A SYSTEMS ENGINEERING PROCESS TO EVALUATE AND ENHANCE THE DISASTER COMMUNICATION CAPABILITIES OF THE AMERICAN RED CROSS

by

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in

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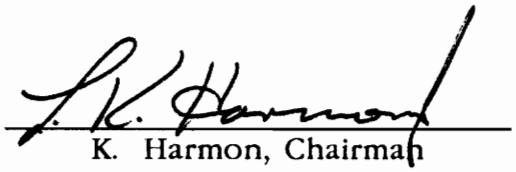

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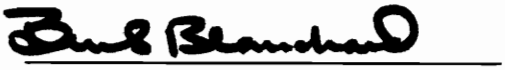

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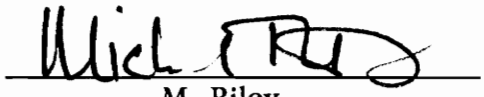

M. Riley

May, 1992
Falls Church, Virginia

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Mark J. McGovern

Committee Chairman: Kenneth Harmon
Engineering Administration

(ABSTRACT)

This project developed a process for developing and evaluating enhancements to the American Red Cross' disaster communication system. The stimulus for this project was a statement from the American Red Cross Disaster Service staff that the present communication system was unable to meet their needs. Some proposals for altering the present system were available, but there was no established means to identify the merits and drawbacks of these proposals.

A principal feature of the proposed development process is a methodology to evaluate the impact, benefit, and cost of proposed enhancements. This methodology can be used to evaluate any proposed change to the disaster communication system.

The process and methodology which have been developed are adaptations of accepted systems engineering tools such as the Life Cycle, mission scenarios, and models.

Acknowledgements

This project has been a lot of work, for me and many others.
I am indebted to many people for the time, patience and support they have given me as I worked on this project. I would like to thank three groups in particular.

I would like to thank the entire Red Cross Disaster Service Staff for the time, resources and patience they have afforded me in my work.

I would like to thank my friends, who someday *may* forgive me for not owning an answering machine,

and

I would like to thank my family for instilling in me the belief that I could succeed.

Table of Contents

1.0 Introduction and Overview

1.1 Introduction

The purpose of this project was to develop a means for developing and evaluating enhancements to the Disaster Services Communication (DiSC) system. The stimulus for this project were statements from the American Red Cross (ARC) Disaster Service staff that the present communication system was unable to meet their needs. Some proposals for altering the present system were available but there was no established means to identify the merits and drawbacks of these proposals.

The final product of this project is a development process, which includes a methodology for evaluating proposed enhancements. The development process and evaluation methodology are adaptations of accepted systems engineering tools such as the Life Cycle, mission scenarios, and models. The proposed evaluation methodology applies these tools and provides a logical process for examining system capabilities.

The process and methodology fulfill the goal of this project by providing the Red Cross with the ability to generate enhancements, and assess the full impact of any proposed change to the DiSC system.

1.2 Disaster Services Communication (DiSC) System

The DiSC system is operated, maintained and developed by the Disaster Service Communication staff. The goal of the DiSC System is to provide and ensure information transfer capabilities between all parties involved in an ARC disaster relief operation. The DiSC system supports only disaster related activities. Non-disaster related activities are supported by other elements within the ARC, such as Military Services and Information Services.

Disaster Services is the element within the ARC which responds to and provides assistance to communities afflicted by a disaster. In supporting disaster activities, the DiSC system supports operations responding to natural (Hurricanes, Floods, etc.), technological (Radiological, Hazardous Waste, etc...) and social disasters (Riots, Wars, etc...). A limited amount of support for International Red Cross and Red Crescent activities is also a requirement which must be supported by the DiSC system.

1.3 Project Stimulus

The stimulus for this project were statements by the Disaster Service staff that the current communication capabilities were unable to properly support disaster operations. Exact identification of the shortfalls which the present system possessed were not possible, since no firm set of requirements existed for disaster communications. This lack of requirements also limited the ability of the Disaster Service Staff to evaluate proposals to improve the system.

Disaster Service personnel offered numerous war stories of shortfalls which the present system had demonstrated in recent disaster activities. Hurricane Hugo and the Loma Prieta earthquake were often cited in these stories. Apparently the size of these disasters coupled with their near coincidence, strained the Red Cross abilities, particularly their communication abilities.

Some past disaster operations had been hindered by the inability to establish communications. Other operations, although capable of communicating, were hindered by the methods used to transfer information. In many of these cases the system was unable to maintain the integrity of information. Timeliness was also cited as a problem.

The Disaster Service staff had several proposals which they felt would improve the system, but there was no established method available to evaluate these alternatives. The lack of this ability was seen as the stimulus for this project. Providing this ability was the goal of this project.

1.4 Strategy of Project

The strategy adopted for this project was based on established systems engineering practices. Activities began by formulating a tentative Life Cycle, and progressed onward to requirement analysis and modelling. The final stage of project activity used all of the tools which had been developed to evaluate the present system and also to evaluate an alteration to the present design.

The development process and evaluation methodology used in these evaluations represents the product of this project. This methodology applies the tools developed throughout the project, and can be used to examine the merits, costs and drawbacks of any system alteration. The value of the methodology is that it provides step-by-step process customized to meet the Red Cross' needs. The benefit of the methodology is that it provides a framework which the Red Cross can pattern future evaluations after.

1.5 Report Structure

The structure of this report mirrors the work which was performed. The report begins with a definition of what method will be used in developing the DiSC system and progresses on to, Life Cycle development, requirement analysis and model definition.

The fourth section of the report presents the methodology which has been

proposed for evaluating changes to the system. The methodology is demonstrated in two manners. The first is a cursory evaluation of the present system, which illustrates the system's current inabilities. The second demonstration of the methodology evaluates an actual proposal to incorporate the AT&T EASYLINK service into the DiSC system.

The sixth and final section of this report provides recommendations for future activities, including application and refinement of this project's products.

2.0 Building the Foundation

The first effort taken in the development of the system was to define WHAT the "development process" was going to be.

A systems engineering viewpoint was adopted, because of previous experience with its processes and its suitability to planning. The benefits of this choice became immediately apparent. The tools this approach offered provided views of the system, useful for both planning and designing.

The following sections provide a summary of the design approach and the Life Cycle adopted for the DiSC system development.

2.1 Design Approach

The DiSC system development process emphasizes a "Systems" approach to development. The goal of this approach is to ensure the abilities and success of the entire system, while minimizing costs and efforts.

System development tools, such as the System Life Cycle and the System Model, allow designers to examine and optimize aspects of a system before it is built, such as lifecycle costs, performance, and personnel requirements. They also

allow the developers to plan the development of the project in a logical manner, and so minimize design efforts and their costs.

The efforts of this project began with an investigation of the project's requirements and a definition of the DiSC system's Life Cycle. These two fundamentals provide the basis for performing cost and operational analysis. The following sections discuss the products of these efforts.

(Note: Appendix A provides a detailed discussion of how the Systems engineering approach has been applied throughout this project.)

2.2 Life Cycle Definition

The first system development tool presented is the Life Cycle. A Life Cycle establishes a birth to death view of the proposed system's life, and segments that view into distinct stages. Associated with each stage is a set of activities, or processes. One of the benefits offered by the Life Cycle is that definition of these associated activities provides insight into the requirements which the system will have to meet.

The Life Cycle definition also provides a planning tool for the system developers. Managers can use the Life Cycle to predict the support and personnel which will be required. Different stages will require different talents and levels of staffing. Certain stages of activity will require a great deal of engineering support,

such as the development stages, while other stages may require more operator, and maintenance support, such as the Operation & Maintenance stages. This type of knowledge has proven very useful in planning and coordinating development activities.

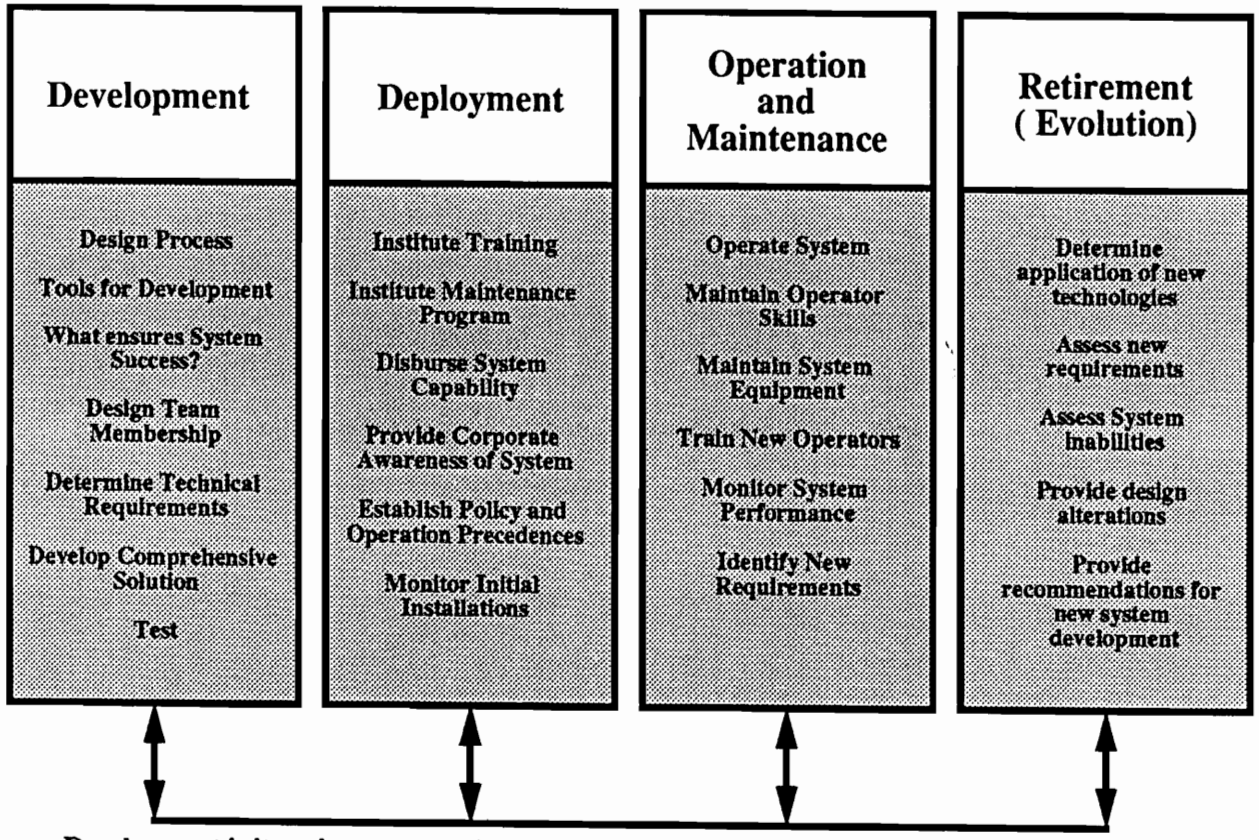
The usefulness of the Life Cycle is best demonstrated by an example. The following section presents the Life Cycle developed for the DiSC system. The remainder of the report will then use this Life Cycle as a guide and tool to explore requirements and plan activities.

2.3 Life Cycle for DiSC System

The Life Cycle adopted for use in this development is segmented into four major stages: Development, Deployment, Operation and Maintenance, and Retirement. (see **Diagram 1**) Each of these four stages will be examined in the following sections. These sections include a brief description of the activities which are anticipated during these stages, as well as commentary on personnel and staffing concerns.

2.3.1 Development Stage

DiSC system development has been undertaken as a two step process. (See **Diagram 2**) The first step, undertaken solely by ARC National, is the initiation of development. The goal of this first step is to develop a structure for the



Development is iterative process. Any stage may be repeated until successful product is generated.

DIAGRAM #1

DiSC System Lifecycle
The Four Stages & Associated Issues

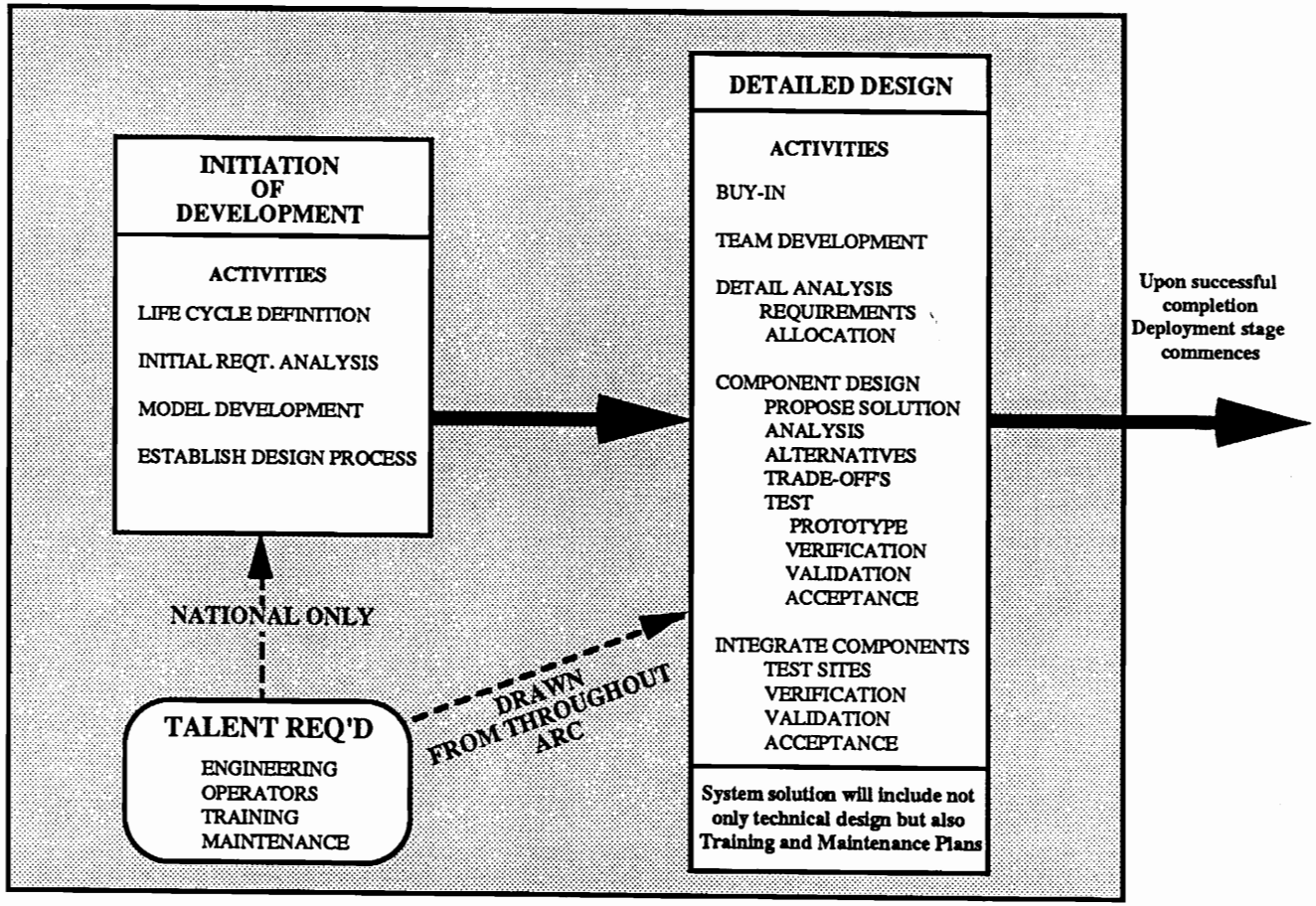


DIAGRAM #2

System Lifecycle

(Development Stage)

development process. This project represents the majority of the efforts associated with this first step.

Efforts during this first step have concentrated on developing tools such as the Life Cycle and a System model to assist the ARC in the second stage of the development, which is to follow this project. In the course of developing these tools, project activities have also produced a set of high level requirements, and proposed a method for conducting further development activities.

The second stage of development, the detailed design stage, will require efforts to be made not only by National, but also by ARC elements located throughout the country. This involvement is required because the success of these developments hinges on their acceptance throughout the ARC.

Activities during this stage will be concentrated on developing a detailed design solution for each component of the DiSC system. Activity will concentrate on detailed requirement analysis, design development, and design analysis. The model and requirements generated in the Development Initiation stage will provide guidance for design team assignments.

The final segment of this report details the activities which are to be undertaken during the Detailed Design stage.

2.3.2 Deployment

During this stage of the DiSC system's life, activities will be concentrated on putting a working system in the field. (See **Diagram 3**) Successful deployment of the system relies not only on proper distribution of equipment to the field, but also the institution of training, establishment of policy precedence and political acceptance by the various elements of the ARC.

The ARC's unique corporate structure and policies place special requirements on the system and the development process during this stage. These requirements are detailed in the Organization Requirement analysis later in this report.

2.3.3 Operations and Maintenance

This stage of the DiSC system's life will undoubtedly commence shortly after the initial deployment begins. Disaster support is a vital function, and also one which makes immediate use of any resource available.

Activities during this stage will be concentrated on maintaining the system's proper operation, and updating any portions for which new requirements have been generated. (See **Diagram 4**) These activities will be handled by ARC personnel at all levels of the ARC organization including: Disaster Services staff, automation teams, chapter personnel, and chapter management personnel.

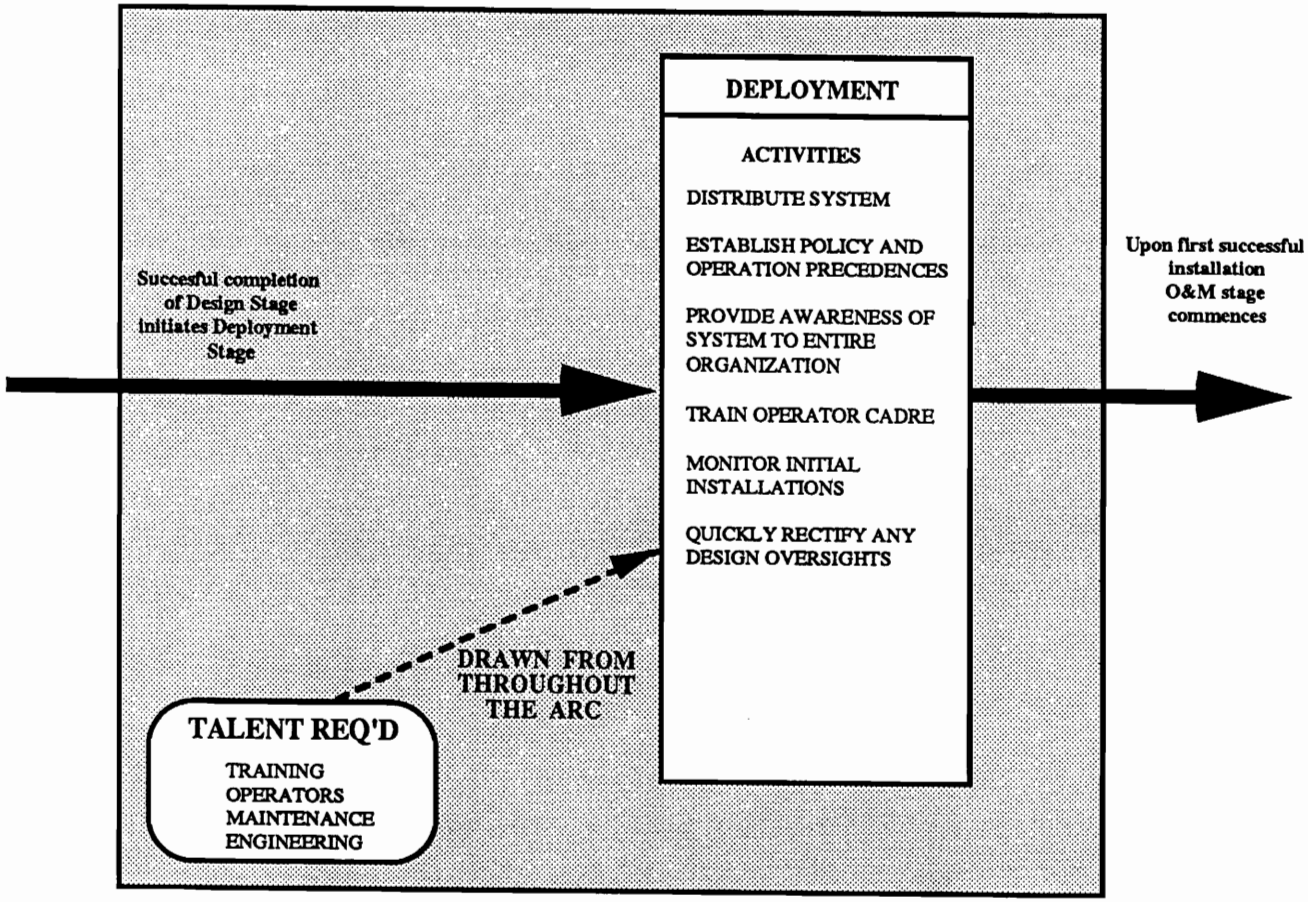


DIAGRAM #3

System Lifecycle
(Deployment Stage)

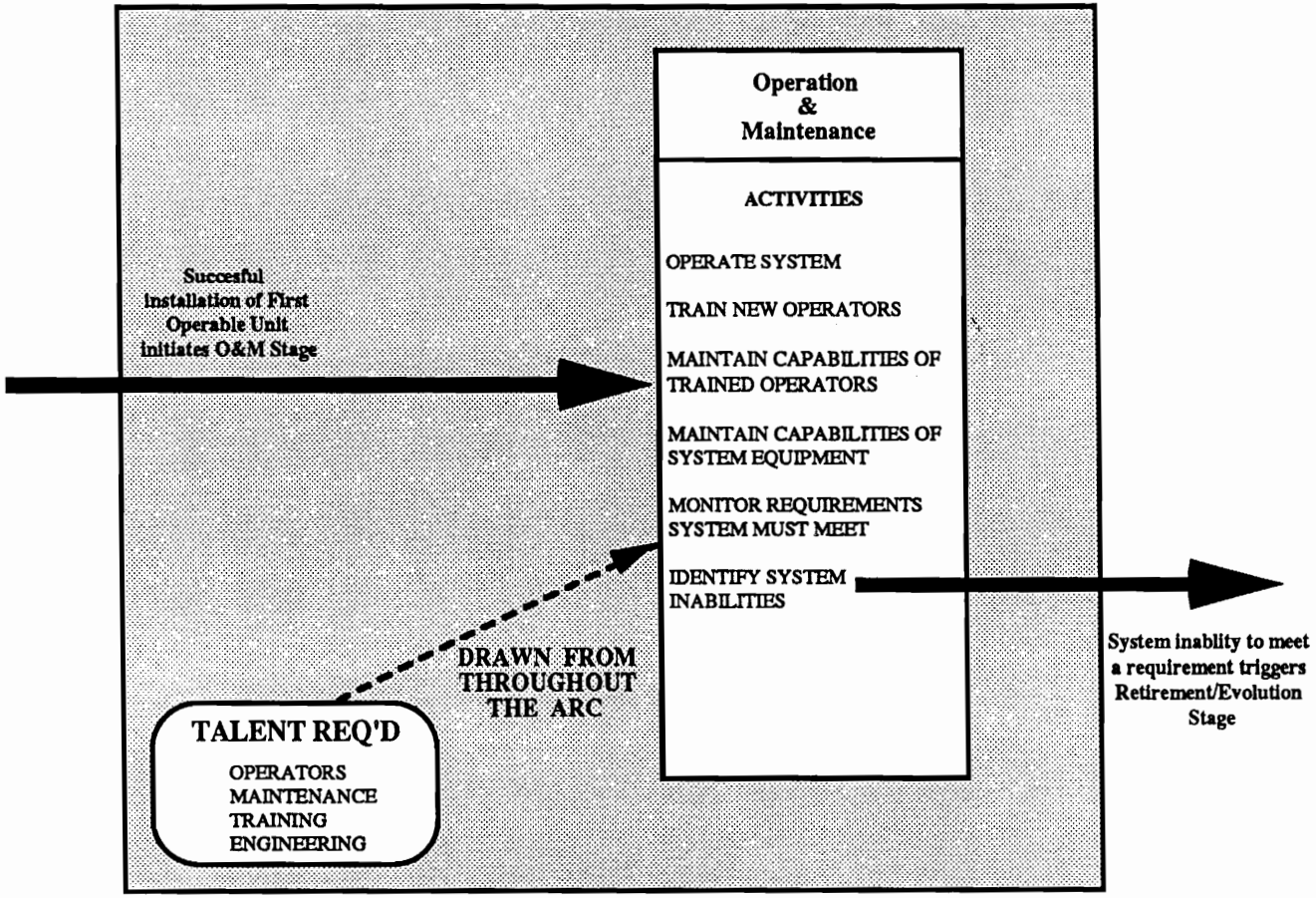


DIAGRAM #4

System Lifecycle

(Operation & Maintenance Stage)

This wide spread involvement is required to ensure the system's proper operation and compatibility. Disaster Service vigilance in these efforts will be the key to maintaining the system's capabilities. The organization requirements, and operation scenario which follow detail the requirements that mandate continued intra-system compatibility.

