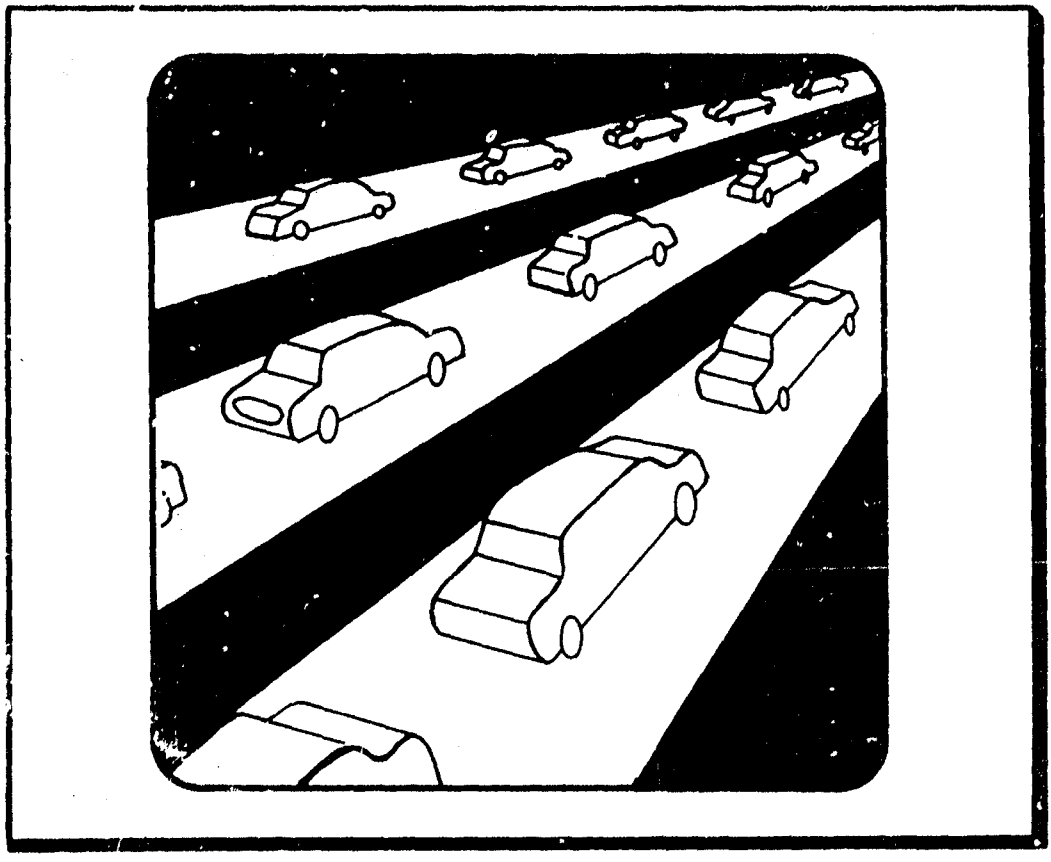
FINAL REPORT

CRISIS RELOCATION WORKSHOPS FOR TRANSPORTATION INDUSTRY REPRESENTATIVES



Prepared for

Federal Emergency Management Agency
Washington, D.C. 20472

Contract No.: DCPA01-78-C-0221
Work Unit: 2313D
December 1979

Approved for Public Release
Distribution Unlimited

SYSTAN

Unclas

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1 REPORT NUMBER	2. GOVT ACCESSION NO
3 RECIPIENT'S CATALOG NUMBER	9
4. TITLE (and Subtitle)	4 Crisis Relocation Workshops for Transportation Industry Representatives.
5. TYPE OF REPORT & PERIOD COVERED	FINAL rept.
6 PERFORMING ORG. REPORT NUMBER	D163
7. AUTHOR(s)	7 John W. Billheimer, Carolyn Fratessa
8. CONTRACT OR GRANT NUMBER(s)	8 DCPA01-78-C-0221
9. PERFORMING ORGANIZATION NAME AND ADDRESS	SYSTAN, Inc. ✓ P.O. Box U, 343 Second Street Los Altos, CA 94022
10 PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS	WU 2313D
11. CONTROLLING OFFICE NAME AND ADDRESS	11 Federal Emergency Management Agency Washington, DC 20472
12. REPORT DATE	December 1979
13 NUMBER OF PAGES	90
14 MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)	14 SYSTAN-D163
15 SECURITY CLASS (of this report)	Unclassified (12) 94
15a. DECLASSIFICATION/DOWNGRADING SCHEDULE	

16. DISTRIBUTION STATEMENT (of this Report)

Approved for Public Release; Distribution Unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18 SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Population relocation; Relocation guidelines; Pilot workshops; Crisis relocation transportation planning; Transportation planning guidance; transportation's role in relocation

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This final report describes the development of a set of workshop materials capable of exposing transportation industry representatives to the concept of crisis relocation, to demonstrate these materials through workshops held in different U.S. cities, and to provide a basis for incorporating the reaction of industry officials in local relocation plans and national planning guidance. A series of three

over

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

Unclas

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

JCB

54160X

pilot workshops with transportation industry representatives and civil defense leaders were held in Wichita, Kansas; San Antonio, Texas; and Charleston, South Carolina. The proceedings of these workshops were summarized in a videotape designed to encourage similar workshops in other cities throughout the United States. The videotape is accompanied by a set of guidelines to enable viewers to organize and conduct crisis relocation transportation workshops in their own communities.

APPROVED FOR PUBLIC RELEASE: DISTRIBUTION UNLIMITED

Final Report

CRISIS RELOCATION WORKSHOPS FOR TRANSPORTATION INDUSTRY REPRESENTATIVES

by

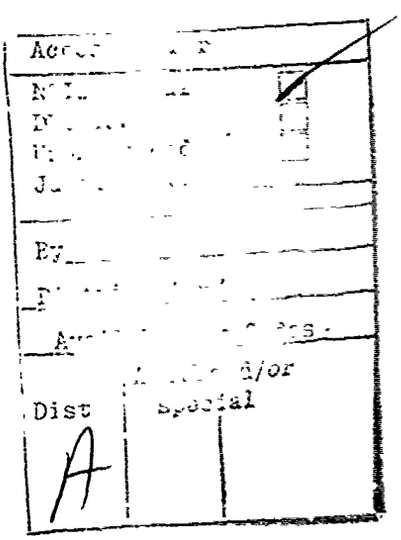
John W. Billheimer
Carolyn Fratessa

for

Federal Emergency Management Agency
Washington, D.C. 20472

Contract No. DCPA01-78-C-0221
FEMA Work Unit No. 2313D

December 1979



FEMA Review Notice

This report has been reviewed in the Federal Emergency Management Agency and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Federal Emergency Management Agency.

PREFACE

This report describes three pilot workshops undertaken in Wichita, Kansas; San Antonio, Texas; and Charleston, South Carolina, in an effort to improve civil defense plans for relocating populations threatened by nuclear attack and educate transportation agency representatives regarding their role in such a relocation. The proceedings of these workshops have been summarized in a videotape entitled The Way Out: Crisis Relocation and Transportation, which is accompanied by a set of guidelines designed to enable viewers to organize and conduct similar workshops in other U.S. cities.

The workshops, videotape, and accompanying guidance materials were sponsored by the Defense Civil Preparedness Agency (DCPA) under Contract Number DCPA-01-78-C-0221, and produced over a one-year period by SYSTAN, Inc. with the cooperation of the National Defense Transportation Association. Dr. John W. Billheimer of SYSTAN acted as principal investigator and moderator of the pilot workshops, while Ms. Carolyn Fratessa of SYSTAN undertook research regarding the role of the NDTA in crisis relocation and prepared the guidance materials accompanying the videotape. Ms. Joan Valdes of The Media Works taped the workshops and edited the final videotape version of The Way Out. Ms. Gail Fondahl of SYSTAN helped to prepare workshop materials, while Ms. Carole Parker organized and edited the final report.

Hanford Edsall of DCPA initiated the NDTA workshop concept and, with Stephen Birmingham of DCPA, acted as the project's technical monitor. Mr. John McConnell, DCPA Assistant Director, and Mr. Gerald W. Collins, NDTA President, offered valuable guidance at the project's inception and participated in the preparation of the final videotape. A debt of gratitude is also acknowledged to all workshop participants, particularly those DCPA and NDTA members who helped to prepare and conduct the workshops in each of the three pilot cities. In Wichita, this group included Frank Mollner of DCPA Region VI, Frank Sotrines of the Kansas Division of Emergency Preparedness, Gene Beaver and Joe Longar of the Sedgwick County Civil Preparedness Department, and Leon Becker, local NDTA chapter president. In San Antonio, William T. Stallings, Jr. and William Jenkins of the City of San Antonio Civil Defense and Disaster Relief Office, and Major Patrick Curoe of the local NDTA chapter assisted with workshop preparations. In Charleston, thanks are extended to Harry Wiseman and Dorothy Gaither of DCPA Region III, Tom Moore and Thomas Beckham of the South Carolina Disaster Preparedness Agency, William Wolfe and Philip Gardner of the Charleston County Disaster Preparedness Office, and Ralph Renau, president of the local NDTA chapter.

SUMMARY

INTRODUCTION

Background

Because of the life-saving potential and tactical importance of relocation in the face of a nuclear threat, the Defense Civil Preparedness Agency (DCPA) is currently assisting state and local governments with the development of detailed plans for relocating the population of each of the areas in the United States likely to be threatened by a nuclear attack. But paper plans created by public agencies are necessarily limited by the extent of those agencies' peacetime jurisdiction and expertise. If the concept of crisis relocation is to succeed, the plans and guidelines developed by DCPA must have the understanding, confidence, and backing of key operators within the transportation industry. Since most of the resources required for the success of these plans are controlled by private citizens and private industry, it is essential that members of the transportation industry be exposed to current plans and guidelines and be given a chance to react to them.

Objectives

The objectives of the research described in this report have been to develop a set of workshop materials capable of exposing transportation industry representatives to the concept of crisis relocation, to demonstrate these materials through workshops held in different U.S. cities, and to provide a basis for incorporating the reactions of industry representatives in local relocation plans and national planning guidance.

Pilot Workshops and Videotape

During the fall and winter of 1978-1979, SYSTAN led a series of three pilot workshops with transportation industry representatives and civil defense leaders in three cities: Wichita, Kansas; San Antonio, Texas; and Charleston, South Carolina. The proceedings of these workshops have been summarized in a videotape entitled "The Way Out...Crisis Relocation and Transportation." This videotape is designed to encourage similar workshops in other cities throughout the United States, and is accompanied by a set of guidelines to enable viewers to organize and conduct such workshops. Copies of the videotape and related workshop guidance can be obtained through DCPA or through the National Defense Transportation Association (NDTA), the organization of transportation industry volunteers whose members represented the transportation industry in each of the pilot workshops.

Report Content

This report describes the three workshops undertaken in Wichita, San Antonio and Charleston, discusses the potential role of the NDTA and other transportation organizations in crisis relocation, and offers guidance for conducting future workshops designed to involve transportation industry professionals in crisis relocation planning.

WORKSHOP CONTENT

Format

The three pilot workshops were divided into four distinct 30-minute segments, followed by a debriefing session. The introductory segment was designed to introduce the transportation industry representatives to the concept of crisis relocation and the assumptions underlying the transportation problems to be discussed. The remaining three half-hour segments focused on specific problems involving the use of vehicles, roadways, and fuel under crisis relocation conditions, and the role of the NDTA in planning for the control of these critical transportation elements. Specific problems addressed in the workshops included procedures for (1) evacuating autoless residents, (2) marshalling trucks for the movement of critical foodstuffs, (3) redistributing fuel supplies, and (4) avoiding disastrous traffic tie-ups.

Findings

In each of the three workshop cities, there appeared to be more than enough transportation resources to meet the demands of crisis relocation. Enough buses were available in public transit garages and the local schoolbus fleet to transport autoless residents, trucks could be diverted from household goods movers to transport critical supplies, outbound road capacity was sufficient to minimize the likelihood of disastrous tie-ups, and the fuel required by one day's relocation effort was less than that consumed during an ordinary working day. Problems of organization, scheduling, driver coordination, and public education were recognized as being more likely and more critical during crisis relocation than vehicle or fuel shortages. Workshop participants emphasized the need for thorough planning, organizational readiness, and clear communications between the transportation industry and civil defense officials, so that these organizational problems could be solved in advance of a crisis.

For the most part, the observations of transportation industry representatives in the workshop cities echoed the transportation planning guidelines resulting from past DCPA research. Although no major changes in past guidance are recommended as a result of the workshops, certain concepts should be emphasized more strongly in future editions of the guidelines. These include:

- The possibility of using truck-trailers for temporary storage in the host area, allowing quicker turn-around times for drivers and motor units;
- The need for a clear, well documented chain of command for controlling transportation drivers and equipment;
- The need to provide identification for drivers and other essential workers; and
- The need to open channels of communication with the transportation industry through workshops similar to those conducted in Wichita, San Antonio and Charleston.

Reactions

Workshop participants generally reacted positively both to the value of the workshops themselves, and to the likelihood that the relocation concept would work in their cities. There appeared to be nearly-unanimous agreement in all three cities that the workshops were successful and useful both in improving DCPA crisis readiness and in educating NDTA members regarding their role in such a crisis.

The Role of the NDTA

As an organization of volunteers representing a wide range of transportation industry expertise and dedicated to transportation preparedness, the NDTA appears to represent an ideal focal point for exposing the crisis relocation concept to the transportation community and coordinating a range of transportation resources under emergency conditions. However, two drawbacks limit the usefulness of the NDTA in crisis relocation circumstances:

(1) NDTA membership often does not represent the full range of transportation resources available locally. In particular, few public transit representatives are included on NDTA membership rolls.

(2) Although the 60 NDTA chapters in the United States cover the majority of the threatened population, over 300 risk areas -- primarily in smaller cities -- have no local NDTA chapter.

In cities with NDTA chapters, then, chapter membership may need to be augmented at workshops to include all sectors of the local transportation industry, from transit to trucks and from taxis to trains. Where no NDTA chapters exist, transportation support is needed from local transportation societies and public and private transportation companies.

To promote emergency readiness in advance of a relocation effort, the transportation industry, acting through local NDTA chapters where possible, should:

- Assist DCPA with relocation planning;
- Prepare equipment inventories;
- Identify key personnel;
- Conduct workshops; and
- Participate in simulated emergencies.

GUIDANCE

This report contains guidance for organizing and conducting workshops designed to introduce members of the transportation industry to the concept of crisis relocation. Suggestions are offered regarding attendance, problem selection, problem formulation, and the conduct of the workshop itself. Workshops may vary in complexity depending on the interests and experience of the attendees

and the shape of local transportation problems. At its simplest, a workshop may consist of an evening spent viewing and discussing the issues raised in the videotape The Way Out...Transportation and Crisis Relocation. Alternatively, the videotape may be used as an introductory tool to be followed by a working session in which specific local transportation problems are addressed.

In addition to workshops for the transportation industry, the videotape format used in the NDTA workshop materials could be adapted and used effectively to introduce other key industry groups to the crisis relocation concept and to encourage them to cooperate with local DCPA personnel.

TABLE OF CONTENTS

1. INTRODUCTION

1.1 BACKGROUND

The current preparedness program of the Defense Civil Preparedness Agency (DCPA) stresses two basic strategies for protecting populations threatened by major hazards. The first strategy relies on shelters to provide the best protection possible with the population essentially in place at or near their homes, schools, and places of work. The second strategy, identified as a crisis relocation strategy, requires people to leave threatened areas to seek refuge in safer places.

Although the strategy for protection in place remains the primary strategy for defense under nuclear attack conditions, the civil preparedness program recognizes the need to plan for the contingency of moving people out of high-risk areas during periods of severe international crisis. Five primary arguments support the need to maintain the capability for evacuation through crisis relocation planning (CRP):

- It is probable that a nuclear attack on the United States will be preceded by a crisis build-up of sufficient duration to permit population relocation from high-risk areas;
- If an adversary's cities were to be evacuated during a crisis period, U.S. cities should also be evacuated;
- It is likely that many citizens will leave large cities in the face of crisis in a "spontaneous evacuation," whether or not they are advised to do so;
- Crisis evacuation has proven feasible in recent large-scale evacuations in the face of hurricane warnings; and
- Given the current availability and location of shelter space, studies have shown that a strategy of population relocation could save far more lives than reliance on in-place protection.

The movement of large population masses in advance of a threatened attack will severely test national and local transportation resources. Plans for evacuating populations, maintaining essential governmental and private services, and transporting critical workers all hinge on the availability, maintenance, and control of the nation's fuel resources, transportation fleet, and road and rail networks. Past research by SYSTAN has assessed the transportation requirements accompanying crisis relocation, identified promising means of reconfiguring the transportation and fuel supply networks to meet these requirements, and developed and documented guidelines for providing transportation support for the crisis relocation strategy (References 2 and 3). These guidelines are currently being used by regional and local DCPA personnel throughout the country in an attempt to develop site-specific relocation plans for all U.S. risk areas.

If the concept of crisis relocation is to succeed, the plans and guidelines developed by DCPA must have the understanding, confidence, and backing of key operators within the transportation industry. The ultimate responsibility for carrying out the plans developed from the DCPA guidelines will rest with these operators. Accordingly, it is essential that members of the transportation industry be exposed to current plans and guidelines and be given a chance to react to them. As an organization composed of volunteers drawn both from the military and from privately-owned transportation firms and dedicated to transportation preparedness, the National Defense Transportation Association (NDTA) appears to represent an ideal forum for (1) exposing the CRP concept to the transportation community and (2) testing the technical feasibility of that concept.

1.2 OBJECTIVES

The purpose of the research described in this report has been to develop a set of workshop materials capable of exposing NDTA members and other transportation industry representatives to the CRP concept, to demonstrate these materials through workshops held in different U.S. cities, and to provide a basis for incorporating the reactions of industry representatives in local CRP plans and national planning guidance.

1.3 SCOPE

As stipulated in Contract No. DCPA01-78-C-0221, the specific services undertaken during the contract period were to include the following tasks:

1. "In three local jurisdictions, to be selected jointly by DCPA and NDTA headquarters, prepare and conduct an emergency Crisis Relocation exercise, with optional variations that adapt it to typical variations in the different NDTA chapters, but basically similar to the exercise conducted in Denver, Colorado in 1975.

2. "Report exercise results to DCPA and NDTA, stressing (a) any recommendations for changes in DCPA crisis relocation guidance documents, and (b) any different exercise procedures and approaches needed to fit the typical variations among the different NDTA local chapters.

3. "On completion of the exercises outlined above and based thereon, develop and deliver end products including but not limited to:

   a) "Recommendations by participating NDTA chapters on the most effective methods of developing and sustaining the readiness of the transportation industry (all modes) to execute its essential roles in Crisis Relocation.

   b) "A complete set of guidance materials, both narrative and audio-visual as required, that will enable other local chapters of NDTA and of other leading industry associations, as well as State Departments of Transportation and local governments, to conduct appropriate emergency exercises and any other activities as required to enlist and maintain local readiness of the transportation industry to meet crisis relocation demands such as the following:

      1-i) "Evacuation of residents not having access to a private automobile.

      1-ii) "Securing additional vehicles needed for food distribution to host areas.

      1-iii)"Provision of transportation despite hazards and obstacles peculiar to the locality (e.g., severe snowstorms in nearby mountains)."

During the fall and winter of 1978-1979, SYSTAN led a series of three workshops with NDTA and civil defense leaders in three cities: Wichita, Kansas; San Antonio, Texas; and Charleston, South Carolina. The proceedings of these workshops have been summarized in a videotape entitled "The Way Out...Crisis Relocation and Transportation." This videotape is designed to encourage similar workshops in other cities throughout the United States, and is accompanied by a set of guidelines to enable the viewers to organize and conduct such workshops.[1] The videotape and accompanying guidance materials represent the primary product of the research described in this report.

1.4 REPORT ORGANIZATION

This report describes the three workshops undertaken in Wichita, San Antonio, and Charleston, discusses the potential role of the NDTA and other transportation organizations in crisis relocation, and offers guidance for conducting future workshops designed to involve transportation industry professionals in crisis relocation planning. Chapter 2 summarizes the results of the three workshops and translates these results into recommendations for future workshops. Chapter 3 outlines the history of the NDTA, addresses the role of the organization in crisis relocation planning, and discusses the problem of developing and sustaining the emergency readiness of the transportation industry. Chapter 4 provides guidance for preparing workshop materials, identifying and addressing key problems, and conducting the workshops themselves. Appendices contain sample workshop materials (Appendix A), a list of currently active NDTA chapters (Appendix B), and the addresses of DCPA and NDTA representatives from whom copies of the videotape The Way Out can be obtained (Appendix C).

---

[1] Copies of the videotape and related workshop guidance can be obtained through the National Headquarters of either DCPA or NDTA, or through DCPA's eight regional offices. (See Appendix C for addresses.)

2. WORKSHOP SUMMARIES

Crisis relocation workshops for transportation industry representatives were conducted in Wichita on October 17, 1978, in San Antonio on November 16, 1978, and in Charleston on February 20, 1979. This section outlines the format of these three workshops, lists the experience of participants, discusses the approach of the participants to specific transportation problems, and summarizes the reaction of the participants to the workshop itself. Recommendations are made regarding the conduct of future workshops, and potential changes in crisis relocation planning guidance are discussed.

2.1 WORKSHOP FORMAT AND CONTENT

The three workshops were generally patterned after the emergency planning exercise conducted by SYSTAN with the Denver NDTA chapter as part of a previous DCPA contract (References 2 and 4). A sample of the workshop materials used in Charleston can be found in Appendix A. The materials have been divided into two parts: (1) an Introductory Section (printed on colored stock) that describes the background, situation, and assumptions surrounding the CRP concept, and (2) a Problem Section (printed on white stock) that poses specific local CRP problems for consideration by NDTA members. After a brief discussion of the introductory material, which lasted approximately 30 minutes, the NDTA members were asked to accept the background material as "given" and to focus on the specific transportation problems.

The approximate timing of each workshop segment proceeded as follows:

Subject	Approximate Time	Comments
Introduction	30 minutes	Review of general material (colored pages of handout)
Problem 1	30 minutes	Evacuation assistance for autoless residents
Break	15 minutes	

Problem 2	30 minutes	Movement of critical supplies
Problem 3	30 minutes	Variety of questions, including identification of road bottlenecks, the role of NDTA, and the ultimate feasibility of the local plan.
Break	15 minutes	
Debriefing	30 minutes	Discussion of exercise itself, focusing on good and bad points, potential improvements, and future NDTA and DCPA activities

Each exercise resulted in roughly two and one-half hours of unedited videotape. This tape has subsequently been edited and combined with visual aids and footage from past DCPA films to produce the half-hour videotape The Way Out, which is to be distributed to NDTA chapters and state and local DCPA organizations as a basis for future workshops. In addition, DCPA has been provided with unedited tapes of the debriefings that followed each exercise.

