T. SITTER

D180-19140-2

NATIONAL FIRE SERVICE SYSTEM REQUIREMENTS ANALYSIS

Phase II: Test and Validation of the Analysis Process

Final Summary Report

NOVEMBER 1975

THE BOEING AEROSPACE COMPANY
Seattle, Washington

Washington State Coordinating Council for
Occupational Education-Fire Service Training

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Final Summary Report

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Seattle, Washington

for
Washington State Coordinating Council for
Occupational Education-Fire Service Training

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The authors gratefully acknowledge the technical advice and review contributed by the Chiefs from many fire departments in the State of Washington and particularly to the Chiefs of the seven fire departments from other states who provided not only encouragement but committed their resources in support of the test and evaluation. The officers from these seven departments who attended the training sessions in Seattle and the evaluation review in Washington D. C. were key contributors to the test, evaluation, and future direction of the program. Phase II would not have been possible without their advice and commitment. To these men we are most grateful:

Lt. Hugo Bilter, Sarasota Fire Department

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Batt. Chief William Keenan, City of New York Fire Department

Training Chief Phillip Kessler, Littleton (Colo.) Fire Department

Division Chief Dodd Miller, Dallas Fire Department

Capt. William Miller, Cincinnati Fire Department

Batt. Chief Harry Powell, Sacramento Fire Department

Ass't. Chief Robert Rathman, Cincinnati Fire Department

Capt. Robert Roark, Sacramento Fire Department

Mr. Joseph Russell, Jr., Virginia Beach Fire Department

Lt. Larry Turner, Littleton (Colo.) Fire Department

Traning Chief Fred Wallin, Dallas Fire Department

District Chief George Wetherington, Virginia Beach Fire Department

Special appreciation is due to Chief Thomas L. Foster of the Kent (Wash.) Fire Department for his generous effort in providing men and equipment for the field exercises which were filmed, reviewed and evaluated as part of the systems requirements analysis training.

PREFACE

The test and validation of the analysis process was begun in February, 1975 and was completed in November, 1975. The program was sponsored by the National Bureau of Standards under Grant Number 4-9008 to the Washington State Coordinating Council for Occupational Education. The effort was performed by the Washington State Coordinating Council for Occupational Education under Contract Number 74-4258(474)02 to The Boeing Aerospace Company and under Contract Number 74-4258(475)02 to associate contractors Training Chief Otis Hay, Battalion Chief Kenneth McAllister, Deputy Chief Leo Jensen, and Deputy Chief Edward Prendergast representing the American Fire Technology Associates, Inc.

Dr. Bernard Levin, Fire Services Program Manager was Program Director for the National Bureau of Standards. Mr. Edwin Hackett of the National Fire Prevention and Control Administration, National Fire Academy, was the Program Technical Monitor. Mr. Lyle Goodrich, Director of Fire Service Training, was Project Officer for the Coordinating Council for Occupational Education. Dr. Thomas E. Sitterley, Manager of Educational Technology and Training Research, was Principle Investigator for The Boeing Aerospace Company.

Phase I of this effort is described in Boeing Document D180-18599-1, National Fire Service System/Task Analysis: Development of the Analysis Process. The detailed technical data, analysis training course program of instruction, and detailed data sheet descriptions are contained in Boeing Document D180-19140-3, National Fire Service System Requirements Analysis - Phase II: Test and Validation of the Analysis Process (Final Technical Data Report).

This report provides a brief overview of the Fire Service System Requirements Analysis Project from its inception to the present. It covers the project background, which includes the history, phasing, technical approach and the organizations which have participated in the project.

It will describe the mechanics of the system requirements analysis process, including the system analysis training of the participants, the data collection procedures, and evaluation results.

Finally, application of the requirements data will be described, including the data format, local and national application, the data acquisition/dissemination process and potential applications of data.

FIRE SERVICE SYSTEM REQUIREMENTS ANALYSIS PROJECT DESCRIPTION

- BACKGROUND/OVERVIEW
  - HISTORY
  - PHASING
  - TECHNICAL APPROACH
  - PARTICIPATING ORGANIZATIONS
- MECHANICS OF SYSTEM REQUIREMENTS ANALYSIS PROCESS
  - SYSTEM ANALYSIS TRAINING
  - DATA COLLECTION
  - DATA RESULTS
- APPLICATION OF DATA
  - DATA FORMAT
  - LOCAL/NATIONAL APPLICATIONS
  - DATA ACQUISITION/DISSEMINATION PROCESS
  - POTENTIAL APPLICATIONS

The Systems Requirements Analysis Project is an outgrowth of the Washington State Skill Degradation Study performed in Seattle. This study produced meaningful data as did studies conducted in California, Dallas and by the National Bureau of Standards and others throughout the United States. Each of these studies yielded incremental pieces of data. There was little or no common thrust, integration or purpose.

The Washington State Fire Service Advisory Committee, representing both management and labor, recognized a need for avoiding potential duplication of efforts and for guiding future research toward providing a "common" data base that would meet fire service needs on a national level.

There were two choices: First, to continue with piecemeal research; collecting and compiling unrelated pieces of work, often so specific that they are meaningful only to the originators. The Advisory Committee felt there was a better choice: to begin an integrated, mutually supportive effort that would provide a goal directed and systematic manner of collecting and disseminating the data so badly needed to meet the objectives of the fire service.

The Fire Service System Requirements Analysis Project was conceived to provide the means to obtain requirements data in a systematic and cost effective manner, with each phase building upon the results of the previous phase. Under the auspices of the National Bureau of Standards, the project was structured into four sequential phases.

HOW WE GOT STARTED

- WASHINGTON STATE SKILL DEGRADATION STUDY
- LOCAL EFFORTS RELATED TO OTHERS THROUGHOUT U.S.
  - CALIFORNIA JOB STUDY
  - DALLAS WORKLOAD STUDY
  - NBS TASK INVENTORY
- WASHINGTON STATE FIRE SERVICE ADVISORY COMMITTEE
- NEED FOR COMMON DATA BASE
- CHOICE
  - PIECEMEAL UNRELATED EFFORTS/DUPLICATION
  - INTEGRATED MUTUALLY SUPPORTIVE EFFORT
- FIRE SERVICE REQUIREMENTS ANALYSIS PROJECT

The first phase defined the scope and developed the basic system analysis approach for national application. In the second phase, tasks associated with several selected evolutions were analyzed on a national level to test and validate this analysis approach.

The proposed third and fourth phases, yet to be implemented, consist of expanded data collection and the development of an integrated data base and retrieval system.

OVERALL PROGRAM APPROACH

PHASE I	DEFINE SCOPE OF THE ANALYSIS AND DEVELOP BASIC TASK ANALYSIS PROCESS FOR NATIONAL APPLICATION.
PHASE II	CONDUCT ANALYSES OF A FEW TASKS ON NATIONAL LEVEL TO TEST/VALIDATE APPROACH.
PHASE III	DIVIDE UP THE WORK AMONG THE PARTICIPANTS AND COMPLETE THE ANALYSES OF ALL FIRE FIGHTING OPERATIONS.
PHASE IV	INTEGRATE DATA BASE AND PROVIDE INFORMATION ACCESS THROUGHOUT COUNTRY.

To conduct a fire service analysis on a national level it was necessary to select and train a cadre of personnel in the use of system requirements process. The National Bureau of Standards selected the participants using criteria recommended by the I.A.F.C. and Lyle Goodrich, Washington State Director of Fire Service Training. The selected participants were from seven geographically dispersed fire departments that reflected variations in size, operational procedures, budgetary constraints and fire problems.

Participants

Two fire officers each were selected by their chiefs from departments in Cincinnati, Littleton (Colorado), Virginia Beach,...

... and from Dallas, New York City, Sacramento and Sarasota.

The selected participants were brought to the Boeing Company in Seattle for an intensive 60 hour course in the rationale and use of the system analysis approach.

Participants

The National Fire Service Systems Analysis Project was developed to provide a data base that will yield the basic requirements information necessary to achieve these objectives:

- To identify human resource requirements.
- To determine entrance requirements necessary to provide the fire service with qualified personnel.
- To identify human performance requirements.
- To establish job performance criteria.
- To identify work loads and to provide for their equitable distribution.
- To identify training requirements.
- To identify present and potential safety hazards.
- To identify problems and their potential solutions and provide for the sharing of this data throughout the fire service.
- To determine apparatus and equipment specifications necessary to meet human factors requirements.

These objectives were written to encompass all elements of the fire service - including fire prevention, suppression and life emergency services, as well as operations support and community services.