2.3.4 Retirement

The retirement of the DiSC system is anticipated to be gradual. The DiSC system's development is being conducted under the premise that technology will continue to advance. (See **Diagram 5**) As more capabilities are developed they will be incorporated into the system, and eventually the entire network will be transformed, physically.

The flexibility which the DiSC system is attempting to incorporate in itself, will minimize the necessity to develop a "new" system, though. Advances may change equipment and policy, but the function and purpose of the DiSC system are not anticipated to change. If proper maintenance of the system is conducted, even major changes to the system will only be viewed as evolutionary.

The requirements placed on the DiSC system by this anticipated evolution/retirement mirror the requirements which deployment of the system demand. These requirements are detailed in the Organization Requirements which follow.

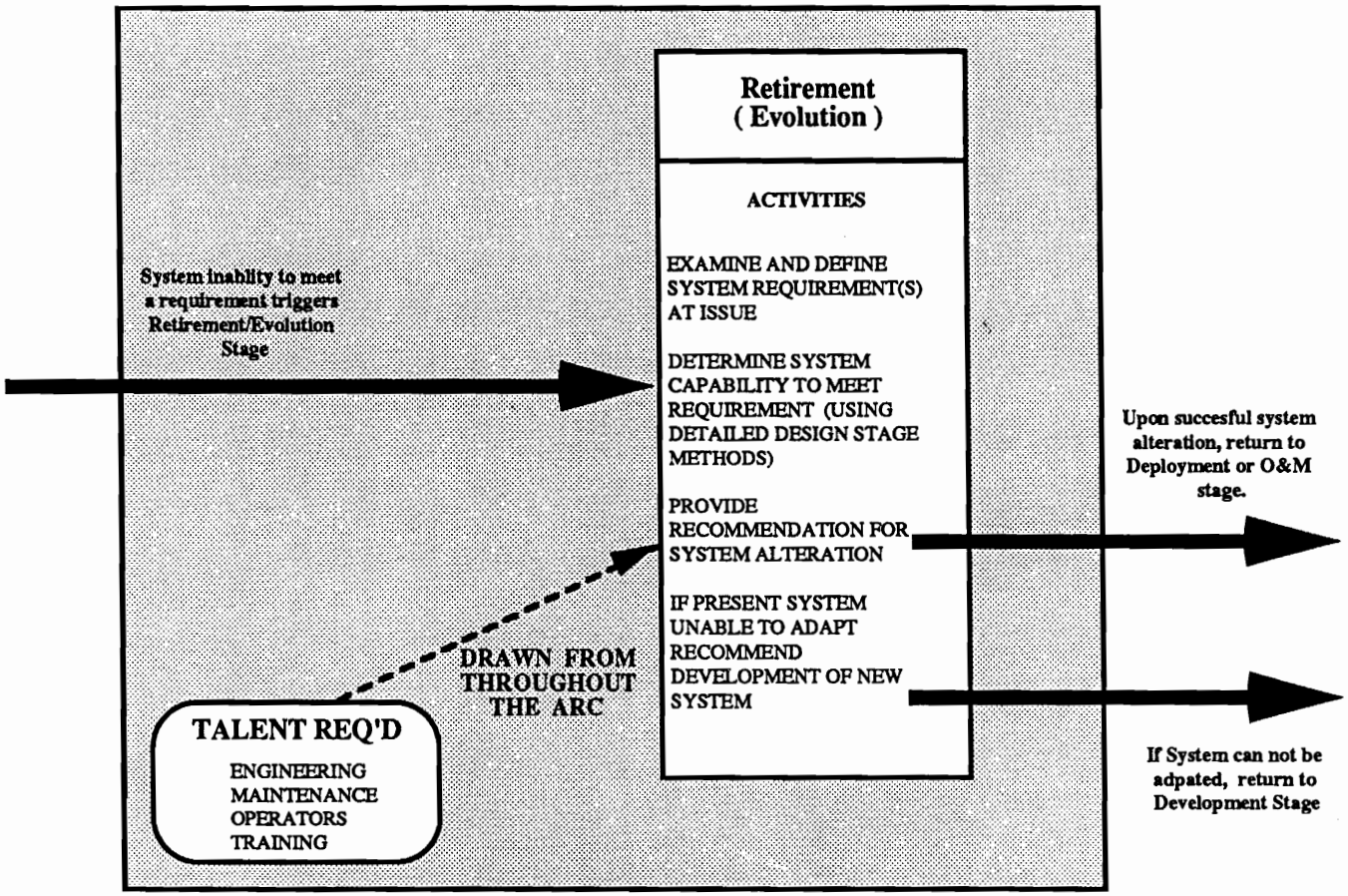


DIAGRAM #5

System Lifecycle

(Retirement or Evolution Stage)

3.0 Requirement Analysis

Requirements for a system are the functionality and qualities which a successful system must possess. Two different sets of requirements have been generated for the DiSC system, a set of Operation requirements, and a set of Organization requirements.

The Operation requirements developed detail the functionality and physical qualities which successful operation of the system mandates. While the "Organizational" requirements detail less tangible requirements which the system must possess if it is to conform to the values, goals and culture of the organization.

The following two sections present the Organization and Operation requirements developed for the DiSC system.

3.1 Organization Requirements

3.1.1 Background: American Red Cross

The American Red Cross is a non-profit charitable organization dedicated to providing humanitarian service to the people of the United States. The ARC is led by volunteers and staffed by both volunteers and full-time paid employees.

The ARC is chartered by the U.S. Congress to provide the American public with communications to members of the Armed Forces in times of emergency, and also to act as the nation's premiere relief agent in supplying aid to communities afflicted by disasters.

3.1.2 Corporate Goals and Values

The values and goals of the ARC are important to this program because the DiSC system will affect the public's view of the ARC. The public's view is significantly affected by the methods the ARC uses and the quality of work these methods produce. As a prominent organization in society, all ARC actions, policies and methods are scrutinized by the government and press. This scrutiny attributes failures and successes to the ARC, not to a system or machine. For this reason the DiSC system must faithfully represent the ARC's values and goals.

This segment of the report examines the values, goals and culture of the ARC[1] and how they apply to the DiSC system. These applications have provided "Organization Requirements" for the DiSC system.

3.1.2.1 Corporate Goals

The Mission and Goals of the American Red Cross provide a clear objective for the entire organization to use in their daily activities. Planning, development, operations and administrative actions often provide services which are not directly addressed in these official statements. This does not mean that these functions are exempt from these corporate ideals. All actions undertaken by or for the ARC are accountable to these statements.

The DiSC system will assist the ARC in delivering disaster relief services to the American public. It should therefor comply with the corporate goals which have been established in regards to service delivery.

Two aspects of service delivery are addressed in the official goal statement; types of service, and methods of service. The following two sections address how these aspects of the ARC's goals can be applied to the DiSC system.

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[1]The official goals and mission of the American Red Cross are summarized in Appendix B. This Appendix also provides a summary of the fundamental principles of the International Red Cross Movement. The documents presented in this Appendix are the official statements and policy of the ARC.

3.1.2.1.1 Corporate Commitment--Types of Service

The official goals of the ARC establish a minimum set of services which are to be provided "throughout the nation". Among these required services are: "Disaster planning, preparedness and education; Prompt relief to victims of major disasters; Emergency communication between members of the United States Armed Forces and their families and supporting caseworker managements services". Services such as," Prompt relief to victims of single family disasters", and "International tracing services" will also be provided by the ARC.

In addition to these services, the ARC goals also state a commitment to supporting the International Red Cross and Red Crescent Movement. Support of these activities is unpredictable. Past requests for support have included requests for personnel, food, funding and technology.

As the United State's premier relief agency, the ARC, anticipates requests for international support will increase in the future. The proposed system should provide the ARC with the ability to respond to requests for international communications support.

To support these corporate commitments the DiSC system should:

* be capable of participating in and supporting disaster preparedness training;

* provide communications capability between the community and military personnel during times of disaster;

* provide communications support for disaster relief operations (both large and small disaster);

* provide ARC ability to respond and support International Red Cross and Red Crescent activities.

3.1.2.1.2 Corporate Commitment--Delivery Method

The ARC corporate goals and procedures emphasize that the delivery of service will be made without regard to race, color, religious affiliation, or personal wealth. They also state that services will be provided "...in a consistent and responsive manner"[2] throughout the nation.

This means that a system developed for disaster response, such the DiSC system will:

* be deployable throughout the nation in a timely or prompt manner;

* provide the same level of service to all communities regardless of geography or demographics.

The goals go on to state that the ARC "will be a unified organization", which adapts its "development and management practices to reflect the changing needs of volunteers."

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[2]American Red Cross #4512, July 1991

This means a disaster relief system will:

* determine capabilities of volunteers and adapt system to their capabilities;

* be developed, operated and maintained in such a way as to represent a united ARC.

3.1.2.2 Corporate Values & Culture

The values of the ARC are embedded in the official statements of corporate goals. And they are also visible in the corporate culture of the organization.

The ARC goals state that:

- services will be provided to the "American people", not the states or communities;

- the ARC holds itself accountable to demonstrate fiscal responsibility and stewardship to the "American people", not to a board of governors, or to contributors;

- and that the "American people can expect the American Red Cross to provide" services.

These statement of goals reinforce ARC's profound dedication to the needs of people, not communities, not the nation, but individuals. The goals which the ARC has created for itself do not establish typical corporate goals such as "cutting

waste" or "raising efficiency". They are goals which emphasize the fact that the ARC's job, efforts and values are all centered around helping people.

The corporate culture of the ARC also reflects this value. As the next section will detail, the corporate structure of the ARC is based upon individual chapters. Chapters provide services to communities, and are given as much latitude in their operations as possible.

This latitude often causes difficulty in standardization, but the ARC is not dedicated to providing standard service. It is dedicated to providing for the needs of the individuals in the community. The chapters are allowed to interpret their community's needs and meet them in a manner which they deem best. ARC's national management only mandates services and actions which it deems essential to all people.

The high value which the ARC places upon individuals can not be overlooked in developing the DiSC system. The value of the individual operator, and the individual chapter must be evaluated. As much leeway must be built into the system as possible, so that individuals can customize the system to their own needs and goals.

Successful operation of the system within the ARC culture will require the system to:

* Provide chapters and operators the ability to customize the system to their needs;

* Minimize the requirements which the system places on the chapters;

* Preserve the independence of the chapters, while maintaining the authority of National.

3.1.3 Organization of Red Cross

The following section summarizes the corporate organization of the ARC. The summary presented is not an official or completely detailed version of the ARC corporate structure. It is an attempt to provide the reader with a clearer view of the environment within which the proposed system will be operated.

3.1.3.1 Corporate Structure

ARC activities are divided into four functional areas; Operations, Blood Services, Policy & Planning, and the Comptroller. The corporate ARC structure physically and operationally separates these four areas of activity. **Diagram 6** provides a visual representation of these areas and their associated activities.

Blood Services

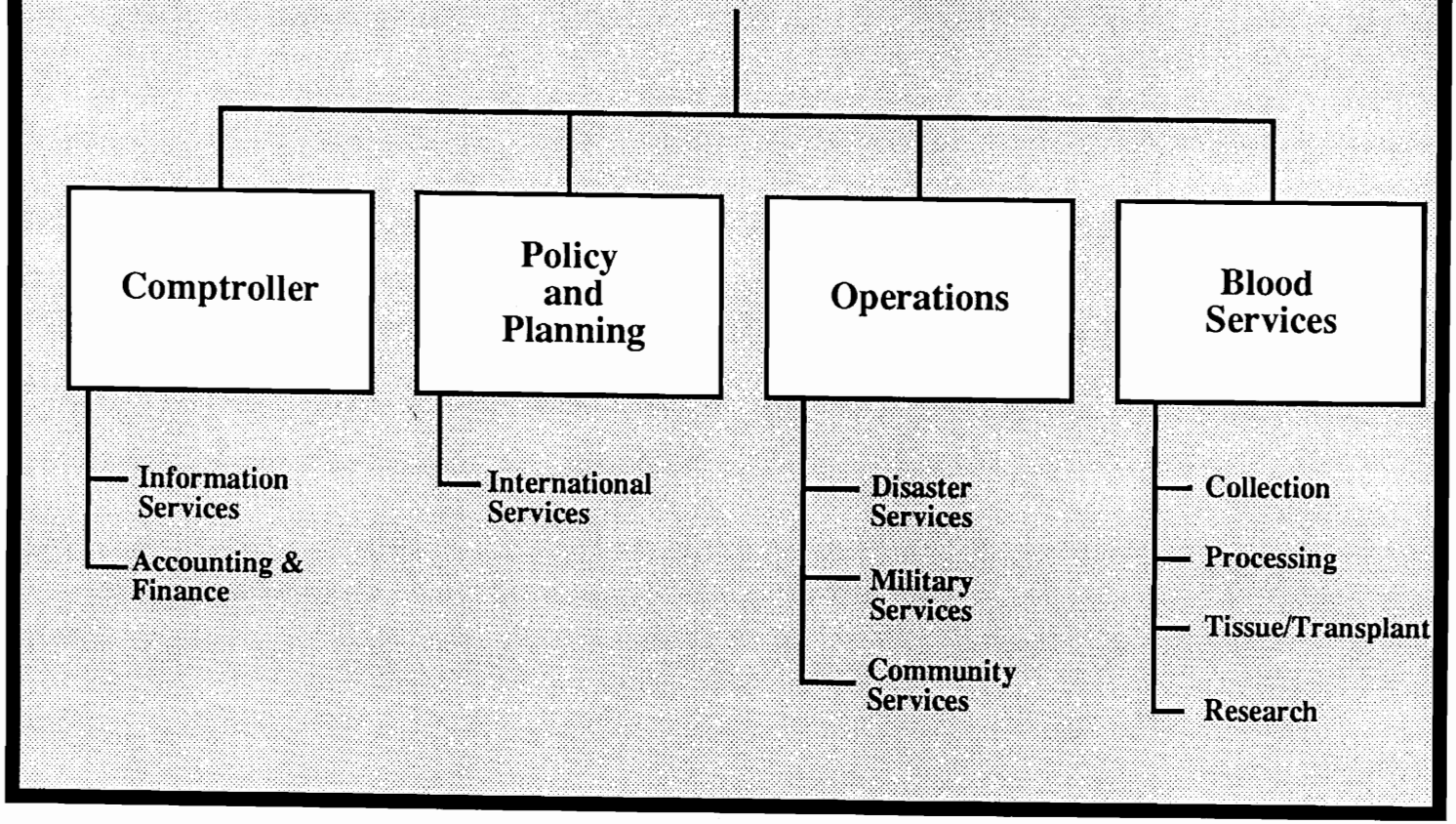
The Blood Services organization concentrates primarily on supplying the nation with a safe and reliable blood supply. Activities include blood drives, testing, processing, distribution, and quality control. ARC activities involving organ transplants and tissue research are also conducted by Blood Services.

Policy & Planning

The Policy & Planning organization provides the ARC with guidance and

DIAGRAM #6

American Red Cross Corporate Structure



direction. This organization develops strategic plans, and develops the methods which will be used to reach those goals. It also provides liaison support between the ARC and International Red Cross activities.

Comptroller

The Comptroller provides financial services and information services to the ARC. Information Services, which provides data system development for the ARC, operates under the auspices of the Comptroller.

Operations

The Operations organization of the ARC is responsible for the Chapter Operations, Disaster Services, Community Services, and Military Services. The ARC has established a nationally deployed framework of facilities and procedures to provide these services.

The DiSC system will be required to fit into this established framework. The following sections provide an overview of the organization currently used to provide these services. Particular attention is be paid to the methods used to provide Disaster services.

3.1.3.2 Services Provided

Community Service activities of the ARC include health and safety training (CPR, HIV, boating, swimming instruction, etc.). These functions are delivered to the community via local chapters.

Disaster Service activities of the ARC provide preparedness, training and support for disaster relief operations. These activities are all coordinated, and often conducted by local chapters.

Military Services provides services such as emergency communications between military personnel and their families, financial assistance to members of the Armed Services, and counseling to military personnel. The operation of these services is also provided to the public via local chapters.

All of these services are administered, directly or indirectly, through the local chapters of the ARC. Changing the methods used to provide service delivery, will affect the abilities of the chapters. The DiSC system is being developed to improve the chapter's abilities.

3.1.3.3 National Structure for Operations

The DiSC system will be used to support the delivery of services, specifically disaster services. It will be used at the chapter level, by chapter personnel. It will affect the way the chapters do their jobs, and the quality of the service they provide. To ensure that the DiSC system has a beneficial affect on the delivery of

service the next section will examine how the Chapters fit into the ARC service delivery process.

3.1.3.3.1 Present Chapter Organization

Each chapter has an established geographic region, or community, for which it is responsible. National Headquarters expects the chapters to provide certain services to their community, and to customize their efforts to meet any additional needs of their community. Typical chapter services include: liaison between military personnel and their immediate family in times of emergency, first aid training, CPR certification, and HIV education.

Chapters are organized by geography into regions. The regional organization provides management of the region's resources and liaison between the region's chapters and other ARC entities. Regions are presently tasked with managing the operations of some smaller chapters through Field Service Managers.

All of the Regions are then grouped together into three operation areas, Eastern (Alexandria, VA), Midwestern (Cleveland, OH) or Western (Burlingame, CA). These three Area Operations Headquarters provide for the management and coordination of resources and operations within their areas. They are presently the primary managing elements of ARC disaster relief operations. They provide personnel, resources, guidance and management to disaster relief operations.

The three Area Operational Headquarters are directly responsible to National Headquarters (Washington, D.C.). National Headquarters is presently responsible for establishing policies and procedures, coordination of inter-area activities, national preparedness, planning, coordination of fundraising activities, distribution of corporate funds and corporate management.

Diagram 7 provides a visual representation of the present chapter structure.

3.1.3.3.2 Anticipated Changes to Organization

At the present time plans are underway to reorganize the Service Delivery organization of the ARC. The **Service Delivery in the 21st Century Report** (SD21 Report) is being used as the basis for this reorganization. This report was commissioned for the purpose of evaluating the present system used by the ARC.

Planning is complicated by the fact that specifics regarding the reorganization have not yet been decided. ARC management has intimated that the structure of the ARC in the future will resemble that depicted in **Diagram 8.**

