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COPPERHEAD OPERATIONAL PERFORMANCE EVALUATION (COPE):
COMPUTER PROGRAM USER AND ANALYST MANUAL

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U. S. ARMY MATERIEL SYSTEMS ANALYSIS ACTIVITY
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TABLE OF CONTENTS

PAGE

<u>CHAPTER 7</u>

7. PROGRAM GENERATED MESSAGES AND DEBUGGING PRINTS 7-1

TABLE OF CONTENTS - Continued

PAGE

PAGE

TABLE OF CONTENTS - Continued

11

TABLE OF CONTENTS - Continued

PAGE

LIST OF COMPUTER LISTINGS

LIST OF FIGURES

LIST OF TABLES

Next page is blank.

PREFACE

This report documents the COPE methodology and computer programs.

Various sections of this report are aimed at different audiences:

Chapter 1 is an introduction to COPE and to this report.

Chapters 2 and 3 are intended for the analyst who is concerned with the modeling methodology and assumptions.

Chapters 4, 5, 6, 7, 14, 15, and 16 are aimed at the user who wants to use the COPE model and its preprocessors in production runs, but who is not interested in programming details.

Chapters 8, 9, 10, 11, 12, and 13 are intended for the programmer who wants a thorough understanding of the COPE computer code in order to implement it on other machines or simply to make changes to it.

The first four appendixes (A, B, C, and D) include program listings and sample cases. The sample cases are cumulative in the sense that the three PAM sample input sets should be run using respectively the three PAM sample runstreams before running the PREPMS program. The sample PREPMS case should then be run using the TAPE 11 created by the PAM runs (this will result in the output of Appendix C). Finally, the COPE sample case should be run using the TAPE 11 created by PAM and PREPMS (this should result in the output of Appendix D). Running these sample cases and comparing the results with those in the appendixes provide a check for correct implementation of COPE and its preprocessors on other machines.

If discrepancies are found in this publication or the associated software, please send notice to:

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US Army Materiel Systems Analysis Activity
ATTN: DRXSY-GS (Mr. R. Sandmeyer)
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Suggestions for improvements to this report or the associated programs may also be sent to the above address.

In addition, requests for magnetic tape copies of the COPE programs and related files should be sent to the same address along with the appropriate paperwork for such requests.

This report may be updated by the issuing of revised pages. The frequency of such updates will, of course, depend on the number of errors requiring correction, the changes made in the model, and the demand for the report. Those desiring to maintain the latest versions of the report and the programs should be certain that they are on the COPE distribution list to be maintained by AMSAA.

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NOTE ON CLASSIFICATION

This report is unclassified, however, when the COPE model is used for actual production runs, it requires some classified inputs. The inputs used in the sample cases (see Appendixes) are correct data except for false values which have been inserted in place of those data whose correct values are classified.

In addition, comment cards with the characters "CSEC" in columns 1-4 point out places in the program code where fictitious constants have been substituted to replace classified values in the listings of PAM and COPE (Listings A-1 and D-1).

The following data are classified (at the time of publication of this report) when correct values are used and identified as such:

In the PAM program: ETH, THEMH, and DISMH are classified by Reference 1 below. ED is classified by Reference 2.

In PREPMS and COPE programs, the values of PE, RNGTTF, and PKTBL, as well as the true seeker sensitivity value, are all classified by Reference 1.

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[1] Security Classification Guide, Projectile, 155mm, Cannon Launched, Guided, XM712, (CLGP), dated 24 July 1979.

[2] Security Classification Guide, Ground Laser Designators, dated 16 June 1978.

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CHAPTER 1

1. INTRODUCTION

1.1 COPE Background.

Traditionally the item level performance of a weapon system has been expressed in terms of the firepower characteristics of the weapon. The weapon characteristics normally included in the computation of firepower were range, accuracy, lethality, and rate-of-fire. With the introduction of more sophisticated weapons, an awareness of the need to include additional factors in the assessment of a weapon's performance has emerged at both the decision and R&D levels. These additional factors have collectively been referred to as the "Battlefield Environment" and include natural phenomena as well as conditions imposed on the system by friendly and enemy forces.

The need for quantifying a weapon system's performance within the battlefield environment recently became most critical with the development of the 155mm XM712 COPPERHEAD artillery projectile. To study its potentially degraded performance under some battlefield environments, AMSAA developed a computer model which is known by the acronym COPE (COPPERHEAD Operational Performance Evaluation).

In addition to being a model for assessing the performance of a weapon system, the model and the manner of generating the input requirements constitute a novel approach to the evaluation of weapon systems. This approach results in a manner of assessing the performance of most weapon systems and potentially can quantitatively produce insight into the performance of one or more weapon systems which previously could only be treated subjectively.

This report describes the COPE model as currently used at AMSAA for the assessment of COPPERHEAD. AMSAA has modified the computer code to obtain models that analyze the performance of other weapon systems within the context of a COPE type "operational performance" analysis. The term COPE itself has now come to have two meanings: (1) "Combat Operational Performance Evaluation" which is the generic name for all of the derivative models of the original COPPERHEAD version and (2) "COPPERHEAD Operational Performance Evaluation" which is the first model in this family of "Operational Performance" models and is the one described in this report.

The models in the COPE family include:

(1) COPPERHEAD Operational Performance Evaluation (COPE) used to evaluate the XM712 COPPERHEAD artillery round,

(2) Tank Performance Evaluator (TAPE) used as part of the XM1 tank evaluation,

(3) TOW Operational Performance Evaluator (TOPE) used to evaluate the TOW anti-tank missile,

(4) SADARM Operational Performance Evaluator (SOPE) used to evaluate the proposed SADARM artillery round,

(5) Top Attack Evaluation Model (TAEM) used to evaluate candidates in the Top Attack Study,

(6) Ground Launched HELLFIRE Operational Performance Evaluation (GLHOPE) used to evaluate ground launched HELLFIRE,

(7) RPVCOPE used to evaluate COPPERHEAD when designation was performed by an RPV, and,

(8) HELLFIRE Operational Performance Evaluation (HOPE) used to evaluate HELLFIRE launched from helicopters.

The input requirements for these models range from moderate to massive. The TAPE and TOPE models for example require no preprocessors and take less input than the COPPERHEAD version. The TAEM program, on the other hand, requires as input results generated by the very costly, long running, TGSM (Terminally Guided Submunition Model) program.

This report is concerned only with the COPE model (in all remaining sections of this report, COPE shall have its second, narrower meaning: "COPPERHEAD Operational Performance Evaluation"); however, much of what is discussed applies to the other models in the family. Any of the models of the COPE family can be obtained from AMSAA, though at the present time only the COPPERHEAD and tank versions have been extensively documented.

1.2 Overview of COPE Computer Programs.

There are actually four computer programs used in the COPPERHEAD Operational Performance Evaluation. They are:

(1) The main COPE program (formerly called SLATCH for Simple Look at the COPPERHEAD) descended from the original proposal put forward by DUSA-OR.

(2) The PAM (Probability of Seeker Acquisition and Round Maneuver) model used to create the probability of engagement tables used as input to the main COPE program. This model is described and documented more thoroughly in a forthcoming AMSAA technical report.

(3) The PREPMS (Preprocessor Mass Storage) program that is used to create and modify the word addressable mass storage file used as the COPE "data base".

(4) The PRBLOS (Probability of Line-of-Sight) model used to obtain the probability of having line-of-sight for the terminal phase of the COPPERHEAD trajectory.
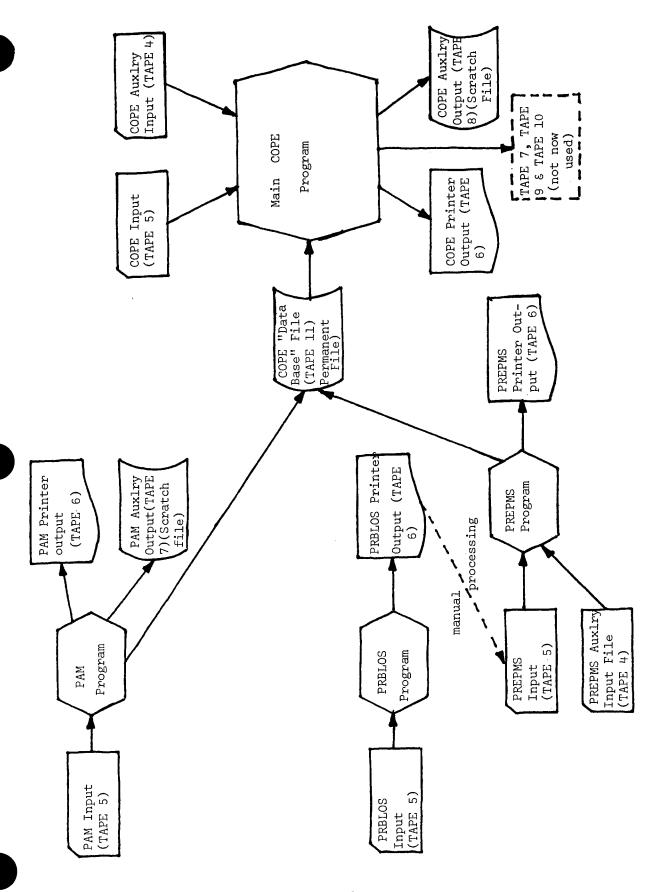
FIGURE 1-1 COPE And Its Preprocessors

All four of these programs are documented in this report, though the PAM model is covered in much less detail than the other three since a more detailed treatment of it will be published in a separate report.

The relationships among the four programs and the word addressable "data base" file are shown in Figure 1-1.

The major data sets (called "data blocks" later in this report) are put on the data base by PAM and PREPMS. Then when one wishes to run COPE, it is necessary only to submit a string of simple input commands describing the cases to be run. For example, when running a case using December weather for 0600 (6 a.m.), one need merely submit a card: WEATHER, DECEMBER, 0600 rather than read in thirty or forty cards filled with the appropriate weather data. This arrangement makes it extremely simple to run many cases of COPE with relatively few input cards once the data base file has been created.

In the event that one wishes to run cases that use a data set not on the data base file, there is a "temporary" option that allows one to read the data into COPE directly; however, if one intends to run multiple cases with such data, it will be easier in the long run to read it onto the permanent data base file once using the PREPMS program and then "call it up" for use as necessary in COPE by submitting the appropriate single card command.

All four programs are written in CDC FORTRAN Extended Version 4.

CHAPTER 2

2. DESCRIPTION OF COPPERHEAD MISSION MODELING

2.1 Application Area of Simulation.

The main COPE program is a simulation of a COPPERHEAD fire mission under battlefield conditions. It takes into account such degrading effects on designator, fire direction center (FDC), artillery battery, and COPPERHEAD round performance as meteorological conditions, terrain shielding, smoke, dust, enemy artillery preparatory fires, enemy direct fire against the designator, communication failures, and target location error as well as numerous factors that affect COPPERHEAD's ability to engage and hit a target.

The main COPE program was designed to evaluate the operational performance of the overall COPPERHEAD system under battlefield conditions.

The output of the program enables one to see which factors contribute most to the degrading of COPPERHEAD system performance and which are, therefore, areas in which performance improvement efforts should be concentrated.

In addition, by varying the input value(s) associated with a particular factor and then studying the results, one can perform the customary sensitivity analysis. A series of such analyses can be expected to show that changes (within realistic limits) in some factors have little effect on overall system operational performance whereas changes in other factors will result in major performance improvement or degradation.

By comparing those factors to which system operational effectiveness is most sensitive with those factors over which system designers and tacticians have some control, one can determine what, if any, design changes or employment doctrine changes might be made to improve overall COPPERHEAD system operational performance. This comparison and analysis, of course, is done outside the COPE program, but the resulting modified COPPERHEAD system and employment doctrine might then be evaluated in the COPE model or a descendent of it.

Finally, several derivative models have been developed from an earlier COPE program (SLATCH version 3.2) and are in use for evaluating tanks, TOW, and Hellfire under battlefield conditions. These models allow limited but informative comparisons of the operational performance of the different weapon systems.

2.2 Description of Model.

2.2.1. Outline of COPPERHEAD Mission.

The heart of the main COPE program is the Monte Carlo simulation of a potential COPPERHEAD fire mission. This simulation consists of a series of steps that would occur in an actual COPPERHEAD fire mission. For a successful mission, these steps start with the unmasking from terrain shielding of a target and end with the killing of a target by COPPERHEAD. For an unsuccessful mission, the steps end before the target is killed.

The steps are grouped into three series bounded by four major events. The following outline gives the four major events as well as the steps (or tests) that must be passed to reach the next major event. All steps and events occur in the order listed.

This describes the tests when the so-called "shooting gallery" line-of-sight model is used. Following the list is a description of the modifications required when the "random occurrence" line-of-sight model is used.

Event 1. A target (one or more target vehicles) unmasks (i.e., enters a region within line-of-sight of the designator operator's position). This is termed an "occasion" and begins the simulation of the potential COPPERHEAD mission.

Test 1: Has the designator operator survived enemy preparatory artillery fires up to the present time?

Test 2: Is the target within the meteorological visibility range limit of the designator operator for the present weather conditions?

Test 3: Is the target within the designation range of the laser designator system being played?

Test 4: Did the designator operator detect/acquire the target before it again became masked by terrain?

Test 5: Is the line-of-sight from designator-to-target sufficiently free of smoke that the designator operator can see and designate the target?

Test 6: Is the line-of-sight from designator-to-target sufficiently free from dust for the designator operator (D.O.) to see and designate the target?

Test 7: Is the target sufficiently far away from the designator operator that he will stay and designate rather than "bail-out?"

Event 2: The designator operator has acquired a target and decides to engage it (i.e., call for COPPERHEAD fire against it). This is termed an "attemped engagement."

Test 8: Is the designator operator able to communicate with the fire direction center (FDC)?

Test 9: Does the message which the designator operator sends to the fire direction center contain the correct information and does the FDC interpret it correctly?

Test 10: Is the target still (after time has been spent on communication and preparing to fire the mission) sufficiently far away that the designator operator will stay and designate rather than "bail-out?"

Test 11: Does the designator operator still have line-of-sight to the target?

If tests 8 through 11 are all passed, then conditions are such that a COPPERHEAD fire mission occurs. This leads to:

Event 3: The battery is ready to fire and the designator is ready to designate. A COPPERHEAD round is fired. This is termed a "shot".

Test 12: Does the designator operator still have line-of-sight to the target during the final critical time interval of the COPPERHEAD trajectory?

Test 13: Has the designator operator been warned to begin lasing the target or has he seen the first COPPERHEAD round of this fire mission already impact?

Test 14: Does the designator survive direct fire from the target being designated and is the line-of-sight to the target unobscured by direct fire rounds landing in front of the designator?

Test 15: Is the COPPERHEAD round just fired reliable?

Test 16: Is the line-of-sight from the designator operator to the target vehicle unobscured by small terrain features?

Test 17: Does the round come sufficiently close to the target for the seeker to receive enough reflected laser energy to engage the target and is the target within the maneuver footprint of the COPPERHEAD?

Test 18: Does the COPPERHEAD round hit the target?

Test 19: Does the COPPERHEAD round kill the target?

If tests 12 through 19 are all passed, then we have:

Event 4: The target vehicle is killed. This is termed a "kill."

If more COPPERHEAD rounds are to be fired for this mission, the model time is moved ahead to account for the time between rounds, and the model resumes at Event 3 for the next COPPERHEAD round.

To model the "random occurrence" line-of-sight case, tests 4 and 11 are not made and test 12 uses a different assumption.

The two ways of handling the line-of-sight problem are called the "shooting gallery" method and the "random occurrence" method.

The "shooting gallery" method assumes that the entire COPPERHEAD mission must be completed during the time interval starting with the first target vehicle entering line-of-sight segment and ending with the last vehicle of the target leaving that same line-of-sight segment (see Figure 2-1).

The "random occurrence" method on the other hand assumes that target vehicles are passing in and out of view. Instead of assuming that all rounds fired after the last target vehicle leaves the line-of-sight segment in which it was acquired are wasted as in the "shooting gallery" technique, the "random occurrence" method does not check loss of line-of-sight until the last critical seconds of the COPPERHEAD trajectory and even then the check allows for the possibility that a target may have left the first line-of-sight segment but entered a second (or subsequent) line-of-sight segment where COPPERHEAD can be used. The "random occurrence" line-of-sight model, then merely checks whether there is at least one unkilled target vehicle that will be within line-of-sight of the designator for the final critical seconds of the COPPERHEAD trajectory (see Figure 2-2).

Now each step (test) in the model is explained in detail:

2.2.2 Preparatory Fires. The first test encountered by a potential COPPERHEAD mission is for designator operator survivability of preparatory fire. A probability that the designator operator is killed by enemy preparatory artillery is input (either explicitly or by default) and for each replication (i.e., each sample potential COPPERHEAD mission) of the given case, a uniformly distributed (pseudo-) random number is drawn. If that random number is less than the input probability that the designator operator is killed by enemy preparatory artillery fire, then the potential COPPERHEAD
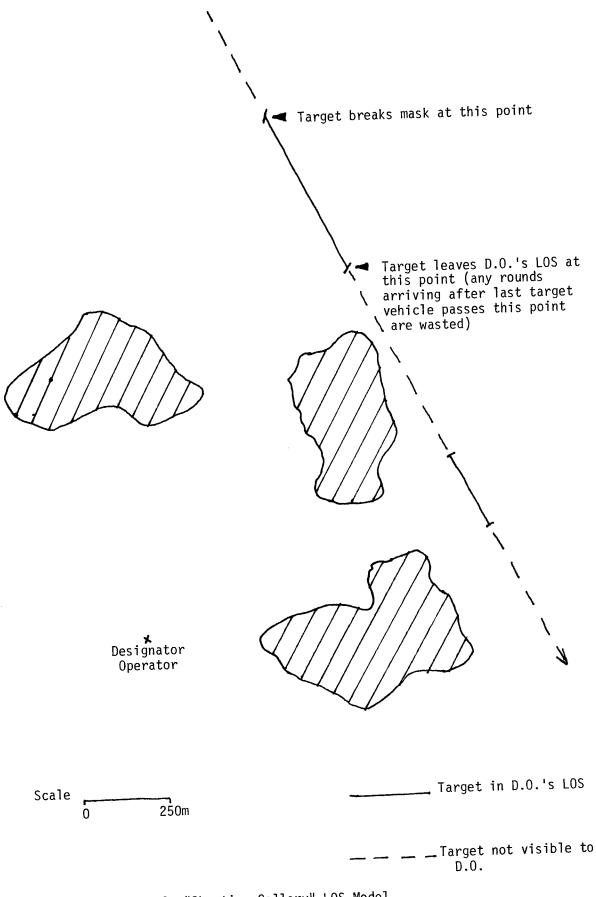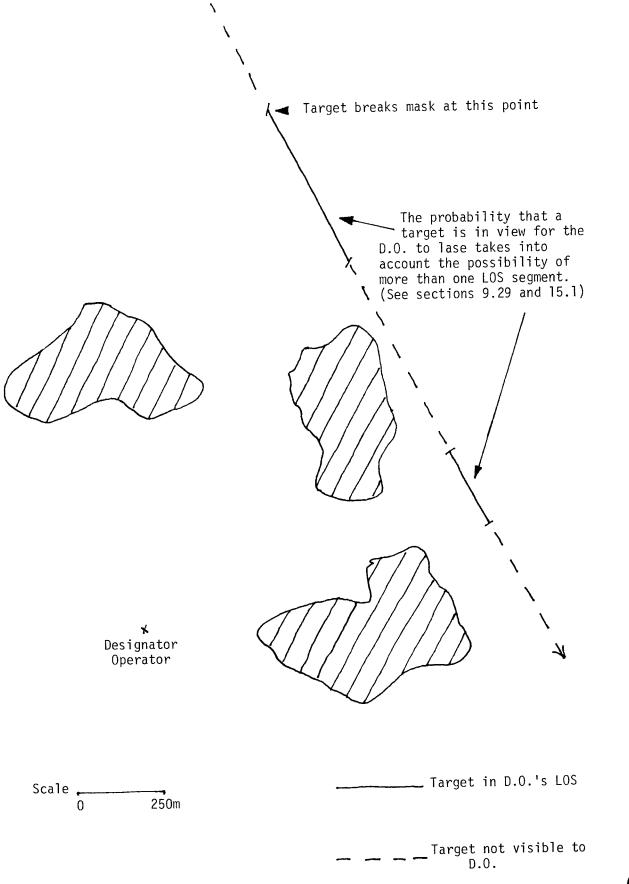
2-4

Target breaks mask at this point

Target leaves D.O.'s LOS at
this point (any rounds
arriving after last target
vehicle passes this point
are wasted)

✗
Designator
Operator

Scale

0   250m

_____ Target in D.O.'s LOS

_ _ _ _ _ _ Target not visible to
D.O.

FIGURE 2-1 "Shooting Gallery" LOS Model

Target breaks mask at this point

The probability that a target is in view for the D.O. to lase takes into account the possibility of more than one LOS segment. (See sections 9.29 and 15.1)

×
Designator
Operator

Scale

0   250m

——————— Target in D.O.'s LOS

— — — — Target not visible to D.O.

FIGURE 2-2 "Random Occurrence" LOS Model

mission aborts because the designator operator is killed; otherwise, the potential COPPERHEAD mission continues to the next test.

2.2.3 Visibility Range. The next test depends on the weather conditions. For the month and time of day that is used for a given case, there is a distribution of weather conditions which includes the probabilities of various cloud ceiling altitude and meteorological visibility range combinations as well as probabilities of various Pasquill atmospheric stability categories, windspeeds, and relative humidities. For each replication of a given case, the cloud ceiling altitude and meteorological visibility range distribution is sampled and the results (cloud ceiling altitude and meteorological visibility limit (range)) obtained are recorded for later use.

The program then samples the acquisition range distribution once for each replication to obtain the range from designator-operator (D.O.) to target terrain unmask for the current replication. If the target unmasks from terrain shielding at a range from the designator-operator beyond the current replication's meteorological visibility limit, then the potential COPPERHEAD mission is aborted since the target cannot be seen and, therefore, cannot be lased by the designator operator; if, on the other hand, the target unmasks at a range less than the visibility limit, then the next test is made.

2.2.4 Designator Maximum Range. Using the above random sample from the acquisition (terrain unmask) range distribution, the next test compares the designator-to-target range with the maximum designator range. If the target is beyond the maximum designation range, then the potential COPPERHEAD fire mission is aborted; otherwise, the tests continue.

At night, the maximum designator range is reduced to the range to which the thermal imagery night sight is usable for aiming the designator.

2.2.5 Target Not Detected. The next test is performed to determine whether the target was in view long enough to be acquired (the entire detection, recognition identification process is lumped into one test and called detection).

After a range from designator-operator to target terrain unmask is obtained as above, a line-of-sight segment length distribution is sampled to obtain the length of the section of the target's path extending from the point of initial terrain unmask to the first point along the path that is obscured from the D.O.'s view. From this line-of-sight segment length together with the target velocity and length of the target unit column, the duration of line-of-sight is calculated. This duration is the time from initial target unmask until the last vehicle in the target unit's column passes out of the D.O.'s view.

To determine whether the target is detected, a time is sampled from a distribution of detection times. This time represents the delay from the time of initial target unmask until the D.O. has detected, recognized, and identified the target and decided to call for COPPERHEAD fire. This is termed detection time.

If the detection time is greater than the duration of the line-of-sight on a particular replication, then the target is considered to have gone in and then out of view before the D.O. could detect it (or really before he could call for fire against it) and the mission aborts. If the detection time is less than the line-of-sight duration, then the D.O. detects and calls for fire on the target before it leaves his line-of-sight and the model continues to the next test.

2.2.6 Smoke. The next test is to determine whether there is sufficient smoke in the area of the target to prevent the D.O. from either seeing or lasing the target. The smoke model computes the fraction of targets that could be obscured from view by taking into account such factors as number and type of RED smoke rounds fired and weather conditions for the month and time of day considered in the current case.

As an alternative to specifying a volume of RED smoke rounds which is then used to calculate the fraction of targets obscured, one can simply input a fractional value which represents the fraction of targets obscured by smoke.

In either case, the fraction of targets (actually fraction of a specified front width) obscured by smoke is played as a "probability of abort due to smoke." For each replication that reaches the smoke test, a random number is drawn from a uniform distribution (from 0 to 1) and if it is less than the probability of abort due to smoke, then the mission is aborted at this step; if it is greater than the probability of abort due to smoke, then the next test is performed.

Note that while the D.O. has a limited target detection capability in smoke by using a thermal site on the designator, the laser beam itself could not penetrate the smoke in those cases where smoke was thick enough to require use of a thermal site. Consequently, COPE plays a "black-white" smoke situation: either smoke completely aborts the mission or has no effect. This is not the case for some of the other COPE variants (such as TAPE, SOPE) where there are three possibilities: (1) smoke is not present and, hence has no effect, (2) smoke is present and kills mission, (3) smoke is present but target can still be detected through thermal site and target is engaged but with reduced accuracy.

2.2.7 Dust. The next test is whether the dust from RED HE artillery fire is sufficient to prevent the D.O. from either seeing the target or lasing it. This is modeled in a very simplistic way in the current generation of COPE.

A probability that dust aborts the mission is estimated out-
side the COPE program and then input for a given COPE case (either
explicitly or by default). Then for each replication that reaches the
dust test, a random number is drawn from a uniform distribution (0 to
1) and compared to the probability that dust aborts the mission. If
the random number is less than the probability that dust aborts the
mission, then the mission is aborted; otherwise, the next test is
made.

2.2.8 Designator Bail-Out (Precommo). The next test is to
check whether the target is so close to the D.O. that in order to survive
he would not engage the target. The assumption is that to avoid being
killed by direct fire from potential COPPERHEAD targets, the D.O. would
move to a new position whenever the enemy front line units closed to within
a certain range; in the case of an isolated lead enemy unit, he might
merely refrain from designating rather than move, but in either case he
would not be calling for COPPERHEAD fire.

To perform this test, the model compares the D.O.-to-target
range against a pre-set "bail-out" range. If the D.O.-to-target range
is less than the bail-out range, the mission aborts; otherwise, the
mission proceeds to the next test.

Note that this bail-out check is made prior to the D.O.'s
call for COPPERHEAD fire. A second bail-out check (see section 2.2.10) is
made later.

2.2.9 Commo-out (Tests 8 and 9). The next test determines
whether the D.O. has a communication link with the F.D.C.

Communication delay time and probability of success (Test 8)
can be played in any one of three ways depending on the input option
selected:

(1) A single response time distribution is used together
with a single probability of having a good communications link. In
this case, a number is randomly sampled from the response time dis-
tribution to determine the total delay time from the D.O.'s call for
Copperhead fire until the firing battery is ready to pull the lanyard
to fire Copperhead. In addition, a second random number is drawn,
this time from a uniform (0 to 1) distribution; if this random number
is less than the probability of having a good communication link, then
the mission proceeds to the Test 9; otherwise, the mission is aborted.

(2) The second way of playing communication delay time and
probability of good communication link is called the "parameterized
response time" option. This case is essentially the same as (1) above
except that the delay time is set at a single fixed value that is the
same for every replication (as opposed to sampling a distribution of
delay times to obtain a new delay time value for each replication).

2-9

START

Is digital commo being played? —Y→ Sample digital commo delay time for entering data in DMD and add to current time

N

Is digital commo successful?

N→

Y

Is voice commo successful? (test 8)

N→

Y

Add time to transmit voice message to current time

Add time to transmit digital message to current time

Add FDC mission processing time and battery response time to current time

Abort COPPERHEAD Fire Mission

←N— Is message sent by D.O. to FDC correct and is it correctly interpreted? (test 9)

Y

RETURN

FIGURE 2-3 Third Communication Model

(3) The third way to model the communication delay time is to use a separate delay time for each part of the process from the D.O.'s calling in a fire mission to the battery's pulling the lanyard. Under this method, a delay time distribution is used to obtain digital communication times for D.O. to FDC messages. This delay time is a function of mission type and time of day (i.e., day or night).

The flowchart in Figure 2-3 gives the complete picture of the time delays when this third model is used.

No matter which of the three ways of modeling delay times is used, either communication fails and the mission aborts or communication is established and a delay time is added to the current time. Finally, if communication is established, another random number (uniform between 0 and 1) is drawn and compared to the probability of a successful (i.e., one containing the correct information) message (Test 9). If the random number is less than this probability, the mission proceeds to the next test; otherwise, the mission aborts because the message from the F.O. had bad data or was incorrectly interpreted.

2.2.10 Designator Bail-Out After Communication. After the communication from D.O. to FDC to firing battery is completed successfully, the D.O.-to-target distance is updated to account for target movement during the communication and processing delay. If the updated position brings the target within the "bailout" range of the D.O. (see 2.2.8) then the mission is aborted; otherwise, the mission continues with the next test.

2.2.11 Line-of-Sight Lost Prior to Firing. The next test is to determine whether the D.O. has lost LOS to the target. The current time (detection time plus communication and processing delay times) is compared to the duration of line-of-sight. If the current time is greater than the duration of line-of-sight, then the target has left the D.O.'s field of view prior to the firing of the first COPPERHEAD and the mission is aborted; otherwise, the mission is fired, the time of flight is added to the current time, and the next test is made.

2.2.12 Line-of-Sight Lost During Mission. The tests prior to this affected the entire mission; the sequence of tests after this point is performed separately for each round in the fire mission.

The current time (which is the time the first (next) COPPERHEAD round is to arrive) is compared to the duration of line-of-sight. If the current time is greater than the duration of line-of-sight, then the current round is aborted (ineffective); otherwise, the mission proceeds to the next test.

2.2.13 Designator Not Warned In Time.

At the time the first COPPERHEAD round is fired for a given mission, a message is sent to the D.O. by the FDC telling him to begin lasing the target. To determine whether the D.O. receives this message, a random number is drawn from a uniform (0 to 1) distribution and compared to the probability of D.O. warned to lase. If the random number is less than the probability, then the message gets through, the D.O. lases, and the next test is performed; otherwise, the message does not get through, the D.O. fails to lase, and the first round is wasted (aborted).

Even if the message warning the D.O. to lase does not get through for the first COPPERHEAD round, the model assumes that the D.O. would see the first round impact and hence know to begin lasing for the second and subsequent rounds; therefore, rounds after the first round are never lost because of D.O.'s failure to lase.

2.2.14 Designator in Direct Fire.

The next test determines whether the D.O. is unable to lase due to incoming direct fire. It is assumed that the target being lased for the COPPERHEAD fire mission has a laser alarm as well as capability that allows it to locate the D.O.'s position (when his laser is on) with sufficient accuracy to fire.

A random number is drawn from a uniform (0 to 1) distribution and compared to probability of kill and probability of suppression values (which are a function of D.O.-to-target range). If the random number is less than the probability of kill, then the D.O. is considered killed and the current round and all subsequent rounds for this replication are aborted. If the random number is greater than the probability of kill but less than the sum of the probability of kill plus the probability of suppression (obscuration due to direct fire), then only the current round is aborted as a result of this test (the test will be performed separately on subsequent rounds of this replication).

If the random number is greater than the probability of kill or suppression, then the mission continues to the next test with no effect from the direct fire.

2.2.15 Round Reliability Failure.

The round is next tested for inflight reliability. A random number is drawn from a uniform distribution (0 to 1) and compared to the round reliability. If the random number is less than the reliability, the round is reliable and the next test is made; otherwise, the round fails.

2.2.16 Target Obscured By Mini-Terrain.

The D.O.-to-target range is computed allowing for target movement up to the current model time (actually, the time the first (or next) COPPERHEAD round is to arrive). A distribution of target exposures (due to mini-terrain) at that range is then sampled to determine whether the target is fully exposed, hull defilade (turret exposed), or completely obscured. If the target is completely obscured, then the round aborts; otherwise, the next test is made.

2.2.17 Round Did Not Engage Target. The next test determines whether the COPPERHEAD round receives sufficient reflected laser energy to initiate maneuver to a target and has the target in its maneuver footprint.

To perform this test, a random number is drawn from a uniform (0 to 1) distribution and then compared to a probability of seeker engagement value which is a function of designator-to-target range, visibility range limit, cloud ceiling altitude, delay time, and number of vehicles in column as well as reflectivity of target, seeker sensitivity, target heading, target velocity, nominal COPPERHEAD system response time, gun-target-D.O. angle, designator type, and deflection biases (offsets). The probability of seeker engagement is the probability that both the seeker receives sufficient reflected laser energy to initiate tracking and the target is within the maneuver footprint of the COPPERHEAD round. If the random number is less than the probability of seeker engagement, then the next test is performed; otherwise, the round fails because its seeker cannot engage the target (or can engage but cannot maneuver to the target).

2.2.18 Round Engaged But Did Not Hit. A probability that the round hits the target given that it engages (i.e., passes the previous test) is obtained as a function of range, exposure (fully exposed or hull defilade), and designator type. A table of these probabilities is obtained as output from the LDWSS program and is intended to account for the possibility that the COPPERHEAD seeker tracks laser over-spill or under-spill rather than the target itself.

Again a uniform distribution (0 to 1) is randomly sampled. If the resulting random number is less than the probability that the round hits, then the round hits the target and we proceed to the next test; otherwise, the round misses and aborts.

2.2.19 Round Hit But Did Not Kill. The final test is to determine whether the round killed the target given that it hit the target. To perform this test, a random number is drawn from a uniform distribution (0 to 1) and compared to a probability of kill given a hit value which is a function of target type and target exposure (fully exposed or hull defilade). If the random number is less than the probability of kill, then the target is killed; otherwise, the target is not killed and the round aborts.

2.2.20 Subsequent Rounds. When a round (not a mission) aborts, subsequent tests in the sequence are not made. Instead, the time is advanced to the next round's arrival time (if there are more rounds left to be considered) and the sequence of tests resumes at the "LOS lost during mission" (section 2.2.12) test for the next round.

If a round does not abort, but instead successfully kills a target, then the time is advanced to the next round's arrival time (if applicable) and the sequence of tests resumes at the "LOS lost during mission" (section 2.2.12) test for the next round.

When no more rounds remain to be fired for a given replication, the replication is ended.

2.2.21 End of Replication. When either a mission (not a round) aborts or all the rounds for a replication have been fired, the replication is considered ended. If more replications remain to be made, the next replication begins with the first test, "Preparatory fires" (section 2.2.2) and proceeds through the sequence of tests as described. If all replications for the current case are done, then the results are printed out and the subsequent case (if any) is begun.

2.2.22 Random Occurrence LOS Model vs Shooting Gallery LOS Model. The step by step description given above of the various tests that must be passed for a successful COPPERHEAD fire mission applies to the "Shooting Gallery" or single continuous LOS segment model. This model assumes that the entire COPPERHEAD mission must be completed during the time interval from the first target vehicle's breaking terrain mask until the last target vehicle leaves that same LOS segment.

The alternate LOS model is called the "Random Occurrence" LOS model and assumes that after the first target vehicle breaks terrain mask, the target vehicles will go in and out of mask at random. The sequence of tests for the random occurrence method is the same as for the shooting gallery except that tests 4 and 11 (sections 2.2.5 and 2.2.11) are omitted and test 12 is modified.

Test 12 (section 2.2.12) is modified so that the probability that at least one target vehicle is visible is given by $Q = 1 - (1 - P)^N$ where P is the probability of a single vehicle being visible if randomly placed along an approach path at the current D.O.-to-target range and N is the number of vehicles left unkilled in the target. A random number is sampled from a uniform distribution (0 to 1) and compared to Q. If the random number is greater than Q, the round is aborted; otherwise, the mission continues with test 13.

2.2.23 Note on Nominal Response Time. The probability of engagement numbers are a function of the time after the D.O.'s call for fire that the rounds arrive. The time is played by establishing a nominal response time $\bar{t}_r$ (an average value for the distribution of total mission communication and processing times which is input and to which is added the time of flight appropriate for the given gun-to-target range.) The model assumes that the D.O. estimates the target's location at $\bar{t}_r$ seconds in the future and calls for fire against that point. The actual COPPERHEAD mission response time is sampled and added to the time of flight to obtain the actual arrival time of the round (t_a). If t_a is greater than $\bar{t}_r$, then the probability of engagement is lowered because of the larger aiming error and TLE.

This is explained in greater detail in the report on the PAM model. The report on modeling target location error (TLE) discusses the problem of estimating target location and the error in the estimate as a function of time (see bibliography).

The only point important to the user at this stage is that COPE uses two response times: a nominal response time $\bar{t}_r$ and an actual response time t_a. The nominal response time is used to estimate target's future location and hence to choose the point at which to aim. The actual response time is used to determine the probability of seeker engagement (PE). Naturally, if t_a is very large, the probability of the target being at the point estimated (based on $\bar{t}_r$) is quite small.

Also, it was assumed that if the firing battery saw that t_a was likely to be less than $\bar{t}_r$ on a particular occasion, it would hold up firing to cause $t_a = \bar{t}_r$ rather than drop early rounds far in front of the target. This assumes a good communication capability between D.O. and battery.

3. PERFORMANCE AND LIMITATIONS

3.1 Computer Related Performance and Limitations.

The COPE program (and its preprocessor programs) has been run primarily on the U.S. Army Ballistic Research Laboratory's Control Data Corporation CYBER 76 computer (CDC 7600). On that computer, a typical case with 10,000 replications and six rounds fired per successful COPPERHEAD mission requires 2.5 to 3.0 seconds per case. The computer memory requirement is about 24,000 words (57 K_8) of SCM and no LCM. The disk space required (which will vary with the size of the data base file) for TAPE 11 was about 155,000 words (456 K_8).

COPE has also been run on a CDC 6600 at Aberdeen Proving Ground and on a CDC 6400 and a CDC 6500 at FT. Leavenworth (using the remote terminal at FT. Sill). On these machines, the run time ranged from eight to sixteen times what it was on the CDC 7600. The memory requirements and disk space on the various CDC 6000 series computers were nearly the same as for the CDC 7600.

At the time of this writing, COPE has not been run on any non-CDC machines; however, chapter 13 of this manual considers some of the changes required to do so. Run time would, of course, vary from machine to machine (e.g., the author's experience with other FORTRAN programs suggests run time on the UNIVAC 1108 computer would be eight to ten times that on the CDC 7600).

Most current non-CDC computers use a word size of fewer than 60 bits (the CDC word size). This means that the program memory required to load the object program on most non-CDC machines will be somewhat larger in terms of number of words than for the CDC computers. Similarly, a slight increase in disk space may be required to put the data base file TAPE 11 on a smaller word machine.

3.2 Program Related Performance and Limitations.

The current version of COPE has been run several hundred times now with no errors detected other than those resulting from invalid input, insufficient run time requested, or insufficient print limit set.

The ability of the program to run multiple cases with relatively small streams of input directives has enabled the users to run hundreds of cases with relatively short set up time.

The main limitation encountered in running the program is the requirement that data selected to fill the eight data blocks be on the random access mass storage data base file created by the preprocessor

programs. Once these preprocessors are run, any case using data already on the data base file can be easily run. This subject is discussed in detail in chapter 5.

3.3 Model Related Performance and Limitations.

One of the main limitations of the COPE model is that much tactical detail is represented by distributions. For this reason, great care must be taken to interpret input distributions when reporting model results. The interpretation of results depends heavily on the conservatism and objectivity of the analyst.

The only attempt (and indeed the only opportunity) to verify the COPE model was by running it with case descriptors matching as closely as possible conditions present in the COPPERHEAD OT II. When this was done, the results predicted by COPE were compared to those obtained in OT II and found to be in quite close agreement. More precisely, the hypothesis that the probability of hit given a shot as obtained from COPE is equal to the true population probability of hit given a shot could not be rejected even with a significance level as high as 50 percent based on the sample of firings in OT II.

This good agreement of the model to test results should not lead to uncritical acceptance of all COPE results. For one thing, tests 1, 5, 6, and 14 were nulled out (that is, always passed). Also, since the OT II rounds were not live, the probability of kill values (test 19) in the model were set to one (so that kills and hits were considered equivalent).

There are some limitations to the COPE model that need to be explicitly pointed out:

3.3.1 Geometry of COPPERHEAD Fire Mission.
The geometry of the gun, D.O., and target positions is only approximated. For any given simulated COPPERHEAD mission, the gun-to-target range, designator-to-target point-of-unmask range, target heading, and nominal gun-target-designator angle are fixed while the target itself moves (i.e., its position is a function of time).

Figure 3-1 represents the geometry of a COPPERHEAD fire mission.

U is the point of target unmask.

R is the point at which round is to arrive on target (provided nominal response time is met).

D is the designator operator location.

G is the gun location.

3-2
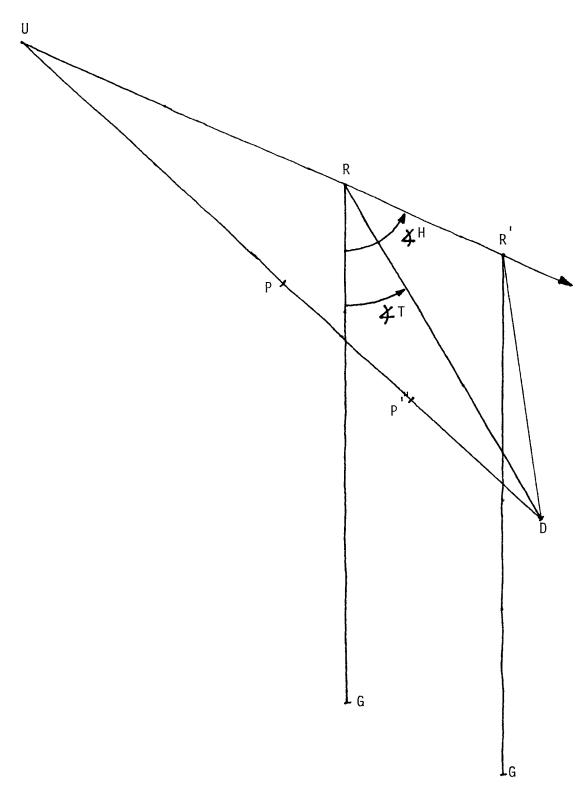
FIGURE 3-1 Geometry of COPPERHEAD Fire Mission

∢H is the target heading (angle between gun-target line and target path at time round arrives on target).

∢T is the angle between the gun-to-target line (GR) and the designator-to-target line ($\overline{DR}$).

UR is the target's path (target travels from U to R).

By the COPE case conditions chosen, ∢T, ∢H, the length of $\overline{GR}$, and the length of $\overline{UD}$ are constant (the first three are constant for a given case; the last, length of $\overline{UD}$, is constant for a given replication, but is sampled anew for each replication). Hence, if the response time is such that the target is at R' on one replication rather than at R (as on, say, a previous replication) when the round arrives, one must move G to G', and D to D' to preserve the fixed values of ∢T, ∢H, length of $\overline{GR}$ (now G'R').

The requirement that G move to G' is, of course, unrealistic since one does not move the battery to a new site just because nominal response time is not met.

A second compromise in the geometric representation of the COPPERHEAD mission is in calculating the designator-to-target range. Rather than compute the designator-to-target range $\overline{DR}$ (or $\overline{DR}'$ in the second case) in the correct manner, the COPE model approximates the designator-to-target range by the distance $\overline{PD}$. P is a point chosen on $\overline{UD}$ such that $\overline{UP} = \overline{UR}$ (or P' such that $\overline{UP}' = \overline{UR}'$ in the second case). This approximation is equivalent to the assumption that the target moves straight toward the designator.

One can see from the line segment lengths in Figure 3-1 that $\overline{PD}$ does not differ greatly from $\overline{RD}$ (in this case) whereas $\overline{P'D}$ does differ considerably from $\overline{R'D}$ in length. For typical range values and velocities used so far in COPE, these errors are considered minor. If one is to use greater target velocities or shorter acquisition ranges, then it would be worthwhile to improve this feature of COPE. (That is, incorporate the trigonometry required to correctly calculate $\overline{DR}$ (or $\overline{DR}'$) and use that value instead of $\overline{PD}$ (or $\overline{DP}'$).

Note: The designator operator-to-target distance is used not only at round arrival to calculate probability of engagement and probability of hit; but also throughout the simulation it is updated and used in checking bail-outs, direct fire suppression, line-of-sight probability for random occurrence, etc.

3.3.2 Target Modeling. The COPE model makes simplifying assumptions about the target. In particular, it assumes that the target is a column of vehicles moving at constant velocity with uniform spacing between successive vehicles. When a vehicle is killed, the length of the column is not reduced in length nor is any attempt made to keep a record of the position that the killed vehicle occupied in the column.

These limitations were not deemed serious in the COPE runs for the COPPERHEAD COEA; however, for the SADARM variant of COPE (called SOPE) the model was modified to keep track of individual vehicle status and to handle more general target layouts. (These modifications were essential to SADARM where there is no designator operator to pick out live targets instead of dead ones, and where the volley attacks an area instead of a point as with a single COPPERHEAD round).

3.3.3 Direct Fire Effects Independent.

The model of direct fire effects of the target against the D.O. (see section 2.2.14) is over-simplified. The model has a single probability of kill (or obscuration) by direct fire for each target-to-D.O. range and this probability (corrected for then current range) is then applied during each COPPERHEAD round's firing to determine whether the D.O. is killed (or obscured) and thus prevented from lasing.

The shortcomings of this model are (1) subsequent rounds fired by the target at the D.O. should be more accurate both due to adjustment (assuming both that the D.O. survived previous rounds fired by the target and that the target survived previous COPPERHEAD's) by the target after seeing its first round impact and due to the D.O.'s giving away his position more times by the additional lasings, and (2) adjacent vehicles in the target unit, after seeing the lasings for the first few rounds, might join in firing at the D.O. on the latter rounds. Both effects (1) and (2) are omitted in COPE's model of direct fire against the D.O..

3.3.4 Only Initial Acquisitions (Unmaskings) Played.

The COPE model only plays the first unmasking of each target unit. A more realistic assessment of COPPERHEAD's contribution would be obtained if the target unit were acquired (or, at least, unmasked to provide a potential acquisition) several times as it closes toward the BLUE position. This would require keeping track of the damage done to the RED target unit as the result of previous unmaskings (and the resulting COPPERHEAD fire missions) so as not to take credit for killing vehicles many times over. It would be a fairly straight forward task to modify the COPE program to allow for multiple acquisitions (and firing) of each target unit. The reason this was not done in the original COPE model is simply that all of the acquisition data (range to unmask and line-of-sight segment lengths) available to the model's creators were for first acquisition only.

3.3.5 Other Limitations.

Other limitations to COPE are chiefly due to either inadequate data or to the desire to keep the model and program simple. These limitations include:

(a) Availability of artillery to fire the COPPERHEAD mission is not considered.

(b) The impact of the attrition of a D.O. or an F.O. (forward observer) on the ability of the direct support artillery to perform its mission is not considered. That is, how much of the lost D.O. capability could be

picked up by neighboring D.O.'s, other Fire Support Team (FIST) members, or platoon F.O.'s?

(c) The permanent loss of communications is not played. This could be partially simulated by reducing the probability of a successful transmission, although that value was intended to represent only degradation due to high communication traffic load and electronic warfare.

CHAPTER 4

4. INPUT DIRECTIVES AND "DATA" STATEMENTS

4.1 Input.

Considerable effort has gone into making the COPE input versatile enough to allow for the running of nearly any combination of input parameters while at the same time requiring a minimum of input changes to switch from one case to another. The stacking of multiple cases for a single run can be easily accomplished with relatively few input cards.

The existence of "default" (baseline case) values built into the program allows the program to be run with only the input cards (or card images) required to change those variables which it is desired to set at other than the default values. If further cases are desired one can continue with additional input changes applied to either the previous case or the baseline case.

The program also allows the insertion of up to three types of user comments which may appear in the output.

Finally, in the event that one wishes to use data not in the "data base" file, a "temporary" option using traditional formatted data is available.

4.2 Data Organization.

For each case that is run, there are numerous parameters whose values are set to provide the mathematical description of that case. These parameters are grouped into eight major blocks, six condition keys, and twenty odd individually selected numerically valued variables.

For the most part, a single input card is used to select each block, key, or variable value. There are some exceptions and some dependencies between choices which are explained below (section 4.8).

Finally, there are numerous data items whose values are set in the Block Data (BDATA1) subprogram because they are relatively fixed from case to case. Obviously, if one chose to vary these items frequently, they could be made into input rather than set via data statements. These items are defined below (section 4.7)

4.3 Keyword Input: General Description.

Each input to select a case description (except when the "temporary" option is used) as well as various inputs to control program options is of the form:

$$\underline{\text{keyword, option word 1, option word 2, , option word n}}$$

where $0 \leq n \leq 9$. Each such input must be contained on one card (or card image); no continuation to another card is allowed.

The keyword is an alphanumeric character string indicating which case descriptor is to be set by the card.

The option words are either alphanumeric character strings that indicates which option is chosen from a pre-defined set or numerical values that are to be used for certain variables.

Option words are order dependent (i.e., $\underline{\text{keyword, x, y}}$ is not equivalent to $\underline{\text{keyword, y, x}}$). If an option word is omitted, a default value is set by the program. If a keyword takes two or more option-words and an option word other than the last one is omitted, then the proper number of separators (commas, for example) must be used to position the later optionwords (e.g.,

$$\underline{\text{keyword, default value for option word 1, option word 2}}$$

is equivalent to

$$\underline{\text{keyword, , option word 2}}$$

but not equivalent to

$$\underline{\text{keyword, option word 2 }}).$$

In most cases, blanks may be freely inserted within keywords or option words to improve readability. (The only exception is covered in the note of section 4.5.3.).

4.4 Keyword Input: Specifics.

Now each keyword is shown with the option words allowed. Note that new option words may be introduced by running the PREPMS pre-processor program to modify the data base file (section 5.3.8 and chapter 14).

4.4.1 FIRST CASE.

(a) general form: <u>FIRST CASE</u>

(b) This card is used only as the first non-comment card in an input deck. If it is omitted, the program will generate a message upon encountering the first non-comment card in the input and then proceed as though the FIRST CASE card were present.

4.4.2 NEXT CASE.

(a) general form: NEXT CASE, option word 1

(b) Currently allowed character strings for option word 1
    are:

    (1) RESET DEFAULTS   or   RD

    (2) DON'T RESET   or   DR.

(c) This card is the first non-comment card of each case
    other than the first case.

If the option word is RESET DEFAULTS, RD, or omitted,
then the values for all case description parameters are reset to their
default values and will differ from the baseline values only as determined
by the remaining input cards for the current case.

If the option word is DON'T RESET or DR, then the values of the
case description parameters remain at their values for the previous case
except for those values changed by the remaining input cards for the current
case.

If the NEXT CASE card is omitted, the program will generate a
message and proceed as though a NEXT CASE, DR card had been encountered.

Note: The PLOT and CONTROL cards (sections 4.4.5 and 4.4.6) are
not controlled by the option on the NEXT CASE card.

4.4.3 END.

(a) general form: END

(b) This card belongs at the end of the input for each case
    other than the final case.

If it is omitted, an error will usually result because the program
will continue reading cards that are really part of the next case's input
until it either hits an END card, ENDF card, or the end of the input file.
This means that the case will run using its own input together with input
from subsequent case (or cases). The user can detect this problem from
the fact that the case descriptors will probably be incorrect (i.e.,
other than the intended values) in the case heading print-out, there may
be unexpected messages stating that certain input cards have superseded
others, and finally, the number of cases in the run will be wrong.

4.4.4 ENDF.

(a) general form: ENDF or END OF FINAL CASE.

(b) This card should be the final card of the final case.

If it is omitted, the program will generate a message on reaching the end of input and then proceed as though an ENDF had been encountered.

If an END card is used instead, there will be no change in the result but the program will waste a few nano-seconds before realizing that there is no more input.

If an ENDF is used prior to the end of the last case, any cards following the ENDF card will be ignored.

4.4.5 PLOT.

(a) general form: PLOT, option word 1, option word 2

(b) Allowed character strings for option word 1 are:

(1) PRINTER

(2) CALCOMP.

Allowed character strings for option word 2 are:

(1) OFF

(2) ON.

(c) This keyword was designed to handle graphic output (bar charts) , but has not been implemented in the current version of the program.

The cards PLOT, PRINTER, ON and PLOT, CALCOMP, ON would cause results to be displayed on bar graphs produced by the line printer and Cal-Comp plotter respectively. At the present time, however, these cards will only cause the program to generate a message saying that no plot was produced.

The cards PLOT, PRINTER, OFF and PLOT, CALCOMP, OFF turn off the production of the bar graphs produced by the line printer and Cal-Comp plotter respectively.

The default for option word 1 is PRINTER; the default for option-word 2 is OFF. So no bar graphs (or, at the present time, "no plot" messages) are produced unless positive action is taken by the user.

Note, that if and when this feature is implemented, the two types of graphs may be selected independently of each other.

A PLOT option once selected remains in effect until a further PLOT card is encountered changing the option (that is, ON to OFF or OFF to ON). It is not affected by a NEXT CASE, RD card.

4.4.6 CONTROL.

(a) general form: CONTROL, option word 1, option word 2

(b) Allowable choices for option word 1 are:

    (1) ECHO

Allowable choices for option word 2 are:

    (1) SHORT

    (2) LONG.

(c) This keyword is designed to control miscellaneous program features. At the present time, the only choice (and the default) for option word 1 is ECHO. If option word 2 is SHORT or omitted, then the short form of the input echoing is used; if option word 2 is LONG, the long form of the input echoing is used (see section 7.6 for input echoing).

The default (which occurs if the card is omitted) is the short form.

A CONTROL option once selected remains in effect until a further CONTROL card is encountered changing the option (that is, LONG to SHORT or SHORT to LONG). It is not affected by a NEXT CASE, RD card.

4.4.7 LINE OF SIGHT MODE.

(a) general form: LINE OF SIGHT MODE, option word 1 or LOS MODE, option word 1

(b) Allowable choices for option word 1:

    (1) SHOOTING GALLERY or SG

    (2) RANDOM OCCURRENCE or RO.

(c) The choice of SHOOTING GALLERY or SG for option word 1 causes the current case to be run using the "shooting gallery" line of sight model. If option word 1 is RANDOM OCCURRENCE or RO, then the "random occurrence" line of sight model is used.

The default is the "shooting gallery" model.

4.4.8 MISSION CODE

(a) general form: MISSION CODE, option word 1 or
     MSNCODE, option word 1

(b) Allowable character strings for option word 1 are:

    (1) PRIORITY PREPLANNED TARGET or PPPT

    (2) PREPLANNED TARGET or PPT

    (3) TARGET OF OPPORTUNITY or TOO.

(c) If option word 1 is PRIORITY PREPLANNED TARGET, PPPT,
     or omitted, then the mission is considered priority pre-
     planned; if option word 2 is PREPLANNED TARGET or PPT,
     then the mission is considered preplanned; and, if option
     word 2 is TARGET OF OPPORTUNITY or TOO, then the mission
     is considered a target of opportunity.

The mission type affects the response time parameters used (see
section 4.4.15) and the modeling of range from unmask to centroid (RUMC,
section 4.4.18). See section 4.8 for side effects of mission code choice.

4.4.9 NUMBER OF DIFFERENT TARGET POSTURES.

(a) general form: NUMBER OF DIFFERENT TARGET POSTURES,
     option word 1 or NUMDIFTGTP, option word 1

(b) Allowable character strings for option word 1 are:

    (1) THREE or 3

    (2) TWO or 2.

(c) If option word 1 is THREE, 3, or omitted, the target
     exposure (mini-terrain) model plays three exposures or pos-
     tures (fully exposed, hull defilade, and completely obscured).

If option word 1 is TWO or 2, the target exposure model plays
two exposures (fully exposed and hull defilade) with the completely obscured
divided between the other two postures in proportion to their relative
fractions.

The default option word 1 is THREE.

4.4.10 TARGET TYPE.

(a) general form: TARGET TYPE, option word 1

(b) Allowable character strings for option word 1 are:

(1) <u>1</u>

(2) <u>2</u>

(3) <u>3</u>

(4) <u>4</u>

(5) <u>5</u>

(6) <u>6</u>

(7) <u>7</u>

(c) If option word 1 is i, then the vulnerability values
     (probability of kill given a hit as a function of target
     exposure) for target type i are used.

The default target type is 1.

4.4.11 DESIGNATOR TYPE.

(a) general form: <u>DESIGNATOR TYPE, option word 1</u> or
     <u>DESIGTYPE, option word 1</u>

(b) Allowable choices for option word 1 are:

(1) <u>GLLD</u> or <u>G</u>

(2) <u>MULE</u> or <u>M</u>

(3) <u>LTD</u> or <u>L</u>

(c) If option word 1 is <u>GLLD</u>, <u>G</u>, or omitted, the desig-
     nator type is the GLLD; if option word 1 is <u>MULE</u> or <u>M</u>, the
     designator type is the MULE; and, if option word 1 is <u>LTD</u> or
     <u>L</u>, the designator type is the LTD.

The default designator type is GLLD.

See section 4.8 for side effects of Designator Type Choice.

4.4.12 DO POSITION.

(a) general form: <u>DO POSITION, option word 1</u>

(b) Allowable choices for option word 1 are:

(1) <u>VANTAGE POINT</u> or <u>VP</u>

(2) <u>MANEUVER UNIT</u> or <u>MU</u>.

(c) If option word 1 is VANTAGE POINT, VP, or omitted, then the target posture table gives break down into target exposure as seen from a vantage point.

If option word 1 is MANEUVER UNIT or MU, then a target posture table is used which gives the breakdown into target exposures as seen from a position down with the maneuver units.

The default for DO POSITION is VP.

4.4.13 WEATHER.

(a) general form: WEATHER, option word 1, option word 2 or W, option word 1, option word 2

(b) Allowable choices for option word 1 are:

   (1) JUNE or J

   (2) DECEMBER or D

   (3) MARCH or M

   (4) SEPTEMBER or S

Allowable choices for option word 2 are:

   (1) 1400 or 14

   (2) 0600 or 06

   (3) 2200 or 22.

(c) The weather data used in COPE is grouped into sets of data; each set corresponding to a certain month and time-of-day combination.

The choice for option word 1 determines the month whose weather data are to be used for the current case.

The choice for option word 2 determines the time-of-day whose weather data are to be used for the current case.

The defaults are JUNE or J for option word 1 and 1400 or 14 for option word 2.

See section 4.8 for side effects of weather choice.

4.4.14 ACQUISITION RANGE DISTRIBUTION.

(a) general form: ACQUISITION RANGE DISTRIBUTION, option word 1 or ACQRNGDIST, option word 1

(b) Allowable choices for optionword 1 are:

    (1) AVERAGE or A

    (2) CLOSE or C

    (3) OPEN or O.

(c) If option word 1 is AVERAGE, A, or omitted, then the acquisition range and line-of-sight segment length distributions used are those for TETAM "average" terrain. If option word 1 is CLOSE or C, then distributions for TETAM "close" terrain are used. If option word 1 is OPEN or O, then distributions for TETAM "open" terrain are used.

The default is to use TETAM "average" terrain.

See section 4.8 for side effects of acquisition data choice.

4.4.15 RESPONSE TIME.

(a) general form: RESPONSE TIME, option word 1, option word 2, option word 3, or RESPTIME, option word 1, option word 2, or option word 3

(b) Allowable choices for option word 1 are:

    (1) FTSILL or FS

    (2) STAUCH or S

    (3) SCUNGIO

    (4) PARAM

Allowable choices for option word 2 are:

    (1) DIGITAL or D

    (2) VOICE or V

    (3) a positive numerical value (which represents response time in seconds).

Allowable choices for option word 3 are:

    (1) DAY or D

    (2) NIGHT or N.

(c) If option word 1 is FT SILL, FS, or omitted, then the
     response time distribution supplied by USAFAS at FT Sill is
     used. This plays the first way of modeling delay time as
     described in Section 2.2.9.

     If option word 1 is STAUCH or S, the response time numbers are
obtained from the BCS DT II for some processes and TACFIRE tests for others.
These data were supplied by Ed Stauch of AMSAA and use the third way of
modeling delay time as described in Section 2.2.9.

     If option word 1 is SCUNGIO, then the response time distribution
used is a hypothetical distribution created by Richard Scungio of AMSAA to
test the sensitivity of COPPERHEAD performance to longer response time.
In this case the third modeling of response time (see Section 2.2.9) is
used.

     If option word 1 is PARAM, then the second way of modeling response
time delay (see Section 2.2.9) is employed (so-called "parameterized"
response time). In this case, the response time is a constant equal to
the positive numerical value used as option word 2.

     If option word 2 is DIGITAL, D, or omitted, then digital communication
is used (with voice back-up when using the third way of modeling in Section
2.2.9).

     If option word 2 is VOICE or V, then voice communication is used
(this will have an affect only when used with the third way of modeling in
Section 2.2.9)

     If option word 2 is a positive numerical value, then this value
is used as the "parameterized" response time. This can only be used with
the PARAM choice for option word 1. A zero or blank option word 2 value
used with PARAM as option word 1 will cause the program to stop (see section
7.5.18).

     (Note: If one really wishes to run a zero parameterized response
time value, a value of .001 could be used. The difference between these
results and those obtained with a true zero response time would be far
below the noise in the model).

     If option word 3 is DAY, D, or omitted, day time response times
are used. If option word 3 is NIGHT or N then nighttime response times are
used. In addition, the choice of day or night influences the target velocity
and maximum designator range (see Sections 4.4.21 and 4.4.22).

     The defaults are: for option word 1, FTSILL; for option word 2,
DIGITAL; for option word 3, DAY.

     See section 4.8 for side effects of response time data choice.

4.4.16 DIRECT FIRE SUPPRESSION.

(a) general form: DIRECT FIRE SUPPRESSION, option word 1
    or DFIRESUPPR, option word 1

(b) Allowable choices for option word 1 are:

    (1) HIGH or H

    (2) NONE or N

(c) If option word 1 is HIGH, H or omitted, then the direct fire
    suppression (obscuration from direct fire) and kill table
    used is for a high level of D.O. suppression and kill (corre-
    sponding to tank fire at the D.O.)

    If option word 2 is NONE or N, then there is no effect of direct
fire on the D.O..

    The default is HIGH.

4.4.17 INVARIANT.

(a) general form: INVARIANT, option word 1

(b) Allowable choices for option word 1:

(c) The only currently allowed choice for invariant data is
     the default. Provision for other choices is built into the
     program for possible future use and may be activated by ap-
     propriate preprocessor run(s).

4.4.18 RUMC.

(a) general form: RUMC, option word 1

(b) Allowable choices for option word 1 are:

     (1) NO or N

     (2) a numerical value.

(c) The RUMC (which stands for range from unmask to centroid)
     value is the distance from the point at which the target
     breaks terrain mask to the centroid of the COPPERHEAD
     footprint.

If option word 1 is NO, N or omitted, then RUMC is assumed to vary with each replication in such a way that the centroid of the footprint is set at the predicted target (first vehicle) location for first round arrival. This predicted location is based on the nominal (estimated) response time (including time-of-flight) and the target velocity.

If option word 1 is a numerical value, then RUMC remains at that value for each replication.

The RUMC keyword has an effect only when the MISSION CODE is PPPT or PPT (see Section 4.4.8). If the MISSION CODE is TOO, then the program behaves as though option word 1 were NO regardless of what may be input on a RUMC card.

The default for RUMC is NO.

4.4.19 SMOKE.

(a) general form: SMOKE, option word 1, option word 2, option word 3

(b) Allowable choices for option word 1:

   (1) SMOKE ROUNDS FIRED or SMKRNDS

   (2) PROBABILITY SMOKE KILLS MISSION or PRBSMOKE.

Allowable choices for option word 2:

   (1) a numerical value

Allowable choices for option word 3:

   (1) a numerical value.

(c) If option word 1 is SMOKE ROUNDS FIRED, SMKRNDS, or omitted, then option words 2 and 3 respectively give the numbers of type 1 smoke rounds fired and type 2 smoke rounds fired.

If option word 1 is PROBABILITY SMOKE KILLS MISSION or PRBSMOKE, then option word 2 gives the probability that smoke kills the potential COPPERHEAD fire mission.

The default for option word 1 is SMKRNDS. The default for option word 2 is 484 when option word 1 is SMOKE ROUNDS FIRED or SMKRNDS, but it is .40 when option word 1 is PROBABILITY SMOKE KILLS MISSION or PRBSMOKE.

The default for option word 3 is 846 when option word 1 is SMOKE ROUNDS FIRED or SMKRNDS; it is unused otherwise.

4-12

Note: When the first alternative for SMOKE option word 1 is chosen, the probability that smoke aborts the potential COPPERHEAD mission is calculated as a function of the number of smoke rounds of each type fired and the weather conditions.

When the second alternative is used, the value input for option word 2 (a probability between 0 and 1) is used as the probability that smoke aborts the potential COPPERHEAD mission. (See section 2.2.6)

4.4.20 DO ARTILLERY PK.

(a) general form: DO ARTILLERY PK, option word 1 or DOARPK, option word 1

(b) Option word 1 must be either a numerical value between 0 and 1 or omitted.

(c) The numerical value input for option word 1 is used as the probability that the D.O. is killed by RED preparatory artillery fire.

The default value is .01.

4.4.21 TARGET VELOCITY.

(a) general form: TARGET VELOCITY, option word 1 or TGTVEL, option word 1

(b) Option word 1 is a positive number which gives the target velocity in meters per second. (The program is currently set up to accept only 2, 3, 5, 8, or 9 as allowed velocity).

(c) The value of option word 1 is used as the target velocity.

The default target velocity is obtained from a table (part of the acquisition range data block) giving target velocities as a function of day or night, weather, and terrain type.

Note: For side effects of velocity choice, see section 4.8.

4.4.22 MAXIMUM DESIGNATOR RANGE.

(a) general form: MAXIMUM DESIGNATOR RANGE, option word 1 or MAXDESRNG, option word 1

(b) Option word 1 is a positive number giving the maximum designator range in meters. This is the designator range mentioned in section 2.2.4.

The default maximum designator range is obtained from a table giving ranges as a function of designator type and day or night.

Note: For side effects of designator range value, see section 4.8.

4.4.23 BAIL OUT RANGE.

(a) general form: BAIL OUT RANGE, option word 1 or BAILOUTRNG, option word 1

(b) Option word 1 is a positive number giving the bail-out range in meters (see section 2.2.8 and 2.2.10). The default bail-out range is 1000m.

4.4.24 TIME OF FLIGHT.

(a) general form: TIME OF FLIGHT, option word 1 or TOF, option word 1

(b) Option word 1 is a positive number giving the time of flight of the COPPERHEAD round in seconds.

The default value for time of flight is obtained from a table giving times of flight as a function of gun-to-target range.

Note: For side effects of time of flight value, see section 4.8.

4.4.25 ANGLE T.

(a) general form: ANGLE T, option word 1

(b) Option word 1 is a number giving the angle (in degrees) between the gun-to-target line and the designator-to-target line. The default value is 25 degrees.

Note: For side effects of angle T value, see section 4.8.

4.4.26 DUST.

(a) general form: DUST, option word 1

(b) Option word 1 is a number from 0 to 1 whose value is the probability that dust kills the potential COPPERHEAD mission.

The default value is .37.

4.4.27 PROBABILITY OF SUCCESSFUL VOICE TRANSMISSION.

(a) general form: PROBABILITY OF SUCCESSFUL VOICE TRANS-MISSION, option word 1 or PRBVOCTRAN, option word 1

(b) Option word 1 is a number from 0 to 1 whose value is the probability that voice communication is established between the D.O. and the battery FDC.

The default value is .975.

4.4.28 PROBABILITY OF SUCCESSFUL DIGITAL TRANSMISSION.

(a) general form: PROBABILITY OF SUCCESSFUL DIGITAL TRANS-
MISSION, option word 1 or PRBDGTTRAN, option word 1

(b) Option word 1 is a number from 0 to 1 whose value is the
probability that digital communication is established be-
tween the D.O. and the battery FDC.

The default value is .915.

4.4.29 ROUND IN FLIGHT RELIABILITY.

(a) general form: ROUND IN FLIGHT RELIABILITY, option word
1 or RNDFLTREL, option word 1

(b) Option word 1 is a number between 0 and 1 whose value is
the probability that the round is reliable (functions
properly).

 The default value is .96.

4.4.30 TIME BETWEEN ROUNDS.

(a) general form: TIME BETWEEN ROUNDS, option word 1 or
TBR, option word 1

(b) Option word 1 is a number whose value is the time (in
seconds) between the firing of successive COPPERHEAD rounds.

The default value is 20 seconds.

4.4.31 NUMBER OF REPLICATIONS.

(a) general form: NUMBER OF REPLICATIONS, option word 1 or
NUMREP, option word 1

(b) Option word 1 is the number of replications (i.e., Monte
Carlo sample size of potential COPPERHEAD fire missions) to be
used for the current case.

4.4.32 NUMBER OF ROUNDS TO BE FIRED.

(a) general form: NUMBER OF ROUNDS TO BE FIRED, option
word 1 or NUMRNDS, option word 1

(b) Option word 1 is the number of rounds to be fired on each potential COPPERHEAD fire mission of this case that reaches the point where firing occurs (i.e., a "shot" event). Since each round is fired and completes its flight (successfully or not) before the next round arrives, one may choose to think of the number of rounds to be fired as the number of one round volleys to be fired.

The default value is 6 rounds.

4.4.33 NUMBER OF VEHICLES PER TARGET.

(a) general form: NUMBER OF VEHICLES PER TARGET, option word 1 or NUMVEHTGT, option word 1

(b) Option word 1 is the number of vehicles in the target column.

The default value is 10 vehicles.

4.4.34 DISTANCE BETWEEN VEHICLES.

(a) general form: DISTANCE BETWEEN VEHICLES, option word 1 or DISTBVEH, option word 1

(b) Option word 1 is the mean distance (in meters) between adjacent vehicles in the target column.

The default value is 61 meters.

4.4.35 GUN TARGET RANGE.

(a) general form: GUN TARGET RANGE, option word 1 or GTRNG, option word 1

(b) Option word 1 is the gun-to-target range in kilometers.

The default value is 8 kilometers.

Note: For the side effects of gun-to-target range, see section 4.8.

4.4.36 REFLECTIVITY.

(a) general form: REFLECTIVITY, option word 1 or REFLECT, option word 1

(b) Option word 1 is a number between 0 and 1 whose value is the reflectivity of the target to laser energy (i.e., it is the fraction of the laser energy at the designator's frequency that is reflected by the target).

The default value is .10.

Note: The side effects of reflectivity are discussed in section 4.8.

4.4.37 DEFLECTION BIAS.

(a) general form: DEFLECTION BIAS, option word 1 or DEFB, option word 1

(b) Option word 1 is the value in meters of the deflection bias which is to be defined as the minimum distance from the target column's path (a line) to the footprint centroid (a point).

The default value is 0.

Note: The side effects of deflection bias are discussed in section 4.8.

4.4.38 TARGET HEADING.

(a) general form: TARGET HEADING, option word 1 or TGTHDG, option word 1

(b) Option word 1 is a number whose value is the angle (in degrees) between the target's line of travel and the target-to-gun line.

The default value is 0.

Note: The side effects of target heading are discussed in section 4.8.

4.4.39 SEEKER SENSITIVITY.

(a) general form: SEEKER SENSITIVITY, option word 1 or SEEKSENS, option word 1

(b) Option word 1 is a number whose value is the minimum amount (threshold value) of energy per area (in joules per square meter) that must reach the COPPERHEAD seeker in order to initiate maneuver.

The default value is 60 joules/m^2. (The true value is not used as the default to avoid any possible classification problem.)

Note: The side effects of the seeker sensitivity value are discussed in section 4.8.

4.4.40 PROBABILITY OF A CORRECT MESSAGE.

(a) general form: PROBABILITY OF A CORRECT MESSAGE, option
     word 1 or PROBCORMSG, option word 1

(b) Option word 1 is a number whose value is the probability
     that the D.O. sends correct information to the FDC and the
     FDC interprets it correctly.

The default value is .975.

4.4.41 PROBABILITY DO WARNED TO LASE.

(a) general form: PROBABILITY DO WARNED TO LASE, option word
     1 or PROBDOWARN, option word 1

(b) Option word 1 is a number whose value is the probability that
     the message warning the D.O. to begin lasing for the first
     COPPERHEAD round is transmitted and received successfully.

The default value is .975.

4.5 Special keywords: OVERRIDE, TEMPORARY, RESET.

4.5.1 Correspondence of Data Blocks to Keywords. As mentioned
previously, a large part of the data used in each case is grouped into
eight blocks. Each of these blocks is normally filled by reading a record
from a word addressible mass storage file that is created by the PREPMS
and PAM programs. The choice of which particular record to read from
the file to fill each data block depends on the various keywords and option
words for the case.

This correspondence of data blocks to keywords can be summarized
as follows:

Record to be read for data block of this type	Depends on options for this (these) keywords
(1) Weather	WEATHER
(2) Acquisition range data	ACQRNGDIST
(3) Response time data	RESPTIME
(4) Direct fire suppression data	DFIRESUPPR
(5) Random occurrence data	ACQRNGDIST and TGTVEL
(6) Probability of engagement data	RESPTIME, MSNCODE, DESIGTYPE, TGTVEL, GTRNG, REFLECT, ANGLE T, DEFLB, TGTHDG, SEEKSENS

(7) Target posture distribution   FO POSITION

(8) Invariant data   INVARIANT

As can be seen, there is but one keyword influencing the choice of record to be read for each data block except in the cases of random occurrence data and probability of engagement data.

4.5.2 OVERRIDE and TEMPORARY Features. Two additional methods of filling in a data block are provided. The first is to choose a record from the word addressible mass storage file to be read into the data block without regard to the options chosen for the keyword(s) that would normally determine the record choice; this is the OVERRIDE feature. The second is to actually supply alternative data as traditional formatted FORTRAN inputs to be read into the data block; this is the TEMPORARY feature.

The OVERRIDE option is provided primarily so that one can choose to use probability of engagement (PE) data that has been generated with one set of conditions under other, not too different, conditions without having to re-run the PAM program. For example, PE data for a case with nominal response time, 130 sec. could be used to run a case identical (in those factors affecting PE) except for a nominal response time of 150 sec. The advantage of this procedure is that one can avoid re-running the relatively expensive PAM program in those cases where the factors affecting PE have changed very little. The disadvantage, of course, is that there are no efficient objective criteria available to determine whether the errors introduced by using wrong (but, it is hoped, approximate) PE data are significant in a given situation.

The TEMPORARY option is provided so that one can directly load data into any data block without having to use the PREPMS preprocessor program. This option allows one to use data for a given run without running the PREPMS program to make that data a "permanent" record in the data base file. This option was provided for flexibility, but was not exercised at all in the original COPPERHEAD Operational Performance Evaluation done for the COEA.

4.5.3 Using the OVERRIDE.

(a) general form: OVERRIDE , keyword, option word 1 or
OVERIDE, keyword, option word 1

(b) Choices for keyword are:

(1) WEATHER or W

(2) ACQUISITION RANGE DISTRIBUTION or ACQRNGDIST

(3) RESPONSE TIME or RESPTIME

(4) DIRECT FIRE SUPPRESSION or DFIRESUPPR

(5) RANDOM OCCURRENCE DISTRIBUTION or RODIST

(6) PEDATA

(7) TARGET POSTURE DISTRIBUTION or TGTPSTDIST

(8) INVARIANT

Option word 1 is the name of any record (on the random access mass storage data base file) containing data for the data block type specified by the keyword choice.

(c) The OVERRIDE causes the selected data block (or blocks, if more than one OVERRIDE card is used in a case) to be filled with data from the record whose name is option word 1.

There is no default for OVERRIDE. An error will result from the omitting of either the keyword or option word 1.

Note: If the record name includes one or more blanks or separators then the record name must be preceded by a "$" (dollar sign). The ten characters forming the record name must immediately follow the dollar sign, any blanks in the name must be included in their proper positions, and no excess blanks may be inserted. For present purposes, separators include commas, slashes, question marks, and parentheses.

4.5.4 Using TEMPORARY.

(a) general form: TEMPORARY, keyword or TEMP, keyword

(b) Choices for keyword are as in section 4.5.3.

(c) The use of the TEMPORARY option will cause the program to begin reading data in FORTRAN formatted fashion. Hence, each use of the TEMPORARY option must be immediately followed by the formatted data cards to be read to fill the data block selected by the keyword.

The formats to be used and the data to be supplied for each block are identical to those used by the PREPMS program for the corresponding block (see section 14.4.2).

Note: If the keyword is PEDATA, then one has the further option of reading the formatted cards from a separate file (TAPE 4). To use this option, a card: USE TAPE 4 must be the next card after the TEMPORARY, PEDATA card; then the formatted data should be on a file to be read by I/O unit 4.

There is no default for TEMPORARY.

4.5.5 RESET.

(a) general form: RESET, keyword

(b) Allowable keywords are as in section 4.5.3.

(c) This card will reset the default conditions for the keyword chosen. Its use is mainly to undo an OVERRIDE or a TEMPORARY without having to use NEXT CASE, RD which might reset other defaults not desired.

Note: The effect of an OVERRIDE or TEMPORARY used on PEDATA or RANDOM OCCURRENCE DISTRIBUTION (RODIST) can be undone only by a RESET, a NEXT CASE, RD, or another OVERRIDE or TEMPORARY for the same data block.

The effect of an OVERRIDE or TEMPORARY for any other data block can also be undone by a card of the usual form for that data block's keyword (i.e., keyword, option word 1, option word 2, -----).

· There is no default on the RESET card.

4.6 Comments.

4.6.1 General Remarks on Comments. The program allows three types of user comment cards to be included in the input. In addition, the program itself generates some comments under certain conditions. The program generated comments are detailed in sections 7.1 and 7.2.

User comments in the input card deck (or card image file) are identified by having "$" (dollar sign) in the first one, two, or three columns of the card.

4.6.2 $ Comments. Cards having a "$" in column 1 but not in column 2 are user comment cards which are totally ignored by the program. When one is read, the program merely goes to the next input card and reads that.

This type of comment is provided only so that the user can leave reminders, separate sections of input, or otherwise label inputs without having an effect on program printouts.

4.6.3 $$ Comments. Cards having "$" in columns 1 and 2 but not in column 3 are user comment cards which are reproduced within the current case's printout only.

The comment (contents of the card) will be reproduced (less the first two columns) with the symbols "** USER **" preceding it in the comment section of the case's printout. (See sample case, Appendix D .)

These comments should be used to note any special details about a case.

4.6.4 $$$ Comments. Cards having "$" in columns 1, 2, and 3 are user comments that are printed out immediately upon being encountered by the program. Again the symbols "** USER **" are appended to the front of the comment and the $'s in columns 1-3 are removed.

These comments are printed on a special page separate from any case's printout. It was originally intended that "$$$" comments be put at the beginning of the input before the FIRST CASE card; however, wherever they are put a special page will be printed containing them, and this page will occur in the printout immediately after the previous case's printout; or, (if there has been no case run yet) immediately after the title page.

4.7 DATA Statement Data.

There are many data which are set in data statements rather than read in from cards or disk file with each run or case.

As a general rule, these data are either labels (alphanumeric data) or numbers that do not change from run to run.

All of these data statements have been collected into the BLOCK DATA subprogram BDATA1. They are now described common block by common block:

4.7.1 ABRLBL. This common block contains the abort labels (i.e., alphanumeric texts) that identify the abort causes on the printouts. They reside in the IDABRT array and are entered as Hollerith constants.

4.7.2 ACHAR. This common block consists of the CHAR array which contains the keywords used to input COPE case descriptors. Each keyword is entered as a string of Hollerith constants. In addition, corresponding to each keyword character string are two numbers, the first of which is the keyword number and the second of which is the number of distinct option word character strings allowed with that keyword. (Note: The second number as entered in the data statement line for each keyword is overwritten by numbers taken from the record named OPTNNUMS on the random access mass storage data base file. Thus, when the number of distinct optionword character strings allowed with a given keyword changes, there is no need to adjust the data statement; the pre-processor program PREPMS is used to adjust the value in OPTNNUMS to the correct value. (See section 14.5.)

Also, NREC, the total number of keyword character strings, is set in this common block's data statements.

4.7.3 DESRNG. This common block contains the DESRNG array which consists of the default values for maximum designator range.

DESRNG (I, J) is the maximum designator range for designator type I under condition J where J=1 for day and J=2 for night.

4-22

4.7.4 DISPLY. This common block contains the DISPT, DISPM, RECLBL, and TMPLBL arrays, all of which are defined in the variable glossary (see chapter 12). Each of these arrays consists of alphanumeric constants entered as Hollerith data.

4.7.5 FLTTIM. This common block consists of the TOFARY array. The array gives the default times of flight: TOFARY (I) is the COPPERHEAD time of flight for a gun-to-target range of I (currently only I=8 and I=12 are used).

4.7.6 FSRESP. This common block consists of the FSRT array which contains the FT Sill supplied response time distribution.

4.7.7 HEADNG. This common block contains the ACQLBL, DAYLBL, DFSLBL, DGTLBL, DOLBL, ROLBL, and RSPLBL arrays all of which are defined in the glossary of variables (chapter 12).

Each of these arrays consists of alphanumeric constants entered as Hollerith data.

4.7.8 LOGFLG. This common block contains various logical flags: FIRSTL, SEQNML, SPCL array, and SHRTEC all of which are defined in the glossary of variables (chapter 12).

These are all logical type variables.

4.7.9 POINT. This common block contains the IPOINT array used in Subroutine INPUT to direct control to various parts of a computed GOTO.

4.7.10 SMOKED. Only the SMK2 and SMK5 arrays plus the variable FRONT of this common block are filled in via data statements. They are all defined in the variable glossary (chapter 12).

4.7.11 STITLE. This common block contains SLVERS and the VERDAT array. Both are used in the title page printout.

4.7.12 SYMBOL. This common block consists of the ALFBET, ANUMBR, and SEP arrays plus the single variables BLANK, DECPNT, and DOLLAR. They are all alphanumeric constants filled in as Hollerith data and defined in the glossary of variables (chapter 12).

4.7.13 XVALUE. This common block contains the XVALUE array which is used to generate PEDATA record names. (See sections 5.4 and 9.34.)

4.8 Side Effects of Certain Inputs.

There are a number of dependencies and side effects connected with some of the inputs.

First, the choice of response time data (4.4.15) and mission code (4.4.8) together with time-of-flight determine the nominal response time. (Time-of-flight itself may be determined either by direct input (4.4.24) or as a result of the choice of gun-to-target range (4.4.35)).

The nominal response time, designator type (4.4.11), target velocity (4.4.21), angle T (4.4.25), gun-to-target range (4.4.35), reflectivity (4.4.36), deflection bias (4.4.37), target heading (4.4.38), and seeker sensitivity (4.4.39) are all used to determine the name of the PE data record (see section 5.4). Indeed, angle T, reflectivity, deflection bias, target heading, and seeker sensitivity play no other roles in COPE than to affect the PE data (by determining the PE data record name) and to appear on the case heading page (see section 6.3) for identification purposes.

The maximum designation range (4.4.22) depends on the time of day (day or night) input with response time data (4.4.15) and the designator type (4.4.11). The maximum designator range can also be set by direct input (4.4.22); however, the user must take care to see that the PE data as well as TTF and RNGTTF arrays contain values appropriate for the maximum designator range used.

The target velocity (4.4.21) can be input directly or as a result of the time of day (day or night) used for the response time data (4.4.15), the month used for weather (4.4.13), and the terrain type (4.4.14) used for acquisition data. (The VELTBL array may need adjusting if additional choices are allowed for acquisition data or weather.)

Finally, the weather data (4.4.13) has a strong side effect on the effectiveness of smoke when the SMOKE option (4.4.19) that plays a specified number of smoke rounds is used.

CHAPTER 5

5. PREPARING TO RUN COPE

        Prior to running the main COPE program, it is necessary to run
the preprocessor programs to create the word addressable mass storage data
base file (TAPE 11). This chapter describes the role of each preprocessor,
the structure of TAPE 11, and the interfacing of TAPE 11 with each of the
programs by means of the record names.

    5.1 Preprocessor Programs.

        There are three programs that may be regarded as preprocessors
to the main COPE simulation program. These three programs are called:

        (1) PREPMS which stands for preprocessor mass storage,

        (2) PRBLOS which stands for probability of line-of-sight,
             and

        (3) PAM which stands for probability of seeker acquisition
             and round maneuver.

        More detailed information on PREPMS, PRBLOS, and PAM is included
in chapters 14, 15, and 16 respectively of this report. In addition, more
thorough documentation of PAM is to be published in a future separate
AMSAA Technical Report.

        As mentioned in chapter 4 of this report, much of the data used
in each COPE case is grouped into eight data blocks. These data blocks
are filled by reading records from TAPE 11 (except in the case of the
TEMPORARY option described in section 4.5). The main purpose of the PREPMS
program (and one of the purposes of the PAM program) is to fill values
into the records on TAPE 11 in such a way that they are accessible to the
main COPE program.

        The PREPMS program is used to fill in records for data blocks
for weather data, acquisition range data, response time data, direct fire
suppression data, random occurrence data, target posture data, and invariant
data. It can also be used to fill in records for PE (probability of engageme
data, but this feature has never been used because the PAM program which
generates PE data has been modified to write its results directly to TAPE
11 and the choice of record name has been entirely automated in this case.
Finally, the PREPMS program is also used to establish and modify the option
words allowed as choices with each keyword (described in sections 4.4.1
through 4.4.19 except for those optionword choices described as "a numerical
value" in sections 4.4.18 and 4.4.19).

The PRBLOS program is used to calculate the probabilities of line-of-sight at various ranges. These values are then used in the random occurrence line-of-sight model. They are read from the PRBLOS printout and entered by hand as input to PREPMS. Because the PRBLOS program does not directly act on TAPE 11, it shall not concern us further in this chapter (see chapter 15 for complete discussion of PRBLOS).

The PAM program takes as input the parameter values describing the conditions under which probability of engagement is to be computed. It then computes the PE data values, creates a record name for its current block of PE data by encoding the input conditions according to a scheme also used in the main COPE program, and then writes the PE data to TAPE 11 under that record name.

5.2 Word Addressable Mass Storage Data Base File (TAPE 11).

The word addressable mass storage data base file (TAPE 11) consists of the records containing the data to be used by each of the eight data blocks mentioned in chapter 4, the records of option words allowed with each keyword (applies only to keywords described in sections 4.4.1 through 4.4.19 and excludes any option words described as "a numerical value"), and a record called OPTNNUMS that records the number of option word character strings allowed for each keyword.

TAPE 11 is a CDC word addressable mass storage file using a name type master index. (This file type and the way it is interfaced with a FORTRAN program is explained in the CDC Fortran Extended Version 4 Reference Manual chapter 8, a section titled "Mass Storage Input/Output"). The important feature to note here is that this file type (with a name type master index) is organized as a set of records each consisting of one or more words of data and each having a unique record name of one to ten characters. This unique record name is set when the record is created and must be used by any program that either reads or modifies the record. It is by using the same system of record names in the COPE program as in the preprocessors PREPPE and PREPMS that the data records written by the pre-processors can be read by the main COPE program.

5.3 Record Names.

5.3.1 Weather Data Record Name. The record name of the data to be used in the weather data block (the WDATA array) has the form : mmmtttt021 where mmm are the first three letters of the name of the month of the weather data, tttt are four numbers giving the time of day (24 hour military time) of the weather data, and the 021 are three numbers signifying that WEATHER has keyword number 21.

Examples:

JUN0600021 is the record name for weather data for a
June day at 0600 (6 AM).

SEP2200021 is the record name for weather data for a
September day at 2200 (10 PM).

5.3.2 Acquisition Data Record Name. The record name of the
data to be used in the acquisition range data block (the ACQDAT array)
has the form: ACQDATnn22 where nn are two digits giving the number of the
choice for option word 1 used with keyword 22 (section 4.4.14).

Examples:

ACQDAT0122 is the record name of the acquisition range and
LOS segment length data to be used when option word
AVERAGE is used with keyword 22 (ACQRNGDIST)

ACQDAT0322 is the record name of the data to be used with
OPEN terrain.

5.3.3 Response Time Data Record Name. The record name of
the data to be used in the response time data block (RSPDAT array) is
of the form: RSPDATnn23 where nn are two digits giving the number of
the choice for option word 1 used with keyword 23 (section 4.4.15)

Examples:

RSPDAT0123 is the name of the record containing the
response time data to be used when the FTSILL option
is selected.

RSPDAT0223 is the name of the record containing the
response time data for the STAUCH option.

Note: There is no data record corresponding to the PARAM choice
for option word 1. This is because the PARAM choice for option word 1
causes the program not to require any of the data in the response time
data block.

5.3 4 Direct Fire Suppression Data Record Name. The record
name of the data to be used in the direct fire suppression data block
(DFSDAT array) is of the form: DFSDATnn24 where nn are two digits giving
the number of the choice for option word 1 used with keyword 24 (section
4.4.16)

Example:

DFSDAT0124 is the record name for HIGH direct fire suppression
data.

5.3.5 Random Occurrence Data Record Name. The record name
of the data to be used in the random occurrence data block (RODATA array)
is of the form: RODAVmTRNn where m is the target velocity in meters per
second (obviously between 0 and 9) and n is the terrain type number (corresponds

to number of option word 1 on ACQRNGDIST card, i.e., 1 for AVERAGE, 2 for CLOSE, 3 for OPEN).

Example:

RODAV8TRN2 is the record name for the random occurrence data to be used when target velocity is 8 m/s and terrain type is 2 (CLOSE).

Note: The program is currently set up only for velocities of 2, 3, 5, 8, and 9. Furthermore, 2 and 8 are treated as 3 and 9 respectively when it comes to looking up RODATA and PEDATA.

5.3.6 Target Posture Distribution Data Record Name. The record name of the data to be used in the target posture data block (PSTDAT array) is of the form: PSTDATnn27 where nn is the number of the choice for option word 1 used with keyword 17 (section 4.4.12).

Example:

PSTDAT0127 is the record name for the target posture distribution used when FO POSITION is VANTAGE POINT.

Note: Keyword 17 (FO POSITION) and keyword 27 (TARGET POSTURE DISTRIBUTION) could each be used to control the choice of target posture distribution data, but only keyword 17 (FO POSITION) has been provided with optionwords and is the only one of the two explained in section 4.4.

5.3.7 Invariant Data Record Name. The record name of the data used in the invariant data block (AINVDA array) is of the form: AINVDAnn28 where nn is the number of the choice for option word 1 used with keyword 28.

Example:

AINVDA0128 is the record name for the invariant data used with the default (omitted) option word 1.

Note: The keyword INVARIANT is currently set up to accept no option words (other than a blank which is equivalent to the default).

5.3.8 Option Word Record Names. For each keyword numbered less than 41 (see section 5.3.9 for keyword numbers) there may be some option words that are not numerical values (see sections 4.4.1 through 4.4.19 for the current option word choices available with each keyword).

To create, modify, or add to the list of character strings that can be used with any keyword, it is necessary to run PREPMS with input specifying the keyword (in its abbreviated form of ten characters or less), the total number of option word character strings that can be used

with that keyword and the keyword number as well as the option word number, the option word choice number and the option word character string for each option word choice. The formatting of this data is explained in chapter 14, but an explanation of its meaning is provided by the sample input following:

```
OPTION WORDS, W, 10, 21
1, 2, JUNE
1, 2, J
2, 2, DECEMBER
2, 2, D
1, 3, 1400
1, 3, 14
2, 3, 0600
2, 3, 06
3, 3, 2200
3, 3, 22
```

where the first line indicates that option word allowable choices are being set for keyword W (or WEATHER), that ten optionword character strings are being input, and that W (or WEATHER) is keyword number 21.

Each of the next ten lines establishes a character string as a possible option word choice. For example, 1, 3, 1400 establishes 1400 as a character string corresponding to the first choice for option word 2 of any input line beginning with keyword W (or WEATHER). The first digit (1) indicates that 1400 is the first choice allowed, the second digit 3 indicates that 1400 is a choice allowed for the third item on the input line (recall that an input line is of the form: Keyword, option word 1, option word 2, - - -, option word n so that option word 2 is actually the third item on an input line), and, of course, 1400 indicates that the input character string to select option 1 for option word 2 is 1400. The fact that the next line is 1, 3, 14 means that 14 has the same effect (first choice for option word 2) as 1400. No more than two lines are allowed to be input with the same ordered pair (choice number, option word number + 1) under any given keyword (though one may input just one line for such a pair if desired).

The PREPMS program then places this option word information on a record whose record name is the keyword (W in the case above). It is for this reason that the keyword used must be ten or fewer characters. Each keyword of length more than ten characters also has an abbreviated form (see the appropriate section of chapter 4 for each keyword; even some keywords of length less than ten characters have abbreviated forms). For example, the keyword ACQUISITION RANGE DISTRIBUTION is suitable for input to COPE, but cannot be used as input to PREPMS because it is too long to be a record name; instead, the abbreviated form ACQRNGDIST must be used when setting option words via PREPMS.

The rule is always to use the abbreviated form of the keyword with PREPMS input (even if the long form of the keyword is itself ten or fewer characters) and to use either form with input to COPE. For keywords with only one form, use it as input to both programs.

Finally, for each new option word choice that is allowed, the user must consider what COPE will do when it encounters the new option word. In the case of option words that control the choice of records to be read from TAPE 11 into data blocks, the user must also have run PREPMS to add the possible data block records into TAPE 11. In our example above, input to PREPMS must have created records named JUN0600021, JUN1400021, JUN2200021, DEC0600021, DEC1400021, and DEC2200021 containing the weather data to be used with each of the possible option word combinations. For the case of option words that control program actions rather than select a data record name, it will usually be necessary to modify the program code so that it will "know" what to do when encountering a new option.

5.3.9 Keyword Numbers, Abbreviated Forms, Etc. The following table gives the current list of allowed keywords, each keyword's number, abbreviated form, and relevant notes. (This overlays some of the information in chapter 4, but it was felt desirable to have all the keywords listed in one place for quick reference; chapter 4, sections 4.4.1 - 4.4.38 are still essential for allowed optionwords and detailed effects of keywords). When two consecutive keywords have the same number, the second is the abbreviated form. (Recall that blanks may be arbitrarily inserted in (or removed from) keywords.) Notes are explained at end of listing.

Keyword Number	Keyword	Notes
1	FIRST CASE	*1 Sec. 4.4.1
2	NEXT CASE	*2 Sec. 4.4.2
3	END OF CASE	*1 Sec. 4.4.3
3	END	*1 "
4	END OF FINAL CASE	*1 Sec. 4.4.4
4	END F	*1 "
5	PLOT	*2 Sec. 4.4.5
6	OVERRIDE	*3 Sec. 4.5.3
6	OVERIDE	*3 "
7	TEMPORARY	*3 Sec. 4.5.4
7	TEMP	*3 "

Keyword Number	Keyword	Notes
8	RESET	*3 Sec. 4.5.5
9	CONTROL	*2 Sec. 4.4.6
11	LINE OF SIGHT MODE	*2 Sec. 4.4.7
11	LOS MODE	*2 "
12	MISSION CODE	*2, *9 Sec. 4.4.8
12	MSN CODE	*2, *9 "
13	NUMBER OF DIFFERENT TARGET POSTURES	*2 Sec. 4.4.9
13	NUMDIFTGTP	*2 Sec. 4.4.9
14	TARGET TYPE	*2 Sec. 4.4.10
16	DESIGNATOR TYPE	*2, *9 Sec. 4.4.11
16	DESIGTYPE	*2, *9 "
17	FO POSITION	*4 Sec. 4.4.12
21	WEATHER	*4 Sec. 4.4.13
21	W	*4 "
22	ACQUISITION RANGE DISTRIBUTION	*4 Sec. 4.4.14
22	ACQRNGDIST	*4 "
23	RESPONSE TIME	*2, *4, *9 Sec. 4.4.15
23	RESPTIME	*2, *4, *9 "
24	DIRECT FIRE SUPPRESSION	*4 Sec. 4.4.16
24	DFIRESUPPR	*4 "
25	RANDOM OCCURRENCE DISTRIBUTION	*10
25	RODIST	*10
26	PEDATA	*10
27	TARGET POSTURE DISTRIBUTION	*10

Keyword Number	Keyword	Notes
27	TGTPSTDIST	*10
28	INVARIANT	*5 Sec. 4.4.17
31	RUMC	*6 Sec. 4.4.18
32	SMOKE	*7 Sec. 4.4.19
41	DO ARTILLERY PK	*8 Sec. 4.4.20
41	DOARPK	*8 "
42	TARGET VELOCITY	*9 Sec. 4.4.21
42	TGTVEL	*9 Sec. 4.4.21
43	MAXIMUM DESIGNATOR RANGE	*8 Sec. 4.4.22
43	MAXDESRNG	*8 "
44	BAIL OUT RANGE	*8 Sec. 4.4.23
44	BAIL OUTRNG	*8 "
45	TIME OF FLIGHT	*8 Sec. 4.4.24
45	TOF	*8 "
46	ANGLE T	*9 Sec. 4.4.25
47	DUST	*8 Sec. 4.4.26
48	PROBABILITY OF SUCCESSFUL VOICE TRANSMISSION	*8 Sec. 4.4.27
48	PRBVOCTRAN	*8 "
49	PROBABILITY OF SUCCESSFUL DIGITAL TRANSMISSION	*8 Sec. 4.4.28
49	PRBDGTTRAN	*8 "
50	ROUND IN FLIGHT RELIABILITY	*8 Sec. 4.4.29
50	RNDFLTREL	*8 "
51	TIME BETWEEN ROUNDS	*8 Sec. 4.4.30

Keyword Number	Keyword	Notes
51	TBR	*8 Sec. 4.4.30
52	NUMBER OF REPLICATIONS	*8 Sec. 4.4.31
52	NUMREP	*8 "
53	NUMBER OF ROUNDS TO BE FIRED	*8 Sec. 4.4.32
53	NUMRNDS	*8 "
54	NUMBER OF VEHICLES PER TARGET	*8 Sec. 4.4.33
54	NUMVEHTGT	*8 "
55	DISTANCE BETWEEN VEHICLES	*8 Sec. 4.4.34
55	DISTBVEH	*8 "
56	GUN TARGET RANGE	*9 Sec. 4.4.35
56	GTRNG	*9 "
57	REFLECTIVITY	*9 Sec. 4.4.36
57	REFLECT	*9 "
58	DEFLECTION BIAS	*9 Sec. 4.4.37
58	DEFLB	*9 "
59	TARGET HEADING	*9 Sec. 4.4.38
59	TGTHDG	*9 "
60	SEEKER SENSITIVITY	*9 Sec. 4.4.39
60	SEEKSENS	*9 "
61	PROBABILITY OF A CORRECT MESSAGE	*8 Sec. 4.4.40
61	PROBCORMSG	*8 "
62	PROBABILITY DO WARNED TO LASE	*8 Sec. 4.4.41
62	PROBDOWARN	*8 "

Explanation of notes:

*1   These keywords do not take option words.

*2   These keywords set certain flags or indices that cause the program to function in one of several alternate ways or else serve as indices for array "look-ups." Any increase in the number of options corresponding to one of these keywords might require code changes to COPE (at the least, redimensioning of some arrays) to specify the actions to be taken for the new options.

*3   These keywords take other keywords (numbers 21 through 28) as their second fields (i.e., as the first item following the separator after the keyword). The items to be used in the second fields are built into the program in data statements (CHAR array) and any changes would require code modifications to COPE. (See sections 4.5.1 through 4.5.5)

*4   These keywords set the names of records on TAPE 11 to be read into the program data blocks. Any increase in the number of options allowed must be accompanied by input to PREPMS creating the records with the names that would be called for if the new options were exercised. (See chapter 14.)

Also, keyword 23 takes some further option words which determine digital or voice communications and day or night visibility. If more options are allowed for these keywords, then code changes are required for COPE.

*5   Currently takes no option words, but if option words were added, it would fall in the same class as keywords with note *4.

*6   The addition of any new options for RUMC would require code changes to COPE.

*7   The addition of any new options for SMOKE would require code changes to COPE.

*8   These keywords all take numerical values for option word 1. Any numerical value that could be read in F10.4 format is allowable though for some option words negative values or values greater than 1.0 may cause program malfunction (as in the case when the value represents a probability). Any attempt to modify one of these keywords to accept options other than numbers would require program code changes in COPE.

*9   These keywords affect the choice of the PEDATA record name to be used (see section 5.4). Any increase in the number of allowed choices here would require changing values in the XVALUE array (in both COPE and PAM) and then running PAM to create any new PEDATA records that may be called for as a result of these changes.

In short, one can see from the above notes that while it is easy to add new optionword choices for a particular keyword (by running the PREPMS program when necessary), it often requires code changes to COPE to make the new choices have the desired effect. About the only keywords for which options can be conveniently changed are those of notes 4, 5, and, to a lesser extent, 9.

5.4 PEDATA Record Names.

The record name for the PEDATA (probability of engagement data) to be used with a given case is a function of ten keywords and their associated optionwords (except, of course, when using the OVERRIDE or TEMPORARY keywords with PEDATA).

When the PAM program is run, nine parameters are input. The values of these parameters determine the record name of the PEDATA created by that run. When COPE is run, the same nine parameters are assigned values (as the result of keyword inputs or defaults), the same function for determining record name is applied, and the record with the resulting name is read from TAPE 11 and filled into the PEDATA data block.

Because there are only a finite number of ten character record names and because the record name depends on the values of nine different parameters, it is necessary to limit the choices allowed for each parameter. This section is devoted mainly to a description of the function that determines record name when given the nine parameter values and to the changes required to introduce a new allowed parameter value.

The nine parameters are:

(1) nominal response time in seconds (determined by keywords 23 and 12),

(2) designator type (determined by keyword 16),

(3) target velocity (determined by keyword 42),

(4) gun-to-target range (determined by keyword 56),

(5) target reflectivity (determined by keyword 57),

(6) angle T (i.e., angle between gun-target line and designator target line; determined by keyword 46),

(7) deflection bias (determined by keyword 58),

(8) target heading (determined by keyword 59),

(9) seeker sensitivity (determined by keyword 60).

The values currently allowed are (by parameter number):

(1) any time t in seconds such that 0.5 second $\leq$ t $<$999.5 seconds

(2) GLLD, MULE, LTD (which COPE and PAM call types 1, 2, and 3 respectively)

(3) 2, 3, 5, 8, and 9 meters per second,

(4) 8 and 12 kilometers,

(5) .05, .10, .20, and .30,

(6) 0, 25, 30, 60, 90, and 120 degrees,

(7) -200, -100, 0, 100, and 200 meters,

(8) -60, -30, 0, 30, and 60 degrees,

(9) 24, 36, 48, 60, and 72 joules per square meter.

The record name function works as follows:

-First, it rounds the nominal response time (parameter one to the nearest integer (call the result t', then $1 \leq t' \leq 999$).

-Next, for each parameter 2 through 9, the function matches the parameter value to one of the allowed values. Say for the jth parameter, the value is found to match the Ijth allowed value (if no match is found, an error stop results).

-Next, the record name is made by converting t' to octal (call it t" where $1_8 \leq t" < 1747_8$), by letting N_i = a function of I_j (usually I_j-1), and then defining

record name = $20053333xxxxN_2N_3N_4N_5N_6N_7N_8N_9$ in octal

where: 20053333 is octal for the alphanumeric "PE00", xxxx are the four octal digits of t" (possibly with leading zero(s) if t" is small enough), N_2, _ _ , N_9 are as defined above (note that when $1 < I_j < 8$, we have $0 < N_i < 7$ so that each N_i is but a single octal digit. It is for this reason that we shall never allow more than eight different choices for the value of any of the parameters 2 through 9).

The values allowed for each parameter 2 through 9 are to be found in the XVALUE array which is defined by data statements in both COPE and PAM (also, in PREPMS). In COPE, the data statement is in BDAT1, in PAM it is in subroutine PENAME, and in PREPMS it is in BDATA2.

The XVALUE array is set up so that XVALUE (I,J,K) is the Ith allowed value for the Jth parameter when K=1 and XVALUE (I,J,K) is the N_J value (as defined above a function of I_J with $0 < N_J < 7$) corresponding to the Ith allowed value of the Jth parameter when K=2.

Notes: (1) Because the first parameter (nominal response time) is allowed a wider range of values, the XVALUE entries with J=1 are not used. (2) Because XVALUE is dimensioned XVALUE (8,9,2) and because not all parameters 2 through 9 actually use the maximum of eight different allowable values, those array spaces XVALUE (I,J,1) and XVALUE (I,J,2) for I greater than the number of allowable values for parameter J are filled with 0's and 8's respectively. Hence, if an NJ value of 8 were to occur, the program has made an invalid parameter value match and a stop with error message will occur. (3) The programs do not distinguish between target velocities of 2 and 3 m/s or between 8 and 9 m/s or between designator types MULE and LTD when it comes to PE data. (There are still distinctions made in other parts of COPE such as calculating current designator target ranges or looking up LDWSS probability of hit numbers as function of designator type). This failure to distinguish can be observed in the XVALUE array: the XVALUE (I,J,2) values are identical for target velocities of 2 and 3 m/s, for example.

To allow more choices for one of the parameters 2 through 9, one need merely modify the data statements defining the XVALUE array so that XVALUE (I, J, 1) with appropriate I and J has the new value and XVALUE (I,J,2) has the corresponding NJ (octal digit). This must be done in both COPE and PAM (and should be done in PREPMS to keep it current also). Then one must run PAM with the parameter combinations using the new allowed value(s) to create the PEDATA corresponding to the case(s) one intends to run in COPE with the new parameter values.

To allow a new choice for parameter 1, one needs merely run PAM with the new value for parameter 1 to create the PEDATA for the case(s) using the new nominal response time and the desired allowed values for the other parameters. Of course, nominal response times outside .5 seconds to 999.5 seconds are not allowed.

Note: The PREPMS program uses the XVALUE array only to decipher PE record names. That is, one can direct that program to list the PEDATA records currently on TAPE 11 and then decipher the PE record names and print the values of the 9 parameters to which each such record corresponds. It is for this reason that the XVALUE array data statement in PREPMS should be updated along with those in COPE and PAM whenever a new value is introduced for any of the parameters 2 through 9.

5.5 Control Cards for COPE and Its Preprocessors.

The appendixes A, B, C, and D at the end of this report include respectively, the control cards used to run PAM, PRBLOS, PREPMS, and COPE. They are explained in these appendixes and hence require no further explanation here. These control card sets, of course, apply only to BRL's computer system and would require minor changes for other CDC installations and major changes for non-CDC computers.

6. OUTPUT

This chapter describes the normal COPE output prints. Special messages and diagnostic or error prints that may occur are described in Chapter 7.

The normal COPE output consists of four types of pages, three of which will always be present and one of which will be present only if one or more "$$$" comments is included in the input.

The page types will ordinarily occur in this order:

Title Page
"$$$" comment page (if present)
First case heading page
First case results page
Second case heading page
Second case results page

nth case heading page
nth case results page

final case heading page
final case results page

An additional "$$$" comment page will occur following the results page of the last case whose END card precedes any "$$$' comment card (or cards).

Each page type is now described in detail.

6.1 Title Page.

This page includes the program name, the names of the program author and the various contributors to the model design and data collection. In addition, it identifies the activity, division, branch, and section responsible for the model.

Of greater practical value, this page also includes the version number of the program and the date that version was created. Finally, the page gives the date and time of the current run of the program.

For an example, see Listing 6-1.

6.2 "$$$" Comment Page.

This page merely lists the user's "$$$' comments (see section 4.6.4) with the symbol "** USER **" to the left of each comment line. In addition, any program generated comments (see section 7.1) are listed with "**COPE**" to the left of each comment line.

C O P P E R H E A D   O P E R A T I O N A L   P E R F O R M A N C E   E V A L U A T I O N

-PROGRAM BY RICHARD SANDMEYER

-MODEL DEVELOPMENT AND DATA COLLECTION BY:

DAVID BARNHART   JULIAN CHERNICK   DIANA FREDERICK

RICHARD SANDMEYER   RICHARD SCUNGIO   MICHAEL STARKS

EDWARD STAUCH   ANNIE YOUNG

-BASED ON A PROPOSAL BY HERBERT FALLIN

-DONE AT THE REQUEST OF DAVID HARDISON (DUSA-OR)

UNITED STATES ARMY MATERIEL SYSTEMS ANALYSIS ACTIVITY

    GROUND WARFARE DIVISION

    SUPPORT WEAPONS ANALYSIS BRANCH

    SYSTEMS EVALUATION SECTION

CORE VERSION 6.2 CURRENT AS OF 6 MARCH 1980

THIS RUN DONE ON 08/14/80 AT TIME 15.41.16.

LISTING 6-1   TITLE PAGE

6-2

For an example, see Listing 6-2.

6.3 Case Heading Page.

        The first page for each case is the heading page. The heading page gives a description of the conditions in effect for the case whose results follow. In addition, the heading page contains a section for any "$$" comments (either user or program generated). The case heading page (Listing 6-3) begins with a line indicating the case number. The next line below that gives the number of replications (i.e., number of potential Copperhead missions generated and tested by the current case of the Monte Carlo COPE model).

        The next area of the case heading page is broken up into nine boxes each of which is surrounded by asterisks and contains descriptors of one aspect of the current case. These boxes are now described one at a time.

        Note: When an OVERRIDE or TEMPORARY option is in effect, the case heading information may be unreliable for those items connected with the data block for which the OVERRIDE or TEMPORARY is in effect.

        In the special case of a PE data block input via the OVERRIDE option, the values given in the comment of section 7.2.6 take precedent over those in the case heading when it comes to determining PE data but not for other purposes (for example, velocity used for calculating designator-to-target range is the velocity printed in the TARGET box rather than that in the comment).

        If in doubt, the user should look at the contents (Data Check) of TAPE 8 for the case in question (see section 7.6) to determine which values were actually used for various parameters.

        6.3.1 TARGET. The first box is labeled "TARGET" and contains data describing the target. These data are:

    (a) Target type

    (b) number of vehicles in the target unit,

    (c) mean distance between target vehicles,

    (d) target velocity (speed)

    (e) target heading (where a heading of zero means the target
         is moving along the gun-to-target line toward the gun.
         Angles are measured counterclockwise from this zero heading).

    (f) target reflectivity.

