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ANALYSIS INTEGRATION (ACCSAI)  
STUDY

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VOLUME II:  
APPENDIXES G-N

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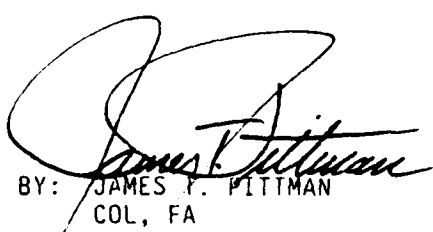
VOLUME II:

APPENDIXES G - N

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CONTINUATION FROM ITEM #19.

Documentation of the proposed program is contained in a proposed DA pamphlet and suggested changes to the existing AR 11-39. This documentation is contained in appendixes and M of this technical document and represents the main product of the ACCSAI project.



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APPENDIX G

EIGENVECTOR METHOD

G-1. Introduction. This appendix will describe some of the mathematics behind the eigenvector method. It will discuss the eigenvector (its existence and its uniqueness). Additionally, this appendix will discuss the consistency index (CI) which is used to show the acceptability of the matrix comparisons. Special thanks is given to Thomas L. Saaty for his permission to utilize his results (see reference 6).

G-2. Weight determination. The weighted priority vector used is the eigenvector for the matrix. The principal eigenvector is the eigenvector associated with the eigenvalue  $\lambda_{max}$  such that for all  $i$ ,  $\lambda_{max} > \lambda_i$ ; where  $\lambda_{max}$  and  $\lambda_i$ ; are eigenvalues of the matrix in question. [It has been proven that this eigenvector exists and is unique. See the Perron-Frobenius theorem p.170 of Saaty's AHP.] The computer is utilized in the calculation. The computer calculates the principal eigenvector by raising the AHP matrix to an arbitrarily large power, then, dividing the sum of the row elements by the sum of the matrix elements.

G-3. Consistency.

a. Consistency in the matrixes used in the eigenvector method is important for it indicates consistency in judgments. If criterion A is more important than criterion B and criterion B is more important than criterion C, the matrix should indicate criterion A is more important than criterion C. (Mathematically, if  $A > B$  and  $B > C$ , then  $A > C$ ). If this relationship is not indicated, our matrix is inconsistent.

$$\{ \text{matrix} \}^k = \{ \text{matrix} \} \cdots \{ \text{matrix} \} = A = \begin{bmatrix} a_{11} \\ a_{1j} \\ a_{1n} \end{bmatrix} \cdot \begin{bmatrix} a_{1j} \\ \vdots \\ a_{nn} \end{bmatrix} \cdot \begin{bmatrix} a_{1n} \\ \vdots \\ a_{nn} \end{bmatrix}$$

(k times)

$$\text{Principal eigenvector} = \frac{\sum_{j=1}^n a_{1j}}{S}$$

$$\frac{\sum_{j=1}^n a_{nj}}{S}$$

where  $S = \sum_{i=1}^n \sum_{j=1}^n a_{ij}$

Figure G-1. Principal eigenvector

b. Since relative weights are used in AHP, even greater care must be taken. For example, if criterion A is three times as important as criterion B, and criterion B is twice as important as criterion C, the matrix should indicate criterion A is six times as important as criterion C. (Mathematically, if  $A=3B$  and  $B=2C$  then  $A=6C$ ) The qualitative judgment made by the rater, however, may state criterion A is five times as important as criterion C. Thus, the matrix would be inconsistent.

c. In matrix notation, the notion of consistency can be shown as follows: for consistent matrixes,  $a(I,J) \cdot a(J,K) = a(I,K)$ . In terms of the weights used, let  $W(I)$  represent the actual weight of program I. Ideally,  $a(I,J) = W(I)/W(J)$  since we are determining the relative weight of program I to program J. In reality,  $a(I,J)$  does not equal  $W(I)/W(J)$  due to human error. Let  $V(I,J)$  represent the variation in  $a(I,J)$  from the ideal state as follows:

$$a(I,J) = \frac{W(I)}{W(J)} \cdot V(I,J)$$

So, if  $V(I,J) = 1$ , the identity element, we have the ideal case. Now, consider:

$$a(I,J) \cdot a(J,K) = \frac{W(I)}{W(J)} \cdot V(I,J) \cdot \frac{W(J)}{W(K)} \cdot V(J,K)$$

in the ideal case  $V(I,J) = 1 = V(J,K)$ . Thus,

$$\begin{aligned} a(I,J) \cdot a(J,K) &= \frac{W(I)}{W(J)} \cdot 1 \cdot \frac{W(J)}{W(K)} \cdot 1 = \frac{W(I)}{W(K)} \cdot 1 \\ &= \frac{W(I)}{W(K)} \cdot V(I,K) = a(I,K) \end{aligned}$$

This is the condition for consistency. If, however, any  $V(I,J) \neq 1$ , the matrix is inconsistent.

d. Some inconsistency is acceptable. Recall the last example where A should have been six times as important as C. If the rater states A is five times as important as C, the inconsistency may be worked around. If the rater says criterion A is of equal importance to criterion C, the inconsistency may be too great to be ignored. Clearly a measure of inconsistency is needed and the consistency ratio (CR) is what is usually used in the AHP method.

#### G-4. The consistency ratio.

a. The consistency ratio (CR) compares the consistency index (CI) with a random index (RI).

$CR = \frac{CI}{RI}$ . CI is defined to be  $\frac{(\lambda_{max}) - n}{n-1}$  and RI is defined to be the average CI for a set of matrixes whose a(I,J) values were randomly determined. (No logic was used in assigning these a(I,J). The RI values are shown for 3X3 to 15X15 matrixes on p.62 of reference 6) Thus, if  $CR = 1$ , then  $1 = \frac{CI}{RI}$  which

implies  $RI = CI$  and this implies the values in the matrix have as great a consistency as a matrix whose elements are randomly determined. According to Saaty, a CR value less than .1 is considered acceptable and the principal eigenvector generated for the matrix is used for the weighted priorities in the AHP process. If  $CR > .1$ , revisions may need to be made because the matrix under consideration has a greater than 10% correlation with a random matrix. (Recall the raters are expected to have some concept of logical priorities.)

b. When the matrix is determined to be so inconsistent that revisions must be made, two choices become available. The first choice is to rescore the matrix and hope the new CR is acceptable. The second choice is to force consistency. One method of forcing consistency is to consider, for each row i,

$$\max_j \left| a(I,J) - \frac{W(I)}{W(J)} \right| = E(I,J) \text{ where } a(I,J)$$
 are the elements of the matrix under consideration and W(I) and W(J) are the weights obtained from the principal eigenvector of the same matrix. For the I and J with the greatest E(I,J) value, let  $a(I,J) = W(I)/W(J)$ . After each row has been considered and the appropriate changes have been made, a new CR value is generated and a new principal eigenvector is obtained. If the CR is acceptable, the new eigenvector contains the weights to be used in AHP. If the new CR is still not acceptable, the forcing process is repeated until an acceptable CR is obtained. There are other methods to force consistency, but, anytime consistency is forced, the answer is distorted. Thus, it is recommended that the rater rethink his/her judgments instead. Note: The CR value "breakpoint" of .1 is not a hard and fast rule, i.e., it is rather arbitrary. The CI value  $\frac{(\lambda_{max}) - n}{n-1}$ , however, is carefully selected.

The Perron-Frobenius theorem (see reference 6, p. 170) shows that as consistency improves,  $CI \rightarrow 0$ . That is to say CI for a consistent matrix is zero.

#### G-5. Approximating $\lambda_{max}$ for the CR.

Let  $w$  = actual principal eigenvector  
 $w_c$  = computer calculated principal eigenvector  
 $A$  = matrix under consideration

We know  $A\vec{w} - \lambda_{max} \vec{w} = 0$ . This is true by definition of the eigenvector and eigenvalue.

Let  $\vec{v} = A\vec{w}$   
 then  $\vec{v} - \lambda_{max} \vec{w} = 0$

In matrix notation, we have

$$\begin{bmatrix} v_1 \\ \vdots \\ v_n \end{bmatrix} = \lambda_{\max} \begin{bmatrix} w_1 \\ \vdots \\ w_n \end{bmatrix}$$

This is the same as having a set of  $n$  equations and any one of these  $n$  equations could be used to solve for  $\lambda_{\max}$  provided  $v(I)$  and  $w(I)$  were known. We do not know  $v(I)$  and  $w(I)$ ; however, we do have  $w_c$ .

Let  $\vec{v}_c(I) = A \vec{w}_c(I)$   
 Since  $\frac{v}{v} - \lambda_{\max} \frac{w}{w} = 0$  and  $\vec{w}_c \approx \vec{w}$   
 $\frac{v_c}{v_c} - \lambda_{\max} \frac{w_c}{w_c} \approx 0$

In matrix notation,

$$\begin{bmatrix} v_c(I) \\ \vdots \\ v_c(N) \end{bmatrix} \approx \lambda_{\max} \begin{bmatrix} w_c(I) \\ \vdots \\ w_c(N) \end{bmatrix}$$

any one of the  $n$  linear equations could be solved to approximate  $\lambda_{\max}$ . A better approximation could be found by averaging the  $n$  approximations for  $\lambda_{\max}$  found by solving the  $n$  equations. Thus,

$$\begin{bmatrix} v_c(I) \\ \vdots \\ v_c(N) \end{bmatrix} = \begin{bmatrix} \lambda_{\text{app}}(1) w_c(I) \\ \vdots \\ \lambda_{\text{app}}(n) w_c(n) \end{bmatrix}$$

where  $\lambda_{\text{app}}(i)$  is found by solving the equation  $v_c(I) = \lambda_{\text{app}}(I) \cdot w_c(I)$ . That is to say  $\lambda_{\text{app}}(I)$  is the approximation to  $\lambda_{\max}$  found by solving the  $i$ th equation.

Let  $\lambda_{\max \text{ approx.}} = \text{avg.} (\lambda_{\text{app}}(I))$   
 $= \frac{\sum_{i=1}^n \lambda_{\text{app}}(I)}{n}$

Since as  $\vec{w}_c \rightarrow \vec{w}$ ,  $\lambda_{\max \text{ app}} \rightarrow \lambda_{\max}$ .  
 Thus  $\lambda_{\max \text{ app}}$  is an acceptable approximation for  $\lambda_{\max}$ . Note: To see how CI would be 0 for a consistent matrix, consider the matrix of values

$$A = \begin{bmatrix} \frac{w_1}{w_1} & & \\ & \ddots & \\ & & \frac{w_n}{w_n} \end{bmatrix}$$

we know  $A w = \lambda_{\max} w$  by definition of the eigenvector and eigenvalue. Find  $\lambda_{\max}$ . To do so consider the matrix notation. (The ideal situation  $a(I,J) = w(I)/w(J)$ ).

$$\begin{bmatrix} \frac{w_1}{w_1} \\ \vdots \\ \frac{w_n}{w_n} \end{bmatrix} \cdot \begin{bmatrix} w_1 \\ \vdots \\ w_n \end{bmatrix} - \lambda_{\max} \begin{bmatrix} w_1 \\ \vdots \\ w_n \end{bmatrix} = 0$$

Again, we have  $n$  equations. The first equation is

$$\frac{w_1}{w_1} (w_1) + \frac{w_1}{w_2} (w_2) + \dots + \frac{w_1}{w_n} (w_n) - \lambda_{\max} w_1 = 0.$$

Simplifying, we have

$$w_1 + w_1 + \dots + w_1 - \lambda_{\max} w_1 = 0$$

$$nw_1 - \lambda_{\max} w_1 = 0$$

$$\text{and } n = \lambda_{\max}$$

Thus in the ideal case,  $n = \lambda_{\max}$  and  $CI = \frac{\lambda_{\max} - n}{n-1} = \frac{n-n}{n-1} = 0$

as was previously stated.

## APPENDIX H

### PRIORITIZATION SOFTWARE DOCUMENTATION

H-1. Introduction. This appendix describes the software needed to facilitate the prioritization methodology described in chapter 5.

H-2. Software. Software is needed to determine the principal eigenvectors of a matrix. Additionally, software is needed to perform the multiplication required to develop a study's contribution score.

a. Software to determine the principal eigenvector already exists and can be utilized. Two alternatives workable on IBM PCs are known to the ACCSAI project team:

1. Decision support software called Topsis has been developed by Kansas State University Professors Dr. Tillman and Dr. Wang through an Army contract. The software may be obtained by contacting the COTR JCS J4 (LTC Alexander) AUTOVON 225-9212/9219. Topsis is convenient and easy to use.

2. A commercial package called "Expert Choice" was written in support of Thomas Saaty's Analytical Hierarchy Process. This software is extremely user friendly.

b. Contained in the ACCSAI database package (reference appendix K) is software which will enable the user to enter the criteria values (determined by the principal eigenvector method), calculate a study's contribution score, and then use the score to prioritize within a desired category of studies.

1. To enter the criteria values, the user should enter 6 in the ACCSAI database package main menu. The user may then enter criteria names and weights for up to ten criteria. There can only be one set of valid criteria at one time.

2. For each individual study, the user should then enter the contribution value of the study for each criteria. This will be done on the second input screen of the study record. The study contribution score is then calculated by multiplying the contribution value of the study for the  $i$ th criteria by the weight of the  $i$ th criteria and summing these for  $i=1$  to 10. These contribution scores can only be calculated using the current criteria values previously input. If the criteria are changed, then the user must edit the second screen of the study record to recalculate the contribution score.

3. The contribution scores are then used to prioritize a particular category of studies which the user can designate after typing four at the main menu to categorize studies (reference appendix K). NOTE: Only categories containing proposed, deliberate studies may be prioritized.

4. The contribution scores are also used in the sequencing/scheduling process to prioritize study sequences for scheduling.

## APPENDIX I

### SEQUENCING SOFTWARE METHODOLOGY/DOCUMENTATION

I-1. Introduction. The software developed to sequence programs is a dBase III Plus program contained in the ACCSAI database package (reference appendix K). This program is accessed by entering 7 at the main menu to sequence/schedule studies.

I-2. Assumptions. Certain assumptions were made to facilitate automated sequencing software development.

a. All proposed, deliberate studies with start dates at least one year beyond the current fiscal year and with an estimated study length of six months or more will be considered eligible for sequencing/scheduling and all other studies will be disregarded.

b. Estimated study lengths are in halfyears (e.g., a study requiring 2 years would have a length of 4 half years).

c. The requisite and prerequisite links will come from data contained in the STUDIES database file.

d. If a study eligible for sequencing/scheduling has a prerequisite which is not eligible for sequencing/scheduling then the eligible study will be sequenced/scheduled disregarding its ineligible prerequisite.

I-3. Program methodology.

a. By creating and manipulating various database files containing study information, the program can construct a file containing the final study sequences which will be input to the scheduling program.

b. Initially, the program creates a database file called SEQFILE. This file will contain a record for each study which meets the requirements for sequencing/scheduling. Each record will contain a field for the study title, three requisite studies, the study contribution score, the study length (in halfyears), and the date in which the study is programmed to begin (fiscal year and halfyear). (A requisite study is a follow on study, i.e., a study with a prerequisite.)

c. Next, SEQFILE is partitioned into 4 separate files based on whether the study has prerequisites, requisites, both, or neither.

1. SEQFILE1. This file will contain studies which have no prerequisite or requisite studies.

2. SEQFILE2. This file will contain studies which have no prerequisites but do have requisites.

3. SEQFILE3. This file will contain studies which do have prerequisites but no requisites.

4. SEQFILE4. This file will contain studies which have both prerequisites and requisites.

5. The structure of these files will be identical to SEQFILE except that each record will only have one requisite field. Therefore, if a study has more than one requisite study there will be multiple records for that study, one pertaining to each requisite study, provided that the requisite study is also eligible for sequencing/scheduling. This will only apply to SEQFILE2 and SEQFILE4 since they are the files which contain studies with requisites.

6. To create the SEQFILE1 through 4 files, the program will first step through SEQFILE, examine each study record, and insert a record into SEQFILE2 for each eligible requisite study fed by that study. If the study record has no eligible requisite studies, then a record will be inserted into SEQFILE1 for this study. When this process is completed, SEQFILE1 will contain all the studies which do not have requisites while SEQFILE2 will contain all studies which do have requisites.

7. To further partition these files based on whether they have prerequisites or not, the program creates a file called FEEDER from SEQFILE2 containing all the requisite studies. The requisites in this file may be thought of as studies which have prerequisites and are used to search for and delete these studies from SEQFILE1 and SEQFILE2 and place them in SEQFILE3 and SEQFILE4 respectively.

d. Now the study sequence file, SEQFILE5, may be constructed. This file will contain a record for each individual study sequence (i.e., an initial study through its requisites to an end study). Each record will have fields for each study name in the sequence (for up to eight studies), average utility of the distinct study sequence to which the individual sequence belongs, the individual sequence length, and the individual sequence start date (fiscal year and halfyear). The study sequences may then be checked for cycling (i.e., a study feeding one of its own prerequisites) and if a cycle is found the program terminates and identifies the cycle for the user to correct. A more detailed discussion of SEQFILE 5 follows.

1. Initially, all of the records of SEQFILE1 will be added to SEQFILE5 because these studies which have no prerequisites or requisites may be thought of as individual study sequences with only one study. Then, by using SEQFILE2 to obtain start studies, SEQFILE4 to obtain middle studies, and SEQFILE3 to obtain end studies, the individual study sequences containing more than one study can be constructed and placed into SEQFILE5.



2. The sequence length is calculated by summing all of the study lengths for each individual study sequence and placing that value in the sequence length field. The sequence start date is simply the estimated start date (fiscal year and halfyear) for the first study in the study sequence.

3. Next, the program must calculate the average utility score of each distinct study sequence. (A distinct study sequence is a conglomeration of one or more individual study sequences which share at least one study). The average utility score is the sum of the contribution scores of each study in a distinct study sequence divided by the number of studies in that distinct study sequence. To find the distinct study sequences, the program creates a database file called SEQFILE6 to contain records for each study in a particular distinct study sequence. Each study record will have two fields, one for the study title and one for its contribution score. Initially, SEQFILE6 is empty and the program will search SEQFILE5 for a sequence which does not have an average utility score yet calculated. When a sequence without an average utility score is found, records for each study in the sequence are placed into SEQFILE6. The program will then step through SEQFILE5 to find other sequences which share at least one study with the studies already contained in SEQFILE6 but do not already have an average utility score. If one is found, then that sequence is in the same distinct sequence as the studies contained in SEQFILE6 and the program will add records to SEQFILE6 for each study in that sequence not already listed in SEQFILE6. The program will continue stepping through SEQFILE5 until end-of-file is reached signifying SEQFILE6 contains all of the studies in a particular distinct study sequence. The average utility score of that distinct study sequence may then be calculated by taking the average of all the contribution scores of the studies in SEQFILE6. This value is then placed in the average utility field of each individual study sequence in SEQFILE5 containing studies in the distinct study sequence in SEQFILE6. SEQFILE6 is then emptied and the program will attempt to extract another distinct study sequence from SEQFILE5, calculate its average utility score, and place that value back into the individual study sequence average utility fields in SEQFILE5. This process is continued until all the individual study sequences in SEQFILE5 have average utility scores.

e. Now, the program will sort SEQFILE5 to place the individual study sequences in proper order for scheduling. First, the file is sorted by the estimated start dates (fiscal year and halfyear) of each individual study sequence so that studies with the earliest estimated start dates will be scheduled first. Then, the file is sorted by average utility scores which will group the individual study sequences into their distinct study sequences, by priority, within their respective start dates. Finally, the file is sorted by sequence length so the longer sequences within each distinct study sequence within each start date will be addressed first. This file, now called SEQFILE7, will be input into the scheduling program for study scheduling.

I-4. Example. To illustrate the sequencing methodology consider the following example with the given initial SEQFILE:

SEQFILE

STUDY TITLE	REQUISITE	REQUISITE	REQUISITE	CONTRIBUTION SCORE	LENGTH	START DATE	
	STUDY 1	STUDY 2	STUDY 3			FY	HYR
study A	study B	--	--	5.0	2	88	1
study B	study C	study D	--	4.0	3	89	1
study C	--	--	--	6.0	2	90	2
study D	--	--	--	7.0	1	91	1
study E	--	--	--	4.0	4	88	1
study F	study D	--	--	3.0	2	89	1

First, SEQFILE is partitioned into the following four files:

SEQFILE1

STUDY TITLE	REQUISITE STUDY	CONTRIBUTION SCORE	LENGTH	START DATE	
				FY	HYR
study E	--	4.0	4	88	1

SEQFILE2

STUDY TITLE	REQUISITE STUDY	CONTRIBUTION SCORE	LENGTH	START DATE	
				FY	HYR
study A	study B	5.0	2	88	1
study F	study D	3.0	2	89	1

SEQFILE3

STUDY TITLE	REQUISITE STUDY	CONTRIBUTION SCORE	LENGTH	START DATE	
				FY	HYR
study C	--	6.0	2	90	2
study D	--	7.0	1	91	1

SEQFILE4

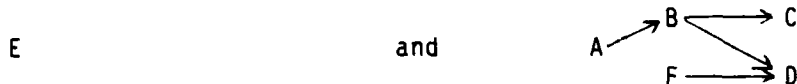
STUDY TITLE	REQUISITE STUDY	CONTRIBUTION SCORE	LENGTH	START DATE	
				FY	HYR
study B	study D	4.0	3	89	1
study B	study C	4.0	3	89	1

Using these four files the program creates SEQFILE5 to hold the individual study sequences.

#### SEQFILE5

<u>STUDY 1</u>	<u>STUDY 2</u>	<u>STUDY 3</u>	<u>STUDY 4</u>	...	<u>STUDY 8</u>	<u>AVERAGE UTILITY</u>	<u>LENGTH</u>	<u>START FY</u>	<u>DATE HYR</u>
study E	--	--	--	...	--	0.0	4	88	1
study A	study B	study D	--	...	--	0.0	6	88	1
study A	study B	study C	--	...	--	0.0	7	88	1
study F	study D	--	--	...	--	0.0	3	89	1

The next step is to calculate the average utility of each distinct study sequence. Recall that a distinct study sequence is a collection of one or more individual study sequences which share at least one study. In this example there are two distinct study sequences:



The distinct study sequences are extracted and placed into SEQFILE6 one at a time so that their average utility score may be calculated and placed into the average utility fields of the individual study sequences in SEQFILE5 with studies contained in SEQFILE6.

#### SEQFILE6

<u>STUDY TITLE</u>	<u>CONTRIBUTION SCORE</u>
study E	4.0

Average utility = 4.0/1 = 4.0

#### SEQFILE6

<u>STUDY TITLE</u>	<u>CONTRIBUTION SCORE</u>
study A	5.0
study B	4.0
study C	6.0
study D	7.0
study F	3.0

Average utility = (5.0 + 4.0 + 6.0 + 7.0 + 3.0)/5 = 5.0

SEQFILE5 now contains average utility scores for every sequence.

SEQFILE5

<u>STUDY 1</u>	<u>STUDY 2</u>	<u>STUDY 3</u>	<u>STUDY 4</u>	...	<u>STUDY 8</u>	<u>AVERAGE UTILITY</u>	<u>LENGTH</u>	<u>START DATE</u>	
								<u>FY</u>	<u>HYR</u>
study E	--	--	--	...	--	4.0	4	88	1
study A	study B	study D	--	...	--	5.0	6	88	1
study A	study B	study C	--	...	--	5.0	7	88	1
study F	study D	--	--	...	--	5.0	3	89	1

SEQFILE5 can now be sorted into SEQFILE7 to be input into the scheduling program.

