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A Headquarters Effectiveness Assessment Tool (HEAT) evaluation of Headquarters Military Airlift Command (HQ MAC) Powder River 1985 (PR85) Command Post Exercise (CPX)

Buettner, Ronald P.

NAVAL POSTGRADUATE SCHOOL

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EVALUATION OF
HEADQUARTERS MILITARY AIRLIFT COMMAND (HQ MAC)
POWDER RIVER 1985 (PR85) COMMAND POST EXERCISE (CPX)

by

Ronald P. Buettner

December 1985

Thesis Advisor: M. G. Sovereign

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A Headquarters Effectiveness Assessment Tool (HEAT) Evaluation of Headquarters Military Airlift Command (HQ MAC) Powder River 1985 (PR85) Command Post Exercise (CPX)

by

Ronald P. Buettner
Captain, United States Air Force
B.A., Southern Illinois University of Edwardsville, 1977
M.S.B.A., Boston University, 1983

Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE in SYSTEMS TECHNOLOGY
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from the

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December 1985

ABSTRACT

The purpose of this thesis is to investigate the use of the Headquarters Effectiveness Assessment Tool (HEAT) for a Command Post Exercise (CPX). Joint Chiefs of Staff (JCS) Exercise Powder River 1985 (PR85) at Headquarters Military Airlift Command (HQ MAC) was chosen for the evaluation. This thesis presents a description of the HEAT process, a description of HQ MAC's organization and interface with the Joint Deployment Agency (JDA), along with a historical accounting of the evaluation, its results, and recommendations.

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I. INTRODUCTION

One of the most acceptable means of determining the worth of a system, is by obtaining some sort of an effectiveness rating for that system. This process of determining an effectiveness rating has for a long time been applied to military weaponry. It has become almost routine practice to ask for the effectiveness of the weapon system prior to any purchase. This is most often stated in terms of P_k or probability of kill. The successfullness of applying this measure towards the success of the weapon, led to the evaluation of other systems in the same manner. The result was an ever increasing need to have some sort of an effectiveness rating for all types of systems.

Applying some sort of an effectiveness rating to something as ill-defined as a Command and Control system, proved to be a challenge. Not only was there no real consensus as to what was a Command and Control system, but when a so-called system was to be evaluated there was no real feel as to what was a more effective system, either it worked and helped the organization or it hindered the organization. As it turned out most of the systems analysis conducted on Command and Control systems was based on the evaluator's past experiences or perception as to what a good Command and Control system should do and how well. There was rarely any set evaluation criteria to judge the effectiveness of the system. Thus, past studies barely accomplished more than identifying some problem area and recommending some solution that the evaluators thought would work. Almost never did the studies indicate what was effective or what standard was used in the evaluation.

A remedy to the subjective nature of Command and Control systems evaluations was needed. No longer could a Command and Control system compete for the scarce defense dollars without some legitimate measure of system effectiveness being applied. To this end, the Headquarters Effectiveness Assessment Tool was developed. Its purpose is to enable a team of internal or external observers to objectively assess and quantify headquarters performance and effectiveness.

This thesis will document one such application of this Headquarters Effectiveness Assessment Tool (HEAT) as it was conducted during JCS exercise Powder River 85. HEAT was applied to the Military Airlift Command Headquarters as it was organized for this exercise and generally how it is organized for a contingency. This thesis will further describe the HEAT process, including the theory behind HEAT and a brief historical perspective on the HEAT development in Chapter II. A description of the organization evaluated by this tool, Headquarters Military Airlift Command (HQ MAC), will be presented in Chapter III. This will include the organization of HQ MAC during a contingency operation or exercise, its relationship and coordination with the JCS Crisis Action System and the Joint Deployment Agency, along with a detailed description of MAC's Requirements and Flow Planning Cell, the center of activity for the scheduling of airlift requirements. Chapter IV will present a detailed chronology of the HEAT evaluation of HQ MAC from the first preliminary aspect through a growing awareness of the true organizational function of MAC and the evolution of the HEAT measures as this awareness unfolded. The results and corrective recommended actions will be presented in Chapter V with a brief section indicating areas for further studies.

II. HEADQUARTERS EFFECTIVENESS ASSESSMENT TOOL (HEAT)

A. HEAT HISTORICAL DEVELOPMENT

The Headquarters Effectiveness Assessment Tool (HEAT) development project was a joint initiative by the Defense Communication Agency (DCA) and the Defense Nuclear Agency (DNA). Their issue concerned the survivability and effectiveness of Command, Control, Communications, and Intelligence (C^3I) systems under the threat and during the course of a nuclear attack. Their main question was one of organizational size. How small could theater level headquarters be while still maintaining the ability to survive and be effective. However, before the question of size could be answered, the problem of determining what is an effective headquarters had to be solved. DCA and DNA decided to first develop a method to differentiate between effective and ineffective headquarters performance. This, then, would be followed by the identification of factors that helped to explain, predict, and eventually be used to control the level of effective performance.

Defense Systems, Inc. (DSI) of Mclean, Virginia was awarded the developmental contract and was tasked with the accomplishment of these first two goals. Their product, HEAT, was developed to meet these goals by enabling a team of internal or external observers to objectively assess and quantify headquarters performance and effectiveness, yielding reproducible effectiveness scores. It was these reproducible, quantitative, objective scores which would enable the evaluation of a headquarters in different configurations (mobile, distributed, unitary, underground, airborne, etc.) and at different times, lending insight into the performance of command centers at all levels.

B. HEAT THEORY

HEAT, as an analysis tool, was developed to render quantitative, objective, and reproducible effectiveness scores in order to assist those charged with designing and running a higher level headquarters. The application of HEAT was for those headquarters that were primarily responsible for the planning, supporting and coordination of fighting forces, not direct war-fighting [Ref.1:p.1-2]. Hence, it was this process of planning the mission, acquiring the resources, and directing the forces to accomplish the mission that was being evaluated. True effectiveness, then, was measured by the ability of the headquarters to develop and implement such plans while adjusting them for the information and assets available.

Other key concepts of headquarters effectiveness identified during the development of HEAT were: [Ref.2:p.1-5]

* Effectiveness is the capacity to accomplish military missions.

* Effectiveness of a theater-level headquarters is its capacity to operate as an adaptive control system such that it keeps crucial factors in its environment (enemy actions, losses of territory, casualties, etc.) within expected boundaries.

* The primary measure of effectiveness is the capacity of the headquarters to develop plans and use the resources available to bring those plans to fruition.

* When plans being used are not working, the effective headquarters is the one that can recognize that fact, develop alternative plans, and implement them in a timely fashion. The effective use of contingent options is an important issue, because of the uncertainty inherent in military operations.

* Effectiveness is always measured in terms of interactions with the environment.

* Timeliness, not speed, is essential for effectiveness.

* Speed and good quality decision making processes may be necessary conditions for successful performance, but they are not sufficient for success.

Thus an effective headquarters is one that can survive, continue to perform its assigned mission, and make its presence felt in its environment. One that effectively produces desired military outcome while efficiently using its resources and time. The concept of mission accomplishment is paramount. A headquarters can not be considered effective, no matter how well individual components accomplished their duties, if the mission failed.

Recall, that the mission or objective of a headquarters (for a HEAT application) was that of planning for the war-fighting and not the war-fighting directly. As such, it would be inappropriate to use the result of combat as a measure of headquarters effectiveness. In fact, it could be argued that success in combat could occur even if the planning for a headquarters were ineffective. Thus, another conceptual approach or model to judge headquarters effectiveness had to be chosen. The approach taken during the HEAT development was that of an Adaptive Control System.

C. THE ADAPTIVE CONTROL SYSTEM

Under this concept the headquarters is seen as a system whose purpose is effectively dealing with an environment. This environment consists of everything outside the headquarters and includes: [Ref.1:p.2-8]

* own forces and the related resources
* enemy forces
* relevant friendly forces
  - superior headquarters
  - adjacent military organizations
  - supporting subordinate military organizations
* operating environment
  - weather
  - terrain
  - political situation
  - economic situation
  - social situation

In order to control these dynamic and sometimes interactive features of the environment, a headquarters must proceed through a set of logical steps. These steps can be thought of as an adaptive control cycle for the headquarters or a headquarters cycle (see Figure 2-1).

1. Monitor/Sense the Environment

The control system must have a way to monitor those aspects of interest within its environment. It does this through the collection of raw data via its sensors. These sensors provide data on the aspects that the headquarters decides to monitor and hopes to control. The quality of this monitoring can be measured by comparing what the headquarters perceives to be true versus what is in fact "ground truth". Another indication of the quality of the monitoring process is the age of the data available. The quantity of old data indicates the quality of the monitoring process.

2. Understand/Perceive the Situation

Once the raw data is received by the headquarters, it must be processed into some usable form. This processed information is then used by the decision makers to interpret or understand the environment. This processed information, however, is almost never complete and up-to-date. Time delays occur through the processing of the raw data and through the communications delay from the sensors to the headquarters. Similarly, a sensor's information may be absent or misleading, instilling even more uncertainty into the evaluation. Thus, a headquarters can never be absolutely certain as to what is going on, but must use all available information to hypothesize about the current situation. This hypothesis of the situation can be correct, adequate for the mission, or incorrect. It is this quality of understanding the situation that HEAT measures.

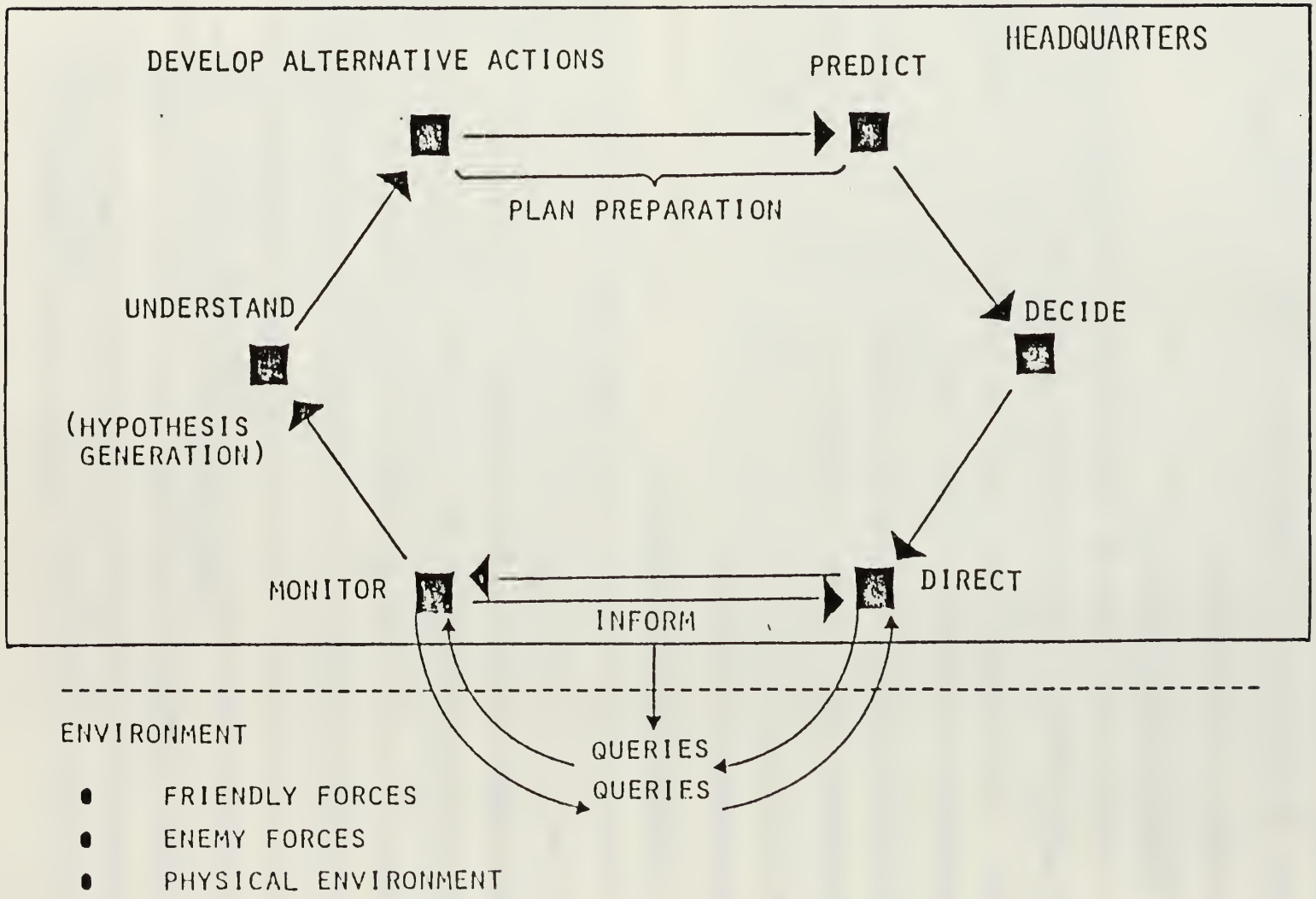


Figure 2-1 The Headquarters Cycle

3. Develop Alternative Actions

The headquarter's next step, after an understanding of the situation is reached, is to compile a list of alternative sets of actions. The emphasis at this point is not on a quality alternative but in surfacing a variety of different alternatives to evaluate. Experience with decision-making has made it clear that better decision processes are characterized by consideration of a number of alternatives and by the variety of alternatives considered. These are not measures of the effectiveness of the alternatives formulated but measures of the quality of the process used to develop them.

4. Predict Results of the Alternative Actions

For each alternative action deemed viable, the headquarters must predict or speculate on the results of that particular action. This must include at least two elements: [Ref.3:p.3-13]

a. do the force and material assets exist, or can they be assembled to carry out the alternative?

b. what will the enemy's response be?

This process of predicting the consequences of an alternative can be evaluated by determining: [Ref.1:p.2-15]

* their completeness: better prediction sets deal with questions of asset availability and enemy reaction across the full range of hypothesized situations for each alternative.

* the correctness of those predictions actually adopted. This is measured on the same scale as the hypothesized understandings --- correct, not incorrect, and incorrect.