        6.3.2 FIRING INFO. Moving vertically down the page, one next finds the FIRING INFO box which gives various information about the firing

$$$ $$$ $$$ $$$ $$$ $$$ $$$ $$$ COMMENTS FOR THIS SET OF CASES $$$ $$$ $$$ $$$ $$$ $$$ $$$ $$$

** USER **   THIS COMMENT WILL APPEAR ON THE $$$ COMMENT PAGE

LISTING 6-2   "$$$" COMMENT PAGE

* C A S E   N U M B E R   1 *

NUMBER OF REPLICATIONS=10000

```
***************************************        ***************************************        ***************************************
*                                     *        *                                     *        *                                     *
*             TARGET                  *        *     DETECT, COMMO, AND PROC TIMES    *        *             WEATHER                 *
*                                     *        *                                     *        *                                     *
* TYPE  1                             *        * PRIORITY PRE-PLANNED TARGET         *        * MONTH OF JUN                        *
* NUMBER OF VEHICLES=10               *        * DIGITAL COMMO                       *        * TIME OF DAY: 0600                   *
* MEAN DISTANCE BETWEEN VEHICLES= 61.M *       * DAY TIME                            *        ***************************************
* TARGET VELOCITY=3. M/SEC            *        * NOMINAL RESPONSE TIME=106. SEC      *
* TARGET HEADING= 0. DEGREES          *        * PROB SUCCESSFUL DIGITAL TRAN= .915  *
* TARGET'S REFLECTIVITY= .10          *        * PROB CORRECT MESSAGE = .975         *        ***************************************
***************************************        * PROB DO WARNED TO LASE = .975       *        *                                     *
                                               ***************************************        *         TERRAIN AND LOS             *
***************************************                                                       *                                     *
*                                     *        ***************************************        * CLOSE TERRAIN                       *
*          FIRING INFO                *        *                                     *        * CONTINUOUS LOS ("SHOOTING GALLERY") *
*                                     *        *            DESIGNATOR               *        ***************************************
* NUMBER OF ROUNDS PER ENGAGEMENT= 6  *        *                                     *
* ROUND RELIABILITY= .96              *        * TYPE 1                              *        ***************************************
* TIME BETWEEN ROUNDS= 20. SEC        *        * MAXIMUM DESIGNATOR RANGE=7000. M    *        *                                     *
* TIME OF FLIGHT= 31.0 SEC            *        * BAIL-OUT RANGE=1000. M              *        *            OBSCURANTS               *
* NOMINAL GUN-TARGET RANGE=  8. KM    *        * DESIGNATOR AT VANTAGE POINT         *        *                                     *
* ANGLE T=.25. DEGREES                *        ***************************************        * PROB SMOKE KILLS MISSION= .75       *
* DEFLECTION BIAS=   0. METERS        *                                                       * VOLUME OF SMOKE FIRED: 484 +   846  *
***************************************        ***************************************        * PROB DUST KILLS MISSION= .37        *
                                               *                                     *        ***************************************
***************************************        *        DESIGNATOR SUPPRESSED        *
*                                     *        *                                     *
*            MISC                     *        * PROB SUPPRESSED BY INDIRECT FIRE=.01 *
*                                     *        * PROB SUPPRESSED BY DIRECT FIRE: HIGH *
* DELTA T3 ASSUMED TO BE ZERO         *        ***************************************
* SEEKER SENSITIVITY= 60. JOULES/M**2 *
***************************************
```

$$ COMMENTS $$

** CODE ** IN PPLOT FOR CASE 1 WITH IPPFG= 1 . NO PLOT PRODUCED .

LISTING 6-3   CASE HEADING PAGE

6-5

of the COPPERHEAD round. These items are:

(a) number of rounds fired per engagement,

(b) round in-flight reliability

(c) time between successive rounds

(d) time of flight of round

(e) nominal gun-to-target range

(f) angle T (angle between target-to-gun line and target-to-designator line)

(g) deflection bias (which is the minimum distance between the COPPERHEAD footprint centroid and the target's path).

6.3.3 MISC. The next box below the FIRING INFO is labeled MISC and contains miscellaneous data relevant to the case. These data are:

(a) either a note that DELTA T3 is zero (in which case RUMC (see section 4.4.18) is optimally chosen for each fire mission or a note that DELTA T3 is not assumed to be zero in which case RUMC is a fixed value for each fire mission.

(b) The value of RUMC (if DELTA T3 is not assumed zero; otherwise, this line is not printed.)

(c) The seeker sensitivity value used for the COPPERHEAD seeker in this case.

6.3.4 DETECT, COMMO, and PROC TIMES. The next box which is located at the top of the second column of boxes contains data pertaining to detection, communication, and processing times. These data are:

(a) The mission type

(b) The type of communication (i.e., digital or voice)

(c) day or night indicator

(d) nominal response time (which is the sum of the median communication and processing times and the time of flight)

(e) probability of successful digital communication link being established when needed (not printed when item (b) above is VOICE)

(f) probability of successful voice communication link
     being established when needed (printed only when applicable
     - see section 2.2.9)

(g) probability of a correct message,

(h) probability that the D.O. is warned to lase.

     If the parameterized response time option is used, then the
parameterized response time (which does not include time of flight)
is listed in this box first.

     6.3.5 DESIGNATOR. The next box gives information about the
designator (both the soldier and the piece of equipment). This information
consists of:

(a) designator type,

(b) maximum designator range,

(c) bail-out range

(d) designator location.

     6.3.6 DESIGNATOR SUPPRESSED. The next box gives information
about suppression of the designator. This information is:

(a) The probability that the FO (D.O.) is killed by Red
     preparatory artillery fires.

(b) A label giving the level of direct fire suppression
     achieved by the target against the D.O.

     6.3.7 WEATHER. The first box of the third column gives weather
data. These data are:

(a) The month whose weather is being used in the current
     case,

(b) The time of day (on a 0 to 2400 clock) whose weather is
     being used in the current case.

     6.3.8 TERRAIN AND LOS. The next box moving down has terrain
and line-of-sight information. This information includes:

(a) The terrain type used for the acquisition range distri-
     bution and line-of-sight segment length distribution.

(b) The line-of-sight model used in the current case
     ("SHOOTING GALLERY" or "RANDOM OCCURRENCE").

6.3.9 OBSCURANTS. The final box gives data on obscurants (smoke and dust). These data are:

(a) Probability that smoke is sufficiently dense to kill a potential COPPERHEAD mission.

(b) Number of smoke rounds fired of types one and two respectively to obtain the level of smoke in (a) above. (This is printed only if smoke effects are played as a function of number of smoke rounds fired (see section 4.4.19).

(c) Probability that dust from RED HE artillery fire is sufficient to abort a potential COPPERHEAD mission.

6.3.10 "$$" Comment Section.

The final section of the heading page for each case consists of a comment section. This comment section includes both any user comments for this case as well as any program generated comments.

If a case has no comments of either type, then the comment section is omitted.

6.4 Case Results Page.

Following the heading page for a given case is the case results page. This page is labeled in such a fashion as to be almost self-explanatory (see Listing 6-4).

The page has one line corresponding to each mission abort condition and two lines for each round abort condition. A mission abort occurs whenever one of the tests that affect the entire potential COPPERHEAD mission is failed (see sections 2.2.2 through 2.2.11); a round abort occurs whenever one of the tests that affect the functioning of a single round is failed (see sections 2.2.12-2.2.20).

Beginning at the top of the results page, one finds the number of occasions, which is the number of potential COPPERHEAD missions sampled for the current case. This number should equal the number of replications on the heading page for the same case.

The first seven abort causes (or tests) are those which would prevent the D.O. from even attempting to employ COPPERHEAD against a target.

Each of these causes of abort has one line giving the following information:

(a) The number of the abort cause (or test),

(b) a label describing the cause of abort,

CAUSE OF ABORT

***** OCCASIONS (10000) *****

#			NUMBER TESTED (% PASSED):
1	DESIGNATOR IN INDIRECT FIRE	84(0.84%)	10000(99.16%)
2	TARGET BEYOND VISIBILITY RANGE	415(4.15%)	9916(95.81%)
3	TARGET BEYOND DESIGNATOR RANGE	0(0.00%)	9501(100.0%)
4	TARGET NOT DETECTED	0(0.00%)	9501(100.0%)
5	SMOKE KILLED MISSION	7123(71.23%)	9501(25.03%)
6	DUST KILLED MISSION	887(8.87%)	2378(62.70%)
7	DESIGNATOR BAILED-OUT PRE-COMM	484(4.84%)	1491(67.54%)

***** ATTEMPTED ENGAGEMENTS (1007) *****

#			NUMBER TESTED (% PASSED):
8	COMMO OUT (BOTH VOICE & DIGTL)	70(0.70%)	1007(93.05%)
9	ERROR IN TRANSMISSION	21(0.21%)	937(97.76%)
10	DESIGNATOR BAILED-OUT POST-COMM	159(1.59%)	916(82.64%)
11	LOS LOST - NO FIRING	55(0.55%)	757(92.73%)

***** SHOTS (702) *****

ROUND NUMBER :		1	2	3	4	5	6
12	LOS LOST DURING MISSION	30(0.30%)	62(0.62%)	96(0.96%)	151(1.51%)	242(2.42%)	345(3.45%)
	NUMBER TESTED (% PASSED)	702(95.73%)	702(91.17%)	702(86.32%)	702(78.49%)	702(65.53%)	702(50.85%)
13	DESIGNATOR NOT WARNED IN TIME	15(0.15%)	0(0.00%)	0(0.00%)	0(0.00%)	0(0.00%)	0(0.00%)
	NUMBER TESTED (% PASSED)	672(97.77%)	640(100.0%)	606(100.0%)	551(100.0%)	460(100.0%)	357(100.0%)
14	DESIGNATOR IN DIRECT FIRE	176(1.76%)	173(1.73%)	194(1.94%)	183(1.83%)	164(1.64%)	144(1.44%)
	NUMBER TESTED (% PASSED)	657(73.21%)	640(72.97%)	606(67.99%)	551(66.79%)	460(64.35%)	357(59.66%)
15	ROUND RELIABILITY FAILURE	20(0.20%)	16(0.16%)	15(0.15%)	16(0.16%)	9(0.09%)	13(0.13%)
	NUMBER TESTED (% PASSED)	481(95.84%)	467(96.57%)	412(96.36%)	368(95.65%)	296(96.96%)	213(93.90%)
16	TARGET OBSCURED BY MINI-TERRN	54(0.54%)	61(0.61%)	83(0.83%)	55(0.55%)	46(0.46%)	29(0.29%)
	NUMBER TESTED (% PASSED)	461(88.29%)	451(86.47%)	397(79.09%)	352(84.38%)	287(83.97%)	200(85.50%)
17	ROUND DID NOT ENGAGE TARGET	1(0.01%)	1(0.01%)	4(0.04%)	2(0.02%)	0(0.00%)	0(0.00%)
	NUMBER TESTED (% PASSED)	407(99.75%)	390(99.74%)	314(98.73%)	297(99.33%)	241(100.0%)	171(100.0%)
18	ROUND ENGAGED BUT DID NOT HIT	105(1.05%)	83(0.83%)	74(0.74%)	54(0.54%)	43(0.43%)	49(0.49%)
	NUMBER TESTED (% PASSED)	406(74.14%)	389(78.66%)	310(76.13%)	295(81.69%)	241(82.16%)	171(71.35%)
19	ROUND HIT BUT DID NOT KILL	156(1.56%)	159(1.59%)	104(1.04%)	128(1.28%)	96(0.96%)	64(0.64%)
	NUMBER TESTED (% PASSED)	301(48.17%)	306(48.04%)	236(55.93%)	241(46.89%)	198(51.52%)	122(47.54%)

***** KILLS *****

	1	2	3	4	5	6
	145	147	132	113	102	58 *****
PROB(KILL/OCSN)=	1.45%	1.47%	1.32%	1.13%	1.02%	.58%
PROB(KILL/ATMP ENG)=	14.40%	14.60%	13.11%	11.22%	10.13%	5.76%
PROB(KILL/SHOT)=	20.66%	20.94%	18.80%	16.10%	14.53%	8.26%
PROB(LOS)=	88.77%	84.54%	80.05%	72.79%	60.77%	47.16%

PPROB(SHOT/ATMP ENG)= 69.71%   PROB(ATMP ENG/OCSN)= 10.07%

PPROB(SHOT/OCSN)= 7.02%

DESIGNATOR SURVIVABILITY: CASES IN WHICH DESIGNATOR KILLED = 141(1.41%)   NUMBER TESTED (% NOT KILLED) = 657(78.54%)

LISTING 6-4   CASE RESULTS PAGE

(c) the number of times the test was failed,

(d) the percentage of the total occasions that failed the
     test

(e) The number of potential COPPERHEAD fire missions on
     which the test was performed, (this number is equal to the
     total number of potential COPPERHEAD fire missions minus
     the number of potential missions that failed prior tests).

(f) The percentage of those potential COPPERHEAD fire missions
     on which the test was performed that passed the test.

Following the seventh abort cause is a line giving the number
of attempted engagements. This is the number of replications (out of
the total original number of potential COPPERHEAD missions) that passed
the first seven tests and have, therefore, reached the point where the
D.O. attempts to call for COPPERHEAD fire.

The next four cause-of-abort lines (abort causes numbers 8
through 11) consist of those tests that must be passed before the battery
will fire a COPPERHEAD mission. Each of these abort causes has one line
giving information as described in (a) through (f) above in this section.

Following the eleventh cause-of-abort line is a line giving
number of shots. This is the number of replications for which the mission
reached the point where the battery actually fired COPPERHEAD (i.e., the
mission passed tests 1 through 11). The number of shots is the number
of missions fired, not the number of individual rounds fired.

The final eight abort causes (numbers 12 through 19) are round
aborts which have two lines each in the printout.

The first line of each round abort cause gives:

(a) The number of the abort cause (test),

(b) a label describing the cause of abort,

(c) the number of times the test was failed for the first
     round,

(d) the percentage of the total occasions for which the
     first round failed the test.

The line continues with items (c) and (d) repeated but for
the second and subsequent rounds up to a total of NRF rounds (NRF$\leq$6).

The second line of each round abort gives

(e)   the number of COPPERHEAD mission first rounds on which
      the test was performed,

(f)   the percentage of those COPPERHEAD fire mission first
      rounds on which the test was performed that passed the test.

The second line continues with items (e) and (f) repeated
but for the second and subsequent rounds of the COPPERHEAD fire mission.

Following the final (19th) abort cause line is a line giving
kills. This line gives the number of replications for which the first
round of the COPPERHEAD mission achieved a kill, the number of replications
for which the second round of the COPPERHEAD mission achieved a kill,
and so on through the final round of the COPPERHEAD mission.

Next, the printout gives a number of probabilities derived
from the case just simulated: (these probabilities are printed as
percentages).

The probability of kill given an occasion for the nth round
of the fire mission is printed and is calculated by dividing the number
of kills for the nth round by the number of occasions.

The probability of kill given an attempted engagement for
the nth round equals the number of kills for the nth round divided by
the number of attempted engagements.

The probability of kill given a shot for the nth round
equals the number of kills for the nth round divided by the number of
shots.

The probability of line-of-sight (LOS) for the nth round is
the probability of having LOS when the round arrives (test 12) given
that LOS existed immediately prior to firing (test 11). (Note: The
preceding applies to the "shooting gallery" LOS model; for random occurrence,
the probability of having line-of-sight for the nth round is just equal
to the success rate of test 12).

The probability of shot given an occasion is the fraction of
potential COPPERHEAD fire missions that actually reach the point where
rounds are fired.

The probability of shot given an attempted engagement is the
number of shots divided by the number of attempted engagements.

The probability of attempted engagements given an occasion
is the number of attempted engagements divided by the number of
occasions.

The final line of the results page gives information on designator survivability. This line gives the number of replications in which the designator was killed by direct fire from the target and the percentage of the total replications that number represents. The line also gives the number of replications for which the test of designator kill was performed and the percentage of those replications in which the designator was not killed.

Note: The number of kills shown on the results page differs slightly in its meaning depending on whether "shooting gallery" or "random occurrence" line-of-sight model is used. When "shooting gallery" is used, no attempt is made to account for multiple kills of the same target vehicle (i.e., the number of kills on the nth round is calculated under the assumption that the vehicle the round hit had not already been killed by a previous round).

When "random occurrence" is used, the number of kills on the nth round takes into account the number of vehicles surviving to the nth round.

This difference, of course, has no effect in comparing first round kills computed using the two differing LOS models. Furthermore, for round n there will be no effect from this difference in bookkeeping if (1) n $\leq$ number of vehicles in the target, (2) distance between target vehicles/target velocity < time between rounds, and (3) the D.O. is assumed always to designate the front most target vehicle in view. In other cases, the results obtained by the two methods will have some differences attributable to the difference in bookkeeping between the two methods.

CHAPTER 7

7. PROGRAM GENERATED MESSAGES AND DEBUGGING PRINTS

The COPE program has been designed so that most of the common
errors will cause the program to come to a stop and print an error message.
Of course, it is not possible to anticipate every possible error and the
user can expect occasionally to encounter a run that terminates with a
dump or a system generated error message. However, the current version
of COPE has been used for hundreds of runs now and has not terminated in
anything other than the normal program termination or one of the anticipated
error stops.

The messages generated by COPE can be divided into five classes:

(1) program generated $$$ comments,

(2) program generated $$ comments,

(3) special program print-outs of a warning nature that do
     not result in program termination

(4) special program prints that occur with abnormal program termin-
     ations and which give information useful in locating the cause
     of termination.

(5) STOP messages that are printed in the day file. (These STOPS
     include the subroutine or function name in which the stop
     occurs.)

The messages are now explained. They are ordered alphabetically
(by first line) within each class. (Note that some messages include
more than one line).

7.1 Program Generated $$$ Comments.

YOU HAVE SEQUENCE NUMBERS IN COLUMNS 73-78 OF TAPE 5. THEY
WILL BE REMOVED BY THE PROGRAM;
HOWEVER, IF THE TEMPORARY OPTION WAS USED TO READ IN ANY
DATA, THE RESULTS MAY BE SUSPECT.

This message is generated in subroutine SEPREC and is part
of a modification added to handle a Control Data peculiar problem.
Users of COPE frequently create TAPE 5 (the file of case descriptors)
using the CDC editor in its default FORTRAN format and then save the
resulting file by the command SAVE, LFN (where LFN is the local file
name). The problem is that the editor then inserts sequence numbers
in columns 73-78 of the saved file. Now one could easily avoid this
problem by using SAVE, LFN, N rather than SAVE, LFN (the additional N

7-1

causing no sequence numbers to be saved). However, to avoid aborting runs in which sequence numbers are present, COPE was modified to check the first non-comment card (or card image) of file TAPE 5 for sequence numbers: if columns 73-78 are filled with numbers and columns 63-72 and 79-80 are blank, then the computer concludes that sequence numbers are present, issues the above comment, and ignores columns 73-78 on all cards of the current run.

As mentioned in the message itself, this ignoring of columns 73-78 could adversely affect the results if the TEMPORARY option is used, since that option quite likely has important information in columns 73-78. In this event, the file TAPE 5 should be created in the editor with 80 character lines (i.e., use CDC command F,CH=80 before creating the file). Then when it is saved, the sequence numbers will be in columns not read by the program.

For keywords other than TEMPORARY, there is not likely to be any adverse effect since the case descriptor character strings on the cards will usually terminate before column 63 and hence the deletion of columns 73-78 will have no effect.

Finally, if the computer should erroneously conclude that sequence numbers are not present when they really are (as could happen if any of columns 63-72 or 79-80 of the first non-comment card were not blank), then the computer would treat the sequence numbers as part of the keyword or optionword and a different error would bring the program to a halt when that keyword or optionword was not found (see section 7.4.5).

One may wish to remove this feature if using a non-CDC computer.

7.2 Program Generated $$ Comments.

7.2.1 CHOICE OF option word FOR RESPONSE TIME DATA IS INCONSISTENT WITH TIME OF option word FOR WEATHER DATA.

The first option word is DAY or NIGHT while the second one is 0600, 1400, or 2200.

This message merely warns the user that one of the following pairs of a RESPONSE TIME data option word and a WEATHER data option word is being used:

RESPONSE TIME option word	WEATHER option word
DAY	2200
NIGHT	0600
NIGHT	1400

7-2

These are all considered inconsistent pairs since daylight is usually gone by 2200. On the other hand, daylight is usually present at 0600 and 1400.

The choice of one of these inconsistent pairs will not abort the program, but merely result in the generating of this message and the executing of the case with the inconsistent data selected.

7.2.2 IN CCPLOT FOR CASE nn WITH ICCPFG= 1. NO PLOT PRODUCED.

nn is the case number.

This message merely means that the user wanted a Cal Comp plot for case number nn, but since the plot routine is not yet implemented, no plot was produced.

7.2.3 IN PPLOT FOR CASE nn WITH IPPFG = 1. NO PLOT PRODUCED.

nn is the case number.

This message merely means that the user wanted a printer plot for case number nn, but since the plot routine is not yet implemented, no plot was produced.

7.2.4 NO ENDF CARD FOUND BUT ONE ASSUMED SINCE END OF INPUT FILE ENCOUNTERED.

This message occurs when no ENDF card has been put at the end of TAPE 5 (INPUT). It merely means that the program reached the end-of-file without encountering an ENDF card and then proceeded as though it had found one there.

7.2.5 NO 'FIRST CASE' OR 'NEXT CASE' CARD FOUND --- NEXT CASE, RD OPTION ASSUMED.

This message means that inputs for a new case (possibly the first case) have been encountered, but were not preceded by a 'FIRST CASE' or 'NEXT CASE' card. In this event, the program proceeds as though. a NEXT CASE, RD card had been encountered prior to the new case's inputs.

7.2.6 PEDATA FOR: TR=xxx. DT= n VEL= yy. GTR= zzz. REFL= a.aa ANGLET= bbb. DEFT= ccc. TGTHD= dd. SKSEN= ee.

xxx., n, yy., zzz., a.aa, bbb., ccc., dd., and ee. are respectively the response time, designator type number, target velocity, gun-to-target range, reflectivity of target, angle T, deflection bias, target heading, and seeker sensitivity used to generate the PEDATA used in this run. This message occurs only when the OVERRIDE option is used with PEDATA.

The units used with each quantity are those normally used on the corresponding keyword cards.

7.2.7 RECORD NAMED: Record Name USED TO OVERRIDE FOR Data Block Name.

Here record name is the name of the record on the word addressible mass storage file that is selected by the OVERRIDE option and data block name is the name of the data block to be filled by this override.

This print occurs only with each data block in a given case for which the OVERRIDE is in effect.

7.2.8 TEMPORARY OPTION IN EFFECT FOR Data Block Name.

Here data block name is the name of the data block filled by use of the TEMPORARY OPTION.

This print occurs only with each data block in a given case for which the TEMPORARY option is in effect.

7.2.9 YOUR INPUT LINE: Input Line Characters SUPERSEDES ONE OF YOUR PREVIOUS INPUT LINES FOR THIS CASE.

The input line characters are the contents of the card that supersedes a previous line. This message is only a warning to the user that he has included two (or more) cards with the same keyword in a single case. When this happens, only the last such card has an effect on the choice of case descriptors.

If two PLOT cards (section 4.4.5) are included in a case (one for CALCOMP and one for PRINTER), then this message will be produced. In such a case, both plot types are set according to the input cards even though the message says the last one superseded the earlier one; this is the one case in which this message can be safely ignored.

In most cases, one will want to check the input cards and probably re-run the case so that no more than one card is used for each keyword. Note that an OVERRIDE or TEMPORARY card applied to a certain keyword counts as an input card with that keyword for purposes of this message (for example, putting an OVERRIDE, W, JUN1400021 card and a W, J, 0600 card in the same case will produce the message of this section).

7.3 Special Program Print-Outs of a Warning Nature That Do Not Result in Program Termination.

7.3.1 IN OUTPUT. PROBLEM 1 J= nnnnn RNDRED=xxxx. NKILL = mmmmm.

nnnnn is the number of the round, xxxx. is the number of kills on the Jth round for this case calculated by adding one each time a kill occurs, and mmmmm is the number of kills on the Jth round for this case calculated by subtracting the number of aborted missions and Jth rounds from the number of replications.

This print occurs only if the Jth round kills (J runs from 1 to NRF) computed by the two methods differ. It indicates a serious problem with the program.

7.3.2 SERIOUS PROBLEM! KTEST AND NTEST ARRAYS DO NOT AGREE II= nnnnn JJ = mmmmm KTEST ARRAY: (Followed By A 20 x 6 Matrix).

nnnnn is the abort number and mmmmm is the round number (or if nnnnn corresponds to a mission abort, mmmmm is 1).

II and JJ are the indices of the first entry in the KTEST and NTEST arrays that do not agree.

The 20 x 6 matrix is the KTEST array where the element in row I column J is KTEST (I, J). The NTEST array elements correspond to the 'number tested' values printed on the case results page where NTEST (I, J) corresponds to the Jth round Ith abort condition (when the abort is a mission abort, J=1).

The KTEST array is filled by incrementing KTEST (I,J) each time the Ith test is made for the Jth round (if the test is for a mission abort J=1). The NTEST array is filled by setting NTEST (I,J) equal to the number of replications minus the number of missions (and Jth rounds) aborted by tests 1 through I-1.

If NTEST and KTEST differ, then the program is not behaving correctly.

7.4 Special Program Prints That Occur with Abnormal Program Termination and Which Give Information Useful in Locating the Cause of Termination.

7.4.1 ERROR IN INPUT. LINE: Character String WITH IT1=nnnnn IS IN ERROR.

The character string is the card image read from TAPE 5 (INPUT) that is in error and nnnnn is the keyword number.

The error occurs when a keyword match is found for the input, but no code has been provided to handle the input. This is a serious error and means that a program change is required.

This message corresponds to STOP in section 7.5.15.

7.4.2 IN COMMNT. TOO MANY $$ COMMENTS (>20): (Followed By 20 Numbered Lines of Comments, Then:) THE FOLLOWING COMMENT CAUSED OVERFLOW OF CMENT ARRAY: (Followed by a 21st Comment Line).

The CMENT array is dimensioned to allow up to 20 $$ comments per case. This message means that 21 $$ comments were generated for the current case and consequently the CMENT array overflowed. The $$ comment count includes both program generated and user comments.

The corrective action is either to reduce the number of comments for the case or increase the second dimension of the CMENT array.

<u>Note</u>: One possible cause of too many comments is the omission of one or more END cards.

This message corresponds to the STOP of section 7.5.1.

7.4.3 INPUT ATTEMPTED TO READ RECORD NAMED Record Name BUT NO SUCH RECORD WAS FOUND.

The record name is the name of the record which the program attempted to read from the word addressible mass storage file but which could not be found on that file.

This message means the desired record does not exist on the mass storage file. In order to create it, one of the pre-processor programs must be run. If the OVERRIDE feature was used, try preceding the record name with a $ (dollar sign), as described in section 4.5.3.

This message is accompanied by a trace back print of the subroutines called to produce the message. This can be used to locate which call to READMS actually caused the abnormal termination.

This message occurs with the STOP in section 7.5.21.

7.4.4 IN FINDIT. KEYWORD: Keyword AND CORRESPONDING VALUE OF IT: Value ARE NOT ALLOWED WITH THE Option Word OPTION.

Here keyword is the keyword character string, value is the keyword number, and option word is an option word character string.

This message occurs when one attempts to use OVERRIDE, TEMPORARY, or RESET features with an option word that is a keyword other than the name of one of the data blocks.

This message corresponds to the STOP of section 7.5.5.

7.4.5 IN FINDIT. NO MATCH FOUND FOR LINE IB= nnn OF THIS B ARRAY: (Followed By Up to 10 Lines of Character Strings).

Here nnn is the value of IB.

IB is the number of the character string for which no match was found. If IB=1, there was no keyword match (this corresponds to the stop of section 7.5.4). If IB=2, then one could be in the situation of the STOP of section 7.5.4, section 7.5.6 or section 7.5.7.

This error usually means the keyword or option word found in line IB was misspelled or does not exist.

7.4.6 IN NUMRIC. LINE nnn EXCEEDS ALLOWABLE FIELD LENGTH
        FOR NUMERIC DATA: (Followed By Up to 10 Lines of
        Character Strings).

Here nnn is the number of the line in the listing of character strings which contains a numerical string of more than 10 characters (including "-" sign and "." if present).

The corrective action is to change the number to one of less than 10 characters (when including "-" and "."). With the parameters used in COPE there should never be occasion to use a number requiring more than 10 characters.

(Note: If the number is written on input without a decimal point, then the program adds a decimal point after the last digit. Hence, if the decimal point is omitted the number should not exceed nine characters).

This error corresponds to the STOP of section 7.5.23.

7.4.7 IN NUMRIC. LINE nnn HAD TOO MANY DECIMAL POINTS:
        (Followed By Up To 10 Lines of Character Strings).

Here nnn is the number of the line in the listing of character strings which contains more than one ".".

The corrective action is to rewrite the input line so that no option word has more than one decimal point.

This error corresponds to the STOP of section 7.5.22.

7.4.8 IN SMPLCD WITH RANDOM NUMBER GREATER THAN 1.0 RN=xx.xxxxxxx.

Here xx.xxxxxx is the random number generated for use in SMPLCD.

This error will occur only if the random number generator malfunctions and produces a number 1.0. If this error occurs, a trace of subroutine calls is produced and the STOP of section 7.5.31 occurs.

7.5 STOP Messages That are Printed in the Dayfile.

7.5.1 STOP IN COMMNT: TOO MANY $$ COMMENTS. This message occurs when too many $$ comments are encountered in one case. See section 7.4.2.

7.5.2 STOP IN COPE: NORMAL PROGRAM TERMINATION. This is the desirable stop message. It means that the program terminated after processing all the inputs and that no abnormal stopping conditions were encountered. Of course, it does not guarantee that the program did what the user expected, and there may be some warning diagnostic messages (of types 1, 2, or 3 above) produced.

7.5.3 STOP IN DFCHK: ERROR NUMBER 1. This stop occurs when the designator-to-target range cannot be bracketed by the range values in the DFFOKL array. This indicates either an error in the range calculation or a need for larger range values in the DFFOKL array.

7.5.4 STOP IN FINDIT: ERROR NUMBER 1. This message means that a search of the CHAR array has found no keyword to match that of the current input card. (If the OVERRIDE, TEMPORARY, or RESET option is used, then this message will also occur if the second character string on the card cannot be matched from the CHAR array).

This stop corresponds to the print-out of section 7.4.5.

7.5.5 STOP IN FINDIT: ERROR NUMBER 2. This message occurs when one attempts to use the OVERRIDE, TEMPORARY, or RESET option with anything other than one of the eight data block names. (See section 4.5.)

See section 7.4.4.

7.5.6 STOP IN FINDIT: ERROR NUMBER 3. This message occurs when no match for a given option word from an input card can be found among the allowable option words for the input card's keyword.

See section 7.4.5.

7.5.7 STOP IN FINDIT: ERROR NUMBER 4. This message means the same as that in 7.5.6, but occurs at a different point in subroutine FINDIT.

7.5.8 STOP IN FPRCNT: ERROR NUMBER 1. This message means that function FPRCNT was called to format into a percentage a number greater than or equal to 100.05. There should never be any percentages greater than 100 in this program, so if this message is obtained, there are major problems in the bookkeeping processes. In particular, the NABORT array and NTEST array are probably filled with wrong numbers.

7.5.9 STOP IN GETRNG: TARGET VELOCITY = 0.0. This message means a target velocity of zero was input. This is not allowed since division by zero in calculating line-of-sight duration would cause division overflow on the computer.

If one really wishes to use zero velocity, it is suggested that one use a velocity of, say, .001 which will create line-of-sight durations so great that the end result will not differ significantly from those of a stationary target.

A subroutine call trace is also produced.

7.5.10 STOP IN GETVIS: RANDOM NUMBER TROUBLE 1. This message means that the attempt to sample weather data failed under cloud free line-of-sight conditions.

This probably means that there is an error in the PRGCFL array or the random number generator is malfunctioning.

A subroutine call trace is also produced.

7.5.11 STOP IN GETVIS: RANDOM NUMBER TROUBLE 2. This message means that the attempt to sample weather data failed under no cloud free line-of-sight conditions.

This probably implies that there are invalid numbers in the W array or the random number generator is malfunctioning.

A subroutine call trace is also produced.

7.5.12 STOP IN HEADER: ERROR NUMBER 1. This error occurs only if IOVER (J) has a value other than 0, 1, or 2 for a value of J = 21, 22, 23, 24, 25, 26, 27, or 28.

This should never happen. If it does there is a serious problem somewhere in the input or the random access mass storage file.

7.5.13 STOP IN HITCHK: FAILED TO BRACKET RANGE. This stop occurs when the designator-to-target range cannot be bracketed by the range values in the RNGPST array. This indicates either an error in the range calculation or a need for longer range values in the RNGTTF array.

7.5.14 STOP IN INPUT: EOF ENCOUNTERED. This stop occurs when an end-of-file is encountered on TAPE 5 after an END card (instead of after the expected ENDF card).

7.5.15 STOP IN INPUT: ERROR NUMBER 1. This stop corresponds to the message of section 7.4.1.

7.5.16 STOP IN INPUT: EXTRA NEXT CASE CARD. This stop occurs when two (or more) NEXT CASE cards occur within the same case (i.e., without an intervening END card). The program will not accept more than one NEXT CASE card per case. (All cards lying between consecutive END cards are considered to form a case. For this purpose, the beginning and end of TAPE 5 may both be regarded as END cards.)

7.5.17 STOP IN INPUT: FIRST CASE CARD IN SUBSEQUENT CASE. This stop occurs if a FIRST CASE card is encountered anywhere on TAPE 5 other than in the first case. Cases other than the first case should be headed by NEXT CASE cards rather than FIRST CASE cards.

7.5.18   STOP IN INPUT: PARAMETERIZED RESPONSE TIME <=0.0. This stop occurs when attempting to play a parameterized response time less than or equal to zero. Such times are not allowed in the program.

7.5.19   STOP IN LOSCHK: ERROR WITH RANDOM OCCURRENCE OPTION. This message means that the designator-to-target range cannot be bracketed by the range value in the RNGPLS array. This indicates either an error in the range calculation or a need for larger range values in the RNGPLS array.

7.5.20   STOP IN MINTRN: FAILED TO BRACKET RANGE. This stop occurs when the designator-to-target range cannot be bracketed by the range values in the RNGPST array. This indicates either an error in the range calculation or a need for larger range values in the RNGPST array.

7.5.21   STOP IN NOREC: ATTEMPTED TO READ NON EXISTENT RECORD. This stop corresponds to the message of section 7.4.3.

A subroutine call trace is also produced.

7.5.22   STOP IN NUMRIC: ERROR NUMBER 1.   This stop corresponds to the error message of section 7.4.7.

7.5.23   STOP IN NUMRIC: ERROR NUMBER 2.   This stop corresponds to the error message of section 7.4.6.

7.5.24   STOP IN PECHK: FAILED TO BRACKET DELTA T. This message means that the time delay cannot be bracketed by the DLTT array time values. This indicates either an error in calculating DELTAT or a need for larger time values in the DLTT array.

7.5.25   STOP IN PENAME: ERROR NUMBER 1.   This stop means that one of the input values that determines which PEDATA record is to be used had a value not found in the XVALUE array. (See section 5.4.)

7.5.26   STOP IN PENAME: ERROR NUMBER 2.   This stop means that an illegal index value was assigned to NP in subroutine PENAME. (See section 5.4.)

7.5.27   STOP IN PENAME: ERROR NUMBER 3.   This stop means that a response time less than zero or greater than or equal to 999.5 was input. This is outside the allowable range of response times.

7.5.28   STOP IN PENAME: (PEIDNT) ERROR NUMBER 4.   This stop means that the PEDATA record name could not be decoded successfully. (See section 5.4.)

7.5.29   STOP IN SEPREC: ERROR NUMBER 1. This error occurs only if the number of keywords and/or option words on an input card is greater than 10 or less than or equal to zero.

7.5.30 STOP IN SMPLCD: FAILED TO BRACKET RANDOM NUMBER. This stop occurs when the random number obtained from the uniform random number (0 to 1) generator cannot be bracketed by the cumulative probability values describing the distribution to be sampled. It indicates either a malfunctioning random number generator or an incomplete description of the distribution to be sampled.

A subroutine call trace is also produced.

7.5.31 STOP IN SMPLCD: RANDOM NUMBER TOO LARGE. This stop corresponds to the error message of section 7.4.8.

A subroutine call trace is also produced.

7.6 Echo Printing.

The COPE program uses TAPE 8 (i.e., logical output unit 8) to echo inputs, to print the values of the case parameters, and to print the initial random number seeds. TAPE 8 is normally a scratch file that is lost when the job is completed; however, if one wishes to see the contents of TAPE 8 for debugging or verification purposes, then one need merely list it or catalog it for future reference.

A sample of TAPE 8 contents is shown in Listings 7-1 and 7-2.

For each case that is run there are two sections of output on TAPE 8. The first section is a listing of the input options (i.e., the case descriptor cards on TAPE 5) that apply to the case.

The second section (Data Check) displays the values of most of the data that describe the case. This section includes data from the word addressable mass storage file (or its equivalent obtained by using the TEMPORARY option), data obtained directly from INPUT cards, and a few computed values. Together, these data give the complete numerical description of the case to be simulated. (This echo print data check has two forms, a long form and a short form. The long form gives all of the data describing the case; the short form gives it all except the PEDATA (i.e., the INDEX and PETBL arrays). (See section 4.4.6.)

Listing 7-1 gives an example of what is printed on TAPE 8 when the short form of the echo print is used. Listing 7-2 shows the TAPE 8 printout when the echo print long form is used.

The values listed in the Data Check section of the TAPE 8 printout are not identified by any printout labeling. Instead, the user must locate the value of a particular variable on the printout by matching the printout lines with the WRITE statements in subroutine ECHO. If the user intends to use this Data Check section frequently, then perhaps some labeling should be added.

In addition to the two sections of output for each case, TAPE 8 also includes the random number seeds. These are printed immediately following the first case data check. Since the random number seeds used for each case are the same, the print of random number seeds is not repeated following the data check prints for subsequent cases.

Note that the column numbers at the top and bottom of each page of Listings 7-1 and 7-2 are not part of the output produced on TAPE 8. They are included here only for the reader's convenience.

00000000000011111111112222222222333333333344444444445555555555666666666677777777778888888888999999999900000000001111111111 COLUMN NOS.
0000000000111111111122222222223333333333444444444455555555556666666666777777777788888888889999999999000000000011111111112
12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890

************************************** INPUT OPTIONS FOR CASE   1 **************************************

FIRST CASE
$$$ THIS COMMENT WILL APPEAR ON THE $$$ COMMENT PAGE
WEATHER,JUNE,0600
ACQRMGDIST,CLOSE
PLOT,PRINTER,ON
END

---------- DATA CHECK FOR CASE   1 ----------

```
10000     6    .0100   .7506    .3700    .4440    .0600
 484.  846
7000.0000
 31.0000   20.0000
  3.0000              61.0000         1
          .5590    10
          .2200    .6900
          .0070    .0000    .0040    .0220    .0000    .0180    .0040    .0510    .0320    .3430
          .0110    .0000    .0040    .0040    .0040    .0110    .0140   0.0000    .0220    .4480
          .0180    .0000   0.0000   0.0000    .0150
          .0070    .0000   0.0000   0.0000    .0040
          .0040    .0000   0.0000   0.0000    .0110
         0.0000    .0070   0.0000   0.0000    .0110
          .0040    .0040   0.0000   0.0000    .0360
         0.0000    .0000   0.0000   0.0000   0.0000
          .0040    .0000   0.0000   0.0000    .0330
         0.0000    .0000    .0040   0.0000    .0040
         0.0000    .0000   0.0000   0.0000    .0510
          .0040    .0040   0.0000   0.0000    .0360
          .0040    .0110    .0150   0.0000    .2520
         0.0000    .0040    .0040   0.0000    .0150
          .0070    .0000   0.0000   0.0000    .0070
          .0070    .0070   0.0000   0.0000    .0070
         0.0000    .0000   0.0000   0.0000   0.0000
          .0070    .0000   0.0000   0.0000    .0070
          .0040   0.0000   0.0000   0.0000   0.0000
          .0040    .0040   0.0000    .0220
         0.0000    .0000   0.0000    .0110
          .0070    .0040   0.0000    .0220
         0.0000    .0040   0.0000    .0220
          .0110    .0040    .0180    .2170
   6    11
          .4850    .5180    .5610    .4440    .6100
         0.0000   0.0000   0.0000    .2700    .1200
         1.0000    .8800   1.0000
         0.0000    .1200   0.0000
         0.0000   0.0000   0.0000
         0.0000   1.0000
  11    11    3
         0.0000    .1000    .2000    .3000    .4000    .5000    .6000    .7000    .8000    .9000   1.0000
       400.0000 650.0000 900.0000 1300.0000 1600.0000 2000.0000 2500.0000 3000.0000 3700.0000 7000.0000
         0.0000    .1000    .2000    .3000    .4000    .5000    .6000    .7000    .8000    .9000   1.0000
```

00000000000011111111112222222222333333333344444444445555555555666666666677777777778888888888999999999900000000001111111111 COLUMN NOS.
0000000000111111111122222222223333333333444444444455555555556666666666777777777788888888889999999999000000000011111111112
12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890

LISTING 7-1   SHORT FORM OF ECHO PRINT

(PAGE 1 OF 3)

7-13

```
                                                                    00000000000000000000000000000000000000000000000000000000011111111111111111111 COLUMN NOS.
                                                                    00000000011111111112222222222333333333344444444445555555555666666666677777777778888888888999999999900000000001111111111112
                                                                    1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890

25.0000   30.0000   40.0000   50.0000   70.0000   120.0000  140.0000  180.0000  280.0000  500.0000  1100.0000
25.0000   30.0000   40.0000   50.0000   70.0000   120.0000  150.0000  200.0000  420.0000  900.0000  1520.0000
25.0000   40.0000   60.0000   100.0000  140.0000  190.0000  210.0000  240.0000  310.0000  590.0000  1600.0000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000

2000.0000 2500.0000 9999.0000
3.0000    2.0000
2.0000    2.0000
1    1    2    0    0
1    1
1000.0000

0.0000    500.0000  1000.0000 1500.0000 2000.0000 3000.0000 3001.0000 9999.0000
0.0000    .5000     .4000     .3000     .2000     .1000     0.0000    0.0000
1.0000    .3000     .2000     .0500     .0100     0.0000    0.0000    0.0000
25.0000   8.0000    .1000     0.0000    60.0000

NAME OF PEDATA RECORD USED: PEOOA):AJS
16
0.0000    .9000    .9500    .9900    .8000    .9000    .6000
500.0000  .9500    .9000    .9500    .7500    .8500    .5500
1000.0000 .9500    .8500    .9000    .7000    .8000    .4000
1500.0000 .9000    .8000    .8500    .6000    .6000    .3000
2000.0000 .8000    .8000    .8500    .6000    .7500    .3000
2500.0000 .8000    .7500    .7000    .6000    .7000    .1500
3000.0000 .7500    .7000    .6500    .5000    .6000    .0500
3500.0000 .7000    .6500    .6000    .4500    .6000    0.0000
4000.0000 .6500    .6000    .5500    .4000    0.0000   0.0000
4500.0000 .6000    .5500    .5000    .3500    0.0000   0.0000
5000.0000 .5500    .5000    .4500    .3000    0.0000   0.0000
5500.0000 .5000    .4500    .4000    .2500    0.0000   0.0000
6000.0000 .5000    .4000    .3500    .2000    0.0000   0.0000
6500.0000 .4000    .3500    .3000    .1500    0.0000   0.0000
7000.0000 .3500    .3000    .2500    .1000    0.0000   0.0000
9000.0000 .3000    .2000    .1000    0.0000   0.0000   0.0000
0.0000    0.0000   0.0000   0.0000   0.0000   0.0000
0.0000    0.0000   0.0000   0.0000   0.0000   0.0000
0.0000    0.0000   0.0000   0.0000   0.0000   0.0000
0.0000    0.0000   0.0000   0.0000   0.0000   0.0000
0.0000    90.0000  150.0000 300.0000 9000.0000
30.0000   .5000    .8000    .7000    .9500    .6000
.5000     .7000    .7000    .7500    1.0000   .3000
.5000     .4500    .7500
8
0.0000    500.0000  1000.0000 1500.0000 2000.0000 2500.0000 3000.0000 9000.0000
.0700     .1300     .1500     .1600     .1700     .1800     .1800
.9000     .8200     .7800     .7600     .7400     .7300     .7300
.0300     .0500     .0700     .0800     .0900     .0900     .0900
20.0000   20.0000   0.0000    0.0000    0.0000    0.0000    0.0000

                                                                    00000000000000000000000000000000000000000000000000000000011111111111111111111 COLUMN NOS.
                                                                    00000000011111111112222222222333333333344444444445555555555666666666677777777778888888888999999999900000000001111111111112
                                                                    1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890
```

LISTING 7-1   SHORT FORM OF ECHO PRINT – CONT'D

(PAGE 2 OF 3)

```
  0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
 69.1900  69.1900  69.1900  46.3200  46.3200  46.3200  46.3200  46.3200
  0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
  9
  0.0000    .1250    .2500    .3750    .5000    .6250    .7500    .8750   1.0000    0.0000
  0.0000   5.0000  10.0000  18.0000  24.0000  36.0000  52.0000  87.0000 174.0000   0.0000
 75.0000  75.0000  75.0000  75.0000  75.0000  75.0000
  0.0000 106.0000    .9150    .9750    .9750    .9750
  1
```

********************************* END OF DATA CHECK FOR CASE   1 *********************************

```
RANDOM NUMBER SEEDS
18512791 13884593 43967877 16198691 62480667 30083283 39339679 46281975 34711481  9256395
 6942297 55538371 41653777 64794765 48596073 53224271 23140987 50910173  4628197 37025581
27769185 20826889 32397383 57852469 60166567 11570493 25455087 23140Q9
```

LISTING 7-1 SHORT FORM OF ECHO PRINT - CONT'D

(PAGE 3 OF 3)

```
*************************** INPUT OPTIONS FOR CASE    2 ********************************

NEXT CASE,DR
DESIGTYPE,MULE
RESPTIME,PARAM,150,N
CONTROL,ECHO,LONG
PLOT,PRINTER,OFF
$ THE OVERRIDE CARD WHICH FOLLOWS OVERRIDES THE NORMAL CHOICE OF
$ PE DATA WITH THE PE DATA RECORD NAMED PFOOA)AAJS
$ NOTE THE USE OF THE $ BEFORE THE PFCORD NAME
OVERRIDE,PEDATA,$PEOOA)AAJS
END

- - - - - - - - - - - - - - - DATA CHECK FOR CASE    2 - - - - - - - - - - - - - - - - - - -
10000     6    .0100    .7506    .3700    .9600
   484   846
2600.0000
  31.0000   20.0000
   2.0000     10   61.0000        1
   .5590    .2200    .6900
   .0070    .0040   0.0000    .0040    .0220   0.0000    .0180    .0040    .0320    .3430
   .0110    .0040   0.0000    .0040    .0040    .0040    .0110    .0140    .0220    .4480
   .0180   0.0000   0.0000   0.0000   0.0000    .0150
   .0070   0.0000   0.0000   0.0000   0.0000    .0040
   .0040    .0070   0.0000    .0000   0.0000    .0110
  0.0000    .0040   0.0000   0.0000   0.0000    .0110
  0.0000   0.0000   0.0000   0.0000   0.0000    .0360
  0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
  0.0000   0.0000   0.0000    .0040   0.0000    .0330
  0.0000   0.0000   0.0000    .0040   0.0000    .0040
  0.0000   0.0000    .0040   0.0000   0.0000    .0510
  0.0000   0.0000    .0040   0.0000   0.0000    .0360
   .0040    .0070    .0150    .0110   0.0000    .2520
   .0040    .0070    .0040    .0040   0.0000    .0150
  0.0000   0.0000   0.0000   0.0000   0.0000    .0070
   .0070   0.0000    .0070   0.0000   0.0000    .0070
   .0070   0.0000    .0070   0.0000   0.0000   0.0000
   .0040   0.0000   0.0000   0.0000   0.0000    .0070
  0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
  0.0000   0.0000   0.0000   0.0000   0.0000    .0220
   .0070   0.0000    .0040   0.0000   0.0000    .0110
  0.0000   0.0000    .0040   0.0000   0.0000    .0220
  0.0000   0.0000   0.0000    .0040   0.0000    .0220
   .0110    .0070    .0040    .0180    .0040    .2120
     6     11
   .4850    .5180    .5610    .4440    .1200    .6100
  0.0000   0.0000   0.0000    .2700
   1.0000    .8800   1.0000
  0.0000    .1200   0.0000
  0.0000   0.0000   0.0000
  0.0000   1.0000   0.0000
```

LISTING 7-2 LONG FORM OF ECHO PRINTS

(PAGE 1 OF 17)

0000000000000000000000000000000000000000000000000000000011111111111111111111 COLUMN NOS.
00000000011111111112222222222333333333344444444445555555555666666666677777777778888888888999999999900000000001111111111112
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890

```
11  11
 3       .1000     .2000     .3000     .4000     .5000     .6000     .7000     .8000     .9000    1.0000
0.0000  400.0000  650.0000  900.0000 1300.0000 1600.0000 2000.0000 2500.0000 3000.0000 3700.0000 7000.0000
0.0000    .1000     .2000     .3000     .4000     .5000     .6000     .7000     .8000     .9000    1.0000
25.0000  30.0000   40.0000   50.0000   70.0000  120.0000  140.0000  180.0000  280.0000  500.0000 1100.0000
25.0000  30.0000   40.0000   50.0000   70.0000  120.0000  150.0000  200.0000  420.0000  900.0000 1520.0000
25.0000  40.0000   60.0000  100.0000  140.0000  190.0000  210.0000  240.0000  310.0000  590.0000 1600.0000
 0.0000   0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000   0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000   0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000   0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000   0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
2000.0000 2500.0000 9999.0000
3.0000 2.0000
2.0000 2.0000
 2   1   2        0   0
1000.0000
0.0000  500.0000 1000.0000 1500.0000 2000.0000 3000.0000 3001.0000 9999.0000  0.0000  0.0000
0.0000    .5000     .4000     .3000     .2000     .1000     .0000     .0000     0.0000  0.0000
1.0000    .3000     .2000     .0500     .0100     0.0000    0.0000
25.0000   8.0000     .1000     .0000     0.0000   60.0000

NAME OF PEDATA RECORD USED: PE0OA)AAJS
INDEX ARRAY FOR I=  1
 1  2
 3  4
 5  6
 7  8
 9 10
INDEX ARRAY FOR I=  2
11 12
13 14
15 16
17 18
19 20
INDEX ARRAY FOR I=  3
21 22
23 24
25 26
27 28
29 30
INDEX ARRAY FOR I=  4
31 32
33 34
35 36
37 38
39 40
INDEX ARRAY FOR I=  5
41 42
```

0000000000000000000000000000000000000000000000000000000011111111111111111111 COLUMN NOS.
00000000011111111112222222222333333333344444444445555555555666666666677777777778888888888999999999900000000001111111111112
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890

LISTING 7-2 LONG FORM OF ECHO PRINTS - CONT'D

(PAGE 2 OF 17)

COLUMN NOS.

0000000000000000000000000000000000000000000000000000000000000000000000000011111111111111111111 COLUMN NOS.
0000000001111111111222222222233333333334444444444555555555566666666667777777788888888889999999999000000000011111111112
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890

```
43  44
45  46
47  48
49  50
INDEX ARRAY FOR I=   6
51  52
53  54
55  56
57  58
59  60

PE ARRAY FOR I=   1
.2900   0.0000   0.0000   0.0000   0.0000   0.0000
1.0000   .5000    .8900    .6600    .1900   0.0000
1.0000  1.0000    .9900    .9800    .9200   0.0000
1.0000   .9900    .9900    .9900    .9900    .7000
 .9900  1.0000   1.0000   1.0000   1.0000   1.0000
 .9900  1.0000    .9900    .9900   1.0000    .9900
1.0000  1.0000    .9900    .9900   1.0000   1.0000
 .9900  1.0000   1.0000    .9900   1.0000   1.0000
1.0000  1.0000   1.0000   1.0000    .9900   1.0000

PE ARRAY FOR I=   2
.3200   0.0000   0.0000   0.0000   0.0000   0.0000
 .9900   .4700    .0100   0.0000   0.0000   0.0000
1.0000  1.0000    .9800    .6900    .2400   0.0000
1.0000  1.0000   1.0000   1.0000    .9700    .8000
1.0000  1.0000   1.0000   1.0000   1.0000   1.0000
1.0000  1.0000   1.0000   1.0000    .9900    .9800
1.0000   .9900   1.0000   1.0000    .9900   1.0000
 .9900  1.0000   1.0000   1.0000    .9800   1.0000
1.0000  1.0000   1.0000    .9900   1.0000    .9900

PE ARRAY FOR I=   3
.4000   0.0000   0.0000   0.0000   0.0000   0.0000
 .9700   .4700    .0100    .5700    .2800   0.0000
 .9700   .9500    .8800    .9600    .8800    .6200
 .9600   .9700    .9800    .9400    .9800    .9700
 .9800   .9600    .9900    .9600    .9700    .9600
 .9700   .9300    .9900    .9500    .9600    .9800
 .9500   .9500    .9500    .9500    .9400    .9600
 .9600   .9800    .9700    .9700    .9200    .9400
 .9800   .9800    .9600    .9700    .9600    .9700

PE ARRAY FOR I=   4
.3400   0.0000   0.0000   0.0000   0.0000   0.0000
 .9600   .4000    .0100    .5700    .2500   0.0000
 .9600   .9400    .8000    .9500    .8400    .6800
 .9800   .9800    .9200    .9800    .9900    .9600
 .9900   .9700    .9600    .9800    .9000    .9600
 .9800   .9300    .9800    .9500    .9500    .9600
```

0000000000000000000000000000000000000000000000000000000000000000000000000011111111111111111111 COLUMN NOS.
0000000001111111111222222222233333333334444444444555555555566666666667777777788888888889999999999000000000011111111112
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890

LISTING 7-2 LONG FORM OF ECHO PRINTS - CONT'D

(PAGE 3 OF 17)

7-18

```
                                        0000000000011111111112222222222333333333344444444445555555555666666666677777777778888888888999999999900000000001111111111  COLUMN NOS.
                                        0000000000111111111122222222223333333333444444444455555555556666666666777777777788888888889999999999000000000011111111112
                                        1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890

        .9900  .9400  .9500  .9400  .9600  .9700  .9500
        .9400  .9800  .9700  .9500  .9800  .9800  .9700
        .9900  .9400  .9700  .9500  .9700  .9600  .9600
        .9700  .9600  .9700  .9700  .9500  .9500  .9800
PE ARRAY FOR  I=   5
        .1900  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        .6900  .5600   .2600   .5700   .2900   .1600   0.0000
        .6800  .6500   .7500   .7100   .6900   .5400   .2800
        .7400  .7500   .7300   .8000   .7200   .6700   .7100
        .6800  .6600   .7600   .7400   .7100   .7300   .7600
        .6900  .7800   .6800   .7100   .6600   .7500   .7800
        .7000  .7300   .6500   .7500   .7700   .7100   .7000
        .7100  .6800   .7100   .7300   .6700   .7500   .7000
        .7000  .6600   .6600   .7300   .7100   .7300   .7500
        .7200  .6800   .6400   .7300   .7100   .7000   .7500
PE ARRAY FOR  I=   6
        .1800  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        .6800  .5200   .2600   .5300   .2600   .1100   0.0000
        .7100  .7800   .7800   .7400   .7200   .5700   .2200
        .7000  .7200   .7400   .7100   .7300   .7200   .6500
        .6600  .7400   .7100   .7000   .7000   .7800   .7100
        .7100  .6800   .7000   .7700   .6900   .6600   .7400
        .6700  .6900   .6700   .6700   .7000   .7600   .6500
        .7700  .6600   .7400   .6600   .7000   .7100   .7000
        .7300  .7100   .7100   .7100   .6900   .6500   .7300
PE ARRAY FOR  I=   7
        .0600  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        .3800  .2100   .0700   .0100   .0700   .0200   0.0000
        .3600  .3900   .3900   .2300   .3600   .3100   .1100
        .4000  .3800   .3500   .4000   .4200   .4100   .3000
        .4200  .4300   .4100   .4500   .3200   .3100   .4500
        .4000  .4100   .3100   .4100   .3400   .2900   .3200
        .3400  .3800   .4200   .3700   .3700   .4300   .4000
        .4200  .3700   .3800   .2800   .3600   .3800   .2800
        .3600  .3100   .4600   .3800   .4600   .3500   .2700
        .3500  .3100   .4100   .3500
PE ARRAY FOR  I=   8
        .1000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        .3700  .2800   .0700   .1600   .1100   .0200   0.0000
        .4700  .4200   .3300   .3500   .3700   .2300   .0800
        .3300  .3800   .3400   .3100   .3600   .3600   .3200
        .3700  .4500   .3500   .3400   .3300   .3800   .2600
        .3300  .4100   .4200   .3400   .4100   .3400   .3600
        .3100  .3800   .3200   .3700   .3500   .4600   .3900
        .3600  .2600   .2600   .3700   .2800   .3600   .3700
        .3600  .3000   .4100   .3600   .3900   .4000   .3900
        .3700  .3500
PE ARRAY FOR  I=   9
        .0100  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

                                        0000000000011111111112222222222333333333344444444445555555555666666666677777777778888888888999999999900000000001111111111  COLUMN NOS.
                                        0000000000111111111122222222223333333333444444444455555555556666666666777777777788888888889999999999000000000011111111112
                                        1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890
```

LISTING 7-2 LONG FORM OF ECHO PRINTS - CONT'D

(PAGE 4 OF 17)

COLUMN NOS.

00000000001111111111111111111111111111
0000000001111111111222222222233333333334444444444555555555566666666667777777777888888888899999999990000000000111111111
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890

```
                .0500  .0400  .0100  0.0000  .0100  0.0000  0.0000  0.0000
                .0400  .0500  .0300  .0100   .0300  0.0000  0.0000  0.0000
                .0100  .1100  .0700  .0600   .0700  .0400   .0200   .0000
                .0200  .0600  .0300  .0500   .0200  .0500   .0500   .0500
                .0100  .0800  .0200  .0400   .0400  .0500   .0500   .0400
                .0600  .0700  .0400  .0800   .0400  .0300   .0500   .0800
                .0500  .0200  .0400  .0400   .0300  .0300   .0500   .0600
                .0600  .0500  .0200  .0500   .0300  .0300   .0500   .0600
                .0500  .0100  .0700  .0200   .0700  .0800   .0800   .0500
PE ARRAY FOR I= 10
  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
  .0600   .0100   .0100  0.0000  0.0000  0.0000  0.0000  0.0000
  .0800   .0700   .0400   .0400   .0400   .0100  0.0000  0.0000
  .1100   .0300   .0300   .0600   .0300   .0500   .0500   .0200
  .0300   .0600   .0700   .0400   .0400   .0400   .0400   .0200
  .0800   .0500   .0200   .0600   .0600   .0400   .0400   .0400
  .0500   .0600   .0800   .0400   .0200   .0400   .0400   .0400
  .0100   .0300   .0300   .0500   .0500   .0500   .0500   .0500
  .0400   .0700   .0700   .0200   .0200   .0100   .0100   .0400
  .0300   .0200   .0600   .0300   .0700   .0400   .0400   .0400
PF ARRAY FOR I= 11
  .2900   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
  .9200   .5000   .8000   .6600   .1900   0.0000  0.0000  0.0000
  1.0000  1.0000  .9900   .9800   .9200   .7000
  1.0000  1.0000  .9900   1.0000  .9900   1.0000  1.0000
  1.0000  .9900   .9900   1.0000  1.0000  1.0000
  .9900   .9900   1.0000  1.0000  1.0000  .9900
  .9900   1.0000  1.0000  .9900   1.0000  1.0000
  .9800   1.0000  .9900   1.0000  1.0000  1.0000
  1.0000  1.0000  1.0000  .9900   1.0000  1.0000
  1.0000  1.0000  1.0000  1.0000  1.0000  .9900
PF ARRAY FOR I= 12
  .3200   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
  .9900   .4700   .0100   .6000   .2400   0.0000  0.0000  0.0000
  1.0000  1.0000  .8800   1.0000  .9700   .8000
  .9900   1.0000  1.0000  1.0000  .9700   1.0000  1.0000
  1.0000  1.0000  1.0000  1.0000  1.0000  1.0000
  1.0000  1.0000  1.0000  1.0000  .9900   .9800
  1.0000  .9900   1.0000  1.0000  1.0000  1.0000
  .9900   1.0000  1.0000  1.0000  .9800   1.0000
  1.0000  1.0000  1.0000  1.0000  1.0000  .9900
PE ARRAY FOR I= 13
  .4000   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
  .9700   .4700   .0100   .5700   .2800   0.0000  0.0000  0.0000
  .9700   .9500   .8800   .9600   .8800   .6200
  .9600   .9700   .9800   .9400   .9800   .9700
  .9700   .9500   .9500   .9400   .9700   .9600
  .0500   .9300   .9900   .9500   .0600   .9800
```

LISTING 7-2 LONG FORM OF ECHO PRINTS - CONT'D

(PAGE 5 OF 17)

```
00000000000111111111112222222222333333333334444444444555555555556666666666777777777788888888889999999999000000000011111111111  COLUMN NOS.
0000000000111111111112222222222333333333344444444445555555555666666666677777777778888888888999999999900000000001111111111 2
12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890

                                           .9600   .0500   .9500   .9400   .9600
                                           .0700   .9700   .9500   .0200   .9400
                                           .9800   .9600   .9700   .9600   .9700
PE ARRAY FOR I=  14
 .3400   0.0000   0.0000   .9500   .9500   .9400   .9600
 .0600    .8600    .0100   .8800   .5700   .2500   .6800
 .9600    .9500    .9400   .9200   .9500   .8400   .9600
 .9400    .9800    .9800   .9200   .9800   .9900   .9600
 .9900    .9700    .9800   .0600   .9800   .9900   .9500
 .0800    .9500    .9300   .0800   .9500   .9800   .9700
 .9900    .9300    .9500   .9600   .9600   .9500   .9600
 .9400    .9500    .9700   .9400   .9800   .9800   .9700
 .9800    .9700    .9700   .9500   .9700   .9600   .9600
 .9900    .9400    .9400   .9500   .9500   .9600   .9800
 .9700    .9600    .9700   .9700   .9500   .9500   .9800

PE ARRAY FOR I=  15
 .1900   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
 .5600    .2600    .5700   .2900   .1600   .5400   .2800
 .6500    .7500    .7800   .5700   .2900   .5400   .7100
 .6500    .7500    .7100   .6000   .5400   .7100   .7100
 .7400    .7600    .8000   .7200   .6700   .7300   .7600
 .6600    .7600    .7400   .7100   .7300   .7100   .7800
 .7800    .6800    .6600   .6600   .7100   .7500   .7000
 .7300    .6500    .7500   .7700   .7500   .7300   .7500
 .6800    .7100    .6700   .6700   .7300   .7000   .7500
 .7400    .7400    .7300   .7300   .6700   .7300   .7500
 .7200    .6800    .6400   .7300   .7100   .7000   .7000

PE ARRAY FOR I=  16
 .1800   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
 .6800    .5200    .5300   .2600   .1100   .5700   .2200
 .7100    .7800    .7400   .7200   .5700   .7200   .6500
 .7000    .8000    .7100   .7300   .7800   .6600   .7100
 .6600    .7200    .7000   .7000   .6600   .7400   .6500
 .7100    .6800    .6900   .6900   .7600   .7000   .7400
 .7500    .7500    .7700   .7000   .6600   .7800   .6500
 .6700    .6500    .6700   .6600   .7100   .6500   .7400
 .7700    .6900    .7400   .6900   .6500   .7000   .6500
 .6700    .6500    .6900   .7000   .7600   .7100   .7000
 .7300    .7100    .7100   .6900   .6500   .6500   .7300

PE ARRAY FOR I=  17
 .0600   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
 .3800    .2100    .0100   .2300   .0700   .0200   .1100
 .3600    .3900    .2300   .4000   .3600   .3100   .3000
 .4000    .3800    .3500   .4000   .4200   .4100   .4500
 .4200    .4300    .4100   .4500   .3200   .3100   .3200
 .4000    .4100    .3100   .4100   .4200   .2900   .4000
 .3400    .3800    .4200   .3700   .3400   .4300   .4000
 .4200    .3700    .3800   .2800   .3700   .3800   .2800
 .3600    .3100    .4600   .3800   .3600   .3800   .2800
 .3500    .3100    .4100   .3500   .4600   .3500   .2700

PE ARRAY FOR I=  18
 .1000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
 .3700    .2800    .0700   0.0000   0.0000   0.0000   0.0000
```

```
00000000000111111111112222222222333333333334444444444555555555556666666666777777777788888888889999999999000000000011111111111  COLUMN NOS.
0000000000111111111112222222222333333333344444444445555555555666666666677777777778888888888999999999900000000001111111111 2
12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890
```

LISTING 7-2 LONG FORM OF ECHO PRINTS - CONT'D

(PAGE 6 OF 17)

COLUMN NOS.

```
000000000011111111112222222222333333333344444444445555555555666666666677777777778888888888999999999900000000001111111111111
000000000011111111112222222222333333333344444444445555555555666666666677777777778888888888999999999900000000001111111111112
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890
```

```
 .4700  .4200  .3300  .1600  .3300  .1100  .0200  0.0000
 .3300  .3800  .3400  .3500  .3100  .3700  .2300  .0800
 .3700  .4700  .3500  .3100  .3600  .3300  .3800  .3200
 .3300  .4500  .4200  .3100  .4200  .3300  .3800  .2600
 .3100  .4100  .3200  .3400  .3200  .4100  .3400  .3600
 .3600  .3800  .2600  .3400  .2600  .3500  .4600  .3900
 .3600  .3100  .3000  .3700  .3000  .3800  .3600  .3700
 .3700  .3500  .4100  .3700  .4100  .2800  .4000  .3900
```

PE ARRAY FOR I=   19

```
-.0100   0.0000   .0000   .0000   .0000   .0000  0.0000
 .0500    .0100   .0400   .0100   .0500   .0500  0.0000
 .0400    .0300   .0800   .0600   .0400   .0500  0.0000
 .0100    .0700   .0600   .0400   .0100   .0200   .0500
 .0100    .0300   .0400   .0800   .0600   .0500   .0400
 .0600    .0200   .0800   .0300   .0300   .0500   .0800
 .0500    .0400   .0300   .0400   .0500   .0500   .0600
 .0600    .0500   .0200   .0200   .0300   .0600   .0600
 .0500    .0100   .0700   .0600   .0400   .0800   .0500
```

PE ARRAY FOR I=   20

```
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
-.0600   -.0300  -.0400  -.0300  -.0600   .0000  0.0000
-.0800    .0300  -.0400  -.0300  -.0100  -.0100  0.0000
-.1100    .0700  -.0300  -.0600  -.0600  -.0500   .0200
-.0300    .0600  -.0700  -.0300  -.0400  -.0400   .0400
-.0800    .0200  -.0400  -.0400  -.0600  -.0400   .0400
-.0500    .0600  -.0200  -.0200  -.0400  -.0500   .0500
-.0100    .0700  -.0800  -.0800  -.0500  -.0100   .0400
-.0400    .0100  -.0300  -.0300  -.0200  -.0400   .0400
```

PE ARRAY FOR I=   21

```
 .2900   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
1.0000    .5000   .8900   .6600   .1900   .9200   .7000
1.0000   1.0000   .9000   .9800  1.0000  1.0000  1.0000
1.0000   1.0000   .9900   .9900   .9900   .9900  1.0000
 .9900    .9900  1.0000  1.0000  1.0000  1.0000  1.0000
1.0000   1.0000   .9900   .9900  1.0000  1.0000   .9900
 .9900    .9800   .9900   .9900   .9900   .9900  1.0000
1.0000   1.0000   .9900   .9900  1.0000  1.0000  1.0000
1.0000   1.0000  1.0000  1.0000   .9900   .9900  1.0000
```

PE ARRAY FOR I=   22

```
 .3200   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 .9900    .4700   .0100   .6900   .2400   .9700   .8000
1.0000   1.0000   .9800  1.0000  1.0000  1.0000  1.0000
 .9900   1.0000  1.0000  1.0000  1.0000   .9700  1.0000
1.0000   1.0000  1.0000  1.0000  1.0000  1.0000  1.0000
1.0000   1.0000  1.0000  1.0000  1.0000   .9900   .9800
1.0000    .9900  1.0000  1.0000  1.0000  1.0000  1.0000
1.0000   1.0000  1.0000  1.0000  1.0000  1.0000  1.0000
```

COLUMN NOS.

```
000000000011111111112222222222333333333344444444445555555555666666666677777777778888888888999999999900000000001111111111111
000000000011111111112222222222333333333344444444445555555555666666666677777777778888888888999999999900000000001111111111112
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890
```

LISTING 7-2 LONG FORM OF ECHO PRINTS – CONT'D

(PAGE 7 OF 17)

```
            .9900  1.0000  1.0000  1.0000  1.0000  1.0000   .9800  1.0000
           1.0000  1.0000  1.0000   .9900   .9900   .9900  1.0000   .9900
PE ARRAY FOR I=  23
            .4000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
            .9700   .9100   .4700   .0100   .8800   .5700   .2500  0.0000
            .9700   .9600   .9500   .8800   .9200   .9500   .8400   .6200
            .0600   .0500   .9700   .9800   .9600   .9800   .8800   .9700
            .9800   .9900   .9500   .9500   .9800   .9400   .9800   .9600
            .9700   .9500   .9600   .9000   .9400   .9600   .9700   .9800
            .9500   .9700   .9600   .9900   .9500   .9500   .9400   .9600
            .9600   .9300   .9500   .9500   .9500   .9200   .9400
            .0700   .9900   .9800   .9700   .9700   .9500
            .0800   .9600   .9800   .9600   .9700

PE ARRAY FOR I=  24
            .3400  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
            .9600   .8600   .4000   .0100   .5700   .5700   .2500  0.0000
            .0600   .9500   .9400   .8800   .9500   .9500   .8400   .6800
            .9400   .9600   .9800   .9200   .9800   .9600   .9900   .9600
            .9900   .0700   .9700   .9800   .9500   .9800   .9500   .9600
            .9800   .9500   .9300   .9600   .9500   .9500   .0700   .9500
            .0900   .9400   .9500   .9400   .9600   .9600   .9800   .9700
            .0400   .9800   .9700   .9500   .9800   .9700   .9600   .9600
            .9900   .9400   .9700   .9500   .9700   .9500   .9500   .9800
            .9700   .9600   .9700   .9700

PE ARRAY FOR I=  25
            .1900  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
            .6900   .5600   .2600   .5700   .2900   .1600   .2800  0.0000
            .6600   .6500   .7500   .7100   .6900   .5400   .7100   .6800
            .7400   .7500   .7300   .8000   .7200   .6700   .7600   .9600
            .6800   .6600   .7600   .7400   .7100   .7300   .7800   .9500
            .6900   .7800   .6800   .7100   .6600   .7100   .7000   .9700
            .7000   .7300   .6500   .7500   .7700   .7500   .7000   .9600
            .7100   .6800   .7100   .7300   .6700   .7300   .7500   .9800
            .7000   .7400   .6600   .7300   .7100   .7000
            .7200   .6800   .6400

PE ARRAY FOR I=  26
            .1800  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
            .6800   .5200   .2600   .5300   .2600   .1100   .2200  0.0000
            .7100   .7800   .7800   .7400   .7200   .5700   .6500   .2200
            .7000   .8000   .7200   .7100   .7300   .7200   .7100   .6500
            .6600   .7200   .7400   .6900   .7000   .7800   .7400   .7100
            .7100   .6800   .7300   .7700   .6900   .6600   .6500   .7400
            .7500   .7500   .6800   .6700   .7000   .7600   .7000   .6500
            .6700   .6500   .6900   .6700   .7400   .7100   .7300   .7000
            .7700   .8100   .6600   .7400   .6600   .6500   .7300
            .7300   .7100   .6900   .7100

PE ARRAY FOR I=  27
            .0600  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
            .3800   .2100   .0700   .0100   .0700   .0200  0.0000  0.0000
            .3600   .3900   .3000   .2300   .0700
```

LISTING 7-2 LONG FORM OF ECHO PRINTS - CONT'D

(PAGE 8 OF 17)

```
                                .4000  .3500  .4000  .3600  .3100  .1100
                                .4200  .0000  .4500  .4200  .4100  .3000
                                .4000  .0000  .4100  .4000  .3100  .4500
                                .3400  .3700  .3800  .3700  .2900  .3200
                                .4200  .2800  .3100  .4300  .3800  .4000
                                .3600  .3800  .3600  .3600  .3600  .2800
                                .3500  .4600  .3500  .4600  .3500  .2700

PE ARRAY FOR I=  28
.1000   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
.3700   .2800   .0700   0.0000  .1100   .0200   0.0000  .0000
.4700   .4200   .3300   .1600   .3700   .2300   .0800   .0800
.3300   .3800   .3400   .3500   .3600   .3600   .3200   .3200
.3700   .4700   .3500   .3100   .3300   .3400   .3600   .2600
.3300   .4500   .4200   .3400   .4100   .4600   .3400   .3600
.3100   .4100   .3200   .3400   .3500   .3600   .4100   .3900
.3600   .3800   .2600   .2600   .3800   .4000   .3500   .3700
.3600   .3100   .3000   .3700   .2800   .3600   .3900
.3700   .3500   .4100   .3700   .4000   .3900

PE ARRAY FOR I=  29
.0100   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
.0500   .0400   .0100   0.0000  .0100   .0000   0.0000  .0000
.0400   .0500   .0300   .0100   .0400   .0500   .0500   .0400
.0100   .1100   .0700   .0600   .0300   .0500   .0500   .0800
.0200   .0600   .0300   .0500   .0700   .0500   .0500   .0600
.0100   .0800   .0200   .0400   .0400   .0600   .0500   .0600
.0600   .0700   .0400   .0800   .0600   .0300   .0500   .0600
.0500   .0200   .0300   .0400   .0300   .0300   .0600   .0500
.0500   .0500   .0300   .0300   .0200   .0300   .0600
.0500   .0100   .0700   .0600   .0400   .0800   .0500

PE ARRAY FOR I=  30
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
.0600   .0300   .0100   0.0000  0.0000  .0100   0.0000  0.0000
.0800   .0300   .0700   .0400   .0600   .0500   .0500   .0200
.1100   .0300   .0200   .0300   .0600   .0400   .0400   .0200
.0300   .0600   .0700   .0400   .0400   .0400   .0400   .0400
.0800   .0500   .0200   .0600   .0600   .0400   .0600   .0800
.0500   .0600   .0800   .0400   .0400   .0500   .0500   .0600
.0100   .0700   .0300   .0200   .0500   .0500   .0100   .0400
.0400   .0100   .0700   .0200   .0200   .0100   .0400
.0300   .0200   .0600   .0800   .0200   .0400   .0500

PE ARRAY FOR I=  31
.2900   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
1.0000  .5000   .0200   0.0000  0.0000  .1900   0.0000  0.0000
1.0000  1.0000  1.0000  .6600   .9800   .9200   .9900   .7000
1.0000  1.0000  1.0000  .9800   1.0000  .9900   1.0000  1.0000
1.0000  .9900   1.0000  1.0000  1.0000  1.0000  1.0000  1.0000
.9900   .9900   .9900   .9900   .9900   1.0000  1.0000  .9900
.9900   1.0000  1.0000  1.0000  1.0000  1.0000  1.0000  1.0000
1.0000  1.0000  .9900   1.0000  1.0000  1.0000  1.0000  1.0000
1.0000  .9800   1.0000  1.0000  1.0000  1.0000  1.0000
.9900   1.0000  1.0000  1.0000  1.0000  1.0000  1.0000
```

LISTING 7-2 LONG FORM OF ECHO PRINTS – CONT'D

(PAGE 9 OF 17)

```
0000000000111111111122222222223333333333444444444455555555556666666666777777777788888888889999999999000000000011111111111111
0000000011111111112222222222333333333344444444445555555555666666666677777777778888888888999999999900000000001111111111111112
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890
```

```
                 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000  .9900 1.0000
PE ARRAY FOR I=  32
         .3200  0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
         .9500   .4700  .0100  .0800  .6900  .2400 0.0000 0.0000
        1.0000  1.0000  .0800  .6900 1.0000  .9700  .8000
        1.0000  1.0000 1.0000 1.0000 1.0000  .9700 1.0000
        1.0000  1.0000 1.0000 1.0000 1.0000 1.0000 1.0000
        1.0000   .9900 1.0000 1.0000 1.0000  .9900  .9800
        1.0000  1.0000 1.0000 1.0000 1.0000 1.0000 1.0000
         .9900  1.0000 1.0000 1.0000 1.0000  .9800 1.0000
        1.0000  1.0000 1.0000 1.0000 1.0000 1.0000  .9900

PE ARRAY FOR I=  33
         .4000  0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
         .9700   .4700  .0100  .5700  .2800  .8800  .6200
         .9700   .9500  .8800  .9600  .8800  .9700  .9700
         .9600   .9700  .9800  .9400  .9800  .9700  .9600
         .9800   .9500  .9500  .9600  .9700  .9800  .9800
         .9700   .9600  .9900  .9500  .9600  .9400  .9600
         .9500   .9300  .9500  .9500  .9500  .9600  .9800
         .9600   .9500  .9900  .9700  .9400  .9400  .9400
         .9700   .9700  .9700  .9500  .9700  .9200  .9600
         .9800   .9800  .9600  .9600  .9700  .9600  .9700

PE ARRAY FOR I=  34
         .3400  0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
         .9600   .8600  .0100  .5700  .2500  .6800
         .9600   .0500  .8800  .9500  .8400  .9600
         .9400   .9400  .9200  .9800  .9900  .9600
         .9800   .9800  .9600  .9500  .9500  .9600
         .9800   .9700  .9800  .9700  .9700  .9500
         .9400   .9300  .9400  .9800  .9800  .9700
         .9900   .9500  .9500  .9800  .9600  .9700
         .9700   .9700  .9500  .9700  .9600  .9800
         .9400   .9400  .9500
         .9700   .9600

PE ARRAY FOR I=  35
         .1900  0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
         .6900   .5600  .5700  .2900  .1600  .5400  .2800
         .6800   .6500  .7100  .6900  .5400  .6700  .7100
         .7400   .7500  .8000  .7200  .6700  .7300  .7600
         .6800   .6600  .7400  .7100  .6600  .7100  .7800
         .6900   .7800  .7100  .6600  .7500  .7100  .7000
         .7000   .7300  .7500  .7700  .7700  .7500  .7000
         .7100   .6800  .7300  .7300  .6700  .7300  .7500
         .7000   .7400  .7000  .7100
         .7200   .6800

PE ARRAY FOR I=  36
         .1800  0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
         .6800   .5200  .2600  .5700  .2600  .1100 0.0000
         .7100   .7800  .5300  .2600  .5300  .5700  .2200
         .7000   .8000  .7400  .7200  .7200
```

```
0000000000111111111122222222223333333333444444444455555555556666666666777777777788888888889999999999000000000011111111111111
0000000011111111112222222222333333333344444444445555555555666666666677777777778888888888999999999900000000001111111111111112
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890
```

LISTING 7-2 LONG FORM OF ECHO PRINTS - CONT'D

(PAGE 10 OF 17)

```
           .6600   .7200   .7400   .7100   .7300   .7100   .7200   .6500
           .7100   .6800   .7300   .6900   .7000   .6900   .7800   .7100
           .7500   .7500   .6800   .7700   .6900   .7700   .6600   .7400
           .6700   .6500   .6900   .7700   .6600   .7400   .7600   .6500
           .7700   .8100   .6600   .7400   .6600   .7000   .7100   .7000
           .7300   .7100   .6900   .7100   .6900   .6500   .7300   .7300

PE ARRAY FOR I=  37
  .0600   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
  .3800    .2100   .0700   .0100   .0100   .0700   .0200   0.0000
  .3600    .3900   .3300   .2300   .3600   .3900   .0700   0.0000
  .4000    .3500   .3400   .4000   .4200   .3500   .3100   .1100
  .4000    .4100   .3500   .4500   .3400   .4200   .4100   .3000
  .3400    .4500   .4200   .3700   .3300   .3300   .3200   .4500
  .4200    .3200   .2600   .2800   .3400   .3400   .2900   .3200
  .3600    .3700   .3000   .3800   .3700   .3700   .4300   .3600
  .3500    .3100   .4100   .3500   .4600   .4600   .3500   .2700

PE ARRAY FOR I=  38
  .1000   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
  .3700    .2800   .0700   .1600   .1100   .2300   .0200   0.0000
  .4700    .4200   .3300   .3500   .3700   .3700   .0200   0.0000
  .3300    .3800   .3400   .3100   .3600   .3600   .2300   .0800
  .3700    .4700   .3500   .3100   .3300   .3800   .3600   .3200
  .3300    .4500   .4200   .3400   .4100   .3400   .3800   .2600
  .3100    .4100   .2600   .3700   .3500   .3500   .4600   .3600
  .3600    .3800   .3000   .3700   .3800   .3800   .3600   .3900
  .3700    .3500   .4100   .3500   .2800   .4600   .4000   .3700
                                                                   .3900

PE ARRAY FOR I=  39
  .0100   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
  .0500    .0400   .0100   .0100   .0500   .0500   0.0000  0.0000
  .0400    .0500   .0300   .0600   .0400   .0500   .0200   0.0000
  .0100    .1100   .0700   .0300   .0500   .0500   .0100   0.0000
  .0200    .0600   .0200   .0400   .0600   .0500   .0500   .0500
  .0100    .0800   .0400   .0500   .0300   .0500   .0400   .0400
  .0600    .0700   .0300   .0800   .0300   .0500   .0400   .0600
  .0F00    .0200   .0300   .0400   .0300   .0500   .0600   .0800
  .0500    .0500   .0300   .0400   .0400   .0800   .0600   .0700
  .0500    .0100   .0700   .0200   .0400   .0400   .0500   .0900

PE ARRAY FOR I=  40
 0.0000   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
  .0600    .0300   .0100   .0000   .0000   .0100   0.0000  0.0000
  .0800    .0300   .0700   .0400   .0000   .0500   0.0000  0.0000
  .1100    .0300   .0200   .0300   .0100   .0100   .0500   0.0000
  .0300    .0600   .0700   .0300   .0500   .0500   .0400   .0200
  .0800    .0500   .0200   .0400   .0400   .0400   .0400   .0200
  .0500    .0600   .0400   .0600   .0400   .0400   .0600   .0400
  .0100    .0700   .0300   .0200   .0400   .0400   .0500   .0400
  .0400    .0100   .0700   .0200   .0500   .0500   .0500   .0500
  .0300    .0200   .0600   .0300   .0200   .0400   .0800   .0400
```

LISTING 7-2 LONG FORM OF ECHO PRINTS - CONT'D

(PAGE 11 OF 17)

7-26

PE ARRAY FOR I=   41

.2000	0.0000	0.0000	0.0000	0.0000	0.0000
.0100	.8900	.5000	.8500	.6600	.1900
.8800	.8700	.9400	.8400	.8700	.8700
.8900	.8800	.9300	.9400	.8700	.7000
.8900	.9000	.8900	.9300	.9000	.8700
.8900	.8000	.8200	.9300	.9000	.9000
.9100	.9000	.9000	.8400	.8300	.8400
.8800	.8500	.8500	.9300	.9400	.9100
.9000	.8700	.8700	.8400	.8700	.8500
.9200	.9000	.8900	.8500	.8800	.9200

PE ARRAY FOR I=   42

.3200	0.0000	0.0000	0.0000	0.0000	0.0000
.8900	.4700	.0100	.9500	.6900	.2400
.9300	.9100	.9500	.9100	.9100	.9000
.9300	.9500	.9300	.9100	.9100	.9300
.9100	.9200	.9400	.9200	.9200	.8400
.9300	.9400	.9300	.9300	.9500	.9000
.9400	.9100	.9300	.9500	.9600	.9100
.9100	.9600	.9000	.9100	.9500	.9400
.9100	.9400	.8800	.9500	.8900	.9600
.9100	.9100	.9000	.9100	.9700	.9400
.9100	.9300	.9500	.9100		

PE ARRAY FOR I=   43

.4000	0.0000	0.0000	0.0000	0.0000	0.0000
.6000	.4700	.0100	.5700	.2800	.6200
.7100	.6700	.7700	.6900	.7700	.7800
.6900	.6700	.6900	.6500	.7000	.7200
.7100	.7100	.6200	.7000	.8200	.6800
.7200	.7700	.7500	.7100	.7300	.6800
.7100	.6900	.6300	.7000	.6300	.6600
.5800	.8000	.6500	.7300	.6700	.6700
.7000	.5700	.6700	.6700	.7700	.6800
.7400	.7600	.6700			

PE ARRAY FOR I=   44

.3400	0.0000	0.0000	0.0000	0.0000	0.0000
.6800	.4000	.0100	.5700	.2500	.6800
.7500	.6400	.7300	.7000	.7200	.7000
.6800	.8000	.7000	.7900	.7600	.7100
.7400	.7600	.6700	.7200	.7400	.7100
.6500	.7000	.7100	.7400	.6300	.7200
.7500	.7700	.7100	.7600	.7300	.6700
.6900	.6600	.6200	.7600	.7400	.6700
.7200	.6600	.7600	.7400	.7600	.6800
.6900	.7300	.7400	.6400	.7700	

PF ARRAY FOR I=   45

.1900	0.0000	0.0000	0.0000	0.0000	0.0000
.2900	.2600	.0100	.2900	.1600	.0000
.2700	.3200	.3300	.2900	.2900	.2800
.3600	.3200	.2600	.2200	.2900	.2800
.3200	.3900	.3600	.3400	.2800	.2700

LISTING 7-2 LONG FORM OF ECHO PRINTS - CONT'D

(PAGE 12 OF 17)

```
         .2800   .2900   .3400   .3000   .2700   .3300   .3400
         .2800   .2800   .3100   .2700   .2300   .2500   .3100
         .2800   .3200   .2600   .3200   .3800   .1100   .2900
         .2700   .2500   .2400   .2900   .2800   .2700   .2400
         .2500   .3400   .2900   .3600   .2900   .3300   .3000
PE ARRAY FOR I=  46
         .1800  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         .2500   .2700   .2600   .0000   .0000   .1100  0.0000
         .2600   .3600   .3200   .2900   .2600   .2700   .2200
         .3100   .3800   .3600   .2200   .3200   .2900   .1900
         .3300   .3000   .2900   .3200   .3000   .2900   .2800
         .2900   .2800   .2700   .2700   .2900   .2800   .2300
         .3000   .2600   .2700   .3800   .3300   .2500   .2300
         .2700   .2500   .2800   .3400   .2500   .2900   .2800
         .3600   .4000   .2200   .3000   .2100   .3600   .2300
         .3100   .2900   .2600   .2900   .3100   .2700   .2600
PE ARRAY FOR I=  47
         .0600  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         .0600   .0700   .0100   .0000   .0000   .0200  0.0000
         .1000   .0800   .1000   .1000   .0700   .1100   .1100
         .1000   .1000   .1200   .1200   .1300   .1100   .0700
         .0700   .1800   .1500   .1500   .0800   .1500   .0800
         .1100   .0500   .1300   .1300   .1400   .0700   .0700
         .0900   .1000   .1100   .1100   .1100   .0800   .1100
         .0900   .0500   .0800   .0800   .0800   .1200   .1100
         .1200   .1400   .1200   .0600   .0600   .1000   .0700
         .0600   .1600   .1000   .1000   .1500   .1100   .0600
PE ARRAY FOR I=  48
         .1000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         .1800   .0700   .0900   .1100   .0800  0.0000
         .1400   .1400   .1000   .0900   .0800   .0800
         .0700   .1300   .1000   .1000   .1100   .0700
         .1000   .0800   .1200   .1000   .1100   .0700
         .1000   .1300   .1200   .0400   .1200   .0500
         .0800   .0300   .0900   .0900   .1000   .0700
         .1300   .0700   .0500   .0900   .1600   .0900
         .0300   .0700   .0600   .0700   .1300   .1200
         .0700   .1000   .0600   .0700   .0900   .0600
PE ARRAY FOR I=  49
         .0100  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        0.0000   .0100  0.0000  0.0000  0.0000  0.0000  0.0000
         .0200   .0200   .0000   .0000   .0000   .0000  0.0000
         .0100   .0100   .0100  0.0000   .0100   .0100  0.0000
        0.0000   .0000   .0100   .0000   .0100   .0200  0.0000
         .0100   .0100  0.0000   .0100   .0100   .0100   .0100
         .0100   .0100  0.0000   .0100   .0100   .0200   .0100
         .0200   .0000  0.0000  0.0000   .0100   .0100   .0100
        0.0000  0.0000  0.0000  0.0000   .0000   .0100   .0100
PE ARRAY FOR I=  50
```

LISTING 7-2 LONG FORM OF ECHO PRINTS - CONT'D

(PAGE 13 OF 17)

```
0000000000011111111112222222222333333333344444444445555555555666666666677777777778888888888999999999900000000001111111111 COLUMN NOS.
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890
```

PE ARRAY FOR I=   51

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
.2900	.5000	.8900	.0100	.0100	.0100	.0100
.9100	.9400	.8700	.0100	.0100	.0200	0.0000
.8800	.9300	.8800	0.0000	.0200	.0200	.0200
.8900	.8900	.9000	.0100	.0200	.0100	.0100
.8900	.8200	.8900	0.0000	.0100	.0100	0.0000
.8800	.9000	.8300	.0100	.0100	0.0000	.0100
.9100	.8500	.9400	0.0000	.0100	.0100	0.0000
.8800	.8700	.8700	.0300	.0300	0.0000	.0100
.9200	.8900	.8800	0.0000			

PE ARRAY FOR I=   52

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
.8900	.4700	.9500	.0100	0.0000	0.0000	0.0000
.9100	.9100	.9500	.6600	.1900	.0000	0.0000
.9100	.9300	.9100	.8800	.8700	.7000	
.9300	.9200	.9400	.9000	.9300	.8700	
.9600	.9400	.9200	.9200	.9000	.9000	
.9600	.9100	.9300	.9500	.9600	.9100	
.9400	.9000	.8800	.9100	.9500	.9400	
.9100	.9200	.8800	.9500	.8900	.9600	
.9100	.9300	.9500	.9100	.9700	.9400	

PE ARRAY FOR I=   53

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
.7700	.4700	.7700	.0100	0.0000	0.0000	0.0000
.7400	.6700	.7700	.5700	.2800	0.0000	0.0000
.6800	.6700	.6900	.6900	.7700	.7800	.6200
.6500	.6800	.7400	.6500	.7000	.7200	.7800
.7300	.7100	.6200	.7000	.8200	.6800	.7200
.7300	.7700	.7500	.7100	.7300	.6600	.6800
.8000	.6900	.7000	.7000	.6300	.6600	.6600
.5700	.6700	.6500	.7300	.6700	.6700	.6700
.7600	.6700	.6700	.6700	.7700	.9400	.6800

PE ARRAY FOR I=   54

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
.6600	.4000	.7300	.0100	0.0000	0.0000	0.0000
.7100	.6400	.7000	.5700	.2500	0.0000	
.6700	.8000	.7000	.7000	.7200	.6800	
.6600	.7600	.6900	.7900	.7600	.7900	
	.7000	.7100	.7200	.7400	.7100	

```
0000000000011111111112222222222333333333344444444445555555555666666666677777777778888888888999999999900000000001111111111 COLUMN NOS.
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890
```

LISTING 7-2 LONG FORM OF ECHO PRINTS - CONT'D

(PAGE 14 OF 17)

```
        .7500   .6200   .7700   .7100   .7400   .6300   .7100
        .6900   .8100   .6600   .6200   .7600   .7300   .7200
        .7200   .7000   .6600   .7600   .7400   .7400   .6700
        .6900   .6500   .7300   .7400   .6400   .7600   .7000

PE ARRAY FOR I=  55
        .1900  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        .2900   .2000   .2600   .3300   .2900   .1600  0.0000
        .2700   .2600   .3200   .2600   .2200   .2700   .2800
        .3600   .2900   .3200   .3600   .3400   .2800   .2700
        .3200   .3200   .3900   .2900   .2700   .3300   .3400
        .2800   .2900   .3400   .2700   .2300   .2500   .3400
        .2800   .2800   .3100   .3800   .3800   .2900   .2400
        .2800   .3200   .2600   .3400   .3000   .3600   .2200
        .2700   .2500   .2400   .3000   .2800   .3100   .3000
        .2500   .3400   .2900   .3600   .2900   .3300   .3000

PE ARRAY FOR I=  56
        .1800  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        .2500   .2700   .2600   .2900   .2600   .1100  0.0000
        .2600   .3600   .3200   .2200   .3200   .2700   .2200
        .3100   .3800   .3600   .3200   .3000   .2900   .1900
        .3300   .3000   .2900   .3200   .2900   .2800   .2800
        .3000   .2800   .2700   .2700   .3300   .2500   .2300
        .2700   .2600   .2800   .3400   .2500   .2900   .2800
        .2500   .2500   .2500   .3000   .2100   .3600   .2300
        .3100   .2900   .2600   .2900   .3100   .2700   .2600

PE ARRAY FOR I=  57
        .0600  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        .1400   .0600   .0700   .0100   .0700   .0200  0.0000
        .1500   .1000   .0800   .1000   .1300   .1100   .1100
        .1000   .1100   .1000   .1200   .0800   .1500   .0700
        .0900   .0700   .1800   .1500   .0800   .0800   .0800
        .1200   .1100   .0500   .1300   .1400   .0700   .0700
        .1400   .0900   .1000   .1100   .1100   .0800   .1100
        .0400   .0900   .0500   .0800   .0600   .1200   .0700
        .0700   .1200   .1400   .1200   .0600   .1000   .0700
        .1200   .0600   .1600   .1000   .1500   .1100   .0600

PE ARRAY FOR I=  58
        .1000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        .0900   .1800   .0700   .0900   .1100   .0200  0.0000
        .1400   .1400   .0900   .1000   .0700   .0800   .0800
        .1000   .0700   .1300   .1200   .1000   .1100   .0700
        .1000   .1000   .0800   .1200   .0400   .1200   .0500
        .0500   .1000   .1300   .0900   .0900   .1000   .0700
        .0400   .0800   .0300   .0500   .0900   .1000   .0700
        .1000   .1300   .0700   .0600   .0700   .1600   .0900
        .1200   .0300   .0700   .0600   .0700   .1300   .1200
        .0700   .1000   .0600   .0900   .1100   .0600   .0600

PE ARRAY FOR I=  59
        .0100  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
```

LISTING 7-2 LONG FORM OF ECHO PRINTS - CONT'D

(PAGE 15 OF 17)

```
0.0000    .0100    0.0000    0.0000    0.0000    0.0000    0.0000
.0200     .0200    .0000     .0000     .0000     .0000     0.0000
0.0000    .0100    .0200     .0000     .0000     .0000     0.0000
0.0000    .0100    .0100     .0100     .0100     .0100     .0100
.0100     .0100    .0100     .0100     .0100     .0100     .0100
.0200     .0000    .0000     .0000     .0200     .0100     .0100
0.0000    .0100    .0000     .0000     .0000     .0100     .0100
0.0000    .0100    .0100     .0000     .0100     .0100     .0000

PE ARRAY FOR I=  60
0.0000    0.0000   0.0000    0.0000    0.0000    0.0000    0.0000
.0100     .0100    .0100     .0100     .0100     .0000     0.0000
.0200     .0100    .0100     .0100     .0100     .0200     .0100
.0100     0.0000   0.0000    .0200     .0200     .0200     .0100
0.0000    .0200    .0100     .0200     .0200     .0100     .0100
.0200     .0000    0.0000    .0200     .0200     .0100     .0000
.0100     .0200    .0100     .0100     .0100     .0100     .0100
0.0000    .0000    0.0000    0.0000    0.0000    0.0000    0.0000
.0000     .0100    .0300     .0000     0.0000    .0000     .0100
.0300     .0300    .0000     .0100     .0300     .0100     .0100

16
0.0000    .9500    .0000     .8000     .8000     .6000     .6000
500.0000  .9000    .9500     .7500     .7500     .5500     .5500
1000.0000 .8500    .0000     .7000     .8000     .4000     .4000
1500.0000 .9000    .0500     .6000     .6000     .3000     .3000
2000.0000 .8000    .8500     .6500     .7500     .3000     .3000
2500.0000 .7500    .7000     .6000     .7000     .1500     .1500
3000.0000 .7000    .6500     .5000     .6000     .0500     .0500
3500.0000 .6500    .6000     .4500     0.0000    0.0000    0.0000
4000.0000 .6000    .5500     .4000     0.0000    0.0000    0.0000
4500.0000 .5500    .5000     .3500     0.0000    0.0000    0.0000
5000.0000 .5000    .4500     .3000     0.0000    0.0000    0.0000
5500.0000 .5000    .4000     .2500     0.0000    0.0000    0.0000
6000.0000 .4000    .3500     .2000     0.0000    0.0000    0.0000
6500.0000 .3500    .3000     .1500     0.0000    0.0000    0.0000
7000.0000 .3000    .2500     .1000     0.0000    0.0000    0.0000
9000.0000 .2000    .1000     0.0000    0.0000    0.0000    0.0000
0.0000    0.0000   0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000   0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000   0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000   0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000   0.0000    0.0000    0.0000    0.0000    0.0000
90.0000   150.0000 300.0000  9000.0000
30.0000   .5000    .8000     .7000     .9500     .6000     0.0000
.7000     .4500    .7500     .7000     1.0000    .3000     0.0000
.6000

e
0.0000    1000.0000 1500.0000 2000.0000 2500.0000 3000.0000 9000.0000
500.0000  .1300     .1500     .1600     .1700     .1800     0.0000
.0700     .8200     .7800     .7600     .7400     .7300     0.0000
.9000     .0500     .0700     .0800     .0900     .0900     0.0000
20.0000   0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
```

LISTING 7-2 LONG FORM OF ECHO PRINTS - CONT'D

(PAGE 16 OF 17)

7-31

```
00000000000000000000000000000000000000000000000000000000000000000000000000111111111111111111111  COLUMN NOS.
00000000001111111111222222222233333333334444444444555555555566666666667777777777888888888899999999990000000000111111111112
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890

0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
69.1900  69.1900  69.1900  46.3200  46.3200  46.3200  46.3200
0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
9
0.0000    .1250    .2500    .3750    .5000    .6250    .7500    .8750   1.0000   0.0000
0.0000   5.0000  10.0000  18.0000  24.0000  36.0000  52.0000  87.0000  174.0000  0.0000
75.0000  75.0000  75.0000  75.0000  75.0000
181.0000  .9150   .9750    .9750    .9750
2

**************************** END OF DATA CHECK FOR CASE    2 ****************************************

00000000000000000000000000000000000000000000000000000000000000000000000000111111111111111111111  COLUMN NOS.
00000000001111111111222222222233333333334444444444555555555566666666667777777777888888888899999999990000000000111111111112
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890

***********
***********       SANDM4R    0011110 LINES PRINTED.  (LSIO)
                  SANDM4R    0011110 LINES PRINTED.  (LSIO)
```

LISTING 7-2 LONG FORM OF ECHO PRINTS - CONT'D

(PAGE 17 OF 17)

08/18/80

CHAPTER 8

8. PROGRAM DESIGN

   8.1 Programming Principles of COPE.

        The main COPE program has been designed according to the following
   principles:

   (1) Input is designed to allow multiple cases per run with only a
       few mnemonically keyed input lines per case. For flexibility,
       it is also possible to read in data as traditional FORTRAN
       formatted input.

   (2) Output is designed so that the printout of results is nearly
       self-explanatory. In addition, user generated comments can easily
       be made to appear in the printout for any case.

   (3) The program is highly modularized. The main program consists
       almost entirely of calls to various subroutines together with
       the logic necessary to initialize and control the execution of
       three nested loops (see section 8.2).

   (4) Most subroutines or functions are designed for a single purpose
       (e.g., perform a test, read input, write output, etc.) so that
       when one wishes to change any aspect of the program it is usually
       necessary to change only a small number of the subroutines
       (usually the one performing a particular test plus the input
       routine).

   (5) The principles of structured programming have been adhered to
       in some degree. Because the program is written in FORTRAN IV
       (extended CDC version) which does not have if-then-else, do-until,
       do-while constructs, it is still necessary to use GO TO's and
       statement labels. However, blank comment cards have been in-
       serted between logical blocks within each program to improve
       readability, and unnecessary GO TO's have been minimized. In
       addition, statement labels are in ascending numerical order
       within each subroutine.

   (6) All data statements have been grouped into a single BLOCK DATA
       subprogram.

   (7) Mnemonically meaningful variable and subroutine names have been
       selected.

   (8) FORTRAN code has been written to minimize the number of non-
       standard (i.e., CDC peculiar) features used. Nevertheless,
       there are some CDC peculiar code features that were impractical
       to omit (e.g., READMS, SYSTEMC, etc.). These are cited in
       Chapter 13.

8.2 General Logic Flow.

The COPE main program can be viewed as three large nested loops on case, replication, and round. Figure 8-1 illustrates the general COPE logic flow including the three loops.

This figure is necessarily oversimplified and a more detailed flow chart is to be found in Chapter 11, but the overall picture is accurately summed up here.

8.3 Subroutine and Function Calling.

Table 8-2 gives a listing of the names of the main program, all of the subroutines, and all of the functions in the COPE program.

COPE is the main program name.

FPRCNT, GAMMA, IDCHAR, NUMRIC, and URAN31 are the function names.

ABRTTL, ADDTBR, ADDTOF, ARTCHK, BLOCHK, CCPLOT, COMMNT, CREAD, DETCTN, DFAULT, DFCHK, DUST, ECHO, FINDIT, GETRNG, GETTIM, GETVIS, HEADER, HITCHK, INITLZ, INPUT, LOSCHK, MINTRN, NOREC, OUTPUT, PECHK, PENAME, PKCHK, PPLOT, PSMOKE, REINTZ, RNDREL, RNGCHK, SEPREC, SMOKE, SMPLCD, TIMCHK, TITLE, USET, VISCHK, and WARNFO are the subroutine names.

PEIDNT is an entry point name in subroutine PENAME.

For each list entry (subprogram name) in Table 8-2, there are sections giving the names of subprograms calling the given list entry, the names of subprograms (in COPE) that the given list entry calls, and the names of system or IMSL routines that the given list entry calls.

There is a discrepany that occurs in the list. Subroutine NOREC is called by system routines LOCF (as an external argument) and SYSTEMC (by address loaded in IRAY array) and hence does not show as "CALLED BY" any routine in Figure 8-2 (see section 9.31).

Table 8-3 lists the system (CDC, standard FORTRAN, and International Mathematical and Statistical Library) routines used in COPE and the subprograms of COPE that call each of them.

Table 8-4 is a subprogram calling tree. Each subprogram (subroutine or function) in column two can be called by the COPE main program directly. Each subprogram in column N calls those subprograms in column N+1 to which it is linked by lines (V's, I's, -'s, and >'s).

NOREC calls no other subprograms in COPE. It is called by SYSTEMC whenever CDC FORTRAN IV Extended execution error 104 is encountered in INPUT, INITLZ, or FINDIT.

8-2

START

Write Title page and initialize case independent variables

Read input for first (next) case and initialize flags, counters, & random number seeds

Initialize flags and counters for first (next) replication

Perform Mission Abort Tests (tests 1-11). Are any tests failed? — Y → Increment Abort counter

N

Initialize for first (next) round

Perform Round Abort Tests (test 12-19). Are any tests failed? — Y → Increment Abort counters

N

Is the current round the last round of this replication? — N

Y

Is the current replication the last replication of this case? — N

Y

Print results for this case.

Is this the last case for this run of the COPE program? — N

Y

STOP

"Case Loop"

"Replication Loop"

"Round Loop"

FIGURE 8-1 General COPE Logic Flow

8-3

TABLE 8-2   PROGRAM UNIT REFERENCES (SUBROUTINES, FUNCTIONS, AND MAIN PROGRAM)

ABRTTL	CALLED BY	ARTCHK	BLOCHK	DETCTN	DFCHK	DUST	GETTIM
		HITCHK	LOSCHK	MINTRN	PECHK	PKCHK	RNDREL
		RNGCHK	SMOKE	TIMCHK	VISCHK	WARNDO	

| ADDTBR | CALLED BY | COPE |

| ADDTOF | CALLED BY | COPE |

| ARTCHK | CALLED BY | COPE |
| | CALLS | ABRTTL | URAN31 |

| BLOCHK | CALLED BY | COPE |
| | CALLS | ABRTTL |

CCPLOT	CALLED BY	INPUT
	CALLS	COMMNT
	CALLS (SYS)	ENCODE

| COMMNT | CALLED BY | CCPLOT | HEADER | INPUT | PPLOT | SEPREC |
| | CALLS (SYS) | ENCODE | WRITE |

COPE	CALLS	ADDTBR	ADDTOF	ARTCHK	BLOCHK	DETCTN	DFCHK
		DUST	GETRNG	GETTIM	GETVIS	HITCHK	INITLZ
		INPUT	LOSCHK	MINTRN	OUTPUT	PECHK	PKCHK
		REINTZ	RNDREL	RNGCHK	SMOKE	TIMCHK	TITLE
		VISCHK	WARNDO

CREAD	CALLED BY	INPUT
	CALLS	SEPREC
	CALLS (SYS)	DECODE	ENCODE	READ

| DETCTN | CALLED BY | COPE |
| | CALLS | ABRTTL | SMPLCD |

| DFAULT | CALLED BY | INITLZ |

DFCHK	CALLED BY	COPE
	CALLS	ABRTTL	URAN31
	CALLS (SYS)	AMAX1

| DUST | CALLED BY | COPE |
| | CALLS | ABRTTL | URAN31 |

| ECHO | CALLED BY | INPUT |
| | CALLS (SYS) | WRITE |

FINDIT	CALLED BY	INPUT
	CALLS	NUMRIC
	CALLS (SYS)	IFIX	LOCF	READMS	SYSTEMC	WRITE

| FPRCNT | CALLED BY | OUTPUT |
| | CALLS (SYS) | ENCODE |

| GAMMA | CALLED BY | GETTIM |
| | CALLS (IMSL) | GGAMA |

8-4

GETRNG	CALLED BY	COPE				
	CALLS	SMPLCD				
	CALLS (SYS)	FLOAT	STRACE			
GETTIM	CALLED BY	COPE				
	CALLS	ABRTTL	GAMMA	SMPLCD	URAN31	
GETVIS	CALLED BY	COPE				
	CALLS	URAN31				
	CALLS (SYS)	STRACE				
HEADER	CALLED BY	INPUT				
	CALLS	COMMNT	PEIDNT			
	CALLS (SYS)	DECODE	ENCODE	WRITE		
HITCHK	CALLED BY	COPE				
	CALLS	ABRTTL	URAN31			
IDCHAR	CALLED BY	NUMRIC	SEPREC			
INITLZ	CALLED BY	COPE				
	CALLS	DFAULT	USET			
	CALLS (SYS)	LOCF	OPENMS	READMS	SYSTEMC	
INPUT	CALLED BY	COPE				
	CALLS	CCPLOT	COMMNT	CREAD	ECHO	FINDIT	HEADER
		PENAME	PPLOT	PSMOKE	SEPREC	USET
	CALLS (SYS)	ABS	DECODE	ENCODE	EOF	FLOAT	LOCF
		READMS	READ	SYSTEMC	WRITE
LOSCHK	CALLED BY	COPE				
	CALLS	ABRTTL	URAN31			
	CALLS (SYS)	AMAX1				
MINTRN	CALLED BY	COPE				
	CALLS	ABRTTL	URAN31			
	CALLS (SYS)	AMAX1				
NOREC	CALLED BY					
	CALLS (SYS)	STRACE	WRITE			
NUMRIC	CALLED BY	FINDIT				
	CALLS	IDCHAR				
	CALLS (SYS)	DECODE	ENCODE	WRITE		
OUTPUT	CALLED BY	COPE				
	CALLS	FPRCNT				
	CALLS (SYS)	FLOAT	WRITE			
PECHK	CALLED BY	COPE				
	CALLS	ABRTTL	URAN31			
	CALLS (SYS)	AMAX1	FLOAT	MAX0	MIN0	MIN1
PEIDNT	CALLED BY	HEADER				
	CALLS (SYS)	ABS	DECODE	FLOAT	MOD	
PENAME	CALLED BY	INPUT				
	CALLS (SYS)	ABS	ENCODE			

PKCHK	CALLED BY	COPE			
	CALLS	ABRTTL	URAN31		
	CALLS (SYS)	MIN∅			
PPLOT	CALLED BY	INPUT			
	CALLS	COMMNT			
	CALLS (SYS)	ENCODE			
PSMOKE	CALLED BY	INPUT			
	CALLS (SYS)	AMIN1	FLOAT		
REINTZ	CALLED BY	COPE			
	CALLS (SYS)	MOD	WRITE		
RNDREL	CALLED BY	COPE			
	CALLS	ABRTTL	URAN31		
RNGCHK	CALLED BY	COPE			
	CALLS	ABRTTL			
SEPREC	CALLED BY	CREAD	INPUT		
	CALLS	COMMNT	IDCHAR		
	CALLS (SYS)	ENCODE			
SMOKE	CALLED BY	COPE			
	CALLS	ABRTTL	URAN31		
SMPLCD	CALLED BY	DETCTN	GETRNG	GETTIM	
	CALLS	URAN31			
	CALLS (SYS)	STRACE	WRITE		
TIMCHK	CALLED BY	COPE			
	CALLS	ABRTTL			
TITLE	CALLED BY	COPE			
	CALLS (SYS)	DATE	TIME	WRITE	
URAN31	CALLED BY	ARTCHK	DFCHK	DUST	GETTIM	GETVIS	HITCHK
		LOSCHK	MINTRN	PECHK	PKCHK	RNDREL	SMOKE
		SMPLCD	WARNDO				
USET	CALLED BY	INITLZ	INPUT		
VISCHK	CALLED BY	COPE			
	CALLS	ABRTTL			
WARNDO	CALLED BY	COPE			
	CALLS	ABRTTL	URAN31		

TABLE 8-3 SYSTEM AND IMSL ROUTINE REFERENCES

ABS	CALLED BY	INPUT	PEIDNT	PENAME		
AMAX1	CALLED BY	DFCHK	LOSCHK	MINTRN	PECHK	
AMIN1	CALLED BY	PSMOKE				
DATE	CALLED BY	TITLE				
DECODE	CALLED BY	CREAD	HEADER	INPUT	NUMRIC	PEIDNT
ENCODE	CALLED BY	CCPLOT	COMMNT	CREAD	FPRCNT	HEADER	INPUT
		NUMRIC	PENAME	FPLOT	SEPREC	
EOF	CALLED BY	INPUT				
FLOAT	CALLED BY	GETRNG	INPUT	OUTPUT	PECHK	PEIDNT	PSMOKE
GGAMA	CALLED BY	GAMMA				
IFIX	CALLED BY	FINDIT				
LOCF	CALLED BY	FINDIT	INITLZ	INPUT		
MAX0	CALLED BY	PECHK				
MIN0	CALLED BY	PECHK	PKCHK			
MIN1	CALLED BY	PECHK				
MOD	CALLED BY	PEIDNT	REINTZ			
OPENMS	CALLED BY	INITLZ				
READMS	CALLED BY	FINDIT	INITLZ	INPUT		
READ	CALLED BY	CREAD	INPUT			
STRACE	CALLED BY	GETRNG	GETVIS	NOREC	SMPLCD	
SYSTEMC	CALLED BY	FINDIT	INITLZ	INPUT		
TIME	CALLED BY	TITLE				
WRITE	CALLED BY	COMMNT	ECHO	FINDIT	HEADER	INPUT	NOREC
		NUMRIC	OUTPUT	REINTZ	SMPLCD	TITLE	

NOTE: ALL ROUTINES LISTED IN THE FIRST COLUMN OF THIS TABLE
       (EXCEPT GGAMA) ARE STANDARD SYSTEM ROUTINES OF CDC
       FORTRAN EXTENDED VERSION 4.
       GGAMA IS A SUBROUTINE FROM THE INTERNATIONAL MATHEMATICAL
       AND STATISTICAL LIBRARY (IMSL).