PROGRAM OBJECTIVES

TO PROVIDE THE BASIS AND SUPPORTING DATA:

1. TO IDENTIFY FIRESERVICE HUMAN RESOURCE REQUIREMENTS
2. TO DETERMINE ENTRANCE REQUIREMENTS
3. TO IDENTIFY HUMAN PERFORMANCE REQUIREMENTS
4. TO ESTABLISH JOB PERFORMANCE CRITERIA
5. TO DETERMINE WORKLOADS AND PROVIDE FOR THEIR EQUITABLE DISTRIBUTION
6. TO IDENTIFY TRAINING REQUIREMENTS
7. TO IDENTIFY PRESENT AND POTENTIAL SAFETY HAZARDS
8. TO IDENTIFY PROBLEMS AND POTENTIAL SOLUTIONS
9. TO DETERMINE APPARATUS AND EQUIPMENT SPECIFICATIONS

As a result of their involvement and evaluation, the fourteen fire officers from the participating departments identified two additional objectives which can be met using the data developed by the project:

1. To define measurable performance standards, and
2. To establish optimum operating procedures.

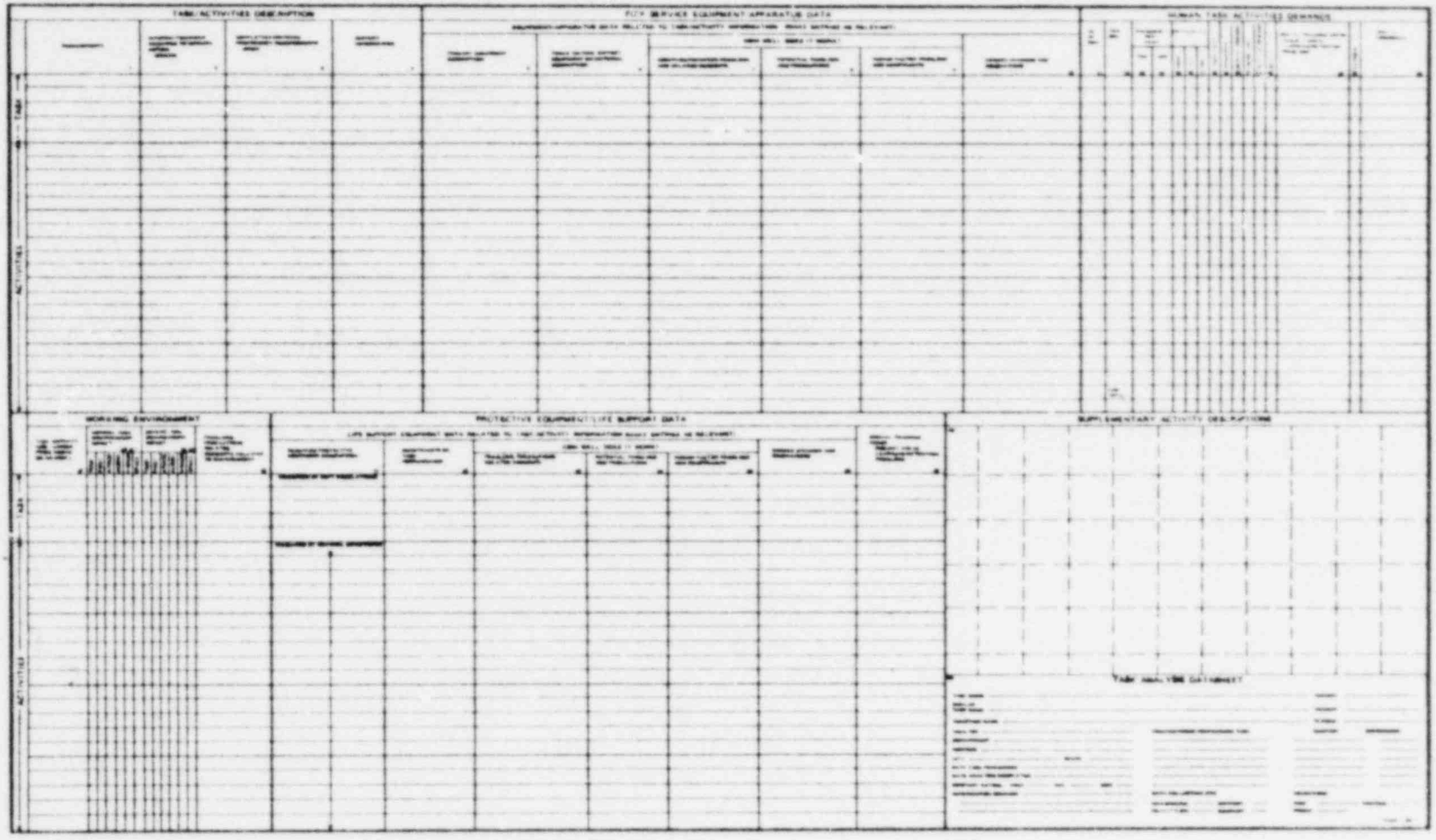
PROGRAM OBJECTIVES IDENTIFIED BY PARTICIPANTS

- TO DEFINE MEASURABLE PERFORMANCE STANDARDS
- TO ESTABLISH OPTIMUM OPERATING PROCEDURES

The analysis process developed during Phase I was designed to provide for the orderly collection of the requirements data. The final stage of this process is the recording of information on the data sheet developed by fire service and Boeing personnel.

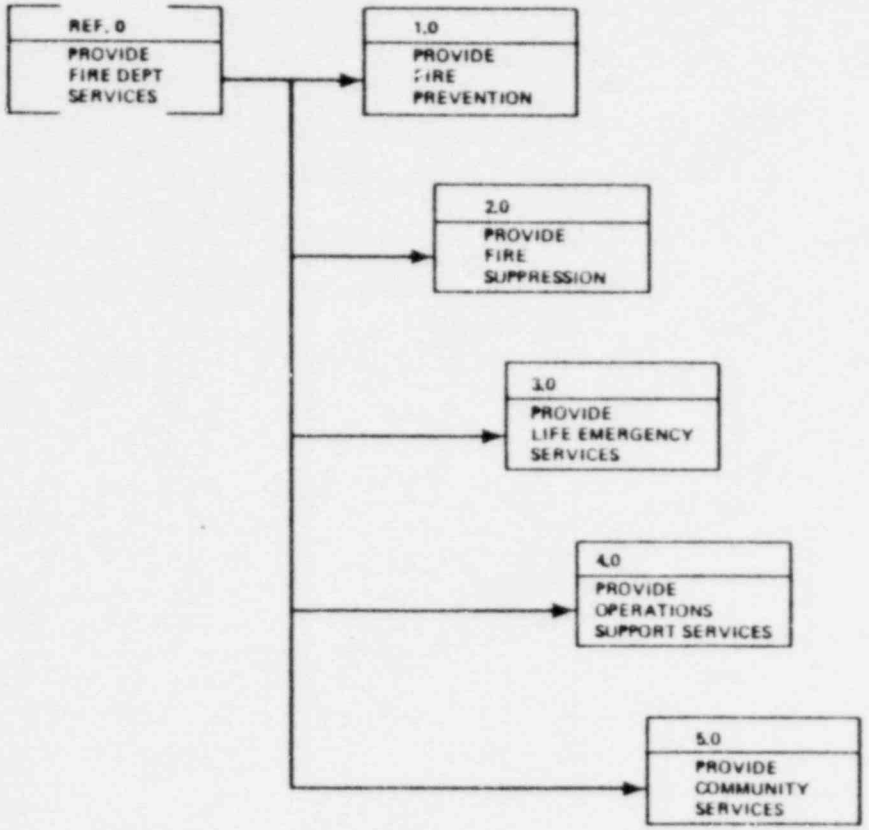
The purpose of this data sheet is to provide an integrated source of data on fire service operations as pertains to:

- Performance Criteria
- Job Required Equipment
- Human Demands
- The Working Environment, and
- Life Support and Safety Equipment