SEQFILE7

<u>STUDY 1</u>	<u>STUDY 2</u>	<u>STUDY 3</u>	<u>STUDY 4</u>	...	<u>STUDY 8</u>	<u>AVERAGE UTILITY</u>	<u>LENGTH</u>	<u>START DATE</u>	
								<u>FY</u>	<u>HYR</u>
study A	study B	study C	--	...	--	5.0	7	88	1
study A	study B	study D	--	...	--	5.0	6	88	1
study E	--	--	--	...	--	4.0	4	88	1
study F	study D	--	--	...	--	5.0	3	89	1

I-5. Source Code. (See next page.)

```

CLEAR
SET BELL OFF
SET TALK OFF
CLOSE DATABASES
*****
*          INITIIALIZE DATABASE FILES AND QUERY THE USER FOR INPUT DATA          *
*****
ERASE SEQFILE.DBF
ERASE SEQFILE1.DBF
ERASE SEQFILE2.DBF
ERASE SEQFILE3.DBF
ERASE SEQFILE4.DBF
ERASE SEQFILE6.DBF
ERASE SEQFILE7.DBF
ERASE INDX.NDX
ERASE INDX1.NDX
ERASE INDX2.NDX
ERASE INDX3.NDX
ERASE INDX4.NDX
ERASE INDX5.NDX
ERASE INDX6.NDX
STORE SPACE(1) TO REPLY
DO WHILE .NOT. REPLY # "Y/N"
STORE SPACE(1) TO REPLY
CLEAR
@3,10 SAY "This program will schedule proposed, deliberate studies with an "
@4,10 SAY "estimated start date at least one year after the current fiscal year"
@6,20 SAY "Do you wish to continue ? (Y/N): " GET REPLY PICTURE "!"
READ
ENDOC
IF REPLY # "N"
RETURN
ENDIF
PUBLIC CLEAR
STORE SPACE(1) TO CLEAR
CLEAR
@7,10 SAY "Enter the current fiscal year: " GET CLEAR PICTURE "!"
READ
***** CREATE SEQUENCE AND EXIT PROGRAM IF EMPTY *****
USE STUDIES
COPY TO SEQUENCE FIELDS TITLE,RSITITLE,RECTITLE,RETTITLE,COI,CONTRNO,NO,
HYEAR FOR STATLER,RYLAND,THREASON,AND,STATE CLEAR,AND,LSN,1
USE SEQFILE
COUNT TO MDCOUNT
IF MDCOUNT = 1
CLEAR
@ 3,10 SAY "There are no study records to schedule at this time."
WAIT
USE
ERASE SEQFILE.DBF
RETURN
ENDIF
CLEAR
@ 3,15 SAY "Please hold on while I sequence the studies."

```

```
*****
*   INITIALIZE SEQFILE1, SEQFILE2, SEQFILE3 AND SEQFILE4 DATABASE FILES   *
*   AND CREATE INDEX FILES FOR EACH                                       *
*****
```

```
COPY STRUCTURE TO SEQFILE1 FIELDS TITLE,RS1TITLE,CONTSORE,LEN,SDATE,HYEAR
COPY STRUCTURE TO SEQFILE2 FIELDS TITLE,RS1TITLE,CONTSORE,LEN,SDATE,HYEAR
COPY STRUCTURE TO SEQFILE3 FIELDS TITLE,RS1TITLE,CONTSORE,LEN,SDATE,HYEAR
COPY STRUCTURE TO SEQFILE4 FIELDS TITLE,RS1TITLE,CONTSORE,LEN,SDATE,HYEAR
COPY TO TEMP FIELDS TITLE
```

```
SELECT 1
USE SEQFILE1
INDEX ON TITLE TO INDX1
SELECT 2
USE SEQFILE2
INDEX ON TITLE TO INDX2
SELECT 3
USE SEQFILE3
INDEX ON TITLE TO INDX3
SELECT 4
USE SEQFILE4
INDEX ON TITLE TO INDX4
SELECT 5
USE TEMP
INDEX ON TITLE TO INDX.NEX
SELECT 6
USE SEQFILE
GO TOP
```

```
*****
*   PLACE STUDIES WITH REQUISITES INTO SEQFILE2 AND STUDIES WITHOUT     *
*   REQUISITES INTO SEQFILE1                                             *
*****
```

```
DO WHILE .NOT. EOF
  READ SEQFILE1 INTO MTITLE
  READ SEQFILE1 INTO MRS1TITLE
  READ SEQFILE1 INTO MCONTSORE
  READ SEQFILE1 INTO MLEN
  READ SEQFILE1 INTO MSDATE
  READ SEQFILE1 INTO MHYEAR
  STORE MCONTSORE TO MCOUNTSCORE
  STORE MLEN TO MLEN
  STORE MHYEAR TO MHYEAR
  STORE MDATE TO MDATE
  STORE MCONTSORE TO FLAG
  *** PLACE STUDIES IN TEMP FILE FOR EACH REQUISITE ELEMENT FOR SEQUENTIAL ***
  IF MRS1TITLE SPACE IS
    SELECT 6
    USE MRS1TITLE
    IF .NOT. EOF
      SELECT 2
      INSERT SEQFILE
      REPLACE TITLE WITH MTITLE
      REPLACE RS1TITLE WITH MRS1TITLE
      REPLACE CONTSORE WITH MCOUNTSCORE
      REPLACE LEN WITH MLEN
      REPLACE HYEAR WITH MHYEAR
      REPLACE SDATE WITH MDATE
      STORE "Y" TO FLAG
    ENDIF
  ENDIF
ENDIF
```

```

IF MRS2TITLE<>SPACE(65)
  SELECT 5
  SEEK MRS2TITLE
  IF .NOT. EOF()
    SELECT 2
    INSERT BLANK
    REPLACE TITLE WITH MTITLE
    REPLACE RS1TITLE WITH MRS2TITLE
    REPLACE CONTSCORE WITH MOONTSORE
    REPLACE LEN WITH MLEN
    REPLACE HYEAR WITH MHYEAR
    REPLACE SDATE WITH MSDATE
    STORE "Y" TO FLAG
  ENDIF
ENDIF

```

```

ENDIF
IF MRS1TITLE<>SPACE(65)
  SELECT 5
  SEEK MRS1TITLE
  IF .NOT. EOF()
    SELECT 2
    INSERT BLANK
    REPLACE TITLE WITH MTITLE
    REPLACE RS1TITLE WITH MRS1TITLE
    REPLACE CONTSCORE WITH MOONTSORE
    REPLACE LEN WITH MLEN
    REPLACE HYEAR WITH MHYEAR
    REPLACE SDATE WITH MSDATE
    STORE "Y" TO FLAG
  ENDIF
ENDIF

```

\*\*\* PLACE RECORDS IN ORDER: FOR EACH STUDY WITH NO ELIGIBLE RECORDS \*\*\*

```

IF FLAG = "Y"
  SELECT 1
  INSERT BLANK
  REPLACE TITLE WITH MTITLE
  REPLACE RS1TITLE WITH MRS1TITLE
  REPLACE CONTSCORE WITH MOONTSORE
  REPLACE LEN WITH MLEN
  REPLACE HYEAR WITH MHYEAR
  REPLACE SDATE WITH MSDATE
  REPLACE AT WITH ATDATE
ENDIF

```

```

SELECT 5
ENDIF
W.CC
USE
PAGE TYPED
PAGE TYPED
SET DELETED ON
SELECT 2
COPY TO FEEDER FOR RS1TITLE..SPACE(65)
SELECT 5
USE FEEDER
GO TOP

```

```

*****
*   USE FEEDER TO FIND ALL THE STUDIES WITH PREREQUISITES AND DELETE THEM   *
*   FROM SEQFILE1 AND SEQFILE2 AND PLACE THEM IN SEQFILE3 AND SEQFILE4     *
*   RESPECTIVELY                                                             *
*****
DO WHILE .NOT. EOF()
  STORE RS1TITLE TO MRS
  SELECT 1
  SEEK MRS
  IF .NOT. EOF()
    STORE TITLE TO MTITLE
    STORE RS1TITLE TO MRS1TITLE
    STORE CONTSORE TO MCONTSORE
    STORE LEN TO MLEN
    STORE HYEAR TO MHYEAR
    STORE SDATE TO MSDATE
    DELETE
    SELECT 3
    INSERT BLANK
    REPLACE TITLE WITH MTITLE
    REPLACE RS1TITLE WITH MRS1TITLE
    REPLACE CONTSORE WITH MCONTSORE
    REPLACE LEN WITH MLEN
    REPLACE HYEAR WITH MHYEAR
    REPLACE SDATE WITH MSDATE
  ENDIF
  SELECT 2
  SEEK MRS
DO WHILE .NOT. EOF()
  STORE TITLE TO MTITLE
  STORE RS1TITLE TO MRS1TITLE
  STORE CONTSORE TO MCONTSORE
  STORE LEN TO MLEN
  STORE HYEAR TO MHYEAR
  STORE SDATE TO MSDATE
  DELETE
  SELECT 4
  INSERT BLANK
  REPLACE TITLE WITH MTITLE
  REPLACE RS1TITLE WITH MRS1TITLE
  REPLACE CONTSORE WITH MCONTSORE
  REPLACE LEN WITH MLEN
  REPLACE HYEAR WITH MHYEAR
  REPLACE SDATE WITH MSDATE
  SELECT 1
  SEEK MRS
ENDIF
SELECT 5
SKIP
ENDDO
SELECT 2
PACK
SELECT 1
PACK
USE

```



```

*****
*                               INITIALIZE SEQFILES AND INSERT SEQUENCES                               *
*****
SELECT 5
USE SEQFILES
DELETE ALL
PACK
APPEND FROM SEQFILE1
ERASE SEQFILE1.DBF
ERASE INDX1.NDX
GO TOP
REPLACE ALL UTIL WITH 0.0
SELECT 2
GO TOP
DO WHILE .NOT. EOF()
    *** INITIALIZE SEQUENCES WITH START STUDIES FROM SEQFILE2 ***
    STORE SPACE(65) TO MRS1,MRS2,MRS3,MRS4,MRS5,MRS6,MRS7
    STORE TITLE TO MTITLE
    STORE RS1TITLE TO MRSTITLE
    STORE HYEAR TO MHYEAR
    STORE BDATE TO MBDATE
    STORE LEN TO MLEN
    STORE 1 TO REC
    SELECT 4
    GO TOP
    SEEK MRSTITLE
    DO WHILE .NOT. EOF() .AND. REC < 8
        ***** CHECK FOR DUPLICING *****
        IF RS1TITLE=MRS1.OR.RS1TITLE=MRS2.OR.RS1TITLE=MRS3.OR.RS1TITLE=MRS4.OR.
           RS1TITLE=MRS5 .OR. RS1TITLE=MRS6
            CLEAR
            @1,10 SAY AT(1,1) "***** duplicate study - please contact *****"
            WAIT
            ERASE SEQFILE1.DBF
            ERASE INDX1.NDX
            ERASE SEQFILE1.DBF
            ERASE TEMP.DBF
            ERASE INDX1.NDX
            ERASE INDX1.NDX
            ERASE INDX1.NDX
            ERASE INDX1.NDX
            RETURN
        ENDP
        *** PLACE MIDDLE STUDIES FROM SEQFILE2 IN SEQUENCES ***
        STORE "MRS"+LTRIM(STR(REC)) TO MRS
        STORE TITLE TO &MRS
        STORE LEN+MLEN TO MLEN
        STORE REC+1 TO REC
        STORE RS1TITLE TO MRSTITLE
        SEEK MRSTITLE
    ENDDO
    SELECT 3
    SEEK MRSTITLE
    *** PLACE END STUDIES FROM SEQFILE2 IN SEQUENCES ***
    IF .NOT. EOF() .AND. REC < 8
        STORE "MRS"+LTRIM(STR(REC)) TO MRS
        STORE TITLE TO &MRS
        STORE LEN+MLEN TO MLEN
    ELSE

```

```

STORE REC-1 TO REC
ENDIF
SELECT 5
APPEND BLANK
*** STORE SEQUENCES IN SEQFILES ***
REPLACE TITLE WITH MTITLE
REPLACE RS1 WITH MRS1
REPLACE RS2 WITH MRS2
REPLACE RS3 WITH MRS3
REPLACE RS4 WITH MRS4
REPLACE RS5 WITH MRS5
REPLACE RS6 WITH MRS6
REPLACE RS7 WITH MRS7
REPLACE UTIL WITH 0.0
REPLACE LEN WITH MLEN
REPLACE HYEAR WITH MHYEAR
REPLACE SDATE WITH MSDATE
STORE REC-1 TO REC
IF REC 1
  SELECT 2
  SKIP
  LOOP
ENDIF
*****
* IF SEQUENCE CONTAINS STUDY WITH MORE THAN ONE REQUISITE THEN DELETE *
* STUDY LINK SO NEXT SEQUENCE WILL REFLECT THE OTHER REQUISITE *
*****
DO WHILE .T.
  STORE "MRS"+LTRIM(STR(REQ)) TO SRCH
  STORE "MRS"+LTRIM(STR(REQ+1)) TO SRCH1
  SELECT 4
  SET DELETED OFF
  SET ORDER TO SRCH
  SET ORDER TO SRCH1
  DELETE
  SET DELETED ON
  EXIT
END
STORE REC-1 TO REC
IF REC 1
  SET DELETED OFF
  SET ORDER TO SRCH
  SET ORDER TO SRCH1
  DELETE
  SET DELETED ON
  EXIT
ENDIF
ENDDO
ENDDC
SET DELETED OFF
CLOSE DATABASES
ERASE SEQFILE2.DBF
ERASE SEQFILE3.DBF
ERASE SEQFILE4.DBF
ERASE TEMP.DBF
ERASE INDX2.NDX
ERASE INDX3.NDX
ERASE INDX4.NDX
ERASE TNDX.NDX

```

```

*****
*      EXTRACT DISTINCT STUDY SEQUENCES FROM SEQFILES AND PLACE THEM INTO *
*      SEQFILE6 AND COMPUTE THEIR AVERAGE UTILITY AND PLACE THE VALUE INTO *
*      THE AVERAGE UTILITY FIELD FOR EACH SEQUENCE IN SEQFILES *
*****
SELECT 3
USE SEQFILE
INDEX ON TITLE TO INDX
COPY STRUCTURE TO SEQFILE6 FIELDS TITLE,CONTSORE
SELECT 2
USE SEQFILE6
INDEX ON TITLE TO INDX6
SELECT 1
USE SEQFILES
INDEX ON UTIL TO INDX5
SEEK 0.000
*FIND SEQUENCE WITHOUT AVERAGE UTILITY VALUE AND PLACE ITS STUDIES IN SEQFILE6*
DO WHILE .NOT. EOF()
  STORE 0 TO REC
  STORE "TITLE" TO SRCH
  SELECT 2
  DO WHILE .T.
    IF SEQFILES->&SRCH=SPACE(65)
      EXIT
    ENDIF
    APPEND BLANK
    REPLACE TITLE WITH SEQFILES->&SRCH
    STORE REC+1 TO REC
    STORE "RS"+LTRIM(STR(REC)) TO SRCH
  ENDDO
  SELECT 1
  *PUT VALUE IN AVERAGE UTILITY FIELD OF SEQUENCE IN CURRENT RECORD OF SEQFILE6*
  *REPLACE WITH 0*
  DO WHILE .T.
    IF SEQFILES->&SRCH=SPACE(65)
      EXIT
    ENDIF
    IF SEQFILES->&SRCH=SPACE(65)
      EXIT
    ENDIF
    SELECT 1
    SEEK SEQFILES->&SRCH
    IF .NOT. EOF()
      STORE 0 TO REC
      STORE "TITLE" TO SRCH
      DO WHILE .T.
        IF SEQFILES->&SRCH=SPACE(65)
          EXIT
        ENDIF
        SEEK SEQFILES->&SRCH
        IF EOF()
          APPEND BLANK
          REPLACE TITLE WITH SEQFILES->&SRCH
        ENDIF
        STORE REC+1 TO REC
        STORE "RS"+LTRIM(STR(REC)) TO SRCH
      ENDDO
    ENDIF
  ENDDO

```

```

        ENDDO
        SELECT 1
        REPLACE UTIL WITH 0.001
        EXIT
    ELSE
        STORE REC+1 TO REC
        STORE "RS"+LTRIM(STR(REC)) TO SRCH
    ENDIF
ENDDO
ENDIF
IF UTIL > 0.000
    SEEK 0.000
ELSE
    SKIP
    DO WHILE UTIL > 0.000 .AND. .NOT. EOF()
        SKIP
    ENDDO
ENDIF
ENDDO
ENDIF
SELECT 2
SET RELATION TO TITLE INTO SEQFILE
GO TOP
DO WHILE .NOT. EOF()
    REPLACE CONTSORE WITH SEQFILE+ CONTSORE
    SKIP
ENDDO
SET RELATION TO
**CALCULATE AVERAGE UTILITY OF DISTINCT SEQUENCE AND PLACE RAD IN SEQFILE+
AVERAGE CONTSORE TO AVEUTIL
SELECT 1
**FIND SEQUENCES WITH 1.001 AVERAGE UTILITY AND REPLACE WITH A BLANK**
SEEK 0.001
DO WHILE .NOT. EOF()
    REPLACE UTIL WITH AVEUTIL
    SKIP
ENDDO
SELECT 2
DELETE ALL
PAD
DEFAULT 1
SEEK 0.001
ENDDO
CLOSE DATABASES
*****
*   ERASE UNNEEDED FILES AND MOVE SEQFILE1 AND SEQFILE7 TO PLACE SEQFILE DEL
*   IN THEIR PROPER ORDER FOR INPUT INTO THE SCHEDULING PROGRAM
*****
ERASE SEQFILE.DBF
ERASE SEQFILE6.DBF
ERASE INDX6.NDX
ERASE INDX.NDX
USE SEQFILES
SORT ON SDATE,HYEAR,UTIL/D,LEN/D TO SEQFILE7
CLOSE DATABASES
ERASE INDX5.NDX
DO A:SCHED.DOC
RETURN

```

## APPENDIX J

### SCHEDULING SOFTWARE METHODOLOGY/DOCUMENTATION

J-1. Introduction. The software developed to schedule studies is contained in the ACCSAI database package (reference appendix K). This program is accessed by entering 7 at the main menu to sequence/schedule studies.

J-2. Assumptions. Some assumptions had to be made to facilitate automated software development for scheduling.

- a. Studies are not to be scheduled before their estimated start dates.
- b. All of a study's prerequisite studies must be completed before the study can be started, except in the case described in paragraph e, below.
- c. A study's resource requirements will be evenly distributed throughout the life of the study.
- d. A study must be performed in a continuous manner (i.e., it cannot start, then stop for a while, and then pick up where it left off at a later date).
- e. If a study requires more resources than the total amount an agency has available, then the study may not be scheduled but its requisites may.
- f. If the study does not have an agency designated within the mission/capability database (MCDB) file to perform it, then the study will be scheduled disregarding study agency resource constraints.

J-3. Program methodology.

a. This program is designed to schedule studies based on their position in the SEQFILE7 database file. The SEQFILE7 file was created by the sequencing program to provide input into the scheduling program. By using the information in SEQFILE7 a study may be scheduled according to its start date, priority, completion of prerequisite studies, length, and resource availability. The scheduling program will schedule studies to be performed in halfyear time intervals beginning at the start date of the first study in SEQFILE7 and continuing in halfyear increments until every study is scheduled.

b. Initially, the program will create two new database files to contain the study and schedule information. The first file, called STUDY, will contain a record for each study to be scheduled with fields for the study title, study agency, required PSY (professional staff

years), estimated study length (in halfyears), and fiscal year and halfyear (initially containing estimated start date of the study). The other file created will be called SCHDFILE which is identical to STUDY but will also have fields for the schedule date (fiscal year and halfyear). Records will be added to this file as they are scheduled; therefore, it is initially empty.

c. Before the program begins scheduling studies, it will initialize the scheduling date (fiscal year and halfyear) to the estimated start date of the first study of the first sequence to be scheduled out of SEQFILE7. The program will also create an AGENCY file which will contain the agency names, their available capabilities (in PSYs), and total capabilities (in PSYs).

d. Next, the program starts at the first study of the first sequence of SEQFILE7 and begins the scheduling process as follows.

1. First, the program searches SCHDFILE to see if the study has already been scheduled in a previous halfyear. If the study has not been previously scheduled, the program will check the estimated start date of the study. If the estimated start date is the same or before the current scheduling date, the program will attempt to schedule the study. If the estimated start date is after the current scheduling halfyear, the program will skip to the next sequence and continue scheduling. Before scheduling a study, the program must ensure that the agency programmed to perform the study has the capabilities available to accommodate the study during that halfyear to be scheduled. (The amount of resources needed by a study during a given halfyear is its total PSY divided by its length in halfyears.) If the resources are not currently available, the study will have to be scheduled in a future halfyear when the resources become available. Otherwise, the study is added to the schedule file, the resources used by the study in the current halfyear are subtracted from the agency's available capabilities and the study's total PSY, the study length is decremented by one halfyear, and the fiscal year and halfyear fields in the study record are updated to the current scheduling fiscal year and halfyear to indicate that the study has been allocated resources during this halfyear. The program will then skip to the next sequence and continue scheduling.

2. If, after searching SCHDFILE, the program finds that the study has been previously scheduled, the program will check to see if the fiscal year and halfyear fields in the study record are different than the current scheduling fiscal year and halfyear to make sure the study has not already been allocated resources during this halfyear. If it has, the program skips to the next sequence and continues scheduling, if not, the program will check the study length field to determine the remaining length of the study.

- (a) If the remaining length is zero, then the study has been completed and the program will attempt to schedule the study's requisite, if it has one. Before scheduling a requisite study, the

program checks to see if it is fed by any other studies. If it is, the program must ensure that these prerequisite studies have also been completed before attempting to schedule the requisite. If they are not, then the requisite will have to wait and the program skips to the next sequence and continues scheduling there.

(b) If the remaining study length is greater than zero then the study is not yet completely scheduled. In this case, the program will attempt to schedule work on the study so that it may be continued during this halfyear. Prior to scheduling, the program checks the capabilities of the study agency to determine if the agency has the resources available to continue work on the study during the halfyear being scheduled. If it does not, then the study will have to be rescheduled from its beginning at a later date when the agency has the resources available to perform the entire study in a continuous manner. If the agency can accommodate the study during the current halfyear, then the study is scheduled by subtracting the resources needed by that study during that halfyear from the agency's available capabilities and the study's total PSY; subtracting one halfyear from the study length; and updating the study fiscal year and halfyear fields to the current scheduling fiscal year and halfyear to indicate that this study has had resources allocated to it this halfyear.

e. Using the scheduling process described above, the program will schedule as many studies as possible in a halfyear period until it has made a complete pass through SEQFILE7. The program will then increment the time interval by one halfyear, reinitialize the agency's available capabilities to its total capabilities, go back to the top of SEQFILE7, and resume scheduling. When the SCHDFILE becomes as large as the STUDY file then all of the studies have been scheduled and the scheduling process is terminated. The user will then have the option of creating a schedule report and a schedule file.

J-4. Example. To illustrate the scheduling process, consider the following example using SEQFILE7 created by the sequencing program and input into the scheduling program (reference appendix I):

SEQFILE7

<u>STUDY 1</u>	<u>STUDY 2</u>	<u>STUDY 3</u>	<u>STUDY 4</u>	...	<u>STUDY 8</u>	<u>AVERAGE</u> <u>UTILITY</u>	<u>LENGTH</u>	<u>START DATE</u>	
								<u>FY</u>	<u>HYR</u>
study A	study B	study C	--	...	--	5.0	7	88	1
study A	study B	study D	--	...	--	5.0	6	88	1
study E	--	--	--	...	--	4.0	4	88	1
study F	study D	--	--	...	--	5.0	3	89	1

The initial study file will be as follows:

STUDY					
<u>STUDY TITLE</u>	<u>STUDY AGENCY</u>	<u>PSY</u>	<u>LENGTH</u>	<u>FY</u>	<u>HYR</u>
study A	agency 1	2.0	2	88	1
study B	agency 1	3.0	3	89	1
study C	agency 1	2.0	2	90	2
study D	agency 1	2.0	1	91	1
study E	agency 1	2.0	4	88	1
study F	agency 1	4.0	2	89	1

The agency file will be as follows:

AGENCY		
<u>AGENCY NAME</u>	<u>AVAILABLE CAPABILITIES</u>	<u>TOTAL CAPABILITIES</u>
agency 1	3.0	3.0

The initial scheduling date will be FY88 halfyear 1.

The program will now go to the top of SEQFILE7 and begin scheduling. The first study to be scheduled is study A. Study A will require one PSY during this halfyear from agency 1 and 3.0 are available so study A will be scheduled for work during this time period. The next sequence also begins with study A and, since it has already been allocated resources during this time period, the program skips to the next sequence and attempts to schedule study E. Study E requires 0.5 PSY during this halfyear from agency 1 and 2.0 are available so study E will be scheduled for work during this time period. The next study to be scheduled is study F but, since it has an estimated start date of FY89 halfyear 1, study F is not yet ready to be scheduled. The end of SEQFILE7 has been reached and the STUDY, SCHDFILE, and AGENCY database files will now look as follows after this pass through SEQFILE7.