2.2 ATTENDANCE

Attendance at the three workshops, and the original Denver prototype, is summarized in Exhibit 2.1. Total attendance ranged from 16 participants in Charleston to 23 in Denver. In general, it appeared that as many as 25 participants might be accommodated without causing the discussions to become unmanageable.

Attendees in each workshop city proved to be both thoughtful and articulate. In Wichita and Charleston, the NDTA representation was drawn from the chapter at large, while in the larger chapters in Denver and San Antonio, attendance was limited to selected members of the chapter's Board of Directors.

In each city visited, the NDTA membership roster failed to cover the full spectrum of transportation expertise likely to be needed in a crisis. In Wichita and Charleston, the public transit operators were not NDTA members. Although the San Antonio NDTA membership was considerably larger than that of the other two cities, the chapter president estimated that they represented only 60% to 70% of the San Antonio transportation industry.

EXHIBIT 2.1

WORKSHOP ATTENDANCE

DENVER

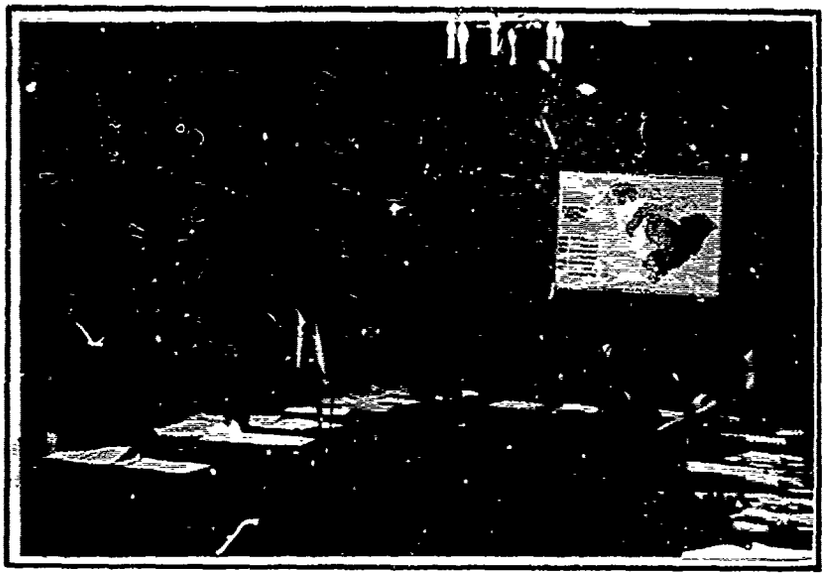
Organization	No. of Attendees	Specific Expertise
SYSTAN	2	Moderator and transportation consultant
NDTA	17	Three private trucking executives, one railroad executive, one airline executive, two National Guard members, one Air Force transportation representative, two Red Cross representatives, one school bus coordinators, and six transportation executives from local industries
DCPA	3	One national, one regional, and one state representative
Denver Emergency Preparedness Office	1	Local emergency preparedness representative.
Denver Total	23	

WICHITA

Organization	No. of Attendees	Specific Expertise
SYSTAN	3	Moderator, cameraperson and helper
NDTA	8	Railroad executive, Boeing transportation officer, two airline executives, two truckers, Red Cross representative, and DCPA representative
Other Local Transportation Reps	1	Public bus operator
DCPA	7	Two local representatives, one state liaison officer, three state NCP planners, and one regional representative
Wichita Total	19	

EXHIBIT 2.1 (Continued)

WOPKSHOP ATTENDANCE



SAN ANTONIO

Organization	No. of Attendees	Specific Expertise
SYSTAN	3	Moderator, cameraperson, and helper
NDTA	8	USAF transportation officer, consultant, NDTA secretary, moving and storage representative, two airline managers, local transit operator, and military busing authority
Local Government	2	Fire chief, assistant
Air Force	3	Liaison support
DCPA	5	Two local representatives, two state representatives, and one regional representative
San Antonio Total	21	

CHARLESTON

Organization	No. of Attendees	Specific Expertise
SYSTAN	3	Moderator, cameraperson, helper
NDTA	6	Trucking representatives
DCPA	7	One local representative, four state representatives, two regional representatives
Charleston Total	16	

There are several ways to address the problem of limited NDTA membership where crisis relocation is concerned. One is to invite representatives of all key transportation elements to participate in workshops, whether or not they are active NDTA members. SYSTAN did this successfully in Wichita, inviting the public transit operator to attend the October 1978 workshop. Attempts to persuade non-NDTA members to attend the workshop were less successful in Charleston, where the relatively low NDTA attendance, coupled with the single focus of the participants' expertise (all truckers) proved to be disappointing. A broader spectrum had been invited, including representatives of the local bus company and truckstop association (neither of whom were NDTA members), but there were a large number of absentees. In defense of the local chapter, it should be noted that Charleston was recovering from a severe ice storm on the meeting day, and parts of the city were without power. The local civil defense director was snowbound in the mountains, bad weather made it impossible for the federal DCPA representative to commute from Washington, and two SYSTAN representatives spent eighteen hours at the Atlanta airport before finally reaching Charleston.

In each of the workshop cities, NDTA chapter officials viewed the workshops as a potential recruiting device, and welcomed the opportunity to invite other representatives of the transportation industry. The San Antonio chapter officers suggested that the NDTA might consider joint meetings with other local transportation groups, in order to obtain a greater breadth of membership expertise. At least three other transportation organizations exist in San Antonio, and several NDTA members are members of more than one organization.

One other means of ensuring broader industry representation in the crisis relocation plan is to use the NDTA membership as a core group responsible for assembling inventories of vehicles and developing an emergency chain of command for the industry at large through their personal contacts and knowledge of local transportation. This approach should work, so long as there is at least one NDTA member representing each key segment of the local transportation industry. The breadth of NDTA membership throughout the United States, and the problem of obtaining full representation from each segment of the local transportation industry, is discussed later in this report (see Section 3.2).

2.3 WORKSHOP DISCUSSIONS

The workshops were divided into four distinct 30-minute segments, followed by a debriefing session. The introductory segment was designed to introduce the transportation industry representatives to the concept of crisis relocation and the assumptions underlying the transportation problems to be discussed. The remaining half-hour segments focused on specific problems involving the use of vehicles, roadways, and fuel under crisis relocation conditions, and the role of the NDTA in planning for the control of these critical transportation elements. Specific problems addressed in the exercises included procedures for (1) evacuating autoless residents, (2) marshalling trucks for the movement of critical foodstuffs, (3) redistributing fuel supplies, and (4) avoiding disastrous traffic tie-ups.

2.3.1 Introductory Material: The Crisis Relocation Concept

Industry representatives generally accepted the need to plan for crisis relocation, accepted the limitations imposed by the assumptions stated in the workshop materials, and approached the specific problems thoughtfully. In all three cities, the device of devoting the first half-hour of discussion, and no more, to the basic concept of crisis relocation proved to be useful. This enabled participants to ask far-ranging questions and get worries off their chests (Where do you expect to put all the people? How do we know the critical workers will be willing to return to the risk area? What about pets? Who pays for all this?...), and focus on questions in their own areas of expertise. These general concerns too often can consume the interest of the uninitiated and keep them from focusing on the planning questions their expertise qualifies them to address.

In San Antonio, local plans were sufficiently advanced to have been committed to camera-ready copy. The availability of these plans made the problem seem more real to the group of transportation experts, helped to focus the entire discussion, and should prove useful as a visual aid for other jurisdictions viewing the final videotape.

2.3.2 Evacuating the Autoless

Although most residents of high-risk areas will leave in their family cars, every city must face the problem of relocating those residents having no access to an automobile. According to the Census of Population, 20% of all U.S. households have no automobile (see Exhibit 2.2). This average ranges from a high of 40% in New York City to a low of 5% in smaller western cities. Of the three workshop cities, Charleston had the highest percentage of autoless households (21.3%), San Antonio had the next highest (14.2%), and Wichita the lowest (9.3%). In preparing the workshop materials, SYSTAN and local DCPA officials used census tract data to trace the number and location of autoless residents in each section of the risk area.

In each of the three workshop cities, there were more than enough buses available locally -- in schoolbus fleets and public transit garages -- to relocate autoless residents. Workshop participants emphasized that, once people have been picked up, they should be taken directly to their ultimate destination in the host area, rather than transferred to intermediate staging areas for further consolidation. This practice would minimize scheduling difficulties and confine the anxiety accompanying the wait for a vehicle to small local groups as opposed to larger, less manageable groups in central staging areas. As suggested in the DCPA planning guidelines prepared by SYSTAN (Reference 2), autoless residents were to be sheltered in refuge areas close to the risk area to minimize the distance traveled by buses shuttling between risk and host areas.

Both San Antonio and Charleston designated local schools as the primary collection points for autoless residents, while Wichita participants debated whether schools, churches, polling places, or Citizen Planning Organization headquarters would make the best pick-up points. San Antonio had also prepared written instructions telling the autoless what to take with them on the buses, and cautioning that under no circumstances should they take more than they could comfortably carry.

In most U.S. cities, the supply of local schoolbuses, tour buses, and urban transit vehicles will be adequate to support the relocation of autoless evacuees (Reference 2). The chief problem confronting the transportation industry in an emergency is not likely to be a vehicle shortage. Problems of organization, scheduling, driver coordination, and public education are likely to be far more pressing. <u>These</u> are the problems that must be solved <u>in advance</u> by transportation professionals and civil defense planners.

Workshop participants recognized that organization and management problems represented a more important question than vehicle availability. Operational personnel requested that lines of authority be clearly identified to avoid conflicting claims on equipment and drivers. These requests were punctuated with accounts of experiences in past emergencies, in which conflicting chains of command impeded the orderly flow of transportation services. Wichita workshop participants also emphasized the need to provide official identification for critical drivers, equipment, and NDTA members.

2.3.3 Moving Critical Supplies

The movement of people is not the only problem faced by transportation planners under crisis relocation conditions. Many trucks and railcars will be needed to move critical supplies such as food and fuel to the outlying host areas. Most of our food comes from supermarkets and wholesale warehouses located in high-risk areas. Although people leaving these areas will take some food with them, large quantities of foods will have to be moved from centrally-located warehouses to stores and mass-feeding centers in outlying host areas.

The need to move more and more food to the host areas is likely to stretch the delivery capability of local supermarket chains. Trucks that normally make short trips between warehouses and central supermarkets will have to travel considerably farther to deliver food to the relocated population (see Exhibit 2.3). Distances traveled can double or triple, so that additional trucks and drivers will have to be found and pressed into service.

In each of the workshop cities, key food suppliers were identified, additional travel distances were estimated, and their distances were translated into requirements for additional drivers and equipment using factors developed by SYSTAN on past research (References 5 and 6). Exhibit 2.3 summarizes the additional driver and equipment needs projected for each workshop city. Workshop participants discussed where these trucks and drivers might be found, and what federal and state regulations would need to be relaxed to optimize their use under emergency conditions.

The task of finding additional equipment to carry food proved to be trivial in both Wichita and Charleston, where relatively few additional trucks were needed. San Antonio NDTA members had assembled a useful inventory of the high-cube trucks available locally, along with contact points identifying the individuals in charge of the trucks. On the

EXHIBIT 2.2

PERCENTAGE OF AUTOLESS HOUSEHOLDS

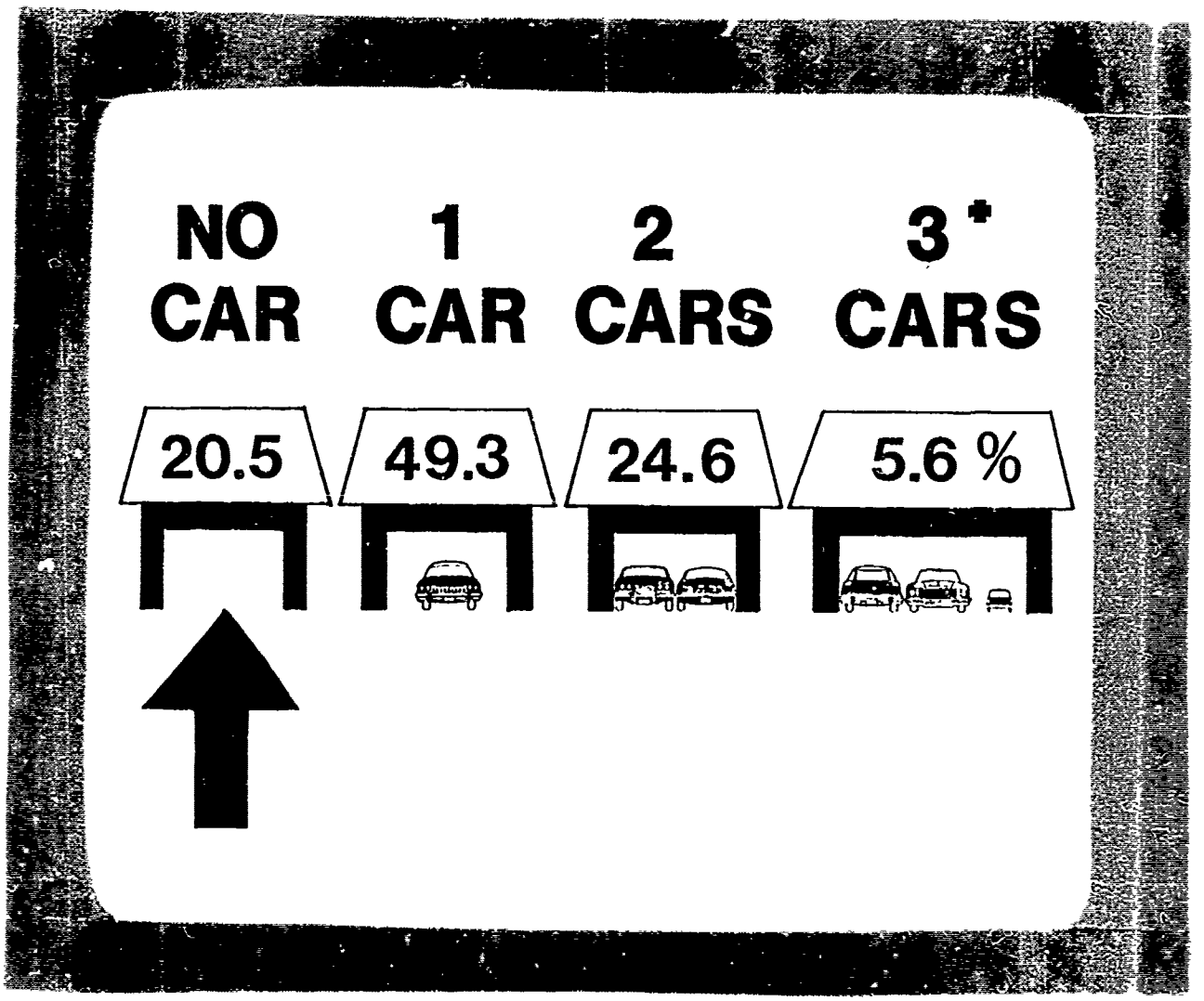
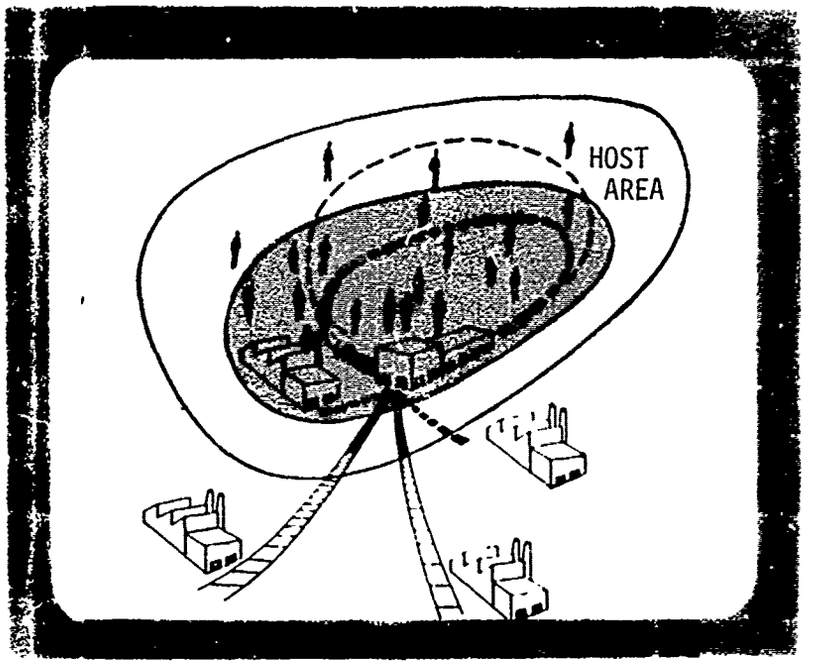
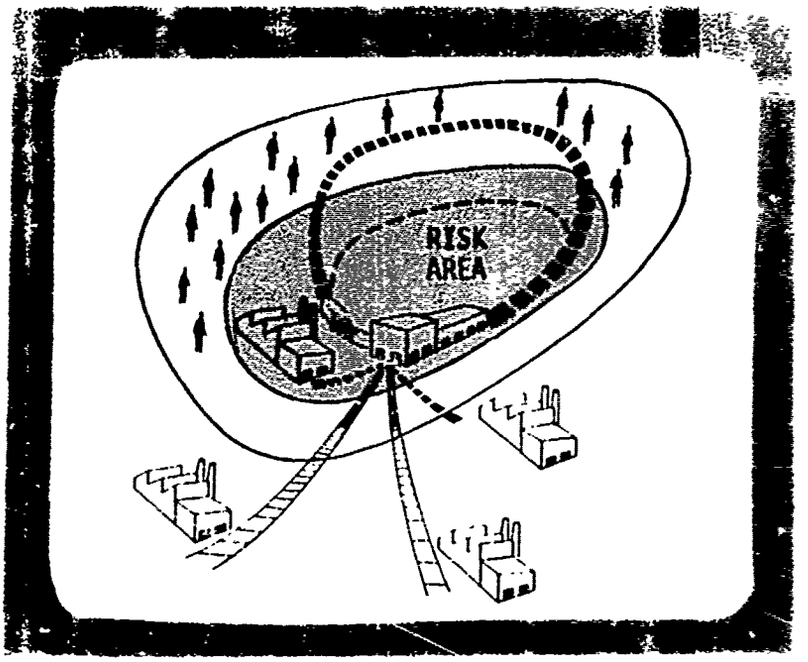


EXHIBIT 2.3

FOOD MOVEMENT BEFORE AND AFTER RELOCATION





ROUGH ESTIMATES OF ADDITIONAL REQUIREMENTS

IMPOSED ON RISK-AREA FOOD WHOLESALERS

	Increases in Travel Distance	Additional Drivers Needed	Additional Tractors Needed	Additional Trailers Needed
WICHITA	70%	15	*	*
SAN ANTONIO	200%	220	70	120
CHARLESTON	99%	20	*	*

* If weight restrictions are relaxed, requirements for additional tractors and trailors will be minimal, but use of trailers for interim host-area storage in Charleston and Wichita would mean that at least 135 additional trailers would be needed in these cities.

basis of this inventory, it was determined that San Antonio could readily supplement its existing food truck fleet with enough trucks from non-critical industries to move food expeditiously to the evacuees.

The trucking industry was heavily represented in Charleston NDTA membership, and chapter members had done a commendable amount of work in advance of the workshop, developing a detailed inventory of available equipment, a communications chain for gaining control of the equipment, and a count of available drivers and their qualifications. In addition, the chapter president had surveyed his own drivers to determine how many would be willing to re-enter the risk area assuming different probabilities (50%, 75%) that they would get out unscathed. Even though the assigned probabilities were lower than can actually be expected, a high percentage of the drivers surveyed expressed a willingness to work in the risk area. At all three workshops, participants worried about the question of driver motivation, and whether drivers would be willing to re-enter the risk area to bring out additional loads of people and supplies. This question appears unanswerable in advance of a specific crisis, and ad hoc surveys by employers are hardly a statistically sound basis for formulating judgements regarding a driver's willingness to risk his life. Nonetheless, each workshop produced tales of historical instances in which drivers had performed selflessly under crisis conditions.

Trucking industry representatives in Charleston discussed a promising alternative for speeding host area food distribution and making better use of drivers and tractors. After arriving at their destination, drivers could leave their trailers for later unloading, and return immediately to the risk area for another trailer-load of food. Trailers left in the host area would then be unloaded and returned to the risk area using tractors already scheduled to make later deliveries. Trailers deposited in the host area might also be used for short-term food storage, and unloaded only as the food is distributed to evacuees. Either of these options would require augmentation of the supply of 40,000-pound trailers currently used by Charleston food wholesalers. At least 135 trailers would have to be diverted from other sectors of the economy if this distribution strategy were followed in Charleston. There appeared to be more than enough trailers available from the critical sectors of local industry to support this strategy, which was endorsed by the NDTA members present as a means of reducing turn-around time and increasing host area storage capabilities.

In all three of the workshop locations, it was generally agreed that certain federal and state regulations

should be relaxed during the emergency to improve the productivity of existing equipment. Charleston truckers estimated that they could haul "three loads for the price of two" if weight restrictions were relaxed. Even if regulations were not formally waived, one member suggested, they would certainly be disregarded informally, as enforcing agencies would be occupied with more important issues than truck weights and operating right .

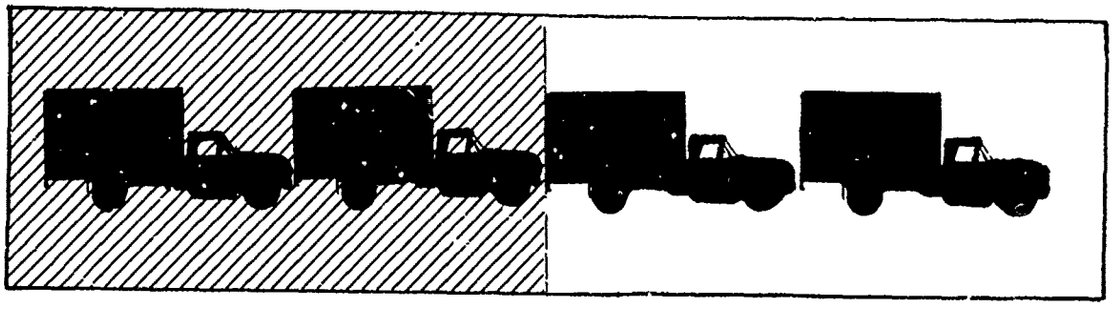
Past SYSTAN research has shown that non-essential shipments can be conservatively estimated to tie up 40% of the trucks used in intercity transportation and half the trucks used in local cargo movement. Thus, the inventory of vehicles and drivers available for transporting critical commodities could be substantially increased under crisis relocation conditions. The distances covered by local supply vehicles will be increased by the relocation strategy but, in most regions, the local vehicle inventories appear to be more than equal to this additional stress, and several measures have been identified for improving vehicle productivity under crisis conditions. If regulatory restrictions are removed, maintenance requirements are relaxed, down-time is minimized, and full-pallet loads are shipped, a tripling of local vehicle mileage can be accommodated by doubling the number of drivers and increasing the number of trucks by 50%. (See Reference 5 and Exhibit 2.4.) Since there are few locations in the United States in which transportation distances can be expected to increase by more than a factor of three, local vehicle inventories should be equal to the demands imposed by emergency cargo movements in most locations. As with population movement, the chief problem is much more likely to be one of organization than of vehicle shortage. Again, workshop participants emphasized the need for creating and publicizing clear chains of command in advance of the emergency.