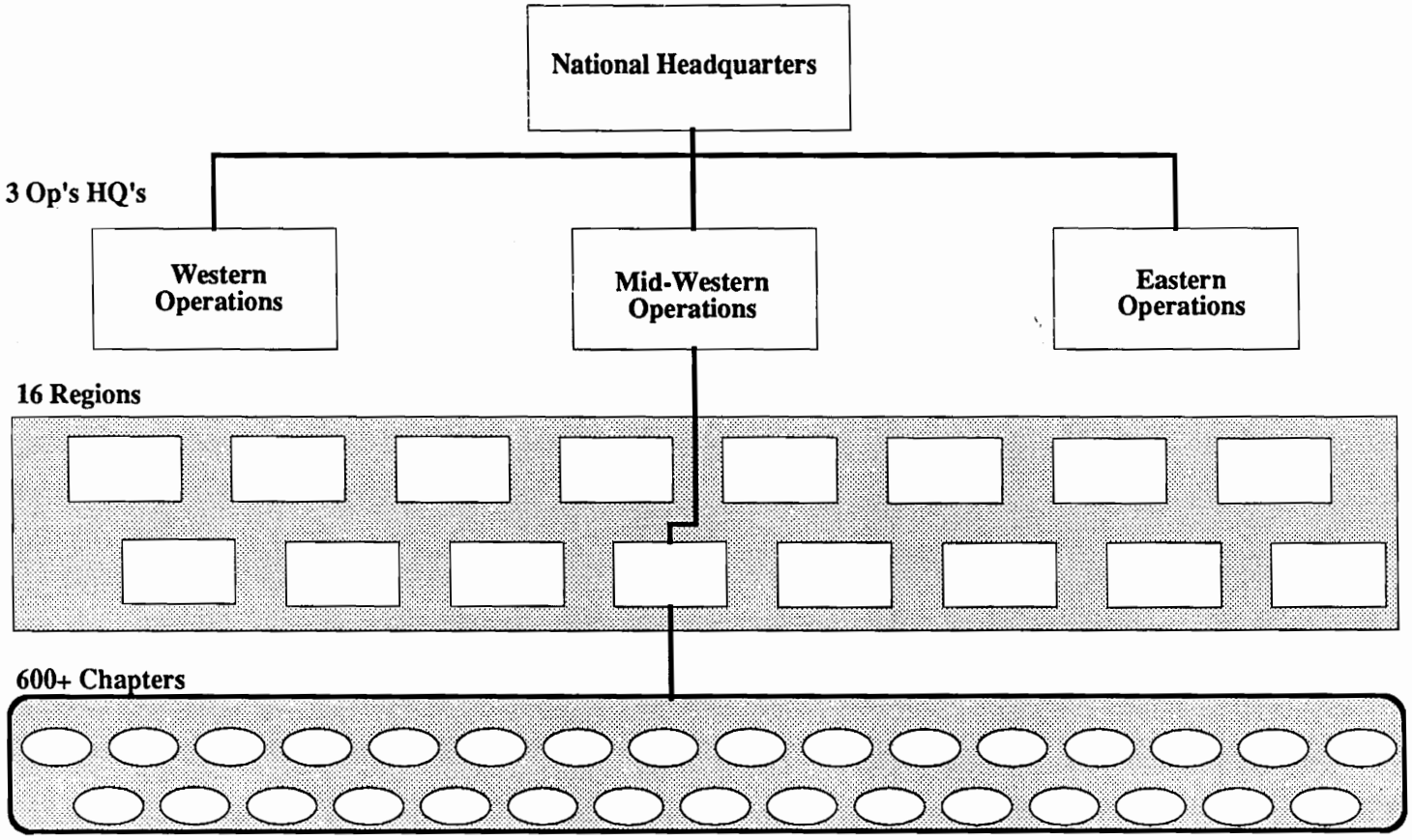


DIAGRAM #7

PRESENT CHAPTER STRUCTURE

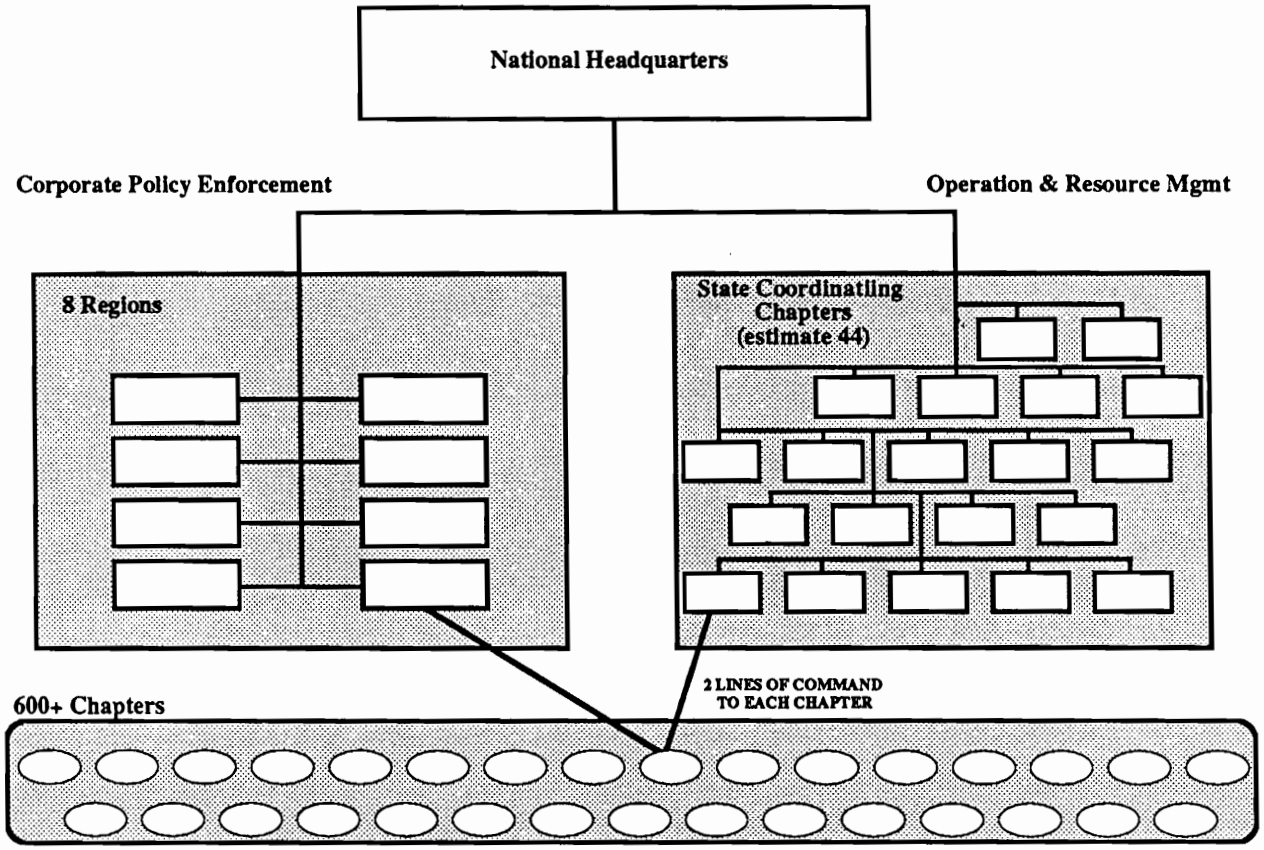


DIAGRAM #8

SD-21 CHAPTER STRUCTURE

As **Diagram 8** indicates, the SD-21 organization will have two separate lines of authority which run from the chapter level to National Headquarters. One of these chains will ensure that the chapters are delivering the services that National policies require. (fundraising, community instruction, etc...) The other chain of command will provide management of Red Cross resources and operations. (Daily operation, Disaster activities, etc...)

Presently the Regions and Operation HQ's are charged with enforcing chapter adherence to corporate policy, and negotiating operational requirements out of chapters. The SD21 committee recognized this arrangement is inadequate, and recommended the separation of these powers.

The proposed change will place the State Coordinating Chapters (SCC's) in charge of operations and resource management, while placing the Regional Field Units in charge of enforcing National policies.

The organization and identification of the SCC's has just begun. Undoubtedly the SCC's will be organized into operational groups based on geography. The question which remains to be answered is where will the regional administrator of the SCC's be located? Since the SD21 plan abolishes the Area Operations Headquarters, the implication is that this management function will be returned to National HQ's .

The SCC's will be responsible for the daily management of the resources within their geographic region, preparedness, planning, and the administration of small disasters. In performing these duties it is expected that the SCC's will

provide liaison and coordinate planning activities with local government agencies, volunteer groups and neighboring SCC's.

National will be responsible for monitoring and supplying the SCC's with any additional resources and management which they require to provide services. National will also become involved in any operation which exceeds the abilities of an SCC.

The SD-21 structure will significantly increase the amount of involvement National headquarter's has in both daily and disaster relief operations. To cope with this increase in activity and responsibility the ARC is planning to establish a Disaster Operations Control Center (DOCC) at National Headquarters. The DOCC will provide 24 hour/day disaster operations management for the ARC.

To support the requirements which the ARC corporate structure places on disaster relief operations the DiSC system must:

* Provide communications and relay data between the top level of ARC management located within affected area and the next higher level of ARC;
* Provide communications support to both pre-SD21 structure and post-SD21 structure, since timeframe for reorganization is unknown;
* Provide communications and relay data between all ARC units which govern affected area/chapters during a disaster (This means **Before SD21:** National HQ, Operations HQ, Region **After SD21:** DOCC, SCC, Region Field Unit).

3.1.4 Organization Requirement Summary

Appendix C provides a summary of the requirements which have been developed in this section.

3.2 Operation Requirements

Mission scenarios, past experiences and anticipated applications of the DiSC system are examined in this section of the report. This examination is then used to produce a set of Operation Requirements for the DiSC system.

3.2.1 ARC Disaster Response

Disasters are caused by nature (hurricanes, tornadoes, floods), technology (radiologic, hazardous waste,) or social strife (war, riots). The size of a disaster can range in size from a fire which damages a single family home to an earthquake which decimates a city.

The ARC is committed to responding to all disasters, regardless of size, which occur in the United States and its territories. The response which the ARC conducts is a function of the Disaster's impact. Basic services (food, shelter, clothing) are afforded to all disaster victims. Customized services are offered as the situation requires.

The ARC has established formal procedures which are used in responding to disasters, the ARC 3000 Series. These procedures establish different levels of response which are offered by the ARC. The disaster Level is established by the financial impact which the relief program is anticipated to incur.

The guidelines used in establishing Levels of disaster are:

Disaster Level	Criteria	Comments
I	10K < Relief Cost	Recurrent/ Chapter Only
II	10K < Relief Cost < 50K	Chapter and Local ARC elements may perform operations.
III	50K < Relief Cost < 250K	Local ARC authority assists chapter in operation, National may become involved.
IV	250K < Relief Cost < 2.5M	National funding, and some resources required.
V	2.5M < Relief Cost	Significant National resources required.

Table 1 - Disaster Level Classification

The Level of response establishes the structure which is be used to respond to a disaster. It establishes what ARC components become involved and the responsibilities which these participants undertake. The Level also determines the administrative and operational capabilities required of the personnel deployed to the disaster.

The DiSC system is being developed to support all ARC reactions to disasters, regardless of the disaster's Level. The system must be flexible enough to react to minor disasters as well as major catastrophes.

NOTE: The SD21 reorganization, currently under development, will affect the ARC's Disaster response organization. The details of this reorganization are unknown at this time. To ensure that the DiSC system development is not outdated by SD21, the descriptions which follow use generic terms, and avoid references to ARC structures which are slated for change. (i.e. Area Operations HQ)

3.2.2 Mission Scenario

The following sections examine the disaster response functions of the ARC. The examination is presented in a chronological order, from disaster initiation to dismantlement and close of the operation. **Diagram 9** provides a visual representation of the major events which occur in a "typical" disaster.

3.2.2.1 Initiation of Disaster Response

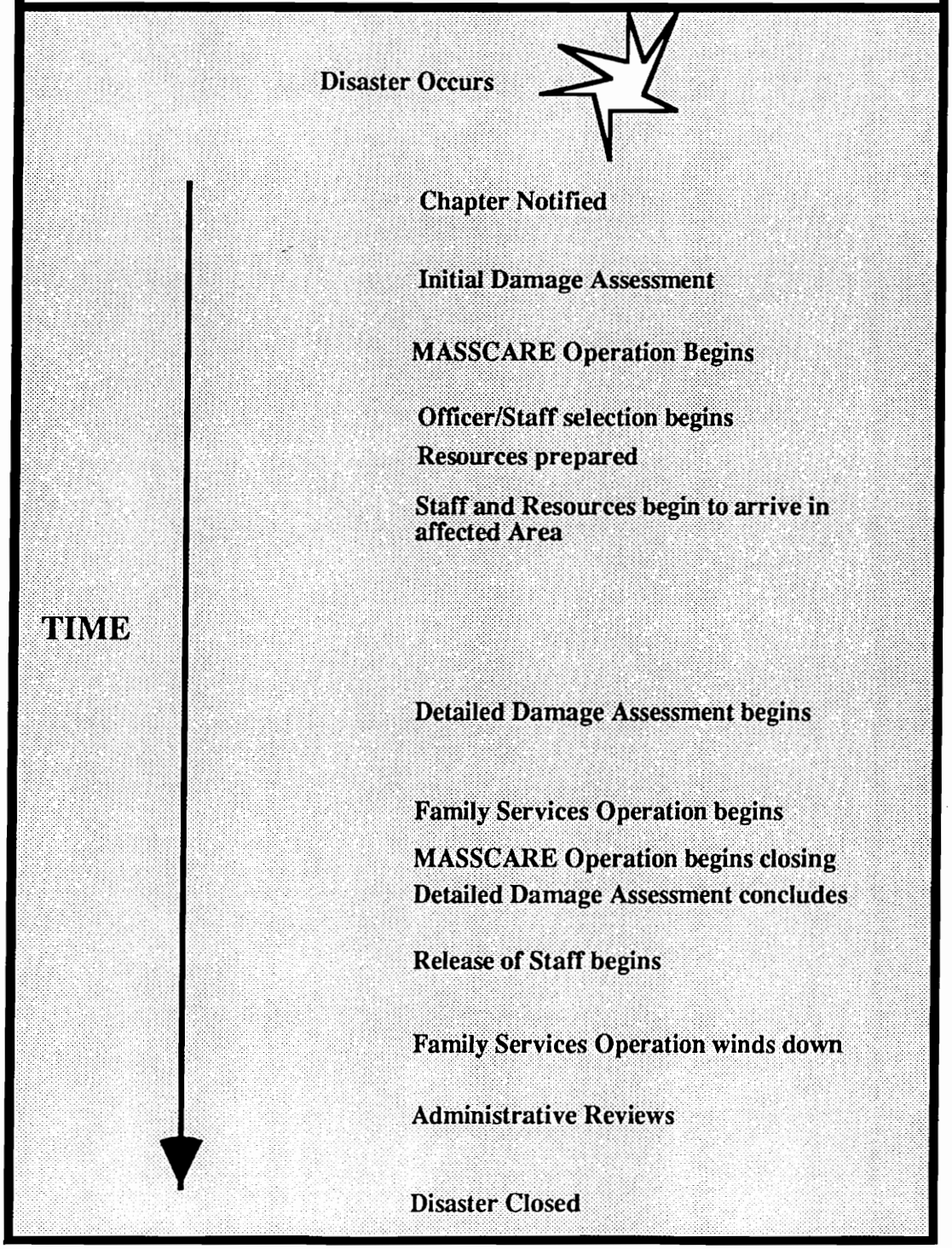
Disaster response begins when the local chapter is notified or becomes aware of a disaster. This notification can come through any number of sources: phone call from victim or neighbors, official notification from local authorities or through local media broadcasts, etc.

Once notified that a disaster may have occurred, the Chapter's first action is to perform a preliminary assessment of the damage caused by the disaster. A team is assembled to respond, and deployed to the affected area.

Initial reports from the team include a "ballpark" estimate of the resources which are required to provide relief services to the victims. Information detailing the damage is relayed from the team to the chapter personnel managing the

DIAGRAM #9

Chronology of a Disaster Relief Operation



chapter's response. A "Disaster Manager" or "Chapter Manager" determines whether or not the chapter has the resources to provide all required services.

It is at this point that the small disaster response diverges from the larger disaster response. A small disaster which can be managed completely by the chapter only notifies the higher levels of ARC for reporting reasons. This reporting may be delayed days or weeks after the disaster occurs.

If the Chapter does not have all the resources required to deal with the operation, The "Disaster Manager" needs to make provisions to obtain the required resources. The method used to obtain these resources is to notify the next level in the ARC disaster response structure, or activate a local means of obtaining them.

To support the process of initiating a disaster relief operation the system must:

* Maximize chapter's ability to be notified of disaster occurrence;

* Provide communications to allow assembly of initial response team;

* Provide communications between the chapter staff, which initially reacts to disaster, and the chapter manager or authority;

* Provide Chapter with ability to notify and advise next ARC level of disaster occurrence;

* Provide communications between the Chapter and other local elements, such as neighboring ARC elements, local churches, and local charities;

* Be capable of responding to the unpredicted disasters, as well as predictable disasters.

3.2.2.2 Disaster Response

Once a Disaster Relief Operation is initiated, work begins setting up the apparatus which will be used to supply services to victims. The process used to establish and operate this apparatus is briefly described here.

Damage Assessment and MASSCARE are the first services activated during a Disaster Relief Operation. The MASSCARE service ensures that the immediate needs (food and shelter) are met, while the Disaster Assessment service provides the ARC with the data needed to estimate, mobilize and procure the resources which will be required to conduct the disaster relief operation.

The chapter's initiation of a disaster relief operation may also activate Logistics and Staffing operations outside of the affected area. These services then provide the ARC with the resources which will be required. Their activation does not require a complete damage assessment.

The first task undertaken by the Staffing function is to recruit personnel to administer the disaster relief operation. Staffing identifies and recruits the Job Director and a staff of officers, on the basis of their experience and training.

These officers are then deployed to the affected area. The remainder of the staff is then identified and deployed.

Logistics immediately begins to estimate the resources and delivery methods it will be required to provide. Logistics provides the job officers and other disaster relief staff transportation into the affected area.

Other Services, such as Communications, and Liaison activities, may also be immediately activated for a Disaster Relief operation. These functions would then prepare for anticipated action, or assist in collecting information regarding disaster impact.

Upon arrival in the affected area, the Job Director establishes an administrative command and begins to direct the Disaster Operation, through his officers. He reports back to his superior, located at the next level of ARC, via reports and estimates generated by his Admin staff.

ARC activities within the affected area initially concentrate on supplying the immediate needs of the victims. Work is concurrently conducted performing damage assessments and establishing facilities which will be used for future activities.

Once the immediate needs of the Disaster victims are met, a detailed damage assessment is performed. This damage assessment is provided to Family Services. It is a record of the damage done to each residence in the affected area.

The Family Services function of the ARC is activated as soon as it is feasible. This function provides disaster victims with the resources to provide themselves with food, housing, clothes and other necessities.

To perform Family Service functions, a detailed damage assessment and a local economy capable of supplying goods is required. For this reason Family Service functions may take weeks to activate after a good sized disaster occurs.

The Records and Reporting Function is established to support the Family Services function. The Records and Reporting function maintains the records and files which Family Services generates.

This discussion has only concentrated on those functions and services which are common to most disaster relief operations. Other ARC Services are activated as the situation and conditions require. The requirements which each of the different ARC services place upon the DiSC system are detailed in the sections **3.2.4 and 3.2.5 (Direct and Support Services)** of this report.

3.2.2.3 Dismantling Operation

The ARC disaster relief operation is flexible. It adapts to the requirements and needs of the victims. When a requirement is eliminated, ARC activity and support is removed. Service centers, shelters, and feeding units remain open for as long as they are required, and are shut down when they are no longer needed. As a result the close of an operation is gradual.

The goal of the ARC is to provide relief as fast as possible. A common analogy used by ARC disaster relief workers is that,"We're in the business of setting up a multi-million dollar operation anywhere in the country on a moment's notice. Once the operation is set up, we try to put it out of business as fast as we can."[3]

Administratively the dismantling of an operation requires that accounts, files and records be accounted for and archived. Official records and copies are generated and financial records are accounted for.

Often disaster relief operations remain open for years after a disaster occurs. This is because the ARC will provide aid to a victim on a long term basis, if no other source for this aid is available. As a result, field operations are often closed long before the operation is "officially" closed.

The close of disaster relief field activities is typically accompanied by a "Narrative". This "Narrative", written by the Job Director and his officers, provides a detailed account of what happened. It details what went right, and what went wrong.

This "Narrative" is a tool which the ARC uses to learn from its experiences. Other tools used in this same manner are: administrative and document reviews; and personnel interviews.

Only after all personnel, facilities and administrative activities cease, can a

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[3] Lee, Judy, et al; Disaster Associate, Disaster Services, ARC National HQ

Disaster Relief operation be closed.

Support of dismantling an operation will require the system to:

* Provide reporting or quality index of its performance;

* Support disaster operations which continue after formal relief operation has concluded;

* Be responsive to diminishing communication requirements and disassemble portions no longer required.

3.2.3 Relief Operation Authority and Command

The administrative structure of a disaster relief operation is established and led by the Job Director. Since the requirements of every disaster relief operation are different, the Job Director is allowed to customize his administration to the needs and conditions which he faces.

The Job Director appoints Admin officers and delegates authority to them. Admin officers assume responsibilities for monitoring operation activities, directing operations, collecting data, processing data and generating reports detailing these operations. These reports are then used, either by the Admin officer, or his commanding element to make decisions and direct operations. Admin officers are deployed as managers of Service Centers, Districts, or in support roles such as Assistant to the Director.

Service officers are charged with the administration of services throughout

the operation. The services and responsibilities which service officers are required to support is detailed in **Sections 3.2.4 and 3.2.5 (Direct and Support Services)**.

To support Admin functions the DiSC system must:

* Provide communications and relay data from Service Delivery Points to the appropriate Admin element;

* Provide communications and relay data between any Admin Officer and their commanding element;

* Provide communications and relay data between the Admin Officer located at Job Headquarters and the Admin element located at the next higher level of the ARC.

3.2.3.1 Disaster Relief Operation Administration

As the previous section detailed, the administration of an ARC disaster relief operation decentralizes the authorities and responsibilities of disaster management. The structure is specifically designed to allow designated personnel on site, to assess their situation, interpret ARC regulations and determine the best course of action.

The administrative structure of a disaster relief operation is determined by the Job Director. ARC regulations do establish a preferred structure, though. This

preferred structure has demonstrated its capabilities, and is usually used. A description of this structure follows.

The structure of a Disaster Relief action is hierarchical. The number of levels which this hierarchy possess is dependent upon the nature of the disaster. **Diagram 10** details the administrative structure which a Disaster typically assumes.

To support the administrative structure of ARC disaster relief activities the system must:

* Provide communications and relay data between each ARC element (Service Delivery Point, District, Job HQ, Staging areas, etc...) and its commanding element.

3.2.3.1.1 Field Headquarters

As **Diagram 11** shows, a Disaster Relief operation is administered by a Job Director. Assisting a Job Director are his assistants and officers. These assistants and officers answer directly to the Job Director.

The Job Director in turn answers directly to the next higher level of the ARC. (At this time that authority is typically the Area Operations Headquarters. On very large jobs the Job Director may answer directly to National.) The Job Director is personally responsible for the Disaster Relief operation.

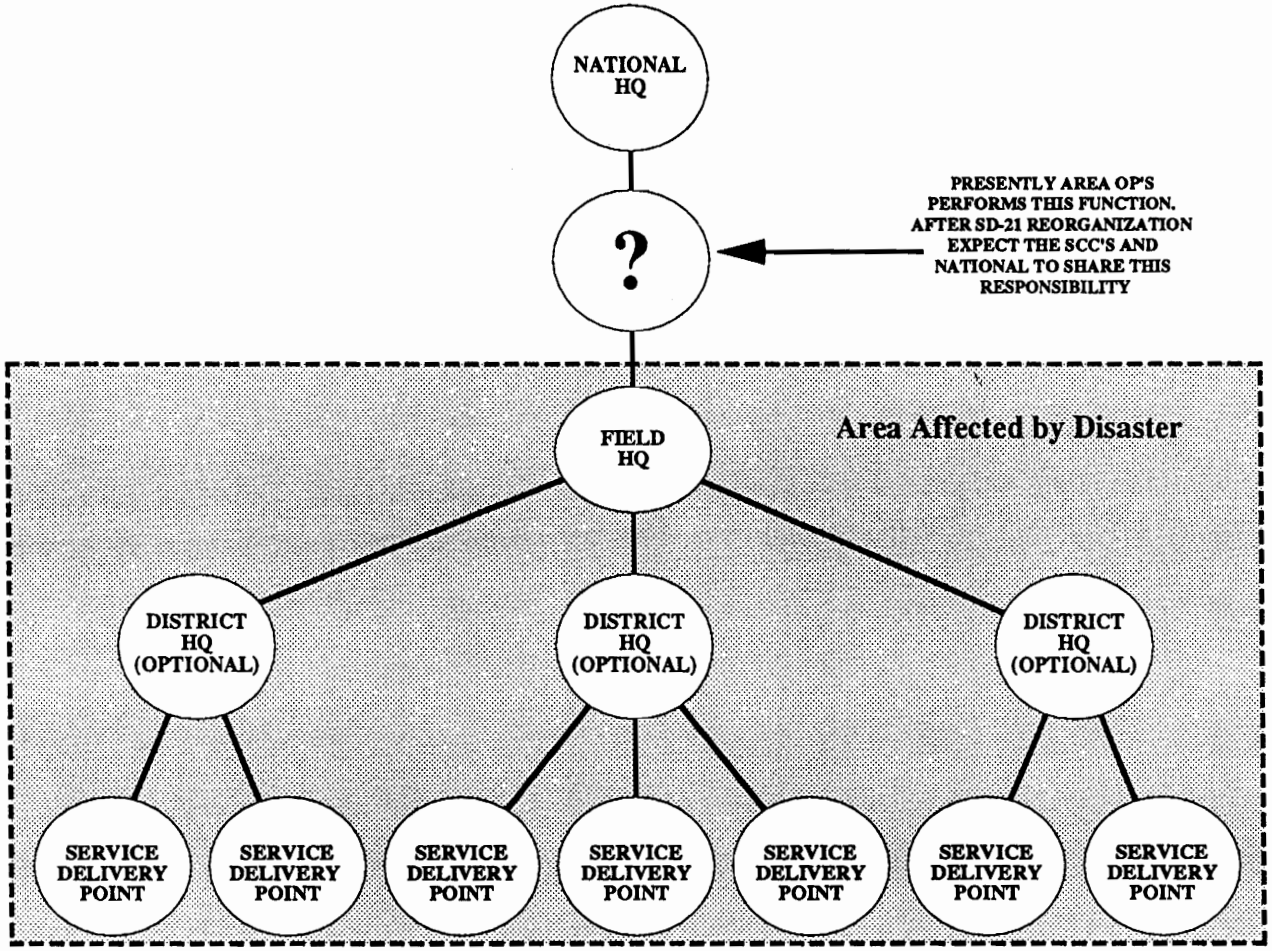

DIAGRAM # 10

Administrative Struture of ARC Disaster Relief Operations

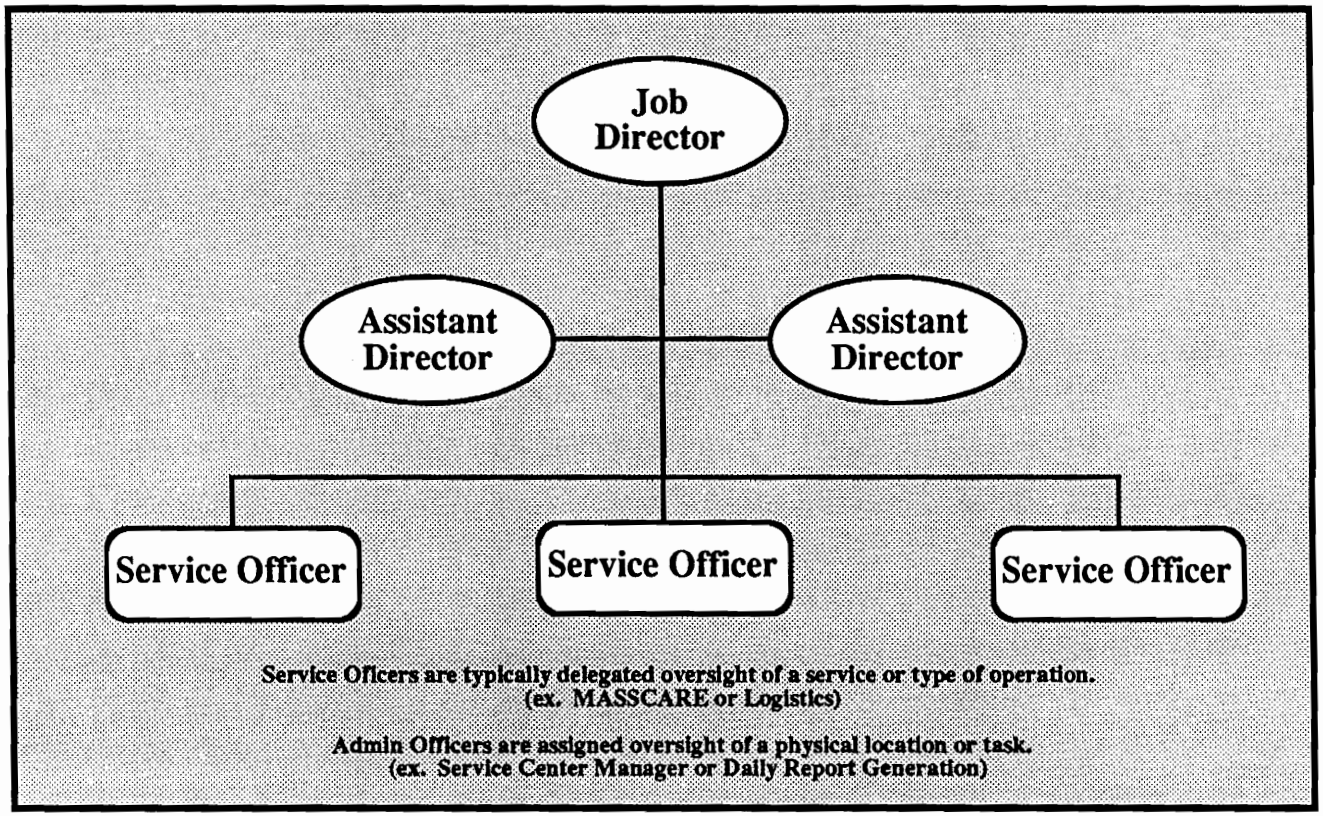

DIAGRAM #11

Disaster Relief Operation
Chain of Command

Service officers assigned to a job are delegated the authority to administer the delivery of services. These services are not limited to the direct services of MASSCARE, Family Services, Health Services and DWI. Support services are also administered by service officers.

