reduced the incidence of death and injury. The lesson to be learned from the early minutes of the disaster in Seward, Valdez, Kodiak, Chenega, Old Harbor and other small villages is simple:

a) At the first sign of an earthquake move as rapidly as possible away from low lying areas around any sizeable body of water. Take persons who cannot walk with you but do not pause to take any of your material possessions. Go to high ground away from the water; distance from the normal water line is not the crucial factor; it is the height of your location that will save you. Stay at your safe location until official word is received that all danger is past. Do not allow the receding water to fool you; additional and larger waves after the first one are almost a certainty. Attempting to save a prized possession may cost you your life!

b) If you are in a boat, especially a small boat, and are near shore you should get to the nearest land as soon as possible and run for high ground. In Kodiak, _____, and _____ persons in boats that were initially near the shore lost their lives. Those who managed to get to shore and stayed there did not. In a few cases persons who were in boats which were at sea or who managed to get their boats out away from the shore a considerable distance were safe.

As the residents of Crescent City, California learned during the early morning hours of March 28, 1964 an earthquake can cause damage and death thousands of miles from its epicenter. Although the average citizen may not realize it, persons residing in or visiting in low lying coastal areas anywhere on the rim of the Pacific Ocean or on islands in the Pacific face danger from tsunamis from earthquakes occurring anywhere in or near the Pacific basin. Since ground vibration cannot be felt more than a few hundred miles away from the epicenter of an earthquake most threatened communities are dependent upon other warning mechanisms. The Crescent City experience clearly indicates that some better method

must be found for promptly ascertaining with greater certainty whether or not seismic sea-waves have been generated by an earthquake. (See William Anderson, Crescent City-Hilo paper.) At Crescent City the official warning message that a tsunami had in fact been generated was received only ten minutes before the first wave struck. The originators were apparently relaying promptly the information available to them. The information was not available in time. Unnecessary death and injury followed.

(2) Transmittal of Warning to Relevant Organizations and the General Public -

Using the FBA and Defense Communications network the Honolulu Observatory of the U.S.C.G.S. sent out three different "warning" messages following a standard format. The first at 0532 (G.M.T.) said, "This is a tidal wave advisory. A severe earthquake has occurred at latitude 61 N., longitude 147.5 W., vicinity of Seward, Alaska at 0336Z, 28 March. It is not known, repeat not known, at this time that a sea wave has been generated. You will be kept informed as further information is available. If a wave has been generated, its ETA for the Hawaiian Islands (Honolulu) is 0900Z, 28 March".

The second message at 0538, labeled an "information" bulletin stated that it was not yet known whether a seismic sea wave had been generated. All participants in the SSWS were given estimated times of arrival of the first wave if one had been generated.

The third and final bulletin at 0630 said, "This is a tidal/seismic sea-wave warning. A severe earthquake has occurred at

latitude 61 N., longitude 147.5 W., vicinity of Seward, Alaska at 0336Z, 28 March. A sea-wave has been generated which is spreading over the Pacific Ocean. The ETA of the first wave at Oahu is 0900Z, 28 March. The intensity cannot, repeat, cannot be predicted. However, this wave could cause great damage in the Hawaiian Islands and elsewhere in the Pacific area. The danger may last for several hours." (ETA's were repeated).

The final message, the only one to specify that a wave had been generated, was of no value to the coastal communities of southcentral Alaska because they had been inundated at least two hours before the bulletin was sent; in fact, they had been hit even before the initial (advisory) bulletin had been released.

Distinction between "advisory," "alert" and "warning" should be maintained and continually reinforced. Need system for round-the-clock receipt of messages. Format of messages should be so standardized that interpretation is not required at the local level. Fail safe procedure for sounding sirens needed.

Local communities should develop a communication plan so that persons who desire to do so may take "precautionary action." E.g., when an "advisory" is received at some central location owners of business establishments who wish to be can be notified so that they can remove valuable records, etc. even before the "alert" message is received.

Need system for direct notification of all relevant community organizations such as fire department, hospitals, public works department, etc.