TABLE 8-4   COPE SUBROUTINE "TREE"

```
COPE---------->ADDTBR
     I--------->ADDTOF
     I--------->ARTCHK-------->ABRTTL
     V                  I------>URAN31
     I--------->BLOCHK-------->ABRTTL
     I--------->DETCTN-------->ABRTTL
     V                  I------>SMPLCD-------->URAN31
     I--------->DFCHK--------->ABRTTL
     V                  I------->URAN31
     I--------->DUST---------->ABRTTL
     V                  I------->URAN31
     I--------->GETRNG-------->SMPLCD-------->URAN31
     I--------->GETTIM-------->ABRTTL
     V                  I------>GAMMA
     V                  I------>SMPLCD-------->URAN31
     V                  I------>URAN31
     I--------->GETVIS-------->URAN31
     I--------->HITCHK-------->ABRTTL
     V                  I------>URAN31
     I--------->INITLZ-------->DFAULT
     V                  I------>USET
     I--------->INPUT--------->CCPLOT-------->COMMNT
     V                  I------->COMMNT
     V                  I------->CREAD-------->SEPREC-------->COMMNT
     V                  V                              I------>IDCHAR
     V                  I------->ECHO
     V                  I------->FINDIT-------->NUMRIC-------->IDCHAR
     V                  I------->HEADER-------->COMMNT
     V                  V                  I------>PEIDNT
     V                  I------->PENAME
     V                  I------->PPLOT--------->COMMNT
     V                  I------->PSMOKE
     V                  I------->SEPREC-------->COMMNT
     V                  V                  I------>IDCHAR
     V                  I------->USET
     I--------->LOSCHK-------->ABRTTL
     V                  I------>URAN31
     I--------->MINTRN-------->ABRTTL
     V                  I------>URAN31
     I--------->OUTPUT-------->FPRCNT
     I--------->PECHK--------->ABRTTL
     V                  I------>URAN31
     I--------->PKCHK--------->ABRTTL
     V                  I------>URAN31
     I--------->REINTZ
     I--------->RNDREL-------->ABRTTL
     V                  I------>URAN31
     I--------->RNGCHK-------->ABRTTL
     I--------->SMOKE--------->ABRTTL
     V                  I------>URAN31
     I--------->TIMCHK-------->ABRTTL
     I--------->TITLE
     I--------->VISCHK-------->ABRTTL
     I--------->WARNDO-------->ABRTTL
     V                  I------>URAN31
NOREC
```

9. SUBPROGRAMS

This chapter explains in moderate detail what each subprogram of COPE does. All four standard FORTRAN subprogram types (main program, block data, function, and subroutine) are present in COPE. In the following, the subprograms are discussed in this order: main program, block data, functions (in alphabetical order), and subroutines (in alphabetical order).

This chapter deals only with subprograms defined by COPE. System subroutines and functions are divided into three classes: standard FORTRAN IV routines, routines peculiar to CDC FORTRAN 4 Extended, and IMSL routines. The reader is assumed to be familiar with the first of these classes (or at least have access to a FORTRAN manual). System routines in the remaining two classes are discussed to some extent in Chapter 13.

9.1 COPE Main Program.

The COPE main program is well summarized by the flowchart in Figure 8-1.

The main program begins by calling routines that write the title page (TITLE) and initialize case independent variables (INITLZ).

Next the main program calls INPUT to read the first (or next) case's input. It then calls REINTZ which re-initializes certain case dependent counters and random number seeds. It then initializes the current replication number at one and the number of FO's (DO's) killed so far in the case at zero. The steps in this paragraph begin the "case loop."

The main program next begins the "replication loop" for the first (or next) replication of the current case. This loop begins by initializing the number of the current round to one and then setting various times, flags, and a counter.

The "replication loop" now continues by calling a sequence of subroutines which perform the tests described in Chapter 2 and sample weather, range-LOS, and time data.

routines (in order called)	purpose
ARTCHK	perform test 1
GETVIS	sample weather distribution
GETRNG	sample acquisition range and LOS segment distributions
VISCHK	perform test 2
RNGCHK	perform test 3
DETCTN	perform test 4
SMOKE	perform test 5
DUST	perform test 6
BLOCHK	perform test 7
GETTIM	sample time distribution(s) and perform tests 8 and 9
BLOCHK	perform test 10
TIMCHK	perform test 11 (for "shooting gallery" only)
ADDTOF	calculate round arrival time

Each of these routines is explained in detail later in this chapter.

Note that if any routine that performs one (or more) of the tests is called and the test is failed, then the subsequent routines in the above list are not called; instead, control transfers to statement 140 (end of "replication loop") where a check is made to determine whether all of the replications for this case have been done. If they have, OUTPUT is called to print case results and then the end of the "case loop" is either hit and control returns to statement 100 which calls INPUT to read the input for the next case or, if the last case has been run, control passes to the STOP and the program terminates. If not all replications for the current case have been completed, then the number of the current replication is increased by one and control returns to statement 110 (which is the start of the "replication loop") to begin next replication.

If none of the tests are failed and the program reaches ADDTOF on the current replication, then the "round loop" begins (with statement 120). The "round loop" consists of a further sequence of subroutines which are called to perform those tests that may affect only one round.

routines(in order called)	purpose
LOSCHK	perform test 12
WARNFO	perform test 13
DFCHK	perform test 14
RNDREL	perform test 15
MINTRN	perform test 16
PECHK	perform test 17
HITCHK	perform test 18
PKCHK	perform test 19

Again, each of these routines is explained in detail later in this chapter.

If any subroutine that performs one of these tests (12 through 19) is called and the test is failed, then the subsequent routines in the above list are not called for the current round; instead, control transfers to statement 130 (end of "round loop") where a check is made to determine whether all of the rounds for this replication have been done. If they have, control transfers to statement 140 (end of "replication loop") where the check is made to determine whether more replications are to be done for the current case. If not all rounds for this replication have been completed, then the time the next round arrives is computed (ADDTBR), the round number is incremented by one, the end replication (or ENDREP) flag is reset and control transfers to statement 120 (start of "round loop") to begin the next round.

If no test is failed, then control reaches statement 130 after the entire sequence of subroutines in the "round loop" has been called. At this point a check is made to determine whether all rounds for this replication have been done. Control then proceeds just as in the case when statement 130 is reached due to a failed test as described in the paragraph above.

When all the rounds for a replication are completed, a check is made to determine whether more replications remain to be done (end of "replication loop"). If more replications remain, control transfers to 110 (start of "replication loop") to begin the next replication. If all replications for the current case are completed, then OUTPUT is called to print results for current case (end of "case loop").

When a case ends and its results are printed, the program checks whether the last case flag (ENDFLG) has been set. If it has, the program stops; if it has not been set, then control goes to statement 100 and INPUT is called to read the next cases input. If there is input for another case, it is read and the entire process from INPUT through end of "case loop" is repeated; if there is no input for further cases, the program terminates.

9.2 BDATA1 Block Data Subprogram.

BDATA1 consists entirely of data statements used to initialize variables in various COMMON blocks. These blocks are listed in section 4.7 and are their variables defined individually in Chapter 12 (Glossary of Variables).

9.3 FPRCNT Function.

This function formats percentages. It takes a numerical argument XIN and a logical argument PAREN and assigns a one word alphanumeric character string as the value of FPRCNT.

If XIN is negative, then FPRCNT is assigned:
the left justified character string UNDEF), when PAREN is true;
the right justified character string UNDEF, when PAREN is false.

If XIN $\geq$ 100.05, a STOP occurs with an error message (see section 7.5.7).

If XIN is positive and less than 100.05, then FPRCNT is assigned:

a left justified character string of the form X.XX%), XX.XX%), or 100.0%), when PAREN is true;

a right justified character string of the form X.XX%, XX.XX%, or 100.0%, when PAREN is false.

The character strings created by FPRCNT are used by OUTPUT to print percentages. FPRCNT is called only from OUTPUT.

9.4 GAMMA Function.

This function takes two arguments, one real parameter ALPHA and one integer IRN, and returns a real value as GAMMA.

ALPHA is the α -parameter of the gamma distribution's probability density function:

$$g(x) = \frac{1}{\Gamma (\alpha)} \; x^{\alpha-1} \; e^{-x}$$

GAMMA is assigned a value obtained by randomly sampling from the above distribution. This sampling is accomplished by calling the IMSL subroutine GGAMA with random number seed IRN.

The function GAMMA itself then really does nothing more than dimension two arrays required by GGAMA, define an additional variable used by GGAMA, call GGAMA with ALPHA, IRN, the two arrays and the additional variable as arguments, and then set GAMMA equal to the random sample obtained by GGAMA from the gamma distribution.

9.5 IDCHAR Function.

The IDCHAR function takes three arguments, one real array A and two integer variables N and I. It returns an integer value.

The array A of dimension N should be filled with left justified characters, one character per word. (Most often A is dimensioned with N=80 and consists of a card image read under 80A1 Format in INPUT). The function IDCHAR then examines the Ith element of the array, that is A(I).

The function IDCHAR is then assigned a value as follows:

IDCHAR = 0   if A(I) is a number or minus sign (hyphen);
IDCHAR = 1   if A(I) is a letter or an apostrophe;
IDCHAR = 2   if A(I) is a decimal point (period);
IDCHAR = 3   if A(I) is a blank;
IDCHAR = 4   if A(I) is a separator (i.e., a comma, a left or
             right parenthesis, a slash, or a question mark);
IDCHAR = 5   if A(I) is a dollar sign; and
IDCHAR = 6   if A(I) is anything else.

9.6   NUMRIC Function (Logical Valued).

The NUMRIC function takes one real array argument, B, and three integer variable arguments N1, N2, and IB.

The array B of dimension N1 by N2 (i.e., DIMENSION B(N1, N2)) is checked to determine whether its IBth line (that is, entries B(J, IB) for J = 1, 2, 3,..., N2) is numeric data (i.e., whether it consists only of numerals, minus sign, and decimal point possibly with trailing blanks).

If the line is numeric data, NUMRIC is assigned the value TRUE. If the line contains some non-numeric characters (letters, commas, etc.), then NUMRIC is assigned the value FALSE.

The IBth line of the B array is treated as a left justified character string (10 characters per word) which is examined character by character. Only the first 80 characters of the line are examined.

When the line being checked meets certain special conditions, other actions may be taken: If more than one decimal point is encountered, an error stop with message occurs. If no decimal point is encountered but the characters are otherwise numeric data, then a decimal point is added to B at the end of the non-blank characters, NUMRIC is assigned the value TRUE, and a return occurs. If the data are numeric but consist of more than ten non-blank characters (including the added decimal point, if any), then an error stop with message occurs. If the data contain imbedded blanks, then checking stops at the first imbedded (i.e., non-trailing) blank and the program behaves as though every character following were a blank. (This should have no effect in practice since the only imbedded blanks occur in PEDATA record names entered with the $ preceding them. Those names will already have failed the numeric test before ever reaching their first imbedded blanks).

9.7   URAN31 Function.

This function takes one integer argument I and returns a real value between 0 and 1 (exclusive).

This is the "random" number generator used to sample most COPE data and to generate "random" numbers to be compared against probabilities to determine whether various tests are passed.

The best results are obtained when I is an odd integer in the range from 0 to 67108864. URAN31 generates a sequence of "random" numbers by replacing I by 3125*I(MOD 67108864) and then setting URAN31 equal to I divided by 67108864. (That is, a linear congruential type random number generator $A(N+1) = A(N)*B(MOD\ C)$ where B = 3125 and C = $2**26$). Then repeating the process with the new value of I gives the next "random" number.

The function is written so that overflow will not occur even on machines with a word size as small as 32 bits.

Normally, one would not define the random number generator explicitly in the program code since one is available on nearly every computer as a standard system function. However, because users on other machines may wish to run the sample cases (see appendices) to check for correct implementation, the URAN31 function has been built into COPE as its standard (system independent) random number generator.

9.8 ABRTTL Subroutine.

This subroutine takes the integer argument IABRT which is the number of the test whose failure caused ABRTTL to be called.

ABRTTL updates the test abort total array NABORT by increasing the proper entry of the NABORT array by one. For mission aborts, the elements corresponding to all rounds of the IABRTth test are increased; for round aborts, only the element corresponding to the IABRTth test and current (KRFth) round is increased.

In addition, the flag ENDREP is set to TRUE to indicate that a test has been failed and the current replication (or round) need not continue through the subsequent tests.

9.9 ADDTBR Subroutine.

This subroutine adds TBR (time between rounds) to TIMRA (time round arrived) to obtain the new value for TIMRA (time next round arrives).

9.10 ADDTOF Subroutine.

This subroutine adds TOF (time of flight) to TIMNOW (time gun is ready to fire Copperhead) to obtain the TIMRA (time first round arrives).

9.11 ARTCHK Subroutine.

This subroutine performs the test to determine whether the FO (or DO, designator operator) has been killed or suppressed by RED preparatory artillery fires on this replication.

9.12 BLOCHK Subroutine.

This subroutine performs the bail out checks (tests 7 and 10).

9.13 CCPLOT Subroutine.

This subroutine would produce a Cal-Comp plot of case results, if implemented. At the present time it merely produces a comment that no plot was produced for the case.

9.14 COMMNT Subroutine.

This subroutine takes four arguments: one real array A containing the character string that is the comment, one integer N1 which is the dimension of A, and two logical flags that indicate whether the comment is a user comment and whether the comment is a program generated "$$$" comment.

The subroutine writes the comment immediately (along with a "$$$" comment page heading, if needed) if the comment is a "$$$" comment (either user or program generated). If the comment is a "$$" comment, then it is encoded into the CMENT array for later printing with the current case. If the comment is a "$" comment, it is ignored and a return occurs.

Note that user comments are in format 80A1 with DIMENSION A (80) whereas program generated comments are in format 8A10 with DIMENSION A(10). This difference need not concern the casual user, but is required knowledge if one is to modify the program in so far as comments are concerned.

9.15 CREAD Subroutine.

This subroutine is called by INPUT whenever the user exercises the temporary option. The second field on the TEMPORARY card will be used by subroutine INPUT to set the value of IT2 equal to the keyword number for which the temporary option is being used.

CREAD then sets ITYPE equal to IT2-20 and executes a computed GO TO on ITYPE. As a result of this computed GO TO, control transfers to one of eight sections where the formatted temporary data is read. Each of these sections corresponds to one of the eight data blocks and each consists mainly of READ statements that fill in that data block's variables. When the reading is completed, control branches to statement number 410 where a return occurs.

9.16 DETCTN Subroutine.

This subroutine samples the detection time distribution to obtain the detection delay time for this replication (i.e., time from unmask until D.O. initiates call for fire. It includes detection, acquisition, and decision time).

If "random occurrence" is being played, control returns. If "shooting gallery" is being played, the detection delay time is compared with the line of sight duration (test 4). If the test is passed, a return occurs; if the test is failed the abort totaller is called (ABRTTL) prior to the return.

9.17 DFAULT Subroutine.

This routine merely sets the default values for many of the case descriptor parameters, data block record names, and flags. (It could really be replaced by some data statements to fill in these same variables if one so desires).

9.18 DFCHK Subroutine.

This subroutine performs test 14. If the FO (DO) has been killed on a previous call for the current replication, control transfers to 120 where the round abort is totalled (call to ABRTTL) followed by a return.

Otherwise, the routine calculates the current designator-to-target range. Then it uses that range value to interpolate in the DFFOKL array to obtain probability that direct fire kills the DO and probability that direct fire obscures but does not kill the DO. When these probabilities are obtained, test 14 is performed to determine whether the DO is unaffected, obscured but not killed, or killed. If the DO is unaffected, the routine returns; if the DO is obscured but not killed, the routine calls ABRTTL to increment the round abort counter and then returns; and, if the DO is killed, the routine increments the DO killed counter, sets the DO killed flag, then calls ABRTTL and returns.

9.19 DUST Subroutine.

This subroutine performs test 6 and calls ABRTTL if the test is failed.

9.20 ECHO Subroutine.

This subroutine takes the integer argument IUNIT. IUNIT is the logical I/o unit to which ECHO will write. (IUNIT = 8 currently)

Subroutine ECHO does nothing more than write out the current values of the parameters, flags, arrays, etc. that describe the conditions of the case. (see section 7.6) This printout is provided primarily as a debugging aid.

9.21 FINDIT Subroutine.

This subroutine takes a real array B of character strings dimensioned N1 by N2 and returns an integer valued array IT dimensioned N3. Normally N1 = 8, N2 = 10, and N3 = 10 so we have

DIMENSION B(8, 10), IT (10). The Kth line of B (i.e., B(J,K) for J = 1,2,3,...,8 with K fixed) consists of the character string found in the Kth field of the input card just read. This character string is compressed by eliminating blanks (the exception is that blanks occurring in PEDATA record names preceded by $ are preserved when moved into the B array) and packing the results 10 characters per word into B.

Subroutine FINDIT compares the first line of the B array (B(1,1) through B(8,1)) with the keywords in the CHAR array in an attempt to find a match. If not successful, an error message and error stop occur; if a match is found, then IT(1) is set to the keyword number (contained in CHAR array also).

Next, if the match occurred with the TEMPORARY, OVERRIDE, or RESET keywords, then a second pass through the keyword list (CHAR array) is made to find a match with the second line of the B array. If this search is successful, IT(2) is set to the value of the matched keyword and a return occurs. If unsuccessful, an error message and stop occurs. An error message and stop also occur if a match is found for a keyword that is not allowed with TEMPORARY, OVERRIDE, or RESET.

If the first match was not with TEMPORARY, OVERRIDE, or RESET, then the routines checks CHAR (2, IMATCH) to see how many option word character strings are allowed with the IT(1)th keyword. If this number is zero, that is the flag to the program that it may have one of the keywords that takes only numerical values and so control transfers to statement 210. At statement 210, B(1,2) is checked. If B(1,2) is blank, a return occurs; if B(1,2) is numeric data, IT(2) is set to zero; if B(1,2) is neither blank nor numeric an error print occurs. Note that the blank occurs either when the keyword has no optionwords allowed (as with FIRST CASE, END, etc.) or when the keyword is omitted (i.e., the default valued is desired).

If CHAR(2, IMATCH) is non-zero, it gives the number of different option word character strings allowed with the current card's keyword. The TAPE 11 record name is then set to the abbreviated form of the keyword and the record of option word character strings allowed with the keyword is read into the CHARA array. The program then proceeds to match B(2,1) through B(2,8) with allowable option word choices for option word 1, B(3,1) through B(3,8) with allowable choices for option word 2, etc. If a match is not found for any line of B, then it is tested to see whether it is numeric; if not, an error message and stop occur, if it is numeric, the next line of B is checked. If line K of B is numeric, IT(K) is set to zero; if line K of B is blank, IT(K) is left at one (the value indicating default) to which it was set near the beginning of FINDIT; if line K of B matches one of the character strings allowed for option word K-1, then IT(K) is set equal to the number of the option word choice.

It is through setting the IT array that FINDIT signals sub-routine INPUT as to which keyword and optionwords were found on the input card. Of course, in the case of numeric data or OVERRIDE record names, the values in the B array will have further use even after IT has been determined.

9.22 GETRNG Subroutine.

This subroutine samples the cumulative distribution of ac-quisition ranges (actually designator-to-target ranges at time of unmask) to obtain the initial designator-to-target range for the current replication. The cumulative distribution of line-of-sight segment lengths corresponding to the range bracket in which the designator-to-target range lies is then sampled to obtain the length of the segment of the target's path that is visible to the DO. This LOS segment length is then added to the target column's length and the sum is divided by the target velocity to obtain the duration of line of sight (i.e., the length of the time interval from target unmask until LOS to last vehicle in column is lost). Next a return is executed.

If the target velocity is zero (or negative) an error stop with message occurs.

9.23 GETTIM Subroutine.

This subroutine serves three basic functions: (1) perform test 8, (2) perform test 9, and (3) calculate the response time (time from DO call for fire until gun is ready to fire Copperhead) for those missions that pass tests 8 and 9.

As mentioned in Chapter 2, there are three different ways of playing communication and processing delay times.

(1) If parameterized response time (PRSPTM) is non-zero, then this routine sets the time the gun is ready to fire (TIMNOW) equal to PRSPTM. It then performs test 8 and 9. If either test fails, ABRTTL is called and a return occurs; otherwise, ABRTTL is not called and the routine executes a return with TIMNOW = PRSPTM.

(2) If parameterized response time is zero, then the routine is to sample to obtain response time. If the variable FTSILL is TRUE, the routine samples the single response time distribution (FSRT array) to obtain the response time which is then added to the detection time to obtain the time at which the gun is ready to fire. It then performs tests 8 and 9. If either test fails, ABRTTL is called and a return occurs; otherwise, ABRTTL is not called and the routine executes a return with TIMNOW set at the value to be used for this replication.

(3) Finally, if parameterized response time is zero and the variable FTSILL is FALSE, then the routine uses the sum of the separate response time components as the response time. If digital communication is modeled, then the time to enter digital data into DMD is sampled and added to current time (TIMNOW which was previously set to DETTIM).

Then an unnumbered test is made to determine whether digital commo is successful. If it is, a transmission time is added to TIMNOW and control transfers to statement 160 (see below). If digital commo fails, then a test is performed to determine whether voice commo is successful. If voice is successful, then a time to switch from digital to voice and the voice commo transmission time are added to TIMNOW before control transfers to statement 160. If voice is also unsuccessful, then test 8 is considered to have been failed, ABRTTL is called, and a return executed.

If digital commo is not selected, then voice commo only is played. In this case, the test for successful voice commo is made (test 8) and if failed, an abort (call to ABRTTL) occurs followed by a return. If the test is passed, a voice commo time is added to TIMNOW and control reaches statement 160.

At statement 160, the battery computer system processing and battery response time are added to TIMNOW. Test 9 is then performed. If it fails, ABRTTL is called and a return executed; if it is passed, then TIMNOW is returned to be used for the current replication.

9.24 GETVIS Subroutine.

This subroutine samples the weather data used in the current case to obtain the cloud ceiling altitude and the visibility range limit.

The routine first randomly determines whether there is a cloud ceiling. Next it randomly determines whether there is a cloud free line-of-sight for the COPPERHEAD trajectory.

If there is a cloud-free line-of-sight, then the cloud ceiling altitude is set to its highest value and a visibility limit is determined by random sampling using the PRGCFL array. Control then branches to statement 160 (see below).

If there is no cloud-free line-of-sight, then the cloud ceiling altitude and visibility limit are both determined by a random sampling from the W array.

Note that the items of importance that are defined by this routine are the subscript of the cloud ceiling altitude (ICC), the subscript of the visibility range limit (IVL), and the visibility range limit itself (VISLIM). Also, note that ICC is initially a function of increasing altitude (that is, higher altitudes correspond to larger values of ICC); however, because the ordering convention for cloud ceilings was reversed between the weather data and the PE data, ICC is redefined after statement

160 by setting the new value of ICC equal to seven minus the old ICC value (so that higher altitudes correspond to lower values of ICC).

9.25 HEADER Subroutine.

This subroutine produces the heading page for each case.

The heading page is produced by encoding the lines for the first column of boxes into the AOUT array; those for the second column into the BOUT array; and those for the third column into the COUT array.

Next the routine generates some comments regarding time inconsistencies, record name overrides, and data read by the TEMPORARY option as applicable.

Finally, following the lines giving case number and number of replications (which are written before HEADER does any encoding) HEADER writes the AOUT, BOUT, and COUT arrays to produce the nine boxes of case description information that occur on the case header page. Then if any "$$" comments are to be printed for this case, the CMENT array is written (this includes both user comments and program generated comments).

9.26 HITCHK Subroutine.

This subroutine performs test 18.

First, it interpolates with respect to designator-to-target range (RNGNOW) in the proper row of the TTF array as determined by designator type and target posture (exposure) to obtain the probability of hit. This probability of hit is really the probability of hit given that the round engages (that is, that the seeker locks onto the laser spot on the target and does so within the maneuver footprint of the COPPERHEAD round).

Next the routine compares a random number (between 0 and 1) to the probability of hit to determine whether the current round hits. If the round hits, a return occurs; if not, ABRTTL is called to record the failure (miss) and a return occurs.

9.27 INITLZ Subroutine.

The subroutine initializes certain case independent values.

After setting IRAY and calling SYSTEMC to set the non-standard error recovery process, the routine proceeds to set the values of CHAR (2,I) for I = 1,2,...NREC from the values in the record named OPTNNUMS on Tape 11. (This record is automatically updated by the PREPMS program each time new optionword character strings are added for a keyword).

The program next calls DFAULT to set the default values for the various case descriptors, record names, etc. Then USET is called to set the values to be used as the base to which the first case input card values are to be applied. Finally, MSABLM is set and a return is executed.

9.28 INPUT Subroutine.

This subroutine reads the input lines for a given case and sets the variables in the program to the values required to run the case.

This routine is the longest and one of the most complex in the COPE model. It is most easily followed by means of a flowchart (see Chapter 11); however, an attempt to sketch its main sections is given here.

(1) First, the routine checks to determine whether there is another case to read. If not, it stops. If there is more to read, the routine first sets IRAY and calls SYSTEMC to establish non-standard error recovery. Then it clears various arrays and counters and increments the case number.

(2) Next it reads input cards until it encounters an END, ENDF, or end-of-file. For each card that it reads, it first checks whether that card is a comment card; if it is, subroutine COMMNT is called and the next card is read. If the card is not a comment, the routine calls SEPREC which separates the fields on the input card and moves each of them into a line of the B array. Then subroutine FINDIT is called to match each line in the B array against the keywords and option words allowed in that field. This matching determines the values of the IT array.

The program next checks to see whether the current card supersedes some of the previous cards for the current case. If it does, a comment is generated; in either case, the routine next branches to one of five statements depending on whether the card is a FIRST CASE, NEXT CASE, END, ENDF, or any other card, respectively. If the card is an END or ENDF, control transfers to statement 490 (see below). If the card is a NEXT CASE, RD (or equivalent), USET is called to establish the default values as the base to which changes caused by the input cards are to be applied; if the card is NEXT CASE, DR, then USET is not called and the changes caused by the input cards are applied to the conditions in effect for the previous case. Either type of NEXT CASE (or FIRST CASE) causes control to then read the next card. If the card is not an END, ENDF, NEXTCASE, or FIRST CASE, then control reaches statement 200.

At statement 200, a many branched computed GO TO is executed; the branch followed depends on the keyword number (IT1 or IT(1)). The actions taken for each case of the computed GO TO are varied but the main activities are to fill the UVALUE array with either numerical values, record names, or flag values. If the keyword was TEMPORARY, CREAD is called; if OVERRIDE, the record name is set; and if RESET, the default for that keyword is reactivated. Each case of the computed GO TO ends with a GO TO returning control to the line that reads the next input card.

(3) At line 490 the routine starts filling in the values of the various parameters that describe the current case (flags, arrays, single variables, etc.). These are generally filled in by calls to READMS to read records to fill in data blocks (record names as established when filling in UVALUE array), by equating variables to UVALUE numerical values, by looking up values in pre-defined arrays according to a subscript value in UVALUE array, by calling a special subroutine (in the case of PEDATA) to generate a record name and then reading that record from TAPE 11 into the data block, or by calling special routines (such as PSMOKE) that use inputs to calculate a parameter value. In any event, by the end of INPUT all variables required to run the case have been set and the replications can begin.

(4) INPUT finishes by calling HEADER and ECHO and then returning.

9.29 LOSCHK Subroutine.

This subroutine is used to determine whether the DO still has (macro-terrain) LOS to the target when the round arrives (test 12).

It performs the test in two different ways depending on the LOS model used.

For "shooting gallery", it merely compares the time the round arrives with the duration of the line-of-sight. If the round arrives before the line-of-sight ends, a return is executed; if the LOS ends before the round arrives, ABRTTL is called prior to the return.

For the "random occurrence" LOS model, the probability P of LOS to a single vehicle in the current designator-to-target range bracket is found. The probability that at least one vehicle is in view is then taken to be equal to $1-(1-P)^{**}XNV$ where XNV is the number of target vehicles currently unkilled. Once this probability is obtained, it is compared to a random number and the result settles test 12. If test 12 is passed, a return occurs; if it is false, ABRTTL is called, then a return occurs.

9.30 MINTRN Subroutine.

This subroutine performs test 16 and sets target posture (exposure) with respect to mini-terrain.

First the current designator-to-target range is computed. Then this range is used to interpolate in each of the three rows of the PSTTBL array. As a result of this interpolation the PSTVAL array is filled with the probabilities of completely obscured target posture, fully exposed target posture, and hull defilade (turret exposed) target posture respectively.

A random number is then drawn and compared to these probabilities to determine which of the three target postures occurs. If the target posture is "completely obscured", then test 16 is failed, ABRTTL is called, and a return occurs; otherwise, ITGTPS is set to indicate the target posture (1 for fully exposed; 2 for hull defilade) to be used in hit and kill probability tests and a return occurs.

9.31 NOREC Subroutine.

This routine is called indirectly through the CDC non-standard error recovery facility (SYSTEMC routine explained in CDC Fortran 4 Extended) It is called whenever READMS attempts to read a record from TAPE 11 using a record name that does not correspond to any of the records on TAPE 11.

The routine writes a message giving the record name that could not be found, executes a subroutine call trace and then executes a stop with message.

9.32 OUTPUT Subroutine.

This subroutine writes the results page for each case.

The routine begins by clearing several arrays.

Next, it calculates the percentage of total missions that have a failure (abort) at each test (for "round" aborts, this percentage is calculated for each round). This is the ABRPCT array.

Then it calculates what percentage of the missions that reached a given test passed it. Again this is calculated for each round for the "round" aborts. This is the PASPCT array.

Next the program sets the number of occasions, attempted engagements, and shots.

Then it compares the number of kills as calculated by two different counters and, if there is a disagreement in value between them, it prints a message (see Section 7.3.1).

Next, it calculates the probability of kill given an occasion, the probability of kill given an attempted engagement, and the probability of kill given a shot. These are calculated separately for each round of the mission.

Then it calculates the probability of a shot given an occasion, probability of a shot given an attempted engagement, and probability of attempted engagement given a shot. It also calculates the probability of having line-of-sight on each round.

Next it compares the number of missions (or rounds, as appropriate) tested for each abort condition as computed in two different ways. If the results differ an error message is generated (see section 7.3.2).

Then the program calculates the FO (DO) survivability measures; that is, probability DO is killed and probability DO is not killed given that the mission reached that test.

Now that all of the values to be printed on the results page have been calculated the routine proceeds to print the results in the order they appear on the case results page (see Chapter 6).

Note that prior to printing percentages, function FPRCNT is applied to format the percentages for output. Also note that any percentage valued variables with the value -1.0 are printed as "UNDEF" indicating undefined value (this occurs when the percentage could not be calculated due to a zero denominator. It is for this reason that all percentage valued variables in OUTPUT are initialized at -1.0 and then only assigned values if the ratio used in computing the percentage has non-zero denominator).

9.33 PECHK Subroutine.

This subroutine performs test 17 (i.e., does COPPERHEAD round engage the target?)

First it calculates the delay time (DELTAT) for the current round. By delay time is meant the time the round arrives minus the expected arrival time (which is based on nominal response time). Next the value of IMUTS (the "MUTS" factor -- see Section 16.1) is determined and the range value indices to be used for interpolation are set.

If IMUTS is 2, it means that not all vehicles in the target column have passed the point of closest approach to the centroid of the COPPERHEAD footprint. That is, delay has no effect and so PE is computed by interpolating with respect to designator-target range alone in the PETBL array (using delay time equal to zero (IDELTT=1) and holding cloud ceiling and visibility limit constant at their previously sampled values (obtained in GETVIS)).

If IMUTS is 1, it means that all vehicles in the target column have passed the point of closest approach to the centroid of the COPPERHEAD footprint. That is, delay time has an effect and so PE is computed by interpolating with respect to both designator-target range and delay time while holding cloud ceiling and visibility limit constant.

In either case, once PE (probability that seeker engages target and target is within Copperhead maneuver footprint) is computed, it is compared to a random number sampled from a uniform distribution (from 0 to 1). If the random number is less than PE, a return occurs; otherwise, ABRTTL is called before the return occurs.

9.34 PENAME Subroutine and PEIDNT Entry.

This subroutine takes ten arguments. When the call is to PENAME the first nine are "input" and the last one is "result"; whereas a call to PEIDNT uses the current value of the tenth argument as "input" and returns the values for the other nine.

This subroutine is used to create PE data record names. The values of the nine parameters (see section 5.4) are taken as arguments (in the same order they are described in section 5.4). They are loaded into the AVALUE array and are searched for in the XVALUE array. When matches are found, the corresponding XVALUE entries (for XVALUE (I,J,2)) are used to construct the record name which is returned as IDCODE.

When PEIDNT is called, the record name is decomposed into the separate XVALUE (I,J,2) values (and TR value) used to create it. The corresponding XVALUE (I,J,1) values are found and equated to the nine parameters (note slightly different handling of TR, nominal response time). These values are then returned.

Note that while every choice of the nine parameters can give at most one record name, there may be more than one choice of parameters that can give that record name. For example, if all parameters are held constant except target velocity (VEL), then VEL = 2 m/s and VEL = 3 m/s will give the same record name (using the current XVALUE array). Hence, when that record name is decoded by PEIDNT to obtain the parameters to which it corresponds, it will have no way of choosing between 2 m/s and 3 m/s for VEL; instead it will merely take the first one that matches (2 m/s in this case).

9.35 PKCHK Subroutine.

This subroutine performs test 19 (i.e., did the COPPERHEAD kill the target?)

The routine looks up the PK (probability of kill given a hit) in an array as a function of target type and target posture (exposure). This value is then compared to a random number sampled from

a uniform distribution (from 0 to 1). If the random number is less than PK, then a kill occurs, the number of vehicles killed on the KRFth round for this case (RNDREC) is incremented, the number of vehicles killed (NVEHKL) on this replication is incremented and a return occurs. If not, ABRTTL is called and then the return occurs.

9.36 PPLOT Subroutine.

This subroutine is currently just a "stub" that producess a "$$" program generated comment saying that no printer plot was produced for the current case.

If implemented, this routine would produce printer plots (bar graphs) giving a graphical presentation of case results.

9.37 PSMOKE Subroutine.

This routine calculates the probability that smoke aborts the potential COPPERHEAD mission. This probability is a function of the number of each of two types of smoke rounds fired (NSMK2 and NSMK5) and the distribution of Pasquill atmospheric stability categories, distribution of wind speed velocities, and distribution of relative humidity levels corresponding to the current case's weather (i.e., month and time of day).

The entire routine reduces to evaluating PSMKKL (probability smoke kills mission) according to the formula:

$$PSMKLL = \frac{1}{FRONT} \sum_{I=1}^{3} \sum_{J=1}^{3} \sum_{K=1}^{2} \left\{ MIN \left(\frac{NSMK2}{SMK2(I,J,K)} + \frac{NSMK5}{SMK5(I,J,K)}, FRONT \right) * \right.$$
$$\left. WNDSPD(I,J) * HUMID(K) * \left[PASQL(2*I-1) + PASQL(2*I) \right] \right\}$$

where all of the variables are as defined in the Glossary of Variables (Chapter 12).

Note that because certain combinations of windspeed and Pasquill category never occur, the SMK2(I,J,K) and SMK5(I,J,K) values corresponding to them have been left blank (i.e., equated to zero). To avoid the division by zero that would otherwise result, the range of J in the summation is sometimes limited in the routine to avoid certain SMK2 and SMK5 values which should have no weight in the sum anyway.

9.38 REINTZ Subroutine.

This subroutine resets certain counter arrays to zero. It also resets the random number seeds for each case and on the first case it writes the seeds on Tape 8.

Note that the seeds are set according to the formula:

$$IR(I) = 2*(MOD(8**I, 29) *2**25/29) + 1$$

for I = 1,2,..., 28.

This assures that each IR is odd and that the IR's are approximately uniformly spaced between 0 and 2^{26}.

9.39 RNDREL Subroutine.

This subroutine performs the test of round reliability (test 15).

9.40 RNGCHK Subroutine.

This subroutine performs test 3.

It compares designator-to-target range at unmask to the maximum designator range. If the maximum designator range is less than the designator-to-target range, ABRTTL is called and a return occurs; otherwise, the test is passed and a return occurs.

9.41 SEPREC Subroutine.

This subroutine takes a real array A of dimension N1 and breaks it up into fields (i.e., separates records) and compresses them one per line into the B array which is of dimension N2 by N3.

The routine first clears several arrays to be used in separating the fields on A. Then it calls IDCHAR once for each element of A to determine what kind of character it is. A is assumed to be an array (usually DIMENSION A(80)) of characters filled by reading one input card under 80A1 format.

If the routine encounters sequence numbers in columns 73-78 of the first card (i.e., elements 73-78 of array A) and blanks in 63-72 and 79-80, then it issues a "$$$" comment (see section 7.1) and removes the sequence numbers on the first card and all subsequent cards (A arrays) of the current run. If it encounters something other than the blanks and sequence numbers as described above in columns 63-80 of the first card, then it leaves columns 73-78 unchanged on all cards of the current run.

Next the program separates the fields on the card (i.e., in A) and compresses them into B. It does this by copying one character at a time from A to PB omitting blanks (except when part of a ten

character string preceded by a "$" sign) and starting a new line of PB every time a separator (comma, left or right parenthesis, question mark, or slash) is encountered. It then encodes each line of PB into a line of B so that each element of B contains up to ten characters.

This means that B(I,J) for I = 1,2,...,8 contains the characters of the Jth field of the input card compressed by removing blanks (with the exception noted) and packed ten characters per word (until the characters run out).

A return now occurs with the B array filled with the character strings to be compared to the keywords and option words allowed.

Note that an input card cannot have more than ten fields nor fewer than one. A field on an input card (or in A) is defined as a string of characters lying between two successive separators where for this definition we include the beginning of the card and the end of the card as separators and do not count characters that would otherwise be separators if they lie in a ten character string following a dollar sign. (The normal separators are mentioned above in this section).

9.42 SMOKE Subroutine.

It compares the value of PSMKKL calculated in PSMOKE with a random number sampled from a uniform distribution to determine whether smoke was sufficient to abort the potential Copperhead mission. As usual, if an abort occurs, ABRTTL is called prior to returning; otherwise, an immediate return occurs.

9.43 SMPLCD Subroutine.

This subroutine randomly samples from a cummulative distribution. As arguments, it takes an array A, its dimensions ND1, ND2, the row number NRS containing the values to be sampled, the number of entries NDR used in the row (NDR $\leq$ ND1), and the random number seed IRNDM. It returns the value sampled XSMPL and the class ICLASS in which it falls.

This routine requires an array A with A(I,1) for I = 1,2,.., NDR $\leq$ ND1 consisting of probabilities A(1,1) = 0.0 $\leq$ A(2,1) $\leq$ ... A(NDR,1) = 1.0. The routine samples a random number RN from a uniform distribution (from 0 to 1) and then brackets this number with two entries from A(I,1) such that A(I,1) $\leq$ RN $\leq$ A(I+1,1).

The corresponding entries A(I,NRS) and A(I+1,NRS) from the NRSth row of A are obtained. The value sampled XSMPL is then defined by straight line interpolation, (i.e., XSMPL is defined so that the point (RN, XSMPL) lies on the line segment joining (A(I,1), A(I,NRS)) to (A(I+1,1), A(I+1,NRS))).

Put in terms of a formula, that means:

$$XSMPL = A(I,NRS) + (RN-A(I,1))*(A(I+1,NRS)-A(I,NRS))/(A(I+1,1) -A(I,1)).$$

ICLASS is then defined to be equal to I and a return occurs.

Note that A defines a cummulative distribution. That is, when sampling.

$$Pr(XSMPL \leq A(I,NRS)) = A(I,1) \text{ for } I = 1,2,\ldots,NDR.$$

Hence, the user must take care to use only cummulative distributions for the input data that will eventually be sampled.

9.44 TIMCHK Subroutine.

This subroutine performs test 11 (i.e., does the DO still have line-of-sight to the target when the battery is ready to fire?)

It is called only for the "shooting gallery" LOS model.

9.45 TITLE Subroutine.

This routine merely writes the Title page of the output (see Chapter 6). It also sets the date and time that the current run began.

9.46 USET Subroutine.

This subroutine is called when the next case to be run is to use the baseline (default) values of the case parameters as the base to which its own input cards are to be applied.

The routine sets the UVALUE common block and a few other variables to their default values. Whatever inputs the next case then contains are applied to changing these variables from their defaults rather than from the previous cases values.

9.47 VISCHK Subroutine.

This subroutine performs test 2.

It compares designator-to-target range at unmask to the visibility range limit. If the visibility range limit is less than the designator-to-target range, ABRTTL is called and a return occurs; otherwise, the test is passed and a return occurs.

9.48 WARNDO Subroutine.

This subroutine performs test 13.

If the current round is the first of this COPPERHEAD mission, then a random number is sampled from a uniform distribution and compared to the probability that DO is warned to lase to determine whether the DO received the message to begin lasing. If he did receive the message, the test is passed and a return occurs; if not, ABRTTL is called prior to returning.

If the current round is <u>not</u> the first round of this COPPERHEAD fire mission, then DO is assumed to have been warned either by communication or by sighting the impact of the first round and, in either case, turns on his laser so test 13 is passed and a return occurs.

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CHAPTER 10

10. MEMORY ORGANIZATION: COMMON BLOCKS AND EQUIVALENCE CLASSES

10.1 Common Blocks.

This chapter describes the common blocks and equivalence classes in COPE. This organization of the values stored in memory is a matter of some importance to anyone attempting to modify the program.

Tables 10-1 and 10-2 give, respectively, a list of the common blocks in each subprogram of COPE and a list of the subroutines in which each common block occurs.

10.2 Equivalence Classes.

Table 10-3 gives the equivalence classes. There are twelve equivalence classes used in COPE (some are used in more than one subroutine). The equivalence classes are described below in alphabetical order of the names of their first items. Eight of the twelve equivalence classes are the eight data blocks referred in Section 4.5.1.:

ACQDAT is the Acquisition Range data block,
AINVDA is the Invariant data block,
DFSDAT is the Direct Fire Suppression data block,
PEDATA is the Probability of Engagement data block,
STDAT is the Target Posture Distribution data block,
RODATA is the Random Occurrence data block,
RSPDAT is the Response Time data block, and
WDATA is the Weather data block.

These data block equivalence classes (along with a MAX equivalence class which has nothing to do with COPE's use of PREPMS) are also present in the PREPMS program.

Each equivalence class is formed by an equivalence statement establishing that one array or non-subscripted variable occupies the same memory locations as a set of one or more other arrays or non-subscripted variables. In each case the one array or non-subscripted variable (after which the equivalence class is named in Table 10-3) occupies all of the computer memory used by that equivalence class and so is dimensioned with a value equal to the entire length of the equivalence class (if the length is 1, then the equivalence class occupies but one word of computer memory and the class is named after a non-subscripted variable).

In Table 10-3, the information about each equivalence class is separated by dashed lines and is read as follows:

The first entry on the left gives the name of the equivalence class.

The next entry (length) gives the length of the equivalence class in terms of the words of computer memory occupied by the members of the equivalence class. This length is also the dimension of the array (or non-subscripted variable if length is one) in the first entry.

The entries under "MEMBERS" give bias, name, and length of each member. That is, for each member (variable) of the equivalence class (other than the member in the first entry above) there are three items given: first the bias or number of words preceding the variable in that equivalence class in computer memory space, second the variable (or array) name, and third the length of the array (or non-subscripted variable) in terms of computer words (one for non-subscripted variables).

Note that for each equivalence class, the memory space occupied is part (or all) of some common block. This correspondence is as follows:

    ACQDAT is in the RNGLOS common block,
    AINVDA is in the HIT common block,
    D is in the DVALUE common block,
    DFSDAT is in the DODF common block,
    ICODE is in the ICODE common block,
    PEDATA is in the HIT common block,
    PSTDAT is in the HIT common block,
    RECODE is in the RECNAM common block,
    RODATA is in the RANDOC common block,
    RSPDAT is in the RSPTIM common block,
    U is in the UVALUE common block, and
    WDATA is in the WEATHR common block.

Also, note that the variables in an equivalence class may be used (under their names in the COMMON statements) in subprograms other than those in which the equivalence class is defined.

10-2

TABLE 10-1 COMMON BLOCKS IN EACH SUBPROGRAM OF THE COPE PROGRAM

SUBPROGRAM	COMMON BLOCKS					
ABRTTL	ABORT	FLAG	RPLCTN			
ADDTBR	TIME					
ADDTOF	TIME					
ARTCHK	KTEST	MISC	RANDOM	RPLCTN		
BDATA1	ABRLBL	ACHAR	DESRNG	DISPLY	FLTTIM	FSRESP	HEADNG
	LOGFLG	POINT	SMOKED	STITLE	SYMBOL	XVALUE	
BLOCHK	BAIL	KTEST	RANGE	RPLCTN	TARGET	TIME	
CCPLOT	RUNDAT					
COMMNT	COMENT					
COPE	ABRLBL	ACHAR	BAIL	DESRNG	DISPLY	DODF	FLAG
	FLTTIM	FSRESP	HEADNG	LOGFLG	POINT	RPLCTN	RUNDAT
	SMOKED	STITLE	SYMBOL	TIME	XVALUE		
CREAD	DODF	HIT	RANDOC	RNGLOS	RSPTIM	WEATHR	
DETCTN	FLAG	KTEST	RANDOM	RPLCTN	RSPTIM	TIME	
DFAULT	DVALUE	RUNDAT				
DFCHK	DODF	KTEST	RANDOM	RANGE	RPLCTN	TARGET	TIME
	WEATHR					
DUST	KTEST	MISC	RANDOM	RPLCTN		
ECHO	BAIL	DODF	FLAG	HIT	LOGFLG	MISC	OVER
	PEDESC	RANDOC	RANGE	RECNAM	RNGLOS	RPLCTN	RSPTIM
	RUNDAT	SMOKED	TARGET	TIME	WEATHR		
FINDIT	ACHAR	ICODE	INDEX1	RUNDAT	SYMBOL	
GETRNG	RANDOM	RANGE	RNGLOS	RPLCTN	TARGET	TIME	WEATHR
GETTIM	FLAG	FSRESP	KTEST	LOGFLG	RANDOM	RPLCTN	RSPTIM
	TIME					
GETVIS	RANDOM	RANGE	RPLCTN	WEATHR		
HEADER	BAIL	COMENT	DISPLY	FLAG	HEADNG	LOGFLG	MISC
	OVER	PEDESC	RANGE	RECNAM	RPLCTN	RSPTIM	RUNDAT
	SMOKED	SYMBOL	TARGET	TIME	UVALUE		
HITCHK	HIT	KTEST	RANDOM	RANGE	RPLCTN	RSPTIM	TARGET
	TIME					
IDCHAR	SYMBOL					

SUBPROGRAM	COMMON BLOCKS						
INITLZ	ABORT UVALUE	ACHAR	DVALUE	FLAG	ICODE	INDEX1	RUNDAT
INPUT	ABORT FLAG OVER RNGLOS TIME	BAIL FLTTIM PEDESC RPLCTN UVALUE	COMENT HIT POINT RSPTIM WEATHR	DESRNG ICODE RANDOC RUNDAT	DISPLY INDEX1 RANDOM SMOKED	DODF LOGFLG RANGE SYMBOL	DVALUE MISC RECNAM TARGET
LOSCHK	FLAG TIME	KTEST	RANDOC	RANDOM	RANGE	RPLCTN	TARGET
MINTRN	HIT	KTEST	RANDOM	RANGE	RPLCTN	TARGET	TIME
NOREC	ICODE						
NUMRIC	SYMBOL						
OUTPUT	ABORT SCCSS	ABRLBL	DODF	FLAG	KTEST	RPLCTN	RUNDAT
PECHK	FLAG TARGET	HIT TIME	KTEST WEATHR	RANDOM	RANGE	RPLCTN	RSPTIM
PENAME	XVALUE						
PKCHK	HIT	KTEST	RANDOM	RPLCTN	SCCSS	TARGET	
PPLOT	RUNDAT						
PSMOKE	SMOKED	WEATHR					
REINTZ	ABORT	KTEST	RANDOM	RPLCTN	SCCSS		
RNDREL	KTEST	MISC	RANDOM	RPLCTN			
RNGCHK	KTEST	RANGE	RPLCTN				
SEPREC	COMENT	LOGFLG	SYMBOL				
SMOKE	KTEST	RANDOM	RPLCTN	SMOKED	WEATHR		
TIMCHK	FLAG	KTEST	RPLCTN	TIME			
TITLE	RUNDAT	STITLE					
USET	DVALUE	LOGFLG	OVER	UVALUE			
VISCHK	KTEST	RANGE	RPLCTN				
WARNDO	FLAG	KTEST	RANDOM	RPLCTN	RSPTIM	TIME	

TABLE 10-2   SUBPROGRAMS OF COPE IN WHICH EACH COMMON BLOCK OCCURS

COMMON	SUBPROGRAMS						
ABORT	ABRTTL	INITLZ	INPUT	OUTPUT	REINTZ		
ABRLBL	BDATA1	OUTPUT					
ACHAR	BDATA1	FINDIT	INITLZ				
BAIL	BLOCHK	COPE	ECHO	HEADER	INPUT		
COMENT	COMMNT	HEADER	INPUT	SEPREC			
DESRNG	BDATA1	INPUT					
DISPLY	BDATA1	HEADER	INPUT				
DODF	COPE	CREAD	DFCHK	ECHO	INPUT	OUTPUT	
DVALUE	DFAULT	INITLZ	INPUT	USET			
FLAG	ABRTTL	COPE	DETCTN	ECHO	GETTIM	HEADER	INITLZ
	INPUT	LOSCHK	OUTPUT	PECHK	TIMCHK	WARNDO	
FLTTIM	BDATA1	INPUT					
FSRESP	BDATA1	GETTIM					
HEADNG	BDATA1	HEADER					
HIT	CREAD	ECHO	HITCHK	INPUT	MINTRN	PECHK	PKCHK
ICODE	FINDIT	INITLZ	INPUT	NOREC			
INDEX1	FINDIT	INITLZ	INPUT				
KTEST	ARTCHK	BLOCHK	DETCTN	DFCHK	DUST	GETTIM	HITCHK
	LOSCHK	MINTRN	OUTPUT	PECHK	PKCHK	REINTZ	RNDREL
	RNGCHK	SMOKE	TIMCHK	VISCHK	WARNDO		
LOGFLG	BDATA1	ECHO	GETTIM	HEADER	INPUT	SEPREC	USET
MISC	ARTCHK	DUST	ECHO	HEADER	INPUT	RNDREL	
OVER	ECHO	HEADER	INPUT	USET			
PEDESC	ECHO	HEADER	INPUT				
POINT	BDATA1	INPUT					
RANDOC	CREAD	ECHO	INPUT	LOSCHK			
RANDOM	ARTCHK	DETCTN	DFCHK	DUST	GETRNG	GETTIM	GETVIS
	HITCHK	INPUT	LOSCHK	MINTRN	PECHK	PKCHK	REINTZ
	RNDREL	SMOKE	WARNDO				
RANGE	BLOCHK	DFCHK	ECHO	GETRNG	GETVIS	HEADER	HITCHK
	INPUT	LOSCHK	MINTRN	PECHK	RNGCHK	VISCHK	

COMMON	SUBPROGRAMS					
RECNAM	ECHO	HEADER	INPUT			
RNGLOS	CREAD	ECHO	GETRNG	INPUT		
RPLCTN	ABRTTL	ARTCHK	BLOCHK	COPE	DETCTN	DFCHK	DUST
	ECHO	GETRNG	GETTIM	GETVIS	HEADER	HITCHK	INPUT
	LOSCHK	MINTRN	OUTPUT	PECHK	PKCHK	REINTZ	RNDREL
	RNGCHK	SMOKE	TIMCHK	VISCHK	WARNDO		
RSPTIM	CREAD	DETCTN	ECHO	GETTIM	HEADER	HITCHK	INPUT
	PECHK	WARNDO					
RUNDAT	CCPLOT	COPE	DFAULT	ECHO	FINDIT	HEADER	INITLZ
	INPUT	OUTPUT	PPLOT	TITLE			
SCCSS	OUTPUT	PKCHK	REINTZ			
SMOKED	BDATA1	ECHO	HEADER	INPUT	PSMOKE	SMOKE
STITLE	BDATA1	TITLE				
SYMBOL	BDATA1	FINDIT	HEADER	IDCHAR	INPUT	NUMRIC	SEPREC
TARGET	BLOCHK	DFCHK	ECHO	GETRNG	HEADER	HITCHK	INPUT
	LOSCHK	MINTRN	PECHK	PKCHK			
TIME	ADDTBR	ADDTOF	BLOCHK	COPE	DETCTN	DFCHK	ECHO
	GETRNG	GETTIM	HEADER	HITCHK	INPUT	LOSCHK	MINTRN
	PECHK	TIMCHK	WARNDO				
UVALUE	HEADER	INITLZ	INPUT	USET		
WEATHR	CREAD	DFCHK	ECHO	GETRNG	GETVIS	INPUT	PECHK
	PSMOKE	SMOKE					
XVALUE	BDATA1	PENAME				

TABLE 10-3 COPE EQUIVALENCE CLASSES

NAME (Name of First Item)	LENGTH	MEMBERS Bias	Name	Length
ACQDAT	161	0	NRP	1
		1	NPP	1
		2	NRNGCL	1
		3	CRNGD	22
		25	SEGLOC	121
		146	RNGCLB	11
		157	VELTBL	4

(Occurs in subroutines CREAD and INPUT)

AINVDA	167	0	DLTT	6
		6	PKTBL	20
		26	NRNGTT	1
		27	RNGTTF	20
		47	TTF	120

(Occurs in subroutines CREAD and INPUT)

D	70	0	DVALUE	70

(Occurs in subroutine INPUT)

DFSDAT	31	0	DFDOKL	30
		30	NDFSP	1

(Occurs in subroutine CREAD and INPUT)

ICODE	1	0	CODE	1

(Occurs in subroutines FINDIT, INITLZ, and INPUT)

PEDATA	4260	0	INDEX	60
		60	PETBL	4200

(Occurs in subroutines CREAD and INPUT)

TABLE 10-3 COPE EQUIVALENCE CLASSES - CONT'D

NAME (Name of First Item)	LENGTH	MEMBERS Bias	Name	Length
PSTDAT	41	0	NRNGPS	1
		1	RNGPST	10
		11	PSTTBL	30

(Occurs in subroutines CREAD and INPUT)

RECODE	8	0	WCODE	1
		1	ACCODE	1
		2	RSCODE	1
		3	DFCODE	1
		4	ROCODE	1
		5	PECODE	1
		6	PSCODE	1
		7	AICODE	1

(Occurs in subroutine (HEADER)

RODATA	22	0	TCRIT	1
		1	NPLOSR	1
		2	RNGPLS	10
		12	PRBLOS	10

(Occurs in subroutines CREAD and INPUT)

RSPDAT	49	0	BATRTM	3
		3	XMVADF	2
		5	DUM1	1
		6	BCSPTM	4
		10	XMTTIM	4
		14	TMEAN	4
		18	TSIGMA	4
		22	DETTMA	20
		42	NDT	1
		43	TRARRY	6

(Occurs in subroutines CREAD and INPUT)

TABLE 10-3 COPE EQUIVALENCE CLASSES - CONT'D

NAME (Name of First Item)	LENGTH	Bias	MEMBERS Name	Length
U (Occurs in subroutines HEADER and INPUT)	70	0	UVALUE	70

NAME (Name of First Item)	LENGTH	Bias	MEMBERS Name	Length
WDATA	193	0	PRCLCG	1
		1	PRCFLS	2
		3	PRGCFL	22
		25	W	132
		157	VIS	11
		168	CLOUD	6
		174	NCC	1
		175	NVL	1
		176	PASQL	6
		182	WNDSPD	9
		191	HUMID	2

(Occurs in subroutines CREAD and INPUT)

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11. FLOWCHARTS

This chapter includes flowcharts of the COPE main program and subroutine INPUT. Flowcharts of the other subroutines are not included since they are generally simple enough to understand by reading the descriptions in chapter 9 and studying the actual program code with the aid of the glossary of variables in chapter 12.

Several conventions are observed in the flowcharts. First, connectors on-page are indicated by circles whereas connectors off-page are indicated by pentagons. Numbered connectors correspond to actual statement numbers in the program code whereas letter connectors are merely flowcharting conveniences. Each STOP block in the flowchart includes the section number of this report that explains that stop.

A list of abbreviations used in the flow charts is included on the next page.

ABBREVIATIONS USED IN FLOW CHARTS

acq	Acquisition	OW	Option word
CLGP	COPPERHEAD	param	parameterized
C.O.	Completely obscured	pr	priority
comt	comment	prob	probability
desig	designator	rd(s)	round(s)
DF	direct fire	resp	response
dgt	digital	R.N.	random number(s)
D.O.	designator operator	rng	range
F.E.	fully exposed	SG	shooting gallery
fn	function	smk	smoke
H.D.	hull defilade	supp	suppression
hdng	heading	temp	temporary
KW	keyword	tgt	target
max	maximum	vel	velocity
mo	month	vis	visibility
msg	message	w/	with
msn	mission	#	number
no	number		
nt	night		
opt	option		

Flowchart of Main Program of COPE

```
      ┌─────────┐                              ( 110 )
      (  START  )                                 │
      └────┬────┘                                 ▼
           │                              ┌──────────────┐
           ▼                              │ Set replica- │
    ┌──────────────┐                      │ tion flags & │
    │ Common Blocks│                      │ counters     │
    │ and type     │                      └──────┬───────┘
    │ statements   │                             │
    └──────┬───────┘                             ▼
           │                              ╱────ARTCHK────╲
           ▼                             ╱   (test 1)     ╲
    ╱─────TITLE─────╲                    ╲ D.O. survives  ╱
   ╱  Print title    ╲                    ╲ prep-fires?  ╱
   ╲     page        ╱                      └─────┬──────┘
    ╲───────────────╱                             │
           │                                      ▼
           ▼                                  ╱───────╲       ┌─────┐
    ╱─────INITLZ────╲                        ╱   Is    ╲  N   │     │
   ╱  Open File      ╲                      ╱  test 1   ╲────▶│ 140 │
   ╱  Tape 11 &       ╲                     ╲  passed   ╱     │     │
   ╲  initialize     ╱                       ╲    ?    ╱      └─────┘
    ╲  variables    ╱                         ╲───────╱
     ╲─────────────╱                             │ Y
           │                                     ▼
           ▼                             ╱─────GETVIS────╲
        ( 100 )                         ╱   Sample        ╲
           │                            ╲   weather        ╱
           │                             ╲   date         ╱
           ▼                              ╲──────┬───────╱
    ╱─────INPUT─────╲                            │
   ╱  Read input     ╲                           ▼
   ╱ & set values     ╲                  ╱─────GETRNG────╲
   ╲  for this        ╱                 ╱   Sample        ╲
    ╲    case        ╱                  ╲   terrain        ╱
     ╲──────────────╱                    ╲   data         ╱
           │                              ╲──────┬───────╱
           ▼                                     │
    ╱─────REINTZ────╲                            ▼
   ╱  Set R.N.       ╲                   ╱─────VISCHK────╲
   ╱  seeds &         ╲                 ╱   (test 2)      ╲
   ╲  various         ╱                 ╲ Is tgt with-    ╱
    ╲  counters      ╱                   ╲ in vis.rng    ╱
     ╲──────────────╱                     ╲ of D.O.?    ╱
           │                                └─────┬─────╱
           ▼                                      │
    ┌──────────────┐                              ▼
    │  KREP = 1    │                           ╱─────╲
    │  NDOKIL = 0  │                          │   A   │
    └──────┬───────┘                           ╲─────╱
           │
           ▼
        ( 110 )
```

FIGURE 11-1 Flowchart of Main Program of COPE (Page 1 of 5)

Left column

A

↓

IS TEST 2 PASSED? —N→ 140

↓ Y

RNGCHK
(test 3)
Tgt within D.O. rng?

↓

IS TEST 3 PASSED? —N→ 140

↓ Y

DETCTN
(test 4)
Is tgt detected?

↓

IS TEST 4 PASSED? —N→ 140

↓ Y

SMOKE
(test 5)
Does smk prevent CLGP?

↓

B

Right column

B

↓

IS TEST 5 PASSED? —N→ 140

↓ Y

DUST
(test 6)
Does dust prevent CLGP?

↓

IS TEST 6 PASSED? —N→ 140

↓ Y

IBAIL = 1

↓

BLOCHK
(test 7)
Does D.O. bail-out now?

↓

IS TEST 7 PASSED? —N→ 140

↓ Y

C

FIGURE 11-1   Flowchart of Main Program of COPE (Page 2 of 5)

11-5

C

GETTIM
(test 8&9)
Have commo link & correct msg?

ARE TEST 8 & 9 BOTH PASSED? —N→ 140

Y

IBAIL = 2

BLOCHK
(test 10)
Does D.O. Bail-out now?

IS TEST 10 PASSED? —N→ 140

Y

IS THIS CASE RANDOM OCCURRENCE? —N→ TIMCHK (test 11) Tgt still in view?

IS TEST 11 PASSED? —N→ 140

Y →

Y (from RANDOM OCCURRENCE)

D

D

ADDTOF
Add time of flight to current time

120

LOSCHK
(test 12)
Is tgt now in view?

IS TEST 12 PASSED? —N→ 130

Y

WARNDO
(test 13)
D.O. warned to lase?

IS TEST 13 PASSED? —N→ 130

Y

E

FIGURE 11-1   Flowchart of Main Program of COPE (Page 3 of 5)

```
        ┌───┐                                    ┌───┐
        │ E │                                    │ F │
        └───┘                                    └───┘
          │                                        │
    ┌───────────┐                            ╱─────────╲
    │  DFCHK    │                           ╱    IS     ╲    N    ┌─────┐
    │ (test 14) │                          ╱  TEST 17    ╲───────▶│ 130 │
    │ Does DF from                         ╲  PASSED?    ╱        └─────┘
    │ tgt prevent                           ╲─────────╱
    │  CLGP?    │                                │ Y
    └───────────┘                          ┌───────────┐
          │                                │  HITCHK   │
    ╱───────────╲                          │ (test 18) │
   ╱     IS      ╲   N    ┌─────┐          │ Does rd   │
  ╱   TEST 14     ╲──────▶│ 130 │          │ hit tgt?  │
  ╲   PASSED?     ╱       └─────┘          └───────────┘
   ╲───────────╱                                 │
          │ Y                               ╱───────────╲
    ┌───────────┐                          ╱     IS      ╲  N    ┌─────┐
    │  RNDREL   │                         ╱   TEST 18     ╲─────▶│ 130 │
    │ (test 15) │                         ╲   PASSED?     ╱      └─────┘
    │ Is CLGP rd                           ╲───────────╱
    │ reliable? │                                │ Y
    └───────────┘                          ┌───────────┐
          │                                │  PKCHK    │
    ╱───────────╲                          │ (test 19) │
   ╱     IS      ╲   N    ┌─────┐          │ Does rd   │
  ╱   TEST 15     ╲──────▶│ 130 │          │ kill tgt? │
  ╲   PASSED?     ╱       └─────┘          └───────────┘
   ╲───────────╱                                 │
          │ Y                                  ┌─────┐
    ┌───────────┐                              │ 130 │
    │  MINTRN   │                              └─────┘
    │ (test 16) │                                 │
    │ Sample &  │                           ╱───────────╲
    │ test tgt  │                          ╱   Final     ╲  Y    ┌─────┐
    │ posture?  │                         ╱  rd for this  ╲─────▶│ 140 │
    └───────────┘                         ╲  replication  ╱      └─────┘
          │                                ╲     ?      ╱
    ╱───────────╲                           ╲─────────╱
   ╱     IS      ╲   N    ┌─────┐                 │ N
  ╱   TEST 16     ╲──────▶│ 130 │          ┌───────────┐
  ╲   PASSED?     ╱       └─────┘          │  ADDTBR   │
   ╲───────────╱                           │ Add time be-
          │ Y                              │ tween rds to
    ┌───────────┐                          │ current   │
    │  PECHK    │                          │ time.     │
    │ (test 17) │                          └───────────┘
    │ Does rd en-                                │
    │ gage tgt? │                             ┌─────┐
    └───────────┘                             │  G  │
          │                                   └─────┘
        ┌───┐
        │ F │
        └───┘
```

FIGURE 11-1   Flowchart of Main Program of COPE (Page 4 of 5)

11-7

FIGURE 11-1 Flowchart of Main Program of COPE (Page 5 of 5)

Flowchart of Subroutine INPUT of COPE

START

Specifica-
tion
statements

Define IRAY
array

SYSTEMC
Non-standard
error recov-
ery for
Error 104

Initialize
counters and
arrays. Bump
case number

Write case
number line
of header
page

130

Read next
line of
INPUT

A

A

EOF
encountered
?

N

Y

Set ENDFLG
to TRUE

Any
lines read
for this
case?

N

STOP(7.5.14)

Y

Encode comment
about EOF

COMMNT
Process
comment

490

140

Write INPUT
line to
TAPE 8

B

FIGURE 11-2   Flowchart of Subroutine INPUT of COPE (Page 1 of 15)

FIGURE 11-2 Flowchart of Subroutine INPUT of COPE (Page 2 of 15)
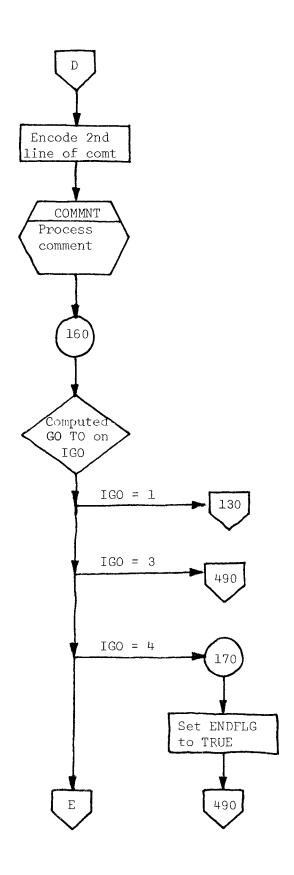
FIGURE 11-2   Flowchart of Subroutine INPUT of COPE (Page 3 of 15)
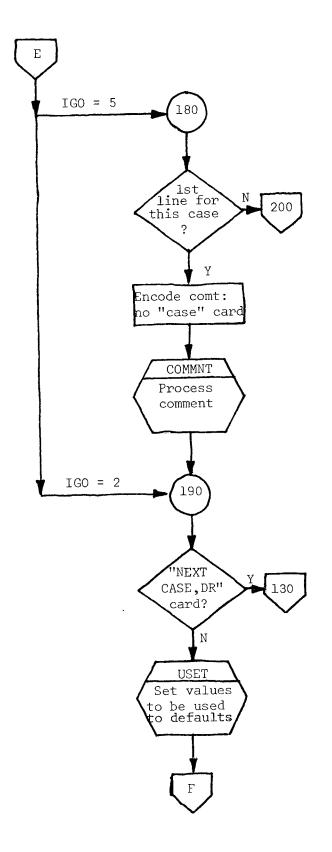
FIGURE 11-2   Flowchart of Subroutine INPUT of COPE (Page 4 of 15)

FIGURE 11-2   Flowchart of Subroutine INPUT of COPE (Page 5 of 15)

11-14

I   J

ITl = 21 → 300 → Encode weather data record name

ITl=22,24 27,28 → 310 → Encode KW ITl data record name

ITl = 23 → 320

Set day/nt flag

Param Resp time ?

N → Encode resp time data record name & set flags

Y

330

Set UPRT to param resp time

Is UPRT ≤ 0.0 ?

N → Set FTSILL to FALSE

Y

K

STOP(7.5.18)

L

FIGURE 11-2   Flowchart of Subroutine INPUT of COPE (Page 7 of 15)

G

ITl = 6 → (240) → Set override flag & record name for KW IT2 → H

ITl = 7 → (250) → Set temporary flag for KW IT2 →

CREAD
Read formatted INPUT →

ITl = 8 → (260) → Clear override (or temp)flag & reset default for KW IT2 →

ITl = 9 → (230) → Set flag for short or long echo print →

ITl = 11 → (270) → Set UVALUE(11) equal to IT(2) →

ITl=12-16 → (280) → Set UVALUE(IT1) equal to IT(2) →

ITl = 17 → (290) → Encode tgt posture data record name →

I

J

FIGURE 11-2   Flowchart of Subroutine INPUT of COPE (Page 6 of 15)

FIGURE 11-2   Flowchart of Subroutine INPUT of COPE (Page 8 of 15)
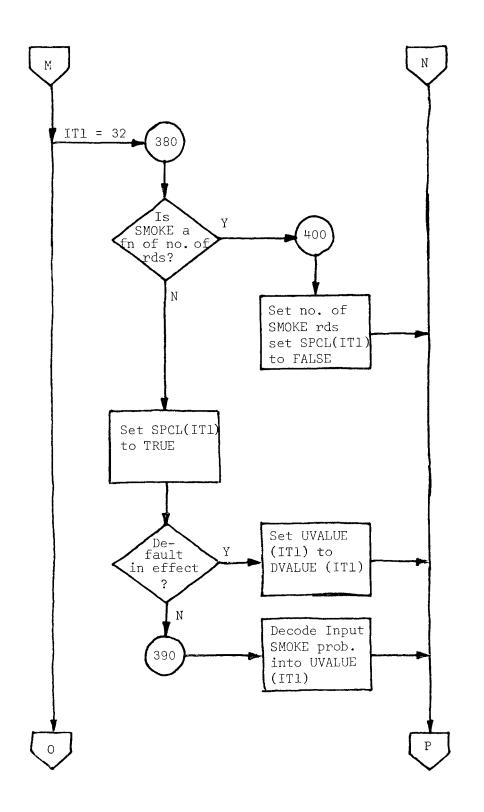
FIGURE 11-2   Flowchart of Subroutine INPUT of COPE (Page 9 of 15)

11-18
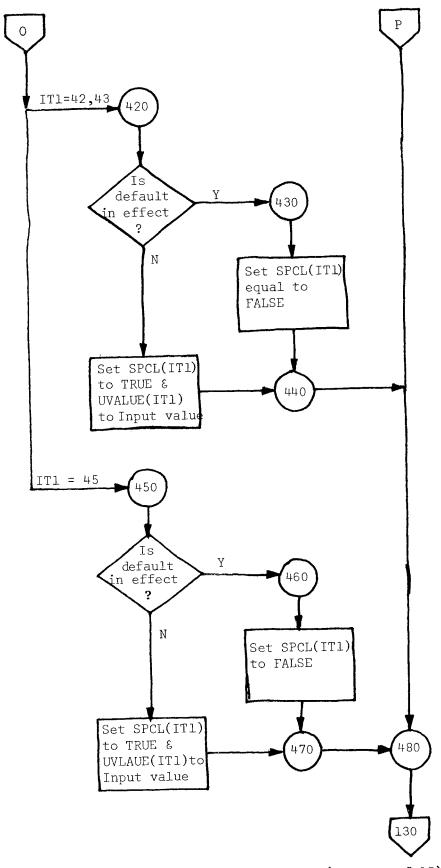
FIGURE 11-2   Flowchart of Subroutine INPUT of COPE (Page 10 of 15)

11-19
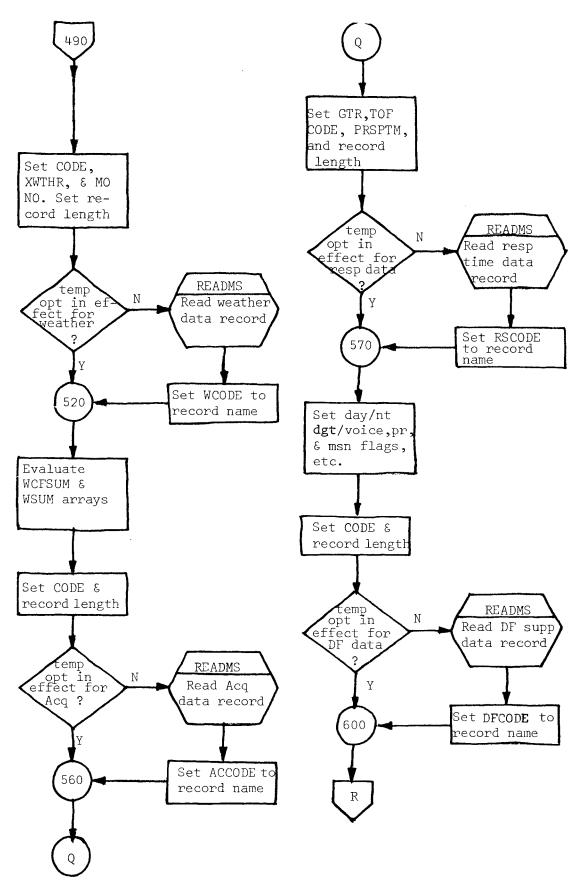
FIGURE 11-2   Flowchart of Subroutine INPUT of COPE (Page 11 of 15)
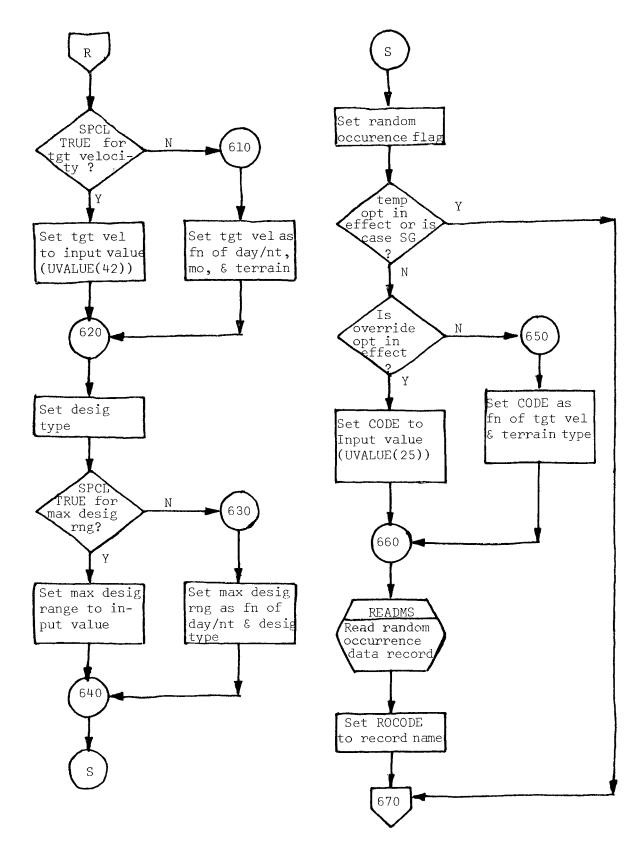
FIGURE 11-2   Flowchart of Subroutine INPUT of COPE (Page 12 of 15)
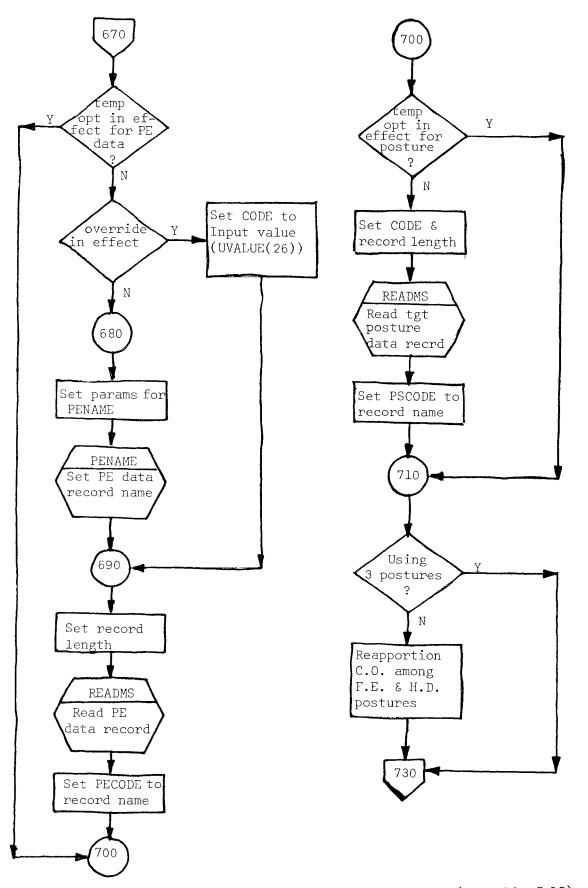
FIGURE 11-2   Flowchart of Subroutine INPUT of COPE (Page 13 of 15)
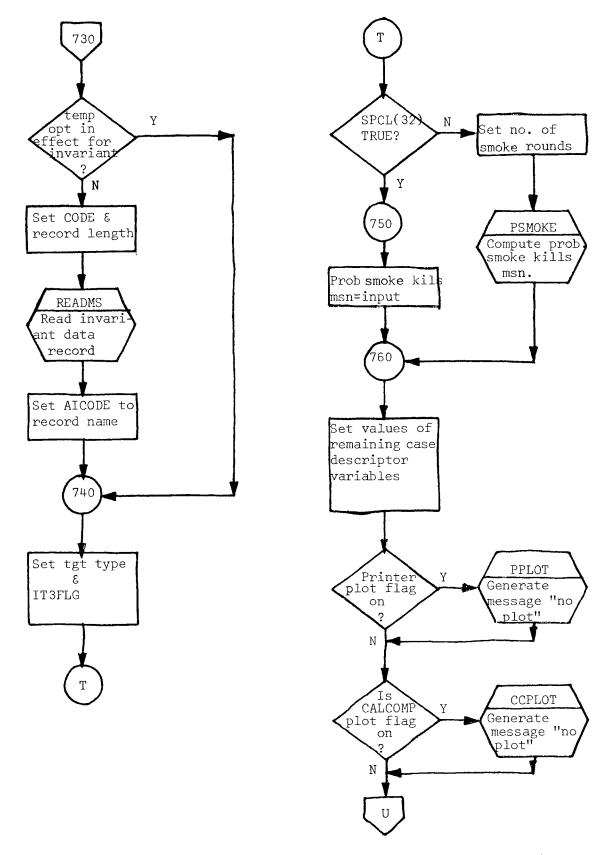
FIGURE 11-2 Flowchart of Subroutine INPUT of COPE (Page 14 of 15)
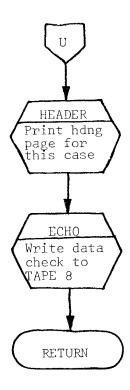
FIGURE 11-2 Flowchart of Subroutine INPUT of COPE (Page 15 of 15)

12. GLOSSARY OF MAIN COPE PROGRAM VARIABLES

This chapter consists of a glossary of variables for the main COPE program. (Glossaries for the PREPMS and PRBLOS preprocessor programs are respectively, included in sections 14.3 and 15.3. No glossary is provided in this report for the PAM preprocessor program.)

The glossary consists of an alphabetical list of the variable names. For each variable name, there is an entry giving VARIABLE, TYPE, COMMON BLOCK, UNITS, and DEFINITION.

Under the VARIABLE heading is the variable name and, if the variable is an array, the array dimensions are given in parentheses after the name.

Under the TYPE column, the variable type is given; if the type is omitted, it means the FORTRAN type default is in effect (i.e., a variable beginning with letter I, J, K, L, M, or N is integer type whereas one beginning with any other letter is single precision real type).

Under the COMMON BLOCK column is the name of the common block (if any) to which the variable belongs. If this column contains "(LOCAL)", it means the variable is a local variable; if it contains "(F.P.)", it means the variable is a formal parameter in a FUNCTION or SUBROUTINE.

Under the UNITS column is the name of the units of measure in which the variable is to be given. If a blank occurs in this column, it means that the variable is unitless.

Finally, under the DEFINITION heading is a brief description of the variable.

GLOSSARY OF MAIN COPE PROGRAM VARIABLES

VARIABLE	TYPE	COMMON BLOCK	UNITS	DEFINITION
A(80) A(N)		(LOCAL) (F.P.)		ARRAY INTO WHICH INPUT LINE IS READ BY SUBROUTINE INPUT. A(I) IS THE ITH CHARACTER IN THE INPUT LINE. ALSO USED AS A FORMAL PARAMETER TO RECEIVE COMMENTS IN SUBROUTINE COMMNT OR TO PASS INPUT LINE TO SUBROUTINE SEPREC TO UNSTRING KEYWORDS AND OPTION WORDS.
ABRPCT(20, 6)		(LOCAL)		ABRPCT(I, J) IS THE PERCENT OF THE TOTAL NUMBER OF REPLICATIONS THAT ABORTED FOR ITH ABORT REASON ON ROUND J. IF ABRPCT(I, J) IS UNDEFINED, IT IS SET EQUAL TO -1.
ACCODE		RECNAM		RECORD NAME KEY FOR THE ACQUISITION DATA RECORD LAST READ FROM THE WORD ADDRESSABLE MASS STORAGE FILE (TAPE 11).
ACQDAT(161)		(LOCAL)		ARRAY TO WHICH ELEMENTS OF ACQUISITION RANGE DATA BLOCK ARE EQUIVALENCED.
ACQLBL(2, 4)		HEADNG		ALPHANUMERIC DESCRIPTOR OF THE TERRAIN TYPE USED FOR CURRENT CASE. IT IS USED TO LABEL THE "TERRAIN AND LOS" BLOCK OF THE OUTPUT HEADING.
AICODE		RECNAM		RECORD NAME KEY FOR THE "INVARIANT" DATA RECORD LAST READ FROM THE WORD ADDRESSABLE MASS STORAGE FILE (TAPE 11).
AINVDA(167)		(LOCAL)		ARRAY TO WHICH ELEMENTS OF INVARIANT DATA BLOCK ARE EQUIVALENCED.
ALF		(LOCAL)		TEMPORARY NAME FOR THE ALPHA PARAMETER OF THE GAMMA DISTRIBUTION USED TO SAMPLE DIGITAL MESSAGE DEVICE DELAY TIME.
ALFBET(27)		SYMBOL		ALFBET(I) IS THE ITH LETTER OF THE ALPHABET FOR I=1,2,...,26 ALFBET(27) IS AN APOSTROPHE. THESE SYMBOLS ARE ALL STORED IN A1 FORMAT.
ALPHA		(F.P.)		ALPHA IS THE 'SHAPING FACTOR' OF THE GAMMA DISTRIBUTION.
ALPHA(2, 2)		RSPTIM		ALPHA(I, J) IS THE ALPHA PARAMETER TO BE USED WITH THE GAMMA DISTRIBUTION (I=1 FOR DAY, I=2 FOR NIGHT, J=1 FOR A PRE-PLANNED TARGET, AND J=2 FOR A TARGET OF OPPORTUNITY).
ANGLET		PEDESC (F.P.)	DEGREES	THE ANGLE BETWEEN THE GUN-TARGET LINE AND THE DESIGNATOR-TARGET LINE.
ANUMBR(11)		SYMBOL		ANUMBR(I)=I-1 FOR 1<I<10. ANUMBR(11) IS A MINUS SIGN. THESE ARE STORED IN A1 FORMAT.

GLOSSARY - CONTINUED

VARIABLE	TYPE	COMMON BLOCK	UNITS	DEFINITION
AOUT(4, 40)		(LOCAL)		ARRAY INTO WHICH THE FIRST COLUMN OF CASE HEADING OUTPUT BLOCKS ARE ENCODED PRIOR TO BEING PRINTED OUT IN SUBROUTINE HEADER.
AVALUE(9)		(LOCAL)		ARRAY USED TO TEMPORARILY STORE VALUES USED IN CREATING AND DECIPHERING PROBABILITY OF ENGAGEMENT RECORD NAME KEYS USED TO READ TAPE 11.
A1		(LOCAL)		USED IN FUNCTION URAN31 TO COMPUTE PSEUDO-RANDOM NUMBER.
B(8, 10) B(M, N)		(LOCAL) (F.P.)		B(I, J) CONTAINS CHARACTERS 10*(I-1)+1 THROUGH 10*I OF THE JTH KEYWORD OR OPTION WORD OF THE MOST RECENTLY READ NON-COMMENT INPUT LINE STORED IN A10 FORMAT WITH MOST BLANKS REMOVED.
BATRTM(3)		RSPTIM	SECONDS	BATRTM(I) IS THE TIME USED BY THE FIRING BATTERY FROM THE TIME IT RECEIVES A COPPERHEAD FIRE MISSION ORDER FROM THE FDC UNTIL IT IS READY TO FIRE THE FIRST COPPERHEAD ROUND OF THAT MISSION. I=1 FOR PRE-PLANNED TARGETS, I=2 FOR TARGETS OF OPPORTUNITY, I=3 FOR PRIORITY PRE-PLANNED TARGETS.
BCSPTM(2, 2)		RSPTIM	SECONDS	BCSPTM(I, J) IS THE TIME REQUIRED FOR THE BATTERY COMPUTER SYSTEM TO PROCESS THE COPPERHEAD FIRE MISSION REQUEST. I=1 FOR DIGITAL COMMUNICATIONS, I=2 FOR VOICE COMMUNICATIONS; J=1 FOR PRE-PLANNED TARGETS, J=2 FOR TARGETS OF OPPORTUNITY.
BETA(2, 2)		RSPTIM	SECONDS	BETA(I, J) IS THE SCALING FACTOR TO BE USED WITH THE GAMMA DISTRIBUTION (I=1 FOR DAY, I=2 FOR NIGHT; J=1 FOR PRE-PLANNED TARGETS, J=2 FOR TARGETS OF OPPORTUNITY).
BLANK		SYMBOL		BLANK IS A BLANK SYMBOL (ONE EMPTY PRINT SPACE) STORED IN A1 FORMAT.
BLORNG		BAIL	METERS	BLORNG IS THE DESIGNATOR BAIL-OUT RANGE.
BOUT(4, 40)		(LOCAL)		ARRAY INTO WHICH SECOND COLUMN OF CASE HEADING OUTPUT BLOCKS ARE ENCODED PRIOR TO BEING PRINTED OUT IN SUBROUTINE HEADER.
C(80)		(LOCAL)		C(I) IS THE ITH CHARACTER OF AN OPTION WORD THAT IS BEING CHECKED TO DETERMINE WHETHER IT IS NUMERIC. (STORED IN A1 FORMAT.)

VARIABLE	TYPE	COMMON BLOCK	UNITS	DEFINITION
CHAR(10, 120)		ACHAR		CHAR(I, J) FOR I>2 CONTAINS CHARACTERS 10*(I-3)+1 THROUGH 10*(I-2) OF THE JTH KEYWORD CHARACTER STRING IN A10 FORMAT. CHAR(1, J) IS THE KEYWORD NUMBER AND CHAR(2, J) IS THE NUMBER OF OPTION WORD CHARACTER STRINGS ALLOWED WITH JTH KEYWORD.
CHARA(10, 30)		(LOCAL)		CHAR(I, J) FOR I>2 CONTAINS CHARACTERS 10*(I-3)+1 THROUGH 10*(I-2) OF THE JTH OPTION WORD CHARACTER STRING IN A10 FORMAT CHARA(1, J) IS THE OPTION WORD CHOICE NUMBER AND CHARA(2, J) IS THE NUMBER INDICATING THE LEVEL (POSITION NUMBER) OF THE OPTION WORD.
CLDCLG		(LOCAL)	METERS	CLOUD CEILING ALTITUDE. (NOT ACTUALLY USED AFTER IT IS SET). THE INDEX OF THE CLOUD CEILING ALTITUDE (ICC) IS THE NUMBER USED TO ACCESS DATA THAT DEPENDS ON CLOUD CEILING ALTITUDE.)
CLOUD(6)		WEATHR	METERS	ARRAY OF CLOUD CEILING ALTITUDE VALUES.
CM(10)		(LOCAL)		CONTAINS COMMENT LINE GENERATED BY PROGRAM AND READY TO BE PROCESSED BY SUBROUTINE COMMNT.
CMENT(13, 20)		COMENT		CMENT(I, J) CONTAINS CHARACTERS 10*(I-1)+1 THROUGH 10*I OF THE JTH LINE OF COMMENTS TO BE PRINTED WITH THE CURRENT CASE
CODE		(LOCAL)		CODE AND ICODE ARE EQUIVALENT. (SEE ICODE)
COUT(4, 40)		(LOCAL)		ARRAY INTO WHICH THIRD COLUMN OF CASE HEADING OUTPUT BLOCKS ARE ENCODED PRIOR TO BEING PRINTED OUT IN SUBROUTINE HEADER.
COMBUF(13)		COMENT		COMMENT BUFFER. IF FOR ANY COPE CASE THE NUMBER OF $$ COMMENTS EXCEEDS THE SECOND DIMENSION OF THE CMENT ARRAY (ORIGINALLY SET AT 20), THEN THE COMMENT THAT CAUSES THE OVERFLOW IS STORED IN COMBUF AND AN ERROR PRINT OCCURS FOLLOWED BY A STOP WITH MESSAGE.
CRNG(11, 2)		RNGLOS	NONE, METERS	CUMULATIVE ACQUISITION RANGE DISTRIBUTION. CRNG(I, 1) IS THE PROBABILITY THAT THE ACQUISITION RANGE IS LESS THAN OR EQUAL TO CRNG(I, 2). (CRNGD(I,1) IS UNITLESS; CRNG(I, 2) IS IN METERS).
D(70)		DVALUE		DEFAULT VALUES FOR PARAMETERS ASSOCIATED WITH KEYWORDS.
DAT		RUNDAT		DATE OF RUN FOR CURRENT COMPUTER JOB. (OBTAINED FROM COMPUTER'S INTERNAL CALENDAR.)

GLOSSARY - CONTINUED

VARIABLE	TYPE	COMMON BLOCK	UNITS	DEFINITION
DAYLBL(2)		HEADNG		ALPHANUMERIC LABELS USED IN LABELING OUTPUT HEADINGS AS DAY OR NIGHT.
DDT		DVALUE		NOT USED.
DECFLG		(LOCAL)		IF DECFLG=1.0, A DECIMAL POINT HAS BEEN ENCOUNTERED IN C ARRAY; IF DECFLG=0.0. NO DECIMAL POINT HAS BEEN ENCOUNTERED IN C ARRAY.
DECPNT		SYMBOL		ALPHANUMERIC SYMBOL FOR DECIMAL POINT STORED IN A1 FORMAT.
DEFB		PEDESC(LOCAL) IN PENAME)	METERS	DEFLECTION BIAS (DISTANCE FROM FOOTPRINT CENTROID TO POINT OF CLOSEST APPROACH OF TARGET).
DELTAT		(LOCAL)	SECONDS	TIME ROUND ARRIVES ON TARGET MINUS TIME LAST TARGET VEHICLE IN COLUMN PASSES POINT OF CLOSEST APPROACH TO FOOTPRINT CENTROID. IF DELTAT AS COMPUTED ABOVE IS NEGATIVE, THEN A VALUE OF ZERO IS USED.
DESRNG(3, 2)		DESRNG	METERS	DESRNG(I,J) IS THE MAXIMUM DESIGNATOR RANGE FOR THE ITH DESIGNATOR TYPE AND THE JTH DAY OR NIGHT CONDITION (J=1 FOR DAY, J=2 FOR NIGHT).
DETTIM		RSPTIM	SECONDS	TIME FROM TARGET UNMASK TO OBSERVER'S CALL FOR COPPERHEAD.
DETTMA(10, 2)		RSPTIM	NONE, SEC	DETECTION TIME CUMULATIVE DISTRIBUTION ARRAY. DETTMA(I,1) IS THE PROBABILITY THAT DETECTION TIME IS LESS THAN OR EQUAL TO DETTMA(I,2).
DFCODE		RECNAM		RECORD NAME KEY FOR THE DIRECT FIRE DATA RECORD LAST READ FROM THE WORD ADDRESSABLE MASS STORAGE FILE (TAPE 11).
DFDOKL(10,3)		DODF	METERS, NONE	DFDOKL(I,1) IS THE ITH RANGE CLASS UPPER LIMIT: DFFOKL(I,2) IS THE PROBABILITY THAT DIRECT FIRE OBSCURES DESIGNATOR'S VIEW OF TARGET AT RANGE DFDOKL(I,1) BUT DOES NOT KILL DESIGNATOR: DFDOKL(I,3) IS THE PROBABILITY THAT DIRECT FIRE KILLS THE DESIGNATOR AT RANGE DFDOKL(I,1).
DFSDAT		(LOCAL)	METERS	ARRAY TO WHICH ELEMENTS OF DIRECT FIRE SUPPRESSION DATA BLOCK ARE EQUIVALENCED.
DFSLBL(2,2)		HEADNG		ARRAY CONTAINING LABELS FOR DIRECT FIRE SUPPRESSION LEVEL PRINT OUT.
DGTLBL(2,2)		HEADNG		ARRAY CONTAINING LABELS FOR COMMUNICATIONS PRINT OUT.

GLOSSARY - CONTINUED

VARIABLE	TYPE	COMMON BLOCK	UNITS	DEFINITION
DIDIGT		DVALUE		DEFAULT COMMUNICATIONS TYPE (DIGITAL).
DIDN		DVALUE		DEFAULT DAY OR NIGHT TIME (DAY).
DISBVH		TARGET	METERS	MEAN DISTANCE BETWEEN CONSECUTIVE VEHICLES IN TARGET COLUMN.
DISPM(12)		DISPLY		DISPM(I) IS THE FIRST THREE LETERS OF THE ITH MONTH NAME USED IN PROGRAM. (A3 FORMAT)
DISPT(24)		DISPLY		DISPT(I) IS THE FOUR DIGIT TIME OF DAY FOR THE ITH TIME OF DAY PLAYED. (A4 FORMAT)
DLTT(6)		HIT	SECONDS	ARRAY OF DELAY TIME VALUES USED FOR INTERPOLATING IN PROBABILITY OF ENGAGEMENT ARRAY.
DOARPK		MISC		PROBABILITY DESIGNATOR HAS BEEN KILLED BY PREPARATORY ARTILLERY FIRES.
DOKILD	LOGICAL	DODF		FLAG USED TO INDICATE THAT DESIGNATOR HAS BEEN KILLED BY DIRECT FIRE. (TRUE = KILLED; FALSE = NOT KILLED)
DOLBL(3,2)		HEADNG		ARRAY OF DESIGNATOR LOCATION LABELS USED FOR PRINT OUT.
DOLLAR		SYMBOL		DOLLAR SIGN SYMBOL IN A1 FORMAT.
DPRT		DVALUE	SECONDS	DEFAULT VALUE FOR PARAMETERIZED RESPONSE TIME.
DSMK(2)		DVALUE		DEFAULT NUMBER OF SMOKE ROUNDS FIRED BY RED. DSMK(1) FOR TYPE 1 SMOKE ROUNDS: DSMK(2) FOR TYPE 2 SMOKE ROUNDS.
DTRNG		RANGE	METERS	DESIGNATOR-TO-TARGET RANGE.
DUM1		RSPTIM		DUMMY VARIABLE NO LONGER USED (BUT RETAINED TO AVOID CHANGING COMMON BLOCK SIZE).
DURLOS		TIME	SECONDS	DURATION OF LINE-OF-SIGHT (TIME FROM WHEN FIRST VEHICLE IN COLUMN UNMASKS UNTIL LAST VEHICLE IN COLUMN LEAVES LINE-OF-SIGHT SEGMENT).
DVALUE(70)		(LOCAL)		DVALUE(I) IS EQUIVALENT TO D(I).
EDDTIM		(LOCAL)	SECONDS	TIME TO ENTER FIRE REQUEST ON DIGITAL MESSAGE DEVICE.
ENDFLG	LOGICAL	FLAG		FLAG INDICATING NO FURTHER CASES TO BE READ.
ENDREP	LOGICAL	FLAG		FLAG INDICATING REPLICATION (OR FIRING OF ROUND) IS TO BE ENDED.

VARIABLE	TYPE	COMMON BLOCK	UNITS	DEFINITION
FDT		(LOCAL)		USED TO CALCULATE FDT2.
FDT1 FDT2		(LOCAL)		USED FOR INTERPOLATING WITH RESPECT TO DELAY TIME IN THE PROBABILITY OF ENGAGEMENT TABLES.
FIRSTL	LOGICAL	LOGFLG		FLAG USED TO INDICATE FIRST INPUT LINE IN CHECKING FOR SEQUENCE NUMBERS.
FPRCNT		FUNCTION		FUNCTION VALUE, SPECIAL FORMATTING OF PERCENTAGES USED FOR PRINT OUT.
FRAC		(LOCAL)		USED TO INTERPOLATE WITH RESPECT TO RANGE IN THE DFDOKL ARRAY.
FRONT		SMOKED	KM	WIDTH OF FRONT WHICH RED WANTS TO SMOKE.
FSRT(14,2)		FSRESP	NONE, SECONDS	FT SILL'S CUMULATIVE RESPONSE TIME DISTRIBUTION. FSRT(I,1) IS THE PROBABILITY THAT THE TOTAL DESIGNATOR-FDC-BATTERY RESPONSE TIME IS LESS THAN OR EQUAL TO FSRT(I,2).
FSRTIM		(LOCAL)	SECONDS	TOTAL DESIGNATOR-FDC-BATTERY RESPONE TIME AS SAMPLED FROM FSRT ARRAY WHEN USING FT SILL RESPONSE TIME DISTRIBUTION.
FTSILL	LOGICAL	LOGFLG		FLAG TO INDICATE WHETHER FT SILL RESPONSE TIME DISTRIBUTION IS BEING USED.
GAMMA		FUNCTION		FUNCTION VALUE. GAMMA DISTRIBUTED RANDOM VARIABLE.
GTR		(F.P.)	KM	GUN-TO-TARGET RANGE AS USED IN SUBROUTINE PENAME.
GTRNG		PEDESC	KM	GUN-TO-TARGET RANGE.
HUMID(2)		WEATHR		HUMID(I) IS THE PROBABILITY THAT THE RELATIVE HUMIDITY FALLS IN CLASS I. (IF I=1, RELATIVE HUMIDITY $\leq$65%; IF I=2, RELATIVE HUMIDITY >65%).
I		(LOCAL) (F.P.)		USED AS CONTROL VARIABLE IN VARIOUS DO-LOOPS AND IMPLIED DO-LOOPS. ALSO USED AS A FORMAL PARAMETER (RANDOM NUMBER SEED AND SUBSCRIPT) AND A COUNTER.
IABRT		(LOCAL) (F.P.)		INDEX NUMBER OF CAUSE OF MISSION (OR ROUND) ABORT.
IACQRL		(LOCAL)		LENGTH OF ACQUISITION DATA RECORD ON WORD ADDRESSABLE MASS STORAGE FILE (TAPE 11).

GLOSSARY - CONTINUED

VARIABLE	TYPE	COMMON BLOCK	UNITS	DEFINITION
IATENG		(LOCAL)		NUMBER OF ATTEMPTED ENGAGEMENTS FOR THE CURRENT CASE.
IB		(LOCAL & F.P.)		USED AS SECOND SUBSCRIPT OF B ARRAY IN NUMRIC AND FINDIT.
IBAIL		BAIL		FLAG INDICATING WHICH BAIL-OUT CHECK IS BEING MADE. IBAIL=1 INDICATES PRE-COMMUNICATIONS CHECK; IBAIL=2 INDICATES POST-COMMUNICATIONS CHECK.
IC		(LOCAL)		CONTROL VARIABLE FOR IMPLIED DO-LOOP IN DECODE STATEMENT. ALSO AN UNUSED RETURNED PARAMETER FROM A CALL TO SMPLCD.
ICC		WEATHR		ICC INDICATES WHICH OF THE SIX CLOUD CEILING ALTITUDES IS BEING USED ON THIS REPLICATION. IF CLOUD FREE LINE-OF-SIGHT EXISTS, ICC=1 (HIGHEST CEILING) IS USED.
ICCPFG		RUNDAT		CALCOMP PLOT FLAG. ICCPFG=0 INDICATES NO CALCOMP PLOT HAS BEEN REQUESTED FOR THE CURRENT CASE; ICCPFG=1 INDICATES THAT CALCOMP PLOT OUTPUT HAS BEEN REQUESTED.
ICFLOS		(LOCAL)		CLOUD FREE LINE-OF-SIGHT FLAG. ICFLOS=1 INDICATES A CLOUD FREE LINE-OF-SIGHT; ICFLOS=2 INDICATES NO CLOUD FREE LINE-OF-SIGHT.
ICHNL		(LOCAL)		NUMBER OF OPTION WORDS IN CHARA ARRAY TO BE CHECKED IN SEARCH FOR MATCH WITH OPTION WORDS OF CURRENT KEYWORD.
ICHRRL		(LOCAL)	,	NUMBER OF WORDS IN OPTION WORD DATA RECORD ON WORD ADDRESSABLE MASS STORAGE FILE (TAPE 11).
ICLASS		(LOCAL) (F.P.)		WHEN A CUMULATIVE DISTRIBUTION IS SAMPLED USING THE SMPLCD SUBROUTINE, THE VALUE RETURNED IN ICLASS IS THE NUMBER OF THE INTERPOLATION INTERVAL FROM WHICH THE SAMPLE WAS OBTAINED.
ICLNGF		(LOCAL)		CLOUD CEILING FLAG. ICLNGF=1 INDICATES A CLOUD CEILING; ICLNGF=2 INDICATES NO CLOUD CEILING (I.E., SCATTERED CLOUDS)
ICMFLG		(LOCAL)		COMMENT FLAG. ICMFLG=0 INDICATES NO TIME OF DAY/WEATHER INCONSISTENCY COMMENT WILL BE PRINTED FOR THIS CASE; ICMFLG=1 INDICATES SUCH A COMMENT WILL BE PRINTED.
ICMNT		COMENT		NUMBER OF $$ COMMENT LINES TO BE PRINTED FOR THIS CASE.
ICODE		ICODE		RECORD NAME KEY WHEN READING FROM WORD ADDRESSABLE MASS STORAGE FILE (TAPE 11). ICODE IS EQUIVALENT TO CODE.

GLOSSARY - CONTINUED

VARIABLE	TYPE	COMMON BLOCK	UNITS	DEFINITION
ICRD				INDEX NUMBER USED TO CHECK WHETHER MORE THAN ONE INPUT LINE HAS BEEN READ WITH THE SAME KEYWORD FOR EACH CASE.
IDABRT(3,19)		ABRLBL		ALPHANUMERIC DESCRIPTORS OF CAUSES OF MISSION (OR ROUND) ABORTS. IDABRT(I,J) CONTAINS CHARACERS 10*(I-1)+1 THROUGH 10*I OF ABORT DESCRIPTOR NUMBER J.
IDCHAR		FUNCTION		FUNCTION VALUE. A NUMERICAL VALUE USED TO INDICATE TO WHICH CLASS OF SYMBOLS A GIVEN CHARACTER BELONGS.
IDCHR		(LOCAL)		A NUMERICAL VALUE INDICATING TO WHICH CLASS OF SYMBOLS A PARTICULAR CHARACTER BELONGS.
IDCODE		(F.P.)		RECORD NAME KEY FOR A PROBABILITY OF ENGAGEMENT DATA RECORD TO BE READ OR INTERPRETED.
IDELTT		(LOCAL)		SUBSCRIPT OF INDEX ARRAY USED WHEN DELTAT IS ZERO.
IDELT1		(LOCAL)		SUBSCRIPT OF INDEX ARRAY USED FOR INTERPOLATION WHEN DELTAT IS POSITIVE.
IDELT2		(LOCAL)		SUBSCRIPT OF INDEX ARRAY USED FOR INTERPOLATION WHEN DELTAT IS POSITIVE (IDELT2=IDELT1+1).
IDFL		(LOCAL)		IDFL=1 INDICATES HIGH LEVEL OF DIRECT FIRE SUPPRESSION; IDFL=2 INDICATES NO DIRECT FIRE SUPPRESSION. (IDFL IS USED TO PRINT CASE HEADING LABELS.)
IDFSRL		(LOCAL)		DIRECT FIRE SUPPRESSION DATA RECORD LENGTH ON WORD ADDRES-SABLE MASS STORAGE FILE (TAPE 11).
IDIGTL		FLAG		FLAG TO INDICATE WHICH METHOD OF COMMUNICATION IS TO BE FIRST CHOICE WHEN DESIGNATOR CALLS REQUEST FOR FIRE TO FDC. (IDIGTL=1 INDICATES DIGITAL COMMUNICATION; IDIGTL=2 INDICATES VOICE COMMUNICATION.)
IDN		FLAG		FLAG TO INDICATE DAY OR NIGHT. (IDN=1 INDICATES DAYTIME; IDN=2 INDICATES NIGHTTIME.)
IDOLOC		(LOCAL)		FLAG TO INDICATE DESIGNATOR OPERATOR LOCATION. (IDOLOC=1 INDICATES VANTAGE POINT LOCATION; IDOLOC=2 INDICATES MANEUVER UNIT LOCATION).
IDSGTP		RSPTIM		FLAG TO INDICATE DESIGNATOR TYPE. (IDSGTP=1 INDICATES GLLD, IDSGTP=2 INDICATES MULE, AND IDSGTP=3 INDICATES LTD).

VARIABLE	TYPE	COMMON BLOCK	UNITS	DEFINITION
IDT		(F.P.)		FORMAL PARAMETER INDICATING DESIGNATOR TYPE. VALUES OF 1,2, AND 3 HAVE SAME MEANING AS FOR THE VARIABLE IDSGTP.
IGO		(LOCAL)		COMPUTED GO TO PARAMETER USED TO SEND CONTROL TO SECTION OF SUBROUTINE INPUT THAT HANDLES A PARTICULAR CLASS OF INPUT LINES.
IGTR		(LOCAL)	KM	GUN-TO-TARGET RANGE ROUNDED TO NEAREST INTEGER.
II		(LOCAL)		USED AS SUBSCRIPT FOR INDEXING PETBL ARRAY. ALSO USED AS DO-LOOP CONTROL VARIABLE.
II1		(LOCAL)		USED AS SUBSCRIPT FOR INDEXING PETBL ARRAY.
II2		(LOCAL)		USED AS SUBSCRIPT FOR INDEXING PETBL ARRAY.
IJ		(LOCAL)		CONTROL VARIABLE IN VARIOUS DO-LOOPS.
IK		(LOCAL)		CONTROL VARIABLE IN DO-LOOP.
IKTEST		(LOCAL)		DO-LOOP CONTROL VARIABLE IN REINITIALIZING KTEST ARRAY.
IL		(LOCAL)		CONTROL VARIABLE IN IMPLICIT DO-LOOP.
IMATCH		(LOCAL)		SUBSCRIPT OF KEYWORD CHARACTER STRING FOUND TO MATCH A CURRENT INPUT LINE CHARACTER STRING.
IMATCH1		(LOCAL)		STORES SUBSCRIPT OF KEYWORD CHARACTER STRING MATCHING FIRST CURRENT INPUT LINE KEYWORD WHILE SECOND KEYWORD IS BEING CHECKED FOR A MATCH (APPLIES ONLY TO "TEMPORARY", "OVERRIDE" AND "RESET" KEYWORDS).
IMNTH		(LOCAL)		INDEX NUMBER OF MONTH OF CURRENT CASE'S WEATHER DATA. (E.G., IF JUNE AND DECEMBER ARE THE ONLY MONTHS PLAYED, IMNTH=1 FOR JUNE AND IMNTH=2 FOR DECEMBER).
IMUTS		TARGET		FLAG AND SUBSCRIPT INDICATING WHETHER TARGET IS PAST THE POINT OF CLOSEST APPROACH TO THE CENTROID OF THE FOOTPRINT. (IMUTS=1 IF TARGET IS PAST POINT OF CLOSEST APPROACH; IMUTS=2 IF NOT).
IMXNR		(LOCAL)		NUMBER OF OPTION WORDS TO BE CHECKED FOR MATCH ON CURRENT INPUT LINE.
IN		(LOCAL)		NUMBER OF GAMMA DISTRIBUTION RANDOM DEVIATES TO BE RETURNED BY CALL OF IMSL SUBROUTINE GGAMA.

GLOSSARY - CONTINUED

VARIABLE	TYPE	COMMON BLOCK	UNITS	DEFINITION
INDEX(6,5,2)		HIT		INDEXING ARRAY FOR REFERENCING PETBL ARRAY. INDEX(I,J,K) IS THE NUMBER OF THE PETBL TO BE USED FOR CLOUD CEILING I, VISIBILITY RANGE J, AND IMUTS VALUE K.
INDX11(2001)		INDEX1		ARRAY CONTAINING MASTER INDEX FOR WORD ADDRESSABLE MASS STORAGE FILE (TAPE 11).
INVDRL		(LOCAL)		INVARIANT DATA RECORD LENGTH ON WORD ADDRESSABLE MASS STORAGE FILE (TAPE 11).
IOCSN		(LOCAL)		NUMBER OF OCCASIONS FOR THE CURRENT CASE (EQUAL TO NREP).
IOPTNM(70)		(LOCAL)		IOPTNM(I) IS THE NUMBER OF DIFFERENT OPTION WORD CHARACTER STRINGS ALLOWED FOR KEYWORD I.
IOVER(70)		OVER		IOVER(I)=1 INDICATES "OVERRIDE" OPTION IN EFFECT FOR KEYWORD I; IOVER(I)=2 INDICATES "TEMPORARY" OPTION IN EFFECT FOR KEYWORD I.
IPERL		(LOCAL)		PROBABILITY OF ENGAGEMENT DATA RECORD LENGTH ON WORD ADDRESSABLE MASS STORAGE FILE (TAPE 11).
IPOINT(70)		POINT		IPOINT(I) IS THE VALUE OF THE COMPUTED GO TO PARAMETER THAT WILL SEND CONTROL THE PROPER PART OF SUBROUTINE INPUT FOR HANDLING KEYWORD I INPUTS.
IPPFG		RUNDAT		PRINTER PLOT FLAG. IPPFG=1 INDICATES PRINTER PLOT OUTPUT REQUESTED FOR THIS CASE; IPPFG=0 INDICATES PRINTER PLOT OUTPUT NOT REQUESTED FOR THIS CASE.
IPREPL		FLAG		PRE-PLANNED TARGET FLAG. IPREPL=1 INDICATES PRE-PLANNED TARGET; IPREPL=2 INDICATES TARGET OF OPPORTUNITY.
IPRINT		(LOCAL)		FLAG TO INDICATE WHETHER CURRENT RANDOM NUMBER SEEDS HAVE YET BEEN WRITTEN TO TAPE 8, IPRINT=0 INDICATES THEY HAVE NOT; IPRINT=1 INDICATES THEY HAVE.
IPRTY		FLAG		PRIORITY FLAG. IPRTY=2 INDICATES PRIORITY PRE-PLANNED TARGET; IPRTY=0 INDICATES NO SPECIAL PRIORITY.
IRAY(6)		(LOCAL)		ARRAY CONTAINING ERROR PROCESSING SPECIFICATIONS FOR CALL OF SYSTEMC SUBROUTINE FOR NON-STANDARD RECOVERY FOR CDC FORTRAN ERROR 104.
IRC		(LOCAL)		UNUSED VALUE RETURNED BY A CALL OF SUBROUTINE SMPLCD.

GLOSSARY - CONTINUED

VARIABLE	TYPE	COMMON BLOCK	UNITS	DEFINITION
IRF		(LOCAL)		INITIAL PARAMETER OF A DO-LOOP (IRF=1).
IRM		(LOCAL)		SUBSCRIPT USED IN INTERPOLATING WITH RESPECT TO RANGE IN RNGTTF ARRAY TO OBTAIN PROBABILITY OF HIT GIVEN AN ENGAGEMENT.
IRN		(LOCAL) (F.P.)		SUBSCRIPT USED IN INTERPOLATING WITH RESPECT TO RANGE IN PSTTBL ARRAY TO OBTAIN PROBABILITIES OF THE VARIOUS TARGET POSTURES. ALSO FORMAL PARAMETER FOR RANDOM NUMBER SEED IN GAMMA.
IRNDM		(F.P.)		RANDOM NUMBER SEED TO BE USED WHEN CALLING URAN31 FROM SMPLCD.
IRNDOC		FLAG		RANDOM OCCURRENCE FLAG. IRNDOC=1 INDICATES RANDOM OCCURRENCE LINE-OF-SIGHT METHODOLOGY USED FOR THIS CASE; IRNDOC=0 INDICATES SHOOTING GALLERY LOS METHODOLOGY USED FOR THIS CASE.
IRNG1		(LOCAL)	KM	LOWER LIMIT OF RANGE BRACKET USED TO INTERPOLATE IN PETBL ARRAY.
IRNG2		(LOCAL)	KM	UPPER LIMIT OF RANGE BRACKET USED TO INTERPOLATE IN PETBL ARRAY.
IRORL		(LOCAL)		RANDOM OCCURRENCE DATA RECORD LENGTH ON WORD ADDRESSABLE MASS STORAGE FILE (TAPE 11).
IROW		(LOCAL)		NUMBER OF THE ROW OF THE SEGLOS ARRAY TO BE USED IN SAMPLING FOR LINE-OF-SIGHT SEGMENT LENGTH ON THIS REPLICATION.
IRSPRL		(LOCAL)		RESPONSE TIME DATA RECORD LENGTH ON WORD ADDRESSABLE MASS STORAGE FILE (TAPE 11).
IR(28)		(LOCAL)		ARRAY OF RANDOM NUMBER SEEDS. IR(1) IS EQUIVALENT TO IR1, IR(2) TO IR2, . . ., IR(28) TO IR28.
IR1, IR2, . . ., IR28		RANDOM		RANDOM NUMBER SEEDS. IR1 IS SEED FOR FIRST RANDOM NUMBER STREAM, IR2 FOR SECOND, ETC.
ISHOT		(LOCAL)		NUMBER OF REPLICATIONS OF CURRENT CASE THAT REACHED THE STAGE IN THE MISSION WHERE A ROUND WAS FIRED.
ISTART		(LOCAL)		DO-LOOP INITIAL PARAMETER. ISTART IS THE SUBSCRIPT FOR THE FIRST LINE TO BE READ FROM CARDS AS RESULT OF A "TEMPORARY" OPTION FOR PEDATA.