5. Compare Prediction with Desired State

This step in the headquarters cycle is implied by the model used by HEAT but is better defined in J.S. Lawson's C3 model (see Figure 2-2). During this step

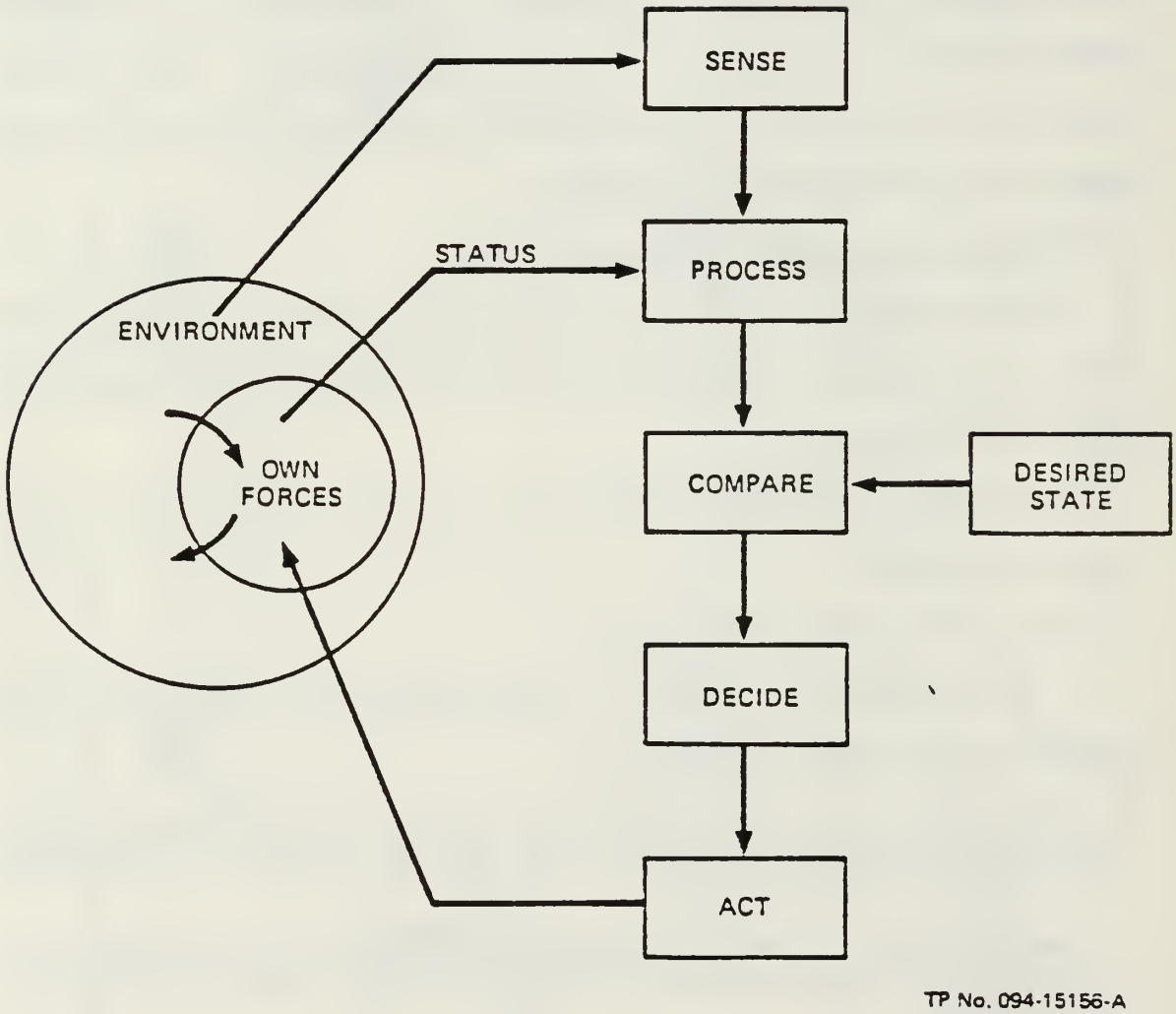


Figure 2-2 Lawson's C3 Model

the predicted results are compared against a desired outcome. Those alternatives that help achieve the desired result are considered for possible execution. Those alternatives which do not meet or assist in obtaining the final desired state are discarded and not continued in the decision cycle. Thus, this step is an aid to the decision maker, reducing the set of possible alternative actions.

6. Decide

Probably the least understood of the headquarters cycle steps, this is where the actual decision takes place to select a given course of action, to develop a plan of action. Of all the alternatives remaining, the "best alternative" is chosen by the decision makers. This process is contingent on the particular headquarters and on the decision makers themselves. Due to the complexity of the actual decision process, there are no direct measures on the quality of the decision. Rather, the quality of the decision made is reflected in the overall effectiveness of the headquarters. However, measurable, tangible entities result from this step and the development of a plan that includes the mission objective, the assets required, and the time-frame to accomplish the mission.

7. Direct

The resultant plan is communicated to the subordinate commanders. The directions given in the plan can be evaluated as to the extent that the headquarters correctly stated the environment and the required mission. An ordinal value of "correct" or "incorrect" can be assigned by comparing the following components with their respective "ground truth":

a. the mission statement

b. the operational boundary or environment

c. the assigned assets

d. the time-frame to accomplish the mission

D. HEAT MEASURES

If HEAT was applied in its entirety, across the full spectrum of the headquarters, in all of its roles and functions, then the HEAT application would yield six overall measures and 135 diagnostic measures of process or effectiveness. Of these 141 individual measures only two can be considered true measures of effectiveness. [Ref.1:p.3-2]

1. Percentage of intended period that plan is not in force.
2. Percentage of control cycles for which the control mechanism is: excellent, adequate, or inadequate.

The 135 diagnostic measures are separable into the six headquarters process steps of the HEAT headquarters cycle (reminder, HEAT did not consider the compare function as a separate step). These measures are, also, separable into six data categories synonymous to the major functional components of a headquarters plan (see Figure 2-3).

Applying all of these measures in a single evaluation would be an immense task, involving large amounts of data and data-gatherers. As such, the normal HEAT application focuses on scoping the 141 measures down to a reasonable and doable number [Ref.1:p.3-1]. This reduction in the number of measures is contingent on the application and the headquarters involved but more specifically on what measures the application will support based on the headquarters Command and Control system being used.

E. HEAT PROCESS

Implementation of the HEAT process is far from automatic [Ref.4:p.5]. The first, and most important, task is of defining the application and the

TRADITIONAL ACTIVITIES AND DATA CATEGORIES	HEADQUARTERS PROCESS STEPS						
	MONITOR	UNDERSTAND	PLAN		DIRECT		INFORM
			ALTERNATIVE ACTIONS	PREDICT CONSEQUENCES	SPECIFY AND/OR COORDINATE	COORDINATE	
Personnel		20,21	41,42,43	66	75-78,79,84	89	111,120,128,129
Intelligence							128,129
Own intelligence assets	1,2,3	22,23	44,45,46	67	75-78,80,85	90	95,100,112,121
Enemy units	2,3,4,6						104,106
Enemy special weapons units	2,3,5,7						105,107
Enemy objectives		12,13					110
Assets assigned to objectives		14,15					110
Assets in reserve		16,17					110
Enemy timetable		18,19					110
Operations							128,129
Combat units	1,2,3	24,25					94,99,113
Support units	1,2,3	24,25					96,101,113
Overall theater operations plans			47,49,51	68	75-78,81,86	91	122
Individual component operations plans			48,50,52	69	75-78,81,86	91	123
Units assigned, not in theater	1,2,3						97,102
Coordinating, supported or supporting units	1,2,3						98,103
Weather	8	34,35,36					108,118
Terrain conditions	9	37,38,39					109,119
Political, economic or social guidance	11	40	65	74			
					75-78,82,87	92	128,129
Logistics							
Supplies at hand		26,27	53,57,61	70			114,124
Logistic demand		28,29	54,58,62	71			115,125
Critical shortages		30,31	56,60,64	73			117,127
Transportation		32,33	55,59,63	72	75-78,83,88	93	116,126
Message center	10						
EAC	130-133						134,135

Underlined measures are measures of headquarters effectiveness.

Figure 2-3 HEAT Measures

headquarters involved. This must be accomplished prior to beginning any of the steps in the HEAT application and is critical for the success of the HEAT evaluation. Without the most through understanding of the headquarters and the interrelationship of the headquarters internal structure (in regards to the particular application), one can not hope to capture the true effectiveness of that organization.

This is where the user or headquarters must take an active part in the evaluation. The headquarters will provide insight as to which areas of the headquarters process it wants evaluated, indicate where in the internal organization those processes occur, and provide the observers with the access required to obtain any necessary data. In other words, the user or headquarters must have a thorough understanding of the HEAT process, just as the observers must have a thorough understanding of the headquarters.

1. Defining the Problem

The first step in the HEAT process, and the most important, is to define the purpose of the study and to determine the focus of the application. If sufficient time and effort was spent with the preparation work (as detailed in the previous paragraphs), the first portion is almost complete. There may need to be some refinement in the actual wording of the purpose to more closely align it with that of HEAT but it should be relatively straight forward. These will enable concentration into the more difficult portion of determining the focus of the evaluation.

Focusing the application will determine the overall level of effort required and the kind of trade-offs that need to be made against the resource constraints. It will lead to the "first cut" of HEAT measures to be applied. This first-cut will

be based primarily on the purpose of the application and will lead into the second step of the HEAT process, scoping the problem.

2. Scoping the Problem

During this phase, the task is cut down to a manageable size that is still broad enough to provide some response to the purpose of the study. Here, the user (headquarters) will formally look into the organization, its functions of interest, and the functions that can be assessed with the available resources. This process consists of four steps: [Ref.1:p.4-3]

* characterize the organization to be studied
* identify functions for study
* map the organization onto the functions
* train the observers

a. Understand the Organization

This step starts with the internal relations identified by the headquarters during the preliminary planning. The internal structure as presented by the organization is verified but more importantly any changes to the structure is annotated. Additionally, the so-called informal organization (the way the organization really works) is documented. Both of these must be captured for the HEAT application to be successful.

b. Identify Functions for Study

This process involves a collection and a refinement of the primary objectives identified during the problem definition phase. Here, the specific exercise or evaluation objectives are identified (see Figure 2-4).

c. Map the Organization onto the Identified Functions

The purpose of this approach is to outline to the observation team how many events are likely to involve each of the staff directorates (of the formal

- VALIDATE HQ ORGANIZATION
- PREPARATATION OF PLANS FOR CONVENTIONAL FORCES
- PROCEDURES FOR MANNING, DEPLOYING, AND OPERATING
- COMMAND RELATIONS BETWEEN A CINC AND XYZ HQ
- COMMUNICATIONS CONNECTIVITY BETWEEN CINC AND XYZ HQ
- C^2 AND COORDINATION OF CONVENTIONAL AND UW OPERATIONS
- COORDINATION OF INTELLIGENCE ASSETS
- C^3 COUNTERMEASURES (C^3CM)

Figure 2-4 Notional List of Exercise Objectives

structure). This mapping (an example presented in Figure 2-5) will be useful in determining the amount of observers required to collect the data and help to scope down the HEAT measures to be evaluated.

The last portion of this step, is the identification of the events which will support the various objectives. This will be useful in determining if the event provides enough data to be observed and in scheduling the limited resources available.

d. Training

Training is essential if the application is to be successful. Individual observers should be familiar with both the organization under study and the concepts and application of HEAT. In addition, the observers should be familiar with the concept of a control cycle and its application to that of the headquarters cycle. With these understandings, it is much more likely that the observers will observe and record significant data.

In summary, a series of matrices (Figure 2-5) and time lines (Figure 2-6) should have been prepared to assist in the determination of what is doable given the limited resources. When concluded, the observer team should understand: [Ref.1:p.4-9]

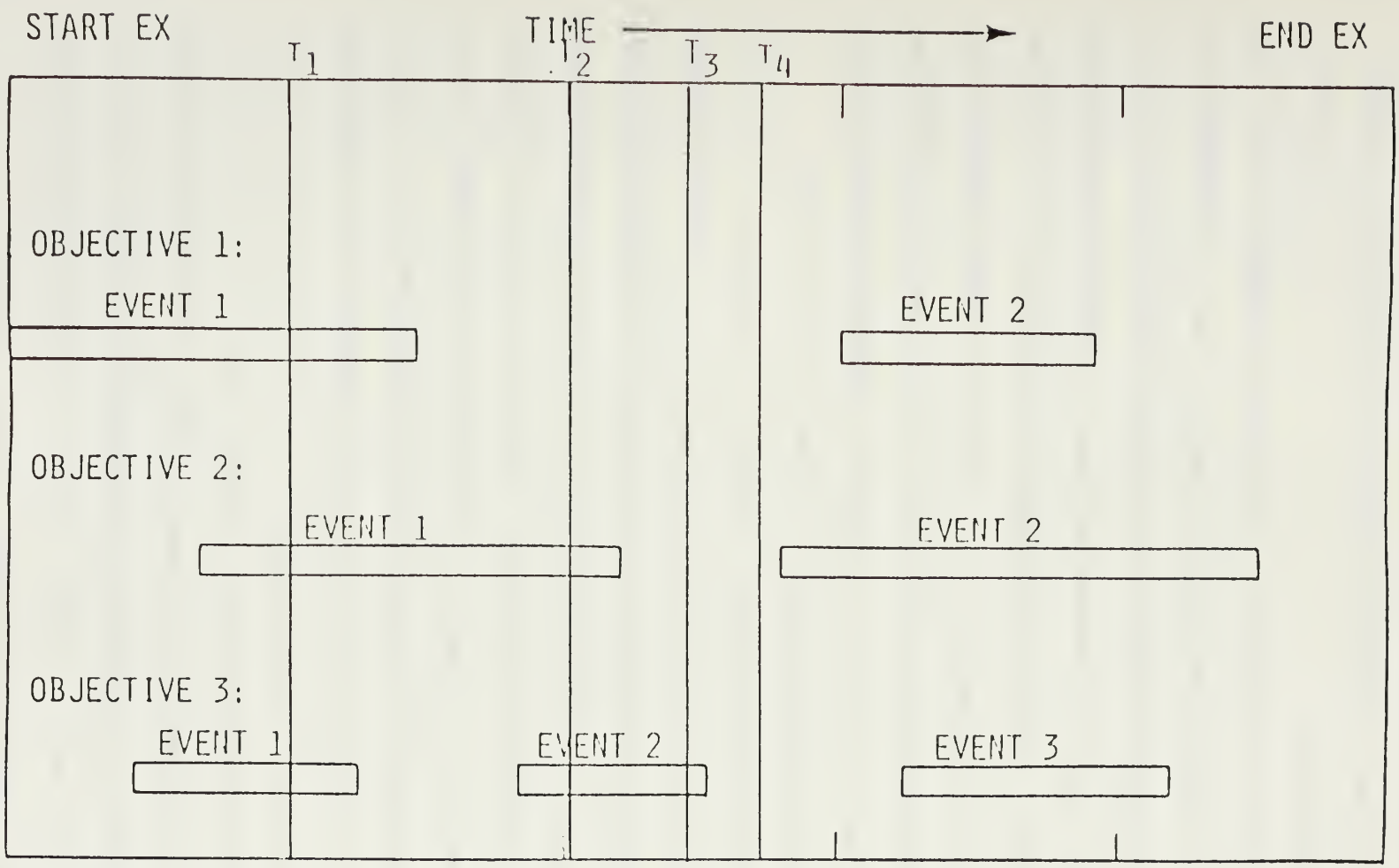
* what the problem is
* what the organization of the HQ being studied looks like
* what functions of the organization are to be tested
* where and when the actions will take place
* how many observers will be necessary to do the job