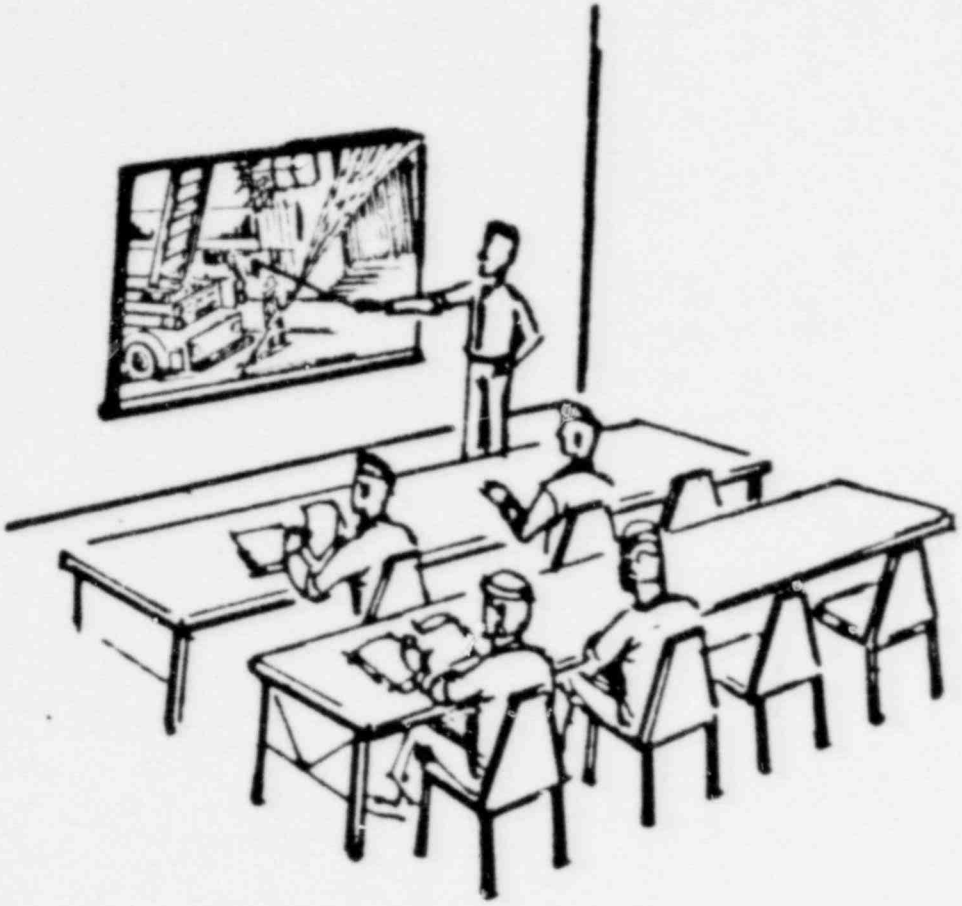


POOR ORIGINAL

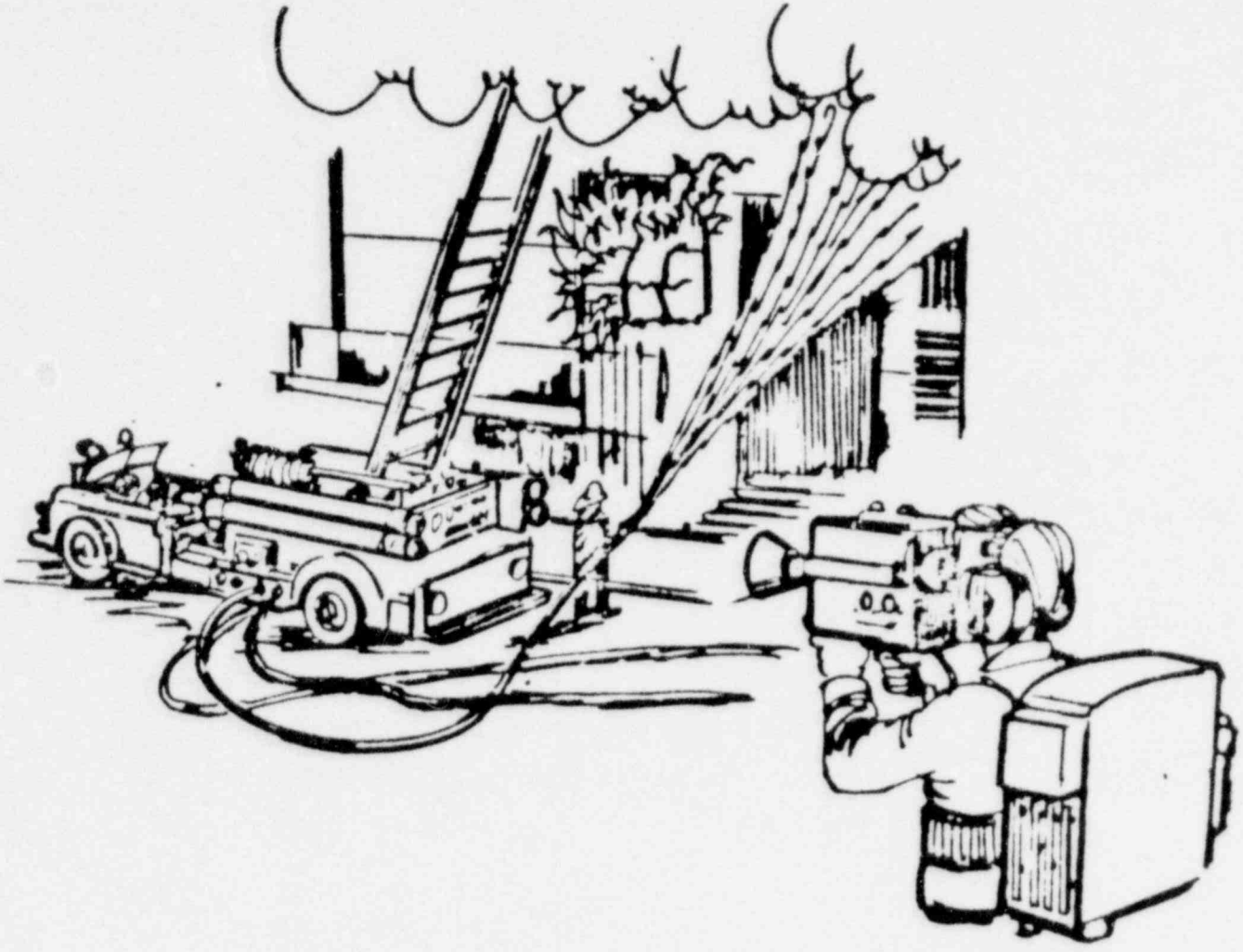
In order to expedite the validation of the system requirements analysis process, the scope of Phase II was narrowed to evaluation of fire suppression operations. The analysis process and collection instruments were developed, however, to provide an orderly and equitable means of collecting relevant data on all fire service operations.


REF. 0
PROVIDE
FIRE DEPT
SERVICES
1.0
PROVIDE
FIRE
PREVENTION
2.0
PROVIDE
FIRE
SUPPRESSION
3.0
PROVIDE
LIFE EMERGENCY
SERVICES
4.0
PROVIDE
OPERATIONS
SUPPORT SERVICES
5.0
PROVIDE
COMMUNITY
SERVICES

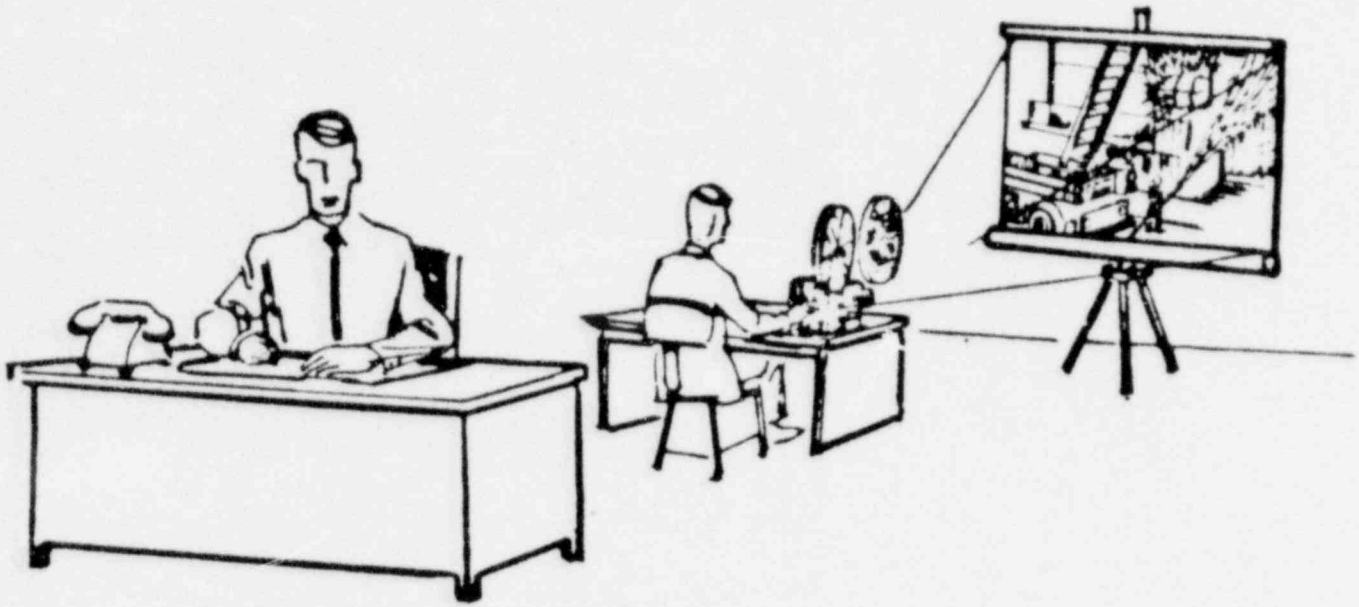
The training consisted of introducing the participants to the mechanics of functional flows, task and timeline analysis, performance assessment and data collection.



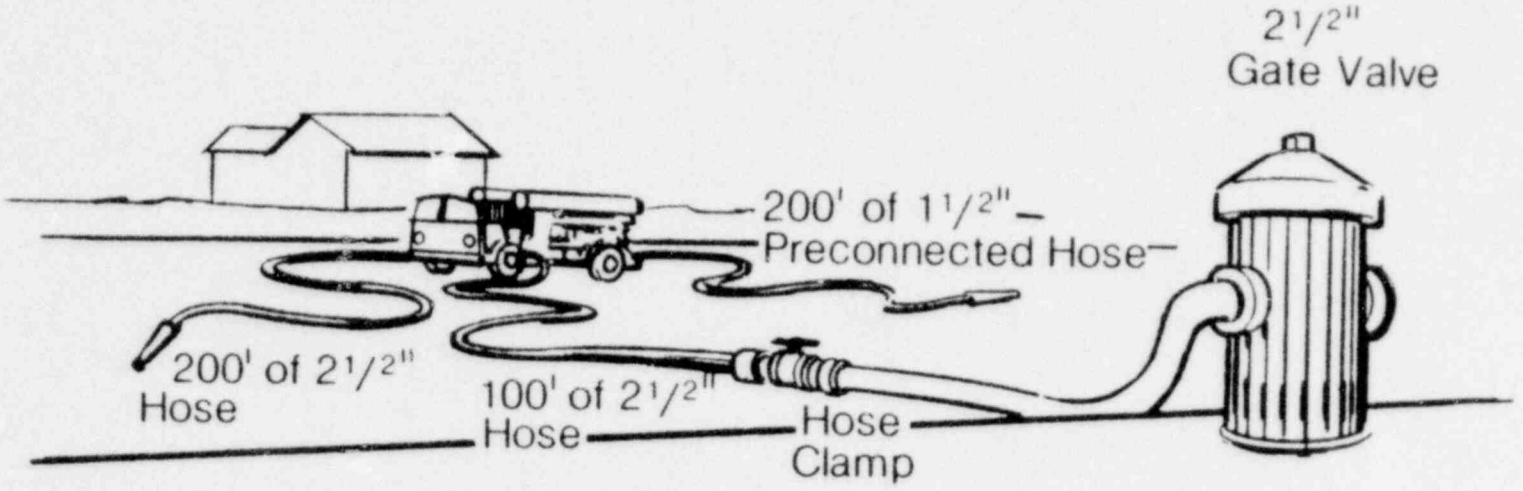
Hands-on training was provided during workshop exercises and a field trip to a neighboring fire department in Kent, Washington, where the participants filmed a fireground training exercise.



They returned to the classroom where they analyzed the field trip films using the system requirements analysis techniques.



At the conclusion of the training session, each fire department was assigned several fire suppression evolutions to analyze. In addition, every department was asked to analyze one particular evolution: a forward lay supplying two attack lines. This assignment was made to provide a cross-sectional check on the consistency of the data generated by the analysis process.