Support services provide the ARC with the tools and resources which are required to provide Direct Services. Included among the support services are: Communications, Logistics, Government Liaison, Public Affairs, Training, Staffing, Records and Reporting, and Administration.

Direct Services to the affected area are provided through Service Delivery Points (service centers, shelters, and mobile feeding units). The geography of a disaster typically require a number of service delivery points to be established. The administration of a service delivery point is the responsibility of a manager.

Shelter managers are responsible for shelters and report to a MASSCARE officer. MASSCARE officers are also responsible for the administration of the fixed and mobile feeding units. Service Center Managers are responsible for administering service centers and report to the appropriate Admin Officer.

3.2.3.1.2 Districts

Some disasters require a level of administration between the service delivery points and the Job Headquarters. A wide geographic dispersion or a large concentration of service delivery points complicates administration from a single

point. To alleviate this sort of complication, a Job Director or Officer may establish Districts.

A District is delegated the authority to administer a number of service delivery points. The District Headquarters is staffed in the same manner that the Field Headquarters is, with a District Director and an appropriate staff of officers. The service delivery points under control of a District answer directly to the District. The District then answers to the Field Headquarters.

Districts reduce the workload of the Field Headquarter's staff, and provide service delivery points with a better quality of administration.

3.2.3.1.3 Service Delivery Points

Service Delivery Points are the physical locations at which the ARC provides services to victims. They are the basic functional unit in the ARC command structure. A disaster may have any number of Service Delivery Points.

Several different types of Service Delivery Points are common in Disaster Relief Operations. The following sections detail these common types, and the staff which is typically located there.

3.2.3.1.3A Shelters

Shelters are Service Delivery points for MASSCARE services and Health Services. Shelters are clean, safe, healthy facilities which provide temporary housing for displaced disaster victims, and relief workers.

A MASSCARE person, known as the Shelter Manager, is in charge of a shelter. Health Service personnel assist MASSCARE personnel in assuring the health and safety of the facility and its residents.

3.2.3.1.3B Feeding Units

Feeding Units are also Service Delivery Points for MASSCARE. They are locations where food is processed, prepared or distributed. Feeding Units provide food to disaster victims and relief workers. They may be geographically fixed, or mobile.

Feeding Units are also under the charge of MASSCARE personnel. Health Services personnel assist MASSCARE personnel in assuring the nutrition, safety and quality of a feeding unit's food and facilities.

3.2.3.1.3C Service Centers

Service Centers are Service Deliver Points for Family Services. A Service Center Manager is in charge of a Service Center. The position of Service Center

Manager is an Admin position. Assisting this Family Service manager, are Damage Assessment personnel, Records and Reporting Personnel and Family Service caseworkers.

3.2.4 Direct Services

The ARC provides a number of direct services to the American people during a time of disaster. These services are designed to ensure that the needs of the individual victims are met, and that their well being and safety are safeguarded. The delivery of services is directed and controlled through the Administrative structure which the Job Director establishes.

Each of the Direct Services is briefly described in the following sections.

3.2.4.1 MASSCARE

The MASSCARE function of the ARC is responsible for providing food and temporary shelter to disaster victims and relief workers who are in need of these services. The MASSCARE Officer is responsible for identifying, establishing and administering the operation of shelters. They are also responsible for providing food and food services, as the situation requires.

The MASSCARE function is initiated as soon as possible after a disaster occurs. Housing and feeding the victims of a disaster is a priority of the ARC. The MASSCARE officer is responsible for seeing that this function is properly executed and administrated. They appoint shelter managers and direct food service

operations.

MASSCARE service functions are delivered through shelters and feeding units. A shelter is a safe, healthy location which is used to temporarily house victims and disaster workers. A feeding unit is a structure or vehicle used to process and deliver food. A feeding unit may be a restaurant, kitchen or a specially equipped vehicle.

In supporting the MASSCARE function of the ARC, the DiSC system must:

* Provide communications support in locating and establishing ARC shelters immediately after disaster strikes;

* Provide communications and relay data between shelters and commanding element;

* Provide communication and relay data between feeding units (mobile or fixed) and commanding element;

* Relay data between managers of feeding units and managers of shelters;

* Provide communications and relay data between MASSCARE officer at Job Headquarters and MASSCARE element located at the next higher level of ARC.

3.2.4.2 Health Services

The Health Services activity of the ARC is responsible for ensuring the health of disaster victims and disaster relief workers is maintained. The Health Service activities include maintaining the health and cleanliness of ARC shelters and providing medical assistance as it is required.

The Health Service officer is responsible for the administration of health professionals, certification of shelters, insuring the safety of food and water supplies, and insuring the physical and mental health of victims and disaster personnel is maintained.

Support of these functions, requires that the DiSC system:

* Provide communications between shelters and medical personnel;

* Relay data from Health Service elements and appropriate DWI facility;

* Insure privacy of communications which contain patient data (Note: Regulations mandate that death notices not be transmitted in the clear);

* Provide communications between Health Service Officer at Job Headquarters and the Health Service element located at the next higher level of the ARC.

3.2.4.3 Family Services

The Family Services activity of the ARC is responsible for providing victims with the ability to provide themselves with: housing, food, clothing, and other

necessities. This ability is usually provided by a process which assess the victims needs and provides them with script to purchase goods and services from local merchants. The script, in this process, takes the form of a "Disbursing Order" (DO).

The assessment of a victim's need is performed by a caseworker in a Service Center. The caseworker reviews the damage assessment of the victim's residence, interviews the victim and factors any extenuating circumstances into his assessment of the victim's needs.

From this analysis the caseworker determines the goods which the victim needs. Pre-established guidelines for prices and goods are available to assist the caseworker in this activity.

Once the caseworker has determined the needs of the victim a DO is generated. Victims are provided a DO worth a certain amount of money. They then have the ability to go to a predetermined store and purchase the goods themselves. This allows the victims to shop for the goods. This practice preserves the self esteem of the victims, and generates business in the local economy.

The accounting process used for the management of DO's is extensive. The involvement of money, mandates that abuse of the system be made difficult. The present DO system provides paper copies of all DO's be provided to Records & Reporting, Accounting, and the local vendor.

Support of these functions, will require the DiSC system to:

* Relay data from the Family Service caseworkers to appropriate Accounting element;

* Maintain the security of DO process;

* Relay data from Damage Assessment to Family Service caseworkers;

* Relay data from the Family Service caseworkers to the Records and Reporting Function;

* Provide communications and relay data between Family Service Officer located at the Job Headquarters and the Family Service element located at the next higher level of the ARC;

* Provide communications and relay data between each Family Service Center and its commanding element.

3.2.4.4 Disaster Welfare Inquiry (DWI)

The Disaster Welfare Inquiry activity of the ARC is responsible for:

- responding to health/safety inquiries concerning victims, generated by family members located outside of affected area;

- reuniting families which have been separated within the affected area;

- providing health/safety messages generated by victims to family members located outside of the affected area.

The DWI function of the ARC requires the coordination and collection of information from a number of sources, including hospitals, ARC elements, morgues, funeral homes, local authorities and federal authorities. The structure and specific DWI services which the ARC will provide, is unclear at this time.

Official policies regarding DWI activities is still under development. The levels of DWI service which the ARC will provide, and the conditions which will stimulate this services will not be determined until ARC corporate policies are stabilized. As a result, the support which the DWI service will require is also unclear.

The primary requirement which the DWI service will impose on the DiSC system will be to:

- Relay data describing victim welfare/status/location from any ARC element to the DWI process area.

The remainder of this report will not address the requirements which DWI might place on the DiSC system. The resources and capabilities which full compliance with present DWI commitments requires is extraordinary, and no lower level of compliance, priority, or process has yet been established within the ARC to facilitate the fulfillment of these commitments.

3.2.5 Support Services

The delivery of Direct Services to disaster victims requires a substantial amount of support activity. The ARC recognizes the importance of these support activities, and the effect they have on the delivery of direct services. Proof of this recognition is that in a disaster response Support Services are administered by officers, just as Direct Services are.

The following summaries detail the support services which are provided during a disaster.

3.2.5.1 Logistic Function

The Logistic function provides the ARC with the supplies and resources required to carry on disaster relief operations. The Logistics Officer is responsible for obtaining, shipping, and disbursing goods and materiel to ARC elements throughout the affected area. Included in these tasks is the requirement to track and manage ARC resources, once they are on site. Additionally, the Logistics Officer is responsible for providing and manning transportation facilities for ARC personnel assigned to the disaster relief operation.

In support of the Logistics officer the DiSC system should:

* Relay data describing Service Delivery Point requisitions to appropriate logistics element;

* Provide communications from Logistics Officer to staging areas, located inside of affected area;

* Provide communications and relay data between Staging Areas located inside and outside of affected area;

* Provide communications and relay data between Logistic Officer at Job Headquarters and the logistics element at next higher level of ARC;

* Provide communications and relay data between any logistics element and its command element;

* Relay data regarding the shipment of goods, and movement of people between appropriate Logistics elements.

3.2.5.2 Communications

The communications function is the subject of this report. This function provides communication support for all ARC Disaster relief activities. The Communications officer is responsible for providing this support to the ARC Disaster Relief activities.

3.2.5.3 Staffing

The Staffing function provides the ARC with the ability to identify, recruit, assign and track qualified paid and volunteer staff for Disaster Relief activities. The Staffing officer is responsible for providing adequate staffing, establishing and

maintaining accurate personnel records, and insuring personnel qualifications match the requirements of their assignments.

In support of these Staffing activities, the DiSC system must:

* Provide communications support to recruitment activities, whether they are conducted inside or outside of affected area;

* Provide communications and relay data between the Staffing Officer at the Job Headquarters and the staffing element located at the next higher level of ARC;

* Provide communications between staff entry point to affected area and appropriate Staffing office;

* Relay Staffing records data from any staffing office to any another;

* Provide communications between any Staffing office and its commanding office.

3.2.5.4 Damage Assessment

The Damage Assessment function provides the ARC with the ability to determine the impact which the disaster has caused in the affected area. The reports generated by the Damage Assessment are used in two critical aspects of the disaster relief operation, planning and Family Service delivery.

Damage assessment is one of the services automatically activated whenever a disaster occurs. This is because the damage assessment reports tell the ARC

what it will be required to provide. The sooner an estimate of the required resources is available, the sooner the resources can be mobilized and made available to the operation. Damage assessments ensure personnel and resources are activated and deployed as they are needed.

Detailed damage assessment reports are used by Family Service caseworkers to determine the needs of the victims. These detailed reports provide the caseworker with knowledge about how severely the disaster affect the victim's residence. This is important, since the caseworker will provide ARC assistance and resources based on this information.

To support these activities, the DiSC system must:

* Be immediately capable of relaying disaster assessment data from affected area to ARC authority;

* Provide communications between any Damage Assessment element and its commanding element;

* Relay data between Damage Assessment elements and the appropriate Records and Reporting elements;

* Relay data from Damage Assessment to appropriate Admin elements;

* Provide communications and relay data between the Damage Assessment Officer at the Job Headquarters and the Damage Assessment element at the next higher level of the ARC.

3.2.5.5 Records and Reporting

The Records and Reporting function manages the files and reports which are generated by Family Service activity. The Records and Reporting officer is responsible for generating statistics based on these files, and properly processing Disbursing Orders (DO's) generated in the delivery of Family Services. They are also responsible for insuring the confidentiality of file material.

The Records and Reporting function works closely with the Damage Assessment and Family Service functions.

In support of the Records and Reporting function the DiSC system must:

* Relay data from any Records and Reporting element to its commanding element;

* Provide communications between any Records and Reporting element and its commanding element;

* Relay data from Records and Reporting to Family Service caseworkers;

* Safeguard the integrity of personal and financial data transfers;

* Provide communications and relay data between the Records and Reporting officer located at the Job headquarters and the Records and Reporting element at the next higher level of the ARC.

3.2.5.6 Accounting

The Accounting function provides the ARC with the ability to manage the finances of a disaster operation. The Accounting officer is responsible for tracking and paying expenditures which are made by the operation. These expenditures include, salary and support of disaster relief workers, as well as the procurement of goods, services and facilities.

To support the Accounting function the DiSC system must:

* Relay data from Logistics officer to appropriate Accounting officer;

* Relay data from Staffing elements to appropriate Accounting elements;

* Relay data from Accounting elements to appropriate Admin elements;

* Provide communications between any Accounting element and their commanding element;

* Provide communication and relay data between the Accounting element located at the Job Headquarters and the Accounting element at the next higher level of the ARC.

3.2.5.7 Public Affairs

The Public Affairs Service is responsible for providing the ARC with communications with the public. The Public Affairs officer is responsible for insuring that the ARC and its activities are properly represented in the media. The

Public Affairs Officer is responsible for any communication with the public, whether in the form of a news story or public health bulletin.

Typical activity of the Public Affairs Officer include: providing public knowledge of ARC services which are available; fund raising activities; raising public awareness of disaster and its impact; and presenting public with requests for goods and services.

In supporting these activities the DiSC system must:

* Provide communications between Public Affairs elements and local media;

* Provide communications and relay data between the Public Affairs Officer at Job Headquarters and the Public Affairs element at the next higher level of ARC.

3.2.5.8 Liaison

(Government, Volunteer, Labor, and Human Relations)

Regardless of the disaster size, ***the Chapter will initiate the Disaster response***. (NOTE: Predictable Disasters such as Hurricanes, often allow the ARC to alert Chapters to impending dangers. Chapters would then be encouraged to take preparatory actions.) As the ARC's lead agents in Disaster Response, the chapters are required to work closely with the local authorities.

The importance of the liaison and communications between the local authorities/organizations and the ARC is accentuated by the fact that assistance

from higher ARC levels may not be immediately available. The delivery of services such as shelter and food can not wait 12 to 24 hours for shipments from warehouses or other chapters. Good relations and communications with local groups such as churches and charities can provide the additional resources which may be required in the initial response to a disaster.

Police, Fire, and Emergency Medical authorities are often the legal authorities charged with responding to a disaster. Good relations, and communications between these authorities and the ARC Chapter is required if the proper services are to be afforded to all disaster victims. Local organizations can provide the chapter with: official notification of disasters, a pool of emergency-trained personnel, assistance with initial disaster assessments, and a mechanism which informs victims that the ARC can be of assistance.

The size of a disaster affects the requirements for community liaison. Larger disasters, typically affect larger geographic regions, more communities are affected, and more authorities need to be coordinated with. A disaster which affects several towns or several states, may require liaison with town, city, county, state and even federal authorities.

It is important to realize that the impact of a disaster may be large while the affected geographic area may be small, such as a block of tenements burning down. The liaison requirements of this type of disaster would be large because the disaster impacts a large number of people. State and federal government might have interest in the disaster, and the ARC might require resources or

services from any number of organizations. This means establishing a means of communications between the ARC and these authorities may be required. Failure to provide this liaison may impair the ability of the ARC to provide services.

Liaison activities with local organizations and authorities also provides the ARC with an additional means of notifying the community that assistance and services are being offered. Liaison activities provide the ARC with knowledge pertaining to local organization abilities, resources, and needs. Establishment of good liaison's with local organizations ensure that the ARC is best positioned to meet the needs of the victims.

From this discussion the following requirements for the DiSC system can be determined. The DiSC must:

* provide chapter with ability to communicate with local organizations and authorities during a disaster;

* allow individual chapters to adapt methods and means which they will use;

* be capable of allowing chapters to conduct periodic testing of communications with local authorities in preparedness and training exercises;

* be able to provide the ARC with ability to communicate and coordinate with governing authorities, such as County, State and Federal authorities.

3.2.5.9 Training

The Training function is responsible for providing disaster relief workers with the training and orientation which they require. The Training Officer is responsible for establishing a process which orients new arrivals, and trains them in the task(s) which they will be assigned.

To support these Training functions the DiSC system must:

* Relay data to Training officer from Logistics element responsible for staff transport into area;

* Relay data between Training officer and Staffing element which is assigning staff personnel;

* Provide communications and relay data between the Training Officer located at the Job Headquarters and the Training element located at the next higher level of the ARC;

* Provide communications between any Training element and its commanding element.

3.2.5.10 Building and Repair

The Building and Repair function is responsible for providing " technical guidance in the repair and/or reconstruction of buildings and for maintaining liaison with contractors providing services to the operation"[4]

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4 Disaster Operations Management, ARC #3105, Nov 1984

To support the Buildings and Repair function, the DiSC system must:

* Provide communication between the appropriate Family Service element and the Buildings and Repair element;

* Relay data between the Damage Assessment elements and the Building and Repair elements;

* Relay data between the Buildings and Repair functions and appropriate Records and Reporting element;

* Provide communications between any Building and Repair element and its commanding element;

* Provide communications and relay data between the Buildings and Repair Officer located at the Job Headquarters and the Buildings and Repair element located at the next higher level of the ARC.

3.2.6 Special Considerations

Some special considerations need to be made for any system which is to be used by the ARC in a Disaster Relief Operation. The following sections detail these special considerations and discuss requirements which the DiSC system must meet.

The Life Cycle established previously was used extensively in exploring these requirements. The Life Cycle stages provided insight into requirements developed for maintenance, operation, and retirement considerations.

3.2.6.1 Operating Environment

The physical environment of an area affected by a disaster is not predictable. Environmental factors such as heat, moisture, wind, salt water, and cold should not affect the operation of a system which is to be deployed to a disaster affected area.

Consideration of ancillary system requirements such as electricity, antenna towers, and telephone lines should be made. The availability of these resources may be extremely limited by a disaster.

To respond to these considerations, the DiSC system should:

* Reduce the reliance on resources which are to be supplied from within affected area (ex. electricity, towers, phones);

* Be resilient to environmental conditions such as heat, cold, humidity.

3.2.6.2 Operator Skills and Abilities

Any system deployed during a disaster relief operation must be operable by non-technical personnel. The ARC does not have a large technical staff.

A typical disaster relief worker has little technical experience, and often has only a cursory amount of disaster relief experience. Disaster relief workers may not regularly partake in disaster operations, and can not be expected to have previously performed any task.

If a precedence in operation has been established in the past, any change to that system will complicate the relief worker's job. This type of complication should be minimized.

Regular training exercises, and or classes may be considered in improving the technical ability and familiarity of operators with equipment. These exercises would provide operators with the ability to become familiar with the equipment, while at the same time ensuring that the operation of the equipment is periodically checked.

To respond to these considerations the DiSC system should:

* Conform itself to methods which are familiar to operators;

* Standardize operations, so operators do not have to relearn their jobs each time they work on a disaster;

* Minimize the amount of technical experience and knowledge required to operate the system;

* Institute training for operators;

* Institute periodic operational exercises to ensure operator and equipment quality.

3.2.6.3 Maintenance Concept

The maintenance of a system deployed for a disaster relief operation should be held to a minimum. The emphasis in disaster operations is to supply services

to victims, not machinery.

If regular maintenance of the system is required a schedule or process should be established to perform this maintenance. The costs and downtime which this maintenance will incur should be minimized.

The operator skill level is also a concern in the maintenance of the system. Maintenance should consider the fact that the operator and caretakers of the equipment have little to no technical experience. Troubleshooting guides or manuals should be addressed to meet this fact.

In responding to these considerations the DiSC system should:

* Require minimum amount of maintenance;

* Provide high reliability when on deployment;

* Require minimum experience or technical knowledge to maintain;

* Institute a maintenance schedule or program for any required maintenance.

3.2.6.4 Catastrophe Assumptions

Planning and designing a system for disaster relief work requires that the system be capable of supporting catastrophic relief operations. A catastrophe is an extremely large or dangerous disaster.

The assumption made when planning for a catastrophe is that NOTHING is left in the affected area. No resources, buildings, towers, electricity, water, or food will be available for use after a catastrophe strikes.

To conform to these considerations, the DiSC system must:

* have the capability of deploying a completely self sufficient unit to any affected area at anytime;

* have the capability to operate in an environment which offers no resources.

3.2.6.5 Federal Response Plan

The Federal Response Plan details how the Federal Government intends to deliver response assistance to state and local governments for a significant or catastrophic disaster. The plan specifically includes one non-government agency, the American Red Cross. The plan designates the ARC as the lead agency responsible for coordinating and providing MASSCARE and DWI service delivery to disaster victims. Several Federal agencies are designated to support the ARC in this function.