STUDY					
<u>STUDY TITLE</u>	<u>STUDY AGENCY</u>	<u>PSY</u>	<u>LENGTH</u>	<u>FY</u>	<u>HYR</u>
study A	agency 1	1.0	1	88	1
study B	agency 1	3.0	3	89	1
study C	agency 1	2.0	2	90	2
study D	agency 1	2.0	1	91	1
study E	agency 1	1.5	3	88	1
study F	agency 1	4.0	2	89	1



SCHDFILE

<u>STUDY</u> <u>TITLE</u>	<u>STUDY</u> <u>AGENCY</u>	<u>TOTAL</u> <u>PSY</u>	<u>TOTAL</u> <u>LENGTH</u>	<u>START</u> <u>DATE</u>		<u>SCHEDULE</u> <u>DATE</u>	
				<u>FY</u>	<u>HYR</u>	<u>FY</u>	<u>HYR</u>
study A	agency 1	2.0	2	88	1	88	1
study E	agency 1	2.0	4	88	1	88	1

AGENCY

<u>AGENCY</u> <u>NAME</u>	<u>AVAILABLE</u> <u>CAPABILITIES</u>	<u>TOTAL</u> <u>CAPABILITIES</u>
agency 1	1.5	3.0

The program will now reset the agency 1 available capabilities back to the total capabilities of 3.0, increment the schedule date one halfyear to FY88 halfyear 2, go to the top of SEQFILE7, and resume scheduling.

The first study to be scheduled is study A. First, the program will search SCHDFILE to determine if the study has already been initially scheduled. Since study A has been scheduled, the program checks the date fields in the study file to determine if study A has been allocated resources in this halfyear or not. Since it has not, the program will check to see if the remaining length of study A is greater than zero. Since the remaining length is greater than zero, the program checks to see if agency 1 has the available resources to continue work on study A in this time period. Since study A only requires one PSY during this halfyear and agency 1 has 3.0 available, study A will be scheduled for work in this halfyear. The next sequence also begins with study A and, since it has already been allocated resources during this time period, the program skips to the next sequence and attempts to schedule study E. Study E will then be scheduled in the same manner as study A and the program skips to the next sequence. The next study to be scheduled is study F but, since it has an estimated start date of FY89, halfyear 1, it is not yet ready to be scheduled. The end of SEQFILE7 has now been reached and the STUDY, SCHDFILE, and AGENCY database files will now look as follows after this pass through SEQFILE7.

STUDY

<u>STUDY</u> <u>TITLE</u>	<u>STUDY</u> <u>AGENCY</u>	<u>PSY</u>	<u>LENGTH</u>	<u>FY</u>	<u>HYR</u>
study A	agency 1	0.0	0	88	2
study B	agency 1	3.0	3	89	1
study C	agency 1	2.0	2	90	2
study D	agency 1	2.0	1	91	1
study E	agency 1	1.0	2	88	2
study F	agency 1	4.0	2	89	1

SCHDFILE

<u>STUDY TITLE</u>	<u>STUDY AGENCY</u>	<u>TOTAL PSY</u>	<u>TOTAL LENGTH</u>	<u>START DATE</u>		<u>SCHEDULE DATE</u>	
				<u>FY</u>	<u>HYR</u>	<u>FY</u>	<u>HYR</u>
study A	agency 1	2.0	2	88	1	88	1
study E	agency 1	2.0	4	88	1	88	1

AGENCY

<u>AGENCY NAME</u>	<u>AVAILABLE CAPABILITIES</u>	<u>TOTAL CAPABILITIES</u>
agency 1	1.5	3.0

The program will now reset agency 1 available capabilities back to the total capabilities of 3.0, increment the schedule date one halfyear to FY89 halfyear 1, go to the top of SEQFILE7, and resume scheduling.

The first study addressed is study A. Since study A has already been initially scheduled and has not been allocated resources in this halfyear, the program now will check to see if the remaining length of study A is greater than zero. Since it is not, study A is completed and its requisite study B may be scheduled. Since no other studies feed study B it is eligible for scheduling and, since its start date has been reached and its PSY of 1 is within the capabilities of agency 1, it is initially scheduled. The program skips to the next sequence and finds study A completed and study B already having resources allocated to it in this halfyear so the next study to be addressed is study E. Since the resources are available to continue work on study E in this halfyear, it is scheduled and the program skips to the next sequence and attempts to schedule study F. Now study F's start date has been reached but study F will require 2 PSY and agency 1 has only 1.5 PSY available because 1.0 is allocated to study B and 0.5 is allocated to study E. Therefore, study F cannot be scheduled during this halfyear. The end of SEQFILE7 has now been reached and the STUDY, SCHDFILE, and AGENCY database files will now look as follows after this pass through SEQFILE7.

STUDY

<u>STUDY TITLE</u>	<u>STUDY AGENCY</u>	<u>PSY</u>	<u>LENGTH</u>	<u>FY</u>	<u>HYR</u>
study A	agency 1	0.0	0	88	2
study B	agency 1	2.0	2	89	1
study C	agency 1	2.0	2	90	2
study D	agency 1	2.0	1	91	1
study E	agency 1	0.5	1	89	1
study F	agency 1	4.0	2	89	1

SCHDFILE

<u>STUDY TITLE</u>	<u>STUDY AGENCY</u>	<u>TOTAL PSY</u>	<u>TOTAL LENGTH</u>	<u>START DATE</u>		<u>SCHEDULE DATE</u>	
				<u>FY</u>	<u>HYR</u>	<u>FY</u>	<u>HYR</u>
study A	agency 1	2.0	2	88	1	88	1
study E	agency 1	2.0	4	88	1	88	1
study B	agency 1	3.0	3	89	1	89	1

AGENCY

<u>AGENCY NAME</u>	<u>AVAILABLE CAPABILITIES</u>	<u>TOTAL CAPABILITIES</u>
agency 1	1.5	3.0

The program will now reset agency 1 available capabilities back to the total capabilities of 3.0, increment the schedule date one halfyear to FY89 halfyear 2, go to the top of SEQFILE7, and resume scheduling.

The studies B and E will both be allocated resources during this pass through SEQFILE7. Studies C and D cannot be addressed because of incompletely scheduled prerequisites and study F must still wait for agency 1 to complete one of its current studies so its resource requirements may be met. STUDY, SCHDFILE, and AGENCY database files will now look as follows after this pass through SEQFILE7.

STUDY

<u>STUDY TITLE</u>	<u>STUDY AGENCY</u>	<u>PSY</u>	<u>LENGTH</u>	<u>FY</u>	<u>HYR</u>
study A	agency 1	0.0	0	88	2
study B	agency 1	1.0	1	89	2
study C	agency 1	2.0	2	90	2
study D	agency 1	2.0	1	91	1
study E	agency 1	0.0	0	89	2
study F	agency 1	4.0	2	89	1

SCHDFILE

<u>STUDY TITLE</u>	<u>STUDY AGENCY</u>	<u>TOTAL PSY</u>	<u>TOTAL LENGTH</u>	<u>START DATE</u>		<u>SCHEDULE DATE</u>	
				<u>FY</u>	<u>HYR</u>	<u>FY</u>	<u>HYR</u>
study A	agency 1	2.0	2	88	1	88	1
study E	agency 1	2.0	4	88	1	88	1
study B	agency 1	3.0	3	89	1	89	1

AGENCY

<u>AGENCY NAME</u>	<u>AVAILABLE CAPABILITIES</u>	<u>TOTAL CAPABILITIES</u>
agency 1	1.5	3.0

Now the program will reset the agency 1 available capabilities back to the total capabilities 3.0, increment the schedule date one halfyear to FY90 halfyear 1, go to the top of SEQFILE7, and resume scheduling.

The program will continue work on study B and, now that study E is completed, the resources are available for study F to be initially scheduled. STUDY, SCHDFILZ, and AGENCY database files will now look as follows after this pass through SEQFILE7.

STUDY

<u>STUDY TITLE</u>	<u>STUDY AGENCY</u>	<u>PSY</u>	<u>LENGTH</u>	<u>FY</u>	<u>HYR</u>
study A	agency 1	0.0	0	88	2
study B	agency 1	0.0	0	90	1
study C	agency 1	2.0	2	90	2
study D	agency 1	2.0	1	91	1
study E	agency 1	0.0	0	89	2
study F	agency 1	2.0	1	90	1

SCHDFILE

<u>STUDY TITLE</u>	<u>STUDY AGENCY</u>	<u>TOTAL PSY</u>	<u>TOTAL LENGTH</u>	<u>START DATE</u>		<u>SCHEDULE DATE</u>	
				<u>FY</u>	<u>HYR</u>	<u>FY</u>	<u>HYR</u>
study A	agency 1	2.0	2	88	1	88	1
study E	agency 1	2.0	4	88	1	88	1
study B	agency 1	3.0	3	89	1	89	1
study F	agency 1	4.0	2	89	1	90	1

AGENCY

<u>AGENCY NAME</u>	<u>AVAILABLE CAPABILITIES</u>	<u>TOTAL CAPABILITIES</u>
agency 1	0.0	3.0

Now the program will reset the agency 1 available capabilities back to the total capabilities of 3.0, increment the schedule date one halfyear to FY90 halfyear 2, go to the top of SEQFILE7, and resume scheduling.

The program will now find that study B has been completed and will attempt to schedule its requisite, study C. Since study C has no incompletely scheduled prerequisites and the resources are available, it will be initially scheduled. The program skips to the next sequence and will attempt to schedule study D. Upon finding that study D has a prerequisite, study F, which is not yet scheduled to completion, the program skips to the next sequence and schedules continued work on study F during this halfyear because the resources are available. STUDY, SCHDFILE, and AGENCY database files will now look as follows after this pass through SEQFILE7.

#### STUDY

<u>STUDY</u> <u>TITLE</u>	<u>STUDY</u> <u>AGENCY</u>	<u>PSY</u>	<u>LENGTH</u>	<u>FY</u>	<u>HYR</u>
study A	agency 1	0.0	0	88	2
study B	agency 1	0.0	0	90	1
study C	agency 1	1.0	1	90	2
study D	agency 1	2.0	1	91	1
study E	agency 1	0.0	0	89	2
study F	agency 1	0.0	0	90	2

#### SCHDFILE

<u>STUDY</u> <u>TITLE</u>	<u>STUDY</u> <u>AGENCY</u>	<u>TOTAL</u> <u>PSY</u>	<u>TOTAL</u> <u>LENGTH</u>	<u>START</u> <u>DATE</u>		<u>SCHEDULE</u> <u>DATE</u>	
				<u>FY</u>	<u>HYR</u>	<u>FY</u>	<u>HYR</u>
study A	agency 1	2.0	2	88	1	88	1
study E	agency 1	2.0	4	88	1	88	1
study B	agency 1	3.0	3	89	1	89	1
study F	agency 1	4.0	2	89	1	90	1
study C	agency 1	2.0	2	90	2	90	2

#### AGENCY

<u>AGENCY</u> <u>NAME</u>	<u>AVAILABLE</u> <u>CAPABILITIES</u>	<u>TOTAL</u> <u>CAPABILITIES</u>
agency 1	0.0	3.0

Now the program will reset the agency 1 available capabilities back to the total capabilities of 3.0, increment the schedule date one halfyear to FY91 halfyear 1, go to the top of SEQFILE7 and resume scheduling.

First, the program will schedule continued work on study C since resources are available. The program will then skip to the next sequence and attempt to schedule study D. Now that study D's prerequisites are all completed and there are resources available, study D may be initially scheduled. STUDY, SCHDFILE, and AGENCY database files now look as follows after this pass through SEQFILE7.

#### STUDY

<u>STUDY TITLE</u>	<u>STUDY AGENCY</u>	<u>PSY</u>	<u>LENGTH</u>	<u>FY</u>	<u>HYR</u>
study A	agency 1	0.0	0	88	2
study B	agency 1	0.0	0	90	1
study C	agency 1	0.0	0	91	1
study D	agency 1	0.0	0	91	1
study E	agency 1	0.0	0	89	2
study F	agency 1	0.0	0	90	2

#### SCHDFILE

<u>STUDY TITLE</u>	<u>STUDY AGENCY</u>	<u>TOTAL PSY</u>	<u>TOTAL LENGTH</u>	<u>START DATE</u>		<u>SCHEDULE DATE</u>	
				<u>FY</u>	<u>HYR</u>	<u>FY</u>	<u>HYR</u>
study A	agency 1	2.0	2	88	1	88	1
study E	agency 1	2.0	4	88	1	88	1
study B	agency 1	3.0	3	89	1	89	1
study F	agency 1	4.0	2	89	1	90	1
study C	agency 1	2.0	2	90	2	90	2
study D	agency 1	2.0	1	91	1	91	1

#### AGENCY

<u>AGENCY NAME</u>	<u>AVAILABLE CAPABILITIES</u>	<u>TOTAL CAPABILITIES</u>
agency 1	0.0	3.0

Now that SCHDFILE is the same size as STUDY file, the program determines that all of the studies have been scheduled and the scheduling process is terminated. SCHDFILE contains the final study schedule. The user now has the option of printing a schedule report and saving the schedule to a file.

J-5. Source Code. (See next page.)

```

CLEAR
@3,15 SAY "Please hold on while I schedule the studies."
SET BELL OFF
SET TALK OFF
CLOSE DATABASES
ERASE STUDY.DBF
ERASE SNDX1.NDX
ERASE SCHDFILE.DBF
ERASE SNDX2.NDX
ERASE AGENCY.DBF
ERASE ANDX.NDX
USE STUDIES
*****
* CREATE STUDY FILE, INITIALIZE SCHDFILE, CREATE AGENCY FILE AND INITIALIZE *
* SCHEDULING DATES (MYR AND MHYR) *
*****
COPY TO STUDY FIELDS TITLE, ANAME, PSY, LEN, SDATE, HYEAR ;
FOR STATUS="P" .AND. TYPE="D" .AND. SDATE > CURFY .AND. LEN > 0
USE STUDY
INDEX ON TITLE TO SNDX1
COPY TO TEMP STRUCTURE EXTENDED
USE TEMP
APPEND BLANK
REPLACE FIELD_NAME WITH "SCHDATE"
REPLACE FIELD_TYPE WITH "D"
REPLACE FIELD_LEN WITH 2
REPLACE FIELD_DEC WITH 0
APPEND BLANK
REPLACE FIELD_NAME WITH "SCHYEAR"
REPLACE FIELD_TYPE WITH "D"
REPLACE FIELD_LEN WITH 1
REPLACE FIELD_DEC WITH 0
CREATE INDEX FILE PACK FOR A
INDEX ON TITLE TO SNDX1
ERASE TEMP.DBF
USE MORE
COPY TO AGENCY FIELDS AGENCY, CAPABILITY, CAPABLE FOR CAPABILITY
SELECT 2
USE AGENCY
INDEX ON AGENCY TO AIX
SELECT 1
USE SINDX1 INDEX SINDX1
COUNT TO MCOUNT1
SET RELATION TO ANAME 1 TO AGENCY
SELECT 4
USE SCHDFILE INDEX SINDX2
COUNT TO MCOUNT2
SELECT 5
USE FEEDER
SELECT 3
USE SEQFILE7
GO TOP
STORE SDATE TO MYR
STORE HYEAR TO MHYR

```

```

*****
* BEGIN SCHEDULING PROCESS AND PERFORM UNTIL SCHEDULE FILE IS AS LARGE AS *
* THE STUDY FILE *
*****
DO WHILE MCOUNT2<MOUNT1
  STORE "TITLE" TO SRCH
  STORE 1 TO REC
  *** STEP THROUGH SEQFILE7 AND SCHEDULE STUDIES FOR CURRENT HALFYEAR ***
  DO WHILE .NOT. EOF()
    SELECT 4
    SEEK SEQFILE7->&SRCH
    *** DETERMINE IF STUDY HAS BEEN INITIALLY SCHEDULED ***
    IF .NOT. EOF()
      *** SCHEDULE STUDIES WHICH HAVE BEEN INITIALLY SCHEDULED ***
      SELECT 1
      SEEK SEQFILE7->&SRCH
      ** DETERMINE IF STUDY HAS RESOURCES ALREADY ALLOCATED THIS HALFYEAR **
      IF SDATE<>MYR .OR. HYEAR<>MYR
        *** DETERMINE IF STUDY IS COMPLETED ***
        IF LEN<1
          STORE "RS"+LTRIM(STR(REC)) TO SRCH1
          IF SEQFILE7->&SRCH1<>SPACE(65)
            SELECT 5
            GO TOP
            LOCATE FOR TITLE=SEQFILE7->&SRCH .AND. RS1TITLE=SEQFILE7->&SRCH1
            *** DETERMINE IF UNCOMPLETED PREREQUISITES EXIST ***
            DO WHILE .NOT. EOF()
              SELECT 1
              SEEK PREREQ->TITLE
              IF LEN<1 .OR. (LEN=1 .AND. (SDATE=MYR .AND. HYEAR=MYR))
                EXIT
              ENDDIF
              SELECT 6
              CONTINUE
            LOOP
          IF EOF
            STORE SRCH1 TO SRCH
            STORE REC1 TO REC
            SELECT 2
            LOOP
          ENDDIF
        ELSE
          SELECT 7
          IF .NOT. EOF
            SELECT 1
            *** SCHEDULE STUDY WHICH CANNOT BE FULLY COMPLETED ***
            IF AGENCY< CAPABILITY < PSY/LEN
              REPLACE PSY WITH SCHDFILE->PSY
              REPLACE LEN WITH SCHDFILE->LEN
              REPLACE SDATE WITH SCHDFILE->SDATE
              REPLACE HYEAR WITH SCHDFILE->HYEAR
              SELECT 4
              DELETE
              PACK
            ELSE

```



```

        *** SCHEDULE STUDY AND AGENCY FOR CONTINUED WORK ***
        SELECT 2
        REPLACE CAPABILITY WITH CAPABILITY-STUDY->PSY/STUDY->LEN
        SELECT 1
        REPLACE PSY WITH PSY-PSY/LEN
        REPLACE LEN WITH LEN-1
        REPLACE SDATE WITH MYR
        REPLACE HYEAR WITH MMYR
    ENDIF
ELSE
    *** SCHEDULE STUDY FOR CONTINUED WORK ***
    SELECT 1
    REPLACE PSY WITH PSY-PSY/LEN
    REPLACE LEN WITH LEN-1
    REPLACE SDATE WITH MYR
    REPLACE HYEAR WITH MMYR
ENDIF
ENDIF
ENDIF
ELSE
    *** SCHEDULE STUDIES WHICH HAVE NOT BEEN INITIALLY SCHEDULED ***
    SELECT 1
    SEEK SECFIL7->MSRCH
    *** DETERMINE IF ESTIMATED START DATE HAS BEEN REACHED ***
    IF (SDATE=MYR).OR.(SDATE=MYR.AND.HYEAR<=MMYR)
        SELECT 2
        IF (.NOT. EOF )
            SELECT 1
            *** DETERMINE IF RESOURCES ARE AVAILABLE ***
            IF AGENCY->CAPABILITY =PSY/LEN
                *** SCHEDULE STUDY AND DESIGNATE AGENCY ***
                SELECT 4
                APPEND BLANK
                REPLACE TITLE WITH STUDY->TITLE
                REPLACE ANAME WITH STUDY->NAME
                REPLACE PSY WITH STUDY->PSY
                REPLACE LEN WITH STUDY->LEN
                REPLACE SDATE WITH STUDY->SDATE
                REPLACE HYEAR WITH STUDY->HYEAR
                REPLACE SDATE WITH MYR
                REPLACE HYEAR WITH MMYR
                SELECT 2
                REPLACE CAPABILITY WITH CAPABILITY->PSY/STUDY->PSY-PSY/LEN
                SELECT 1
                REPLACE PSY WITH PSY-PSY/LEN
                REPLACE LEN WITH LEN-1
                REPLACE SDATE WITH MYR
                REPLACE HYEAR WITH MMYR
            ELSE
                *** IF AGENCY UNABLE TO HANDLE STUDY AT FULL STAFF **
                IF AGENCY->CAPABLE=PSY/LEN
                    SELECT 4
                    APPEND BLANK
                    REPLACE TITLE WITH STUDY->TITLE
                    REPLACE ANAME WITH 'CANNOT BE SCHEDULED'
                    REPLACE PSY WITH STUDY->PSY
                    REPLACE LEN WITH STUDY->LEN
                    REPLACE SDATE WITH STUDY->SDATE
                    REPLACE HYEAR WITH STUDY->HYEAR
                    SELECT 1
                
```

```

                REPLACE PSY WITH 0.0
                REPLACE LEN WITH 0
                REPLACE SDATE WITH MYR
                REPLACE HYEAR WITH MHYR
            ENDIF
        ENDIF
    ELSE
        SELECT 4
        *** SCHEDULE STUDY WITHOUT DESIGNATED AGENCY ***
        APPEND BLANK
        REPLACE TITLE WITH STUDY->TITLE
        REPLACE ANAME WITH STUDY->ANAME
        REPLACE PSY WITH STUDY->PSY
        REPLACE LEN WITH STUDY->LEN
        REPLACE SDATE WITH STUDY->SDATE
        REPLACE HYEAR WITH STUDY->HYEAR
        REPLACE SCHDATE WITH MYR
        REPLACE SCHYEAR WITH MHYR
        SELECT 1
        REPLACE PSY WITH PSY-PSY/LEN
        REPLACE LEN WITH LEN-1
        REPLACE SDATE WITH MYR
        REPLACE HYEAR WITH MHYR
    ENDIF
ENDIF
ENDIF
SELECT 3
SKIP
STORE "TITLE" TO SRCH
STORE 1 TO REC
ENDDO
*** INCREMENT SCHEDULE DATE ONE HALFYEAR ***
IF VAL(MHYR)=1
    STORE LTRIM(STR(VAL(MHYR)+1)) TO MHYR
ELSE
    STORE LTRIM(STR(VAL(MHYR)+.5)) TO MHYR
    STORE "1" TO MHYR
ENDIF
SELECT 2
GO TOP
*** REINITIALIZE AGENCY CAPABILITIES TO TOTAL CAPABILITIES ***
DO WHILE (.NOT. EOR)
    REPLACE CAPABILITY WITH CH-ABLE
    SKIP
ENDDO
SELECT 4
COUNT TO MODLNTD
SELECT 3
GO TOP
ENDDO
CLOSE DATABASES
ERASE AGENCY.DBF
ERASE ANDX.DBF
ERASE STUDY.DBF
ERASE SNDX1.NDX
ERASE SNDX2.NDX
ERASE SEQFILE7.DBF
ERASE FEEDER.DBF

```

```

**** ALLOW USER TO CREATE SCHEDULE REPORT AND WRITE SCHEDULE TO A FILE ****
STORE SPACE(1) TO REPLY
DO WHILE .NOT. REPLY $ "YN"
CLEAR
STORE SPACE(1) TO REPLY
@3,10 SAY "Do you wish to print a listing of the schedule ? (Y/N): " ;
GET REPLY PICTURE "!"
READ
ENDDO
IF REPLY="Y"
STORE SPACE(1) TO ANS
DO WHILE .NOT. ANS $ "PS"
CLEAR
STORE SPACE(1) TO ANS
@3,5 SAY "Do you want the report sent to the printer or the screen ? (P/S): " ;
GET ANS PICTURE "!"
READ
ENDDO
USE SCHDFILE
IF ANS="P"
REPORT FORM SCHDRPT TO PRINT
ELSE
CLEAR
DISPLAY OFF ALL LEFT(TITLE,20),LEFT(ANAME,20).PSY,LEN,SDATE,HYEAR,SCHDATE,;
SCHYEAR
WAIT
ENDIF
ENDIF
USE
STORE SPACE(1) TO REPLY
DO WHILE .NOT. REPLY $ "YN"
CLEAR
STORE SPACE(1) TO REPLY
@3,5 SAY "Do you wish to create a file containing the scheduled records ? (Y/N): " ;
GET REPLY PICTURE "!"
READ
ENDDO
IF REPLY="Y"
ERASE SCHDFILE.DBF
ELSE
CLEAR
STORE SPACE(3) TO FILENM
@3,10 SAY "Enter a name for the file: " GET FILENM PICTURE "XXXXXXXX"
READ
STORE TRIM(FILENM)+".DBF" TO FILENM
RENAME SCHDFILE.DBF TO &FILENM
ENDIF
RETURN

```

## APPENDIX K

### DATA BASE MANAGEMENT

K-1. General. The ACCSAI project developed a management program by which ACCS studies, projects, tools, and test or exercise data may be integrated Army-wide. A database software package was designed using dBase III Plus to facilitate this process.