Direct communication necessary from point of initial message

receipt to all radio and TV stations. Should include an arrangement so that even if there is only a "skeleton" staff on duty at radio or TV stations the message will in fact come to the immediate attention of a staff member who is authorized to put it on the air. In communities without twenty-four hours a day broadcasting schedules special arrangements need to be made with one or more local radio stations to begin broadcasting promptly when an alert has been received in the community.

Electronic mass media should be urged to pre-plan special program material to meet the following objectives:

- a) Keep the public continuously informed of the probability of impending danger.
- b) Reinforcement of information concerning the appropriate action to be taken by general public.
- c) Educate the public concerning the general nature of the hazard and the limitations of current knowledge and technology in predicting accurately the timing and extent of probable damage.

Evidence from Hawaii and other disasters suggests that continuous "emergency programming" will be more effective than sporadic announcements interspersed with regular programming.

CD or some similar agency should take the responsibility for providing the specialized knowledge required to meet the three objectives stated above. If such knowledge is not provided and made readily available to the stations, announcers who have the best of intentions but lack the necessary expert knowledge will frequently confuse and misinform the public. It is also important to remember that the average citizen may not understand the technical language used in the standardized alert and

warning messages; careful and repeated interpretation by qualified persons is necessary. Similarly, the content of programming material to meet objective "c" requires explanation and interpretation based on expert knowledge.

The effective use of sirens as communication devices requires that the public know the meaning of the different signals emitted. While a variety of teaching devices should be used probably none is more crucial than instructions and explanations printed in documents known to be widely distributed and readily available to most citizens, e.g., the local telephone directory.

(3) Related Problems -

Perhaps there is nothing more certain in disaster than the fact that many persons will converge on centers of activity or at "points of interest." When sirens and the mass media convey the message of impending threat it must be assumed that persons will gather to "watch the action." In the case of tsunamis this means that the curious will go to "watch the waves come in" and this frequently means that they will go to the waterfront areas. Thus, communications designed to warn the public to prepare for evacuation or to actually evacuate will have the reverse effect on a part of the population. According to newspaper reports this was a common occurrence at several points along the Pacific Coast following the Good Friday earthquake.

Controlling the curious in such situations calls for three interrelated efforts all of which need to be planned in advance:

- a) Establish a perimeter around hazardous areas and have law enforcement officers prohibit entry to the curious.
- b) Have the electronic mass media repeatedly warn the population to stay away from the danger areas.
- c) Evacuate all persons from the danger zones. (In rare cases, persons in certain tsunami resistant structures may need only to move to the upper floors.)

During peacetime in the U.S. civil authorities can not legally force citizens to evacuate their homes; they can only advise them to do so. In communities which have recently been hit by tsunamis such advice seems to have the desired result almost without exception. There is some evidence that the problem is more acute in communities which have had repeated "false alarms." There apathy and occasional hostility are experienced by those urging the evacuation. Needed improvements are as follows:

- a) By improving the technology reduce the proportion of "false alarms" thereby increasing public confidence in the validity of advice to evacuate.
- b) Develop and repeatedly use various public education techniques so that most persons can readily understand the significance of evacuation warnings.
- c) Develop a system for "saturation warning" whereby clearly recognizable public official such as police officers or firemen go through the danger area block by block.

B. Assessment of Damage and Injury

(1) Locating Sources of Malfunction in Communication Systems -

Once a community has been hit by a damaging earthquake and/or seismic sea-waves it is essential that information concerning the extent and location of damage and injury be transmitted promptly and accurately to those persons and organizations that

can and will alleviate the problems. Under non-disaster conditions when emergencies occur relevant information is usually transmitted via telephone and radio. Following an earthquake these communications facilities are often impaired. Persons who have knowledge of significant injury and damage often have great difficulty in notifying the appropriate organizations.

The first task, then, is to locate the sources and points of malfunction and correct them so that the standard modes of communication can be used. Electric power distributors and telephone companies usually have trained personnel, necessary equipment and planned procedures for coping with minor disruptions. They may or may not have established plans for coping with widespread and large scale breakdowns in the system.