3. Plan the Approach

This phase is concerned with the details of the application. This includes the placement of the observers, the identification of the MOE's, deciding on an

	COMMANDER	CHF OF STAFF	J-1	J-2	J-3	J-4	J-5	C45
Validate HQ Organization	X	X	X	X	X	X	X	X
Preparation of Plans for Conventional Forces	X	X			X	X	X	
Procedures for Manning, Deploying, and Operating	X	X	X		X	X	X	
Command Relations between a CINC and XYZ HQ	X	X			X			
Communications Connectivity between CINC and XYZ HZ	X	X			X			X
C^2 and Coordination of Conventional and UW Operations	X	X			X			
Coordination of INTEL Assets	X	X		X				
C^3 Countermeasures (C^3CM)	X	X		X	X			

Figure 2-5 Organization/Objectives Matrix



SOURCE: MASTER INCIDENT LIST (MIL) OR MASTER EVENTS SEQUENCE LIST (MESL)

Figure 2-6 Exercise Events Timeline

approach to be taken, developing command standards, and developing a collection plan.

a. Placing Observers

Placement of the observers is a crucial step in obtaining useable data. The organization/function matrix will be of assistance during this step. There may be physical limitations imposed by the organization being evaluated, but if at all possible, have observation teams of two people for each of the organizational cells being studied. In addition, one or more roving observers will be required depending on the size and geography of the organization. These roving observers will assist the individual observation teams by transferring information between the respective teams. In addition, this observer would gather more a subjective impression of the overall organization.

b. Selection of HEAT Measures

Now that one has an understanding of how the Headquarters is organized, how it accomplishes its mission, what functions within the organization are going to be observed, and what the evaluation objectives are, one can now identify the specific HEAT measures to be evaluated. Since the HEAT measures are specific for a given Headquarters process and function, it is a simple matter to select appropriate measures once the function to be observed is identified. The specific measure can be isolated/narrowed even further by identifying the required data and verifying that that data can be collected.

c. Decide on a Approach

This step is concerned with what type of data to collect and how that data is to be collected. It also takes care of some of the logistics needs of the observation teams, such as: lodging, subsistence, access to operational areas, travel, and distribution of collected data. Data can be collected in many ways:

collect everything, collect in random cycles, or collect in prearranged cycles. Regardless, the sources of data must be identified. Some examples of possible sources are:

* briefing charts
* messages
* status reports and briefings
* maps and photographs
* telephone and radio logs or conversations
* computer printouts
* letters and memos

d. Command Standards

While this step is necessary for the scoring of the collected data, it in itself is not necessary for the actual collection. However, having command standards (Figure 2-7) at the beginning will help identify to the observers what is acceptable limits for a given process. Regardless, to be truly acceptable, these standards should at the very least be concurred to by the Headquarters if not jointly developed.

e. Develop a Collection Plan

The Collection Plan (Figure 2-8) is where all the previous efforts are documented. This is not a static document and it may (and probably should) undergo many revisions before a final collection of the data is performed. The collection plan will function as a ledger of all past activities and the reasons for them. If kept current, it will prove to be quite useful in documenting any changes in the final report. (This report format and premises of a current Collection Plan is the basis for Chapter IV).

Key: X Command standards required
+ Standards optional: default value is 0
1 Standards optional: default value is 100%
A Optional for average, not applicable to single score

MEAT Measures	Units of Raw Scores	Standards Needed: For raw scores: Minimum window	Desired accuracy	Good/adeq. acc'y	Acceptable delay	For normalized scores: Maximum acceptable (minimum desired+) Delay	Error	Time	Queries	Percent	Score for: Contingency	Adequate	Marginal	Incorrect	Not made
Overall															
A	Percent not in force									1					
B	Percent excellent, adequate, inadequate										X				
C	Time to plan							X							
D	Time to adapt							X							
E	Time to adjust							X							
F	Percent inadequate	X								1					
Monitor															
1	Percent inaccurate		X							1					
2	Percent late				X					1					
3	Percent not queried									1					
4-5 (location)	Percent good, adequate			X								X			
4-5 (other)	Percent incorrect									1					
6-7	Percent incorrect by > 1									1					
8,9,11	Plans changed									X					
10	Delivery time					X									
Understand															
12,14,16,18	Percent correct, conting., incorr.										X				
13,15,17,19	Percent not made									1					
Even, 20-32	Percent corr., cont., incorr., none										X			+	X
Odd, 21-33	Percent inaccurate		X							1					
34,37,40	Plans changed									X					
35,38	Percent incorrect									1					
36,39	Error in time of change						X								
Plan															
41,44,47-48,53-56,65	Alternative actions planned?									A					
42,45,49-50,57-60	Planners												X		
43,46,51-52,61-64	Alternatives examined												X		
66-74	Percent correct, conting., incorr.										X				

Figure 2-7 Command Standards

Key: X Command standards required
+ Standards optional: default value is 0
1 Standards optional: default value is 100%
A Optional for average, not applicable to single score

HEAT Measures	Units of Raw Scores	Standards Needed: For raw scores: Minimum window	Desired accuracy	Good/adeq. acc'y	Acceptable delay	For normalized scores: Maximum acceptable (minimum desired+) Delay	Error	Time	Queries	Percent	Score for Contingency	Adequate	Marginal	Incorrect	Not made
Direct															
75-78	Contradiction?									A					
79-83	Time to issue directive					X									
84-88	Queries received								X						
89-93	Time to issue adjustment					X									
Inform															
94-98	Percent inaccurate		X							1					
99-103,106-107	Percent late				X					1					
104-105 (location),108-109	Percent good, adequate			X								X			
104-105 (other)	Percent incorrect									1					
110-119	Percent correct, conting.. (understandings)										X			+	X
120-127	incorrect, not stated (predictions)										X			+	X
128	Age of information					X									
129	Queries per addressee								X						
Special Weapons															
130	Percent miscategorized (monitor)									1					
131	Percent out of contact									1					
132	Time out of contact							X							
133	Percent out of authorized hands									1					
134	Time late of reports					X									
135	Percent miscategorized (reports)									1					

Figure 2-7 Command Standards (continued)

1.0 Problem Statement

- Objective or Objectives

2.0 Background

2.1 Headquarters to be Studied

- Organization
  - + Formal
  - + Informal
- Personnel Assigned
- C^3 System Organization
- Functions of Interest

2.2 Exercise

- Details (Dates, Location, Participants)
- Objectives
- Objectives of Interest
- Events of Interest from MIL or MESL
- Points of Interest from Exercise Plan

2.3 Resources

- No. of Observers Available
- Background of Observers
- Objectives and Events to be Worked
- Travel Money Necessary
- Locations to be Visited

3.0 Approach

3.1 Collection

- Sources of Data
  - + Manuals, Messages, Exercise Plan, Directives, Interviews, Historical Data, Interviews
  - + List of all Possible and Most Probable
  - + Objectives and Events to be Worked
- Quality and Detail of Data (All Data, Random Data, Planned Sequences of Data)
- Procedures to Set Up Automatic Distribution (Messages, Briefing Slides, Telephone Summaries, etc.)

Figure 2-8 HEAT Collection Plan Format

3.2 Observers

- Organization
  + Organization of Teams
  + No. in a Team
  + Team Reporting Structure
  + Responsibilities
- Objectives and Events to be Worked by Observers
- Assignments

3.3 Command Standards

- Identify What Types Needed
  + MOE's, Data Sheets, Sources
- Develop Early Straw Man, Iterate Approvals with User's

4.0 Timing

- Organization
  + List All Details
  + Arrange in Sequence for Accomplishments
  + Assign Times
- Suggested Topics
  Arrange Pre-Details, Deploy Advance Team, Deploy Observers, Collet Data, Arrange for Return to Base, Reduce Data Perform Analysis, Write-Up
- Construct Task-Timing Chart

5.0 Oustanding Problems

- Suggested Problem Areas:
  (Clearances, Travel, Local Travel, Food and Lodging, Courier Letters, Classified Storage, Badges, Who to Contact if Problems Occur)
- Construct a Log Book Early and Keep it Current
  + All Decisions
  + All Key Events
  + All Problems--List What, Who, and How Solved

Figure 2-8 HEAT Collection Plan Format

4. Data Collection

Upon reaching this stage of the HEAT process, most of the group's time and work has been completed, for the rest is almost mechanical in nature. There is however, one more important step that could save time and avoid complications, deploy an advance party. This advance party will take care of all the logistic and administrative items that were missed. Items that their checklist should include are:

* clearances, lodging, and local transportation for all observers
* arranging for the automatic collection of certain data
  - messages, incoming and outgoing
  - briefing slides, notes, minutes
  - telephone and radio logs
  - internal memos and letters
  - data automation products

5. Analysis and Write-up

With the multitude of data collected, it is now time to do some thing with it. One of the most useful tools in organizing the data for analysis is a time-line (refer to Figure 2-6). This time-line may be a simple listing of the chronological events or a more complicated time diagram illustrating intervals between events as well. Depending on the complexity of the evaluation, it may be desirable to have multiple time-lines, one for each function observed or one for each headquarters cell observed. Regardless of how detailed, a time-line will ease the data reduction and analysis.

HEAT also offers two other aids to data analysis. After the data is collected it is entered onto data sheets (Figures 2-9 and 2-10). These sheets identify what specific information is needed for each of the functions or

DATA SHEETS

1. Decision-Direction Data Sheet (Code D)
2. Enemy Unit Data Sheet (Code E)
3. Environment Data Sheet (Code V)
4. Friendly Unit Data Sheet (Code F)
5. Guidance Message Data Sheet (Code G)
6. Information Report Data Sheet (Code I)
7. Outgoing Queries Data Sheet (Code Q)
8. Prediction Data Sheet (Code P)
9. Special Weapons Data Sheet (Code W)
10. System Operability Data Sheet (Code S)
11. Understanding (External) Data Sheet (Code X)
12. Understanding (Own Forces) Data Sheet (Code U)

Figure 2-9 HEAT Data Sheets

CATEGORY: (check one) Combat Units [ ] Intelligence Assets [ ] Support Units [ ] Assigned, Not in Theater [ ] Coordinating etc. [ ]

MEASURES: 1-3,94,99 1-3,95,100 1-3,96,101 1-3,97,102 1-3,98,103

SOURCE TYPE: (check one) Headquarters [ ] (Code P) Outgoing Report [ ] (Code R) Ground Truth [ ] (Code T)

ORGANIZATION OBSERVED _____ FROM _____ TO _____ CYCLE _____

SOURCE DOCUMENT _____ OBSERVER _____

UNIT[1]	LOCATION/TIME[2]	STATUS[3]/TIME[2]	PLANS/TIME[2]	MODE[4]/TIME[2]	REMARKS

NOTES:

1. List all known units in th a category.
2. Headquarters data: time of receipt; report data: time of transmission; ground truth: time of event or of report.
3. Status: strength; logistic supplies on hand (by class); critical logistic shortages; in contact or not (combat units); projected requirements for personnel, logistics (by class), ending anticipated critical shortages.
4. Modes: Offensive, Defensive, Committed Reserve, Uncommitted Reserve.

SCORING SHEETS: O,F

Figure 2-10 Example HEAT Date Sheet

measures of interest. This process helps to reduce data from a variety of sources to only a few separate data sheets (a few hundred at times) referencing the original document. The next reduction of data is accomplished thru the process of transcribing certain information from the data sheets to the HEAT score sheets (Figures 2-11 and 2-12). These data sheets and score sheets are cross matched with each score sheet identifying which data sheets are needed to complete it and vice versa. The only additional input needed for the score sheets is the command standards. These standards, as mentioned earlier (Figure 2-7), are needed to score what the organization views as acceptable limits or variation.

Once all the analysis is conducted, the final report can be assembled. This report, format presented in Figure 2-13, should include a brief description of HEAT, a description of the organization studied, a chronology of exercise events, and the data analysis along with the conclusions and recommendations.

SCORING SHEETS

1. Alternative Actions Scoring (Code A)
2. Decision (Direction) Scoring (Code D)
3. Enemy Location Scoring (Code L)
4. Enemy Monitor/Report Scoring (Code M)
5. Enemy Unit Timeliness Scoring (Code E)
6. Environment Report Scoring (Code V)
7. External Conditions Scoring (Code K)
8. Guidance Message Scoring (Code G)
9. Headquarters Cycle Scoring (Code H)
10. Information Report Scoring (Code I)
11. Own Timeliness Scoring (Code F)
12. Own Unit Accuracy Scoring (Code O)
13. Plan Quality Scoring (Code Q)
14. Prediction Scoring (Code P)
15. Report (Prediction) Scoring (Code T)
16. Report (Understanding) Scoring (Code R)
17. Special Weapons (Category) Scoring (Code C)
18. Special Weapons (Perception Scoring) (Code W)
19. Understanding (Enemy) Scoring (Code X)
20. Understanding (Implementation) Scoring (Code U)
21. Understanding (Operability) Scoring (Code S)

Figure 2-11 HEAT Score Sheets

CATEGORY: (check one) ☐ Combat Units ☐ Intelligence Assets ☐ Support Units ☐ Assigned, Not in Theater ☐ Coordinating etc.