2.3.4 Road Capacity

Road capacity is a serious concern in the crisis relocation plans of most cities. Every major city has a limited number of outbound highways, and the capacity of most regional road networks will be severely limited by the relocation effort. Bottlenecks are likely to develop on narrow rural roads outside city limits. If an initial rush to evacuate the city causes severe congestion to develop behind these bottlenecks, the success of the entire relocation plan will be threatened. Although many of the potential road capacity problems can be solved through careful advance planning, planners must recognize that rated road capacities are not likely to be attainable for 24 hours per day, and that severe peaks in travel patterns can be

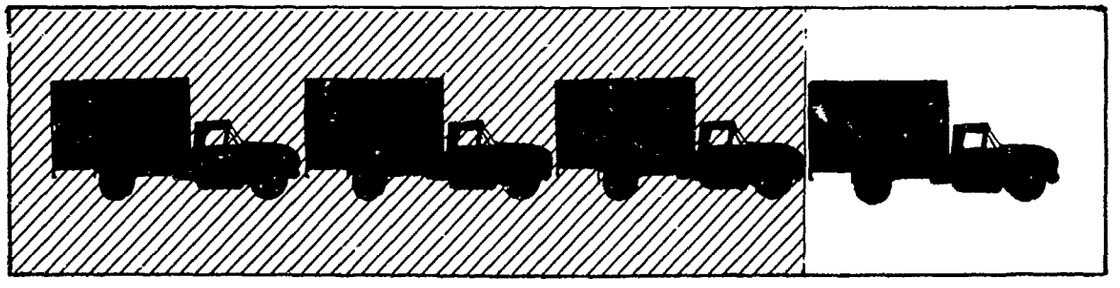
EXHIBIT 2.4

TYPICAL LOCAL VEHICLE AVAILABLITY



CRITICAL NON-CRITICAL

BEFORE RELOCATION



CRITICAL RESERVE

AFTER RELOCATION

(Assuming a 200% Increase in Local Travel Distances)

expected, particularly on the first day of relocation. All available outbound routes should be used, and contingency plans should be developed in advance to deal with potential tie-ups on any single route.

In preparing for the three workshops, the evacuation routes leading to the host areas were mapped and the estimated number of vehicles assigned to each route was computed and compared with rated road capacities. Workshop participants tried to identify where road tie-ups might occur, and to specify means for avoiding them. Both Wichita and San Antonio proved to be atypical cities, in that they are blessed with an ample supply of freeways radiating in all directions, and extensive traffic bottlenecks were not anticipated. Even in the port city of Charleston, the average three-day volumes estimated on the most traveled of the limited evacuation routes did not exceed one-quarter of the roads' rated capacity. Even so, all three cities stressed the need for continuing public information and control.

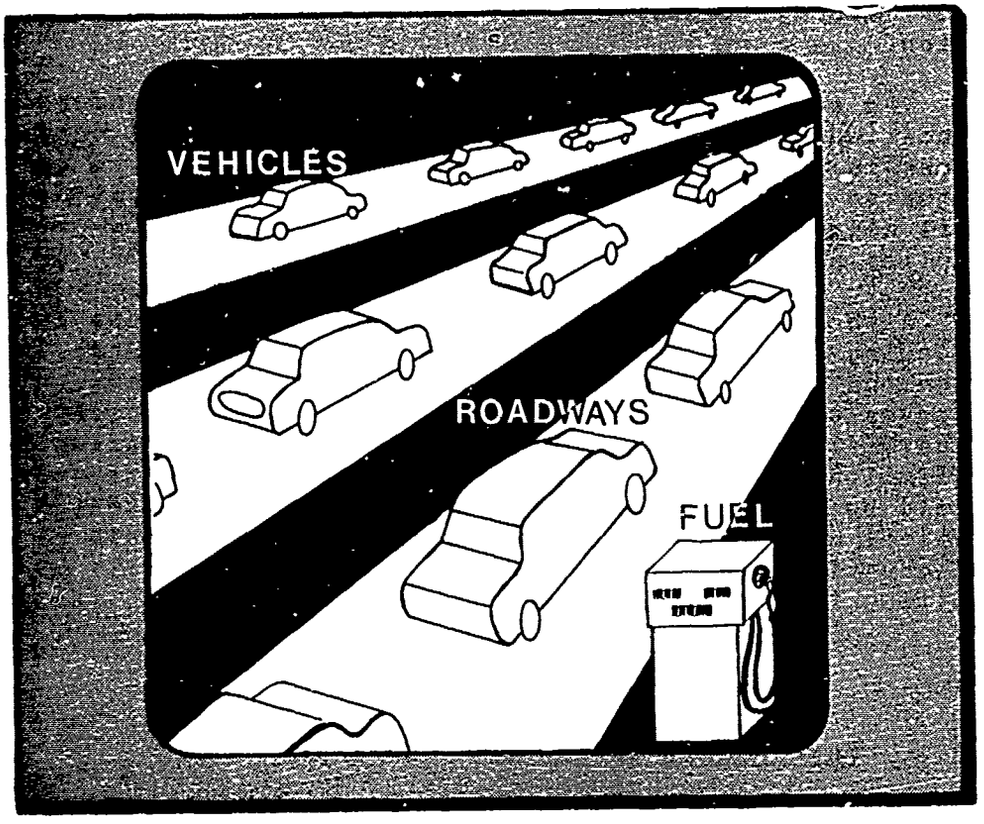
Even in risk areas with apparently ample outbound highway capacity, disastrous traffic jams may develop if everyone hits the road at once. Careful planning, scheduling and control will be required to avoid serious tie-ups on these highways during relocation (see Exhibit 2.5). Past research (Reference 2) suggests the following means for scheduling outbound departures:

> "In most risk areas, it is imperative that measures be adopted to persuade evacuees to stagger their departure times, thereby limiting the number of vehicles on the road at any given time and minimizing the possibility of severe congestion. One of the most important means of influencing departure times and travel patterns will be the frequent broadcasting of information regarding traffic conditions on outbound routes. Such reports aiso serve to advise motorists of traffic tie-ups and alternate route choices. Other means of persuading evacuees to smooth their departure times and limit congestion include suggesting off-peak departure times; advising that families take only one automobile to the host area; operating support services around the clock; and introducing odd/even gasoline purchase limitations. Certain groups of the population are subject to more direct scheduling controls. Bus departures can be scheduled to avoid peak travel hours, and the departure of organizational relocatees may be delayed until the later stages of relocation. If necessary, odd/even license plate restrictions may be announced as controls on the daily use of evacuation routes. The actual enforcement of such movement restrictions on the general public will be difficult, however, and probably undesirable in most circumstances."

EXHIBIT 2.5

COMMENT ON THE IMPORTANCE OF

PLANNING IN OPTIMIZING THE USE OF ROAD CAPACITY



"Evacuating a threatened city might be compared to clearing a room on fire. If everyone tries to leave at once, the exits become clogged, and the chance of getting out safely is diminished. The best use of the exit roads requires careful advance planning with the participation of transportation experts familiar with local traffic patterns."

*The Way Out - Transportation and Crisis Relocation videotape prepared by SYSTAN, Inc.

2.3.5 Fuel

Past SYSTAN research (Reference 2) has shown that the fuel needed during each day of relocation will be less than that used by shoppers, commuting workers, truckers, and other drivers during a typical weekday (see Exhibit 2.6). After relocation is completed, daily fuel requirements will be even lower. So long as shortages do not exist before relocation, there should be more than enough fuel in pipelines, storage tanks, and service stations to support relocation.

The primary motor fuel problem to be faced under crisis relocation conditions is one of distribution, not supply. Stocks in the secondary distribution system must be redirected so they are available where needed. San Antonio civil defense officials have plans to pre-position gasoline supplies along evacuation routes.

Although fuel is not likely to be in short supply following relocation, planning guidelines (Reference 2) recommend certain conservation measures so that adequate reserves can be built up in the relatively invulnerable host areas: "The use of private automobiles in host areas should be limited following relocation, and buses and carpools should be used to the fullest extent possible in carrying critical workers between risk and host areas. Both of these conservation measures also improve overall security by limiting the access of vehicles to the risk area" (Reference 2).

2.3.6 The Role of the NDTA

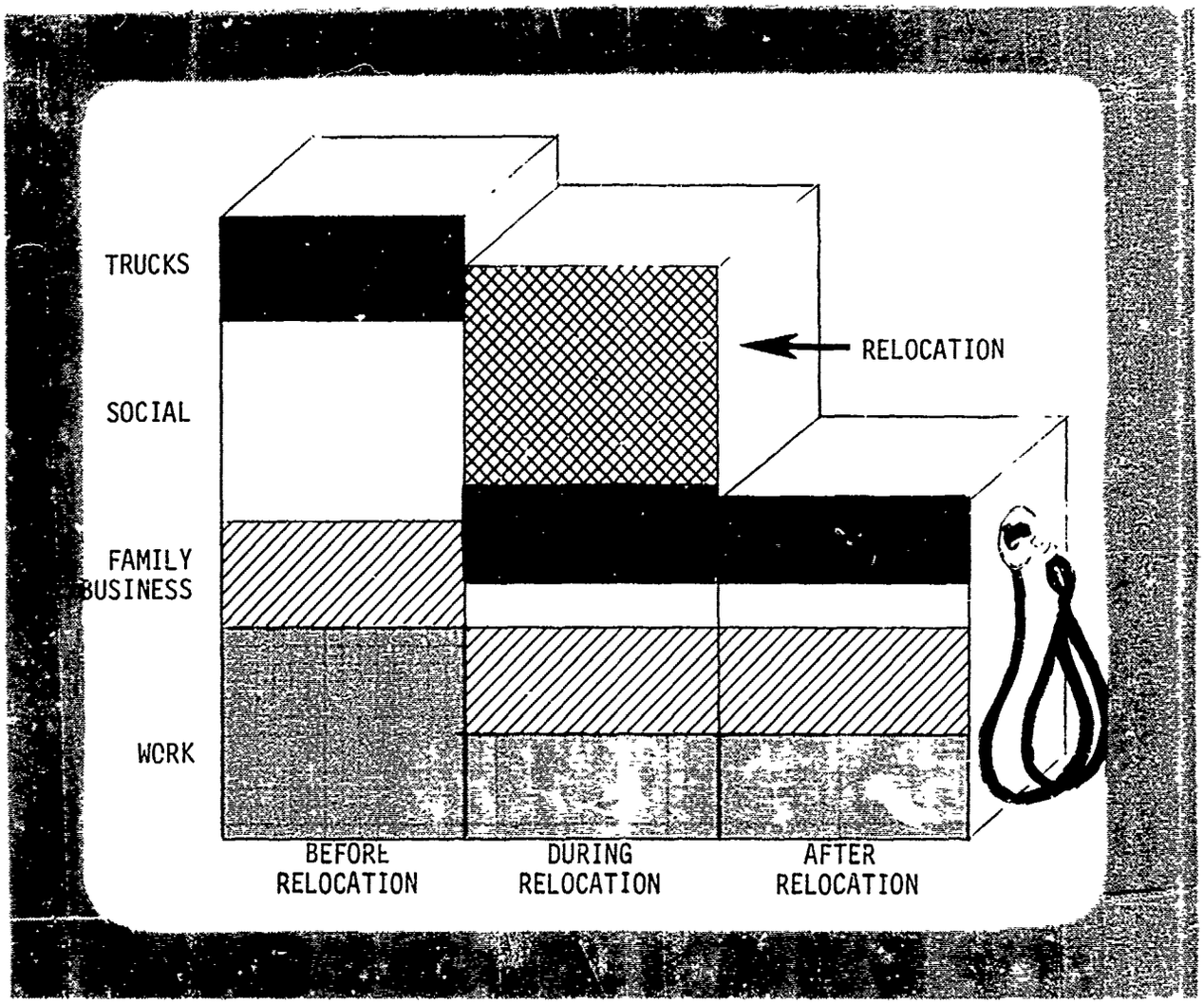
Workshop participants also discussed the role of the NDTA in planning and participating in crisis relocation activities. Participants stressed the need for thorough planning, organizational readiness, and clear communication lines between transportation industry representatives and civil defense officials.

Pre-Crisis Planning. NDTA chapters can undertake a variety of tasks to provide and sustain emergency readiness during peacetime. Possible activities include:

- Assistance with relocation planning;
- Preparation and updating of equipment inventories;
- Identification of key personnel;
- Participation in workshops; and

EXHIBIT 2.6

FUEL NEEDS BEFORE, DURING, AND AFTER RELOCATION



- Participation in simulated emergencies.

Each of these activities is discussed in more detail in Section 3.3 of Chapter 3.

Crisis Responsibilities. The question of precise NDTA responsibilities during a crisis was discussed in all three workshop cities. In San Antonio, the discussion developed into a heated debate, during which the NDTA chapter president questioned his own ability to guarantee direct NDTA participation in a crisis relocation. As a USAF officer, he could not expect to be available, and anticipated that many other NDTA members, all of whom are volunteers, might have prior commitments to their companies in case of emergency. He had no problem providing DCPA with a list of vehicles and the names and telephone numbers needed to command the use of those vehicles, but felt that he could not accept responsibility for the presence of an NDTA member in the EOC during the evacuation. In the opinion of the local civil defense director, the presence in the EOC of a transportation expert familiar with the vehicles and faces on the other end of the telephone line was absolutely necessary during a crisis. This debate was finally resolved when the NDTA member responsible for developing the vehicle inventory and list of industry contacts indicated that he expected that his superiors would not balk if he volunteered for EOC duty. The local transit operator also indicated that they wanted to have a staff member in the EOC if their buses were being used. The availability of volunteers for crisis duty is an important question that must be resolved in advance in each risk area as part of the task of establishing a clear chain of command.

2.4 REACTIONS TO THE WORKSHOPS

2.4.1 Debriefing Sessions

In the debriefing session following the workshops, key participants were asked to state their opinion of the workshops, to suggest possible improvements, and to comment on potential future workshops. DCPA has been provided with unedited tapes of these debriefing sessions for all three workshops. A representative sampling of quotes from these tapes appears below.

> Frank Mollner, DCPA Region VI, Denver, Colorado: "I thought that the response that the NDTA members gave was very positive. I felt that they accepted the crisis for what it could do to the city of Wichita and the surrounding area, and I felt that they responded quite well ... I think that this was valuable."

Eugene Beaver, Director, Sedgwick County Emergency Preparedness Office, Wichita, Kansas: "Although many of these gentlemen (transportation industry representatives) ... had at least an inkling of an idea of what we were talking about in crisis relocation planning, they had really not addressed themselves to those specific problems that were brought up here tonight. And now it's started their thinking process."

Hugh Philippus, VIA Metro Transit, San Antonio, Texas: "I'm ... a firm believer in education ...There's got to be an educational process so that when it does happen, we get the people going where we want them to go at the speed we want them to go and when we want them to go."

William T. Stallings, Jr., Director, City of San Antonio Civil Defense and Disaster Relief: "I think it went off very smoothly, and I think we accomplished the mission ... I'm very pleased with the turnout and the enthusiasm and support that was represented in the room."

Gerald Hurst, Johnson Motor Lines, Charleston, South Carolina: "I myself learned a lot about transportation in Charleston ... I think that this thing (crisis relocation) has been discussed thoroughly tonight, and I've learned a great deal about what civil defense will do."

Ralph Renau, G & P Trucking, Charleston, South Carolina: "We in transportation need to know more about what civil defense is doing ... Without meetings like this or getting together with civil defense we have no idea of what's going on or what needs to be done."

There appeared to be nearly unanimous agreement in all three cities that the workshops were successful and useful both in improving NDTA crisis readiness and in educating NDTA members regarding their role in such a crisis. The workshop opened channels of communication between DCPA planners and the transportation industry, and these industry members cooperated to provide a data base for use in relocation planning. The most common reservation expressed by participants regarding the workshops concerned the need for broader representation from the transportation community. In Charleston, NDTA attendees were exclusively representatives of the trucking industry, and neither the Wichita nor the San Antonio NDTA chapter membership represented the full spectrum of transportation expertise available locally. In future workshops. chapter membership lists should be

expanded to include all elements of the transportation industry, from transit to trucks and from taxis to trains.

2.4.2 Other Concerns

Although the responses recorded on videotape immediately following the workshops were almost universally favorable, some criticism of one of the workshops was expressed after the fact by the DCPA regional office. This criticism appeared to stem from a misunderstanding of the purpose of the workshops. Certain regional representatives had apparently expected a more elaborate exercise, during which specific relocation events would be simulated, command chains would be tested, and artificial crises would be created to provide a real-time test of the local plan. To avoid such misunderstandings in the future, attempts to promote cooperation and coordination between NDTA and DCPA should be clearly labeled as "workshops," rather than as exercises, and the intent and scope of the workshop should be clearly specified in advance.

In two of the three workshop cities, DCPA personnel who had attended past meetings of the local NDTA chapters had come to view the chapters primarily as social organizations. Consequently, some skepticism was expressed in advance of the workshops regarding the potential reliability of the chapter members in an emergency. No such skepticism was voiced after the workshops, which were held on evenings set apart from the normal NDTA chapters' meeting times, conducted in an atmosphere removed from the ordinary NDTA meeting or social function, and attended by members seriously interested in emergency preparedness. The clear consensus of opinion following the workshops was that "the NDTA can play a vital role in the EOC" in time of emergency, that the "...exchange of views has been invaluable," and that "we don't see how we can operate without them (the NDTA)."

2.4.3 Reactions to the Videotape

Before the final editing of the videotape The Way Out: Transportation and Crisis Relocation, the tape was screened for the Board of Directors of the San Francisco NDTA chapter, DCPA National headquarters, and SYSTAN's staff of transportation consultants. As in the case of the workshops themselves, reaction to the tape was almost unanimously favorable. Certain weaknesses in the original introductory scenes were noted by all three viewing groups, and these scenes were strengthened in the final versions of the

videotape. The screening before the Board of the San Francisco NDTA chapter was held under less than ideal viewing conditions. The videotape was shown on one of the hottest days of the year in a room lacking air conditioning following a full lunch and a lengthy business meeting. Nonetheless, the surviving viewers participated in a useful discussion, and a limited sampling of questionnaire responses indicated that all viewers felt that the concept of crisis relocation was clearly presented.

2.4.4 Feasibility of Crisis Relocation

In all three workshop cities, the NDTA representatives concluded that from a transportation standpoint, at least, the CRP strategy was feasible and could be made to work successfully in their locale. This conclusion must, of course, be interpreted in the light of the characteristics of the cities themselves and the assumptions used as a framework for the workshop. Nonetheless, the positive reaction of transportation industry leaders responsible for the local implementation of a crisis relocation strategy constitutes an encouraging endorsement of the technical and operational soundness of one of the most important elements of that strategy.

2.5 FUTURE DIRECTIONS

The experience gained in conducting the workshop, coupled with the reactions of NDTA and DCPA participants to the workshop, has led to a number of recommendations regarding the direction of future workshops and potential changes in crisis relocation planning guidance.

2.5.1 Recommendations for Future Workshops

Future workshops can be as simple as an evening spent viewing and discussing the videotape The Way Out, or as complex as a more detailed investigation of specific local relocation problems. Chapter 4 gives detailed instructions for planning and conducting future workshops. On the basis of the three pilot workshops conducted by SYSTAN, however, certain guidelines for future workshops are worth emphasizing. They include:

- Clearly specify the intent and scope of the workshop in advance;

- Conduct the workshop at a time set aside for just that purpose. Videotape viewing or discussion sessions do not mix well as a part of meetings with other agenda items or social events.

- Introduce the general concept of crisis relocation and discuss it briefly. Set a time limit on general questions.

- Set a time limit for the discussion of each problem.

- Conduct a wrap-up discussion for summarizing thoughts on the workshop, deciding on the next steps to be taken or the mechanisms to be used for staying current on crisis relocation planning.

2.5.2 Recommended Guidelines Changes

In the past, SYSTAN has assisted DCPA is preparing guidance to be used by state and local planners in developing the transportation and food distribution components of crisis relocation plans (References 2 and 3). Exhibit 2.7 summarizes the guidance provided to transportation planners. For the most part, the observations of NDTA members in Wichita, San Antonio and Charleston tended to echo the general concepts promulgated in these guidelines. Although few entirely new ideas appeared, it was heartening to hear the voices of experience endorsing the general concepts of the guidelines, and the videotaped excerpts of the observations of these voices included in The Way Out should make a valuable teaching aid for other jurisdictions.

Although no major guidelines changes are recommended as a result of the exercises, certain concepts should be emphasized more strongly in future editions of the guidelines. These include:

- The possibility of using truck-trailers for temporary storage in the host area, allowing quicker turn-around times for drivers and motor units;

- The need for a clear, well documented chain of command for controlling transportation drivers and equipment;

- The need to provide identification for drivers and other essential workers; and

- The need to open channels of communication with the transportation industry through workshops similar to those conducted in Wichita, San Antonio and Charleston.

EXHIBIT 2.7

RECOMMENDED GUIDELINES FOR TRANSPORTATION SUPPORT OF THE CRISIS RELOCATION STRATEGY

STATE AND REGIONAL ACTIVITIES

- Revise fuel distribution patterns from secondary sources to the consumer
- Arrange for additional drivers and equipment needed to distribute food, fuel, & other critical items.
- Waive vehicle highway weight restrictions
- Publicize revised regulations and chain of command.