Two significant considerations are raised by the Federal Response Plan. The first of these is: If resources and support are available from the Plan, what level of ARC provided support should be planned? The second aspect of consideration

is, what additional communication requirements does the Federal Plan place upon the DiSC system?

The following sections will explore these considerations.

3.2.6.5.1 Federal Response Plan: Planned Capabilities

The Federal response plan can be activated at the request of state authorities, and requires a formal Presidential declaration. The need for activating the plan can be affected by the disaster's magnitude, the preparedness of the community, state and local abilities, and the prevailing political environment. No strict guidelines have yet been developed for activation of the plan.

Inability to precisely define the conditions which will trigger plan activation, limits the confidence that Federal assistance will be available to any disaster operation, except catastrophic. For this reason the development of a communication system for the ARC should not rely on the intervention and assistance of Federal authorities, except in catastrophic response.

A catastrophic event would prompt an immediate Presidential declaration. Catastrophic planning should therefor be conducted with the expectation that Federal assistance will be available. The Federal plan and its provision of Federal coordination should be used to ensure that the assistance Federal agencies offer is compatible with DiSC system elements, and provide the ARC with capabilities to support requirements the DiSC system can not.

Catastrophic planning should always be mindful of the fact that the anticipated impact of the catastrophe will be immense. Each of the Federal agencies cited in the Federal plan has a limited amount of resources, and inevitably some requirements will not be met. The DiSC system should provide as much support for ARC catastrophic response activity as possible. This will ensure that the burden and reliance which the ARC places on supporting Federal agencies will be minimized.

(Please Note: This planning strategy is not intended to eliminate the need to develop relations and agreements with the supporting Federal Agencies. Coordination and planning are still required, and should continue to strive towards developing a plan in which the optimum use of all available resources is achieved.)

To support these Catastrophic planning considerations the system will be required to:

* Provide full communications support for all ARC Disaster Relief Operations except catastrophic response;

* Provide as much communication support as possible to catastrophic relief operations;

* Coordinate activities with Federal Response Plan Agencies to ensure continuity of service during a catastrophic response.

3.2.6.5.2 Federal Response Plan: Communication Reqt's

The Federal Response Plan establishes the ARC as the lead agency in coordinating and providing MASSCARE and DWI services to a disaster affected area. It also cites the ARC as a support element to several other functions.

These operational requirements will require the ARC to coordinate activities during a disaster relief operation, with a host of other service providers. Among the Federal Agencies with which communications will be required are: Department of Agriculture, Federal Emergency Management Agency (FEMA), the Health and Human Services Administration (HHS), and the Department of Defense (DoD).

The structure within which Plan operations are to work, will require that the ARC be capable of communicating with any number of response elements within the affected area, and outside of the affected area. The Plan calls for a Disaster Field Office (DFO) facility to be located within the affected area. The DFO will then act as the geographic hub of inter-Agency activities.

Assuming that the DFO is established, this would be the primary communication requirement added by the Federal Plan to operations conducted within the affected area.

The Plan generates an extensive requirement for communications outside of the affected area. Coordination, communication and data transfers between the twenty seven agencies involved in the Federal Response Plan can not be predicted

at this time. Planning to meet these communication requirements will take time and negotiation among all of the interested agencies and the ARC.

To support the communications requirements generated by the Federal Response Plan the DiSC system must:

* Provide communications and data transfer capability between the Federal DFO and the ARC Job Headquarters;

* Provide flexibility in providing communications and data transfer support between ARC and Federal support elements collocated outside of affected area.

3.2.6.6 Cost / Multi-functionality

The design of a system for disaster relief operation should balance the costs of the system, with it's ability to meet the ARC's requirements. This balance is vital because the cost of the system will be borne not only by National HQ but also by individual chapters. Lower costs will improve the chances that chapters will chose to become involved with the DiSC system.

One of the methods for reducing cost which the ARC has previously endorsed is multi-functional components. A multi-function design allows the ARC to use a specific piece of equipment, or sub-system, in several different capacities. This reduces the number of different systems which must be purchased. It also

has the added advantage of minimizing the Training, Shipping and Maintenance costs which the system will incur during its life.

To support these considerations the system should:

* Balance cost and ability of system;

* Provide ARC with ability to use equipment in a number of capacities.

3.2.7 Operation Requirement Summary

Appendix C provides a summary of the requirements which have been developed in this section.

4.0 Tool Development and Application

The previous section of this report detailed the requirements which the DiSC system must fulfill. This section of the report will develop a set of tools for use in developing a successful system.

The two primary tools which will be presented are a model of the DiSC system, and a method of evaluating design proposals. Example applications of both are presented.

4.1 Model Development

The purpose of a model is to simplify the development of the system. A model identifies different aspects of the system, and isolates them into components or subsystems. This allows design efforts to be concentrated on a single subsystem, or component.

Each piece of the model is defined by the requirements allocated to it, and the interface it must provide to other pieces of the system. The allocation of requirements to model pieces is performed in such a way that the interactive performance of the pieces meets the overall system requirement.

The development of a model can be initiated whenever a competent view of the process or system under evaluation has been achieved. The DiSC development is presently at such a point. The view provided by the initial set of requirements and mission scenario developed in the previous section, is more than adequate.

4.1.1 Development of DiSC System Model

The model which will be used to represent the DiSC system segments the entire communication support operation into three sub-systems: a chapter based subsystem, an SCC (or for pre-SD21: Operations HQ) based subsystem and a National based subsystem. The relation between these subsystems and ARC disaster response elements is depicted in **Diagram 12**.

The following sections will detail the requirements which each of the sub-systems must meet. These requirements are derived directly from those developed in the previous sections.

4.1.1.1 The Chapter Based System (CBS)

The Chapter Based System (CBS) will provide the ARC with its core of communications capabilities. The CBS will, as the name suggests, be based at the chapters. The chapter and its staff will be responsible for developing and maintaining its capabilities. The SCC's will be tasked with insuring all locations

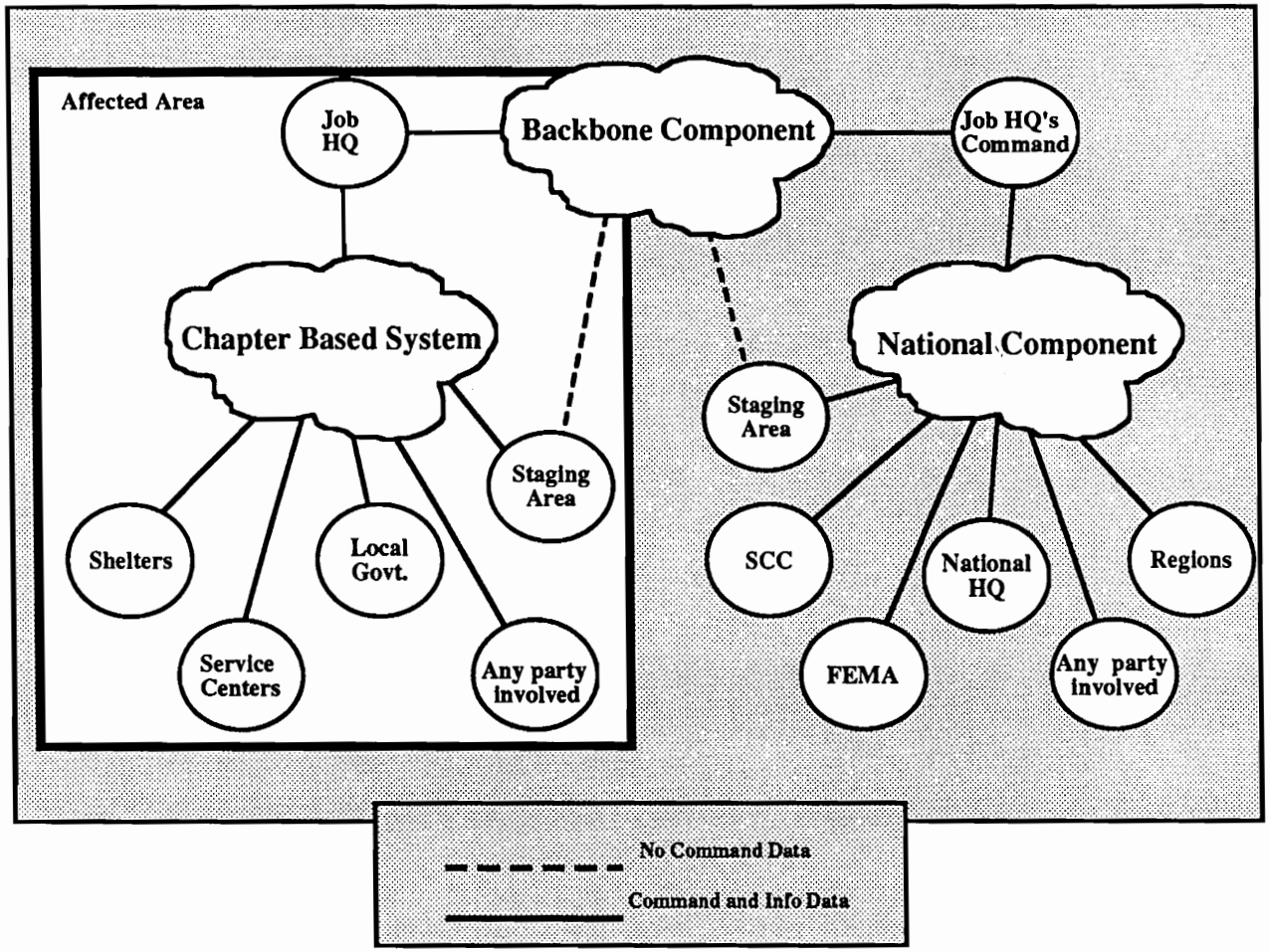


DIAGRAM #12

The Disaster Service Communications (DiSC) System

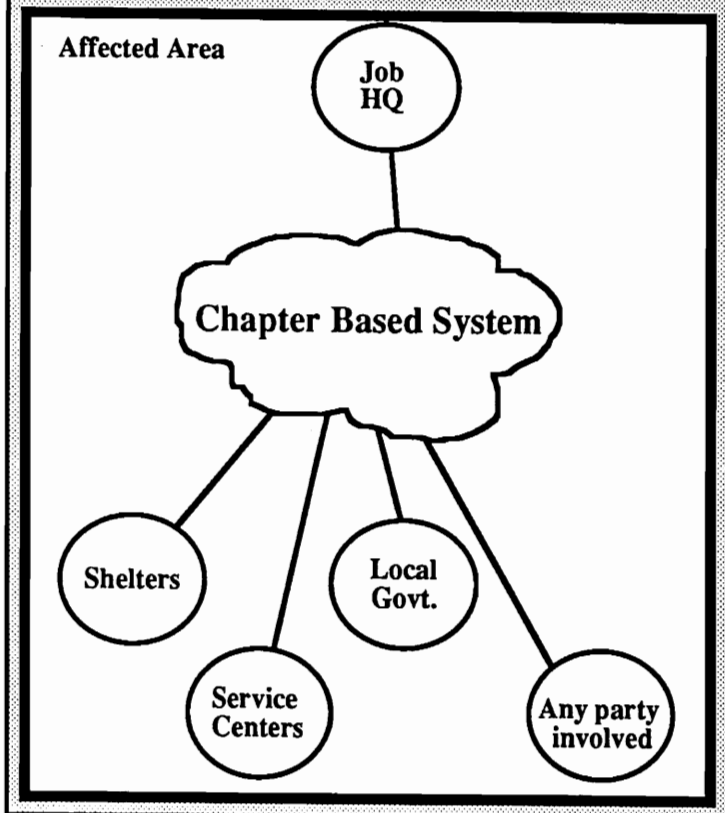
within their region are covered by a CBS and inter-CBS compatibility is maintained.

The CBS will play a vital role in supporting disaster relief operations. It will be responsible for providing communications support for all disaster relief activities, which are conducted within the affected area before assistance from the outside arrives.

Once assistance from outside the affected area arrives, the CBS will be responsible for continuing support of ARC activities within the affected area. It is an acknowledged fact that the CBS may not be capable of fully supporting large or non-recurrent disasters. For this reason the CBS must be compatible with any additional capabilities which are required and supplied by ARC from outside the affected area. The CBS will be expected to provide a majority of the communications support required for recurrent disaster relief operations.

Diagram 13 depicts the connectivity and functions which the CBS will be expected to provide.

As the primary communications support for the initiation and first actions of any ARC disaster, the CBS must be capable of providing support without relying on local resources which may be damaged or destroyed by a disaster. This means



Chapter Based System:

-Required to support communications throughout chapter's entire zone of control;

-Required to support immediate Disaster response activities;

- Required to support all communications support for recurrent disaster op's;

- Required to be compatible with additional support which large or non-recurrent op's may require;

- Developed and Maintained by chapters.

Issues in development of Chaper Based System:

- What entity will assume responsibility for zones which are not covered by chapters after SD-21?

- National guidelines required which are flexible, but state: functions, capabilities, and compatibility chapter system must possess;

- What role will SCC play? Region? National?

DIAGRAM #13

The Disaster Service Communications (DiSC) System

the reliance on telephones should be discouraged. Alternative methods of communicating with chapter members, the next higher level of the ARC, and local authorities should be integrated into the CBS.

The specific requirements which the CBS must meet are indicated in Appendix C.

4.1.1.2 The Backbone Component (BC)

The Backbone Component (BC) will provide communications between the affected area and unaffected areas. It will support communications requirements which cross into or out of the affected area. **Diagram 14** provides a graphic representation of the BC component.

Notification of disaster operation initiation is the responsibility of the CBS, not the BC. The BC will not be based at the chapter. It would be an asset which ARC personnel would bring into affected area, after disaster relief operation has been initiated.

The primary goal of the BC is to provide connectivity between ARC command within the affected area, and its commanding element. Communications between associated staging areas is a goal which has lower priority for this sub-system, since communications between these two elements has an alternate, though convoluted, route through their command elements.

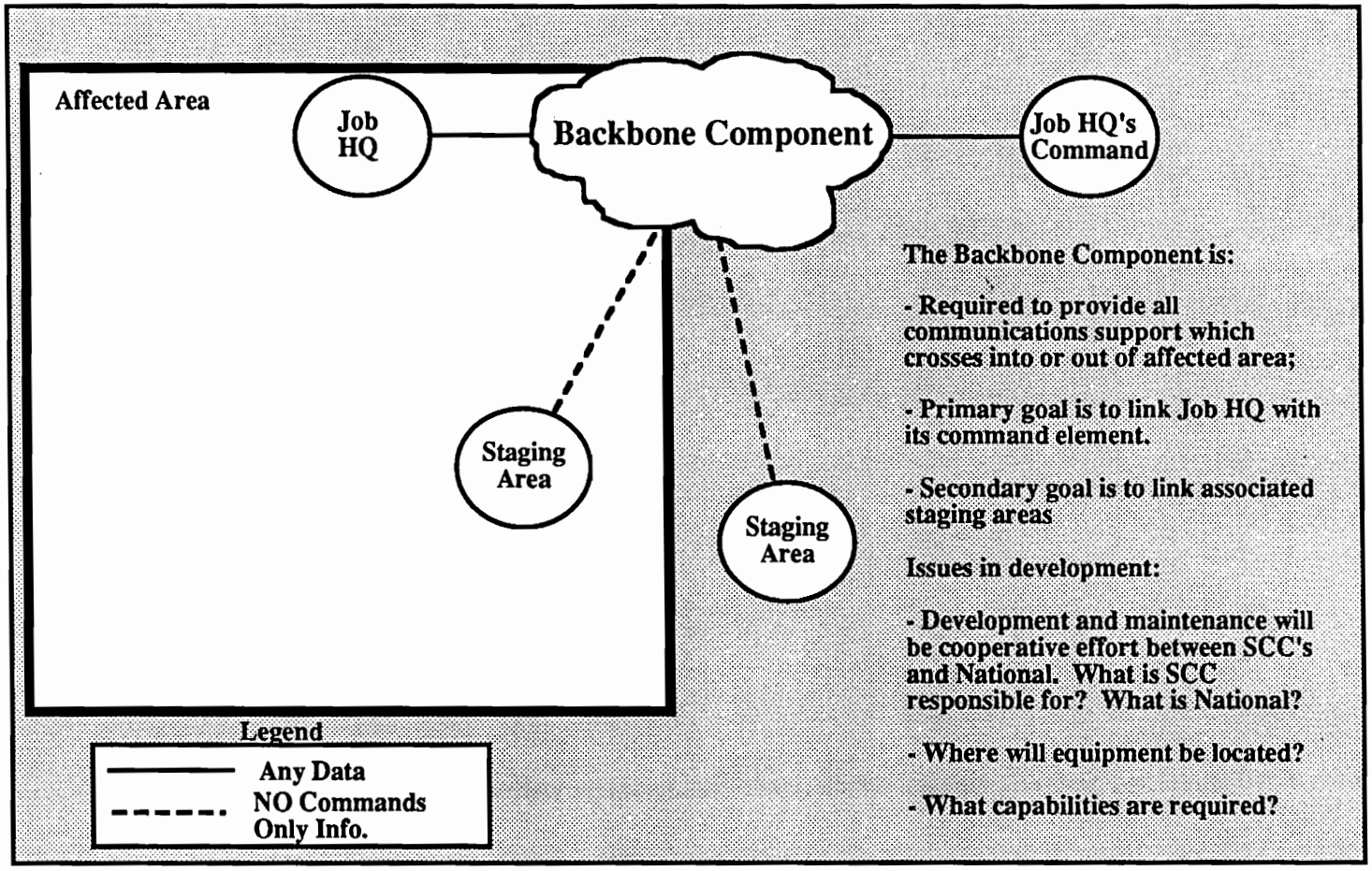


DIAGRAM #14

The Disaster Service Communications (DiSC) System

It is notable that this sub-system is anticipated to provide the majority of ARC support to International Red Cross and Red Crescent activities. The anticipated wireless, and long distance capabilities of this sub-system coupled with the requirements placed on its deployment, make it the ideal candidate for international relief support.

Development and maintenance of the BC will be coordinated between the SCC's (or the Op's HQ before SD21), and National HQ's.

The specific requirements which the ABC requirements must meet are indicated in Appendix C.

4.1.1.3 The National Component (NC)

The National Component (NC) subsystem will provide communications to all interested parties who are collocated outside of the affected area. The NC will provide connectivity between each of the ARC elements and Federal agencies, national volunteer organizations, labor organizations, media organizations, unions, and any other organization involved in a disaster relief operation. **Diagram 15** provides a graphic representation of the NC component.

A major consideration for the NC is to provide communications support in a manner which is similar to "normal daily" operation. The additional connectivity and functionality which support of a disaster relief operation requires, should not require NC users to learn or institute major changes in their methods.

The National System is to provide communications support between all elements collocated outside of affected area.

Issues in development of the National System:

- National will be responsible for this component;

- Identification of all parties interested in disaster and catastrophe operations;

- Maintenance and updating capabilities between disaster op's.

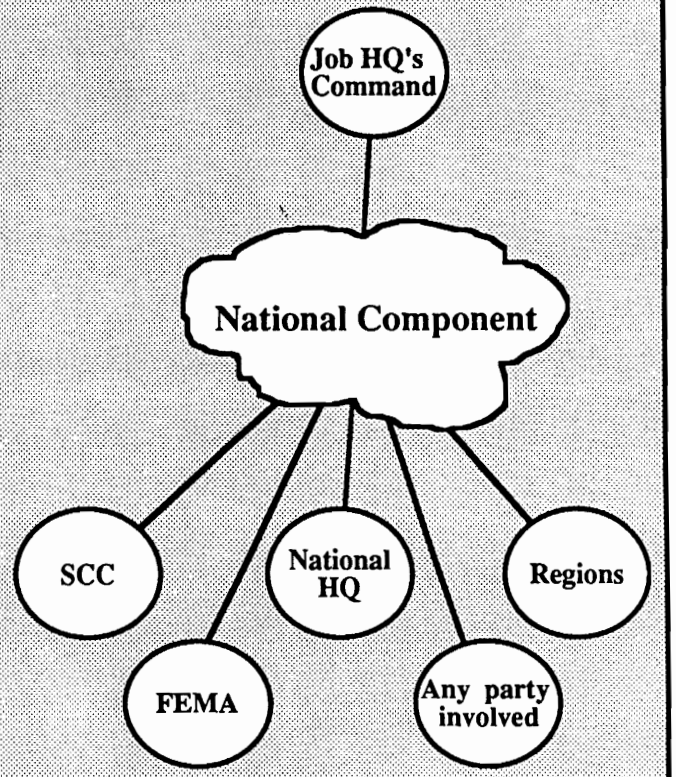


DIAGRAM #15

The Disaster Service Communications (DiSC) System

Flexibility of the NC is also a major consideration. The connectivity which the NC will be required to provide is not completely detailed at this time. Future development of the Federal Plan and the unpredictable nature of disasters will require the NC to adapt quickly to requirements which are generated during a disaster operation.

The specific requirements which the NBC must meet are indicated in Appendix C.

4.1.1.4 Interface Between DiSC System Components

Examination of the DiSC model indicates that the majority of anticipated communications will traverse only one component of the DiSC system. Data from the field is transferred to/from commanding units via the CBS. Data from commanding units is sent to/from Field HQ's via the CBS. Data from Field HQ's is sent to/from the next higher level of the ARC via the BC. While, data to/from any entities collocated outside of the affected area is exchanged via the NC.

The interfaces between the components of the DiSC system are the ARC elements which they support. These units can be Service Officers, Admin elements, or operating field units. These units will receive data from the DiSC system, process the data, and possibly pass their results on to another element via the DiSC system.

The DiSC system components must be capable of adapting their interfaces to the abilities and requirements of these ARC elements. If automation has been provided to a center, the DiSC system should strive to retain the benefits which have been achieved by automating.

As the DiSC system Life Cycle details, coordination, and adaptation of the DiSC system will be an on-going activity throughout the life of the system. A primary reason for this is that the interfaces which the different ARC elements will constantly be undergoing changes. Automation development, the availability of data processing equipment, and the evolution of data processing equipment used by the ARC, are all factors which will require the DiSC system interfaces to adapt.

4.1.2 Model Application: Examination of Present Methods

The following three segments use the DiSC model to examine and evaluate the present methods used by the ARC to support communications requirements.

4.1.2.1 Present Method: Chapter Based System (CBS)

The present ARC system has a wide range of capabilities to provide communication services to disaster relief operations. ARC chapters throughout the country have periodically been encouraged to develop their communication abilities.

Many chapters have approached local amateur radio groups and asked them to assist them in planning and supporting disaster relief operations. Other chapters have developed their own sophisticated mobile communication systems with the cooperation of local merchants and authorities. The results of these efforts has produced packet radio, mobile cellular, microwave and satellite based communication systems.

Although this array of abilities appears extensive, it does not meet the requirements of the ARC. The quality of communications capability available at the chapter level is uncontrolled. Some chapters have extensive capabilities, others have no capability at all.

One of the goals of the ARC is to provide every community with a baseline of services. This is a requirement of the CBS. The present system does not meet this goal.

Two significant factors apparently need to be examined to rectify this: a standard set of capabilities which every CBS must support, and a method of ensuring compatibility with any externally provided assistance.

4.1.2.2 Present Method: Backbone Component (BC)

The methods presently available to communicate with an affected area vary widely. Yet, the majority of disasters use two methods for communications, phone lines and physical transport. Data or information required immediately is

transferred over the phone. Anything which can tolerate a delay of a few days will be shipped or mailed out of the affected area (ex. return of DO's). These methods do not meet the ARC's needs.

In recent years the availability of phone lines has not been significantly affected by most disasters. When phone service is disabled, service is usually restored within a few days. Fortunately, restoration of service to the ARC is considered a priority by phone companies. Yet, the ARC can not rely solely on a phone based BC.