MEASURES: 1,94 1,95 1,96 1,97 1,98

SUBCATEGORY: (check one) ☐ Location ☐ Status ☐ Plans ☐ Mode

ORGANIZATION OBSERVED _____ FROM _____ TO _____ CYCLE _____ ANALYST _____

DATA SHEET:	FT	USER	FP		USER	FR	
DATUM: UNIT	TRUE STATE	ACCEPTABLE PERCEPTIONS	PERCEIVED STATE	PERCEPTION ACCEPTABLE? Y/N	ACCEPTABLE REPORTS	REPORTED STATE	REPORT ACCEPTABLE? Y/N
(n) Number of units				(a) Number of Ns			(b) Number of Ns

MEASURE	RAW SCORE	MAXIMUM ACCEPTABLE VALUE	DESIRED VALUE	NORMALIZED SCORE ($0 \leq N \leq 1$)
1	$R = 100\ a/n =$	$M =$	$D =$	$N = (M - R)/(M - D) =$
94-98	$R = 100\ b/n =$	$M =$	$D =$	$N = (M - R)/(M - D) =$

Figure 2-12 Example HEAT Score Sheet

A. INTRODUCTION

- Problem to be studied
- Purpose of the exercise
- Overview of the analysis

B. HEAT OVERVIEW

C. DESCRIPTION OF THE XYZ HEADQUARTERS PROCESS CONCERNING THE EXERCISE PURPOSE

- XYZ Headquarters Command Relationships to Superior and Component Organizations
  + Formal
  + Informal

  XYZ Headquarters Organization
  + Formal
  + Informal

- Process Information Flow

  + in terms of the generic headquarters process (brief)
  + in actuality (as much detail as necessary to serve purpose of analysis document)

D. NARRATIVE AND CHRONOLOGY

- Time-line of events
- Narrative focusing on patterns of stimulus-decision-response-outcome

E. ANALYSIS

- XYZ Headquarters Processes and Effectiveness

  + Monitoring

    - Data Base Accuracy
    - Data Base Timeliness
    - Queries for/on reports

  + Understanding

  + Planning

    - Developing Alternatives
    - Developing Predictions

Figure 2-13 HEAT Report Format

+ Direct (Coordinate)

  - Compliance of coordination actions with higher guidance
  - Timeliness of coordination actions

+ Query-Response

  - Queries on XYZ Headquarters messages
  - XYZ Headquarters responsiveness to queries for information

- XYZ Headquarters opportunities vis-a-vis original problem statement

F. CONCLUSIONS AND RECOMMENDATIONS

Figure 2-13 HEAT Report Format (continued)

III. HEADQUARTERS MILITARY AIRLIFT COMMAND (HQ MAC)

A. INTRODUCTION

How does the Military Airlift Command accomplish its mission? For that matter how does it receive its mission requirements, especially for any given contingency. These questions will be addressed in the next few pages.

The Military Airlift Command's mission is varied and complex. As a Specified Command, it is responsible for the air transportation of both cargo and troops. This includes both long haul/trans-oceanic movement and also, intra-theater movements. As described in Air Force Regulation 23-17 its mission is one of support to the Theater Commanders.

> "The overall mission of MAC is to maintain, in a constant state of readiness, the military airlift system and other systems and services to perform all tasks assigned by the Joint Chiefs of Staff (JCS) and appropriate JCS and Air Force guidance documents." [Ref. 5:p.1-3]

However, it has a dual role. MAC must not only transport the needs (people, equipment, etc.) of the theater commanders, but also, their own requirements. Many times MAC must transport additional support equipment so that it can accomplish its primary goal of support to the theater commanders. It must ensure that all the necessary ground equipment is at the receiving air field to enable their self to accomplish their mission. As such, MAC has the dual role of being a supporting CINC and a supported CINC. This complexity of a dual role plays an important part in MAC's interface with the Joint Deployment Agency (JDA) and the Joint Deployment System (JDS).

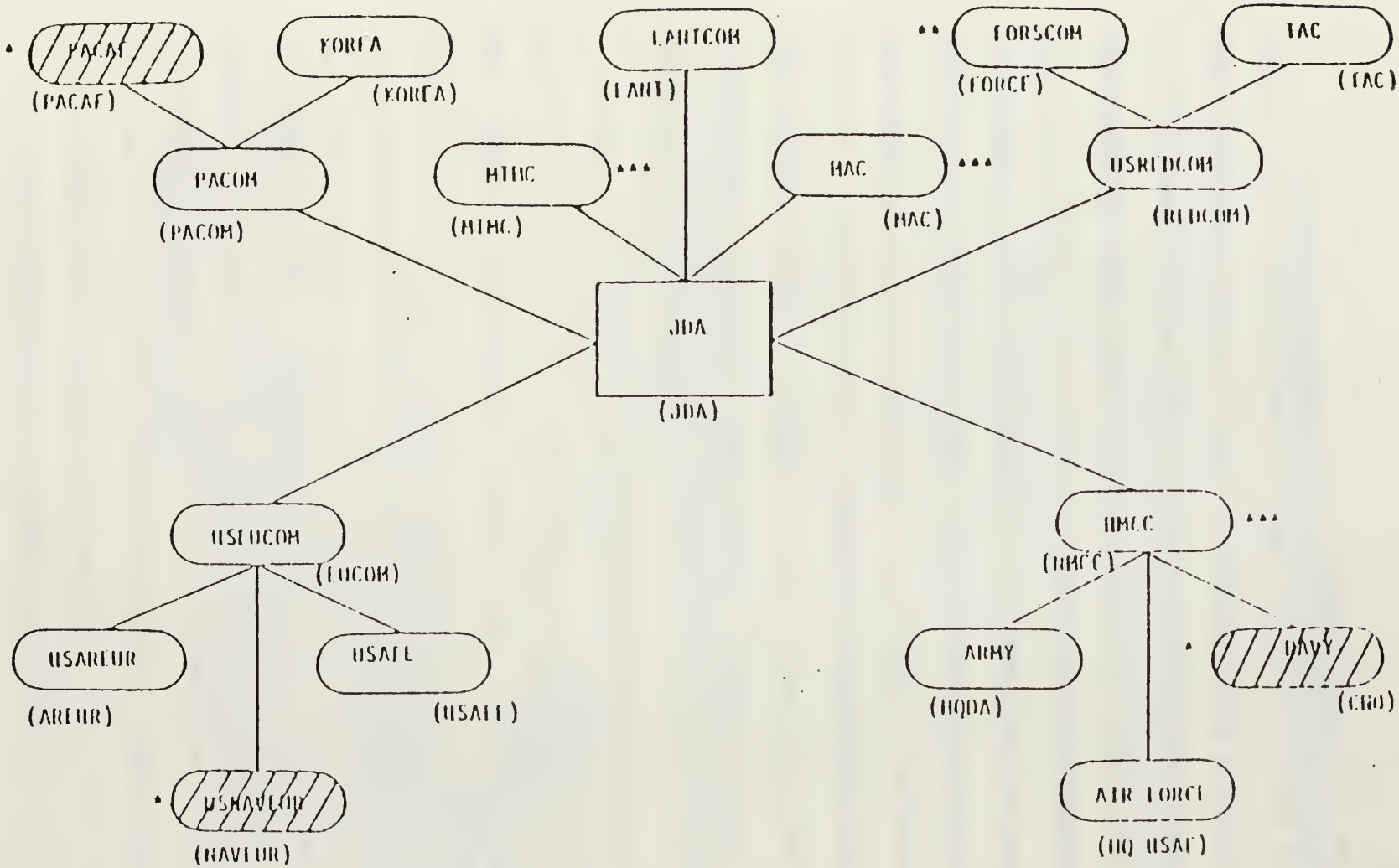
B. THE JOINT DEPLOYMENT SYSTEM

The Joint Deployment System (Figure 3-1) was developed to more efficiently handle the immense task of support to theater commanders especially during times of crisis. At the core of the JDS is the planning cycle which refines the operational plan (OPLAN) and produces Timed-Phased Force Deployment Data (TPFDD) for the OPLAN. This TPFDD sets the initial data base as to which units are to be employed, which units require deployment, along with an estimate of the transportation requirements and a priority code to indicate the order or sequence of their movement. A brief look at this planning cycle is in order before preceding to look at the actions taken during a contingency situation.

The planning cycle begins when the supported commander produces a plan concept. This plan concept is in turn used to initiate a basic TPFDD for submission to JDA for review and refinement. The submitted TPFDD will include as much of the following information as possible. [Ref.6:p.4-2]

- types of forces required
- type of unit, movement data (TUCHA) ****
- providing organization
- proposed routing
- proposed origin
- proposed ready to load date at origin
- earliest and latest arrival dates at port of debarkation
- desired port of debarkation
- required delivery date at debarkation

The review process is accomplished in two phases. Phase 1 validates and completes the supported commander's TPFDD to permit more accurate evaluation of transportation requirements and the scheduling of movements [Ref.6:p.4-3]. This is accomplished by identifying the actual force units to meet force requirements, any non-unit personnel or augmentation requirements, and the actual movement characteristics (as listed above) of these requirements. The



* JDS NOT INSTALLED
** JDSIP MODULE ONLY
*** DUPLICATE OF JDA DATA BASE
( ) WIN SITE NAME FOR TELNET/TCP USE

Figure 3-1 Joint Deployment System Configuration

supported commander and the supporting commander resolve any variations or changes and identify any shortfalls in meeting the requirements. All of the following actions are taken during the Phase 1 validation. [Ref.6:p.4-6]

- refinement and completion of the TPFDD
- designation and validation of specific forces
- identifies force shortfalls, coordinates resolution if possible
- determine capability to fill non-unit personnel or augmentation requirements
- identifies non-unit personnel shortfalls
- establishes dates for the supporting commands to finalize movement tables and sets a date for the next review, Phase 2.

Phase 2 verifies that the transportation requirements are within the capabilities of the Joint Services. All transportation difficulties are resolved and any shortfalls in force structure are accounted. Upon resolution of all shortfalls the TPFDD is finally ready to be included in the OPLAN and loaded as the JDS data base for that OPLAN. This data base is the basis of all transportation requirements if this OPLAN is exercised.

The JDS data base can be quite useful during a crisis situation. As it contains a basis to begin planning, it is used throughout the Crisis Action System (CAS) planning cycle. This cycle is divided into six phases [Ref.6:p.6-1].

(1) Phase 1 - Situation Development.
(2) Phase 2 - Crisis Assessment.
(3) Phase 3 - Course of Action Development.
(4) Phase 4 - Decision.
(5) Phase 5 - Execution Planning.
(6) Phase 6 - Execution

The JDS data base plays only a minor role in the first two phases of the CAS cycle. Phase 1 is the identification of a possible crisis situation and the reviewing of available plans or options. Here, the JDS data base is used for problem analysis and to determine if there exists an OPLAN and TPFDD for the possible crisis. During Phase 2, a crisis is actually declared. In this phase the

JDS data base continues as a problem analysis tool but, more emphasis is placed on the impact of execution of the OPLAN(s).

Phase 3 is the first operational use of the JDS data base. Upon issuance of the Warning Order (issued at the end of Phase 2), the Joint Deployment Agency starts preparing a deployment estimate to include a tentative C-day and L-hour. This can be accomplished in three ways. First, if an existing OPLAN covers the situation JDA will load its associated TPFDD for immediate update and refinement. Second, if the appropriate OPLAN requires modification, the JDS data base has been modularized to ease any modification. The last and most time consuming case is if no OPLAN exists. Here, the procedures identified in the JDS planning cycle (OPLAN and TPFDD refinement) need to be accomplished. Once the initial requirements are identified by the supported commander, they are entered into the data base for refinement under this phase. The validation (the review process mentioned in preceding paragraphs) is not conducted per se but, at the expense of probably more transportation shortfalls. These shortfalls are a direct result of not enough time to enable the more thorough review afforded when a plan is not prepare in a crisis situation.

Again, during Phase 4 the JDS data base is not used extensively. After the update to the data base is accomplished in Phase 3, JDA provides this information in a capsulized form, along with a tentative C-day/L-hour to the JCS. The JCS will then issue an Alert Order which will initiate Phase 5.

The Execution Planning, Phase 5, begins upon receipt of the proposed C-day/L-hour in the Alert Order. JDA will immediately coordinate with the supported and supporting commanders and recommend a firm C-day/L-hour. At the same time, JDA will accomplish and coordinate any last minute updates to the data base, focusing on the first six days of air movement and the first 30 days

for surface movements, based on earliest arrival date (EAD). JDA will continue to update the data base in one-day increments for those C+5 and C+29 day air and surface requirements.

Extensive participation by the supporting commanders is required during this phase. The procedures that the Military Airlift Command (MAC) follows will be discussed in detail. However, keep in mind that similar actions are taken by the Military Traffic Management Command and the Military Sealift Command for surface movements.

Upon notice from JDA that the first six days of the data base is ready, MAC will pull or extract the first five days of air movement requirements, based on latest arrival date (LAD). (Reminder; JDA accomplishes their update by EAD, this could possibly cause some conflict). These requirements are grouped by ONLOAD/OFFLOAD channels (scheduled air routes). MAC will then develop schedules to meet the requirements over these onload-to-offload channels. MAC will, as soon as possible, send the first two days of schedule back to the JDS. This will be followed by the remaining three days. This will enable JDS to assign specific units of payload, by the requirement's priority of movement, to the scheduled carrier. This process will repeat itself in 1-day increments upon notification from JDA that the next days movements are available for scheduling.

The last phase, Phase 6 - Execution, is initiated when the Execute or Deployment Order is issued. Once again the JDS data base has a limited role. The actual Execution Phase is the direction and monitoring of previously planned movements. Thus, there is a constant transition between these last two phases. While one day's movements are being executed, one-plus-five day's requirements are being scheduled. In fact, in a changing situation where the original OPLAN is

no longer valid, returning to Phase 3 and the current day's movements may be required.

As described, one can see the benefits of this system as a management aid, especially during times of conflict. Briefly, the JDS is a data base to help the supported commanders identify their requirements for a given OPLAN. To obtain this data base, the supported commander must develop Time Phased Force Deployment Data or TPFDD. This TPFDD goes through a review process to decrease the possibility of transportation shortfalls (this usually means a decrease in requirements at this stage), and once finalized is the basis of support for that OPLAN. When a crisis develops, planning is expedited if an OPLAN and TPFDD exist. Regardless, crisis planning is accomplished in the six phases of the Crisis Action System (CAS). Throughout, CAS planning relies heavily on the JDS data base (as always the data base is only as good as its last update, it therefore relies heavily on the CINC's for update). Even during times of transition between OPLANs, the JDS data base can be used to more efficiently and quickly identify new requirements and schedule their movements.

C. THE MILITARY AIRLIFT COMMAND

The previous section described how MAC received its movement requirements and very briefly how MAC interfaced with the Joint Deployment System (JDS). Now, we will take a more in depth look at how MAC schedules aircraft to meet these requirements and how MAC responds to a crisis situation.

MAC is an active participant in the JCS Crisis Action System (CAS). In response to a more formalized procedure to support the CAS, MAC formed the Headquarters MAC Crisis Action Team (CAT). This CAT provides for the

interface between JCS requirements and the scheduling of those requirements. As such, the CAT is the MAC focal point during a crisis.

> The Headquarters MAC Crisis Action Team (CAT) provides CINCMAC expedited staff action and a single focal point within the MAC staff for the execution management of MAC forces during time-sensitive operations. Additionally, the Headquarters MAC CAT serves as a single staff activity for providing required critical information to the JCS, other tasking agencies, and subordinate MAC organizations.
>
> The Headquarters MAC CAT acts as CINCMAC's executive agent. Instructions issued by the MAC CAT through the MAC CAT Director are directive upon the MAC staff and all MAC forces. [Ref.7:p.1-1]

The MAC CAT (Figure 3-2) is organized in a layered approach with only the Prime CAT being immediately notified in a crisis situation. The senior airlift controller will then recommend to the CAT Director the addition or deletion of CAT members based on the nature of the crisis [Ref.7:p.2-2]. These additional personnel may include the Special CAT, task-oriented support cells, or any other designated individuals. The Prime CAT will be the principal agency through which command guidance is passed for implementation [Ref.7:p.3-1]. For closely held operations, the Prime CAT may be the sole members responsible for developing MAC's course of action. Composition of the MAC CAT is diagramed in Table 3-1.