	GENERAL GUIDELINES	RISK AREA ACTIVITIES	HOST AREA ACTIVITIES
POPULATION MOVEMENT	• Most evacuees will relocate in private automobiles. • Autoless residents should proceed to nearest school or polling place in accordance with publicized schedules.	• Evacuees with autos should maximize vehicle occupancy & schedule departures to minimize likelihood of congestion. • Local buses should operate on reduced holiday schedules during early stages of relocation. Remainder of fleet will be used in evacuation. In most cities, school buses, public transit, & local tour buses will be adequate to relocate autoless residents; intercity buses should be directed to cities with vehicle shortages. Bus departures should be scheduled to minimize congestion • Rail passenger service should be used where possible. Heavy trucks and boxcars can supplement evacuation vehicle fleet in cases of extreme emergency	• Use of private autos will be restricted once host area is reached. • Following relocation, risk area buses will provide public transportation capability in host area. • Buses & carpools should be used to extent possible in commuting of critical workers.
CARGO MOVEMENT	• Intercity cargo flow will generally follow normal patterns, with movements restricted to critical goods. • Local cargo flow will be restricted to movement of critical goods, but travel distances will be increased, increasing requirements for vehicles & drivers carrying critical commodities. • Specialized motor vehicles (e.g., ambulances, dump trucks, debris-removal equipment) and critical rail rolling stock will be evacuated to host areas, spare parts will be stockpiled in safe locations	• Continue to operate all major fuel wholesale operations, primary & secondary fuel storage terminals, & other distribution facilities for critical commodities. • Augment vehicle fleet & driver pool for transportation of critical goods as required, following guidelines & procedures established by NDTA for obtaining personnel & equipment from less critical sectors. • Increase vehicle & driver productivity by taking advantage of waived restrictions & weight limitations; minimizing down time; relaxing maintenance requirements, increasing vehicle loads, loading only full pallet quantities, & shipping only necessary commodities. Relocate specialized motor vehicles, critical rolling stock and repair equipment to host areas.	• Continue all warehousing & distribution activities for critical goods, expanding operations where possible through use of commandeered space, worker overtime, & relocated workers. • Augment transportation fleet & driver pool as required, following guidelines and procedures established by NDTA for obtaining personnel & new equipment from other sectors. • Increase vehicle & driver productivity by taking advantage of waived driver restrictions & weight limitations; minimizing down time; relaxing maintenance requirements; increasing vehicle loads; loading only full pallet quantities; & shipping only necessary commodities • Stockpile vehicle parts and maintenance manuals.
ROAD NETWORK UTILIZATION	• Advance planning should identify bottlenecks & use all available roads to maximize outbound flow. Effects of congestion on road capacity should be explicitly considered, & contingency plans should be developed to bypass congested bottlenecks. • Traffic flow should be monitored throughout relocation period, preferably by helicopter • Police & emergency rescue vehicles should patrol evacuation routes to remove disabled vehicles	• All available means should be employed to persuade population to limit number of vehicles used in evacuation & spread departures evenly over three-day relocation period. • Frequent reports on traffic conditions should be provided throughout the relocation period to allow departing evacuees to enter traffic flow streams at optimal times & to permit motorists to adjust travel plans en route • Where the possibility of congestion is high license plate controls should be used to schedule departures • Move rail panels to host area on flatcars.	• Reception stations should remain open around the clock to facilitate spreading of risk area departure times • Service stations & rest areas will serve as staging points for emergency vehicle patrols during relocation. • Identify key host area terminals (truckstops and railyards) in advance and plan for their support.
FUEL CONTROL AND DISTRIBUTION	• If fuel shortages do not exist prior to relocation, they are not likely to occur during or after relocation. However, rationing & other point-of-purchase controls may be desirable to conserve fuel against the shortages that can be expected if an attack ensues • The flow of motor fuel will be redirected from risk area terminals & stations to host area bulk terminals & gas stations. • Intercompany fuel transfers should be permitted to facilitate the redirection of flow from risk to host areas. • To the extent possible, vehicles moving between risk & host areas with critical workers & commodities should refuel in the risk area. • Restrictions on the use of leaded fuel should be eliminated. • Excess fuel produced during relocation period should be stockpiled in host areas.	• Secondary bulk terminals and pipeline outlets will continue to operate to supply host area stations & terminals & critical risk area stations. Once the relocation order is given, only a limited number of critical stations will be resupplied. Where possible, risk area pipeline outlets should supply these stations. • All gasoline stations should remain open around the clock during three-day relocation period until their tanks are drained. Following relocation, only critical stations will remain open. • Non-critical stations with fuel remaining following relocation should deposit keys with public safety officials so that inventories can be used to support movement of critical workers & commodities. • Stations should observe rationing controls & odd/even regulations established nationally during pre-crisis period & evacuation period. • Strengthen critical pipeline terminals and refineries on fringes of target area against attack	• Supplies to stations along evacuation routes will be bolstered. These stations should remain open around the clock during relocation • Where appropriate, host area pipeline terminals should be used to advantage in diverting flow of motor fuel. • Following relocation, deliveries to bulk terminals & gasoline stations will be stepped up to meet relocated demand & to develop fuel stockpiles in less vulnerable locales. • Stations should observe rationing controls, odd/even regulations, & any purchase restrictions established nationally before & after relocation. • Construct expedient fuel storage facilities where necessary.

(Source: Reference 3)

3. THE NDTA ROLE IN CRISIS RELOCATION PLANNING

Present crisis relocation planning relies on the cooperation and support of the transportation industry to carry out vital evacuation tasks. The primary link being forged between DCPA and the transportation industry is the National Defense Transportation Association (NDTA). This chapter will examine the history and coverage of the NDTA, the tasks it is being asked to perform, the suitability of the current organizational structure for performing these tasks, and alternative approaches for obtaining transportation assistance during crisis relocation in areas where the NDTA is not represented.

3.1 HISTORY OF THE NDTA

The NDTA evolved from alliances formed during World War II. Transportation industry personnel joining the Army applied their expertise to military logistical problems. The first step in preserving this partnership with the military was to form the Army Transportation Association in 1944. When the U.S. Department of Defense was created in 1949, the base was broadened to include other services, and the organization was renamed the National Defense Transportation Association.

During the 1950's, NDTA efforts focused on civil defense activities and planning for the possibility of nuclear disasters; later, these efforts were expanded to include natural disasters. The NDTA has often been called on to organize the transportation of food and equipment to areas stricken by floods and other disasters. As in the Alaskan earthquake, the NDTA is most often asked to commandeer local trucks to move critical supplies to stricken areas.

The basis for these activities has been documented in the NDTA constitution,[1] which lists the following NDTA objectives related to national defense and disaster planning:

---

[1]NDTA, Constitution and By-Laws, September 25, 1977.

- "To provide active assistance...to Federal, State and Local Government agencies engaged in transportation preparedness planning, and to promote recognition of the need for cooperation and support of carrier management in operationally effective planning.

- "To encourage implementation of plans and programs to assure transportation capability in time of national emergency.

- "To provide advisory assistance, upon request, to governmental agencies concerning defense transportation problems.

- "To encourage transportation and related industries to make available transportation management and operational personnel for prompt support of disaster agencies in periods of emergency.

3.2 NDTA CHAPTER COVERAGE

The NDTA is a non-profit, industry-financed organization with approximately 10,000 members worldwide and 9,000 in the United States. Sixty chapters now operate in the United States; they typically exist near major military installations or in cities where transportation is a significant economic factor. In the past, membership totaled about 12,000 people in 75 chapters, but the closing of a number of military bases depleted this membership. The number of members in a chapter varies widely; a chapter may be chartered by as few as 25 Association members, but large chapters (400 to 600 members) exist in such transportation centers as New York, Chicago, and San Francisco.

In locations where NDTA chapters exist, they provide a single focal point for coordinating a range of transportation resources under emergency conditions. However, two major drawbacks limit the usefulness of the NDTA in crisis relocation circumstances: (1) chapters do not exist in many areas, and (2) membership often does not fully represent the local transportation industry.

3.2.1 Chapters Versus Risk Areas

The NDTA organization has state-level representation in 35 states, and local chapters in 60 cities (see Exhibit 3.1). An estimation of the population of NDTA chapter cities show that they include about 55% of the U.S. risk-area population.

EXHIBIT 3.1

NDTA CHAPTER CITIES

(60)

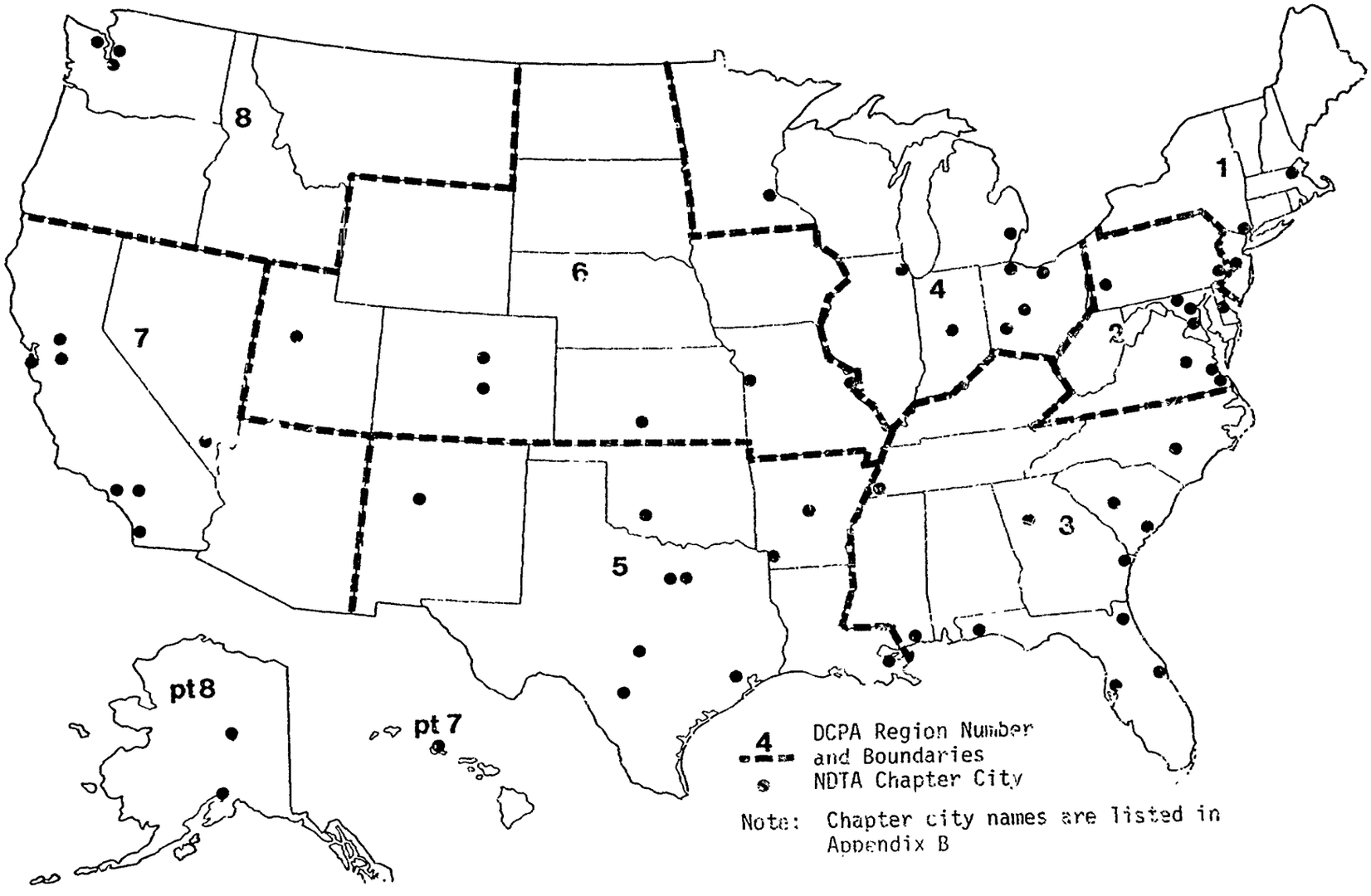
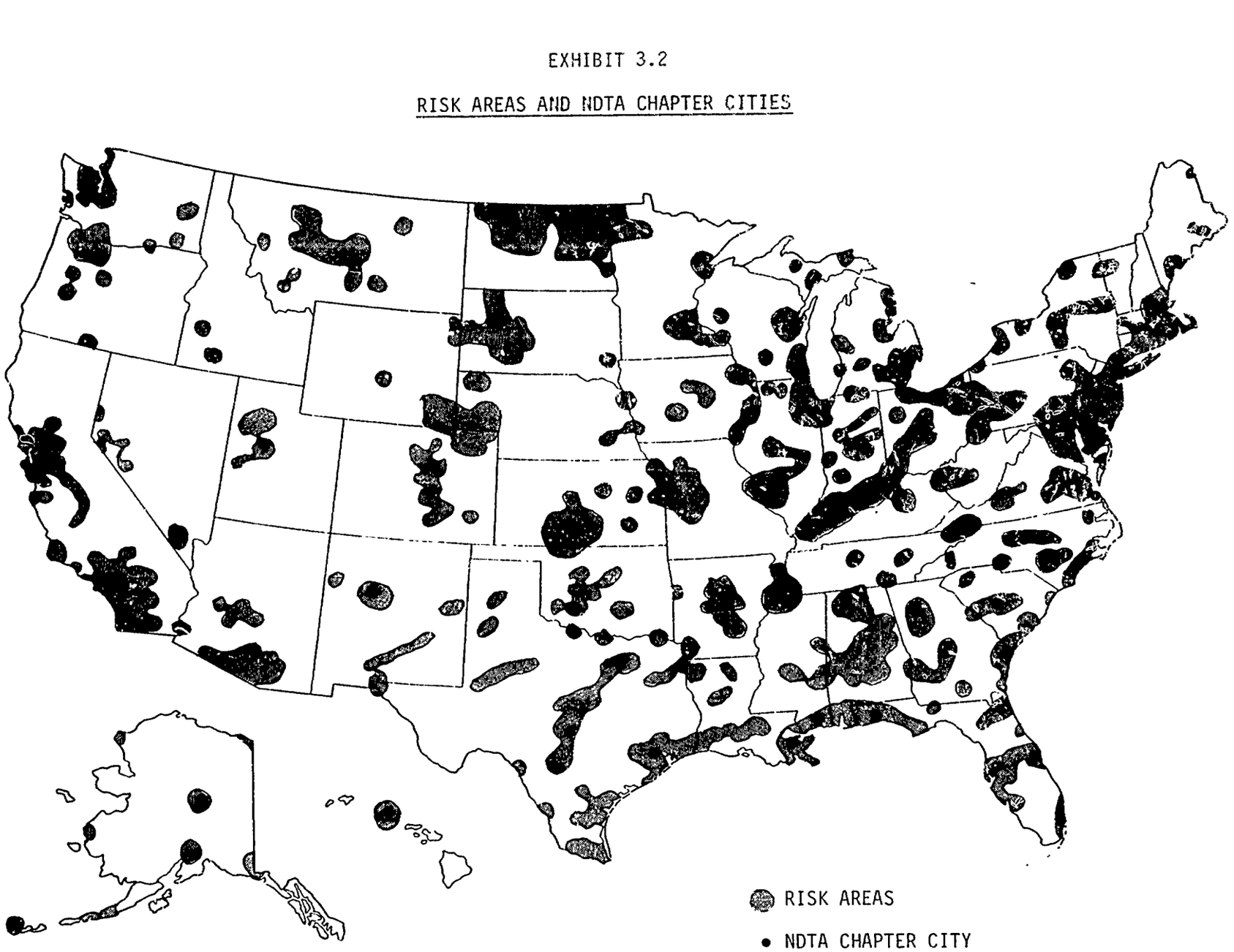


EXHIBIT 3.2

RISK AREAS AND NDTA CHAPTER CITIES



	1970	1976 (est.)
Population	203,235,298	214,669,000
Risk-Area Population	139,909,218	148,122,000
NDTA Chapter Cities (SMSA population)	78,617,000 (est.)	81,518,000
% Risk-Area Pop. Covered	56	55
Number of Risk Areas to be Evacuated	400	400
Number of NDTA Chapters	75	60
% of Risk Areas Served by NDTA Chapters	19%	15%

Thus, 85% of all risk areas -- containing 45% of the population at risk -- have no NDTA chapter. In these locations, another focal point will have to be found to muster transportation resources in time of crisis.

Exhibit 3.2 shows the potential areas in the United States in relation to NDTA chapter cities. The largest land area not covered by NDTA chapters is in the northwestern United States; other such areas include Arizona, southeast New Mexico/West Texas, Mississippi/Alabama, Tennessee/Kentucky, and Wisconsin/Michigan (except the Detroit area).

3.2.2 Membership Skill Representation

NDTA membership covers a variety of transportation modes, related industries and government agencies. On a national basis, membership groups include:

Truckers	16.2%
Railroads	12.8%
Active Military	12.6%
Home Subscribers	11.2%
Manufacturers	8.3%
Water	8.2%
Air	5.7%
Government	5.5%
Freight Forwarders	4.8%
Bus	1.0%
Miscellaneous	13.7%

Local chapter members also reflect its geographical setting or the presence of military installations. For example, the San Francisco chapter has a 21% maritime representation drawn from the port-associated activities in the bay area. The Chicago and Indianapolis chapters reflect the local concentration of the trucking industry.

Chapter membership, however, does not generally include representatives of the local transit agencies, schoolbus operators, taxi companies, and other local transportation resources that could be useful in an emergency. Bus companies that have joined the NDTA are the national organizations such as Trailways and Greyhound. As Exhibit 3.3 illustrates, the list of corporate NDTA members is composed primarily of national and regional firms. Although these firms would be valuable resources in a national emergency, working relationships with civil defense for planning and maintaining readiness must be established at the community level, where crisis relocation would take place. Where this local relationship exists, it is generally formalized in a Memorandum of Understanding to promote operation and planning coordination.

Other transportation organizations besides the NDTA may exist in different cities, and these organizations may be called on to complement the resources represented by NDTA members. In San Antonio, Texas, it was estimated that NDTA membership represented only 60% to 70% of the transportation industry. However, the NDTA is one of the few nationwide organizations specifically chartered to provide emergency assistance under crisis conditions. As a San Francisco member stated, "the NDTA is the only organization in focus. The other organizations are scattered and diffuse." This same chapter is currently attempting to enhance the effectiveness of all Bay Area transportation agencies through a coordinating council. A poll was taken of all the local traffic clubs, transportation organizations, physical distribution management groups, and the local transportation fraternity. The response was positive, and activities are now being directed toward the exchange of information and developing joint programs of mutual interest.

3.3 MAINTAINING CRP READINESS

In cities in which NDTA chapters exist, the chapter should play a lead role in coordinating transportation industry support for relocation planning. Chapter membership may need to be augmented by including all elements of the local transportation industry in supporting roles. Where no NDTA chapters exist, transportation support is needed from local transportation societies and public and private transportation companies.

This section discusses potential roles for the transportation industry in promoting and maintaining emergency readiness. The industry should:

EXHIBIT 3.3

NDTA SUSTAINING MEMBERS (106)

Acme Fast Freight
Aero Mayflower Transit Company, Inc.
Air Transport Association of America
Allegheny Airlines, Inc.
Allied Van Lines, Inc.
American Airlines, Inc.
American Export Lines, Inc.
American Movers Conference
American President Lines, Ltd.
American Red Ball Transit Co., Inc.
American Trucking Associations
Association of American Railroads
The Atchison, Topeka & Santa Fe Railway Company
AVCO Corporation

The Boeing Company
Braniff International
Burlington Northern Inc.

Castle & Cooke Terminals, Ltd.
Central Gulf Lines, Inc.
Chessie System:
The Baltimore & Ohio Railroad Company
The Chesapeake & Ohio Railway Company
Western Maryland Railway Company
Cooper-Jarrett, Inc.
Continental Airlines, Inc.
Crowley Maritime Corporation

Delta Air Lines
Denver & Rio Grande Western Railroad Company

Eastern Airlines, Inc.
Eastman Kodak Company
Emery Air Freight Corporation

The Family Lines System
Farrell Lines Incorporated
Federal Express Corporation
The Firestone Tire & Rubber Company
The Flying Tigers
Ford, Bacon & Davis, Inc.
Fruehauf Corporation
Fruit Growers Express Company

Gateway Transportation
General Dynamics Corporation
General Motors Corporation
Georgia Highway Express, Inc.
The Goodyear Tire & Rubber Company
Government Traffic Developers, Inc.
Greyhound Lines, Inc.

Illinois Central Gulf Railroad
IML Freight, Inc.
Imperial Van Lines International, Inc.
Ingersoll-Rand Company
International Business Machine Corporation
International Harvester Company
IU International Management Corporation
Ivory Vanlines, Inc.

Koppers Company, Inc.

Lockheed Corporation
Lykes Bros. Steamship Company, Inc.

Matson Navigation Company
McDonnell Douglas Corporation
McLean Trucking Company
Missouri-Kansas-Texas Railroad Company
Missouri Pacific Railroad Company
Moore-McCormack Lines, Inc.

National Air Carrier Association, Inc.
National Airlines, Inc.
National Trailways Bus System
Norfolk and Western Railway Company
North American Van Lines, Inc.
Northwest Airlines, Inc.

Overnite Transportation Company

Pan American World Airways, Inc.
Port of Long Beach, Board of Harbor Commissioners
Prudential Lines, Inc.

Richmond, Fredericksburg & Potomac Railroad Company
J.H. Rose Truck Line, Inc.

St. Louis-San Francisco Railway Company
Sea-Land Service, Inc.
Seaboard World Airlines, Inc.
Seatrain/Gitmo, Inc.
Societa Nazionale Trasporti Fratelli Gondrand
Southern Pacific Transportation Company
Southern Railway System
Spector Freight System, Inc.
Sundance Transportation, Inc.

Terminal Transport Company, Inc.
T.I.M.E.-D.C., Inc.
Trailer Train Company
Trans International Airlines
Trans World Airlines, Inc.
Tri-State Motor Transit Co.

Union Mechling Corporation
Union Pacific Railroad Company
Union Oil Co. of California
Union Tank Car Co.
United Technologies Corporation
United Airlines
United Parcel Service
United States Lines, Inc.
United States Postal Service
United States Steel Corporation
United Van Lines Inc.
Universal Carloading & Distributing Co. Inc.

Viktoria-Transport GmbH & Co. KG

Waterman Steamship Corporation
Western Gear Corporation
The Western Pacific Railroad Co.
Westinghouse Air Brake Company
WTC Air Freight

Yellow Freight System, Inc.

AUGUST 1978

- Assist the civil defense staff in relocation planning;
- Prepare equipment inventories;
- Identify key personnel;
- Conduct training workshops; and
- Participate in simulated emergency exercises.

During recent workshops, the participants emphasized the need for thorough advance planning, organizational readiness, and clear communication lines between the transportation industry and local civil defense officials.

3.3.1 Assisting Civil Defense Staff

If the transportation industry is to assist local civil defense personnel with relocation planning, communication channels must be opened between the industry and the civil defense staff. Technical, operational and organization questions on transportation must be resolved if crisis relocation is to succeed. The local civil defense staff needs the expertise of transportation personnel, a knowledge of local resources and conditions, and feedback on the feasibility of crisis relocation itself. One civil defense director stated his need for transportation industry help as "I want eyeball-to-eyeball contact with an NDTA member in the emergency operating center." Communications can be aided by informal briefings, workshops, exercises, and presentations. In recent years, many NDTA chapters have invited civil defense speakers to their meetings for the purpose of establishing a working relationship between the two groups.