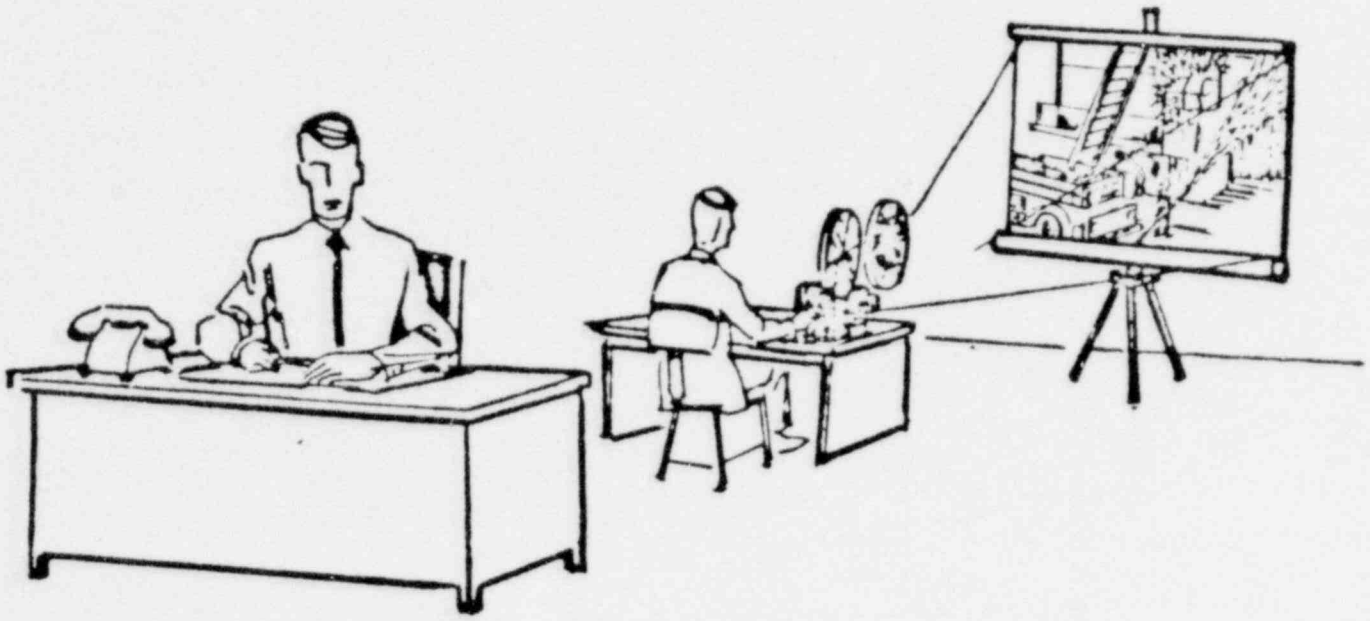


Evolution No. 2: Forward to Fire and Pump

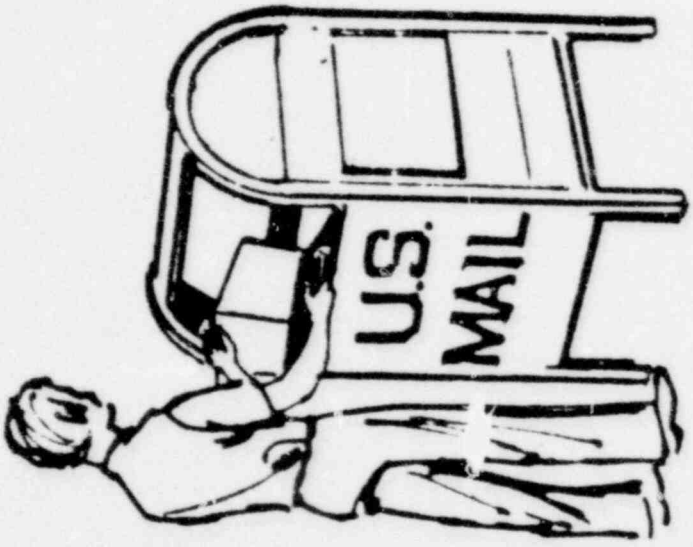
- Lay Off Necessary Equipment
- Supply Two Attack Lines
- Four Man Crew

When the participants returned to their respective fire departments they filmed their assigned fire suppression operations as is shown here in Virginia Beach.

They then analyzed the film, recorded the data in the prescribed manner,...



... and mailed the films and data sheets to Seattle. The results were compiled and the data were evaluated for accuracy, consistency, completeness, and demonstrated understanding of the analysis process.



Evaluation of the products produced by the analysis process confirmed the anticipated potential of the program. Not only were the results of high quality, but this quality was consistently reflected across all departments. The participants reported that the types of data were very appropriate to their fire service needs, and for many departments, produced immediate and meaningful benefits. The fact that the process could be rapidly learned and effectively implemented demonstrated that the approach is both feasible and practical.

PHASE II EVALUATION RESULTS

- CONSISTENT ACROSS DEPARTMENTS
- APPROPRIATE TO FIRE SERVICE NEEDS
- FEASIBLE AND PRACTICAL

Let's look at some of the types of data collected. One, is the time required to perform identifiable fireground tasks common to many evolutions. For such data to be useful, it is important that there is agreement on what constitutes a task. The number of departments that specifically identified each task is shown in the column adjacent to the task title. The task elements not specifically identified were almost always combined under another task title to provide commonality approaching 95%.

When this level of consistency is achieved across departments, the time required by individual fire departments to perform each commonly defined task can be easily extracted from the data sheets.

TASK/TIME DATA

Task	# dept. ident tasks	Cities						
		1	2	3	4	5	6	7
Connect to hydrant	7	95	86	68	82	89	90	79
Lay And connect supply line	6	66	45	69	52	(32)	48	66
Prepare apparatus for pumping	3	8	10	29	10	27	8	5
Lay 200' 2 1/2" attack line	4	82	70	95	117	77	62	78
Lay 200' 1 1/2" attack line	4	51	27	61	44	56	37	63
Supply Attack line	6	37	34	34	(9)	30	(10)	44

( ) Does not contain same composite activity data

This task/time data provides an important performance parameter which fire chiefs can use to comparatively assess their respective operations in relation to their counter parts across the country. This derivation of time ranges, averages, and standard deviations could eventually evolve into the establishment of performance time criteria or standards. It would then be possible for an individual fire chief not only to determine that he may have a task operation problem but to identify through the data sheet the types of equipment, procedures, manning levels, etc. that have resulted in better performance.

EVOLUTION #2 TASK TIME (SECONDS)

task	range	average	standard deviation
connect to hydrant	68-95	84	8.9
lay and connect supply line	45-69	58	10.5
prepare apparatus for pumping	5-29	14	9.8
lay 200' 2 1/2" attack line	62-117	83	18.1
lay 200' 1 1/2" attack line	27-63	48	13.2
supply attack line	30-44	36	5.2

The analysis process also identified probable safety hazards and areas of potential time savings. Corrective changes and innovations were then identified or developed to correct the potential hazard, improve performance, or shorten reflex time. The innovations and changes identified to be within present funding levels, that is with impact of less than $200 on the budget, are shown above the dashed lines. Those requiring relatively unlimited funding, that is, an impact of more than $200 but still within today's technology, are shown below the dashed lines. A total of 178 innovations and changes were identified as being necessary.

AREA

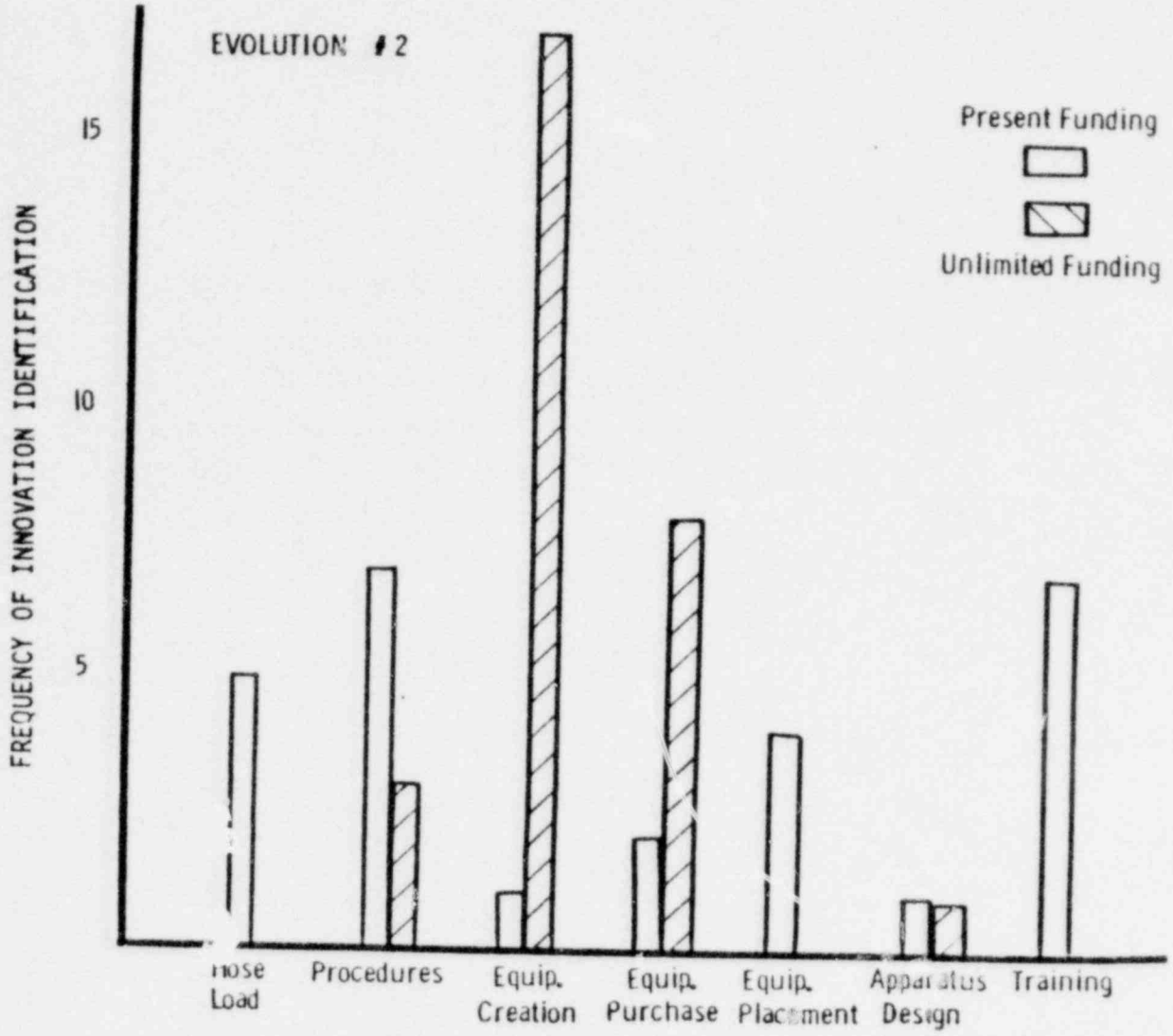
IDENTIFIED INNOVATIONS/CHANGES (FREQUENCY)