1. The Prime Crisis Action Team

The Prime CAT will focus on airlift concept development, coordination with JCS, Services and supported commands, as well as monitoring the execution of airlift operations. The Prime CAT will be the principal agency through which command guidance is passed for implementation. [Ref.7:p.3-1]

a. The CAT Director

The CATD acts as CINCMAC's executive agent. All CAT messages are released under his authority. His responsibilities are: [Ref.7:p.4-3]

(1) Ensure the proper response to emergency requirements

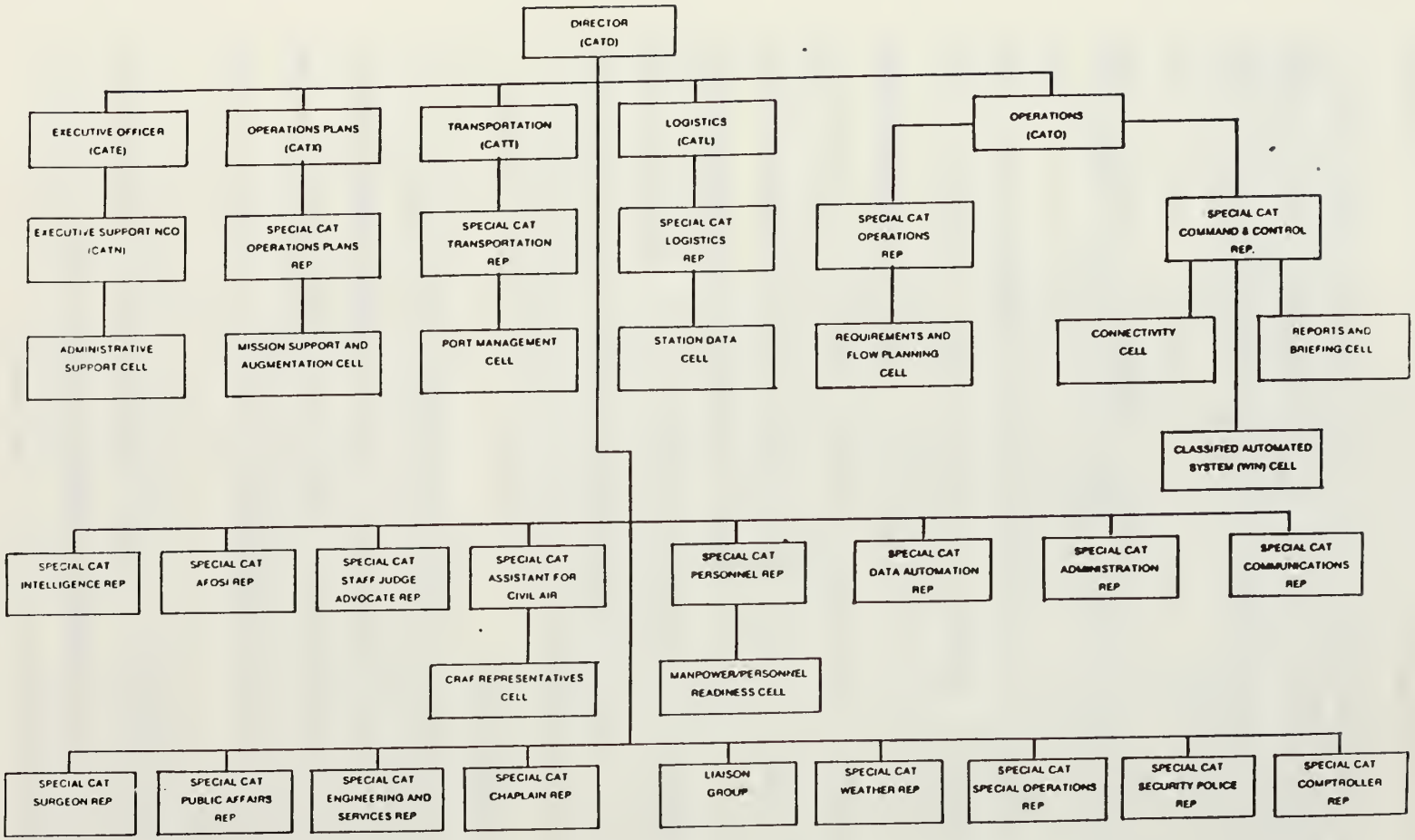


Figure 3-2 HQ MAC Crisis Action Team Organization

TABLE 3-1: HQ MAC CAT MANNING/SOURCING

Prime CAT:

Director (CATD)	Operations (CATO)
Executive Officer (CATE)	Operations Plans (CATX)
Executive Support NCO (CATN)	Transportation (CATT)
	Logistics (CATL)

Special CAT:

Intelligence	Communications
Security Police	Surgeon
Comptroller	Public Affairs
Engineering and Services	Weather
Chaplain	Personnel
Assistant for Civil Air	AFOSI
Administration	Data Automation
Special Operations	Staff Judge Advocate
Operations	Command and Control
Transportation	Logistics
Operations Plans	Liaison Groups
	(Army,Navy,Marine,TAC,SAC,ESC, AFRES,and ANG as required)

Task-Oriented Cells:

Support Cell	Responsible to Special CAT
Requirements and Flow Planning	Operations Rep
Manpower/Personnel Readiness	Personnel Rep
Mission Support and Augmentation	Operations Plans Rep
Station Data	Logistics Rep
Port Management	Transportation Rep
Connectivity	Command and Control Rep
Reports and Briefing	Command and Control Rep
Classified Automated System (WIN)	Command and Control Rep
Administrative Support	"Prime CAT Exec (CATE)"
CRAF Representatives	Assistant for Civil Air

(2) Ensure tasks assigned to MAC are accomplished

(3) Ensure CINCMAC and staff are informed of all critical information impacting the Command

(4) Serve as the primary point of contact for JCS, Air Force, supported CINC, and MAC numbered Air Force Battle Staff/CAT directors.

b. The CAT Executive Officer

The CATE serves as the executive officer and the administrative officer for the CATD. As such his duties include the screening of incoming/outgoing messages, maintaining the CAT message file, and provide administrative support as required.

c. The CAT Executive Support NCO

The CATN is the chief administrative clerk for the MAC CAT. He ensures that all needed administrative support is available.

d. The CAT Operations Officer

The CATO assists the CATD in developing MAC courses of action. He serves as primary contact and director of all MAC Air Force operations. He is responsible for directing and supervising the activities of the Special CAT Operations and Command and Control representatives to include determination of airlift requirements, flow planning, airlift taskings, emergency action procedures, communications connectivity requirements, and reports and briefings. He is also responsible for consolidating the daily situation report (SITREP). [Ref.7:p.6-2]

e. The CAT Operations Plans Officer

The CATX is responsible for accomplishing the required emergency action procedures. In addition, he provides the required information applicable to existing support plans.

f. The CAT Transportation Officer

The CATT is responsible for Airlift Concept Development in relation to the aerial port. He monitors aerial port manpower and equipment resources and directs relocation of assets as appropriate.

g. The CAT Logistics Officer

The CATL is responsible for the maintenance and supply support for the airframes and aerial ports.

2. The Special Crisis Action Team

The Special CAT encompasses most functional areas within the headquarters. Special CAT members serve as the direct liaison between the Prime CAT and their assigned functional areas. It should be emphasized that Special CAT members do not work in isolation. They are expected to call on members of their functional area staffs to assist them as required. [Ref.7:p.3-2]

3. The CAT Support Cells

Task-Oriented Support Cells (Figure 3-3) combines expertise from across the MAC staff into specific task-oriented teams. Cell composition should be reviewed frequently by cell team chiefs to ensure the most effective and efficient manning is assigned to conduct the detailed staff work required. [Ref.7:p.3-2]

a. The Requirements and Flow Planning Cell

This cell analyzes movement requirements and the airlift capability to meet the requirements. They are responsible to prepare a flow plan (airlift schedule).

CELL	CAT OPR	TEAM CHIEF	SOURCING (INCLUDES TEAM CHIEF) (1)
REQUIREMENTS AND FLOW PLANNING	SPECIAL CAT OPERATIONS REP	DOOM	DOOM 1 · DOT 1 · TRKS 1 · XP 1 · XPW (2) 1 · XOS (3) 1
MANPOWER/PERSONNEL READINESS	SPECIAL CAT PERSONNEL REP	DPXX	DPXX 2 · XPMPC 1 · XPM (4) 1 · XOR (4) 1
MISSION SUPPORT AND AUGMENTATION (5)	SPECIAL CAT OPERATIONS PLANS REP	XOX	XOX 2 · DOCSA 1 · LGX 2 · TRX (6) 1 · XPM (4) 1
STATION DATA	SPECIAL CAT LOGISTICS REP	LGSF	LGSF 1 · DOVF 1 · DE 1 · TR (6) 1 · XPW (2) 1
PORT MANAGEMENT	SPECIAL CAT TRANSPORTATION REP	TRX	TR 3
CONNECTIVITY (7)	SPECIAL CAT COMMAND AND CONTROL REP	DOCW	DOCW 1
REPORTS AND BRIEFING	SPECIAL CAT COMMAND AND CONTROL REP	DOC	DOCB 1 · DOCR 1
CLASSIFIED AUTOMATED SYSTEM (WIN)	SPECIAL CAT COMMAND AND CONTROL REP	DOCCW	MAC STAFF NCOs AS REQUIRED
ADMINISTRATIVE SUPPORT	EXECUTIVE OFFICER (CATE)	EXECUTIVE SUPPORT NCO (CATN)	MAC STAFF NCOs AND SECRETARIES, AS REQUIRED
CRAF REPRESENTATIVES (8)	SPECIAL CAT ASSISTANT FOR CIVIL AIR	XPW	CIVIL CARRIER REPRESENTATIVES, AS REQUIRED

NOTES

(1) MANNING REPRESENTS A SINGLE SHIFT. A MAXIMUM OF FOUR INDIVIDUALS MAY BE ASSIGNED AGAINST EACH POSITION

(2) CONTINUOUS MANNING BY XPW IS NOT POSSIBLE. CRAF EXPERTISE WILL BE PROVIDED THROUGH THE SPECIAL CAT ASSISTANT FOR CIVIL AIR, AS REQUIRED

(3) REPRESENTATIVE PROVIDED WHEN FLOGEN NETWORKING EXPERTISE IS REQUIRED

(4) REPRESENTATIVES PROVIDED WHEN USE OF AIR RESERVE FORCES MOBILIZATION IS REQUIRED

(5) EXPERTISE FROM ACROSS THE MAC STAFF MAY BE REQUESTED THROUGH SPECIAL CAT REPRESENTATIVES FOR FUNCTIONAL AREA ASSISTANCE REQUIRED TO SIZE AND SOURCE MAC MISSION SUPPORT AND AUGMENTATION FORCES

(6) EXPERTISE PROVIDED BY THE PORT MANAGEMENT CELL, AS REQUIRED

(7) DCO, CSG, DOO, DOX, ESC, AND INW REPRESENTATIVES MAY BE REQUESTED AS REQUIRED

(8) THIS CELL WILL BE LOCATED IN THE LGC CONFERENCE ROOM

FIGURE 3-2. TYPICAL HQ MAC CAT SUPPORT CELL ORGANIZATION

Figure 3-4 Task-Oriented Support Cells

b. The Manpower/Personnel Readiness Cell

This Support Cell is responsible for personnel tracking. In conjunction with Air Force Personnel Readiness Center ensures the augmentation of forces when required.

c. The Mission Support and Augmentation Cell

This cell is responsible for personnel tracking and tasking with the MAC forces. When mobilization is required, they must furnish the manpower and personnel readiness cell with validated requirements.

d. The Station Data Cell

The Station Data Cell has responsibility for the tracking of airfield suitability.

e. The Port Management Cell

This Support Cell monitors the passenger and cargo workloads at the airfields.

f. The Connectivity Cell

This cell insures real-time interoperability between the intelligence, operations, communications, and command and control functional areas.

g. The Reports and Briefing Cell

This Support Cell reviews all reports and briefings prior to the CATD approval and release.

h. The Classified Automated System (WIN) Cell

The WIN Cell operates and ensures continuous connectivity over the WWMCCS Interface Network (WIN).

i. The Administrative Support Cell

The Administrative Support Cell is responsible to the CATE and CATN to provide required administrative support.

j. The CRAF Representative Cell

This Support Cell provides information and advice on the Civil Reserve Air Fleet.

While each CAT member or task cell accomplishes a vital function, it is primarily the Operations and Command and Control representatives to the Prime and Special CAT that interfaces most with the Joint Deployment System (JDS) and the MAC forces. As such, the CATO is the focal point of all actions effecting the scheduling or movement of MAC forces. He has direct responsibility for the Special CAT Operations and Command and Control sections. As mentioned previously his responsibilities bear repeating.

> The CATO will assist the CATD in developing MAC courses of action during concept development, and make necessary revisions during execution. The CATO will serve as the CATD's primary contact with, and director of, all MAC Air Force operations. The CATO is responsible for directing and supervising the activities of the Special CAT Operations and Command and Control representatives to include determination of airlift requirements, flow planning, airlift taskings, emergency action procedures, communications connectivity requirements, and reports and briefings. The CATO is responsible for consolidating the daily situation report (SITREP). [Ref.7:p.6-2]

The CATO further divides his multitude of responsibilities between the Special CAT Operations and Special CAT Command and Control. The Special CAT Operations representative is mostly concerned with the operations of the MAC forces. His activities include airlift requirements, flow planning, airlift taskings, and emergency action procedures. Of primary concern are the first two, airlift requirements and flow planning accomplished by the Requirements and Flow Planning Cell. The Special CAT Command and Control representative is concerned with the communication of information from the requirements to the forces and the reporting of the forces current status. Of most importance is the interface with the JDS accomplished by the Classified Automated Systems (WIN) Cell. We will take a closer look as to how these two cells accomplish their duties.

The Classified Automated System (WIN) Cell, consisting of up to nine NCO's (depending on the severity of the contingency and on WIN traffic load), has a very simple yet, important task; to maintain communications over the WWMCCS Interface Network (WIN). This network is used to communicate or access the JDS data base and secondly, for other message traffic to and from supported commanders or MAC forces. As such, it is the prime communications media by which MAC receives its requirements and informs others of its scheduled airlifts. This system or cell supports all the CAT members but in particular the Requirements and Flow Planning Cell.