The transportation industry can also assist the civil defense staff by identifying key industry personnel and helping to set up a clear chain of command for emergency operations. As a consultant said to a workshop group, "the Governor doesn't know where the trucks are, the civil defense people don't, and the consultants aren't going to be here. You (the transportation industry) are the people on the spot. The mayor will be calling on you, and perhaps learning for the first time about the chain of command." From past experience, NDTA members emphasize that a clear chain of command must be established and understood to avoid conflicting claims on equipment and drivers.

3.3.2 Maintaining Inventories

To aid relocation planning, the transportation industry representatives can develop inventories of critical transportation equipment along with a list of people to contact to mobilize the equipment (see Exhibit 3.4). In the Charleston workshop, the NDTA members had prepared a detailed inventory of available equipment, a communication chain for gaining control of the equipment, and a count of available drivers and their qualifications.

Catalogs of transportation industry resources and contacts are needed both in planning for relocation and in carrying out a full-scale evacuation. The San Antonio NDTA president argued convincingly that such information was most essential in the emergency operating center during relocation. He felt that a list of vehicles and the names and telephone numbers needed to command the use of those vehicles would provide civil defense officials with the necessary means of commandeering equipment in the event that NDTA volunteers were needed elsewhere. Most civil defense officials, however, felt that at least one NDTA member was needed in the EOC along with this inventory. Presented with some intricacies of a trucking operation, one civil defense man stated that "we need to know these things; we need the NDTA in the EOC." Another said simply, "we can't get along without them."

3.3.3 Identifying Key Personnel

Sample organizational charts depicting state, local and chapter chains of command are shown in Exhibits 3.5 through 3.7. Exhibit 3.5 and 3.6 show the transportation coordinator positions at the state level in Colorado and the county level in Charleston, South Carolina. It is intended that each of these organizational slots be filled by an NDTA member. At another level of detail, additional information is needed to bring the transportation resources of the private firms into a relocation operation. An example of such an organization chart, developed by the Denver NDTA chapter on a mode-by-mode basis, appears in Exhibit 3.7.

3.3.4 Conducting Workshops

A workshop can be as simple as an evening spent viewing and discussing the videotape The Way Out, or as complex as a more detailed investigation of specific local relocation problems. Guidance for conducting workshops can be found in Chapter 4, and in a separate set of materials designed to accompany the videotape presentation.

EXHIBIT 3.4

SAMPLE INVENTORY AND ORGANIZATION LISTINGS

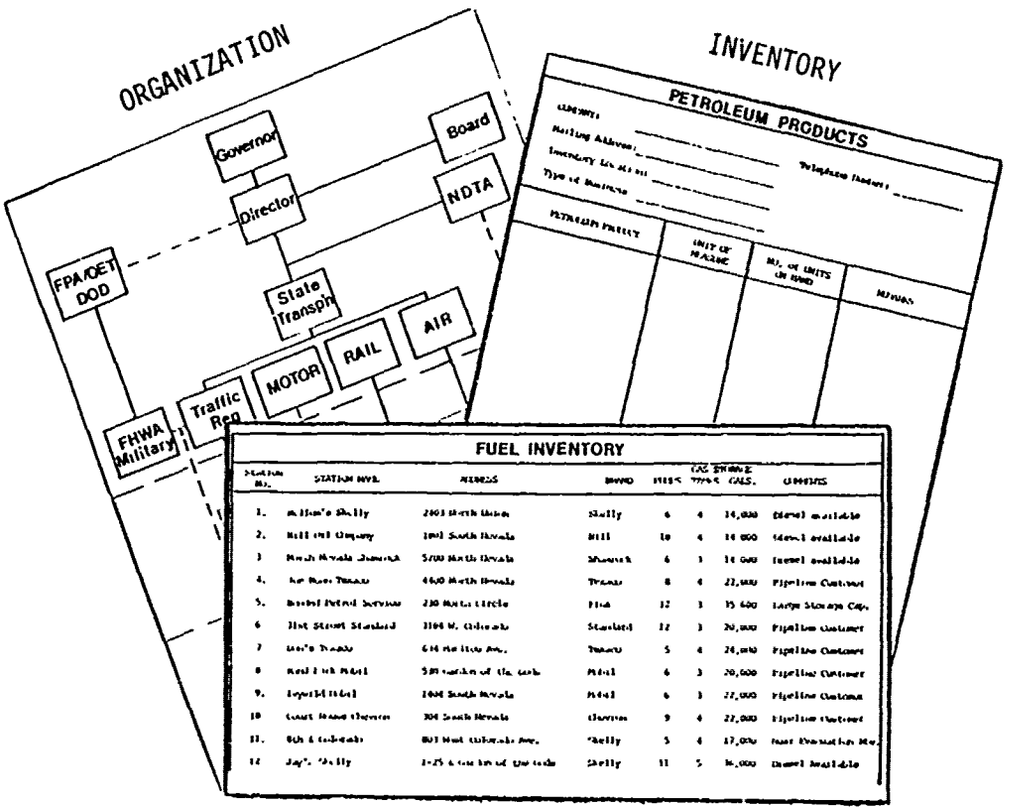


EXHIBIT 3.5

SAMPLE ORGANIZATION FOR MANAGEMENT OF TRANSPORT RESOURCES

(State of Colorado)

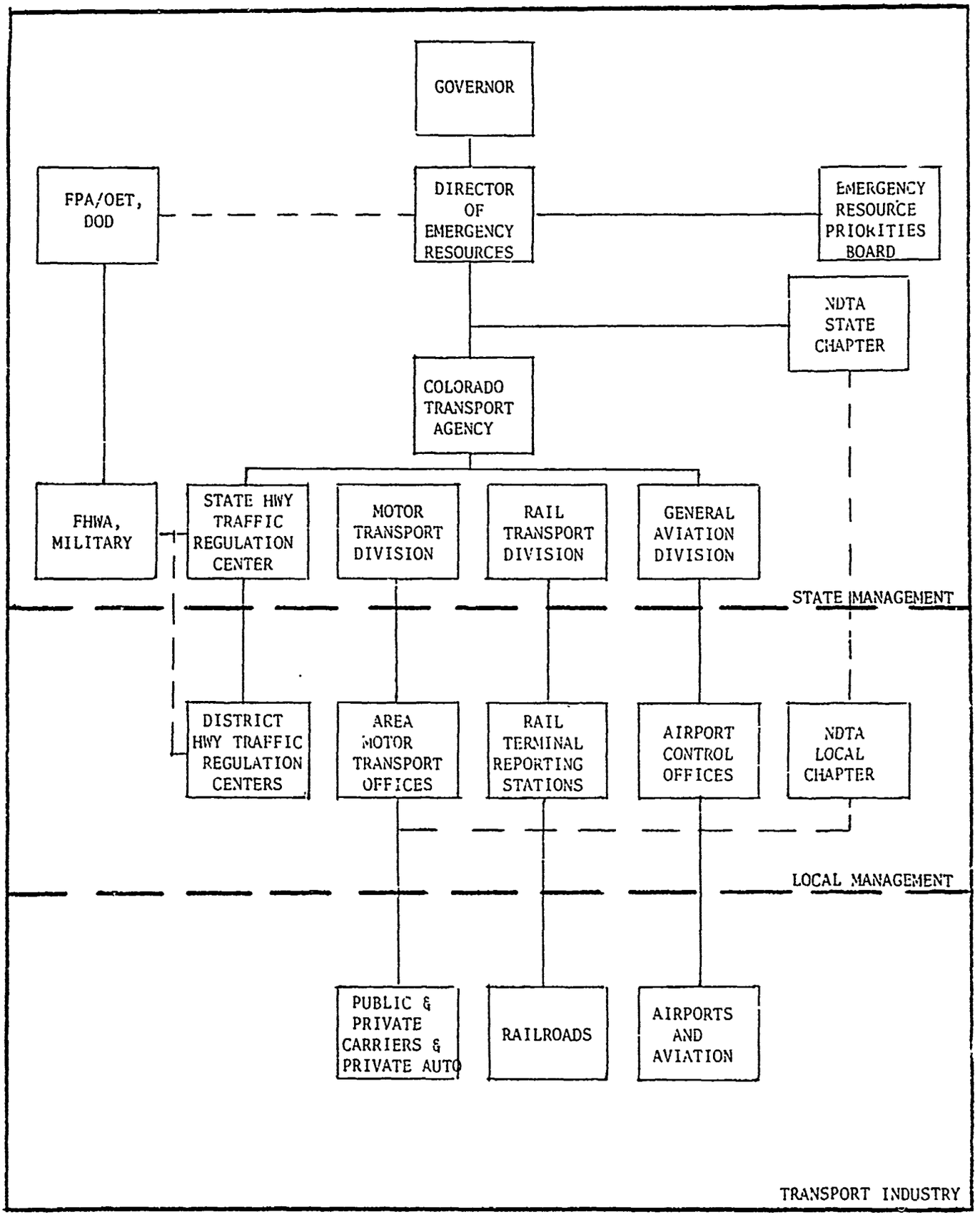


EXHIBIT 3.6

CHARLESTON COUNTY ORGANIZATIONAL CHART

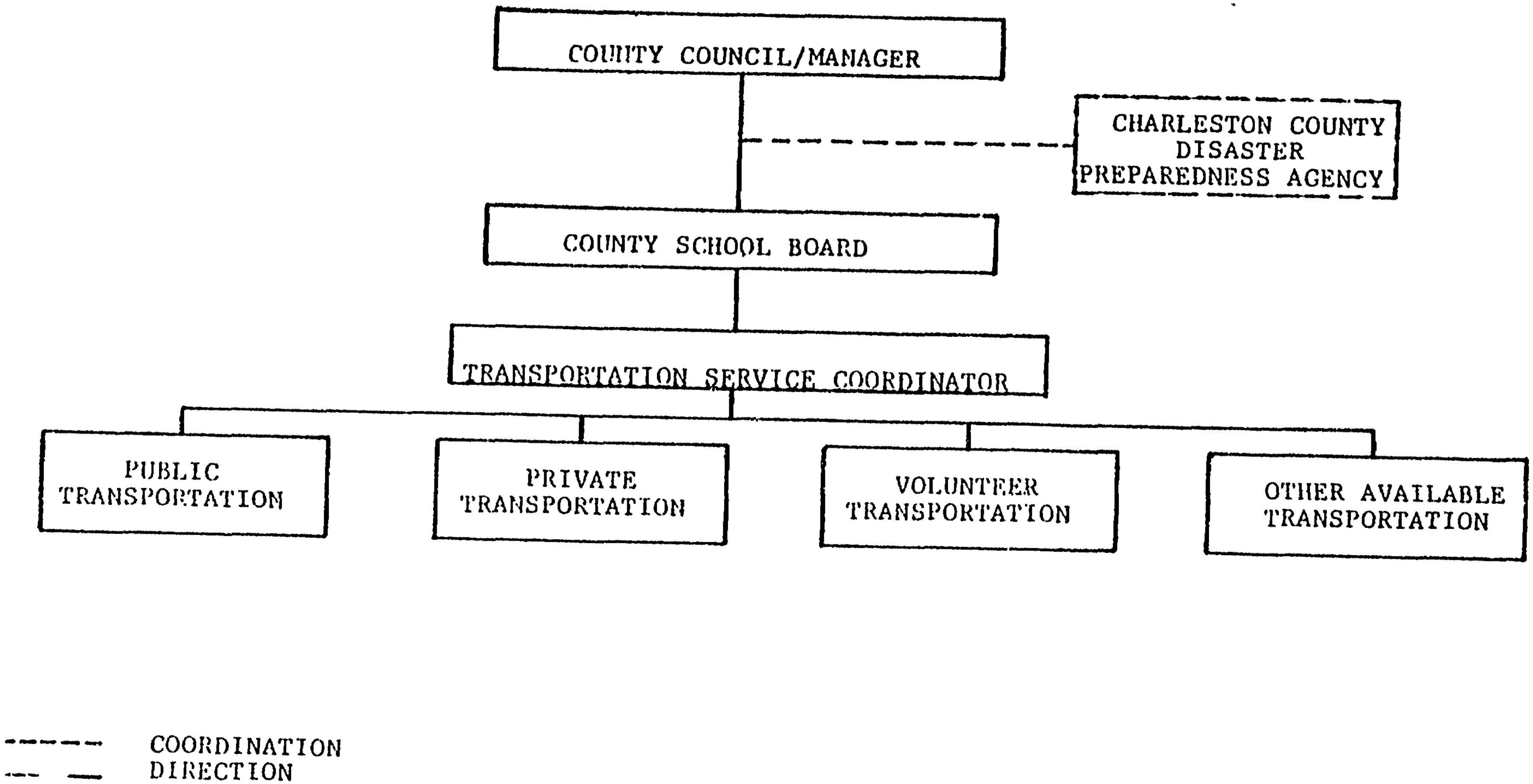
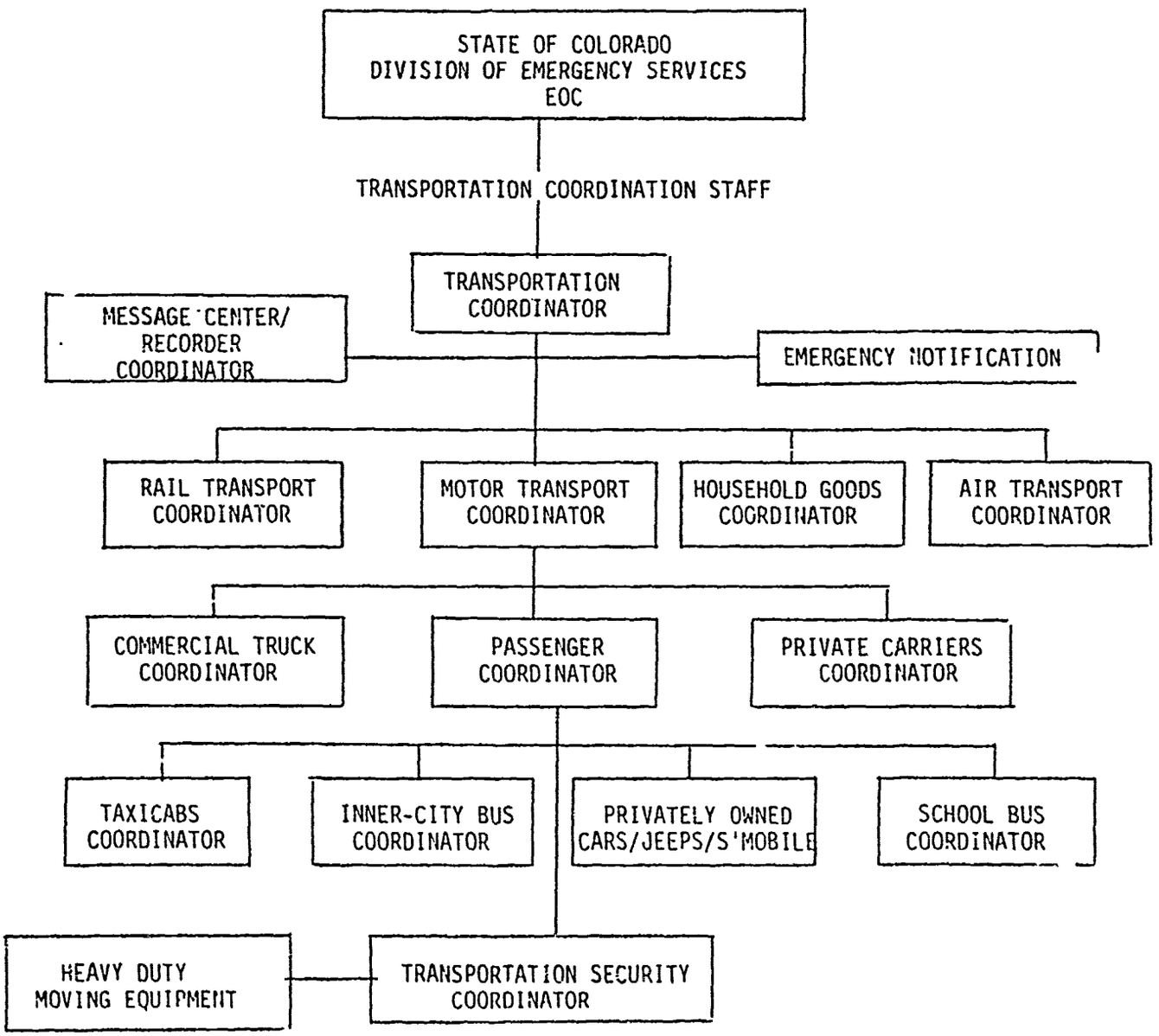


EXHIBIT 3.7

NATIONAL DEFENSE TRANSPORTATION ASSOCIATION
DENVER CHAPTER



The purpose of a workshop is two-fold: to improve the emergency readiness of NDTA members by exposing them to the current relocation plans and to improve the plans themselves by exposing them to an on-the-spot review by local transportation experts. During recent workshops, the participants generally reacted favorably to the value of the workshop experience and to the feasibility of crisis relocation plans in their communities. The workshop experience indicated that once the NDTA was brought into the problem and planning, they were ready with enough equipment and drivers.

Several desirable ends are accomplished by using a workshop to expose local NDTA chapters to the crisis relocation concept:

1. NDTA chapter members and DCPA personnel are encouraged to work together to address potential preparedness problems;

2. Crisis relocation problems assume immediate relevance, rather than being treated as abstract concepts;

3. The combined experience of local transportation industry personnel is focused on DCPA plans and guidelines, providing an invaluable basis for adapting those plans and guidelines to reflect local needs; and

4. Responsible local officials and industry personnel are exposed to the crisis relocation concept, thereby improving the chances for successful execution of the concept.

The workshops can be important for establishing communication and the basis for sustaining a working relationship between civil defense staff and the transportation experts. As one Charleston NDTA workshop member said, "I've learned about transportation in Charleston and what civil defense does."

3.3.5 Conducting Exercises

Simulated emergency exercises provide another opportunity for civil defense and transportation people to work together. These exercises generally encompass the whole range of problems likely to be encountered during a crisis. In the course of simulating a crisis relocation, simulated relocation events would be timed to occur in such a manner as to test command chains, communications equipment, and operating procedures. Artificial crises (e.g., traffic jams

on a specific bridge, looting in a suburban area) are simulated to provide a real-time test of local relocation plans. Reference 7 discusses the application of simulation training exercises to crisis relocation planning.

3.4 CURRENT NDTA MEMBERSHIP TRENDS

In recent years, NDTA membership has been declining, along with the number of active chapters. To quote one NDTA member, "twelve to fifteen years ago, we had quite an organization. We've lost that forward thrust." As the number of years since the organization's formation in World War II increases, moreover, the number of members with hands-on experience in evacuations and crisis situations dwindles. Thus, it is all the more important that the existing membership be encouraged to undertake relocation planning tasks while there are still members around with experience in crisis situations. In many areas, the NDTA has come to be viewed as a purely social organization. While social gatherings are one important means of sustaining membership activities when there is no immediate need for emergency transportation support, local organizations should not be allowed to lose sight of the group's charter to provide such support. The pilot workshops conducted in Wichita, San Antonio and Charleston suggest that, given the opportunity, NDTA members will respond willingly and effectively to the task of providing emergency planning support.

The workshops were recognized by many NDTA members as a potential membership recruiting device. The workshops present an attractive opportunity to restate and focus on the vital role the transportation industry performans during disasters. If the whole industry is represented, new faces may appear at the workshops to work on local logistics problems. This common experience may highlight the need for continued communication or lead to new NDTA membership. Another means of broadening the scope of NDTA membership is to follow the course charted by the San Francisco NDTA chapter and undertake joint activities with other transportation groups in the same area.

3.5 OTHER TRANSPORTATION ORGANIZATIONS

In the many cities where no NDTA chapters exist, and in those instances where NDTA chapters exist but fail to encompass the full spectrum of local transportation resources, other organizations need to be identified and brought into the crisis relocation planning effort. At several workshops, the necessity for this action was recog-

nized, and discussion followed about initiating interaction with other transportation associations through joint meetings or emergency preparedness presentations. Such organizations were identified as:

The Traffic Club;
The Women's Traffic Club;
The Transportation Club;
The Physical Distribution Management Association;
The Delta Nu Alpha Fraternity; and
The American Trucking Association.

Another way to bring all the key transportation elements together is to conduct a workshop. In both Wichita and San Antonio, it was suggested that broader representation from the trucking industry was desirable, and that truck dispatchers and teamster union representatives would have useful operational experience to offer.

3.6 SUMMARY

Workshop experience indicates that the NDTA membership can be used as a core group responsible for assembling and maintaining vehicle inventories and industry contacts through their knowledge of local transportation. This approach should work so long as there is at least one NDTA member representing each broad area of the local transportation picture. Where no NDTA chapter exists, local transportation elements from the public and private sector need to be identified, and their representatives brought into the crisis relocation planning. Active chapters can help coordinate industry support for relocation planning. The willingness to participate was expressed by an NDTA member: "Someone needs to get behind this thing and push....it is a part of our charter."

4. PLANNING FUTURE WORKSHOPS

This section provides guidance for organizing and conducting workshops designed to introduce members of the transportation industry to the concept of crisis relocation. Suggestions are offered regarding attendance, problem selection, problem formulation, and the conduct of the workshop itself. Workshops may vary in complexity depending on the interests and experience of the attendees and the shape of local transportation problems. At its simplest, a workshop may consist of an evening spent viewing and discussing the issues raised in the videotape The Way Out - Transportation and Crisis Relocation. Alternatively, the videotape may be used as an introductory tool to be followed by a working session in which specific local transportation problems are addressed.

4.1 THE WAY OUT

The half-hour videotape entitled The Way Out has been designed to introduce members of the transportation industry to the concept of crisis relocation and to encourage them to assist civil defense planners in working on local relocation problems. On the tape, an explanation of the concept of crisis relocation is followed by a series of excerpts from pilot workshops in Wichita, San Antonio and Charleston, showing local transportation experts grappling with typical crisis relocation problems in a workshop setting.

Tapes are available in VHS, beta and 3/4" format. Copies of the tape are available on loan from DCPA regional offices or through NDTA national headquarters. The addresses of these offices appear in Appendix C. Copies of the tape are accompanied by a brochure summarizing the guidelines contained in this chapter. For videotape viewing, equipment needs include:

1. A television set; and

2. A video cassette player (VHS, beta or 3/4").

4.2 WORKSHOP ATTENDANCE

The following suggestions were gleaned from workshop experience for organizations and personnel to participate in a workshop on crisis relocation. Others may be added to this list after local resources are assessed. The key factor is to include a full representation of the resources of the transportation industry. Local NDTA chapters are a useful starting point, but they may need to be supplemented by representatives from local bus companies or other local transportation associations.

Workshop attendance of from 20 to 25 people works well for both viewing the videotape and discussing its contents.