K-2. Software.

- a. IBM PC DOS release 2.0 or higher or MS DOS release 2.1 or higher.
- b. dBase III Plus software package.
- c. Expert Choice software package (written in support of Thomas Saaty's Analytical Hierarchy Process). This is used to establish the criteria values.
- d. The collection of programs, database files, memory files, and report format files created with dBase III Plus which allows the user to manipulate the data base.

K-3. Hardware. An IBM personal computer, IBM AT, IBM XT, or some other 100% IBM-compatible computer and any printer that prints 80 or more characters across the page will be required.

K-4. Software documentation.

- a. Four data base files were created to hold the various data records.
  1. STUDIES.DBF - This file contains the study records. It holds both deliberate and quick-response studies which may be either proposed or on-going. Once a study is completed, it is to be deleted from the data base.
  2. ACCSTOOL.DBF - This file contains the tool records. They may be tool requirements records or records of tools already developed. The different tool types are data bases, models/simulations, scenarios, and other.
  3. MCDB.DBF - This file contains the mission/capability records submitted by the various study agencies.
  4. DATADB.DBF - This file contains records of data requirements or test or exercise data already available.
- b. To use the programs designed to manipulate the data base files, go to the dBase III Plus dot prompt and enter the command "DO MENU." The main menu should appear on your screen. (Next page.)

## MAIN MENU

1. INPUT DATA
2. EDIT DATA
3. DELETE DATA
4. CATEGORIZE DATA
5. REPORT DATA
6. SET CRITERIA
7. SEQUENCE/SCHEDULE STUDIES
8. EXIT PROGRAM

1. INPUT DATA - After choosing 1, indicating you wish to input a record, a menu of the data base files will appear; enter the number of the file in which you wish to input a record. You will then be asked for the number of a data entry screen to enter data. A study record has four screens, a tool record has four screens, a mission/capability record has two screens, and a data record has one screen. You may proceed through the screens in any order entering the data off of an appropriate input form. When you have finished inputting the data, type 0 (zero) for screen number and you will be asked if you would like to store the record in the data base; answer by typing Y or N. You will then be asked if you would like to enter another record; answer by typing Y or N.

2. EDIT DATA - After choosing 2, indicating you wish to edit a record, a menu of data base files will appear; enter the number of the file containing the record you would like to edit. You will then be prompted for the key used to search the data base for the record. If you are editing a study record, you will be prompted for the PUIC (project unique identification code) for that record. If you are editing a tool record, you will be prompted for the name of the agency which either requested or created the tool, whether it's a tool requirement record or a record of an already developed tool, and the type of tool. If you are editing a mission/capability record, you will be prompted for the agency name. If you are editing a data record, you will be prompted for the name of the agency and whether it's a data requirement record or a record of available data. After entering the key value, the data base will search for the record. If the record is not found, you will be asked if you would like to try again or exit back to the main menu; answer by typing Y or N. If the record is found, you will be asked for a data entry screen number. You may proceed through the screens containing the record's data and edit accordingly. When you are satisfied with the record's contents, type 0 (zero) for the screen number and you will be asked if you wish to store the changes you just made; answer by typing Y or N. You will then be given the opportunity to edit another record or exit back to the main menu.

3. DELETE DATA - After choosing 3, indicating you wish to delete a record, a menu of data base files will appear; enter the number of the file containing the record you wish to mark for deletion. You will then be prompted for the key values used to search for the record. If the record is not found, you will be asked if you would like to try again or exit; answer by typing Y or N. If the record is found, you will be asked to verify its deletion; answer by typing Y or N. You will then be given the opportunity to delete another record or exit. When you exit, before you return to the main menu, you will be asked if you would like to "pack" the data base (i.e., physically remove the records marked for deletion); answer by typing Y or N.

4. CATEGORIZE DATA - After choosing 4 to categorize data, a menu of the data base files will appear; enter the number of the file to categorize.

(a) If you choose to categorize study records, you will be asked if you wish to include only records of a particular study sponsor. If you type Y, you will be prompted for the sponsor name and only the records containing that sponsor name will be included. If you type N, the sponsor name will not be used for categorization. You will also be given an opportunity to specify records containing a particular study agency or a particular start year. You may then choose to include deliberate, quick-response, or both types of studies and whether to include proposed, on-going, or both study status types. If the category contains either quick-response or on-going studies, the studies within it may not be prioritized because the studies have already been initiated into action. You will then be shown a screen with the same categorization values used on the input form. Proceed through the screen marking (T) rue the minimal amount of categorization values needed to create a particular study category. You will then be told whether the category contains records or not. If not, you may create another category or exit back to the main menu. If the category contains records, you will be asked if you wish to prioritize the study records by their contribution scores within their respective start dates. Remember, you will not be able to prioritize studies within a category which has only one record. You will then be allowed to print a listing of the category on the printer or the screen. You will next be asked if you would like to create a file containing the categorized records; if so, you will be prompted for a file name. You may then create another category or exit back to the main menu.

(b) If you choose to categorize tool records, you will be asked if you wish to include only records of a particular study agency. If you type Y, you will be prompted for the agency name and only the records containing that agency name will be included. You may then choose to include tool requirements, developed tool, or both tool status types, and whether you would like to include data bases, models/simulations, scenarios, others, or all types of tool records. You will then proceed through three screens with the same categorization values used in the input form, marking (T) rue the minimal amount of categorization values needed to create a particular tool category. You will then be told if the category contains records or not. If not, you may create another category or exit. If the category has records, you will be allowed to print a listing of the category on the printer or screen. Next, you will be asked if you wish to create a file containing the categorized records; if so, you will be prompted for a file name. You may then create another category or exit to the main menu.

(c) If you choose to categorize mission/capability records, you will be shown a screen containing the same categorization values as seen on the input form. Proceed through the screen and mark (T) rue the minimal amount of categorization values needed to delineate a category of study agencies. You will then be told if the category contains records or not. If not, you may create another category or exit. If the category does contain records, you will be allowed to print a listing of the category on the printer or the screen. You will next be asked if you wish to create a file containing the categorized records; if so, you will be prompted for a file name. You may then create another category or exit to the main menu.

(d) If you choose to categorize data records, you will be asked if you wish to include only records of a particular agency. If you type Y, you will be prompted for the agency name and only the records containing that agency name will be included. You may then choose to include data requirements, available data, or both types of data records. You will then proceed through the data categorization values used on the input form. Mark (T)rue the minimal amount of categorization values needed to create a particular data record category. You will then be told if the category contains records or not. If not, you may create another category or exit. If the category does contain records, you will be allowed to print a listing of the category on the printer or the screen. Next, you will be asked if you wish to create a file containing the categorized records; if so, you will be prompted for a file name. Then you may create another category or exit back to the main menu.

5. REPORT DATA - After choosing 5, indicating you wish to print a report of a record, a menu of data base files will appear; enter the number of the file containing the record you would like to print. You will then be prompted for the key values used to search the data base for the record. If the record is not found, you will be asked if you would like to try again or exit; answer by typing Y or N. If the record is found, you will receive a message to verify that the printer is powered up and on line. After this, the record report will begin to print. When printing is complete, you will be asked if you would like to print another record or exit; answer by typing Y or N.

6. SET CRITERIA - After choosing 6, indicating you wish to set the criteria values, you will be shown a screen containing the current criteria names and values for up to 10 criteria. Proceed through the screen entering the criteria names and values previously determined. The values will be multiplied by the individual study criteria values and then summed to make the contribution score used for prioritization.

7. SEQUENCE/SCHEDULE STUDIES - After choosing 7 to sequence/schedule studies, the program will display a message telling you that this program is designed to schedule only proposed, deliberate studies with an estimated start date at least one year beyond the current fiscal year and a length greater than zero. You will be allowed to continue or exit. If you continue, the program will ask for the current fiscal year and all of the eligible studies will then enter into the sequencing process. Once the sequencing is completed, the studies will be scheduled based on start year, priority, prerequisite completion, and designated study agency resource constraints. When the scheduling is finished, you may print a schedule report to either the screen or the printer and may also create a database file containing records of the scheduled studies. (For a discussion of the sequencing and scheduling methodology, see appendix I and appendix J.)

NOTE: The sequencing/scheduling process may take up to 15 minutes depending on the total number of studies to be scheduled and the interrelationships of these studies.

8. EXIT PROGRAM - After choosing 8, indicating you wish to exit the program, you will return to the dBase III Plus dot prompt from where you may return to DOS by entering the command QUIT.

K-5. Miscellaneous Comments.

a. You may exit a data entry screen by proceeding through each prompt using the enter key or you may use the escape key. You must press ENTER after typing a data value in order for the value to be stored. Also, do not press ESCAPE until the entire screen is shown.

b. The PUIC should be unique for each study record and the agency name should be unique for each mission/capability record. The tool records and the data records may have records with the same agency names, statuses, and types. When a search for a tool or data record occurs and multiple records fit the key values, you will be allowed to scroll through the records and pick the one you want.

c. If you receive a screen prompt during the execution of an ACCSAI database program warning that a certain file already exists and "Would you like to write over it?" answer by typing Y.

d. You should create a separate directory to contain the dBase III Plus software along with the programs and files used with it. You may then store the programs and files used with it in the same directory or leave the programs and files on the floppy disk and use the "SET PATH TO A": command to access the programs and files from the disk drive.

e. To merge files with the same structure but different records, use the APPEND FROM command. To do this, you must go to the dBase dot prompt and issue the command USE <filename> where filename is the name of the file contained in the dBase directory to which you wish to add records. Next you would issue the command APPEND FROM <filename> where filename is the name of the file from which you wish to merge. An example of merging a study file from a floppy disk with the study file in the dBase directory would be to go to the dot prompt and enter USE STUDIES; then insert the floppy disk into the disk drive and enter APPEND FROM A:STUDIES and the study records contained on the floppy disk will be added to the study file in the dBase directory. There are other ways to merge files, but this is the easiest.

f. The name for a categorized file must be eight characters or less with the first character being a letter and the remaining characters being numbers or letters.

g. You may recall records marked for deletion with the RECALL command before the data base file becomes packed, which physically removes records marked for deletion.

h. The key values used to search the data base for a particular record must be entered exactly as they appear in the record for the search to be successful. That means the punctuation marks, the letter case, and the spacing must be the same.

i. The criteria values must be entered prior to the study contribution values in order to calculate the study contribution score. If the criteria values are changed, then the second study input screen containing the contribution values should be accessed by editing that record in order to recalculate the contribution score.



j. If the study schedule report says a particular study could not be scheduled, then the study requires more resources than its designated agency has available. The other studies included in the study sequence will be scheduled disregarding the unscheduled study. To correct this, either increase the study agency capabilities, decrease the study PSY requirement, or increase the study length.

k. PSYs are a measure of an agency's available professional staff years and may be expended in halfyear time intervals.

APPENDIX L

Pamphlet  
No. \_\_\_\_\_

DA Pam \_\_\_\_\_

Headquarters  
Department of the Army  
Washington, D.C. \_\_\_\_\_

ARMY COMMAND AND CONTROL SYSTEM ANALYSIS  
INTEGRATION (ACCSAI) STUDIES

Guidance for Army command and control system study sponsor/proponents,  
analysis organizations, and management components related to the Army Command  
and Control System Analysis Integration (ACCSAI) Program.

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CHAPTER 1

GENERAL

1-1. Purpose. This pamphlet outlines:

a. The types of studies to be included in the Army Command and Control System Analysis Integration (ACCSAI) program.

b. The responsibilities of the participants in the ACCSAI program; the schedules and cycles involved with the ACCSAI program; and all necessary forms and instructions for participation in the ACCSAI program.

1-2. Remarks on content. The material contained in this document is intended to:

a. Act as a guide to the management components of the ACCSAI program for the maintenance of the ACCSAI program.

b. Educate the action officer regarding the Army management requirements associated with the initiation, conduct, and termination of studies concerning the Army Command and Control System.

c. Assist the action officer with the fulfillment of the Army management requirements referred to in 1-2b, above.

## CHAPTER 2

### DEFINITION OF AN ACCSAI PROGRAM STUDY

#### 2-1. General.

##### a. The Army Command and Control System (ACCS).

(1) A system with facilities, equipment (including hardware and software), communications, procedures, and staff essential to Army commanders to plan, direct, and control operations with assigned resources. (See AR 11-39.)

(2) The ACCS is an integrated system of individual system networks at the sustaining base, strategic, theater, and tactical echelons. The ACCS architecture brings together four subarchitectures (functional, organizational, systems, information) into a single architecture designed to support command and control from the forward foxhole through the Army interface at the National Command Authority. See Army Command and Control Master Plan (AC2MP). The ACCS architecture is divided into four geographic zones:

(a) Sustaining base. Army functions and organizations involved in sustainment training, resource acquisition and management, and the development and maintenance of combat readiness. (Example system: ATIS - the Army Training Information System.)

(b) Strategic. Army functions and organizations involved in strategic planning, coordination, and direction of military movements and operations. (Example system: AWIS - The Army WWMCCS Information System.)

(c) Theater. Army functions performed by the theater Army and/or field Army echelon.

(d) Tactical. The Army Tactical Command and Control System (ATCCS) focuses on the information flow to and from the maneuver commander on the modern battlefield within a given hierarchical structure. Within each echelon, the battlefield has been divided into five battlefield functional areas (BFAs), maneuver, fire support, air defense, combat service support, and intelligence and electronic warfare. Information has been classified as technical, staff (functional), or command to facilitate collection, analysis, and dissemination. To provide effective command and control, the ATCCS consists of a number of systems:

1. Subordinate system. Automated, remote, or manual systems normally designed to support internal technical missions of a BFA (such as the Standard Installation/Division Personnel System (SIDPERS)).

2. Control system. Facilities, equipment, communications, procedures, and personnel that provide a BFA with the capability to process and analyze data for internal functional command and control purposes (such as the Advanced Field Artillery Tactical Data System (AFATDS)).

3. Force-level (echelon) command system. Provide the force (maneuver) commander and his staff with key information necessary to develop the maneuver concept of operation and subsequent conduct of battle. The five BFA command and control information exchange networks support the command system.

b. Studies and analyses.

(1) Studies and analyses are primarily concerned with taking existing data derived from intelligence and testing and, through primarily mathematical means, applying this knowledge in the resolution of questions about nearly any aspect of training, organizing, and equipping the Army for the battlefield. This may be done as part of the concept-based requirements system (CBRS) process (for example, the mission area analyses (MAA)), as part of the life cycle system management model (LCSMM) process (resource studies, force structure studies, logistics studies, personnel studies, cost and operational effectiveness analysis), as part of the training development process (developmental training analysis), or in resolution of other identified Army needs. The AR 5-5 studies program is the controlling mechanism for the proper utilization of Army study and analysis assets.

(2) Studies are analytical examinations to assist Army decision makers. Studies develop supporting methodologies, alternatives, assessments, and recommendations. Studies contribute to greater understanding of relevant issues and lead to conclusions and recommendations for use by decisionmakers.

(3) A study addresses a problem on which a decision must be made in light of the alternatives available to the decisionmaker. The Army, constrained by budgetary, personnel, and other limitations, strives to determine how best to employ its resources to produce the greatest effectiveness. The size and complexity of the Army require that an orderly procedure be established to obtain this effectiveness. The Army study process as outlined in AR 5-5 provides the required discipline. It is a principal aid to the decisionmaker in accomplishing the evaluation of the military-economic problems with which he is constantly faced.

2-2. Studies to be included in the ACCSAI program.

a. All efforts which evaluate any portion of the ACCS (C2, C3, C3I materiel, organizations, doctrine, or training, or which represent C2, C3, or C3I.)

b. All ACCS efforts that require greater than six man-months work by organizational staff personnel, in-house Army study activities, and/or contractors. ACCS efforts address Headquarters, Department of the Army (HQDA) or major command (MACOM) issues and/or contribute to the decision-making process or policy development.

c. All ACCS efforts included in AR 5-5 and/or AR 5-14.

2-3. Deliberate and quick-response studies.

a. In order to make the ACCSAI program responsive to the study needs of the Army, two categories of studies have been defined for the purposes of this program:

(1) Deliberate studies. Deliberate studies are studies which, by their early identification, allow preplanning and prescheduling.

(2) Quick-response studies. Studies, which because of their late identification and high priority for immediate conduct and completion, require out-of-cycle scheduling.

b. The above defined two types of studies are managed by the ACCSAI program through different processes. These procedures are detailed in the following chapters of this pamphlet.

2-4. Examples of ACCSAI program study and nonstudy efforts.

a. The examples of AR 5-5 and AR 5-14 study efforts apply for ACCSAI efforts.

b. The following, if more than six man-month efforts, will be included in the ACCSAI program:

(1) ACCS systems engineering and integration efforts.

(2) Analyses to support test, design, and evaluations; independent evaluation plans/reports; mission area management plans.

(3) Developing and maintaining ACCS data bases, user interface requirements, mission area development plans, master plans, concepts, etc.

(4) ACCS problem/deficiency solving.

(5) ACCS efforts whose results will impact another MACOM.

(6) All ACCS efforts that are marginal between study and nonstudy efforts.

c. The following are examples of study efforts not to be included in the ACCSAI program:

(1) Research and exploratory developments funded in 6.1 and 6.2 RDTE program categories.

(2) Development and modification of automatic data processing systems which support other than study and analysis activities (AR 18-1).

(3) Value engineering.

- (4) Project program planning and monitoring.
- (5) Engineering design.
- (6) System fabrication.
- (7) System test.



## CHAPTER 3

### ARMY COMMAND AND CONTROL SYSTEM ANALYSIS INTEGRATION (ACCSAI) PROGRAM OVERVIEW

3-1. Purpose. The Army Command and Control System Analysis Integration (ACCSAI) program is a management program conducted by Department of the Army, Office of the Deputy Chief of Staff for Operations and Plans (DA ODCSOPS), which ensures the best use of the Army's analysis resources in the development of the ACCS program (AR 11-39).

#### 3-2. Program operations.

a. DA ODCSOPS publishes guidance concerning the future direction of the Army command and control system. The guidance serves as long-term direction for development of the ACCS program. The guidance describes where priority of development within the ACCS architecture (chapter 2) should be placed and identifies the most pressing ACCS issues. The guidance provides impetus for the generation of new ACCS study requirements by acting as the template against which present/future capabilities and presently identified ACCS study requirements may be compared.

b. As ACCS study requirements are identified, they are initiated by their proponent. Depending on the type of study, deliberate or quick-response (chapter 2), the following procedures are followed:

(1) Deliberate. Prior to submission of any ACCS study request, the proponent must conduct a preliminary literature search of both the Defense Technical Information Center (DTIC) and the Army Command Control System Study and Tool/data Schedule (ACCS STATS). ACCS STATS is accessible through the ACCSAI program office. The proponent then submits the study requirements to the MACOM ACCSAI program office, through the use of DD Form 1498, a study directive, and an ACCSAI attachment form to DD Form 1498 (AAD) (Chapter 6). Studies should be submitted four years in advance or as soon as they are identified. The large lead time enhances study quality by ensuring that: tools/data are available when needed, the studies are integrated with other study requirements, and the study will be completed by the requested time. However, studies may be submitted at any time prior to their requested start date.

(2) Quick-response. Upon the identification of a quick-response-type study, the proponent conducts a literature search of both DTIC and ACCS STATS. After determining a nonduplicative nature to the study requirement, the proponent notifies the MACOM ACCSAI program office through either a phone call or the submission of a study input form (chapter 6).

c. Each major command (MACOM) ACCSAI program office processes the ACCS study requests. Processing involves various procedures, also dependent upon the type of study. ACCSAI program offices are responsible for the following processes:

(1) Deliberate studies. ACCSAI program offices are responsible for study categorizing, sequencing, prioritizing, and scheduling. (Prioritization of deliberate study requests will be approved by representatives of the proponents.) Scheduling involves the setting of a date for the conduct of the deliberate study as well as the determination of the appropriate analysis agency. (Some MACOMs have study programs other than the ACCSAI program which will determine the analysis agency. The ACCSAI program will not usurp the responsibilities of these existing programs, and study proponents must ensure that they go through all appropriate channels for study initiation, conduct, and termination.) Deliberate studies are programmed for conduct one year in advance of conduct. They are tentatively scheduled two and three years in advance of conduct. All studies are categorized, listed, and used for reference. All information concerning ongoing and projected studies is retained within each MACOM's ACCSAI program office in Army Command and Control System Studies and Tool/data Schedule (ACCS STATS), an automated data base.

(2) Quick-response studies. The ACCSAI program offices are responsible for categorizing quick-response studies, searching for duplications in study efforts, and maintaining information concerning quick-response studies in ACCS STATS.

d. All ACCS studies which qualify for the AR 5-5 or AR 5-14 study program must be submitted by the proponent to Department of the Army through the appropriate AR 5-5 and AR 5-14 channels upon the programming of those studies through the ACCSAI program. At the same time, the programmed AR 5-5 and AR 5-14 studies must be submitted to DTIC.

e. Organizations performing ACCS studies must contact the MACOM ACCSAI program tool/data office as soon as they are scheduled to perform a study in order to coordinate the acquisition of necessary tools and data. The analysis organizations are also responsible for keeping the proponent updated on the status of the study.

f. Proponents are responsible for submitting updates of studies to their MACOM's ACCSAI program office as well as to DTIC (if the study is AR 5-5 or AR 5-14). The completion of all studies must be reported to DTIC and to their MACOM's ACCSAI program office.

g. For technical details concerning the prioritization methodology and software documentation, reference the TRADOC Analysis Command Technical Document TRAC/TD-6/86.

## CHAPTER 4

### ACCSAI PROGRAM RESPONSIBILITIES

4-1. ACCSAI program management structure. Figure L-1 represents the management structure associated with the ACCSAI program. Associated tasks are outlined in 4-2 (below).

4-2. Program tasks.

a. DA ODCSOPS.

(1) Provide annual futuristic guidance concerning the development of the ACCS program and ACCS analysis.

(2) Ensure program conformance of all MACOMs.

(3) Chair the ACCSAI steering committee and working group.

(4) Manage the ACCSAI program and keep the program viable.

b. ACCS steering committee (ACCS SC). (Chaired by ODCSOPS. Members include the DUSA(OR) and representatives from each MACOM). The ACCS SC will be called upon only when issues cannot be resolved by the ACCS working group.

c. ACCS working group (WG). (Chaired by ODCSOPS. Members include the ODUSA(OR) and representatives from each MACOM). The ACCS WG will meet annually to:

(1) Identify MACOM-specific ACCS issues.

(2) Eliminate duplicate efforts across the MACOMs, as identified by MACOM program offices.

(3) Identify noncompliance to the ACCSAI program.

d. ACCSAI program office (ACCSAI PO). Each MACOM will:

(1) Act as the MACOM clearing house for all study requirements. Tasks include: gather and manage information concerning all ACCS study requirements, both deliberate and quick-response; identify and eliminate duplicate efforts; sequence, prioritize, and schedule deliberate studies to be done within the next three years; maintain information concerning quick-response and deliberate studies in ACCS STATS. (Reference TRAC/TD-6/86 for documentation of methodologies to be employed as well as software documentation and computer hardware specifications.)