GLOSSARY- CONTINUED

VARIABLE	TYPE	COMMON BLOCK	UNITS	DEFINITION
IT(10)		(LOCAL)		IT(1) = NUMBER OF CURRENT INPUT LINE'S KEYWORD. IT(J) IS THE NUMBER OF THE (J-1)ST OPTION WORD CHOICE OF THE CURRENT LINE FOR J>1.
ITDGTL		(LOCAL)		FLAG FOR CURRENT COMMUNICATIONS MODE. ITDGTL=1 FOR DIGITAL; ITDGTL=2 FOR VOICE.
ITGTPS		TARGET		TARGET POSTURE FLAG. ITGTPS=1 FOR FULLY EXPOSED TARGET; ITGTPS=2 FOR HULL DEFILADE TARGET.
ITGTTP		TARGET		TARGET TYPE NUMBER. ITGTTP=1 FOR TARGET TYPE 1, ITGTTP=2 FOR TARGET TYPE 2, ETC.
ITIMDL		(LOCAL)		ITIMDL=1 INDICATES FIRST METHOD OF MODELING RESPONSE TIME IS PLAYED (SINGLE DISTRIBUTION SAMPLED); ITIMDL=2 INDICATES SECOND METHOD OF MODELING RESPONSE TIME IS PLAYED (SINGLE VALUE USED); ITIMDL=3 INDICATES THIRD METHOD OF MODELING RESPONSE TIME IS PLAYED (ADDING CONTRIBUTIONS OF INDIVIDUAL DELAY COMPONENTS).
ITPSRL		(LOCAL)		TARGET POSTURE DATA RECORD LENGTH FOR WORD ADDRESSABLE MASS STORAGE FILE (TAPE 11).
ITRRN		(LOCAL)		SUBSCRIPT INDICATING TERRAIN TYPE USED FOR CURRENT CASE. USED TO REFERENCE ACQLBL ARRAY FOR OUTPUT HEADING.
ITRY		(LOCAL)		FLAG USED TO INDICATE WHETHER CURRENT ATTEMPT TO MATCH KEY-WORD IS FOR FIRST OR SECOND KEYWORD OF CURRENT INPUT LINE. APPLIES ONLY TO "TEMPORARY", "OVERRIDE", AND "RESET" FIRST KEYWORDS.
ITVEL		(LOCAL)	METERS/SEC	TARGET VELOCITY.
ITYPE		(LOCAL)		COMPUTED GO TO PARAMETER USED TO SEND CONTROL TO PROPER READ STATEMENTS WHEN "TEMPORARY" OPTION IS USED.
IT1		(LOCAL)		NUMBER OF CURRENT INPUT LINE'S FIRST KEYWORD.
IT2		(LOCAL)		NUMBER OF CURRENT INPUT LINE'S SECOND KEYWORD OR FIRST OPTION WORD.
IT3		(LOCAL)		NUMBER OF CURRENT INPUT LINE'S SECOND OPTION WORD.
IT3FLG		FLAG		FLAG USED TO INDICATE WHETHER RUMC IS TO BE CONSTANT. IF IT3FLG=0, RUMC VARIES FROM REPLICATION TO REPLICATION; IF IT3FLG=1, RUMC IS CONSTANT.

VARIABLE	TYPE	COMMON BLOCK	UNITS	DEFINITION
IUNIT		(F.P.) (LOCAL)		LOGICAL UNIT NUMBER TO WHICH OUTPUT OF SUBROUTINE ECHO IS TO BE WRITTEN. ALSO UNIT FROM WHICH "TEMPORARY" OPTION PEDATA IS TO BE READ IN SUBROUTINE CREAD.
IVL		WEATHR	KM	VISIBILITY RANGE LIMIT FOR THIS REPLICATION.
IVLA		(LOCAL)		VISIBILITY RANGE SUBSCRIPT VALUE FOR REFERENCING PETBL ARRAY (IVLA=IVL EXCEPT THAT IF IVL>10, THEN IVLA=10).
IW		(LOCAL)		COUNTER INDICATING POSITION NUMBER OF THE KEYWORD OR OPTION WORD CURRENTLY BEING ANALYZED IN THE SEPREC SUBROUTINE.
IWTHRL		(LOCAL)		WEATHER DATA RECORD LENGTH ON WORD ADDRESSABLE MASS STORAGE FILE (TAPE 11).
IX		(LOCAL)		COUNTER USED IN SEPREC SUBROUTINE SEPARATION ALGORITHM.
IXXX		(LOCAL)		IXXX=1 INDICATES GOOD WEATHER (CURRENTLY JUNE AND SEPTEMBER) IXXX=2 INDICATES BAD WEATHER (CURRENTLY MARCH AND DECEMBER) IXXX GOVERNS THE VALUE OF THE VELTBL ARRAY TO BE USED IN THE CURRENT CASE. (APPLICABLE ONLY IF TARGET VELOCITY DEFAULT IS IN EFFECT.)
I1		(LOCAL)		CONTROL PARAMETER FOR IMPLIED DO-LOOPS.
I2		(LOCAL)		CONTROL PARAMETER FOR IMPLIED DO-LOOPS. ALSO RECEIVING ARGUMENT FOR DESIGNATOR TYPE IN CALL OF PEIDNT.
J		(LOCAL)		CONTROL VARIABLE IN VARIOUS DO-LOOPS. ALSO USED IN CALCULATION OF RANDOM NUMBER IN URAN31 AND AS A COUNTER IN SEPREC.
JEND		(LOCAL)		DO-LOOP MAXIMUM LIMIT (NUMBER OF DIFFERENT WIND SPEEDS USED IN SMOKE CALCULATION FOR THIS PASQUILL CATEGORY).
JJ		(LOCAL)		DO-LOOP CONTROL VARIABLE.
JK		(LOCAL)		CONTROL VARIABLE FOR DO-LOOPS AND IMPLIED DO-LOOPS.
JKTEST		(LOCAL)		CONTROL VARIABLE FOR DO-LOOP.
JL		(LOCAL)		CONTROL VARIABLE FOR IMPLICIT DO-LOOP.
K		(LOCAL)		CONTROL VARIABLE FOR VARIOUS DO-LOOPS AND IMPLICIT DO-LOOPS. ALSO USED IN CALCULATING INITIAL RANDOM NUMBER SEEDS.

GLOSSARY- CONTINUED

VARIABLE	TYPE	COMMON BLOCK	UNITS	DEFINITION
KCHAR		(LOCAL)		NUMBER OF CHARACTERS IN KEYWORD OR OPTION WORD ABOUT TO BE ENCODED.
KI		(LOCAL)		POSITION NUMBER OF CHARACTER OF OPTION WORD CURRENTLY BEING CHECKED TO DETERMINE WHETHER OPTION WORD IS A NUMERIC VALUE.
KREP		RPLCTN		NUMBER OF CURRENT REPLICATION.
KRF		RPLCTN		NUMBER OF THE ROUND (SHOT) CURRENTLY BEING SIMULATED.
KTEST(20,6)		KTEST		KTEST(I,J) IS THE NUMBER OF TIMES ABORT CONDITION I IS TESTED FOR ROUND (SHOT) NUMBER J. IF I < MSABLM, THEN KTEST(I,J)=0 FOR J>1; IN SUCH CASES KTEST (I,1) IS THE NUMBER OF TIMES MISSION ABORT CONDITION I IS TESTED.
LIMU		(LOCAL)		MAXIMUM LIMIT ON DO-LOOP COMPARING KTEST AND NTEST ARRAYS. (LIMU=1 IF COMPARING MISSION ABORT TESTS; LIMU=6 IF COMPARING ROUND ABORT TESTS).
LSTCMA		(LOCAL)		GIVES POSITION OF LAST COMMA ENCOUNTERED THUS FAR IN SEPARATING KEYWORDS AND OPTION WORDS OF CURRENT INPUT LINE.
M		(LOCAL)		USED IN CALCULATION OF INITIAL RANDOM NUMBER SEEDS.
MSABLM		ABORT		MISSION ABORT LIMIT. CAUSE OF ABORT NUMBERS LESS THAN OR EQUAL TO MSABLM ARE MISSION ABORTS WHEREAS ABORT CAUSES NUMBERED GREATER THAN MSABLM ARE ROUND ABORTS. A MISSION ABORT CANCELS ALL FURTHER STEPS IN THE POTENTIAL COPPERHEAD FIRE MISSION (REPLICATION) WHEREAS A ROUND ABORT MEANS ONLY THAT THE CURRENT ROUND IS UNSUCCESSFUL.
MXDRNG	REAL	RANGE	METERS	MAXIMUM DESIGNATOR-TO-TARGET RANGE AT WHICH DESIGNATOR OPERATOR WILL CALL FOR COPPERHEAD FIRE.
N		(F.P.)		NUMBER OF CHARACTERS IN INPUT LINE WHOSE ITH CHARACTER IS CURRENTLY BEING CHECKED FOR SYMBOL CLASS.
NABORT(20,6)		ABORT		NABORT(I,J) IS THE NUMBER OF TIMES TEST I WAS FAILED ON ROUND (SHOT) J. IF I < MSABLM, THEN NABORT(I,J)=0 FOR J>1; IN SUCH CASES NABORT(I,1) IS THE NUMBER OF TIMES MISSION ABORT TEST I WAS FAILED.

GLOSSARY - CONTINUED

VARIABLE	TYPE	COMMON BLOCK	UNITS	DEFINITION
NC(80)		(LOCAL)		NC(I) IS THE NUMBER INDICATING WHICH TYPE OF SYMBOL THE ITH CHARACTER OF THE CURRENT INPUT LINE IS. (0 INDICATES NUMERAL OR MINUS SIGN, 1 INDICATES LETTER OR APOSTROPHE, 2 INDICATES DECIMAL POINT, 3 INDICATES BLANK, 4 INDICATES SEPARATOR, 5 INDICATES A DOLLAR SIGN, AND 6 INDICATES ANY OTHER CHARACTER.)
NCASE		RUNDAT		SEQUENCE NUMBER OF CASE CURRENTLY BEING EXECUTED IN THIS PROGRAM RUN.
NCC		WEATHR		NUMBER OF DIFFERENT CLOUD CEILING ALTITUDE VALUES USED IN WEATHER DATA.
NCODE		(LOCAL)		USED IN CREATING AND DECIPERING PEDATA RECORD NAME.
NCPR(10)		(LOCAL)		NCPR(I) IS THE NUMBER OF CHARACTERS IN THE ITH LINE OF THE B ARRAY (ITH FIELD ON INPUT LINE AFTER COMPRESSING MOST BLANKS AND POSSIBLY ADDING DECIMAL POINTS).
NCRD(70)		(LOCAL)		NCRD(I) IS THE NUMBER OF INPUT LINES READ FOR THE CURRENT CASE THAT DETERMINE THE OPTIONS USED WITH KEYWORD NUMBER I.
NDFSP		DODF		NUMBER OF RANGE POINTS USED IN DIRECT FIRE SUPPRESSION DISTRIBUTION (DFDOKL ARRAY).
NDOKIL		DODF		NUMBER OF REPLICATIONS IN WHICH DESIGNATOR OPERATOR HAS BEEN KILLED FOR CURRENT CASE.
NDR		(F.P.)		INDICATES NUMBER OF POINTS USED IN DEFINITION OF CUMULATIVE DISTRIBUTION FUNCTION NOW BEING SAMPLED.
NDRM1		(LOCAL)		MAXIMUM LIMIT ON DO-LOOP. (EQUALS NDR-1).
NDT		RSPTIM		NUMBER OF POINTS USED IN DETECTION TIME DISTRIBUTION.
ND1		(F.P.)		FIRST DIMENSION OF ARRAY WHOSE ELEMENTS DEFINE CUMULATIVE DISTRIBUTION BEING SAMPLED.
ND2		(F.P.)		SECOND DIMENSION OF ARRAY WHOSE ELEMENTS DEFINE CUMULATIVE DISTRIBUTION BEING SAMPLED.
NKILL(6)		(LOCAL)		NKILL(I) IS THE NUMBER OF REPLICATIONS IN WHICH THE ITH ROUND OF THE FIRE MISSION KILLED A VEHICLE FOR THE CURRENT CASE.
NLRTC		(LOCAL)		NUMBER OF INPUT LINES READ SO FAR FOR THE CURRENT CASE.

GLOSSARY - CONTINUED

VARIABLE	TYPE	COMMON BLOCK	UNITS	DEFINITION
NP(9)		(LOCAL)		USED TO CONSTRUCT THE PEDATA RECORD NAME. NP(I) IS THE INDEX NUMBER (IN THE XVALUE ARRAY) OF THE CURRENT VALUE OF THE ITH PARAMETER OF THE PEDATA RECORD NAME.
NPLOSR		RANDOC		NUMBER OF RANGE POINTS USED IN THE PROBABILITY OF LINE-OF-SIGHT FOR RANDOM OCCURRENCE (RNGPLS ARRAY).
NPP		RNGLOS		NUMBER OF POINTS USED IN DEFINING CUMULATIVE DISTRIBUTIONS FOR LINE-OF-SIGHT SEGMENT LENGTHS.
NRE		(LOCAL)		NUMER OF KEYWORDS AND OPTION WORDS ENCOUNTERED ON CURRENT INPUT LINE.
NREC		ACHAR		NUMBER OF DIFFERENT KEYWORD CHARACTER STRINGS ALLOWED AS INPUTS.
NREP		RPLCTN		NUMBER OF REPLICATIONS TO BE DONE FOR THE CURRENT CASE.
NRF		RPLCTN		NUMBER OF ROUNDS (SHOTS) TO BE FIRED FOR EACH REPLICATION (POTENTIAL FIRE MISSION SAMPLE) FOR THIS CASE.
NRNGCB		(LOCAL)		NUMBER OF ROWS TO BE READ INTO SEGLOS DISTRIBUTION.
NRNGCL		RNGLOS		NUMBER OF RANGE CLASSES INTO WHICH LINE-OF-SIGHT SEGMENT LENGTH DATA IS DIVIDED.
NRNGP1		(LOCAL)		MAXIMUM LIMIT ON DO-LOOP. (EQUALS NRNGPS)
NRNGPS		HIT		NUMBER OF RANGE POINTS FOR WHICH TARGET POSTURE DATA IS ENTERED IN RNGPST ARRAY.
NRNGTT		HIT		NUMBER OF RANGE POINTS FOR WHICH "TRUE TARGET FACTOR" DATA IS ENTERED IN RNGTTF ARRAY.
NRP		RNGLOS		NUMBER OF POINTS USED IN CUMULATIVE ACQUISITION RANGE DISTRIBUTION TABLE (CRNGD ARRAY).
NRS		(F.P.)		ROW OF A ARRAY IN WHICH INTERPOLATION IS TO BE PERFORMED TO OBTAIN RANDOM VARIABLE VALUE IN SUBROUTINE SMPLCD.
NSMK2		SMOKED	TYPE 1 SMOKE ROUNDS	NUMBER OF TYPE 1 SMOKE ROUNDS FIRED BY RED TO CREATE SMOKE SCREEN.
NSMK5		SMOKED	TYPE 2 SMOKE ROUNDS	NUMBER OF TYPE 2 SMOKE ROUNDS FIRED BY RED TO CREATE SMOKE SCREEN.

GLOSSARY - CONTINUED

VARIABLE	TYPE	COMMON BLOCK	UNITS	DEFINITION
NTEST(20,6)		(LOCAL)		NTEST(I,J) IS THE NUMBER OF TIMES ABORT CONDITION I HAS BEEN TESTED FOR ROUND J FOR THIS CASE. FOR I≤ MSABLM, NTEST(I,J)= NTEST(J,1) FOR J>1.
NTRC		COMENT		NUMBER OF "TRIPLE $" COMMENTS READ AND WRITTEN WITH CURRENT CASE.
NUMRIC	LOGICAL	FUNCTION VALUE		TRUE, IF THE ITEM TESTED IS NUMERIC (CONTAINS ONLY NUMERALS, "-", AND "." AS SYMBOLS); FALSE, IF ITEM IS NOT NUMERIC.
NVEHCL		TARGET		NUMBER OF VEHICLES IN TARGET UNIT.
NVEHKL		RPLCTN		NUMBER OF VEHICLES KILLED BY COPPERHEAD THUS FAR IN CURRENT REPLICATION. (APPLIES ONLY TO RANDOM OCCURRENCE LINE-OF-SIGHT OPTION).
NVL		WEATHR		NUMBER OF DIFFERENT METEOROLOGICAL VISIBILITY RANGE LIMITS USED WITH WEATHER DATA.
NXTLIN		(LOCAL)		COUNTER USED IN KEEPING TRACK OF LINE NUMBERS IN PRINTING OF CASE HEADING OUTPUT.
N1		(F.P.)		VARIABLE ARRAY DIMENSION.
N2		(F.P.)		VARIABLE ARRAY DIMENSION.
N3		(F.P.)		VARIABLE ARRAY DIMENSION.
OUT(6)		(LOCAL)		ARRAY USED TO STORE ITEMS ABOUT TO BE WRITTEN ON THE PRINTOUT.
PAREN	LOGICAL	(F.P.)		FLAG TO INDICATE WHETHER A RIGHT PARENTHESIS IS TO BE INCLUDED IN FORMATTING A PERCENTAGE. (TRUE INDICATES PARENTHESIS IS TO BE INCLUDED; FALSE INDICATES IT IS NOT).
PASPCT(20,6)		(LOCAL)		PASPCT(I,J) IS THE PERCENTAGE OF REPLICATIONS TESTED AT ABORT CONDITION I THAT PASSED (DID NOT ABORT) FOR ROUND J. (IF I≤ MSABLM, PASPCT(I,J) = PASPCT(I,1) FOR J>1; IF NTEST(I,J)=0, PASPCT(I,J) IS SET TO -1).
PASQL(6)		WEATHR		PASQL(I) IS THE PROBABILITY OF OCCURRENCE OF PASQUILL ATMOSPHERIC STABILITY CATEGORY I FOR THE CURRENT CASE'S WEATHER CONDITIONS.
PASQT		(LOCAL)		THE PASQL VALUES ARE GROUPED IN PAIRS. PASQT IS THE SUM OF PASQL(2*I-1) AND PASQL(2*I) FOR THE CURRENT VALUE OF I.

GLOSSARY - CONTINUED

VARIABLE	TYPE	COMMON BLOCK	UNITS	DEFINITION
PB(80,10)		(LOCAL)		PB(I,J) IS THE ITH CHARACTER OF THE JTH KEYWORD OR OPTION WORD OF THE CURRENT INPUT LINE.
PCRMSG		RSPTIM		PROBABILITY THAT THE DESIGNATOR-TO-FDC CALL-FOR-FIRE MESSAGE CONTAINS THE CORRECT FIRE MISSION INFORMATION AND IS CORRECTLY INTERPRETED.
PDOKIL		(LOCAL)		PROBABILITY THAT DESIGNATOR OPERATOR IS KILLED BY DIRECT FIRE FROM TARGET VEHICLE.
PDOSUP		(LOCAL)		PROBABILITY THAT DESIGNATOR OPERATOR IS SUPPRESSED DUE TO OBSCURANTS CREATED BY NEAR MISSES CAUSED BY DIRECT FIRE FROM TARGET VEHICLE.
PDSTKL		MISC		PROBABILITY THAT DUST FROM HE ARTILLERY FIRE IS SUFFICIENT TO OBSCURE TARGET AND PREVENT USE OF COPPERHEAD.
PE		(LOCAL)		PROBABILITY THAT ROUND ENGAGES TARGET (I.E., SUFFICIENT REFLECTED LASER ENERGY IS PICKED UP BY THE SEEKER AND THE TARGET IS WITHIN THE MANEUVER FOOTPRINT OF THE COPPERHEAD ROUND).
PECHK		(LOCAL)		USED TO DECIPHER PEDATA RECORD NAME FOR CASE HEADING OUTPUT.
PECODE		RECNAM		RECORD NAME KEY FOR PROBABILITY OF ENGAGEMENT DATA RECORD ON WORD ADDRESSABLE MASS STORAGE FILE (TAPE 11).
PEDATA(4260)		(LOCAL)		ARRAY TO WHICH THE ELEMENTS OF THE PROBABILITY OF ENGAGEMENT (PE) DATA BLOCK ARE EQUIVALENCED.
PETBL(60,10,7)		HIT		PETBL(I,J,K) IS THE PROBABILITY THAT THE COPPERHEAD ROUND ENGAGES THE TARGET GIVEN INDEX VALUE I, VISIBILITY RANGE LIMIT J, AND DESIGNATOR TARGET RANGE K.
PET1R1		(LOCAL)		PROBABILITY OF ENGAGEMENT VALUE FOR TIME 1 AND RANGE 1 WHEN INTERPOLATING IN PROBABILITY OF ENGAGEMENT DATA WITH IMUTS=1
PET1R2		(LOCAL)		SAME AS PET1R1 BUT FOR TIME 1 AND RANGE 2.
PET2R1		(LOCAL)		SAME AS PET1R1 BUT FOR TIME 2 AND RANGE 1.
PET2R2		(LOCAL)		SAME AS PET1R1 BUT FOR TIME 2 AND RANGE 2.
PE1		(LOCAL)		LOWER RANGE PROBABILITY OF ENGAGEMENT VALUE WHEN INTERPOLATING WITH RESPECT TO RANGE IN PROBABILITY OF ENGAGEMENT DATA WITH IMUTS=2.

GLOSSARY - CONTINUED

VARIABLE	TYPE	COMMON BLOCK	UNITS	DEFINITION
PE2		(LOCAL)		UPPER RANGE PROBABILITY OF ENGAGEMENT VALUE WHEN INTERPOLATING WITH RESPECT TO RANGE IN PROBABILITY OF ENGAGEMENT DATA WITH IMUTS=2.
PH		(LOCAL)		PROBABILITY ROUND HITS TARGET GIVEN THAT ROUND ENGAGES.
PK		(LOCAL)		PROBABILITY ROUND KILLS TARGET VEHICLE GIVEN THAT ROUND HITS TARGET VEHICLE.
PKTBL(10,2)		HIT		PKTBL(I,J) IS THE PROBABILITY OF KILL GIVEN A HIT FOR COPPERHEAD AGAINST TARGET TYPE I IN TARGET POSTURE J.
PR		(LOCAL)		USED TO BRACKET UNIFORM RANDOM NUMBER IN A WEATHER CLASS PROBABILITY TABLE.
PRBAEO		(LOCAL)		PROBABILITY OF ATTEMPTED ENGAGEMENT GIVEN AN OCCASION.
PRBKAE		(LOCAL)		PROBABILITY OF KILL GIVEN AN ATTEMPTED ENGAGEMENT.
PRBKO		(LOCAL)		PROBABILITY OF KILL GIVEN AN OCCASION.
PRBKS		(LOCAL)		PROBABILITY OF KILL GIVEN A SHOT.
PRBLOS(10)		RANDOC		PRBLOS(I) IS THE PROBABILITY THAT A SINGLE VEHICLE LOCATED AT RANDOM ALONG AN APPROACH PATH IN RANGE BRACKET I WILL BE WITHIN THE DESIGNATOR OPERATOR'S LINE-OF-SIGHT FOR AT LEAST THE CRITICAL TIME (TCRIT SECONDS).
PRBSAE		(LOCAL)		PROBABILITY OF SHOT GIVEN AN ATTEMPTED ENGAGEMENT.
PRBSO		(LOCAL)		PROBABILITY OF SHOT GIVEN AN OCCASION.
PRCFLS(2)		WEATHR		PRCFLS(I) IS THE PROBABILITY OF CLOUD FREE LINE-OF-SIGHT GIVEN CONDITION I. (I=1 INDICATES A CLOUD CEILING; I=2 INDICATES SCATTERED CLOUDS ONLY).
PRCLCG		WEATHR		PROBABILITY THAT THERE IS A CLOUD CEILING.
PRDOKC		(LOCAL)		PROBABILITY DESIGNATOR KILLED BY DIRECT FIRE GIVEN THAT DIRECT FIRE OCCURRED.
PRDOKL		(LOCAL)		PROBABILITY DESIGNATOR KILLED GIVEN AN OCCASION
PRDOW		RSPTIM		PROBABILITY THAT THE DESIGNATOR-OPERATOR IS WARNED TO BEGIN LASING IN TIME TO GUIDE THE FIRST ROUND OF THE FIRE MISSION TO THE TARGET.

VARIABLE	TYPE	COMMON BLOCK	UNITS	DEFINITION
PRGCFL(11,2)		WEATHR		PRGCFL(I,J) IS THE PROBABILITY OF METEOROLOGICAL VISIBILITY RANGE LIMIT I GIVEN CLOUD FREE LINE-OF-SIGHT AND CONDITION J (J=1 INDICATES CLOUD CEILING; J=2 INDICATES SCATTERED CLOUDS)
PRHLOS(6)		(LOCAL)		PRHLOS(I) IS THE PROBABILITY THE LINE-OF-SIGHT EXISTS FROM DESIGNATOR TO TARGET FOR ROUND I. (I.E., LOS EXISTS BOTH BEFORE FIRING AND DURING TERMINAL PHASE OF TRAJECTORY).
PRIV		(LOCAL)		PROBABILITY THAT AT LEAST ONE TARGET IS IN VIEW FOR THE CRITICAL TIME (TCRIT SECONDS) DURING THE TERMINAL PHASE OF THE COPPERHEAD TRAJECTORY.
PRLOS		(LOCAL)		PROBABILITY OF LINE-OF-SIGHT TO A SINGLE TARGET FOR THE CRITICAL TIME DURATION (TCRIT SECONDS) DURING THE TERMINAL PHASE OF THE COPPERHEAD TRAJECTORY.
PRSDT		RSPTIM		PROBABILITY THAT DESIGNATOR TO FDC DIGITAL COMMUNICATION LINK IS OPERATING SUCCESSFULLY.
PRSPTM		RSPTIM	SECONDS	PARAMETERIZED RESPONSE TIME.
PRSVT		RSPTIM		PROBABILITY THAT DESIGNATOR TO FDC VOICE COMMUNICATION IS SUCCESSFUL.
PR1		(LOCAL)		USED TO BRACKET RANDOM NUMBER IN A WEATHER CLASS PROBABILITY TABLE.
PSCODE		RECNAM		NAME RECORD KEY FOR TARGET POSTURE DATA RECORD ON WORD ADDRESSABLE RANDOM ACCESS MASS STORAGE FILE (TAPE 11).
PSMKKL		SMOKED		PROBABILITY THAT SMOKE ABORTS POTENTIAL COPPERHEAD FIRE MISSION.
PSTDAT(41)		(LOCAL)		ARRAY TO WHICH THE ELEMENTS OF THE TARGET POSTURE DISTRIBUTION DATA BLOCK ARE EQUIVALENCED.
PSTTBL(10,3)		HIT		PSTTBL(I,J) IS THE PROBABILITY THAT A MOVING TARGET AT RANGE I IS IN POSTURE J (WHERE J=1 INDICATES A COMPLETELY OBSCURED TARGET, J=2 INDICATES A FULLY EXPOSED TARGET, AND J=3 INDICATES A HULL DEFILADE TARGET).
PSTVAL(3)		(LOCAL)		PSTVAL(I) IS THE PROBABILITY THAT THE TARGET IS IN POSTURE I WHERE I=1,2 AND 3 RESPECTIVELY INDICATE THAT THE TARGET IS COMPLETELY OBSCURED, FULLY EXPOSED, AND HULL DEFILADE.
R(1)		(LOCAL)		GAMMA RANDOM DEVIATE.

GLOSSARY - CONTINUED

VARIABLE	TYPE	COMMON BLOCK	UNITS	DEFINITION
RECLBL(8)		DISPLY		RECLBL(I) IS AN ALPHANUMERIC CODE THAT FORMS PART OF THE RECORD NAME KEY FOR WORD ADDRESSABLE MASS STORAGE FILE (TAPE 11) RECORDS OF TYPE I. (WHICH CORRESPOND TO KEYWORD 20+I).
REFL		PEDESC (F.P.)		REFLECTIVITY OF TARGET TO LASER ENERGY IN DESIGNATOR WAVE LENGTH.
RELIF		MISC		ROUND IN FLIGHT RELIABILITY. PROBABILITY THAT ROUND FUNCTIONS CORRECTLY.
RN		(LOCAL)		UNIFORMLY DISTRIBUTED RANDOM NUMBER.
RNDREC(6)		SCCSS		RNDREC(I) IS THE NUMBER OF TARGETS KILLED FOR THE CURRENT CASE BY THE ITH ROUND. (RNDREC(I) = NKILL(I).)
RNGCLB(11)		RNGLOS	METERS	RNGCLB(I) IS THE UPPER BOUNDARY OF THE ITH RANGE CLASS FOR LINE-OF-SIGHT SEGMENT LENGTHS.
RNGK		(LOCAL)	KM	RNGK IS THE CURRENT DESIGNATOR-TO-TARGET RANGE IN KILOMETERS
RNGNOW		(LOCAL)	METERS	CURRENT DESIGNATOR-TO-TARGET RANGE IN METERS.
RNGPLS(10)		RANDOC	METERS	RNGLOS(I) IS THE UPPER BOUNDARY OF THE ITH RANGE CLASS OF PRBLOS ARRAY.
RNGPST(10)		HIT	METERS	RNGPST(I) IS THE DESIGNATOR-TO-TARGET RANGE FOR THE ITH POSTURE BREAKDOWN DISTRIBUTION IN THE PSTTBL ARRAY.
RNGTTF(20)		HIT	METERS	RNGTTF(I) IS THE DESIGNATOR-TO-TARGET RANGE FOR THE ITH SET OF "TRUE TARGET FACTORS" IN THE TTF ARRAY.
RN1, RN2, . . RN22		(LOCAL)		THE RANDOM NUMBERS RESULTING FROM CALLS OF URAN31 (I.E., RNi=URAN31 (IRi)) SOME OF THE RN'S (RN9 FOR EXAMPLE) ARE NO LONGER PRESENT IN THE PROGRAM).
ROCODE		RECNAM		RECORD NAME KEY FOR RANDOM OCCURRENCE DATA RECORD ON WORD ADDRESSABLE MASS STORAGE FILE (TAPE 11).
RODATA(22)		(LOCAL)		ARRAY TO WHICH THE ELEMENTS OF THE RANDOM OCCURRENCE DATA BLOCK ARE EQUIVALENCED.
ROLBL(4,2)		HEADNG		ARRAY OF ALPHANUMERIC CONSTANTS USED TO CREATE LABELING OF LOS MODE SECTION OF OUTPUT.
RSCODE		RECNAM		RECORD NAME KEY FOR RESPONSE TIME DATA RECORD ON WORD ADDRESSABLE MASS STORAGE FILE (TAPE 11).

GLOSSARY - CONTINUED

VARIABLE	TYPE	COMMON BLOCK	UNITS	DEFINITION
RSPDAT(49)		(LOCAL)		ARRAY TO WHICH THE ELEMENTS OF THE RESPONSE TIME DATA BLOCK ARE EQUIVALENCED.
RSPLBL(3,3)		HEADNG		ARRAY OF ALPHANUMERIC CONSTANTS USED TO CREATE LABELING OF RESPONSE TIME SECTION OF OUTPUT.
RUMC		RSPTIM	METERS	RANGE FROM TARGET UNMASK TO FOOTPRINT CENTROID.
SEGLNG		(LOCAL)	METERS	LENGTH OF LINE-OF-SIGHT SEGMENT DRAWN FOR THE CURRENT REPLICATION.
SEGLOS(11,11)		RNGLOS	NONE, METERS	SEGLOS(I,J) FOR J=1 IS THE ITH PROBABILITY VALUE USED FOR BRACKETING A UNIFORM RANDOM NUMBER WHEN INTERPOLATING IN CUMULATIVE LOS SEGMENT LENGTH DISTRIBUTION. SEGLOS(I,J) FOR J>1 IS THE ITH LINE-OF-SIGHT SEGMENT LENGTH VALUE USED FOR INTERPOLATING IN RANGE CLASS J-1. (SEGLOS(I,1) IS THE PROBABILITY THAT A LINE-OF-SIGHT SEGMENT IN RANGE CLASS J-1 IS LESS THAN OR EQUAL TO SEGLOS(I,J)).
SEP(5)		SYMBOL		AN ARRAY OF ALPHANUMERIC SYMBOLS THAT CAN BE USED AS KEYWORD OR OPTION WORD SEPARATORS (",", "(", ")", "/", "?") THEY ARE STORED IN A1 FORMAT.
SEQNML	LOGICAL	LOGFLG		FLAG TO INDICATE WHETHER SEQUENCE NUMBERS (FROM CDC EDITOR) ARE PRESENT IN COLUMNS 73-78 OF INPUT FILE. (TRUE INDICATES SEQUENCE NUMBERS; FALSE INDICATES NO SEQUENCE NUMBERS).
SHRTEC	LOGICAL	LOGFLG		FLAG TO INDICATE WHETHER SHORT OR LONG FORM OF SUBROUTINE ECHO'S OUTPUT IS TO BE USED. (SHRTEC=TRUE FOR SHORT FORM; SHRTEC=FALSE FOR LONG FORM).
SKSEN		PEDESC F.P.	JOULES/M^2	COPPERHEAD SEEKER SENSITIVITY.
SLCOM3	LOGICAL	F.P.		FLAG TO INDICATE WHETHER A COMMENT IS A PROGRAM GENERATED "TRIPLE $" COMMENT. (IF TRUE, IT IS; IF FALSE, IT IS NOT).
SLVERS		STITLE		VERSION NUMBER OF PROGRAM (INCREASED AS PROGRAM IS MODIFIED)
SMK2(3,3,2)		SMOKED	TYPE 1 SMK ROUNDS	SMK2(I,J,K) IS THE NUMBER OF TYPE 1 SMOKE ROUNDS REQUIRED TO CREATE A SMOKE SCREEN FOR 30 MINUTES ACROSS 1 KILOMETER OF FRONT SUFFICIENT TO PREVENT THE USE OF COPPERHEAD AGAINST TARGETS IN THE SMOKED AREA GIVEN PASQUILL ATMOSPHERIC STABILITY CATEGORY 2*I OR 2*I-1, WIND SPEED J, AND RELATIVE HUMIDITY K.

GLOSSARY - CONTINUED

VARIABLE	TYPE	COMMON BLOCK	UNITS	DEFINITION
SMK5(3,3,2)		SMOKED	TYPE 2 SMK ROUNDS	SAME AS SMK2 EXCEPT FOR TYPE 2 SMOKE ROUND.
SPCL(70)	LOGICAL	LOGFLG		SPCL(I) IS TRUE IF A SPECIAL OPTION IS IN EFFECT FOR KEYWORD I; FALSE IF SPECIAL OPTION NOT IN EFFECT.
TBR		TIME	SECONDS	TIME BETWEEN SUCCESSIVE ROUNDS FIRED ON A SINGLE REPLICATION.
TCRIT		RANDOC	SECONDS	CRITICAL TIME. LENGTH OF TIME INTERVAL AT TERMINAL PHASE OF TRAJECTORY DURING WHICH COPPERHEAD SEEKER MUST BE TRACKING A SPOT DESIGNATED ON (OR NEAR) THE TARGET.
TF		(LOCAL)		FACTOR USED FOR INTERPOLATING WITH RESPECT TO RANGE IN PROBABILITY OF ENGAGEMENT TABLES WHEN IMUTS=2.
TFRAC		(LOCAL)		WEIGHTING FACTOR USED FOR INTERPOLATING WITH RESPECT TO RANGE IN TARGET POSTURE DISTRIBUTION TABLE.
TFRAC1		(LOCAL)		WEIGHTING FACTOR USED FOR INTERPOLATING WITH RESPECT TO RANGE IN "TRUE TARGET FACTOR" TABLE.
TF1		(LOCAL)		WEIGHT FACTOR APPLIED FOR SHORTER RANGE WHEN INTERPOLATING WITH RESPECT TO RANGE IN PROBABILITY OF ENGAGEMENT TABLES WITH IMUTS=1.
TF2		(LOCAL)		WEIGHT FACTOR APPLIED FOR LONGER RANGE WHEN INTERPOLATING WHEN RESPECT TO RANGE IN PROBABILITY OF ENGAGEMENT TABLES WITH IMUTS=1.
TGTHD		PEDESC (F.P.)	DEGREES	ANGLE BETWEEN FOOTPRINT CENTROID-TO-GUN LINE AND TARGET DIRECTION OF TRAVEL.
TIM		RUNDAT		ALPHANUMERIC DISPLAY OF TIME AT WHICH PROGRAM WAS RUN (OBTAINED FROM COMPUTER's INTERNAL CLOCK).
TIMNOW		TIME	SECONDS	CURRENT TIME IN SECONDS SINCE TARGET UNMASKED FROM TERRAIN.
TIMRA		TIME	SECONDS	TIME AT WHICH ROUND CURRENTLY BEING CONSIDERED WILL ARRIVE (IMPACT).
TIMRA1		TIME	SECONDS	TIME AT WHICH FIRST ROUND OF THIS REPLICATION WILL ARRIVE (IMPACT).

VARIABLE	TYPE	COMMONBLOCK	UNITS	DEFINITION
TMEAN(2,2)		RSPTIM	SECONDS	TMEAN(I,J) IS THE MEAN TIME REQUIRED TO ENTER COPPERHEAD FIRE MISSION REQUEST IN DIGITAL MESSAGE DEVICE FOR CONDITION I,J. (I=1 INDICATES DAY, I=2 INDICATES NIGHT, J=1 INDICATES PRE-PLANNED TARGET, J=2 INDICATES TARGET OF OPPORTUNITY).
TMPLBL(8)		DISPLY		ALPHANUMERIC CONSTANTS USED TO LABEL OUTPUT HEADINGS WHEN TEMPORARY OR OVERRIDE OPTION IS USED.
TOF		TIME	SECONDS	TIME OF FLIGHT FOR COPPERHEAD ROUND (TIME FROM FIRING UNTIL IMPACT).
TOFARY(16)		FLTTIM	SECONDS	TOFARY(I) IS THE TIME OF FLIGHT OF COPPERHEAD ROUND (USING PREFERRED ELEVATION AND CHARGE) FOR GUN-TO-TARGET RANGE OF I KILOMETERS.
TR		(LOCAL)	SECONDS	NOMINAL DESIGNATOR-FDC-BATTERY RESPONSE TIME.
TRARRY(3,2)		RSPTIM	SECONDS	TRARRY(I,J) IS THE NOMINAL DESIGNATOR-FDC-BATTERY RESPONSE TIME FOR MISSION TYPE I AND COMMUNICATION TYPE J. (I=1 INDICATES PRE-PLANNED TARGET, I=2 INDICATES TARGET OF OPPORTUNITY, I=3 INDICATES PRIORITY PRE-PLANNED TARGET, J=1 INDICATES DIGITAL COMMUNICATION, J=2 INDICATES VOICE COMMUNICATION).
TRBAR		RSPTIM	SECONDS	NOMINAL DESIGNATOR-FDC-BATTERY RESPONE TIME PLUS TIME OF FLIGHT.
TRBAR1		(LOCAL)	SECONDS	SAME AS TRBAR.
TSIGMA(2,2)		RSPTIM	SECONDS	TSIGMA(I,J) IS THE STANDARD DEVIATION OF THE DISTRIBUTION OF TIME REQUIRED TO ENTER COPPERHEAD FIRE MISSION REQUEST IN DIGITAL MESSAGE DEVICE FOR CONDITION I,J. (I,J HAVE SAME MEANING AS FOR THE VARIABLE TMEAN).
TTF(3,20,2)		HIT		TTF(I,J,K) IS THE PROBABILITY COPPERHEAD HITS THE TARGET GIVEN SEEKER ENGAGEMENT WITH DESIGNATOR TYPE I, RANGE J, AND TARGET POSTURE K. (I=1,2,3 INDICATE DESIGNATOR TYPES 1,2,3 RESPECTIVELY; J INDICATES JTH RANGE OF RNGTTF ARRAY; K=1 INDICATES FULLY EXPOSED TARGET, K=2 INDICATES HULL DEFILADE TARGET).
TVEL		TARGET	METERS/ SECONDS	TARGET SPEED.

GLOSSARY - CONTINUED

VARIABLE	TYPE	COMMON BLOCK	UNITS	DEFINITION
T1		(LOCAL)	SECONDS	FIRST TIME DELAY COMPONENT OF DELTAT. (ACCOUNTS FOR MULTIPLE VEHICLES AND MULTIPLE ROUNDS). ALSO, NOMINAL RESPONE TIME VALUE FOR PRINTING IN COMMENT.
T2		(LOCAL)	SECONDS	SECOND TIME DELAY COMPONENT OF DELTAT. (ACCOUNTS FOR ACTUAL RESPONE TIME AND DETECTION TIME VERSUS NOMINAL RESPONSE TIME).
T3		(LOCAL)	SECONDS, M/S	THIRD TIME DELAY COMPONENT OF DELTAT. (ACCOUNTS FOR POSITIONING OF FOOTPRINT WHEN RUMC IS PLAYED). ALSO, TARGET SPEED VALUE FOR PRINTING IN COMMENT.
T4		(LOCAL)	KM	GUN-TO-TARGET RANGE VALUE FOR PRINTING IN COMMENT.
T5		(LOCAL)		TARGET REFLECTIVITY VALUE FOR PRINTING IN COMMENT.
T6		(LOCAL)	DEGREES	ANGLE T VALUE FOR PRINTING IN COMMENT.
T7		(LOCAL)	METERS	DEFLECTION BIAS (POINT OF CLOSEST APPROACH TO FOOTPRINT CENTROID) VALUE FOR PRINTING IN COMMENT.
T8		(LOCAL)	DEGREES	TARGET HEADING VALUE FOR PRINTING IN COMMENT.
T9		(LOCAL)	JOULES/M^2	SEEKER SENSITIVITY VALUE FOR PRINTING IN COMMENT.
U(70)		UVALUE		U(I) IS A VALUE ASSOCIATED WITH KEYWORD I AND USED IN THE CURRENT CASE (EQUIVALENT TO UVALUE).
UDT		UVALUE		NO LONGER USED.
UIDIGT		UVALUE		UIDIGT=1.0 INDICATES DIGITAL DESIGNATOR-FDC COMMUNICATIONS; UIDIGT=2 INDICATES VOICE DESIGNATOR-FDC COMMUNICATIONS.
UIDN		UVALUE		UIDN=1 INDICATES DAY; UIDN=2 INDICATES NIGHT.
UMC		UVALUE		USED MISSION CODE. UMC=1,2,3 MEAN RESPECTIVELY PRE-PLANNED TARGET, TARGET OF OPPORTUNITY, PRIORITY PRE-PLANNED TARGET.
UPRT		UVALUE	SECONDS	USED PARAMETERIZED RESPONSE TIME.
URAN31		FUNCTION VALUE		URAN31 IS THE UNIFORM (PSEUDO-) RANDOM NUMBER GENERATOR USED IN THIS PROGRAM.
USERC	LOGICAL	F.P.		USERC=TRUE INDICATES A USER'S COMMENT; USERC=FALSE INDICATES A PROGRAM GENERATED COMMENT.

GLOSSARY - CONTINUED

VARIABLE	TYPE	COMMON BLOCK	UNITS	DEFINITION
USMK(2)		UVALUE		USMK(1) IS THE NUMBER OF TYPE 1 SMOKE ROUNDS USED. USMK(2) IS THE NUMBER OF TYPE 2 SMOKE ROUNDS USED.
UVALUE(70)				EQUIVALENT TO U ARRAY.
VEL		F.P.	METERS/ SECONDS	TARGET SPEED.
VELTBL(2,2)		RNGLOS	METERS/ SECONDS	VELTBL(I,J) IS TARGET SPEED IN CONDITIONS I,J. (I=1 FOR DAY, I=2 FOR NIGHT, J=1 FOR SUMMER, J=2 FOR WINTER).
VERDAT(2)		STITLE		DATE (ALPHANUMERIC CONSTANT) OF LAST CHANGE TO CURRENT PROGRAM.
VIS(11)		WEATHR	KM	VIS(I) IS THE ITH METEOROLOGICAL VISIBILITY RANGE LIMIT VALUE USED IN THE WEATHER DATA.
VISLIM		RANGE	KM	THE METEOROLOGICAL VISIBILITY RANGE LIMIT VALUE FOR THE CURRENT REPLICATION.
VSMK		(LOCAL)	KM	LENGTH OF FRONT THAT CAN BE SMOKED WITH GIVEN NUMBER OF ROUNDS AND GIVEN WEATHER CONDITIONS. INTERMEDIATE VARIABLE IN CALCULATION OF PSMKKL.
W(6,11,2)		WEATHR		W(I,J,K) IS THE PROBABILITY (GIVEN A CLOUD CEILING) OF HAVING WEATHER WITH CLOUD CEILING ALTITUDE I, METEOROLOGICAL VISIBILITY RANGE LIMIT J, AND CLOUD FREE LOS CONDITION K (K=1 INDICATES CLOUD FREE LOS; K=2 INDICATES NO CLOUD FREE LOS).
WCFSUM(2)		WEATHR		SCFSUM(I) IS THE SUM OF ELEMENTS PRGCFL(1,I) THROUGH PRGCFL (NVL,I). (USED TO NORMALIZE RANDOM NUMBERS BEFORE SAMPLING FROM PRGCFL ARRAY).
WCODE		RECNAM		RECORD NAME KEY FOR WEATHER DATA RECORD ON WORD ADDRESSABLE MASS STORAGE FILE (TAPE 11).
WDATA(193)		(LOCAL)		ARRAY TO WHICH THE ELEMENTS OF THE WEATHER DATA BLOCK ARE EQUIVALENCED.
WK(6)		LOCAL		WORKING AREA ARRAY USED BY IMSL ROUTINE GGAMA.
WNDSPD(3,3)		WEATHR		WNDSPD(I,J) IS THE PROBABILITY OF HAVING JTH WINDSPEED GIVEN PASQUILL ATMOSPHERIC STABILITY CATEGORY 2*I OR 2*I-1.

GLOSSARY - CONTINUED

VARIABLE	TYPE	UNITS	COMMON BLOCK	DEFINITION
WSUM(2)			WEATHR	WSUM(I) IS THE SUM OF ELEMENTS W(1,1,I) THROUGH W(6,11,I). (USED TO NORMALIZE RANDOM NUMBERS BEFORE SAMPLING FROM W ARRAY).
X			(LOCAL)	USED AS INTERMEDIATE VARIABLE FOR CALLING FPRCNT.
XIN			(F.P.)	PERCENTAGE VALUE SENT TO FPRCNT FUNCTION FOR FORMATTING.
XMTTIM(2,2)		SECONDS	RSPTIM	XMTTIM(I,J) IS THE TIME REQUIRED TO TRANSMIT THE REQUEST FOR COPPERHEAD FIRE FROM DESIGNATOR OPERATOR TO FDC USING COMMUNICATION MODE I FOR A MISSION TYPE J. (I=1 FOR DIGITAL COMMUNICATION, I=2 FOR VOICE; J=1 FOR PRE-PLANNED TARGET, J=2 FOR TARGET OF OPPORTUNITY).
XMVADF(2)		SECONDS	RSPTIM	XMVADF(I) IS THE TIME REQUIRED TO TRANSMIT REQUEST FOR COPPERHEAD FIRE FROM DESIGNATOR OPERATOR TO FDC VIA VOICE AFTER TRYING DIGITAL (AND FAILING DIGITAL) FOR MISSION TYPE I. (I=1 FOR PRE-PLANNED TARGET, I=2 FOR TARGET OF OPPORTUNITY.)
XNV			(LOCAL)	NUMBER OF CURRENTLY UNKILLED VEHICLES IN TARGET.
XOUT			(LOCAL)	NAME OF VALUES OUTPUT AFTER SPECIAL FORMATTING.
XSMPL			(F.P.)	RANDOM SAMPLE VALUE RETURNED BY SUBROUTINE SMPLCD.
XVALUE(8,9,2)			XVALUE	XVALUE(I,J,1) IS THE ITH ALLOWABLE VALUE FOR THE JTH PARAMETER USED TO CONSTRUCT (OR DECIPHER) THE PEDATA RECORD NAME. XVALUE(I,J,2) IS THE CODE NUMBER CORRESPONDING TO XVALUE (I,J,1). (NOTE THAT NOT ALL POSSIBLE I,J COMBINATIONS NEED CORRESPOND TO VALUES ACTUALLY ALLOWED IN CURRENT CASES.)
XWTHR			(LOCAL)	ALPHANUMERIC ABBREVIATION FOR NAME OF MONTH WHOSE WEATHER DATA IS BEING USED.
Y			(LOCAL)	INTERMEDIATE VARIABLE NAME USED IN CALL TO FPRCNT.
YOUT			(LOCAL)	REFORMATTED PERCENTAGE VALUES.
TWTHR			(LOCAL)	ALPHANUMERIC TIME OF DAY VALUE FOR WEATHER DATA.
ZOUT			(LOCAL)	REFORMATTED PERCENTAGE VALUES.

CHAPTER 13

13. CONVERSION TO OTHER COMPUTERS

The COPE model and its preprocessors were written for use on the US Army Ballistic Research Laboratories Control Data Corporation CYBER 76 (CDC 7600) computer. These programs use some of the features that are peculiar to CDC machines. This chapter points out some of the changes to COPE and its preprocessors that will be required to convert them to run on other machines.

13.1 Conversion To Other CDC Computers.

COPE and its preprocessors have been run on other CDC machines (a CDC 6600 at Aberdeen Proving Ground and a CDC 6400 and a CDC 6500 at FT Leavenworth, KS).

Two changes were required. The first was to change the Hollerith string delimiters from '(single quote) to whatever the host machine uses to delimit Hollerith strings (" double quote on the FT Leavenworth machine, $\neq$ on machines using CDC's standard, * at some other installations). This includes strings on STOP statements.

The second change was to define the cotangent function in PAM. The BRL CDC machines have the cotangent (COT) function as a library function; some other machines do not. This can be easily fixed by defining COT(X) = 1./TAN(X) as an in-line or statement function in PAM. Of course an alternate fix is to replace each occurrence of COT(X) by (1./TAN(X)).

Once these changes were made, the COPE program and its preprocessors ran without any trouble on the other CDC machines.

13.2 Conversion To Non-CDC Computers.

The author cannot anticipate every problem the user may encounter in converting COPE and its preprocessors to run on other machines; however, there are certain changes that will have to be made and of which the author is aware. The only machine (other than the CDC machines) that the author uses to any significant extent is the UNIVAC 1108, so most of the comments in this section deal with changes the author knows will have to be made to get the programs working on the UNIVAC machines.

13.2.1 Hollerith Delimiters and STOP's.
The first change that may be required is to change the Hollerith string delimiters from ' to whatever is used on the host machine.

The CDC machines allow a STOP statement with a message (the message is in Hollerith string delimiters itself) which is printed when that STOP is encountered. Other machines may allow only a number with the stop, only a shorter message (CDC allows up to 70 characters; UNIVAC allows 6 characters), or nothing at all. So depending on the STOP

messages allowed, all of the STOP statements in COPE and its preprocessors may require changes.

13.2.2 A FORMATS and Alphanumeric Arrays. The CDC machines use a 60 bit word and a six bit character code so that each word holds 10 characters. Hence, most of the alphanumeric reads, writes, encodes, and decodes use A10 format and most data statements use 10H format to set alphanumeric values.

For machines that use shorter words or 8 bit character codes, the number of characters per word will probably be fewer. This means that the A10 formats in COPE and its preprocessors (and, indeed, all An formats where n> number of characters per word on the host machine) must be changed. A similar remark applies to all 10H (or nH with n as above) formats in data statements. Reducing these formats to the limits of the host machine will sometimes require that arrays containing the alphanumeric data be redimensioned. For example, the B array in subroutine INPUT is currently dimensioned B(8,10); if used on the UNIVAC 1108 which has 6 characters per word, it would have to be redimensioned B(14,10) so that each row could still contain a full card image (80 characters).

13.2.3 Word Addressable Mass Storage Files. The CDC system subroutines to open, read from, write to, and close a word addressable mass storage file are respectively OPENMS, READMS, WRITMS, and CLOSMS. The array INDEX11, the system subroutine SYSTEMC, and the user routines NOREC and NOREC2 are also connected with COPE's use of word addressable files.

The most convenient way to adapt COPE's handling of these files to the host machine is probably to write subroutines OPENMS, READMS, WRITMS, and CLOSMS that use the host machine's equivalent file type and commands, and which perform the same operations as on CDC.

In the specific case of the UNIVAC, for example, OPENMS would be a subroutine which first does a DEFINE FILE, then reads from the direct access file (using UNIVAC terminology -- this is equivalent to the CDC word addressable file) the current values of the INDX11 array. Subroutine READMS would search the INDX11 array for the desired record name and then when the name was found and the corresponding address v looked up, it would do a READ (11'v); if the record name were not found, NOREC would be called (or NOREC2 in PREPMS). Subroutine WRITMS would add a record name and address to INDX11 (or perhaps just modify the addresses if the record name were already present) and the do a WRITE (11'v). CLOSMS would do a WRITE (11'v) of INDX11 to TAPE11.

Non-CDC machines may also require redimensioning of INDX11 to allow record names to take up two (or more) words of characters. Also additional bookkeeping of record addresses may be required in PREPMS.

The calls to SYSTEMC and the defining of IRAY can be dispensed with if error prints are added that occur when attempting to read a non-existent record.

13.2.4 ENCODE and DECODE. Although most computers with FORTRAN IV compilers have ENCODE and DECODE statement's, there are some that may not and there are others that differ from CDC's.

If the host machine does not have ENCODE and DECODE statements, it would probably be worthwhile to write subroutines that perform the functions of ENCODE and DECODE and then replace all ENCODES and DECODES in COPE with calls to those subroutines.

If the host machine has ENCODE and DECODE a check should be made to see that they take the same arguments in the same order as the CDC ENCODE and DECODE statements and, if not, the necessary changes should be made.

13.2.5 DATE and TIME. CDC has two subroutines DATE and TIME that respectively give an 8 character date and a 9 character time. These are only called to obtain date and time values to be printed on the title page of the output. If the user's computer does not have equivalent subroutines, the calls to DATE and TIME may be deleted.

13.2.6 STRACE. The subroutine STRACE causes a printing of traceback information from the current subroutine back to the main program. This information gives the subroutine and line from which STRACE was called, the subroutine and line from which that subroutine was called, and so on back to the main program.

STRACE is available on both CDC and UNIVAC but it may not exist in some FORTRAN implementations (or it may have a different name). In either case, the user will need to check this point.

13.2.7 EOF. The CDC machine has a function called EOF. The value of EOF (IUNIT) is zero if the end of file has not been encountered on I/O unit IUNIT. After a READ, a test of EOF will yield a non-zero value if the end-of-file on that I/O unit has been encountered.

The CDC statements:

READ (IUNIT, 100) iolist
IF (EOF(IUNIT).NE.0.0) GO TO 99

are equivalent to:

READ (IUNIT, 100, END = 99) iolist

on most other machines.

13-3

13.2.8 COTANGENT. The PAM program uses the cotangent function (COT). If this is not a library function on the user's computer, then it should either be defined as a function (a statement function or external function) or else each occurrence of COT(X) should be replaced by (1./TAN(X)).

13.2.9 Im.n FORMAT. The CDC FORTRAN includes an Im.n format which specifies that an integer is to be written right justified in a field m characters wide with a minimum of n characters printed ($m \geq n$). This means that leading zeros are generated when the output value requires fewer than n digits. For example, if an integer variable with value 23 were to be written under I5.4 format, the result would be: b0023. Here b represents a blank so we have a field width of m=5 with n=4 characters printed even though 2 would have sufficed.

The Im.n is a standard format in FORTRAN 77, but since COPE is written in FORTRAN IV that may be of no help to the user whose FORTRAN IV compiler does not include it. On some machines a similar format (such as the UNIVAC Jn format) may be substituted; on other machines the user may have to simulate this format by using one of several different formats depending on the number of digits required to write the integer value.

13.3 GGAMA Function (IMSL).

The main COPE program uses the International Mathematical and Statistical Library (IMSL) function GGAMA. It is called from function GAMMA which is in turn called from GETTIM (it is used when the third method of playing response time is used).

If the IMSL is available on the user's computer, then it should be made available when COPE is loaded and run.

If the IMSL is not available to the user, then a function GGAMA should be written by the user or obtained from another library. It should take a random number seed IRN, an alpha parameter value (ALPHA), and return a gamma distributed random deviate R (with α = ALPHA and β = 1). The arguments IN and WK are arguments used by the IMSL routine and may or may not be used by the user's GGAMA.

14. PREPMS PREPROCESSOR PROGRAM

14.1 General Remarks

The PREPMS preprocessor program performs three functions:

(1) to create or modify records on the word addressable data base file (TAPE 11) by reading input cards (or card images) and writing their contents (in appropriate format and order) to TAPE 11.

(2) to generate and print a list of the names of the current records on TAPE 11, and

(3) to generate and print a list of the PE data records currently on TAPE 11 along with their respective parameter values (see section 5.4 for the relation of 9 parameters to PE data record names).

Because the PREPMS program is quite straightforward in design and shares many subroutines with COPE, it is not documented as thoroughly as the main COPE program; however, this chapter gives enough information to set up the input, understand the output, and generally understand what the program does.

A re-reading of Chapter 5 may be helpful in understanding what follows.

14.2 PREPMS Program Design.

The PREPMS program consists of seven subprograms: the main program PREPMS, the block data subprogram BDATA2, the subroutines NOREC2, PENAME, and SEPRC2, and the functions IDCHAR and NUMRIC.

The subprograms PENAME, IDCHAR, and NUMRIC are identical to the subprograms of the same name in COPE. BDATA2 is merely a subset of BDATA1 of COPE; that is, it contains data statements that fill in the three common blocks LOGFLG, SYMBOL, and XVALUE as does BDATA1, but it does not fill in any of the other common blocks of BDATA1 as they are not needed by PREPMS.

The subroutine SEPRC2 is nearly identical to SEPREC of COPE. The only difference is that the message about sequence numbers in columns 73-78 of the input cards is written directly to OUTPUT instead of encoded and written via a call to COMMNT.

The subroutine NOREC2 is called (as a result of using CDC's SYSTEMC feature) whenever the program attempts to read a record named OPTNNUMS from TAPE 11 but does not find such a record. This should happen only when PREPMS is creating a new TAPE 11; when PREPMS is modifying an
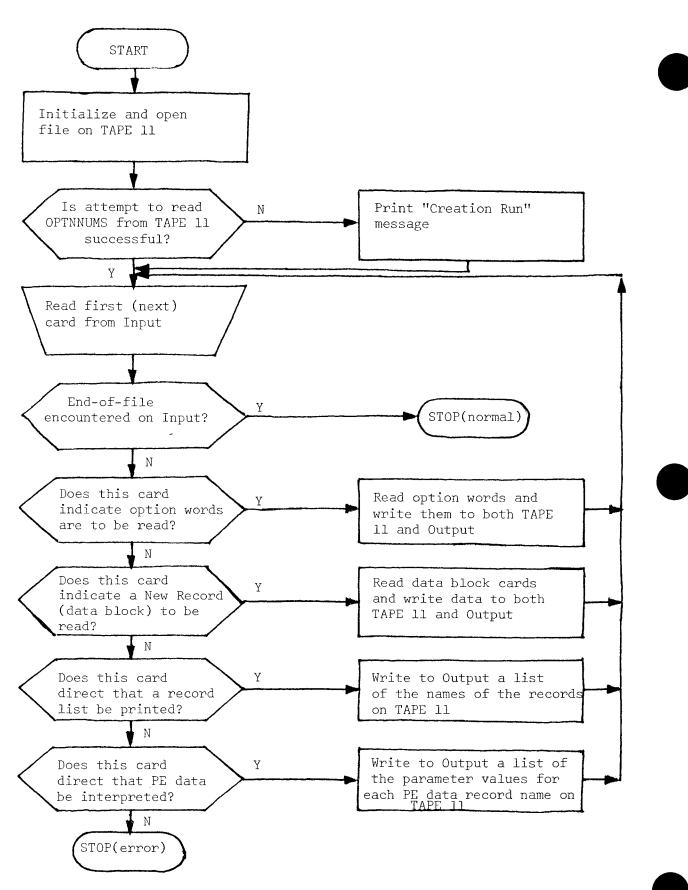
FIGURE 14-1 Logic Flow of PREPMS

existing TAPE11, there will already be an OPTNNUMS record on TAPE11.
When no such record is found, NOREC2 is called; it then prints a message
saying that the current job is a creation run and allows the program to
continue.

The main program PREPMS is different from anything in COPE.
Its main logic flow is shown in Figure 14-1. It begins by initializing
(via DATA statements), calling SYSTEMC to set an error recovery procedure,
and opening the file TAPE11. If it successfully reads the record named
OPTNNUMS, it continues; if not, NOREC2 is called, a message is printed,
and execution resumes. Next it attempts to read a card; if successful,
the program continues; if unsuccessful, it has hit the end of file and a
stop with normal termination message is issued.

The main program examines the card just read to determine what
action to take next. Five possibilities exist:

(1) The card indicates a set of option words follows. In this
case, the option words are read, printed on OUTPUT and written to TAPE 11.

(2) The card indicates a new record is to be read. In this
case, the data for the new data block record is read, printed on OUTPUT,
and written to TAPE11.

(3) The card indicates a list of the names of the records
currently on TAPE11 is desired. In this case, such a list is generated
and printed on OUTPUT.

(4) The card indicates PE data record names are to be interpreted.
In this case, the names of the PE data records currently on TAPE11 are
examined and the corresponding parameter values are determined. A list
is then printed giving each PE data record's name and the corresponding
parameter values.

(5) None of the above in which case a stop with error message
occurs.

Note: The terms INPUT and OUTPUT refer respectively to the files
TAPE5 and TAPE6 which correspond to I/o units 5 and 6. TAPE11 corresponds
to I/o unit 11 and is another name for the word addressable data base
file. Note that OUTPUT (or TAPE6) normally corresponds to a line printer
and INPUT (or TAPE5) corresponds to either a punched card reader or a
mass storage file of card images.

14.3 Glossary of PREPMS Variables.

The majority of the PREPMS variables have the same meaning as
their namesakes in the COPE program. Therefore, the glossary in this
section gives definitions only for those variables different from the
main COPE model.

14-3

GLOSSARY OF PREPMS VARIABLES

VARIABLES	TYPE	COMMON BLOCK	UNITS	DEFINITION
CLABEL	REAL	(LOCAL)		THE RECORD NAME OF THE OPTION WORD RECORD JUST READ. NORMALLY THIS WILL BE THE ABBREVIATED FORM OF THE KEYWORD TO WHICH THE OPTION WORDS BELONG.
ICASE	INTEGER	(LOCAL)		THE TYPE NUMBER OF THE DATA BLOCK RECORD JUST READ. ICASE = 1 FOR WEATHER DATA, 2 FOR ACQUISITION DATA, 3 FOR RESPONSE TIME DATA, 4 FOR DIRECT FIRE SUPPRESSION DATA, 5 FOR RANDOM OCCURRENCE DATA, 6 FOR PEDATA, 7 FOR POSTURE DISTRIBUTION DATA, 8 FOR INVARIANT DATA, AND 9 FOR SADARM DATA (9 IS NOT USED IN RUNNING PREPMS FOR COPE).
ILIST(2000)	INTEGER	(LOCAL)		ILIST (2I-1) IS THE NAME OF THE ITH RECORD ON TAPE 11 ILIST (2I) IS A NUMBER (PRINTED IN OCTAL) GIVING THE LENGTH AND ADDRESS ON DISK (PACKED) OF THE ITH RECORD ON TAPE 11.
IOUT	INTEGER	(LOCAL)		IOUT IS A COUNTER USED TO RECORD THE NUMBER OF ILIST ENTRIES TO BE PRINTED.
IPECOD	INTEGER	(LOCAL)		IPECOD IS THE NAME OF THE PE DATA RECORD CURRENTLY BEING EXAMINED TO DETERMINE PARAMETER VALUES.
IRLT1, IRLT2, ..., IRLT9	INTEGER	(LOCAL)	WORDS	IRLT1 IS THE RECORD LENGTH OF TYPE 1 DATA BLOCK RECORDS (WEATHER DATA); IRLT2 IS THE RECORD LENGTH OF TYPE 2 DATA BLOCK RECORDS (ACQUISITION DATA); - - - -; IRLT9 IS THE RECORD LENGTH OF TYPE 9 DATA BLOCK RECORDS (SADARM DATA).
IUNIT	INTEGER	(LOCAL)		I/O UNIT FROM WHICH PE DATA IS TO BE READ (MUST BE EITHER 4 OR 5).
I2	INTEGER	(LOCAL)		DESIGNATOR TYPE NUMBER (1 = GLLD, 2 = MULE, 3 = LTD).
NOPTNM(70)	INTEGER	(LOCAL)		NOPTNM(I) IS THE NUMBER OF OPTION WORD CHARACTER STRINGS CURRENTLY AVAILABLE FOR USE WITH KEYWORD NUMBER I.
NOPT1	INTEGER	(LOCAL)		NUMBER OF THE KEYWORD CORRESPONDING TO THE SET OF OPTION WORDS JUST READ.
NREAD	INTEGER	(LOCAL)		NUMBER OF OPTION WORD CHARACTER STRINGS TO BE READ IN THIS SET OF OPTION WORDS.

GLOSSARY OF PREPMS VARIABLES - CONTINUED

VARIABLES	TYPE	COMMON BLOCK	UNITS	DEFINITION
OPT	REAL	(LOCAL)		TEMPORARY NAME FOR THE VALUE TO BE LOADED INTO CHARA (1,IJ). IT IS THE NUMBER OF THE OPTION FOR ITS OPTION WORD POSITION (GIVEN BY CHARA (2,IJ) OR XLEV) TO WHICH THE CHARACTER STRING TO FOLLOW BELONGS.
PECHK	REAL	(LOCAL)		PECHK IS THE FIRST FOUR CHARACTERS (LEFT JUSTIFIED WITH BLANK FILL) OF THE NAME OF THE RECORD ON TAPE11 CURRENTLY BEING EXAMINED TO DETERMINE WHETHER IT IS A PE DATA RECORD.
RLABEL	REAL	(LOCAL)		NAME OF CURRENT DATA BLOCK RECORD.
T1, T3, T4, T5, T6, T7, T8, T9	REAL	(LOCAL)		THESE CORRESPOND RESPECTIVELY TO THE FIRST, THIRD, FOURTH, ----, NINTH ARGUMENTS OF SUBROUTINE PENAME (AND ITS ENTRY PEIDNT) T1 IS NOMINAL RESPONSE TIME, T3 IS TARGET VELOCITY, T4 IS GUN-TARGET RANGE, T5 IS TARGET REFLECTIVITY, T6 IS ANGLE T, T7 IS DEFLECTION BIAS, T8 IS TARGET HEADING, AND T9 IS SEEKER SENSITIVITY.
X	REAL	(LOCAL)		TEMPORARY NAME FOR VALUE TO BE LOADED INTO NREAD (DEFINED ABOVE).
XLEV	REAL	(LOCAL)		XLEV IS TEMPORARY NAME FOR VALUE TO BE LOADED INTO CHARA(2,IJ). IT IS THE OPTION WORD NUMBER FOR WHICH THE CHARACTER STRING TO FOLLOW IS A POSSIBLE CHOICE.
Y	REAL	(LOCAL)		Y IS A TEMPORARY NAME FOR THE VALUE TO BE LOADED INTO NOPT1 (DEFINED ABOVE).
ZCASE	REAL	(LOCAL)		TEMPORARY NAME FOR VALUE TO BE LOADED INTO ICASE (DEFINED ABOVE).

To find the definition of a variable in PREPMS, one should first look in the glossary of this section. Then, if the variable is not found, look in the glossary of COPE variables in Chapter 12.

Note that all variables in common block SADARB are used only with the SADARM variant of COPE (called SOPE) and are not defined herein. This remark also applies to the WPNDAT array.

14.4 PREPMS INPUTS.

The PREPMS inputs are divided into four types:

(1) option word records
(2) data block records
(3) REPORT RECORD LIST directives, and
(4) INTERPRET PEDATA directives.

The second type (data block records) is further divided into eight types of data blocks. The sections concerning data block record types (sections 14.4.2(1) through 14.4.2(8)) also give instructions for setting up data to be read by COPE using the TEMPORARY feature (see section 4.5).

Note that if two or more option word records are read corresponding to the same keyword (see section 14.4.1) then only the last one read will have any effect. Similarly, if two or more data block records are read under the same record name, only the last one read will be retained on TAPE11. This means that any modifications to either type 1 or type 2 input (as listed above) require that the entire desired record contents be read (not just the additions).

Also, note that inputs of the four types may be arranged in any order provided that the integrity of the multiple card (or card image) input types (types 1 and 2) is preserved. However, types 3 and 4 only have effect on the file (TAPE11) as it exists at the time they are encountered; hence, they are usually put at the end of the input.

14.4.1 Option Word Records.
Each option word record consists of one card (or card image) of type 1 and NREAD cards of type 2 following the type 1 card.

The general form of the type 1 card is:

OPTION WORDS, keyword, m, n

or

OPTWDS, keyword, m, n

where: keyword is replaced by the character string giving the abbreviated form of the keyword to which the option words are to apply;

m = NREAD, a positive integer giving the number of type 2 cards to be read for this option word; and

n = NOPT1, a positive integer giving the keyword number (see section 5.3.9) of the keyword to which the option words are to apply.

The general form of each type 2 card is:

mm, nn, Option word character string

where: mm = NOPTWC, the number of the option word choice to which the character string belongs (NOPTWC is a positive integer);

nn = NOPTW, a positive integer equal to one plus the number of the option word for which the character string is an allowed choice; and

Option word character string is the actual character string allowed as a choice.

The subsequent use of option word character string in a COPE run as a choice for option word NOPTW-1 on a keyword input card for keyword number NOPT1 causes option number NOPTWC to be activated for option word NOPTW-1. (See example in section 5.3.8; for a second example, see appendixes C and D.)

Note: While blanks may be freely inserted in COPE inputs (keywords and option words) with no effect (the single exception being blanks occurring within 10 spaces after a "$" - see section 4.5.3), there should be no internal blanks in the character strings on type 2 cards.

Also, no more than 2 option word character strings applying to the same keyword are allowed to correspond to a given NOPTWC, NOPTW pair.

Finally, no more than 30 type 2 cards are allowed with any type 1 card.

14.4.2 Data Block Records.   There are eight data block record types:

(1) Weather data
(2) Acquisition data
(3) Response time data
(4) Direct Fire Suppression data
(5) Random Occurrence data
(6) PE (probability of engagement data)
(7) Target Posture Distribution data
(8) Invariant data

14-7

The formatting of the input required for each of these types is presented in a separate subsection of this section.

Note that these eight data blocks correspond exactly to the eight data blocks that can be used with the TEMPORARY option in COPE. Furthermore, the formats used by COPE under the TEMPORARY option and by PREPMS are identical except for the first card (or card image) of each set. The sections that follow give the set-ups required for use with either program.

The first card (header card) in each case is free format: blanks may be freely inserted, fields are defined by separators (commas, for example). Subsequent cards of each data block type are formatted FORTRAN inputs and care must be taken to conform to the specified formats.

1. Weather Data Block Input.

When reading weather data into PREPMS for transfer onto TAPE11, the first card (which indicates a weather data record is to be input) must be of the form:

NEW RECORD, record name, 1

or

NEW REC, record name, 1

where record name is the name of the weather data record to be read. (See section 5.3.1 for the form of weather data record names).

When using the TEMPORARY option with COPE, the weather data is headed by a card of the form:

TEMPORARY, WEATHER or TEMPORARY, W

or

TEMP, WEATHER or TEMP, W

In either case (whether reading weather data in PREPMS or COPE), the remaining cards of the weather data are as follows:

WEATHER DATA   CARD SET   Card No. 2

Variable name	UNITS	Format	columns	Description
NCC		I5	1-5	Number of different cloud ceiling altitude values used with the current weather data. (If NCC >6, then array dimension changes are required).
NVL		I5	6-10	Number of different visibility range limits used with the current weather data. (If NVL ≠ 11, then array dimension changes and program modifications are usually required).

WEATHER DATA _____ CARD SET   Card No. _3_____

Variable name	UNITS	Format	columns	Description
PRCLCG		F10.4	1-10	Probability that there is a cloud ceiling.
PRCFLS(1)		F10.4	11-20	Probability that there is a cloud free line-of-sight given that there is a cloud ceiling.
PRCFLS(2)		F10.4	21-30	Probability that there is a cloud free line-of-sight given that there is no cloud ceiling (i.e., scattered clouds only).

WEATHER DATA   CARD SET   Card No. 4ᵃ

Variable name	UNITS	Format	columns	Description
PRGCFL(1,1)		F10.4	1-10	PRGCFL(I,1) is the probability that the visibility range limit is equal to I kilometers given that there is a cloud ceiling and a cloud free line-of-sight.
PRGCFL(2,1)		F10.4	11-21	
⋮				Note: The visibility range limit is considered to be I kilometers if (I-1/2)km < visibility range limit <(Ī+1/2)km.
PRGCFL(8,1)		F10.4	71-80	

Variable name	UNITS	Format	columns	Description
PRGCFL(9,1)		F10.4	1-10	PRGCFL(I,1) is described on previous page.
PRGCFL(11,1)		F10.4	21-30	

WEATHER DATA   CARD SET   Card No. 5a

Variable name	UNITS	Format	columns	Description
PRGCFL(1,2)		F10.4	1-10	PRGCFL(I,2) is the probability that the visibility range limit is equal to I kilometers given that there is no cloud ceiling and that
PRGCFL(2,2)		F10.4	11-20	there is a cloud free line-of-sight. The note on card 4a applies.
⋮				
PRGCFL(8,2)		F10.4	71-80	

Variable name	UNITS	Format	columns	Description
PRGCFL(9,2)		F10.4	1-10	PRGCFL(I,2) is described on previous page.
⋮				
PRGCFL(11,2)		F10.4	21-30	

Variable name	UNITS	Format	columns	Description
W(1,1,1)		F10.4	1-10	W(I,J,I) is the probability of having the Ith cloud ceiling altitude and the Jth visibility range limit given that there is a cloud ceiling but no cloud free line-of-sight.
W(2,1,1)		F10.4 .	11-20	
W(3,1,1)		F10.4	21-30	
W(4,1,1)		F10.4 .	31-40	
W(5,1,1)		F10.4	41-50	
W(6,1,1)		F10.4	51-60	

WEATHER DATA   CARD SET   Card No. 6b

Variable name	UNITS	Format	columns	Description
W(1,2,1)		F10.4	1-10	W(I,J,1) is as defined on previous page.
W(2,2,1)		F10.4	11-20	
W(3,2,1)		F10.4	21-30	
W(4,2,1)		F10.4	31-40	
W(5,2,1)		F10.4	41-50	
W(6,2,1)		F10.4	51-60	

14-16

Cards 6c through 6k are similar to cards 6a and 6b except each successive card contains W(I,J,1) values for a higher value of J:

card 6a	contains	W(1,1,1)	through	W(6,1,1)
" 6b	"	W(1,2,1)	"	W(6,2,1)
" 6c	"	W(1,3,1)	"	W(6,3,1)
" 6d	"	W(1,4,1)	"	W(6,4,1)
" 6e	"	W(1,5,1)	"	W(6,5,1)
" 6f	"	W(1,6,1)	"	W(6,6,1)
" 6g	"	W(1,7,1)	"	W(6,7,1)
" 6h	"	W(1,8,1)	"	W(6,8,1)
" 6i	"	W(1,9,1)	"	W(6,9,1)
" 6j	"	W(1,10,1)	"	W(6,10,1)
" 6k	"	W(1,11,1)	"	W(6,11,1)

Each of these cards contains six values,

$$\left\{ W(1,J,1), \; W(2,J,1), \; W(3,J,1), \; W(4,J,1), \; W(5,J,1), \text{ and } W(6,J,1) \right\},$$

in 6F10.4 format (exactly as illustrated for cards 6a and 6b on the previous two pages).

WEATHER DATA _____ CARD SET   Card No. 7a _____

Variable name	UNITS	Format	columns	Description
W(1,1,2)		F10.4	1-10	W(I,J,2) is the probability of having the Ith cloud ceiling altitude
W(2,1,2)		F10.4	11-20	and the Jth visibility range limit
W(3,1,2)		F10.4	21-30	given that there is no cloud ceiling and no cloud free line-of-sight.
W(4,1,2)		F10.4	31-40	
W(5,1,2)		F10.4	41-50	
W(6,1,2)		F10.4	51-60	

14-18

WEATHER DATA _____ CARD SET   Card No. __7b__

Variable name	UNITS	Format	columns	Description
W(1,2,2)		F10.4	1-10	W(I,J,2) is as defined on previous page.
W(2,2,2)		F10.4	11-20	
W(3,2,2)		F10.4	21-30	
W(4,2,2)		F10.4	31-40	
W(5,2,2)		F10.4	41-50	
W(6,2,2)		F10.4	51-60	

14-19

Cards 7c through 7k are similar to cards 7a and 7b except each successive card contains W(I,J,2) values for a higher value of J:

card	7a	contains		W(1,1,2)	through	W(6,1,2)
"	7b	"		W(1,2,2)	"	W(6,2,2)
"	7c	"		W(1,3,2)	"	W(6,3,2)
"	7d	"		W(1,4,2)	"	W(6,4,2)
"	7e	"		W(1,5,2)	"	W(6,5,2)
"	7f	"		W(1,6,2)	"	W(6,6,2)
"	7g	"		W(1,7,2)	"	W(6,7,2)
"	7h	"		W(1,8,2)	"	W(6,8,2)
"	7i	"		W(1,9,2)	"	W(6,9,2)
"	7j	"		W(1,10,2)	"	W(6,10,2)
"	7k	"		W(1,11,2)	"	W(6,11,2)

Each of these cards contains six values,

$$\left\{ W(1,J,2),\ W(2,J,2),\ W(3,J,2),\ W(4,J,2),\ W(5,J,2),\ \text{and}\ W(6,J,2) \right\},$$

in 6F10.4 format (exactly as illustrated for cards 7a and 7b on the previous two **pages**).

WEATHER DATA _____ CARD SET   Card No. 8a _____

Variable name	UNITS	Format	columns	Description
VISLIM(1)	km.	F10.4	1-10	VISLIM (I) is the Ith visibility range limit value.
VISLIM (2)	km.	F10.4	11-20	Any choice other than VISLIM(I) = I kilometers will require program
VISLIM (3)	km.	F10.4	21-30	changes to COPE.
'	'	'		
'	'	'		
'	'	'		
'	'	'		
VISLIM (8)	km.	F10.4	71-80	

WEATHER DATA CARD SET　　　　Card No. __8b__

Variable name	UNITS	Format	columns	Description
VISLIM (9)	km.	F10.4	1-10	VISLIM (I) is as described on previous page.
'	'	'		
'	'	'		
'	'	'		
VISLIM (11)	km.	F10.4	21-30	

WEATHER DATA   CARD SET   Card No. 9

Variable name	UNITS	Format	columns	Description
CLOUD (1)	meters	F10.4	1-10	CLOUD (I) is the Ith cloud ceiling altitude in meters used for the current set of weather data.
CLOUD (2)	meters	F10.4	11-20	
CLOUD (3)	meters	F10.4	21-30	
CLOUD (4)	meters	F10.4	31-40	
CLOUD (5)	meters	F10.4	41-50	
CLOUD (6)	meters	F10.4	51-60	

14-23

Variable name	UNITS	Format	columns	Description
PASQL (1)		F10.4	1-10	PASQL(I) is the probability of occurrence of the Ith Pasquill atmospheric stability category. (Category A corresponds to I=1, B to I=2, etc.)
PASQL (2)		F10.4	11-20	
PASQL (3)		F10.4	21-30	
PASQL (4)		F10.4	31-40	
PASQL (5)		F10.4	41-50	
PASQL (6)		F10.4	51-60	

WEATHER DATA _____CARD SET   Card No. __11__

Variable name	UNITS	Format	columns	Description
WNDSPD (1)		F10.4	1-10	WNDSPD (I) is the probability that the windspeed is in speed bracket I. (Speed bracket I=1 includes windspeeds from 0 to 5 knots, I=2 includes from 5 to 15 knots and I=3 includes 15 knots and over).
WNDSPD (2)		F10.4	11-20	
WNDSPD (3)		F10.4	21-30	

Variable name	UNITS	Format	columns	Description
HUMID (1)		F10.4	1-10	HUMID (1) is the probability that the relative humidity is less than 65%;
HUMID (2)		F10.4	11-20	HUMID (2) is the probability that the relative humidity is greater than (or equal to) 65%.

2. Acquisition Data Block Input.

When reading acquisition data into PREPMS for transfer onto TAPE11, the first card (which indicates an acquisition data record is to be read) must be of the form:

NEW RECORD, record name, 2

or

NEW REC, record name, 2

where record name is the name of the acquisition data record to be read (see section 5.3.2 for the form of acquisition data record names).

When using the TEMPORARY option with COPE, the acquisition data is headed by a card of the form:

TEMPORARY, ACQUISITION RANGE DISTRIBUTION

or

TEMPORARY, ACQRNGDIST

or

TEMP, ACQUISITION RANGE DISTRIBUTION

or

TEMP, ACQRNGDIST

In either case (whether reading acquisition data in PREPMS or COPE), the remaining cards of the acquisition data are as follows:

ACQUISITION DATA _____ CARD SET   Card No. _2_____

Variable name	UNITS	Format	columns	Description
NRP		I5	1-5	Number of range points used in the CRNGD array (Cumulative distribution of acquisition (unmasking) ranges.)
NPP		I5	5-10	Number of points used within each range class to describe cumulative distribution of line-of-sight segment lengths.
NRNGCL		I5	11-15	Number of range class boundary value to be used (equals one less than the number of range classes) Note: Zero is always assumed to be the lower boundary of the shortest range class so it need not be explicitly entered as input nor counted as a boundary value for NRNGCL.

14-28

ACQUISITION DATA_____CARD SET   Card No. _3a____

Variable name	UNITS	Format	columns	Description
CRNGD(1,1)		F10.4	1-10	CRNGD(I,1) is the probability that the designator-to-target range at time of target unmasking is less
CRNGD(2,1)		F10.4	11-20	than or equal to the value in CRNGD(I,2)
CRNGD(3,1)		F10.4	21-30	Note:
/		/	/	CRNGD(1,1) = 0.0
/		/	/	and
/		/	/	CRNGD(NRP,1) = 1.0
/		/	/	must be satisfied.
/		/	/	Also, the entries must increase as I increases.
CRNGD(8,1)		F10.4	71-80	

Note: If NRP $\leq$ 8, only one card of
      this type will be needed; if
      NRP > 8, then a second card
      must continue with CRNGD(9,1)
      through CRNGD(NRP,1). NRP
      cannot exceed 11 with current
      dimensions.

14-29

ACQUISITION DATA _____ CARD SET   Card No. _3b_____

Variable name	UNITS	Format	columns	Description
CRNGD(1,2)	meters	F10.4	1-10	CRNGD(I,2) is the range value corresponding to
CRNGD(2,2)	meters	F10.4	11-21	the cumulative probability value in CRNGD(I,1).
⁞	⁞	⁞	⁞	The values must increase as I increases.
⁞	⁞	⁞	⁞	
CRNGD(8,2)	meters	F10.4	71-80	Note: If NRP ≤ 8, only one card of this type will be needed; if NRP > 8, then a second card must continue with CRNGD(9,2) through CRNGD(NRP,2) NRP cannot exceed 11 with current dimensions.

Variable name	UNITS	Format	columns	Description
SEGLOS(1,1)		F10.4	1-10	SEGLOS(I,1) is the probability that the length of a line-of-sight segment in range class K is less
SEGLOS(2,1) ⁞ ⁞ ⁞ ⁞ ⁞ ⁞ ⁞		F10.4 ⁞ ⁞ ⁞ ⁞ ⁞ ⁞ ⁞	11-20	than or equal to SEGLOS (I, K+1) meters. _Note_: SEGLOS(1,1) = 0.0 SEGLOS(NPP,1) = 1.0 and SEGLOS(I,1)< SEGLOS(I+1,1) for I = 1,2, --- NPP-1.
SEGLOS(8,1)		F10.4	71-80	
				If NPP ≤8, only one card of this type will be needed; if NPP >8, then a second card must continue with SEGLOS (9,1) through SEGLOS(NPP,1). NPP cannot exceed 11 with current dimensions.

14-31

ACQUISITION DATA _____ CARD SET   Card No. __4b____

Variable name	UNITS	Format	columns	Description
SEGLOS(1,2)	meters	F10.4	1-10	SEGLOS(I,2) is the line-of-sight segment length value corresponding to the cumulative probability value in SEGLOS(I,1) when the range from D.O. to target unmask falls in the first range class.
SEGLOS(2,2)	meters	F10.4	11-20	
SEGLOS(2,3)	meters	F10.4	21-30	

Note:

SEGLOS(I,2)< SEGLOS (I+1,2) for I = 1,2,---, NPP-1.

Note:

If NPP $\leq$8, only one card of this type is needed; if NPP >8, then a second card must continue with SEGLOS(9,2) through SEGLOS(NPP,2). NPP cannot exceed 11 with current dimensions.

The SEGLOS array is read from additional cards similar to 4b up to a maximum of 11 cards (or card pairs if NNP >8).

Each card (or card pair if NPP >8) has the following content:

card 4a   contains   SEGLOS(1,1)   through   SEGLOS(NPP,1)
"   4b   "   SEGLOS(1,2)   "   SEGLOS(NPP,2)
"   4c   "   SEGLOS(1,3)   "   SEGLOS(NPP,3)
"   4d   "   SEGLOS(1,4)   "   SEGLOS(NPP,4)
"   4e   "   SEGLOS(1,5)   "   SEGLOS(NPP,5)
"   4f   "   SEGLOS(1,6)   "   SEGLOS(NPP,6)
"   4g   "   SEGLOS(1,7)   "   SEGLOS(NPP,7)
"   4h   "   SEGLOS(1,8)   "   SEGLOS(NPP,8)
"   4i   "   SEGLOS(1,9)   "   SEGLOS(NPP,9)
"   4j   "   SEGLOS(1,10)   "   SEGLOS(NPP,10)
"   4k   "   SEGLOS(1,11)   "   SEGLOS(NPP,11)

If NPP >8 then each card above is replaced by a card pair. In this case, the first card of each pair contains eight values and the second card contains NPP-8 values (each card is in 8F10.4 format). SEGLOS(1,J) through SEGLOS(NPP,J) contain (for J$\geq$2) the line-of-sight segment lengths in meters for range class J-1 corresponding respectively to the cumulative probability values in SEGLOS(1,1) through SEGLOS(NPP,1). The total number of cards (or card pairs if NPP>8) will be NRNGCL + 1 (one for probabilities plus one for each range class). Hence, if NRNGCL = 10, all cards 3a through 3k will be used; but, if NRNGCL <10, then only the first NRNGCL + 1 cards (or card pairs if NPP >8) shown above will be used.

ACQUISITION DATA_____CARD SET   Card No.___5____

Variable name	UNITS	Format	columns	Description
RNGCLB(1)	meters	F10.4	1-10	RNGCLB(I) is the Ith non-zero range class boundary. That is, range class 1 runs from zero to RNGCLB(1) meters and, for I > 1, range class I runs from RNGCLB(I-1) meters to RNGCLB(I) meters.
RNGCLB(2)	meters	F10.4	11-20	
/	/	/	/	
/	/	/	/	(When the DO-to-target unmask range lies in range class I, then the (I + 1)st row of the SEGLOS array is sampled to obtain LOS segment lengths.)
/	/	/	/	
/	/	/	/	
RNGCLB(8)	meters	F10.4	71-80	Note that $0 < RNGCLB(1) < \ldots < RNGCLB(I) \ldots < RNGCLB(I+1) < \ldots < \infty$.

RNGCLB(I) is the Ith non-zero range class boundary. That is, range class 1 runs from zero to RNGCLB(1) meters and, for I > 1, range class I runs from RNGCLB(I-1) meters to RNGCLB(I) meters. (When the DO-to-target unmask range lies in range class I, then the (I + 1)st row of the SEGLOS array is sampled to obtain LOS segment lengths.) Note that $0 < RNGCLB(1) < \ldots < RNGCLB(I) \ldots < RNGCLB(I+1) < \ldots < \infty$.

Also note that if $NRNGCL \leq 8$, then only one card of this type is needed; but, if NRNGCL > 8, then a second card must continue with RNGCLB(9) through RNGCLB(NRNGCL). Finally, RNGCLB cannot exceed 10 with current dimensioning.

14-34

ACQUISITION DATA _____ CARD SET   Card No. 6a_____

Variable name	UNITS	Format	columns	Description
VELTBL(1,1)	M/S	F10.4	1-10	VELTBL(I,J) gives the target velocity default value in the current terrain under
VELTBL(2,1)	M/S	F10.4	11-20	day/night condition I and weather condition J.
				$\quad$ I = 1 for day time
				$\qquad$ 2 for nighttime
				$\quad$ J = 1 for "good" weather
				$\qquad$ 2 for "bad" weather

14-35

ACQUISITION DATA _____ CARD SET   Card No. __6b__

Variable name	UNITS	Format	columns	Description
VELTBL(1,2)	M/S	F10.4	1-10	(see previous page)
VELTBL(2,2)	M/S	F10.4	11-20	

3. Response Time Data Block Input.

When reading response time data into PREPMS for transfer to TAPE11, the first card (which indicates that a response time data record is to be read) must be of the form:

NEW RECORD, record name, 3

or

NEW REC, record name, 3

where record name is the name of the response time record to be read (see section 5.3.3. for response time record names).

When using the TEMPORARY option with COPE, the response time data is headed by a card of the form:

TEMPORARY, RESPONSE TIME

or

TEMPORARY, RESPTIME

or

TEMP, RESPONSE TIME

or

TEMP, RESPTIME

Note: When the first method (section 2.2.9) of modeling delay times in COPPERHEAD mission communication and processing is played, in COPE, the response time distribution used is the one defined by data statements in BDATA1 (namely, the FSRT array - see section 4.7.6).

Because this array is sampled to obtain response times, the values on cards 4, 5, and 6 of this card set are not used. However, cards must still be input (though they may be blank) so that the statements which read the later cards of this set will pick up the correct data.

The record name used with the data for the first method of playing response time must be RSPDAT0123 unless one makes code changes in COPE to allow for others.

In any case (whether reading response time data in PREPMS or COPE), the remaining cards of the response time data are as follows:

RESPONSE TIME   CARD SET   Card No. 2

Variable name	UNITS	Format	columns	Description
NDT		I5	1-5	Number of points to be entered in each row of DETTMA array. NDT ≤ 10 with current dimensions.

RESPONSE TIME _____ CARD SET   Card No. __3a__

Variable name	UNITS	Format	columns	Description
DETTMA (1,1)		F10.4	1-10	DETTMA (I,1) is the probability that the "detection" time is less than or equal to DETTMA(I,2) seconds.
DETTMA (2,1)		F10.4	11-20	
⋮		⋮		Note: $\overline{DETTMA\ (1,1) = 0.0}$ and DETTMA (I) < DETTMA (I +1)
DETTMA(8,1)		F10.4	71-80	Also note that if NDT < 8, only one card of this type is required; if NDT > 8, then a second card is required with DETTMA (9,1) through DETTMA (NDT,1).

RESPONSE TIME   CARD SET   Card No.   3b

Variable name	UNITS	Format	columns	Description
DETTMA (2,1)	seconds	F10.4	1-10	DETTMA (I,2) is the "detection" time in seconds corresponding to DETTMA (I,1).
DETTMA (2,2)	seconds	F10.4	11-20	
⋮	⋮	⋮	⋮	Note: DETTMA (I) < DETTMA (I+1)
DETTMA (8,2)	seconds	F10.4	71-80	Also, if NDT ≤ 8 only one card is needed; if NDT > 8, then DETTMA (9,2) through DETTMA (NDT,2) continue on a second card.

Variable name	UNITS	Format	columns	Description
BATRTM (1)	seconds	F10.4	1-10	BATRTM (I) is the response time at the battery for a Copperhead mission of type I.
BATRTM (2)	seconds	F10.4	11-20	I = 1 for preplanned targets
BATRTM (3)	seconds	F10.4	21-30	I = 2 for targets of opportunity
				I = 3 for priority preplanned targets
XMVADF (1)	seconds	F10.4	31-40	XMVADF (I) is the time required to transmit message via voice commo after failing to transmit via digital commo.
XMVADF (2)	seconds	F10.4	41-50	I = 1 for pre-planned targets (priority or not) I = 2 for targets of opportunity

Note: The first way of modeling delay times does not use the data on cards 4, 5, and 6; hence, they may be left blank.

The second way of modeling delay times does not use any RESPONSE TIME data block values, so no record is prepared corresponding to the PARAM option.

Finally, the third delay time model uses all data in the data block.

See sections 2.2.9, 4.4.15 and 9.23 for further details on the three delay time models.

RESPONSE TIME _____ CARD SET   Card No. __5__

Variable name	UNITS	Format	columns	Description
BCSPTM (1,1)	seconds	F10.4	1-10	BCSPTM (I,J) is the battery computer system processing time for commo type I and mission type J.
BCSPTM (2,1)	seconds	F10.4	11-20	
BCSPTM (1,2)	seconds	F10.4	21-30	I· = 1 for digital commo
BCSPTM (2,2)	seconds	F10.4	31-40	I = 2 for voice commo J = 1 for pre-planned target (priority or not) J = 2 for target of opportunity
XMTTIM (1,1)	seconds	F10.4	41-50	XMTTIM (I,J) is the commo transmission time for commo type I and mission type J where I and J are as for BCSPTM above.
XMTTIM (2,1)	"	F10.4	51-60	
XMTTIM (1,2)	"	F10.4	61-70	
XMTTIM (2,2)	"	F10.4	71-80	

RESPONSE TIME _____ CARD SET   Card No. __6__

Variable name	UNITS	Format	columns	Description
TMEAN (1,1)	seconds	F10.4	1-10	TMEAN (I,J) is the mean time for DO to enter data in the digital
TMEAN (2,1)	seconds	F10.4	11-20	message device in day/night condition I and mission type J.
TMEAN (1,2)	seconds	F10.4	21-30	I = 1 for day time
TMEAN (2,2)	seconds	F10.4	31-40	I = 2 for night J = 1 for pre-planned target (priority or not) J = 2 for target of opportunity
TSIGMA (1,1)	seconds	F10.4	41-50	TSIGMA (I,J) is the standard deviation of the distribution of
TSIGMA (2,1)	seconds	F10.4	51-60	times required for the DO to enter data in digital message device under
TSIGMA (1,2)	seconds	F10.4	61-70	day/night condition I and mission type J.
TSIGMA (2,2)	seconds	F10.4	71-80	I and J are as defined above for TMEAN.

14-43

RESPONSE TIME _____ CARD SET   Card No. ___7___

Variable name	UNITS	Format	columns	Description
TRARRY (1,1)	seconds	F10.4	1-10	TRARRY (I,J) is the nominal response time for mission type I and commo type J.
TRARRY (2,1)	seconds	F10.4	11-20	
TRARRY (3,1)	seconds	F10.4	21-30	I = 1 for pre-planned targets I = 2 for targets of opportunity I = 3 for priority pre-planned targets.
TRARRY (1,2)	seconds	F10.4	31-40	
TRARRY (2,2)	seconds	F10.4	41-50	J = 1 for digital commo
TRARRY (3,2)	seconds	F10.4	51-60	J = 2 for voice commo

Note: These nominal response times are not to include time-of-flight. (TOF is added in COPE itself to obtain TRBAR).

4. Direct Fire Suppression Data Block Input.

When reading direct fire suppression data into PREPMS for transfer to TAPE 11, the first card (which indicates that a direct fire suppression data record is to be read) must be of the form:

NEW RECORD, record name, 4

or

NEW REC, record name, 4

where record name is the name of the direct fire suppression record to be read (see section 5.3.4 for direct fire suppression record names).

When using the TEMPORARY option with COPE, the direct fire suppression data is headed by a card of the form:

TEMPORARY DIRECT FIRE SUPPRESSION

or

TEMPORARY, DFIRE SUPPR

or

TEMP, DIRECT FIRE SUPPRESSION

or

TEMP, DFIRE SUPPR

In either case (whether reading direct fire suppression data in PREPMS or COPE), the remaining cards of the direct fire suppression data are as follow:

DIRECT FIRE SUPPRESSION CARD SET   Card No. ___2___

Variable name	UNITS	Format	columns	Description
NDFSP		I5	1-5	Number of points to be entered for each of the three rows of the DFDOKL array. (Number of range points for DFDOKL array). With current dimensions, NDFSP $\leqslant$ 10.

14-46

DIRECT FIRE SUPPRESSION   CARD SET   Card No. 3a

Variable name	UNITS	Format	columns	Description
DFDOKL (1,1)	meters	F10.4	1-10	DFDOKL (I,1) is the range in meters corresponding to a probability of DO being suppressed (obscured) of DFDOKL (I,2) and a probability of DO being killed of DFDOKL (I,3)
DFDOKL (2,1)	meters	F10.4	11-20	
				DFDOKL (1,1) = 0.0 and DFDOKL (I,1)< DFDOKL (I+1,1).
DFDOKL (8,1)	meters	F10.4	71-80	If NDFSP > 8, then a second card is required for DFDOKL (9,1) through DFDOKL (NDFSP,1).

Variable name	UNITS	Format	columns	Description
DFDOKL (1,2)		F10.4	1-10	DFDOKL (I,2) is the probability that direct fire dust from the target at range DFDOKL (I,1) obscures the DO (but he is not killed).
DFDOKL (2,2)		F10.4	11-20	
DFDOKL (8,2)		F10.4	71-80	If NDFSP > 8, then a second card is needed for DFDOKL (9,2) through DFDOKL (NDFSP,2).

14-48

DIRECT FIRE SUPPRESSION   CARD SET   Card No.   3c

Variable name	UNITS	Format	columns	Description
DFDOKL (1,3)		F10.4	1-10	DFDOKL (I,3) is the probability that direct fire from the target at range DFDOKL (I,1) kills the DO.
DFDOKL (2,3)		F10.4	11-20	
:		:	:	If NDFSP > 8, then a second card is needed for DFDOKL (9,3) through
:		:	:	
DFDOKL (8,3)		F10.4	71-80	DFDOKL (NDFSP,3)

14-49

5. <u>Random Occurrence Data Block Input</u>.

　　　　When reading random occurrence data in PREPMS for transfer to TAPE 11, the first card (which indicates that a random occurrence data record is to be read) must be of the form:

<u>NEW RECORD, record name, 5</u>

or

<u>NEW REC, record name, 5</u>

where record name is the name of the random occurrence record to be read (see section 5.3.5 for random occurrence record names).

　　　　When using the TEMPORARY option with COPE, the random occurrence data is headed by a card of the form:

<u>TEMPORARY,RANDOM OCCURRENCE DISTRIBUTION</u>

or

<u>TEMPORARY, RODIST</u>

or

<u>TEMP, RANDOM OCCURRENCE DISTRIBUTION</u>

or

<u>TEMP, RODIST</u>

　　　　In either case (whether reading random occurrence data in PREPMS or COPE), the remaining cards of the random occurrence data are as follow:

RANDOM OCCURRENCE DATA   CARD SET   Card No.   2

Variable name	UNITS	Format	columns	Description
NPLOSR		I5	1-5	Number of range classes for probability of LOS data for random occurrence. Current dimensions require NPLOSR≤10.

RANDOM OCCURRENCE DATA   CARD SET   Card No.   3

Variable name	UNITS	Format	columns	Description
TCRIT	seconds	F10.4	1-10	Critical time for laser designation (i.e., the length of the time interval immediately prior to impact during which the target must be continuously lased in order to have a successful Copperhead mission).

Variable name	UNITS	Format	columns	Description
RNGPLS (1)	meters	F10.4	1-10	RNGPLS (I) is the upper limit of the Ith range class for random occurrence line of sight data.
RNGPLS (2)	meters	F10.4	11-20	
⋮	⋮	⋮	⋮	Range class 1 extends from zero to RNGPLS (1); range class I for $I > 1$ extends from RNGPLS (I) to RNGPLS (I+1).
RNGPLS (8)	meters	F10.4	71-80	RNGPLS(I) < RNGPLS (I+1)
				If NPLOSR > 8, then a second card must be used to contain RNGPLS (9) through RNGPLS (NPLOSR).

RANDOM OCCURRENCE DATA   CARD SET   Card No. 5

Variable name	UNITS	Format	columns	Description
PRBLOS (1)		F10.4	1-10	PRBLOS (I) is the probability that a single vehicle in range class I is in view of the DO for the final TCRIT seconds of the Copperhead flight.
PRBLOS (2)		F10.4	11-20	
PRBLOS (8)		F10.4	71-80	If NPLOSR >8, then a second card is needed to contain PRBLOS(9) through PRBLOS(NPLOSR).

6. PE Data Block Input.

When reading PE data in PREPMS for transfer to TAPE 11, the first card (which indicates that a PE data record is to be read) must be of the form:

NEW RECORD, record name, 6

or

NEW REC, record name, 6

where record name is the name of the PE data record to be read (see section 5.4 for PE record names).

When using the TEMPORARY option with COPE, the PE data are headed by a card of the form:

TEMPORARY, PEDATA

or

TEMP, PEDATA

In either case (whether reading PE data in PREPMS or COPE), there is an optional card that can be inserted next:

USE TAPE 4

If this card is used, then the program (PREPMS or COPE) reads the remaining cards of the PE data from I/O unit 4 instead of the normal I/O unit 5; if this card is not used, then the PE data are read from I/O unit 5. In either case (whether I/O unit 4 or 5 is used), the remaining PE data cards are as described after this note:

Note: Because the PAM program (see Chapter 16) can write the PE data records directly to TAPE 11 without any need to run PREPMS, it is very unlikely that the need will arise to use PREPMS (or COPE) to read PE data as described in this section; however, the capability is provided.

Variable name	UNITS	Format	columns	Description
INDEX (I,J,1)		I5	1-5	INDEX $(I,J,K) = 10*(I-1)+2*(J-1)+K$ where $K = 1,2$
INDEX (I,J,2)		I5	6-10	$J = 1,2,...,5$ $I = 1,2,...,6$

The values are read two to a card and the values are arranged varying K first, then J, and then I.

This procedure yields a set of 30 cards. The Nth such card having the values $(2N-1)$ and $2N$ on it in $2I5$ format.

The index array is used to access the PETBL array.

PE DATA   CARD SET   Card No. 3a - 3b [24]

(600 cards)

Variable name	UNITS	Format	columns	Description
PETBL (I,J,1)		F10.4	1-10	PETBL (I,J,K) is the probability of engagement value for DO-to-target range K, visibility range J, and index value I.
PETBL (I,J,2)		F10.4	11-20	
PETBL (I,J,3)		F10.4	21-30	The values are input seven per card so that K varies first, then J, and finally I.
PETBL (I,J,4)		F10.4	31-40	
PETBL (I,J,5)		F10.4	41-50	K = 1,2,...,7 J = 1,2,...,10 I = 1,2,...60.
PETBL (I,J,6)		F10.4	51-60	
PETBL (I,J,7)		F10.4	61-70	This makes for a total of 600 cards with seven entries per card in 7F10.4 format.

7. Posture Data Block Input.

When reading posture data in PREPMS for transfer to TAPE 11, the first card (which indicates that a Target Posture data record is to be read) must be of the form:

NEW RECORD, record name, 7

or

NEW REC, record name, 7

where record name is the name of the target posture data to be read (see section 5.3.6 for target posture record names).

When using the TEMPORARY option with COPE, the target posture data are headed by a card of the form:

TEMPORARY, TARGET POSTURE DISTRIBUTION

or

TEMPORARY, TGTPSTDIST

or

TEMP, TARGET POSTURE DISTRIBUTION

or

TEMP, TGTPSTDIST

In either case (whether reading target posture data in PREPMS or COPE), the remaining cards of the target posture data are as follow:

POSTURE DATA _____ CARD SET   Card No. _2_____

Variable name	UNITS	Format	columns	Description
NRNGPS		I5	1-5	Number of range classes used for target posture data. Current dimensions require NRNGPS ≤ 10.

POSTURE DATA _____ CARD SET   Card No. __3__

Variable name	UNITS	Format	columns	Description
RNGPST (1)	meters	F10.4	1-10	RNGPST (I) is the upper limit of the Ith range class for posture data.
RNGPST (2)	meters	F10.4	11-20	
RNGPST (3)	meters	F10.4	21-30	The first range class runs from zero to RNGPST (1); the Ith range class extends from RNGPST (I) to RNGPST (I+1).
⁞	⁞	⁞	⁞	
RNGPST (8)	meters	F10.4	71-80	Note RNGPST (I) < RNGPST (I+1) Also, if NRNGPS > 8, the a second card is required: for RNGPST (9) through RNGPST (NRNGPS).

POSTURE DATA _____ CARD SET   Card No. ___4a___

Variable name	UNITS	Format	columns	Description
PSTTBL (1,1)		F10.4	1-10	PSTTBL (I,1) is the probability that the target is completely obscured when at DO-to-target range RNGPST (I).
PSTTBL (2,1)		F10.4	11-20	
PSTTBL (8,1)		F10.4	71-80	If NRNGPS > 8, then a second card is required for PSTTBL (9,1) through PSTTBL (NRNGPS,1).

Variable name	UNITS	Format	columns	Description
PSTTBL (1,2)		F10.4	1-10	PSTTBL (I,2) is the probability that the target is fully exposed when at DO-to-target range RNGPST (I).
PSTTBL (2,2)		F10.4	11-20	
⫶		⫶	⫶	
				As usual, if NRNGPS > 8, a second
PSTTBL (8,2)		F10.4	71-80	card is needed for PSTTBL (9,2) through PSTTBL (NRNGPS,2).

POSTURE DATA   CARD SET   Card No. 4c

Variable name	UNITS	Format	columns	Description
PSTTBL (1,3)		F10.4	1-10	PSTTBL (I,3) is the probability that the target is hull defilade (turret exposed) when at a ΩO-to-target range of RNGPST (I).
PSTTBL (2,3)		F10.4	11-20	
PSTTBL (8,3)		F10.4	71-80	Again, if NRNGPS > 8, a second card is needed for PSTTBL (9,3) through PSTTBL (NRNGPS,3).

14-63

8. Invariant Data Block.

　　　　When reading invariant data in PREPMS for transfer to TAPE 11, the first card (which indicates that an invariant data record is to be read) must be of the form:

NEW RECORD, record name, 8

or

NEW REC, record name, 8

where record name is the name of the invariant data record to be read (see section 5.3.7 for invariant data record names).

　　　　When using the TEMPORARY option with COPE, the invariant data is headed by a card of the form:

TEMPORARY, INVARIANT

or

TEMP, INVARIANT

　　　　In either case (whether reading invariant data in PREPMS or COPE), the remaining cards of the invariant data are as follow:

INVARIANT DATA _____ CARD SET   Card No. _2_____

Variable name	UNITS	Format	columns	Description
NRNGTT		I5	1-5	The number of range classes used with the LDWSS probability of hit numbers. NRNGTT ≤ 20 with current dimensions.

Variable name	UNITS	Format	columns	Description
RNGTTF (J)	meters	F10.4	1-10	RNGTTF (J) is the Ith range at which probability of hit data is entered. RNGTTF (1) = 0.0 and RNGTTF (I) < RNGTTF (I+1).
TTF (1,J,1)		F10.4	11-20	TTF (I,J,K) is the probability of hit at range J using designator
TTF (1,J,2)		F10.4	21-30	type I against a target in posture K.
TTF (2,J,1)		F10.4	31-40	I = 1 for GLLD I = 2 for MULE
TTF (2,J,2)		F10.4	41-50	I = 3 for LTD K = 1 for fully exposed
TTF (3,J,1)		F10.4	51-60	K = 2 for hull defilade (turret exposed)
TTF (3,J,2)		F10.4	61-70	There will be NRNGTT cards of this type with each card containing the same data points as its predecessor but for the next J value.
				There will be a maximum of 20 such cards.

Variable name	UNITS	Format	columns	Description
DLTT (1)	seconds	F10.4	1-10	DLTT (I) is the Ith response time delay value to be used in interpolating with respect to delay time in the PETBL array.
DLTT (2)	seconds	F10.4	11-20	
DLTT (3)	seconds	F10.4	21-30	DLTT (1) = 0.0 and DLTT (I) $\angle$ DLTT (I+1).
DLTT (4)	seconds	F10.4	31-40	
DLTT (5)	seconds	F10.4	41-50	
DLTT (6)	seconds	F10.4	51-60	

INVARIANT DATA   CARD SET   Card No. __5a__

Variable name	UNITS	Format	columns	Description
PKTBL (1,1)		F10.4	1-10	PKTBL (I,1) is the probability of kill given a Copperhead hit against target type I in a fully exposed posture,
PKTBL (2,1)		F10.4	11-20	
PKTBL (3,1)		F10.4	21-30	
PKTBL (4,1)		F10.4	31-40	
PKTBL (5,1)		F10.4	41-50	
PKTBL (6,1)		F10.4	51-60	
PKTBL (7,1)		F10.4	61-70	

Variable name	UNITS	Format	columns	Description
PKTBL (1,2)		F10.4	1-10	PKTBL (I,2) is the probability of kill given a Copperhead hit against target type I in a hull defilade (turret exposed) posture.
PKTBL (2,2)		F10.4	11-20	
PKTBL (3,2)		F10.4	21-30	
PKTBL (4,2)		F10.4	31-40	
PKTBL (5,2)		F10.4	41-50	
PKTBL (6,2)		F10.4	51-60	
PKTBL (7,2)		F10.4	61-70	

14.4.3 REPORT RECORD LIST Directive.   The third type of input
to PREPMS is a line of the form:

REPORT RECORD LIST

or

REP REC LIST

Inserting this line (card or card image) in the PREPMS input
will cause the program to print a list of the names of the records on
TAPE 11 at the time the line is encountered.

The usual practice is to place a line of this type in the input
after all of the option word records and data block records so that the
list produced will include all of the records created by the current run.

An example of the list produced is shown in Appendix C.

14.4.4 INTERPRET PEDATA Directive.   The fourth type of input
to PREPMS is a line of the form:

INTERPRET PEDATA

Inserting a line of this form in the PREPMS input will cause
the program to print a list of the names of the current PE data records
on TAPE 11 as well as the values of the nine parameters corresponding to
each such record (see section 5.4).