Transportation Industry

- Trucking
- Railroad
- Air
- Public Transportation
- Schoolbus Coordinator
- Shipping
- Taxi Association Representative

Government/Other Agency Representation

- State and local NCP planners
- Regional, state and local DCPA representatives
- Red Cross liaison
- Local law enforcement
- Local fire department
- National Defense Executive Reserve

Other Expertise

- Traffic engineer
- Truck dispatcher
- Fuel industry representative

4.3 WORKSHOP PREPARATION

4.3.1 Preliminary Meeting

Prior to the workshop, a little advance work is needed. A preliminary meeting should be held between civil defense officials and NDTA chapter officers. At this meeting, the time and place of the workshop should be set, and discussion groundrules agreed upon. The preliminary meeting should be held at least one month in advance of the workshop date to allow DCPA time to prepare workshop materials and

NDTA time to advise its members of the workshop date. It is desirable that the workshop occur at a time separate from that ordinarily devoted to the NDTA chapter's business affairs or social activities.

General topics to be discussed at the workshop should also be identified at the preliminary meeting. These topics should reflect both the problems anticipated by local relocation planners and the experience of the transportation professionals expected to attend the workshop. Major transportation problems anticipated during crisis relocation include:

1. Transportation of carless residents;

2. The movement of critical supplies; and

3. Traffic control through highway bottlenecks.

Workshop experience has pointed out that a discussion of these problems will also raise institutional and organizational questions. Questions regarding methods for identifying critical workers and appropriate chains of command for controlling vehicles and drivers can be raised and resolved. Local weather conditions or geography may add other problems to this list.

Following the preliminary meeting, the local civil defense staff should develop background material designed to familiarize participants with the concept of crisis relocation, the current state of local crisis relocation plans, and the conditions under which the local population might be relocated. An example of the background material used in the pilot workshop in Charleston, South Carolina can be found in Appendix A. For best results, the background material should be distributed to participants in advance of the workshop date.

4.3.2 Problem Formulation

If a problem discussion session is planned, the qualitative and quantitative aspects of the problems to be discussed must be formulated in advance of the workshop by civil defense planners. Exhibit 4.1 through 4.4 contain problem worksheets designed to assist planners in developing background information on four typical problems:

EXHIBIT 4.1

CARLESS RESIDENTS PROBLEM WORKSHEET

Problem: To compute the number of vehicles needed to evacuate those residents who do not own cars.

Sources of Information: U.S. Bureau of Statistics,
Census of Population & Housing,
Census Tracts
Table H-2: Equipment & Financial Characteristics of Housing Units

REQUIREMENTS

1. Sum totals of households owning no cars
2. Multiply this total by the average household size (as given in census data)

Number of carless residents

RESOURCES

1. Inventory of school buses
2. Inventory of public buses

Total passenger seats available on buses

?

- How will carless residents be contacted?
- Where will carless residents be picked up?
- Where will carless residents housed in host areas? (To get maximum use from buses, carless residents should be assigned to host areas a short distance away from target areas.)

- Is the existing bus fleet adequate or will other vehicles be needed?
- Who will drive the vehicles?
- How will equipment be scheduled?

EXHIBIT 4.2

CRITICAL SUPPLIES PROBLEM WORKSHEET

Problem: To calculate the stress on the local food distribution system when the population is relocated to host areas.

Sources of Information: Appendix A, (attached) from Effects of Attack on Food Distribution to the Relocated Population, Vol. II: Revised Planning Guidelines, SYSTAN, Inc. Sept. 1978.

Worksheet 1 (in Appendix A which is attached) contains a formula for calculating the distribution from within a central point within the risk area. Data needed to make these calculations include: the risk area population, the host area population, radius of the risk area and host area.

Supermarket News, Distribution Study of Grocery Store Sales in 289 Cities, Fairchild Publications, Inc. N.Y., 1978. (sample page attached).

REQUIREMENTS

1. Compute transportation stress on food distribution system (additional mileage, worksheet 1)

2. Translate additional mileage into drivers and equipment Exhibit A-3

RESOURCES

1. Number of trucks & drivers in existing food distribution fleet

1. Inventory existing truck & rail resources

?

- How can drivers & equipment be identified and safeguarded?
- Are drivers and equipment from other industries interchangeable?

?

- How many additional trucks & drivers are needed?
- Where can they be found?
- Can and should trailers be left in host areas for unloading?
- What regulatory constraints (weight limits, PUC restrictions etc.) be relaxed in an emergency?

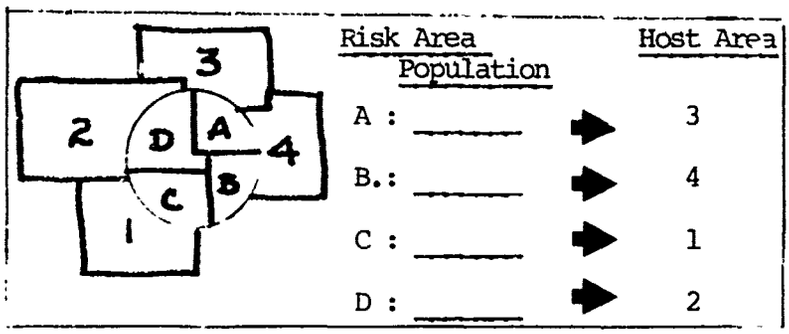
EXHIBIT 4.3

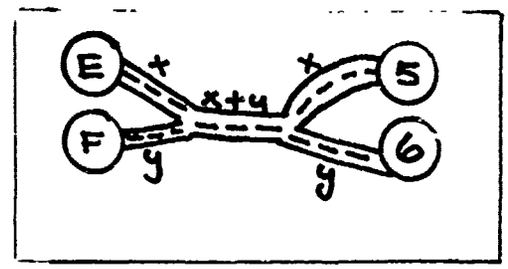
ROAD BOTTLENECK PROBLEM WORKSHEET

Problem: To assess whether road network can carry evacuees within a three day period.

Sources of Information:
U.S. Bureau of Statistics,
Census of Population & Housing
Census Tracts
Table P-1: General Characteristics of the Population

Highway Capacity Manual
Road Sufficiency Ratings





REQUIREMENTS

1. Identify population assigned to each host area.

2. Assign population to evacuation routes

3. Calculate number of vehicles on each route segment.

RESOURCES

1. Determine evacuation routes
   - Identify number of lanes
   - Assess capacity of each segment of roadway
   - Identify minimum capacity along each segment

?

- Can the population be reassigned to balance loads on outbound routes?
- Can departures be scheduled in advance?
- Is rated road capacity sufficient to handle all outbound traffic?

NO ? YES

- How many hours are required for evacuation over most constrained route?
- Are alternate routes available?
- What traffic control measures will be necessary?

EXHIBIT 4.4

NDTA ROLE PROBLEM WORKSHEET

Problem: Discuss the following organization

1. What are the authorities and responsibilities of NDTA members during crisis relocation?
   To whom do they report?
   How do they obtain and verify information and who do they direct or coordinate?
   Does a formal memorandum of understanding exist between the local NDTA and state or local governments?

2. To what degree is it feasible or desirable to accomplish these NDTA functions from the emergency operating center (EOC)?
   How many NDTA members might be required at the EOC to assist with evacuation operations?

3. How long will it take for these members to see to the safety of their families in nearby host counties and report to the EOC?

4. What sort of coordination, if any, will be necessary between the local NDTA chapter and other NDTA chapters? How might this be accomplished?

5. Comment on documentation requirements and potential paperwork problems (e.g., bills of lading, pay vouchers, cash transactions, priority items).

Workshop
Exhibit Nos.

4.1	Autoless Residents
4.2	Movement of Critical Supplies
4.3	Road Network Bottlenecks
4.4	Role of NDTA and Other Transportation Representatives

These worksheets outline the calculation of resource requirements, provide for a survey of available resources, and indicate questions that might arise when requirements are compared with available resources. An example of the final problem statements presented to workshop participants in Charleston, South Carolina can be found in Appendix A. As with background material, problem statements should also be distributed in advance of the workshop.

In addition to the background material and problem statements, the following material should be available at the workshop itself.

DCPA

Map of State Risk Areas
Map of Local Risk and Host Areas
Transportation Annex of Local Plan (if available)
Maps of Evacuation Routes

NDTA

Membership List
Equipment Inventory (if available)

4.4 CONDUCTING THE WORKSHOP

4.4.1 Practical Guidance

The following points have been useful in guiding effective workshop discussions:

- Clearly specify the intent and scope of the workshop in advance;
- Conduct the workshop at a time set aside for only that purpose. Videotape viewing or discussion sessions do not mix well as a part of social events or meetings on other agenda items.

- Introduce the general concept of crisis relocation and discuss it briefly. Set a time limit on general questions.

- Set a time limit for the discussion of each problem.

- Conduct a wrap-up discussion for summarizing thoughts on the workshop, and for deciding on the next steps to be taken and the mechanisms to be used for staying current on crisis relocation planning.

4.4.2 Workshop Feedback

The local civil defense office should prepare a brief report summarizing the content of the workshop shortly after its completion. Questionnaires have been included in these guidance materials to provide the local office with insights into the attitudes and perceptions of participants regarding the concept of crisis relocation and the workshop itself (see Exhibit 4.5). Copies of these questionnaires should be distributed to all workshop participants and collected as soon as possible following the completion of the workshop.

4.5 ENCOURAGING FUTURE WORKSHOPS

To encourage local civil defense officials and NDTA chapters to cooperate in future CRP planning activities, the videotape The Way Out should be widely distributed. The availability of the tape should be advertised to both NDTA chapters and civil defense regions. The Defense Transportation Journal published by the NDTA is a useful mechanism for calling the tape to the attention of NDTA members. In addition, the tape should be featured at the annual national convention of NDTA members. A mailing from NDTA national headquarters to each chapter president describing the tape and suggesting the possibility of a joint NDTA/DCPA workshop might also have the desired effect.

In the case of DCPA, copies of the videotape should be distributed to each regional office, and those offices should both view the tape and encourage state and local NCP planners to use it as a basis for opening lines of communication with the NDTA and other transportation organizations.

In addition to workshops for the transportation industry, the videotape format used in the NDTA workshop materials could be used effectively to introduce other key industry groups to the CRP concept and to encourage them to

EXHIBIT 4.5

SAMPLE WORKSHOP QUESTIONNAIRE

We would like your opinion and comments in order to assess and improve crisis relocation guidance material.

CRISIS RELOCATION

	Yes	No
Is the concept clearly presented?	☐	☐
Do you have unanswered questions about crisis relocation?	☐	☐

If so, please note them: _____

ROLE OF TRANSPORTATION INDUSTRY

What can the transportation industry do in advance of a crisis?

- ☐ Review plans
- ☐ Set up a chain of contacts
- ☐ Participate in simulated exercises
- ☐ Maintain equipment inventory
- ☐ Participate in workshops
- ☐ Other _____

What is the role of NDTA during a crisis relocation situation?

_____

What associations other than NDTA should be included in crisis relocation activities?

_____

How do you assess the readiness of the transportation industry to carry out crisis relocation planning?

_____

Are there any improvements you would suggest?

_____

What are the most effective ways to develop and sustain readiness?

_____

WORKSHOPS

What is the best use of a workshop on crisis relocation?

_____

Do you have any questions/suggestions on how to conduct such a workshop?

_____

GUIDANCE MATERIALS

Are they adequate? _____ How can they be improved? _____

MAILBACK ADDRESS:

cooperate with local DCPA personnel. The format of the tape could be easily adapted to reflect the concerns of any group, and pilot workshops could be conducted to obtain materials for the videotape and encourage similar activities on the part of the viewing audience. Target audiences for future videotape presentations might include:

- Active chapters of the National Defense Executive Reserve;
- The food industry; and
- Key defense industries.

At the screening of The Way Out, a representative from Lockheed observed that his company's internal security forces could profit from exposure to the CRP concept, and asked to use the final version of the tape for such a purpose. In addition to addressing CRP logistic problems, videotapes directed at key industries could also instruct them in methods for hardening their plants against attack and encourage them to consider organizational relocation requirements.

REFERENCES

1. Defense Civil Preparedness Agency, High Risk Areas for Civil Preparedness Nuclear Defense Planning Purposes, TR-82, Department of Defense, Washington, D.C., April 1975.

2. Billheimer, J.W. et al., Impacts of the Crisis Relocation Strategy on Transportation Systems, SYSTAN, Inc. Report D147 on DCPA Work Unit 2313-D, Los Altos, California, August, 1976.

3. Billheimer, J.W., G. Fondahl and A. Simpson, Postattack Impacts of the Crisis Relocation Strategy on Transportation Systems, SYSTAN, Inc. Report D151, September, 1978.

4. Billheimer, J.W., "Crisis Relocation Planning," Defense Transportation Journal, April, 1976.

5. Billheimer, John W., Frank J. Jones and Myron Myers, Food System Support of the Relocation Strategy, SYSTAN, Inc. for Defense Civil Preparedness Agency, Work Unit 2312F, Los Altos, California, September, 1975.

6. Billheimer, J.W. and Arthur W. Simpson, Effects of Attack on Food Distribution to the Relocated Population, SYSTAN, Inc. Report D152 on Work Unit 2312F, Defense Civil Preparedness Agency, September, 1978.

7. Harker, R.A. and C.C. Coleman, Application of Simulation Training Exercises to Crisis Relocation Planning, Center for Planning and Research, Inc., Palo Alto, California, January, 1976.

APPENDICES

A. Sample Workshop Materials (Charleston, South Carolina)

B. List of NDTA Chapters

C. Videotape Sources

D. Simplified Stress Factor Calculations

E. Pilot Workshop Participants

APPENDIX A

SAMPLE WORKSHOP MATERIALS

TRANSPORTATION INDUSTRY WORKSHOP IN CRISIS RELOCATION PLANNING

Prepared by:

SYSTAN, Inc.
Los Altos, California

for the

National Defense Transportation Association
Charleston, South Carolina Chapter

February 1979

BACKGROUND

Evolution of the Civil Preparedness Program

Since 1961, when the Federal Civil Defense Program was made a responsibility of the Department of Defense, the Program's basic objective has been to assist local and state governments--financially, technically, and administratively--in protecting their residents from the dangerous radioactive fallout that would follow a nuclear attack on the United States. In pursuing this objective, federal, state and local governments have identified more than 226,000 facilities with fallout shelter space for about 225 million persons. Despite this, there is a deficit of public shelter space in rural and suburban areas. A great deal of lower-quality shelter exists, however, which could be upgraded during a crisis to provide fallout protection. In addition to fallout shelters, other necessary components of a nationwide civil defense system have been developed, including warning and communications networks, radiological monitoring, and state and local emergency operating centers.

As the nationwide program of defense against nuclear radiation moved forward in the 1960's and early 1970's, all state governments and most local governments expanded their emergency preparedness programs to include protection of residents from natural disasters and other peacetime catastrophes, as well as from nuclear fallout. Following this lead, the Defense Civil Preparedness Agency (DCPA) broadened its effort a few years ago. It instituted an all-hazard, all-contingency program designed to help state and local governments develop the emergency operating capability needed to cope with peacetime disasters as well as nuclear attack. Emergency planning for both peacetime disasters and nuclear attack was further consolidated in 1978, when President Carter recommended the creation of a Federal Emergency Management Agency (FEMA), which will officially combine all emergency planning functions in a single executive agency.

The Concept of Crisis Relocation Planning (CRP)

DCPA's current civil preparedness program involves two basic protection strategies: the first provides the best protection possible with the population essentially in place at or near their homes, schools, and places of work; the second requires people to leave threatened areas to seek refuge in safer places.

Five primary arguments support the need to provide the capability for evacuation through crisis relocation planning:

- It is probable that a nuclear attack upon the United States will be preceded by a crisis buildup of sufficient duration to permit population relocation from high-risk areas;
- If an adversary's cities were to be evacuated during a period of crisis, the United States cities should also be evacuated;
- It is likely that many citizens will leave large cities in the face of crisis in a "spontaneous evacuation" whether or not they are advised to do so;
- Crisis evacuation has proven feasible in recent large-scale evacuations in the face of hurricane warnings; and

° Given the current availability and location of shelter space, studies have shown that a strategy of population relocation could save far more lives than reliance on in-place protection.

Current Status of Crisis Relocation Planning

In its present state of development, CRP can be defined as a comprehensive effort by DCPA to develop plans for evacuating high-risk areas if a nuclear attack threatens, and temporarily relocating non-essential residents of those areas into small towns and rural areas where nuclear blast and fire effects are unlikely.

To improve on CRP expertise, DCPA is now engaged in:

1. Finding solutions to CRP programs. These include:

   a. Determining how fallout protection and other life-sustaining services can best be provided to residents of high-risk areas after they are relocated;

   b Identifying "key workers" who should commute from the host area to the high-risk area to keep essential industries operating; and

   c. Locating shelter space within the high-risk area for use by key workers.

2. Testing and verifying the "workability" of proposed solutions to CRP problems through special study, prototype plans, exercises, and pilot projects.

3. Developing plans at the state and local level for evacuating the high-risk areas of the United States.

The Role of Transportation in Crisis Relocation Planning

The movement of large population masses in advance of a threatened attack will severely test national and local transportation resources. Workable plans for evacuating populations, distributing supplies, maintaining essential government and private services, and transporting key workers will be crucial in the event of a crisis. These plans will all hinge on the availability, maintenance, and control of the nation's fuel resources, transportation fleet, and road and rail networks. It is anticipated that the National Defense Transportation Association (NDTA) can play an important role in organizing, maintaining, and controlling the nation's transportation resources under conditions of crisis relocation. The accompanying exercise has been designed to encourage the members of the Charleston Chapter of NDTA to address several of the specific transportation problems which must be solved in evacuating the Charleston Metropolitan Area. This exercise is one of many investigations currently being sponsored by DCPA to improve the nation's CRP capability.

SITUATION

1. A nuclear attack on the United States will probably be preceded by a period of international tension and crisis. In that case, sufficient time would be available for protective actions to be taken, including the temporary relocation of target area residents to lower-risk areas.

2. The Soviet Union has well-established plans to evacuate the residents of its major cities over a three-day period, should an intense crisis occur.

3. By agreement with the South Carolina Disaster Preparedness Agency, three urbanized areas within the State of South Carolina, including all or part of six counties, and unincorporated areas including parts of five additional counties, have been designated as high-risk areas for which population relocation should be planned. Attachment 1 maps the areas considered to be threatened by direct weapons effects in the event of nuclear attack.

4. All of metropolitan Charleston, as well as certain portions of rural Charleston County and Berkeley County, have been designated as high-risk areas. In cooperation with the State Disaster Preparedness Agency, Charleston and Berkeley County officials identified lower-risk relocation areas for the 244,058 residents of those areas. The locations of these lower-risk host areas are shown in Attachment 2.

5. The following counties were selected to host evacuees from Charleston and Berkeley risk areas:

    1. Colleton;
    2. Dorchester;
    3. Georgetown;
    4. Williamsburg; and
    5. Rural portions of Charleston and Berkeley Counties.

    Evacuees have been assigned to specific host counties according to their sector of residence within Charleston. No host county has been assigned more than three times its resident population. Host counties are currently preparing plans for the reception and care of relocated residents.

6. Certain vital facilities and activities must be continued in the evacuated high-risk areas, either to preserve the integrity of the vacant city, or to assist in the provision of essential goods and services to the relocated population and their hosts. These critical activities will include police services, fire protection, public utility operation, broadcasting facilities, certain food processing and distribution activities, and other critical industries. Essential workers needed for these activities will be billeted with their families in non-risk areas of Charleston, Colleton, and Dorchester Counties, and will commute to work in daily shifts.

ASSUMPTIONS

1. Relocation of the Charleston population has been ordered by the Governor of South Carolina, at the request of the President of the United States.

2. Relocation will be carried out primarily in family groups using private vehicles. The entire relocation period is not to exceed three days.

3. Some portion of the high-risk area population, estimated at between 10 and 20 percent, can be expected to leave the area in advance of a directed crisis relocation. These "spontaneous" evacuees will probably consist mainly of families whose members do not have public or emergency responsibilities and who have a vacation home or relatives in mind as a destination. The location, identification and destination of this group will be unknown. Moreover, some individuals may refuse to relocate. However, evacuation of the total population (except military personnel) has been planned.

4. After relocation, no goods or services will be required in the high-risk areas, except as necessary for the preservation of property and the support of essential activities.

5. Once crisis relocation of the high-risk areas' population has been directed, the minimum duration of the relocation will be seven days. The maximum duration of the relocation period is uncertain, but could last several weeks.

6. The State of South Carolina will advise local authorities of the possibility that a crisis relocation will be ordered at least six hours prior to the actual order from the Governor, allowing time to accomplish preparatory procedures.

7. The relocation period will be terminated either by a peaceful resolution of the crisis or by nuclear attack on the United States; both contingencies must be planned for.

8. Return of the relocated population to their homes following crisis relocation will begin only at the direction of the Governor of South Carolina, generally at the request of the President of the United States.

9. The full cooperation of public and private organizations and the public in the execution of relocation plans in a crisis can be expected.

PROBLEMS FOR DISCUSSION

Assume that the Governor of South Carolina has directed the evacuation of the Charleston urbanized area.

The time of the evacuation is assumed to be the present (February 1979).

Evacuation Assistance

An estimated 41,626 residents will not have automobiles and must be provided with other transportation if they are to reach their host area destinations. Most of the autoless residents are clustered near the center of Charleston (see Attachments 3 and 4).

1. The Charleston area currently has an inventory of approximately 339 buses with a combined seating capacity of 12,000 people; most of these vehicles are schoolbuses. Will these buses be sufficient to accomplish the evacuation of those 41,626 transit-dependent people within three days? What is the best source of bus drivers? What is the possibility of using trucks or rail equipment to assist in the evacuation of residents?

2. Assuming that the transit-dependent will be assigned to host counties relatively close to the risk area, how should transportation equipment be scheduled and deployed to evacuate the autoless? As one aspect of deployment, should certain equipment be dedicated to local collection of residents, while larger buses are used in the over-the-road movement to host counties, or should a single carrier be used for both pick-up and delivery? If separate vehicles are used, identify appropriate staging areas (departure points) for the final trip to host area counties.

3. Discuss the following organizational questions:

   a. How might the locations of transit-dependent residents be determined?

   b. What additional information will be required to simplify the evacuation of transit-dependent relocatees?

Movement of Critical Supplies

It appears that the most effective strategy for food distribution under crisis relocation conditions is to allow agricultural output and major processing plants to follow normal distribution channels, and to continue to use wholesale outlets located in high-risk areas to serve the evacuated population through host area retail outlets and mass feeding centers. Food sold in Charleston grocery stores is shipped from wholesale warehouses in three major South Carolina locations: Charleston Heights (46%), Greenville (27%), and Columbia (21%). The remainder comes from such out-of-state areas as Jacksonville, Florida and Charlotte, North Carolina. Major wholesalers in each of these risk area cities would continue to operate their warehouses during a crisis relocation.