Recommendation:

Responsible officials in such organizations should ask the question, "What should we do if extensive damage should occur as a result of an earthquake?" Detailed plans should be developed and insofar as possible they should be tested periodically. For example, even if there has not been extensive damage to a telephone system parts of it may become inoperable when thousands of persons try to use the system simultaneously thus overloading the exchange equipment to the point where it malfunctions due to blown fuses or for other reasons. This apparently happened in Anchorage for several days following the earthquake. In Hilo, Hawaii the community disaster plan calls for a telephone repairman to go immediately to each exchange location so that any malfunction there can be located and corrected promptly.

(2) Establishing Priorities for use of Communications Equipment -

Even communication systems which remain fully operable are usually quickly overloaded following an earthquake. With a little planning, organizations with mobile radio equipment can keep less than high priority messages off the air during the early critical

hours following a disaster. Clearly, persons engaged in search and rescue efforts should have immediate access to the fastest and most reliable modes of communication. Arrangements should be made so that they have constant radio communication with hospitals and those who can provide immediate ambulance service.

While reports of damage seldom entail the same degree of urgency involved in reports of injuries it is clear that the optimal response from the responsible organization requires rapid communication of the early assessments of damage. Many of these early damage reports will come via telephone from citizens in the community if phone lines are available. Anchorage organizations suffered ~~both~~ from an insufficient number of phone lines as well as a larger system that was only partially functioning.

Several solutions need to be considered.

a) Each organization should have at least one telephone the number of which is known only by a small number of outside organizational officials who are likely to have access to early damage reports. All too frequently critical information is known in one organization but does not get relayed to other organizations which need it until hours later. Planning for such communication is just as crucial as providing the necessary equipment. If the cost of maintaining such a seldom used system is considered prohibitive a near by public telephone can serve the same purpose, though less conveniently, if the phone number is known by the relevant officials.

b) Since earthquakes, hurricanes and tornadoes often disrupt the telephone system stand-by radio equipment is often essential. At the very minimum each municipal agency should have radio monitoring equipment and qualified personnel to utilize it so that it will have immediate access to information which is relevant to its' operation. The ability to monitor police and fire department radio channels is particularly critical during the early hours following a disaster.

In contrast to receiving or monitoring equipment, access to broadcasting or transmitting equipment should be carefully

limited. Only persons who have clear responsibility for rescue and damage assessment (in addition to regular users) should have access to broadcasting equipment. An overloaded radio channel is almost useless.

(3) Supplemental and Alternative Means of Communication -

In light of the Alaska experience the following modes of communication should be considered.

- a) Amateur ("Ham") radio - If carefully planned in advance this can be a most useful system. Especially important are ham radio sets which are installed in vehicles. By systematically deploying such radio equipped vehicles throughout the impacted areas, injury and damage assessment reports can be transmitted to the appropriate points promptly. Such a system has the advantage of not being dependent on standard sources of electric power and above all it is highly flexible due to the relative ease of mobility. In addition the range of transmission is important for inter-community communication. It has several disadvantages: Ham operators normally hold other full time jobs which might interfere with their availability when needed; they are usually volunteers in this context and thus problems of command and control may exist; fuel supply may occasionally be a problem; in floods and massive earthquakes the mobility of the vehicles might be limited.
- b) Citizens Band radio - The emergence in recent years of Citizens' Band radio clubs provides another significant alternative. This system has many of the same advantages and disadvantages as the ham radio system. A significant handicap is its much shorter range of effective transmission; in large metropolitan areas it may be limited to a few miles or even less if the city is built on hilly terrain. In addition frequencies desired for emergency use might be utilized simultaneously by business enterprises which have radio equipped vehicles.
- c) Radio equipped taxis - In Kodiak taxis proved to be an invaluable resource. Here is an established, functioning system that can often be pressed into service as an emergency communication network. It usually includes a central dispatching unit with a reasonable range of transmission. The number of vehicles available can be determined almost immediately and sent to desired locations. Since the drivers are regular employees of a business firm problems of command and control are usually minimal.
- d) Radio equipped vehicles of "non-emergency" public agencies - In many communities there are many city, county and state agencies whose responsibilities may not call for direct involvement in the immediate emergency activities following a disaster.

Some of them are almost certain to have a number of radio equipped vehicles. If adequate prior planning is done they can be of great value.

e) Human messengers - When the electronic modes of communication are inoperable or overloaded, communication between organizations or parts of the community need not stop completely. After all even in an electronic age, the U.S. Post Office and Western Union still find human carriers quite indispensable! With a little planning Boy Scouts and other volunteer messengers can do very well especially over short distances. Volunteers with cars can be used to supplement the walking messengers. It may not be a very exotic procedure but it worked in Alaska and can work elsewhere.