A major catastrophe or even a disaster affecting a large area, could disable phone capabilities for weeks. During Hurricane Hugo the ARC experienced just this condition. Relief operations in St.Croix, were unable to use phones. The island's service was disabled for weeks. Relief activities were severely impaired by this fact.

A second reason reliance on phone lines is not practical is that ARC activities must have the capability to react and operate immediately. Communications support must be available for this activity. The present system has limited capabilities to provide this support, when the phone lines are out of service, even if the outage has a short duration.

When the phone lines are operating, a fax machine is the preferred tool for transferring reports and forms immediately. Fax's are used to relay anything which can be put on paper: reports, news clippings, narratives and requisitions. FAX's do not provide this data in usable form.

A major drawback to the FAX is that it does not relay data, it relays images. Data generated by computers is printed, and then faxed. When these faxes are received, they must be processed. People must interpret the FAX, and enter the data back into the local processing system, manually. This manual activity results in time delays, personnel costs, and errors. As a result data files, long lists, and programs are not readily transferred via FAX's.

As the ARC progresses farther and farther along with their automation activities, the requirements for data transfers will increase. FAX processing will impose more strain on the system. The limitations which the present system places on data transfers, coupled with its reliance on the phone system indicates that the present BC portion of the DiSC system does not meet all of the ARC's requirements.

4.1.2.3 Present Method: National Component (NC)

The NC of the DiSC system is responsible for communications between any two interested parties collocated outside of the affected area. The ARC presently provides much of this communication support for its daily activity. Indeed FAX's and reports received from disasters are manually entered into this "daily" structure.

Diagram 16 provides a graphic representation of the present NC system.

A major component of the present system is the VAN network. Presently this VAN is the AT&T EASYLINK Service. The Emergency Communications

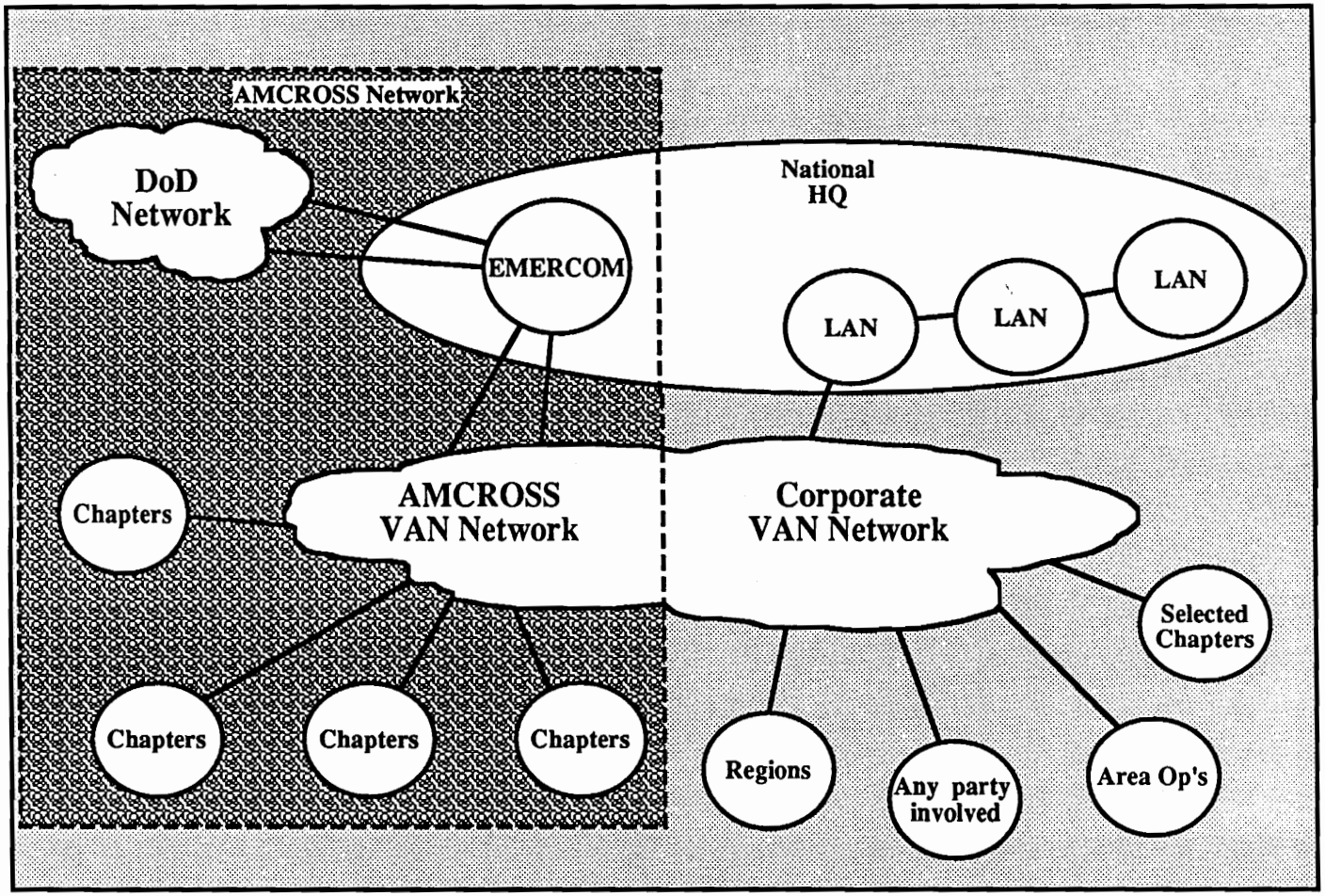


DIAGRAM #16

Present National Component of DiSC System

(EMERCOM) portion of Military Services, is the primary user of this system. Work is being conducted at this time to integrate all of the chapter LAN's, EMERCOM and the National HQ LAN system.

The National HQ LAN system consists of a number of IBM Token Ring networks. Brouter's interconnect most of the networks and provide inter-LAN connectivity. This connectivity allows LAN users to transfer e-mail, and files. Access to the National system, by other ARC elements is provided through two gateways. One of these gateways provides access to the National LAN. The other is a complex switch developed and maintained by EMERCOM to provide communications between military personnel and their families. This switch provides an interface between the VAN, and the DoD networks.

EMERCOM is responsible for fulfilling the ARC commitment to providing the American public with communications to members of the Armed Forces in times of emergency. The AMCROSS system was developed to accomplish this. The AMCROSS system provides over 600 chapters throughout the nation the capability of receiving and transmitting messages. Chapter to chapter, Chapter to National and National to DoD communications are all possible in the AMCROSS network.

The connectivity which Disaster operations requires is not fully determined at this time. The connectivity which the present NC system provides is constantly being expanded, as new requirements for daily communication surface. This means links with potential disaster involved parties are always under development.

The present NC system allows the ARC to distribute data and information using a myriad of delivery processes. The present system allows the ARC to transfer data directly from their LAN's into the VAN network. The VAN then provides transformation of the data into the required delivery format (FAX, Phone, Next Day Delivery, Telegram, E-MAIL, etc...), and delivers the message. This capability gives the present NC an exceptional amount of flexibility.

The flexibility and capabilities of the present system appear to fulfill most of the requirements of the DiSC system. The only notable exception at this time appears to be the isolation of the Accounting systems, which is required for the DO process.

4.2 Proposed Development Process

The previous section's cursory examination of ARC capabilities indicates that work needs to be done if the DiSC system is to fulfill all of its requirements. This section will propose a method or viewpoint which may be used in developing the DiSC system capabilities.

4.2.1 Buy-In / Agreement

The first step in the developing the capability of the DiSC system is to ensure that the final product will be accepted. In the ARC organization, acceptance is not assured. Success mandates that design and development efforts

be coordinated with personnel and staffs from all over the ARC. This would include representatives of the chapters, and their staffs. These personnel can be viewed as customers.

The final product must be accepted by these customers. Introducing representatives of these staffs into the development process, early, will increase the chances of success.

A conference of ARC personnel from around the nation is presently planned for just such a reason. Conference attendees will be presented a summary of the work completed, and will be asked to assist in the development which is anticipated. Conference activities will be centered on establishing a united set of goals, and establishing recommendations for future development.

4.2.2 Design Teams

Once an established set of priorities and goals have been established. Design teams can be formed to concentrate on specific design considerations. The DiSC model developed in this report will be of value in this process. It's delineation of system components and their functions will allow teams to be assigned different tasks.

The process of developing the design teams should take into consideration political, and technical concerns. Representation of the chapters must be

maintained throughout the development process. Political success of the DiSC system requires this.

Membership of the design teams should also consider technical abilities of prospective members. A balance between technically literate operators, technical proficient types ("tecchies"), and non-technical types should be maintained. A good balance of all three types will limit the impact of individual preferences and widen the discussions beyond "accepted" or previous methods used.

4.2.3 Detailed Design

The proposed conference represents the start of the second stage of the proposed Development, the Detailed Design Stage. The DiSC Life Cycle noted that the first effort, or development initiation, would be undertaken by solely by the ARC's National staff. This initial stage will conclude once the conference ends.

The second stage of development will use teams of ARC personnel from throughout the organization to research, design and develop the DiSC system. Each team will be assigned a different component on which to concentrate.

National will provide guidance and oversight of the different teams. National will also be responsible for maintaining the DiSC model. Trade offs, technologic inabilities or costs may cause the teams to recommend changes to the model. A single version of the model must be maintained, though.

Any changes which are made to the model may affect several teams. National will be responsible for maintaining this single version. It will also be responsible for informing all parties of any changes, if some are required.

4.2.4 Design Evaluation Methodology

Once the teams have had time to evaluate their aspect of the system, they will begin to generate solutions. Determining which of the solutions is the best choice can be difficult. The tools developed in this report can be of use, though, in evaluating design choices.

The following steps are recommended for evaluating any design alternative:

1. Determine component of model under consideration (limit scope to one at a time if multiple involved)
2. List requirements of component
3. Determine design alternative's capabilities to meet these requirements
4. Establish Mission Scenario for design alternative
5. Determine Life Cycle for alternative
6. Evaluate costs and benefits using Life Cycle and Requirement evaluation.
7. Compare alternatives.

The following section provides an example evaluation of how a technology or piece of equipment can be evaluated for use in the DiSC system. **Diagram 17** provides a graphic view of the proposed evaluation process.

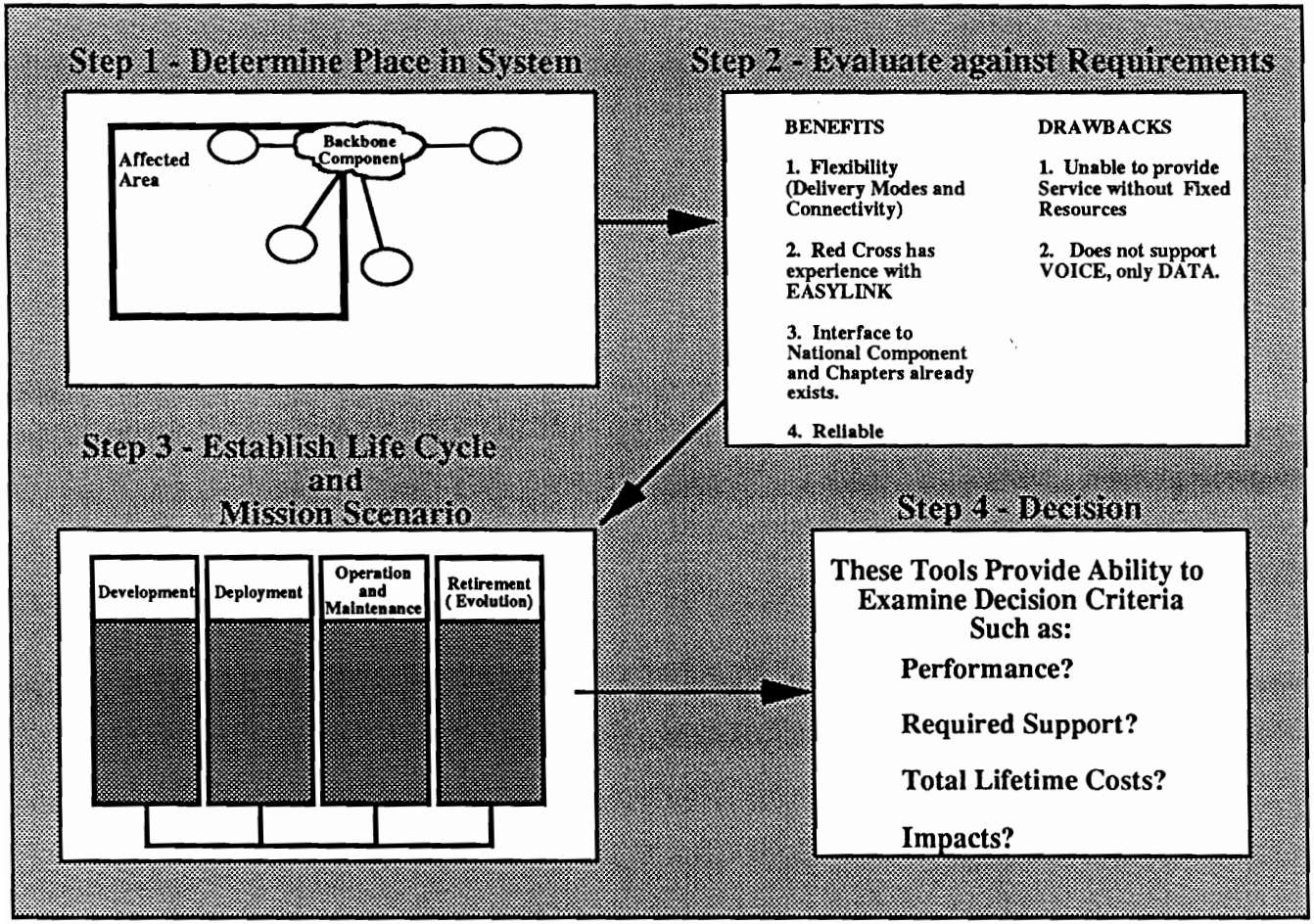


Diagram #17

Proposed Evaluation Methodology

4.2.4.1 Application of Design Evaluation Methodology

The EASYLINK system has been identified by the ARC staff as a service of which they would like to take full advantage. The service has been used by the ARC in and around National Hq, and has proven quite useful. Indeed, the AT&T EASYLINK Service forms the heart of the present NC system.

The following sections will use the tools developed in the previous sections to evaluate how the EASYLINK system might be applied to the Backbone Component of the DiSC system.

4.2.4.1.1 What is EASYLINK ?

EASYLINK is a service offered by AT&T. It is a Value Added Network (VAN) service which provides customers with "datagram" services. Data or messages entered into the system are delivered to addressees.

The EASYLINK service assigns users electronic mailboxes. These mailboxes store messages addressed to their owner, until the owner requests delivery. Users request delivery by dialling up the system, providing a password, and requesting a mailbox dump.

An alternative method of delivery known as "Forced Delivery" is also offered by EASYLINK. This delivery mode immediately upon accepting a message calls the

addressees, and delivers the message. The addressee does not have to poll a mailbox.

Messages are typically entered into the system electronically via dial up modems. Once received by EASYLINK, messages can be delivered electronically via modems, or through mailgrams, TELEX, telegrams, next day mail, voice messaging, or FAX. Billing is based on delivery modes, and time required to deliver message.

The EASYLINK service allows users to customize service delivery. Special message formats, "closed" networks, and custom delivery services are all supported by EASYLINK.

4.2.4.1.2 EASYLINK & The ARC

The EASYLINK system presently provides the ARC with a majority of it's daily communications support. EASYLINK provides the ARC with all inter-location E-mail, EMERCOM and inter-location file capability.

Development activity is underway to provide National HQ staff the ability to fax information directly from their LAN terminals. This is anticipated to reduce the requirements for FAX equipment throughout the National facilities. (Unfortunately LAN technology is not presently capable of receiving, reading the address and delivering incoming FAX's to the proper LAN account.)

One of the reasons that the EASYLINK system has become so relied on by

National is its flexibility to provide data in the format desired. Data can be entered into the EASYLINK system, converted to another format and delivered. Data conversions can be made between: Fax, E-mail, TWIX, Mailgram, Telegram, voice, as well as any user-specific formats.

An additional feature of the EASYLINK system which has endeared it to the ARC is the technical support which it has provided. EASYLINK personnel have provided a consistently high level of quality support to the ARC. This support has taken many forms, from custom programming services into the system to providing quick reactions and solutions to technical issues or concerns.

4.2.4.1.3 Capabilities vs. Requirements

Appendix D lists requirements of the DiSC Backbone Component (BC), and correlates them to the ability or inability of the EASYLINK service. Comments and notations provide an explanation of how the system might be employed to fulfill the requirement.

Examination of Appendix D indicates that the EASYLINK system does not fully meet the requirement of the BC. The following sections discuss the more notable concerns which an EASYLINK based BC raise.

4.2.4.1.3A Transmission Inability

The EASYLINK service offers superior data store and forward capabilities.

Its addressing, reporting, and data conversion capabilities are all applicable to the ARC's needs.

What the EASYLINK system is unable to do, is provide transmission and reception capabilities without a fixed resource. Fixed resources are required to contact the EASYLINK service.

The ability to transmit into or out of the affected area is the prime objective of the Backbone Component (BC). The EASYLINK system can only do this when the phone lines are available, or when an alternate method of communicating provides communication between the affected area and EASYLINK.

The inability of EASYLINK to provide transmission capabilities does not preclude it's use as a BC. It can be used on the majority of disaster which the ARC reacts to, since phone service is not typically disabled for long.

Use of the EASYLINK on a regular basis will increase the importance of training and exercises which simulate operation with limited telephone or fixed communications. Constant use of the EASYLINK and phone system will foster a reliance on the system. Exercises and training should maintain the ARC's ability to communicate when the phones are not available.

These exercises may place a communication capability between the Job Headquarters and EASYLINK, or it may completely bypass EASYLINK. Serious operation changes should not be planned for the EASYLINK fallback, since this would negate any past experiences and confidence which relief workers may have developed.

Preparedness for serious disaster work is vital. Without it, when the "Big One" hits serious amounts of time will be lost trying to develop new ways of communicating.

4.2.4.1.3B Access Control

A second concern raised by the use of an EASYLINK BC is network control. The NC EASYLINK network must only have access to the command element of the Job HQ.

Access to the Job HQ's should not be available to any ARC element except its commanding element. The administrative structure of the ARC requires that all instruction and guidance be passed through the command chain. Allowing direct access from the National Component to the Job Headquarters, would allow orders or messages which resemble orders, an invalid path to the field staff.

The EASYLINK systems can and should provide isolation between these components.

4.2.4.1.3C Lack of Voice

The EASYLINK system is a datagram based system. Voice can not at this time be supported by the EASYLINK system.

The importance of voice is a primary concern only for command in an ARC operation. This means that all operations can be accomplished without voice,

provided preparation has been done to establish the proper protocols and methods.

Voice is considered a primary concern in command situations because managers and commanders are naturally more capable of assessing their personnel by listening than by reading.

The human voice can convey stress, anger, joy, and frustration more succinctly than the written word. This asset is valuable in disaster relief operations which are notably stressful. An additional complication in the ARC is that officers and managers may not have any personal experience with their staff.

An EASYLINK BC's inability to support voice communications should not severely impact a disaster operation, though. The reason for this is that the backbone link conveys a minimal amount of command data. The majority of data carried by the backbone is technical in nature: requisitions, personnel files, technical guidance, or reporting. The only command data transferred via the backbone is direction to the Job Director.

Command of the affected area is the responsibility of the Job Director, who has been appointed based on his experience and capabilities. The Job Director selection process ensures he will require little guidance from his superiors.

4.2.4.1.4 Mission Scenario for EASYLINK based BC

The previous section detailed how the EASYLINK system's capabilities matched the requirements of the BC component. The restrictions which this correlation developed, were incorporated into the mission scenario which follows.

The purpose of the mission scenario is to demonstrate to the users, and designers how the final system will fit together. It can be thought of as a verbal prototype.

Operation Begins:

The initial reaction team has been notified of a disaster has occurred. Upon responding the Red Cross staff determines that the chapter is unable to provide all the assistance required. Resources, and personnel are required. These facts are incorporated into their report and relayed via the CBS to the Chapter Manager.

The Chapter manager, also using the CBS, notifies the next higher level of the ARC of the situation. This notification includes details of the disaster and specific requests for assistance.

The next higher level of the ARC, upon notification, begins preparation of resources. Recruitment of personnel is also initiated.

Deployment of EASYLINK

Once a team of officers and Job Director are recruited, they are deployed. They carry with them the equipment or software required to establish their field headquarters operation.

The "equipment" which these officers are deployed with will vary, depending on the capabilities of the local chapter. Prior coordination of chapter resources would have established requirements for the deployed equipment. Deployment equipment may range from nothing, to fully equipped computer terminals, mobile satellite terminal and software.

Once on site, the officers will have the training and experience to establish communications with their commanding unit using EASYLINK. File transfers, e-mail, and software updates transferred between the Job Headquarters and its commanding unit, are initially delivered to fax machines. But as automated office equipment is set up, delivery mode is switched to direct data transfers.

Access to the EASYLINK system may be limited to a single phone line. It is also possible to establish multiple access points to the EASYLINK system, if geography or traffic flow requires.

Support of On-going Operation

Established procedures are used to transfer files and messages between the Job Headquarters and its commanding unit. Transfers with high precedence are

force delivered to the proper terminal, while lower priority messages are delivered to electronic mailboxes.

The Job Headquarters provides linkage between the local CBS and the BC. Data collected from various locations within the affected area is transmitted to the Job Headquarters via the local CBS. The CBS, Job Headquarter's automated system, and the BC all work together to ensure that data entry tasks are minimized. Once data has been entered into the system, it can be transferred between these three systems electronically.

Reports, files, software, and raw data are transferred between the two command elements using a paperless process. Fax transmission is limited to transmission of data not readily available in an electronic form, such as newspaper clippings.

Dismantling Operation

The shelters and family service centers are beginning to close down. The number of data transfers between the Job Headquarters and its commanding unit is dwindling. Technical guidance bulletins, and DO's are also beginning to decrease.

Calls into the EASYLINK system are infrequent. Most of the officers and equipment have left the disaster, and the Job Director has transmitted his narrative back via EASYLINK.

Back at the commanding element, reports regarding the traffic passed through EASYLINK are being collected. Reports divide traffic costs and statistics based on the mailbox to which it was addressed.

Official closure of the operation can not be achieved because additional assistance is required for two families. Official reporting for this assistance will be relayed back to HQ's via the chapter's AMCROSS terminal, which has EASYLINK capability.

4.2.4.1.5 Trade off Analysis

The previous sections have developed how the EASYLINK system will be operationally applied to disaster relief operation, as the Backbone Component (BC). Although the mission scenario is very important, it does not provide a full view of the affects which the EASYLINK system will have on disaster operations.

The following sections will identify the activities, personnel, and costs which will be affected by the EASYLINK application.

The approach used to define these affects, is the Life Cycle of the BC equipped with EASYLINK. The Life Cycle approach was presented in development of the DiSC system, for a similar purpose. The examination of the total costs, and affects which a decision will incur, can only be generated by examining the entire life of the system.

4.2.4.1.5.1 Life Cycle for EASYLINK based BC

The Life Cycle of the EASYLINK application has been segmented into four stages: Development, Deployment, Operations and Maintenance, and Retirement. Each of these four stages will be discussed in the following sections.

4.2.4.1.5.1A Development

Activities during the Development stage would begin by establishing the specific technical requirements which the EASYLINK system will be required to perform. Interfaces, data formats, timeliness of delivery, and accuracy specifications are among the subjects which would be examined. These requirements would augment the requirements developed in this project, by providing a greater level of detail.