Since the population leaving Charleston will generally be moving toward Greenville and Columbia, trucks from warehouses in these areas will travel no farther to reach the host counties than they normally travel in reaching Charleston itself. However, the distance between wholesale warehouses in Charleston Heights and the relocated Charleston population will be considerably lengthened by the proposed evacuation. Trucks from local Charleston wholesalers will have to travel twice as far as they now travel in distributing food to Charleston residents. Though this may not require any additional tractors or trailers, at least 20 additional drivers will have to be diverted from less critical sectors of the Charleston transportation sector.

One promising alternative exists for speeding host area food distribution: After arriving at their destination, drivers could leave their trailers for later unloading, and return immediately to the risk area for another trailerload of food. Trailers left in the host area would then be unloaded and returned to the risk area using tractors already scheduled to make later deliveries. Trailers deposited in the host area might also be used for short-term food storage, unloaded only as the food is distributed to evacuees. Either of these options would require augmentation of the supply of 40,000-pound trailers currently used by Charleston food wholesalers. At least 135 trailers would have to be diverted from other sectors of the economy if this distribution strategy were followed in Charleston.

1. Comment or the estimates of additional driver and equipment needs. Do they appear reasonable? Where might additional drivers and equipment be found? What is the maximum number of drivers and large trucks that could be diverted from less essential activities? What are the advantages and drawbacks of leaving trailers in the host area to be unloaded or used for short-term storage?

2. How might emergency drivers and equipment be identified and safeguarded so that the food warehouses will entrust loads to their care? Are there any operational or organizational problems involved in switching drivers and equipment where needed?

3. Discuss existing regulatory constraints (weight limitations, union driver restrictions, PUC regulations, etc.) that will limit the performance of the transportation system under emergency conditions. Which should be abandoned in time of emergency, which retained, and which relaxed? What steps might be taken in advance of a crisis to ensure that severely limiting constraints can be relaxed when necessary?

Conducting the Evacuation

An evacuation of the Charleston area will require the coordination of several key elements of the transportation system, including vehicles, fuel, and the road network. Some general questions regarding the evacuation itself are listed below.

1. Attachment 5 shows the evacuation routes assigned to Charleston County evacuees, and the estimated number of vehicles using each route over the three-day evacuation. Where are bottlenecks likely to develop along the indicated evacuation routes? What traffic control measures (e.g., scheduling of departures, rerouting, monitoring) might be employed to minimize the possibility of traffic jams?

2. Discuss the following organizational questions:

   a. What are the authorities and responsibilities of NDTA members during crisis relocation? To whom do they report? How do they obtain and verify information and who do they direct or coordinate? Does a formal memorandum of understanding exist between the Charleston NDTA and state or local governments?

   b. To what degree is it feasible or desirable to accomplish these NDTA functions from the emergency operating center (EOC)? How many NDTA members might be required at the EOC to assist with evacuation operations?

   c. How long will it take for these members to see to the safety of their families in nearby host counties and report to the EOC?

   d. What sort of coordination, if any, will be necessary between the Charleston NDTA chapter and other NDTA chapters? How might this be accomplished?

   e. Comment on documentation requirements and potential paperwork problems (e.g., bills of lading, pay vouchers, cash transactions, priority items).

3. At the time a crisis relocation is implemented, many essential and non-essential supplies will be in transit on the nation's road, rail, air and water networks. Discuss the disposition of both essential and non-essential supplies destined for the Charleston risk area. How will this disposition be controlled? How will coordination with vendors and customers be accomplished?

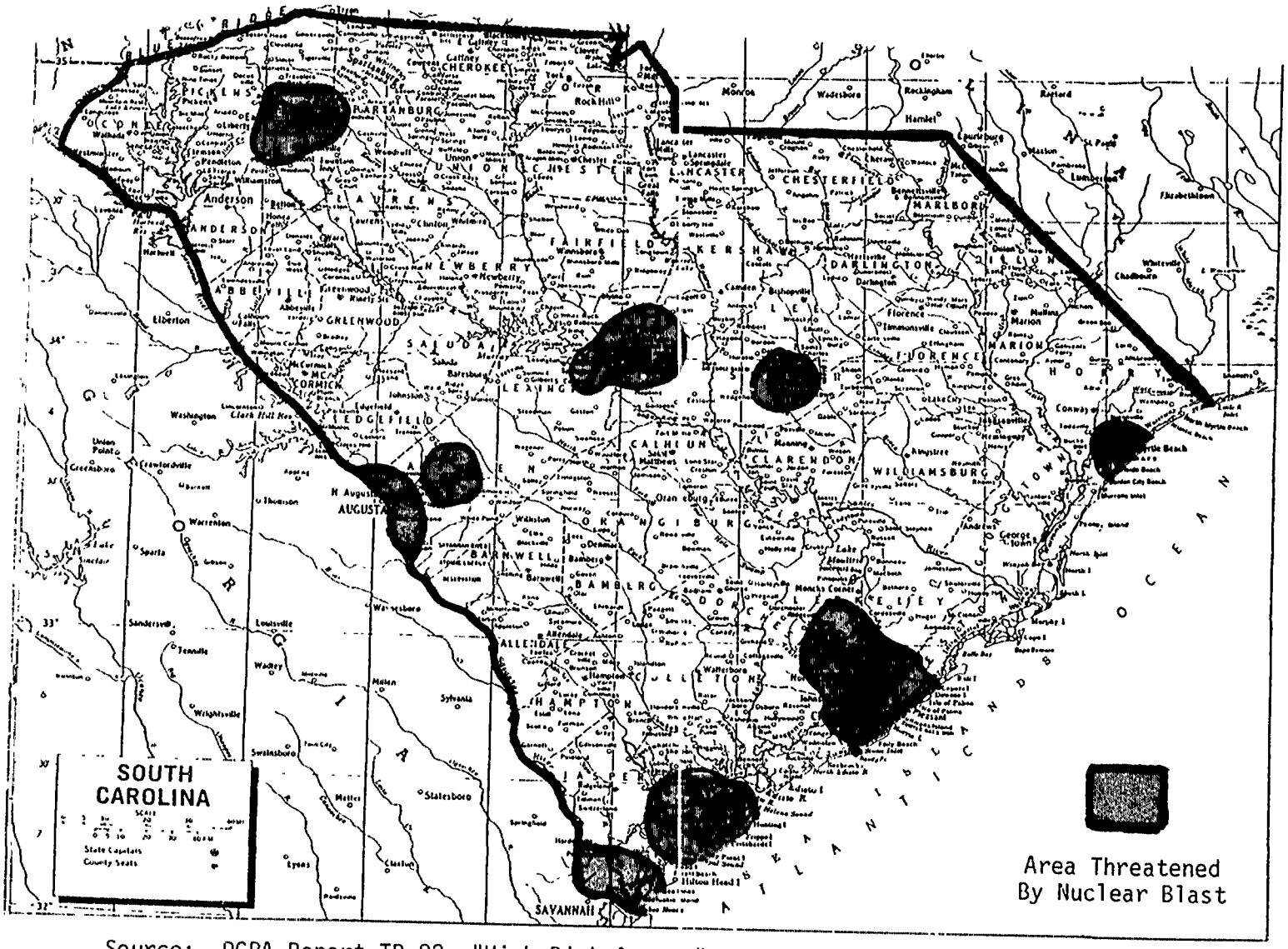
4. In general, the fuel needed to support the relocation effort will be less than that ordinarily used during a typical weekday. However, some fuel from the risk area should be reallocated to gasoline stations along the evacuation route and an attempt made to store as much fuel as possible in the host area during and after evacuation.

   a. What fuel storage facilities are likely to be found in the host area?

   b. If additional tank trucks are necessary to transport fuel from the risk area to the host area, where might they be obtained?

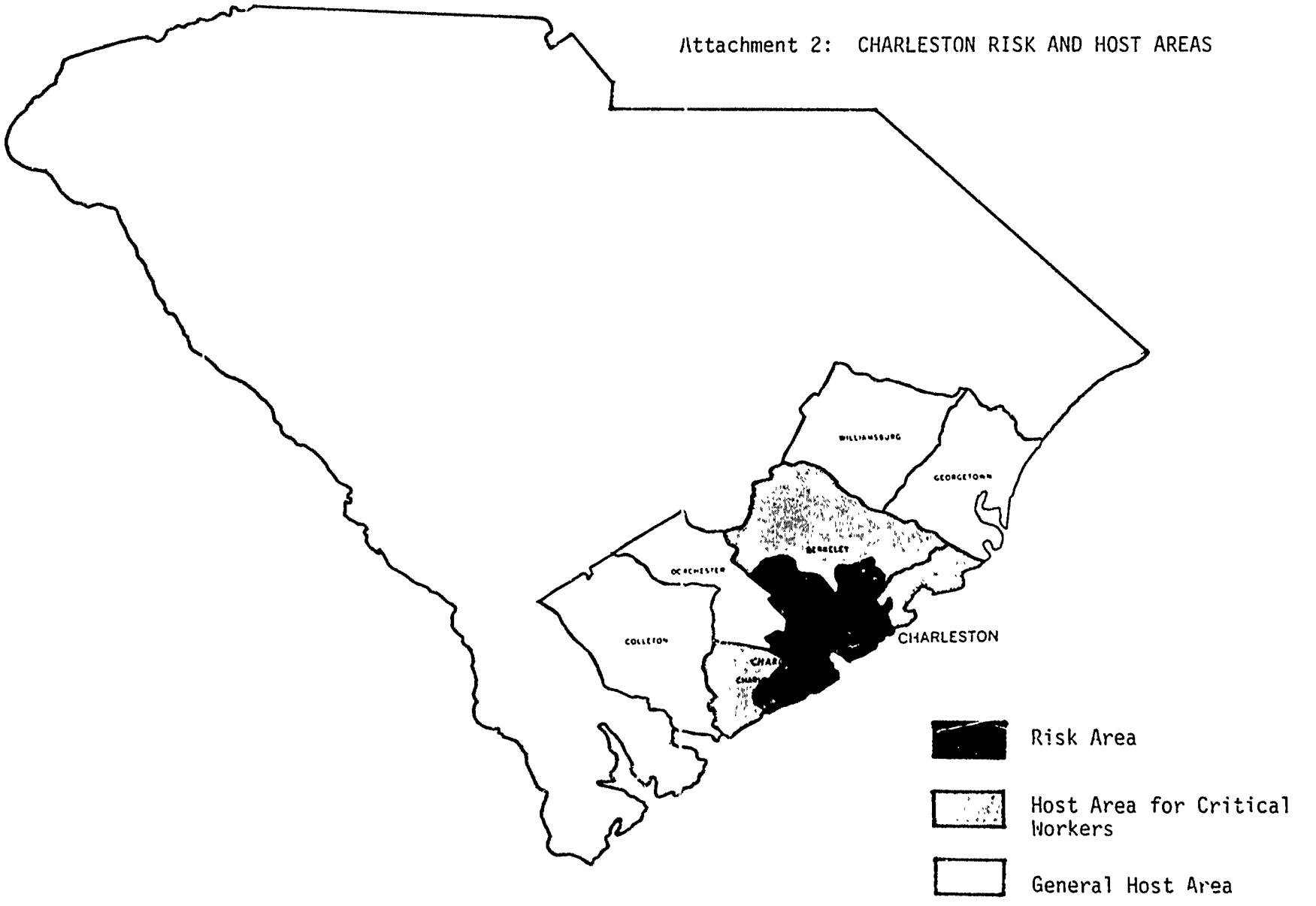
5. Comment on the overall feasibility of the CRP strategy from the standpoint of the transportation system. Is it likely to succeed in Charleston? In Atlanta? In Aiken? In New York City?

ATTACHMENT 1: HIGH RISK AREAS IN SOUTH CAROLINA



Source: DCPA Report TR-82, "High Risk Areas," Washington, D.C., April 1975.

Attachment 2: CHARLESTON RISK AND HOST AREAS



Attachment 3

AUTO OWNERSHIP IN U.S. AND CHARLESTON COUNTY

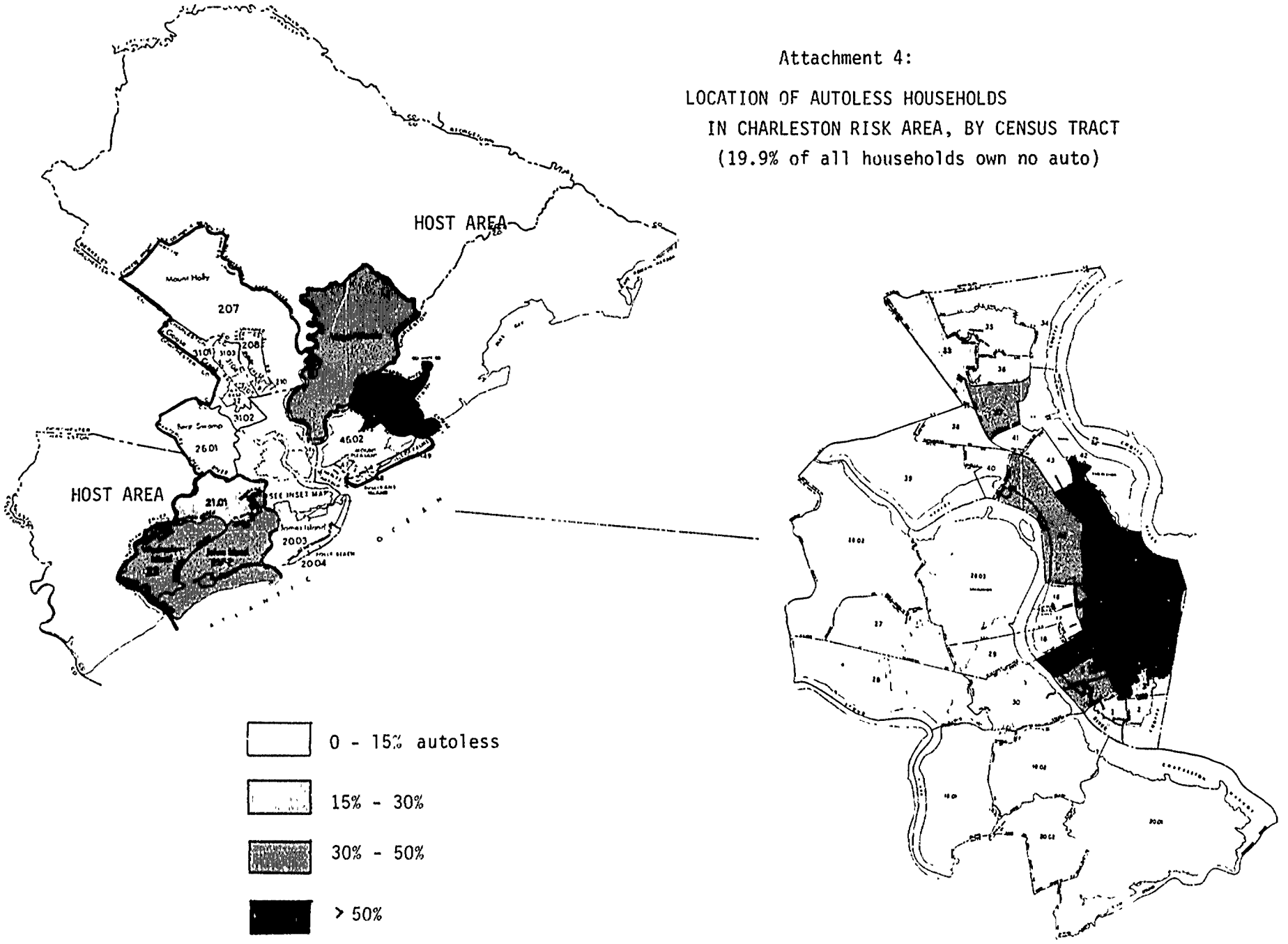
	PERCENT OF HOUSEHOLD OWNING				
					
	No Car	One or More Cars	One Car	Two Cars	Three or More Cars
ALL US HOUSEHOLDS.....	20.5%	79.5%	49.3%	24.6%	5.6%
ALL CHARLESTON COUNTY HOUSEHOLDS.....	21.3%	78.7%	44.7%	29.7%	4.3%

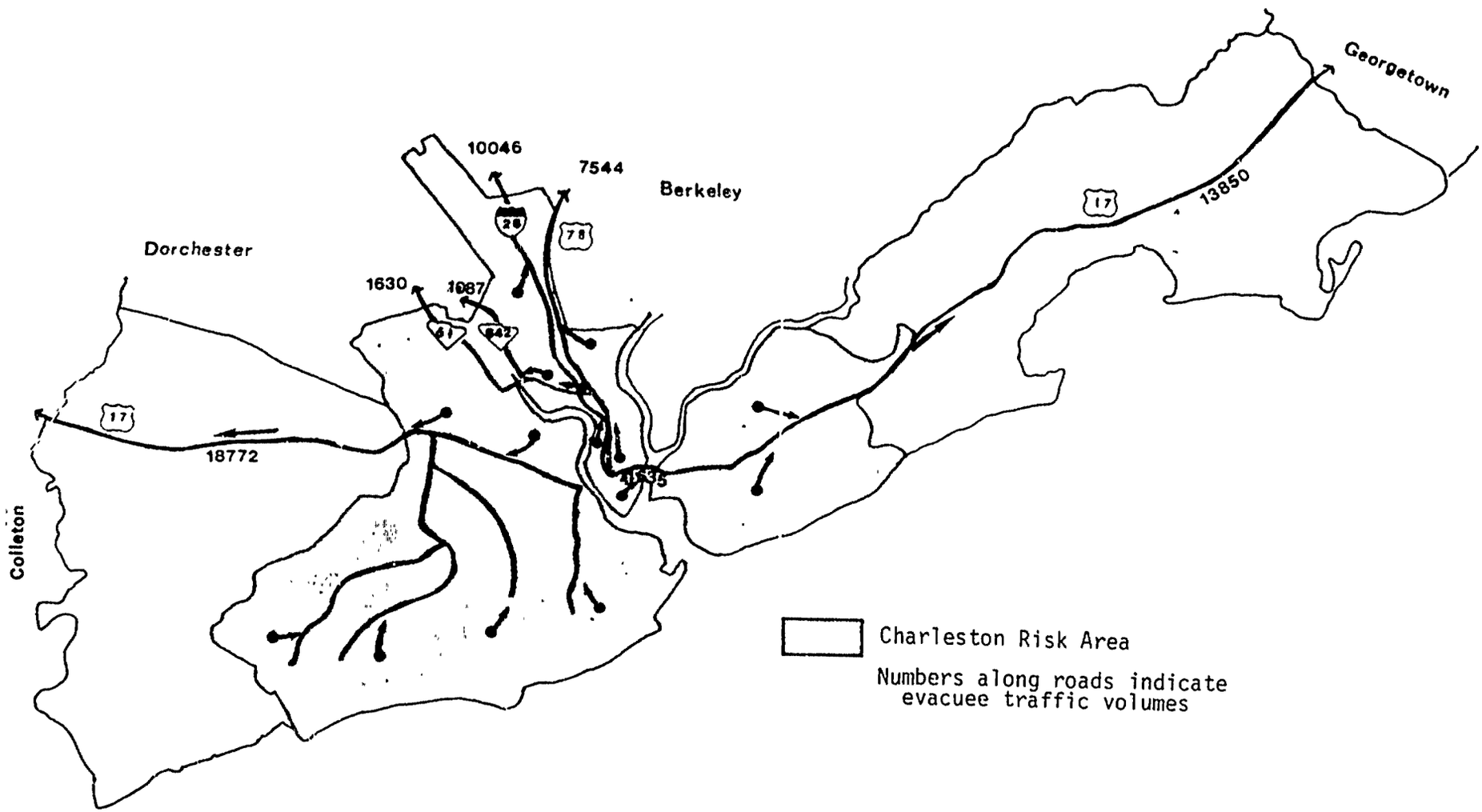
Source: 1. 1973/74 Automobile Facts and Figures, Motor Vehicle Manufacturers Association of the United States, Inc., Detroit, Michigan.

2. 1970 U.S. Census of Housing: Housing Characteristics for States, Cities and Counties, South Carolina, U.S. Bureau of the Census, Washington, D.C.

Attachment 4:

LOCATION OF AUTOLESS HOUSEHOLDS
IN CHARLESTON RISK AREA, BY CENSUS TRACT
(19.9% of all households own no auto)





Attachment 5: HIGHWAY SYSTEM IN CHARLESTON COUNTY STUDY AREA

APPENDIX B: NDTA REGIONS AND CHAPTER CITIES (60)

EASTERN

DELAWARE

- Del-Mar-Va

DIST. OF COLUMBIA

- Washington, D.C.

MAINE

- (no chapter)

MARYLAND

- Baltimore
- Hagerstown

MASSACHUSETTS

- New England

NEW JERSEY

- Greater Trenton

NEW YORK

- New York

OHIO

- Cleveland
- Columbus
- Dayton
- Toledo

PENNSYLVANIA

- Philadelphia
- Pittsburgh

VIRGINIA

- Fort Eustis-Peninsula
- Norfolk
- Richmond

SOUTHEASTERN

ALABAMA

- (no chapter)

FLORIDA

- Cape Canaveral
- Jacksonville
- Northwest Florida
- Tampa Bay

GEORGIA

- Atlanta
- Savannah

MISSISSIPPI

- Mississippi Gulf Coast

NORTH CAROLINA

- Fayetteville-Fort Bragg

SOUTH CAROLINA

- Charleston
- Central South Carolina

TENNESSEE

- Memphis

CENTRAL

COLORADO

- Denver
- Greater Colorado

ILLINOIS

- Chicago

INDIANA

- Indiana

KANSAS

- Wichita

MICHIGAN

- Detroit

MINNESOTA

- Twin Cities

MISSOURI

- St. Louis
- Kansas City

SOUTHWESTERN

ARKANSAS

- Greater Little Rock
- Texarkana

LOUISIANA

- New Orleans

NEW MEXICO

- Albuquerque

OKLAHOMA

- Lawton-Fort Sill

TEXAS

- Cen-Tex (Killeen)
- Dallas
- Fort Worth
- Houston
- San Antonio

PACIFIC SOUTHWESTERN

CALIFORNIA

- Inland Empire (San Bernardino/ Riverside)
- Los Angeles
- Sacramento
- San Diego
- San Francisco Bay Area
- San Joaquin Valley

HAWAII

- Aloha

NEVADA

- Las Vegas

UTAH

- Salt Lake City

PACIFIC NORTHWESTERN

ALASKA

- Fairbanks
- North Pole

WASHINGTON

- Kitsap County
- Seattle
- Tacoma

APPENDIX C

VIDEOTAPE SOURCES

The videotape, The Way Out, is available through:

Federal Emergency Management Agency
Washington, D.C. 20472
(703) 235-2464

FEMA Region I
150 Causeway Street, Room 710
Boston, MA 02114
(617) 223-4271

FEMA Region II
26 Federal Plaza
New York, NY 10007
(201) 264-8980

FEMA Region III
Curtis Building, 7th Floor
6th and Walnut Streets
Philadelphia, PA 19106
(609) 597-9416

FEMA Region IV
Federal Regional Center
Thomasville, GA 31792
(912) 881-1301

FEMA Region V
One North Dearborn Street
Room 1610
Chicago, IL 60602

FEMA Region VI
1100 Commerce Street
Dallas, TX 75242
(214) 729-0801

FEMA Region VII
Old Federal Office Building
911 Walnut Street
Kansas City, MO 64106
(816) 758-5912

FEMA Region VIII
Building 710
Denver Federal Center
Denver, CO 80225
(303) 234-2553

FEMA Region IX
211 Main Street, Room 220
San Francisco, CA 94105

FEMA Region X
Federal Regional Center
Bothell, WA 98011
(206) 396-0284

NDTA Headquarters:

Gerald W. Collins, President
National Defense Transportation Association
910 - 17th Street, N.W.
Washington, D.C. 20006
(202) 331-1414

APPENDIX D

SIMPLIFIED CALCULATION OF DISTRIBUTION STRESS FACTOR

Controlled evacuation of a large percent of the population from potential risk areas near urban centers to outlying host areas could severely strain the local food distribution system. Adjusting delivery to the newly-distributed population's needs will considerably increase the distance traveled by local delivery trucks, requiring more equipment and drivers for an adequate level of service. To analyze the ability of the local food distribution to accomodate such movements of population, mathematical models quantifying transportation system stress have been developed.* An estimate of this stress factor is provided by the ratio of the average distance traveled in distributing food to the population prior to relocation (i.e., under normal conditions) to the average post-relocation distance. Computing the stress factor of a study area will provide a measure of that area's susceptibility to increased stress, and suggest the extent to which further analysis of vulnerability of the food distribution system should be pursued.