The Requirements and Flow Planning Cell, consisting of between four and six officers, is the one entity which is directly evolved in all phases of the operational mission planning. Upon receipt of the requirements from either the JDS or some other means, this cell must develop a schedule of MAC airflights to fulfill the requirements. In this aspect, they are the direct users of the JDS data base and their scheduling product is the required input into the Joint Deployment System. The Requirements and Flow Planning Cell responsibilities include but are not limited to the following [Ref.7:p.6-3]:

(a) Determining and analyzing movement requirements and current airlift capability to meet those requirements based on guidance from the Special CAT Operations representative.

(b) Preparing manual flow plans to support crisis/contingency requirements.

(c) Preparing applicable portions of the CAT worksheets to establish parameters for operators to input to FLOGEN when generating an automated airlift flow.

(d) Monitoring and analyzing the automated airlift schedule to determine airlift flow constraints, recommending changes to improve the flow and, with the concurrence of the Special CAT Operations representative, implementing required changes.

(e) Preparing and coordinating MAC mission directives for CATD release.

(f) Chairing intercell discussions to ensure unified actions to support the operational requirements.

Three of the above six responsibilities deserve some additional clarification and explanation. To begin with, once the requirements are retrieved from the JDS data base, they are inputted into MAC's automated flow generator (FLOGEN). The end product from the FLOGEN system is then analyzed for deficiencies (deficiencies are inherent within the FLOGEN product, some of these will be discussed later). The Requirements and Flow Planning Cell will combine some under utilized air missions and cancel some completely due to their limited cargo. Once updated the final schedule is then loaded into the JDS data base and previously prioritized TPFDD cargo is manifested against a particular air movement.

The final responsibility of interest is that of manual flow planning (manual scheduling of aircraft). This immense and sometimes unmanageable task is mandated if there is less than 72 hours to first air movement and no OPLAN (TPFDD) exist. Additionally, if any changes are necessary for the next three days of schedule, it must be done manually since FLOGEN can only change the schedule beyond 72 hours. (This causes a change in the data base of the OPLAN or TPFDD. HQ MAC estimates the 72 hours for development of the new data base.) If dictated, mission planners must manually match JDS requirements with available resources and produce a complete, workable schedule. A small indication of this immense task is illustrated in Figure 3-4.

To briefly recap, MAC is an active participant in the JCS Crisis Action System (CAS). Its main body of response is the MAC Crisis Action Team (CAT) which provides for the command's focal point in a contingency operation. The MAC CAT has a layered organization consisting of the Prime CAT, the Special CAT, and Task

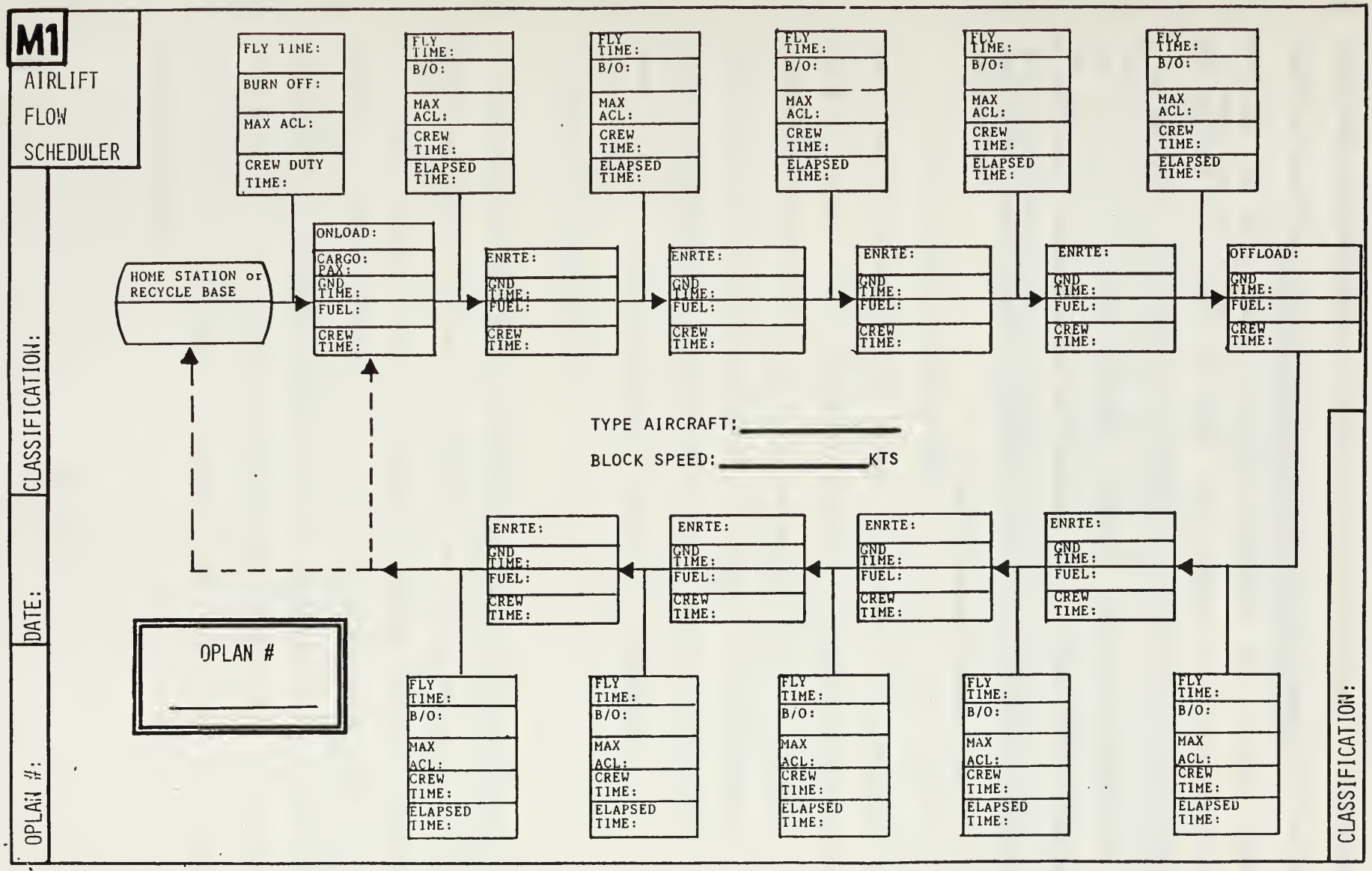


Figure 3-4 Manual Airlift Flow Scheduler

Oriented Cells. This approach provides flexibility in assembling only those units required for the crisis. As mentioned previously, two of the most important Task Oriented Cells are the Classified Automated System (WIN) Cell and the Requirements and Flow Planning Cell. While the "WIN" Cell provides the connectivity to retrieve the requirements and load the completed schedule, it is the Requirements and Flow Planning Cell which performs/executes the Headquarters MAC mission. This immense task of air movement scheduling is automated to some degree but, inherent deficiencies necessitates at least manual analysis if not a complete manual schedule.

IV. POWDER RIVER 1985 HEAT COLLECTION PLAN

A. PRELIMINARY COLLECTION PLAN

This chapter will document the changes in the approach taken using HEAT to evaluate HQ MAC during Powder River 1985. The first encounter with HEAT and its application towards PR85 occurred in August 1984. At that time a HEAT training session was held and some very preliminary introduction to HQ MAC was accomplished.

The next meeting concerning HEAT or HQ MAC was in September 1984, approximately three weeks later. At this time it was deemed appropriate to visit HQ MAC and obtain more information as to how HQ MAC is organized during a contingency. Prior to this visit, it was appropriate to prepare a tentative list of objectives. This Preliminary Collection Plan (Figure 4-1) was comprised only of a problem statement and a tentative list of HEAT measures. This information was based only on a general knowledge of HQ MAC and air operations.

B. INITIAL COLLECTION PLAN

During the HQ MAC visit in late September, 1984, a tour of the Crisis Action Center was given. This tour, even though given during a period of construction was enlightening on how the MAC CAT operated during a contingency. Additionally access was afforded to a draft copy of MAC Regulation 55-28, HQ MAC CRISIS ACTION TEAM GUIDANCE, MAC's supplement to JCS's Powder River 1985 Manual (S), and a listing of exercise events list (S). All of this information proved useful in preparing the first draft of the Powder River 1985 Collection Plan (Figure 4-2).

HEADQUARTERS MILITARY AIRLIFT COMMAND
POWDER RIVER 1985

1.0 Problem Statement

Perform a feasibility analysis for HQ MAC.

* Can HEAT be applied for HQ MAC.
  -- Use representative measures from each data category. (Personnel Data Category not covered in original measures).
  -- Can Command Standards be quantified.

2.0 Evolution of HEAT Measures

Data Category	Measure #'s
Enemy Units	2, 3, 4, 104, 106
Enemy Objectives	12, 13, 110
Enemy Timetable	18, 19, 110
Combat Units	1, 2, 3, 24, 25, 94, 99, 113
Support Units	1, 2, 3, 24, 25, 96, 101, 113
Units not in Theater	1, 2, 3, 97, 102
Coord/Support Units	1, 2, 3, 98, 103
Weather	8, 34,108, 118
Polit/Econ/Soc Guidance	11, 40, 65, 74
Critical Shortages	30, 31, 56, 60, 64, 73, 117, 127

Figure 4-1 Preliminary Collection Plan

HEADQUARTERS MILITARY AIRLIFT COMMAND
POWDER RIVER 1985 COLLECTION PLAN
3 OCTOBER 1985

1.0 Problem Statement

Perform a feasibility analysis for HQ MAC.

* Can HEAT be applied for HQ MAC.
  -- Use representative measures from each data category. (Personnel Data Category not covered in original measures).
  -- Can Command Standards be quantified.
  -- Are there observable HQ cycles, if so observe a limited set (2).
  -- Is HEAT more applicable at a Numbered Air Force or Air Division level.
* If HEAT can be applied, will it yield useful information.
  -- Is the Contingency Action Team (CAT) organizational structure adequate for the mission.
  -- Is the concept of Air operations-vs-HQ directorates appropriate.
  -- Are CAT procedures adequate for the mission.
  -- Is training needed, if so: where, what type.

2.0 Background

2.1 Headquarters to be Studied

* MAC CAT
  -- Required representation.
  -- Procedure for calling and the use of the Special CAT and the functional units (i.e. Connectivity Cell).
* Organization and Responsibility
  -- Prime CAT

     The Prime CAT will focus on airlift concept development, coordination with JCS, Services and supported commands, as well as monitoring the execution of airlift operations. The Prime CAT will be the principal agency through which command guidance is passed for implementation. For close hold, conventional operations, the Prime CAT, augmented on a selected basis by supporting CAT members, will develop MAC courses of action for CINCMAC, JCS, and supported CINC approval.

Figure 4-2 Initial Collection Plan

-- Prime CAT Manning and Sourcing

Position	Source	Manning
Director (CATD)	MAC/DO	06
Executive Officer (CATE)	MAC Staff	04/03
Executive Support NCO (CATN)	MAC Staff	E6/E5
Operations (CATO)	MAC/DO	06
Operations Plans (CATX)	MAC/XO	05
Transportation (CATT)	MAC/TR	06
Logistics (CATL)	MAC/LG	06/05

-- Special CAT

The Special CAT encompasses most functional areas within the headquarters. Special CAT members serve as the direct liaison between the Prime CAT and their assigned functional areas. It should be emphasized that Special CAT members do not work in isolation. They are expected to call on members of their functional area staffs to assist them as required.

-- Special CAT Sourcing

Position	Source
Intelligence	IN
Communications	DC
Security Police	SP
Surgeon	SG
Comptroller	AC
Liaison Group	Army, Navy, Marine, TAC, SAC, ESC, AFRES, and ANG Liaison Personnel, as required.
Public Affairs	PA
Engineering and Services	DE
Weather	DOW
Chaplain	HC
Assistant for Civil Air	XPW
Personnel	DP
AFOSI	AFOSI MAC Representative
Administration	DA
Data Automation	AD
Special Operations	DOX
Staff Judge Advocate	JA
Operations	DOO
Command and Control	DOC
Transportation	TR
Logistics	LG
Operations Plans	XO

Figure 4-2 Initial Collection Plan (continued)

-- Task-Oriented Support Cell
The Task-Oriented Support Cells combines expertise from across the MAC staff into specific task-oriented teams. Cell composition should be reviewed frequently by cell team chiefs to ensure the most effective and efficient manning is assigned to conduct the detailed staff work required.Task-Oriented Cells:

-- Support Cell Relation to Prime/Special CAT Member

Support Cell	Responsible to
Requirements and Flow Planning	Operations
Manpower/Personnel Readiness	Personnel
Mission Support and Augmentation	Operations Plans
Station Data	Logistics
Port Management	Transportation
Connectivity	Command and Control
Reports and Briefing	Command and Control
Classified Automated System	Command and Control
Administrative Support	CATE
CRAF Representatives	Assistant for Civil Air

* Functions of Interest
  -- Mobility of aircraft.
  -- Resolution of conflicting demands.
  -- The call-up and employment of the Civil Reserve Air Fleet (CRAF).
  -- Deployment of non-unit personnel resources (NPR).
  -- Non-combatant evacuation order (NEO).

2.2 Exercise Selection
* Powder River 1985
  -- HQ MAC, 15 Oct 84 thru 26 Oct 84.
* Details to be obtained
  -- JCS exercise plan and system description notes.
  -- MAC exercise supplement.
  -- JCS evaluation guide forms.
* Events of Interest
  See master events list (S)

2.3 Resources
* Observers
  -- Committed
  NPS---Capt Ronald P Buettner
  DSI---Mr Dan Bucchioni
  Mr Phil Rice
  DCA---Mr John Kirzl
  -- Possible
  NPS---Dr Michael Sovereign
  AFCC--Mr Charles Jacobs (poc for observers)
  JCS---Collection Team members

Figure 4-2 Initial Collection Plan (continued)

* Objectives and events to be worked
  -- Stationing of observers.
     Two in the CAT (see floor plan, fig 2)
     One or two in the control group.
  -- Degree of coverage.
     Dates: Exercise Days 1 & 2,
            Exercise Days 8-10.
     Times: single shift (10-12 hrs)
     Events: To Be Determined.
  -- Obtain written data (msg traffic etc)
     Arrange with Col Pagani

3.0 Approach

3.1 Collection

* Sources of Data
  -- JCS exercise plan
  -- JCS systems description
  -- HQ MAC exercise plan
  -- HQ MAC supporting plans
     NEO, others
* Automatic Distribution
  -- Messages and autodin data
  -- Telephone logs
  -- Briefing slides
  -- JCS data collectors worksheets

3.2 Observers

* Organization
  -- Two people in the CAT (physical limit)
  -- One or two in the control group
* Objective-events matrix
  -- Evolution of HEAT Measures (30, down from 53).