(4) Receipt and Distribution of Injury and Damage Assessment Information -

If early information on the scope and nature of the impact is to be of maximum value it must, of course, get to the appropriate points in the community. If the injured are to get the fastest possible and most adequate medical care hospitals, especially the emergency rooms, need to know whether an unusually large number of patients is to be expected.

An effort should be made to establish some system so that each medical facility will be notified promptly of the demands which will probably be placed on it. Radio equipped ambulances and a single dispatching center could satisfy this need. On a related matter it should be remembered that the first person to know about a disaster caused injury will usually be someone who knows very little about ambulance service in the community. Having a single, widely-publicized telephone number for such service should help to reduce the time which elapses between injury and the application of qualified medical attention.

The damage which is produced by a disaster such as an earthquake may range from damage to buildings, roads, bridges and

disruption of electric and telephone lines, water, gas and sewer lines to extensive flooding and fires. In each case the appropriate agency or organization must find out the nature and extent of the damage before any meaningful response can be made. While electric and telephone companies typically have skilled personnel and organizational procedures for quickly locating disruptions and repairing the damage the Alaskan experience suggests that many other kinds of damage are not so quickly located and reported to appropriate points.

Responsible community officials need to ask themselves a series of questions.

- a) Exactly who should have direct responsibility for the initial search and rescue efforts? To whom should they report their findings? How frequently? By what mode(s) of communication?
- b) Who shall be responsible for the initial assessment of damage? What skills do they need to have? What equipment, if any? To whom shall they report their findings? How frequently? By what mode(s) of communication?
- c) Are different skills needed for assessing damage to large commercial and public buildings as contrasted to smaller residential and commercial buildings?
- d) Since tall damaged buildings might collapse and thereby are a potential public hazard, who should make such an initial determination? To whom shall the decision be reported?
- e) What arrangements need to be made for rapid and accurate communication among responsible organizations so that damage information known to one organization will be distributed promptly to others needing it?

Until such questions are answered and the technical and organizational means for carrying out the decisions are operative public officials have not met their obligation to the welfare of the community.

One final point in this area should be mentioned. An early

report on the functioning of organizations in Anchorage following the earthquake noted that there was a tendency for information coming to an organization to stay with the recipient. Unless there is some previously established procedure for recording and circulation of critical pieces of information throughout the organization it usually doesn't happen. At best, only a very limited amount of such information gets circulated and that is done in a hit or miss fashion. While "paper work" needs to be held to a minimum information concerning death, injury and damage needs to be systematically and accurately distributed throughout an organization, especially during the early, critical hours. Such information is, after all, the major basis for deciding on the organizational response that should be made.

C. Response to Reports of Damage and Injury

If there is to be any serious effort at coordinating the various response efforts in the community a continuing flow of prompt, accurate reports of actions of organizations, groups and individuals must come in to one or a few communication centers. To the same communication center should come many if not most of the inevitable offers of help (personnel, equipment, specialized skills and resources). It is only through such an arrangement that duplication of effort and neglect of certain needs can be minimized.

The location of such a center should, of course, be predetermined and should be designed to utilize, insofar as possible, already established communication networks which are operative daily and have a supply of skilled communicators. As Alaskans soon learned, auxiliary electrical power sources are extremely important for many reasons, but

especially for communication. They also learned that reliance on a single mode of communication (e.g., - telephone) can play havoc. Some alternative and supplementary modes of communication are discussed in the preceding section and, therefore, will not be discussed here.

In Anchorage as elsewhere in Alaska there was a tendency for information about damage and offers of help to flow into various organizational headquarters. In many cases messages were received at the appropriate center but frequently they came to inappropriate points further aggravating the problem of communication overload. The police department, for example, often received messages dealing with matters which were not within the scope of police responsibility. One way of reducing this unnecessary communications overload is to prepare in advance a "communications guide" for the general public. It should specify where various kinds of messages should go, e.g., "If you observe broken telephone lines, report the matter immediately to ____." Such a guide should have wide distribution such as being printed yearly in the local telephone directory. Following a disaster it should be broadcast repeatedly via radio and TV.