14.5 PREPMS Output.

PREPMS writes to two files, TAPE 11 and TAPE 6 (also called
OUTPUT). TAPE 11 receives the data block records, the option word records,
the record named OPTNNUMS (which is automatically maintained by PREPMS
with no user attention), and the record index array which is automatically
maintained by the CDC word addressable mass storage file facilities. TAPE
6 (usually a line printer) is a sequential file on which PREPMS echoes
the inputs that create the data block records and option name records as
well as prints the lists generated by INTERPRET PEDATA and REPORT RECORD
LIST directives.

A sample of PREPMS output (TAPE 6) is given in Appendix C, so
further discussion is not given here.

14.6 PREPMS Diagnostic Messages.

Since several of the subroutines used by PREPMS are similar to those used in COPE, any diagnostic messages not found in this section (which gives only the PREPMS-peculiar messages) should be given in Chapter 7.

14.6.1 Messages of Informational Nature Not Terminating Program.

1. **PREPMS** NON-FATAL WARNING! YOU HAVE SEQUENCE NUMBERS IN COLS. 73-78 OF TAPE5. THEY WILL BE REMOVED BY THE PROGRAM; HOWEVER, THE RESULTS MAY BE SUSPECT.

This message is generated in SEPRC2 and is caused when the computer detects editor sequence numbers in the INPUT file (see section 7.1).

This message does not stop the program; however, it is very probable that the wrong data has been used if this message is printed. Great care should be taken to assure that the OUTPUT shows the correct (intended) values and that no sequence numbers were taken as input.

Note that the sequence numbers are removed only from those lines entered in free format. All lines entered as formatted data will still have sequence numbers which may be read instead of the intended data (for columns 73-78).

To avoid this problem, one should always use an 80 character line length when editing the input file for PREPMS (i.e., F,CH=80 on CDC).

2. **PREPMS** THIS IS A CREATION RUN FOR RECORD OPTNNUMS.

This message is not really a diagnostic but merely indicates to the user that this run of PREPMS creates a new TAPE 11. If this message is not present, it means that the current PREPMS run is modifying an existing TAPE 11 rather than creating a new one.

14.6.2 STOPS With Messages in Day Files.

1. STOP IN PREPMS: ERROR NUMBER 1.

This stop occurs when the program has read an input card which should be the first card of one of the four input types of section 14.4, but does not recognize the card as one of those four types.

This error is most likely to happen when either the card is mispunched or the previous input set (especially if it was type 1 or type 2 input) has the wrong number of cards.

2. STOP IN PREPMS: ERROR NUMBER 2.

This error occurs when the third field of a type 1 card of a type 1 input is not a number. (That is, the option word record input type starts with a card that has a non-numeral for the value of NREAD. See section 14.4.1 for the correct form of this card type).

3. STOP IN PREPMS: ERROR NUMBER 3.

This error occurs when the fourth field of a type 1 card (the value of NOPT1) of a type 1 input is not a number. (See section 14.4.1 for the correct form of this card type).

4. STOP IN PREPMS: ERROR NUMBER 4.

This error occurs when the first field of a type 2 card of a type 1 input is not a number. Again, see section 14.4.1 for the correct form of this card.

5. STOP IN PREPMS: ERROR NUMBER 5.

This error occurs when the second field of a type 2 card of a type 1 input is not a number. See section 14.4.1 for the correct form of this card.

6. STOP IN PREPMS: ERROR NUMBER 6.

This error occurs when the third field of the first card of a type 2 input is not a number. See section 14.4.2 (subsections 1 through 8) for the proper first card form for this input type.

7. STOP IN PREPMS: PROGRAM TERMINATION.

This means that the program reached the end of a file on TAPE 5 (INPUT) without any errors detected. It is the message that accompanies a successful run, but of course it is no guarantee that the data are correct (only that they are formatted in a valid form).

8. STOP IN SEPRC2: ERROR NUMBER 1.

This stop occurs only if the number of fields on a free formatted input card is greater than 10 or less than or equal to 0.

15. PRBLOS PREPROCESSOR

The PRBLOS preprocessor is used to calculate the probability that a target randomly located along a route of approach within a certain designator-to-target range band will be in the line-of-sight of the designator for at least the final critical seconds of the COPPERHEAD trajectory.

This chapter gives: (1) the mathematical derivation of the method for computing the probability mentioned above, (2) a description of the program, (3) a glossary of program variables, (4) description of inputs, and (5) description of outputs. A program listing along with sample inputs and the resulting outputs are given in Appendix B.

15.1 Method For Calculating PRBLOS.

For a particular designator-to-target range band (e.g., ranges 2000m to 3000m) define F and G to be the cumulative distribution functions for in-view and out-of-view segment lengths respectively. That is, the probability that a randomly selected LOS segment for the given range band is of length less than or equal to X is F(X); the probability that a randomly selected out-of-view segment in the given range band is of length less than or equal to X is G(X).

Let t_c be the critical time; that is the time interval at the end of the COPPERHEAD trajectory during which the target must be designated in order for the COPPERHEAD to track and hit the target. Also, let v_t be the target velocity (target velocity is assumed constant).

Then the history of a target's exposure can be thought of as a sequence of alternating in-view and out-of-view segments. For example, the sequence f_1, g_1, f_2, g_2, f_3, g_3----,h_n, where the f_i's are in-view segment lengths forming a sample from a population of segment lengths distributed according to the cumulative distribution F, the g_i's are out-of-view segment lengths forming a sample from a population of segment lengths distributed according to cumulative distribution G, and h_n is the last segment which is either an f_i or a g_i depending on whether the final segment is in-view or out-of-view.

Then for a particular target's exposure (i.e., in-view, out-of-view) history, one can calculate its probability of being in-view as probability target is in-view = fraction of target's path in-view =

$$\frac{\sum_{i=1}^{N} f_i}{\sum_{i=1}^{N} f_i + \sum_{i=1}^{M} g_i}$$

where M is equal to either N or N-1 depending on whether the last segment is respectively out-of-view or in-view.

In our problem though, we do not want the probability that the target is in-view, but rather the probability that it is in-view and will remain in-view for the next t_c time units. This means that the target must be in an in-view segment and be at least t_c*v_t distance from the end of that segment. The probability that the target is in such a location is equal to the fraction of the target's path that consists of points that are in-view and at least a distance t_c*v_t from the next out-of-view segment.

For each in-view segment either (1) $f_i \leq t_c*v_t$ in which case that in-view segment contributes nothing to the total path length satisfying the conditions, or (2) $f_i > t_c*v_t$ distance from the next out-of-view segment.

Therefore, we have:

probability target is in-view and at least t_c*v_t distance from next out-of-view segment =

fraction of target's path that is in-view and at least t_c*v_t distance from the next out-of-view segment =

$$\frac{\sum\limits_{i=1}^{N} \max\{0, f_i - t_c*v_t\}}{\sum\limits_{i=1}^{N} f_i + \sum\limits_{i=1}^{M} g_i}$$

where M and N are as before and $\max\{0, t_i - t_c*v_t\}$ is the length contributed by the ith in-view segment to the total path length that is in-view and at least t_c*v_t away from the next out-of-view segment.

Note: $\max\{0, f_i - t_c*v_t\}$ means that the ith term of the sum is to be the maximum of the two quantities 0 and $(f_i - t_c*v_t)$.

Let $S_i = \max\{0, f_i - t_c*v_t\}$ then the S_i's can be obtained by sampling f_i's from a population with cumulative distribution F and then applying the formula $S_i = \max\{0, f_i - t_c*v_t\}$. This is equivalent to sampling from a population with cumulative distribution S where:

$$S(0) = F(t_c*v_t) \text{ and}$$

$$S(X) = F(x + t_c*v_t) \text{ for } x > 0.$$

Hence, our probability that the target is in-view and at least t_c*v_t from the next out-of-view segment can be written:

$$\frac{\dfrac{1}{N}\sum_{i=1}^{N} \max\{0,\ f_i - t_c*v_t\}}{\dfrac{1}{N}\sum_{i=1}^{N} f_i \quad + \quad \dfrac{1}{N}\sum_{i=1}^{M} g_i}$$

Now to obtain an overall estimate of this probability (which we call PRBLOS) we can imagine that we let our target wander back and forth over the various paths in the given range band. As this is done, $N \rightarrow \infty$ (and also $M/N \rightarrow 1$) so that

$$\frac{1}{N}\sum_{i=1}^{N} f_i \rightarrow M_f \text{ (mean of } f_i \text{ population)}$$

$$\frac{1}{N}\sum_{i=1}^{M} g_i \rightarrow \frac{M}{N}\left\{\frac{1}{M}\sum_{i=1}^{M} g_i\right\} \rightarrow \frac{M}{N} M_g \rightarrow M_g \text{ (mean of } g_i \text{ population)}$$

$$\frac{1}{N}\sum_{i=1}^{N} \max\{0,\ f_i - t_c*v_t\} = \frac{1}{N}\sum_{i=1}^{N} s_i \rightarrow M_s \text{ (mean of } s_i \text{ population)}$$

Therefore,

$$\text{PRBLOS} = \frac{M_s}{M_f + M_g}$$

is used as the probability that a vehicle randomly located in a given range band is in-view (from the designator's position) and will remain in-view for at least t_c time units.

15.2 Description of PRBLOS Program and Glossary of Variables.

The program is extremely simple and consists of nothing but the steps required to perform the calculations described in 15.1 as well as to read the input and print the results.

The program can be summarized as four main steps:

(1) Read the input for the next case and print it for checking purposes; if no input, stop.

(2) Form the modified distribution (the one with cumulative distribution function S in section 15.1) and print it.

(3) Calculate the means of the three distributions F, G, and S (i.e., M_f, M_g, M_s) and from that calculate PRBLOS.

(4) Print PRBLOS and return to step (1) to see whether there is another case.

The subroutine AVEL of the program computes the mean of a distribution with cumulative distribution function F by using the formula:

$$M_f = \int_L^U xf(x)dx = UF(U)-LF(L) - \int_L^U F(x)dx$$

where f is the probability density function (i.e., **f = F' almost everywhere**) and U and L are respectively the upper and lower bounds of the distribution (in our cases, $0 \leq L < U < \infty$).

Since F is defined in the program by an array of ordered pairs (x_i, F_i) i = 1, 2...K where F_i = probability that x is less than or equal to x_i, it is possible to approximate the right most integral by:

$$(*) \quad \int_L^U F(x)dx \simeq \frac{1}{2}\sum_{i=1}^{K-1} (x_{i+1}-x_i)(F_{i+1}+F_i).$$

Hence, the subroutine AVEL calculates the mean of a population with cumulative distribution function F using the formula:

$$M_f = x_K F_K - x_1 F_1 - \frac{1}{2}\sum_{i=1}^{K-1} (x_{i+1}-x_i)(F_{i+1}+F_i).$$

The actual variable names used in the program are different from those used in sections 15.1 and 15.2; however, they are defined in the variable glossary so understanding should be fairly easy.

GLOSSARY OF PRBLOS VARIABLES

VARIABLE	TYPE	COMMON BLOCK	UNITS	DEFINITION
A(6)		(LOCAL)		The A array contains up to 60 alphamuneric characters used as a case title
AVE		(LOCAL) (F.P.)	meters	AVE is the value returned by subroutine AVEL as the mean length of the distribution with which it (AVEL) was called
AVEIV		(LOCAL)	meters	AVEIV is the mean length of the in-view segment lengths (M_f of section 15.1)
AVEIVM		(LOCAL)	meters	AVEIVM is the mean length of the modified in-view segment lengths (M_s of section 15.1)
AVEOOV		(LOCAL)	meters	AVEOOV is the mean length of the out-of-view segment lengths (M_g of section 15.1)
CD		(LOCAL)	meters	CD is the critical distance; that is, the distance that the target will cover during the critical time ($t_c * v_t$ in the notation of section 15.1)
I		(LOCAL)		I is used as a DO-LOOP control variable and as a subscript value.
J		(LOCAL)		J is used as a DO-LOOP control variable and as a subscript value.
K		(LOCAL)		K is used as a DO-LOOP control variable and as a subscript value.
NIV		(LOCAL)		NIV is the number of points (ie, pairs, PRIV(I,1) and PRIV(I,2) used in the current case to describe the cumulative in-view segment length distribution (NIV $\leq$ 20 with current program dimensions)
NIVM		(LOCAL)		NIVM is the number of points (ie, pairs PRIVM(I,1) and PRIVM(I,2) used in the current case to describe the cumulative modified in-view segment length distribution (NIVM $\leq$ 20 with current program dimensions).
NOOV		(LOCAL)		NOOV is the number of points (ie, pairs PROOV(I,1) and PROOV(I,2) used in the current case to describe the cumulative out-of-view segment length distribution (NOOV $\leq$ 20 with current program dimensions).
NU		(LOCAL)		NU is equal to one less then the number of points used to describe the cumulative distribution whose mean is being calculated by subroutine AVEL. It is the number of terms in the sum of equation (*) of section 15.2.
N1		(LOCAL) (F.P.)		N1 is the first dimension of the P array. In this program, N1 is always equal to 20.

GLOSSARY OF PRBLOS VARIABLES - CONTINUED

VARIABLE	TYPE	COMMON BLOCK	UNITS	DEFINITION
N2		(LOCAL) (F.P.)		N2 is the second dimension of the P array. In this program, N2 is always equal to 2.
N3		(LOCAL) (F.P.)		N3 is the number of points used to describe the cumulative distribution whose mean is being calculated by subroutine AVEL.
P(N1,N2)		(LOCAL) (F.P.)	P(I,2) is in meters	P(I,1) is the probability that a segment length (randomly selected from the population whose mean is now being calculated by subroutine AVEL) is less than or equal to P(I,2). (where I=1, 2, ..., N3).
PRBIVM		(LOCAL)		This is the variable PRBLOS of section 15.1 (Since the program card uses PRBLOS as the program name it was necessary to call the variable by another name) It is the probability that a vehicle randomly located along an approach path in the given range band is currently in view and will remain in view for at least t_c seconds.
PRIV(20,2)		(LOCAL)	PRIV (I,2) is in meters	PRIV is the array describing the cumulative distribution of in-view segment lengths (F of section 15.1) PRIV (I,1) is the probability that a randomly chosen in-view segment is of length PRIV(I,2) or less.
PRIVM(20,2)		(LOCAL)	PRIVM(I,2) is in meters	PRIVM is the array describing the cumulative distribution of modified in-view segment lengths (S of section 15.1). PRIVM(I,1) is the probability that a randomly chosen modified in-view segment is of length PRIVM(I,2) or less.
PROOV(20,2)		(LOCAL)	PROOV(I,2) is in meters	PROOV is the array describing the cumulative distribution of out-of-view segment lengths (G of section 15.1). PROOV(I,1) is the probability that a randomly chosen out-of-view segment is of length PROOV(I,2) or less.
SUM		(LOCAL)		SUM is the value of the summation of equation (*) of section 15.2.
TC		(LOCAL)	seconds	TC is the critical time (t_c of section 15.1) It is the duration of the interval at the end of the Copperhead trajectory during which the target must be (nearly) continuously lased in order that the round can track and hit the target.
TGTVEL		(LOCAL)	meters/sec.	TGTVEL (v_t of section 15.1) is the velocity of the target.

15-6

15.3   PRBLOS Inputs.

For each case that is to be run with the PRBLOS program, a set of input cards (or card images) composed of card types 1 through 5b must be prepared. Multiple cases can be run by simply stacking card sets for the various cases one after another. The first card of each case has room (columns 21 through 80) for an identifying alphanumeric string which is reproduced on output for easier case identification. The program runs all cases until it either runs out of input or encounters an illegal input value.

Since the normal use of the PRBLOS program is to calculate the values to fill the RANDOM OCCURRENCE Data Block of COPE (in particular the PRBLOS array), each case run of the PRBLOS program corresponds to a given terrain, target velocity, and range band combination. For consistency, the PRIV data for PRBLOS should be obtained from the same source as the SEGLOS data for COPE. (Indeed, there is no reason why for a given terrain the same values cannot be used for PRIV(I,1) as for SEGLOS (I,1) and for PRIV(I,2) as for SEGLOS (I,J) in the (J-1)th range band.)

VARIABLE NAME	UNITS	FORMAT	COLUMNS	DESCRIPTION
TGTVEL	meters/sec.	F10.4	1-10	The velocity of the target
TC	seconds	F10.4	11-20	The critical time
A(1)		AIO	21-30	A(1) through A(6) can be used to hold up to 60 characters of case heading which are copied from this card to the first output line of each case. This has no effect on calculations but enables the user to label the cases.
A(2)		AIO	31-40	
A(3)		A10	41-50	
A(4)		AIO	51-60	
A(5)		A10	61-70	
A(6)		A10	71-80	

VARIABLE NAME	UNITS	FORMAT	COLUMNS	DESCRIPTION
NIV		I5	1-5	This is the number of points to be read to describe the cumulative in-view segment length distribution. NIV controls reading of PRIV: PRIV (I,1) for I=1,2...,NIV PRIV (I,2) for I=1,2...,NIV NOTE: Current program dimensions require NIV $\leq$ 20.

VARIABLE NAME	UNITS	FORMAT	COLUMNS	DESCRIPTION
PRIV(1,1)		F10.5	1-10	PRIV(I,1) is the probability that a randomly chosen in-view segment has length less than or equal to PRIV(I,2).
PRIV(2,1)		F10.5	11-20	NOTE:
PRIV(3,1)		F10.5	21-30	PRIV(I,1) $\leq$ PRIV(I+1,1) for I = 1,2, NIV-1;
PRIV(4,1)		F10.5	31-40	$0 \leq$ PRIV(I,1) $\leq$ 1 for I = 1,2...,NIV; and
PRIV(5,1)		F10.5	41-50	PRIV(NIV,1) = 1.0
PRIV(6,1)		F10.5	51-60	If NIV > 8, then an additional card (or two) is needed for PRIV(9,1) through PRIV(NIV,1)
PRIV(7,1)		F10.5	61-70	The additional card(s) should have 8F10.4 format also.
PRIV(8,1)		F10.5	71-80	PRIV(I,1) and PRIV(I,2) together correspond to the F_i and X_i values respectively (in the notation of section 15.2) for the in-view distribution.

VARIABLE NAME	UNITS	FORMAT	COLUMNS	DESCRIPTION
PRIV(1,2)	meters	F10.5	1-10	PRIV(I,2) is the in-view segment length corresponding to cumulative probability PRIV(I,1)
PRIV(2,2)	meters	F10.5	11-20	
PRIV(3,2)	meters	F10.5	21-30	NOTE:
PRIV(4,2)	meters	F10.5	31-40	PRIV(I,2) $\leq$ PRIV(I+1,2) for I = 1,2, ...,NIV-1
PRIV(5,2)	meters	F10.5	41-50	
PRIV(6,2)	meters	F10.5	51-60	If NIV>8, then an additional card (or two) is needed for PRIV(9,2) through
PRIV(7,2)	meters	F10.5	61-70	PRIV(NIV,2). The additional card(s) have 8F10.4 format.
PRIV(8,2)	meters	F10.5	71-80	

VARIABLE NAME	UNITS	FORMAT	COLUMNS	DESCRIPTION

NOOV		I5	1-5	NOOV is the number of points to be read to describe the cumulative out-of-view segment length distribution.
				  NOOV controls reading of PROOV:
				
				  PROOV(I,1) for I=1,2...,NOOV
				  PROOV(I,2) for I=1,2...,NOOV
				
				NOTE: Current dimensions require
				        NOOV $\leq$ 20.

VARIABLE NAME	UNITS	FORMAT	COLUMNS	DESCRIPTION
PROOV(1,1)		F10.4	1-10	PROOV(I,1) is the probability that a randomly chosen out-of-view segment has length less than or equal to PROOV(I,2).
PROOV(2,1)		F10.4	11-20	
PROOV(3,1)		F10.4	21-30	NOTE:
PROOV(4,1)		F10.4	31-40	PROOV(I,1) $\leq$ PROOV (I+1,1) for I = 1,2,...,NOOV-1;
PROOV(5,1)		F10.4	41-50	0 $\leq$ PROOV(I,1) $\leq$ 1.0 for I = 1,2..., $\overline{NOOV}$; and
PROOV(6,1)		F10.4	51-60	PROOV (NOOV,1) = 1.0
PROOV(7,1)		F10.4	61-70	If NOOV > 8, then an additional card(or two) is needed for PROOV(9,1) through PROOV(NOOV,1).
PROOV(8,1)		F10.4	71-80	The additional card(s) should have 8F10.4 format.

PROOV(I,1) and PROOV(I,2) correspond to a point on the cumulative distribution G of section 15.1 (a point with coordinates (PROOV(I,2),PROOV(I,1)) in the usual notation.

VARIABLE NAME	UNITS	FORMAT	COLUMNS	DESCRIPTION
PROOV(1,2)	meters	F10.4	1-10	PROOV(I,2) is the out-of-view segment length corresponding to cumulative probability PROOV (I,1).
PROOV(2,2)	meters	F10.4	11-20	
PROOV(3,2)	meters	F10.4	21-30	NOTE:
PROOV(4,2)	meters	F10.4	31-40	PROOV(I,2) $\leq$ PROOV (I+1,2) for I = 1,2,...,NOOV-1;
PROOV(5,2)	meters	F10.4	41-50	0.0 $\leq$ PROOV(I,2) $\leq$ 1.0 for I = 1, 2,...,NOOV.
PROOV(6,2)	meters	F10.4	51-60	
PROOV(7,2)	meters	F10.4	61-70	If NOOV > 8, then an additional card (or two) is needed for PROOV(9,2) through
PROOV(8,2)	meters	F10.4	71-80	PROOV(NOOV,2). The additional card(s) have 8F10.4 format.

15-14

15.4 PRBLOS Output and Diagnostics.

15.4.1 Output. The output of the PRBLOS program is very brief and easy to understand.

For each case run, the first line of output prints the case identifier (if any). The next line prints the target velocity and critical time values. Then comes the PRIV array preceded by NIV. Next the PROOV array preceded by NOOV and the PRIVM array preceded by NIVM. Finally, it prints the average segment lengths of the three distributions and the PRBLOS value followed by the words "END OF CASE".

In the special case that $t_c * v_t$ is greater than the longest possible in-view segment, a message to that effect is printed along with the value of PRBLOS (namely, 0.0). In this case, the PRIVM array is not printed.

Note that PRBIVM is labeled PRBLOS when printed. (This is because PRBIVM is a second choice name for PRBLOS used only because the program card name PRBLOS prevented the use of a variable PRBLOS in the program).

A program listing as well as sample input and output for PRBLOS is contained in Appendix B.

15.4.2 Diagnostic ("STOP") Messages in Dayfile.

1. **STOP END OF INPUT.**

This message means that the program has encountered the end of file of TAPE5 (INPUT). This is the normal program termination message, but of course, it is no guarantee that the results are correct.

2. **STOP NIV>20 EXCEEDS DIMENSIONS OF PRIV ARRAY.**

This message means the user attempted to read in an NIV value greater than 20. It may occur because NIV is not right justified in columns 1-5 of its input card. Of course, it may also occur if NIV is really greater than 20; if this is the case, then the user must either use fewer points to describe PRIV or redimension PRIV in the program (and change N1 in first call of AVEL. Redimensioning of PRIVM and changing N1 in the third call of AVEL may also be required).

3. **STOP NOOV>20 EXCEEDS DIMENSIONS OF PROOV ARRAY.**

This message means the user attempted to read in an NOOV value greater than 20. It may occur because NOOV is not right justified in columns 1-5 of its input card. Of course, it may also occur if NIV is really greater than 20; if this is the case, then the user must either use fewer points to describe PROOV or redimension PROOV in the program (and change N2 in the second call of AVEL).

16. PAM PREPROCESSOR

Unlike the other programs documented in this report (COPE, PREPMS, and PRBLOS), the PAM program was not written by the author of this report. Since the author (Michael Starks, GWD, AMSAA) of PAM will document it in a separate report, this chapter is limited to a brief explanation of the program's purpose and a description of the input. Appendix A contains a program listing as well as sample inputs and outputs.

16.1 General Description of PE Program (PAM).

The PAM program is used to compute the probability of engagement of the target by the COPPERHEAD seeker. More precisely, probability of engagement (PE) is the probability that the COPPERHEAD seeker receives enough reflected laser energy from the target for the COPPERHEAD round to initiate maneuver toward the target and that the target is within the maneuver footprint of the COPPERHEAD.

The PAM model produces a table of 4200 PE values (6 cloud ceiling altitudes x 10 meteorological visibility limits x 5 delay times x 7 designator-to-target ranges x 2 "MUTS" factors). (The multi-unit target factor ("MUTS" factor) allows TLE to be reduced when the predicted impact point is bracketed by a column of target vehicles.)

Such a table then has PE values as a function of cloud ceiling, visibility limit, delay time, MUTS factor, and designator-to-target range. In addition, the set of PE's in the table is a function of the 9 parameters mentioned in section 5.4 (namely, nominal response time, designator type (power), target velocity, gun-target range, reflectivity of target, angle T, deflection bias (distance between footprint centroid and target path point of closest approach), target heading, and seeker sensitivity). Hence, for each different combination of values of the 9 parameters a different set of PE values is needed which, in turn, requires another run of the PAM program.

The PAM program includes the code mentioned in section 5.4 that generates PE data block record names from the values of the 9 parameters. The subroutine PENAM2 is included in PAM and is identical to the PENAME subroutine in COPE and PREPMS except for the change in name and the fact that the data statement for the XVALUE array is included in PENAM2 rather than in a separate BLOCK DATA subprogram as in COPE and PREPMS. The error stops with messages produced by PENAM2 correspond to those for PENAME as explained in section 7.5.

Assuming that the user runs PAM with values of the 9 parameters that are permitted by PENAME (see section 5.4 and discussion of XVALUE array), then a PE DATA record name is generated. The PE values are loaded in the arrays PE (for writing to TAPE 11 as a PE data record for use by COPE) and PENG (for writing to TAPE 6 (output) to provide a hard copy of the PE values).

In order that the values written to TAPE 11 are accessible by COPE, of course, it is necessary to catalog TAPE 11 and use it with the COPE runs. The interface between PAM and COPE has been covered in section 5.4.

The output of PAM consists mainly of the inputs which are echoed for checking purposes (some of the angles are converted to radians before being printed). The PE values are printed in 70 groups of 60 (6 cloud ceiling altitudes, 10 visibility limits) with each group corresponding to a particular designator-to-target range, time delay, and MUTS factor combination.

A program listing together with sample inputs and outputs is included in in Appendix A.

16.2 PAM Inputs.

The PAM program takes all its inputs in free format (in CDC terminology, it uses list-directed reads). This means that on each card in the following description that takes more than one variable, the values of the variables are punched one after another with commas between successive values. (See sample input in Appendix A).

VARIABLE NAME	UNITS	FORMAT	COLUMNS	DESCRIPTION
IMF		Free		Mission type flag IMF = 1 for preplanned target (priority of not) IMF = 2 for target of opportunity

16-3

ETH _____ CARD SET   CARD NO. ___2____

VARIABLE NAME	UNITS	FORMAT	COLUMNS	DESCRIPTION
ETH	Joules/km^2	Free		ETH is the energy threshold. That is, the amount of energy/area that must reach the seeker to initiate maneuver.

16-4

AOF_____CARD SET   CARD NO.___3_____

VARIABLE NAME	UNITS	FORMAT	COLUMNS	DESCRIPTION
AOF	Degrees	Free		AOF is the angle of fall of the COPPERHEAD round (measured from the horizontal).

VARIABLE NAME	UNITS	FORMAT	COLUMNS	DESCRIPTION
TH	Degrees	Free		Target heading. The angle between the gun-to-target line and the target path when measured counter-clockwise from the gun-target line.
PCA	Degrees	Free		Point of closest approach (deflection bias). This is the distance between the footprint centroid and the closest point on the target's path to the centroid.

16-6

AZDT, V, RHO, ED, TR CARD SET   CARD NO.___5_____

VARIABLE NAME	UNITS	FORMAT	COLUMNS	DESCRIPTION
AZDT	Degrees	Free		AZDT is the angle T (that is, the angle between the designator-target line and gun-target line measured counter-clockwise from the gun-target line.)*
V	Meters/Sec	Free		V is the target velocity.
RHO		Free		RHO is the target's reflectivity.
ED	Millijoules	Free		Designator energy.
TR	Seconds	Free		Nominal respone time (time from DO's call for fire to expected round arrival. It includes time-of-flight in this case.

*Note: AZDT is the nominal angle T; that is, the angle between the designator-target line and the gun target-line when TR seconds have passed since DO's call for fire. |

16-7

NK, RNG, ACCX, ACCY   CARD SET   CARD NO.   6

VARIABLE NAME	UNITS	FORMAT	COLUMNS	DESCRIPTION
NK		Free		NK is the Monte Carlo sample size used in the program.
RNG	Meters	Free		Gun-to-target range (must be the range for which footprints are supplied).
ACCX	Meters	Free		ACCX is the COPPERHEAD total delivery error standard deviation in the deflection direction.*
ACCY	Meters	Free		ACCY is the COPPERHEAD total delivery error standard deviation in the range direction.* *Note: These are the delivery error standard deviations for unguided COPPERHEAD.

16-8

IDRMN, IDRMX, IVMX   CARD SET   CARD NO.   7

VARIABLE NAME	UNITS	FORMAT	COLUMNS	DESCRIPTION
IDRMN	Km	Free		Minimum designator-to-target range.
IDRMX	Km	Free		Maximum designator-to-target range.
IVMX	Km	Free		Maximum visibility range.

16-9

VARIABLE NAME	UNITS	FORMAT	COLUMNS	DESCRIPTION

NI(J)		Free		NI(J) is the number of points used to describe the maneuver footprint **for the Jth altitude.**
				
				J = 1 for highest altitude
				    2 for second highest altitude
				     .
				     .
				     .
				    6 for lowest altitude
				
				The six altitudes for which footprints are entered are the six altitudes used for cloud ceiling altitudes in COPE weather data.
				
				Note that there will be a set of cards 8a, 8b, 8c for each footprint for a total of six such sets in all. They must be input in order of ascending J's.
				
				With current dimensions
				  NI(J) $\leq$ 11 for all J.

VARIABLE NAME	UNITS	FORMAT	COLUMNS	DESCRIPTION
THEMH(1,J)	degrees	free		THEMH(I,J) is the angle used to represent the Ith point on the boundary of the Jth footprint.
THEMH(2,J)	degrees	free		
THEMH(3,J)	degrees	free		Note that the Jth footprint is represented by a set of points$\{(\rho_i, \theta_i)\}$ in polar coordinates, where
THEMH(4,J)	degrees	free		
THEMH(5,J)	degrees	free		θ_i = THEMH(I,J) ρ_i = DISMH(I,J).
THEMH(6,J)	degrees	free		THEMH(1,J) = 0.0
THEMH(7,J)	degrees	free		THEMH(NI(J), J) = 180.0 The angles are measured off the ray in the positive range direction from the centroid of the footprint.
THEMH(8,J)	degrees	free		
THEMH(9,J)	degrees	free		
THEMH(10,J)	degrees	free		
THEMH(11,J)	degrees	free		Because the footprint is symmetric about the range axis, only one half of it is read in. It is for this reason that the THEMH(I,J) values do not exceed 180 degrees.

Also note that
   THEMH(I,J) < THEMH(I+1,J)
   for I = 1,2,...,NI(J) - 1

   If NI(J) < 11, then only NI(J) entries occur
on this card rather than the 11 entries
shown.

VARIABLE NAME	UNITS	FORMAT	COLUMNS	DESCRIPTION
DISMH(1,J)	meters	free		DISMH(I,J) is the distance from the centroid to the Ith point on the boundary of the Jth footprint.
DISMH(2,J)	meters	free		
DISMH(3,J)	meters	free		
DISMH(4,J)	meters	free		
DISMH(5,J)	meters	free		
DISMH(6,J)	meters	free		
DISMH(7,J)	meters	free		
DISMH(8,J)	meters	free		
DISMH(9,J)	meters	free		
DISMH(10,J)	meters	free		
DISMH(11,J)	meters	free		If NI(J) < 11, then this card will have only NI(J) entries rather than the 11 shown.

APPENDIX A

LISTING AND SAMPLE CASE OF PAM

APPENDIX A

LISTING AND SAMPLE CASE OF PAM

This appendix contains:

(1) A listing of the FORTRAN code for the PAM program. In addition to the routines in this listing, PAM also uses the function URAN31 which is included in the COPE listing in Appendix D.

(2) Three sets of sample case input for PAM.

(3) Three sample runstreams for PAM (one corresponding to each set of sample input).

(4) Sample output created by running PAM with the first set of sample input.

Note: The column numbers included in some of the listings in this appendix are not a part of the program code, the data, or the output, but are provided only for the reader's convenience.

```
      PROGRAM PAM (INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT,TAPE7,TAPE11)    PR-PAM    2
C                                                                         PR-PAM    3
C **  THIS VERSION OF PAM IS CONFIGURED FOR USE AS A PREPROCESSOR         PR-PAM    4
C **  FOR COPE.  MAKE THESE CHANGES FOR STAND-ALONE RUNS:                 PR-PAM    5
C **    1.  DELETE CALL TO OPENMS (FIRST EXECUTABLE STATEMENT)            PR-PAM    6
C **    2.  DELETE CALL TO PENAM2                                         PR-PAM    7
C **    3.  DELETE CALLS TO WRITMS AND CLOSMS                             PR-PAM    8
C **    4.  DELETE SUBROUTINE PENAM2                                      PR-PAM    9
C                                                                         PR-PAM   10
      DIMENSION ACQ(6,6), M(6), TOT(6), INDEX(6,5,2), PE(60,10,7),        PR-PAM   11
     1 AMTX(4260), INDX11(20001), THEMH(11), TOT2(6,10), DISMH(11,6),     PR-PAM   12
     2 DISMHI(11), THFMH(11,6), NI(6), LKUP(7,5,2), PENG(70,10,6),        PR-PAM   13
     3 GAMARY(11), DTS(5)                                                 PR-PAM   14
C                                                                         PR-PAM   15
      EQUIVALENCE (AMTX(1),INDEX(1)), (AMTX(61),PE(1))                    PR-PAM   16
C                                                                         PR-PAM   17
      REAL MDIS                                                           PR-PAM   18
C                                                                         PR-PAM   19
C **  GAMARY HOLDS THE ATTENUATION COEFFICIENTS AS A FUNCTION OF RANGE    PR-PAM   20
      DATA GAMARY /2.6644, 1.2058, .7496, .5317, .4059, .3252, .2727,    2038000   21
     1334, .2030, .1803, .1618/                                          038010   22
      PI=3.1416                                                          038020   23
C                                                                        038030   24
C **  H ARRAY HOLDS ALTITUDES FOR WHICH ACQUISITION IS CHECKED           038040   25
      DATA H /1372.0, 914.0, 762.0, 610.0, 457.0, 304.0/                 038050   26
C                                                                        038060   27
C **  DTS ARRAY HOLDS DELAY TIMES PLAYED                                 038070   28
      DATA DTS /0.0, 30., 90., 150., 300./                               038080   29
      DATA IRN1 /1234567/                                                038090   30
      DATA IRN2 /7654321/                                                038100   31
      CALL OPENMS (11,INDX11,2001,1)                                     038110   32
      READ (5,*) IMF                                                     038120   33
      IF (IMF.EQ.1) WRITE (6,300)                                        038130   34
      IF (IMF.EQ.2) WRITE (6,310)                                        038140   35
      READ (5,320) ETH                                                   038150   36
      WRITE (6,330) ETH                                                  038160   37
      SKSEN=ETH*1000000.                                                 038170   38
      READ (5,*) AOF                                                     038180   39
      AOF=AOF*.01745329252                                               038190   40
      READ (5,*) TH,PCA                                                  038200   41
      READ (5,*) AZDT,V,PHD,ED,TR                                        038210   42
      WRITE (6,350) AZDT,V,PHD,ED,TR,AOF                                 038220   43
      WRITE (6,340) TH,PCA                                               038230   44
CSEC  THE CONSTANT VALUES TO WHICH ED IS COMPARED IN THE NEXT TWO        038240   45
CSEC  STATEMENTS ARE FALSE VALUES INSERTED TO MAKE THIS LISTING          038250   46
CSEC  UNCLASSIFIED.  THEY SHOULD BE CHANGED TO THE CORRECT VALUES WHEN   038260   47
CSEC  USING THE PROGRAM IN A SECURE ENVIRONMENT.  THESE TWO VALUES       038270   48
CSEC  ARE RESPECTIVELY THE DESIGNATOR ENERGIES FOR GLLD AND MULE.        038280   49
CSEC  THE VALUE FOR LTP IS EQUAL TO THAT FOR MULE.                       038290   50
CSEC  THE FALSE VALUES IN THIS LISTING ARE USED ONLY FOR SAMPLE CASES.   038300   51
CSEC  THE PHYSICAL UNITS USED FOR THESE VALUES ARE THE SAME AS FOR THE   038310   52
CSEC  VARIABLE ED.                                                       038320   53
      IF (ED.EQ..20) IDSG=1                                              038330   54
      IF (ED.EQ..14) IDSG=2                                              038340   55
```

LISTING A-1 FORTRAN LISTING OF PAM PROGRAM

(PAGE 1 OF 11)

A-3

```
      READ (5,*) NK,RNG,ACCX,ACCY                                              038350   PR-PAM  56
      GTR=RNG/1000.                                                            038360   PR-PAM  57
      WRITE (6,360) NK,RNG,ACCX,ACCY                                           038370   PR-PAM  58
      READ (5,*) IDRMN,IDP.MX,IVMX                                             038380   PR-PAM  59
      WRITE (6,370) IDRMN,IDRMX,IVMX                                           038390   PR-PAM  60
      DO 110 J=1,6                                                             038400   PR-PAM  61
      READ (5,*) NI(J)                                                         038410   PP-PAM  62
      NIJ=NI(J)                                                                038420   PR-PAM  63
      WRITE (6,390) J,NI(J)                                                    038430   PR-PAM  64
      READ (5,*) (THEMH(I,J),I=1,NIJ)                                          038440   PR-PAM  65
      READ (5,*) (DISMH(I,J),I=1,NIJ)                                          038450   PR-PAM  66
      WRITE (6,380) (THEMH(I,J),I=1,NIJ)                                       038460   PR-PAM  67
      WRITE (6,400) (DISMH(I,J),I=1,NIJ)                                       038470   PP-PAM  68
      DO 100 I=1,NIJ                                                           038480   PR-PAM  69
      THEMH(I,J)=THEMH(I,J)*0.0174532929252                                    038490   PR-PAM  70
  100 CONTINUE                                                                 038500   PR-PAM  71
  110 CONTINUE                                                                 038510   PR-PAM  72
      CALL PENAM2 (TP,IDSG,V,GTP,RHO,AZDT,PCA,TH,SKSEN,IDCODE)                 038520   PR-PAM  73
      WRITE (6,410) IDCODE,IDCODE                                              038530   PR-PAM  74
      WRITE (6,420) V,TR,ED,RHO                                                038540   PR-PAM  75
C                                                                              038550   PR-PAM  76
C                                                                              038560   PR-PAM  77
      TH=TH*.0174532929252                                                     038570   PP-PAM  78
      DO 240 IDR=IDRMN,IDP.MX                                                  038580   PR-PAM  79
      RD=FLOAT(IDR)                                                            038590   PR-PAM  80
      DO 230 IV=1,IVMX                                                         038600   PR-PAM  81
      DO 220 IDELT=1,5                                                         038610   PR-PAM  82
      DT=DTS(IDELT)                                                            038620   PR-PAM  83
C                                                                              038630   PR-PAM  84
      DO 210 IMTS=1,2                                                          038640   PR-PAM  85
C     COMPUTE SIGMA OF RANDOM TLE                                             038650   PR-PAM  86
      TLOC=SQRT(2500.+(TR+DT)**2)                                              038660   PR-PAM  87
      IF (IMF.EQ.1) TLOC=SQRT(2500.+1.5*((TR+DT)**2.)))                        038670   PR-PAM  88
      IF (IMTS.EQ.2.AND.IDELT.EQ.1) TLOC=.68*TLOC                              038680   PR-PAM  89
C                                                                              038690   PR-PAM  90
C     COMPUTE COORDINATES OF POINT OF CLOSEST APPROACH                        038700   PP-PAM  91
      PCAX=PCA*COS(TH)                                                         038710   PR-PAM  92
      PCAY=PCA*SIN(TH)                                                         038720   PR-PAM  93
C     COMPUTE TARGET COORDINATES FOR GIVEN DELAY/VELOCITY                     038730   PR-PAM  94
      BIASX=PCAX+(SIN(TH))*V*DT)                                               038740   PR-PAM  95
      BIASY=PCAY-(COS(TH))*V*DT)                                               038750   PR-PAM  96
C                                                                              038760   PR-PAM  97
C     BEGIN MONTE CARLO LOOP BY SAMPLING TLF                                  038770   PR-PAM  98
      DO 150 K=1,NK                                                            038780   PR-PAM  99
      CALL NRAN31 (SX1,SX2,IPN1)                                               038800   PR-PAM 100
      TLOCY=SX1*TLOC                                                           038810   PR-PAM 101
      TLOCX=SX2*TLOC                                                           038820   PR-PAM 102
C     SUM RANDOM ERROR TO BIAS ERROR                                         038830   PR-PAM 103
      TLEX=TLOCX+BIASX                                                         038840   PR-PAM 104
      TLEY=TLOCY+BIASY                                                         038850   PR-PAM 105
C     SAMPLE BALLISTIC ACCURACY                                              038860   PR-PAM 106
      CALL NRAN31 (SX1,SX2,IPN2)                                               038870   PR-PAM 107
      BIPY=SX1*ACCY                                                            038880   PP-PAM 108
      BIPX=SX2*ACCX                                                            038890   PR-PAM 109
```

LISTING A-1 FORTRAN LISTING OF PAM PROGRAM - CONT'D

(PAGE 2 OF 11)

```
C
C        AQUISITION VOLUME ENERGY COMPARISON                              038890   PR-PAM 110
C                                                                         038900   PR-PAM 111
                                                                          038910   PP-PAM 112
         DO 140 IC=1,6                                                    038920   PR-PAM 113
         DO 130 IA=IC,6                                                   038930   PR-PAM 114
         YINT=-H(IA)*COT(ANF)+BIPY                                        038940   PR-PAM 115
         XINT=BIPX                                                        038950   PR-PAM 116
         X=(TLEX-XINT)                                                    038960   PR-PAM 117
         Y=(TLEY-YINT)                                                    038970   PR-PAM 118
         ALPHA=ATAN2(X,Y)                                                 038980   PR-PAM 119
         ANGSUM=(AZDT*.017453292252)+ALPHA                               038990   PR-PAM 120
         GAM=GAMRY(IV)                                                    039000   PR-PAM 121
         TD=EXP(-GAM*RD)                                                  039010   PR-PAM 122
         HS=(H(IA)*3.28)                                                  039020   PR-PAM 123
         RS=SQRT((XINT-TLEX)**2.+(YINT-TLEY)**2.+H(IA)**2.)              039030   PR-PAM 124
         RS=RS/1000.0                                                     039040   PP-PAM 125
         TS=EXP(-GAM*RS)*(1.-EXP(-.00025*HS))/(.00025*HS))              039050   PR-PAM 126
         TFACT=COS(ANGSUM)                                               039060   PR-PAM 127
         ES=(ED*TD*TS*RHO*TFACT)/(PI*PS*RS)                             039070   PR-PAM 128
         IF (ETH.GT.ES) GO TO 130                                        039080   PR-PAM 129
C                                                                         039090   PR-PAM 130
C        MANUEVERABILITY FOOTPRINT DISTANCE COMPARISON                   039100   PR-PAM 131
C                                                                         039110   PP-PAM 132
         TANG=ABS((TLEY-BIPY)/(TLEX-BIPX))                              039120   PP-PAM 133
         BETA=ATAN(TANG)                                                 039130   PR-PAM 134
         BETA=1.5708-BETA                                                039140   PR-PAM 135
         IF (TLEY.LT.BIPY) BETA=3.1416-BFTA                             039150   PR-PAM 136
         DIST=SQRT((TLEX-BIPX)**2.+(TLEY-BIPY)**2.)                     039160   PR-PAM 137
         NIJ=NI(IA)                                                      039170   PR-PAM 138
         DO 120 J=1,NIJ                                                  039180   PR-PAM 139
         THEMHI(J)=THEMHI(J,IA)                                          039190   PR-PAM 140
         DISMHI(J)=DISMHI(J,IA)                                          039200   PR-PAM 141
  120    CONTINUE                                                        039210   PR-PAM 142
         CALL DVDINT (BETA,MDIS,THEMHI,DISMHI,NIJ,2)                     039220   PR-PAM 143
         IF (DIST.GT.MDIS) GO TO 130                                     039230   PR-PAM 144
         ACQ(IC,IA)=ACQ(IC,IA)+1.0                                       039240   PR-PAM 145
         GO TO 140                                                       039250   PR-PAM 146
  130    CONTINUE                                                        039260   PP-PAM 147
  140    CONTINUE                                                        039270   PR-PAM 148
  150    CONTINUE                                                        039280   PR-PAM 149
C                                                                         039290   PR-PAM 150
C        ACCUMULATE RESULTS OVER CEILING AND ALTITUDE                    039300   PR-PAM 151
         DO 160 IC=1,6                                                   039310   PR-PAM 152
         DO 160 IA=1,6                                                   039320   PR-PAM 153
         ACQ(IC,IA)=ACQ(IC,IA)/FLOAT(NK)                                 039330   PR-PAM 154
         TOT(IC)=TOT(IC)+ACQ(IC,IA)                                      039340   PR-PAM 155
  160    WRITE(6,102)(H(IIC),IC=1,6),(H(IA),(ACQ(IC,IA),IC=1,6),IA=1,6)  039350   PR-PAM 156
         WRITE(6,100) (TOT(IC),IC=1,6)                                   039360   PR-PAM 157
C                                                                         039370   PR-PAM 158
C        INDEX RESULTS FOR CORE INTERFACE AND FOR TAPE6 OUTPUT           039380   PR-PAM 159
C                                                                         039390   PR-PAM 160
         DO 170 II=1,6                                                   039400   PR-PAM 161
         JPE=10*(II-1)+2*(IDELT-1)+IMTS                                  039410   PR-PAM 162
         INDEX(II,IDELT,IMTS)=JPE                                        039420   PR-PAM 163
```

LISTING A-1 FORTRAN LISTING OF PAM PROGRAM - CONT'D

(PAGE 3 OF 11)

A-5

```
170 PE(JPE,IV,IDR)=TOT(II)                                                    039430  PR-PAM 164
    DO 180 II=1,6                                                             039440  PR-PAM 165
    IPE=10*(IDR-1)+2*(IDELT-1)+IMTS                                           039450  PR-PAM 166
    LKUP(IDR,IDELT,IMTS)=IPE                                                  039460  PR-PAM 167
    180 PENG(IPE,IV,II)=TOT(II)                                               039470  PR-PAM 168
    DO 190 IC=1,6                                                             039480  PR-PAM 169
    TOT2(IC,IV)=TOT(IC)                                                       039490  PR-PAM 170
190 CONTINUE                                                                  039500  PR-PAM 171
    DO 200 IC=1,6                                                             039510  PR-PAM 172
    DO 200 IA=1,6                                                             039520  PR-PAM 173
    ACQ(IC,IA)=0.                                                             039530  PR-PAM 174
    TOT(IC)=0.                                                                039540  PR-PAM 175
200 CONTINUE                                                                  039550  PR-PAM 176
210 CONTINUE                                                                  039560  PR-PAM 177
220 CONTINUE                                                                  039570  PR-PAM 178
230 CONTINUE                                                                  039580  PR-PAM 179
240 CONTINUE                                                                  039590  PR-PAM 180
    DO 250 I=1,7                                                              039600  PR-PAM 181
    DO 250 J=1,5                                                              039610  PR-PAM 182
    DO 250 K=1,2                                                              039620  PR-PAM 183
    IF ((K.EQ.2).AND.(J.GT.1)) GO TO 250                                      039630  PR-PAM 184
    DT=DTS(J)                                                                 039640  PR-PAM 185
    WRITE (6,430) I,DT,K                                                      039650  PR-PAM 186
    IQ=10*(I-1)+2*(J-1)+K                                                     039660  PR-PAM 187
    WRITE (6,440) ((PENG(IQ,JQ,KQ),KQ=1,6),JQ=1,10)                          039670  PR-PAM 188
250 CONTINUE                                                                  039680  PR-PAM 189
    IUNIT=7                                                                   039690  PR-PAM 190
260 DO 270 I=1,6                                                              039700  PR-PAM 191
    WRITE (IUNIT,450) ((INDEX(I,J,K),K=1,2),J=1,5)                           039710  PR-PAM 192
270 CONTINUE                                                                  039720  PR-PAM 193
    DO 280 I=1,60                                                             039730  PR-PAM 194
    WRITE (IUNIT,460) ((PE(I,J,K),K=1,7),J=1,10)                             039740  PR-PAM 195
280 CONTINUE                                                                  039750  PR-PAM 196
    IF (IUNIT.EQ.7) GO TO 290                                                 039760  PR-PAM 197
    IUNIT=7                                                                   039770  PR-PAM 198
    GO TO 260                                                                 039780  PR-PAM 199
290 CALL WRITHS (11,AMTX,4260,IPCODE,-1,0)                                    039790  PR-PAM 200
    CALL CLOSMS (11)                                                          039800  PR-PAM 201
    STOP ' IN PAM: NORMAL PROGRAM TERMINATION '                             039810  PR-PAM 202
C                                                                            039820  PR-PAM 203
C                                                                            039830  PR-PAM 204
C *** F O R M A T   S T A T E M E N T S ***                                 039840  PR-PAM 205
C                                                                            039850  PR-PAM 206
300 FORMAT (1H ,17HPREPLANNED TARGET)                                        039860  PR-PAM 207
310 FORMAT (1H ,21HTARGET OF OPPORTUNITY)                                     039870  PR-PAM 208
320 FORMAT (F12.8)                                                           039880  PR-PAM 209
330 FORMAT (1H ,4HETH=,F12.8)                                                039890  PR-PAM 210
340 FORMAT (1H ,24H TARGET HEADING ANGLE = ,F5.2,13H PT CLS APP= ,F7.2      039900  PR-PAM 211
   1)                                                                        039910  PR-PAM 212
350 FORMAT (1H ,6H AZOT=,F5.2,3H V=,F5.2,6H RHO= ,F5.2,5H ED= ,F4.2,5H     039920  PR-PAM 213
   1 TR= ,F7.2,6H AOF= ,F5.2)                                                039930  PR-PAM 214
360 FORMAT (1H ,5H NK= ,16,6H PHG= ,F10.1,6H ACCX=,F6.2,8H ACCY = ,F6.0    039940  PR-PAM 215
   11,)                                                                      039950  PR-PAM 216
370 FORMAT (1H ,6HIDRNH=,14,8H IDPMX=,14,7H IVMX=,14)                        039960  PR-PAM 217
```

LISTING A-1 FORTRAN LISTING OF PAM PROGRAM - CONT'D

(PAGE 4 OF 11)

```
380 FORMAT (1H ,12HTHEMH(I,J)= /(12F10.1))                                          039970  PR-PAM  218
390 FORMAT (1H0,5H   J= ,I4,9H   NI(J)= ,I4)                                        039980  PR-PAM  219
400 FORMAT (1H ,12H DISMH(I,J)=/(11F10.1))                                          039990  PR-PAM  220
410 FORMAT (1H ,10H IDCODE = ,A10,9H IDCODE= ,O20)                                  040000  PR-PAM  221
420 FORMAT (1H ,10H VELOCITY=,F4.2,16H MEAN RESP TIME=,F7.2,18H DESIGN040010         040010  PR-PAM  222
    1ATOR POWER=,F4.2,15H REFLECTIVITY= ,F4.2)                                      040020  PR-PAM  223
430 FORMAT (1H ,/,1H ,18HDESIGNATION RANGE=,I4,13H DELTA TIME=,F8.4,204030          040030  PR-PAM  224
    15H ONE OR SEVERAL TARGETS =,I4)                                               040040  PR-PAM  225
440 FORMAT (6F10.5)                                                                040050  PR-PAM  226
450 FORMAT (2I10)                                                                  040060  PR-PAM  227
460 FORMAT (7F10.5)                                                                040070  PR-PAM  228
    END                                                                           040080  PR-PAM  229
```

LISTING A-1 FORTRAN LISTING OF PAM PROGRAM - CONT'D

(PAGE 5 OF 11)

A-7

```
         SUBROUTINE DVDINT (X,FX,XT,FT,NP,ND)          040100    SR-DVDINT2
         DIMENSION XT(NP), FT(NP), T(16)               040110    SP-DVDINT3
         N=ND                                          040120    SR-DVDINT4
         N1=(N-1)/2                                    040130    SR-DVDINT5
         N2=N/2                                        040140    SR-DVDINT6
         N3=NP-N2+1                                    040150    SR-DVDINT7
         IF (NP-N) 250,100,100                         040160    SR-DVDINT8
   100   N4=N1+2                                       040170    SP-DVDINT9
         IF (XT(1)-XT(2)) 110,330,260                  040180    SP-DVDIN10
   110   CONTINUE                                      040190    SP-DVDIN11
         IF (X-2.*XT(1)+XT(2)) 240,240,120             040200    SR-DVDIN12
   120   IF (X-2.*XT(NP)+XT(NP-1)) 130,130,240         040210    SR-DVDIN13
   130   IF (NP.LT.10) GO TO 150                       040220    SP-DVDIN14
         N5=NP-N                                       040230    SP-DVDIN15
   140   N5=N5/2                                       040240    SR-DVDIN16
         N6=N4+N5                                       040250    SR-DVDIN17
         IF (XT(N6).LT.X) N4=N6                         040260    SR-DVDIN18
         IF (N5.GT.1) GO TO 140                         040270    SR-DVDIN19
   150   IF (X-XT(N4)) 180,160,160                      040280    SR-DVDIN20
   160   IF (N4-N3) 170,180,170                         040290    SR-DVDIN21
   170   N4=N4+1                                        040300    SR-DVDIN22
         GO TO 150                                      040310    SR-DVDIN23
   180   N4=N4-1                                        040320    SR-DVDIN24
         N5=N4-N1                                       040330    SR-DVDIN25
         DO 190 I=1,N                                   040340    SR-DVDIN26
         T(I)=FT(N5)                                    040350    SR-DVDIN27
   190   N5=N5+1                                        040360    SR-DVDIN28
         L=(N+1)/2                                      040370    SR-DVDIN29
         TR=T(L)                                        040380    SR-DVDIN30
         N6=N4                                          040390    SR-DVDIN31
         N7=N4+1                                        040400    SP-DVDIN32
         JU=1                                           040410    SR-DVDIN33
         N2=N-1                                         040420    SR-DVDIN34
         UN=1.0                                         040430    SP-DVDIN35
         DO 230 J=1,N2                                  040440    SR-DVDIN36
         N5=N4-N1                                       040450    SP-DVDIN37
         N3=N-J                                         040460    SP-DVDIN38
         DO 200 I=1,N3                                  040470    SR-DVDIN39
         N8=N5+J                                        040480    SP-DVDIN40
         T(I)=(T(I+1)-T(I))/(XT(N8)-XT(N5))            040490    SP-DVDIN41
   200   N5=N5+1                                        040500    SR-DVDIN42
         GO TO (210,220), JU                           040510    SP-DVDIN43
   210   UN=UN*(X-XT(N6))                              040520    SP-DVDIN44
         JU=2                                           040530    SP-DVDIN45
         N6=N6-1                                        040540    SR-DVDIN46
         GO TO 230                                      040550    SP-DVDIN47
   220   UN=UN*(X-XT(N7))                              040560    SR-DVDIN48
         JU=1                                           040570    SP-DVDIN49
         N7=N7+1                                        040580    SP-DVDIN50
   230   TR=TR+UN*T(L)                                  040590    SR-DVDIN51
         L=L-1                                          040600    SR-DVDIN52
         FX=TR                                          040610    SR-DVDIN53
         RETURN                                         040620    SP-DVDIN54
   240   WRITE (6,340) X,XT(1),XT(NP)                  040630    SP-DVDIN55
```

LISTING A-1 FORTRAN LISTING OF PAM PROGRAM – CONT'D

(PAGE 6 OF 11)

A-8

```
         STOP                                                      040640  SR-DVDIN56
  250  WRITE (6,350) NP,ND                                         040650  SR-DVDIN57
         STOP                                                      040660  SR-DVDIN58
  260  IF (X-2.*XT(1)+XT(2)) 270,240,240                           040670  SR-DVDIN59
  270  IF (X-2.*XT(NP)+XT(NP-1)) 240,280,280                       040680  SR-DVDIN60
  280  IF (NP.LT.10) GO TO 300                                     040690  SR-DVDIN61
         N5=NP-N                                                   040700  SR-DVDIN62
  290  N5=N5/2                                                     040710  SR-DVDIN63
         N6=N4+N5                                                  040720  SR-DVDIN64
         IF (XT(N6).GT.X) N4=N6                                    040730  SR-DVDIN65
         IF (N5.GT.1) GO TO 290                                    040740  SR-DVDIN66
  300  IF (X-XT(N4)) 310,310,180                                   040750  SR-DVDIN67
  310  IF (N4-N3) 320,180,320                                      040760  SR-DVDIN68
  320  N4=N4+1                                                     040770  SR-DVDIN69
         GO TO 300                                                 040780  SR-DVDIN70
  330  WRITE (6,360) XT(1)                                         040790  SR-DVDIN71
         STOP                                                      040800  SR-DVDIN72
   C                                                               040810  SR-DVDIN73
   C  *** FORMAT STATEMENTS ***                                    040820  SR-DVDIN74
   C                                                               040830  SR-DVDIN75
  340  FORMAT (23H ARG. NOT IN TABLE  X= ,E14.7,9H  XT(1)= ,E14.7,10H  X040840  SR-DVDIN76
         1(NP)= ,E14.7,2X,6HDVDINT)                                040850  SR-DVDIN77
  350  FORMAT (22H TABLE TOO SMALL  NP= ,I5,6H  ND= ,I5,2X,6HDVDINT)040860  SR-DVDIN78
  360  FORMAT (23H CONSTANT TABLE XT(1)= ,E14.7,2X,6HDVDINT)       040870  SR-DVDIN79
         END                                                       040880  SR-DVDIN80
   C                                                               040890  SR-DVDIN81
```

LISTING A-1 FORTRAN LISTING OF PAM PROGRAM - CONT'D

(PAGE 7 OF 11)

A-9

```
00000000011111111112222222222333333333344444444445555555555666666666677777777778888888888 9   COLUMN NUMBERS
12345678901234567890123456789012345678901234567890123456789012345678901234567890123456 7890  (READ VERTICALLY)

      SUBROUTINE NRAN31 (X1,X2,I)                                                040910    SR-NRAN312
      X3=SQRT(-2.0*ALOG(URAN31(I)))                                             040920    SR-NRAN313
      X4=6.2831853072*URAN31(I)                                                 040930    SR-NRAN314
      X2=X3*SIN(X4)                                                             040940    SR-NRAN315
      X1=X3*COS(X4)                                                             040950    SR-NRAN316
      RETURN                                                                     040960    SR-NRAN317
      END                                                                        040970    SR-NRAN318

00000000011111111112222222222333333333344444444445555555555666666666677777777778888888888 9   COLUMN NUMBERS
12345678901234567890123456789012345678901234567890123456789012345678901234567890123456 7890  (READ VERTICALLY)
```

LISTING A-1 FORTRAN LISTING OF PAM PROGRAM - CONT'D

(PAGE 8 OF 11)

A-10

```
      SUBROUTINE PENAM2 (TR,IDT,VEL,GTR,REFL,ANGLET,DEFB,TGTHD,SKSEN,      040990  SR-PENAM22
     1 IDCODE)                                                            041000  SR-PENAM23
C                                                                         041010  SR-PENAM24
      COMMON /XVALUE/ XVALUE(8,9,2)                                       001100  CM+XVALUE2
      DIMENSION AVALUE(9), NP(9)                                          041030  SR-PENAM26
C                                                                         041040  SR-PENAM27
C * * * * *   FILL IN XVALUE COMMON BLOCK   * * * * *                     001610  DT+XVALUE2
C                                                                         001620  DT+XVALUE3
C                                                                         001630  DT+XVALUE4
      DATA (((XVALUE(I,J,K),I=1,8),K=1,2),J=1,9) /                        001640  DT+XVALUE5
C     DUMMY SLOTS FOR NOMINAL RESPONSE TIMES                             001650  DT+XVALUE6
     1 8*0.,                                                              001660  DT+XVALUE7
     2 8*8.,                                                              001670  DT+XVALUE8
C     DESIGNATOR TYPES                                                    001680  DT+XVALUE9
     1 1.,    2.,    3.,    5*0.,                                         001690  DT+XVALU10
     2 0.,    1.,    1.,    5*8.,                                         001700  DT+XVALU11
C     TARGET VELOCITIES                                                   001710  DT+XVALU12
     1 2.,    3.,    5.,    8.,    9.,    3*0.,                           001720  DT+XVALU13
     2 0.,    0.,    1.,    2.,    2.,    3*8.,                           001730  DT+XVALU14
C     GUN-TARGET RANGES                                                   001740  DT+XVALU15
     1 8.,    12.,   20.,   30.,   40.,   10.,   16.,   0.,               001750  DT+XVALU16
     2 0.,    1.,    2.,    3.,    4.,    5.,    6.,    8.,               001760  DT+XVALU17
C     REFLECTIVITIES                                                      001770  DT+XVALU18
     1 .05,   .10,   .20,   .30,   4*0.,                                  001780  DT+XVALU19
     2 0.,    1.,    2.,    3.,    4*8.,                                  001790  DT+XVALU20
C     ANGLES T                                                            001800  DT+XVALU21
     1 0.,    25.,   30.,   60.,   90.,   120.,   2*0.,                   001810  DT+XVALU22
     2 0.,    1.,    2.,    3.,    4.,    5.,    2*8.,                     001820  DT+XVALU23
C     DEFLECTION BIASES                                                   001830  DT+XVALU24
     1 -200., -100., 0.,    100.,  200.,  3*0.,                          001840  DT+XVALU25
     2 0.,    1.,    2.,    3.,    4.,    3*8.,                           001850  DT+XVALU26
C     TARGET HEADINGS                                                     001860  DT+XVALU27
     1 -60.,  -30.,  0.,    30.,   60.,   3*0.,                          001870  DT+XVALU28
     2 0.,    1.,    2.,    3.,    4.,    3*8./                          001880  DT+XVALU29
C     SEEKER SENSITIVITIES                                                001890  DT+XVALU30
CSEC  THE FOLLOWING CARD CONTAINS FALSE SEEKER SENSITIVITY VALUES TO      001900  DT+XVALU31
CSEC  AVOID INCLUDING CLASSIFIED NUMBERS IN THE PROGRAM LISTING.          001910  DT+XVALU32
CSFC  THE CORRECT VALUES SHOULD BE RESTORED WHEN RUNNING IN A SECURE      001920  DT+XVALU33
CSEC  ENVIRONMENT.  RUNS DONE WITH THESE FALSE VALUES ARE FOR EXAMPLE     001930  DT+XVALU34
CSEC  PURPOSES ONLY.                                                      001940  DT+XVALU35
     1 24.,   36.,   48.,   60.,   72.,   3*0.,                          001950  DT+XVALU36
     2 0.,    1.,    2.,    3.,    4.,    3*8./                          001960  DT+XVALU37
C                                                                         001970  DT+XVALU38
C                                                                         041060  SR-PENAM29
      AVALUE(1)=TR                                                        041070  SR-PENAM10
      AVALUE(2)=IDT                                                       041080  SR-PENAM11
      AVALUE(3)=VEL                                                       041090  SR-PENAM12
      AVALUE(4)=GTR                                                       041100  SR-PENAM13
      AVALUE(5)=REFL                                                      041110  SR-PENAM14
      AVALUE(6)=ANGLET                                                    041120  SR-PENAM15
      AVALUE(7)=DEFB                                                      041130  SR-PENAM16
      AVALUE(8)=TGTHD                                                     041140  SR-PENAM17
      AVALUE(9)=SKSEN                                                     041150  SR-PENAM18
C                                                                         041160  SR-PENAM19
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LISTING A-1 FORTRAN LISTING OF PAM PROGRAM - CONT'D

(PAGE 9 OF 11)

A-11

```
      DO 110 J=2,9
      DO 100 I=1,8
      IF (ABS(AVALUE(J)-XVALUE(I,J,1)).GT..0001) GO TO 100      041170  SR-PENAM20
      NP(J)=XVALUE(I,J,2)+.5                                    041180  SR-PENAM21
      GO TO 110                                                 041190  SR-PENAM22
100   CONTINUE                                                  041200  SR-PENAM23
      STOP ' IN PENAM2: ERROR NUMBER 1'                         041210  SR-PENAM24
110   CONTINUE                                                  041220  SR-PENAM25
C                                                               041230  SP-PENAM26
      DO 120 J=2,9                                              041240  SP-PENAM27
      IF (NP(J).GE.0) STOP ' IN PENAM2: ERROR NUMBER 2 '        041250  SP-PENAM28
120   CONTINUE                                                  041260  SR-PENAM29
C                                                               041270  SR-PENAM30
      IF (TR.LE.0.0.OR.TR.GE.999.5) STOP ' IN PENAM2: ERROR NUMBER 3 '  041280  SR-PENAM31
      NCODE=TR+.50                                              041290  SR-PENAM32
C                                                               041300  SR-PENAM33
      DO 130 J=2,9                                              041310  SR-PENAM34
130   NCODE=8*NCODE+NP(J)                                       041320  SR-PENAM35
C                                                               041330  SR-PENAM36
      ENCODE (10,170,IPCODE) NCODE                              041340  SR-PENAM37
C                                                               041350  SR-PENAM38
      RETURN                                                    041360  SR-PENAM39
C                                                               041370  SR-PENAM40
C  *    *    *    *    *    *    *    *    *    *                041380  SR-PENAM41
C                                                               041390  SR-PENAM42
      ENTRY PEIDNT                                              041400  SR-PENAM43
C                                                               041410  SR-PENAM44
      DECODE (10,180,IPCODE) NCODE                              041420  SR-PENAM45
C                                                               041430  SR-PENAM46
      DO 140 J=2,9                                              041440  SR-PENAM47
      NP(11-J)=MOD(NCODE,8)                                     041450  SR-PENAM48
      NCODE=NCODE/8                                             041460  SR-PENAM49
140   CONTINUE                                                  041470  SR-PENAM50
C                                                               041480  SP-PENAM51
      NP(1)=NCODE                                               041490  SR-PENAM52
C                                                               041500  SR-PENAM53
      DO 160 J=2,9                                              041510  SP-PENAM54
      DO 150 I=1,8                                              041520  SR-PENAM55
      IF (ABS(FLOAT(NP(J))-XVALUE(I,J,2)).GT..0001) GO TO 150   041530  SR-PENAM56
      AVALUE(J)=XVALUE(I,J,1)                                   041540  SR-PENAM57
      GO TO 160                                                 041550  SR-PENAM58
150   CONTINUE                                                  041560  SP-PENAM59
      STOP ' IN PENAM2 (PEIDNT): ERROR NUMBER 4'                041570  SP-PENAM60
160   CONTINUE                                                  041580  SP-PENAM61
C                                                               041590  SR-PENAM62
      AVALUE(1)=NCODE                                           041600  SR-PENAM63
C                                                               041610  SR-PENAM64
      TR=AVALUE(1)                                              041620  SR-PENAM65
      IDT=AVALUE(2)                                             041630  SR-PENAM66
      VEL=AVALUE(3)                                             041640  SP-PENAM67
      GTR=AVALUE(4)                                             041650  SR-PENAM68
      REFL=AVALUE(5)                                            041660  SR-PENAM69
      ANGLET=AVALUE(6)                                          041670  SR-PENAM70
      DEFB=AVALUE(7)                                            041680  SR-PENAM71
                                                                041690  SP-PENAM72
                                                                041700  SR-PENAM73
```

LISTING A-1 FORTRAN LISTING OF PAM PROGRAM - CONT'D

(PAGE 10 OF 11)

```
00000000011111111112222222222333333333344444444445555555555666666666677777777778888888889 COLUMN NUMBERS
12345678901234567890123456789012345678901234567890123456789012345678901234567890 (READ VERTICALLY)

      TGTHD=AVALUE(8)                                        041710   SR-PENAM74
      SKSEN=AVALUE(9)                                        041720   SR-PENAM75
                                                             041730   SR-PENAM76
C     RETURN                                                 041740   SR-PENAM77
                                                             041750   SR-PENAM78
C                                                            041760   SR-PENAM79
C     * * *  F O R M A T  S T A T E M E N T S  * * *         041770   SR-PENAM80
C                                                            041780   SR-PENAM81
  170 FORMAT (4HPE00,P6)                                     041790   SR-PENAM82
  180 FORMAT (4X,P6)                                         041800   SR-PENAM83
      END                                                    041810   SR-PENAM84

00000000011111111112222222222333333333344444444445555555555666666666677777777778888888889 COLUMN NUMBERS
12345678901234567890123456789012345678901234567890123456789012345678901234567890 (READ VERTICALLY)
```

LISTING A-1 FORTRAN LISTING OF PAM PROGRAM - CONT'D
(PAGE 11 OF 11)

```
1
.000060
20.0
0.0,0.0
25.,5.,,10.,2,106.
100,8000.,100.,200.
1,7,10
8
0.,20.,30.,45.,60.,90.,135.,180.
2000.,1800.,1600.,1400.,1200.,1000.,800.,600.
8
0.,20.,30.,45.,60.,90.,135.,180.
2000.,1800.,1600.,1400.,1200.,1000.,800.,600.
8
0.,20.,30.,45.,60.,90.,135.,180.
1500.,1400.,1300.,1200.,1100.,1000.,800.,600.
8
0.,20.,30.,45.,60.,90.,135.,180.
1500.,1400.,1300.,1200.,1100.,1000.,800.,600.
8
0.,20.,30.,45.,60.,90.,135.,180.
1000.,900.,800.,700.,600.,500.,400.,300.
8
0.,20.,30.,45.,60.,90.,135.,180.
1000.,900.,800.,700.,600.,500.,400.,300.
```

LISTING A-2A   SAMPLE INPUT SET 1 FOR PAM

A-14

```
1
.000060
20.0
0.,0,0.0
25.,3.,,10.,2,106.
100.,8000.,100.,200.
1,7,10
8
0.,0.,20.,30.,45.,60.,90.,135.,180.
2000.,1800.,1600.,1400.,1200.,1000.,800.,600.
8
0.,20.,30.,45.,60.,90.,135.,180.
2000.,1800.,1600.,1400.,1200.,1000.,800.,600.
8
0.,20.,30.,45.,60.,90.,135.,180.
1500.,1400.,1300.,1200.,1100.,1000.,800.,600.
8
0.,20.,30.,45.,60.,90.,135.,180.
1500.,1400.,1300.,1200.,1100.,1000.,800.,600.
8
0.,20.,30.,45.,60.,90.,135.,180.
1000.,900.,800.,700.,600.,500.,400.,300.
8
0.,20.,30.,45.,60.,90.,135.,180.
1000.,900.,800.,700.,600.,500.,400.,300.
```

LISTING A-2B   SAMPLE INPUT SET 2 FOR PAM

```
1
.000060
20.0
0.0,0.0
60.,5.,.30,.20,106.
100,2000.,100.,200.
1,7,10
8
0.,0,20.,30.,45.,60.,90.,135.,180.
2000.,1800.,1600.,1400.,1200.,1000.,800.,600.
8
0.,20.,30.,45.,60.,90.,135.,180.
2000.,1800.,1600.,1400.,1200.,1000.,800.,600.
8
0.,20.,30.,45.,60.,90.,135.,180.
1500.,1400.,1300.,1200.,1100.,1000.,800.,600.
8
0.,20.,30.,45.,60.,90.,135.,180.
1500.,1400.,1300.,1200.,1100.,1000.,800.,600.
8
0.,20.,30.,45.,60.,90.,135.,180.
1000.,900.,800.,700.,600.,500.,400.,300.
8
0.,20.,30.,45.,60.,90.,135.,180.
1000.,900.,800.,700.,600.,500.,400.,300.
```

LISTING A-2C SAMPLE INPUT SET 3 FOR PAM

```
JOB CARD.    CHANGE THIS CARD TO CONFORM TO INSTALLATION USAGE.
ACCOUNT CARD.    CHANGE THIS CARD TO CONFORM TO INSTALLATION USAGE.
COMMENT.    THIS RUNSTREAM IS USED WITH THE FIRST RUN OF THE PAM PROGRAM;
COMMENT.    THAT IS, THE RUN IN WHICH TAPE11 IS FIRST CREATED.
COMMENT.    THE NEXT STATEMENT DECLARES TAPE5 TO BE A FILE OF RECORD
COMMENT.    TYPE Z WITH 80 CHARACTER LINES.  THIS IS REQUIRED SINCE TAPE5
COMMENT.    IS A FILE FROM THE "FRONT END" COMPUTER WHICH USES A DIFFERENT
COMMENT.    DEFAULT FILE TYPE FROM THE "BACK END" COMPUTER ON WHICH THIS
COMMENT.    JOB IS TO BE RUN.
FILE,TAPE5,RT=Z,FL=80,BT=C.
COMMENT.    THE NEXT STATEMENT OBTAINS A COPY OF THE PAM INPUT FROM THE
COMMENT.    "FRONT END" COMPUTER AND PUTS IT IN THE LOCAL FILE TAPE5.
GETPF,TAPE5,PAMSAMPLEINPUT1,ID=SANDMEYER,ST=MFA.
COMMENT.    THE NEXT STATEMENT ATTACHES THE MACHINE LANGUAGE ("OBJECT
COMMENT.    CODE") CREATED BY RUNNING THE PAM SOURCE CODE THROUGH THE
COMMENT.    FORTRAN COMPILER IN A PREVIOUS JOB.
ATTACH,LGO,PAMSAMPLEBINARY,ID=SANDMEYER.
COMMENT.    THE NEXT STATEMENT RESERVES SPACE ON A PERMANENT FILE DEVICE
COMMENT.    FOR THE FILE WHOSE LOCAL NAME IS TAPE11.
REQUEST,TAPE11,*PF.
COMMENT.    THE NEXT STATEMENT LOADS AND EXECUTES THE PAM PROGRAM USING
COMMENT.    TAPE5 AS THE INPUT FILE.
LGO(TAPE5)
COMMENT.    THE NEXT STATEMENT CATALOGS TAPE11 AS A PERMANENT FILE.
CATALOG,TAPE11,SAMPLETAPE11,ID=SANDMEYER.
COMMENT.    END OF JOB.
```

LISTING A-3A   SAMPLE RUNSTREAM 1 FOR PAM

```
JOB CARD.   CHANGE THIS CARD TO CONFORM TO INSTALLATION USAGE.
ACCOUNT CARD.  CHANGE THIS CARD TO CONFORM TO INSTALLATION USAGE.
COMMENT.   THIS RUNSTREAM IS USED WITH RUNS OF THE PAM PROGRAM MADE AFTER
COMMENT.   TAPE11 HAS BEEN CREATED.
COMMENT.   THE NEXT STATEMENT DECLARES TAPE5 TO BE A FILE OF RECORD
COMMENT.   TYPE Z WITH 80 CHARACTER LINES.  THIS IS REQUIRED SINCE TAPE5
COMMENT.   IS A FILE FROM THE "FRONT END" COMPUTER WHICH USES A DIFFERENT
COMMENT.   DEFAULT FILE TYPE FROM THE "BACK END" COMPUTER ON WHICH THIS
COMMENT.   JOB IS TO BE RUN.
FILE,TAPE5,RT=Z,FL=80,BT=C.
COMMENT.   THE NEXT STATEMENT OBTAINS A COPY OF THE PAM INPUT FROM THE
COMMENT.   "FRONT END" COMPUTER AND PUTS IT IN THE LOCAL FILE TAPE5.
GETPF,TAPE5,PAMSAMPLEINPUT2,ID=SANDMEYER,ST=MFA.
COMMENT.   THE NEXT STATEMENT ATTACHES THE MACHINE LANGUAGE ("OBJECT
COMMENT.   CODE") CREATED BY RUNNING THE PAM SOURCE CODE THROUGH THE
COMMENT.   FORTRAN COMPILER IN A PREVIOUS JOB.
ATTACH,LGO,PAMSAMPLEBINARY,ID=SANDMEYER.
COMMENT.   THE NEXT STATEMENT ATTACHES THE ALREADY EXISTING TAPE11 ("CORE
COMMENT.   DATA BASE" FILE) WHICH WILL BE MODIFIED ("EXTENDED") BY THIS
COMMENT.   RUN.  THE MULTI-READ OPTION IS TURNED OFF SO THAT THE FILE CAN
COMMENT.   BE EXTENDED.
ATTACH,TAPE11,SAMPLETAPE11,ID=SANDMEYER,MR=0.
COMMENT.   THE NEXT STATEMENT LOADS AND EXECUTES THE PAM PROGRAM USING
COMMENT.   TAPE5 AS THE INPUT FILE.
LGO(TAPE5)
COMMENT.   THE NEXT STATEMENT EXTENDS TAPE11.  THIS MEANS THAT THE
COMMENT.   CHANGES MADE BY THIS RUN ARE NOW INCORPORATED IN THE PERMANENT
COMMENT.   FILE THAT WAS ATTACHED UNDER LOCAL FILE NAME TAPE11.
EXTEND,TAPE11.
COMMENT.   END OF JOB.
```

LISTING A-3B SAMPLE RUNSTREAM 2 FOR PAM

```
JOB CARD.    CHANGE THIS CARD TO CONFORM TO INSTALLATION USAGE.
ACCOUNT CARD.  CHANGE THIS CARD TO CONFORM TO INSTALLATION USAGE.
COMMENT.    THIS RUNSTREAM IS USED WITH RUNS OF THE PAM PROGRAM MADE AFTER
COMMENT.    TAPE11 HAS BEEN CREATED.
COMMENT.    THE NEXT STATEMENT DECLARES TAPE5 TO BE A FILE OF RECORD
COMMENT.    TYPE Z WITH 80 CHARACTER LINES.  THIS IS REQUIRED SINCE TAPE5
COMMENT.    IS A FILE FROM THE "FRONT END" COMPUTER WHICH USES A DIFFERENT
COMMENT.    DEFAULT FILE TYPE FROM THE "BACK END" COMPUTER ON WHICH THIS
COMMENT.    JOB IS TO BE RUN.
FILE,TAPE5,RT=Z,FL=80,BT=C.
COMMENT.    THE NEXT STATEMENT OBTAINS A COPY OF THE PAM INPUT FROM THE
COMMENT.    "FRONT END" COMPUTER AND PUTS IT IN THE LOCAL FILE TAPE5.
GETPF,TAPE5,PAMSAMPLEINPUT3,ID=SANDMEYER,ST=MFA.
COMMENT.    THE NEXT STATEMENT ATTACHES THE MACHINE LANGUAGE ("OBJECT
COMMENT.    CODE") CREATED BY RUNNING THE PAM SOURCE CODE THROUGH THE
COMMENT.    FORTRAN COMPILER IN A PREVIOUS JOB.
ATTACH,LGO,PAMSAMPLEBINARY,ID=SANDMEYER.
COMMENT.    THE NEXT STATEMENT ATTACHES THE ALREADY EXISTING TAPE11 ("COPE
COMMENT.    DATA BASE" FILE) WHICH WILL BE MODIFIED ("EXTENDED") BY THIS
COMMENT.    RUN.  THE MULTI-READ OPTION IS TURNED OFF SO THAT THE FILE CAN
COMMENT.    BE EXTENDED.
ATTACH,TAPE11,SAMPLETAPE11,ID=SANDMEYER,MR=O.
COMMENT.    THE NEXT STATEMENT LOADS AND EXECUTES THE PAM PROGRAM USING
COMMENT.    TAPE5 AS THE INPUT FILE.
LGO(TAPE5)
COMMENT.    THE NEXT STATEMENT EXTENDS TAPE11.  THIS MEANS THAT THE
COMMENT.    CHANGES MADE BY THIS RUN ARE NOW INCORPORATED IN THE PERMANENT
COMMENT.    FILE THAT WAS ATTACHED UNDER LOCAL FILE NAME TAPE11.
EXTEND,TAPE11.
COMMENT.    END OF JOB.
```

LISTING A-3C   SAMPLE RUNSTREAM 3 FOR PAM

A-19

0000000000000000001111111111112222222222333333333344444444445555555555666666666677777777778888888888999999999900000000001111111111 COLUMN NOS.
0000000000111111111122222222223333333333444444444455555555556666666666777777777788888888889999999999000000000011111111112
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890

PREPLANNED TARGET
ETH= .00006000
AZDT=25.00 V= 5.00 RHD= .10 ED= .20 TP= 106.00 ADF= .35
TARGET HEADING ANGLE = 0.00 PT CLS APP= 0.00
NK= 100 RNG= 8000.0 ACCX=100.00 ACCY = 200.0
IDRMH= 1 IDPMX= 7 IVMX= 10

J= 1 NI(J)= 8
THFMH(I,J)=
0.0 20.0 30.0 45.0 60.0 90.0 135.0 180.0
DISMH(I,J)=
2000.0 1800.0 1600.0 1400.0 1200.0 1000.0 800.0 600.0

J= 2 NI(J)= 8
THFMH(I,J)=
0.0 20.0 30.0 45.0 60.0 90.0 135.0 180.0
DISMH(I,J)=
2000.0 1800.0 1600.0 1400.0 1200.0 1000.0 800.0 600.0

J= 3 NI(J)= 8
THFMH(I,J)=
0.0 20.0 30.0 45.0 60.0 90.0 135.0 180.0
DISMH(I,J)=
1500.0 1400.0 1300.0 1200.0 1100.0 1000.0 800.0 600.0

J= 4 NI(J)= 8
THFMH(I,J)=
0.0 20.0 30.0 45.0 60.0 90.0 135.0 180.0
DISMH(I,J)=
1500.0 1400.0 1300.0 1200.0 1100.0 1000.0 800.0 600.0

J= 5 NI(J)= 8
THFMH(I,J)=
0.0 20.0 30.0 45.0 60.0 90.0 135.0 180.0
DISMH(I,J)=
1000.0 900.0 800.0 700.0 600.0 500.0 400.0 300.0

J= 6 NI(J)= 8
THFMH(I,J)=
0.0 20.0 30.0 45.0 60.0 90.0 135.0 180.0
DISMH(I,J)=
1000.0 900.0 800.0 700.0 600.0 500.0 400.0 300.0
IDCODE = PFOOAIAAJS IDCODE= 20053330152010111223
VELOCITY=5.00 MEAN RESP TIME= 106.00 DESIGNATOR POWER= .20 REFLECTIVITY= .10

DESIGNATION RANGE= 1 DELTA TIME= 0.0000 ONE OR SEVERAL TARGETS = 1
.29000 .29000 .29000 .29000 .29000
1.00000 1.00000 1.00000 .91000 .91000
1.00000 1.00000 1.00000 .88000 .88000
1.00000 1.00000 1.00000 .89000 .89000

0000000000000000001111111111112222222222333333333344444444445555555555666666666677777777778888888888999999999900000000001111111111 COLUMN NOS.
0000000000111111111122222222223333333333444444444455555555556666666666777777777788888888889999999999000000000011111111112
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890

LISTING A-4 SAMPLE OUTPUT FROM PAM
(PAGE 1 OF 11)

A-20

```
                           DELTA TIME=  0.0000 ONE OR SEVERAL TARGETS =  2
1.00000   1.00000   1.00000    .89000    .89000
 .99000    .99000    .99000    .89000    .89000
 .99000    .99000    .99000    .91000    .91000
1.00000   1.00000   1.00000    .88000    .88000
 .99000    .99000    .99000    .90000    .90000
1.00000   1.00000   1.00000    .92000    .92000

DESIGNATION RANGE=
 .32000    .32000    .32000    .32000    .32000
 .99000    .99000    .99000    .93000    .93000
1.00000   1.00000   1.00000    .93000    .93000
 .99000    .99000    .99000    .92000    .92000
1.00000   1.00000   1.00000    .91000    .91000
1.00000   1.00000   1.00000    .94000    .94000
1.00000   1.00000   1.00000    .91000    .91000
1.00000   1.00000   1.00000    .91000    .91000
 .99000    .99000    .99000    .91000    .91000
1.00000   1.00000   1.00000    .91000    .91000
```

```
                           DELTA TIME= 30.0000 ONE OR SEVERAL TARGETS =  1
DESIGNATION RANGE=
 .40000    .40000    .40000    .40000    .40000
 .97000    .97000    .97000    .60000    .60000
 .97000    .97000    .97000    .71000    .71000
 .96000    .96000    .96000    .69000    .69000
 .98000    .98000    .98000    .71000    .71000
 .97000    .97000    .97000    .72000    .72000
 .95000    .95000    .95000    .71000    .71000
 .96000    .96000    .96000    .58000    .58000
 .97000    .97000    .97000    .70000    .70000
 .98000    .98000    .98000    .74000    .74000
```

```
                           DELTA TIME= 90.0000 ONE OR SEVERAL TARGETS =  1
DESIGNATION RANGE=
 .19000    .19000    .19000    .19000    .19000
 .69000    .69000    .69000    .29000    .29000
 .68000    .68000    .68000    .27000    .27000
 .74000    .74000    .74000    .36000    .36000
 .68000    .68000    .68000    .32000    .32000
 .69000    .69000    .69000    .28000    .28000
 .70000    .70000    .70000    .28000    .28000
 .71000    .71000    .71000    .28000    .28000
 .70000    .70000    .70000    .27000    .27000
 .72000    .72000    .72000    .25000    .25000
```

```
                           DELTA TIME=150.0000 ONE OR SEVERAL TARGETS =  1
DESIGNATION RANGE=
 .06000    .06000    .06000    .06000    .06000
 .38000    .38000    .38000    .14000    .14000
 .36000    .36000    .36000    .15000    .15000
 .40000    .40000    .40000    .10000    .10000
 .42000    .42000    .42000    .09000    .09000
 .40000    .40000    .40000    .12000    .12000
```

LISTING A-4 SAMPLE OUTPUT FROM PAM
(PAGE 2 OF 11)

```
 .34000   .34000   .34000   .14000   .14000
 .42000   .42000   .42000   .04000   .04000
 .36000   .36000   .36000   .07000   .07000
 .35000   .35000   .35000   .12000   .12000

DESIGNATION RANGE=   1   DELTA TIME=300.0000   ONE OR SEVERAL TARGETS =   1
 .01000   .01000   .01000   .01000   .01000
 .05000   .05000   .05000  0.00000  0.00000
 .04000   .04000   .04000   .02000   .02000
 .01000   .01000   .01000   .01000   .01000
 .02000   .02000   .02000  0.00000  0.00000
 .01000   .01000   .01000  0.00000  0.00000
 .06000   .06000   .06000   .01000   .01000
 .05000   .05000   .05000   .01000   .01000
 .06000   .06000   .06000   .02000   .02000
 .05000   .05000   .05000  0.00000  0.00000

DESIGNATION RANGE=   2   DELTA TIME=   0.0000   ONE OR SEVERAL TARGETS =   1
0.00000  0.00000  0.00000  0.00000  0.00000
 .92000   .92000   .92000   .89000   .89000
1.00000  1.00000  1.00000   .87000   .87000
1.00000  1.00000  1.00000   .88000   .88000
1.00000  1.00000  1.00000   .90000   .90000
 .99000   .99000   .99000   .89000   .89000
 .99000   .99000   .99000   .88000   .88000
 .98000   .98000   .98000   .93000   .93000
1.00000  1.00000  1.00000   .86000   .86000
1.00000  1.00000  1.00000   .90000   .90000

DESIGNATION RANGE=   2   DELTA TIME=   0.0000   ONE OR SEVERAL TARGETS =   2
0.00000  0.00000  0.00000  0.00000  0.00000
 .97000   .97000   .97000   .89000   .89000
1.00000  1.00000  1.00000   .91000   .91000
1.00000  1.00000  1.00000   .91000   .91000
1.00000  1.00000  1.00000   .93000   .93000
1.00000  1.00000  1.00000   .91000   .91000
1.00000  1.00000  1.00000   .96000   .96000
1.00000  1.00000  1.00000   .94000   .94000
1.00000  1.00000  1.00000   .91000   .91000
1.00000  1.00000  1.00000   .91000   .91000

DESIGNATION RANGE=   2   DELTA TIME=  30.0000   ONE OR SEVERAL TARGETS =   1
0.00000  0.00000  0.00000  0.00000  0.00000
 .91000   .91000   .91000   .77000   .77000
 .96000   .96000   .96000   .74000   .74000
 .95000   .95000   .95000-  .68000   .68000
 .99000   .99000   .99000   .65000   .65000
 .95000   .95000   .95000   .65000   .65000
 .97000   .97000   .97000   .73000   .73000
 .99000   .99000   .99000   .80000   .80000
```

LISTING A-4   SAMPLE OUTPUT FROM PAM

(PAGE 3 OF 11)

```
                                                                                                              COLUMN NOS.
0000000000000000000000000000000000000000000000000000000000000000000000000001111111111111111111111111111111112
00000000011111111112222222222333333333344444444445555555555666666666677777777778888888888999999999900000000001111111112
12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890
```

```
.93000    .93000    .93000    .57000    .57000
.96000    .96000    .96000    .76000    .76000
```

DESIGNATION RANGE=   2   DELTA TIME= 90.0000   ONE OR SEVERAL TARGETS = 1

```
0.00000   0.00000   0.00000   0.00000   0.00000
.21000    .56000    .56000    .20000    .20000
.39000    .65000    .65000    .26000    .26000
.38000    .75000    .75000    .29000    .29000
.43000    .66000    .66000    .32000    .32000
.41000    .78000    .78000    .29000    .29000
.38000    .73000    .73000    .28000    .28000
.37000    .68000    .68000    .32000    .32000
.31000    .74000    .74000    .25000    .25000
.31000    .68000    .68000    .34000    .34000
```

DESIGNATION RANGE=   2   DELTA TIME=150.0000   ONE OR SEVERAL TARGETS = 1

```
0.00000   0.00000   0.00000   0.00000   0.00000
.21000    .21000    .21000    .06000    .06000
.39000    .39000    .39000    .10000    .10000
.38000    .38000    .38000    .11000    .11000
.43000    .43000    .43000    .07000    .07000
.41000    .41000    .41000    .11000    .11000
.38000    .38000    .38000    .09000    .09000
.37000    .37000    .37000    .09000    .09000
.31000    .31000    .31000    .12000    .12000
.31000    .31000    .31000    .06000    .06000
```

DESIGNATION RANGE=   2   DELTA TIME=300.0000   ONE OR SEVERAL TARGETS = 1

```
0.00000   0.00000   0.00000   0.00000   0.00000
.04000    .04000    .04000    .00000    .00000
.05000    .05000    .05000    .02000    .02000
.11000    .11000    .11000    .01000    .01000
.06000    .06000    .06000    .02000    .02000
.08000    .08000    .08000    .01000    .01000
.07000    .07000    .07000    .01000    .01000
.02000    .02000    .02000    .01000   0.00000
.05000    .05000    .05000   0.00000   0.00000
.01000    .01000    .01000   0.00000   0.00000
```

DESIGNATION RANGE=   3   DELTA TIME= 0.0000   ONE OR SEVERAL TARGETS = 1

```
0.00000   0.00000   0.00000   0.00000   0.00000
.50000    .50000    .50000    .50000    .50000
1.00000   1.00000   1.00000    .94000    .94000
1.00000   1.00000   1.00000    .93000    .93000
.99000    .99000    .99000    .89000    .89000
.99000    .99000    .99000    .82000    .82000
1.00000   1.00000   1.00000    .90000    .90000
1.00000   1.00000   1.00000    .85000    .85000
1.00000   1.00000   1.00000    .87000    .87000
1.00000   1.00000   1.00000    .89000    .89000
```

```
                                                                                                              COLUMN NOS.
0000000000000000000000000000000000000000000000000000000000000000000000000001111111111111111111111111111111112
00000000011111111112222222222333333333344444444445555555555666666666677777777778888888888999999999900000000001111111112
12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890
```

LISTING A-4   SAMPLE OUTPUT FROM PAM

(PAGE 4 OF 11)

```
00000000000000000000000000000000000000000000000000000000000000000000000000000111111111111111111111  COLUMN NOS.
00000000011111111112222222222333333333344444444445555555555666666666677777777778888888888999999999900000000001111111111
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890
```

DESIGNATION RANGE= 3   DELTA TIME= 0.0000 ONE OR SEVERAL TARGETS = 2

0.00000	0.00000	0.00000
.47000	.47000	.47000
1.00000	1.00000	.91000
1.00000	1.00000	.95000
1.00000	1.00000	.92000
1.00000	1.00000	.94000
.99000	.99000	.91000
1.00000	1.00000	.90000
1.00000	1.00000	.92000
1.00000	1.00000	.93000

DESIGNATION RANGE= 3   DELTA TIME= 30.0000 ONE OR SEVERAL TARGETS = 1

0.00000	0.00000	0.00000
.47000	.47000	.47000
.95000	.95000	.67000
.97000	.97000	.67000
.95000	.95000	.68000
.96000	.96000	.71000
.93000	.93000	.77000
.95000	.95000	.69000
.98000	.98000	.67000
.98000	.98000	.67000

DESIGNATION RANGE= 3   DELTA TIME= 90.0000 ONE OR SEVERAL TARGETS = 1

0.00000	0.00000	0.00000
.26000	.26000	.26000
.75000	.75000	.32000
.73000	.73000	.32000
.76000	.76000	.39000
.68000	.68000	.34000
.65000	.65000	.31000
.71000	.71000	.26000
.66000	.66000	.24000
.64000	.64000	.29000

DESIGNATION RANGE= 3   DELTA TIME=150.0000 ONE OR SEVERAL TARGETS = 1

0.00000	0.00000	0.00000
.07000	.07000	.07000
.39000	.39000	.08000
.35000	.35000	.10000
.41000	.41000	.18000
.31000	.31000	.05000
.42000	.42000	.10000
.38000	.38000	.05000
.46000	.46000	.14000
.41000	.41000	.16000

DESIGNATION RANGE= 3   DELTA TIME=300.0000 ONE OR SEVERAL TARGETS = 1

```
00000000000000000000000000000000000000000000000000000000000000000000000000000111111111111111111111  COLUMN NOS.
00000000011111111112222222222333333333344444444445555555555666666666677777777778888888888999999999900000000001111111111
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890
```

LISTING A-4   SAMPLE OUTPUT FROM PAM
(PAGE 5 OF 11)

A-24

```
0.00000   0.00000   0.00000   0.00000   0.00000
 .01000    .01000    .01000    .01000    .01000
 .03000    .03000    .03000    .03000    .02000
 .07000    .07000    .07000    .02000    .02000
 .03000    .03000    .03000   0.00000   0.00000
 .02000    .02000    .02000    .01000    .01000
 .04000    .04000    .04000    .01000    .01000
 .03000    .03000    .03000   0.00000   0.00000
 .03000    .03000    .03000    .01000   0.00000
 .07000    .07000    .07000    .01000    .01000
```

DESIGNATION RANGE=   4   DELTA TIME= 0.0000 ONE OR SEVERAL TARGETS =   1
```
0.00000   0.00000   0.00000   0.00000   0.00000
0.00000   0.00000   0.00000   0.00000   0.00000
 .89000    .89000    .89000    .85000    .85000
 .99000    .99000    .99000    .84000    .84000
 .99000    .99000    .99000    .94000    .94000
1.00000   1.00000   1.00000    .93000    .93000
 .99000    .99000    .99000    .84000    .84000
1.00000   1.00000   1.00000    .93000    .93000
 .99000    .99000    .99000    .84000    .84000
1.00000   1.00000   1.00000    .85000    .85000
```

DESIGNATION RANGE=   4   DELTA TIME= 0.0000 ONE OR SEVERAL TARGETS =   2
```
0.00000   0.00000   0.00000   0.00000   0.00000
 .01000    .01000    .01000    .01000    .01000
 .98000    .98000    .95000    .95000    .95000
1.00000   1.00000    .93000    .93000    .93000
1.00000   1.00000    .94000    .94000    .94000
1.00000   1.00000    .93000    .93000    .93000
1.00000   1.00000    .93000    .93000    .93000
1.00000   1.00000    .88000    .88000    .88000
1.00000   1.00000    .88000    .88000    .88000
1.00000   1.00000    .95000    .95000    .95000
```

DESIGNATION RANGE=   4   DELTA TIME= 30.0000 ONE OR SEVERAL TARGETS =   1
```
0.00000   0.00000   0.00000   0.00000   0.00000
 .01000    .01000    .01000    .01000    .01000
 .88000    .88000    .88000    .77000    .77000
 .98000    .98000    .98000    .69000    .69000
 .95000    .95000    .95000    .74000    .74000
 .99000    .99000    .99000    .62000    .62000
 .99000    .99000    .99000    .75000    .75000
 .95000    .95000    .95000    .63000    .63000
 .97000    .97000    .97000    .65000    .65000
 .96000    .96000    .96000    .67000    .67000
```

DESIGNATION RANGE=   4   DELTA TIME= 99.0000 ONE OR SEVERAL TARGETS =   1
```
0.00000   0.00000   0.00000   0.00000   0.00000
0.00000   0.00000   0.00000   0.00000   0.00000
```

LISTING A-4   SAMPLE OUTPUT FROM PAM

(PAGE 6 OF 11)

```
.57000   .57000   .57000   .57000    .33000   .33000
.71000   .71000   .71000   .71000    .26000   .26000
.80000   .80000   .80000   .80000    .36000   .36000
.74000   .74000   .74000   .74000    .39000   .39000
.71000   .71000   .71000   .71000    .27000   .27000
.75000   .75000   .75000   .75000    .32000   .32000
.73000   .73000   .73000   .73000    .29000   .29000
.73000   .73000   .73000   .73000    .36000   .36000
```

DESIGNATION RANGE= 4   DELTA TIME=150.0000   ONE OR SEVERAL TARGETS =   1

```
0.00000  0.00000  0.00000  0.00000   0.00000  0.00000
.01000   .01000   .01000   .01000    .01000   .01000
.23000   .23000   .23000   .23000    .10000   .10000
.40000   .40000   .40000   .06000    .12000   .12000
.45000   .45000   .45000   .05000    .15000   .15000
.41000   .41000   .41000   .04000    .13000   .13000
.37000   .37000   .37000   .08000    .11000   .11000
.28000   .28000   .28000   .04000    .08000   .08000
.38000   .38000   .38000   .05000    .12000   .12000
.35000   .35000   .35000   .02000    .10000   .10000
```

DESIGNATION RANGE= 4   DELTA TIME=300.0000   ONE OR SEVERAL TARGETS =   1

```
0.00000  0.00000  0.00000  0.00000   0.00000  0.00000
.01000   .01000   .01000   .01000    .01000   .01000
.06000   .06000   .06000   .06000    .10000   .10000
.05000   .05000   .05000   .05000    .01000   .01000
.04000   .04000   .04000   .04000    .01000   .01000
.08000   .08000   .08000   .08000    .01000   .01000
.04000   .04000   .04000   .04000    .00000   .00000
.04000   .04000   .04000   .04000    .00000   .00000
.05000   .05000   .05000   .05000    .00000   .00000
.02000   .02000   .02000   .02000    .01000   .01000
```

DESIGNATION RANGE= 5   DELTA TIME= 0.0000   ONE OR SEVERAL TARGETS =   1

```
0.00000  0.00000  0.00000  0.00000   0.00000  0.00000
.66000   .66000   .66000   .66000    .87000   .87000
.98000   .98000   .98000   .88000    .80000   .87000
1.00000  1.00000  1.00000  .90000    .90000   .88000
.99000   .99000   1.00000  .83000    .83000   .90000
1.00000  1.00000  .99000   .94000    .94000   .83000
.99000   .99000   .99000   .87000    .87000   .94000
1.00000  1.00000  1.00000  .88000    .88000   .87000
                                              .88000
```

DESIGNATION RANGE= 5   DELTA TIME= 0.0000   ONE OR SEVERAL TARGETS =   2

```
0.00000  0.00000  0.00000  0.00000   0.00000  0.00000
.69000   .69000   .69000   .69000    .69000   .69000
1.00000  1.00000  1.00000  1.00000   .91000   .91000
```

LISTING A-4   SAMPLE OUTPUT FROM PAM

(PAGE 7 OF 11)

```
1.00000   1.00000   1.00000   1.00000    .91000    .91000
1.00000   1.00000   1.00000   1.00000    .92000    .92000
1.00000   1.00000   1.00000   1.00000    .95000    .95000
1.00000   1.00000   1.00000   1.00000    .91000    .91000
1.00000   1.00000   1.00000   1.00000    .95000    .95000
 .99000    .99000    .99000    .99000    .91000    .91000

DESIGNATION RANGE= 5  DELTA TIME= 30.0000 ONE OR SEVERAL TARGETS = 1
0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
 .57000    .57000    .57000    .57000    .57000    .57000
 .96000    .96000    .96000    .94000    .69000    .69000
 .94000    .94000    .94000    .96000    .65000    .65000
 .96000    .96000    .96000    .95000    .70000    .70000
 .95000    .95000    .95000    .95000    .71000    .71000
 .95000    .95000    .95000    .95000    .70000    .70000
 .95000    .95000    .95000    .95000    .70000    .70000
 .97000    .97000    .97000    .97000    .73000    .73000
                                          .67000    .67000

DESIGNATION RANGE= 5  DELTA TIME= 90.0000 ONE OR SEVERAL TARGETS = 1
0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
 .29000    .29000    .29000    .29000    .29000    .29000
 .69000    .69000    .69000    .69000    .22000    .22000
 .72000    .72000    .72000    .72000    .34000    .34000
 .71000    .71000    .71000    .71000    .27000    .27000
 .66000    .66000    .66000    .66000    .23000    .23000
 .77000    .77000    .77000    .77000    .38000    .38000
 .67000    .67000    .67000    .67000    .28000    .28000
 .71000    .71000    .71000    .71000    .29000    .29000

DESIGNATION RANGE= 5  DELTA TIME=150.0000 ONE OR SEVERAL TARGETS = 1
0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
 .07000    .07000    .07000    .07000    .07000    .07000
 .36000    .36000    .36000    .36000    .13000    .13000
 .42000    .42000    .42000    .42000    .08000    .08000
 .32000    .32000    .32000    .32000    .14000    .14000
 .34000    .34000    .34000    .34000    .11000    .11000
 .37000    .37000    .37000    .37000    .08000    .08000
 .36000    .36000    .36000    .36000    .06000    .06000
 .46000    .46000    .46000    .46000    .15000    .15000

DESIGNATION RANGE= 5  DELTA TIME=300.0000 ONE OR SEVERAL TARGETS = 1
0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
 .04000    .04000    .04000    .04000   0.00000   0.00000
 .05000    .05000    .05000    .05000   0.00000   0.00000
 .06000    .06000    .06000    .06000    .01000    .01000
```

LISTING A-4 SAMPLE OUTPUT FROM PAM

(PAGE 8 OF 11)

```
000000000000000000000000000000000000000000000000000000000000000000000000001111111111111111111 COLUMN NOS.
000000000111111111222222222233333333334444444444555555555566666666667777777777888888888899999999990000000000111111111
123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890
```

```
.03000    .03000    .03000    .03000    .01000    .01000
.03000    .03000    .03000    .03000    .01000    .01000
.03000    .03000    .03000    .03000   0.00000   0.00000
.04000    .04000    .04000    .04000   0.00000   0.00000

DESIGNATION RANGE=   6  DELTA TIME=   0.0000 ONE OR SEVERAL TARGETS  =  1
0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
 .19000    .19000    .19000    .19000    .19000    .19000
 .92000    .92000    .92000    .92000    .87000    .87000
 .99000    .99000    .99000    .99000    .93000    .93000
1.00000   1.00000   1.00000   1.00000    .90000    .90000
1.00000   1.00000   1.00000   1.00000    .93000    .93000
1.00000   1.00000   1.00000   1.00000    .88000    .88000
1.00000   1.00000   1.00000   1.00000    .85000    .85000
 .99000    .99000    .99000    .99000    .87000    .87000

DESIGNATION RANGE=   6  DELTA TIME=   0.0000 ONE OR SEVERAL TARGETS  =  2
0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
 .24000    .24000    .24000    .24000    .24000    .24000
 .97000    .97000    .97000    .90000    .90000    .90000
 .97000    .97000    .97000    .93000    .93000    .93000
1.00000   1.00000   1.00000    .84000    .84000    .84000
 .99000    .99000    .99000    .96000    .96000    .96000
1.00000   1.00000   1.00000    .95000    .95000    .95000
 .98000    .98000    .98000    .89000    .89000    .89000
1.00000   1.00000   1.00000    .97000    .97000    .97000

DESIGNATION RANGE=   6  DELTA TIME=  30.0000 ONE OR SEVERAL TARGETS  =  1
0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
 .28000    .28000    .28000    .28000    .28000    .28000
 .88000    .88000    .88000    .88000    .77000    .77000
 .98000    .98000    .98000    .70000    .70000    .70000
 .97000    .97000    .97000    .82000    .82000    .82000
 .96000    .96000    .96000    .73000    .73000    .73000
 .94000    .94000    .94000    .63000    .63000    .63000
 .92000    .92000    .92000    .67000    .67000    .67000
 .96000    .96000    .96000    .77000    .77000    .77000

DESIGNATION RANGE=   6  DELTA TIME=  90.0000 ONE OR SEVERAL TARGETS  =  1
0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
 .16000    .16000    .16000    .16000    .16000    .16000
 .54000    .54000    .54000    .67000    .29000    .29000
 .67000    .67000    .67000    .67000    .20000    .20000
 .73000    .73000    .73000    .73000    .28000    .28000
 .71000    .71000    .71000    .71000    .33000    .33000
 .75000    .75000    .75000    .75000    .25000    .25000
                                          .29000    .29000
```

```
000000000000000000000000000000000000000000000000000000000000000000000000001111111111111111111 COLUMN NOS.
000000000111111111222222222233333333334444444444555555555566666666667777777777888888888899999999990000000000111111111
56789012345678901234567890123456789012345678901234567890123456789012345678901234567890
```

LISTING A-4 SAMPLE OUTPUT FROM PAM

(PAGE 9 OF 11)

```
      .73000    .73000    .73000    .73000    .31000
      .70000    .70000    .70000    .70000    .33000

DESIGNATION RANGE=  6   DELTA TIME=150.0000  ONE OR SEVERAL TARGETS = 1
    0.00000   0.00000   0.00000   0.00000   0.00000
    0.00000   0.00000   0.00000   0.00000   0.00000
     .02000    .02000    .02000    .02000    .02000
     .31000    .31000    .31000    .31000    .11000
     .41000    .41000    .41000    .15000    .15000
     .31000    .31000    .31000    .07000    .07000
     .29000    .29000    .29000    .08000    .08000
     .43000    .43000    .43000    .12000    .12000
     .38000    .38000    .38000    .10000    .10000
     .35000    .35000    .35000    .11000    .11000

DESIGNATION RANGE=  6   DELTA TIME=300.0000  ONE OR SEVERAL TARGETS = 1
    0.00000   0.00000   0.00000   0.00000   0.00000
    0.00000   0.00000   0.00000   0.00000   0.00000
     .02000    .02000    .02000    .02000    .00000
     .05000    .05000    .05000    .01000    .01000
     .05000    .05000    .05000    .02000    .02000
     .05000    .05000    .05000    .01000    .01000
     .05000    .05000    .05000    .02000    .02000
     .05000    .05000    .05000    .01000    .01000
     .05000    .05000    .05000    .01000    .01000
     .08000    .08000    .08000    .01000    .01000

DESIGNATION RANGE=  7   DELTA TIME=  0.0000  ONE OR SEVERAL TARGETS = 1
    0.00000   0.00000   0.00000   0.00000   0.00000
    0.00000   0.00000   0.00000   0.00000   0.00000
     .70000    .70000    .70000    .70000    .70000
    1.00000   1.00000   1.00000    .87000    .87000
    1.00000   1.00000   1.00000    .90000    .90000
     .99000    .99000    .99000    .84000    .84000
    1.00000   1.00000   1.00000    .91000    .91000
    1.00000   1.00000   1.00000    .91000    .91000
    1.00000   1.00000   1.00000    .92000    .92000

DESIGNATION RANGE=  7   DELTA TIME=  0.0000  ONE OR SEVERAL TARGETS = 2
    0.00000   0.00000   0.00000   0.00000   0.00000
    0.00000   0.00000   0.00000   0.00000   0.00000
     .80000    .80000    .80000    .80000    .80000
    1.00000   1.00000   1.00000    .93000    .93000
    1.00000   1.00000   1.00000    .90000    .90000
     .98000    .98000    .98000    .91000    .91000
    1.00000   1.00000   1.00000    .94000    .94000
    1.00000   1.00000   1.00000    .96000    .96000
     .99000    .99000    .99000    .94000    .94000
```

LISTING A-4 SAMPLE OUTPUT FROM PAM

(PAGE 10 OF 11)

DESIGNATION RANGE =   7   DELTA TIME= 30.0000 ONE OR SEVERAL TARGETS =   1

0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000
.62000	.62000	.62000	.62000
.97000	.97000	.97000	.78000
.96000	.96000	.96000	.72000
.98000	.98000	.98000	.68000
.96000	.96000	.96000	.66000
.94000	.94000	.94000	.67000
.97000	.97000	.97000	.68000

DESIGNATION RANGE =   7   DELTA TIME= 90.0000 ONE OR SEVERAL TARGETS =   1

0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000
.28000	.28000	.28000	.28000
.71000	.71000	.71000	.27000
.76000	.76000	.76000	.34000
.78000	.78000	.78000	.34000
.70000	.70000	.70000	.24000
.75000	.75000	.75000	.22000
.75000	.75000	.75000	.30000

DESIGNATION RANGE =   7   DELTA TIME=150.0000 ONE OR SEVERAL TARGETS =   1

0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000
.11000	.11000	.11000	.11000
.30000	.30000	.30000	.07000
.45000	.45000	.45000	.08000
.32000	.32000	.32000	.07000
.40000	.40000	.40000	.11000
.28000	.28000	.28000	.07000
.27000	.27000	.27000	.06000

DESIGNATION RANGE =   7   DELTA TIME=300.0000 ONE OR SEVERAL TARGETS =   1

0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000
.05000	.05000	.05000	.05000
.04000	.04000	.04000	.01000
.08000	.08000	.08000	.00000
.06000	.06000	.06000	.01000
.06000	.06000	.06000	.01000
.06000	.06000	.06000	.01000
.05000	.05000	.05000	.00000

LISTING A-4 SAMPLE OUTPUT FROM PAM

(PAGE 11 OF 11)

APPENDIX B

LISTING AND SAMPLE CASE OF PRBLOS

APPENDIX B

LISTING AND SAMPLE CASE OF PRBLOS

This appendix contains:

(1) A listing of the FORTRAN code for the PRBLOS program.

(2) One set of sample inputs for PRBLOS.

(3) One sample runstream for PRBLOS.

(4) Sample output created by running PRBLOS with the
sample input.

Note: The column numbers included in some of the listings
in this appendix are not a part of the program code, the data, or the
output, but are included only for the reader's convenience.