EVOL. NUMBER	DESCRIPTION	Adj. Eq.	HOSE LOAD	PROCEDURES	EQUIPMENT			APPARATUS DESIGN	TRAINING
					CREATION	PURCHASE	PLACEMENT		
1	Reverse from fire to hydrant - master stream appliance	5	2	11			3	1	3
		5			13	13		8	
2	Forward to fire from hydrant - 2 attack lines (through pump)	6	5	7	1	2	4	1	7
		5		3	19	9		1	
3	Forward to fire (gravity line) - 2 attack lines	2	4	2	3		2		1
		3	1		5	8	2		
4	Reverse from fire to hydrant - 2 attack lines	3		1		1	1		7
		2			6	4			
5	Forward to fire from hydrant - master stream (through pump)	2	1	3					
		2			5	6		2	

AN EVALUATION OF THE FREQUENCY OF INNOVATION/CHANGE

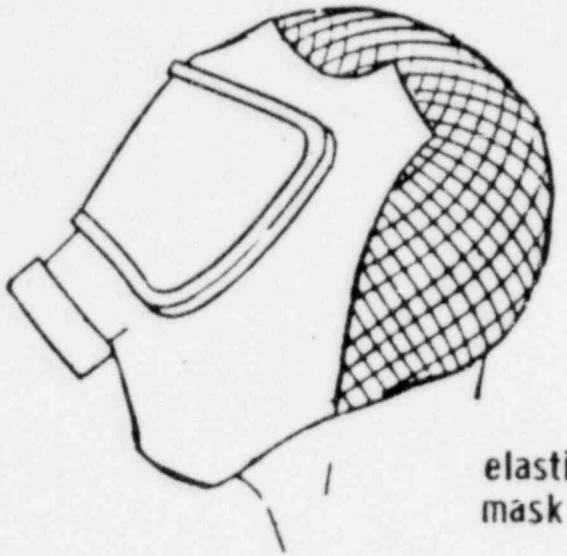
A bar graph of the present funding level changes for Evolution 2 reveals that training and procedural changes were recognized most frequently, with hose loading and equipment placement not far behind.

With unlimited funding, equipment creation and equipment purchase far exceeded all other categories. It should be noted that we are looking at the number of innovations and changes identified, not the time saved or the number of accidents prevented. The graph shows that this process can be applied by the local analysts to identify changes in their operations that would reduce the reflex time or correct potential safety hazards. The quality of improvements was very high, with several participants reporting potential time savings of 30% to 50% for the total evolution from innovations within their present funding level.


EVOLUTION #2
Present Funding
Unlimited Funding
FREQUENCY OF INNOVATION IDENTIFICATION
15
10
5
Procedures
Equip. Creation
Equip. Purchase
Equip. Placement
Apparatus Design
Training

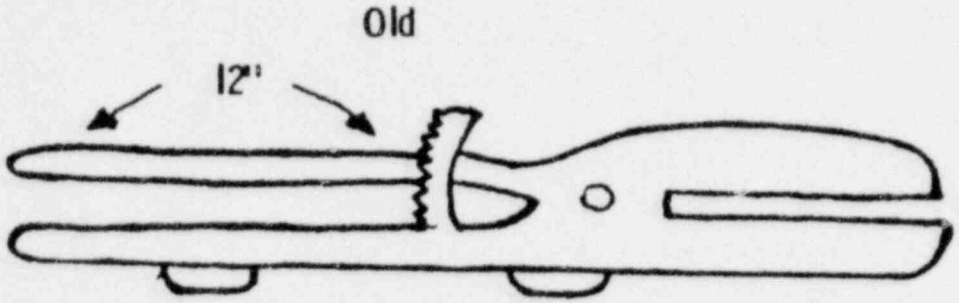
Also submitted were several drawings of proposed innovations or desired changes. Here is one participant's effort to reduce the time consumed adjusting face mask straps. That a manufacturer recently announced a similar innovation does not diminish the fact that the analysis process helped identify a solution that was original to him.

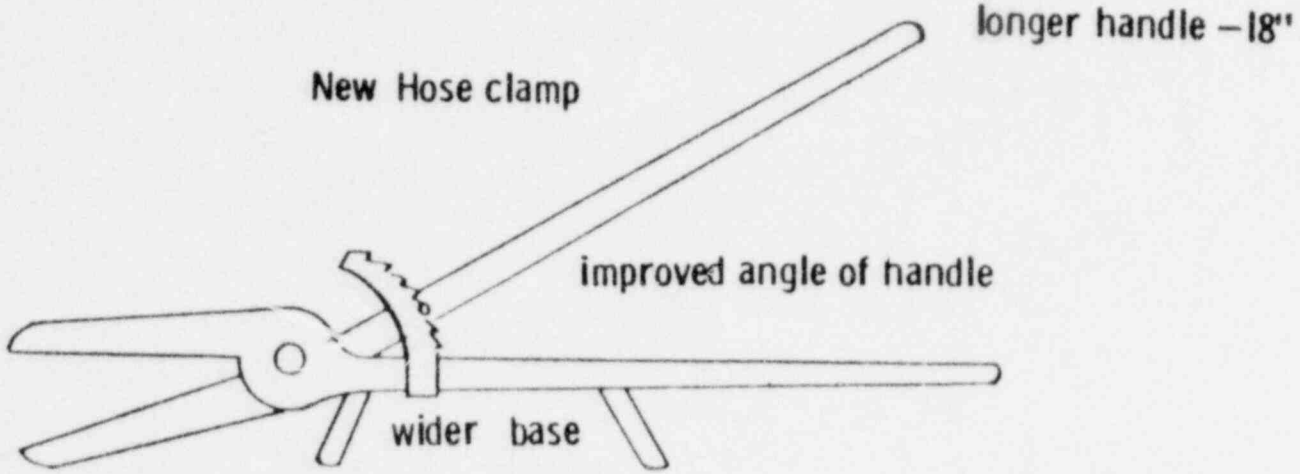
Head net attached to breathing apparatus face piece



elastic net would secure mask to face

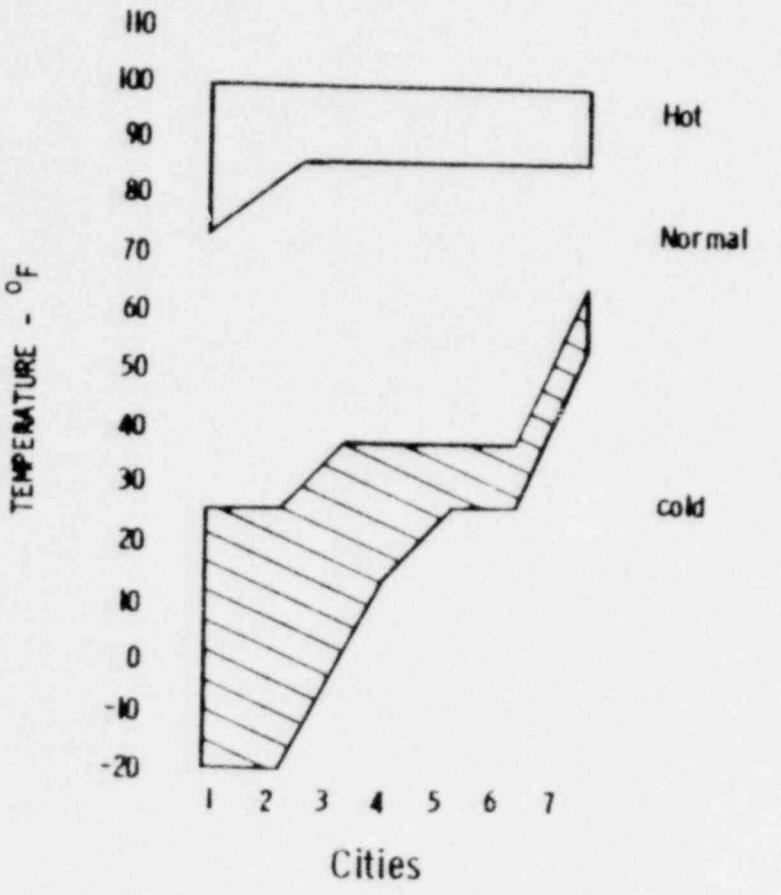
Another participant identified a potential safety hazard with the scissors style hose clamp. His proposed solution was to alter the angle of the compression arm and to provide a wider base.


Old
12"


longer handle – 18"
New Hose clamp
improved angle of handle
wider base

In addition to a description of the impact of working environment factors such as temperature, contaminates, footing, noise, etc., weather data was also collected. It is interesting to note that all of the cities felt that a hot day was somewhere between 80^{o} and 100^{o} but a cold day fluctuated between -20^{o} and $+55^{o}$. While perhaps amusing, information concerning geographical environmental adaptation is important to those who design fire service equipment if we are ever to fit the tool to the man to the job.