It is generally conceded that county officials and organizations have an obligation to provide "public information" -- information about what is being done to restore the community to its normal state. In the early days following the Good Friday earthquake Alaska Civil Defense officials and representatives of the other departments of state government working at State Civil Defense headquarters were repeatedly harassed for information by representatives of the news media and by citizens of the community of Anchorage. Their work load was already unbearable and these additional demands, which were reasonable for the most part, forced

them to repeatedly lay aside really urgent matters for a time so that they could provide the requested "public information."

The lesson to be learned is fairly obvious. Every organization that is likely to be involved in coping with a disaster needs to have plans whereby one or more persons who have public information skills are assigned to the specific responsibility of collecting, collating and disseminating information which is certain to be demanded by the public and news media representatives. This is especially necessary for all public agencies such as Civil Defense, Police and executive units of municipal government. On some occasions it may be desirable for the mayor or head of an organization to personally appear for the release of information, e.g., when information concerning the number of dead and injured is first given out and when major policy decisions are to be announced, but under most circumstances such officials will be so deeply involved in other activities that adequate handling of this task can only be done by persons specifically assigned to the public information function.

2. COORDINATION

It should be clear from the previous discussion that any meaningful coordination of the multiplicity of disaster-related tasks requires a complex, reliable communication system. Having such a system, however, is a necessary but not a sufficient condition for effective coordination.

At a minimum successful coordination also requires a comprehensive set of pre-established voluntary agreements regarding areas of responsibility among the various organizations and groups which are likely to get involved in coping with disaster-created problems. Since it is unlikely

that all of the disaster-created problems can be accurately anticipated, some additional agreements and understandings will need to be arrived at as promptly as possible after the consequences of the impact are known.

Within each organization and among certain constellations of organizations, e.g., municipal governmental agencies, established authority relations may serve in lieu of voluntary agreements. That is, officials at the highest levels of authority may order the various agencies, divisions and groups to accept responsibility for certain regular and even non-regular tasks if and when a disaster occurs. But even in this case some unanticipated, problematic situations are likely to arise in the immediate post-impact period and someone will need to make and enforce decisions if duplication of effort and neglect of certain needs are to be avoided.

In short, regardless of the extensiveness of prior agreements and/or established lines of authority someone needs to know (a) the extent of death, injury and damage, (b) the consequences for normal functioning in the community, and (c) what efforts are underway by whom with what results, so that duplication and gaps in effort can be reduced to a minimum. This coordination can come about either through the direct use of authority, as in a military campaign, the securing of voluntary agreements or some combination of both. In United States communities the various organizations and groups attempting to cope with a disaster always include both public and private agencies making voluntary agreements a necessity in any coordination effort. In all cases, however, there needs to be a continual flow of information about what needs to be done and what is being attempted. In order to be effective this must be a two-way flow between the acting agencies and groups on the one hand and the coordinator(s) on the other.

A. The Emergency Period -

The most difficult coordination problems in the Good Friday earthquake came in the search and rescue efforts carried out in the early hours of the emergency period. It is not difficult to understand why this was the case. With a general failure of electric power it was difficult to tell just where physical damage and therefore probable injury had occurred. Without previously established plans for comprehensive and rapid reconnaissance of the entire community it was impossible for any official to quickly organize and dispatch search and rescue teams. Therefore, search and rescue efforts in Anchorage and to a lesser degree in other communities started slowly and a considerable amount of duplication of effort occurred.

The following recommendations should be considered in planning for search and rescue operations.

(1) The community should be divided into pre-designated "search and rescue areas." The size of an area should be such that an eight man search and rescue team could be expected to complete its reconnaissance in less than one hour.

(2) Each team should have a Captain, Alternate Captain and eight other members. It must be assumed that one or two of the team members will not be available on any given day so that while the total team size should be ten the anticipated size of a team in action would be eight.

(3) Team members should be selected from persons whose normal occupational commitments can be readily suspended during a disaster-caused emergency.

(4) Team members should live and work in or near their designated

"search and rescue area."