Once the system's technical requirements had been developed the EASYLINK system, and its vendors would be queried. The system and its services would be formalized. Custom software or features might be developed at this stage.

The development of training material and procedures would begin shortly after an evaluation establishes EASYLINK is capable of fulfilling the ARC's needs. The incorporation of Training activity early in the development will ensure that the operator's viewpoint is always present. For this reason the Training staff should have the same technical level or experience background as the potential

operators. Early involvement will also improve the technical abilities of the training staff.

The final activities of the Development stage will be the test and verification stages. These stages will verify that the entire system works. The entire deployment/ training/ operation/ maintenance process will be checked using prototypes, single chapter deployments, and possibly practical application to a disaster.

4.2.4.1.5.1B Deployment

The Deployment stage of the EASYLINK Life Cycle will concentrate on making the system available to the entire ARC. Efforts will concentrate on training operators, spreading the word of its availability, and distributing whatever physical goods are required to utilize the system.

Strong efforts will be made throughout this stage and the early portions of the O&M stage to monitor system performance and analyze failures. Design mistakes or oversights will require quick remedy if the system is to establish itself with a good reputation.

4.2.4.1.5.1C Operation & Maintenance (O&M)

The O&M stage of the EASYLINK will concentrate on maintaining the skills of the operators and the abilities of the system. Development of new technologies

and automation of disaster operations will require the EASYLINK BC and its operators to adapt.

Training efforts will concentrate on maintaining the skill levels of current operators, training new operators and adapting training practices to EASYLINK BC upgrades.

Maintenance of the EASYLINK BC may also require physical maintenance of computer equipment or software. The logistics and responsibility for these functions will need to be determined in the Development Stage.

4.2.4.1.5.1D Retirement

The EASYLINK BC Is envisioned as an adaptable tool. It's retirement will be gradual. As with any other technology, eventually the system will become outdated. Present intentions are to slowly phase in other technologies, much as the EASYLINK system, is proposed to be phased into the present system.

Alternatives which may replace the EASYLINK system are: privately maintained X.25 system, Virtual Private Network Services of Public Switched Telephone System, or Satellite Network. As these technologies stabilize, their value to the ARC will be evaluated, much as EASYLINK Is being evaluated here.

4.2.4.1.5.2 Decision (Approve/Disapprove)

The final decision to approve or disapprove a design alternative will be based upon a number of factors. Different managers and staffs will use different criteria in making a decision. Typical factors used in a design or policy decision are costs, performance, and risks. The evaluation of requirements v. capabilities analysis and the Life Cycle developed for the design alternative, allow managers and designers to assess these factors.

The requirements v. capabilities analysis can be used to provide a view of how the design's performance meets the needs of the ARC. The mission scenario augments this analysis by providing a narrative prototype, or view of how the design fits into the entire system. Discussion and refinement of these tools will assist both designers and managers in identifying the factors which are critical to them.

The Life Cycle developed for the design alternative, allows managers to investigate the costs and impact which the design will impose throughout its existence. The cost of a system is not limited to the initial purchase costs. Costs such as training, maintenance, operation, personnel and salvage are all factors which the Life Cycle an be used to examine. Table 2 illustrates how the Life Cycle might be used to evaluate personnel requirements of a design alternative.

Stage of Life Cycle	Develop	Deploy	O&M	Retire	Comments
Training	High	High	High	High	Training will be involved at a high level throughout the project
Operator	Low	Med	High	Low	Operators will be phased into project. Initially limited involvement is required to assess requirements and operator abilities.
Vendor	High	Med	Low	?	Vendor supplies technical assistance. Role in Retirement dependent on replacement.
Engineering	High	Med	Low	High	Engineering talents required early on, phase out as system design is verified and accepted.
Maintenance	High	High	High	High	Maintenance is required at a high level throughout the project. They are caretakers of system.

Table 2 - Personnel Requirements for EASYLINK BC Life Cycle

(Please Note that a detailed personnel cost analysis would assign personnel to tasks, rather than stages of activity. Estimates of time and costs could then be more accurately estimated.)

Care should be taken in this evaluation to compare costs allocated throughout the anticipated life on an appropriate basis. Cost analysis should include factors which provide appropriate weighting to funds immediately required, and funds required at some future time. Techniques such as the Future Value of Money, or the Present Value of Money might be considered for this purpose. Management preference is the driving force in the choice of a method to do this.

The final decision to approve a design alternative will be affected by both technical and managerial concerns. This fact was recognized, and incorporated into the proposal for design alternative analysis. The tools used and the factors emphasized, can provide the staff which will make the final decision all of the information they require, whether managerial, technical or financial.

4.2.5 Concerns Related to Detail Design Activities

The detailed design stage of the DiSC system Life Cycle is associated with tasks other than development of a final technical design. Training, logistics, and political development of the system are also activities which are to be performed. The Life Cycle of the DISC system details these concurrent activities.

Efforts in these endeavors should proceed concurrently with the technical development. These activities should not be viewed as separate from the technical development. The concerns which these activities raise should be incorporated

into the design of the system. Maintaining close ties between development, training, operation, and maintenance personnel ensures that the final design will not only look good on paper, but will also be useful, efficient, and accepted.

Previous sections have recommended that the technical development activity be farmed out to specific design teams. These design teams would the investigate the detailed requirements of components and develop design alternatives which might solve them. National would coordinate the activities of these design teams, and appoint additional teams as they are required. These additional teams might be responsible for integration of the individual component designs or oversight of testing.

A major concern which needs to be addressed before the detailed design stage concludes is a system verification and acceptance test. The system components, whether they support training, maintenance or technical operation need to be tested. Two types of tests are typically proposed for a system, verification and validation.

Verification testing proves that the system does what the designers wanted it to do. Functions, operation and content are reviewed by the staff or their counterparts. Validation testing insures that the product does what the customer wants it to do. There is a significant difference between these two types of tests. The design team can perform verification tests, but only a true customer can perform the validation tests.

Validation testing might take the form of a single chapter deployment. It should ensure that any anomalies or oversights which the design team may have made is caught. To do this it is best to obtain a "typical" environment and deploy the system as the final design proposes. External influences from the design team should be minimized. Training, logistics, maintenance and operation should be conducted as the final system design proposes.

Once the system has successfully passed all tests, activities can begin to concentrate on the next stage of the System Life Cycle, Deployment. In this way the Life Cycle again acts as a guide to the system designers.

4.2.6 Anticipated Development Problems

Problems are inevitable. The development of a system with goals as far reaching as the DiSC system's is bound to have difficulty at some point. Assessing risks and preparing can minimize their impacts on the final product and its success. The next few sections discuss some of the problems foreseen for the DiSC system development.

4.2.6.1 Politics

The unique organization of the ARC places significant burdens on the development of the DiSC system. The success of the final system is equally dependent upon its technical capabilities, and its political appeal to the chapters.

For this reason Politics are foreseen as a major concern in the development of the DiSC system.

The involvement of the chapters must be maintained throughout the system Life Cycle. While maintaining this involvement it is also important for National to maintain control of the system. Chapters, regions or SCC's all have their personal preferences. National must ensure that the system's design meets the nation's needs, not just the needs or preferences of a particular faction.

4.2.6.2 Precedence

An additional problem which is foreseen is a lack of successful system design precedence. The ARC has not established a methodology for successfully developing systems.

Previous technical developments performed for the ARC have not been very successful. A common problem cited by ARC personnel is the lack of apparent understanding the system developers have of the design requirements. Faults cited with previous products developed include: require too much technical knowledge, do not perform required functions, do not conform to established standards or do not provide the reliability which is required.

The development process proposed for the DiSC system has attempted to reduce the risk of losing touch with the end user, and required functionality. The proposed process incorporates operators in the requirements analysis as well as

throughout the development process. Additionally the Training staff, which should also represent the operator's viewpoints, is heavily involved throughout the design process.

5.0 Summary of Work

This section provides a brief summary of the proposed Development Process and the Evaluation Methodology.

5.1 Development Process

The process which is recommended for developing enhancements to the DiSC system fulfills the tasks assigned to the first stage of the DiSC LifeCycle, **The Development Stage**.

Five major steps are proposed for developing enhancements:

1. Obtain Buy-In
2. Establish Design Teams
3. Generate Enhancements and Alternatives
4. Evaluate Enhancements and Alternatives
5. Make Decision

The first step in the developing the capability of the DiSC system is to ensure that the development process and related goals have been accepted.

Acceptance, or Buy-In is required from both National ARC management and chapters.

Once Buy-In has been obtained, design teams can be formed to concentrate on specific design considerations. These teams will research, design and develop different components of the DiSC system. The DiSC model developed in this report will be of value in this process. It's delineation of system components and their functions will allow teams to be assigned different tasks. National will provide guidance and oversight of the different teams and maintain the DiSC model.

Once the teams have had time to evaluate their aspect of the system, they will begin to generate solutions. Determining which of the solutions is the best choice can be accomplished using the evaluation methodology developed in this report.

The final step in the development process is to decide which alternative will be accepted. This decision will be made by the management and staff of the ARC. The evaluation methodology proposed for use, provides the tools and process for investigating the factors on which this decision will be based.

5.2 Evaluation Methodology

Throughout this project emphasis has been placed on developing the ability to evaluate proposed changes the DiSC system. The result of this emphasis is the following evaluation methodology. A major benefit of this methodology is that it can be used to evaluate any change to the DiSC system.

The following steps are recommended for evaluating any design alternative:

1. Determine component of model under consideration (limit scope to one at a time if multiple involved)
2. List requirements of component
3. Determine design alternative's capabilities to meet these requirements
4. Establish Mission Scenario for design alternative
5. Determine Life Cycle for alternative
6. Evaluate costs and benefits using Life Cycle and Requirement evaluation.
7. Compare alternatives.

Diagram 18 provides a graphic view of the proposed evaluation process.

This process was demonstrated in evaluating the EASYLINK based Backbone Component. (Section **4.2.4.1** details this application)

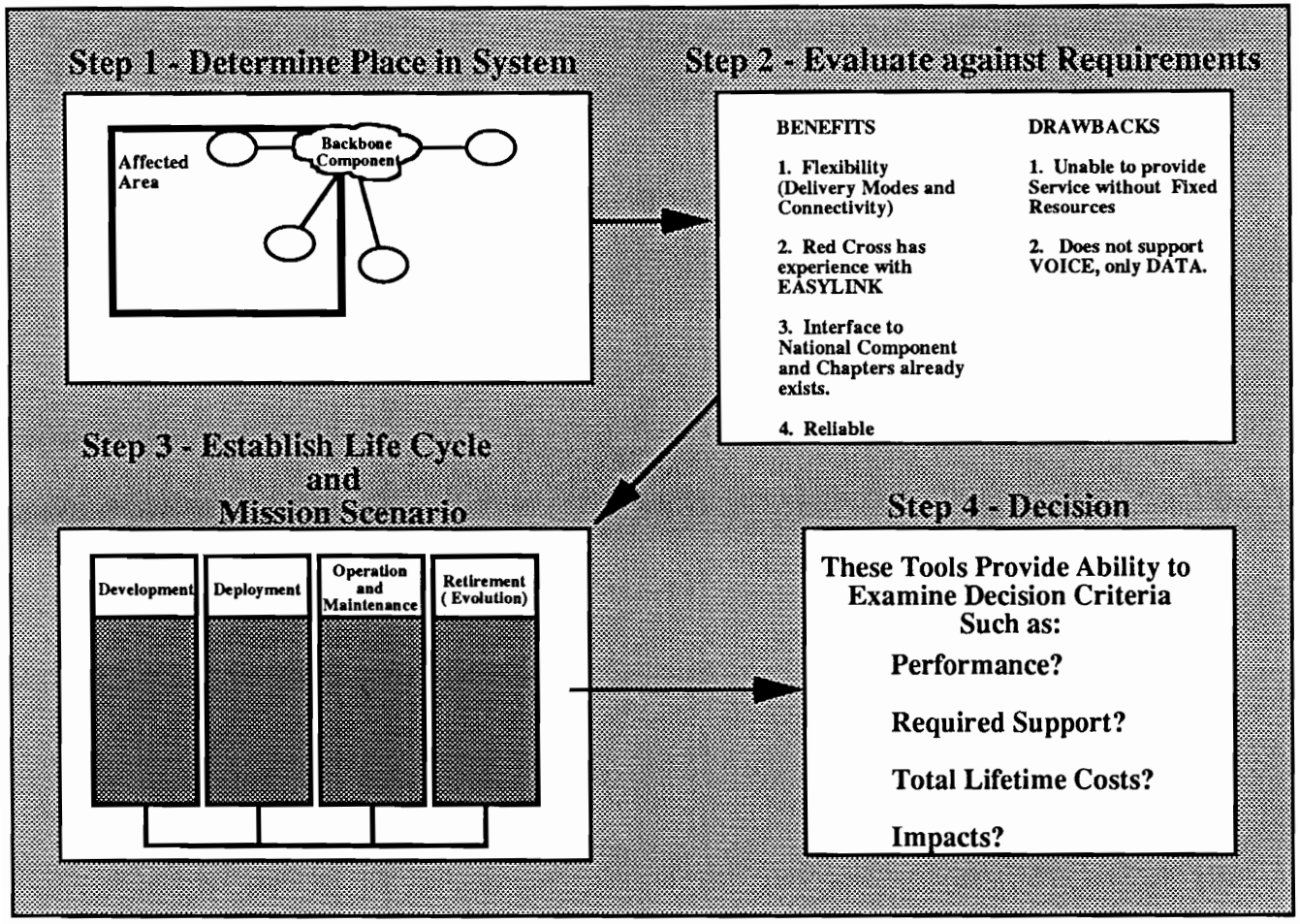


Diagram #18

Proposed Evaluation Methodology

6.0 Recommendations & Conclusion

6.1 Recommended Actions

Completion of this project does not signal the end of the DiSC system's development. Many tasks remain unfinished. The following segments summarize the recommendations which are seen as critical to the ultimate success of the DiSC system.

6.1.1 Continue Proposed Development Process

The Life Cycle for the DiSC system provides a guideline for future activities. The work performed in this project fulfilled a majority of the tasks assigned to the **Development Initiation Step**. Several of this step's tasks still remain uncompleted, though.

The first of these tasks is completing development of the process which has been proposed. The processes for developing and evaluating changes to the DiSC system are not complete until Red Cross management accepts it.

Recommendations and comments from Red Cross management will result in adjustments being made to the work performed in this project.

Once National's representatives have accepted the evaluation process, chapters can be presented with it. Obtaining chapter acceptance, or Buy-In has been demonstrated in this project as important to the ultimate success of DiSC development activities.

Once the evaluation process is accepted, and chapter buy-In has been obtained the **Detailed Design Step** can begin. The tasks and activities assigned to this step, as well as ensuing stages, are detailed in **Sections 2.3.1** and **4.2** of this report.

6.1.2 Continuous Refinement of Process

As development of the DiSC system continues, new requirements, managerial concerns, and economic factors will change. The evaluation process and design of the DiSC system must change also. Continuous efforts should be made to ensure the evaluation process provides informative and accurate analyses.

The methodology and tools proposed in this report have all been adapted from accepted systems engineering standards, and should not be viewed as unalterable. The process has been customized to meet the present needs of the Red Cross. As the Red Cross' needs change so should the evaluation process.

6.1.3 Retain Administrative Control

One further action is proposed to ensure the success of the DiSC system. Disaster Services should posture itself as the developer of the DiSC system. Past developments have typically been managed and controlled by Information Services (IS). This group provides technical services to the ARC including: programming, technical integration, equipment maintenance, etc. As a foreign entity, IS, has not been fully capable of appreciating the requirements or intentions of their customers.

As the developer of the system, Disaster Services, would be in a position of determining the tasking and personnel which will be used to develop the system. IS personnel may be asked to perform some of these tasks, but Disaster Services will retain full administrative control of the process. In this way Disaster Services, the customer, will remain involved in all aspects of the system development. This would help alleviate the apparent disconnect which has occurred in the past between developers and customers.

6.2 Conclusion

The work performed in this project has produced a methodology for the American Red Cross to use in developing the Disaster Services Communication (DiSC) System. Indications from Red Cross staff and management indicate that the methodology will be formally accepted, and used in developing their system.

The feature most commonly cited by Red Cross staff in reviews of this work is the holistic or all encompassing view which it provides. The Life Cycle, requirements and models organize the entire DiSC system, and provide structure for the development process. This view is a result of the systems approach which was used throughout the project.

Future activities and success for DiSC system development activities will require that this view be maintained.

Vita

Mark J. McGovern was born in Jersey City, New Jersey, on August 18, 1965. In 1987 he received a B.S. Electrical Engineering from Worcester Polytechnic Institute, Worcester, MA. After working for IBM, and the Singer Kearfott Guidance and Navigation Corp, Mr. McGovern relocated to Northern Virginia, where he currently lives, works and plays well with others.

Appendix A: Systems Engineering Overview

What is a "System" ?

The term "System" seems simple enough, almost generic. It is this generic quality which causes confusion. A "System" is many things to many people. When "System" development is mentioned many people think of multi-component equipment arrangements, others think of computers.

The "System" process does not address a problem in terms of equipment or technology. It views a process on the basis of what is required, and then determines how all of those requirements can be met. The product, system, or solution it delivers may incorporate any combination of elements.

The system development process, which is detailed in the following sections, is useful to anyone interested in producing a success. The generic term "system" is used to describe the process because the term offers no limitation. The "System" process will develop anything required to produce a success: training, regulations, support abilities, equipment, anything.

What is Systems Engineering?

Engineers have traditionally solved problems they faced by applying knowledge from one or two engineering disciplines, such as electrical and mechanical engineering. This approach to problem solving has proven adequate for many problems which are limited in scope. Unfortunately as technology and society have developed so has the scope of the problems which engineers must solve.

Society has used technology to build systems which provide services and improve performance. These systems widen the scope of even "small" problems by linking the operation of even a single widget in a system to the system's overall performance. As a result the solution of "small" problems can require an in depth knowledge of the interactions between all of the system's widgets.

The systems engineering discipline was developed to assist the engineer in solving these more complex problems. The methods used by systems engineering incorporate the talents of many different disciplines to solve problems. Systems engineering provides the engineer with the tools required to: model problems, assess their scope, determine the talents required to develop a solution, and then manage the process of that development.

Unlike traditional engineering disciplines systems engineering does not limit solutions to the application of pure technical knowledge. Disciplines such as:

project management, human factors, environmental implications and economics are embraced by systems engineering. These disciplines are used to give the engineer a full view of the effects which his/her decision will have, and so induce a better solution to any problem.

How can the American Red Cross use systems engineering?

Anytime that money and efforts are to be invested by an organization in a project, questions arise. Questions such as:

> Is this the best way to do this?...
>
> Will this meet all of our needs?...
>
> What is this really going to cost?...
>
> Will we be able to fit this into our current system?...
>
> Who's going to be responsible for this system's operation/maintenance/procurement?...

The American Red Cross (ARC) is not exempt from this. Fortunately the systems engineering approach provides tools and methods for evaluating the answers to these questions and many others.

The following section details the systems engineering approach which was used for this project.

Requirement Analysis

The first step taken was to determine the requirements which the system must meet. A requirement was defined as any characteristic, function or quality which the solution must possess.

The method used to determine these requirements was to examine the proposed operation of the system. This means the WHO/ WHAT/ WHERE/ WHEN/ HOW's of the proposed system was determined. This was done by examining the present system, interviewing the ARC staff, and reviewing ARC procedural documents.

Analysis of the data collected in these activities was used to produce a set of Operation requirements. These requirements describe: maintenance, logistics, functionality, operator requirements, and anticipated future capability.

The development of these Operation requirements required a considerable amount of time be spent in and around ARC facilities. This was an added bonus which provided for the development of a second product, a set of requirements which has been called the Organizational Requirements.

Every organization has goals and values, or Organization Requirements, which are used to decide how to do business. These corporate values are not typically found in any document or creed, but they are evident in daily procedures and decision making. A successful solution will incorporate as many of these unwritten values and goals as possible and will not contradict any of them.

Development of System Solution

The systems engineering approach to problem solving is more than just requirements analysis. The Development Initiation stage of activity also introduced the Life Cycle approach, modelling and systems analysis. Special emphasis was placed on the applicability each of these tools has to the ARC.

The Development Initiation has concentrated on the importance of planning and management in the development of the system. Tools such as the system Life Cycle, a system model, and analysis have been developed to help the ARC organize their efforts, optimize the benefits which will result, and minimize errors made along the way.

The System Life Cycle

The system Life Cycle is a model of how the system will be developed, procured, tested, deployed, and eventually disposed of. It was important that each aspect of the proposed system process be evaluated before the actual development begins, since different conceptions of when and what should be done can divide personnel and efforts.

The Life Cycle was used extensively in the development of system requirements, although a formal statement of the Life Cycle was not generated

until later. The Life Cycle enabled the designers to look down the road, and evaluate how future activities would affect the system. Each of the four stages of the Life Cycle, Operation, deployment, retirement, and development placed requirements on the system.

The forecasting ability of the Life Cycle allows it to be used in the future to manage personnel and resources. Assignments, activities and responsibilities, for support or action, can be assigned on the basis of the functions and stages of the lifecycle. Development, training, maintenance, disposal, and procurement are all activities which appear in the system Life Cycle. Assignment of personnel to these activities at early stages will insure these activities get off to a good start.

System Model Development

After the system Life Cycle and requirements were established, the next activity was to develop a model of the system. This model divided the system into logical units. The basis used to establish these logical units, were the tools developed in the Requirements Analysis. (i.e. The Operation Requirements, and The Organizational Requirements)

Each of the logical units were allocated operation requirements, organization requirements and interface requirements. The operation and organization requirements of each logical unit was directly derived from the

overall system's requirements. The interface requirements describe how the logical units connect into each other and existing systems.

The model makes the system more manageable. It allows designers to examine the operation of any single logical unit, or to analyze the affect a change to any logical unit would have on the entire system's performance.

Like the Life Cycle, the model can also be used to efficiently task ARC personnel and resources. Assignments can be made to work on the well defined functions of the logical units, rather than global tasks such as improving overall system performance.

System Analysis

Once the system model was established, it was available for use in generating and evaluating proposals to change or enhance the system. Evaluation of proposals or applications can be evaluated on the basis of the requirements established by the model.

The final stage of activity introduced an analysis process and some tools which the ARC might adopt. A sample evaluation of applying the EASYLINK service was conducted which used some of these tools. The system model was a great asset during this evaluation.

Conclusion

The goal of this project was to present the American Red Cross, Disaster Services, with the capability of evaluating changes and developments to their communication system. This paper has attempted to formalize how the systems engineering approach can be applied throughout this task.

System engineering tools such as: The System Lifecycle, System Modelling, Requirements Analysis and Allocation, and System Analysis have been introduced and applied. Project activities have attempted to provide the ARC not only with a set of tools, but also the ability to produce a similar set of tools for any requirements they may generate.

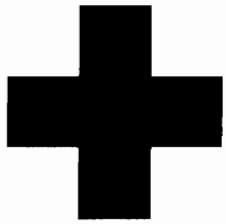
APPENDIX B - Official Red Cross Mission and Goals

Attached are:

ARC Document # 1325, The Fundamental Principles of the International Red Cross Movement, Feb 1988.

ARC Document # 4512, American Red Cross Mission and Goals, July 1991.

ARC Document #4513, The Mission of the American Red Cross, July 1991.