ENVIRONMENTAL DATA



Other factors

Humidity

rain

Heavy rains

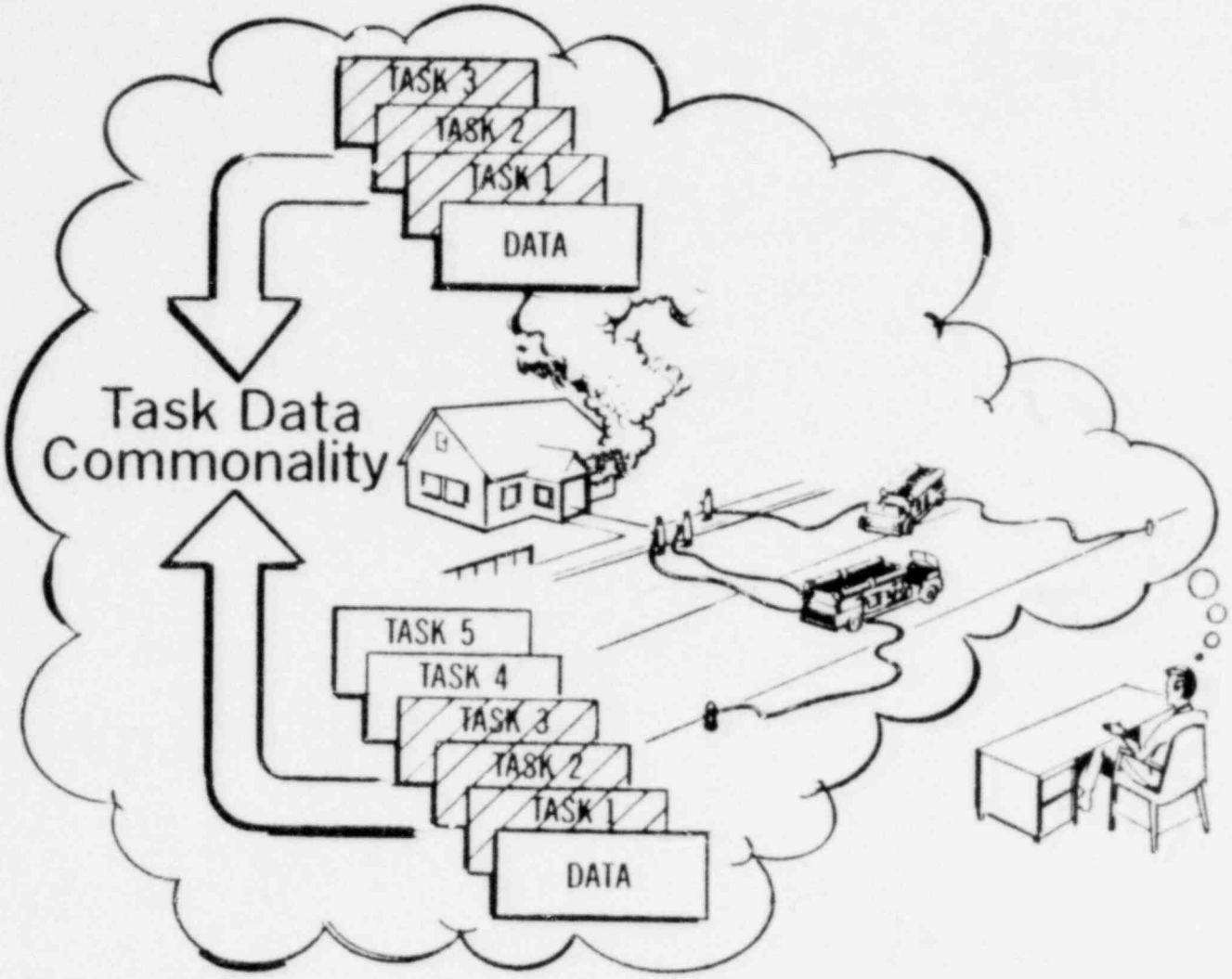
High winds

hail

snow

ice

While overall approaches to fire service operations appear to differ from city to city, individual tasks or units of work are found to be very comparable. Similarily, different evolutions are found to be made up of many common units of work which are repeated or rearranged to achieve a new objective. The analysis data for each task can be thought of as a building block that can be assembled and reassembled by the chief in evaluating and planning his department's operations. This building block approach provides a flexible assessment tool that is just as applicable in Sarasota as it is in Cincinnati.


TASK 3
TASK 2
TASK 1
DATA
Task Data
Commonality
TASK 5
TASK 4
TASK 3
TASK 2
TASK 1
DATA

As part of the evaluation review held in Washington, D. C., the fire service participants made an assessment of the project's local and national applications. They recognized a number of immediate applications of the project to their own departments, among which were:

- The identification of human, equipment and procedure problems and constraints as they pertain to requirements, specifications, standards and innovations.

- The increased awareness of operational strengths and weakness.

- It provided a tool for evaluating training requirements.

- It supplies the data required to make sound decisions as it pertains to manpower, apparatus, procedures, policy, equipment and priorities.

- It can provide quantifiable data to justify manpower and equipment expenditures to the city administration, and

- it can supply data to justify specific selection and promotion criteria.

PROJECT LOCAL APPLICATIONS

- IDENTIFICATION OF HUMAN/EQUIPMENT PROBLEMS AND CONSTRAINTS.
  - REQUIREMENTS
  - SPECIFICATIONS
  - STANDARDS
  - INNOVATIONS
- INCREASED AWARENESS OF OPERATIONAL STRENGTHS AND WEAKNESS.
- A TOOL FOR EVALUATING TRAINING REQUIREMENTS.
- DATA AVAILABLE TO MAKE SOUND DECISIONS.
  - MANPOWER
  - APPARATUS
  - PROCEDURES
  - POLICY
  - EQUIPMENT
  - PRIORITIES
- JUSTIFICATION OF MANPOWER AND EQUIPMENT TO THE CITY ADMINISTRATION.
- DATA TO DEVELOP AND JUSTIFY SELECTION AND PROMOTION CRITERIA.

The participants also identified some of the project's national applications, such as providing a common data base usable by all. It establishes better communications between departments in terms of identifying information sources and commonality of terminology.

It provides a source of equipment design constraints, problems and requirements for use in manufacturing equipment, and it establishes a basis for increased commonality of equipment.

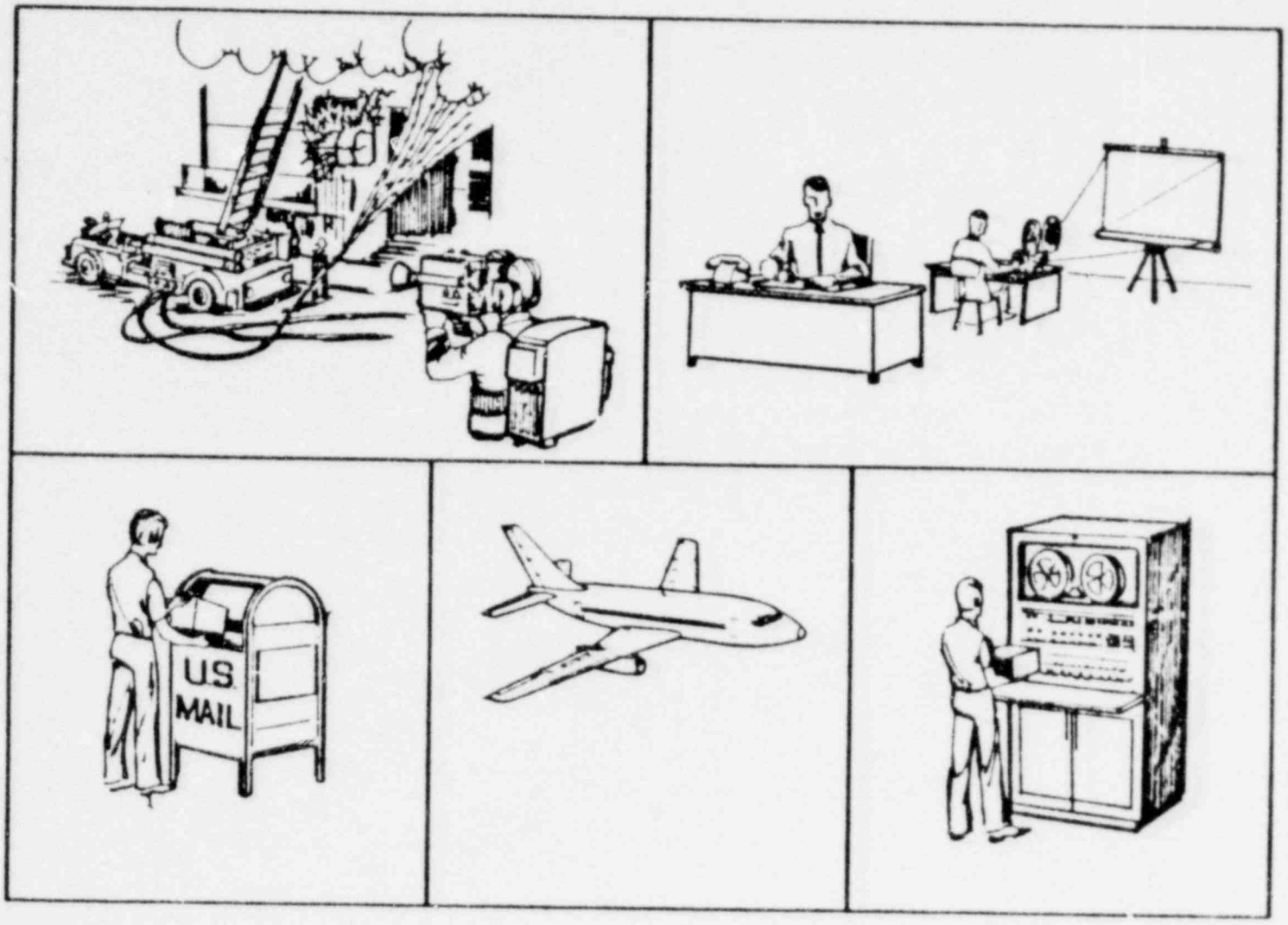
It also supplies a centralized source of problems, solutions and innovations. Training in the system analysis process itself, provides a more critical set of eyes for self evaluation.