(5) Training of the members should be conducted by or at least under the auspices of the Fire department. It should cover search and rescue techniques and first-aid knowledge and skills.

(6) Each team should have a designated primary and an alternate place to assemble in the event of an emergency. Responsibility of coming to the point of assembly should be placed with each individual member. When in doubt about the need to assemble the member should telephone the captain. If for any reason that call is not possible each member should go immediately to the assembly point in order to ascertain if his services are needed. In short, when a members hears of the occurrence of any event in his "search and rescue area" which might involve persons being trapped in buildings or injured he should understand that it is his responsibility to ascertain whether or not his services are needed by contacting his team captain.

(7) Each team member should have a kit which includes an up-to-date map of his area of the community which shows all buildings. Also included should be a flashlight and standard first-aid supplies. In addition each member should have heavy shoes and warm clothing readily available.

(8) Stored in a secure place at the primary and alternate assembly points should be other basic equipment needed for search and rescue: extra flashlights and first-aid supplies, "hard hats," a walkie-talkie radio for each two-team-members and light weight rescue equipment such as crowbars and litters.

(9) Each member should have two forms of identification; appropriate insignia on his "hard hat" and an ID card to be carried in his billfold. Entrance into restricted areas should be assured for any person showing proper identification.

(10) The S&R teams should be a special type of fire department auxiliary for the following reasons:

a) The fire department is best qualified to provide the necessary training.

b) The fire department has an established radio and communications capability including a dispatcher and assigned radio frequencies which are crucial for any effective S&R function.

c) Affiliation of S&R teams with an established and respected community agency will reduce problems of entrance into restricted areas and increase the likelihood of gaining the cooperation of hospitals and ambulance services.

(11) In communities where flooding may occur each team needs to have arrangements made for the use of boats; arrangements which guarantee their availability at all times.

(12) The captain and alternate captain should have radio equipped cars. This will make it possible for them to report periodically to the fire department communications center on the progress being made and to request promptly the dispatching of ambulances when needed.

(13) One member of each S&R team should be assigned the task of making a rapid and necessarily gross estimate of the extent of physical damage to the area. This estimate can then be sent via the captain's radio to the fire department dispatcher who in turn would have the responsibility of transmitting it to all of

the appropriate agencies.

(14) The success of any complex effort such as S&R depends to a large degree on practice. Periodic exercises are mandatory.

B. Early Rehabilitation Period (one to seven days) -

The complex interdependence of the various functions and organizations in a community becomes more obvious than usual when a disaster has disrupted the normal flow of events. In Alaska as in other disasters the need for some coordination at the community level soon became recognized and was followed by a variety of attempts at coordination.

An Emergency Operations Center

At the very minimum each involved organization needs to know what almost every other organization has done since impact, is now doing and is planning to do in the near future. This can be done best by establishing in advance an emergency operations center (EOC) and a set of general procedures to be followed in case of a community-wide emergency. The office of Civil Defense at the federal, regional and state levels has developed a series of guidelines for EOC's designed for use in a military emergency. Many of their suggestions can be used in planning for a natural disaster.

Since such guidelines are readily available to community leaders, no attempt will be made here to describe in detail how an EOC should work. Rather, the discussion will be confined to some of the more significant functions which such a coordination center should provide.

(1) Continuous information exchange -

Information regarding community needs, offers of assistance

and the activities and plans of every involved organization should flow into EOC where all organizational representatives who need it can have ready access to it.

(2) Rapid decision making -

With all of the available information centered at one location the heads of organizations, both public and private can confer as necessary on a convenient face-to-face basis and make decisions which commit their organizations to the performance of needed tasks. This should minimize duplication of effort and the inadvertent neglect of bona fide needs.

(3) Recording of communication and decisions made -

Every organizational head located in the EOC will need to be in continuous contact with his own organization. By keeping a communications log which also includes a record of decisions made members of each organization will have a ready reference source which is needed for several purposes: preparation of public information releases, as a basis for briefings to be given at periodic meetings with other officials, to provide a means for relief personnel to be updated on what has occurred, and for preparing after-action reports or critiques when the emergency is over.