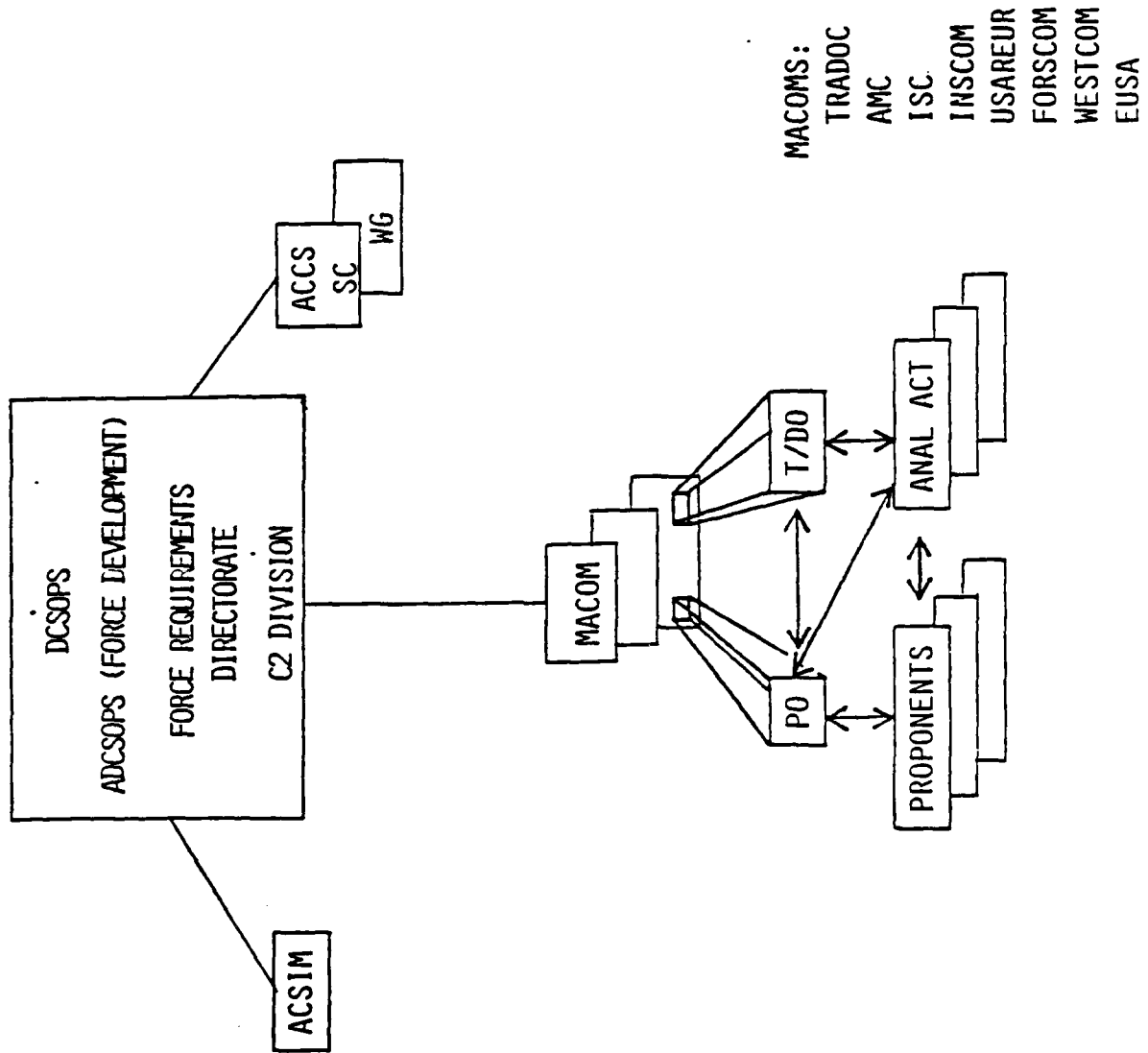


Figure L-1. ACCSAI program management structure

(2) Schedule deliberate studies to reflect the appropriate analysis agencies.

(3) Maintain an automated reference inventory of all projected and on-going studies and projects within the MACOM, identifying, for each study, the following information (where appropriate): proponent, analysis agency POCs, description codes, status, start date, end date, sequence, priority, decision maker, and decision to be made. The automated reference inventory is referred to as the Army Command and Control System Study and Tool/data Schedule (ACCS STATS). (For technical details concerning data base design, reference TRAC/TD-6/86.)

\*(4) Deliver semiannual information concerning programmed, scheduled, on-going, and listed (forecasted) studies to the central ACCS STATS data base. (This encompasses all studies and study requirements currently in the ACCSAI program office's data base.)

\*\* (5) Semiannually disseminate consolidated information concerning programmed, scheduled, on-going and listed (forecasted) studies to all MACOMs. (This is a consolidated version of what was sent in (4), above.)

\*\* (6) Provide inter-MACOM coordination and integration by identifying and attempting to eliminate duplicate efforts for ACCS study requirements across all MACOMs (unresolved conflicts will be referred to the ACCS WG).

(7) Ensure use of ACCS STATS and DTIC for literature search through the education of individuals involved in ACCS studies.

(8) Chair annual meeting of study proponents to validate deliberate study prioritization.

e. ACCSAI program tool/data office (ACCSAI T/DO) (each MACOM).

(1) Assist MACOM ACCS analysis organizations with forecasting/scheduling ACCS tool/data requirements (to ensure no duplication and timely availability of necessary tool/data), based on programmed and scheduled studies within the AR 5-5, AR 5-14, and the ACCSAI program.

(2) Assist MACOM ACCS analysis organizations procuring input data from governmental and commercial sources to support future ACCS studies within the AR 5-5, AR 5-14, and the ACCSAI program.

(3) Maintain an automated reference inventory of ACCS models, data bases, and scenarios. The automated data base (ACCS STATS (tools)) will contain information concerning the origin, current status, existing documentation, expertise within MACOM, past applications, and future status of the tool/data. (Reference TRAC/TD-6/86 for data base design and hardware specifications.)

-----  
\*All MACOMs except TRADOC

\*\*TRADOC only

(4) Coordinate across MACOMs to other ACCSAI program tool/data offices as required on a case-by-case basis for specific tools/data.

(5) Coordinate with the MACOM ACCSAI program office for purposes of ensuring timely data/tool availability for use in ACCS studies as required on a case-by-case basis for specific tools/data.

+(6) Annually deliver information concerning available and projected models, data bases, and data to the consolidating ACCS STATS (tools) office for incorporation into the consolidated data base.

++(7) Annually disseminate consolidated information concerning available and projected ACCS models, data bases, and data to all MACOMs.

++(8) Provide inter-MACOM coordination and integration of ACCS tools/data by identifying and attempting to eliminate duplicate efforts (unresolved conflicts will be referred to the ACCS WG).

(9) Act as a MACOM correspondent with the Joint Technical Coordinating Group for Munitions Effectiveness (JTTCG-ME).

(10) Meet annually (summer) to discuss major tool/data requirements and forecasted developments.

f. ACCS study proponents will:

(1) Conduct literature searches of both DTIC and ACCS STATS before initiating any study. (Chapter 7.)

(2) Submit all study requirements, both deliberate and quick-response, to the MACOM ACCSAI program office. (Chapter 6.)

(3) Submit the appropriate ACCS studies to the AR 5-5 and AR 5-14 program after the studies are programmed under the ACCSAI program. (Chapter 6.)

(4) Submit all AR 5-5 and AR 5-14 studies to DTIC (chapter 7) at the following times: upon submission of the study to the AR 5-5 and/or AR 5-14 studies program, whenever a major change to the study occurs, and upon study completion.

(5) Submit all non-AR 5-5/AR 5-14 studies to DTIC (both deliberate and quick-response) upon completion. (Chapter 8.)

(6) Submit study updates to the MACOM ACCSAI program office for all studies with major changes. (Chapter 7.)

(7) Submit copy of final DTIC form (DD Form 1498) along with a study completion form, when a deliberate or quick-response study has been completed, to the MACOM ACCSAI program office. (Chapter 8.)

-----  
+All MACOMs except AMC  
++AMC only

(8) Attend annual ACCS study prioritization meeting to validate study priorities.

g. ACCS analysis organizations (all organizations performing ACCS studies).

(1) Conduct literature searches of both DTIC and ACCS STAIS at the outset of any study. (Chapter 7.)

(2) Submit tool/data requirements to ACCSAI program tool/data office. (Chapter 7.)

(3) Keep appropriate proponents updated on the status of studies.

(4) Submit follow-on study requirements to proponents.

## CHAPTER 5

### ACCSAI PROGRAM ANNUAL CYCLE AND RESPONSIBILITIES

5-1. Annual cycles by organization. Tables L-1, L-2, L-3, L-4, L-5, and L-6 represent the responsibilities, by month, of participants and management components of the ACCSAI program.

5-2. ACCSAI program annual cycle.

a. The diagram at figure L-2 represents the annual cycle for the ACCSAI program. The purpose of figure L-2 is to show how the annual cycles of the organizations involved in the management of the ACCSAI program coincide. Based on the definition of deliberate and quick-response studies (chapter 2), only the deliberate study will be managed through the annual cycle shown in figure L-2.

b. Years are referenced as follows:

- CY = Current study year.
- PY = Program year (CY+1). Studies are programmed for conduct in the PY during March of the CY.
- SY1 = Schedule year one (CY+2). Studies are preliminarily scheduled according to conduct time and analysis agency.
- SY2 = Scheduled year two (CY+3). Studies are preliminarily scheduled according to conduct time and analysis agency.
- LY = List year (CY+4). Studies are retained within ACCS STATS for reference purposes.
- FY = Fiscal year.

c. To read figure L-2, start in the upper left-hand corner of the chart and follow the arrows. The organizations listed on the left side of the chart are opposite the tasks they perform. The ACCSAI tool/data office and the study agencies tasks do not directly affect the program management cycle.

5-3. Reporting procedures for quick-response studies. Figure L-3 diagrams the procedures involved with quick-response studies. No timeline is associated with these procedures since, by definition of quick-response studies, the timeframe of quick-response studies cannot be predetermined.



Table L-1. DA ODCSOPS (ACCSAI program manager)

JUNE	*Provide ACCS guidance for two to ten years into the future.
FEBRUARY JULY	*Organize and chair the ACCSAI working group.
*THROUGHOUT THE YEAR	(1) Provide ACCSAI program management. (2) Ensure program conformance by all MACOMs.

Table L-2. ACCSAI working group

JULY	ACCSAI WG meets to identify MACOM-specific ACCS issues derived from DA ODCSOPS guidance, to eliminate duplicate efforts across the MACOMs identified by the MACOM program offices, and to identify noncompliance to the ACCSAI program.
FEBRUARY	Each MACOM presents its most resource-intensive studies for review.

Table L-3. ACCSAI program office (one per MACOM)

OCTOBER	*	Request new deliberate studies and verification of previously submitted deliberate studies from proponents.
NOVEMBER		Receive and begin categorization and sequencing of deliberate study requests.
DECEMBER		Complete deliberate study categorization and sequencing and begin deliberate study prioritization and scheduling.
JANUARY		Complete prioritization and scheduling of all deliberate study requests.
FEBRUARY		Chair meeting of study proponents to validate deliberate study priorities. Gain MACOM approval of FY study program. Attend ACCS WG meeting; present most resource-intensive studies.
MARCH		
APRIL	*	
MAY		
JUNE		Supply lists of requested deliberate studies (by proponent) to working group.
JULY		Attend ACCS WG meeting; present future MACOM study emphases.
THROUGHOUT THE YEAR		<ol style="list-style-type: none"> <li>(1) Provide information to proponents and analysis agencies for literature searches.</li> <li>(2) Receive, prioritize, categorize, and manage information concerning quick-response study requirements.</li> <li>(3) Facilitate quick reaction time to quick-response studies.</li> <li>(4) Receive and process deliberate study requirements.</li> <li>(5) Correspond with the ACCSAI tool/data office to ensure data/tools are available in a timely manner for use in studies.</li> </ol>

\*All MACOMS submit ACCS STATS updates to executive agent data base at TRADOC (early in month). TRADOC disseminates consolidated ACCS STATS updates back to all MACOMS (late in month).

Table L-4. ACCSAI program tool/data office (one per MACOM)

NOVEMBER	*
MAY	*
JULY	Meet to discuss major tool/data requirements and forecasted developments. (Partial joint meeting with ACCS WG.)
THROUGHOUT THE YEAR	See chapter 4, paragraph 4-2e.

\*All MACOMs deliver information concerning available and projected models, data bases, and data to the tool/data (AMC) executive agent for consolidation. (Executive agent tool/data office disseminates consolidated tool/data information back out to all MACOM tool/data offices.)

Table L-5. ACCS study proponents

OCTOBER	Submit study requests to MACOM ACCSAI program office.
FEBRUARY	Attend meeting to validate study priorities.
MARCH	Submit appropriate programmed studies to the AR 5-5 program and to DTIC.
THROUGHOUT THE YEAR	Reference paragraph 4-2f.

Table L-6. ACCS analysis organizations

THROUGHOUT THE YEAR	Reference paragraph 4-2g.
---------------------	---------------------------

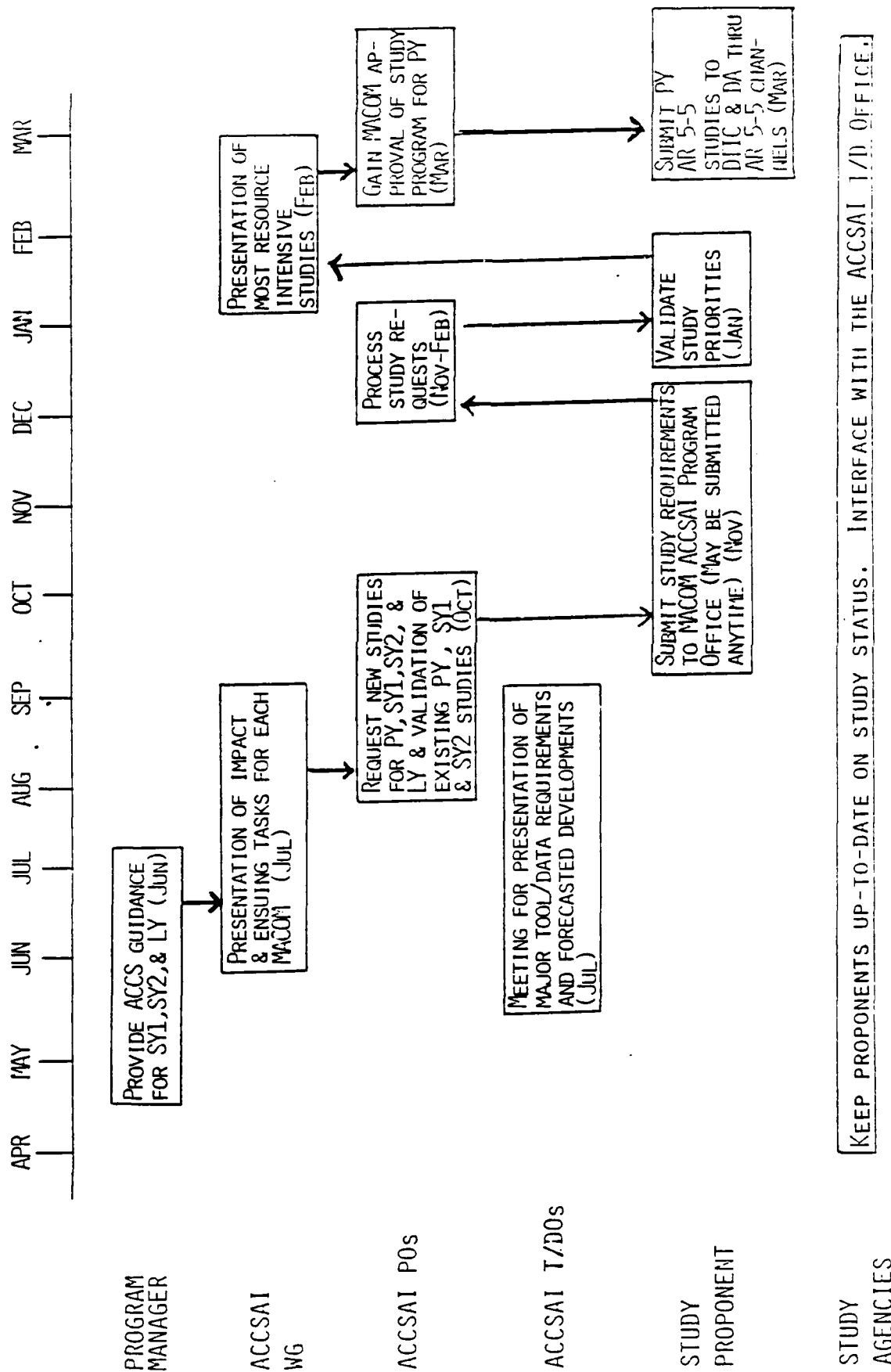


Figure L-2. ACCSAI program annual cycle

T I M E

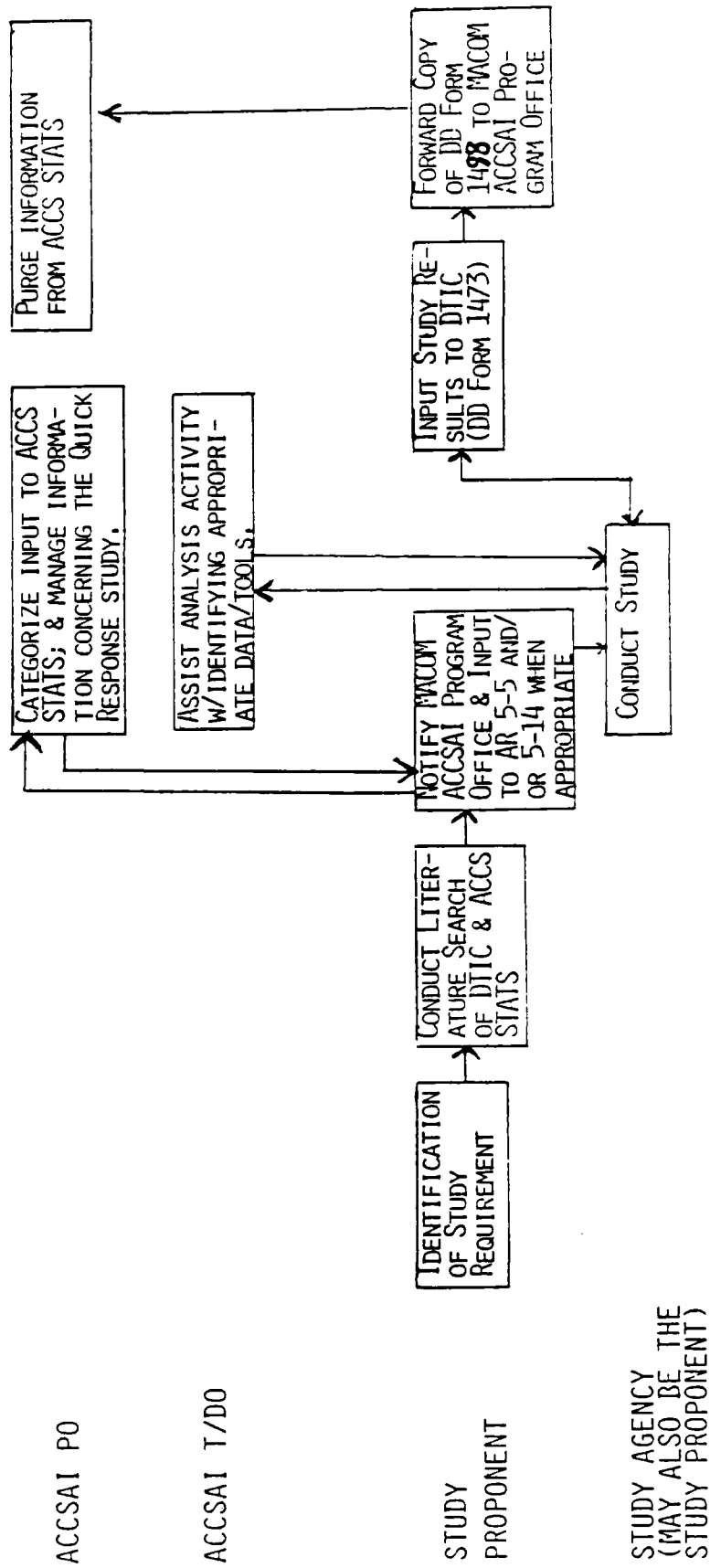


Figure L-3. Reporting procedures for quick-response studies

## CHAPTER 6

### STUDY INITIATION

6-1. General. Study initiation concerns the steps taken from the time a study requirement is identified to the time a study is conducted. Before finalizing a study requirement for either a deliberate or a quick-response study, searches should be made on DTIC (chapter 7) and ACCS STATS (chapter 7) to ensure the requirement has not been fulfilled. Possible sources for study requirements are the identification of gaps or deficiencies in the force and the need to capitalize on advances in technology to improve the force. Once a study requirement has been identified, it must be approved by the proponent's chain of command. Upon receiving this approval, actions may be taken to clarify the study requirement in preparation for study conduct. Writing a study directive is one such preparatory action (this is often referred to as front-end analysis and is essential for all deliberate studies.) The approved study requirement and preparatory documents as appropriate for deliberate and quick-response studies (see paragraph 6-2) are passed to the ACCSAI program office (PO) of the proponent's MACOM. Deliberate studies should be submitted to the ACCSAI PO at least one year before the study begins. For study requirements input more than one year in advance, an update is given by the proponent to the PO every October. The PO will use the preparatory documents to allocate the deliberate studies to an analysis agency, then categorize, sequence, prioritize, and schedule the deliberate studies (which fulfill the study requirement) for conduct. For quick-response studies, information provided by the proponents to the ACCSAI program is input to ACCS STATS, disseminated, and is made available for literature searches. Those studies which fall under the AR 5-5 or AR 5-14 program are submitted to the appropriate program by the proponent after the PO has scheduled the study for conduct. (In the case of quick-response studies which are AR 5-5 and/or AR 5-14, submission(s) to the appropriate program(s) should be made after notifying the ACCSAI PO.)

#### 6-2. Administration.

a. Quick-response. The following administrative steps are to be taken for study initiation after a quick-response-type study has been identified by the proponents:

(1) Proponents conduct a literature search of DTIC and ACCS STATS to ensure that the requirement is not duplicative of any ongoing, historic, or projected studies.

(2) After ensuring the requirement for the study and gaining chain-of-command approval for the study, the MACOM ACCSAI program office is notified through either a phone call or through mailing:

(a) A photocopy of DD Form 1498 (see figure L-4) with all appropriate blanks filled in.

(b) A completed ACCSAI attachment form to DD Form 1498 (AAD) (see figure L-5).

(c) A draft study directive, if available (see figure L-6 and annex I).

(3) Those studies which fall under the AR 5-5 and/or AR 5-14 guidelines are submitted through the appropriate channels by the proponent after the PO has been notified. All AR 5-5 and AR 5-14 studies must be submitted to DTIC upon initiation.

b. Deliberate. The following administrative steps are to be taken for study initiation after a deliberate study requirement has been identified by the proponent.

(1) Proponents conduct a literature search of DTIC and ACCS STATS to ensure that the requirement is not duplicative of any ongoing, historic, or projected studies.

(2) After ensuring the requirement for the study and gaining chain-of-command approval for the study, proponents send to the ACCSAI program office (in the October/November timeframe of each year or upon identification and verification of the study requirement) the following items:

(a) A photocopy of DD Form 1498 (see figure L-4) (for study requirements, questions 1, 4, 5, 9, 10, 17, and 25 are omitted). Applicable items checked in paragraph 30 on the AAD (next below) should be included in the narrative, along with systems and facilities in paragraphs 31-33. (This will facilitate easy location of particular types of studies during literature searches of DTIC.)

(b) A completed ACCSAI attachment form to DD Form 1498 (AAD) (see figure L-5).

(c) A draft study directive (see figure L-6 and annex I).

(3) Those studies which fall under the AR 5-5 and/or AR 5-14 guidelines are submitted through the appropriate channels by the proponent after the PO has scheduled the study for conduct.

(4) Additional steps required by each MACOM may vary. These steps must still be performed. The ACCSAI program does not usurp the responsibilities of MACOM-specific programs.

### 6-3. Other responsibilities.

a. Analysis agencies submit mission capabilities statements to PO in November of each year (see figure L-7).

b. Proponents must update the status of projected studies annually in the October/November timeframe of each year.

c. The ACCSAI program office must process all deliberate study requirements as outlined in chapters 4 and 5.

d. The ACCSAI program office must manage information on quick-response studies as outlined in chapters 4 and 5.

e. Appropriate proponent representatives must validate study priorities in January of each year.

6-4. Results. The administrative results will be used as follows.

a. The PO will use the information contained in DD Form 1498, AAD, and the draft study directive to categorize, sequence, prioritize, and schedule deliberate ACCS studies. (The analysis agency will use the draft study directive to guide their analysis.)

b. The PO will match the mission capabilities statement to deliberate study requirements for allocation.

c. Information retained by the PO on quick-response studies will facilitate communication, integration, and coordination within and across the MACOMS.

d. The AR 5-5 input is used to manage AR 5-5 studies.

e. The additional steps required by each MACOM are generally for managerial purposes.

f. Keeping ACCS STATS and DTIC updated allows the flow of information necessary for thorough literature searches.

g. Literature searches help ensure that the Army's analysis resources are used to the best advantage by eliminating duplications in study efforts and educating analysts on applicable methodologies and results used in other studies.