Data Category	Measure #'s
Enemy Units	2, 3, 4, 104, 106
Combat Units	1, 2, 3, 24, 25, 94, 99, 113
Support Units	1, 2, 3, 24, 25, 96, 101, 113
Units not in Theater	1, 2, 3, 97, 102
Polit/Econ/Soc Guidance	11, 40, 65, 74

  -- Representative coverage of all process steps.
     Direct/coordinate not covered, see fig b-1.
  -- Representative coverage of all data categories.
     Personnel and Logistics not covered, see fig b-1.
  -- Recognize more measures in the monitor and inform areas.

Figure 4-2 Initial Collection Plan (continued)

3.3 Command Standards

* Identify final measures which need command standards.
* Finalize Proposed Strawman.

MEASURE #	COMMAND STANDARD
1	a. 100% accuracy on aircraft port location and operational status b. within two UNITREP categories for ground units c. 100% accuracy for reserve aircraft required
2	Maximum acceptable time late a. aircraft----1 hr b. ground unit-----24 hr c. reserve aircraft-----72 hr d. intel status-----24 hr
4	Desired accuracy location a. SAM-----10 miles b. AIR-----100 miles
24	Time for implementation of plan a. air movement-----24 hr b. log response-----24 hr c. grd movement-----24 hr
74	Intended period of plan, determined for each plan
113	Intended period of status understanding--24 hr

4.0 Timing

Names of observers for access
Measures and Command standards strawman for coordination
  * HQ MAC/DOC---Col Pagani
  * HQ MAC/DOOX--Capt Wilkinson
Reservations---accomplished by individuals.
Courier orders
Advance party preparations
  * Procedures for access
  * Gather required documents and plans
  * Set up work area
  * Obtain classified storage area
  * Set up automatic distribution
  * Coordinate with JCS data collectors

5. Problem Areas

Resolve potential conflict of CRAF representation-----where?
Potential overcrowding of CAT workarea. Are all members needed?

Figure 4-2 Initial Collection Plan (continued)

C. FIRST SUPPLEMENTAL COLLECTION PLAN

This initial plan was deemed sufficient when the HEAT evaluation started in mid-October. (This was not to be the main evaluation effort. This was an advance party sent to verify clearances and administrative and logistical support. Their second objective was to check the feasibility of the collection plan). However, during this brief two-day visit, the advance party identified some shortfalls with the existing collection plan. The observations of the advance party led to the following amendments to the Collection Plan (Figure 4-3). In addition, the advance party developed data collection aides based on the displays used by the Crisis Action Center (Figures 4-4 to 4-7).

D. SECOND SUPPLEMENTAL COLLECTION PLAN

This first supplemented plan was based on the information gathered by the advance team. It was the first time that any direct observation of the HQ MAC CAT was afforded. This first-hand experience of the CAT operations, as limited as it was, provided the additional information needed for a workable collection plan, or so it appeared. However, during the main collection effort, serious deficiencies in collection plan were found. The most serious deficiency was in the actual concept of the MAC CAT organization and function.

Up to this time, the Prime CAT was considered to be the focal point of all action for this exercise. This was not true in this particular instance. With the inability to obtain actual ground truth information (another serious deficiency in the collection plan) due to the nature of this Command Post Exercise (CPX), the actual center of activity was with the Requirements and Flow Planning Cell. (It is my opinion that this would be the center of most activity in any exercise or

HEADQUARTERS MILITARY AIRLIFT COMMAND
POWDER RIVER 1985 COLLECTION PLAN
(SUPPLEMENTED 16 OCT 85)

2.0 Background

2.1 Headquarters to be Studied

* MAC CAT
  -- Required representation.
  -- Procedure for calling and the use of the Special CAT and the functional units (i.e. Connectivity Cell).
* Organizational Structure
  Same as initial collection plan
* Functions of Interest
  -- Mobility of aircraft.
  -- Resolution of conflicting demands.
  -- Allocation of Airlift Resources
     1. Determine and analyze movement requirements and current airlift capability to meet those requirements. (monitor/understand)
     2. Prepare manual flow plan to support requirements. (plan)
     3. Prepare worksheets for flogen when generating an automated airlift flow plan. (plan)
     4. Monitor and analyze automated airlift schedule to determine airlift flow constraints and make improvements. (monitor/understand)
     5. Prepare and coordinate MAC mission directives. (direct)

Figure 4-3 First Supplemental Collection Plan

3.0 Approach

3.1 Collection

* Sources of Data
  -- JCS exercise plan
  -- JCS systems description
  -- HQ MAC exercise plan
  -- HQ MAC supporting plans
     NEO, others
* Automatic Distribution
  -- Messages and autodin data
  -- Telephone logs
  -- Briefing slides
  -- JCS data collectors worksheets

3.2 Observers

* Organization
  -- Two people in the CAT (physical limit)
  -- One or two in the control group
* Objective-events matrix
  -- Evolution of HEAT Measures (20 from 30 from 53).

Data Category	Measure #'s
Combat Units	1, 2, 3, 24, 25, 94, 99, 113
Individual Op Plans	48, 50, 52, 69, 75-78, 81, 86, 91, 123

Figure 4-3 First Supplemental Collection Plan (continued)

MISSION SUMMARY AS OF ____________ Z

	C-5	C-141	C-131	CRAF		AIRLIFTED	REMAINING
TOTAL MISSIONS					PAX		
SCHEDULED					CARGO		
OPERATED							
REMAINING							

MISSION SUMMARY AS OF ____________ Z

	C-5	C-141	C-131	CRAF		AIRLIFTED	REMAINING
TOTAL MISSIONS					PAX		
SCHEDULED					CARGO		
OPERATED							
REMAINING							

MISSION SUMMARY AS OF ____________ Z

	C-5	C-141	C-131	CRAF		AIRLIFTED	REMAINING
TOTAL MISSIONS					PAX		
SCHEDULED					CARGO		
OPERATED							
REMAINING							

RESPONSIBLE AGENCY ______________________________

SOURCE DOCUMENT ______________________________

Figure 4-4 Data Collection Aide 1

FORCE STATUS AS OF_____Z

UNIT OR LOCATION	AIRCRAFT				CREWS			
	OR	NORM	NORS	OR HRS				

RESPONSIBLE AGENCY _____

SOURCE DOCUMENT _____

Figure 4-5 Data Collection Aide 2

AIRFIELD DATA AS OF _____Z

LOCATION	REMARKS

RESPONSIBLE AGENCY _____

SOURCE DOCUMENT _____

Figure 4-6 Data Collection Aide 3

MISSION REQUIREMENTS AS OF _____Z

PLAN CHANNEL/ SAAM	MILITARY						CRAF PASSENGER AIRCRAFT						CRAF CARGO AIRCRAFT							
	C-5	C-141 A/B	KC-10	C-130	C-123	C-7	747	DC-10	L-1011	DC-8	707	727	747	DC-10	DC-8	707	727	L-100 L-188	DC-8	737

RESPONSIBLE AGENCY _____

SOURCE DOCUMENT _____

Figure 4-7 Data Collection Aide 4

contingency involving airlift requirements). As such, for all of the collection effort, the data gatherers were concentrating in the wrong location. Realizing the problem, the data gathers tried to adapt the HEAT process (one relying on ground truth as a basis) to this particular exercise and in general to any exercise where ground truth would not be available or obtainable. The results of this effort are documented in the Second Supplemental Collection Plan (Figure 4-8) and will be elaborated further in the next chapter.

E. POST COLLECTION PLAN

With the realization that most of the data would not support a detailed HEAT evaluation (due to the lack of ground truth information), a search was begun to see what information could be extracted from the data. After a complete sifting of the data, the only useful and supported analysis was the measure of effectiveness for the intended period of the plan. However, while this is one of the major measures in the HEAT process, it did not provide insight into the effectiveness of this organization since the one occurrence of plan conflict did not occur during the evaluation process. (The data gatherers were not present during this period because it was deemed a period of low interest by the MAC representative). Thus, a HEAT analysis was not possible with the data captured. However, the attempt to formalize a means to apply HEAT when no actual ground truth information is available resulted in useful information and a some what successful evaluation.

HEADQUARTERS MILITARY AIRLIFT COMMAND
POWDER RIVER 1985
COLLECTION PLAN
(SUPPLEMENTED 25 OCT 85)

2.0 Background

2.1 Headquarters to be Studied

* MAC CAT
  -- Required representation.
  -- Procedure for calling and the use of the Special CAT and the functional units (i.e. Connectivity Cell).
* Organizational Structure
  Same as the initial collection plan.
* Functions of Primary Interest
  -- Mobility of aircraft.
  -- Resolution of conflicting demands.
  -- Allocation of Airlift Resources
     1. Determine and analyze movement requirements and current airlift capability to meet those requirements. (monitor/understand)
     2. Prepare manual flow plan to support crisis or contingency requirements. (plan)
     3. Prepare worksheets for FLOGEN (an automated airlift flow plan). (plan)
     4. Monitor, analyze and recommend improvements to the automated airlift schedule. (monitor/understand/plan)
     5. Prepare and coordinate MAC mission directives. (direct)

     NOTE: All of these functions are performed by one portion of the MAC contingency staff, the Requirements and Flow Planning Cell. It is foreseeable that most of the data categories and HEAT measures are appropriate for this cell. If the scope of the evaluation was narrowed to the monitoring of assets, the building of the plan, and directing the execution of the plan; all of this can and should be evaluated from within this cell.

Figure 4-8 Second Supplemental Collection Plan

3.0 Approach

3.1 Collection

* Sources of Data
  -- JCS exercise plan
  -- JCS systems description
  -- HQ MAC exercise plan
  -- HQ MAC supporting plans
     NEO, others
* Automatic Distribution
  -- Messages and autodin data
  -- Telephone logs
  -- Briefing slides
  -- JCS data collectors worksheets

3.2 Observers

* Organization
  -- Two people in the CAT (physical limit)
  -- One or two in the control group
* Objective-events matrix
  -- Evolution of HEAT Measures (28 vice 20 or 53)

Data Category	Measure #'s
Personnel	21, 120
Enemy Objectives	13, 110
Combat Units	1, 2, 25, 94, 99
Support Units	1, 2, 25, 96, 101
Theater Op Plans	81, 86, 91, 122
Individual Op Plans	75-78, 81, 86, 91, 123
Critical Shortages	31, 127

Figure 4-8 Second Supplemental Collection Plan (continued)

V. RESULTS AND RECOMMENDATIONS

A. HEAT RESULTS

With all of the changes and difficulties mentioned in the last chapter, where does this leave the HEAT analysis of Powder River 1985? Since the analysis was to be performed on the MAC CAT organization as a whole and that the initial collection plan as modified by the advance party (fist suppllemental plan) was deemed sufficient (at the time), the analysis efforts were based on that collection plan. While the second supplemental collection plan would be better for a similar analysis of the MAC CAT now or in the future, it is inappropriate for what was observed and collected during Powder River 1985.

Recall, under the First supplemental Collection Plan, there were a total of twenty HEAT measures to be applied. These twenty measures along with the required data sheets and score sheets are presented in Table 5-1.

TABLE 5-1 POWDER RIVER 85 HEAT MEASURES

MEASURE #'s	DATA SHEET	SCORE SHEET
1, 2, 3, 94, 99	F	O, F
24, 25, 48, 50, 52, 113	U	U, A, R
69, 123	P	P, T
75-78, 81, 86, 91	D	Q, H, D, K

With these measures selected, the data was collected and compiled onto the data sheets. There was little difficulty in assembling perceived or reported data for the data sheets, however, with the absence of a ground truth, that category of data was left blank (refer to Data Sheets Source Type P-perceived, R-reported, and T-ground truth). As such, for Data Sheet F (Figure 5-1) all columns could be filled for perceived and reported states but none for ground truth. For Data

CATEGORY: (check one) Combat Units [ ] Intelligence Assets [ ] Support Units [ ] Assigned, Not in Theater [ ] Coordinating etc. [ ]

MEASURES: 1-3,94,99 1-3,95,100 1-3,96,101 1-3,97,102 1-3,98,103

SOURCE TYPE: (check one) Headquarters [ ] (Code P) Outgoing Report [ ] (Code R) Ground Truth [ ] (Code T)

ORGANIZATION OBSERVED _____ FROM _____ TO _____ CYCLE _____

SOURCE DOCUMENT _____ OBSERVER _____

UNIT[1]	LOCATION/TIME[2]	STATUS[3]/TIME[2]	PLANS/TIME[2]	MODE[4]/TIME[2]	REMARKS

NOTES:

1. List all known units in th s category.
2. Headquarters data: time of receipt; report data: time of transmission; ground truth: time of event or of report.
3. Status: strength; logistic supplies on hand (by class); critical logistic shortages; in contact or not (combat units); projected requirements for personnel, logistics (by class), ending anticipated critical shortages.
4. Modes: Offensive, Defensive, Committed Reserve, Uncommitted Reserve.

SCORING SHEETS: O,F

Figure 5-1 HEAT Data Sheet F

Sheet U (Figure 5-2) only column 1-current situation, column 5-end of forecast period, and column 6-number of planners could be filled out for the perceived and reported states. The remainder of Data Sheet U could not be filled out because there was no change in the situations that were observed (the one known change in situation the data gatherers were not present due to a period of supposedly slow activity). The same comments apply to Data Sheet P (Figure 5-3). Again, there was no change in situation observed and no ground truth to record. For Data Sheet D (Figure 5-4) little information could be entered. All directives issued were for new plans, existing plans or decisions were not changed (for the data observed). This resulted in only the time of issue and intended period of the plan along with the information on did the directive contradict the commanders decision being recorded.

From these data sheets an attempt was made in scoring the available data. Table 5-2 illustrates the score sheets corresponding to the data sheets used and their reliance on ground truth to produce a score.

TABLE 5-2 POWDER RIVER 85 SCORE SHEETS

Data Sheet	Requiring Ground Truth	Not Requiring Ground Truth
F	O, F	
U	U, R	A
P	P, T	
D	H	Q, D

With the absence of ground truth only three of the ten score sheets could be completed in some detail. Score Sheet A (Figure 5-5) attempts to score the planning process relying on a number of alternative actions for each contingency actual taken. Since MAC's plans deal with the generation of an airlift schedule, alternative schedules are not considered only one airlift schedule is prepared.