```
      PROGRAM PRBLOS (INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT)            036770    PR-PRBLOS2
C                                                                      036780    PR-PRBLOS3
      DIMENSION PRIV(20,2), PRODV(20,2), PRIVM(20,2)                   036790    PR-PRBLOS4
      DIMENSION A(6)                                                   036800    PR-PRBLOS5
C                                                                      036810    PR-PRBLOS6
100   WRITE (6,290)                                                    036820    PR-PRBLOS7
C                                                                      036830    PR-PRBLOS8
      READ (5,220) TGTVEL,TC,(A(I),I=1,6)                              036840    PR-PRBLOS9
      IF (EOF(5).NE.0.0) STOP ' END OF INPUT '                         036850    PR-PRBLO10
      WRITE (6,230) (A(I),I=1,6)                                       036860    PR-PRBLO11
      WRITE (6,240) TGTVEL,TC                                          036870    PR-PRBLO12
      READ (5,280) NIV                                                 036880    PR-PRBLO13
      IF (NIV.GT.20) STOP ' NIV>20 EXCEEDS DIMENSIONS OF PRIV ARRAY '  036890    PR-PRBLO14
      DO 110 J=1,2                                                     036900    PR-PRBLO15
110   READ (5,270) (PRIV(I,J),I=1,NIV)                                 036910    PR-PRBLO16
      WRITE (6,250) NIV                                                036920    PR-PRBLO17
      DO 120 J=1,2                                                     036930    PR-PRBLO18
120   WRITE (6,300) (PRIV(I,J),I=1,NIV)                                036940    PR-PRBLO19
C                                                                      036950    PR-PRBLO20
      READ (5,280) NODV                                                036960    PR-PRBLO21
      IF (NODV.GT.20) STOP ' NODV>20 EXCEEDS DIMENSIONS OF PRODV ARRAY 036970    PR-PRBLO22
     1                                                                 036980    PR-PRBLO23
      DO 130 J=1,2                                                     036990    PR-PRBLO24
130   READ (5,270) (PRODV(I,J),I=1,NODV)                               037000    PR-PRBLO25
      WRITE (6,260) NODV                                               037010    PR-PRBLO26
      DO 140 J=1,2                                                     037020    PR-PRBLO27
140   WRITE (6,300) (PRODV(I,J),I=1,NODV)                              037030    PR-PRBLO28
C                                                                      037040    PR-PRBLO29
C                                                                      037050    PR-PRBLO30
      CD=TC*TGTVEL                                                     037060    PR-PRBLO31
C                                                                      037070    PR-PRBLO32
      DO 150 I=1,NIV                                                   037080    PR-PRBLO33
      PRIVM(I,1)=PRIV(I,1)                                             037090    PR-PRBLO34
150   PRIVM(I,2)=PRIV(I,2)-CD                                          037100    PR-PRBLO35
C                                                                      037110    PR-PRBLO36
      DO 160 I=1,NIV                                                   037120    PR-PRBLO37
      IF (PRIVM(I,2).GT.0.0) GO TO 170                                 037130    PR-PRBLO38
160   CONTINUE                                                         037140    PR-PRBLO39
      WRITE (6,310) CD,PRIV(NIV,2)                                     037150    PR-PRBLO40
      GO TO 210                                                        037160    PR-PRBLO41
C                                                                      037170    PR-PRBLO42
170   IF (I.EQ.1) GO TO 190                                            037180    PR-PRBLO43
      PRIVM(I,1)=PRIV(I-1,1)+(PRIV(I,1)-PRIV(I-1,1))*(CD-PRIV(I-1,2))  037190    PR-PRBLO44
     1 /(PRIV(I,2)-PRIV(I-1,2))                                        037200    PR-PRBLO45
      PRIVM(I,2)=0.0                                                   037210    PR-PRBLO46
      NIVM=NIV-I+2                                                     037220    PR-PRBLO47
      DO 180 K=2,NIVM                                                  037230    PR-PRBLO48
      PRIVM(K,1)=PRIVM(I-2+K,1)                                        037240    PR-PRBLO49
180   PRIVM(K,2)=PRIVM(I-2+K,2)                                        037250    PR-PRBLO50
190   CONTINUE                                                         037260    PR-PRBLO51
      WRITE (6,320) NIVM                                               037270    PR-PRBLO52
      DO 200 J=1,2                                                     037280    PR-PRBLO53
200   WRITE (6,300) (PRIVM(I,J),I=1,NIVM)                              037290    PR-PRBLO54
C                                                                      037300    PR-PRBLO55
```

LISTING B-1 FORTRAN LISTING OF PRBLOS PROGRAM

(PAGE 1 OF 3)

```
C
      CALL AVEL (PRIV,20,2,NIV,AVFIV)                                    037310    PR-PRBL056
      CALL AVEL (PROOV,20,2,NOOV,AVEOOV)                                 037320    PR-PRBL057
      CALL AVEL (PRIVM,20,2,NIVM,AVEIVM)                                 037330    PR-PRBL058
C                                                                        037340    PR-PRBL059
      WRITE (6,330) AVEIV,AVEOOV,AVEIVM                                  037350    PR-PRBL060
C                                                                        037360    PR-PRBL061
      PRBIVM=AVEIVM/(AVEIV+AVEOOV)                                       037370    PR-PRBL062
      WRITE (6,340) PRBIVM                                               037380    PR-PRBL063
C                                                                        037390    PR-PRBL064
  210 WRITE (6,350)                                                      037400    PR-PRBL065
      GO TO 100                                                          037410    PR-PRBL066
C                                                                        037420    PR-PRBL067
C                                                                        037430    PR-PRBL068
C *** F O R M A T   S T A T E M E N T S   * * *                         037440    PR-PRBL069
C                                                                        037450    PR-PRBL070
  220 FORMAT (2F10.4,6A10)                                               037460    PR-PRBL071
  230 FORMAT (7H CASE: ,6A10)                                            037470    PR-PRBL072
  240 FORMAT (10H TGTVEL= ,F10.4,5X,4HCT= ,F10.4)                        037480    PR-PRBL073
  250 FORMAT (18H PRIV ARRAY: NIV= ,I5)                                  037490    PR-PRBL074
  260 FORMAT (20H PROOV ARRAY: NOOV= ,I5)                                037500    PR-PRBL075
  270 FORMAT (8F10.4)                                                    037510    PR-PRBL076
  280 FORMAT (16I5)                                                      037520    PR-PRBL077
  290 FORMAT (1H1)                                                       037530    PR-PRBL078
  300 FORMAT (1H ,8F12.4)                                                037540    PR-PRBL079
  310 FORMAT (1H ,//,19H CRITICAL DISTANCE=,F10.4,72H WHICH IS GREATER T 037550    PR-PRBL080
     1HAN OR EQUAL TO THE LONGEST POSSIBLE IN-VIEW SEGMENT ,F10.4,//,23H 037560;037570 PR-PRBL081
     2 THEREFORE, PRBLOS=0.0)                                            037580    PR-PRBL082
  320 FORMAT (20H PRIVM ARRAY: NIVM= ,I5)                                037590    PR-PRBL083
  330 FORMAT (1H ,//,32H AVERAGE IN-VIEW SEGMENT LENGTH=,F10.4,/,36H AVE 037600    PR-PRBL084
     1RAGE OUT-OF-VIEW SEGMENT LENGTH=,F10.4,//,41H AVERAGE MODIFIED IN-V 037610    PR-PRBL085
     2IEW SEGMENT LENGTH=,F10.4)                                         037620    PR-PRBL086
  340 FORMAT (1H ,//,8H PRBLOS=,F10.4)                                   037630    PR-PRBL087
  350 FORMAT (1H ,//,13H END OF CASE ,///)                               037640    PR-PRBL088
      END                                                               037650    PR-PRBL089
```

LISTING B-1 FORTRAN LISTING OF PRBLOS PROGRAM - CONT'D

(PAGE 2 OF 3)

```
        SUBROUTINE AVEL (P,N1,N2,N3,AVE)        037670    SR-AVEL   2
C                                               037680    SR-AVEL   3
        DIMENSION P(N1,N2)                      037690    SR-AVEL   4
C                                               037700    SR-AVEL   5
        NU=N3-1                                 037710    SR-AVEL   6
        SUM=0.0                                 037720    SR-AVEL   7
        DO 100 I=1,NU                           037730    SR-AVEL   8
        SUM=SUM+(P(I+1,2)-P(I,2))*(P(I+1,1)+P(I,1))   037740    SR-AVEL   9
100     CONTINUE                                037750    SR-AVEL  10
C                                               037760    SR-AVEL  11
        AVE=P(N3,1)*P(N3,2)-P(1,1)*P(1,2)-.5*SUM   037770    SR-AVEL  12
        RETURN                                  037780    SR-AVEL  13
        END                                     037790    SR-AVEL  14
```

LISTING B-1 FORTRAN LISTING OF PRBLOS PROGRAM - CONT'D

(PAGE 3 OF 3)

```
3.    15.                    CLOSE TERRAIN: RANGE BAND FROM ZERO TO 2000 METERS
                    .1    .2    .3    .4    .5    .6    .7
3.    11
0.    .1    .2    .3    .4    .5    .6    .7
.8    .9    1.0   .8    .85   .865  .874  .9
25.   30.   40.   50.   70.   120.  140.  180.
280.  500.  1100.
      13
0.    .61   .743  .8    .85   .865  .874  .9
.01   .95   .98   .99   1.0
0.    25.   50.   75.   100.  125.  150.  175.
200.  400.  600.  800.  1000.

3.    15.                    CLOSE TERRAIN: RANGE BAND FROM 2000 TO 2500 METERS
                    .1    .2    .3    .4    .5    .6    .7
3.    11
0.    .1    .2    .3    .4    .5    .6    .7
.8    .9    1.0   .8    .85   .865  .874  .9
25.   30.   40.   50.   70.   120.  150.  200.
420.  900.  1520.
      13
0.    .61   .743  .8    .85   .865  .874  .9
.91   .95   .98   .99   1.0
0.    25.   50.   75.   100.  125.  150.  175.
200.  400.  600.  800.  1000.

3.    15.                    CLOSE TERRAIN: RANGE BAND FROM 2500 TO 9999 METERS
                    .1    .2    .3    .4    .5    .6    .7
3.    11
0.    .1    .2    .3    .4    .5    .6    .7
.8    .9    1.0   .8    .85   .865  .874  .9
25.   40.   60.   100.  140.  190.  210.  240.
310.  590.  1600.
      13
0.    .61   .743  .8    .85   .865  .874  .9
.91   .95   .98   .99   1.0
0.    25.   50.   75.   100.  125.  150.  175.
200.  400.  600.  800.  1000.
```

LISTING B-2   SAMPLE INPUT FOR PRBLOS

B-6

```
JOB CARD.  CHANGE TO CONFORM TO INSTALLATION USAGE.
ACCOUNT CARD.  CHANGE TO CONFORM TO INSTALLATION USAGE.
COMMENT.  THE FOLLOWING CARD ATTACHES THE MACHINE LANGUAGE (OBJECT CODE) FILE
COMMENT.  OF THE PRBLOS PROGRAM.  THIS FILE WAS CREATED BY RUNNING THE SOURCE
COMMENT.  LISTING OF PRBLOS THROUGH THE FORTRAN COMPILER IN A
COMMENT.  PREVIOUS JOB.
ATTACH,LGO,PRBLOSBINARY,ID=SANDMEYER.
COMMENT.  THE NEXT CARD DECLARES TAPE5 TO BE A FILE OF RECORD TYPE Z WITH
COMMENT.  80 CHARACTER RECORDS.  THIS CARD IS NECESSARY BECAUSE TAPE5 IS TO
COMMENT.  BE OBTAINED FROM THE "FRONT END" COMPUTER WHICH USES A DIFFERENT
COMMENT.  DEFAULT RECORD TYPE FOR ITS FILES.
FILE,TAPE5,RT=Z,FL=80,BT=C.
COMMENT.  THE NEXT CARD OBTAINS A COPY OF TAPE5 (PRBLOS INPUT FILE) FROM
COMMENT.  THE "FRONT END" MACHINE.
GETPF,TAPE5,PRBLOSSAMPLEINPUT,ID=SANDMEYER,ST=MFA.
COMMENT.  THE NEXT CARD LOADS AND EXECUTES THE PROGRAM USING TAPE5 AS INPUT.
LGO(TAPE5)
```

LISTING B-3   SAMPLE RUNSTREAM FOR PRBLOS

```
CASE: CLOSE TERRAIN: RANGE BAND FROM ZERO TO 2000 METERS
TGTVEL=    3.0000      CT=   15.0000
PRIV ARRAY: NIV=   11
    0.0000       .1000       .2000       .3000       .4000       .5000       .6000       .7000
     .8000       .9000      1.0000
   25.0000     30.0000     40.0000     50.0000     70.0000    120.0000    140.0000    180.0000
  280.0000    500.0000   1100.0000
PROOV ARRAY: NOOV=   13
    0.0000       .6100       .7430       .8000       .8500       .8650       .8740       .9000
     .9100       .9500       .9800       .9900      1.0000
    0.0000     25.0000     50.0000     75.0000    100.0000    125.0000    150.0000    175.0000
  200.0000    400.0000    600.0000    800.0000   1000.0000
PRIVM ARRAY: NIVM=    9
     .2500       .3000       .4000       .5000       .6000       .7000       .8000       .9000
    1.0000
    0.0000      5.0000     25.0000     75.0000     95.0000    135.0000    235.0000    455.0000
 1055.0000


AVERAGE IN-VIEW SEGMENT LENGTH=  197.2500
AVERAGE OUT-OF-VIEW SEGMENT LENGTH=   72.5750
AVERAGE MODIFIED IN-VIEW SEGMENT LENGTH=  155.1250


PRBLOS=     .5749


END OF CASE
```

LISTING B-4   SAMPLE OUTPUT FROM PRBLOS
(PAGE 1 OF 3)

CASE: CLOSE TERRAIN: RANGE BAND FROM 2000 TO 2500 METERS
TGTVEL=   3.0000   CT=   15.0000
PRIV ARRAY: NIV=   11
   0.0000   .1000   .2000   .3000   .4000   .5000   .6000   .7000
    .8000   .9000   1.0000
  25.0000   30.0000   40.0000   50.0000   70.0000   120.0000   150.0000   200.0000
 420.0000   900.0000 1520.0000
PRODV ARRAY: NOOV=   13
   0.0000   .6100   .7430   .8000   .8500   .8650   .8740   .9000
    .9100   .9500   .9800   .9900   1.0000
   0.0000   25.0000   50.0000   75.0000   100.0000   125.0000   150.0000   175.0000
 200.0000   400.0000   600.0000   800.0000 1000.0000
PRIVM ARRAY: NIVM=   9
    .2500   .3000   .4000   .5000   .6000   .7000   .8000   .9000
   1.0000
 1475.0000   0.0000   5.0000   25.0000   75.0000   105.0000   155.0000   375.0000   855.0000

AVERAGE IN-VIEW SEGMENT LENGTH= 275.2500
AVERAGE OUT-OF-VIEW SEGMENT LENGTH=   72.5750
AVERAGE MODIFIED IN-VIEW SEGMENT LENGTH= 233.1250

PRBLOS=   .6702

END OF CASE

LISTING B-4   SAMPLE OUTPUT FROM PRBLOS
(PAGE 2 OF 3)

CASE: CLOSE TERRAIN: RANGE BAND FROM 2500 TO 9999 METERS
TGTVEL=   3.0000   CT=   15.0000
PPIV ARRAY: NIV=   11

```
   0.0000      .1000      .2000      .3000      .4000      .5000      .6000      .7000
    .8000      .9000     1.0000
  25.0000    40.0000    60.0000   100.0000   140.0000   190.0000   210.0000   240.0000
 310.0000   590.0000  1600.0000
```

PRODV ARRAY: NODV=   13

```
   0.0000      .6100      .7430      .8000      .8500      .8650      .8740      .9000
    .9100      .9500      .9800      .9900     1.0000
   0.0000    25.0000    50.0000    75.0000   100.0000   125.0000   150.0000   175.0000
 200.0000   400.0000   600.0000   800.0000  1000.0000
```

PRIVM ARRAY: NIVM=   10

```
    .1250      .2000      .3000      .4000      .5000      .6000      .7000      .8000
    .9000     1.0000
   0.0000    15.0000    55.0000    95.0000   145.0000   165.0000   195.0000   265.0000
 545.0000  1555.0000
```

AVERAGE IN-VIEW SEGMENT LENGTH= 269.2500
AVERAGE OUT-OF-VIEW SEGMENT LENGTH=   72.5750
AVERAGE MODIFIED IN-VIEW SEGMENT LENGTH= 225.5625

PRBLOS=   .6590

END OF CASE

LISTING B-4   SAMPLE OUTPUT FROM PRBLOS

(PAGE 3 OF 3)

APPENDIX C

LISTING AND SAMPLE CASE OF PREPMS

APPENDIX C

LISTING AND SAMPLE CASE OF PREPMS

This appendix contains:

(1) A listing of the FORTRAN code for the PREPMS program. In addition to the routines in this listing, PREPMS also uses the functions IDCHAR and NUMRIC and the subroutine PENAME which are included in the COPE listing in Appendix D.

(2) One set of sample inputs for PREPMS.

(3) One sample runstream for PREPMS.

(4) Sample output created by running PREPMS with the sample input (and with the records created by the three sample cases of PAM already written to TAPE 11).

Note: The column numbers included in some of the listings in this appendix are not a part of the program code, the data, or the output, but are included only for the reader's convenience.

```
      PROGRAM PREPMS (INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT,DEBUG=OUTPUT   032250    PR-PREPMS2
     1 ,TAPE4,TAPE11)                                                      032260    PR-PREPMS3
                                                                           032270    PR-PREPMS4
C
      COMMON /DODF/ DFDOKL(10,3), NDFSP, NDOKIL, DOKILD                     000250    CM-DODF  2
      LOGICAL DOKILD                                                        000260    CM-DODF  3
      COMMON /INDEX1/ INDX11(2001)                                         .000470    CM-INDEX12
      COMMON /HIT/ INDEX(6,5,2), PETBL(60,10,7), DLIT(6), PKTBL(10,2),      000410    CM-HIT   2
     1 NRNGTF, RNGTTF(20), TTF(3,20,2), NPNGPS, RNGPST(10), PSTTBL(10,      000420    CM-HIT   3
     2 3)                                                                   000430    CM-HIT   4
      COMMON /RANDOC/ TCRIT, NPLOSR, RNGPLS(10), PRPLOS(10)                 000620    CM-RANDOC2
      COMMON /RNGLOS/ NPP, NPP, NRNGCL, CRNGN(11,2), SEGLOS(11,2)           000740    CM-RNGLOS2
     1 RNGCLB(11), VELTBL(2,2)                                             000750    CM-RNGLOS3
      COMMON /RSPTIM/ BATRTM(3), XHVADF(2), DUM1, BCSPTM(2,2), XMTTIM(2,    000790    CM-RSPTIM2
     1 2), TMEAN(2,2), TSIGMA(2,2), DETTMA(10,2), NDT, TRARPY(3,2),         000800    CM-RSPTIM3
     2 PRSPTM, TRBAR, PRSDT, PRSVT, ALPHA(2,2), BETA(2,2), DETTIM,          000810    CM-RSPTIM4
     3 IDSGTP, RUHC, PCRNSG, PRDOW                                          000820    CM-RSPTIM5
      COMMON /SADARB/ MAX, PACQ(10), PKILL(10,7), SCANP(10), RADIS,         000860    CM-SADARB2
     1 RTAB(10), BERPX(10), BERRY(10), PFPPX(10), PEPRY(10), NTAB,          000870    CM-SADARB3
     2 IMPSYS                                                               000880    CM-SADARB4
      COMMON /SYMBOL/ BLANK, DECPHT, ALFBET(27), ANUMBR(11), SEP(5),        000970    CM-SYMBOL2
     1 DOLLAR                                                               000980    CM-SYMBOL3
      COMMON /WEATHER/ PRCLCG, PRCFLS(2), PRGCFL(11,2), W16,11,2),          001060    CM-WEATHR2
     1 VIS(11), CLOUD(6), NCC, NVL, PASQL(6), WNDSPD(3,3), HUMID(2),        001070    CM-WEATHR3
     2 WSUM(2), WCFSUM(2), ICC, IVL                                         001080    CM-WEATHR4
                                                                           032370    PR-PREPM14
                                                                           001220    DM+M    2
      DIMENSION WDATA(193), ACQDAT(161), PSPDAT(49), DFSDAT(31)             001230    DM+M    3
      DIMENSION PDDATA(22), PEDATA(4260), PSTDAT(41), AINVDA(167)           001240    DM+M    4
                                                                           001250    DM+M    5
      EQUIVALENCE (WDATA(1),PPCLCG)                                         001260    DM+M    6
      EQUIVALENCE (ACQDAT(1),HRP)                                           001270    DM+M    7
      EQUIVALENCE (PSPDAT(1),BATRTM(1))                                     001280    DM+M    8
      EQUIVALENCE (DFSDAT(1),DFDOKL(1))                                     001290    DM+M    9
      EQUIVALENCE (PDDATA(1),TCRIT)                                         001310    DM+M   10
      EQUIVALENCE (PEDATA(1),INDEX(1))                                      001320    DM+M   11
      EQUIVALENCE (PSTDAT(1),NPNGFS)                                        001330    DM+M   12
      EQUIVALENCE (AINVDA(1),DLTT(1))                                       001350    DM+M   13
                                                                           001360    DM+N    2
      DIMENSION WPMDAT(143)                                                001370    DM+N    3
                                                                           001380    DM+N    4
      EQUIVALENCE (MAX,WPMDAT(1))                                           001390    DM+N    5
                                                                           001400    DM+N    6
      EXTERNAL NOREC2                                                       032400    PR-PREPM17
      LOGICAL NUMPIC                                                        032410    PR-PREPM18
                                                                           032420    PR-PREPM19
      DIMENSION A(80), E(8,10)                                              032430    PR-PREPM20
      DIMENSION ILIST(2000)                                                 032440    PR-PREPM21
      DIMENSION CHARA(10,30), NDPTIM(70)                                    032450    PP-PREPM22
      DIMENSION IRAY(6)                                                     032460    PR-PREPM23
                                                                           032470    PP-PREPM24
      DATA IRLT1 /193/ , IPLT2 /161/ , IRLT3 /49/ , IPLT4 /31/ , IPLT5     /032480    PR-PREPM25
     122/ , IRLT6 /4260/ , IRLT7 /41/ , IRLT8 /167/ , ICHRRL /300/          032490    PR-PREPM26
      DATA IPLT9 /143/                                                     032500    PR-PREPM27
```

```
00000000011111111112222222222333333333344444444445555555555666666666677777777778888888889   COLUMN NUMBERS
12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789 0  (READ VERTICALLY)
```

LISTING C-1 FORTRAN LISTING OF PREPMS PROGRAM

(PAGE 1 OF 12)

C-3

```
C
      IRAY(1)=0
      IRAY(5)=LOCF(NOPTC2)
      CALL SYSTEMC (104,IRAY)
C
      WRITE (6,710)
C
      CALL OPENMS (11,INDX11,2001,1)
      CALL READMS (11,NOPTPM,70,8NOPTNNUMS)
C
100   WRITE (6,720)
      READ (5,610) (A(I),I=1,80)
      IF (EOF(5).EQ.0.0) GO TO 110
      CALL CLOSMS (11)
      STOP ' IN PREPMS: NORMAL PROGRAM TERMINATION '
C
110   WRITE (6,640) (A(I),I=1,80)
      CALL SEPPC2 (A,80,8,8,10)
      IF (B(1,1).EQ.10HOPTIONWORD.OR.B(1,1).EQ.6HOPTWDS) GO TO 120
      IF (B(1,1).EQ.10HNEWRECORD .OR.B(1,1).EQ.6HNEWREC) GO TO 1P0
      IF (B(1,1).EQ.10HREPORTRECO.OR.B(1,1).EQ.10HRFPRECLIST) GO TO 540
      IF (B(1,1).EQ.10HINTERPPETP) GO TO 560
      STOP ' IN PREPMS: ERROR NUMBER 1 '
C
120   DO 150 J=1,30
130   DO 130 I=1,2
      CHAPA(I,J)=0.0
140   DO 140 I=3,10
      CHARA(I,J)=BLANK
150   CONTINUE
      CLABEL=B(1,2)
      WRITF (6,680) CLABEL
      IF (.NOT.NUMRIC(B,8,10,3)) STOP ' IN PREPMS: ERROR NUMBER 2 '
      DECODE (10,630,P(1,3) )X
      NREAD=X
      IF (.NOT.NUMRIC(B,8,10,4)) STOP ' IN PREPMS: ERROR NUMBER 3 '
      DECODE (10,630,B(1,4) )Y
      NOPT1=Y
      WRITE (6,690) NREAD,NOPT1
C
      DO 170 IJ=1,NREAD
C
      READ (5,610) (A(I),I=1,80)
      WRITE (6,640) (A(I),I=1,80)
      CALL SEPPC2 (A,80,B,8,10)
      IF (.NOT.NUMRIC(E,8,10,1)) STOP ' IN PREPMS: ERROR NUMBER 4 '
      DECODE (10,630,B(1,1) )OPT
      IF (.NOT.NUMRIC(B,P,10,2)) STOP ' IN PREPMS: ERROR NUMBER 5 '
      DECODE (10,630,B(1,2) )XLEV
      CHAPA(1,IJ)=OPT
      CHARA(2,IJ)=XLEV
      DO 160 IK=1,8
      CHAPA(2+IK,IJ)=B(IK,3)
160   CONTINUE
```

```
032510  PR-PREPM28
032520  PR-PREPM29
032530  PP-PREPM30
032540  PP-PREPM31
032550  PP-PREPM32
032560  PP-PREPM33
032570  PP-PREPM34
032580  PR-PREPM35
032590  PR-PREPM36
032600  PR-PREPM37
032610  PR-PREPM38
032620  PR-PREPM39
032630  PP-PREPM40
032640  PP-PREPM41
032650  PR-PREPM42
032660  PR-PREPM43
032670  PR-PREPM44
032680  PR-PREPM45
032690  PP-PREPM46
032700  PP-PREPM47
032710  PP-PREPM48
032720  PR-PREPM49
032730  PR-PREPM50
032740  PR-PREPM51
032750  PR-PREPM52
032760  PR-PREPM53
032770  PR-PREPM54
032780  PR-PREPM55
032790  PR-PREPM56
032800  PR-PREPM57
032810  PR-PREPM58
032820  PR-PREPM59
032830  PR-PREPM60
032840  PR-PREPM61
032850  PR-PREPM62
032860  PP-PREPM63
032870  PR-PREPM64
032880  PR-PREPM65
032890  PR-PREPM66
032900  PR-PREPM67
032910  PR-PREPM68
032920  PR-PREPM69
032930  PR-PREPM70
032940  PR-PREPM71
032950  PR-PREPM72
032960  PP-PREPM73
032970  PP-PREPM74
032980  PR-PREPM75
032990  PR-PREPM76
033000  PR-PREPM77
033010  PR-PREPM78
033020  PR-PREPM79
033030  PR-PREPM80
033040  PP-PREPM81
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LISTING C-1 FORTRAN LISTING OF PREPMS PROGRAM - CONT'D

(PAGE 2 OF 12)

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00000000001111111111222222222233333333334444444444555555555566666666667777777777788888888889   COLUMN NUMBERS
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890   (READ VERTICALLY)

  170 CONTINUE                                                           033050   PR-PREPM82
C                                                                        033060   PR-PREPM83
      NOPTNM(NOPT1)=NRFAD                                                033070   PR-PREPM84
      CALL WRITMS (11,CHAPA,ICHPRL,CLABFL,-1)                            033080   PR-PREPM85
      CALL WRITMS (11,NOPTNM,70,8NOPTNNMS,-1)                            033090   PR-PREPM86
      GO TO 100                                                          033100   PR-PREPM87
C                                                                        033110   PR-PREPM88
  180 FLABEL=B(1,2)                                                      033120   PR-PREPM89
      IF (.NOT.NUMRIC(B,8,10,3)) STOP ' IN PREPMS: ERROR NUMBER 6 '      033130   PR-PREPM90
      DECODE (10,630,B(1,3) )ZCASF                                       033140   PR-PREPM91
      ICASE=ZCASE                                                        033150   PR-PREPM92
      WRITE (6,700) RLARFL,ICASE                                         033160   PR-PREPM93
C                                                                        033170   PR-PREPM94
      GO TO (190,240,290,320,350,370,430,460,500), ICASE                033180   PR-PREPM95
C                                                                        033190   PR-PREPM96
  190 DO 200 I=1,IRLT1                                                   033200   PR-PREPM97
  200 WDATA(I)=0.0                                                       033210   PR-PREPM98
      READ (5,620) NCC,NVL                                              033220   PR-PREPM99
      WRITE (6,650) NCC,NVL                                             033230   PR-PREP100
      READ (5,630) PRCLCG,(PRCFLS(I),I=1,2)                              033240   PR-PREP101
      WRITE (6,660) PRCLCG,(PPCFLS(I),I=1,2)                             033250   PR-PREP102
      DO 210 J=1,2                                                       033260   PR-PREP103
      READ (5,630) (PPGCFL(I,J),I=1,11)                                  033270   PR-PREP104
  210 WRITE (6,660) (PPGCFL(I,J),I=1,11)                                 033280   PR-PREP105
      DO 220 K=1,2                                                       033290   PR-PREP106
      DO 220 J=1,11                                                      033300   PR-PREP107
      READ (5,630) (W(I,J,K),I=1,6)                                      033310   PR-PREP108
  220 WRITE (6,660) (W(I,J,K),I=1,6)                                     033320   PR-PREP109
      READ (5,630) (VIS(I),I=1,NVL)                                      033330   PR-PREP110
      READ (5,630) (CLOUD(I),I=1,6)                                      033340   PR-PREP111
      WRITE (6,660) (VIS(I),I=1,NVL)                                     033350   PR-PREP112
      WRITE (6,660) (CLOUD(I),I=1,NCC)                                   033360   PR-PREP113
      READ (5,630) (PASQL(I),I=1,6)                                      033370   PR-PREP114
      WRITE (6,660) (PASQL(I),I=1,6)                                     033380   PR-PREP115
      DO 230 J=1,3                                                       033390   PR-PREP116
      READ (5,630) (WNDSPD(I,J),I=1,3)                                   033400   PR-PREP117
      WRITE (6,660) (WNDSPD(I,J),I=1,3)                                  033410   PR-PREP118
  230 CONTINUE                                                           033420   PR-PREP119
      READ (5,630) (HUMID(I),I=1,2)                                      033430   PR-PREP120
      WRITE (6,660) (HUMID(I),I=1,2)                                     033440   PR-PREP121
      NRNGCB=NRNGCL+1                                                    033450   PR-PREP122
      CALL WRITMS (11,WDATA,IRLT1,PLABEL,-1)                             033460   PR-PREP123
      GO TO 530                                                          033470   PR-PREP124
C                                                                        033480   PR-PREP125
  240 DO 250 I=1,IRLT2                                                   033490   PR-PREP126
  250 ACQDAT(I)=0.0                                                      033500   PR-PREP127
      READ (5,620) NRP,NPP,NPNGCL                                        033510   PR-PREP128
      WRITE (6,650) NRP,NPP,NPNGCL                                       033520   PR-PREP129
      NRNGCB=NPNGCB                                                      033530   PR-PREP130
      DO 260 J=1,2                                                       033540   PR-PREP131
      READ (5,630) (CRNGD(I,J),I=1,NRP)                                  033550   PR-PREP132
  260 WRITE (6,660) (CRNGD(I,J),I=1,NRP)                                 033560   PR-PREP133
      DO 270 J=1,NPNGCB                                                  033570   PR-PREP134
      READ (5,630) (SFCLNS(I,J),I=1,NPP)                                 033570   PR-PREP134
      WRITE (6,660) (SEGLQS(I,J),I=1,NPP)                                033580   PR-PREP135

00000000001111111111222222222233333333334444444444555555555566666666667777777777788888888889   COLUMN NUMBERS
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890   (READ VERTICALLY)

            LISTING C-1   FORTRAN LISTING OF PREPMS PROGRAM - CONT'D
                                (PAGE 3 OF 12)
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C-5

COLUMN NUMBERS (READ VERTICALLY)

00000000011111111112222222222333333333344444444445555555555666666666677777777778888888889
12345678901234567890123456789012345678901234567890123456789012345678901234567890

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270   CONTINUE                                                      033590  PR-PREP136
      READ (5,630) (RNGCLB(I),I=1,MRNGCL)                           033600  PR-PREP137
      WRITE (6,660) (RNGCLB(I),I=1,NRNGCL)                          033610  PR-PREP138
      DO 280 J=1,2                                                  033620  PR-PREP139
      READ (5,630) (VELTBL(I,J),I=1,2)                              033630  PR-PREP140
      WRITE (6,660) (VELTBL(I,J),I=1,2)                             033640  PR-PREP141
280   CONTINUE                                                      033650  PR-PREP142
      CALL WRITMS (11,ACQDAT,IRLT2,RLABEL,-1)                       033660  PR-PREP143
      GO TO 530                                                     033670  PR-PREP144
C                                                                   033680  PR-PREP145
290   DO 300 I=1,IRLT3                                              033690  PR-PREP146
300   RSPDAT(I)=0.0                                                 033700  PR-PREP147
      READ (5,620) NDT                                              033710  PR-PREP148
      WRITE (6,650) NDT                                             033720  PR-PREP149
      DO 310 J=1,2                                                  033730  PR-PREP150
      READ (5,630) (DETTMA(I,J),I=1,NDT)                            033740  PR-PREP151
      WRITE (6,660) (DETTMA(I,J),I=1,NDT)                           033750  PR-PREP152
310   CONTINUE                                                      033760  PR-PREP153
      READ (5,630) (BATRTM(I),I=1,3),(XNVADF(I),I=1,2)              033770  PR-PREP154
      WRITE (6,660) (BATRTM(I),I=1,3),(XNVADF(I),I=1,2)             033780  PR-PREP155
      READ (5,630) ((DCSPTM(I,J),J=1,2),((XMTTIM(I,J),J=1,2),I=1,   033790  PR-PREP156
     1 2)                                                           033810  PR-PREP157
      WRITE (6,660) ((DCSPTM(I,J),I=1,2),((XMTTIM(I,J),I=1,2),J=1,  033800  PR-PREP158
     1 ,2)                                                          033810  PR-PREP159
      READ (5,630) ((TMEAN(I,J),I=1,2),J=1,2),((TSIGMA(I,J),I=1,2),J=1, 033830  PR-PREP160
     1 2)                                                           033840  PR-PREP161
      WRITE (6,660) ((TMEAN(I,J),J=1,2),((TSIGMA(I,J),J=1,2),I=1,   033850  PR-PREP162
     1 2)                                                           033860  PR-PREP163
      READ (5,630) ((TRAPRY(I,J),I=1,3),J=1,2)                      033870  PR-PREP164
      WRITE (6,660) ((TRARRY(I,J),I=1,3),J=1,2)                     033880  PR-PREP165
      CALL WRITMS (11,RSPDAT,IRLT3,RLABEL,-1)                       033890  PR-PREP166
      GO TO 530                                                     033900  PR-PREP167
C                                                                   033910  PR-PREP168
320   DO 330 I=1,IRLT4                                              033920  PR-PREP169
330   DFSDAT(I)=0.0                                                 033930  PR-PREP170
      READ (5,620) NDFSP                                            033940  PR-PREP171
      WRITE (6,650) NDFSP                                           033950  PR-PREP172
      DO 340 J=1,3                                                  033960  PR-PREP173
      READ (5,630) (DFDOKL(I,J),I=1,NDFSP)                          033970  PR-PREP174
      WRITE (6,660) (DFDOKL(I,J),I=1,NDFSP)                         033980  PR-PREP175
340   CONTINUE                                                      033990  PR-PREP176
      CALL WRITMS (11,DFSDAT,IRLT4,RLABEL,-1)                       034000  PR-PREP177
      GO TO 530                                                     034010  PR-PREP178
C                                                                   034020  PR-PREP179
350   DO 360 I=1,IRLT5                                              034030  PR-PREP180
360   RNDATA(I)=0.0                                                 034040  PR-PREP181
      READ (5,620) NPLOSR                                           034050  PR-PREP182
      READ (5,630) TCRIT                                            034060  PR-PREP183
      READ (5,630) (RNGPLS(I),I=1,NPLOSR)                           034070  PR-PREP184
      READ (5,630) (PPRLOS(I),I=1,NPLOSR)                           034080  PR-PREP185
      WRITE (6,650) NPLOSR                                          034090  PR-PREP186
      WRITE (6,660) TCRIT                                           034100  PR-PREP187
      WRITE (6,660) (RNGPLS(I),I=1,NPLOSR)                          034110  PR-PREP188
      WRITE (6,660) (PPRLOS(I),I=1,NPLOSR)                          034120  PR-PREP189
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12345678901234567890123456789012345678901234567890123456789012345678901234567890

COLUMN NUMBERS (READ VERTICALLY)

LISTING C-1 FORTRAN LISTING OF PREPMS PROGRAM - CONT'D

(PAGE 4 OF 12)

```
      CALL WRITMS (11,RDDATA,IRLT5,RLABEL,-1)                        034130  PR-PREP190
      GO TO 530                                                      034140  PP-PREP191
C                                                                    034150  PR-PREP192
  370 DO 380 I=1,IRLT6                                               034160  PR-PREP193
  380 PEDATA(I)=0.0                                                  034170  PR-PREP194
      IUNIT=5                                                        034180  PR-PREP195
      READ (5,610) (A(I),I=1,80)                                     034190  PR-PREP196
      CALL SEPRC2 (A,80,B,8,10)                                      034200  PP-PREP197
      IF (B(1,1).NE.8HUSETAPE4) GO TO 390                            034210  PP-PREP198
      IUNIT=4                                                        034220  PR-PREP199
      WRITE (6,600)                                                  034230  PR-PREP200
      GO TO 400                                                      034240  PR-PREP201
  390 ENCODE (20,610,B(1,1) )(A(I),I=1,20)                           034250  PP-PREP202
      DECODE (20,670,B(1,1) )(INDFX(I,1,K),K=1,2)                    034260  PR-PREP203
  400 CONTINUE                                                       034270  PR-PREP204
      DO 410 I=1,6                                                   034280  PR-PREP205
      ISTART=1                                                       034290  PR-PREP206
      IF (I.EQ.1.AND.IUNIT.EQ.5) ISTART=2                            034300  PP-PREP207
      DO 410 J=ISTART,5                                              034310  PP-PREP208
      READ (IUNIT,670) (INDEX(I,J,K),K=1,2)                          034320  PR-PREP209
      WRITE (6,650) (INDEX(I,J,K),K=1,2)                             034330  PR-PREP210
  410 CONTINUE                                                       034340  PR-PREP211
      DO 420 I=1,60                                                  034350  PR-PREP212
      DO 420 J=1,10                                                  034360  PR-PREP213
      READ (IUNIT,630) (PETBL(I,J,K),K=1,7)                          034370  PR-PREP214
      WRITE (6,660) (PETRL(I,J,K),K=1,7)                             034380  PR-PREP215
  420 CONTINUE                                                       034390  PR-PREP216
      GO TO 530                                                      034400  PR-PREP217
C                                                                    034410  PR-PREP218
  430 DO 440 I=1,IRLT7                                               034420  PR-PREP219
  440 PSTDAT(I)=0.0                                                  034430  PR-PREP220
      READ (5,620) NRNGPS                                            034440  PR-PREP221
      WRITE (6,650) NRNGPS                                           034450  PR-PREP222
      READ (5,630) (PNGPST(I),I=1,NRNGPS)                            034460  PR-PREP223
      WRITE (6,660) (RNGPST(I),I=1,NRNGPS)                           034470  PR-PREP224
      DO 450 J=1,3                                                   034480  PR-PREP225
      READ (5,630) (PSTTBL(I,J),I=1,NRNGPS)                          034490  PR-PREP226
      WRITE (6,660) ("PSTTBL(I,J),I=1,NRNGPS)                        034500  PR-PREP227
  450 CONTINUE                                                       034510  PR-PREP228
      CALL WRITMS (11,PSTDAT,IPLT7,RLABFL,-1)                        034520  PR-PREP229
      GO TO 530                                                      034530  PR-PREP230
C                                                                    034540  PR-PREP231
  460 DO 470 I=1,IPLTB                                               034550  PR-PREP232
  470 AINVDA(I)=0.0                                                  034560  PR-PREP233
      READ (5,620) NRNGTT                                            034570  PR-PREP234
      WRITE (6,650) NRNGTT                                           034580  PP-PREP235
      DO 480 J=1,NRNGTT                                              034590  PR-PREP236
      READ (5,630) RNGTTF(J),((TTF(I,J,K),K=1,2),I=1,3)             034600  PR-PREP237
      WRITE (6,660) PNGTTF(J),((TTF(I,J,K),Y=1,2),I=1,3)            034610  PP-PREP238
      READ (5,630) (DLTT(I),I=1,6)                                   034620  PR-PREP239
      WRITE (6,660) (DLTT(I),I=1,6)                                  034630  PR-PREP240
      DO 490 J=1,2                                                   034640  PR-PREP241
      READ (5,630) (PKTBL(I,J),I=1,7)                                034650  PR-PREP242
  490 WRITE (6,660) (PKTBL(I,J),I=1,7)                               034660  PR-PREP243
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LISTING C-1 FORTRAN LISTING OF PREPMS PROGRAM - CONT'D

(PAGE 5 OF 12)

```
      CALL WRITMS (11,AINVDA,IPLT8,PLABEL,-1)
      GO TO 530
C
  500 DO 510 I=1,IPLT9
  510 WPNDAT(I)=0.0
      READ (5,620) MAX
      WRITE (6,650) MAX
      READ (5,630) (PACQ(I),I=1,MAX)
      WRITE (6,660) (PACQ(I),I=1,MAX)
      DO 520 J=1,7
      READ (5,630) (PKILL(I,J),I=1,MAX)
      WRITE (6,660) (PKILL(I,J),I=1,MAX)
  520 CONTINUE
      READ (5,630) (SCANR(I),I=1,MAX)
      WRITE (6,660) (SCANR(I),I=1,MAX)
      READ (5,630) RADIS
      WRITE (6,660) RADIS
      READ (5,620) NTAB
      WRITE (6,650) NTAB
      READ (5,630) (RTAB(I),I=1,NTAB)
      WRITE (6,660) (RTAB(I),I=1,NTAB)
      READ (5,630) (BERRX(I),I=1,NTAB)
      WRITE (6,660) (BERRX(I),I=1,NTAB)
      READ (5,630) (BERRY(I),I=1,NTAB)
      WRITE (6,660) (BERRY(I),I=1,NTAB)
      READ (5,630) (PERRX(I),I=1,NTAB)
      WRITE (6,660) (PERRX(I),I=1,NTAB)
      READ (5,630) (PERRY(I),I=1,NTAB)
      WRITE (6,660) (PERRY(I),I=1,NTAB)
      CALL WRITMS (11,WPNDAT,IRLT9,PLABEL,-1)
      GO TO 530
C
  530 CONTINUE
      GO TO 100
C
  540 IOUT=1
      DO 550 I=2,2000,2
      IF (INDX11(I).EQ.0) GO TO 550
      ILIST(IOUT)=INDX11(I)
      ILIST(IOUT+1)=INDX11(I+1)
      IOUT=IOUT+2
  550 CONTINUE
C
      WRITE (6,730) (ILIST(IJ),IJ=1,IOUT)
C
      GO TO 100
C
  560 CONTINUE
      DO 570 I=2,2000,2
      DECODE (10,580,INDX11(I) )PECHK
      IF (PECHK.NE.4HPE00) GO TO 570
      IPECOD=INDX11(I)
      CALL PEIDNT (T1,I2,T3,T4,T5,T6,T7,T8,T9,IPECOD)
      WRITE (6,590) IPECOD,T1,I2,T3,T4,T5,T6,T7,T8,T9
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034670 PP.-PREP244
034680 PR.-PREP245
034690 PR.-PREP246
034700 PR.-PREP247
034710 PR.-PREP248
034720 PR.-PREP249
034730 PR.-PREP250
034740 PR.-PREP251
034750 PR.-PREP252
034760 PR.-PREP253
034770 PR.-PREP254
034780 PR.-PREP255
034790 PR.-PREP256
034800 PR.-PREP257
034810 PR.-PREP258
034820 PR.-PREP259
034830 PR.-PREP260
034840 PR.-PREP261
034850 PR.-PREP262
034860 PR.-PREP263
034870 PR.-PREP264
034880 PR.-PREP265
034890 PR.-PREP266
034900 PR.-PREP267
034910 PR.-PREP268
034920 PR.-PREP269
034930 PR.-PREP270
034940 PR.-PREP271
034950 PR.-PREP272
034960 PR.-PREP273
034970 PR.-PREP274
034980 PR.-PREP275
034990 PP.-PREP276
035000 PR.-PREP277
035010 PP.-PREP278
035020 PR.-PREP279
035030 PR.-PREP280
035040 PR.-PREP281
035050 PR.-PREP282
035060 PR.-PREP283
035070 PR.-PREP284
035080 PR.-PREP285
035090 PR.-PREP286
035100 PR.-PREP287
035110 PR.-PREP288
035120 PP.-PREP289
035130 PP.-PREP290
035140 PR.-PREP291
035150 PR.-PREP292
035160 PR.-PREP293
035170 PR.-PREP294
035180 PR.-PREP295
035190 PR.-PREP296
035200 PR.-PREP297

COLUMN NUMBERS (READ VERTICALLY)

LISTING C-1 FORTRAN LISTING OF PREPMS PROGRAM - CONT'D

(PAGE 6 OF 12)

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000000000111111111122222222223333333333444444444455555555556666666666777777777788888888889   COLUMN NUMBERS
123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890   (READ VERTICALLY)

  570 CONTINUE                                                                       035210   PR-PREP298
                                                                                     035220   PR-PREP299
    C     GO TO 100                                                                   035230   PR-PREP300
                                                                                     035240   PR-PREP301
    C                                                                                035250   PR-PREP302
    C                                                                                035260   PR-PREP303
    C                                                                                035270   PR-PREP304
    C  *** F O R M A T   S T A T E M E N T S ***                                      035280   PR-PREP305
  580 FORMAT (A4,6X)                                                                  035290   PR-PREP306
  590 FORMAT (5X,11HPE RECORD: ,A10,4H TR=,F4.0,4H DT=,I1,5H VEL=,F2.0,5 035290   PR-PREP307
     1H GTR=,F3.0,6H REFL=,F4.2,8H ANGLF T=,F4.0,6H DEFB=,F4.0,7H TGTHD=, 035300   PR-PREP307
     2F3.0,7H SKSEN=,F3.0)                                                            035310   PR-PREP308
  600 FORMAT (1H ,36H TAPE4 USED TO INPUT THIS PE DATA : )                            035320   PR-PREP309
  610 FORMAT (80A1)                                                                   035330   PR-PREP310
  620 FORMAT (16I5)                                                                   035340   PR-PREP311
  630 FORMAT (8F10.4)                                                                 035350   PR-PREP312
  640 FORMAT (1H ,80A1)                                                               035360   PR-PREP313
  650 FORMAT (1H ,16I5)                                                               035370   PR-PREP314
  660 FORMAT (1H ,8F10.4)                                                             035380   PR-PREP315
  670 FORMAT (2I10)                                                                   035390   PR-PREP316
  680 FORMAT (1H ,33H OPTION WORD TYPE RECORD NAMED : ,A10,13H BEING INP 035400   PR-PREP317
     1UT )                                                                            035410   PR-PREP318
  690 FORMAT (1H ,I2,37H OPTION CARDS READ FOR KEYWORD NUMBER,I3)                     035420   PR-PREP319
  700 FORMAT (1H ,16H RECORD NAMED : ,A10,9H OF TYPE ,I2,16H NOW BEING R 035430   PR-PREP320
     1EAD )                                                                           035440   PR-PREP321
  710 FORMAT (1H1)                                                                    035450   PR-PREP322
  720 FORMAT (1H ,R(10H* * * * ))                                                     035460   PR-PREP323
  730 FORMAT (1H ,47H RECORD NAMES AND FILE INFORMATION FOR TAPE11 :,/,( 035470   PR-PREP324
     11H ,3(A10,2X,O20,10X)))                                                         035480   PR-PREP325
      END                                                                             035490   PR-PREP326

000000000111111111122222222223333333333444444444455555555556666666666777777777788888888889   COLUMN NUMBERS
123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890   (READ VERTICALLY)
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LISTING C-1 FORTRAN LISTING OF PREPMS PROGRAM - CONT'D

(PAGE 7 OF 12)

C-9

```
C     BLOCK DATA BDATA2                                                        035510   BD-BDATA22
                                                                               035520   BD-BDATA23
      COMMON /LOGFLG/ FIRSTL, SEQNML, SPCL(70), SHRTEC, FTSILL                 000510   CM+LOGFLG2
      LOGICAL FIRSTL, SEQNML, SPCL, SHRTEC, FTSILL                             000520   CM+LOGFLG2
      COMMON /SYMBOL/ BLANK, DECPNT, ALFBET(27), ANUMBR(11), SEP(5),           000970   CM+SYMBOL2
     1 DOLLAR                                                                  000980   CM+SYMBOL3
      COMMON /XVALUE/ XVALUE(8,9,2)                                            001100   CM+XVALUE2
                                                                               035560   BD-BDATA27
C     * * * * *   FILL IN LOGFLG COMMON BLOCK    * * * * *                     001420   DT+LOGFLG2
                                                                               001430   DT+LOGFLG3
      DATA FIRSTL /.TRUE./, SEQNML /.FALSE./                                   001440   DT+LOGFLG4
      DATA (SPCL(I),I=1,70) /70*.FALSE./                                       001450   DT+LOGFLG5
      DATA SHRTEC /.TRUE./                                                     001460   DT+LOGFLG6
                                                                               001480   DT+SYMBOL2
C     * * * * *   FILL IN SYMBOL COMMON BLOCK    * * * * *                     001490   DT+SYMBOL3
                                                                               001500   DT+SYMBOL4
      DATA BLANK /1H /, DECPNT /1H./                                           001510   DT+SYMBOL5
      DATA ALFBET /1HA, 1HB, 1HC, 1HD, 1HE, 1HF, 1HG, 1HH, 1HI, 1HJ, 1HK,001520   DT+SYMBOL6
     1, 1HL, 1HM, 1HN, 1HO, 1HP, 1HQ, 1HR, 1HS, 1HT, 1HU, 1HV, 1HW, 1HX,001530   DT+SYMBOL7
     2 1HY, 1HZ, 1H*/                                                          001540   DT+SYMBOL8
      DATA ANUMBR /1HO, 1H1, 1H2, 1H3, 1H4, 1H5, 1H6, 1H7, 1H8, 1H9, 1H-001550   DT+SYMBOL9
     1/                                                                        001560   DT+SYMBO10
      DATA SEP /1H$, 1H/, 1H?, 1H(, 1H)/                                       001570   DT+SYMBO11
      DATA DOLLAR /1H$/                                                        001580   DT+SYMBO12
                                                                               001590   DT+SYMBO13
C     * * * * *   FILL IN XVALUE COMMON BLOCK    * * * * *                     001610   DT+XVALUE2
                                                                               001620   DT+XVALUE3
      DATA (((XVALUE(I,J,K),I=1,8),J=1,2),K=1,9) /                            001630   DT+XVALUE4
C         DUMMY SLOTS FOR NOMINAL RESPONSE TIMES                               001640   DT+XVALUE5
     1    8*0.,                                                                001650   DT+XVALUE6
     2    8*8.,                                                                001660   DT+XVALUE7
C         DESIGNATOR TYPES                                                     001670   DT+XVALUE8
     1    1.,    2.,    3.,    5*0.,                                           001680   DT+XVALUE9
     2    0.,    1.,    1.,    5*8.,                                           001690   DT+XVALU10
C         TARGET VELOCITIES                                                    001700   DT+XVALU11
     1    2.,    3.,    5.,    8.,    0.,    3*0.,                             001710   DT+XVALU12
     2    0.,    0.,    1.,    2.,    2.,    3*8.,                             001720   DT+XVALU13
C         GUN-TARGET RANGES                                                    001730   DT+XVALU14
     1    8.,   12.,   20.,   30.,   40.,   10.,   16.,   0.,                 001740   DT+XVALU15
     2    0.,    1.,    2.,    3.,    4.,    5.,    6.,    8.,                 001750   DT+XVALU16
C         REFLECTIVITIES                                                       001760   DT+XVALU17
     1    .05,   .10,   .20,   .30,   4*0.,                                    001770   DT+XVALU18
     2    0.,    1.,    2.,    3.,    4*8.,                                    001780   DT+XVALU19
C         ANGLES T                                                            001790   DT+XVALU20
     1    0.,   25.,   30.,   60.,   90.,  120.,  2*0.,                       001800   DT+XVALU21
     2    0.,    1.,    2.,    3.,    4.,    5.,    2*8.,                      001810   DT+XVALU22
C         DEFLECTION BIASES                                                    001820   DT+XVALU23
     1 -200., -100.,    0.,  100.,  200.,  3*0.,                              001830   DT+XVALU24
     2    0.,    1.,    2.,    3.,    4.,    3*8.,                             001840   DT+XVALU25
C         TARGET HEADINGS                                                      001850   DT+XVALU26
     1  -60.,  -30.,    0.,   30.,   60.,   3*0.,                             001860   DT+XVALU27
     2    0.,    1.,    2.,    3.,    4.,    3*8.,                             001870   DT+XVALU28
C         SEEKER SENSITIVITIES                                                 001880   DT+XVALU29
                                                                               001890   DT+XVALU30
```

LISTING C-1   FORTRAN LISTING OF PREPMS PROGRAM - CONT'D

(PAGE 8 OF 12)

```
CSEC  THE FOLLOWING CARD CONTAINS FALSE SEEKER SENSITIVITY VALUES TO     001900   DT+XVALU31
CSEC  AVOID INCLUDING CLASSIFIED NUMBERS IN THE PROGRAM LISTING.         001910   DT+XVALU32
CSEC  THE CORRECT VALUES SHOULD BE RESTORED WHEN RUNNING IN A SECURE     001920   DT+XVALU33
CSEC  ENVIRONMENT.  RUNS DONE WITH THESE FALSE VALUES ARE FOR EXAMPLE    001930   DT+XVALU34
CSEC  PURPOSES ONLY.                                                     001940   DT+XVALU35
      1   24.,  36.,  48.,  60.,  72.,  3*0.,                            001950   DT+XVALU36
      2   0.,   1.,   2.,   3.,   4.,   3*8./                            001960   DT+XVALU37
                                                                         001970   DT+XVALU38
C     END                                                                035600   BD-BDATA11
```

LISTING C-1 FORTRAN LISTING OF PREPMS PROGRAM - CONT'D

(PAGE 9 OF 12)

```
      SUBROUTINE SEPRC2 (A,N1,B,N2,N3)
C
      COMMON /LNGFLG/ FIRSTL, SEQNML, SPCL(70), SHRTEC, FTSILL
      LOGICAL FIRSTL, SEQNML, SPCL, SHRTEC, FTSILL
      COMMON /SYMBOL/ BLANK, DECPNT, ALFBET(27), ANUMBR(11), SEP(5),
     1 DOLLAR
C
      DIMENSION A(N1), B(N2,N3), NCPR(10)
      DIMENSION NC(80), PB(80,10), IC(80,10), NUMFLG(10)
C
      DO 110 I=1,10
      NUMFLG(I)=0
      DO 100 J=1,80
      IC(J,I)=0
  100 CONTINUE
  110 CONTINUE
  120 NC(I)=0
      DO 130 I=1,N2
      DO 130 J=1,N3
  130 B(I,J)=BLANK
      DO 140 I=1,80
      DO 140 J=1,10
  140 PB(I,J)=BLANK
      DO 150 I=1,10
  150 NCPR(I)=0
C
      DO 160 I=1,N1
  160 NC(I)=IDCHAR(A,N1,I)
C
      IF (.NOT.FIRSTL) GO TO 200
      FIRSTL=.FALSE.
      DO 170 I=73,78
      IF (NC(I).NE.0) GO TO 230
  170 CONTINUE
      DO 180 I=63,72
      IF (NC(I).NE.3) GO TO 230
  180 CONTINUE
      DO 190 I=79,80
      IF (NC(I).NE.3) GO TO 230
  190 CONTINUE
      SEQNML=.TRUE.
      WRITE (6,330)
      WRITE (6,340)
      GO TO 210
  200 IF (.NOT.SEQNML) GO TO 230
  210 DO 220 I=73,78
      NC(I)=3
  220 CONTINUE
  230 CONTINUE
C
C SEPARATE RECORDS ON INPUT CARD.
C
      I=1
```

Sequence	Label
035620	SR-SEPRC22
035630	SP-SEPRC23
000510	CM+LOGFLG2
000520	CM+LOGFLG3
000970	CM+SYMBOL2
.000980	CM+SYMBOL3
035660	SR-SEPRC26
035670	SR-SEPRC27
035680	SR-SEPRC28
035690	SR-SEPRC29
035700	SR-SEPRC10
035710	SR-SEPRC11
035720	SR-SEPRC12
035730	SR-SEPRC13
035740	SR-SEPRC14
035750	SR-SEPRC15
035760	SR-SEPRC16
035770	SR-SEPRC17
035780	SR-SEPRC18
035790	SR-SEPRC19
035800	SR-SEPRC20
035810	SP-SEPRC21
035820	SP-SEPRC22
035830	SR-SEPRC23
035840	SR-SEPRC24
035850	SR-SEPRC25
035860	SR-SEPRC26
035870	SR-SEPRC27
035880	SR-SEPRC28
035890	SR-SEPRC29
035900	SR-SEPRC30
035910	SR-SEPRC31
035920	SR-SEPRC32
035930	SR-SEPRC33
035940	SR-SEPRC34
035950	SR-SEPRC35
035960	SR-SEPRC36
035970	SR-SEPRC37
035980	SR-SEPRC38
035990	SR-SEPRC39
036000	SR-SEPRC40
036010	SR-SEPRC41
036020	SR-SEPRC42
036030	SR-SEPRC43
036040	SR-SEPRC44
036050	SR-SEPRC45
036060	SP-SEPRC46
036070	SR-SEPRC47
036080	SR-SEPRC48
036090	SR-SEPRC49
036100	SR-SEPRC50
036110	SP-SEPRC51
036120	SR-SEPRC52
036130	SP-SEPRC53

LISTING C-1 FORTRAN LISTING OF PREPMS PROGRAM - CONT'D

(PAGE 10 OF 12)

```
       IW=0                                                              036140    SR-SEPRC54
       IX=0                                                              036150    SR-SEPRC55
       J=0                                                              036160    SR-SEPRC56
       LSTCMA=0                                                          036170    SR-SEPRC57
  240  IF (I.GT.N1) GO TO 300                                            036180    SR-SEPRC58
       IF (NC(I).NE.3.OR.IW.NE.IX) GO TO 260                             036190    SR-SEPRC59
  250  I=I+1                                                            036200    SR-SEPRC60
       GO TO 240                                                        036210    SR-SEPRC61
  260  IF (NC(I).EQ.3.OR.NC(I).EQ.4.OR.IW.NE.IX) GO TO 270               036220    SR-SEPRC62
       IW=IW+1                                                           036230    SR-SEPRC63
       J=0                                                              036240    SR-SEPRC64
       GO TO 290                                                        036250    SR-SEPRC65
  270  IF (NC(I).NE.4) GO TO 290                                         036260    SR-SEPRC66
       IF (I.NE.(LSTCMA+1)) GO TO 280                                    036270    SR-SEPRC67
       IW=IW+1                                                           036280    SR-SEPRC68
  280  IX=IW                                                            036290    SR-SEPRC69
       LSTCMA=I                                                          036300    SR-SEPRC70
       GO TO 250                                                        036310    SR-SEPRC71
  290  IF (NC(I).EQ.3) GO TO 250                                         036320    SR-SEPRC72
       J=J+1                                                            036330    SR-SEPRC73
       PB(J,IW)=A(I)                                                     036340    SR-SEPRC74
       IC(J,IW)=NC(I)                                                    036350    SR-SEPRC75
       NCPP(IW)=NCPP(IW)+1                                               036360    SR-SEPRC76
       GO TO 250                                                        036370    SR-SEPRC77
  300  CONTINUE                                                          036380    SR-SEPRC78
       NRE=IW                                                            036390    SR-SEPRC79
       IF (NRE.GE.0.AND.NRE.LE.10) GO TO 310                             036400    SR-SEPRC80
       STOP ' IN SEPRC2: ERROR NUMBER 1 '                               036410    SR-SEPRC81
C                                                                        036420    SR-SEPRC82
C      ENCODE RECORDS INTO B ARRAY .                                    036430    SR-SEPRC83
C                                                                        036440    SR-SEPRC84
  310  CONTINUE                                                          036450    SR-SEPRC85
       DO 320 I=1,NRE                                                    036460    SR-SEPRC86
       KCHAR=NCPP(I)                                                     036470    SR-SEPRC87
       ENCODE (80,350,B(1,I) )(PB(J,I),J=1,KCHAR)                        036480    SR-SEPRC88
  320  CONTINUE                                                          036490    SR-SEPRC89
C                                                                        036500    SR-SEPRC90
       RETURN                                                           036510    SR-SEPRC91
C                                                                        036520    SR-SEPRC92
C                                                                        036530    SR-SEPRC93
C   *** F O R M A T   S T A T E M E N T S  * * *                        036540    SR-SEPRC94
C                                                                        036550    SR-SEPRC95
  330  FORMAT (12H **PREPMS** ,10QHNON-FATAL WARNING ! YOU HAVE SEQUENCE 036560    SR-SEPRC96
      1NUMBERS IN COLS. 73-78 OF TAPE5.  THEY WILL BE REMOVED BY THE PROG036570    SR-SEPRC97
      2RAM; )                                                           036580    SR-SEPRC98
  340  FORMAT (12H **PREPMS** ,38H HOWEVER, THE RESULTS MAY BE SUSPECT. )036590    SR-SEPRC99
  350  FORMAT (80A1)                                                     036600    SR-SEPR100
       END                                                              036610    SR-SEPR101
```

LISTING C-1 FORTRAN LISTING OF PREPMS PROGRAM - CONT'D

(PAGE 11 OF 12)

```
0000000001111111111222222222233333333334444444444555555555566666666667777777777888888889 COLUMN NUMBERS
123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890 (READ VERTICALLY)

C                                                                        036630    SR-NOREC22
      SUBROUTINE NOREC2                                                  036640    SR-NOREC23
C                                                                        036650    SR-NOREC24
      WRITE (6,100)                                                      036660    SR-NOREC25
C                                                                        036670    SR-NOREC26
      RETURN                                                             036680    SR-NOREC27
C                                                                        036690    SR-NOREC28
C                                                                        036700    SR-NOREC29
C * * *  F O R M A T   S T A T E M E N T S  * * *                        036710    SR-NOREC10
C                                                             036720      SR-NOREC11
  100 FORMAT (12H **PREPMS** ,44H THIS IS A CREATION RUN FOR RECORD OPTN  036730    SR-NOREC12
     1NUMS )                                                             036740    SR-NOREC13
      END                                                                036750    SR-NOREC14
C

0000000001111111111222222222233333333334444444444555555555566666666667777777777888888889 COLUMN NUMBERS
123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890 (READ VERTICALLY)
```

LISTING C-1 FORTRAN LISTING OF PREPMS PROGRAM - CONT'D

(PAGE 12 OF 12)

```
NEW RECORD,XINVNA0128,8
     16
0.        .99    .95    .99    .80    .90    .60
500.      .95    .90    .95    .75    .85    .55
1000.     .95    .85    .90    .70    .80    .40
1500.     .90    .80    .85    .65    .75    .30
2000.     .85    .80    .70    .60    .70    .15
2500.     .80    .75    .65    .50    .60    .05
3000.     .75    .70    .60    .45    .0     .0
3500.     .70    .65    .55    .40    .0     .0
4000.     .65    .60    .50    .35    .0     .0
4500.     .60    .55    .45    .30    .0     .0
5000.     .55    .50    .40    .25    .0     .0
5500.     .50    .45    .35    .20    .0     .0
6000.     .45    .40    .30    .15    .0     .0
6500.     .40    .35    .25    .10    .0     .0
7000.     .35    .30    .20    .0     .0     .0
9000.     .30    .20    .10    .0     .0     .0
0.        30.    90.    150.   300.   9000.  .600
.500      .700   .500   .800   .700   .950   .300
.500      .600   .450   .750   .700   1.00
NEW RECORD,JUN06.00021,1
     6    11
.559      .22    .69    .004   .022   .0     .004
.007      .004   .0     .004   .004   .004   .014
.051      .032   .343          .004
.011      .0     .448
.0        .022          .0     .015   .018
.018      .0     .0     .0     .004   .011
.007      .0     .0     .0     .011
.004      .0     .0     .0     .011
.0        .007          .0     .036
.0        .004   .0     .0     .0
.004                    .0     .033
.004             .0     .0     .004
.0        .0     .004   .0     .051
.0        .0            .004   .036
.0        .004   .011          .252
.004      .007   .004   .015   .015
.004      .007                 .007
.007                    .0     .007
.007      .0     .0     .0     .0
.004      .0            .0     .007
.0        .0     .0     .0     .0
.007      .004   .0     .0     .022
.0        .004   .0     .0     .011
.0        .004   .004   .0     .022
.0        .0     .0     .0     .022
```

LISTING C-2 SAMPLE INPUT FOR PREPMS
(PAGE 1 OF 15)

LISTING C-2 SAMPLE INPUT FOR PREPMS - CONT'D

(PAGE 2 OF 15)

```
.378           .01      .003     .0       .014     .003
.0             .0       .0       .007
.406           .0       .0       .0
.0             .0       .0       .0
.0             .007     .007     .003
.0             .0       .0       .0
.0             .003     .003     .021
.0             .003     .003     .007
.003           .003     .007     .021
.0             .003     .017     .035
.01            .0       .0       .339
.0             .0       .0       .0
.0             .0       .003     .0
.0             .0       .0       .003
.0             .0       .0       .0
.0             .0       .003     .003
.0             .0       .0       .007
.003           .003     .0       .024
.007           .014     .028     .357
.0             4.       5.       6.       7.       8.
3.             762.     914.     1372.
11.            .1       .05      .85
610.           0.       0.
0.             1.       1.
1.             .0
.0
.0
.95
NEW PFC,DEC0600021,1
6   11

.22      .69      .033     .136     .0       .103     .017
.026     .04      .0       .013     .0       .017     .023
.043     .199     .0       .0
.01      .003     .0       .0
.026     .130     .0       .017
.007     .007     .003     .003
.0       .003     .0       .01
.003     .003     .0       .01
.003             .017     .013     .03
.01      .02      .007     .013     .03
.0       .0       .0       .0
.003     .01      .017     .023
.003     .0       .0       .01
.003     .01      .003     .033
.003     .0       .0       .03
```

LISTING C-2 SAMPLE INPUT FOR PREPMS - CONT'D
(PAGE 3 OF 15)

```
.007      .0       .007     .017     .02      .149
.01       .003     .003     .003     .003     .003
.01       .0       .0       .0       .0       .0
.003      .0       .0       .0       .0       .0
.0        .00      .0       .0       .0       .007
.007      .0       .0       .007     .0       .0
.007      .0       .003     .0       .003     .0
.02       .0       .0       .0       .003     .007
.01       .003     .003     .01      .003     .04
.026      .007     .013     .01      .026
1.        .023     3.       4.       5.       6.
9.        2.       11.
304.      10.      610.     762.     914.     1372.
.0        457.     .0       .66      .09      .26
1.        .0       1.
.0        .6       .0
.01       .2
          .99
NEW PFC,DFC1400021,1
 6    11
.637      .22      .69      .027     .104     .003               .067     .04
.05       .02      .023     .013     .007     .01                .023     .013
.047      .034     .221     .003     .007     .0
.02       .003     .007     .003     .0       .003
.007      .023     .235     .0       .003     .013
.034      .003     .003     .0       .003     .034
.01       .01      .0       .0       .007     .003
.01       .0       .003     .003     .0       .007
.047      .003     .0       .0       .007     .013
.034      .017     .0       .0       .0       .034
.02       .007     .0       .003     .02      .003
.01       .003     .003     .017     .003     .007
.0        .003     .007     .003     .0       .013
.007      .003     .003     .0       .0       .023
.007      .013     .0       .0       .0       .023
.003      .0       .007     .0       .007     .144
.007      .007     .0       .0       .003     .003
.003      .003     .0       .0       .0       .0
.01       .007     .0       .003     .0       .003
.013      .003     .003     .034     .034     .003
.003      .0       .0                         .013
.0        .0       .0                         .064
.003      .003     .0       .003     .003     .003
.034      .037     .034     .034     .034     .003
1.0       2.       3.       4.       5.       6.        7.        8.
```

LISTING C-2 SAMPLE INPUT FOR PREPMS - CONT'D
(PAGE 4 OF 15)

COLUMN NOS.

0000000000000000000000000000000000000000000000000000000000000011111111111111111111 COLUMN NOS.
00000000011111111112222222222333333333344444444445555555555666666666677777777778888888888999999999900000000001111111111112
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890

```
9.      10.     11.     762.    914.    1372.
304.    457.    610.    .79     .0      .0
.0      .05     .16
1.      .21     1.      .0
.0      .26     .0
.02     .98

NEW PFC,DEC2200021,1
6       11
.757    .22     .69     .033    .123    .0      .107    .013
.083    .027    .037    .007    .017    .0      .027    .013
.063    .04     .230    .007
.023    .0      .007
.017    .013    .12
.033    .0      .003    .007    .003    .037
.023    .0      .003    .0      .0      .0
.02     .0      .01     .0      .003    .007
.013    .02     .003    .01     .02     .013
.05     .0      .0      .0      .0      .017
.0      .0      .0      .0      .017    .037
.03     .017    .007    .0      .007    .003
.003    .0      .0      .003    .007    .027
.01     .01     .007    .003    .007    .027
.003    .0      .0      .023    .03     .133
.007    .01     .027    .01     .0      .0
.01     .003    .0      .0      .0      .0
.0      .0      .0      .0      .0      .0
.007    .0      .0      .0      .0      .003
.007    .0      .0      .003    .0      .0
.007    .0      .003    .0      .0      .013
.007    .003    .0      .0      .003    .0
.01     .0      .0      .0      .0      .01
.007    .003    .007    .0      .0      .003
.0      .003    .01     .01     .01     .06     7.      8.
.017    .013    .01     .01     .01
1.      2.      3.      4.      5.      6.

NEW PFC,ACQDAT0122,2
11      11      5
.0      .1      .2      .3      .4      .5      .6      .7
.8      .9      1.
0.      900.    1500.   2300.   2900.   3400.   3900.   4300.
4600.   4900.   7000.
```

LISTING C-2 SAMPLE INPUT FOR PREPMS - CONT'D
(PAGE 5 OF 15)

```
                 .0      .1      .2      .3      .4      .5      .6      .7
                 .8      .9      1.
NEW PFC,ACQDATO222,2
    11     11     3
                 .0      .1      .2      .3      .4      .5      .6      .7
                 .8      .9      1.
                25.     40.     70.     90.    150.    230.    300.    420.
               580.   1140.   1400.    130.    230.    300.    360.    400.
                25.    670.     70.    130.    230.    400.    480.    620.
               500.     40.    980.    130.    210.    320.    380.    420.
                25.   1330.     70.    170.    250.    330.    390.    490.
              1000.     40.   1600.
                25.    570.     70.
               460.     50.    980.
                25.    950.    100.
               720.   1500.   1425.
              1000.          2000.
                5.      3.    2500.
                3.      2.    9999.

NEW PFC,ACQDATO322,2
     8     11     1
                 .0      .1      .2      .3      .4      .5      .6      .7
                 .0     .04     .04      .1      .2      .3     .32     1.0
                 .0   2000.   3000.   3500.   5000.   5900.   7000.   9999.
                 .0      .1      .2      .3      .4      .5      .6      .7
                 .8      .9      1.
                25.     30.     40.     50.     70.    120.    140.    180.
               280.    500.   1100.     50.     70.    120.    150.    200.
                25.     30.     40.    100.    140.    190.    210.    240.
               420.    900.   1520.
                25.     40.     60.
               310.    590.   1600.
              2000.   2500.
                3.      2.
                2.      2.

NEW PFC,RSPDATO223,3
     9
                 .0      .1      .2      .3      .4      .5      .6      .7
                 .0    .125     .25    .375      .5    .625     .75    .875
                1.      5.     10.     18.     24.     36.     52.   9999.
                 .0    174.     45.     54.     97.    .975     87.      .7
               174.
                45.
```

LISTING C-2 SAMPLE INPUT FOR PREPMS – CONT'D
(PAGE 6 OF 15)

```
17.37   37.37   27.67   47.67   6.      6.      25.     6.      73.
13.57   15.72   32.92   37.13   6.9     6.9     6.9     5.95    5.95
89.     112.    57.     89.     176.    89.
NEW REC,PSTDAT0127,7
R       500.    1000.   1500.   2000.   2500.   3000.   9000.
0.
.07     .07     .13     .15     .16     .17     .18     .18
.9      .9      .82     .78     .76     .74     .73     .73
.03     .03     .05     .07     .08     .09     .09     .09
NEW REC,DFSDAT0124,4
R       500.    1000.   1500.   2000.   3000.   3001.   9999.
.0
.0      .0      .4      .3      .2      .1      .0      .0
0.      .5
1.      .3      .2      .05     .01     .0      .0      .0
NEW REC,DFSDAT0224,4
2
0.      9999.
0.      0.
0.      0.
OPTION WORDS,NEXTCASE,4,2
1,2,RESETDEFAULTS
1,2,PD
2,2,DON'T RESET
2,2,DR
OPT WDS,PLOT,4,5
1,2,PRINTER
2,2,CALCOMP:
1,3,OFF
2,3,ON
OPT WDS,LOSMODE,4,11
1,2,SHOOTINGGALLERY
1,2,SG
2,2,RANDOMOCCURRENCE
2,2,FD
OPT WDS,MSNCODE,6,12
1,2,PRIORITYPEPLANNEDTARGET
1,2,PPT
2,2,PREPLANNEDTARGET
2,2,PPT
3,2,TARGETOFOPPORTUNITY
3,2,TOO
OPTWDS,NUMDIFTGTP,4,13
1,2,THREE
1,2,3
2,2,TWO
2,2,2
OPTWDS,TARGFTTYPE,7,14
1,2,1
2,2,2
3,2,3
```

LISTING C-2 SAMPLE INPUT FOR PREPMS - CONT'D

(PAGE 7 OF 15)

```
4,2,4
5,2,5
6,2,6
7,2,7
OPTWDS,DESIGTYPE,6,16
1,2,GLD
1,2,G
2,2,MULE
2,2,M
3,2,LTD
3,2,L
OPTWDS,FOPOSITION,4,17
1,2,VANTAGEPOINT
1,2,VP
2,2,MANEUVERUNIT
2,2,MU
OPTWDS,TLEFACTORS,1,33
1,1,NOTHING
OPTWDS,ACQRNGDIST,8,22
1,2,AVERAGE
1,2,A
2,2,CLOSE
2,2,C
3,2,OPEN
3,2,O
4,2,STAGS
4,2,S
OPTWDS,RESPTIME,15,23
2,2,STAUCH
2,2,S
1,2,FTSILL
1,2,FS
3,2,SCUNGIO
11,2,PARAM
11,2,P
1,3,DIGITAL
1,3,D
2,3,VOICE
2,3,V
1,4,DAY
1,4,D
2,4,NIGHT
2,4,N
OPT WDS,DFIRESUPPF,4,24
1,2,HIGH
1,2,H
2,2,NONE
2,2,N
OPTWDS,PUNC,2,31
1,2,NO
```

LISTING C-2 SAMPLE INPUT FOR PREPMS - CONT'D
(PAGE 8 OF 15)

C-22

```
1,2,M
OPTWDS,CONTROL,3,9
1,2,FCHD
1,3,SHORT
2,3,LONG
OPTWDS,SMOKE,4,32
1,2,SMOKEROUNDSFIRED
1,2,SMKRNDS
2,2,PROBABILITYSMOKEKILLSMISSION
2,2,PPBSMOKE
NEW PEC,PSPDATO123,3
0

0.      .125    .25     .375    .5      .625    .75     .875
1.      5.      10.     18.     24.     36.     52.     87.
174.
20.     20.     20.     0.      0.      1.0     0.      0.
20.     0.      69.19   69.19   46.32   46.32   46.32   46.32
69.19   75.     75.     75.     75.
75.
NEW PEC,RODAV3TPN1,5
5
15.     2000.   2500.   9999.
1000.   .7040   .6962   .7617
.7392   .8008
NEW PEC,RODAV5TF.N1,5
5
15.     2000.   2500.   9999.
1000.   .6403   .6309   .7078
.6831   .7580
NEW PEC,RODAV8TPN1,5
5
15.     2000.   2500.   9999.
1000.   .5539   .5422   .6336
.6120   .6998
NEW PEC,RODAV3TPN2,5
3
15.     2000.   2500.   9999.
2000.   .6702   .6599
.5749   .6590
NEW PEC,PODAV5TFN2,5
5
15.     2500.   9999.
2000.   .6139   .5888
.5023
NEW PEC,PODAV8TPN2,5
3
15.     2500.   9999.
2000.   .5434   .4959
.4114
```

LISTING C-2 SAMPLE INPUT FOR PREPMS - CONT'D

(PAGE 9 OF 15)

COLUMN NOS.

0000000000000000000000000000000000000000000000000000000000000000000011111111111111111111
0000000011111111112222222222333333333344444444445555555555666666666677777777778888888888999999999900000000001111111112
12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890

NEW REC,RODAV3TRM3,5
        1
      15.
    9999.
    .8008
NEW REC,RODAV5TRM3,5
        1
      15.
    9999.
    .7580
NEW REC,RODAV8TFM3,5
        1
      15.
    9999.
    .6998
NEW REC,RSPDAT0323,3
     0

0.0   .125   .25   .375   .5   .625   .75   .875
1.0   5.   10.   18.   24.   36.   52.   87.
0.0
174.
0.0   0.0   0.0   0.0   0.0   .975   0.   0.
50.   50.   50.   50.   0.   0.   0.   80.
159.   150.   150.   159.   80.   80.   80.
209.   209.   209.   209.   209.
NEWREC,MAP0600021,1
     6   11
.650   .22   .69   .039   .042   .0   .071   .01
.032   .01   .023   .006   .003   .032   .029   .019
.087   .068   .28   .006   .003   .042
.026   .01   .0   .006   .013   .003
.035   .029   .174   .013   .026   .225
.013   .0   .0   .0   0.   .019
.010   .0   .006   .0   .0   .003
.006   .006   .01   .003   .0   .0
.006   .0   .0   .0   .0   .01
.0   .01   .0   .0   .0   .0
.013   .013   .0   .006   .0   .023
.0   .003   .003   .003   .0
.013   .01   .01   .006   .0
.006   .006   .003   .013   .0
.000   .000   .016   .0   .0
.003   .0   .003   .0   .0
.006   .0   .0   .0
.0   .0   .0   .0   .0
.006   .0   .003   .0   .01
.0   .0   .0   .0   .0
.0   .0   .0   .0
.006   .0   .0   .0   .023

COLUMN NOS.

0000000000000000000000000000000000000000000000000000000000000000000011111111111111111111
0000000011111111112222222222333333333344444444445555555555666666666677777777778888888888999999999900000000001111111112
12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890

LISTING C-2 SAMPLE INPUT FOR PREPMS - CONT'D
(PAGE 10 OF 15)

C-24

```
.003    .0      .0      .003    .0      .013
.006    .003    .0      .0      .003    .023
.0      .003    .0      .0      .003    .023
.003    .003    .016    .0      .026    .125
1.      2.      3.      4.      5.      6.      7.      8.
9.      10.     11.     762.    914.    1372.
304.    457.    610.    .65     .11     .24
0.      0.      0.
1.      .51     1.
0.      .30     0.
0.      .19     0.
.009    .991
NEWRFC,MAR1400021,1
      6       11
```

```
.598    .22     .69     .003    .032    .003
.000    .003    .006    .006    .003    .0      .019    .009
.035    .06     .418    .006    .003    .0      .009    .016
.022    .0      .003    .0      .0      .0
.009    .009    .332    .0      .0      .0
.0      .003    .0      .003    .003    .003
.009    .0      .0      .0      .0      .0
.0      .000    .003    .0      .0      .006
.003    .003    .0      .0      .003    .003
.0      .0      .003    .0      .003    .006
.003    .013    .013    .009    .013    .016
.019    .003    .013    .051    .073    .032
.0      .013    .028    .0      .0      .234
.0      .0      .0      .0      .0      .0
.0      .0      .0      .0      .0      .0
.003    .0      .003    .0      .0      .0
.003    .0      .0      .0      .003    .0
.0      .0      .0      .0      .0      .0
.006    .0      .0      .003    .003    .013
.0      .009    .006    .003    .0      .003
.0      .003    .0      .0      .0      .006
.006    .013    .025    .06     .108    .120
1.      2.      3.      4.      5.      6.      7.      8.
9.      10.     11.     762.    914.    1372.
304.    457.    610.    .60     .0      .0
.04     .15     .21
1.      .3      1.
0.      .28     0.
.0      .42     .0
.377    .623
NEWRFC,MAR2200021,1
```

LISTING C-2 SAMPLE INPUT FOR PREPMS - CONT'D
(PAGE 11 OF 15)

COLUMN NOS.

00000000000000000000000000000000000000000000000011111111111111111111 COLUMN NOS.
00000000011111111112222222222333333333344444444445555555555666666666677777777778888888888999999999900000000001111111111
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890

```
          6    11
.679    .22     .69     .003    .003    .042    .003    .032    .019
.016    .003    .006     0      .003     .003    0      .032    .01
.077    .087    .391     .003     0       0
.01      0      .0       .224
.016    .022    .0        0       0       .016
.0       0      .0        0       0       .0
.003     0      .0        0       0       .0
.003    .003    .003      0      .003     .003
.0       0      .0        0       0       .016
.01     .003    .003     .006     0       .003
.0       0      .0        0       0       .003
.0       0      .0        0       0       .029
.006    .01     .01       0      .003     .016
.0       0      .006      0       0       .045
.0      .003    .006      0      .006     .074
.0      .003    .013      0      .03     .324
.0       0      .003      0      .003    .006
.022     0      .0        0       0       .0
.0       0      .0        0       0       .0
.0       0      .0        0       0       .0
.0       0      .0        0      .003     .006
.0      .003    .0        0       0       .006
.0      .01     .0        0       0       .003
.003    .003    .0        0      .006     .003
.003    .003    .0        0      .003     .01
.006    .003    .013     .006    .016    .179
1.      2.      3.       4.      5.       6.       7.       8.
9.      10.     11.
304.    457.    610.     762.    914.    1372.
0.      0.      0.       .58     .08      .34
1.      .42     1.
.0      .27     .0
.0      .31
.0      1.0

NFWPEC,SEP0600021,1
          6    11
.568    .22     .69     .022    .043    .0       .04      .0
.129    .025    .036    .018    .032    .0       .032    .011
.05     .04     .183            .032    .0
.04     .007    .014
.036    .022    .219
.101     0      .0       0       0      .029
.007     0      .0      .004     0      .014
.004     0      .007     0       0      .025
.0       0      .0       0       0      .022
.004     0      .0       0      .004    .036
.0       0      .0       0       0      .0
.0       0      .0       0      .004    .036
```

LISTING C-2 SAMPLE INPUT FOR PREPMS – CONT'D
(PAGE 12 OF 15)

COLUMN NOS.

00000000000000000000000000000000000000000000000000000000000000000011111111111111111111 COLUMN NOS.
00000000011111111112222222222333333333344444444445555555555666666666677777777778888888888999999999900000000001111111111112
12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890

```
.0       .0       .0       .0       .0
.004     .0       .0       .007     .04
.0       .004     .011     .004     .036
.014     .0       .0       .018     .147
.007     .0       .0       .0       .025
.0       .004     .0       .0       .0
.004     .0       .0       .0       .011
.011     .0       .004     .0       .014
.0       .0       .0       .0       .018
.0       .0       .0       .0       .0
.004     .0       .0       .004     .032
.0       .0       .0       .007     .011
.004     .004     .004     .004     .029
.022     .007     .004     .022     .007
1.       .011     .0       .0       .155
2.       3.       4.       5.       6.       7.       8.
9.       11.
304.     457.     610.     762.     914.     1372.
1.       .0       .0       .11      .32
1.       .79      1.       .0
.0       .15
.0       .06
.0       1.0

NEWPFC,SEP1400021,1
     6   11
.437     .22      .69      .007     .01      .003     .014     .0
.0       .031     .357     .0       .01      .0       .01      .021
.014     .0       .488     .0       .0       .0
.007     .024     .0       .0       .0       .0
.003     .0       .0       .0       .0       .0
.0       .0       .0       .0       .007
.003     .003     .0       .0       .003
.003     .0       .0       .0       .01
.0       .0       .0       .03      .0
.0       .0       .0       .0       .007
.0       .0       .003     .003     .024
.0       .003     .007     .045     .202
.003     .0       .0       .0       .003
.003     .0       .0       .0       .0
.0       .0       .0       .0       .0
.0       .0       .0       .0       .003
.003     .003     .0       .0       .0
.0       .0       .0       .007     .0
.003     .0       .01      .003     .003
.003     .0       .0       .0       .003
.0       .0       .0
```

LISTING C-2 SAMPLE INPUT FOR PREPMS - CONT'D
(PAGE 13 OF 15)

COLUMN NOS.

0000000000000000000000000000000000000000000000000000000000000000000000000000000011111111111111111111 COLUMN NOS.
00000000011111111112222222222333333333344444444445555555555666666666677777777778888888888999999999900000000001111111111
12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890

```
.0      .007    .007                    .01
.007    .031    .034    .220    .179
1.      2.      3.      4.      5.      6.      7.      8.
9.      10.     11.     762.    914.    1372.
304.    457.    610.                    .0
.04     .21     .29     .46
1.      .43     1.
.0      .32     .0
.0      .25     .0
.547    .453
NFWPFC,SEP2200021,1
  6     11

.602    .22     .69
.013    .003    .003    .024    .0      .04     .01
.047    .071    .384    .01     .01     .003    .02     .003
.020    .0      .003    .0      .013
.017    .04     .279
.0              .0      .0      .0
.0      .003    .0      .0      .01
.0              .0      .0      .0
.003            .0      .0      .02
.003            .0      .0      .0
.003            .0      .0      .037
.003            .003    .0      .01
.0              .0      .0      .044
.003            .0      .01     .061
.003            .0      .013    .367
.003            .0      .003    .013
.003            .0      .0      .0
.0              .0      .0      .0
.007            .0      .0      .0
.007            .003    .003    .003
.007            .0      .0      .01
.007            .0      .0      .003
.007            .0      .007    .01
.0      .003    .013    .034    .034
1.      2.      3.      4.      5.      6.      7.      8.
9.      10.     11.     762.    914.    1372.
304.    457.    610.    .48     .13     .30
.0      .0      .0
1.      .7      1.
.0      .3      .0
.0      .0      .0
.043    .957
OPTWDS,W,14,21
1,2,JUIIF
1,2,J
```

LISTING C-2 SAMPLE INPUT FOR PREPMS - CONT'D

(PAGE 14 OF 15)

```
0000000000000000000000000000000000000000000000000111111111111111111111 COLUMN NOS.
00000000011111111112222222222333333333344444444445555555555666666666677777777778888888889999999999000000000011111111112
12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890

2,2,DECEMBER
2,2,D
3,2,MARCH
3,2,M
4,2,SEPTEMBER
4,2,S
1,3,1400
1,3,14
2,3,0600
2,3,06
3,3,2200
3,3,22
REPORT RECORD LIST
INTERPRET PEDATA

0000000000000000000000000000000000000000000000000111111111111111111111 COLUMN NOS.
00000000011111111112222222222333333333344444444445555555555666666666677777777778888888889999999999000000000011111111112
12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890
```

LISTING C-2 SAMPLE INPUT FOR PREPMS - CONT'D

(PAGE 15 OF 15)

```
JOB CARD.    CHANGE THIS CARD TO CONFORM TO INSTALLATION USAGE.
ACCOUNT CARD.   CHANGE THIS CARD TO CONFORM TO INSTALLATION USAGE.
COMMENT.  THIS RUNSTREAM IS USED WITH RUNS OF THE PREPMS PROGRAM MADE
COMMENT.  AFTER TAPE11 HAS BEEN CREATED.
COMMENT.  THE NEXT STATEMENT DECLARES TAPE5 TO BE A FILE OF RECORD
COMMENT.  TYPE Z WITH 80 CHARACTER LINES.  THIS IS REQUIRED SINCE TAPE5
COMMENT.  IS A FILE FROM THE "FRONT END" COMPUTER WHICH USES A DIFFERENT
COMMENT.  DEFAULT FILE TYPE FROM THE "BACK END" COMPUTER ON WHICH THIS
COMMENT.  JOB IS TO BE RUN.
FILE,TAPE5,RT=Z,FL=80,BT=C.
COMMENT.  THE NEXT STATEMENT OBTAINS A COPY OF THE PREPMS INPUT FROM THE
COMMENT.  "FRONT END" COMPUTER AND PUTS IT IN THE LOCAL FILE TAPE5.
GETPF,TAPE5,PREPMSAMPLEINPUT,ID=SANDMEYER,ST=MTA.
COMMENT.  THE NEXT STATEMENT ATTACHES THE MACHINE LANGUAGE ("OBJECT
COMMENT.  CODE") CREATED BY RUNNING THE PREPMS SOURCE CODE THROUGH THE
COMMENT.  FORTRAN COMPILER IN A PREVIOUS JOB.
ATTACH,LGO,PREPMSSAMPLEBINARY,ID=SANDMEYER.
COMMENT.  THE NEXT STATEMENT ATTACHES THE ALREADY EXISTING TAPE11 ("CORE
COMMENT.  DATA BASE" FILE) WHICH WILL BE MODIFIED ("EXTENDED") BY THIS
COMMENT.  RUN.  THE MULTI-READ OPTION IS TURNED OFF SO THAT THE FILE CAN
COMMENT.  BE EXTENDED.
ATTACH,TAPE11,SAMPLETAPE11,ID=SANDMEYER,MR=0.
COMMENT.  THE NEXT STATEMENT LOADS AND EXECUTES THE PREPMS PROGRAM USING
COMMENT.  TAPE5 AS THE INPUT FILE.
LGO(TAPE5)
COMMENT.  THE NEXT STATEMENT EXTENDS TAPE11.  THIS MEANS THAT THE
COMMENT.  CHANGES MADE BY THIS RUN ARE NOW INCORPORATED IN THE PERMANENT
COMMENT.  FILE THAT WAS ATTACHED UNDER LOCAL FILE NAME TAPE11.
EXTEND,TAPE11.
COMMENT.  END OF JOB.
```

LISTING C-3   SAMPLE RUNSTREAM FOR PREPMS

PREPMS THIS IS A CREATION RUN FOR RECORD OPTNUMS.
* *
NEW RECORD,AINVDAO128,8
RECORD NAMED : AINVDAO128 OF TYPE 8 NOW BEING READ
16

0.0000	.9900	.9500	.9000	.8000	.9000	.6000
500.0000	.9500	.9000	.9500	.7500	.8500	.5500
1000.0000	.9500	.8500	.9000	.7000	.8000	.4000
1500.0000	.9000	.8000	.8500	.6000	.6000	.3000
2000.0000	.8500	.8000	.8500	.6500	.7500	.3000
2500.0000	.8000	.7500	.7000	.6000	.7000	.1500
3000.0000	.7500	.7000	.6500	.5000	.6000	.0500
3500.0000	.7000	.6500	.6000	.4500	.6000	0.0000
4000.0000	.6500	.6000	.5500	.4000	0.0000	0.0000
4500.0000	.6000	.5500	.5000	.3500	0.0000	0.0000
5000.0000	.5500	.5000	.4500	.3000	0.0000	0.0000
5500.0000	.5000	.4500	.4000	.2500	0.0000	0.0000
6000.0000	.4500	.4000	.3500	.2000	0.0000	0.0000
6500.0000	.4000	.3500	.3000	.1500	0.0000	0.0000
7000.0000	.3500	.3000	.2500	.1000	0.0000	0.0000
9000.0000	.3000	.2000	.1000	0.0000	0.0000	0.0000
0.0000	30.0000	90.0000	150.0000	300.0000	9000.0000	0.0000
.5000	.7000	.5000	.8000	.7000	.9500	.6000
.5000	.6000	.4500	.7500	.7000	1.0000	.3000

* *
NEW RECORD,JUN0600021,1
RECORD NAMED : JUN0600021 OF TYPE 1 NOW BEING READ
6   11

.5590	.2200	.6900	.0040	.0220	0.0000	.0180	.0040
.0070	.0040	0.0000	.0040	.0040	.0040	.0110	.0140
.0510	.0320	.3430					
.0110	0.0000	0.0000					
0.0000	.0220	.4480					
.0180	0.0000	0.0000	0.0000	.0150			
.0070	0.0000	0.0000	0.0000	.0040			
.0040	.0070	0.0000	0.0000	.0110			
0.0000	.0040	0.0000	0.0000	.0110			
.0040	0.0000	0.0000	0.0000	.0360			
0.0000	0.0000	0.0000	0.0000	0.0000			
.0040	0.0000	0.0000	.0040	.0330			
0.0000	0.0000	0.0000	0.0000	.0040			
0.0000	.0040	0.0000	0.0000	.0510			
0.0000	.0040	0.0000	0.0000	.0360			
.0040	.0110	.0150	.0110	.2520			
.0040	.0040	.0040	.0040	.0150			
.0040	.0070	0.0000	0.0000	.0070			
.0070	0.0000	0.0000	0.0000	.0070			
.0070	0.0000	0.0000	0.0000	0.0000			
.0040	0.0000	0.0000	.0000	.0070			
0.0000	0.0000	0.0000	0.0000	0.0000			

* *

LISTING C-4   SAMPLE OUTPUT FROM PREPMS

(PAGE 1 OF 17)

COLUMN NOS.

0000000000000000001111111111111111111111111111111
0000000001111111111222222222233333333334444444444555555555566666666667777777777888888888899999999990000000001111111112
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890

```
  0.0000    0.0000    .0040    0.0000    0.0000    .0220
   .0070    0.0000    .0040    0.0000    0.0000    .0110
  0.0000     .0040    .0040     .0040    0.0000    .0220
  0.0000     .0070   0.0000    0.0000    0.0000    .0220
   .0110    0.0000    .0040    .0040     .0040     .2120
  1.0000    2.0000   3.0000   4.0000   5.0000    .0180
  9.0000   10.0000  11.0000                      6.0000         7.0000         8.0000
304.0000  457.0000  610.0000 762.0000 914.0000 1372.0000
  0.0000    0.0000    .8800     .2700    .1200     .6100
  1.0000    1.0000   1.0000
  0.0000     .1200   0.0000
  0.0000    0.0000   0.0000
  0.0000    1.0000
```

```
* * * * * * * * * * * * * * * * * * * * * * * * * *
NEW RFC,JUN140021,1
RECORD NAMED : JUN140021 OF TYPE  1 NOW BEING READ
  6   11
   .4690    .2200    .6900    0.0000    .0040    0.0000
  0.0000   0.0000   0.0000    .0040    0.0000                  .0180         0.0000
   .0110    .0180    .4150   0.0000    .0040   0.0000          .0040          .0140
   .0110   0.0000    .4910   0.0000   0.0000
  0.0000   0.0000   0.0000   0.0000   0.0000
  0.0000   0.0000   0.0000   0.0000   0.0000
  0.0000   0.0000   0.0000   0.0000   0.0000
  0.0000   0.0000   0.0000   0.0000   0.0000
   .0040    .0040    .0040   0.0000    .0040
  0.0000   0.0000   0.0000   0.0000   0.0000
   .0040   0.0000    .0040    .0070    .0070
  0.0000    .0070   0.0000   0.0000   0.0000
  0.0000   0.0000    .0040    .0040   0.0000
   .0070    .0040    .0220    .0140    .0140
   .0070   0.0000   0.0000    .1120    .2560
  0.0000   0.0000   0.0000   0.0000    .0040
  0.0000   0.0000   0.0000   0.0000   0.0000
  0.0000    .0040   0.0000   0.0000   0.0000
  0.0000   0.0000   0.0000   0.0000   0.0000
  0.0000   0.0000   0.0000    .0040   0.0000
   .0070   0.0000   0.0000    .0040   0.0000
  0.0000   0.0000   0.0000    .0040   0.0000
   .0040    .0040   0.0000    .0040   0.0000
  1.0000   2.0000   3.0000   4.0000   5.0000
   .1500    .2200    .0400    .0360    .1950
  1.0000    .3900   1.0000    .0400
  9.0000   10.0000  11.0000                      6.0000         7.0000         8.0000
304.0000  457.0000  610.0000 762.0000 914.0000 1372.0000
   .1500    .2200    .2600    .3700   0.0000
  1.0000    .3900   1.0000
  0.0000    .3600   0.0000
```

LISTING C-4 SAMPLE OUTPUT FROM PREPMS - CONT'D

(PAGE 2 OF 17)

0.0000   .2500   0.0000
 .6300   .3700

* *

NEW REC,JUN2200021,1
RECORD NAMED : JUN2200021 OF TYPE 1 NOW BEING READ
 6   11

 .5200   .2200   .6900   0.0000   .0170   0.0000   .0280   .0170
 .0100   0.0000   0.0000   .0100   .0030   .0000   .0140   .0030
 .0350   .0350   .3780
 .0030   0.0000   0.0000
 .0100   .0280   .4060
 .0030   0.0000   0.0000   0.0000   0.0000   .0070
0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
0.0000   0.0000   0.0000   .0070   0.0000   .0030
 .0070   0.0000   0.0000   0.0000   0.0000   0.0000
0.0000   0.0000   0.0000   0.0000   0.0000   .0210
0.0000   .0030   .0030   0.0000   .0030   .0070
0.0000   .0030   0.0000   .0030   .0030   .0210
0.0000   0.0000   .0030   .0070   0.0000   .0350
0.0000   0.0000   .0100   0.0000   .0170   .3390
0.0000   .0030   0.0000   .0030   0.0000   0.0000
0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
0.0000   0.0000   0.0000   0.0000   .0030   0.0000
 .0030   0.0000   0.0000   0.0000   0.0000   0.0000
0.0000   0.0000   0.0000   0.0000   .0030   0.0000
0.0000   0.0000   0.0000   0.0000   0.0000   .0030
0.0000   0.0000   .0030   0.0000   0.0000   .0070
0.0000   0.0000   0.0000   0.0000   0.0000   .0240
 .0070   .0070   .0140   .0280   .3570
1.0000   2.0000   3.0000   4.0000   5.0000   6.0000
9.0000   10.0000   11.0000
304.0000 457.0000 610.0000 762.0000 914.0000 1372.0000 7.0000 8.0000
1.0000   0.0000   0.0000   .1000   .0500   .8500
0.0000   1.0000   1.0000
0.0000   0.0000   0.0000
0.0000   0.0000   0.0000
 .0500

* *

NEW REC,DEC0600021,1
RECORD NAMED : DEC0600021 OF TYPE 1 NOW BEING READ
 6   11

 .7350   .2200   .6900   .0330   .1360   0.0000   .1030   .0170
 .0730   .0260   .0400   0.0000   0.0000   0.0000
 .0660   .0430   .1990
 .0260   .0100   .0030   0.0000   .0130   0.0000   .0170   .0230
 .0070   .0260   .1390

* *

LISTING C-4 SAMPLE OUTPUT FROM PREPMS - CONT'D

(PAGE 3 OF 17)

```
       .0400    .0070    .2200    .6370
       .0200    .0000    .0200    .0500
       .0230    .0030    .0340    .0470
       .0200    .0100    .0030    .0200
       .0460   0.0000    .0230    .0070
      0.0000    .0030    .0030    .0340
       .0430    .0030    .0100    .0100
       .0030    .0030   0.0000    .0100
       .0170   0.0000    .0030    .0470
       .0100   0.0000    .0170   0.0000
       .0070   0.0000   0.0000    .0340
       .0100   0.0000    .0070    .0200
       .0100   0.0000    .0030    .0100
       .0030   0.0000    .0030   0.0000
      0.0000   0.0000   0.0000    .0070
       .0070   0.0000    .0030
      0.0000   0.0000   0.0000
       .0200   0.0000   0.0000
      0.0000   0.0000   0.0000
       .0100    .0070    .0130
       .0260    .0230
      1.0000    2.0000    3.0000
      9.0000   10.0000   11.0000
    304.0000  457.0000  610.0000   762.0000  914.0000 1372.0000
      0.0000   0.0000    .6600    .0900     .2600
      1.0000    .6000    1.0000
      0.0000    .2000
      0.0000    .9900
       .0100

  .0030   .0170
  .0000   .0030
  .0000   .0100
  .0130   .0100
  .0000   .0300
  .0170   .0000
  .0000   .0230
  .0000   .0100
  .0000   .0330
  .0170   .0300
  .0030   .1490
  .0030   .0030
  .0000   .0000
  .0000   .0000
  .0000   .0000
  .0030   .0070
  .0030   .0000
  .0000   .0000
  .0030   .0000
  .0030   .0070
  .0100   .0400
  4.0000  5.0000   6.0000   7.0000   8.0000
```

```
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
NEW RFC, DEC1400021,1
RECORD NAMED : DEC1400021 OF TYPE    1 NOW BEING READ
  6    11
```

```
  .6370   .6900   .0270   .1040   .0030   .0670   .0400
  .0500   .0230   .0130   .0070   .0100   .0230   .0130
  .0470   .2210           .0100
  .0200   .0070
  .0070   .2350   .0030   .0070  0.0000
  .0340   .0030  0.0000  0.0000
  .0100  0.0000   .0030   .0030
  .0000   .0030  0.0000   .0130
  .0100  0.0000   .0070   .0340
  .0470   .0170  0.0000   .0030
 0.0000  0.0000  0.0000   .0070
  .0340  0.0000   .0200   .0130
  .0200   .0030  0.0000   .0230
  .0100   .0070   .0030   .0230
 0.0000   .0030  0.0000  0.0000
  .0070   .0200   .0170   .1440
```

LISTING C-4   SAMPLE OUTPUT FROM PREPMS - CONT'D

(PAGE 4 OF 17)

```
 .0070   0.0000   .0070   .0030   0.0000   .0030
 .0030   0.0000   0.0000  0.0000  0.0000   0.0000
 .0070   .0030    0.0000  0.0000  0.0000   .0030
 .0070   0.0000   0.0000  0.0000  0.0000   .0030
 .0030   0.0000   0.0000  0.0000  0.0000   .0030
 .0100   0.0000   0.0000  0.0000  0.0000   0.0000
 .0130   .0030    0.0000  0.0000  0.0000   .0030
 .0030   0.0000   0.0000  0.0000  .0070    .0030
 0.0000  0.0000   0.0000  0.0000  .0030    .0030
 .0030   0.0000   0.0000  0.0000  .0130    .0130
 .0340   .0370    .0340   .0340   .0340    .0640
 1.0000  2.0000   3.0000  4.0000  5.0000   6.0000      7.0000   8.0000
 9.0000  10.0000  11.0000
 304.0000 457.0000 610.0000 762.0000 914.0000 1372.0000
 0.0000  .0500    .1600   .7000   0.0000   0.0000
 1.0000  .5300    1.0000
 0.0000  .2100    0.0000
 0.0000  .2600    0.0000
 .0200   .9800

* * * * * * * * * * * * * * * * * * * * * * * * * * * *
NEW PTC, DEC2200021,1
RECORD NAMED : DEC2200021 OF TYPE   1  NOW BEING READ
   6    11
 .7570   .2200   .6900   .0330   .1230   0.0000   .1070   .0130
 .0830   .0270   .0370   .0370   .0170   0.0000   .0270   .0130
 .0630  -.0400   .2300   .0070   .0000   0.0000
 .0230   0.0000  .0070   .0070   .0170   0.0000
 .0170   .0130   .1200   0.0000  0.0000  .0370
 .0330   0.0000  .0030   .0070   .0030   0.0000
 .0230   0.0000  .0030   0.0000  0.0000  .0070
 .0200   0.0000  .0100   0.0000  0.0000  .0130
 .0130   0.0000  .0030   .0100   .0200   .0170
 .0500  -.0200  -.0070   0.0000  0.0000  .0370
 0.0000  0.0000  0.0000  0.0000  .0170   0.0000
 .0300   .0170   .0070   .0070   .0070   .0030
 .0030   0.0000  0.0000  0.0000  0.0000  .0270
 .0100  -.0100  -.0070   .0030   .0070   .0270
 .0030   0.0000  .0030   0.0000  0.0000  .1330
 .0070   .0100   .0270   .0230   .0300   0.0000
 .0100   .0030  -.0100  -.0100  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 .0070   0.0000  0.0000  0.0000  0.0000  0.0000
 .0070   0.0000  .0030  -.0030   .0030   0.0000
 .0070  -.0030   0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 .0070   .0030   0.0000  .0030   .0030   .0130
 .0100   0.0000  .0030   0.0000  0.0000  0.0000
 .0070   0.0000  0.0000  0.0000  0.0000  .0100
 0.0000  .0030   0.0000  0.0000  0.0000  .0030
 .0170   .0130   .0100   .0100   .0100   .0600
```

LISTING C-4 SAMPLE OUTPUT FROM PREPMS - CONT'D

(PAGE 5 OF 17)

```
       1.0000       2.0000       3.0000       4.0000       5.0000       6.0000       7.0000       8.0000
       9.0000      10.0000      11.0000
     304.0000     457.0000     610.0000     762.0000     914.0000    1372.0000
       0.0000       0.0000       0.0000        .8200        .0700        .1100
       1.0000        .4700       1.0000
       0.0000        .2500       0.0000
       0.0000        .2800       0.0000
       0.0000       1.0000

* * * * * * * * * * * * * * * * * * * * * * *
NEW REC, ACQDAT0122,2
RECORD NAMED : ACQDAT0122 OF TYPE   2 NOW BEING READ
  11   11    5
       0.0000        .1000        .2000        .3000        .4000        .5000        .6000        .7000
        .8000        .9000       1.0000
       0.0000     900.0000    1500.0000    2300.0000    2900.0000    3400.0000    3900.0000    4300.0000
    4600.0000    4900.0000    7000.0000
       0.0000        .1000        .2000        .3000        .4000        .5000        .6000        .7000
        .8000        .9000       1.0000
      25.0000      40.0000      70.0000      90.0000     150.0000     230.0000     300.0000     420.0000
     580.0000    1140.0000    1400.0000
      25.0000      40.0000      70.0000     130.0000     230.0000     300.0000     360.0000     400.0000
     500.0000     670.0000     980.0000
      25.0000      40.0000      70.0000     130.0000     230.0000     400.0000     480.0000     620.0000
    1000.0000    1330.0000    1600.0000
      25.0000      40.0000      70.0000     130.0000     210.0000     320.0000     380.0000     420.0000
     460.0000     570.0000     980.0000
      25.0000      50.0000     100.0000     170.0000     250.0000     330.0000     390.0000     490.0000
     720.0000     950.0000    1425.0000
    1000.0000    1500.0000    2000.0000    2500.0000    9999.0000
       5.0000       3.0000
       3.0000       2.0000

* * * * * * * * * * * * * * * * * * * * * * *
NEW REC, ACQDAT0222,2
RECORD NAMED : ACQDAT0222 OF TYPE   2 NOW BEING READ
  11   11    3
       0.0000        .1000        .2000        .3000        .4000        .5000        .6000        .7000
        .8000        .9000       1.0000
       0.0000     400.0000     650.0000     900.0000    1300.0000    1600.0000    2000.0000    2500.0000
    3000.0000    3700.0000    7000.0000
       0.0000        .1000        .2000        .3000        .4000        .5000        .6000        .7000
        .8000        .9000       1.0000
      25.0000      30.0000      40.0000      50.0000      70.0000     120.0000     140.0000     180.0000
     280.0000     500.0000    1100.0000
      25.0000      30.0000      40.0000      50.0000      70.0000     120.0000     150.0000     200.0000
     420.0000     900.0000    1520.0000
      25.0000      40.0000      60.0000     100.0000     140.0000     190.0000     210.0000     240.0000
     310.0000     590.0000    1600.0000
    2000.0000    2500.0000    9999.0000
       3.0000       2.0000
       2.0000       2.0000

* * * * * * * * * * * * * * * * * * * * * * *
```

LISTING C-4   SAMPLE OUTPUT FROM PREPMS - CONT'D

(PAGE 6 OF 17)

* * * * * * * * * * * *
NEW REC, ACQDATO322,2
RECORD NAMED : ACQDATO322 OF TYPE   2 NOW BEING READ
   8   11   1
0.0000   .0200   .0400   .1000   .2000   .3000   .3200   1.0000
0.0000   2000.0000   3000.0000   3500.0000   5000.0000   5900.0000   7000.0000   9999.0000
0.0000   .1000   .2000   .3000   .4000   .5000   .6000   .7000
   .8000   .0000   1.0000
  25.0000   40.0000   70.0000   130.0000   230.0000   400.0000   480.0000   620.0000
1000.0000   1330.0000   1600.0000
9999.0000
   8.0000   3.0000
   5.0000   2.0000
* * * * * * * * * * * * * * * * *

NEW REC, RSPDATO223,3
RECORD NAMED : RSPDATO223 OF TYPE   3 NOW BEING READ
   9
0.0000   .1250   .2500   .3750   .5000   .6250   .7500   .8750
1.0000
0.0000   5.0000   10.0000   18.0000   24.0000   36.0000   52.0000   87.0000
174.0000
  45.0000   20.0000   54.0000   97.0000   25.0000   6.0000   73.0000
  17.3700   27.6700   47.6700   6.0000   6.0000   6.9500   5.9500
  13.5700   15.7200   32.9200   37.1300   6.9000   6.0000
  89.0000   112.0000   57.0000   89.0000   176.0000   89.0000
* * * * * * * * * * * * * * * * * * * *

NEW REC, PSTDATO127,7
RECORD NAMED : PSTDATO127 OF TYPE   7 NOW BEING READ
   8
0.0000   500.0000   1000.0000   1500.0000   2000.0000   2500.0000   3000.0000   9000.0000
  .0700   .1300   .1500   .1600   .1700   .1800   .1800
  .9000   .0000   .8200   .7800   .7600   .7400   .7300   .7300
  -.0300   .0300   .0500   .0700   .0800   .0900   .0900   .0900
* *

NEW REC, DFSDATO124,4
RECORD NAMED : DFSDATO124 OF TYPE   4 NOW BEING READ
   8
0.0000   500.0000   1000.0000   1500.0000   2000.0000   3000.0000   3001.0000   9999.0000
0.0000   .5000   .4000   .3000   .2000   .1000   .0000   .0000
1.0000   .3000   .2000   .0500   .0100   .0000   .0000   .0000
* *

NEW REC, DFSDATO224,4
RECORD NAMED : DFSDATO224 OF TYPE   4 NOW BEING READ
   2
0.0000   9999.0000
0.0000   .0000
0.0000   .0000
* *
OPTION WORDS, NEXTCASE, 4, 2
OPTION WORD TYPE RECORD NAMED : NEXTCASE   BEING INPUT

LISTING C-4 SAMPLE OUTPUT FROM PREPMS - CONT'D

(PAGE 7 OF 17)

C-37

```
   4 OPTION CARDS READ FOR KEYWORD NUMBER  2
1,2,RESETDEFAULTS
2,2,DON'T RESET
2,2,DR
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
OPT WDS,PLOT,4,5
   OPTION WORD TYPE RECORD NAMED : PLOT      BEING INPUT
   4 OPTION CARDS READ FOR KEYWORD NUMBER  5
1,2,PPINTER
2,2,CALCOMP
1,3,OFF
2,3,ON
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
OPT WDS,LOSMODE,4,11
   OPTION WORD TYPE RECORD NAMED : LOSMODE    BEING INPUT
   4 OPTION CARDS READ FOR KEYWORD NUMBER 11
1,2,SHOOTINGGALLERY
1,2,SG
2,2,RANDOMOCCURRENCE
2,2,RO
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
OPT WDS,MSNCODE,6,12
   OPTION WORD TYPE RECORD NAMED : MSNCODE    BEING INPUT
   6 OPTION CARDS READ FOR KEYWORD NUMBER 12
1,2,PRIORITYPREPLANNEDTARGET
1,2,PPT
2,2,PREPLANNEDTARGET
2,2,PPT
3,2,TARGETOFOPPOPTUNITY
3,2,TOO
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
OPTWDS,NUMDIFTGTP,4,13
   OPTION WORD TYPE RECORD NAMED : NUMDIFTGTP BEING INPUT
   4 OPTION CARDS READ FOR KEYWORD NUMBER 13
1,2,THREE
1,2,3
2,2,TWO
2,2,2
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
OPTWDS,TARGETTYPE,7,14
   OPTION WORD TYPE RECORD NAMED : TARGETTYPE BEING INPUT
   7 OPTION CARDS READ FOR KEYWORD NUMBER 14
1,2,1
2,2,2
3,2,3
4,2,4
5,2,5
6,2,6
7,2,7
```

LISTING C-4 SAMPLE OUTPUT FROM PREPMS - CONT'D

(PAGE 8 OF 17)

C-38

```
OPTWDS,DESIGTYPE,6,16
OPTION WORD TYPE RECORD NAMED : DESIGTYPE   BEING INPUT
6 OPTION CARDS READ FOR KEYWORD NUMBER 16
1,2,GLLD
1,2,G
2,2,MULF
2,2,M
3,2,LTD
3,2,L
OPTWDS,FOPOSITION,4,17
OPTION WORD TYPE RECORD NAMED : FOPOSITION BEING INPUT
4 OPTION CARDS READ FOR KEYWORD NUMBER 17
1,2,VANTAGEPOINT
1,2,VP
2,2,MANEUVEPUNIT
2,2,MU
OPTWDS,TLEFACTORS,1,33
OPTION WORD TYPE RECORD NAMED : TLEFACTORS BEING INPUT
1 OPTION CARDS READ FOR KEYWORD NUMBER 33
1,1,NOTHING
OPTWDS,ACQRNGDIST,8,22
OPTION WORD TYPE RECORD NAMED : ACQRNGDIST BEING INPUT
8 OPTION CARDS READ FOR KEYWORD NUMBER 22
1,2,AVERAGE
1,2,A
2,2,CLOSE
2,2,C
3,2,OPEN
3,2,O
4,2,STAGS
4,2,S
OPTWDS,RESPTIME,15,23
OPTION WORD TYPE RECORD NAMED : RESPTIME    BEING INPUT
15 OPTION CARDS READ FOR KEYWORD NUMBER 23
2,2,STAUCH
2,2,S
1,2,FTSILL
1,2,FS
3,2,SCUNGID
11,2,PAPAM
11,2,P
1,3,DIGITAL
1,3,D
2,3,VNICE
2,3,V
```

LISTING C-4 SAMPLE OUTPUT FROM PREPMS - CONT'D

```
1,4,DAY
1,4,D
2,4,NIGHT
2,4,N
* * * * * * * * * * * * * * * * * * * * * * * * * * *
OPT WDS,DFIRESUPPP,4,24
   OPTION WORD TYPE RECORD NAMED : DFIRESUPPP BEING INPUT
   4 OPTION CARDS READ FOR KEYWORD NUMBER 24
1,2,HIGH
1,2,H
2,2,NONE
2,2,N
* * * * * * * * * * * * * * * * * * * * * * * * * * *
OPTWDS,PUNC,2,31
   OPTION WORD TYPE RECORD NAMED : PUNC      BEING INPUT
   2 OPTION CARDS READ FOR KEYWORD NUMBER 31
1,2,NP
1,2,N
* * * * * * * * * * * * * * * * * * * * * * * * * * * *
OPTWDS,CONTROL,3,9
   OPTION WORD TYPE RECORD NAMED : CONTROL     BEING INPUT
   3 OPTION CARDS READ FOR KEYWORD NUMBER  9
1,2,ECHO
1,3,SHORT
2,3,LONG
* * * * * * * * * * * * * * * * * * * * * * * * * * * *
OPTWDS,SMOKE,4,32
   OPTION WORD TYPE RECORD NAMED : SMOKE      BEING INPUT
   4 OPTION CARDS READ FOR KEYWORD NUMBER 32
1,2,SMOKEROUNDSFIRED
1,2,SMKRNDS
2,2,PPROBABILITYSMOKEKILLSMISSION
2,2,PPBSMDKF
* * * * * * * * * * * * * * * * * * * * * * * * * * * *
NEW REC,RSPDAT0123,3
RECORD NAMED : RSPDAT0123 OF TYPE   3 NOW BEING READ
   9
   0.0000    .1250    .2500    .3750    .5000    .6250    .7500    .8750
   1.0000
   0.0000   5.0000  10.0000  18.0000  24.0000  36.0000  52.0000  87.0000
 174.0000
  20.0000  20.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
   0.0000   0.0000   0.0000  69.1900  46.3200  46.3200  46.3200  46.3200
  69.1900  69.1900  75.0000  75.0000  75.0000  75.0000
  75.0000  75.0000
* * * * * * * * * * * * * * * * * * * * * * * * * *
NEW REC,RODAV3TRNL,5
RECORD NAMED : RODAV3TRNL OF TYPE   5 NOW BEING READ
   5
  15.0000
```

```
0000000000000000000000000000000000000000000000000000000000000000000000000000001111111111111111111111
00000000011111111112222222222333333333344444444445555555555666666666677777777778888888888999999999900000000001111111111
12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890

1000.0000 1500.0000 2000.0000 2500.0000 9999.0000
    .7392      .7040      .8008      .6962      .7617
* * * * * * * * * * * * * * * * * * * * * * * * * *
NEW REC,RODAV5TRN1,5
RECORD NAMED : RODAV5TRN1 OF TYPE  5 NOW BEING READ
    5
   15.0000
1000.0000 1500.0000 2000.0000 2500.0000 9999.0000
    .6831      .6403      .7580      .6309      .7078
* * * * * * * * * * * * * * * * * * * * * * * * * * * *
NEW REC,RODAV8TRN1,5
RECORD NAMED : RODAV8TRN1 OF TYPE  5 NOW BEING READ
    5
   15.0000
1000.0000 1500.0000 2000.0000 2500.0000 9999.0000
    .6129      .5539      .6998      .5422      .6336
* * * * * * * * * * * * * * * * * * * * * * * * * * * * *
NEW REC,RODAV3TRN2,5
RECORD NAMED : RODAV3TRN2 OF TYPE  5 NOW BEING READ
    3
   15.0000
2000.0000 2500.0000 9999.0000
    .5749      .6702      .6599
* * * * * * * * * * * * * * * * * * * * * * * * * * * * *
NEW REC,RODAV5TRN2,5
RECORD NAMED : RODAV5TRN2 OF TYPE  5 NOW BEING READ
    5
   15.0000
2000.0000 2500.0000 9999.0000    0.0000    0.0000
    .5023      .6139      .5888      0.0000    0.0000
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
NEW REC,RODAV8TRN2,5
RECORD NAMED : RODAV8TRN2 OF TYPE  5 NOW BEING READ
    3
   15.0000
2000.0000 2500.0000 9999.0000
    .4114      .5434      .4950
* * * * * * * * * * * * * * * * * * * * * * * * * * * * *
NEW REC,RODAV3TRN3,5
RECORD NAMED : RODAV3TRN3 OF TYPE  5 NOW BEING READ
    1
   15.0000
9999.0000
    .8008
* * * * * * * * * * * * * * * * * * * * * * * * * *
NEW REC,RODAV5TRN3,5
RECORD NAMED : RODAV5TRN3 OF TYPE  5 NOW BEING READ
    1
   15.0000
9999.0000
```

```
00000000000000000000000000000000000000000000000000000000000000000000000000000011111111111111111111111
00000000011111111112222222222333333333344444444445555555555666666666677777777778888888888999999999900000000001111111111
12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890
```

LISTING C-4   SAMPLE OUTPUT FROM PREPMS - CONT'D

(PAGE 11 OF 17)

C-41

.7580

* *
NEW REC, RODAV8TRN3,5
RECORD NAMED : RODAV8TRN3 OF TYPE 5 NOW BEING READ
    1
    15.0000
  9999.0000
     .6998

* *
NEW REC, RSPDATO323,3
RECORD NAMED : RSPDATO323 OF TYPE 3 NOW BEING READ
    9
  0.0000   .1250   .2500   .3750   .5000   .6250   .7500   .8750
  1.0000
  0.0000   5.0000 10.0000 18.0000 24.0000 36.0000 52.0000 87.0000
174.0000
  0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
 50.0000 50.0000 50.0000 50.0000 80.0000 80.0000 80.0000
159.0000 159.0000 159.0000 209.0000 80.0000 80.0000
209.0000 209.0000 209.0000 209.0000

* *
NEW REC, MAR06000021,1
RECORD NAMED : MAR06000021 OF TYPE 1 NOW BEING READ
    6   11
   .6590   .2200   .6900   .0390   0.0000   .0710   .0100
   .0320   .0100   .0230   .0190   0.0000   .0290   .0190
   .0870   .0680   .2800   0.0000   .0160
   .0260   .0100   .1740   0.0000   .0030
   .0350   .0290   .0000   .0030   .0030
   .0130   0.0000   0.0000   0.0000   .0160
   .0100   0.0000   0.0000   .0030   .0260
   .0060   .0060   .0100   .0000   0.0000
   .0060   .0100   .0030   0.0000   .0320
  0.0000   0.0000   0.0000   .0060   .0030
   .0130   .0130   0.0000   .0030   .0420
  0.0000   .0030   .0060   .0130   .0450
   .0130   .0100   0.0000   0.0000   .2250
   .0060   .0160   .0130   .0260   .0190
  0.0000   .0030   .0000   .0190   .0030
   .0030   0.0000   0.0000   0.0000   0.0000
   .0060   0.0000   .0030   .0100   .0100
  0.0000   .0030   0.0000   0.0000   0.0000
  0.0000   0.0000   0.0000   0.0000   0.0000
   .0060   0.0000   0.0000   0.0000   .0230
   .0030   .0130   .0030   0.0000   .0130
   .0060   0.0000   0.0000   .0030   .0230
  0.0000   .0030   0.0000   .0030   .0230
  0.0000   0.0000   0.0000   0.0000

LISTING C-4 SAMPLE OUTPUT FROM PREPMS - CONT'D

(PAGE 12 OF 17)

C-42

COLUMN NOS.