PROJECT NATIONAL APPLICATIONS

- PROVIDES A COMMON DATA BASE USABLE BY ALL.
  - EVERYONE CONTRIBUTES A LITTLE AND GETS A LOT BACK.
- ESTABLISHES BETTER COMMUNICATION BETWEEN DEPARTMENTS.
  - IDENTIFICATION OF INFORMATION SOURCES
  - COMMONALITY OF TERMINOLOGY.
- SOURCE OF EQUIPMENT DESIGN CONSTRAINTS/PROBLEMS/REQUIREMENTS FOR MANUFACTURER USE.
- ESTABLISHES THE BASIS FOR INCREASED COMMONALITY OF EQUIPMENT.
- SUPPLIES CENTRALIZED SOURCE OF PROBLEMS, SOLUTIONS AND INNOVATIONS.
- PROVIDES A CRITICAL SET OF EYES FOR SELF EVALUATION.

The fourteen participants also prepared a conceptual data gathering and dissemination approach. Shown here is the data gathering portion where the local departments film the operations, analyze their performance methods and complete the data forms.

The raw data is then forwarded to a computer data bank for storage.


US
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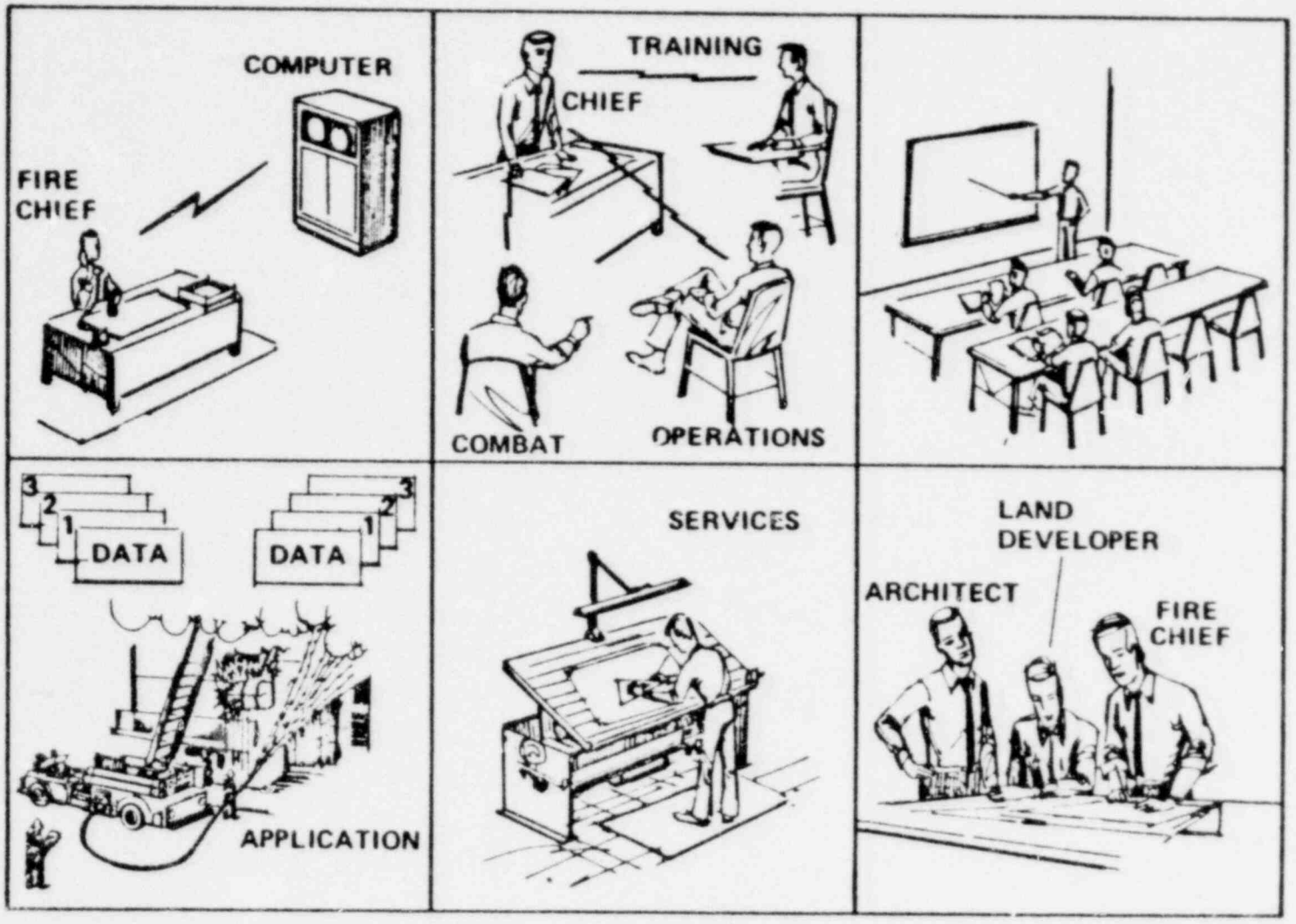
The fire chief is able to access data that is relevant to the problem at hand and then communicate his decisions to the appropriate personnel. The data may relate to training needs, fire scene operations, apparatus design or even provide the explanation or justification of required codes to architects and builders.

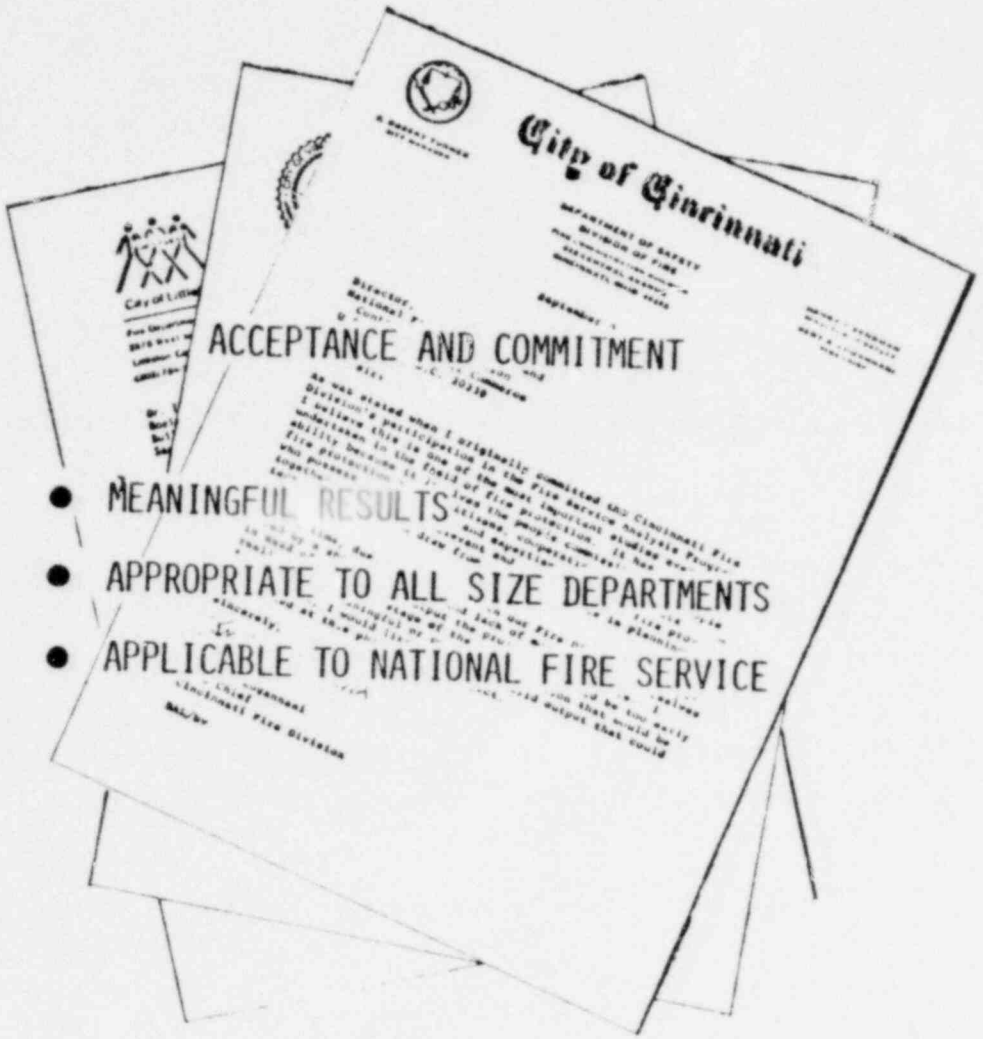

COMPUTER
FIRE CHIEF
TRAINING
CHIEF
COMBAT
OPERATIONS
3
2
1
DATA
DATA
APPLICATION
SERVICES
LAND DEVELOPER
ARCHITECT
FIRE CHIEF

For what types of problems would this process yield assistance was another consideration. The fire service participants addressed this with the results ranging from increasing manpower efficiency to improving protective equipment and from identifying knowledge required of the fire inspector to defining the best method of utilizing manpower to inspect structures.

EXAMPLES OF QUESTIONS THAT CAN BE ANSWERED VIA THE SYSTEMS ANALYSIS APPROACH

- HOW CAN LIMITED MANPOWER BE UTILIZED TO MAXIMUM EFFICIENCY?
- HOW CAN APPARATUS BE DESIGNED TO PROVIDE THE MOST EFFECTIVE USE?
- WHAT ARE THE PROBLEMS ASSOCIATED WITH FIRE FIGHTER PROTECTIVE EQUIPMENT?
- WHAT KNOWLEDGE IS REQUIRED OF A FIRE INSPECTOR?
- HOW CAN MANPOWER BE EFFECTIVELY UTILIZED IN THE INSPECTION OF STRUCTURES?
- WHAT ARE THE EDUCATIONAL REQUIREMENTS FOR PERSONNEL?