RESEARCH AND TECHNOLOGY WORK UNIT SUMMARY				1. AGENCY ACCESSION	2. DATE OF SUMMARY	REPORT CONTROL SYMBOL DD-DR&ETAR 536	
3. DATE PREV SUMMARY	4. KIND OF SUMMARY	5. SUMMARY SCTY	6. WORK SECURITY	7. REGRADING	8. DISB'N INSTR'N	9. LEVEL OF SUM A. WORK UNIT	
10. NO. COCES	PROGRAM ELEMENT	PROJECT NUMBER	TASK AREA NUMBER	WORK UNIT NUMBER			
a. PRIMARY							
b. CONTRIBUTING							
c. CONTRIBUTING							
11. TITLE (Precede with Security Classification Code)							
12. SUBJECT AREAS							
13. START DATE	14. ESTIMATED COMPLETION DATE	15. FUNDING ORGANIZATION	16. PERFORMANCE METHOD				
17. CONTRACT/GRANT				18. RESOURCES ESTIMATE			
a. DATE EFFECTIVE	EXPIRATION	FISCAL YEARS	a. PROFESSIONAL WORKYEARS	b. FUNDS (In thousands)			
b. CONTRACT/GRANT NUMBER							
c. TYPE	d. AMOUNT						
e. KIND OF AWARD	f. CUM/TOTAL						
19. RESPONSIBLE DOD ORGANIZATION			20. PERFORMING ORGANIZATION				
a. NAME			a. NAME				
b. ADDRESS (include zip code)			b. ADDRESS				
c. NAME OF RESPONSIBLE INDIVIDUAL			c. NAME OF PRINCIPAL INVESTIGATOR				
d. TELEPHONE NUMBER (include area code)			d. TELEPHONE NUMBER (include area code)				
21. GENERAL USE			f. NAME OF ASSOCIATE INVESTIGATOR (if available)				
MILITARY/CIVILIAN APPLICATION			g. NAME OF ASSOCIATE INVESTIGATOR (if available)				
22. KEYWORDS (Precede EACH with Security Classification Code)							
23. TECHNICAL OBJECTIVE 24. APPROACH 25. PROGRESS (Precede text of each with Security Classification Code)							

26. Does this study evaluate some portion of the ACCS? \_\_\_\_\_

27. How will the results of this study be used? \_\_\_\_\_

28. Does this study feed other studies (programmed or proposed)? If so, state study title, POC, and phone number.

Title _____	POC _____	AV _____
Title _____	POC _____	AV _____
Title _____	POC _____	AV _____

29. Decisionmaker for which study will be done: \_\_\_\_\_

30. Date decisionmaker needs decision: \_\_\_\_\_

31. Within each category below, check all items that apply.

Broad Focus:  manpower and personnel  operations and force structure  
(AR-5-5)  concepts and plans  science, technology, systems and equipment

Echelon:  sustaining base  strategic  tactical  theater/operational

Mission Area:  C2  air defense  close combat, light  
 (Must check  comm  aviation  combat service support  
 at least one)  IEW  fire support  close combat, heavy  
 special operations forces  combat support, NBC  
 combat support, engineering &  combined arms  
 mine warfare

Refined Focus:  utility  requirements/specifications  
 capability/effectiveness  enhancement/solution  
 vulnerability

Keywords:  air interdiction  command  interoperability  
 automation  control  nuclear warfare  
 biological warfare  conventional  management  
 chemical warfare  cost analysis  rear area (deep)  
 close combat  countermeasures  rear area (friendly)  
 communications  individual training  survivability  
 collective training  information  support

32. Item - level of system: \_\_\_\_\_

33. Network of systems: \_\_\_\_\_

34. C3I facility: \_\_\_\_\_

35. If making a change, state the reason for the change: \_\_\_\_\_

Figure L-5. ACCSAI attachment to DD Form 1498 (AAD)

## AAD INSTRUCTIONS

36. State how the study results will be used. Example: This study will look at brigade CP radios only and the radios interoperability with division main and brigade elements.

37. State any studies which would utilize output from this study. Example:  
Title Army Radios POC Ein Stein AV 000-111

38. State the position title of the decisionmaker for which the study is being done. Example: DA DCSOPS.

39. State the date by which the decisionmaker needs the decision. Example: Nov 1988.

40. For each category, check all items that apply. For example, all four broad focus descriptors may be checked. Then for echelon, "tactical" may be checked, while in mission area, one may check "C2" and "comm." The refined focus may be "vulnerabilities" and the keywords may be "interoperability" and "survivability." A short definition for each of the category items is appended to the back pages of these instructions.

41. If the study concentrates on an item level\* of a system, such as a computer, then state "computer"; i.e., item-level of system: computer.

**\*ITEM-LEVEL SYSTEMS:** An item-level system is a materiel system which operates within one functional area and generally one tactical echelon. It is the most familiar subject of Army cost and operational effectiveness analyses (COEA). Some examples are a tactical computer terminal, a communications device, a division air defense control system, a fire support control system, and a combat service support mainframe computer. (Ref: Command and Control Effectiveness Evaluation Report, Executive Summary, page 7, MITRE Corp., undated.)

42. If the study concerns a network of systems\* such as radio nets, then state "radio nets"; i.e., network of systems: radio net.

**\*NETWORK OF SYSTEMS:** One may need to analyze many systems linked together to accomplish a mission. Such a network might also be called an architecture. The collection may be within a functional area and echelon or may link various echelons and functional areas. Some examples of networks of systems include: a battalion fire support system, a brigade command net, an all-source analysis system, and a division supply system. (Ref: ibid, item 41.)

43. State the C2/C3I facility\*, such as a command post which the study concentrates on. Example: division command post.

**\*C2 FACILITIES:** A C2 facility is a fixed or mobile collection of equipment and procedures whose purpose is to allow the commander and his staff to command and control his subordinate forces and to receive orders and information from higher headquarters. Some examples of C2 facilities include a battalion commander's command vehicle, a division alternative tactical operations center, and the corps support command rear command post. (Ref: ibid, item 42.)

AAD DICTIONARY

(1) Category Heading: Broad Focus

concepts and plans - Examination of concepts, policies, techniques, methods, and systems in terms of their costs and effectiveness to determine the preferred employments of the several forces. Development of programs, postures, and strategies which optimize the attainment of U.S. objectives in potential or actual conflict. (Ref: AR 5-5, 15 Oct 81.)

manpower and personnel - Examinations of the personnel requirements and costs of forces and programs and applications of effective methods and policies for the recruitment, selection, testing, classification, training, allocation, assignment, sustaining, and separating of personnel. (Ref: AR 5-5, 15 Oct 81.)

operations and force structure - Examinations of preferred mixes of combined forces to meet existing and potential threats to U.S. security. Establishment of quantitative requirements for weapon systems or other military materiel. Comparisons of the effectiveness and costs of alternatively constituted and equipped forces. Development and application of techniques to study military operations and tactics and describe or evaluate the results of combat engagements. (Ref: AR 5-5, 15 Oct 81.)

science, technology, systems, and equipment - Examinations of technical concepts, systems, subsystems, and components to compare their operational benefits and costs in relation to computing concepts, systems, subsystems, and components. Determination of alternative research and development (R&D) programs and the selection of programs that yield the greatest return from expenditure for R&D. Development of mission envelopes for individual systems and equipment. Analyses of test approaches for individual systems and equipment. (Ref: AR 5-5, 15 Oct 81.)

(2) Category Heading: Echelon

strategic - Army functions and organizations involved in strategic planning, coordination, and direction of military movements and operations. (Ref: AC2MP, Aug 85.)

sustaining base - Army functions and organizations involved in sustainment training, resource acquisition and management, and the development and maintenance of combat readiness. (Ref: AC2MP, Aug 85.)

tactical - Army functions performed by the corps and subordinate echelons. (Ref: AC2MP, Aug 85.)

theater - Army functions performed by the theater Army and/or field Army echelon. (Ref: AC2MP, Aug 85.)

Figure L-5 (Cont)

(3) Category Heading: Mission Area

air defense - All defensive measures designed to destroy attacking enemy aircraft or missiles in the earth's envelope of atmosphere or to nullify or reduce the effectiveness of such attack. (Ref: JCS Pub 1, p. 14, 1 Jan 86.)

aviation - The operation, maintenance, procurement, or supply of aircraft equipment or the procurement, training, and management of personnel for aviation and aviation associated duties. (Ref: AR 310-25, Aviation Duty.)

close combat - Fighting at close quarters with the enemy. (Ref: AR 310-25, p. 37, 31 May 86.)

combat service support - The assistance provided operating forces primarily in the fields of administrative services, chaplain service, civil affairs, finance, legal service, health services, maintenance, military police, supply, transportation, construction, troop construction, acquisition and disposal of real property, facilities engineering, topographic and geodetic engineering functions, food service, graves registration, laundry, dry cleaning, bath, property disposal, and other logistical services. (Ref: JCS Pub 1, p. 69, 1 Jan 86.)

combat support - Operational assistance furnished combat elements by other designated units. (Ref: AR 310-25, p. 61, 15 Nov 83.)

combined arms - More than one tactical branch of the Army used together in operations. (Ref: AR 310-25, p. 40, 21 May 86.)

C2 (command and control) - The exercise of authority and direction by a properly designated commander over assigned forces in the accomplishment of the mission. Command and control functions are performed through an arrangement of personnel, equipment, communications, facilities, and procedures employed by a commander in planning, directing, coordinating, and controlling forces and operations in the accomplishment of the mission. (Ref: JCS Pub 1, p. 77, 1 Jan 86.)

Comm (communications) - A method of conveying information of any kind from one person or place to another. (Ref: JCS Pub 1, p. 80, 1 Jan 86.)

fire support - Assistance to those elements of the ground forces which close with the enemy (such as infantry and armor units), rendered by delivering mortar fire, field artillery fire, naval gun fire, and close air support. (Ref: AR 310-25, p. 69, 21 May 86.)

Figure L-5 (Cont)

IEW (intelligence and electronic warfare) - Intelligence is the product resulting from the collection, processing, evaluation, analysis, integration, and interpretation of available information concerning foreign countries or areas. (Ref: JCS Pub 1, p. 186, 1 Jan 86.)  
Electronic warfare is military action involving the use of electromagnetic energy to determine, exploit, reduce, or prevent hostile use of the electromagnetic spectrum and action which retains friendly use of electromagnetic spectrum. Also called EW. (Ref: JCS Pub 1, p. 126, 1 Jan 86.)

NBC - Nuclear, biological, and chemical.

special operations - Special operations (SO) are overt, clandestine, or covert military operations conducted during periods of peace or war. (Ref: FM 1-100, p. 30, 28 Sep 84.)

(4) Category Heading: Refined Focus for Sequencing

utility - The military/operational value of an item/system when measured from within a pertinent Army concept program and against the threat analysis and future concept, doctrine, environment, organizations, skills, availability, reliability, maintainability, obsolescence, and other materiel objectives/requirements. (Ref: AR 310-25, p. 176, 21 May 86.)

capability/effectiveness - Capability is a measure of the chance that a system will achieve mission objectives given the conditions during the mission (dependability). Effectiveness is a quantitative measure of the degree to which a system can achieve a set of specific mission requirements. (Ref: Engineering Design Handbook, DARCOM 706-101, p. 2-7 and p. 2-5, respectively, Nov 77.)

vulnerability - A quantitative measure of the susceptibility to damage of a target structure or item of materiel to a given attack mechanism. (Ref: Engineering Design Handbook, DARCOM 706-102, p. 38-2, Oct 79.)

requirements/specifications - A requirement is: (a) a necessity, or (b) something wanted or needed. Specifications are explicit details. (Ref: Webster's Ninth New Dictionary.)

enhancement/solution - An enhancement is an improvement. For solution, there is: (a) an action or process of solving a problem, and (b) an answer to a problem. (Ref: Webster's Ninth New Dictionary, p. 412 and p. 1123, respectively, 1985.)

Figure L-5 (Cont)

(5) Category Heading: Keywords

air interdiction - Air operations conducted to destroy, neutralize, or delay the enemy's military potential before it can be brought to bear effectively against friendly forces at such distance from friendly forces that detailed integration of each air mission with the fire and movement of friendly forces is not required. (Ref: JCS Pub 1, p.18, 1 Jan 86.)

automation - (1) The implementation of processes by automatic means.  
(2) The conversion of a procedure, a process, or equipment to automatic operation. (Ref: JCS Pub 1, pp. 42-43, 1 Jan 86.)

biological warfare - Employment of biological agents to produce casualties in man or animals and damage to plants or materiel; or defense against such employment. (Ref: JCS Pub 1, p. 52, 1 Jan 86.)

chemical warfare - All aspects of military operations involving the employment of lethal and incapacitating munitions/agents and the warning and protective measures associated with such offensive operations. Since riot control agents and herbicides are not considered to be chemical warfare agents, those two items will be referred to separately or under the broader term "chemical," which will be used to include all types of chemical munitions/agents collectively. The term "chemical warfare weapons" may be used when it is desired to reflect both lethal and incapacitating munitions/agents of either chemical or biological origin. Also called CW. (Ref: JCS Pub 1, p. 66, 1 Jan 86.)

close combat - Fighting at close quarters with the enemy. (Ref: AR 310-25, p. 37, 21 May 86.)

command - (1) The authority vested in an individual of the armed forces for the direction, coordination, and control of military forces. (2) An order given by the commander; that is, the will of the commander expressed for the purpose of bringing about a particular action. (3) A unit or units, an organization, or an area under the command of one individual. (4) To dominate by a field of weapon fire or by observation from a superior position. (Ref: JCS Pub 1, p. 77, 1 Jan 86.) (5) A specifically designated line-type organization with direct line authority from the next higher commander of the Chief of Staff, United States Army. It must have a clearly identifiable headquarters and organizational structure composed of a variety of units, agencies, activities, depots, arsenals, or installations. The headquarters of a command may be organized under either table(s) of organization and equipment or tables of distribution and allowances. An organization which is comprised of one or relatively few separate TDA/TOE units would not normally be termed a command. (Ref: AR 310-25, p. 40, 21 May 86.)

Figure L-5 (Cont)

communications - A method or means of conveying information of any kind from one person or place to another. (Ref: JCS Pub 1, p. 80, 1 Jan 86.)

control - That authority exercised by a commander over part of the activities of subordinate organizations or other organizations not normally under his command which encompasses the responsibility for implementing orders or directives. All or part of this authority may be transferred or delegated. (Ref: JCS Pub 1, p. 188, 1 Jan 86.)

conventional forces - Those forces capable of conducting operations using nonnuclear weapons. (Ref: JCS Pub 1, p. 90, 1 Jan 86.)

cost analysis - An analytical process employed to estimate the cost of materiel development and procurement programs, management information/operating system development and operation, forces, and facilities. This cost is a measurement of economic resource requirements, i.e., manpower, equipment, real property, facilities, and supplies. Cost analysis generally involves the following three steps: a. The development of relationships between prior and current system resource requirements, design or performance characteristics, and force deployment. b. The application of these relationships to new systems specifications as a means of projecting their resource requirements. c. The examination of the sensitivity of resources varying assumptions regarding future system performance, operational concept, and force composition. Cost analysis is not designed to provide the precise measurements required for budgetary purposes. (Ref: AR 310-25, p. 49, 21 May 86.)

countermeasures - That form of military science which by the employment of devices and/or techniques has as its objective the impairment of the operational effectiveness of enemy activity. (Ref: JCS Pub 1, p. 94, 1 Jan 86.)

information - (1) In intelligence usage, unevaluated material of every description that may be used in the production of intelligence. (2) The meaning that a human assigns to data by means of the known conventions used in their representation. (Ref: JCS Pub 1, p. 181, 1 Jan 86.)

interoperability - (1) The ability of systems, units, or forces to provide and accept services from other systems, units, or forces and to use the services so exchanged to enable them to operate effectively together. (2) The condition achieved among communications-electronics systems or communications-electronics equipment when information or services can be exchanged directly and satisfactorily between them and/or their users. The degree of interoperability should be defined when referring to specific cases. (Ref: JCS Pub 1, p. 191, 1 Jan 86.) (3) Capability of two or more items or components of equipment to perform essentially the same function or to complement each other in a system, regardless of differences in technical characteristics and with negligible additional training of personnel. (Ref: AR 310-25, p.86, 21 May 86.)

Figure L-5 (Cont)



management - A process of establishing and attaining objectives to carry out responsibilities. Management consists of those continuing actions of planning, organizing, directing, coordinating, controlling, and evaluating the use of men, money, materials, and facilities to accomplish missions and tasks. Management is inherent in command, but it does not include as extensive authority and responsibilities as command. (Ref: JCS Pub 1, p. 216, 1 Jan 86.)

nuclear warfare - Warfare involving the employment of nuclear weapons.  
(Ref: JCS Pub 1, p. 251, 1 Jan 86.)

rear area - For any particular command, the area extending forward from its rear boundary to the rear of the area of responsibility of the next lower level of command. This area is provided primarily for the performance of combat service support functions. (Ref: JCS Pub 1, p. 299, 1 Jan 86.)

support - (1) The action of a force which aids, protects, complements, or sustains another force in accordance with a directive requiring such action. (2) A unit which helps another unit in battle. Aviation, artillery, or naval gunfire may be used as support for infantry. (3) A part of any unit held back at the beginning of an attack as a reserve. (4) An element of a command which assists, protects, or supplies other forces in combat. (Ref: JCS Pub 1, p. 351, 1 Jan 86.)

survivability - That characteristic of personnel and the materiel which enable them to withstand (or avoid) adverse military action or effects of natural phenomena which ordinarily and otherwise would result in the loss of capability to continue effective performance of the prescribed mission.  
(Ref: Engineering Design Handbook, DARCOM-P 706-102, p. 38-2, Oct 79.)

individual training - Training which the officer, NCO, or soldier receives in institution, units, OJT, or by self-study. This training prepares the individual to perform specified duties or tasks related to the assigned or next higher specialty code or MOS skill level and duty position.  
(Ref: AR 350-1, p. A-1, 1 Aug 81.)

collective training - Training in units to prepare cohesive teams and units to accomplish their combined arms mission on the integrated battlefield.  
(Ref: AR 350-1, p. A-1, 1 Aug 81.)

Figure L-5 (Concluded)

(office symbol)

(date)

SUBJECT:

MEMORANDUM FOR

1. Purpose of study directive.
2. Background.
3. Study sponsor and sponsor's study director.
4. Study agency.
5. Terms of reference.
6. Responsibilities.
7. Literature search.
8. References.
9. Administration.

(AUTHORITY LINE)

(sponsor signature block)

Copy Furnished (CF):

Suspenses:

Figure L-6. Study directive outline

MISSION/CAPABILITIES STATEMENT

1. Agency: \_\_\_\_\_  
 2. Mission: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

3. Capabilities: (PSY) \_\_\_\_\_

Within each category below, check all items that apply:

a. Broad Focus:  manpower and personnel  operations and force structure  
 (AR 5-5)  concepts and plans  science, technology, systems and equipment

b. Echelon:  sustaining base  strategic  theater/operational  
 tactical

c. Mission Area:  C2  air defense  close combat, light  
 (Must check  comm  aviation  combat service support  
 at least one)  IEW  fire support  close combat, heavy  
 special operations forces  combat support, NBC  
 combat support, engineering,  combined arms  
 and mine warfare

d. Refined Focus:  utility  vulnerability  
 capability/effectiveness  requirements/specifications  
 enhancement/solution

4. Keywords:  
 air interdiction  communications  interoperability  
 automation  control  nuclear warfare  
 biological warfare  conventional forces  management  
 chemical warfare  cost analysis  rear area (deep)  
 close combat  countermeasures  rear area(friendly)  
 collective training  individual training  survivability  
 command  information  training

5. Limitations: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Figure 1-7. Mission/capabilities statement

### MISSION/CAPABILITIES STATEMENT INSTRUCTIONS

This statement is to be filled out by a representative of the agency listed in question 1.

1. State the agency's name.
2. Provide a brief description of the agency's mission. Indicate issues which the agency is expected to address.
3. Provide a brief description of the agency's capabilities in PSY.
4. Check those items which would apply to the type of studies your agency should perform. These items match question 30 of the AAD. Definitions can be found in the AAD Dictionary. Since this data will be cross-referenced with study requirements data, accurate answers should prevent the need for reparceling.
5. List the agency's limitations concerning the conduct of studies (for example: "no computers are available").

Figure L-7 (Concluded)

## CHAPTER 7

### STUDY CONDUCT

7-1. General. Study conduct refers to the problem-solving stage. It concerns the actions taken after a study is initiated until the time a study is completed. Under the ACCS program, the ACCSAI program office (PO) for each MACOM will help disseminate information (Army-wide) about ongoing and projected studies (both deliberate and quick-response). This information (which includes, when applicable, the study's analysis agency, description category, priority, and schedule for conduct) is available upon request. The agency or proponent merely requests the information from their MACOM's ACCSAI PO. All MACOMs will interface through a master data base located at TRADOC. Each MACOM sends (via floppy disk) the information associated with its ongoing and projected studies. The TRADOC PO will consolidate this information and disseminate the results back to each MACOM (again, by floppy). At present, only unclassified information will be stored on the master data base.

7-2. Literature search. Prior to beginning analysis for a study, analysis agencies must conduct a literature search. Through this literature search, it can be verified again that the study is not a duplication; also, helpful related studies and methodologies may be identified. At the very least, DTIC and ACCS STATS must be referenced.

a. DTIC. The Defense Technical Information Center (DTIC) manages a data base which stores information concerning ongoing, projected, and completed studies. Additionally, it contains final reports from the test and experimentation (T&E) activities of the Army. It is accessible Army-wide. Through keyword searches, studies and T&E reports can be located. For example, a search could be conducted for command and control studies or tests. The computer would list all studies or tests which listed command and control as a descriptor. (Usually, a one-word search will yield too many titles to be helpful. More specific information such as corps, command and control, and doctrine may yield a more useful subset.) The computer listing can provide the title, author, classification, brief description, and other important points about each study or test found. Additionally, the document associated with each study or test is accessible.

b. ACCS STATS. As mentioned previously (para 5-1), the MACOM ACCSAI POs can provide information concerning ongoing and projected ACCS studies through ACCS STATS. These studies are accessible by category, title, and priority.

7-3. Administration. Administrative steps to be taken for all ACCS studies during the conduct of a study are as follows:

a. Proponents must submit a DD Form 1498 (figure L-4) and an AAD (figure L-5) to the ACCSAI program office at the beginning of conduct.

b. Proponents must submit a DD Form 1498 (figure L-4) and an AAD (figure L-5) to the ACCSAI program office, reflecting any major changes that occur to the study (deliberate or quick-response) during its conduct. Only the

changed/new information needs to be provided on the forms. All other boxes/questions/paragraphs may be left blank with the exception of study title, date of summary, agency accession number, and POC information.

b. Proponents must submit a DD Form 1498 update information to DTIC if the study is regulated by AR 5-5 and/or 5-14. Changes to AR 5-5 and/or AR 5-14 studies must also be submitted to the MACOM.

c. All other actions required by each MACOM's programs/regulations are to be followed.

d. Contracts. The contract cycle is shown in figure L-8.

(1) For scientific, engineering, advanced systems planning and engineering, and technical support contracted through a Federal Contract Research Center (FCRC), specific actions must be taken as detailed in annex II. (These contracts are noncompetitive.)

(2) For competitive contracts, specific actions must be taken as detailed in annex III.

e. Analysis activities must submit tool/data input forms (see figures L-9 and L-10) to the ACCSAI tool/data office for the MACOM as soon as tool or data needs are identified. The identification of tool/data requirements should be made as early as possible before the conduct of a study to facilitate the timely availability of the required tool/data.

7-4. Application. The administrative results are used as follows.

a. The ACCSAI PO reflects study changes in the ACCS STATS data base which contains ongoing and projected studies. The ACCSAI PO will also use these updates to adjust studies sequencing, priority, and scheduling as appropriate.

b. Updated DD Forms 1498 keep the DTIC files (which are accessible Army-wide) current.

c. AR 5-5 updates keep AR 5-5 studies current.

d. MACOM requirements permit MACOM management.

e. Early identification of tool/data requirements permits each MACOM tool/data office to ensure that tool and data requirements can be met.

f. Keeping ACCS STATS and DTIC updated allows the flow of information necessary for thorough literature searches.

g. Literature searches help ensure that the Army's analysis resources are used to the best advantage by eliminating duplications in study efforts and educating analysts on applicable methodologies and results used in other studies.