Several approaches to determining the stress factor of a study area are available. Simple calculations based on an abstract city model (discussed below) are initially used to identify how severe the problem might be. More complex approaches may then be appropriate if stress is likely to be a significant problem or if distributors are likely to experience unequal degrees of stress.**

The abstract city analysis depicts an urban area as a number of concentric zones with varying population densities. In the simplest, two-zone model of the city, relocation would entail movement from the central risk area to the surrounding host area. One possible food distribution pattern, distribution from a central point within the risk area, is described below.

Central Point Distribution

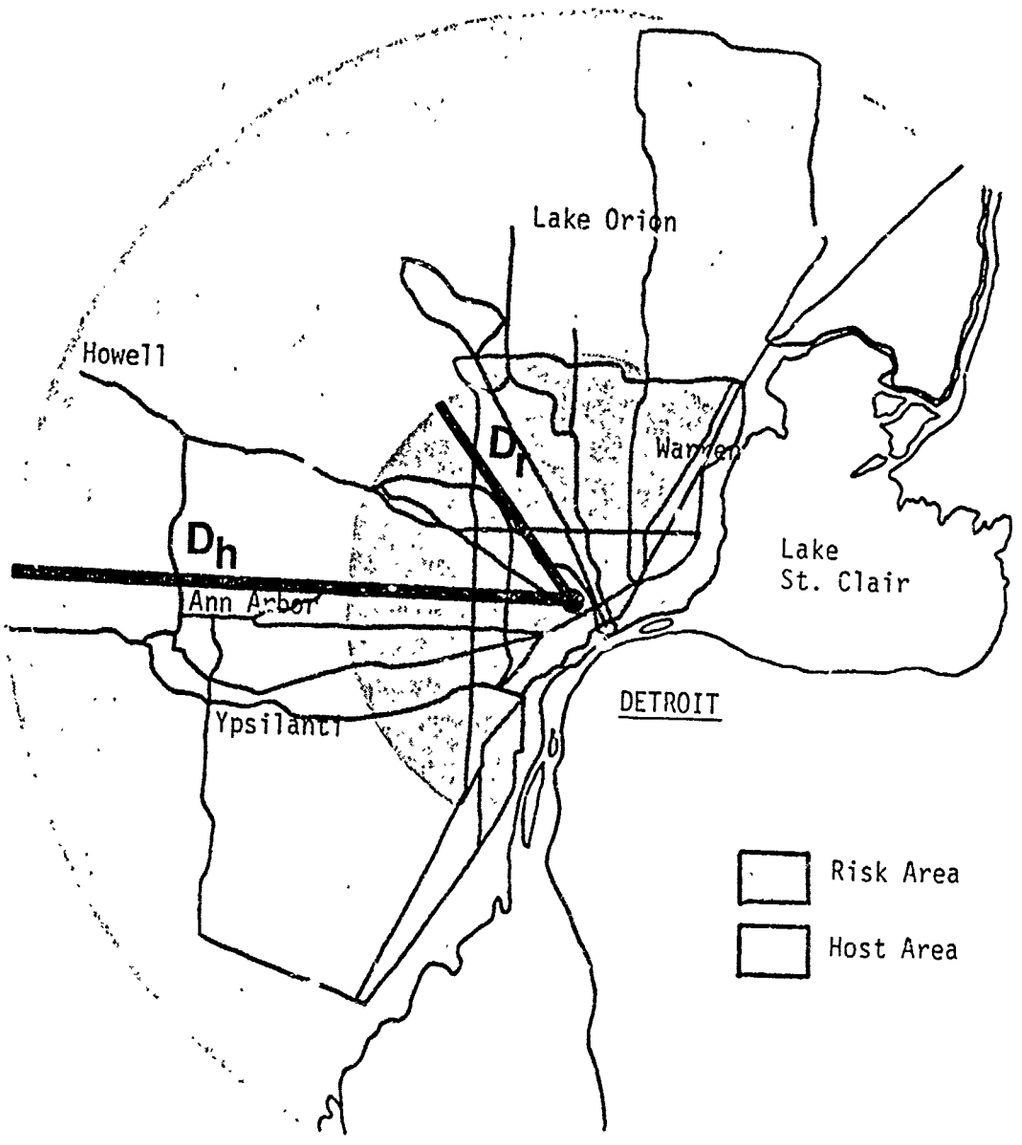
Food normally distributed from a central point within a risk area will require greater travel distance after population relocation to the doughnut-shaped host area (see Figure A-1). The stress factor utilizes the ratio of average distance traveled in distributing food prior to relocation to the average distance after relocation. This ratio may be expressed analytically in terms of the risk-area radius D_r, the host-area radius, D_h, and the risk and host area populations, P and P_h. If the ratio of the host area radius to the risk area

---

*See Billheimer et al., Food System Support of the Relocation Strategy, Final Report, Volume II, Appendix F (September 1975).

**Two such models discussed more fully in Billheimer et al., merit mention. The Network Model (a computer model) utilizes route-finding and traffic assignment to analyze stress. A formula for the Population Surrogate substitutes the population distribution for retail store distribution.

EXHIBIT D-1: CENTRAL POINT DISTRIBUTION



radius, D_b/D_r, is designated as , and the ratio of risk-area population to total population, P_r/P, is designated as γ, then the transportation stress factor, S_c, may be expressed as follows:

$$\text{Central Distribution Stress Factor} = \frac{(1+\rho)^2 - \rho}{(1+\rho)^2 - \rho - \gamma\rho^2} = S_c \qquad (1)$$

(For easier computation of the stress factor, Worksheet 1 has been provided.)

This stress factor assumes that the total risk-area population is evacuated to the host area (i.e., $\alpha = 1$). In the event that some fraction of the risk area population is not evacuated (i.e., $0<\alpha<1$), the stress factors may be expressed as the following linear function of:

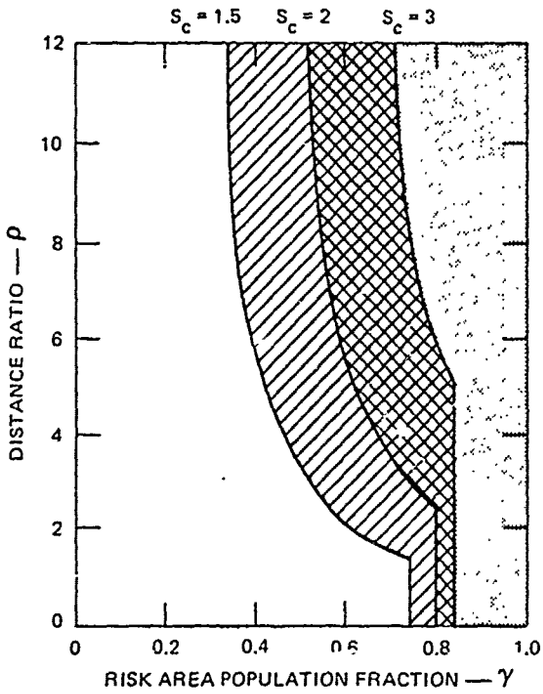
$$S_c(\alpha) = 1 - \alpha + \alpha S_c; \quad 0 \leq \alpha \leq 1 \qquad (2)$$

This expression will be maximized, and the greatest stress will be placed on the transportation when $\alpha=1$. In such a case, Equation (1) applies, and it is possible to solve the equation for ratios ρ and γ associated with a given transportation stress factor, S_c.

Solutions to S_c have been graphed in Exhibit A-2, which may alternatively be used to determine the stress factor for a central point distribution system. By locating the risk-area population fraction (γ, as calculated above) along the x-axis, and the distance ratio (ρ) along the y-axis, one identifies from the intersection of these two figures, whether stress is non-existent, slight, medium or severe. From a transportation standpoint, an S_c factor between 1.5 and 2 can be expected to place a slight amount of stress on the distribution system (e.g., driver overtime) while an S factor in excess of 3 represents severe stress (e.g., commandeered trucks, additional personnel, disregarded union rules).

EXHIBIT D-2

STRESS CURVES FOR CENTRAL POINT DISTRIBUTION



No Stress

Slight Stress

Medium Stress

Severe Stress

SOURCES: Hall & Billheimer, op cit.

WORKSHEET 1

Computing the Central Distribution Stress Factor (S_c):

$$\frac{(1+\rho)^2 - \rho}{(1+\rho)^2 - p - \gamma\rho^2} = S_c$$

$D_h/D_r = \rho =$ _____ (A)

$1 + \rho =$ _____ (B)

$\rho^2 =$ _____ (C)

$(1+\rho)^2 =$ (B) X (B) = _____ (D)

$(1+\rho)^2 - p =$ (D) - (A) = _____ (E)

$P_r/P = \gamma =$ _____ (F)

$\gamma\rho^2 =$ (F) X (C) = _____ (G)

$(1+\rho)^2 - \rho - \gamma\rho^2 =$ (E) - (G) = _____ (H)

(E) ÷ (H) = _____ = S_c

Interpreting Transportation Stress

The calculated transportation stress factor can be used to roughly determine equipment or additional equipment and drivers needed for food distribution following relocation of the population. Exhibit A-3 charts the increased needs for vehicles and drivers corresponding to stress.* On the average, a transportation stress factor of 2.5 for food deliveries (i.e., a 150% increase in vehicle mileage) would require an influx of 18% more vehicles and 71% more drivers from other sectors of the economy. A doubling of local fuel truck mileage (i.e., a transportation stress factor of 2) would require, on the average, an 8% increase in vehicles and a 63% increase in drivers. These estimates do not allow for attrition in the existing driver force in the face of emergencies, and assume that the length of the crisis relocation period will be relatively short (one to two weeks).

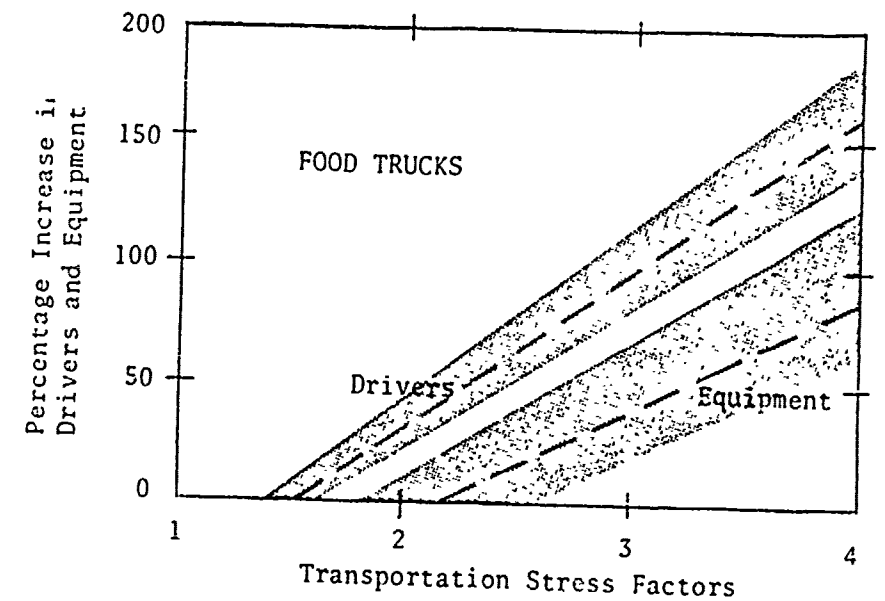
As mentioned above, the abstract city analysis computations provide a quantitative measure of stress that suggests the need for further analysis. If calculation of central point distribution stress factors shows medium or severe stress, more accurate techniques of analysis should be employed to identify the specific distributors who will require a large increase in drivers and equipment.

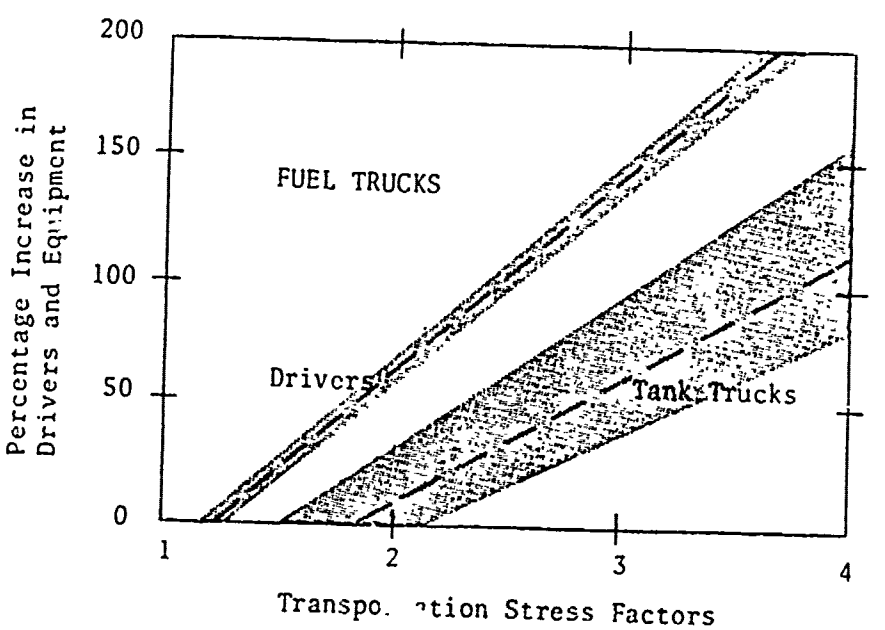
---

* Ibid., p. F-17.

EXHIBIT D-3

RANGE OF ADDITIONAL DRIVERS AND EQUIPMENT
ASSOCIATED WITH TRANSPORTATION STRESS FACTORS





APPENDIX E

PILOT WORKSHOP PARTICIPANTS

WICHITA

Bill Barker	Santa Fe Railway NDTA - Wichita
Paul Barkley	Kansas Emergency Preparedness
Gene Beaver	Director, Sedgwick County Civil Preparedness
Leon Becker	Continental Airlines NDTA - Wichita
Vernon Clark	American Red Cross Wichita
Jim Cochran	Kansas Emergency Preparedness
Wilson Cooley	Consultant NDTA - Wichita
Ken Hastings	Sedgwick County Civil Preparedness
Carroll Little	Braniff International NDTA - Wichita
Joseph Longar	Sedgwick County Civil Preparedness
Stan McDonald	Graves Truck Lines NDTA - Wichita
Frank Mollner	DCPA - Region VI
R.J. Ruddell	MTA - Metro Transit Wichita
Frank Sotrines	Kansas Emergency Preparedness
Felix Tos	Boeing NDTA - Wichita
Gar Weed	Kansas Emergency Preparedness

Appendix E, Continued

SAN ANTONIO

Ellen Bland	NDTA - San Antonio
Patrick Curoe	Major, U.S. Air Force NDTA - San Antonio
Ashley Eledge	Texas Disaster Emergency Services
Robert Gamble	Texas Disaster Emergency Services
Tom Hunt	SATO, Lackland Air Force Base NDTA - San Antonio
William Jenkins	San Antonio Civil Defense
Robert Joyce	NDTA - San Antonio
Roy Kirk	Moving and Storage NDTA - San Antonio
I.O. Martinez	San Antonio Fire Chief
Jan Miller	San Antonio Assistant Fire Chief
John Patterson	Eastern Airlines NDTA - San Antonio
Hugh Philippus	Via Metro Transit NDTA - San Antonio
James Roby	Texas Disaster Emergency Services
Charles Sheffield	Military NDTA - San Antonio
William Stallings	Director, San Antonio Civil Defense
Mattie Treadwell	DCPA Region V

Appendix E, Continued

CHARLESTON

Thomas Beckham	South Carolina Disaster Preparedness
William Buttons	South Carolina Disaster Preparedness
James Forrest	South Carolina Disaster Preparedness
Dor thy Gaither	DCPA Region III
Philip Gardner	Charleston County Disaster Preparedness
Gerald Hurst	Johnson Motor Lines NDTA - Charleston
Reginald Hyatt	Watkins Motor Lines NDTA - Charleston
Floyd Kirby	Thurston Motor Lines NDTA - Charleston
Glenn Lewis	Bowman Transportation NDTA - Charleston
Tom Moore	South Carolina Disaster Preparedness
Ralph Renau	G & P Trucking NDTA - Charleston
John Stoioff	Southeastern Freight Lines NDTA - Charleston
Harry Wiseman	NDTA Region III

October 1979

DISTRIBUTION LIST

(Number of Copies - One unless otherwise indicated)

Federal Emergency Management Agency
Mitigation and Research
ATTN: Administrative Officer
Washington, D.C. 20472 (60)

Assistant Secretary of the Army (R&D)
Attn: Assistant for Research
Washington, D.C. 20301

Chief of Naval Research
Washington, D.C. 20360

Commander, Naval Supply Systems
Command (0421G)
Department of the Navy
Washington, D.C. 20376

Commander
Naval Facilities Engineering Command
Research and Development (Code 0322C)
Department of the Navy
Washington, D.C. 20390

Defense Documentation Center
Cameron Station
Alexandria, Virginia 22314 (12)

Civil Defense Research Project
Oak Ridge National Laboratory
ATTN: Librarian
P.O. Box X
Oak Ridge, Tennessee 37830

Mr. Gerald Collins
National Defense Transportation Assn.
910 17th Street, N.W.
Suite 301
Washington, D.C. 20006

SYSTAN, Inc., Los Altos, California 94022 UNCLASSIFIED

CRISIS RELOCATION WORKSHOPS FOR TRANSPORTATION INDUSTRY REPRESENTATIVES by John W. Billheimer and Carolyn Fratessa; Final Report, December 1979, 90 pages, Contract No. DCPA01-78-C-0221, FEMA Work Unit No. 2313D.

This final report describes the development of a set of workshop materials capable of exposing transportation industry representatives to the concept of crisis relocation, to demonstrate these materials through workshops held in different U.S. cities, and to provide a basis for incorporating the reaction of industry officials in local relocation plans and national planning guidance. A series of three pilot workshops with transportation industry representatives and civil defense leaders were held in Wichita, Kansas; San Antonio, Texas; and Charleston, South Carolina. The proceedings of these workshops were summarized in a videotape designed to encourage similar workshops in other cities throughout the United States. The videotape is accompanied by a set of guidelines to enable viewers to organize and conduct crisis relocation transportation workshops in their own communities.

SYSTAN, Inc., Los Altos, California 94022 UNCLASSIFIED

CRISIS RELOCATION WORKSHOPS FOR TRANSPORTATION INDUSTRY REPRESENTATIVES by John W. Billheimer and Carolyn Fratessa; Final Report, December 1979, 90 pages, Contract No. DCPA01-78-C-0221, FEMA Work Unit No. 2313D.

This final report describes the development of a set of workshop materials capable of exposing transportation industry representatives to the concept of crisis relocation, to demonstrate these materials through workshops held in different U.S. cities, and to provide a basis for incorporating the reaction of industry officials in local relocation plans and national planning guidance. A series of three pilot workshops with transportation industry representatives and civil defense leaders were held in Wichita, Kansas; San Antonio, Texas; and Charleston, South Carolina. The proceedings of these workshops were summarized in a videotape designed to encourage similar workshops in other cities throughout the United States. The videotape is accompanied by a set of guidelines to enable viewers to organize and conduct crisis relocation transportation workshops in their own communities.

SYSTAN, Inc., Los Altos, California 94022 UNCLASSIFIED

CRISIS RELOCATION WORKSHOPS FOR TRANSPORTATION INDUSTRY REPRESENTATIVES by John W. Billheimer and Carolyn Fratessa; Final Report, December 1979, 90 pages, Contract No. DCPA01-78-C-0221, FEMA Work Unit No. 2313D.

This final report describes the development of a set of workshop materials capable of exposing transportation industry representatives to the concept of crisis relocation, to demonstrate these materials through workshops held in different U.S. cities, and to provide a basis for incorporating the reaction of industry officials in local relocation plans and national planning guidance. A series of three pilot workshops with transportation industry representatives and civil defense leaders were held in Wichita, Kansas; San Antonio, Texas; and Charleston, South Carolina. The proceedings of these workshops were summarized in a videotape designed to encourage similar workshops in other cities throughout the United States. The videotape is accompanied by a set of guidelines to enable viewers to organize and conduct crisis relocation transportation workshops in their own communities.

SYSTAN, Inc., Los Altos, California 94022 UNCLASSIFIED

CRISIS RELOCATION WORKSHOPS FOR TRANSPORTATION INDUSTRY REPRESENTATIVES by John W. Billheimer and Carolyn Fratessa; Final Report, December 1979, 90 pages, Contract No. DCPA01-78-C-0221. FEMA Work Unit No. 2313D.

This final report describes the development of a set of workshop materials capable of exposing transportation industry representatives to the concept of crisis relocation, to demonstrate these materials through workshops held in different U.S. cities, and to provide a basis for incorporating the reaction of industry officials in local relocation plans and national planning guidance. A series of three pilot workshops with transportation industry representatives and civil defense leaders were held in Wichita, Kansas; San Antonio, Texas; and Charleston, South Carolina. The proceedings of these workshops were summarized in a videotape designed to encourage similar workshops in other cities throughout the United States. The videotape is accompanied by a set of guidelines to enable viewers to organize and conduct crisis relocation transportation workshops in their own communities.