0000000000011111111112222222222333333333344444444445555555555666666666677777777778888888888999999999900000000001111111111 COLUMN NOS.
0000000000111111111122222222223333333333444444444455555555556666666666777777777788888888889999999999000000000011111111112
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890

```
   .0030      .0160     0.0000      .0260      .1250     7.0000     8.0000
  1.0000     2.0000     3.0000     4.0000     5.0000     6.0000
  9.0000    10.0000    11.0000
304.0000   457.0000   610.0000   762.0000   914.0000  1372.0000
  0.0000     0.0000                .6500      .1100      .2400
  1.0000     .5100
  0.0000     .3000
  0.0000     .1900
   .0090     .0910
```

* *

NEWFEC,MAR1400021,1
RECORD NAMED : MAP1400021 OF TYPE 1 NOW BEING READ
  6   11

```
  .5980      .2200      .6900      .0030      .0320      .0190      .0090
  .0090      .0030      .0060      .0060      .0030      .0090      .0160
 -.0350     -.0600      .4180
 0.0000     0.0000      .3320
 -.0220     -.0000     -.0000
 -.0090     0.0000     0.0000     0.0000     0.0000     0.0000
 0.0000     -.0030     0.0000     0.0000      .0030
 0.0000     0.0000     0.0000     0.0000      .0060
 -.0090     -.0030     0.0000     0.0000      .0030
 0.0000     -.0030     0.0000     0.0000      .0090
 0.0000     0.0000     0.0000     0.0000      .0060
 0.0000      .0130     0.0000      .0030      .0160
 -.0030     -.0030     0.0000      .0130      .0320
 -.0130     -.0280      .0510      .0730      .2340
 -.0190     0.0000     0.0000     0.0000     0.0000
 0.0000     0.0000     0.0000     0.0000     0.0000
 0.0000     0.0000     0.0000     0.0000     0.0000
 -.0030     -.0030      .0030     0.0000     0.0000
 -.0030     0.0000     0.0000      .0030     0.0000
 0.0000     0.0000     0.0000     0.0000     0.0000
 0.0000     0.0000     0.0000     0.0000     0.0000
 -.0060     0.0000     0.0000     -.0030     0.0000
 0.0000     0.0000     -.0030      .0030     -.0130
 0.0000     -.0060     -.0030     0.0000     -.0030
 -.0090     0.0000      .0060     0.0000     0.0000
 -.0130      .0250      .0600     -.0600      .1080      .1200
 2.0000     3.0000     4.0000     5.0000     6.0000     7.0000     8.0000
 10.0000   11.0000
457.0000   610.0000   762.0000   914.0000  1372.0000
 -.0400      .2100      .6000     0.0000     0.0000
 1.0000     1.0000
 0.0000     .2800
 0.0000     .4200
  .3770     .6230
```

* *
NEWFEC,MAR2200021,1

0000000000011111111112222222222333333333344444444445555555555666666666677777777778888888888999999999900000000001111111111 COLUMN NOS.
0000000000111111111122222222223333333333444444444455555555556666666666777777777788888888889999999999000000000011111111112
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890

LISTING C-4 SAMPLE OUTPUT FROM PREPMS - CONT'D

(PAGE 13 OF 17)

RECORD NAMED : MAP2200021 OF TYPE 1 NOW BEING READ
 6   11

```
.6790    .2200    .6900    .0030    .0420    .0030    .0320    .0190
.0160    .0030    .0060             .0030                      .0100
.0770    .0870    .3910   -.0030   -.0030    0.0000   .0320
.0100    0.0000   0.0000   0.0000   0.0000   0.0000
.0160    .0220    .2240    0.0000   0.0000   .0160
0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
.0030    .0030    0.0000   0.0000   0.0000   0.0000
.0030    .0030    0.0000   .0030    .0030    .0030
.0100    0.0000   .0030    0.0000   0.0000   .0160
0.0000   0.0000   0.0000   0.0000   0.0000   .0030
0.0000   0.0000   0.0000   .0030    0.0000   .0290
0.0000   0.0000   0.0000   0.0000   0.0000   .0160
.0060    0.0000   .0100    .0030    .0030    .0450
0.0000   .0030    .0060    .0060    .0060    .0740
0.0000   .0030    .0130    .0130    .0380    .3240
0.0000   0.0000   .0030    .0030    0.0000   .0060
0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
.0030    0.0000   0.0000   0.0000   0.0000   0.0000
.0030    0.0000   0.0000   0.0000   0.0000   0.0000
.0220    0.0000   0.0000   0.0000   0.0000   .0060
0.0000   .0030    0.0000   0.0000   0.0000   .0060
0.0000   .0100    0.0000   .0030    0.0000   .0030
0.0000   0.0000   0.0000   .0060    .0060    .0100
0.0000   .0060    .0130    .0030    .0160    .1790
.0060    .0030    .0130    .0060    .0160
1.0000   2.0000   3.0000   4.0000   5.0000   6.0000   7.0000   8.0000
9.0000   10.0000  11.0000
304.0000 457.0000 610.0000 762.0000 914.0000 1372.0000
0.0000   0.0000   0.0000   .5800    .0900    .3400
1.0000   4.2000   1.0000
0.0000   .2700    0.0000
0.0000   .3100    0.0000
0.0000   1.0000   0.0000
```

* * * * * *
NEWREC,SEP0600021,1
RECORD NAMED : SEP0600021 OF TYPE 1 NOW BEING READ
 6   11

```
.5680    .2200    .6900    .0220    .0430    0.0000   .0400    0.0000
.1290    .0250    .0360    .0180    .0320    0.0000   .0320    .0110
.0500    .0400    .1830
.0400    .0070    .0140
.0360    .0220    .2190
.1010    0.0000   0.0000   0.0000   0.0000   .0290
.0070    0.0000   0.0000   .0040    0.0000   .0140
.0040    0.0000   .0070    0.0000   0.0000   .0250
0.0000   0.0000   0.0000   0.0000   0.0000   .0220
```

LISTING C-4 SAMPLE OUTPUT FROM PREPMS - CONT'D

(PAGE 14 OF 17)

COLUMN NOS.

0000000000000000000000000000000000000000000000001111111111111111111112
00000000011111111112222222222333333333344444444445555555555666666666677777777778888888888999999999900000000001111111112
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678 90

```
 .0040   0.0000   0.0000   0.0000    .0040    .0360
0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
0.0000   0.0000   0.0000   0.0000    .0040    .0360
0.0000   0.0000   0.0000    .0070   0.0000    .0400
0.0000   0.0000   0.0000   0.0000    .0040    .0360
 .0040    .0040    .0110    .0180    .0180    .1470
0.0000   0.0000   0.0000   0.0000   0.0000    .0250
 .0140   0.0000   0.0000   0.0000   0.0000   0.0000
 .0070   0.0000    .0090   0.0000    .0110    .0110
0.0000    .0040    .0040    .0040    .0090    .0140
 .0040   0.0000   0.0000   0.0000    .0040    .0180
 .0110   0.0000   0.0000   0.0000   0.0000   0.0000
0.0000   0.0000   0.0000   0.0000   0.0000    .0320
0.0000   0.0000   0.0000   0.0000   0.0000    .0110
0.0000   0.0000   0.0000   0.0000    .0040    .0290
 .0040   0.0000   0.0000    .0040    .0070    .0070
 .0220    .0070    .0110    .0040    .0220    .1550
1.0000   2.0000   3.0000   4.0000   5.0000   6.0000   7.0000   8.0000
9.0000  10.0000  11.0000
304.0000 457.0000 610.0000 762.0000 914.0000 1372.0000
0.0000   0.0000    .5700    .1100    .3200
1.0000    .7900   1.0000
0.0000    .1500   0.0000
0.0000    .0600   0.0000
0.0000   1.0000   0.0000
```

* *
NEWREC,SEP1400021,1
RECORD NAMED : SEP1400021 OF TYPE 1 NOW BEING READ
  6   11

```
 .4370    .2200    .6900    .0070    .0100    .0030    .0140   0.0000
0.0000   0.0000   0.0000    .0100    .0100   0.0000    .0100    .0210
 .0140    .0310    .3570   0.0000   0.0000   0.0000
 .0070    .0240    .4880
 .0030   0.0000   0.0000   0.0000   0.0000   0.0000
0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
 .0030    .0030   0.0000   0.0000    .0070    .0070
 .0030   0.0000   0.0000   0.0000    .0030    .0030
0.0000   0.0000   0.0000   0.0000    .0300    .0100
0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
0.0000   0.0000   0.0000    .0030    .0030    .0070
0.0000   0.0000    .0030   0.0000   0.0000    .0240
 .0030    .0070    .0070    .0450    .2920
 .0030    .0030   0.0000   0.0000    .0030    .0030
0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
```

LISTING C-4 SAMPLE OUTPUT FROM PREPMS - CONT'D

(PAGE 15 OF 17)

```
  .0030     .2200     .6020      .0030    0.0000    0.0000              .0030
0.0000    0.0000     .0130    0.0000    0.0000    0.0000            0.0000
 .0030    0.0000     .0470     .0100     .0070     .0070              .0030
 .0030    0.0000     .0200      .0100     .0030     .0030              .0030
0.0000    0.0000     .0170    0.0000    0.0000    0.0000            0.0000
0.0000     .0070    0.0000     .0070     .0070     .0070            0.0000
 .0070     .0310     .0170     .0340     .2200     .1790              .1790
1.0000    2.0000    3.0000    4.0000    5.0000    6.0000    7.0000    8.0000
9.0000   10.0000   11.0000
304.0000 457.0000 610.0000 762.0000 914.0000 1372.0000
 .0400    .2100    .2900    .4600   0.0000   0.0000
1.0000    .4300   1.0000
0.0000    .3200   0.0000
0.0000    .2500   0.0000
 .5470    .4530
```

* *

NEWREC,SEP2200021,1
RECORD NAMED : SEP2200021 OF TYPE 1 NOW BEING READ
     6   11

```
 .6020     .2200     .6900      .0100     .0240    0.0000     .0400    .0100
 .0130    0.0000     .0030      .0100     .0100     .0030     .0200    .0030
 .0470     .0710     .3840    0.0000    0.0000     .0130
 .0200    0.0000     .0030    0.0000    0.0000    0.0000
 .0170     .0400     .2790    0.0000    0.0000     .0100
0.0000    0.0000    0.0000    0.0000    0.0000     .0200
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000    0.0000     .0370
 .0030    0.0000    0.0000    0.0000    0.0000     .0100
 .0030    0.0000    0.0000    0.0000    0.0000     .0440
0.0000    0.0000    0.0000    0.0000     .0100     .0610
0.0000    0.0000    0.0000    0.0000     .0100     .3670
 .0030    0.0000    0.0000     .0030     .0030     .0130
 .0030    0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000     .0030    0.0000
 .0070    0.0000    0.0000    0.0000    0.0000     .0030
0.0000    0.0000    0.0000     .0030    0.0000     .0100
 .0070    0.0000    0.0000    0.0000    0.0000     .0030
 .0070    0.0000    0.0000    0.0000    0.0000     .0100
0.0000    0.0000    0.0000    0.0000     .0070     .0340
0.0000     .0030     .0130     .0340     .0340     .2190
1.0000    2.0000    3.0000    4.0000    5.0000    6.0000    7.0000    8.0000
9.0000   10.0000   11.0000
304.0000 457.0000 610.0000 762.0000 914.0000 1372.0000
0.0000   0.0000   0.0000    .4800    .1300    .3900
```

LISTING C-4 SAMPLE OUTPUT FROM PREPMS - CONT'D

(PAGE 16 OF 17)

C-46

```
1.0000    .7000    1.0000
0.0000    .3000   0.0000
0.0000   0.0000   0.0000
         -.0430    .9570
```

* *

```
OPTWDS,W,14,21
OPTION WORD TYPE RECORD NAMED : W     BEING INPUT
14 OPTION CARDS READ FOR KEYWORD NUMBER 21
1,2,JUNE
1,2,J
2,2,DECEMBER
2,2,D
3,2,MARCH
3,2,M
4,2,SEPTEMBER
4,2,S
1,3,1400
1,3,14
2,3,0600
2,3,06
3,3,2200
3,3,22
```

* *

```
REPORT RECORD LIST
RECORD NAMES AND FILE INFORMATION FOR TAPE11
PEOOAJAAJS  20001024400000000101     PEOOAJ:AJS  20001024400000010345     PEOOAJACZS  20001024400000020611
AINVDAO128  20000024700000031055     JUN0600021  20000030100000031324     JUN1400021  20000030100000031625
JUN2200021  20000030100000032126     DEC0600021  20000030100000032427     DEC1400021  20000030100000032730
DEC2200021  20000030100000033231     ACQDATO122  20000024100000033532     ACQDATO222  20000024100000033773
ACQDATO322  20000024100000034234     RSPDATO223  20000006100000034475     PSTDATO127  20000005100000034556
DFSDATO124  20000037000000034627     DFSDATO224  20000037000000036666     NEXTCASE    20000045400000034725
OPTINNUMS   20000010600000035401     PLOT        20000045400000035507     LOSMODE     20000045400000036163
MSNCODE     20000045400000036637     NUMDIFTGTP  20000045400000037313     TARGETTYPE  20000045400000037767
DESIGTYPE   20000045400000040443     FOPOSITION  20000045400000041117     TLEFACTORS  20000045400000041573
ACQRNGDIST  20000045400000042247     RESPTIME    20000045400000042723     DFIRESUPPR  20000045400000043377
RUMC        20000045400000044053     CONTROL     20000045400000044527     SMOKE       20000045400000045203
RSPDATO123  20000006100000045657     RODAV3TRN1  20000026000000045740     RODAV5TRN1  20000026000000045766
RODAV8TFN1  20000026000000046014     RODAV3TRN2  20000026000000046042     RODAV5TRN2  20000026000000046070
RODAV8TRN2  20000026000000046116     RODAV3TRN3  20000006100000046144     RODAV5TRN3  20000026000000046172
RODAV8TRN3  20000026000000046220     RSPDATO323  20000006100000046246     MAR0600021  20000030100000046327
MAP1400021  20000030100000046630     MAP2200021  20000030100000047131     SEP0600021  20000030100000047432
SEP1400021  20000030100000047733     SEP2200021  20000030100000050234     W           20000045400000050535
```

* *

```
INTERPRET PEDATA
PE RECORD: PEOOAJAAJS  TR=106.  DT=1  VEL=5.  GTP= 8.  REFL= .10  ANGLET= 25.  DEFB= 0.  TGTHD= 0.  SKSEN=60.
PE RECORD: PEOOAJ:AJS  TR=106.  DT=1  VEL=2.  GTP= 8.  REFL= .10  ANGLET= 25.  DEFB= 0.  TGTHD= 0.  SKSEN=60.
PE RECORD: PEOOAJACZS  TR=106.  DT=1  VEL=5.  GTP= 8.  REFL= .30  ANGLET= 60.  DEFB= 0.  TGTHD= 0.  SKSEN=60.
```

* *

LISTING C-4 SAMPLE OUTPUT FROM PREPMS - CONT'D

(PAGE 17 OF 17)

Next page is blank.

APPENDIX D

LISTING AND SAMPLE CASE OF COPE

APPENDIX D

LISTING AND SAMPLE CASE OF COPE

This appendix contains:

(1) A listing of the FORTRAN code for the COPE program.

(2) One set of sample case inputs for COPE.

(3) One sample runstream for COPE.

(4) Sample output created by running COPE with the sample input (and with the TAPE11 created by previous PAM and PREPMS sample case runs). The output produced on TAPE8 by this run (for cases 1 and 2) is included in Listings 7-1 and 7-2 of section 7.6.

Note: The column numbers included in some of the listings in this appendix are not a part of the program code, the data, or the output, but are included only for the reader's convenience.

```
      PROGRAM COPE (INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT,DEBUG=OUTPUT,    PR-COPE   2
     1  TAPE4,TAPE7,TAPE8,TAPE9,TAPE10,TAPE11)                             PR-COPE   3
C     *         *         *         *         *         *         *        PR-COPE   4
C                                                                         PR-COPE   5
C     COPE TAPE (I/O UNIT) USE:                                           PR-COPE   6
C                                                                         PR-COPE   7
C     -TAPE5 (INPUT) IS THE I/O UNIT FROM WHICH THE INPUT DIRECTIVES      PR-COPE   8
C     ARE READ. IT IS ALSO USED WHEN THE "TEMPORARY" OPTION IS USED TO    PR-COPE   9
C     READ FORMATTED INPUT.                                               PR-COPE  10
C     -TAPE4 IS AN ALTERNATE INPUT FILE THAT MAY BE USED WHEN READING PE  PR-COPE  11
C     DATA UNDER THE "TEMPORARY" OPTION.                                  PR-COPE  12
C     -TAPE6 (OUTPUT) IS THE FILE TO WHICH THE NORMAL OUTPUT IS WRITTEN.  PP-COPE  13
C     IT IS USUALLY THE FILE SENT TO THE PRINTER FOR HARD COPY OUTPUT.    PR-COPE  14
C     IT IS ALSO EQUATED TO DEBUG SO THAT SUBROUTINE TRACEBACKS WILL BE   PR-COPE  15
C     PRINTED ON IT.                                                      PR-COPE  16
C     -TAPE7 IS NOT CURRENTLY USED. IT IS INTENDED AS THE FILE TO WHICH   PR-COPE  17
C     OUTPUT WILL BE WRITTEN FOR USE BY A POSSIBLE FUTURE COPE ANALYSIS   PR-COPE  18
C     PROGRAM.                                                            PR-COPE  19
C     -TAPE8 IS THE FILE TO WHICH ECHO PRINTS ("DATA CHECKS") ARE         PR-COPE  20
C     WRITTEN.  UNLESS USER ACTION IS TAKEN, IT IS TREATED AS A SCRATCH   PP-COPE  21
C     FILE.                                                               PR-COPE  22
C     -TAPE9 IS THE FILE TO WHICH PRINTER PLOTS WILL BE WRITTEN IF        PR-COPE  23
C     AND WHEN THAT PLOT OPTION IS IMPLEMENTED.                           PP-COPE  24
C     -TAPE10 IS THE FILE TO WHICH THE CALCOMP PLOT OUTPUT WILL BE        PR-COPE  25
C     WRITTEN IF AND WHEN THAT PLOT OPTION IS IMPLEMENTED.                PR-COPE  26
C     -TAPE11 IS THE WORD ADDRESSABLE MASS STORAGE "DATA BASE" FILE FROM  PR-COPE  27
C     WHICH COPE OBTAINS THE DATA RECORDS USED TO FILL THE EIGHT DATA     PR-COPE  28
C     BLOCKS AS DESCRIBED IN THE DOCUMENTATION.    TAPE11 IS CREATED BY   PR-COPE  29
C     THE PREPMS AND PAM PREPROCESSOR PROGRAMS.                           PR-COPE  30
C                                                                         PR-COPE  31
C     *         *         *         *         *         *         *        PR-COPE  32
C                                                                         PR-COPE  33
      COMMON /BAIL/ BLOPNG, IRAIL                                         PR-COPE  34
      COMMON /DODF/ DFDOKL(10,3), HDFSP, NDOKIL, DOKILD                   CM+BAIL   2
      LOGICAL DOKILD                                                      CM+DODF   2
      COMMON /FLAG/ ENDPEP, IDM, IPFFPL, IDIGTL, IPETY, IPNDOC, IT3FLG,   CM+DODF   3
     1  ENDFLG                                                            CM+FLAG   2
      LOGICAL ENDFLG, ENDPEP                                              CM+FLAG   3
      COMMON /RPLCTR/ KREP, HPEP, KPE, NPE, NVEHKL                        CM+FLAG   4
      COMMON /RUNDAT/ DAT, TIM, NCASE, ICCPFG, IPPFG                      CM+RPLCTN2
      COMMON /TIME/ DUPLOS, TIMNOW, TOF, TBR, TIMPA, TIMPA1               CM+RUNDAT2
C                                                                         CM+TIME   2
      CALL TITLE                                                          PP-COPE  41
      CALL INITLZ                                                         PR-COPE  42
C                                                                         PR-COPE  43
C     BEGIN "CASE" LOOP                                                   PR-COPE  44
C                                                                         PR-COPE  45
  100 CALL INPUT                                                          PR-COPE  46
C                                                                         PR-COPE  47
      CALL REINTZ                                                         PR-COPE  48
C                                                                         PR-COPE  49
      KREP=1                                                              PR-COPE  50
      NDOKIL=0                                                            PR-COPE  51
                                                                          PP-COPE  52
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM

(PAGE 1 OF 82)

D-3

```
C
C     BEGIN "REPLICATION" LOOP                        002500   PR-COPE 53
C                                                     002510   PR-COPE 54
                                                      002520   PR-COPE 55
110 KPF=1                                             002530   PR-COPE 56
    TIMNOW=0.0                                        002540   PR-COPE 57
    TIMRA=0.0                                         002550   PP-COPE 58
    ENDREP=.FALSE.                                    002560   PP-COPE 59
    NVEHKL=0                                          002570   PR-COPE 60
    DOKILD=.FALSE.                                    002580   PP-COPE 61
C                                                     002590   PP-COPE 62
    CALL ARTCHK                                       002600   PR-COPE 63
    IF (ENDREP) GO TO 140                             002610   PP-COPE 64
C                                                     002620   PR-COPE 65
    CALL GETVIS                                       002630   PP-COPE 66
C                                                     002640   PR-COPE 67
    CALL GETRNG                                       002650   PR-COPE 68
C                                                     002660   PP-COPE 69
    CALL VISCHK                                       002670   PR-COPE 70
    IF (ENDREP) GO TO 140                             002680   PR-COPE 71
C                                                     002690   PR-COPE 72
    CALL RNGCHK                                       002700   PR-COPE 73
    IF (ENDREP) GO TO 140                             002710   PP-COPE 74
C                                                     002720   PR-COPE 75
    CALL DETCTN                                       002730   PR-COPE 76
    IF (ENDREP) GO TO 140                             002740   PR-COPE 77
C                                                     002750   PR-COPE 78
    CALL SMOKE                                        002760   PR-COPE 79
    IF (ENDREP) GO TO 140                             002770   PP-COPE 80
C                                                     002780   PP-COPE 81
    CALL DUST                                         002790   PP-COPE 82
    IF (ENDREP) GO TO 140                             002800   PR-COPE 83
C                                                     002810   PP-COPE 84
    IBATL=1                                           002820   PP-COPE 85
    CALL BLOCHK                                       002830   PR-COPE 86
    IF (ENDREP) GO TO 140                             002840   PR-COPE 87
C                                                     002850   PP-COPE 88
    CALL GETTIM                                       002860   PR-COPE 89
    IF (ENDREP) GO TO 140                             002870   PR-COPE 90
C                                                     002880   PP-COPE 91
    IBATL=2                                           002890   PP-COPE 92
    CALL BLOCHK                                       002900   PP-COPE 93
    IF (ENDREP) GO TO 140                             002910   PR-COPE 94
C                                                     002920   PP-COPE 95
    IF (IPMDOC.EQ.0) CALL TIMCHK                      002930   PR-COPE 96
    IF (ENDREP) GO TO 140                             002940   PR-COPE 97
C                                                     002950   PR-COPE 98
    CALL ADDTOF                                       002960   PP-COPE 99
C                                                     002970   PR-COPE100
C     BEGIN "POUND" LOOP                              002980   PR-COPE101
C                                                     002990   PR-COPE102
120 CALL LOSCHK                                       003000   PR-COPE103
    IF (ENDREP) GO TO 130                             003010   PP-COPE104
C                                                     003020   PR-COPE105
    CALL WARNDO                                       003030   PP-COPE106
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 2 OF 82)

D-4

```
        IF (ENDREP) GO TO 130
C
        CALL DFCHK
        IF (ENDREP) GO TO 130
C
        CALL RNDREL
        IF (ENDREP) GO TO 130
C
        CALL MINTRN
        IF (ENDREP) GO TO 130
C
        CALL PECHK
        IF (ENDREP) GO TO 130
C
        CALL HITCHK
        IF (ENDREP) GO TO 130
C
        CALL PKCHK
C
  130 IF (KRF.EQ.NRF) GO TO 140
C
        CALL ADDTBR
C
        KRF=KRF+1
        ENDREP=.FALSE.
        GO TO 120
C
C END "ROUND" LOOP
C
  140 IF (KREP.EQ.MREP) GO TO 150
        KREP=KREP+1
        GO TO 110
C
C END "REPLICATION" LOOP
C
  150 CALL OUTPUT
C
        IF (.NOT.ENDFLG) GO TO 100
C
C END "CASE" LOOP
C
        STOP ' IN COPE: NORMAL PROGRAM TERMINATION '
C
        END
```

```
003040    PR-COPE107
003050    PR-COPE108
003060    PR-COPE109
003070    PR-COPE110
003080    PR-COPE111
003090    PR-COPE112
003100    PR-COPE113
003110    PR-COPE114
003120    PR-COPE115
003130    PR-COPE116
003140    PR-COPE117
003150    PR-COPE118
003160    PR-COPE119
003170    PR-COPE120
003180    PR-COPE121
003190    PR-COPE122
003200    PR-COPE123
003210    PR-COPE124
003220    PR-COPE125
003230    PR-COPE126
003240    PR-COPE127
003250    PR-COPE128
003260    PR-COPE129
003270    PR-COPE130
003280    PR-COPE131
003290    PR-COPE132
003300    PR-COPE133
003310    PR-COPE134
003320    PR-COPE135
003330    PR-COPE136
003340    PR-COPE137
003350    PR-COPE138
003360    PR-COPE139
003370    PR-COPE140
003380    PR-COPE141
003390    PR-COPE142
003400    PR-COPE143
003410    PR-COPE144
003420    PR-COPE145
003430    PR-COPE146
003440    PR-COPE147
003450    PR-COPE148
003460    PR-COPE149
003470    PR-COPE150
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 3 OF 82)

```
C         BLOCK DATA BDATA1                                              003490   BD-BDATA12

          COMMON /ABRLBL/ IDABRT(3,19)                                   003500   BD-BDATA13
          COMMON /ACHAR/ CHAR(10,120), NREC                             000130   CM+ABRLBL2
          COMMON /DESRNG/ DESRNG(3,2)                                    000150   CM+ACHAR 2
          COMMON /DISPLY/ DISPT(24), DISPM(12), RECLBL(6), TMPLBL(8)     000210   CM+DESPNG2
          COMMON /FLTTIM/ TOFARY(16)                                     000230   CM+DISPLY2
          COMMON /FSRESP/ FSRT(14,2)                                     000340   CM+FLTTIM2
          COMMON /HEADNG/ ACQLBL(2,4), DAYLBL(2), DFSLBL(2), DGTLBL(2,2),  000360  CM+FSRESP2
         1  DDLBL(3,2), RDLBL(4,2), RSPLBL(3,3)                          000380   CM+HEADNG2
          COMMON /LOGFLG/ FIRSTL, SEQNML, SPCL(70), SHRTEC, FTSILL       000390   CM+HEADNG3
          LOGICAL FIRSTL, SEQNML, SPCL, SHRTEC, FTSILL                   000510   CM+LOGFLG2
          COMMON /POINT/ IPOINT(70)                                      000520   CM+LOGFLG3
          COMMON /SMOKED/ SNK2(3,3,2), SMK5(3,3,2), FPONT, NSMK2, NSMK5, 000600   CM+POINT 2
         1  PSMKKL                                                       000920   CM+SMOKED2
          COMMON /STITLE/ SLVERS, VELDAT(2)                              000930   CM+SMOKED3
          COMMON /SYMBOL/ BLANK, DECPNT, ALFBFT(27), AINMBR(11), SEP(5), 000950   CM+STITLE2
         1  DOLLAR                                                       000970   CM+SYMBOL2
          COMMON /XVALUE/ XVALUE(8,9,2)                                  000980   CM+SYMBOL3
                                                                         001100   CM+XVALUE2
C * * * *     FILL IN ARPLBL COMMON BLOCK   * * * * *                    003640   RD-BDATA17
C                                                                        003650   BD-BDATA18
C                                                                        003660   BD-BDATA19
          DATA ((IDABRT(I,J),I=1,3),J=1,19)/                            003670   BD-BDATA20
         1 10HDESIGNATOR,10H IN IMDIRE,10HCT FIRE     ,                  003680   BD-BDATA21
         2 10HTARGET BEY,10HOND VISIBI,10HILITY RANGE,                   003690   BD-BDATA22
         3 10HTARGET BEY,10HOND DESIGN,10HATOR RANGE,                    003700   BD-BDATA23
         4 10HTARGET NOT,10H DETECTED ,10H         ,                     003710   BD-BDATA24
         5 10HSMOKE KILL,10HED MISSION,10H         ,                     003720   BD-BDATA25
         6 10HDUST KILLE,10HD MISSION ,10H         ,                     003730   BD-BDATA26
         7 10HDESIGNATOR,10H BAILED-OU,10HT PPE-COMM,                    003740   BD-BDATA27
         8 10HCOMMO OUT ,10H(BOTH VOIC,10HE & DIGTL),                    003750   BD-BDATA28
         9 10HERROR IN T,10HPANSMISSIO,10HN         ,                    003760   BD-BDATA29
         A 10HDESIGNATOR,10H BAILED-OU,10HT POST-COM,                    003770   BD-BDATA30
         B 10HLOS LOST -,10H NO FIRING,10H         ,                     003780   BD-BDATA31
         C 10HLOS LOST D,10HURING MISS,10HION       ,                    003790   BD-BDATA32
         D 10HDESIGNATOR,10H NOT MARNE,10HD IN TIME ,                    003800   PD-BDATA33
         E 10HDESIGNATOR,10H IN DIRECT,10H FIRE     ,                    003810   BD-BDATA34
         F 10HRQUND RELI,10HABILITY FA,10HILUPE     ,                    003820   BD-BDATA35
         G 10HTARGET OBS,10HCURED BY M,10HINI-TEPPN ,                    003830   BD-BDATA36
         H 10HRQUND DID ,10HNOT ENGAGE,10H TARGET   ,                    003840   BD-BDATA37
         I 10HRQUND ENGA,10HGED BUT DI,10HD NOT HIT ,                    003850   BD-BDATA38
         J 10HRQUND HIT ,10HRUT DID NO,10HT HIT KILL/                    003860   BD-BDATA39
                                                                         003870   BD-BDATA40
                                                                         003880   BD-BDATA41
C * * * *     FILL IN ACHAR COMMON BLOCK   * * * * *                     003890   BD-BDATA42
C                                                                        003900   BD-BDATA43
C                                                                        003910   BD-BDATA44
          DATA ((CHAR(I,J),I=1,10),J=1,13)/                            003920   BD-BDATA45
         1 1.,0.,10HFIRSTCASF ,7*1H ,                                    003930   BD-BDATA46
         2 2.,4.,10HNEXTCASE  ,7*1H ,                                    003940   BD-BDATA47
         3 3.,0.,10HENDOFCASE ,7*1H ,                                    003950   BD-BDATA48
         4 3.,0.,10HEND      ,7*1H ,                                     003960   BD-BDATA49
         5 4.,0.,10HENDOFFINAL,10HCASF      ,7*1H ,                      003970   BD-BDATA50
         6 4.,0.,10HENDF     ,7*1H ,                                     003980   BD-BDATA51
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LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 4 OF 82)

D-6

```
00000000011111111112222222222333333333344444444445555555555666666666677777777778888888888   COLUMN NUMBERS
12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789O   (READ VERTICALLY)

      7  5.,4.,10HPLOT       ,7*1H ,                                                           003990   BD-BDATA52
      8  6.,0.,10HOVERRIDE   ,7*1H ,                                                           004000   BD-BDATA53
      9  6.,0.,10HOVERIDE    ,7*1H ,                                                           004010   BD-BDATA54
      A  7.,0.,10HTEMPORARY  ,7*1H ,                                                           004020   BD-BDATA55
      B  7.,0.,10HTEMP       ,7*1H ,                                                           004030   BD-BDATA56
      C  8.,0.,10HRESET      ,7*1H ,                                                           004040   BD-BDATA57
      D  9.,3.,10HCONTROL    ,7*1H /                                                           004050   BD-BDATA58
                                                                                              004060   BD-BDATA59
      C
         DATA  ((CHAR(I,J),I=1,10),J=14,23)/                                                   004070   BD-BDATA60
      1  11.,4.,10HLINEOFSIGH,10HTMODE                                                         004080   BD-BDATA61
      2  11.,4.,10HLOSMODE   ,7*1H ,                                                           004090   BD-BDATA62
      3  12.,6.,10HMISSIONCOD,10HE        ,6*1H ,                                              004100   BD-BDATA63
      4  12.,6.,10HMSNCODE   ,7*1H ,                                                           004110   BD-BDATA64
      5  13.,4.,10HNUMBEROFDI,10HFFERENTTAR,10HGETPOSTURE,1HS,4*1H ,                           004120   BD-BDATA65
      6  13.,4.,10HNUMDIFTGTP,7*1H ,                                                           004130   BD-BDATA66
      7  14.,7.,10HTARGETTYPE,7*1H ,                                                           004140   BD-BDATA67
      8  16.,6.,10HDESIGNATOR,10HTYPE       ,6*1H ,                                            004150   BD-BDATA68
      9  16.,6.,10HDESIGTYPE ,7*1H ,                                                           004160   BD-BDATA69
      A  17.,4.,10HDOPOSITION,7*1H /                                                           004170   BD-BDATA70
                                                                                              004180   BD-BDATA71
      C
         DATA  ((CHAR(I,J),I=1,10),J=24,37)/                                                   004190   BD-BDATA72
      1  21.,10.,10HWEATHER   ,7*1H ,                                                          004200   BD-BDATA73
      2  21.,10.,10HW         ,7*1H ,                                                          004210   BD-BDATA74
      3  22.,8.,10HACQUISITIO,10HNRANGEDIST,10HRIBUTION   ,5*1H ,                              004220   BD-BDATA75
      4  22.,8.,10HACQRNGDIST,7*1H ,                                                           004230   BD-BDATA76
      5  23.,12.,10HRESPONSETI,10HME         ,6*1H ,                                           004240   BD-BDATA77
      6  23.,12.,10HRESPTIME  ,7*1H ,                                                          004250   BD-BDATA78
      7  24.,4.,10HDIRECTFIRE,10HSUPPRESSIO,10HN         ,5*1H ,                               004260   BD-BDATA79
      8  24.,4.,10HDFIRESUPPR,7*1H ,                                                           004270   BD-BDATA80
      9  25.,0.,10HRANDOMOCCU,10HRRPENCEDIST,10HRIBUTION   ,5*1H ,                             004280   BD-BDATA81
      A  25.,0.,10HPODIST    ,7*1H ,                                                           004290   BD-BDATA82
      B  26.,0.,10HPEDATA    ,7*1H ,                                                           004300   BD-BDATA83
      C  27.,4.,10HTARGETPOST,10HUPEDISTRIB,10HUTION      ,5*1H ,                              004310   BD-BDATA84
      D  27.,4.,10HTGTPSTDIST,7*1H ,                                                           004320   BD-BDATA85
      E  28.,0.,10HINVARIANT ,7*1H /                                                           004330   BD-BDATA86
                                                                                              004340   BD-BDATA87
      C
         DATA  ((CHAR(I,J),I=1,10),J=38,39)/                                                   004350   BD-BDATA88
      1  31.,0.,10HRUMC      ,7*1H ,                                                           004360   BD-BDATA89
      2  32.,4.,10HSMOKE     ,7*1H /                                                           004370   BD-BDATA90
                                                                                              004380   BD-BDATA91
      C
         DATA  ((CHAR(I,J),I=1,10),J=40,55)/                                                   004390   BD-BDATA92
      1  41.,0.,10HDOARTILLER,10HYPK                  ,6*1H ,                                  004400   BD-BDATA93
      2  41.,0.,10HD0ARPK    ,7*1H ,                                                           004410   BD-BDATA94
      3  42.,0.,10HTARGETVELO,10HCITY               ,6*1H ,                                    004420   BD-BDATA95
      4  42.,0.,10HTGTVEL    ,7*1H ,                                                           004430   BD-BDATA96
      5  43.,0.,10HMAXIMUMDES,10HIGNATORFAIL,10HGE                                             004440   BD-BDATA97
      6  43.,0.,10HMAXDFSRNG ,7*1H ,                                                           004450   BD-BDATA98
      7  44.,0.,10HBAILOUTRAM,10HGE          ,6*1H ,                                           004460   BD-BDATA99
      8  44.,0.,10HBAILOUTRNG,7*1H ,                                                           004470   BD-BDAT100
      9  45.,0.,10HTIMEOFFLIG,10HHT          ,6*1H ,                                           004480   BD-BDAT101
      A  45.,0.,10HTOF       ,7*1H ,                                                           004490   BD-BDAT102
      B  46.,0.,10HANGLEFT   ,7*1H ,                                                           004500   BD-BDAT103
      C  47.,0.,10HRUST      ,7*1H ,                                                           004510 BD-BDAT104
      D  48.,0.,10HPROBABILIT,10HYOFSUCCESS,10HFULVOICETR,10HANSMISSION,4*004520   BD-BDAT105
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00000000011111111112222222222333333333344444444445555555555666666666677777777778888888888   COLUMN NUMBERS
12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789O   (READ VERTICALLY)
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LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 5 OF 82)

D-7

```
      EIH ,
     F 48.,0.,10HPPBVOCTRAN,7*1H ,
     G 49.,0.,10HPROBABILIT,10HYOFSUCCESS,10HFULDIGITAL,10HTRANSMISS,10      004530   BD-BDAT106
      HHON   ,3*1H ,                                                        004540   BD-BDAT107
     I 49.,0.,10HPRBDGTPRAN,7*1H /                                          004550   BD-BDAT108
                                                                            004560   BD-BDAT109
C                                                                           004570   BD-BDAT110
      DATA  ((CHAR(I,J),I=1,10),J=56,73) /                                  004580   BD-BDAT111
     1 50.,0.,10HPQUHDOIHFL1,10HGHTPFLIARI,10HLITY        ,5*1H ,           004590   BD-BDAT112
     2 50.,0.,10IRRHDFLTFEL ,7*1H ,                                         004600   BD-BDAT113
     3 51.,0.,10HTIMEREFWEF,10HNPOUNDS   ,6*1H ,                            004610   BD-BDAT114
     4 51.,0.,10HTRR        ,7*1H ,                                         004620   BD-BDAT115
     5 52.,0.,10HNUMBEROFRE,10HPLICATIONS,6*1H ,                            004630   BD-BDAT116
     6 52.,0.,10HNUMREP     ,7*1H ,                                         004640   BD-BDAT117
     7 53.,0.,10HHUMBEPOFPO,10HUNDSTOREF,10HRPFD       ,5*1H ,              004650   BD-BDAT118
     8 53.,0.,10HNUMRNDS    ,7*1H ,                                         004660   BD-BDAT119
     9 54.,0.,10HNUMBEROFVE,10HHICLESPERT,10HARGET      ,5*1H ,             004670   BD-BDAT120
     A 54.,0.,10HNHUMVFHTGT ,7*1H ,                                         004680   BD-BDAT121
     B 55.,0.,10HDISTANCEBE,10HTWFFNVEHIC,10HLFS        ,5*1H ,             004690   BD-BDAT122
     C 55.,0.,10HDISTBVEH   ,7*1H ,                                         004700   BD-BDAT123
     D 56.,0.,10HGUMTARGETR,10HANGE      ,6*1H ,                            004710   BD-BDAT124
     E 56.,0.,10HGTRNG      ,7*1H ,                                         004720   BD-BDAT125
     F 57.,0.,10HREFLECTIVI,10HTY        ,6*1H ,                            004730   BD-BDAT126
     G 57.,0.,10HPEFLECT    ,7*1H ,                                         004740   BD-BDAT127
     H 58.,0.,10HDEFLECTION,10HBIAS      ,6*1H ,                            004750   BD-BDAT128
     I 58.,0.,10HDFFLB      ,7*1H /                                         004760   BD-BDAT129
                                                                            004770   BD-BDAT130
C                                                                           004780   BD-BDAT131
      DATA  ((CHAR(I,J),I=1,10),J=74,81) /                                  004790   BD-BDAT132
     1 59.,0.,10HTARGETHFAD,10HING       ,6*1H ,                            004800   BD-BDAT133
     2 59.,0.,10HTGTHNG     ,7*1H ,                                         004810   BD-BDAT134
     3 60.,0.,10HSEEKERPSENS,10HITIVITY  ,6*1H ,                            004820   BD-BDAT135
     4 60.,0.,10HSEEKSENS   ,7*1H ,                                         004830   BD-BDAT136
     5 61.,0.,10HPROBABILIT,10HYOFACORREC,10HTMFSSAGE   ,5*1H ,             004840   BD-BDAT137
     6 61.,0.,10HPOBCORMSG,7*1H ,                                           004850   BD-BDAT138
     7 62.,0.,10HPROBABILIT,10HYDOWMAPNEDT,10HDLASE     ,5*1H ,             004860   BD-BDAT139
     8 62.,0.,10HPROBDMWARH,7*1H /                                          004870   BD-BDAT140
                                                                            004880   BD-BDAT141
      DATA NPEC /81/                                                        004890   BD-BDAT142
                                                                            004900   BD-BDAT143
C                                                                           004910   BD-BDAT144
C * * * *    FILL IN DFSPNG COMMON BLOCK    * * * * *                       004920   BD-BDAT145
C                                                                           004930   BD-BDAT146
      DATA ((DESPNG(I,J),I=1,3),J=1,2) /7000., 3500., 2600., 7000., 3500., 2600., 2600., 004940   BD-BDAT147
     1., 2600./                                                            004950   BD-BDAT148
                                                                            004960   BD-BDAT149
C * * * *    FILL IN DISPLY COMMON BLOCK    * * * * *                       004970   BD-BDAT150
C                                                                           004980   BD-BDAT151
      DATA (DISPT(I),I=1,3) /4H1400, 4H0600, 4H2200/                        004990   BD-BDAT152
      DATA (DISPM(I),I=1,4) /3HJUN, 3HDFC, 3HHAR, 3HSEP/                    005000   BD-BDAT153
      DATA (RECLBL(I),I=1,8) /1H , 6HACQDAT, 6HPSPDAT, 6HDFSDAT, 5HPSPDAT, 6HDFSDAT, 5HPODAV 005010   BD-BDAT154
     1,1H , 6HPSTDAT, 6HAIHVDA/                                            005020   BD-BDAT155
      DATA (TMPLBL(I),I=1,8) /5HWDATA, 6HACQDAT, 6HPSPDAT, 6HDFSDAT, 6HR    005030   BD-BDAT156
     1DCATA, 6HPFDATA, 6HPSTDAT, 6HAIHVFA/                                  005040   BD-BDAT157
                                                                            005050   BD-BDAT158
C * * * *    FILL IN FLTTIM COMMON BLOCK    * * * * *                       005060   BD-BDAT159
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM – CONT'D

(PAGE 6 OF 82)

```
C        DATA (TDFARY(I),I=1,16) /7*0., 31., 3*0., 44.4, 3*0., 67./                    005070  BD-BDAT160
                                                                                       005080  BD-BDAT161
C                                                                                      005090  BD-BDAT162
C   * * * * *    FILL IN FSRESP COMMON BLOCK    * * * * *                              005100  BD-BDAT163
C                                                                                      005110  BD-BDAT164
         DATA ((FSRT(I,J),I=1,14),J=1,2) /.0, .03, .21, .60, .75, .83, .88,005120      BD-BDAT165
        1 .91, .93, .97, .98, .99, 1.0, 20., 40., 60., 80., 100., 120.,005130         BD-BDAT166
        2, 140., 160., 180., 200., 220., 240., 260., 280./                 005140      BD-BDAT167
                                                                                       005150  BD-BDAT168
C                                                                                      005160  BD-BDAT169
C   * * * * *    FILL IN HEADNG COMMON BLOCK    * * * * *                              005170  BD-BDAT170
C                                                                                      005180  BD-BDAT171
         DATA ((ACQLBL(I,J),I=1,2),J=1,4) /10HAVERAGE TE, 5HRRAIN, 10HCLOSE005180      BD-BDAT171
        1 TERR, 3HAIN, 10HOPEN TERRA, 2HIN, 10HSTAGS TERR, 3HAIN/              005190   BD-BDAT172
         DATA (DAYLBL(I),I=1,2) /8HDAY TIME, 10HNIGHT TIME/                    005200   BD-BDAT173
         DATA (DFSLBL(I),I=1,2) /4HHIGH, 4HNONE/                               005210   BD-BDAT174
         DATA ((DGTLBL(I,J),I=1,2),J=1,2) /10HDIGITAL CO, 3HMMO, 10HVOICE C005220      BD-BDAT175
        10MM, 1HO/                                                             005230   BD-BDAT176
         DATA ((DDLBL(I,J),I=1,3),J=1,2) /10HDESIGNATOR, 10H AT VANTAG, 7HE005240      BD-BDAT177
        1 POINT, 10HDESIGNATOR, 10H WITH MANE, 10HUVER UNIT /                  005250   BD-BDAT178
         DATA ((RMLBL(I,J),I=1,4),J=1,2) /10HCONTINUOUS, 10H LOS ("SHO, 10H005260      BD-BDAT179
        10TING GALL, 5HERY"), 10HBROKEN LOS, 10H ("RANDOM , 10HOCCURRENCE, 005270       BD-BDAT180
        22H"/                                                                  005280   BD-BDAT181
         DATA ((RSPLBL(I,J),I=1,3),J=1,3) /10HPFE-PLANNE, 10HD TARGET , 1H005290       BD-BDAT182
        1 , 10HTARGET OF , 10HOPPORTUNIT, 1HY, 10HPRIORITY P, 10HRE-PLANNE005300       BD-BDAT183
        2, 7H TARGET/                                                          005310   BD-BDAT184
                                                                                       005320  BD-BDAT185
C                                                                                      001420  DT+LOGFLG2
C   * * * * *    FILL IN LOGFLG COMMON BLOCK    * * * * *                              001430  DT+LOGFLG3
C                                                                                      001440  DT+LOGFLG4
         DATA FIPSTL /.TRUE./, SEQHML /.FALSE./                                001450   DT+LOGFLG5
         DATA (SPCL(I),I=1,70) /70*.FALSE./                                    001460   DT+LOGFLG6
         DATA SHRTFC /.TRUE./                                                  005340   BD-BDAT187
                                                                                       005350  BD-BDAT188
C                                                                                      005360  BD-BDAT189
C   * * * * *    FILL IN POINT COMMON BLOCK    * * * * *                               005370  BD-BDAT190
C                                                                                      005380  BD-BDAT191
         DATA (IPOINT(I),I=1,70) /1, 2, 3, 4, 66*5/                            005390   BD-BDAT192
                                                                                       005400  BD-BDAT193
C                                                                                      008005410 BD-BDAT194
C   * * * * *    FILL IN (PART OF) SMOKED COMMON BLOCK    * * * * *                    005420  BD-BDAT195
C                                                                                      005430  BD-BDAT196
         DATA (((SMK2(I,J,K),I=1,3),J=1,3),K=1,2) /1936., 376., 220., 0.,5005440      BD-BDAT197
        126., 0., 1220., 0., 1260., 280., 178., 0., 530., 0., 826.,005450         BD-BDAT198
        2 0./                                                                  005460   BD-BDAT199
         DATA (((SMK5(I,J,K),I=1,3),J=1,3),K=1,2) /1230., 240., 168., 0.,5005470      BD-BDAT200
        116., 0., 800., 0., 656., 160., 118., 0., 300., 0., 436.,  005480         BD-BDAT201
        2./                                                                    005490   BD-BDAT202
         DATA FRONT /12.0/                                                     005500   BD-BDAT203
                                                                                       005510  BD-BDAT204
C                                                                                      005520  BD-BDAT205
C   * * * * *    FILL IN STITLE COMMON BLOCK    * * * * *                              001480  DT+SYMBOL2
C                                                                                      001490  DT+SYMBOL3
         DATA SLVERS /6.2/ , (VERDAT(I),I=1,2) /10H6 MARCH 19, 2HRO/          001500   DT+SYMBOL4
                                                                                       001510  DT+SYMBOL5
C
C   * * * * *    FILL IN SYMBOL COMMON BLOCK    * * * * *
C
         DATA BLANK /1H / , DECPNT /1H./
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 7 OF 82)

D-9

```
      DATA ALFRET /1HA, 1HB, 1HC, 1HD, 1HE, 1HF, 1HG, 1HH, 1HI, 1HJ, 1HK 001520    DT+SYMBOL6
     1, 1HL, 1HM, 1HN, 1HO, 1HP, 1HQ, 1HR, 1HS, 1HT, 1HU, 1HV, 1HW, 1HX, 001530    DT+SYMBOL7
     2 1HY, 1HZ, 1H'/                                                     001540    DT+SYMBOL8
      DATA ANUMBR /1HO, 1H1, 1H2, 1H3, 1H4, 1H5, 1H6, 1H7, 1H8, 1H9, 1H- 001550    DT+SYMBOL9
     1/                                                                   001560    DT+SYMBOL10
      DATA SEP /1H., 1H,, 1H?, 1H(, 1H)/                                  001570    DT+SYMBOL11
      DATA DOLLAR /1H$/                                                   001580    DT+SYMBOL12
                                                                          001590    DT+SYMBOL13
C                                                                         005540    BD-BDAT207
C                                                                         001610    DT+XVALUE2
C     *  *  *  *  *    FILL IN XVALUE COMMON BLOCK    *  *  *  *  *        001620    DT+XVALUE3
C                                                                         001630    DT+XVALUE4
      DATA (((XVALUE(I,J,K),I=1,8),K=1,2),J=1,9) /                        001640    DT+XVALUE5
C         DUMMY SLOTS FOR NOMINAL RESPONSE TIMES                          001650    DT+XVALUE6
     1  8*0.,                                                             001660    DT+XVALUE7
     2  8*8.,                                                             001670    DT+XVALUE8
C         DESIGNATOR TYPES                                                001680    DT+XVALUE9
     1  1.,   2.,   3.,   5*0.,                                           001690    DT+XVALU10
     2  0.,   1.,   1.,   5*8.,                                           001700    DT+XVALU11
C         TARGET VELOCITIES                                               001710    DT+XVALU12
     1  2.,   3.,   5.,   8.,   0.,   3*0.,                               001720    DT+XVALU13
     2  0.,   0.,   1.,   2.,   2.,   3*8.,                               001730    DT+XVALU14
C         GUN-TARGET RANGES                                               001740    DT+XVALU15
     1  8.,  12.,  20.,  30.,  40.,  10.,  16.,   0.,                     001750    DT+XVALU16
     2  0.,   1.,   2.,   3.,   4.,   5.,   6.,   8.,                     001760    DT+XVALU17
C         REFLECTIVITIES                                                  001770    DT+XVALU18
     1  .05,  .10,  .20,  .30,  4*0.,                                     001780    DT+XVALU19
     2  0.,   1.,   2.,   3.,   4*8.,                                     001790    DT+XVALU20
C         ANGLES T                                                        001800    DT+XVALU21
     1  0.,  25.,  30.,  60.,  90.,  120.,  2*0.,                         001810    DT+XVALU22
     2  0.,   1.,   2.,   3.,   4.,   5.,   2*8.,                         001820    DT+XVALU23
C         DEFLECTION BIASES                                               001830    DT+XVALU24
     1 -200., -100.,  0.,  100.,  200.,  3*0.,                           001840    DT+XVALU25
     2  0.,   1.,   2.,   3.,   4.,   3*8.,                               001850    DT+XVALU26
C         TARGET HEADINGS                                                 001860    DT+XVALU27
     1 -60., -30.,   0.,  30.,  60.,  3*0.,                              001870    DT+XVALU28
     2  0.,   1.,   2.,   3.,   4.,   3*8./                               001880    DT+XVALU29
C         SEEKER SENSITIVITIES                                            001890    DT+XVALU30
CSEC  THE FOLLOWING CARD CONTAINS FALSE SEEKER SENSITIVITY VALUES TO      001900    DT+XVALU31
CSEC  AVOID INCLUDING CLASSIFIED NUMBERS IN THE PROGRAM LISTING.          001910    DT+XVALU32
CSEC  THE CORRECT VALUES SHOULD BE RESTORED WHEN RUNNING IN A SECURE      001920    DT+XVALU33
CSEC  ENVIRONMENT.  RUNS DONE WITH THESE FALSE VALUES ARE FOR EXAMPLE     001930    DT+XVALU34
CSEC  PURPOSES ONLY.                                                      001940    DT+XVALU35
     1  24.,  36.,  48.,  60.,  72.,  3*0.,                              001950    DT+XVALU36
     2  0.,   1.,   2.,   3.,   4.,   3*8./                               001960    DT+XVALU37
                                                                          001970    DT+XVALU38
C                                                                         005560    BD-BDAT209
      END
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 8 OF 82)

D-10

```
      FUNCTION FPRCNT (XIN,PAREN)                                           005580   FN-FPRCNT2
C                                                                           005590   FN-FPRCNT3
      LOGICAL PAREN                                                         005600   FN-FPRCNT4
C                                                                           005610   FN-FPRCNT5
      IF (XIN.GE.100.05) STOP ' IN FPRCNT: ERROR NUMBER 1 '                 005620   FN-FPRCNT6
      IF (.NOT.PAREN) GO TO 100                                             005630   FN-FPRCNT7
C                                                                           005640   FN-FPRCNT8
      IF (XIN.LT.0.0) XOUT=6HUNDER)                                         005650   FN-FPRCNT9
      IF (0.0.LE.XIN.AND.XIN.LT.1.) ENCODE (6,120,XOUT) XIN                 005660   FN-FPRCN10
      IF (1..LE.XIN.AND.XIN.LT.10.) ENCODE (7,130,XOUT) XIN                 005670   FN-FPRCN11
      IF (10..LE.XIN.AND.XIN.LT.100.) ENCODE (7,140,XOUT) XIN               005680   FN-FPRCN12
      IF (XIN.GE.100.) XOUT=7H100.0%)                                       005690   FN-FPRCN13
      FPRCNT=XOUT                                                           005700   FN-FPRCN14
      GO TO 110                                                             005710   FN-FPRCN15
C                                                                           005720   FN-FPRCN16
  100 IF (XIN.LT.0.) XOUT=10H     UNDEF                                     005730   FN-FPRCN17
      IF (0.0.LE.XIN.AND.XIN.LT.100.) ENCODE (10,150,XOUT) XIN              005740   FN-FPRCN18
      IF (XIN.GE.100.) XOUT=10H   100.0%                                    005750   FN-FPRCN19
      FPRCNT=XOUT                                                           005760   FN-FPRCN20
C                                                                           005770   FN-FPRCN21
  110 RETURN                                                                005780   FN-FPRCN22
C                                                                           005790   FN-FPRCN23
C                                                                           005800   FN-FPRCN24
C *** F O R M A T   S T A T E M E N T S * * *                              005810   FN-FPRCN25
C                                                                           005820   FN-FPRCN26
  120 FORMAT (1H0,F3.2,2H%))                                                005830   FN-FPRCN27
  130 FORMAT (F4.2,2H%))                                                    005840   FN-FPRCN28
  140 FORMAT (F5.2,2H%))                                                    005850   FN-FPRCN29
  150 FORMAT (4X,F5.2,1H%)                                                  005860   FN-FPRCN30
      END                                                                   005870   FN-FPRCN31
C                                                                           005880   FN-FPRCN32
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 9 OF 82)

```
00000000011111111112222222222333333333344444444445555555555666666666677777777778888888888  COLUMN NUMBERS
12345678901234567890123456789012345678901234567890123456789012345678901234567890  (READ VERTICALLY)

      FUNCTION GAMMA (ALPHA,IPN)                                005900  FN-GAMMA  2
      DIMENSION WK(6), P(1)                                     005910  FN-GAMMA  3
      IN=1                                                      005920  FN-GAMMA  4
      CALL GGAMA (IRN,ALPHA,IN,WK,P)                            005930  FN-GAMMA  5
      GAMMA=P(1)                                                005940  FN-GAMMA  6
      RETURN                                                    005950  FN-GAMMA  7
      END                                                       005960  FN-GAMMA  8

00000000011111111112222222222333333333344444444445555555555666666666677777777778888888888  COLUMN NUMBERS
12345678901234567890123456789012345678901234567890123456789012345678901234567890  (READ VERTICALLY)
```

LISTING D-1   FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 10 OF 82)

```
C         FUNCTION IDCHAR (A,N,I)                                          005980    FN-IDCHAR2

          COMMON /SYMBOL/ BLANK, DECPNT, ALFBET(27), ANUMBR(11), SEP(5),   005990    FN-IDCHAR3
         1 DOLLAR                                                          000970    CM+SYMBOL2
          DIMENSION A(N)                                                   000980    CM+SYMBOL3
C                                                                          006010    FN-IDCHAR5
          IF (A(I).NE.BLANK) GO TO 100                                     006020    FN-IDCHAR6
          IDCHAR=3                                                         006030    FN-IDCHAR7
          RETURN                                                          006040    FN-IDCHAR8
  100     IF (A(I).NE.DECPNT) GO TO 110                                    006050    FN-IDCHAR9
          IDCHAR=2                                                         006060    FN-IDCHA10
          RETURN                                                          006070    FN-IDCHA11
  110     DO 120 J=1,11                                                    006080    FN-IDCHA12
          IF (A(I).NE.ANUMBR(J)) GO TO 120                                 006090    FN-IDCHA13
          IDCHAR=0                                                         006100    FN-IDCHA14
          RETURN                                                          006110    FN-IDCHA15
  120     CONTINUE                                                        006120    FN-IDCHA16
          DO 130 J=1,5                                                     006130    FN-IDCHA17
          IF (A(I).NE.SEP(J)) GO TO 130                                    006140    FN-IDCHA18
          IDCHAR=4                                                         006150    FN-IDCHA19
          RETURN                                                          006160    FN-IDCHA20
  130     CONTINUE                                                        006170    FN-IDCHA21
          DO 140 J=1,27                                                    006180    FN-IDCHA22
          IF (A(I).NE.ALFBET(J)) GO TO 140                                 006190    FN-IDCHA23
          IDCHAR=1                                                         006200    FN-IDCHA24
          RETURN                                                          006210    FN-IDCHA25
  140     CONTINUE                                                        006220    FN-IDCHA26
          IF (A(I).NE.DOLLAR) GO TO 150                                    006230    FN-IDCHA27
          IDCHAR=5                                                         006240    FN-IDCHA28
          RETURN                                                          006250    FN-IDCHA29
  150     IDCHAR=6                                                         006260    FN-IDCHA30
          RETURN                                                          006270    FN-IDCHA31
          END                                                             006280    FN-IDCHA32
                                                                          006290    FN-IDCHA33
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 11 OF 82)

D-13

```
      LOGICAL FUNCTION NUMRIC(B,N1,N2,IB)                               006310   FN-NUMRIC2
C                                                                       006320   FN-NUMRIC3
      COMMON /SYMBOL/ BLANK, DECPNT, ALFBET(27), ANUMBR(11), SEP(5),    000970   CM+SYMBOL2
     1  DOLLAR                                                          000980   CM+SYMBOL3
      DIMENSION B(N1,N2), C(80)                                         006340   FN-NUMRIC5
C                                                                       006350   FN-NUMRIC6
      NUMRIC=.FALSE.                                                    006360   FN-NUMRIC7
      DECFLG=0.0                                                        006370   FN-NUMRIC8
      DECODE (80,160,B(1,IB) )(C(IC),IC=1,80)                           006380   FN-NUMRIC9
C                                                                       006390   FN-NUMRI10
      KI=1                                                              006400   FN-NUMRI11
100   IF (KI.GT.80) GO TO 140                                           006410   FN-NUMRI12
      IDCHR=IDCHAR(C,80,KI)                                             006420   FN-NUMRI13
      IF (IDCHP.NE.0) GO TO 110                                         006430   FN-NUMRI14
      KI=KI+1                                                           006440   FN-NUMRI15
      GO TO 100                                                         006450   FN-NUMRI16
110   IF (IDCHR.NE.2) GO TO 130                                         006460   FN-NUMRI17
      IF (DECFLG.EQ.0.0) GO TO 120                                      006470   FN-NUMRI18
      WRITE (6,170) IB,((B(I1,I2),I1=1,N1),I2=1,N2)                     006480   FN-NUMRI19
      STOP ' IN NUMRIC: ERROR NUMBER 1 '                               006490   FN-NUMRI20
120   DECFLG=1.0                                                        006500   FN-NUMRI21
      KI=KI+1                                                           006510   FN-NUMRI22
      GO TO 100                                                         006520   FN-NUMRI23
130   IF (IDCHR.NE.3) RETURN                                            006530   FN-NUMRI24
140   IF (DECFLG.NE.0.0) GO TO 150                                      006540   FN-NUMRI25
      C(KI)=DECPNT                                                      006550   FN-NUMRI26
      ENCODE (80,180,B(1,IB) )(C(I),I=1,80)                             006560   FN-NUMRI27
150   NUMRIC=.TRUE.                                                     006570   FN-NUMRI28
      IF (KI.LE.10) RETURN                                              006580   FN-NUMRI29
      WRITE (6,190) IB,((B(I1,IB),I1=1,N1),I2=1,N2)                     006590   FN-NUMRI30
      STOP ' IN NUMRIC: ERROR NUMBER 2 '                               006600   FN-NUMRI31
C                                                                       006610   FN-NUMRI32
C                                                                       006620   FN-NUMRI33
C *** F O R M A T   S T A T E M E N T S  * * *                          006630   FN-NUMRI34
C                                                                       006640   FN-NUMRI35
160   FORMAT (80A1)                                                     006650   FN-NUMRI36
170   FORMAT (1H ,17H IN NUMRIC.  LINE,I3,30H HAD TOO MANY DECIMAL POINT006660   FN-NUMRI37
     1S ;,/,(1X,8A10))                                                  006670   FN-NUMRI38
180   FORMAT (80A1)                                                     006680   FN-NUMRI39
190   FORMAT (1H ,17H IN NUMRIC.  LINE,I3,49H EXCEEDS ALLOWABLE FIELD WI006690   FN-NUMRI40
     1DTH FOR NUMERIC DATA :,/,(1X,8A10))                               006700   FN-NUMRI41
      END                                                               006710   FN-NUMRI42
```

LISTING D-1   FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 12 OF 82)

```
      FUNCTION URAN31 (I)                         006730    FN-URAN312
      IF (I) 110,100,110                          006740    FN-URAN313
100   I=1111111                                   006750    FN-URAN314
110   J=I                                         006760    FN-URAN315
      J=J*25                                       006770    FN-URAN316
      J=J-(J/67108864)*67108864                    006780    FN-URAN317
      J=J*25                                       006790    FN-URAN318
      J=J-(J/67108864)*67108864                    006800    FN-URAN319
      J=J*5                                        006810    FN-URAN310
      J=J-(J/67108864)*67108864                    006820    FN-URAN311
      A1=J                                         006830    FN-URAN312
      I=J                                          006840    FN-URAN313
      URAN31=A1/67108864.                          006850    FN-URAN314
      RETURN                                       006860    FN-URAN315
      END                                          006870    FN-URAN316
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 13 OF 82)

```
      SUBROUTINE ABPTTL (IARRT)                              006890    SR-ABRTTL2
C                                                            006900    SR-ABRTTL3
      COMMON /ABORT/ NABORT(20,6), MSARLM                    000110    CM+ABORT 2
      COMMON /FLAG/ ENDREP, IDH, IPPEPL, IDIGTL, IPPTY, IRNDOC, IT3FLG,  000300    CM+FLAG  2
     1 ENDFLG                                                000310    CM+FLAG  3
      LOGICAL ENDFLG, ENDREP                                 000320    CM+FLAG  4
      COMMON /RPLCTN/ KRFP, NRFP, KPF, NRF, NVFHKL           000070    CM+RPLCTN2
C                                                            006940    SR-ABRTTL7
      IRF=1                                                  006950    SR-ABRTTL8
      IF (IARRT.LE.MSARLM) GO TO 100                         006960    SR-ABRTTL9
      NABORT(IABRT,KRF)=NABORT(IABRT,KRF)+1                  006970    SR-ABRTT10
      GO TO 120                                              006980    SR-ABRTT11
C                                                            006990    SR-ABRTT12
  100 DO 110 IJ=IRF,NRF                                      007000    SR-ABRTT13
      NABORT(IABRT,IJ)=NABORT(IABRT,IJ)+1                    007010    SR-ABRTT14
  110 CONTINUE                                               007020    SR-ABRTT15
C                                                            007030    SR-ABRTT16
  120 ENDREP=.TRUE.                                          007040    SR-ABRTT17
C                                                            007050    SR-ABRTT18
      RETURN                                                 007060    SR-ABRTT19
C                                                            007070    SR-ABRTT20
      END                                                    007080    SR-ABRTT21
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM – CONT'D

(PAGE 14 OF 82)

```
      SUBROUTINE ADDTBR                                              007100    SR-ADDTBR2
C                                                                    007110    SR-ADDTBR3
      COMMON /TIME/ DUPLOS, TIMNOW, TOF, TBR, TIMPA, TIMPA1          001020    CM+TIME  2
C                                                                    007130    SR-ADDTBR5
      TIMPA=TIMPA+TBR                                                007140    SR-ADDTBR6
C                                                                    007150    SR-ADDTBR7
      RETURN                                                         007160    SR-ADDTBR8
C                                                                    007170    SR-ADDTBR9
      END                                                            007180    SR-ADDTBR10
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D
(PAGE 15 OF 82)

```
0000000001111111111222222222233333333334444444444555555555566666666667777777777888888888889  COLUMN NUMBERS
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890  (READ VERTICALLY)

       SUBROUTINE ADDTOF                                        007200    SR-ADDTOF2
C                                                               007210    SR-ADDTOF3
       COMMON /TIME/ DUPLOS, TIMNOW, TOF, TBR, TIMRA, TIMRA1    001020    CM+TIME 2
C                                                               007230    SR-ADDTOF5
       TIMRA=TIMNOW+TOF                                         007240    SR-ADDTOF6
C                                                               007250    SR-ADDTOF7
       RETURN                                                   007260    SR-ADDTOF8
C                                                               007270    SR-ADDTOF9
       END                                                      007280    SR-ADDTO10

0000000001111111111222222222233333333334444444444555555555566666666667777777777888888888889  COLUMN NUMBERS
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890  (READ VERTICALLY)
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LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 16 OF 82)

```
00000000011111111112222222222333333333344444444445555555555666666666677777777778888888888  COLUMN NUMBERS
12345678901234567890123456789012345678901234567890123456789012345678901234567890            (READ VERTICALLY)

      SUBROUTINE APTCHK                                                         007300   SR-ARTCHK2
C                                                                              007310   SR-ARTCHK3
      COMMON /KTEST/ KTEST(20,6)                                               000490   CM+KTEST 2
      COMMON /MISC/ DNARPK, PDSTKL, RELIF                                      000540   CM+MISC  2
      COMMON /RANDOM/ IP1, IR2, IP3, IP4, IP5, IR6, IP7, IR8, IP9, IR10, IR10,000640   CM+RANDOM2
     1  IR11, IR12, IR13, IR14, IR15, IR16, IP17, IR18, IR19, IP20, IR21      000650   CM+RANDOM3
     2  , IR22, IR23, IR24, IP25, IP26, IR27, IP28                            000660   CM+RANDOM4
      COMMON /RPLCTN/ KPEP, MPEP, KPF, MPF, NVEHKL                            000770   CM+RPLCTN2
C                                                                              007360   SR-ARTCHK8
      RM1=UPAN31(IR1)                                                          007370   SR-ARTCHK9
C                                                                              007380   SP-ARTCH10
      KTEST(1,KPF)=KTEST(1,KPF)+1                                             007390   SR-ARTCH11
      IF (RM1.GT.DNARPK) GO TO 100                                            007400   SR-ARTCH12
C                                                                              007410   SP-ARTCH13
      IABRT=1                                                                  007420   SR-ARTCH14
      CALL ABRTTL (IABRT)                                                     007430   SR-ARTCH15
C                                                                              007440   SR-ARTCH16
  100 RETURN                                                                   007450   SP-ARTCH17
C                                                                              007460   SP-ARTCH18
      END                                                                      007470   SR-ARTCH19

00000000011111111112222222222333333333344444444445555555555666666666677777777778888888888  COLUMN NUMBERS
12345678901234567890123456789012345678901234567890123456789012345678901234567890            (READ VERTICALLY)
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 17 OF 82)

```
000000000111111111122222222223333333333444444444455555555556666666666777777777788888888899  COLUMN NUMBERS
123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890  (READ VERTICALLY)


      SUBROUTINE BLOCHK                                  007490    SR-BLOCHK2
C                                                        007500    SR-BLOCHK3
                                                         000170    CM+BAIL    2
      COMMON /BAIL/ BLORNG, IBAIL                        000490    CM+KTEST   2
      COMMON /KTEST/ KTEST(20,6)                         000680    CM+RANGE   2
      COMMON /RANGE/ DTRNG, MXDRNG, VISLIM, RNGNOW       000690    CM+RANGE   3
      REAL MXDRNG                                        000770    CM+RPLCTN2
      COMMON /RPLCTN/ KREP, NREP, KPF, NPF, NVEHKL       001000    CM+TARGET2
      COMMON /TARGET/ TVEL, NVEHCL, DISEVH, ITGTTP, IMUTS, ITGTPS  001020    CM+TIME   2
      COMMON /TIME/ DUELOG, TIMNOW, TOF, TBR, TIMEA, TIMPA1        007570    SR-BLOCH10
C                                                        007580    SR-BLOCH11
      IF (IBAIL.EQ.1) KTEST(7,KPF)=KTEST(7,KPF)+1        007590    SR-BLOCH12
      IF (IBAIL.EQ.2) KTEST(10,KPF)=KTEST(10,KPF)+1      007600    SR-BLOCH13
      IF ((DTRNG-TVEL*TIMNOW).GT.BLORNG) GO TO 100       007610    SR-BLOCH14
C                                                        007620    SR-BLOCH15
      IABRT=7                                            007630    SR-BLOCH16
      IF (IBAIL.EQ.2) IABRT=10                           007640    SR-BLOCH17
      CALL ABRTL (IABRT)                                 007650    SR-BLOCH18
C                                                        007660    SR-BLOCH19
  100 RETURN                                             007670    SR-BLOCH20
C                                                        007680    SR-BLOCH21
      END


000000000111111111122222222223333333333444444444455555555556666666666777777777788888888899  COLUMN NUMBERS
123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890  (READ VERTICALLY)



            LISTING D-1  FORTRAN LISTING OF COPE PROGRAM - CONT'D

                           (PAGE 18 OF 82)
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D-20

```
      SUBROUTINE CCPLOT                                                007700   SR-CCPLOT2
C                                                                      007710   SR-CCPLOT3
      COMMON /RUNDAT/ DAT, TIM, NCASE, ICCPFG, IPPFG                   000840   CM+RUNDAT2
C                                                                      007730   SR-CCPLOT5
      DIMENSION CM(10)                                                 007740   SR-CCPLOT6
C                                                                      007750   SR-CCPLOT7
      ENCODE (100,100,CM(1) )NCASF,ICCPFG                              007760   SP-CCPLOT8
      CALL COMMNT (CM,10,.FALSE.,.FALSE.)                              007770   SR-CCPLOT9
C                                                                      007780   SP-CCPLO10
      RETURN                                                           007790   SR-CCPLO11
C                                                                      007800   SR-CCPLO12
C                                                                      007810   SR-CCPLO13
C *** F O R M A T   S T A T E M E N T S ***                            007820   SR-CCPLO14
C                                                                      007830   SR-CCPLO15
  100 FORMAT (1H ,20H IN CCPLOT FOR CASE ,I2,14H WITH ICCPFG= ,I1,23H .  007840   SP-CCPLO16
     1 NO PLOT PRODUCED . )                                            007850   SR-CCPLO17
      END                                                              007860   SR-CCPLO18
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM – CONT'D
(PAGE 19 OF 82)

```
      SUBROUTINE COMMNT (A,N1,USERC,SLCOM3)                                007880   SR-COMMNT2
C                                                                          007890   SR-COMMNT3
      COMMON /COMENT/ CMENT(13,20), COMBUF(13), ICMNT, NTRC                000190   CM+COMENT2
C                                                                          007910   SR-COMMNT5
      DIMENSION A(N1)                                                      007920   SR-COMMNT6
      LOGICAL USERC, SLCOM3                                                0Q7930   SR-COMMNT7
C                                                                          007940   SR-COMMNT8
      IF (.NOT.USERC) GO TO 110                                            007950   SR-COMMNT9
      IF (A(2).NE.1H$) GO TO 140                                           007960   SR-COMMN10
C                                                                          007970   SR-COMMN11
      IF (A(3).EQ.1H$) GO TO 100                                           007980   SR-COMMN12
C                                                                          007990   SR-COMMN13
      ICMNT=ICMNT+1                                                        008000   SR-COMMN14
      ENCODE (120,150,CMENT(1,ICMNT) )(A(I),I=3,80)                        008010   SR-COMMN15
      GO TO 130                                                            008020   SP-COMMN16
C                                                                          008030   SR-COMMN17
100   IF (NTRC.EQ.0) WRITE (6,160)                                         008040   SR-COMMN18
      WRITE (6,150) (A(I),I=4,80)                                          008050   SP-COMMN19
      NTRC=NTRC+1                                                          008060   SR-COMMN20
      GO TO 140                                                            008070   SR-COMMN21
C                                                                          008080   SR-COMMN22
110   IF (SLCOM3) GO TO 120                                                008090   SR-COMMN23
      ICMNT=ICMNT+1                                                        008100   SP-COMMN24
      ENCODE (120,170,CMENT(1,ICMNT) )(A(I),I=1,10)                        008110   SP-COMMN25
      GO TO 130                                                            008120   SP-COMMN26
C                                                                          008130   SR-COMMN27
120   IF (NTRC.EQ.0) WRITE (6,160)                                         008140   SR-COMMN28
      WRITE (6,170) (A(I),I=1,10)                                          008150   SP-COMMN29
      NTRC=NTRC+1                                                          008160   SR-COMMN30
      GO TO 140                                                            008170   SR-COMMN31
C                                                                          008180   SR-COMMN32
130   IF (ICMNT.LE.20) GO TO 140                                           008190   SR-COMMN33
      WRITE (6,180) (K,(CMENT(J,K),J=1,13),K=1,21)                         008200   SR-COMMN34
      STOP ' IN COMMNT: TOO MANY $$ COMMENTS '                            008210   SP-COMMN35
C                                                                          008220   SP-COMMN36
140   RETURN                                                               008230   SP-COMMN37
C                                                                          008240   SR-COMMN38
C                                                                          008250   SP-COMMN39
C *** F O R M A T   S T A T E M E N T S ***                                008260   SP-COMMN40
C                                                                          008270   SR-COMMN41
150   FORMAT (12H ** USER ** ,80A1)                                        008280   SR-COMMN42
160   FORMAT (1H1,5(8H$$$ $$$ ),4X,30HCOMMENTS FOR THIS SET OF CASES,4X,   008290   SP-COMMN43
     15(8H$$$ $$$ ),/)                                                     008300   SR-COMMN44
170   FORMAT (12H ** COPE ** ,10A10)                                       008310   SP-COMMN45
180   FORMAT (40H IN COMMNT.  TOO MANY $$ COMMENTS (>20),/,20(1X,I2,1X,    008320   SR-COMMN46
     113A10,/),/,54H THE FOLLOWING COMMENT CAUSED OVERFLOW OF CMENT ARRAO  008330   SR-COMMN47
     2Y:,/,1X,I2,1X,13A10)                                                 008340   SP-COMMN48
      END                                                                  008350   SR-COMMN49
```

LISTING D-1   FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 20 OF 82)

```
      SUBROUTINE CREAD (IT2)                                              008370   SR-CREAD  2
C                                                                         008380   SP-CREAD  3
      COMMON /DODF/ DFDOKL(10,3), NDFSP, NDOKIL, DOKILD                   000260   CM+DODF   2
      LOGICAL DOKILD                                                      000410   CM+DODF   3
      COMMON /ULT/ INDEX(6,5,2), PETBL(60,10,7), DLTT(6), PKTBL(10,2),    000420   CM+HIT    2
     1 NRNGTT, RNGTTT(20), TTF(3,20,2), NRNGPS, RNGPST(10), PSTTBL(10,    000430   CM+HIT    3
     2 3)                                                                 000620   CM+HIT    4
      COMMON /RANDOC/ TCRIT, HPLOSF, RNGPLS(10), PRELOS(10)               000740   CM+RANDOC2
      COMMON /RNGLOS/ NRP, NPP, NRNGCL, CPNGD(11,2), SEGLOS(11,11),       000750   CM+RNGLOS2
     1 RNGCLB(11), VELTBL(2,2)                                            000790   CM+RNGLOS3
      COMMON /RSPTIM/ RATPTM(3), XINVARF(2), DUM1, BCSPTM(2,2), XMTTIM(2, 000800   CM+RSPTIM2
     1 2), TMEAN(2,2), TSIGMA(2,2), DFTTMA(10,2), NDT, TRARRY(3,2),       000810   CM+RSPTIM3
     2 PPSPTM, TRBAR, PRSDT, PRSVF, ALPHA(2,2), BETA(2,2), DETTIM,        000820   CM+RSPTIM4
     3 IDSGTP, RUMC, PCRMSG, PPDOW                                        001060   CM+RSPTIM5
      COMMON /WEATHR/ PPCLCG, PPCFLS(2), PPGCFL(11,2), W(6,11,2),         001070   CM+WEATHR2
     1 VIS(11), CLOUD(6), NCC, NVL, PASQL(6), WNDSPD(3,3), HUMID(2),      001080   CM+WEATHR3
     2 WSUM(2), WCFSUM(2), ICC, IVL                                       001220   CM+WEATHR4
C                                                                         001230   DM+M      3
      DIMENSION WDATA(193), ACQDAT(161), PSPDAT(49), DFSDAT(31)           001240   DM+M      4
      DIMENSION RDDATA(22), PEDATA(4260), PSTDAT(41), AINVDA(167)         001250   DM+M      5
C                                                                         001260   DM+M      6
      EQUIVALENCE (WDATA(1),PPCLCG)                                       001270   DM+M      7
      EQUIVALENCE (ACQDAT(1),NPP)                                         001280   DM+M      8
      EQUIVALENCE (RSPDAT(1),BATRTM(1))                                   001290   DM+M      9
      EQUIVALENCE (DFSDAT(1),DFDOKL(1))                                   001300   DM+M     10
      EQUIVALENCE (RDDATA(1),TCRIT)                                       001310   DM+M     11
      EQUIVALENCE (PEDATA(1),INDEX(1))                                    001320   DM+M     12
      EQUIVALENCE (PSTDAT(1),NRNGPS)                                      001330   DM+M     13
      EQUIVALENCE (AINVDA(1),DLTT(1))                                     008460   SR-CREAD11
      DIMENSION A(80), B(8,10)                                           008470   SR-CREAD12
C                                                                         008480   SR-CREAD13
      ITYPE=IT2-20                                                        008490   SR-CREAD14
C                                                                         008500   SR-CREAD15
      GO TO (100,150,200,230,260,280,340,370), ITYPF                     008510   SR-CREAD16
C                                                                         008520   SR-CREAD17
  100 DO 110 I=1,193                                                      008530   SR-CREAD18
  110 WDATA(I)=0.0                                                        008540   SR-CREAD19
      READ (5,420) NCC,NVL                                               008550   SR-CREAD20
      READ (5,430) PPCLCG,(PPCFLS(I),I=1,2)                              008560   SR-CREAD21
      DO 120 J=1,2                                                        008570   SR-CREAD22
      READ (5,430) (PPGCFL(I,J),I=1,11)                                  008580   SR-CREAD23
  120 CONTINUE                                                            008590   SP-CREAD24
      DO 130 K=1,2                                                        008600   SP-CREAD25
      DO 130 J=1,11                                                       008610   SP-CREAD26
      READ (5,430) (W(I,J,K),I=1,NCC)                                    008620   SP-CREAD27
  130 CONTINUE                                                            008630   SR-CREAD28
      READ (5,430) (VIS(I),I=1,NVL)                                      008640   SR-CREAD29
      READ (5,430) (CLOUD(I),I=1,NCC)                                    008650   SR-CREAD30
      READ (5,430) (PASQL(I),I=1,6)                                      008660   SR-CREAD31
      DO 140 J=1,3                                                        008670   SP-CREAD32
      READ (5,430) (WNDSPD(I,J),I=1,3)                                   008680   SP-CREAD33
  140 CONTINUE                                                            008690   SR-CREAD34
      READ (5,430) (HUMID(I),I=1,2)                                      008700   SP-CREAD35
      GO TO 410
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 21 OF 82)

```
      C                                                                        008710   SR-CREAD36
      150 DO 160 I=1,161                                                       008720   SP-CPEAD37
      160 ACQDAT(I)=0.0                                                        008730   SR-CREAD38
          READ (5,440) NPP,NPP,NRNGCL                                         008740   SP-CREAD39
          NRNGCB=NRNGCL+1                                                      008750   SR-CREAD40
          DO 170 J=1,2                                                         008760   SR-CREAD41
          READ (5,460) (CPNGD(I,J),I=1,NPP)                                   008770   SR-CREAD42
      170 CONTINUE                                                             008780   SR-CREAD43
          DO 180 J=1,NRNGCB                                                    008790   SR-CREAD44
          READ (5,460) (SEGLDS(I,J),I=1,NPP)                                  008800   SR-CREAD45
      180 CONTINUE                                                             008810   SR-CREAD46
          READ (5,460) (RNGCLB(I),I=1,NRNGCL)                                 008820   SR-CREAD47
          DO 190 J=1,2                                                         008830   SR-CREAD48
          READ (5,460) (VELTRL(I,J),I=1,2)                                    008840   SR-CREAD49
      190 CONTINUE                                                             008850   SP-CREAD50
          GO TO 410                                                            008860   SR-CREAD51
      C                                                                        008870   SR-CREAD52
      200 DO 210 I=1,49                                                        008880   SR-CREAD53
      210 RSPDAT(I)=0.0                                                        008890   SR-CREAD54
          READ (5,450) NDT                                                     008900   SR-CREAD55
          DO 220 J=1,2                                                         008910   SR-CREAD56
          READ (5,460) (DETTMA(I,J),I=1,NDT)                                  008920   SR-CREAD57
      220 CONTINUE                                                             008930   SR-CREAD58
          READ (5,460) (BATRTM(I),I=1,3),(XMVADF(I),I=1,2)                    008940   SR-CREAD59
          READ (5,460) ((BCSPTM(I,J),I=1,2),J=1,2),((XMTTIM(I,J),I=1,2),J=1,  008950   SR-CREAD60
         1 2)                                                                  008960   SR-CREAD61
          PFAD (5,460) ((TMEAN(I,J),I=1,2),J=1,2),((TSIGMA(I,J),I=1,2),J=1,   008970   SR-CREAD62
         1 2)                                                                  008980   SP-CREAD63
          READ (5,460) ((TRARRY(I,J),I=1,3),I=1,2)                            008990   SR-CREAD64
          GO TO 410                                                            009000   SR-CREAD65
      C                                                                        009010   SP-CREAD66
      230 DO 240 I=1,31                                                        009020   SR-CREAD67
      240 DFSDAT(I)=0.0                                                        009030   SR-CREAD68
          READ (5,450) NDFSP                                                   009040   SR-CREAD69
          DO 250 J=1,3                                                         009050   SR-CREAD70
          READ (5,460) (DFDOKL(I,J),I=1,NDFSP)                                009060   SP-CREAD71
      250 CONTINUE                                                             009070   SR-CREAD72
          GO TO 410                                                            009080   SR-CREAD73
      C                                                                        009090   SR-CREAD74
      260 DO 270 I=1,22                                                        009100   SR-CREAD75
      270 RODATA(I)=0.0                                                        009110   SR-CREAD76
          READ (5,450) NPLOSP                                                  009120   SR-CREAD77
          READ (5,460) TCPIT                                                   009130   SR-CREAD78
          READ (5,460) (PMGPLS(I),I=1,NPLOSP)                                 009140   SR-CREAD79
          READ (5,460) (PRBLOS(I),I=1,NPLOSP)                                 009150   SR-CREAD80
          GO TO 410                                                            009160   SR-CREAD81
      C                                                                        009170   SP-CREAD82
      280 DO 290 I=1,4260                                                      009180   SR-CREAD83
      290 PFDATA(I)=0.0                                                        009190   SR-CREAD84
          IUNIT=5                                                              009200   SR-CREAD85
          READ (5,490) (A(I),I=1,80)                                          009210   SP-CREAD86
          CALL SEPREC (A,RC,B,8,10)                                           009220   SP-CREAD87
          IF (B(1,1).NE.8HUS(TAPE4) GO TO 300                                 009230   SR-CREAD88
          IUNIT=4                                                              009240   SP-CREAD89
```

LISTING D-1   FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 22 OF 82)

D-24

```
        GO TO 310                                                      009250    SR-CREAD90
300     ENCODE (20,490,B(1,1) )(A(I),I=1,20)                           009260    SR-CREAD91
        DECODE (20,470,B(1,1) )(INDEX(1,1,K),K=1,2)                    009270    SP-CREAD92
310     CONTINUE                                                       009280    SP-CREAD93
        DO 320 I=1,6                                                   009290    SR-CREAD94
        ISTART=1                                                       009300    SP-CREAD95
        IF (I.EQ.1.AND.IUNIT.EQ.5) ISTART=2                            009310    SR-CREAD96
        DO 320 J=ISTART,5                                              009320    SR-CREAD97
        READ (IUNIT,470) (INDEX(I,J,K),K=1,2)                          009330    SP-CREAD98
320     CONTINUE                                                       009340    SR-CREAD99
        DO 330 I=1,60                                                  009350    SP-CREA100
        DO 330 J=1,10                                                  009360    SR-CREA101
        READ (IUNIT,480) (PETBL(I,J,K),K=1,7)                          009370    SR-CREA102
330     CONTINUE                                                       009380    SP-CREA103
        GO TO 410                                                      009390    SP-CREA104
C                                                                      009400    SR-CREA105
340     DO 350 I=1,41                                                  009410    SR-CREA106
350     PSTDAT(I)=0.0                                                  009420    SP-CREA107
        READ (5,450) NRNGPS                                            009430    SP-CREA108
        READ (5,460) (RNGPST(I),I=1,NRNGPS)                            009440    SR-CREA109
        DO 360 J=1,3                                                   009450    SR-CREA110
        READ (5,460) (PSTTBL(I,J),I=1,NRNGPS)                          009460    SR-CREA111
360     CONTINUE                                                       009470    SR-CREA112
        GO TO 410                                                      009480    SR-CREA113
C                                                                      009490    SP-CREA114
370     DO 380 I=1,167                                                 009500    SP-CREA115
380     AINVDA(I)=0.0                                                  009510    SR-CREA116
        READ (5,450) NRNGTT                                            009520    SR-CREA117
        DO 390 J=1,NRNGTT                                              009530    SR-CREA118
        READ (5,460) PNGTTF(J),((TTF(I,J,K),K=1,2),I=1,3)              009540    SR-CREA119
390     CONTINUE                                                       009550    SR-CREA120
        READ (5,460) (DLTT(I),I=1,6)                                   009560    SR-CREA121
        DO 400 J=1,2                                                   009570    SR-CREA122
        READ (5,460) (PKTBL(I,J),I=1,7)                                009580    SR-CREA123
400     CONTINUE                                                       009590    SR-CREA124
        GO TO 410                                                      009600    SR-CREA125
C                                                                      009610    SR-CREA126
410     RETURN                                                         009620    SP-CREA127
C                                                                      009630    SR-CREA128
C                                                                      009640    SR-CREA129
C  ***  F O R M A T   S T A T E M E N T S  * * *                       009650    SR-CREA130
C                                                                      009660    SR-CREA131
420     FORMAT (2I5)                                                   009670    SR-CREA132
430     FORMAT (8F10.4)                                                009680    SR-CREA133
440     FORMAT (3I5)                                                   009690    SR-CREA134
450     FORMAT (I5)                                                    009700    SR-CREA135
460     FORMAT (8F10.4)                                                009710    SP-CREA136
470     FORMAT (2I10)                                                  009720    SR-CREA137
480     FORMAT (7F10.5)                                                009730    SR-CREA138
490     FORMAT (80A1)                                                  009740    SR-CREA139
        END                                                            009750    SP-CREA140
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 23 OF 82)

```
C      SUBROUTINE DETCTN                                                          009770    SR-DETCTN2
                                                                                  009780    SR-DETCTN3
       COMMON /FLAG/ ENDREP, IDN, IPPEPL, IDIGTL, IPPTY, IRNDOC, IT3FLG,          000300    CM+FLAG  2
      1 ENDFLG                                                                    000310    CM+FLAG  3
       LOGICAL ENDFLG, ENDREP                                                     000320    CM+FLAG  4
       COMMON /KTEST/ KTEST(20,6)                                                 000490    CM+KTEST 2
       COMMON /RANDOM/ IR1, IR2, IR3, IR4, IR5, IR6, IR7, IR8, IR9, IR10,         000640    CM+RANDOM2
      1 IP11, IP12, IP13, IP14, IP15, IP16, IP17, IP18, IR19, IP20, IR21          000650    CM+RANDOM3
      2 , IR22, IR23, IR24, IR25, IR26, IR27, IR28                               000660    CM+RANDOM4
       COMMON /RPLCTN/ KPEP, MPEP, NPEP, NVEHKL                                   000770    CM+RPLCTN2
       COMMON /RSPTIM/ DATRTM(3), XMVADF(2), DUM1, BCSPTM(2,2), XMTTIM(2,         000790    CM+RSPTIM2
      1 2), TMEAN(2,2), TSIGMA(2,2), DETTMA(10,2), NDT, TRAPPY(3,2),              000800    CM+RSPTIM3
      2 PRSPTM, TRDAP, PRSDT, PRSVT, ALPHA(2,2), BETA(2,2), DETTIM,               000810    CM+RSPTIM4
      3 IDSGTP, RUMC, PCRNSG, PRDOM                                               000820    CM+RSPTIM5
       COMMON /TIME/ DUFLOS, TIMNDW, TDF, TBR, TIMRA, TIMRA1                      001020    CM+TIME  2
C                                                                                 009850    SR-DETCT10
       CALL SMPLCD (DETTMA,10,2,2,10,IP8,DETTIM,ICLASS)                           009860    SR-DETCT11
C                                                                                 009870    SR-DETCT12
       IF (IRNDOC.EQ.1) GO TO 100                                                 009880    SR-DETCT13
C                                                                                 009890    SR-DETCT14
       KTEST(4,KRF)=KTEST(4,KRF)+1                                               009900    SP-DETCT15
       IF (DETTIM.LT.DUFLOS) GO TO 100                                           009910    SR-DETCT16
C                                                                                 009920    SR-DETCT17
       IABPT=4                                                                    009930    SR-DETCT18
       CALL ABRTTL (IARET)                                                        009940    SR-DETCT19
C                                                                                 009950    SP-DETCT20
  100  RETURN                                                                     009960    SR-DETCT21
       END                                                                        009970    SP-DETCT22
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 24 OF 82)

D-26

```
      SUBROUTINE DFAULT                                        009990  SR-DFAULT2
C                                                              010000  SR-DFAULT3
      COMMON /DVALUE/ D(70), DPRT, DDT, DIDN, DIDIGT, DSMK(2)  000280  CM+DVALUE2
      COMMON /RUNDAT/ DAT, TIM, NCASE, ICCPFG, IPPFG           000840  CM+RUNDAT2
C                                                              010030  SR-DFAULT6
      ICCPFG=0                                                 010040  SR-DFAULT7
      IPPFG=0                                                  010050  SP-DFAULT8
      D(11)=1.                                                 010060  SR-DFAULT9
      D(12)=1.                                                 010070  SR-DFAUL10
      D(13)=1.                                                 010080  SR-DFAUL11
      D(14)=1.                                                 010090  SR-DFAUL12
      D(16)=1.                                                 010100  SR-DFAUL13
      D(17)=1.                                                 010110  SR-DFAUL14
      D(21)=10HJUN1400021                                      010120  SR-DFAUL15
      D(22)=10HACQDATO122                                      010130  SR-DFAUL16
      D(23)=10HRSPDATO123                                      010140  SR-DFAUL17
      D(24)=10HDFSDATO124                                      010150  SR-DFAUL18
      D(27)=10HPSTDATO127                                      010160  SR-DFAUL19
      D(28)=10HAINVDAO128                                      010170  SR-DFAUL20
      D(31)=0.0                                                010180  SR-DFAUL21
      D(32)=.40                                                010190  SR-DFAUL22
      D(41)=.01                                                010200  SR-DFAUL23
      D(42)=3.                                                 010210  SR-DFAUL24
      D(43)=0.                                                 010220  SR-DFAUL25
      D(44)=1000.                                              010230  SR-DFAUL26
      D(45)=31.0                                               010240  SR-DFAUL27
      D(46)=25.                                                010250  SR-DFAUL28
      D(47)=.37                                                010260  SR-DFAUL29
      D(48)=.975                                               010270  SR-DFAUL30
      D(49)=.915                                               010280  SR-DFAUL31
      D(50)=.96                                                010290  SR-DFAUL32
      D(51)=20.                                                010300  SR-DFAUL33
      D(52)=10000.                                             010310  SR-DFAUL34
      D(53)=6.                                                 010320  SR-DFAUL35
      D(54)=10.                                                010330  SR-DFAUL36
      D(55)=61.                                                010340  SR-DFAUL37
      D(56)=8.                                                 010350  SR-DFAUL38
      D(57)=.10                                                010360  SR-DFAUL39
      D(58)=0.0                                                010370  SR-DFAUL40
      D(59)=0.0                                                010380  SR-DFAUL41
CSEC  THE FOLLOWING CARD CONTAINS AN INCORRECT SEEKER SENSITIVITY 010390  SR-DFAUL42
CSEC  DEFAULT VALUE TO AVOID MAKING THE PROGRAM LISTING CLASSIFIED. 010400  SR-DFAUL43
CSEC  WHEN RUNNING IN A SECURE ENVIRONMENT, THE CORRECT VALUE SHOULD BE 010410  SR-DFAUL44
CSEC  USED. RUNS MADE WITH THE VALUE BELOW APE USED ONLY FOR THE SAMPLE 010420  SR-DFAUL45
CSEC  CASES.                                                   010430  SR-DFAUL46
      D(60)=60.                                                010440  SR-DFAUL47
      D(61)=.975                                               010450  SR-DFAUL48
      D(62)=.975                                               010460  SR-DFAUL49
      DPRT=0.0                                                 010470  SR-DFAUL50
      DDT=1.                                                   010480  SR-DFAUL51
      DIDN=1.                                                  010490  SR-DFAUL52
      DIDIGT=1.                                                010500  SR-DFAUL53
      DSMK(1)=484.                                             010510  SR-DFAUL54
      DSMK(2)=846.                                             010520  SR-DFAUL55
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 25 OF 82)

D-27

```
C
       RETURN                                           010530   SR-DFAUL56
       END                                              010540   SR-DFAUL57
                                                        010550   SF-DFAUL58
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 26 OF 82)

```
      SUBROUTINE DFCHK                                                   010570      SR-DFCHK  2
C                                                                        010580      SP-DFCHK  3
      COMMON /DDDF/ DFDDKL(10,3), NDFSP, NDDKIL, DOKILD                  000250      CM+DDDF   2
      LOGICAL DOKILD                                                     000260      CM+DDDF   3
      COMMON /KTEST/ KTEST(20,6)                                         000490      CM+KTEST  2
      COMMON /RANDOM/ IR1, IR2, IR3, IR4, IR5, IR6, IR7, IR8, IR9, IR10, 000640,000640  CM+RANDOM2
     1  IR11, IR12, IR13, IR14, IR15, IR16, IR17, IR18, IR19, IR20, IR21 000650  CM+RANDOM3
     2  , IR22, IR23, IR24, IR25, IR26, IR27, IR28                       000660      CM+RANDOM4
      COMMON /RANGE/ DTRNG, MXDRNG, VISLIM, RNGNOW                       000680      CM+RANGE  2
      REAL MXDRNG                                                        000690      CM+RANGE  3
      COMMON /RPLCTN/ KREP, NREP, KRF, NRF, NVEHKL                       000770      CM+RPLCTN2
      COMMON /TARGET/ TVEL, NVEHCL, DISPVH, ITGTTP, IMUTS, ITGTPS        001000      CM+TARGET2
      COMMON /TIME/ DUPLOS, TIMNOW, TOF, TBR, TIMRA, TIMRA1              001020      CM+TIME   2
      COMMON /WEATHR/ PRCLCG, PPCFLS(2), PRGCFL(11,2), W(6,11,2),        001060      CM+WEATHR2
     1  VIS(11), CLOUD(6), NCC, NVL, PASQL(6), WNDSPD(3,3), HUMID(2),    001070      CM+WEATHR3
     2  WSUM(2), WCFSUM(2), ICC, IVL                                     001080      CM+WEATHR4
C                                                                        010670      SR-DFCHK 12
      KTEST(14,KRF)=KTEST(14,KRF)+1                                      010680      SR-DFCHK 13
      IF (DOKILD) GO TO 120                                              010690      SP-DFCHK 14
C                                                                        010700      SR-DFCHK 15
      RNGNOW=AMAX1(0.0,DTRNG-TVEL*TIMRA)                                 010710      SR-DFCHK 16
      DO 100 I=1,NDFSP                                                   010720      SR-DFCHK 17
      IF (DFDDKL(I,1).LE.RNGNOW.AND.RNGNOW.LT.DFDDKL(I+1,1)) GO TO 110   010730      SR-DFCHK 18
  100 CONTINUE                                                           010740      SR-DFCHK 19
      STOP ' IN DFCHK: ERROR NUMBER 1 '                                  010750      SR-DFCHK 20
C                                                                        010760      SR-DFCHK 21
  110 FRAC=(RNGNOW-DFDDKL(I,1))/(DFDDKL(I+1,1)-DFDDKL(I,1))              010770      SP-DFCHK 22
      PDOSUP=DFDDKL(I,2)+FRAC*(DFDDKL(I+1,2)-DFDDKL(I,2))                010780      SR-DFCHK 23
      PDDKIL=DFDDKL(I,3)+FRAC*(DFDDKL(I+1,3)-DFDDKL(I,3))                010790      SR-DFCHK 24
C                                                                        010800      SR-DFCHK 25
      RN15=URAN31(IR15)                                                  010810      SR-DFCHK 26
      IF (RN15.GT.(PDOSUP+PDDKIL)) GO TO 130                             010820      SP-DFCHK 27
      IF (RN15.GT.PDDKIL) GO TO 120                                      010830      SR-DFCHK 28
      NDDKIL=NDDKIL+1                                                    010840      SR-DFCHK 29
      DOKILD=.TRUE.                                                      010850      SP-DFCHK 30
  120 CONTINUE                                                           010860      SP-DFCHK 31
C                                                                        010870      SR-DFCHK 32
      IABRT=14                                                           010880      SP-DFCHK 33
      CALL ABRTTL (IABRT)                                                010890      SR-DFCHK 34
C                                                                        010900      SR-DFCHK 35
  130 RETURN                                                            010910      SR-DFCHK 36
C                                                                        010920      SR-DFCHK 37
      END                                                                010930      SP-DFCHK 38
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 27 OF 82)

```
00000000011111111112222222222333333333344444444445555555555666666666677777777778888888889  COLUMN NUMBERS
12345678901234567890123456789012345678901234567890123456789012345678901234567890  (READ VERTICALLY)

      SUBROUTINE DUST                                                          010950    SR-DUST   2
C                                                                              010960    SR-DUST   3
                                                                                         CM+KTEST  2
      COMMON /KTEST/ KTEST(20,6)                                               000490    CM+MISC   2
      COMMON /MISC/ DDARPK, PDSTKL, RELIF                                      000540    CM+RANDOM2
      COMMON /RANDOM/ IP1, IP2, IP3, IP4, IP5, IR6, IP7, IR8, IP9, IP10,000640 CM+RANDOM3
     1 IR11, IR12, IR13, IR14, IP15, IR16, IP17, IP18, IR19, IP20, IR21000650  CM+RANDOM4
     2 , IR22, IP23, IP24, IR25, IP26, IR27, IP28                            000660   CM+RPLCTN2
      COMMON /RPLCTN/ KREP, NREP, KRF, NRF, NVEHKL                           000770   SR-DUST   8
C                                                                             011010   SP-DUST   9
                                                                              011020   SR-DUST  10
      RN14=URAN31(IR14)                                                       011030   SP-DUST  11
C                                                                             011040   SR-DUST  12
      KTEST(6,KRF)=KTEST(6,KRF)+1                                            011050   SR-DUST  13
      IF (RN14.GT.PDSTKL) GO TO 100                                          011060   SP-DUST  14
C                                                                            011070   SR-DUST  15
      IABRT=6                                                                011080   SP-DUST  16
      CALL ABRTTL (IABPT)                                                    011090   SR-DUST  17
C                                                                            011100   SP-DUST  18
  100 RETURN                                                                 011110   SR-DUST  19
C                                                                            011120
      END