APRIL	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	DECEMBER
COTRs begin contract package (CP) formulation	COTRs complete CP	Installation CP coordination	MACOM CP coordination	DA CP coordination	CP to contracting officer (CO)	Co-obligates CP funds

Figure L-8. Contract cycle

TOOL REQUIREMENTS INPUT FORM

1. Agency requesting the tool: \_\_\_\_\_

2. POC: \_\_\_\_\_ AV: \_\_\_\_\_

3. Date tool is needed: \_\_\_\_\_

4. Check only those items which are a minimum requirement for the model:

a. Different levels & intensities of warfare: MIN

(1) Intense combat in main battle area: \_\_\_\_\_

(2) Light combat as in screening force or economy of force action: \_\_\_\_\_

(3) Nuclear warfare: \_\_\_\_\_

(4) Chemical warfare: \_\_\_\_\_

(5) Rear area operations: \_\_\_\_\_

b. Varied tactics:

	<u>MIN</u>		<u>MIN</u>
(1) Frontal attack:	_____	(2) Flanking attack:	_____
(3) Meeting engagement:	_____	(4) Screening operation:	_____
(5) Strong point defense:	_____	(6) Area defense:	_____
(7) Spoiling attack:	_____	(8) Retrograde operations:	_____
(9) Vertical envelopment:	_____	(10) Other. Describe:	_____
			_____
			_____
			_____

c. AirLand Battle:

	<u>MIN</u>		<u>MIN</u>
(1) See deep (how deep):	_____	(2) Shoot deep (how deep):	_____
(3) Discontinuous line of contact:	_____	(4) Integrated air ground operations:	_____

d. Difficult terrain:

	<u>MIN</u>		<u>MIN</u>
(1) Deserts:	_____	(2) Mountains:	_____
(3) River crossings:	_____	(4) Forests and jungles:	_____
(5) MOUT:	_____	(6) Snow:	_____
(7) Other: Describe:	_____		_____
	_____		_____
	_____		_____
	_____		_____

Figure L-9. Tool requirements input form



- e. Critical areas of the world: MIN
- |                          |            |                                  |            |
|--------------------------|------------|----------------------------------|------------|
| (1) Europe: <u>    </u>  | <u>MIN</u> | (2) SE Asia: <u>    </u>         | <u>MIN</u> |
| (3) NE Asia: <u>    </u> |            | (4) SW Asia: <u>    </u>         |            |
| (5) Mideast: <u>    </u> |            | (6) Other. Describe: <u>    </u> |            |
|                          |            |                                  |            |
- f. Varied levels of command: MIN
- |  |            |
|--|------------|
| (1) Highest level needs to be played: <u>    </u>                      | <u>MIN</u> |
| (2) Lowest level needs to be played: <u>    </u>                       |            |
| (3) Number of echelons need to be played in a single game: <u>    </u> |            |
- g. Play of arms and services: MIN
- |                                      |            |  |            |
|--------------------------------------|------------|--|------------|
| (1) All combat arms: <u>    </u>     | <u>MIN</u> | (2) All combat support arms: <u>    </u> | <u>MIN</u> |
| (3) Total logistics: Yes <u>    </u> |            | (4) Air Force: <u>    </u>               |            |
| (5) Civilians: <u>    </u>           |            |  |            |
- h. Play of allied forces: MIN
- |                                  |            |                          |            |
|----------------------------------|------------|--------------------------|------------|
| (1) Europe: <u>    </u>          | <u>MIN</u> | (2) Mideast: <u>    </u> | <u>MIN</u> |
| (3) Other. Describe: <u>    </u> |            |                          |            |
|                                  |            |                          |            |
- i. Play of varied dispositions: MIN
- |   |            |  |            |
|---|------------|--|------------|
| (1) Continuous defenses: <u>    </u>                  | <u>MIN</u> | (2) Discontinuous defense: <u>    </u> | <u>MIN</u> |
| (3) Very wide coverage delay and defense: <u>    </u> |            | (4) Multiple attacks: <u>    </u>      |            |
- j. Play of contingency operations: MIN
- |  |            |
|--|------------|
| (1) Deployability considered: <u>    </u>                              | <u>MIN</u> |
| (2) Light forces examined: <u>    </u>                                 |            |
| (3) Principal contingency areas played: <u>    </u>                    |            |
| If not all needed, state which principal contingency areas are needed. |            |
- k. Play of degraded environments: MIN
- |                                   |            |                             |            |
|-----------------------------------|------------|-----------------------------|------------|
| (1) Smoke: <u>    </u>            | <u>MIN</u> | (2) Dust, haze: <u>    </u> | <u>MIN</u> |
| (3) Fog, sleet, rain: <u>    </u> |            | (4) Jamming: <u>    </u>    |            |
| (5) Chaff: <u>    </u>            |            |                             |            |
- l. Battle: MIN
- |                                      |            |                                  |            |
|--------------------------------------|------------|----------------------------------|------------|
| (1) Completed two-sided: <u>    </u> | <u>MIN</u> | (2) Blue only: <u>    </u>       | <u>MIN</u> |
| (3) Red only: <u>    </u>            |            | (4) Other. Describe: <u>    </u> |            |
|                                      |            |                                  |            |

Figure L-9 (Cont)

m. Smallest unit to which resolved:

	<u>MIN</u>		<u>MIN</u>
(1) Item:	___	(2) Squad:	___
(3) Platoon:	___	(4) Company:	___
(5) Brigade:	___	(6) Division:	___
(7) Corps:	___	(8) Theater:	___

n. Functional coverage.

	<u>MIN</u>		<u>MIN</u>
(1) Close combat(L) including dismounted operation:	___	(2) Close combat (H):	___
(4) Engineer & mine warfare:	___	(3) Fire support:	___
(6) Air defense:	___	(5) NBC:	___
(8) CSS:	___	(7) Intel EW:	___
(10) Communications:	___	(9) Aviation:	___
		(11) Command and control:	___

5. Other information:

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#### TOOL REQUIREMENTS INPUT FORM INSTRUCTIONS

1. List the agency which is requesting the tool.
2. State the POC within the agency for obtaining this tool and the POC's AUTOVON number.
3. State the date by which the tool must be available.
4. Suggest the minimum requirements of the model by placing a check beside those elements which must be portrayed in the model. (These terms were extracted from TRADOC Reg 5-4.)
5. List additional information which could assist in describing the tool needed.

Figure L-9. (Concluded)

DATA REQUIREMENTS INPUT FORM

1. Agency: \_\_\_\_\_
2. POC: \_\_\_\_\_ PHONE: \_\_\_\_\_
3. Title of study needing data: \_\_\_\_\_
4. Will this data be input to a model? YES \_\_\_\_\_ NO \_\_\_\_\_
5. Date data needed: \_\_\_\_\_
6. Information products:  
 Control information       Status information
7. Information architecture boundaries:
  - a. Geographic zone:  
 Sustaining base    Strategic    Theater(operational)    Tactical
  - b. Readiness phases:  
 Training(collective/individual)    Mobilization/deployment  
 Employment    Sustainment
8. If, under 7a, "Tactical" was checked, fill out this block:

<u>TECHNICAL</u>	<u>STAFF (Functional)</u>		<u>COMMAND</u>
	1. General:	2. Functional:	
<input type="checkbox"/> enemy	<input type="checkbox"/> enemy	<input type="checkbox"/> air defense artillery	<input type="checkbox"/> enemy
<input type="checkbox"/> friendly	<input type="checkbox"/> friendly	<input type="checkbox"/> combat service support	<input type="checkbox"/> friendly
<input type="checkbox"/> mission	<input type="checkbox"/> mission	<input type="checkbox"/> IEW	<input type="checkbox"/> mission
<input type="checkbox"/> environment	<input type="checkbox"/> environment	<input type="checkbox"/> fire support	<input type="checkbox"/> environment
		<input type="checkbox"/> maneuver control	

9. Other information:  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Figure L-10. Data requirements input form

#### DATA REQUIREMENTS INPUT FORM INSTRUCTIONS

1. State the agency in need of the data.
2. State the agency's POC for this data and his/her AUTOVON/FIS number.
3. State the study which needs the data.
4. Will this data be input to a model? (i.e., is it a scenario?)
5. State the date by which the data is needed.
6. When asking for information products, check the appropriate box. Control information refers to information which causes a change in the environment. Status information describes the situation in the environment.
7. For the information architecture boundaries, check the appropriate items under "geographic zone" and "readiness phases" which apply to the data needed.
8. If "tactical" was checked under item 7a, the following information must be provided:
  - In the first column, if technical information is needed, check all items in that column which apply.
  - In the second column, if staff information is needed, first check the general items which apply and then check the functional areas which apply.
  - In the third column, if command information is needed, check the appropriate items.
9. Provide other information which would help to clarify the data needed.

Figure L-10 (Concluded)

CHAPTER 8  
STUDY COMPLETION

8-1. General. When any study is completed, it is important that the results and methodologies be available Army-wide. A few simple administrative steps permit the flow of information.

8-2. Administration. The administrative requirements to complete projects and studies, both deliberate and quick-response, are as follows:

- a. Complete DD form 1498 and submit the information to DTIC.
- b. Send a photocopy of DD Form 1498 to the MACOM ACCSAI program office.
- c. Complete a DD Form 1473 (figure L-11) to accompany the completed study report to DTIC.
- d. Take the appropriate actions if your study is an AR 5-5 and/or AR 5-14 study. (Reference AR 5-5 and/or AR 5-14 for details.)
- e. Fulfill your individual MACOM's requirements.
- f. RETAIN FILES FOR AT LEAST 5 YEARS. (DoD Directive 5010.22.)

8-3. Application. The administrative results will be used as follows:

- a. DTIC stores ongoing studies separately from completed studies. DD Form 1498 permits DTIC to store the study as a completed study. The photocopy of the DD Form 1498 sent to the MACOM ACCSAI program office helps ensure that the appropriate information has been input to DTIC.
- b. The ACCS STATS data base contains only ongoing and projected studies. Completed studies will be purged from this system. The photocopy of DD Form 1498 mailed to the MACOM ACCSAI program office is a consent form to purge the study and free resources for other studies.
- c. AR 5-5 and AR 5-14 requirements permit management of their respective studies.
- d. MACOM requirements permit MACOMs to manage their studies and resources.
- e. Retaining files for 5 years provides information for future reference.
- f. Keeping DTIC updated allows the flow of information necessary for thorough literature searches.

REPORT DOCUMENTATION PAGE				Form Approved CMB No 0704-0188 Exp Date Jun 30 '986	
1a REPORT SECURITY CLASSIFICATION		1b RESTRICTIVE MARKINGS			
2a SECURITY CLASSIFICATION AUTHORITY		3 DISTRIBUTION/AVAILABILITY OF REPORT			
2b DECLASSIFICATION/DOWNGRADING SCHEDULE					
4 PERFORMING ORGANIZATION REPORT NUMBER(S)		5. MONITORING ORGANIZATION REPORT NUMBER(S)			
6a NAME OF PERFORMING ORGANIZATION		6b. OFFICE SYMBOL <i>(If applicable)</i>	7a. NAME OF MONITORING ORGANIZATION		
6c. ADDRESS (City, State, and ZIP Code)		7b. ADDRESS (City, State, and ZIP Code)			
3a. NAME OF FUNDING / SPONSORING ORGANIZATION		8b. OFFICE SYMBOL <i>(If applicable)</i>	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER		
3c. ADDRESS (City, State, and ZIP Code)		10. SOURCE OF FUNDING NUMBERS			
		PROGRAM ELEMENT NO.	PROJECT NO.	TASK NO	WORK UNIT ACCESSION NO
11 TITLE (Include Security Classification)					
12. PERSONAL AUTHOR(S)					
13a. TYPE OF REPORT		13b. TIME COVERED FROM _____ TO _____	14 DATE OF REPORT (Year, Month, Day)		15 PAGE COUNT
16 SUPPLEMENTARY NOTATION					
17 COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)		
FIELD	GROUP	SUB-GROUP			
19. ABSTRACT (Continue on reverse if necessary and identify by block number)					
20 DISTRIBUTION/AVAILABILITY OF ABSTRACT <input type="checkbox"/> UNCLASSIFIED/UNLIMITED <input type="checkbox"/> SAME AS RPT <input type="checkbox"/> DTIC USERS			21 ABSTRACT SECURITY CLASSIFICATION		
22a NAME OF RESPONSIBLE INDIVIDUAL			22b TELEPHONE (Include Area Code)		22c OFFICE SYMBOL

## INSTRUCTIONS FOR PREPARATION OF REPORT DOCUMENTATION PAGE

### GENERAL INFORMATION

The accuracy and completeness of all information provided in the DD Form 1473, especially classification and distribution limitation markings, are the responsibility of the authoring or monitoring DoD activity.

Because the data input on this form will be what others will retrieve from DTIC's bibliographic data base or may determine how the document can be accessed by future users, care should be taken to have the form completed by knowledgeable personnel. For better communication and to facilitate more complete and accurate input from the originators of the form to those processing the data, space has been provided in Block 22 for the name, telephone number, and office symbol of the DoD person responsible for the input cited on the form.

All information on the DD Form 1473 should be typed.

Only information appearing on or in the report, or applying specifically to the report in hand, should be reported. If there is any doubt, the block should be left blank.

Some of the information on the forms (e.g., title, abstract) will be machine indexed. The terminology used should describe the content of the report or identify it as precisely as possible for future identification and retrieval.

**NOTE:** Unclassified abstracts and titles describing classified documents may appear separately from the documents in an unclassified context, e.g., in DTIC announcement bulletins and bibliographies. This must be considered in the preparation and marking of unclassified abstracts and titles.

The Defense Technical Information Center (DTIC) is ready to offer assistance to anyone who needs and requests it. Call Data Base Input Division, Autovon 284-7044 or Commercial (202) 274-7044.

### SECURITY CLASSIFICATION OF THE FORM

In accordance with DoD 5200.1-R, Information Security Program Regulation, Chapter IV Section 2, paragraph 4-200, classification markings are to be stamped, printed, or written at the top and bottom of the form in capital letters that are larger than those used in the text of the document. See also DoD 5220.22-M, Industrial Security Manual for Safeguarding Classified Information, Section II, paragraph 11a(2). This form should be unclassified, if possible.

### SPECIFIC BLOCKS

**Block 1a.** Report Security Classification: Designate the highest security classification of the report. (See DoD 5220.1-R, Chapters I, IV, VII, XI, Appendix A.)

**Block 1b.** Restricted Marking: Enter the restricted marking or warning notice of the report (e.g., CNWDI, RD, NATO).

**Block 2a.** Security Classification Authority: Enter the commonly used markings in accordance with DoD 5200.1-R, Chapter IV, Section 4, paragraph 4-400 and 4-402. Indicate classification authority.

**Block 2b.** Declassification / Downgrading Schedule: Indicate specific date or event for declassification or the notation, "Originating Agency Determination Required" or "OADR." Also insert (when applicable) downgrade to \_\_\_\_\_ (e.g., Downgrade to Confidential on 6 July 1983). (See also DoD 5220.22-M, Industrial Security Manual for Safeguarding Classified Information, Appendix II.)

**NOTE:** Entry must be made in Blocks 2a and 2b except when the original report is unclassified and has never been upgraded.

**Block 3.** Distribution/Availability Statement of Report: Insert the statement as it appears on the report. If a limited distribution statement is used, the reason must be one of those given by DoD Directive 5200.20, Distribution Statements on Technical Documents, as supplemented by the 18 OCT 1983 SECDEF Memo, "Control of Unclassified Technology with Military Application." The Distribution Statement should provide for the broadest distribution possible within limits of security and controlling office limitations.

**Block 4.** Performing Organization Report Number(s): Enter the unique alphanumeric report number(s) assigned by the organization originating or generating the report from its research and whose name appears in Block 6. These numbers should be in accordance with ANSI STD 239 23-74, "American National Standard Technical Report Number." If the Performing Organization is also the Monitoring Agency, enter the report number in Block 4.

**Block 5.** Monitoring Organization Report Number(s): Enter the unique alphanumeric report number(s) assigned by the Monitoring Agency. This should be a number assigned by a DoD or other government agency and should be in accordance with ANSI STD 239 23-74. If the Monitoring Agency is the same as the Performing Organization, enter the report number in Block 4 and leave Block 5 blank.

**Block 6a.** Name of Performing Organization: For in-house reports, enter the name of the performing activity. For reports prepared under contract or grant, enter the contractor or the grantee who generated the report and identify the appropriate corporate division, school, laboratory, etc., of the author.

**Block 6b.** Office Symbol: Enter the office symbol of the Performing Organization.

**Block 6c.** Address: Enter the address of the Performing Organization. List city, state, and ZIP code.

**Block 7a.** Name of Monitoring Organization: This is the agency responsible for administering or monitoring a project, contract, or grant. If the monitor is also the Performing Organization, leave Block 7a blank. In the case of joint sponsorship, the Monitoring Organization is determined by advance agreement. It can be either an office, a group, or a committee representing more than one activity, service, or agency.

**Block 7b.** Address: Enter the address of the Monitoring Organization. Include city, state, and ZIP code.

**Block 8a.** Name of Funding/Sponsoring Organization: Enter the full official name of the organization under whose immediate funding the document was generated, whether the work was done in-house or by contract. If the Monitoring Organization is the same as the Funding Organization, leave 8a blank.

**Block 8b.** Office Symbol: Enter the office symbol of the Funding/Sponsoring Organization.

**Block 8c.** Address: Enter the address of the Funding/Sponsoring Organization. Include city, state and ZIP code.

**Block 9. Procurement Instrument Identification Number:** For a contractor/grantee report, enter the complete contract or grant number(s) under which the work was accomplished. Leave this block blank for in-house reports.

**Block 10. Source of Funding (Program Element, Project, Task Area, and Work Unit Number(s)):** These four data elements relate to the DoD budget structure and provide program and/or administrative identification of the source of support for the work being carried on. Enter the program element, project, task area, work unit accession number, or their equivalents which identify the principal source of funding for the work required. These codes may be obtained from the applicable DoD forms such as the DD Form 1498 (Research and Technology Work Unit Summary) or from the funding instrument. If this information is not available to the authoring activity, these blocks should be filled in by the responsible DoD Official designated in Block 22. If the report is funded from multiple sources, identify only the Program Element and the Project, Task Area, and Work Unit Numbers of the principal contributor.

**Block 11. Title:** Enter the title in Block 11 in initial capital letters exactly as it appears on the report. Titles on all classified reports, whether classified or unclassified, must be immediately followed by the security classification of the title enclosed in parentheses. A report with a classified title should be provided with an unclassified version if it is possible to do so without changing the meaning or obscuring the contents of the report. Use specific, meaningful words that describe the content of the report so that when the title is machine-indexed, the words will contribute useful retrieval terms.

If the report is in a foreign language and the title is given in both English and a foreign language, list the foreign language title first, followed by the English title enclosed in parentheses. If part of the text is in English, list the English title first followed by the foreign language title enclosed in parentheses. If the title is given in more than one foreign language, use a title that reflects the language of the text. If both the text and titles are in a foreign language, the title should be translated, if possible, unless the title is also the name of a foreign periodical. Transliterations of often used foreign alphabets (see Appendix A of MIL-STD-347B) are available from DTIC in document AD-A080 800.

**Block 12. Personal Author(s):** Give the complete name(s) of the author(s) in this order: last name, first name, and middle name. In addition, list the affiliation of the authors if it differs from that of the performing organization.

List all authors. If the document is a compilation of papers, it may be more useful to list the authors with the titles of their papers as a contents note in the abstract in Block 19. If appropriate, the names of editors and compilers may be entered in this block.

**Block 13a. Type of Report:** Indicate whether the report is summary, final, annual, progress, interim, etc.

**Block 13b. Time Covered:** Enter the inclusive dates (year, month, day) of the period covered, such as the life of a contract in a final contractor report.

**Block 14. Date of Report:** Enter the year, month, and day, or the year and the month the report was issued as shown on the cover.

**Block 15. Page Count:** Enter the total number of pages in the report that contain information, including cover, preface, table of contents, distribution lists, partial pages, etc. A chart in the body of the report is counted even if it is unnumbered.

**Block 16. Supplementary Notation:** Enter useful information about the report in hand, such as: "Prepared in cooperation with..." "Translation of (or by)..." "Symposium..." If there are report numbers for the report which are not noted elsewhere on the form (such as internal series numbers or participating organization report numbers) enter in this block.

**Block 17. COSATI Codes:** This block provides the subject coverage of the report for announcement and distribution purposes. The categories are to be taken from the "COSATI Subject Category List" (DoD Modified), Oct 65 AD-624 000. A copy is available on request to any organization generating reports for DoD. At least one entry is required as follows:

**Field -** to indicate subject coverage of report

**Group -** to indicate greater subject specificity of information in the report

**Sub-Group -** if specificity greater than that shown by Group is required, use further designation as the numbers after the period (.) in the Group breakdown. Use only the designation provided by AD-624 000.

**Example:** The subject "Solid Rocket Motors" is Field 21, Group 08, Subgroup 2 (page 32, AD-624 000).

**Block 18. Subject Terms:** These may be descriptors, keywords, posting terms, identifiers, open-ended terms, subject headings, acronyms, code words, or any words or phrases that identify the principal subjects covered in the report, and that conform to standard terminology and are exact enough to be used as subject index entries. Certain acronyms or "buzz words" may be used if they are recognized by specialists in the field and have a potential for becoming accepted terms. "Laser" and "Reverse Osmosis" were once such terms.

If possible, this set of terms should be selected so that the terms individually and as a group will remain UNCLASSIFIED without losing meaning. However, priority must be given to specifying proper subject terms rather than making the set of terms appear "UNCLASSIFIED." Each term on classified reports must be immediately followed by its security classification, enclosed in parentheses.

For reference on standard terminology the "DTIC Retrieval and Indexing Terminology" ORIT-1979, AD-A068 500, and the OOD "Thesaurus of Engineering and Scientific Terms (TES7) 1968, AD-672 000, may be useful.

**Block 19. Abstract:** The abstract should be a pithy, brief (preferably not to exceed 300 words), factual summary of the most significant information contained in the report. However, since the abstract may be machine-searched, all specific and meaningful words and phrases which express the subject content of the report should be included, even if the word limit is exceeded.

If possible, the abstract of a classified report should be unclassified and consist of publicly releasable information (Unlimited), but in no instance should the report content description be sacrificed for the security classification.

**NOTE:** An unclassified abstract describing a classified document may appear separately from the document in an unclassified context, e.g., in DTIC announcement or bibliography products. This must be considered in the preparation and marking of unclassified abstracts.

For further information on preparing abstracts, employing scientific symbols, verbalizing, etc., see paragraphs 2.1(n) and 2.3(b) in MIL-STD-347B.

**Block 20. Distribution / Availability of Abstract:** This block must be completed for all reports. Check the applicable statement: "unclassified/unlimited," "same as report," or, if the report is available to DTIC registered users "DTIC users."

**Block 21. Abstract Security Classification:** To ensure proper safeguarding of information, this block must be completed for all reports to designate the classification level of the entire abstract. For CLASSIFIED abstracts, each paragraph must be preceded by its security classification code in parentheses.

**Block 22a,b,c. Name, Telephone and Office Symbol of Responsible Individual:** Give name, telephone number, and office symbol of DoD person responsible for the accuracy of the completion of this form.



ANNEX I

STUDY DIRECTIVE FORMAT

(Appendix C, DA Pamphlet 5-5)

The format described below may be modified to meet the requirements of each study. When appropriate, an approval memorandum may be used in lieu of a study directive, i.e., a study proposal originating within an organization which will also perform the study. As a minimum, the directive (HQDA letter, Chief of Staff Memorandum (CSM), MACOM letter, or memorandum) should describe the problem; state the scope, objectives, and assumptions; and list the essential elements of analysis. It should also indicate that a thorough literature search has been made, and it should address ADP requirements.

SUBJECT: Study: (Study Title, including acronym, if any).

MEMORANDUM FOR: (Appropriate addressees) (or LETTER TO:).