THE FUNDAMENTAL PRINCIPLES OF THE INTERNATIONAL RED CROSS MOVEMENT

HUMANITY

THE INTERNATIONAL RED CROSS MOVEMENT, BORN OF A DESIRE TO BRING ASSISTANCE WITHOUT DISCRIMINATION TO THE WOUNDED ON THE BATTLEFIELD, ENDEAVOURS, IN ITS INTERNATIONAL AND NATIONAL CAPACITY, TO PREVENT AND ALLEVIATE HUMAN SUFFERING WHEREVER IT MAY BE FOUND. ITS PURPOSE IS TO PROTECT LIFE AND HEALTH AND TO ENSURE RESPECT FOR THE HUMAN BEING. IT PROMOTES MUTUAL UNDERSTANDING, FRIENDSHIP, CO-OPERATION AND LASTING PEACE AMONGST ALL PEOPLES.

IMPARTIALITY

IT MAKES NO DISCRIMINATION AS TO NATIONALITY, RACE, RELIGIOUS BELIEFS, CLASS OR POLITICAL OPINIONS. IT ENDEAVOURS TO RELIEVE THE SUFFERING OF INDIVIDUALS, BEING GUIDED SOLELY BY THEIR NEEDS, AND TO GIVE PRIORITY TO THE MOST URGENT CASES OF DISTRESS.

NEUTRALITY

IN ORDER TO CONTINUE TO ENJOY THE CONFIDENCE OF ALL, THE MOVEMENT MAY NOT TAKE SIDES IN HOSTILITIES OR ENGAGE AT ANY TIME IN CONTROVERSIES OF A POLITICAL, RACIAL, RELIGIOUS OR IDEOLOGICAL NATURE.

INDEPENDENCE

THE MOVEMENT IS INDEPENDENT. THE NATIONAL SOCIETIES, WHILE AUXILIARIES IN THE HUMANITARIAN SERVICES OF THEIR GOVERNMENTS AND SUBJECT TO THE LAWS OF THEIR RESPECTIVE COUNTRIES, MUST ALWAYS MAINTAIN THEIR AUTONOMY SO THAT THEY MAY BE ABLE AT ALL TIMES TO ACT IN ACCORDANCE WITH THE PRINCIPLES OF THE MOVEMENT.

VOLUNTARY SERVICE

IT IS A VOLUNTARY RELIEF MOVEMENT NOT PROMPTED IN ANY MANNER BY DESIRE FOR GAIN.

UNITY

THERE CAN BE ONLY ONE RED CROSS SOCIETY IN ANY ONE COUNTRY. IT MUST BE OPEN TO ALL. IT MUST CARRY ON ITS HUMANITARIAN WORK THROUGHOUT ITS TERRITORY.

UNIVERSALITY

THE INTERNATIONAL RED CROSS MOVEMENT, IN WHICH ALL SOCIETIES HAVE EQUAL STATUS AND SHARE EQUAL RESPONSIBILITIES AND DUTIES IN HELPING EACH OTHER, IS WORLDWIDE.

The Fundamental Principles were proclaimed by the XXth International Conference of the Red Cross, Vienna, 1965.

ARC 1325 Feb. 1988

American Red Cross

Mission

The American Red Cross is a humanitarian organization, led by volunteers, that provides relief to victims of disasters and helps people prevent, prepare for, and respond to emergencies. It does this through services that are consistent with its congressional charter and the fundamental principles of the International Red Cross Movement.

Goals

July 1, 1991—June 30, 1997

1. The American people can expect the American Red Cross to deliver quality mission-related products and services in a consistent and responsive manner.

2. The American people can expect the American Red Cross to provide nationwide—
   - Disaster planning, preparedness, and education;
   - Prompt relief to victims of major disasters;
   - Emergency communication between members of the United States Armed Forces and their families and supporting casework management services; and
   - International tracing services.

3. The American people can expect the American Red Cross to be a leading provider of—
   - Prompt relief to victims of single-family disasters;
   - Information, referral, and financial assistance to members of the United States Armed Forces and their families;
   - First aid training;
   - Cardiopulmonary resuscitation (CPR) training;
   - Swimming and lifeguard training; and
   - HIV/AIDS education.

4. The American people can expect the American Red Cross to provide a reliable and adequate supply of blood, blood products, tissue services, and related biomedical products and services to meet the needs of those it serves, as well as to support corporate and regional biomedical research and development.

5. As a member of the International Red Cross and Red Crescent Movement, the American Red Cross will mobilize the support of the American people for international disaster relief and international humanitarian law.

6. American Red Cross products and services, governance and management, and paid and volunteer staff will reflect the diversity of the communities served.

7. The American Red Cross will adapt its volunteer development and management practices to reflect the changing needs of volunteers.

8. The American Red Cross will develop sufficient financial support by the American people to provide quality products and services consistent with its mission, and will continue to demonstrate fiscal responsibility and stewardship to the American people.

9. The American Red Cross will be a unified organization for its customers, clients, and contributors.

American Red Cross

THE MISSION OF THE AMERICAN RED CROSS

THE AMERICAN RED CROSS IS
A HUMANITARIAN ORGANIZATION,
LED BY VOLUNTEERS,
THAT PROVIDES RELIEF TO VICTIMS OF
DISASTERS AND HELPS PEOPLE PREVENT,
PREPARE FOR, AND RESPOND TO
EMERGENCIES. IT DOES THIS THROUGH
SERVICES THAT ARE CONSISTENT
WITH ITS CONGRESSIONAL CHARTER
AND THE FUNDAMENTAL PRINCIPLES
OF THE INTERNATIONAL
RED CROSS MOVEMENT.

Appendix C - Requirement Summary

DiSC System Requirements Summary and Allocation

The DiSC system has been segmented into three distinct components. The following summary details the allocation of DiSC system requirements to these three components.

CHAPTER BASED SYSTEM (CBS)

The Chapter Based System (CBS) will provide communications and relay data between any two entities collocated within the affected area.

BACKBONE COMPONENT (BC)

The Backbone component of the DiSC system will provide communications and relay data between the affected area and the non-affected area.

NATIONAL COMPONENT (BC)

The National Component of the DiSC system will provide communications and relay data between any two ARC entities collocated outside of the affected area.

Allocation of Requirement to DiSC system components is indicated by:

CBS - Chapter Based System
BC - Backbone Component
NC - National Component

Interface Requirements

- Provide communications/data in format which optimizes operation of Job HQ/Commanding element or Staging Area(s) regardless of automation level; **[CBS, BC, NC]**

- Maintain quality and performance benefits achieved at terminal sites by automation. **[CBS, BC, NC]**

Organization Requirements

Goals

- be deployable throughout the nation in a timely or prompt manner; **[CBS, BC]**

- provide the same level of service to all communities regardless of geography or demographics; **[CBS, BC, NC]**

Services

- be capable of participating in and supporting disaster preparedness training; **[CBS, BC, NC]**

- provide communications capability between the community and military personnel during times of disaster; **[CBS, BC, NC]**

- provide communications support for disaster relief operations (both large and small disaster); **[CBS, BC, NC]**

- provide ARC ability to respond and support International Red Cross and Red Crescent activities; **[BC, NC]**

Values

- determine capabilities of volunteers and adapt system to their capabilities; **[CBS, BC, NC]**

- be developed, operated and maintained in such a way as to represent a united ARC. **[CBS, BC, NC]**

- Provide chapters and operators the ability to customize the system to their needs; **[CBS, BC, NC]**

- Minimize the requirements which the system places on the chapters; **[CBS, BC, NC]**

- Preserve the independence of the chapters, while maintaining the authority of National. **[CBS, BC, NC]**

Structure

- Provide communications support to both pre-SD21 structure and post-SD21 structure, since timeframe for reorganization is unknown; **[CBS, BC, NC]**

- Provide communications and relay data between all ARC units which govern affected area/chapters during a disaster (This means **Before SD21:** National HQ, Operations HQ, Region **After SD21:** DOCC, SCC, Region Field Unit). **[BC, NC]**

Operation Requirements

Operation Initiation

- Maximize chapter's ability to be notified of disaster occurrence **[CBS]**

- Provide communications to allow assembly of initial response team **[CBS]**

- Provide communications between the chapter staff, which initially reacts to disaster, and the chapter manager or authority; **[CBS]**

- Provide Chapter with ability to notify and advise next ARC level of disaster occurrence; **[CBS]**

- Provide communications between the Chapter and other local elements, such as neighboring ARC elements, local churches, and local charities; **[CBS]**

- Be capable of responding to the unpredicted disasters, as well as predictable disasters. **[CBS, BC, NC]**

Support of On-going Operation

Command and Administration

- Provide communications and relay data between each ARC element (Service Delivery Point, District, Job HQ, Staging areas, etc...) and its commanding element. **[CBS]**

- Provide communications and relay data from Service Delivery Points to the appropriate Admin element; **[CBS]**

- Provide communications and relay data between any Admin Officer and their commanding element; **[CBS]**

- Provide communications and relay data between any Officer located at Job Headquarters and the commanding element located at the next higher level of the ARC. **[BC]**

Service Delivery

Direct Services

MASSCARE

- Provide communications support in locating and establishing ARC shelters immediately after disaster strikes; **[CBS]**

- Provide communications and relay data between shelters and commanding element; **[CBS]**

- Provide communication and relay data between feeding units (mobile or fixed) and commanding element; **[CBS]**

- Relay data between managers of feeding units and managers of shelters; **[CBS]**

Health Services

- Provide communications between shelters and medical personnel; **[CBS]**

- Relay data from Health Service elements and appropriate DWI facility; **[???]**

- Insure privacy of communications which contain patient data (Note: Requirements mandate that death notices not be transmitted in the clear); **[CBS, BC, NC]**

Family Services

- Relay data from the Family Service caseworkers to appropriate Accounting element; **[CBS]**

- Support & Maintain the security of DO process; **[CBS, BC, NC]**

- Relay data from Damage Assessment to Family Service caseworkers; **[CBS]**

- Relay data from the Family Service caseworkers to the Records and Reporting Function; **[CBS]**

- Provide communications and relay data between each Family Service Center and its commanding element. **[CBS]**

DWI

- Relay data describing victim welfare/status/location from any ARC element to the DWI process area. **[???]**

Support Services

Logistics

- Relay data describing Service Delivery Point requisitions to appropriate logistics element; **[CBS]**

- Provide communications from Logistics Officer to staging areas, located inside of affected area; **[CBS]**

-Provide communications and relay data between Staging Areas located inside and outside of affected area; **[BC]**

- Provide communications and relay data between any logistics element and its command element; **[CBS]**

- Relay data regarding the shipment of goods, and movement of people between appropriate Logistics elements. **[CBS, BC, NC]**

Staffing

- Provide communications support to recruitment activities, whether they are conducted inside or outside of affected area; **[CBS, NC]**

- Provide communications between staff entry point to affected area and appropriate Staffing office; **[CBS]**

- Relay Staffing records data from any staffing office to any another; **[CBS]**

- Provide communications between any Staffing office and its commanding office. **[CBS]**

Damage Assessment

- Be immediately capable of relaying disaster assessment data from affected area to ARC authority; **CBS]**

- Provide communications between any Damage Assessment element and its commanding element; **[CBS]**

- Relay data between Damage Assessment elements and the appropriate Records and Reporting elements; **[CBS]**

- Relay data from Damage Assessment to appropriate Admin elements; **[CBS]**

Records & Reporting

- Relay data from any Records and Reporting element to its commanding element; **[CBS]**

- Provide communications between any Records and Reporting element and its commanding element; **[CBS]**

- Relay data from Records and Reporting to Family Service caseworkers; **[CBS]**

- Safeguard the integrity of personal and financial data transfers; **[CBS, BC, NC]**

Accounting

- Relay data from Logistics officer to appropriate Accounting officer; **[CBS]**

- Relay data from Staffing elements to appropriate Accounting elements; **[CBS]**

- Relay data from Accounting elements to appropriate Admin elements; **[CBS]**

- Provide communications between any Accounting element and their commanding element; **[CBS]**

Public Affairs

- Provide communications between Public Affairs elements and local media; **[CBS, NC]**

Liaison

- provide chapter with ability to communicate with local organizations and authorities during a disaster; **[CBS, NC]**

- allow individual chapters to adapt methods and means which they will use; **[CBS, BC, CBS]**

- be capable of allowing chapters to conduct periodic testing of communications with local authorities in preparedness and training exercises; **[CBS, BC, NC]**

- be able to provide the ARC with ability to communicate and coordinate with governing authorities, such as County, State and Federal authorities. **[CBS, NC]**

Training

- Relay data to Training officer from Logistics element responsible for staff transport into area; **[CBS]**

- Relay data between Training officer and Staffing element which is assigning staff personnel; **[CBS]**

- Provide communications between any Training element and its commanding element **[CBS]**

Building & Repair

- Provide communication between the appropriate Family Service element and the Buildings and Repair element; **[CBS]**

- Relay data between the Damage Assessment elements and the Building and Repair elements; **[CBS]**

- Relay data between the Buildings and Repair functions and appropriate Records and Reporting element; **[CBS]**

- Provide communications between any Building and Repair element and its commanding element; **[CBS]**

Dismantlement of Operation

- Provide reporting or quality index of its performance; **[CBS, BC, NC]**

- Support disaster operations which continue after formal relief operation has concluded; **[CBS, BC, NC]**

- Be responsive to diminishing communication requirements and disassemble portions no longer required. **[CBS, BC, NC]**

Environment

Disaster

- Provide full communications support for all ARC Disaster Relief Operations except catastrophic response; **[CBS, BC, NC]**

- Reduce the reliance on requirements which are to be supplied from within affected area (ex. electricity, towers, phones); **[CBS, BC]**

- Be resilient to environmental conditions such as heat, cold, humidity. **[CBS, BC]**

Catastrophic

- have the capability of deploying a completely self sufficient unit to any affected area at anytime; **[CBS, BC]**

- have the capability to operate in an environment which offers no resources; **[CBS, BC]**

- Provide as much communication support as possible to catastrophic relief operations; **[CBS, BC, NC]**

- Coordinate activities with Federal Response Plan Agencies to ensure continuity of service during a catastrophic response. **[CBS, BC, NC]**

Federal Plan

- Provide communications and data transfer capability between the Federal DOC and the ARC Job Headquarters; **[CBS]**

- Provide a flexibility in providing communications and data transfer capability between the ARC and any of the other Agencies involved in the Federal Plan; **[NC]**

Operator

- Conform itself to methods which are familiar to operators; **[CBS, BC, NC]**

- Standardize operations, so operators do not have to relearn their jobs each time they work on a disaster; **[CBS, BC, NC]**

- Minimize the amount of technical experience and knowledge required to operate the system; **[CBS, BC, NC]**

- Institute training for operators; **[CBS, BC, NC]**

- Institute periodic operational exercises to ensure operator and equipment quality. **[CBS, BC, NC]**

Maintenance

- Require minimum amount of maintenance; **[CBS, BC, NC]**

- Provide high reliability when on deployment; **[CBS, BC]**

- Require minimum experience or technical knowledge to maintain; **[CBS, BC, NC]**

- Institute a maintenance schedule or program for any required maintenance. **[CBS, BC, NC]**

Deployment
- Balance cost and ability of system; **[CBS, BC, NC]**

- Provide ARC with ability to use equipment in a number of capacities **[CBS, BC, NC]**

Retirement
- Provide flexibility to adapt and evolve system by addition of new technologies, and equipment **[CBS, BC, NC]**

Appendix D - Backbone Component - EASYLINK Application

DiSC System Requirements Summary and Allocation

The DiSC system has been segmented into three distinct components. The following summary details the allocation of DiSC system requirements to the Backbone Component.

Notation following each requirement indicates which of the components share this requirement.

Allocation of Requirement to DiSC system components is indicated by:

CBS - Chapter Based System
BC - Backbone Component
NC - National Component

BACKBONE COMPONENT (BC)

The Backbone component of the DiSC system will provide communications and relay data between the affected area and the non-affected area.

Requirement	Comply (Y/N)	Comments
Interface Requirements		
Provide communications/data in format which optimizes operation of Job HQ/Commanding element or Staging Area(s) regardless of automation level; **[CBS, BC, NC]**	Y	System capable of multiple delivery formats.
Maintain quality and performance benefits achieved at terminal sites by automation. **[CBS, BC, NC]**	Y	Capable of receiving and delivering electronically.
Organization Requirements		
Goals - be deployable throughout the nation in a timely or prompt manner; **[CBS, BC]**	Y	Accessible from throughout U.S.
- provide the same level of service to all communities regardless of geography or demographics; **[CBS, BC, NC]**	Y	Services are standard throughout the U.S.
Services - be capable of participating in and supporting disaster preparedness training; **[CBS, BC, NC]**	Y	System is always operating.
- provide communications capability between the community and military personnel during times of disaster; **[CBS, BC, NC]**	Y	Presently provides this service daily.

Requirement	Comply (Y/N)	Comments
- provide ARC ability to respond and support International Red Cross and Red Crescent activities; **[BC, NC]**	N	System offers no unique communication ability to International.
- provide communications support for disaster relief operations (both large and small disaster); **[CBS, BC, NC]**	Y	Capable of handling significant range of traffic.
Values - determine capabilities of volunteers and adapt system to their capabilities; **[CBS, BC, NC]**	Y	Operation has been successful in AMCROSS with volunteer staffs.
- be developed, operated and maintained in such a way as to represent a united ARC. **[CBS, BC, NC]**	Y	System provides same capabilities and services throughout operating area.
- Provide chapters and operators the ability to customize the system to their needs; **[CBS, BC, NC]**	Y	System allows users to adapt service to their needs, large or small.
- Minimize the requirements which the system places on the chapters; **[CBS, BC, NC]**	Y	Operation with EASYLINK requires a minimum of training,hardware or funding

Requirement	Comply (Y/N)	Comments
- Preserve the independence of the chapters, while maintaining the authority of National. **[CBS, BC, NC]**	Y	System allows National to institute service on demand.
Structure - Provide communications support to both pre-SD21 structure and post-SD21 structure, since timeframe for reorganization is unknown; **[CBS, BC, NC]**	Y	Addressing of EASYLINK can be easily adjusted.
- Provide communications and relay data between all ARC units which govern affected area/chapters during a disaster (This means **Before SD21:** National HQ, Operations HQ, Region **After SD21:** DOCC, SCC, Region Field Unit). **[BC, NC]**	Y	Multiple addressees are possible in EASYLINK. Private network might also be considered.
Operation Requirements		
Operation Initiation - Be capable of responding to the unpredicted disasters, as well as predictable disasters. **[CBS, BC, NC]**	Y	System capabilities are available on demand.
Support of On-going Operation		
Command and Administration - Provide communications and relay data between any Officer located at Job Headquarters and the commanding element located at the next higher level of the ARC. **[BC]**	Y	Connectivity possible.
Service Delivery		
Direct Services		

Requirement	Comply (Y/N)	Comments
MASSCARE - None		
Health Services - Relay data from Health Service elements and appropriate DWI facility; **[???]**		
- Insure privacy of communications which contain patient data (Note: Requirements mandate that death notices not be transmitted in the clear); **[CBS, BC, NC]**	Y	System presently conveys these sensitive messages on a daily basis.
Family Services - Support & Maintain the security of DO process; **[CBS, BC, NC]**	?	Will require consultation with Accounting staff.
DWI - Relay data describing victim welfare/status/location from any ARC element to the DWI process area. **[???]**		
Support Services		
Logistics - Provide communications and relay data between Staging Areas located inside and outside of affected area; **[BC]**	Y	Connectivity possible.
- Relay data regarding the shipment of goods, and movement of people between appropriate Logistics elements. **[CBS, BC, NC]**	Y	Connectivity possible.
Staffing - None		
Damage Assessment - None		

Requirement	Comply (Y/N)	Comments
Records & Reporting - Safeguard the integrity of personal and financial data transfers; **[CBS, BC, NC]**	?	Requires consultation with Accounting Staff.
Accounting - None		
Public Affairs - None		
Liaison - allow individual chapters to adapt methods and means which they will use; **[CBS, BC, CBS]**	Y	EASYLINK can adapt delivery or acceptance of message to any number of media or formats.
- be capable of allowing chapters to conduct periodic testing of communications with local authorities in preparedness and training exercises; **[CBS, BC, NC]**	Y	System capabilities are always available.
Training - None		
Building & Repair - None		
Dismantlement of Operation		
- Provide reporting or quality index of its performance; **[CBS, BC, NC]**	Y	EASYLINK will provide reports, and billing based on user defined criteria.
- Support disaster operations which continue after formal relief operation has concluded; **[CBS, BC, NC]**	Y	System capabilities are always available.

Requirement	Comply (Y/N)	Comments
- Be responsive to diminishing communication requirements and disassemble portions no longer required. **[CBS, BC, NC]**	Y	System capabilities are available on demand.
Environment		
Disaster - Provide full communications support for all ARC Disaster Relief Operations except catastrophic response; **[CBS, BC, NC]**	N	See below.
- Reduce the reliance on requirements which are to be supplied from within affected area (ex. electricity, towers, phones); **[CBS, BC]**	N	EASYLINK must be accessed through a fixed resource.
- Be resilient to environmental conditions such as heat, cold, humidity. **[CBS, BC]**	N/A	Not a physical entity. Would be applied to terminal or entry device.
Catastrophic - have the capability of deploying a completely self sufficient unit to any affected area at anytime; **[CBS, BC]**	N/A	See above.
- have the capability to operate in an environment which offers no resources; **[CBS, BC]**	N	Access to EASYLINK requires a fixed resource.
- Provide as much communication support as possible to catastrophic relief operations; **[CBS, BC, NC]**	Y	EASYLINK once accessed would be capable of supplying full support.

Requirement	Comply (Y/N)	Comments
- Coordinate activities with Federal Response Plan Agencies to ensure continuity of service during a catastrophic response. **[CBS, BC, NC]**	Y	Presently some Federal Agencies already subscribe to service.
Federal Plan - None		
Operator - Conform itself to methods which are familiar to operators; **[CBS, BC, NC]**	Y	AMCROSS already has set precedence for system.
- Standardize operations, so operators do not have to relearn their jobs each time they work on a disaster; **[CBS, BC, NC]**	Y	EASYLINK access would be controlled by terminal software, and procedures developed.
- Minimize the amount of technical experience and knowledge required to operate the system; **[CBS, BC, NC]**	Y	EASYLINK has a minimal technical requirement for operator.
- Institute training for operators; **[CBS, BC, NC]**	N/A	Would have to be undertaken by the development team. EASYLINK does not offer on-line help.
- Institute periodic operational exercises to ensure operator and equipment quality. **[CBS, BC, NC]**	Y	Again this would have to be undertaken by ARC elements. EASYLINK does not typically offer this.

Requirement	Comply (Y/N)	Comments
Maintenance - Require minimum amount of maintenance; **[CBS, BC, NC]**	Y	EASYLINK requires no physical maintenance, terminal software might require it though.
- Provide high reliability when on deployment; **[CBS, BC]**	Y	EASYLINK receives high amount of support and is redundant system.
- Require minimum experience or technical knowledge to maintain; **[CBS, BC, NC]**	Y	EASYLINK requires a minimal amount of technical knowledge to operate with.
- Institute a maintenance schedule or program for any required maintenance. **[CBS, BC, NC]**	Y	Would again have to be undertaken by ARC elements. Address validity checks and such.
Deployment - Balance cost and ability of system; **[CBS, BC, NC]**	?	Requires comparison to other alternatives. Relative measure.
- Provide ARC with ability to use equipment in a number of capacities **[CBS, BC, NC]**	Y	EASYLINK is already used in EMERCOM and Daily NC communications.

Requirement	Comply (Y/N)	Comments
Retirement - Provide flexibility to adapt and evolve system by addition of new technologies, and equipment **[CBS, BC, NC]**	Y	EASYLINK is constantly being upgraded to adapt to new technologies.