The commitment displayed by the fire service participants demonstrates that this program has gained acceptance by showing immediate meaningful results that are both appropriate to fire departments of all sizes and are equally applicable to the fire service on a national level.



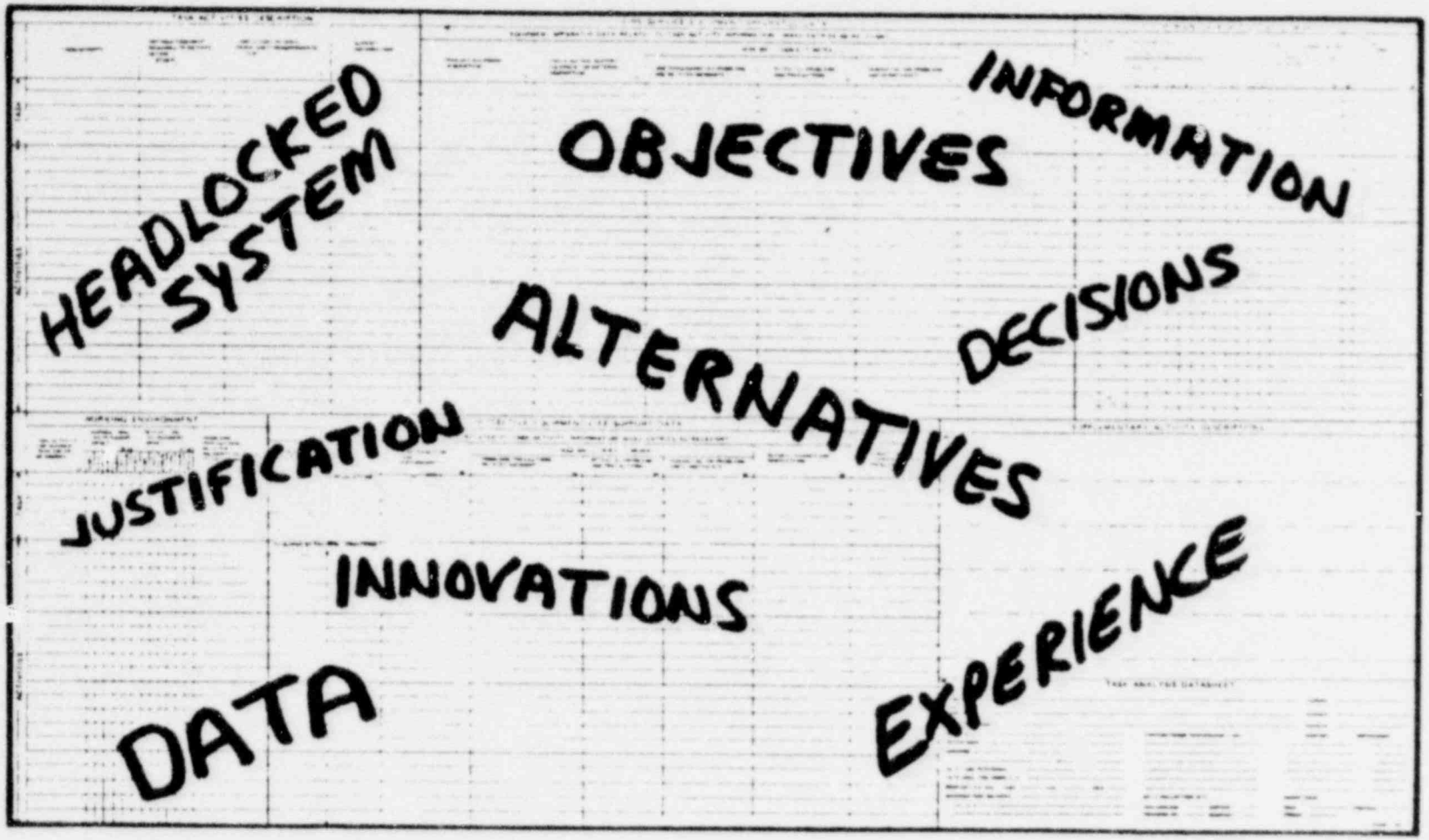
- MEANINGFUL RESULTS
- APPROPRIATE TO ALL SIZE DEPARTMENTS
- APPLICABLE TO NATIONAL FIRE SERVICE

The systematic evaluation approach, requirements information, and data produced by the project crosses many other bridges:

- It can be the initial step to eliminate a system in which information, experience, and innovation is headlocked in our senior fire personnel, and which is lost to us at retirement;

- It can provide us with the solid method to obtain the data necessary to develop meaningful objectives and then to validate their attainment; and,

- It can provide valuable assistance in developing alternatives and their justification for use in the Master Planning process.



The purpose of Phase II was to test and validate a systems analysis approach that was specifically structured for the fire service to provide needed requirements data. Evaluation of the participant's work has shown that fire service personnel can effectively use this systems analysis technique to provide data of consistent and high quality. Local applications of the data produced to date demonstrates that the data can be used to meet the fire service objectives. The acceptance and commitment of the fire service personnel and departments involved in the project indicates that the objective to provide a feasible and practical means for improving fire service effectiveness on both a local and national level can be met.

NATIONAL FIRE SERVICE SYSTEM
REQUIREMENTS ANALYSIS

PHASE II EVALUATION CONCLUSIONS

- APPROACH VALIDATED
- FEASIBILITY DEMONSTRATED
- OBJECTIVES MET
- USER ACCEPTANCE GAINED

Recommendations for Phase III, Implementation of the Requirements Analysis on a National Level, were developed as part of the Phase II effort. Considerable guidance and direction was received from the fire service personnel who participated in the project. At the evaluation review meeting, the participants provided their recommendations based upon their experiences in the initial training, the use of the approach, and their application of the data in their own departments. Their recommendations for the continuation of the project, and the specific steps that should be taken, were strongly considered and integrated into the recommended plan for Phase III.

Four overall tasks are envisioned to be completed in Phase III. Each task is a relatively circumscribed package of work which is designed to lead the Requirements Analysis Project into full national application in a logical and orderly manner.

The first task is to develop and implement a course of instruction on Fire Service Requirements Analysis Methods and Techniques. As part of the NFPCA National Fire Academy, this course could be made available to fire departments throughout the nation.

Because of the strongly expressed need for requirements data, the second task is to continue the analysis of fire service operations using a cadre of existing and newly trained fire service personnel. The data collected will provide the basis for immediate solution to the participating department's needs, and when made available nationally, will satisfy the needs of many other departments.

In order to properly organize and guide the collection of this requirements data, the third task is to complete the functional analysis for selected fire service functions. The functional analysis provides the structure needed to assess priorities, avoid duplication, discover data gaps, and catalog the requirements data for storage and retrieval.

The fourth task is to identify the desired characteristics of and to design a centralized data collection and retrieval system. This system will provide the necessary repository for requirements data collected throughout the nation and permit rapid and effective retrieval of information requested by others.

RECOMMENDATIONS FOR PHASE III
IMPLEMENTATION OF THE REQUIREMENTS ANALYSIS

TASK 1: DEVELOP NFPCA ACADEMY COURSE FOR FIRE SERVICE REQUIREMENTS ANALYSIS.

TASK 2: CONTINUE ANALYSIS OF FIRE SERVICE OPERATIONS USING TRAINED FIRE SERVICE PERSONNEL.

TASK 3: COMPLETE FUNCTIONAL ANALYSIS FOR SELECTED FIRE SERVICE FUNCTIONS.

TASK 4: DESIGN CENTRALIZED DATA COLLECTION AND RETRIEVAL SYSTEM.

TASK 1: DEVELOP NFPCA ACADEMY COURSE FOR FIRE SERVICE REQUIREMENTS ANALYSIS.

- INCORPORATE REVISIONS/ADDITIONS TO ANALYTICAL PROCESS INTO LESSON PLAN.
- IDENTIFY FIXED CONTENT PORTIONS OF COURSE AND PREPARE AUTOMATED COURSE PACKAGES (VIDEOTAPE, SLIDE/SOUND).
- EXPAND INSTRUCTOR'S LESSON PLANS FOR PRODUCTION USE.
- PREPARE STUDENT PROCEDURE MANUAL.
- IMPLEMENT NFPCA REQUIREMENTS ANALYSIS COURSE.

TASK 2: CONTINUE ANALYSIS OF FIRE SERVICE OPERATIONS USING TRAINED FIRE SERVICE PERSONNEL.

- IDENTIFY NEXT SET OF OPERATIONS/EVOLUTIONS FOR ANALYSIS AND ASSIGN TO PARTICIPATING DEPARTMENTS.
- PERFORM SYSTEM/TASK ANALYSES.
- VERIFY, EDIT, AND PREPARE ANALYSIS DATA FOR HARDCOPY ACCESS.
    - EXISTING DATA FROM PHASE II
    - NEW DATA

TASK 3: COMPLETE FUNCTIONAL ANALYSIS FOR SELECTED FIRE SERVICE FUNCTIONS.

- IDENTIFY FUNCTIONS AND LEVEL OF DETAIL FOR ANALYSIS.
- PERFORM FUNCTIONAL ANALYSIS AND PREPARE FLOW DIAGRAMS.
- PREPARE FUNCTIONAL DESCRIPTIONS.
- REVIEW, EDIT, AND REVISE.
- MAINTAIN FUNCTIONAL FLOW CONFIGURATION CONTROL FILE.

TASK 4: DESIGN CENTRALIZED DATA COLLECTION AND RETRIEVAL SYSTEM.

- ESTABLISH SYSTEM RESPONSIBILITIES AND FOCAL POINTS.
- IDENTIFY AND EVALUATE NATIONAL NEEDS/USE.
- DEFINE DATA BASE IMPLEMENTATION REQUIREMENTS AND OPTIONS.
- DEVELOP PRELIMINARY SYSTEM DESIGN.
- DETERMINE TEST CASE/TEST SITE.
- PREPARE DETAILED DEVELOPMENT PLAN, IMPLEMENTATION COSTS, AND SCHEDULE.