1. Purpose of study directive. State the purpose of the study directive. For example, "This directive provides for the establishment of an ad hoc study group to conduct subject study and provide recommendations to CSA."
2. Background. Provide background information identifying the problem, condition, or reason for the effort. Include past or ongoing actions to resolve the issue.
3. Study sponsor and sponsor's study director. Provide the title of the Army Staff agency or MACOM designated as having study sponsor responsibility, and the name of the official assigned as the sponsor's study director (SSD).
4. Study agency. Designate the organization which will conduct the study.
5. Terms of reference. Provide specific guidance for study content. Terms of reference will be stated completely and clearly to ensure that the study is responsive to its purpose. If the terms of reference are lengthy, they may be included as an enclosure. Terms of reference will be developed by the SSD in consultation with the originator and appropriate Army Staff agencies and MACOMs. The terms will state the following:
  - a. Scope. Clearly define the scope of the effort.
  - b. Objective. State the aim of the study. List each specific objective of the study, the tasks to be performed by the study agency, and the results or products desired for each objective.
  - c. Timeframe. Provide the timeframe to be addressed by the effort, e.g., 1980-2000.
  - d. Assumptions. State any assumptions which are relevant to the study.

e. Essential elements of analysis (EEA). List relevant EEA.

f. Environmental and threat guidance. Provide environmental and threat aspects.

(1) Identify the scenario reference and approval requirements together with directed adjustments in timing, location, deployment, and application of the scenario, as appropriate. If the scenario for the study is to be provided from any source other than ODCSOPS and HQDA, this fact and the reasons for it will be stated in this subparagraph.

(2) As a minimum, the threat guidance subparagraph will contain the location, general situation, and intensity of combat applicable to the study. It will direct coordination with the appropriate intelligence threat organizations in accordance with AR 381-11 to validate threat requirements and guidelines to be followed.

(3) Environmental impact considerations, such as land, water, and noise pollution, should be listed. If none are contemplated, enter the following: "No environmental consequences are envisioned; however, the study agency is required to surface and address any environmental considerations that develop in the course of the study effort."

g. Estimated cost savings or other benefits. Instruct the study-performing organization to develop the cost savings or avoidance or other benefits expected from implementation of study results. The study must explain what difference the results will make--how will the Army benefit? If no cost savings can be determined, nonquantifiable benefits must be described as a minimum.

6. Responsibilities. List the responsibilities of all agencies involved in the study. A separate subparagraph may be used for each agency tasked to contribute input to the study. In the case of ad hoc studies, list the number and qualifications of personnel who will be assigned to the study.

7. Literature search. List past or ongoing studies related to the issue and prescribe the additional research requirements for the study agency.

8. References. List the references needed by the addressees to initiate action on the study. Each reference will be placed in a separate subparagraph. References are:

a. Administrative and procedural, such as AR 5-5 and AR 5-14.

b. Substantive, such as memorandums, directives, and studies which may furnish input to the study being directed.

9. Administration. Provide essential administration instructions. Include all applicable topics.

a. Assign responsibilities for providing funds (TDY, per diem, overtime, ect.).

b. Identify administrative support to be provided, such as clerical, office space, office equipment, etc. Such support is usually furnished by the study sponsor for in-house studies.

c. Cite cost limitations imposed, if applicable.

d. Provide details of contract studies already authorized or to be requested.

e. Identify current and future resources required for automatic data processing equipment (ADPE).

f. Prescribe the milestone schedule for the study. Include, as a minimum, the date the final report is due to the decisionmaker. Include requirements for interim status reports and in-process reviews; indicate the responsible organization and date due. An impact statement should be provided when leadtime is short or urgency is cited.

g. Appoint the SSD and provide instructions for the establishment of a study advisory group (SAG) when a SAG is appropriate.

h. Designate responsibility for preparing and submitting DD Form 1498 and final study documents to DTIC.

i. Attach any specific study outline or format that is desired as an enclosure.

j. Prescribe specific action documents to be prepared and submitted with the study, e.g., executive summary, policy papers, implementation plan, regulations.

(AUTHORITY LINE)

Enclosure (list)

(Appropriate signature block)

COPY FURNISHED:

SUSPENSES: Provide milestone dates for responsibilities assigned and reference appropriate paragraph of the directive.

## ANNEX II

### FCRC CONTRACT PROCEDURES

B-1. General. Scientific, engineering, advanced systems planning and engineering, and technical support may be contracted through a Federal Contract Resource Center (FCRC). Specific policies, criteria, precautions, and procedures are contained in AR 70-6. FCRC support may be used only when:

a. There are no other known contractors with the experienced personnel, technical objectivity, and capabilities necessary to perform the effort, or

b. Constraints are such that there is not time to perform the civilian contract process. The steps outlined in this appendix ensure that abuse is avoided. They also provide assistance in managing these noncompetitive contracts.

B-2. Studies. An FCRC will not perform studies or analyses.

B-3. FCRC roles. The basic roles assigned to FCRCs in providing technical and scientific support include:

a. Systems acquisition (including systems and subsystems engineering)

b. Systems research and planning.

c. Research and experimentation.

d. Technical support (including technology and selected studies).

B-4. Background.

a. Federal Contract Research Centers are independent, not-for-profit, sole-source corporations which were created to provide scientific, engineering, advanced systems engineering and planning, and technical review in specific fields to enhance the capabilities of DoD agencies. FCRC effort is controlled by an annual, congressionally approved, limitation/ceiling.

b. The MITRE Corporation is an FCRC sponsored by the Air Force which was formed in 1958 to perform scientific and engineering services in the field of command, control, communications, and intelligence (C3I) systems.

c. All DoD and other government agency support provided by the MITRE C3I Division is established and controlled through an Air Force/MITRE contract administered by HQ Electronics System Division (ESD), Hanscom AFB, Maine. Any request for data related to the AF/MITRE contract must be coordinated with ESD/ALF. Utilization of MITRE support is contained in AF/ESD Reg 80-1.

d. The contract statement of work (SOW) is divided into functional categories of effort. General descriptions of the type of work required in support of each category/area are provided and projects are established within these functional work areas based on the required levels of effort.

e. Technical objectives and plans (TO&Ps) are written descriptions of the individual projects and expand the general contractual SOW by defining the government's specific objectives for particular programs or projects together with MITRE's implemental plans and schedules for accomplishing these objectives. (MITRE prepares the milestones of events.) These documents, properly authenticated and published, are incorporated in and made a part of the AF/MITRE contract by reference therein.

f. The unit of measure in distributing MITRE support among programs/projects is members of the technical staff (MTS) man-years of effort. One MTS includes the principal investigator, supporting technical and administrative assistants, overhead, and appropriate other direct charges such as travel, equipment, computer usage, service, etc. Because these resources vary on each project, the cost per MTS is also a variable. (Cost per MTS is provided annually by HQDA, Office of the Under Secretary of Defense for Research and Engineering (OUSDRE), in the instructions for submission of requirements for FCRC support.)

**B-5. Steps required to obtain MITRE support (see AF/ESD Reg 80-1).**

a. Identification of FCRC requirements. FCRC requirements ceiling is programmed annually (September timeframe) for two years beyond the budget execution year (i.e., execution year is FY90, FCRC requirements are programmed for FY92 and FY93).

b. Approval authority. Approval for work to be done by MITRE is obtained when programmed ceiling is approved and allocated to a proponent organization by the OUSDRE. (Funds to accompany ceiling must be available.)

**B-6. Preparation of documentation by the proponent organization action officer (use AF/ESD Reg 80-1).**

a. Technical objectives and plans (TO&P) to be used as the statement of work.

b. DD Form 1423, Contract Data Requirements List.

c. Sole-source procurement justification. (For SJA review only. Documentations justify the sole-source procurement of MITRE support.)

d. Sole-source certification for MITRE support form to be signed by a general officer who certifies that work proposed for MITRE is IAW ESD Reg 80-1 and is in conformance with the appropriate provisions of the Competition in Contracting Act and applicable federal acquisition regulations (figure L-12).

e. DD Form 254, Contract Security Classification Specification, will be updated or initially prepared as required.

B-7. SJA review. An action DF and the above documentation will be forwarded to the SJA for review and approval of the sole-source justification prior to the signing of the sole source certification for MITRE support form by the general officer. The general officer is the final approving authority required for a MITRE contract.

B-8. Forwarding Documentation in B-6 above (except B-6c) will be forwarded to MITRE through ESD/ALF.

B-9. Fund certification and transfer. A military interdepartmental purchase request (MIPR) to transfer funds will be forwarded from HQDA or the MACOM RMD to the AF contracting office during the budget execution year.

Sole-Source Certification for MITRE Support

Project Title \_\_\_\_\_

Project Number \_\_\_\_\_

I hereby certify that (1) the work described by the Technical Objectives and Plans (TO&P) document for the MITRE project identified above meets the criteria for assignment of work to the C3I Division of The MITRE Corporation as prescribed by the provisions of ESD Regulation 80-1, dated 25 May 1983, (2) there are no other known contractors with the experienced personnel, technical objectivity, and capabilities necessary to perform this effort, (3) acquisition of this effort is in full compliance with applicable procurement statutes, policies, and regulations for noncompetitive actions, (4) this action is not being taken in order to avoid competition, (5) that only MITRE can satisfy the Government's requirements for this particular effort, and (6) it is not feasible to forego the work without unacceptable delay in work vital to the national defense.

\_\_\_\_\_  
SIGNATURE

\_\_\_\_\_  
TYPED NAME & TITLE

Figure L-12. Sole-source certification for MITRE support

ANNEX III  
CIVILIAN CONTRACTS

	PAGE
SECTION I - Competitive contract package	L-III-4
SECTION II - Sole-source contract package	L-III-6
SECTION III - AR 5-5/5-14 study reference papers	L-III-8



ANNEX III  
CIVILIAN CONTRACTS

AR 5-5/5-14

The following administrative requirements must be accomplished for civilian contracts:

C-1. Initiation.

a. Background directives and correspondence such as:

- (1) Tasking directive.
- (2) Bibliography of related prior study reports.
- (3) Verification of literature search.

b. Study initiation decision document (directive, memorandum) with supporting documents such as:

- (1) Coordinating actions.
- (2) Other related letters and papers.

C-2. Contract support packages.

- a. Competitive (see section I)
- b. Sole-source (see section II)

C-3. After contract award.

- a. Request and authorization for release of funds (MIPR/PR).
- b. DD Form 1423 (Contract Data Requirements List), if applicable.

C-4. SAG documentation (required only for a significant study that has an SAG; see DA Pam 5-5).

- a. Member listing.
- b. Notices of meetings.
- c. Meeting agendas.
- c. Briefings presented to SAG.
- d. SAG minutes with approval action and forwarding letters.
- e. Management evaluation of study efforts.

C-5. In-progress documentation.

- a. All correspondence with contracting officer and contractor.

b. Memorandums of discussions and meetings with contracting officer or contractor.

c. DD Forms 1498 (Research and Technology Work Unit Summary) with updates, to include completion reports.

d. Progress reports provided by contractor.

e. Contractor cost and status of fund reports.

f. Requests for contract modifications.

g. Evaluation of contractor's performance.

h. Draft report with comments, recommendations, and approval documentation.

C-6. Study completion.

a. Final report with associated information and decision papers.

b. Results and uses documentation.

c. DD Form 1593 (Contract Administration Completion Record).

d. DD Form 1498 (Research and Technology Work Unit Summary).

e. DD Form 1473 (Report Documentation Page).

C-7. Reference files. The set of study reference papers that the study proponent must retain for a major study is found at section III.

Section I

COMPETITIVE CONTRACT PACKAGE

1. Identity source of funding.
2. Determine type of contract.
3. Documentation required.
  - a. Management decision document -- Mark FOUO.
  - b. Statement of work (SOW) -- Mark FOUO if estimates cost is referred to in the SOW. Task contractor within SOW to prepare a monthly "Contractor's Progress Report" (see AR 5-14).
  - c. Cost estimate -- Mark FOUO.
  - d. DD Form 254.
  - e. DD Form 1423.
  - f. Patent checklist.
  - g. Evaluation criteria -- Mark FOUO.
  - h. Weights for evaluation criteria -- Mark FOUO.
  - i. List of potential contractors (bidders list).
  - j. DD Form 1664.
  - k. DD Form 1498 (AR 5-14 contract) -- Mark FOUO.
  - l. ACCSAI attachment to DD Form 1498 (chapter 6).
  - m. PR/MIPR if funding document is required.
4. Model development contracts will be staffed with MACOM tool/data office. Contact this office for model documentation requirements, if any.

5. References.

- a. AR 5-14, Managing Analytical Support Services.

Chapter 3, General guidance.

Chapter 4, Five phases of an analytical support service contract effort.

Appendix B, Categories of analytical support services  
(category B of AR 5-14 are contracts for studies and analyses of the AR 5-5 study program)

Formats for contract support packages for category B are in TRADOC Reg 5-3. Do not use formats in AR 5-3. (Use AR 5-14 formats for other type contracts.)

- b. DA Pam 5-5, Guidance for Study Sponsors, Directors, SAGs, and CORs.

Appendix D, Types of files to be maintained.

Appendix E, Independent government estimate.

Appendix F, Evaluation factors and weights.

Appendix G, Sample DD Form 254

Appendix L, Keyword thesaurus, page L-4 (block 22, keywords on DD Form 1498. At least one from each category. Can use more than one.)

- c. DOD 3200.12-M-1, Research and Technology Work Unit Information System Manual.

Table 2-1, Detailed field descriptions for DD Form 1498 (pp. 2-3).

Table 2-2, Scientific and Technological Fields and Groups, pp. 2-3/.  
Field 12 of DD Form 1498. (At least 2; maximum of 3.)

Appendix D, DD Form 1498 data fields pertaining to AR 5-5 studies, pp. D-1 through D-3 and pp. D-5 and D-6, definition of study categories.

Section II

SOLE-SOURCE CONTRACT PACKAGE

1. Identify source of funding.
2. Determine type of contract.
3. Documentation required.
  - a. Study program description sheet (if unprogrammed AR 5-5 effort; study program description sheets will be forwarded to S&A, CAID; CAID will prepare the transmittal letter for approval by HQ TRADOC).
  - b. Management decision document -- Mark FOUO.
  - c. Statement of work (SOW) -- Mark FOUO if estimated cost is referred to in the SOW. Task contractor within SOW to prepare a monthly "Contractor's Progress Report" (see AR 5-14).
  - d. Independent government cost estimate -- Mark FOUO.
  - e. DD Form 254.
  - f. DD Form 1423.
  - g. Patent checklist.
  - h. Sole-source justification.
  - i. DD Form 1664.
  - j. DD Form 1498 (if AR 5-14 contract) -- Mark FOUO.
  - k. PR/MIPR if funding document is required.
4. Model development contracts will be staffed with MACOM tool/data office. Contact this office for model documentation requirements, if any.
5. References:
  - a. AR 5-14, Managing Analytical Support Services.  
Chapter 3, General guidance.  
  
Chapter 4, Five phases of an analytical support service contract effort.  
  
Appendix B, Categories of analytical support services (category B, contracts in support of AR 5-5 program).  
Formats for category B are in TRADOC Reg 5-3.  
Other type contracts formats are in AR 5-14.

- b. DA Pam 5-5, Guidance for Study Sponsors, Directors, SAGs, and CORs.
  - Appendix D, Types of files to be maintained.
  - Appendix E, Independent government cost estimate.
  - Appendix G, Sample DD Form 254.
  - Appendix L, Keyword thesaurus, p. L-4, (block 22, keywords on DD Form 1498. At least one word from each category must be used. (Can use more than one.)
- c. DOD 3200.12-M-1, Research and Technology Work Unit Information System Manual.
  - Table 2-1, Detailed field descriptions for DD Form 1498.
  - Table 2-2, Scientific and Technological Fields and Groups. Field 12 of DD Form 1498. (At least 2, maximum of 3).
  - Appendix D, DD Form 1498 data fields pertaining to AR 5-5 studies (pages D-1 through D-3).
  - Pages D5 and D6, definition of study categories.

Section III

AR 5-5/5-14 CONTRACT

STUDY REFERENCE PAPERS

The following documents must be retained in a file for five years in accordance with DODD 5010.22.

- a. Background directives and correspondence such as:
  - (1) Tasking directive.
  - (2) Unsolicited study proposals and in-house evaluation/recommendations.
  - (3) Bibliography of related prior study reports.
  - (4) Verification of literature search.
  
- b. Study initiation decision document (directive, memorandum) with supporting documents such as:
  - (1) Cost estimates.
  - (2) Coordinating actions.
  - (3) Statement of work (SOW).
  - (4) Other related letters and papers.
  
- c. Contracting officer's representative (COR) appointment letter.
  
- d. List of contractors recommended for solicitation.
  
- e. Request and authorization for release of funds.
  
- f. Recommendation for sole-source procurement.
  
- g. Proposal evaluation plan (PEP) consisting of evaluation factors, factors weights, and evaluation worksheet.
  
- h. Letter of appointment of contract proposal evaluation panel.
  
- i. Independent government cost estimate.
  
- j. Minutes of contract proposal evaluation panel proceedings.
  
- k. DD Form 254, DOD Contract Security Classification Specification.
  
- l. Patent checklist.
  
- m. Secretarial determination and findings (D&F), if applicable.
  
- n. DD Form 1423, Contract Data Requirements List, if applicable.

- o. Contract and modifications.
- p. Contractor clearances (as required).
- q. Study plan as approved by sponsor.
- r. SAG documentation (required only for a significant study that has a SAG; see DA Pam 5-5):
  - (1) Member listing.
  - (2) Notices of meetings.
  - (3) Meeting agendas.
  - (4) Briefings presented to SAG.
  - (5) SAG minutes with approval action and forwarding letters.
  - (6) Management evaluation of study efforts.
- s. All correspondence with contracting officer and contractor.
- t. Memorandums of discussions and meetings with contracting officer or contractor.
- u. DD Forms 1498, Research and Technology Work Unit Summary, with updates, to include completion reports.
- v. Progress reports provided by contractor.
- w. Contractor cost and status of fund reports.
- x. Requests for contract modifications.
- y. Evaluation of contractor's performance.
- z. Draft report with comments, recommendations, and approval documentation.
  - aa. Final report with associated information and decision papers.
  - ab. Results and uses documentation.
  - ac. DD Form 1593, Contract Administration Completion Record.
  - ad. DD Form 1473, Report Documentation Page.



ANNEX IV

REFERENCES

Section I. Required Publications

AR 5-5                    Army Studies and Analyses  
AR 5-14                  Managing Analytical Support Services  
AR 11-39                 The ACCS Program  
AR 70-6                  Management of RDT&E, Army Appropriation  
DA Pam 5-5               Guidance for Army Study Sponsors, Study Directors, Study  
                                 Advisory Groups, and Contracting Officer Representatives  
AF/ESD Reg 80-1        Utilization of MITRE Support

Section II. Related Publications

AR 5-7                    Defense Logistics Studies Information Exchange  
AR 11-18                 The Cost Analysis Program  
AR 70-1                  Army Research, Development, and Acquisition

APPENDIX M

PROPOSED CHANGES TO AR 11-39

(DA Form 2028, Recommended Changes to Publications and Blank Forms)

<b>RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS</b> For use of this form, see AR 310-1; the proponent agency is the US Army Adjutant General Center.	Use Part II (reverse) for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	DATE 31 Mar 87
	TO: (Forward to proponent of publication or form) (Include ZIP Code) HQDA ATTN: DAMO-FDC Pentagon Washington, D.C. 20310	

FROM: (Activity and location) (Include ZIP Code) Cdr, USACACDA ATTN: ATZL-CAC-D Ft Leavenworth, KS 66027-5300
--

**PART I - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS**

PUBLICATION/FORM NUMBER AR 11-39	DATE 1 Aug 83	TITLE Army Command and Control System Program
-------------------------------------	------------------	--

ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO.*	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON (Provide exact wording of recommended change, if possible).
1	1	1	3			Add after "(ACCS)": "and ACCS Analysis Integration (ACCSAI)."
2	1	2				Add: "e. DA Pam xx-xx (Army Command and Control System Analysis Integration Program)."
3	1	4a(1)	2			Add: "program development and analysis integration."
4	1	4b				Add new (9): "Serve as the program manager for the ACCSAI program (DA Pam xx-xx) by annually providing long-term guidance for ACCS program development, and ensuring ACCSAI program conformance by all MACOMS."  Change current (9) to (10), (10) to (11), etc.
5	4	4o				Add new 4.o: "All MACOM commanders and agency heads will submit supporting study and analysis requirements as described in DA Pam xx-xx, The ACCSAI Program. These commanders will-- (1) Establish an ACCSAI program office and a tool/data office. (2) Solicit ACCS study requirements from proponent organizations. (3) Process ACCS study and tool/data requirements. (4) Submit an ACCS study schedule and tool/data requirements to the TRADOC ACCSAI Program Office and AMC ACCSAI Tool/data Office, respectively. (5) Ensure compliance of the ACCSAI program by subordinate organizations."

\*Reference to line numbers within the paragraph or subparagraph.

TYPED NAME, GRADE OR TITLE Roland Groover ORA	TELEPHONE EXCHANGE/AUTOVON. PLUS EXTENSION AV: 552-4721	SIGNATURE 
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**DA FORM 2028**  
1 FEB 74

REPLACES DA FORM 2028, 1 DEC 66, WHICH WILL BE USED.

<b>RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS</b> For use of this form, see AR 310-1; the proponent agency is the US Army Adjutant General Center.	Use Part II (reverse) for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	DATE 31 Mar 87
	TO: (Forward to proponent of publication or form) (Include ZIP Code) HQDA ATTN: DAMO-FDC Pentagon Washington, D.C. 20310	

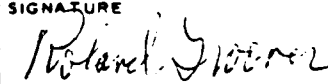
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**PART I - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS**

PUBLICATION/FORM NUMBER AR 11-39	DATE 1 Aug 83	TITLE Army Command and Control System Program
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ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO.*	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON (Provide exact wording of recommended change, if possible).
6	4	6				<p>Add new paragraph 6: Description of the ACCSAI program</p> <p>a. The ACCSAI program</p> <p>(1) Is a management program conducted by HQDA, ODCSOPS.</p> <p>(2) Ensures the best use of the Army's limited analysis resources to develop the ACCS program.</p> <p>(3) Provides for the integration and management of ACCS study requirements and ACCS tool/data requirements within and among MACOMs.</p> <p>(4) Provides an annual cycle to assist the timely submission of integrated ACCS study requirements to the AR 5-5 study program.</p> <p>(5) Provides procedures to categorize, prioritize, sequence, and schedule study requirements.</p> <p>(6) Provides a guide to initiate, conduct, and terminate ACCS studies.</p> <p>b. Each MACOM will establish an</p> <p>(1) ACCSAI program office to process study requirements. Tasks include:</p> <p>(a) Gather and manage information concerning all ACCS study requirements, both deliberate and quick-response.</p> <p>(b) Identify and eliminate duplicate efforts.</p> <p>(c) Categorize, prioritize, sequence, and schedule deliberate studies to be done within the next three years.</p> <p>(d) Maintain information concerning deliberate and quick-response studies</p> <p>(2) ACCSAI program tool/data office to process tool/data requirements. Tasks include:</p> <p>(a) Assist MACOM ACCS analysis organizations with:</p>

\*Reference to line numbers within the paragraph or subparagraph.

TYPED NAME, GRADE OR TITLE  Roland Groover ORA	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION  AV: 552-4721	SIGNATURE 
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**DA FORM 2028**  
1 FEB 74

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For use of this form, see AR 310-1; the proponent agency is the US Army Adjutant General Center.								
TO: (Forward to proponent of publication or form) (Include ZIP Code) HODA ATTN: DAMO-FDC Pentagon Washington, D.C. 20310						FROM: (Activity and location) (Include ZIP Code) Cdr, USACACDA ATTN: ATZL-CAC-D Ft. Leavenworth, KS 66027-5300		
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PUBLICATION FORM NUMBER AR 11-39						DATE 1 Aug 83	TITLE Army Command and Control System Program	
ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO.*	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON (Provide exact wording of recommended change, if possible).		
						<p style="text-align: center;">- forecasting/scheduling ACCS tool/data requirements</p> <p style="text-align: center;">- procuring input data to support future ACCS studies.</p> <p style="text-align: center;">(b) Maintain an inventory of ACCS models, data II bases, and scenarios.</p> <p style="text-align: center;">c. DA Pam XX-XX describes the program and responsibilities in detail. It also provides procedures and forms to initiate, conduct, and terminate studies.</p> <p>REASON: To implement the ACCSAI program within the ACCS program.</p>		
*Reference to line numbers within the paragraph or subparagraph.								
TYPED NAME, GRADE OR TITLE  Roland Groover ORA						TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION  AV: 552-4721		SIGNATURE  <i>Roland K. Groover</i>

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