(4) Convenient location for meetings with state, regional and national officials -

If the community is included in a federally-designated disaster area, representatives from the President's Office of Emergency Planning, the Small Business Administration and a number of other officials will want to meet with the heads of

many community organizations and agencies. This can be accomplished most conveniently in or near the EOC since most of the interested officials will already be stationed there.

Coping With Convergence

When the occurrence of a disaster becomes widely known gifts, both material and monetary, and offers of manpower, skill and equipment soon begin to flow in from near and far. The disaster area seems to function like a magnet in this respect. There is, therefore, the inevitable problem of convergence.

While most of the offers and contributions may spring from the purest of motives, the result is not usually an unmitigated blessing. Perhaps the situation is best characterized as "over response" and "irrelevant response." The tide of material gifts is often the most bothersome. When a truckload of unsorted, used clothing arrives in the community there are immediate problems of storage, sorting and distribution. When a large shipment of unneeded medical supplies suddenly appears at the local airport someone must decide where to take it and if and when it should be used.

Some gifts, of course, have been requested by and are sent to specific organizations. In such cases it is reasonable to assume that the requesting organization has both available storage space and established procedures for utilizing the material received. But in Alaska and in other disasters shipments arrived which had not been requested in any formal way and the addresses many times have been vague; e.g., "Disaster Committee," "City Council," "Mayor's Office." If an EOC has been established it will be the place where the most

complete information regarding the range of community needs is kept. By designating someone as "materials coordinator" and assigning him to the EOC this part of the convergence problem can be at least partially alleviated.

A second type of convergence can be handled in a similar manner. When large numbers of persons come to the EOC or call offering their services (and they are certain to do so), a "manpower and equipment coordinator" can estimate the various needs, check with the appropriate organizational representatives located in the EOC and then inform the volunteers where their services are most needed. In most instances the coordinator will need to develop some rapid procedure for ascertaining what are the skills which the various volunteers have to offer. He must also be prepared for the probability that at certain times within the first few days there may be as many as several dozen volunteers milling around waiting for assignments. The logistics of volunteer convergence is not small problem.

Fatigue and Related Factors

While there are many organizations in a community which operate around the clock such as the police, fire departments and hospitals, there are many which have only a single shift of workers. When a large-scale emergency arises which requires continuous operation for several consecutive days the single shift organizations face a critical problem.

Because of the hectic pace much of the information concerning needs, resources and plans which comes to an official actively engaged in emergency operations is not written down but is simply "kept in his

head." As the hours fly by he quite understandably comes to feel that the operation would be seriously impaired if some other person, however competent, were to take his place while he gets some sleep. He feels fully justified in staying "on the firing line" because he "knows" that he is the only person in the organization that has certain critical information. Even when he begins to realize how fatigue has slowed his effectiveness it is difficult for him to entertain the idea that he ought to get some rest and allow someone else to try to carry out his functions. Unless specifically ordered to leave for a period of time to rest he is likely to stay on the job far beyond the point where a rested person, however lacking in information, could do a more effective job.

This is a problem which was not unique to Alaskans following the earthquake. It is the inevitable result of inadequate planning for large-scale emergencies. There are several things that can be done to alleviate the problem. Some procedure for recording incoming and outgoing messages is a must. Even if a notation is only a partial summary of a communication it can be of great value to a "relief man." A record can probably be kept best by an assistant who can take short-hand but almost any record is better than none.

Even though the demands on an organization may seem overwhelming in the first day or two following a disaster, if competent relief personnel are to be available when needed some procedure must be established to insure that those who are going to serve in a relief capacity have had adequate rest. This means, in short, that within the first few hours after impact some decision must be made which stipulates which of the personnel must leave the "scene of action" for rest and

and also when they should return. Failure to do so will certainly impair the effectiveness of the early recovery effort.

3. PLANS AND RESOURCES

Almost any planning is better than none. While the Alaskan experience suggests that no one could have developed plans which would have anticipated every community need and problem which followed the earthquake, nevertheless it should be clear by now that there are certain general problems which any community will face in a disaster and some preparation can be of great value when the community is stricken.

In the preceeding sections of this paper we have suggested some of the problems and demands which emerged following the Good Friday disaster in Alaska. In certain cases some general plans and procedures have been suggested on the assumption that while there are some unique characteristics to every community and some idiosyncratic elements to every disaster, nevertheless there are some common problems and therefore the possibility of common solutions.