CATEGORY: (check one) Personnel [ ] Intelligence assets[1] [ ] Combat and support[1] [ ] Supplies at hand, class: _____ [ ] Logistic demand, class: _____ [ ] Critical logistic shortages [ ] Transportation situation [ ] Political econ., social guidance

MEASURES: 20,21,41-43,111 | 22,23,44-46,112 | 24,25,47-52,113 | 26,27,53,57,61,114 | 28,29,54,58,62,115 | 30,31,56,60,64,117 | 32,33,55,59,63,116 | 65

SOURCE TYPE: (check one) Headquarters [ ] (Code P) Outgoing Report [ ] (Code R) Ground Truth [ ] (Code T)

ORGANIZATION OBSERVED _____ FROM _____ TO _____ CYCLE _____

SUBCATEGORY[1] _____ SOURCE DOCUMENT _____ OBSERVER _____

TIME OF UNDERSTANDING _____	TIME OF FIRST CHANGE[2] _____	TIME OF SECOND CHANGE[2] _____	TIME OF THIRD CHANGE[2] _____	END OF FORECAST PERIOD _____	NUMBER OF PLANNERS[5] _____
CURRENT SITUATION[3]	CHANGED SITUATION	CHANGED SITUATION	CHANGED SITUATION	NUMBER OF ALTERNATIVE ACTIONS EXAMINED[4,5]	REMARKS

NOTES:
1. For intelligence, combat and support units, indicate subcategory: location, status, plans, or mode of operations.
2. Codes P and R: time of expected change; Code T: time of actual change.
3. For codes P and R, list all hypotheses considered/reported, beginning with the one considered most likely.
4. Alternative action: a potential assignment of assets to a mission (or missions), and a timetable. For combat/support unit category, distinguish between overall theater operations plans and individual component plans.
5. Code P only.

SCORING SHEETS: U,A,R

Figure 5-2 HEAT Data Sheet U

CATEGORY: (check one) ☐ Personnel ☐ Intelligence assets ☐ Theater ops plans ☐ Indiv. component plans ☐ Change in supply sit., class____ ☐ Change in log demand, class____ ☐ Transportation situation ☐ Critical shortages ☐ Political, econ, social future

MEASURES: 66,120 67,121 68,122 69,123 70,124 71,125 72,126 73,127 74

SOURCE TYPE: (check one) Headquarters ☐ (Code P) Outgoing Report ☐ (Code R) Ground Truth ☐ (Code T)

ORGANIZATION OBSERVED_____ FROM_____ TO_____ CYCLE_____

SOURCE DOCUMENT_____ OBSERVER_____

TIME OF PREDICTION_____	TIME OF FIRST CHANGE[1]_____	TIME OF SECOND CHANGE[1]_____	TIME OF THIRD CHANGE[1]_____	END OF FORECAST PERIOD_____
CONSEQUENCES OF ACTION SELECTED[2]	CHANGED SITUATION	CHANGED SITUATION	CHANGED SITUATION	REMARKS

NOTES:
1. Codes P and R: time of expected change; Code T: time of actual change.
2. For Codes P and R, list all predicted contingencies beginning with the one considered most likely. Specify, as applicable, adversary reaction, degree of mission accomplishment by asset, residual capacity of own and enemy units involved.

SCORING SHEETS: P,T

Figure 5-3 HEAT Data Sheet P

CATEGORY:
(check one or more)

☐ Personnel	☐ Intelligence	☐ Operations	☐ Logistics, class_____	☐ Transportation
79,84,89	80,85,90	81,86,91	82,87,92	83,88,93

MEASURES: 8,9,11,34,37,40,75-78, and

ORGANIZATION OBSERVED_____ FROM_____ TO_____ CYCLE _____ OBSERVER_____

SOURCE DOCUMENT_____ TIME PLAN OR ADJUSTMENT ISSUED_____

REASON FOR NEW PLAN (check one or more):

Misperception of: Erroneous prediction of:

☐ Weather ☐

☐ Terrain conditions ☐

☐ Political, economic, or social guidance ☐

☐ Other: _____

_____

REASON FOR ADJUSTMENT (coordination)

Notification (document)_____

Time of Receipt_____

REMARKS

Source document for commander's decision_____ Time of decision_____

Does the directive contradict the commander's decision with respect to:

Missions assigned? Yes ☐ No ☐

Assets assigned? Yes ☐ No ☐

Boundaries assigned? Yes ☐ No ☐

Timetable? Yes ☐ No ☐

Queries received on this plan or adjustment:

_____ _____ _____ _____

_____ _____ _____ _____

_____ _____ _____ _____

SCORING SHEETS: K,D

Figure 5-4 HEAT Data Sheet D

CATEGORY (check one)	Personnel ☐	Intelligence assets ☐	Theater ops plans ☐	Indiv. component plans ☐	Supplies at hand, class____ ☐	Logistic demand, class____ ☐	Transportation ☐	Critical shortages ☐	Pol.-econ.-social guidance ☐
MEASURES:	41-43	44-46	47,49,51	48,50,52	53,57,61	54,58,62	55,59,63	56,60,64	65
DATA SHEET:	UP	UP	UP	UP	UP	UP	UP	UP	UP

ORGANIZATION OBSERVED_____ FROM_____ TO_____ CYCLE_____ ANALYST_____

NUMBER OF PLANNERS (a) =

CONTINGENCY	NUMBER OF ALTERNATIVE ACTIONS EXAMINED
1. (Likeliest)	b(1)
2.	b(2)
3.	b(3)
4.	b(4)
5.	b(5)
6.	b(6)
7.	b(7)
8.	b(8)
9.	b(9)
10.	b(10)

MEASURES	SCORE FOR MARGINAL VALUE (0 ≤ S ≤ 1)	RAW SCORE (R) AND NORMALIZED SCORE (N) R = N = 1 if	R=0.5, N=S if	R = N = 0 if	R	N
41,44,47,48,53-56,65	----	all b(i) > 0	---	any b(i) = 0		
42,45,49,50,57-60	S =	a ≥ 3	a = 2	a ≤ 1		
43,46,51,52,61-64	S =	3 ≤ b(i) ≤ 5	b(i) = 2	b(i) ≤ 1 or b(i) ≥ 6		

Figure 5-5 HEAT Score Sheet A

As such, the raw and normalized score is always zero when no alternatives are considered. Score Sheet Q (Figure 5-6) attempts to measure the quality of the plan instead of the process. For the periods of data collection (recall, the one known instance of change was not collected), there was no change in situation and all plans lasted their intended period. This results in a raw score always equal to one. Score Sheet D (Figure 5-7) measures the accuracy of the directive in relation to the decision. In all cases observed there was no directive that contradicted the commanders decision. This will almost always be the case when only one plan is generated and the decision is to implement that plan.

Thus, for Powder River 1985, HQ MAC prepared quality plans (for the plans observed) that reflected the decision of the commander. However, these plans were based on only the one alternative and were static in nature. If a change in the perceived situation would occur it is doubtful that the plan in effect could accommodate the change (as was the case in the one known change not recorded).

B. PROBLEMS ENCOUNTERED

There were two major problems encountered in the analysis of HQ MAC during Powder River 85. The first was the absence of ground truth, the second was a misperception of where the center of planning activity was located. Both of these problems stem from one cause, not enough time and effort given to planning the collection effort.

For HEAT to work successfully, a full and thorough understanding of the organization and the exercise is required. This was not obtained in this instance until well into the collection effort (in fact the collection effort was almost over). The failure in understanding the exercise and how it was conducted led to the inability to capture ground truth. Knowing that an actual ground truth (that

CATEGORY: (check one) Personnel ☐ Intelligence ☐ Operations ☐ Logistics, ☐ class_____ Transportation ☐

MEASURES: A,B

DATA SHEET: D

ORGANIZATION OBSERVED_____ FROM_____ TO_____ ANALYST_____

MEASURE A: MAXIMUM ACCEPTABLE VALUE (M) = DESIRED VALUE (D) =

(1) PLAN	(2) IMPLEMENTATION TIME (I)	(3) END OF INTENDED PERIOD	(4) IMPLEMENTATION TIME OF SUPERSEDING PLAN (T)	(5) RAW SCORE (R) = 100(E-T)/(E-1)	(6) NORMALIZED SCORE (N) = (M-R)/(M-D)
			(a) Number of new plans		

MEASURE B: Number of activations of contingencies (b) = Number of minor adjustments (c) =

RAW SCORE

$R_1 = 100c/(a+b+c) =$

$R_2 = 100b/(a+b+c) =$

$R_3 = 100a/(a+b+c) =$

SCORE FOR FOLLOWING CONTINGENCY PLAN ($0 \leq S \leq 1$)

S =

NORMALIZED SCORE

$N = (R_1 + SR_2)/100 =$

Figure 5-6 HEAT Score Sheet Q

CATEGORY: (check one) ☐ Personnel ☐ Intelligence ☐ Operations ☐ Logistics, class _____ ☐ Transportation

MEASURES: 75-78 and: 79,84,89 80,85,90 81,86,91 82,87,92 83,88,93

Check One: ☐ DIRECTIVES ☐ ADJUSTMENTS TO PLAN

Data Sheet: D

ORGANIZATION OBSERVED _____ FROM _____ TO _____ ANALYST _____

(1)	(2)				(3)	(4)	(5)	(6)	(7)	(8)
IDENTIFICATION OF DIRECTIVE (CYCLE) OR ADJUSTMENT	DECISION-DIRECTIVE CONTRADICTION? (SEE DATA SHEETS; CHECK IF YES) MISSIONS	ASSETS	BOUNDARIES	TIMETABLE	(ADJUSTMENTS ONLY) TIME OF RECEIPT OF NOTIFICATION OF NEED (P)	TIME OF DECISION (T)	TIME OF ISSUE OF DIRECTIVE OR ADJUSTMENT (R)	R-T	(ADJUSTMENTS ONLY) R-P	NUMBER OF QUERIES ON DIRECTIVE OR ADJUSTMENT
	☐	☐	☐	☐						
	☐	☐	☐	☐						
	☐	☐	☐	☐						
	☐	☐	☐	☐						
	☐	☐	☐	☐						
	☐	☐	☐	☐						
	☐	☐	☐	☐						
	☐	☐	☐	☐						
	☐	☐	☐	☐						
	☐	☐	☐	☐						
(n) Number of directives	Measures: 75	76	77	78			Totals:	(a) 1 day	(b)	(c) 0

MEASURE	RAW SCORE	MAXIMUM ACCEPTABLE VALUE	DESIRED VALUE	NORMALIZED SCORE ($0 \leq N \leq 1$)
75-76	See above	---	---	$N = 1 - R$ (scored individually)
79-83	$R = a/n = 1$ day	M =	D =	$N = (M - R)/(M - D) = .84$
84-88	$R = c/n = 0$	M =	D =	$N = (M - R)/(M - D) = 1$
89-93 (adjustments only)	$R = b/n =$	M =	D =	$N = (M - R)/(M - D) =$

Figure 5-7 HEAT Score Sheet D

normally available during a field exercise where combat units are actually positioned) was not available, procedures or corrective actions could have been taken or developed to enable a successful collection effort. This indeed is what happened when the Second Supplemental Collection Plan was conceived. The misunderstanding of the center of planning activity is secondary in comparison. While the main collection effort would not have been focused on the planning activity, good reliable data that could be based or compared could be obtained. The planning process could not have been evaluated in this posture but most other measures could. If both misconceptions could have been avoided a successful analysis may have resulted.

However, to completely overcome the misconceptions, a more thorough understanding was required. This takes time. In this respect HEAT is a very front loaded, time intensive project. To achieve this detail of understanding, the data gatherers must have almost first-hand experience about the type of exercise and the organization. Without the time taken to gain this first-hand experience, the problem of not knowing where to best place the data gatherers will surface again and again.

C. PROPOSED HEAT APPLICATION FOR FUTURE CPX's

One of the problems encountered, was the absence of a ground truth. This, in part, is based on the notion of ground truth tied to the actual movement of forces (either actual movement as in a Field Training Exercise, FTX, or simulated as in computer simulation or better controlled CPX). This tying of ground truth to the movement/location of force is a hindrance for this type of CPX. Assumptions can be made to obtain a quasi ground truth when no forces are involved in the

exercise. Assumptions of this type were the basis of the Second Supplemental Collection Plan.

In the case of Powder River 85, the Requirement and Flow Planning Cell was taken as the center of activity or planning process. An artificial boundary was placed around this cell for the purpose of data gathering. All data within the Requirements and Flow Planning cell was considered perceived data while data outside the cell was considered ground truth. This enabled the comparison of data required with HEAT. The comparison in this instance was how well the Requirements and Flow Planning Cell perceived the data that the remaining sections of the MAC CAT provided. Thus, all the data requirements of perceived, reported, and ground truth could be captured.

The question remains, do the results obtained apply to the organization as a whole or just to the one part. Given that the artificial boundary encases the main planning function of the organization, then the results can be interpreted as applying to the entire organization. This will only work if the essence of the planning activity is enclosed in the boundary. If decisions for the entire organization is made outside the imposed boundary then there are other factors to consider before the results can be postulated to whole. If on the other hand, all organizational decision are made inside the boundary then the essence of the organization has been captured (for this purpose) and the results can apply. (This is a new concept in applying HEAT and therefore should be approved or recognized by HEAT theorist before an application is tried.)

D. POTENTIAL AREAS OF FURTHER STUDY

1. Computerized Data Entry

With the use of micro computers the sometimes immence task of recording information may be made easier. At times the observer is overwhelmed with data that needs to be recorded. The use of a menu driven or menu aided computer device these periods may be less frequent. This has been attempted at the Naval Postgraduate School first, with Dr. J. Lawson in the spring of 1985 and second, during the DCA/DSI War Game Exercise in December, 1985. (Both times Radio Shack M100's were used.) More analysis is needed in the area to confirm that the computer aided input is a benefit or not.

2. Computerized Data Scoring and Presentation

This area has seen little interest in the past by either DCA or DSI. However, some preliminary work was attempted in the spring of 1985. At that time, an attempt was made to use a relational data base for the MacIntosh (Helix, by Odessta) to store the collected data from the HEAT Instruction Manual and make queries upon the data similar to the HEAT Score Sheets. The ideal was good and the tools did exist (dBase III for example) however, the data base selected (Helix) was not fully capable at the time of the undertaking. (Since then, Odessta has improved upon Helix with two revision released to make it more capable.) A renewed attempt in this area using either Helix or another relational data base would prove to be an interesting study.

3. Testing of the Proposed HEAT Application for CPX's

This proposed application contained in this thesis requires further investigation and testing. Assistance in this endeavor may have to come or

originate from either DSI or DCA. If such a study was attempted this author would appreciate any knowledge gain from the attempt.

4. Reevaluation of HQ MAC

Since this thesis did not come to any conclusive results for HQ MAC, a HEAT analysis should still be performed. The Crisis Action Team structure at MAC has had time to develop and correct some of the inherent problems with a new organization. (Powder River 85 was the first time that this version of the MAC CAT was ever convened for an exercise.) Also, this study and similar HEAT studies would aide the evaluation team in preparing for the analysis. Remember, the more time spent in the planning for the evaluation, understanding the organization, and knowing the exercise limitations, the better the chance of a successful HEAT analysis.

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