It goes without saying that the plans for coping with a large-scale emergency should be tailored to fit each specific community. The nature of the most probable hazard (Floods, hurricanes, earthquakes, etc.) varies among communities as does the kind and amount of relevant resources. Governmental structure also varies from one locality to the next.

Anticipating Probable Damage and Injury

In planning for response to disaster one needs to start by attempting to anticipate the probable scope and severity of impact. There may be a tendency to assume that a "really bad one isn't very likely here." But many Alaskans

would now say that it is better to assume that when "the next one comes it will be as bad or worse than anything in the history of the community." It is probably much better to overestimate the probable destruction and disruption than to underestimate it. In the case of potential damage from floods, earthquakes and tsunamis it is often possible to establish certain "hazard" zones for planning purposes.

In order to avoid undue repetition of some of the points made earlier in this article we will list here the major areas of concern which should be taken into account in planning for community response to disaster. In most cases the discussion will be brief since the problem has been treated under the heading of "communication" or "coordination" or both.

Major Types of Response Thought to be Necessary and Appropriate

When those involved in planning have before them an estimate of what the physical destruction might entail plus an estimate of the number of injuries and deaths that might be associated with such a calamity, the next logical question is, "What are the major kinds of tasks that need to be carried out and which should receive first priority?" This should be followed by an attempt to estimate how large and complex an effort it will take to adequately perform each function. This is an important step since without such an estimate it will be impossible to determine whether or not the resources within the community are going to be adequate for the tasks which will be faced.

Available Organized Resources

The question now is, "What do we have available to meet these needs if and when we are faced with such a disaster situation?" Someone must take the responsibility for collecting the information necessary to answer that

question. It can be done in a variety of ways ranging from a series of meetings with organizational officials from both public agencies and private organizations and associations to a formal survey via a mailed questionnaire. It should be remembered that certain types of skills, equipment and critical information may be more readily available on certain days and times of day than at others. It should not be assumed that a disaster will strike at the time of maximum resource availability.

Once a "catalog of relevant resources" is completed it will be necessary to secure commitments from the owners and/or managers of the various resources so that it is clearly established that the resources will in fact be available if needed. These commitments should be secured in writing if possible since oral agreements are easily forgotten especially with turnover in personnel in various organizations. It is also obvious that these agreements will need to be updated yearly.

Now, with estimated needs and available resources "in hand" areas of responsibility should be assigned. It needs to be clearly established that certain persons and organizations have the responsibility for mobilizing the resources and carrying out the efforts necessary to meet the major areas of anticipated need. If it appears that certain types of resources may be in short supply efforts can then be made to eliminate such deficiencies. Some resources may be available at surrounding locations such as military bases, cities and industrial sites.

Need for Specialized Information

Surprising as it may seem the Alaskan experience suggests that certain types of basic information about the community are not readily available immediately following a disaster. We refer here to information regarding the average daily consumption of certain goods and services: food staples

such as bread, milk, meat and baby food; ice, gasoline and whole blood; door-to-door laundry and garbage collection service. Information about the number of residents residing in the "hazard zones" can also be very helpful, especially in planning for evacuation shelters.

Even crude estimates are better than none since it is very difficult to secure such information in the first hectic days following a disaster. It goes without saying that such basic information should be kept up to date.

Communities which could conceivably be isolated by massive flooding in the area should make a special point of keeping such information readily available.

Need for Specialized Equipment and Skills

In most communities it is relatively easy to identify and locate physicians, pharmacists and perhaps nurses if there is an unusual need for their services. By working through the trade unions it is usually possible to secure carpenters and electricians in large number. It should not be assumed, however, that it will be just as easy to secure certain specialized equipment and skilled personnel to meet all of the needs that may arise. Specialized equipment and skilled operators for such work as rescue efforts and debris clearance will often be much more difficult to locate. Cranes and earth-moving equipment may prove invaluable when the "chips are down." Station wagons and small delivery trucks (vans) can be used, if necessary, for mass transportation of injured and dead. Water purification equipment was a critical item in the Alaskan experience. Chemical latrines are often needed in a disaster.

An up-to-date list of such resources has obvious advantages.