00000000011111111112222222222333333333344444444445555555555666666666677777777778888888889  COLUMN NUMBERS
12345678901234567890123456789012345678901234567890123456789012345678901234567890  (READ VERTICALLY)
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 28 OF 82)

```
      SUBROUTINE FCHO (IUNIT)                                          011140  SR-ECHO   2
c                                                                      011150  SP-ECHO   3
      COMMON /BAIL/ BLDRNG, IBAIL                                      000170  CM+BAIL   2
      COMMON /DODF/ DFDOKL(10,3), NDFSP, NDOKIL, NOKILD               000250  CM+DODF   2
      LOGICAL DOKILD                                                   000260  CM+DODF   3
      COMMON /FLAG/ ENDREP, IDN, IPREPL, IDIGTL, IPPTY, IRNDDC, IT3FLG, 000300 CM+FLAG   2
     1 ENDFLG                                                          000310  CM+FLAG   3
      LOGICAL ENDFLG, FNDREP                                           000320  CM+FLAG   4
      COMMON /HIT/ INDEX(6,5,2), FETBL(60,10,7), DLTT(6), PKTBL(10,2), 000410 CM+HIT    2
     1 NRNGTT, RNGTTF(20), TTF(3,20,2), NRNGPS, PNGPST(10), PSTTBL(10, 000420 CM+HIT    3
     2 3)                                                              000430  CM+HIT    4
      COMMON /LOGFLG/ FIRSTL, SEQNML, SPCL(70), SHRTEC, FTSILL        000510  CM+LOGFLG2
      LOGICAL FIRSTL, SEQNML, SPCL, SHRTEC, FTSILL                     000520  CM+LOGFLG3
      COMMON /MISC/ DOAFPK, PDSTKL, PELIF                             000540  CM+MISC   2
      COMMON /OVER/ INVER(70)                                          000560  CM+OVER   2
      COMMON /PEDESC/ ANGLET, GTRNG, RFFL, DEFB, TGTHID, SKSFN        000580  CM+PEDESC2
      COMMON /PANDDC/ TCRIT, NPLDSP, PNGPLS(10), PERLDS(10)           000620  CM+RANDDC2
      COMMON /RANGF/ DTPNG, MXDRNG, VISLIM, PNGNOW                    000680  CM+RANGE  2
      REAL MXDRNG                                                      000690  CM+RANGE  3
      COMMON /RECNAM/ WCODE, ACCODE, P.SCODE, DFCODE, PDCODE, PFCODE,  000710 CM+RECNAM2
     1 PSCODE, AICODE                                                  000720  CM+RECNAM3
      COMMON /RNGLOS/ NPP, NPP, MPNGCL, CPNGD(11,2), SEGLOS(11,11),   000740  CM+RNGLOS2
     1 RNGCLB(11), VELTBL(2,2)                                         000750  CM+RNGLOS3
      COMMON /RPLCTN/ KREP, NREP, KRF, NRF, NVEHKL                    000770  CM+RPLCTN2
      COMMON /RSPTIM/ BATRTM(3), XMVADF(2), NUM1, BCSPTM(2,2), XMTTIM(2, 000790 CM+RSPTIM2
     1 2), TMEAN(2,2), TSIGMA(2,2), DETTMA(10,2), NDT, TRARRY(3,2),    000800  CM+RSPTIM3
     2 PP.SPTM, TRBAR, PRSDT, PRSVT, ALPHA(2,2), BETA(2,2), DETTIM,    000810  CM+RSPTIM4
     3 IDSGTP, PUMC, PCRMSG, PPDOW                                     000820  CM+RSPTIM5
      COMMON /RUNDAT/ DAT, TIM, NCASE, ICCPFG, IPPFG                  000840  CM+RUNDAT2
      COMMON /SMOKED/ SMK2(3,3,2), SMK5(3,3,2), FRDNT, NSMK2, NSMK5,  000920  CM+SMOKED2
     1 PSMKKL                                                          000930  CM+SMOKED3
      COMMON /TARGET/ TVEL, NVEHCL, DISBVH, ITGTTP, IMUTS, ITGTPS     001000  CM+TARGET2
      COMMON /TIME/ DIFLOS, TIIHOW, TOF, TBR, TIMPA, TIMRA1           001060  CM+TIME   2
      COMMON /WEATHR/ PRCLCG, PRCFLS(2), PPGCFL(11,2), W(6,11,2),     001060  CM+WEATHP2
     1 VIS(11), CLOUD(6), NCC, NVL, WNDSPD(3,3), HUHID(2),            001070  CM+WEATHP3
     2 WSUM(2), WCFSUM(2), ICC, IVL                                    001080  CM+WEATHR4
c                                                                      011350  SR-ECHO  23
      WRITE (IUNIT,200) NCASF                                          011360  SR-ECHO  24
      WRITE (IUNIT,210) NREP,NPF                                       011370  SR-ECHO  25
      WRITE (IUNIT,220) DOAPPK,PSMKKL,PDSTKL,PELIF                    011380  SP-ECHO  26
      WRITE (IUNIT,210) NSMK2,NSMK5                                    011390  SR-ECHO  27
      WRITE (IUNIT,220) MXDPNG                                         011400  SP-ECHO  28
      WRITE (IUNIT,220) TOF,TBR                                        011410  SP-ECHO  29
      WRITE (IUNIT,230) TVEL,NVEHCL,DISBVH,ITGTTP                     011420  SR-ECHO  30
      WRITE (IUNIT,220) PPCLCG,(PPCFLS(I),I=1,2)                      011430  SP-ECHO  31
      WRITE (IUNIT,240) ((PPGCFL(I,J),I=1,11),J=1,2)                 011440  SR-ECHO  32
      DO 100 K=1,2                                                     011450  SP-ECHO  33
      DO 100 J=1,NVL                                                   011460  SR-ECHO  34
      WRITE (IUNIT,220) (W(I,J,K),I=1,NCC)                            011470  SR-ECHO  35
100   CONTINUE                                                         011480  SR-ECHO  36
      WRITE (IUNIT,210) NCC,NVL                                        011490  SR-ECHO  37
      WRITE (IUNIT,220) (WCFSUM(I),I=1,2),(WSUM(I),I=1,2)            011500  SR-ECHO  38
      WRITE (IUNIT,220) (PASOL(I),I=1,6)                              011510  SR-ECHO  39
      DO 110 J=1,3                                                     011520  SP-ECHO  40
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 29 OF 82)

```
      WRITE (IUNIT,220) (WNDSPD(I,J),J=1,3)                                              011530  SR-ECHO  41
  110 CONTINUE                                                                           011540  SP-ECHO  42
      WRITE (IUNIT,220) (HUMID(I),I=1,2)                                                 011550  SR-ECHO  43
      WRITE (IUNIT,210) NRP,NPP,NPNGCL                                                   011560  SR-ECHO  44
      WRITE (IUNIT,240) ((CRNGDI(I,J),I=1,11),J=1,2)                                     011570  SR-ECHO  45
      WRITE (IUNIT,240) ((SEGLOS(I,J),I=1,11),J=1,11)                                    011580  SR-ECHO  46
      WRITE (IUNIT,240) (RNGCLR(I),I=1,11)                                               011590  SR-ECHO  47
      DO 120 J=1,2                                                                       011600  SR-ECHO  48
      WRITE (IUNIT,220) (VELTBL(I,J),I=1,2)                                              011610  SP-ECHO  49
  120 CONTINUE                                                                           011620  SR-ECHO  50
      WRITE (IUNIT,210) IDN,IPPEPL,IDIGTL,IPRTY,IRNDOC,IT3FLG                            011630  SR-ECHO  51
      WRITE (IUNIT,220) BLDRNG                                                           011640  SR-ECHO  52
      WRITE (IUNIT,250) ((DFDRKL(I,J),I=1,10),J=1,3)                                     011650  SR-ECHO  53
      WRITE (IUNIT,250) ANGLET,GTRNG,REFL,DEFR,TGTHD,SKSEN                               011660  SR-ECHO  54
      IF (IUNVER(26).NE.2) WRITE (IUNIT,180) PECODE                                      011670  SR-ECHO  55
      IF (IUNVER(26).EQ.2) WRITE (IUNIT,190)                                             011680  SP-ECHO  56
      IF (SHRTEC) GO TO 150                                                              011690  SR-ECHO  57
      DO 130 I=1,6                                                                       011700  SR-ECHO  58
      WRITE (IUNIT,260) I,((INDEX(I,J,K),K=1,2),J=1,5)                                   011710  SR-ECHO  59
  130 CONTINUE                                                                           011720  SR-ECHO  60
      DO 140 I=1,60                                                                      011730  SR-ECHO  61
      WRITE (IUNIT,270) I,((PFTBL(I,J,K),K=1,7),J=1,10)                                  011740  SP-ECHO  62
  140 CONTINUE                                                                           011750  SR-ECHO  63
  150 CONTINUE                                                                           011760  SR-ECHO  64
      WRITE (IUNIT,210) NRNGTT                                                           011770  SR-ECHO  65
      DO 160 J=1,20                                                                      011780  SR-ECHO  66
  160 WRITE (IUNIT,220) RNGTTF(J),((TTF(I,J,K),K=1,2),I=1,3)                             011790  SR-ECHO  67
      WRITE (IUNIT,280) (DLTT(I),I=1,6)                                                  011800  SR-ECHO  68
      WRITE (IUNIT,280) ((PKTBL(I,J),I=1,10),J=1,2)                                      011810  SP-ECHO  69
      WRITE (IUNIT,210) NPNGPS                                                           011820  SR-ECHO  70
      WRITE (IUNIT,280) (RNGPST(I),I=1,10)                                               011830  SR-ECHO  71
      WRITE (IUNIT,280) ((PSTTBL(I,J),I=1,10),J=1,3)                                     011840  SR-ECHO  72
      WRITE (IUNIT,220) (BATRTM(I),I=1,3),(XMVADF(I),I=1,2)                              011850  SR-ECHO  73
      WRITE (IUNIT,220) ((BCSPTM(I,J),I=1,2),J=1,2),((XMTTIM(I,J),I=1,2),I=1,2)          011860  SP-ECHO  74
     1,J=1,2)                                                                            011870  SP-ECHO  75
      WRITE (IUNIT,220) ((TMEAN(I,J),I=1,2),I=1,2),((TSIGMA(I,J),I=1,2),I=1,2),          011880  SR-ECHO  76
     1 J=1,2)                                                                            011890  SP-ECHO  77
      WRITE (IUNIT,220) ((ALPHA(I,J),I=1,2),I=1,2),((BETA(I,J),I=1,2),                   011900  SR-ECHO  78
     1 J=1,2)                                                                            011910  SR-ECHO  79
      WRITE (IUNIT,210) NDT                                                              011920  SR-ECHO  80
      WRITE (IUNIT,280) ((DETTMA(I,J),I=1,10),J=1,2)                                     011930  SR-ECHO  81
      WRITE (IUNIT,220) ((TPAPRY(I,J),I=1,3),J=1,2)                                      011940  SR-ECHO  82
      WRITE (IUNIT,220) PRSPTM,TRBAP,PRSDT,PRSVI,PCPMSG,PRDOW,RUMC                       011950  SR-ECHO  83
      WRITE (IUNIT,210) IDSGTP                                                           011960  SR-ECHO  84
      IF (IFNDAC.EQ.0) GO TO 170                                                         011970  SR-ECHO  85
      WRITE (IUNIT,220) TCPIT                                                            011980  SR-ECHO  86
      WRITE (IUNIT,210) NPLOSP                                                           011990  SR-ECHO  87
      WRITE (IUNIT,280) (RNGPLS(I),I=1,10)                                               012000  SP-ECHO  88
      WRITE (IUNIT,280) (PRBLOS(I),I=1,10)                                               012010  SR-ECHO  89
  170 CONTINUE                                                                           012020  SR-ECHO  90
      WRITE (IUNIT,290) NICASE                                                           012030  SR-ECHO  91
                                                                                         012040  SR-ECHO  92
C                                                                                        012050  SP-ECHO  93
C *** F O R M A T   S T A T E M E N T S ***                                              012060  SR-ECHO  94
C
```

```
000000000111111111122222222223333333333444444444455555555556666666666777777777788888888889  COLUMN NUMBERS
123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890  (READ VERTICALLY)
```

LISTING D-1   FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 30 OF 82)

D-32

```
C
180 FORMAT (1H ,28H NAME OF PEDATA RECORD USED:,1X,A10)          012070 SR-ECHO 95
190 FORMAT (1H ,34H TEMPORARY OPTION USED FOR PEDATA )           012080 SR-ECHO 96
200 FORMAT (1H ,13(4H   - ),21H DATA CHECK FOR CASE ,I3,13(4H   - ))  012090 SR-ECHO 97
210 FORMAT (1H ,16I5)                                            012100 SR-ECHO 98
220 FORMAT (1H ,8F10.4)                                          012110 SR-ECHO 99
230 FORMAT (1H ,F10.4,I10,F10.4,I10)                             012120 SP-ECHO100
240 FORMAT (1H ,11F10.4)                                         012130 SR-ECHO101
250 FORMAT (1H ,10F10.4)                                         012140 SR-ECHO102
260 FORMAT (1H ,18HINDEX ARRAY FOR I=,I5,/,(2I5))                012150 SP-ECHO103
270 FORMAT (1H ,15HPE ARRAY FOR I=,I5,/,(1H ,7F10.4))            012160 SR-ECHO104
280 FORMAT (1H ,10F10.4)                                         012170 SR-ECHO105
290 FORMAT (1H ,8(6H******),27H END OF DATA CHECK FOR CASE,I4,1X,8(6H*012190 SR-ECHO106
   1******))                                                     012180 SR-ECHO107
    END                                                          012190 SR-ECHO108
                                                                 012200 SP-ECHO108
                                                                 012210 SR-ECHO109
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LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 31 OF 82)

```
          0000000000111111111122222222223333333333444444444455555555556666666666777777777788888888889   COLUMN NUMBERS
          1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890   (READ VERTICALLY)

          SUBROUTINE FINDIT (B,N1,N2,IT,N3)                                                012230   SR-FINDIT2
      C                                                                                    012240   SR-FINDIT3
          COMMON /ACHAR/ CHAR(10,120), NREC                                                000150   CM+ACHAR 2
          COMMON /ICODE/ ICODE                                                             000470   CM+ICODE 2
          COMMON /INDEX1/ INDX11(2001)                                                     000840   CM+INDEX12
          COMMON /RUNDAT/ DAT, TIM, NCASE, ICCPFG, IPPFG                                   000970   CM+RUNDAT2
          COMMON /SYMBOL/ BLANK, DECPNT, ALFRET(271), ANUMRP(11), SEP(5),                  000980   CM+SYMBOL2
         1 DOLLAR                                                                                   CM+SYMBOL3
          EXTERNAL NDREC                                                                   012300   SP-FINDIT9
      C                                                                                    012310   SR-FINDI10
          DIMENSION B(N1,N2), IT(N3)                                                       012320   SR-FINDI11
          DIMENSION CHAPA(10,30), IPAY(6)                                                  012330   SR-FINDI12
      C                                                                                    012340   SR-FINDI13
          EQUIVALENCE (ICODE,CODE)                                                         012350   SP-FINDI14
      C                                                                                    012360   SP-FINDI15
          LOGICAL NUMRIC                                                                   012370   SP-FINDI16
      C                                                                                    012380   SR-FINDI17
          IRAY(1)=0                                                                        012390   SR-FINDI18
          IRAY(5)=LOCF(NDREC)                                                              012400   SR-FINDI19
          CALL SYSTEMC (104,IPAY)                                                          012410   SR-FINDI20
      C                                                                                    012420   SR-FINDI21
          DO 100 I=1,N3                                                                    012430   SR-FINDI22
      100 IT(I)=1                                                                          012440   CP-FINDI23
      C                                                                                    012450   SR-FINDI24
          IB=1                                                                             012460   SR-FINDI25
          ITRY=0                                                                           012470   SR-FINDI26
      110 DO 130 I=1,NREC                                                                  012480   SR-FINDI27
          DO 120 J=1,8                                                                     012490   SR-FINDI28
          IF (B(J,IB).NE.CHAR(J+2,I)) GO TO 130                                            012500   SR-FINDI29
      120 CONTINUE                                                                         012510   SR-FINDI30
          IT(IB)=CHAR(1,I)                                                                 012520   SR-FINDI31
          IMATCH=I                                                                         012530   SR-FINDI32
          GO TO 140                                                                        012540   SR-FINDI33
      130 CONTINUE                                                                         012550   SR-FINDI34
      C                                                                                    012560   SR-FINDI35
          WRITE (6,240) IB,((B(I1,I2),I1=1,N1),I2=1,N2)                                    012570   SP-FINDI36
          STOP ' IN FINDIT: ERROR NUMBER 1 '                                              012580   SR-FINDI37
      C                                                                                    012590   SR-FINDI38
      140 IF (IT(1).LT.6.OR.IT(1).GT.8) GO TO 160                                          012600   SP-FINDI39
          IF (ITRY.EQ.0.OR.(20.LT.IT(2).AND.IT(2).LE.30)) GO TO 150                        012610   SR-FINDI40
          WRITE (6,230) (B(2,JK),JK=1,N2),IT(2),CHAP(3,IMATCH)                             012620   SR-FINDI41
          STOP ' IN FINDIT: ERROR NUMBER 2 '                                              012630   SR-FINDI42
      150 CONTINUE                                                                         012640   SR-FINDI43
          IF (ITRY.EQ.1) RETURN                                                            012650   SR-FINDI44
          ITRY=1                                                                           012660   SR-FINDI45
          IMATCH1=IMATCH                                                                   012670   SP-FINDI46
          IB=2                                                                             012680   SP-FINDI47
          GO TO 110                                                                        012690   SP-FINDI48
      C                                                                                    012700   SR-FINDI49
      160 IT1=IT(1)                                                                        012710   SP-FINDI50
          IF (CHAP(2,IMATCH).EQ.0.0) GO TO 210                                            012720   SR-FINDI51
          ICHNL=CHAP(2,IMATCH)                                                             012730   SP-FINDI52
          ICHPRL=300                                                                       012740   SP-FINDI53
          CODE=CHAP(3,IMATCH)                                                              012750   SR-FINDI54

          0000000000111111111122222222223333333333444444444455555555556666666666777777777788888888889   COLUMN NUMBERS
          1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890   (READ VERTICALLY)
```

LISTING D-1   FORTRAN LISTING OF COPE PROGRAM - CONT'D

```
      IF (CHAR(1,IMATCH).EQ.CHAR(1,IMATCH+1)) CODE=CHAR(3,IMATCH+1)          012760    SR-FINDI55
      CALL READMS (11,CHARA,ICHPL,ICNDF)                                     012770    SR-FINDI56
      IMXNR=N3                                                               012780    SR-FINDI57
      DO 200 I=2,IMXNR                                                       012790    SP-FINDI58
      IF (B(1,I).EQ.BLANK) GO TO 200                                         012800    SR-FINDI59
      DO 180 K=1,ICHNL                                                       012810    SR-FINDI60
      IF (I.NE.IFIX(CHAFA(2,K))) GO TO 180                                   012820    SP-FINDI61
      DO 170 J=1,8                                                           012830    SP-FINDI62
      IF (B(J,I).NE.CHAFA(J+2,K)) GO TO 180                                  012840    SR-FINDI63
  170 CONTINUE                                                               012850    SR-FINDI64
      IT(I)=CHARA(1,K)                                                       012860    SR-FINDI65
      GO TO 200                                                              012870    SR-FINDI66
  180 CONTINUE                                                               012880    SR-FINDI67
      IB=I                                                                   012890    SR-FINDI68
      IF (NUMRIC(B,N1,N2,IB)) GO TO 190                                      012900    SR-FINDI69
      WRITE (6,240) IB,((B(I1,I2),I1=1,N1),I2=1,N2)                          012910    SP-FINDI70
      STOP ' IN FINDIT: ERROR NUMBER 3 '                                     012920    SP-FINDI71
C                                                                            012930    SP-FINDI72
  190 IT(IB)=0                                                               012940    SR-FINDI73
  200 CONTINUE                                                               012950    SR-FINDI74
C                                                                            012960    SR-FINDI75
      RETURN                                                                 012970    SR-FINDI76
  210 IB=2                                                                   012980    SR-FINDI77
      IF (B(1,IB).EQ.BLANK) RETURN                                          012990    SR-FINDI78
      IF (.NOT.NUMRIC(B,N1,N2,IB)) GO TO 220                                 013000    SR-FINDI79
      IT(IB)=0                                                               013010    SR-FINDI80
      RETURN                                                                 013020    SP-FINDI81
  220 WRITE (6,240) IB,((B(I1,I2),I1=1,N1),I2=1,N2)                          013030    SR-FINDI82
      STOP ' IN FINDIT: ERROR NUMBER 4 '                                     013040    SR-FINDI83
C                                                                            013050    SR-FINDI84
C                                                                            013060    SR-FINDI85
C *** FORMAT STATEMENTS ***                                                 013070    SR-FINDI86
C                                                                            013080    SR-FINDI87
  230 FORMAT (1H ,21H IN FINDIT, KEYWORD: ,8A10,/,32H AND CORRESPONDING      013090    SR-FINDI88
     1VALUE OF IT: ,I3,26H ARE NOT ALLOWED WITH THE ,A10,8H OPTION )         013100    SP-FINDI89
  240 FORMAT (1H ,39H IN FINDIT: NO MATCH FOUND FOR LINE IB=,I3,19H OF       013110    SR-FINDI90
     1HIS B ARRAY : ,/,(1X,8A10))                                           T013120    SR-FINDI91
      END                                                                    013130    SR-FINDI92
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 33 OF 82)

```
C     SUBROUTINE GETRNG

      COMMON /RANDOM/ IP1, IR2, IP3, IR4, IR5, IR6, IP7, IP8, IP9, IP10, IP21    SP-GETRNG2    013150
     1  IR11, IP12, IP13, IR14, IP15, IP16, IP17, IP18, IR19, IP20, IR28         SR-GETRNG3    013160
     2  , IR22, IR23, IR24, IR25, IR26, IR27, IR28                               CM+RANDOM2    000640
      COMMON /RANGE/ DTRNG, NXDRNG, VISTIM, RNGNOW                               CM+RANDOM3    000650
      REAL NXDRNG                                                               CM+RANDOM4    000660
      COMMON /RNGLOS/ NRP, NPP, NRNGCL, CRNGD(11,2), SEGLOS(11,11),             CM+RANGE 2    000680
     1  RNGCLB(11), VELTBL(2,2)                                                 CM+RANGE 3    000690
      COMMON /PPLCTN/ KPEP, NPEP, KPF, NPF, NVEHKL                              CM+RNGLOS2    000740
      COMMON /TARGET/ TVEL, NVEHCL, DISRVH, ITGTP, IMUTS, ITGTPS                CM+RNGLOS3    000750
      COMMON /TIME/ DUPLOS, TIMNOW, TOF, TBP, TIMPA, TIMPA1                     CM+RPLCTN2    000770
      COMMON /WEATHR/ PRCCLCG, PRCFLS(2), PRGCFL(11,2), W(6,11,2),              CM+TARGET2    001000
     1  VIS(11), CLOUD(6), NCC, NVL, PASOL(6), WNDSPD(3,3), HUMID(2),           CM+TIME  2    001020
     2  WSUM(2), WCFSUM(2), ICC, IVL                                            CM+WEATHR2    001060
                                                                               CM+WEATHR3    001070
                                                                               CM+WEATHR4    001080
C     CALL SMPLCD (CRNGD,11,2,2,NRP,IR6,DTRNG,IPC)                             SR-GETRN11    013240
                                                                               SP-GETRN12    013250
C                                                                              SR-GETRN13    013260
      DO 100 I=1,NRNGCL                                                         SR-GETRN14    013270
      IF (DTRNG.LE.RNGCLB(I)) GO TO 110                                        SP-GETRN15    013280
100   CONTINUE                                                                  SP-GETRN16    013290
C                                                                              SR-GETRN17    013300
110   IROW=I+1                                                                  SR-GETRN18    013310
C                                                                              SR-GETRN19    013320
      IF (TVEL.GT.0.0) GO TO 120                                               SP-GETRN20    013330
      CALL STPACE                                                              SP-GETRN21    013340
      STOP ' IN GETRNG: TARGET VELOCITY = 0.0 '                                SR-GETRN22    013350
C                                                                              SR-GETRN23    013360
120   CALL SMPLCD (SEGLOS,11,11,IROW,NPP,IP7,SEGLNG,ICLASS)                    SR-GETRN24    013370
      DUPLOS=(SEGLNG+FLOAT(NVEHCL-1)*DISBVH)/TVEL                              SP-GETRN25    013380
C                                                                              SR-GETRN26    013390
      RETURN                                                                    SR-GETRN27    013400
C                                                                              SR-GETRN28    013410
      END                                                                      SR-GETRN29    013420
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 34 OF 82)

```
      SUBROUTINE GETTIM                                                         013440   SR-GETTIM2
C                                                                               013450   SP-GETTIM3
      COMMON /FLAG/ ENDREP, IDN, IPREPL, IDIGTL, IPRTY, IRNDOC, IT3FLG,         000300   CM+FLAG  2
     1 ENDFLG                                                                   000310   CM+FLAG  3
      LOGICAL ENDFLG, ENDREP                                                    000320   CM+FLAG  4
      COMMON /FSRESP/ FSRT(14,2)                                                000360   CM+FSRESP2
      COMMON /KTEST/ KTEST(20,6)                                                000490   CM+KTEST 2
      COMMON /LOGFLG/ FIRSTL, SEQNML, SPCL(70), SHRTEC, FTSILL                  000510   CM+LOGFLG2
      LOGICAL FIRSTL, SEQNML, SPCL, SHRTEC, FTSILL                              000520   CM+LOGFLG3
      COMMON /RANDOM/ IR1, IR2, IR3, IR4, IR5, IR6, IP7, IR8, IP9, IR10,        000640   CM+RANDOM2
     1 IR11, IR12, IP13, IP14, IP15, IP16, IP17, IR8, IP18, IP19, IP20, IR21   000650   CM+RANDOM3
     2 , IR22, IR23, IF24, IP25, IP26, IP27, IR28                              000660   CM+RANDOM4
      COMMON /RPLCTN/ KFEP, NREP, KRF, NRF, NVEHKL                              000770   CM+RPLCTN2
      COMMON /RSPTIM/ EATPTM(3), XMVADF(2), DUM1, BCSPTM(2,2), XMTTIM(2,        000790   CM+RSPTIM2
     1 2), TMEAN(2,2), TSIGMA(2,2), DFTTMA(10,2), NDT, TRARPY(3,2),             000800   CM+RSPTIM3
     2 PRSPTM, TRBAR, PRSDT, PPSVT, ALPHA(2,2), BETA(2,2), DETTIM,              000810   CM+RSPTIM4
     3 IDSGTP, RUMC, PCRMSG, PRDOW                                              000820   CM+RSPTIM5
      COMMON /TIME/ DURLOS, TIMNOW, TOF, TBR, TIMRA, TIMRA1                     001020   CM+TIME  2
C                                                                               013540   SR-GETTI12
      ITIMDL=3                                                                  013550   SR-GETTI13
      IF (FTSILL) ITIMDL=1                                                      013560   SR-GETTI14
      IF (PRSPTM.NE.0.0) ITIMDL=2                                              013570   SP-GETTI15
C                                                                               013580   SR-GETTI16
      GO TO (100,110,120), ITIMDL                                              013590   SR-GETTI17
C                                                                               013600   SP-GETTI18
C  FIRST METHOD OF MODELING RESPONSE TIME (A SINGLE DISTRIBUTION)              013610   SP-GETTI19
C                                                                               013620   SR-GETTI20
  100 TIMNOW=DFTTIM                                                             013630   SR-GETTI21
C                                                                               013640   SR-GETTI22
      CALL SMPLCD (FSRT,14,2,2,14,IR9,FSPTIM,IC)                               013650   SR-GETTI23
      TIMNOW=TIMNOW+FSPTIM                                                      013660   SR-GETTI24
C                                                                               013670   SR-GETTI25
      RN10=URAN31(IR10)                                                         013680   SR-GETTI26
      KTEST(8,KRF)=KTEST(8,KRF)+1                                               013690   SR-GETTI27
      IF (RN10.LE.PRSDT) GO TO 170                                             013700   SP-GETTI28
C                                                                               013710   SR-GETTI29
      IABPT=8                                                                   013720   SR-GETTI30
      CALL ABRTTL (IABPT)                                                       013730   SP-GETTI31
      GO TO 180                                                                 013740   SP-GETTI32
C                                                                               013750   SP-GETTI33
C  SECOND METHOD OF MODELING RESPONSE TIME (A SINGLE VALUE)                    013760   SP-GETTI34
C                                                                               013770   SR-GETTI35
  110 TIMNOW=PRSPTM                                                            013780   SR-GETTI36
C                                                                               013790   SR-GETTI37
      RN10=URAN31(IR10)                                                         013800   SR-GETTI38
      KTEST(8,KRF)=KTEST(8,KRF)+1                                               013810   SR-GETTI39
      IF (RN10.LE.PRSDT) GO TO 170                                             013820   SP-GETTI40
C                                                                               013830   SR-GETTI41
      IARPT=8                                                                   013840   SR-GETTI42
      CALL ABRTTL (IARPT)                                                       013850   SP-GETTI43
      GO TO 180                                                                 013860   SR-GETTI44
C                                                                               013870   SR-GETTI45
C  THIRD METHOD OF MODELING RESPONSE TIME (ADDING CONTRIBUTIONS OF             013880   SP-GETTI46
C  VARIOUS DELAY COMPONENTS)                                                   013890   SR-GETTI47
```

```
00000000011111111112222222222333333333344444444445555555555666666666677777777778888888889  COLUMN NUMBERS
12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789  (READ VERTICALLY)
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 35 OF 82)

D-37

```
C  120 CONTINUE                                                              013900  SR-GETTI148
C                                                                            013910  SR-GETTI149
C     IF IDN = 1 , DAYTIME ; IF IDN = 2 , NIGHT .                           013920  SR-GETTI150
C     IF IPREPL = 1 , PRE-PLANNED ; IF IPREPL = 2 , TARGET OF OPPORTUNITY   013930  SR-GETTI151
C     IF IDIGTL = 1 , USF CMD ; IF IDIGTL = 2 , USE VOICE .                 013940  SR-GETTI152
C     IF IPRTY=2, PRIORITY PRE-PLANNED TARGET; OTHERWISE, NOT PRIORITY      013950  SR-GETTI153
                                                                            013960  SR-GETTI154
      ITDGTL=IDIGTL                                                          013970  SR-GETTI155
      KTEST(8,KPF)=KTEST(8,KPF)+1                                           013980  SR-GETTI156
      IF (ITDGTL.NE.1) GO TO 130                                            013990  SR-GETTI157
C                                                                            014000  SR-GETTI158
      ALF=ALPHA(IDN,IPREPL)                                                  014010  SR-GETTI159
      EDDTIM=BETA(IDN,IPREPL)+GAMMA(ALF,IP9)                                014020  SR-GETTI160
      TIMNOW=TIMNOW+EDDTIM                                                   014030  SR-GETTI161
C                                                                            014040  SR-GETTI162
      PN1Q=URAN31(IR1Q)                                                      014050  SR-GETTI163
      IF (PN1Q.GT.PRSPT) GO TO 130                                          014060  SR-GETTI164
      TIMNOW=TIMNOW+XMTTIM(ITDGTL,IPPEPL)                                   014070  SR-GETTI165
      GO TO 160                                                             014080  SR-GETTI166
C                                                                            014090  SR-GETTI167
  130 PN11=URAN31(IP11)                                                      014100  SR-GETTI168
      IF (PN11.LE.PPSVT) GO TO 140                                          014110  SR-GETTI169
      IABRT=8                                                               014120  SR-GETTI170
      CALL ABRTTL (IABRT)                                                   014130  SR-GETTI171
      GO TO 180                                                             014140  SR-GETTI172
C                                                                            014150  SR-GETTI173
  140 IF (IDIGTL.EQ.2) GO TO 150                                            014160  SR-GETTI174
      TIMNOW=TIMNOW+XMTTIM(ITDGTL,IPREPL)+XMVADF(IPREPL)                    014170  SR-GETTI175
      ITDGTL=2                                                               014180  SR-GETTI176
      GO TO 160                                                             014190  SR-GETTI177
C                                                                            014200  SR-GETTI178
  150 TIMNOW=TIMNOW+XMTTIM(ITDGTL,IPREPL)                                   014210  SR-GETTI179
  160 TIMNOW=TIMNOW+BCSPTM(ITDGTL,IPPEPL)                                   014220  SR-GETTI180
      TIMNOW=TIMNOW+BATPTM(IPPEPL+IPRTY)                                    014230  SR-GETTI181
C                                                                            014240  SR-GETTI182
C     CHECK FOR CORRECT MESSAGE                                             014250  SR-GETTI183
C                                                                            014260  SR-GETTI184
  170 KTEST(9,KPF)=KTEST(9,KPF)+1                                           014270  SR-GETTI185
      PN12=URAN31(IP12)                                                      014280  SR-GETTI186
      IF (PN12.LT.PCRMSG) GO TO 180                                         014290  SR-GETTI187
C                                                                            014300  SR-GETTI188
      IABRT=9                                                               014310  SR-GETTI189
      CALL ABRTTL (IABRT)                                                   014320  SR-GETTI190
C                                                                            014330  SR-GETTI191
  180 RETURN                                                                014340  SR-GETTI192
C                                                                            014350  SR-GETTI193
      END                                                                   014360  SR-GETTI194
                                                                            014370  SR-GETTI195
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 36 OF 82)

```
      SUBROUTINE GETVIS                                              014390    SR-GETVIS2
C                                                                    014400    SR-GETVIS3
C     THIS SUBROUTINE SAMPLES WEATHER DATA ARRAY TO OBTAIN CLOUD CEILING  014410    SR-GETVIS4
C     AND VISIBILITY RANGE LIMIT.                                    014420    SR-GETVIS5
C                                                                    014430    SR-GETVIS6
      COMMON /RANDOM/ IP1, IP2, IP3, IP4, IP5, IP6, IP7, IP8, IP9, IP10, 000640    CM+RANDOM2
     1 IR11, IP12, IP13, IR14, IP15, IP16, IR17, IP18, IR19, IR20, IR21  000650    CM+RANDOM3
     2 , IR22, IR23, IR24, IP25, IR26, IR27, IR28                    000660    CM+RANDOM4
      COMMON /RANGE/ DTRNG, MXDRNG, VISLIM, RNGNOW                    000680    CM+RANGE 2
      REAL MXDRNG                                                     000690    CM+RANGE 3
      COMMON /RPLCTN/ KFEP, NREP, KPF, NPF, NVEHKL                    000770    CM+RPLCTN2
      COMMON /WEATHR/ PPCLCG, PRCFLS(2), PRGCFL(11,2), W(6,11,2),     001060    CM+WEATHR2
     1 VIS(11), CLOUD(6), NCC, NVL, PASQL(6), WNDSPD(3,3), HUMID(2),  001070    CM+WEATHR3
     2 WSUM(2), WCFSUM(2), ICC, IVL                                   001080    CM+WEATHR4
C                                                                    014480    SR-GETVI11
C     IF THERE IS A CLOUD CEILING, ICLNGF=1; IF NOT,ICLNGF=2 .       014490    SR-GETVI12
C                                                                    014510    SR-GETVI13
      RN2=URAN31(IR2)                                                014520    SP-GETVI15
      ICLNGF=2                                                       014530    SR-GETVI16
      IF (RN2.LT.PRCLCG) ICLNGF=1                                    014540    SR-GETVI17
C                                                                    014550    SP-GETVI18
C     IF THERE IS A CLOUD FREE LOS, ICFLOS=1;IF NOT, ICFLOS=2 .      014560    SR-GETVI19
C                                                                    014570    SR-GETVI20
      RN3=URAN31(IR3)                                                014580    SP-GETVI21
      ICFLOS=2                                                       014590    SP-GETVI22
      IF (RN3.LT.PRCFLS(ICLNGF)) ICFLOS=1                            014600    SR-GETVI23
      IF (ICFLOS.EQ.2) GO TO 120                                     014610    SR-GETVI24
C                                                                    014620    SR-GETVI25
C     CLOUD FREE LINE-OF-SIGHT                                       014630    SR-GETVI26
C     USE PRGCFL ARRAY PPROBABILITIES IN SAMPLING TO OBTAIN IVL      014640    SP-GETVI27
C     SET ICC TO MAXIMUM CLOUD CEILING ALTITUDE INDEX (ICC=6)        014650    SR-GETVI28
C                                                                    014660    SR-GETVI29
      ICC=6                                                          014670    SR-GETVI30
      CLDCLG=CLOUD(ICC)                                              014680    SR-GETVI31
C                                                                    014690    SR-GETVI32
      PR=0.0                                                         014700    SR-GETVI33
      RN4=URAN31(IR4)*WCFSUM(ICLNGF)                                 014710    SR-GETVI34
      DO 100 IJ=1,NVL                                                014720    SP-GETVI35
      PR1=PR                                                         014730    SR-GETVI36
      PR=PP+PRGCFL(IJ,ICLNGF)                                        014740    SP-GETVI37
      IF (PR1.LF.RN4.AND.RN4.LT.PR) GO TO 110                        014750    SP-GETVI38
100   CONTINUE                                                       014760    SP-GETVI39
C                                                                    014770    SP-GETVI40
      CALL STRACE                                                    014780    SR-GETVI41
      STOP ' IN GETVIS: RANDOM NUMBER TROUBLE 1 '                    014790    SR-GETVI42
C                                                                    014800    SP-GETVI43
110   VISLIM=VIS(IJ)                                                 014810    SP-GETVI44
      IVL=IJ                                                         014820    SR-GETVI45
      GO TO 160                                                      014830    SR-GETVI46
C                                                                    014840    SR-GETVI47
C     NO CLOUD FREE LINE-OF-SIGHT                                    014850    SP-GETVI48
C     USE W ARRAY PROBABILITIES IN SAMPLING TO OBTAIN ICC AND IVL    014860    SR-GETVI49
C                                                                    014870    SR-GETVI50
120   PR=0.0
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 37 OF 82)

D-39

```
0000000000111111111122222222223333333333444444444455555555556666666666777777777788888888889  COLUMN NUMBERS
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678 90  (READ VERTICALLY)

      RM5=URAN31(IR5)*WSUM(ICLNGF)                     014880  SR-GETVI51
      DO 140 I=1,NCC                                   014890  SR-GETVI52
      DO 130 J=1,NVL                                   014900  SR-GETVI53
      PR1=PR.                                          014910  SR-GETVI54
      PR=PR+W(I,J,ICLNGF)                              014920  SR-GETVI55
      IF (PR1.LT..RM5.AND.RM5.LT.PR) GO TO 150         014930  SR-GETVI56
130   CONTINUE                                         014940  SR-GETVI57
140   CONTINUE                                         014950  SR-GETVI58
C                                                      014960  SR-GETVI59
      CALL STRACE                                      014970  SR-GETVI60
      STOP ' IN GETVIS: RANDOM NUMBER TROUBLE 2 '      014980  SR-GETVI61
C                                                      014990  SR-GETVI62
150   VISLIM=VIS(J)                                    015000  SR-GETVI63
      CLDCLG=CLOUD(I)                                  015010  SR-GETVI64
      IVL=J                                            015020  SR-GETVI65
      ICC=I                                            015030  SR-GETVI66
C                                                      015040  SR-GETVI67
160   ICC=7-ICC                                        015050  SR-GETVI68
C                                                      015060  SR-GETVI69
      RETURN                                           015070  SR-GETVI70
C                                                      015080  SR-GETVI71
      END                                              015090  SR-GETVI72

0000000000111111111122222222223333333333444444444455555555556666666666777777777788888888889  COLUMN NUMBERS
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678 90  (READ VERTICALLY)
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 38 OF 82)

```
      SUBROUTINE HEADER
c
      COMMON /BAIL/ BLORNG, IBAIL
      COMMON /COMENT/ CNENT(13,20), CONBUF(13), ICMNT, NTRC
      COMMON /DISPLY/ DISPT(24), DISPH(12), RFCLBL(8), TMPLBL(8),
      COMMON /FLAG/ ENDREP, IDH, IPPEPL, IDIGTL, IPRTY, IPNDDC, IT3FLG,
     1 ENDFLG
      LOGICAL ENDFLG, ENDREP
      COMMON /HEADNG/ ACQLBL(2,4), DAYLRL(2), DFSLBL(2), DGTLRL(2,2),
     1 DOLBL(3,2), ROLBL(4,2), PSPLBL(3,3)
      COMMON /LOGFLG/ FIRSTL, SEQHML, SPCL(70), SHRTEC, FTSILL
      LOGICAL FIRSTL, SEQHML, SPCL, SHRTEC, PELIF
      COMMON /MISC/ DNAPPK, PDSTKL, PELIF
      COMMON /OVER/ IOVER(70)
      COMMON /PEDESC/ ANGLET, GTRNG, RETL, DEFB, TGTHD, SKSEN
      COMMON /RANGE/ DTRNG, MXDPNG, VISLIM, PNGNOW
      REAL MXDRNG
      COMMON /RECNAM/ WCODE, ACCODF, RSCODE, DFCODE, PDCODE, PECODE,
     1 PSCODE, AICODE
      COMMON /RPLCTN/ KPEP, NREP, KRF, NRF, NVEHKL
      COMMON /RSPTIM/ BATRTM(3), XNVADF(2), DUM1, RCSPTM(2,2), XMTTIM(2,2),
     1 2), THEAN(2,2), TSIGMA(2,2), RETTMA(10,2), NDT, TRARPY(3,2),
     2 PRSPTM, TRBAR, PPSDT, PP.SVT, ALPHA(2,2), BETA(2,2), DFTTIM,
     3 IDSGTP, RUMC, PCRMSG, PRDOW
      COMMON /RUNDAT/ DAT, TIM, NCASE, ICCPFG, IPPFG
      COMMON /SMOKED/ SMK2(3,3,2), SMK5(3,3,2), FPDNT, NSMK2, NSMK5,
     1 PSMKKL
      COMMON /SYMBOL/ BLANK, DECPNT, ALFRFT(27), ANUMBR(11), SEP(5),
     1 DOLLAR
      COMMON /TARGET/ TVEL, NVEHCL, DISBVH, ITGTTP, IMUTS, ITGTPS
      COMMON /TIME/ DURLOS, TIMNOW, TOF, TBR, TIMPA, TIMRAI
      COMMON /UVALUE/ U(70), UPRT, UDT, UIDN, UIDIGT, USMK(2)
c
      DIMENSION AOUT(4,40), BOUT(4,40), COUT(4,40)
      DIMENSION CM(10), RECODE(8)
      DIMENSION UVALUE(70)
c
      EQUIVALENCE (U(1),UVALUE(1))
      EQUIVALENCE (RECODE(1),WCODF)
c
      DO 100 I=1,4
      DO 100 J=1,40
      AOUT(I,J)=BLANK
      BOUT(I,J)=BLANK
      COUT(I,J)=BLANK
  100 CONTINUE
c
      WRITE (6,400) NCASE
      WRITE (6,410) NRFP
c
      NXTLIN=0
      ENCODE (40,420,AOUT(1,1+NXTLIN) )
      ENCODE (40,430,AOUT(1,2+NXTLIN) )
      ENCODE (40,440,AOUT(1,3+NXTLIN) )
```

Label	Number
SP-HEADER2	015110
SP-HEADER3	015120
CM+BAIL 2	000170
CM+COMENT2	000190
CM+DISPLY2	000230
CM+FLAG 2	000300
CM+FLAG 3	000310
CM+FLAG 4	000320
CM+HEADNG2	000380
CM+HEADNG3	000390
CM+LOGFLG2	000510
CM+LOGFLG3	000520
CM+MISC 2	000540
CM+OVER 2	000560
CM+PEDESC2	000580
CM+RANGE 2	000680
CM+RANGE 3	000690
CM+RECNAM2	000710
CM+RECNAM3	000720
CM+RPLCTN2	000770
CM+RSPTIM2	000790
CM+RSPTIM3	000800
CM+RSPTIM4	000810
CM+RSPTIM5	000820
CM+RUNDAT2	000840
CM+SMOKED2	000920
CM+SMOKED3	000930
CM+SYMBOL2	000970
CM+SYMBOL3	000980
CM+TARGET2	001000
CM+TIME 2	001020
CM+UVALUE2	001040
SR-HEADE23	015320
SR-HEADE24	015330
SR-HEADE25	015340
SR-HEADE26	015350
SR-HEADE27	015360
SR-HEADE28	015370
SR-HEADE29	015380
SR-HEADE30	015390
SR-HEADE31	015400
SR-HEADE32	015410
SR-HEADE33	015420
SR-HEADE34	015430
SR-HEADE35	015440
SR-HEADE36	015450
SR-HEADE37	015460
SR-HEADE38	015470
SR-HEADE39	015480
SR-HEADE40	015490
SR-HEADE41	015500
SR-HEADE42	015510
SR-HEADE43	015520
SR-HEADE44	015530

LISTING D-1   FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 39 OF 82)

```
      ENCODE (40,430,ADUT(1,4+NXTLIN) )                          015540   SR-HEADE45
      ENCODE (40,450,ADUT(1,5+NXTLIN) )ITGTTP                    015550   SP-HEADE46
      ENCODE (40,460,ADUT(1,6+NXTLIN) )NVFHCL                    015560   SR-HEADE47
      ENCODE (40,470,ADUT(1,7+NXTLIN) )DISBVH                    015570   SR-HEADE48
      ENCODE (40,480,ADUT(1,8+NXTLIN) )TVFL                      015580   SR-HEADE49
      NXTLIN=1                                                   015590   SR-HEADE50
      ENCODE (40,290,ADUT(1,NXTLIN+8) )TGTHD                     015600   SR-HEADE51
      NXTLIN=NXTLIN+1                                            015610   SR-HEADE52
      ENCODE (40,300,ADUT(1,NXTLIN+8) )PEFL                      015620   SR-HEADE53
      ENCODE (40,430,ADUT(1,9+NXTLIN) )                          015630   SR-HEADE54
      ENCODE (40,420,ADUT(1,10+NXTLIN) )                         015640   SR-HEADE55
C                                                                015650   SF-HEADE56
      ENCODE (40,420,ADUT(1,12+NXTLIN) )                         015660   SP-HEADE57
      ENCODE (40,430,ADUT(1,13+NXTLIN) )                         015670   SR-HEADE58
      ENCODE (40,490,ADUT(1,14+NXTLIN) )                         015680   SR-HEADE59
      ENCODE (40,430,ADUT(1,15+NXTLIN) )                         015690   SR-HEADE60
      ENCODE (40,500,ADUT(1,16+NXTLIN) )MFF                      015700   SR-HEADE61
      ENCODE (40,510,ADUT(1,17+NXTLIN) )PFLIF                    015710   SR-HEADE62
      ENCODE (40,520,ADUT(1,18+NXTLIN) )TRR                      015720   SR-HEADE63
      ENCODE (40,530,ADUT(1,19+NXTLIN) )TOF                      015730   SR-HEADE64
      NXTLIN=NXTLIN+1                                            015740   SR-HEADE65
      ENCODE (40,310,ADUT(1,NXTLIN+19) )GTPHG                    015750   SR-HEADE66
      NXTLIN=NXTLIN+1                                            015760   SR-HEADE67
      ENCODE (40,320,ADUT(1,NXTLIN+19) )ANGLET                   015770   SP-HEADE68
      NXTLIN=NXTLIN+1                                            015780   SR-HEADE69
      ENCODE (40,330,ADUT(1,NXTLIN+19) )DFFB                     015790   SR-HEADE70
      ENCODE (40,430,ADUT(1,20+NXTLIN) )                         015800   SR-HEADE71
      ENCODE (40,420,ADUT(1,21+NXTLIN) )                         015810   SR-HEADE72
C                                                                015820   SR-HEADE73
      ENCODE (40,420,ADUT(1,23+NXTLIN) )                         015830   SR-HEADE74
      ENCODE (40,430,ADUT(1,24+NXTLIN) )                         015840   SP-HEADE75
      ENCODE (40,540,ADUT(1,25+NXTLIN) )                         015850   SR-HEADE76
      ENCODE (40,430,ADUT(1,26+NXTLIN) )                         015860   SR-HEADE77
      IF (IT3FLG.EQ.0) GO TO 110                                 015870   SR-HEADE78
      ENCODE (40,550,ADUT(1,27+NXTLIN) )                         015880   SP-HEADE79
      ENCODE (40,560,ADUT(1,28+NXTLIN) )RUMC                     015890   SR-HEADE80
      NXTLIN=NXTLIN+29                                           015900   SR-HEADE81
      GO TO 120                                                  015910   SR-HEADE82
110   ENCODE (40,570,ADUT(1,27+NXTLIN) )                         015920   SP-HEADE83
      NXTLIN=NXTLIN+28                                           015930   SR-HEADE84
120   CONTINUE                                                   015940   SP-HEADE85
      ENCODE (40,340,ADUT(1,NXTLIN) )SKSEM                       015950   SR-HEADE86
      NXTLIN=NXTLIN+1                                            015960   SR-HEADE87
      ENCODE (40,430,ADUT(1,NXTLIN) )                            015970   SR-HEADE88
      NXTLIN=NXTLIN+1                                            015980   SP-HEADE89
      ENCODE (40,420,ADUT(1,NXTLIN) )                            015990   SR-HEADE90
C                                                                016000   SP-HEADE91
      NXTLIN=0                                                   016010   SR-HEADE92
      ENCODE (40,420,BDUT(1,1) )                                 016020   SR-HEADE93
      ENCODE (40,430,BDUT(1,2) )                                 016030   SP-HEADE94
      ENCODE (40,580,BDUT(1,3) )                                 016040   SF-HEADE95
      ENCODE (40,430,BDUT(1,4) )                                 016050   SR-HEADE96
      NXTLIN=5                                                   016060   SR-HEADE97
      IF (PRSPTM.EQ.0.0) GO TO 130                               016070   SR-HEADE98
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LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 40 OF 82)

D-42

```
        ENCODE (40,590,BOUT(1,5) )PPSPTH                               016080    SR-HEADE99
        NXTLIN=6                                                       016090    SP-HEAD100
130     ENCODE (40,600,BOUT(1,NXTLIN) )(PSPLBL(I,IPPEPL+IPPTY),I=1,3)  016100    SP-HEAD101
        ENCODE (40,610,BOUT(1,NXTLIN+1) )(DGTLBL(I,IDIGTL),I=1,2)      016110    SR-HEAD102
        ENCODE (40,620,BOUT(1,NXTLIN+2) )(DAYLBL(IDN))                 016120    SR-HEAD103
        NXTLIN=NXTLIN+3                                                016130    SR-HEAD104
        TRBAR1=TRBAR                                                   016140    SP-HEAD105
        IF (PRSPTM.GT.0.0) TPRAP1=PPSPTM+TPF                           016150    SR-HEAD106
        ENCODE (40,630,BOUT(1,NXTLIN) )TRRAP1                          016160    SR-HEAD107
        NXTLIN=NXTLIN+1                                                016170    SP-HEAD108
        IF (IDIGTL.EQ.2) GO TO 140                                     016180    SR-HEAD109
        ENCODE (40,640,BOUT(1,NXTLIN) )PPSPT                           016190    SP-HEAD110
        NXTLIN=NXTLIN+1                                                016200    SR-HEAD111
        IF (FTSILL) GO TO 150                                          016210    SR-HEAD112
        IF (PRSPTM.GT.0.0) GO TO 150                                   016220    SR-HEAD113
140     ENCODE (40,650,BOUT(1,NXTLIN) )PPSVT                          016230    SR-HEAD114
        NXTLIN=NXTLIN+1                                                016240    SR-HEAD115
150     ENCODE (40,260,BOUT(1,NXTLIN) )PCPMSG                         016250    SR-HEAD116
        NXTLIN=NXTLIN+1                                                016260    SR-HEAD117
        ENCODE (40,270,BOUT(1,NXTLIN) )PPROW                          016270    SR-HEAD118
        NXTLIN=NXTLIN+1                                                016280    SR-HEAD119
        ENCODE (40,430,BOUT(1,NXTLIN) )                                016290    SP-HEAD120
        NXTLIN=NXTLIN+1                                                016300    SP-HEAD121
        ENCODE (40,420,BOUT(1,NXTLIN) )                                016310    SP-HEAD122
                                                                       016320    SR-HEAD123
C                                                                      016330    SR-HEAD124
        NXTLIN=NXTLIN+2                                                016340    SR-HEAD125
        ENCODE (40,420,BOUT(1,NXTLIN) )                                016350    SR-HEAD126
        NXTLIN=NXTLIN+1                                                016360    SP-HEAD127
        ENCODE (40,430,BOUT(1,NXTLIN) )                                016370    SR-HEAD128
        ENCODE (40,660,ROUT(1,NXTLIN+1) )                             016380    SP-HEAD129
        ENCODE (40,430,BOUT(1,NXTLIN+2) )                             016390    SR-HEAD130
        ENCODE (40,670,BOUT(1,NXTLIN+3) )IDSGTP                       016400    SR-HEAD131
        ENCODE (40,680,BOUT(1,NXTLIN+4) )MXDRNG                       016410    SR-HEAD132
        ENCODE (40,690,BOUT(1,NXTLIN+5) )BLORNG                       016420    SR-HEAD133
        IODLOC=UVALUE(13)                                             016430    SR-HEAD134
        ENCODE (40,700,BOUT(1,NXTLIN+6) )(DOLBL(I,IODLOC),I=1,3)      016440    SP-HEAD135
        ENCODE (40,430,ROUT(1,NXTLIN+7) )                             016450    SR-HEAD136
        ENCODE (40,420,BOUT(1,NXTLIN+8) )                             016460    SR-HEAD137
                                                                       016470    SR-HEAD138
C                                                                      016480    SP-HEAD139
        ENCODE (40,420,BOUT(1,NXTLIN+10) )                            016490    SR-HEAD140
        ENCODE (40,430,BOUT(1,NXTLIN+11) )                            016500    SR-HEAD141
        ENCODE (40,710,BOUT(1,NXTLIN+12) )                            016510    SR-HEAD142
        ENCODE (40,430,BOUT(1,NXTLIN+13) )                            016520    SP-HEAD143
        ENCODE (40,720,ROUT(1,NXTLIN+14) )DOAPPK                      016530    SR-HEAD144
        DECODE (10,730,UVALUE(24) )IDFL                               016540    SP-HEAD145
        ENCODE (40,740,BOUT(1,NXTLIN+15) )DFSLRL(IDFL)                016550    SP-HEAD146
        ENCODE (40,430,BOUT(1,NXTLIN+16) )                            016560    SR-HEAD147
        ENCODE (40,420,BOUT(1,NXTLIN+17) )                            016570    SR-HEAD148
                                                                       016580    SR-HEAD149
C                                                                      016590    SR-HEAD150
        NXTLIN=NXTLIN+1                                                016600    SR-HEAD151
        ENCODE (40,420,COUT(1,1) )                                    016610    SP-HEAD152
        ENCODE (40,430,COUT(1,2) )
        ENCODE (40,750,COUT(1,3) )
        ENCODE (40,430,COUT(1,4) )
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LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 41 OF 82)

D-43

```
00000000001111111111222222222233333333334444444444555555555566666666667777777777888888889  COLUMN NUMBERS
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678890  (READ VERTICALLY)

      IF (IOVER(21).NE.0) GO TO 160                                    016620   SP-HEAD153
      DECODE (10,760,UVALUE(21) )XWTHR,YWTHR                           016630   SR-HEAD154
      ENCODE (40,770,CRUT(1,5) )XWTHR                                  016640   SR-HEAD155
      ENCODE (40,780,CRUT(1,6) )YWTHR                                  016650   SP-HEAD156
      NXTLIN=7                                                         016660   SP-HEAD157
      GO TO 170                                                        016670   SR-HEAD158
160   IF (IOVER(21).EQ.1) ENCODE (40,790,COUT(1,5) )UVALUE(21)        016680   SP-HEAD159
      IF (IOVER(21).EQ.2) ENCODE (40,800,CRUT(1,5) )                  016690   SR-HEAD160
      NXTLIN=6                                                         016700   SR-HEAD161
170   ENCODE (40,430,COUT(1,NXTLIN) )                                 016710   SR-HEAD162
      ENCODE (40,420,CRUT(1,NXTLIN+1) )                               016720   SR-HEAD163
C                                                                     016730   SR-HEAD164
      ENCODE (40,420,CRUT(1,NXTLIN+3) )                               016740   SR-HEAD165
      ENCODE (40,430,CRUT(1,NXTLIN+4) )                               016750   SP-HEAD166
      ENCODE (40,810,CRUT(1,NXTLIN+5) )                               016760   SR-HEAD167
      ENCODE (40,430,CRUT(1,NXTLIN+6) )                               016770   SR-HEAD168
      IF (IOVER(22).NE.0) GO TO 180                                   016780   SR-HEAD169
      DECODE (10,820,UVALUE(22) )ITPRRM                               016790   SR-HEAD170
      ENCODE (40,830,CRUT(1,NXTLIN+7) )(ACQLBL(I,ITPRM),I=1,2)        016800   SR-HEAD171
      GO TO 190                                                       016810   SR-HEAD172
180   IF (IOVER(22).EQ.1) ENCODE (40,840,COUT(1,NXTLIN+7) )UVALUE(22) 016820   SP-HEAD173
      IF (IOVER(22).EQ.2) ENCODE (40,850,COUT(1,NXTLIN+7) )           016830   SR-HEAD174
190   ENCODE (40,860,CRUT(1,NXTLIN+8) )(ROLRL(I,IPNDOC+1),I=1,4)      016840   SR-HEAD175
      NXTLIN=NXTLIN-1                                                  016850   SR-HEAD176
      ENCODE (40,430,COUT(1,NXTLIN+10) )                              016860   SR-HEAD177
      ENCODE (40,420,CRUT(1,NXTLIN+11) )                              016870   SR-HEAD178
C                                                                     016880   SR-HEAD179
      ENCODE (40,420,COUT(1,NXTLIN+13) )                              016890   SR-HEAD180
      ENCODE (40,430,COUT(1,NXTLIN+14) )                              016900   SR-HEAD181
      ENCODE (40,870,CRUT(1,NXTLIN+15) )                              016910   SR-HEAD182
      ENCODE (40,430,COUT(1,NXTLIN+16) )                              016920   SR-HEAD183
      ENCODE (40,350,CRUT(1,NXTLIN+17) )PSMKKL                        016930   SR-HEAD184
      IF (SPCL(32)) GO TO 200                                         016940   SR-HEAD185
      NXTLIN=NXTLIN+1                                                  016950   SR-HEAD186
      ENCODE (40,880,CRUT(1,NXTLIN+17) )NSMK2,NSMK5                   016960   SR-HEAD187
200   CONTINUE                                                        016970   SR-HEAD188
      ENCODE (40,890,CQUT(1,NXTLIN+18) )PDSTKL                        016980   SR-HEAD189
      ENCODE (40,430,COUT(1,NXTLIN+19) )                              016990   SR-HEAD190
      ENCODE (40,420,CRUT(1,NXTLIN+20) )                              017000   SR-HEAD191
C                                                                     017010   SR-HEAD192
      ICMFLG=0                                                         017020   SR-HEAD193
      IF (IDN.EQ.1.AND.YWTHR.EQ.4H2200) ICMFLG=1                      017030   SP-HEAD194
      IF (IDN.EQ.2.AND.YWTHR.NE.4H2200) ICMFLG=1                      017040   SR-HEAD195
      IF (ICMFLG.EQ.0) GO TO 210                                      017050   SP-HEAD196
      ENCODE (100,280,CM1) )DAYLBL(IDN),YWTHR                         017060   SR-HEAD197
      CALL COMMNT (CM,10,.FALSE.,.FALSE.)                             017070   SR-HEAD198
210   CONTINUE                                                        017080   SR-HEAD199
C                                                                     017090   SR-HEAD200
      DO 230 I=1,8                                                     017100   SR-HEAD201
      IF (IOVER(20+I).EQ.0) GO TO 230                                 017110   SP-HEAD202
      IF (IOVER(20+I).EQ.1) GO TO 220                                 017120   SR-HEAD203
      IF (IOVER(20+I).NE.2) STOP ' IN HEADER: ERROR NUMBER 1 '        017130   SR-HEAD204
      ENCODE (100,360,CM1) )TMPLBL(I)                                 017140   SR-HEAD205
      CALL COMMNT (CM,10,.FALSE.,.FALSE.)                             017150   SR-HEAD206

00000000001111111111222222222233333333334444444444555555555566666666667777777777888888889  COLUMN NUMBERS
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678890  (READ VERTICALLY)
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LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 42 OF 82)

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      GO TO 230                                                          017160   SR-HEAD207
  220 ENCODE (100,370,CM(1) )PECODE(1),TMPLBL(I)                         017170   SR-HEAD208
      CALL COMMNT (CM,10,.FALSE.,,FALSE.)                                017180   SR-HEAD209
      IF (I.NE.6) GO TO 230                                              017190   SR-HEAD210
      DECODE (10,380,PECODE(6) )PECHK                                    017200   SR-HEAD211
      IF (PECHK.NE.4HPE00) GO TO 230                                     017210   SR-HEAD212
      CALL PEIDNT (T1,I2,I3,T4,T5,T6,T7,T8,T9,PECODE)                    017220   SR-HEAD213
      ENCODE (100,390,CM(1) )T1,I2,T3,T4,T5,T6,T7,T8,T9                  017230   SR-HEAD214
      CALL COMMNT (CM,10,.FALSE.,,FALSE.)                                017240   SR-HEAD215
  230 CONTINUE                                                           017250   SR-HEAD216
C                                                                        017260   SR-HEAD217
      DO 240 J=1,36                                                      017270   SR-HEAD218
      WRITE (6,900) (AOUT(I,J),I=1,4),(BOUT(I,J),I=1,4),(COUT(I,J),I=1,  017280   SR-HEAD219
     1 4)                                                                017290   SR-HEAD220
  240 CONTINUE                                                           017300   SR-HEAD221
      WRITE (6,910)                                                      017310   SR-HEAD222
      IF (ICMNT.NE.0) WRITE (6,920)                                      017320   SR-HEAD223
      DO 250 J=1,ICMNT                                                   017330   SR-HEAD224
      WRITE (6,930) (CMFNT(I,J),I=1,13)                                  017340   SR-HEAD225
  250 CONTINUE                                                           017350   SR-HEAD226
C                                                                        017360   SR-HEAD227
      RETURN                                                             017370   SR-HEAD228
C                                                                        017380   SR-HEAD229
C                                                                        017390   SR-HEAD230
C *** F O R M A T   S T A T E M E N T S ***                             017400   SR-HEAD231
C                                                                        017410   SR-HEAD232
  260 FORMAT (1H*,23H PROB CORRECT MESSAGE =,F6.3,9X,1H*)                017420   SR-HEAD233
  270 FORMAT (1H*,25H PROB DO WARNED TO LASE =,F6.3,7X,1H*)              017430   SR-HEAD234
  280 FORMAT (1H ,10HCHOICE OF ,A10,53H FOR RESPONSE TIME DATA IS INCONS 017440   SP-HEAD235
     1ISTENT WITH TIME OF ,A4,18H FOR WEATHER DATA )                     017450   SR-HEAD236
  290 FORMAT (1H*,16H TARGET HEADING=,F4.0,8H DEGREES,10X,1H*)           017460   SR-HEAD237
  300 FORMAT (1H*,23H TARGET'S REFLECTIVITY=,F4.2,11X,1H*)               017470   SR-HEAD238
  310 FORMAT (1H*,26H NOMINAL GUN-TARGET RANGE=,F4.0,3H KM,5X,1H*)       017480   SR-HEAD239
  320 FORMAT (1H*,9H ANGLE T=,F4.0,8H DEGREES,17X,1H*)                   017490   SR-HEAD240
  330 FORMAT (1H*,17H DEFLECTION BIAS=,F5.0,7H METEPS,9X,1H*)            017500   SR-HEAD241
  340 FORMAT (1H*,20H SEEKER SENSITIVITY=,F4.0,12H JOULES/M**2,2X,1H*)   017510   SR-HEAD242
  350 FORMAT (1H*,26H PROB SMOKE KILLS MISSION=,F4.2,8X,1H*)             017520   SR-HEAD243
  360 FORMAT (32H TEMPORARY OPTION IN EFFECT FOR ,A6)                    017530   SR-HEAD244
  370 FORMAT (15H RECORD NAMED: ,A10,22H USED TO OVERRIDE FOR ,A6)       017540   SR-HEAD245
  380 FORMAT (A4,6X)                                                     017550   SP-HEAD246
  390 FORMAT (16H PEDATA FOR: TR=,F4.0,4H DT=,I1,5H VEL=,F2.0,5H GTR=,F3 017560   SR-HEAD247
     1 0,6H REFL=,F4.3,8H ANGLET=,F4.0,6H DEFR=,F4.0,7H IGTHO=,F3.0,7H   017570   SP-HEAD248
     2KSEN=,F3.0)                                                        017580   SR-HEAD249
  400 FORMAT (1H1,5(10H* * * * * ),2X,21HC A S E   N U M B E P,I5,2X,5(1 017590   SR-HEAD250
     110H* * * * * ),//)                                                 017600   SR-HEAD251
  410 FORMAT (1H ,1X,23HNUMBER OF REPLICATIONS=,I5,/)                    017610   SR-HEAD252
  420 FORMAT (8(5H*****) )                                               017620   SR-HEAD253
  430 FORMAT (1H*,38X,1H*)                                               017630   SR-HEAD254
  440 FORMAT (1H*,16X,6HTARGET,16X,1H*)                                  017640   SR-HEAD255
  450 FORMAT (1H*,6H TYPE ,I2,30X,1H*)                                   017650   SR-HEAD256
  460 FORMAT (1H*,20H NUMBER OF VEHICLES=,I2,16X,1H*)                    017660   SR-HEAD257
  470 FORMAT (1H*,32H MEAN DISTANCE BETWEEN VEHICLES=,F4.0,3HM *)        017670   SR-HEAD258
  480 FORMAT (1H*,17H TARGET VELOCITY=,F2.0,6H M/SEC,13X,1H*)            017680   SR-HEAD259
  490 FORMAT (1H*,13X,11HFIRING INFO,14X,1H*)                            017690   SP-HEAD260
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LISTING D-1   FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 43 OF 82)

D-45

```
500 FORMAT (1H*,33H NUMBER OF POUNDS PER ENGAGEMENT=,F4.2,15X,1H*)      017700  SP-HEAD261
510 FORMAT (1H*,19H ROUND RELIABILITY=,F4.2,15X,1H*)                    017710  SR-HEAD262
520 FORMAT (1H*,21H TIME BETWEEN ROUNDS=,F4.0,4H SEC,9X,1H*)            017720  SR-HEAD263
530 FORMAT (1H*,16H TIME OF FLIGHT=,F5.1,4H SEC,13X,1H*)                017730  SR-HEAD264
540 FORMAT (1H*,17X,4HMISC,17X,1H*)                                     017740  SR-HEAD265
550 FORMAT (1H*,26H DELTA T3 NOT ASSUMED ZERO,12X,1H*)                  017750  SR-HEAD266
560 FORMAT (1H*,6H PUNC=,F5.0,1HH,26X,1H*)                              017760  SR-HEAD267
570 FORMAT (1H*,28H DELTA T3 ASSUMED TO BE ZERO,10X,1H*)                017770  SR-HEAD268
580 FORMAT (1H*,4X,29HDETECT, COMMD, AND PROC TIMES,5X,1H*)             017780  SR-HEAD269
590 FORMAT (1H*,29H PARAMETERIZED RESPONSE TIME=,F4.0,6H SEC *)         017790  SP-HEAD270
600 FORMAT (1H*,1X,3A10,7X,1H*)                                         017800  SP-HEAD271
610 FORMAT (1H*,1X,2A10,17X,1H*)                                        017810  SR-HEAD272
620 FORMAT (1H*,1X,A10,27X,1H*)                                         017820  SR-HEAD273
630 FORMAT (1H*,23H NOMINAL RESPONSE TIME=,F4.0,4H SEC,7X,1H*)          017830  SR-HEAD274
640 FORMAT (1H*,30H PROB SUCCESSFUL DIGITAL TRAN=,F5.3,3X,1H*)          017840  SR-HEAD275
650 FORMAT (1H*,28H PROB SUCCESSFUL VOICE TRAN=,F5.3,5X,1H*)            017850  SR-HEAD276
660 FORMAT (1H*,14X,10HDESIGNATOR,14X,1H*)                             017860  SR-HEAD277
670 FORMAT (1H*,6H TYPE ,I2,30X,1H*)                                    017870  SR-HEAD278
680 FORMAT (1H*,26H MAXIMUM DESIGNATOR RANGE=,F5.0,2H M,5X,1H*)         017880  SP-HEAD279
690 FORMAT (1H*,16H RAIL-OUT RANGE=,F5.0,2H M,15X,1H*)                  017890  SP-HEAD280
700 FORMAT (1H*,1X,3A10,7X,1H*)                                         017900  SR-HEAD281
710 FORMAT (1H*,8X,21HDESIGNATOR SUPPRESSED,9X,1H*)                     017910  SR-HEAD282
720 FORMAT (1H*,34H PROB SUPPRESSED BY INDIRECT FIRE=,F3.2,2H *)        017920  SP-HEAD283
730 FORMAT (6X,I2,2X)                                                   017930  SR-HEAD284
740 FORMAT (1H*,32H PROB SUPPRESSED BY DIRECT FIRE=,1X,A4,2H *)         017940  SR-HEAD285
750 FORMAT (1H*,16X,7HWEATHER,15X,1H*)                                  017950  SP-HEAD286
760 FORMAT (A3,A4,3X)                                                   017960  SR-HEAD287
770 FORMAT (1H*,10H MONTH OF ,A3,25X,1H*)                               017970  SR-HEAD288
780 FORMAT (1H*,14H TIME OF DAY: ,A4,20X,1H*)                           017980  SP-HEAD289
790 FORMAT (1H*,27H OVERRIDE WITH WEATHER REC ,A10,2H *)                017990  SP-HEAD290
800 FORMAT (1H*,32H USING "TEMPORARY" WEATHER DATA ,6X,1H*)             018000  SR-HEAD291
810 FORMAT (1H*,11X,15HTERRAIN AND 10S,12X,1H*)                         018010  SR-HEAD292
820 FORMAT (6X,I2,2X)                                                   018020  SR-HEAD293
830 FORMAT (1H*,1X,2A10,17X,1H*)                                        018030  SR-HEAD294
840 FORMAT (1H*,27H OVERRIDE WITH TERRAIN REC ,A10,2H *)                018040  SR-HEAD295
850 FORMAT (1H*,31H USING "TEMPORARY" TERRAIN DATA,7X,1H*)              018050  SP-HEAD296
860 FORMAT (1H*,1X,3A10,A7,1H*)                                         018060  SR-HEAD297
870 FORMAT (1H*,14X,10HOBSCURANTS,14X,1H*)                              018070  SR-HEAD298
880 FORMAT (1H*,24H VOLUME OF SMOKE FIRED: ,I4,3H +,I4,3X,1H*)          018080  SP-HEAD299
890 FORMAT (1H*,25H PROB DUST KILLS MISSION=,F4.2,9X,1H*)               018090  SR-HEAD300
900 FORMAT (1H ,2X,4A10,3X,4A10,3X,4A10)                                018100  SR-HEAD301
910 FORMAT (/)                                                          018110  SP-HEAD302
920 FORMAT (1H ,6(8H)$  $$  ),8X,15HC O M M E N T S,9X,6(8H  $$
   1),/018120  $$)/                                                     018130  SR-HEAD304
930 FORMAT (1H ,13A10)                                                  018140  SR-HEAD305
    END                                                                 018150  SR-HEAD306
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 44 OF 82)

```
C      SUBROUTINE HITCHK                                                            018170   SR-HITCHK2
                                                                                    018180   SR-HITCHK3
       COMMON /HIT/ INDEX(60,5,2), PETRL(60,10,7), DLTT(6), PKTBL(10,2),            000410   CM+HIT    2
      1 HRNGTT, RNGTTF(20), TTF(3,20,2), HRNGPS, PNGPST(10), PSTTBL(10,             000420   CM+HIT    3
      2 3)                                                                          000430   CM+HIT    4
       COMMON /KTEST/ KTEST(20,6)                                                   000490   CM+KTEST  2
       COMMON /RANDOM/ IR1, IR2, IR3, IR4, IR5, IR6, IR7, IR8, IR9, IR10,          000640   CM+RANDOM2
      1 IR11, IR12, IR13, IR14, IR15, IR16, IR17, IR18, IR19, IP20, IR21           000650   CM+RANDOM3
      2 , IR22, IR23, IR24, IR25, IR26, IR27, IR28                                 000660   CM+RANDOM4
       COMMON /RANGE/ DTRNG, HXDRNG, VISLIM, PNGNOW                                 000680   CM+RANGE  2
       REAL MXDRNG                                                                  000690   CM+RANGE  3
       COMMON /RPLCTN/ KREP, NREP, KRF, NRF, NVEHKL                                 000770   CM+RPLCTN2
       COMMON /RSPTIM/ RATPTH(3), XHVADF(2), DUM1, RCSPTM(2,2), XMTTIM(2,000790     CM+RSPTIM2
      1 2), TMEAN(2,2), TSIGMA(2,2), DETTMA(10,2), NDT, TRAPRY(3,2),               000800   CM+RSPTIM3
      2 PRSPTN, TRBAR, PRSDT, PRSVT, ALPHA(2,2), RETA(2,2), DETTIM,                000810   CM+RSPTIM4
      3 IDSGTP, RUHC, PCRMSG, PRDNW                                                 000820   CM+PSPTIM5
       COMMON /TARGET/ TVEL, NVEHCL, DISBVH, ITGTTP, IMUTS, ITGTPS                  001000   CM+TARGET2
       COMMON /TIME/ DURLOS, TIMNOW, TOF, TBP, TIMPA, TIMPAI                        001020   CM+TIME   2
                                                                                    018270   SP-HITCH12
       DO 100 IK=1,HRNGTT                                                           018280   SR-HITCH13
       IF (PNGNOW.LT.RNGTTF(IK).OR.RNGTTF(IK+1).LE.PNGNOW) GO TO 100                018290   SR-HITCH14
       IPM=IK                                                                       018300   SR-HITCH15
  100  CONTINUE                                                                     018310   SR-HITCH16
       GO TO 110                                                                    018320   SR-HITCH17
       STOP ' IN HITCHK: FAILED TO BRACKET RANGE '                                  018330   SR-HITCH18
                                                                                    018340   SR-HITCH19
  110  TFRAC1=(PNGNOW-RNGTTF(IRM))/(RNGTTF(IR M+1)-RNGTTF(IRM))                     018350   SR-HITCH20
       PH=TTF(IDSGTP,IRM,ITGTPS)+TFRAC1*(TTF(IDSGTP,IRM+1,ITGTPS)                   018360   SR-HITCH21
      1 -TTF(IDSGTP,IRM,ITGTPS))                                                    018370   SR-HITCH22
                                                                                    018380   SR-HITCH23
       RN20=UPAN31(IR20)                                                           018390   SR-HITCH24
       KTEST(18,KRF)=KTFST(18,KPF)+1                                               018400   SP-HITCH25
       IF (RN20.LE.PH) GO TO 120                                                   018410   SR-HITCH26
                                                                                    018420   SR-HITCH27
       IABRT=18                                                                     018430   SR-HITCH28
       CALL ABRTTL (IABRT)                                                          018440   SR-HITCH29
                                                                                    018450   SR-HITCH30
  120  RETURN                                                                       018460   SP-HITCH31
       END                                                                          018470   SR-HITCH32
```

LISTING D-1   FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 45 OF 82)

```
      SUBROUTINE INITLZ                                               018490    SR-INITLZ2
C                                                                     018500    SR-INITLZ3
      COMMON /ABOPT/ NABORT(20,6), MSABLM                             000110    CM+ABORT 2
      COMMON /ACHAR/ CHAR(10,120), NPEC                               000150    CM+ACHAR 2
      COMMON /DVALUE/ D(70), DPRT, DDT, DIDN, DIDIGT, DSMK(2)         000280    CM+DVALUE2
      COMMON /FLAG/ ENDREP, IDN, IPPFL, IPPFL, IDIGTL, IPPTY, IPNDOC, IT3FLG, 000300  CM+FLAG 2
    1 ENDFLG                                                          000310    CM+FLAG 3
      LOGICAL ENDFLG, ENDREP                                          000320    CM+FLAG 4
      COMMON /ICODE/ ICODE                                            000450    CM+ICODE 2
      COMMON /INDEX1/ INDX11(2001)                                    000470    CM+INDEX12
      COMMON /RUNDAT/ DAT, TIM, NCASE, ICCPFG, IPPFG                  000840    CM+RUNDAT2
      COMMON /UVALUE/ U(70), UPRT, UDT, UIDN, UIDIGT, USMK(2)         001040    CM+UVALUE2
      DIMENSION IRAY(6)                                               018590    SR-INITL12
      DIMENSION IOPTNM(70)                                            018600    SP-INITL13
                                                                      018610    SP-INITL14
C     EXTERNAL NDREC                                                  018620    SR-INITL15
                                                                      018630    SP-INITL16
C     EQUIVALENCE (ICDRF,CDRF)                                        018640    SR-INITL17
                                                                      018650    SR-INITL18
C     IRAY(1)=0                                                       018660    SP-INITL19
      IRAY(5)=LDCF(NDREC)                                             018670    SR-INITL20
      CALL SYSTFMC (104,IRAY)                                         018680    SR-INITL21
                                                                      018690    SP-INITL22
C     CALL OPENMS (11,INDX11,2001,1)                                  018700    SP-INITL23
                                                                      018710    SP-INITL24
C     ICODE=8HOPTNNUMS                                                018720    SR-INITL25
      CALL READMS (11,IOPTNM,70,ICODE)                                018730    SR-INITL26
                                                                      018740    SR-INITL27
C     DO 100 I=1,NPEC                                                 018750    SR-INITL28
      J=CHAR(1,I)                                                     018760    SP-INITL29
      CHAR(2,I)=IOPTNM(J)                                             018770    SR-INITL30
  100 CONTINUE                                                        018780    SR-INITL31
                                                                      018790    SR-INITL32
C     CALL DFAULT                                                     018800    SR-INITL33
      CALL USET                                                       018810    SR-INITL34
                                                                      018820    SR-INITL35
C     MSABLM=11                                                       018830    SR-INITL36
      ENDFLG=.FALSE.                                                  018840    SR-INITL37
                                                                      018850    SP-INITL38
C     RETURN                                                          018860    SP-INITL39
      END                                                             018870    SR-INITL40
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 46 OF 82)

```
0000000001111111111222222222233333333334444444444555555555566666666667777777777888888888  COLUMN NUMBERS
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678890 (READ VERTICALLY)

C     SUBROUTINE INPUT                                                       018890   SP-INPUT  2
                                                                             018900   SR-INPUT  3
      COMMON /ABORT/ MABORT(20,6), MSABLM                                    000110   CM+ABORT  2
      COMMON /BAIL/ BLORNG, IBAIL                                            000170   CM+BAIL   2
      COMMON /COMENT/ CMENT(13,20), COMRUF(13), ICMNT, NTRC                  000190   CM+COMENT2
      COMMON /DESRNG/ DESRNG(3,2)                                            000210   CM+DESRNG2
      COMMON /DISPLY/ DISPT(24), DISPM(12), RECLBL(R), TMPLBL(8)             000230   CM+DISPLY2
      COMMON /DODF/ DFDDKL(10,31), NDFSP, NDOKIL, DOKILD                     000250   CM+DODF   2
      LOGICAL DOKILD                                                         000260   CM+DODF   3
      COMMON /DVALUE/ D(70), DPRT, DDT, DIDM, DIDIGT, DSMK(2)                000280   CM+DVALUF2
      COMMON /FLAG/ ENDFEP, IDM, IPFEPL, IDIGTL, IPPTY, IRNDOC, IT3FLG,      000300   CM+FLAG   2
     1 ENDFLG                                                                000310   CM+FLAG   3
      LOGICAL ENDFLG, ENDREP                                                 000320   CM+FLAG   4
      COMMON /FLTTIM/ TOFAFY(16)                                             000340   CM+FLTTIM2
      COMMON /HIT/ INDEX(6,5,2), PETBL(60,10,7), DLTT(6), PKTRL(10,2),       000410   CM+HIT    2
     1 NRNGTT, RNGTTF(20), TTF(3,20,2), NRNGPS, PNGPST(10), PSTTBL(10,       000420   CM+HIT    3
     2 3)                                                                    000430   CM+HIT    4
      COMMON /ICODE/ ICODE                                                   000450   CM+ICODE  2
      COMMON /INDEX1/ INDX11(2001)                                           000470   CM+INDEX12
      COMMON /LOGFLG/ FIPSTL, SFQNML, SPCL(70), SHRTEC, FTSILL               000510   CM+LOGFLG2
      LOGICAL FIRSTL, SFQNML, SPCL, SHRTEC, FTSILL                           000520   CM+LOGFLG3
      COMMON /MISC/ DOARPK, PDSTKL, RFLIF                                    000540   CM+MISC   2
      COMMON /OVER/ IOVER(70)                                                000560   CM+OVER   2
      COMMON /PEDESC/ ANGLET, GTPNG, REFL, DEFB, TGTHD, SKSEN                0005R0   CM+PEDESC2
      COMMON /POINT/ IPOINT(70)                                              000600   CM+POINT  2
      COMMON /RANDOC/ TCPIT, NPLOSP, PNGPLS(10), PPRLOS(10)                  000620   CM+RANDOC2
      COMMON /RANDOM/ IR1, IR2, IP3, IR4, IP5, IR6, IP7, IR8, IP9, IR10, IP21 000640  CM+RANDOM2
     1 IR11, IR12, IR13, IP14, IP15, IP16, IP17, IP18, IP19, IP20,          000650   CM+RANDOM3
     2 , IR22, IR23, IP24, IP25, IP26, IP27, IP28                           000660   CM+RANDOM4
      COMMON /RANGE/ DTPNG, MXDPNG, VISLIM, PNGNOW                           000680   CM+RANGE  2
      REAL MXDPNG                                                            000690   CM+RANGE  3
      COMMON /RECNAM/ WCODE, ACCODE, PSCODE, DFCODE, ROCODE, PECODE,         000710   CM+RECNAM2
     1 PSCODE, AICODE                                                        000720   CM+RECNAM3
      COMMON /RNGLOS/ NPP, NPP, NPNGCL, CPNGD(11,2), SFGLOS(11,11),          000740   CM+RNGLOS2
     1 PNGCLB(11), VFLTBL(2,2)                                               000750   CM+RNGLOS3
      COMMON /RPLCTN/ KREP, NREP, KFF, NRF, NVEHKL                           000770   CM+RPLCTN2
      COMMON /RSPTIM/ RATRTM(3), XMVADF(2), DUML, RCSPTM(2,2), XMTTIM(2,     000790   CM+RSPTIM2
     1 2), TMFAN(2,2), TSIGMA(2,2), RETTMA(10,2), NDT, TPARPY(3,2),          000800   CM+RSPTIM3
     2 PFSPTM, TRRAP, PRSDT, PRSVT, ALPHA(2,2), BETA(2,2), DETTIM,           000810   CM+RSPTIM4
     3 IDSGTP, RUMC, PCRMSG, PRDDW                                           000820   CM+RSPTIM5
      COMMON /RUNDAT/ DAT, TIM, NCASE, ICCPFG, IPPFG                         000840   CM+RUNDAT2
      COMMON /SMOKED/ SMK2(3,3,2), SMK5(3,3,2), FRONT, NSMK2, NSMK5,         000920   CM+SMOKED2
     1 PSMKXL                                                                000930   CM+SMOKED3
      COMMON /SYMBOL/ BLANK, DECPNT, ALFRFT(27), ANUMBR(11), SEP(5),         000970   CM+SYMBOL2
     1 DOLLAR                                                                000980   CM+SYMBOL3
      COMMON /TARGET/ TVEL, NVEHCL, DISRVH, ITGTTP, IMUTS, ITGTPS            001000   CM+TARGET2
      COMMON /TIME/ DUPLOS, TITMTW, TOF, TPR, TIMPA, TIMPA1                  001020   CM+TIME   2
      COMMON /UVALUE/ UI(70), UPRT, UDT, UIDN, UIDIGT, USMK(2)               001040   CM+UVALUE2
      COMMON /WEATHR/ PPCLCG, PPCLS(2), PPGCFL(11,2), W(6,11,2),             001060   CM+WEATHR2
     1 VIS(11), CLOUR(6), NCC, NVL, PASQL(6), WNDSPD(3,3), HUMID(2),         001070   CM+WEATHR3
     2 WSUM(2), WCFSMM(2), ICC, IVL                                          0010R0   CM+WEATHR4
      EXTERNAL NOREC                                                         001120   DM+L      2
                                                                             001130   DM+L      3
C     DIMENSION IRAY(6)                                                      001140   DM+L      4

0000000001111111111222222222233333333334444444444555555555566666666667777777777888888888  COLUMN NUMBERS
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678890 (READ VERTICALLY)
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 47 OF 82)

```
      DIMENSION A(80), B(8,10), TT(10)
      DIMENSION NCRD(70), CM(10)
      DIMENSION UVALUF(70), DVALUF(70)

C
      EQUIVALENCE (ICDDF,CDDF)
      EQUIVALENCE (UT(1),UVALUE(1)), (D(1),DVALUE(1))

C
      DIMENSION WDATA(193), ACQDAT(161), PSPDAT(49), DFSDAT(31)
      DIMENSION RDDATA(22), PEDATA(4260), PSTDAT(41), AINVDA(167)

C
      EQUIVALENCE (WDATA(1),PRCLCG)
      EQUIVALENCE (ACQDAT(1),NRP)
      EQUIVALENCE (PSPDAT(1),BATRTM(1))
      EQUIVALENCE (DFSDAT(1),DFDOKL(1))
      EQUIVALENCE (PDDATA(1),TCRIT)
      EQUIVALENCE (PEDATA(1),INDEX(1))
      EQUIVALENCE (PSTDAT(1),NPNGPS)
      EQUIVALENCE (AINVDA(1),DLTT(1))

C
      IPAY(1)=0
      IPAY(5)=LOCF(NORFC)
      CALL SYSTEMC (104,IPAY)

C
      DO 110 I=1,13
      CDMRUF(I)=BLANK
      DO 100 J=1,20
  100 CMENT(I,J)=BLANK
  110 CONTINUE
      DO 120 I=1,70
  120 NCRD(I)=0

C
      ICMNT=0
      NLRTC=0
      NTRC=0
      NCASE=NCASE+1

C
      WRITE (8,770) NCASE

C
C
C
  130 READ (5,870) (A(I),I=1,80)
      IF (TOF(5).EQ.0.0) GO TO 140
      ENDFLG=.TRUE.
      IF (NLRTC.EQ.0) STOP ' IN INPUT: FOF ENCOUNTERED '
      ENCODE (100,890,CM(1) )
      CALL COMMNT (CM,10,.FALSE.,.FALSE.)
      GO TO 490

C
  140 WRITE (8,880) (A(I),I=1,80)

C
      IF (A(1).NE.INS) GO TO 150
      CALL COMMNT (A,80,.TRUE.,.FALSE.)
      GO TO 130

C
```

(PAGE 48 OF 82)

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

```
150 NLRTC=NLRTC+1                                                              019600   SR-INPUT73
    CALL SEPREC (A,RC,B,8,10)                                                  019610   SP-INPUT74
    CALL FINDIT (B,R,10,IT,10)                                                 019620   SR-INPUT75
    IT1=IT(1)                                                                  019630   SR-INPUT76
    IGO=IPOINT(IT1)                                                            019640   SR-INPUT77
    ICRD=IT1                                                                   019650   SR-INPUT78
    IF (6.LE.IT1.AND.IT1.LE.8) ICRD=IT(2)                                      019660   SP-INPUT79
    NCRD(ICRD)=NCRD(ICRD)+1                                                    019670   SP-INPUT80
    IF (ICRD.EQ.1.AND.NCASE.GT.1) STOP ' IN INPUT: FIRST CASE CARD IN          019680   SR-INPUT81
1SUBSEQUENT CASE '                                                            019690   SP-INPUT82
    IF (ICRD.EQ.2.AND.(NCRD(1).GT.0.OR.NCRD(2).GT.1) STOP ' IN INPUT:          019700   SR-INPUT83
1 EXTRA NEXT CASE CARD '                                                      019710   SR-INPUT84
    IF (NCRD(ICRD).EQ.1) GO TO 160                                             019720   SR-INPUT85
    ENCODE (100,810,CM(1) )(A(I),I=1,80)                                       019730   SR-INPUT86
    CALL CONMNT (CM,10,.FALSE.,.FALSE.)                                        019740   SP-INPUT87
    ENCODE (100,820,CM(1) )                                                    019750   SR-INPUT88
    CALL COMNT (CM,10,.FALSE.,.FALSE.)                                         019760   SP-INPUT89
C                                                                             019770   SP-INPUT90
160 GO TO (130,190,490,170,180), IGO                                          019780   SR-INPUT91
C                                                                             019790   SR-INPUT92
170 ENDFLG=.TRUE.                                                             019800   SR-INPUT93
    GO TO 490                                                                  019810   SR-INPUT94
C                                                                             019820   SR-INPUT95
180 IF (NLRTC.NE.1) GO TO 200                                                 019830   SR-INPUT96
    ENCODE (100,900,CM(1) )                                                    019840   SR-INPUT97
    CALL COMMNT (CM,10,.FALSE.,.FALSE.)                                        019850   SR-INPUT98
190 IF (IGO.EQ.2.AND.IT(2).EQ.2) GO TO 130                                    019860   SP-INPUT99
    CALL USET                                                                  019870   SR-INPU100
    IF (IGO.EQ.2) GO TO 130                                                    019880   SR-INPU101
C                                                                             019890   SR-INPU102
200 CONTINUE                                                                  019900   SR-INPU103
C                                                                             019910   SR-INPU104
C                                                                             019920   SR-INPU105
C   CASE IT1 OF "KEYWORD"                                                     019930   SR-INPU106
C                                                                             019940   SR-INPU107
    GO TO (210,210,210,210,220,250,260,230,210,270,280,280,280,280,280019950   SR-INPU108
1  ,280,290,210,210,210,300,310,320,310,310,210,310,210,340019960   SR-INPU109
2  ,380,210,210,210,210,210,360,420,360,450,360,360019970   SP-INPU110
3  ,360,360,360,360,360,360,360,360,360,360,360,210019980   SR-INPU111
4  ,210,210,210,210,210,210), IT1                                            019990   SP-INPU112
C                                                                             020000   SR-INPU113
210 WRITE (6,790) (A(I),I=1,80),IT1                                           020010   SR-INPU114
    STOP ' IN INPUT: ERROR NUMBER 1 '                                         020020   SR-INPU115
C                                                                             020030   SR-INPU116
220 IF (IT(2).EQ.1) IPPFG=IT(3)-1                                             020040   SR-INPU117
    IF (IT(2).EQ.2) ICCPFG=IT(3)-1                                            020050   SR-INPU118
    GO TO 480                                                                  020060   SR-INPU119
C                                                                             020070   SP-INPU120
230 SHPTEC=.TRUE.                                                             020080   SR-INPU121
    IF (IT(3).EQ.2) SHPTEC=.FALSE.                                            020090   SP-INPU122
    GO TO 480                                                                  020100   SP-INPU123
C                                                                             020110   SR-INPU124
240 IT2=IT(2)                                                                 020120   SP-INPU125
    UVALUE(IT2)=B(1,3)                                                        020130   SP-INPU126
    IOVER(IT2)=1
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 49 OF 82)

D-51

```
      GO TO 480                                                           020140   SR-INPU127
C                                                                         020150   SP-INPU128
  250 IT2=IT(2)                                                           020160   SR-INPU129
      IOVER(IT2)=2                                                        020170   SR-INPU130
      CALL CREAD (IT2)                                                    020180   SR-INPU131
      GO TO 480                                                           020190   SP-INPU132
C                                                                         020200   SP-INPU133
  260 IT2=IT(2)                                                           020210   SR-INPU134
      IOVER(IT2)=0                                                        020220   SR-INPU135
      IF (NCRD(IT2).EQ.0) U(IT2)=D(IT2)                                   020230   SR-INPU136
      GO TO 480                                                           020240   SR-INPU137
C                                                                         020250   SP-INPU138
  270 UVALUE(11)=IT(2)                                                    020260   SR-INPU139
      GO TO 480                                                           020270   SP-INPU140
C                                                                         020280   SP-INPU141
  280 UVALUE(IT1)=IT(2)                                                   020290   SP-INPU142
      GO TO 480                                                           020300   SP-INPU143
C                                                                         020310   SP-INPU144
  290 ENCODE (10,800,UVALUE(27) )RECLBL(7),IT(2)                          020320   SP-INPU145
      GO TO 480                                                           020330   SR-INPU146
C                                                                         020340   SP-INPU147
  300 IT2=IT(2)                                                           020350   SR-INPU148
      IT3=IT(3)                                                           020360   SP-INPU149
      IOVER(IT1)=0                                                        020370   SR-INPU150
      ENCODE (10,840,UVALUE(21) )DISPM(IT2),DISPT(IT3),IT1               020380   SP-INPU151
      GO TO 480                                                           020390   SP-INPU152
C                                                                         020400   SR-INPU153
  310 ENCODE (10,850,UVALUE(IT1) )RECLBL(IT1-20),IT(2),IT1               020410   SR-INPU154
      IOVER(IT1)=0                                                        020420   SR-INPU155
      GO TO 480                                                           020430   SR-INPU156
C                                                                         020440   SP-INPU157
  320 UIDN=IT(4)                                                          020450   SP-INPU158
      IOVER(IT1)=0                                                        020460   SR-INPU159
      IF (IT(2).EQ.11) GO TO 330                                          020470   SP-INPU160
      ENCODE (10,850,UVALUE(IT1) )RECLBL(IT1-20),IT(2),IT1               020480   SP-INPU161
      UPRT=0.0                                                            020490   SP-INPU162
      UIDIGT=IT(3)                                                        020500   SP-INPU163
      FTSILL=.FALSE.                                                      020510   SR-INPU164
      IF (IT(2).EQ.1) FTSILL=.TRUE.                                       020520   SR-INPU165
      GO TO 480                                                           020530   SP-INPU166
  330 DECODE (10,910,D(1,3) )UPRT                                         020540   SR-INPU167
      IF (UPRT.LE.0.0) STOP ' IN INPUT: PARAMETERIZED RESPONSE TIME <=0. 020550   SP-INPU168
     10 '                                                                 020560   SP-INPU169
      FTSILL=.FALSE.                                                      020570   SR-INPU170
      GO TO 480                                                           020580   SP-INPU171
C                                                                         020590   SP-INPU172
  340 IF (IT(2).EQ.1) GO TO 350                                           020600   SP-INPU173
      UVALUE(31)=1.0                                                      020610   SR-INPU174
      DECODE (10,910,R(1,2) )PUNC                                         020620   SR-INPU175
      GO TO 480                                                           020630   SP-INPU176
  350 UVALUE(31)=DVALUE(31)                                               020640   SR-INPU177
      GO TO 480                                                           020650   SR-INPU178
C                                                                         020660   SP-INPU179
  360 IF (IT(2).NE.1) GO TO 370                                           020670   SP-INPU180
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM – CONT'D

(PAGE 50 OF 82)

```
      UVALUE(IT1)=DVALUE(IT1)                                        020680  SR-INPU181
      GO TO 480                                                      020690  SR-INPU182
  370 DECODE (10,910,B(1,2) )UVALUE(IT1)                             020700  SR-INPU183
      GO TO 480                                                      020710  SR-INPU184
C                                                                    020720  SR-INPU185
                                                                     020730  SR-INPU186
  380 IF (IT(2).EQ.1) GO TO 400                                      020740  SR-INPU187
      SPCL(IT1)=.TRUE.                                               020750  SR-INPU188
      IF (IT(3).NE.1) GO TO 390                                      020760  SR-INPU189
      UVALUE(IT1)=DVALUE(IT1)                                        020770  SR-INPU190
      GO TO 480                                                      020780  SR-INPU191
  390 DECODE (10,910,B(1,3) )UVALUE(IT1)                             020790  SR-INPU192
      GO TO 480                                                      020800  SR-INPU193
  400 SPCL(IT1)=.FALSE.                                              020810  SP-INPU194
      DO 410 JK=3,4                                                  020820  SR-INPU195
      IF (IT(JK).EQ.1) USMK(JK-2)=DSMK(JK-2)                         020830  SR-INPU196
      IF (IT(JK).NE.1) DECODE (10,910,B(1,JK) )USMK(JK-2)            020840  SR-INPU197
  410 CONTINUE                                                       020850  SR-INPU198
      GO TO 480                                                      020860  SR-INPU199
C                                                                    020870  SR-INPU200
  420 IF (IT(2).EQ.1) GO TO 430                                      020880  SR-INPU201
      SPCL(IT1)=.TRUE.                                               020890  SR-INPU202
      DECODE (10,910,B(1,2) )UVALUE(IT1)                             020900  SP-INPU203
      GO TO 440                                                      020910  SR-INPU204
  430 SPCL(IT1)=.FALSE.                                              020920  SR-INPU205
  440 CONTINUE                                                       020930  SR-INPU206
      GO TO 480                                                      020940  SR-INPU207
C                                                                    020950  SR-INPU208
  450 IF (IT(2).EQ.1) GO TO 460                                      020960  SR-INPU209
      SPCL(IT1)=.TRUE.                                               020970  SR-INPU210
      DECODE (10,910,B(1,2) )UVALUE(IT1)                             020980  SR-INPU211
      GO TO 470                                                      020990  SR-INPU212
  460 SPCL(IT1)=.FALSE.                                              021000  SR-INPU213
  470 CONTINUE                                                       021010  SR-INPU214
C                                                                    021020  SR-INPU215
C     END OF "KEYWORD" CASES                                         021030  SR-INPU216
C                                                                    021040  SR-INPU217
  480 CONTINUE                                                       021050  SR-INPU218
C                                                                    021060  SR-INPU219
C     END OF "READ-A-LINE-OF-INPUT" LOOP                             021070  SR-INPU220
C                                                                    021080  SR-INPU221
      GO TO 130                                                      021090  SR-INPU222
C                                                                    021100  SR-INPU223
C     * * * * * * * * * * * * * * * * * * * * * *                    021110  SR-INPU224
C                                                                    021120  SR-INPU225
C     FILL IN VALUES TO BE PASSED TO REST OF PROGRAM VIA COMMON.     021130  SR-INPU226
C                                                                    021140  SR-INPU227
  490 CODE=UVALUE(21)                                                021150  SR-INPU228
      DECODE (10,780,ICODE) XWTHR                                    021160  SR-INPU229
      DO 500 I=1,12                                                  021170  SR-INPU230
      IF (XWTHR.NE.DISPH(I)) GO TO 500                               021180  SR-INPU231
      IMNTH=I                                                        021190  SR-INPU232
      GO TO 510                                                      021200  SR-INPU233
  500 CONTINUE                                                       021210  SR-INPU234
  510 CONTINUE
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 51 OF 82)

```
      IWTHRL=193                                               021220  SR-INPU235
      IF (IOVER(21).EQ.2) GO TO 520                            021230  SP-INPU236
      CALL READMS (11,WDATA,IWTHRL,ICODE)                      021240  SR-INPU237
      WCODE=CODE                                               021250  SP-INPU238
  520 DO 530 I=1,2                                             021260  SR-INPU239
      WSUM(I)=0.0                                              021270  SR-INPU240
  530 WCFSUM(I)=0.0                                            021280  SR-INPU241
      DO 550 I=1,NVL                                           021290  SP-INPU242
      DO 550 J=1,2                                             021300  SR-INPU243
      WCFSUM(J)=WCFSUM(J)+PRGCFL(I,J)                          021310  SR-INPU244
      DO 540 K=1,NCC                                           021320  SR-INPU245
  540 WSUM(J)=WSUM(J)+W(K,I,J)                                 021330  SP-INPU246
  550 CONTINUE                                                 021340  SR-INPU247
C                                                              021350  SP-INPU248
      CODE=UVALUE(22)                                          021360  SR-INPU249
      IACQRL=161                                               021370  SR-INPU250
      IF (IOVER(22).EQ.2) GO TO 560                            021380  SR-INPU251
      CALL READMS (11,ACQDAT,IACQFL,ICODE)                     021390  SR-INPU252
      ACCODE=CODE                                              021400  SR-INPU253
C                                                              021410  SR-INPU254
  560 GTRNG=UVALUE(56)                                         021420  SP-INPU255
      IGTR=GTRNG+.5                                            021430  SP-INPU256
      TOF=TOFARY(IGTR)                                         021440  SP-INPU257
      IF (SPCL(45)) TOF=UVALUE(45)                             021450  SR-INPU258
C                                                              021460  SR-INPU259
      CODE=UVALUE(23)                                          021470  SR-INPU260
      PRSPTM=UPRT                                              021480  SR-INPU261
      IRSPRL=49                                                021490  SR-INPU262
      IF (IOVER(23).EQ.2) GO TO 570                            021500  SP-INPU263
      CALL READMS (11,PSPDAT,IRSPRL,ICODE)                     021510  SR-INPU264
      RSCODE=CODE                                              021520  SP-INPU265
  570 IDN=UIDM                                                 021530  SR-INPU266
      IDIGTL=UIDIGT                                            021540  SR-INPU267
      IPRTY=0                                                  021550  SP-INPU268
      UMC=UVALUE(12)                                           021560  SR-INPU269
      IF (UMC.EQ.1.) IPRTY=2                                   021570  SR-INPU270
      IPREPL=2                                                 021580  SR-INPU271
      IF (UMC.LT.3.) IPREPL=1                                  021590  SR-INPU272
      TRBAR=TRARPY(IPREPL+IPRTY,IDIGTL)+TOF                    021600  SP-INPU273
      IF (PRSPTM.NE.0.0) TRBAR=PRSPTM+TOF                      021610  SP-INPU274
      IF (FTSILL) GO TO 590                                    021620  SR-INPU275
      IF (PRSPTM.GT.0.0) GO TO 590                             021630  SR-INPU276
      DO 580 I=1,2                                             021640  SP-INPU277
      DO 580 J=1,2                                             021650  SR-INPU278
      ALPHA(I,J)=(THBAM(I,J)/TSIGMA(I,J))**2                   021660  SR-INPU279
  580 BETA(I,J)=TSIGMA(I,J)**2/TMBAM(I,J)                      021670  SR-INPU280
  590 CONTINUE                                                 021680  SR-INPU281
C                                                              021690  SP-INPU282
      CODE=UVALUE(24)                                          021700  SR-INPU283
      IDFSRL=31                                                021710  SR-INPU284
      IF (IOVER(24).EQ.2) GO TO 600                            021720  SR-INPU285
      CALL READMS (11,DFSDAT,IDFSRL,ICODE)                     021730  SR-INPU286
      DFCODE=CODE                                              021740  SR-INPU287
                                                               021750  SP-INPU288
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 52 OF 82)

```
0000000001111111111222222222233333333334444444444555555555566666666667777777777888888889  COLUMN NUMBERS
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890  (READ VERTICALLY)

 600 CONTINUE                                                                    021760  SP-INPU289
C                                                                               021770  SP-INPU290
     IF (.NOT.SPCL(42)) GO TO 610                                               021780  SP-INPU291
     TVEL=UVALUE(42)                                                            021790  SP-INPU292
     GO TO 620                                                                  021800  SP-INPU293
 610 IXXX=3.0-ABS(2.5-FLOAT(IINTI))                                             021810  SP-INPU294
     TVEL=VELTRL(IDN,IXXX)                                                      021820  SP-INPU295
 620 CONTINUE                                                                   021830  SP-INPU296
C                                                                               021840  SP-INPU297
     IDSGTP=UVALUE(16)                                                          021850  SP-INPU298
     IF (.NOT.SPCL(43)) GO TO 630                                               021860  SR-INPU299
     MXDRNG=UVALUE(43)                                                          021870  SR-INPU300
     GO TO 640                                                                  021880  SP-INPU301
 630 MXDRNG=DESRNG(IDSGTP,IDN)                                                  021890  SP-INPU302
 640 CONTINUE                                                                   021900  SP-INPU303
C                                                                               021910  SR-INPU304
     IRNDOC=UVALUE(11)-1.0                                                      021920  SR-INPU305
     IF (IRNDOC.EQ.0.OR.IOVTP(25).EQ.2) GO TO 670                              021930  SP-INPU306
     IF (IINVER(25).NE.1) GO TO 650                                            021940  SP-INPU307
     CODE=UVALUE(25)                                                            021950  SR-INPU308
     GO TO 660                                                                  021960  SR-INPU309
 650 DECODE (10,830,II(22) )ITRRN                                               021970  SP-INPU310
     ITVEL=TVEL                                                                 021980  SP-INPU311
     IF (ITVEL.EQ.9) ITVEL=8                                                    021990  SP-INPU312
     IF (ITVEL.EQ.2) ITVEL=3                                                    022000  SR-INPU313
     ENCODE (10,860,ICODE) PECLBL(5),ITVEL,ITRRN                               022010  SR-INPU314
 660 IPDRL=22                                                                   022020  SR-INPU315
     CALL READMS (11,PODATA,IPDPL,ICODE)                                        022030  SR-INPU316
     RDCODE=CODE                                                                022040  SR-INPU317
 670 CONTINUE                                                                   022050  SR-INPU318
C                                                                               022060  SP-INPU319
     IF (IOVER(26).EQ.2) GO TO 700                                             022060  SR-INPU320
     IF (IOVER(26).NE.1) GO TO 680                                             022070  SR-INPU321
     CODE=UVALUE(26)                                                            022080  SR-INPU322
     GO TO 690                                                                  022090  SP-INPU323
 680 ANGLET=UVALUE(46)                                                          022100  SR-INPU324
     PEFL=UVALUE(57)                                                            022110  SR-INPU325
     DEFB=UVALUE(58)                                                            022120  SP-INPU326
     TGTHD=UVALUE(59)                                                           022130  SR-INPU327
     SKSEN=UVALUE(60)                                                           022140  SP-INPU328
     CALL PENAME (TRBAP,IDSGTP,TVEL,GTRNG,PEFL,ANGLET,DEFR,TGTHD,SKSEN,        022150  SP-INPU329
    1ICODE)                                                                     022160  SR-INPU330
 690 IPEPL=4260                                                                 022170  SR-INPU331
     CALL READMS (11,PEDATA,IPEPL,ICODE)                                        022180  SR-INPU332
     PECODE=CODE                                                                022190  SP-INPU333
 700 CONTINUE                                                                   022200  SP-INPU334
C                                                                               022210  SR-INPU335
     IF (IOVER(27).EQ.2) GO TO 710                                             022220  SP-INPU336
     CODE=UVALUE(27)                                                            022230  SF-INPU337
     ITPSPL=41                                                                  022240  SR-INPU338
     CALL READMS (11,PSTRAT,ITPSFL,ICODE)                                       022250  SF-INPU339
     PSCODE=CODE                                                                022260  SP-INPU340
 710 CONTINUE                                                                   022270  SR-INPU341
C                                                                               022280  SR-INPU342

0000000001111111111222222222233333333334444444444555555555566666666667777777777888888889  COLUMN NUMBERS
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890  (READ VERTICALLY)
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 53 OF 82)

```
      IF (UVALUE(13).EQ.1.) GO TO 730                             022300  SR-INPU343
      NRNGP1=NRNGPS                                               022310  SR-INPU344
      DO 720 I=1,NRNGP1                                           022320  SR-INPU345
      IF (PSTTBL(I,1).EQ.0.0) GO TO 720                           022330  SR-INPU346
      PSTTBL(I,2)=PSTTBL(I,2)/(1.-PSTTBL(I,1))                    022340  SP-INPU347
      PSTTBL(I,3)=1.-PSTTBL(I,1)                                  022350  SR-INPU348
      PSTTBL(I,1)=0.0                                             022360  SP-INPU349
  720 CONTINUE                                                    022370  SP-INPU350
  730 CONTINUE                                                    022380  SR-INPU351
C                                                                 022390  SR-INPU352
      IF (IOVER(28).EQ.2) GO TO 740                               022400  SR-INPU353
      CODE=UVALUE(28)                                             022410  SP-INPU354
      INVDPL=167                                                  022420  SR-INPU355
      CALL READMS (11,AINVDA,INVDPL,ICODE)                        022430  SR-INPU356
      AICODE=CODE                                                 022440  SP-INPU357
  740 CONTINUE                                                    022450  SP-INPU358
C                                                                 022460  SR-INPU359
      ITGTTP=UVALUE(14)                                           022470  SR-INPU360
C                                                                 022480  SR-INPU361
C                                                                 022490  SR-INPU362
      IT3FLG=UVALUE(31)                                           022500  SR-INPU363
C                                                                 022510  SR-INPU364
      IF (SPCL(32)) GO TO 750                                     022520  SR-INPU365
      NSMK2=USMK(1)                                               022530  SR-INPU366
      NSMK5=USMK(2)                                               022540  SR-INPU367
      CALL PSMOKE                                                 022550  SP-INPU368
      GO TO 760                                                   022560  SR-INPU369
  750 PSMKFL=UVALUE(32)                                           022570  SR-INPU370
  760 CONTINUE                                                    022580  SP-INPU371
C                                                                 022590  SR-INPU372
      DDARPK=UVALUE(41)                                           022600  SP-INPU373
      BLDRMG=UVALUE(44)                                           022610  SP-INPU374
      PDSTKL=UVALUE(47)                                           022620  SR-INPU375
      PRSVT=UVALUE(48)                                            022630  SP-INPU376
      PRSDT=UVALUE(49)                                            022640  SP-INPU377
      RELIF=UVALUE(50)                                            022650  SR-INPU378
      TBR=UVALUE(51)                                              022660  SP-INPU379
      NREP=UVALUE(52)                                             022670  SR-INPU380
      NRF=UVALUE(53)                                              022680  SR-INPU381
      NVEHCL=UVALUE(54)                                           022690  SP-INPU382
      DISBVH=UVALUE(55)                                           022700  SR-INPU383
      PCRMSG=UVALUE(61)                                           022710  SP-INPU384
      PRDOW=UVALUE(62)                                            022720  SR-INPU385
C                                                                 022730  SR-INPU386
C  IF CC PLOT AND/OR. PPLOT ARE IMPLEMENTED AS REAL PLOT PROGRAMS PATHER  022740  SP-INPU387
C  THAN AS PROGRAM STUBS, THEN THE CALL STATEMENTS TO THEM (BFLOW)        022750  SP-INPU388
C  SHOULD BE MOVED TO A SUBROUTINE THAT IS CALLED AT THE COMPLETION       022760  SR-INPU389
C  OF EACH REPLICATION (SUCH AS OUTPUT)                         022770  SR-INPU390
C                                                                 022780  SR-INPU391
      IF (IPPFG.EQ.1) CALL PPLOT                                  022790  SP-INPU392
      IF (ICCPFG.EQ.1) CALL CCPLOT                                022800  SR-INPU393
C                                                                 022810  SR-INPU394
      CALL HEADER                                                 022820  SR-INPU395
C                                                                 022830  SR-INPU396
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 54 OF 82)

D-56

```
        CALL ECHO (8)                                                          022840     SR-INPU397
                                                                               022850     SR-INPU398
C       RETURN                                                                 022860     SR-INPU399
                                                                               022870     SR-INPU400
C                                                                              022880     SR-INPU401
C                                                                             .022890     SR-INPU402
C   * * *  F O R M A T   S T A T E M E N T S  * * *                            022900     SR-INPU403
C                                                                              022910     SR-INPU404
770 FORMAT (1H ,50(1H*),1X,23HINPUT OPTIONS FOR CASE ,I3,1X,50(1H*))           022920     SR-INPU405
780 FORMAT (A3,7X)                                                          13022930     SR-INPU406
790 FORMAT (1H ,23H ERROR IN INPUT. LINE: ,80A1,1H WITH IT1= ,I5,/,           022940     SR-INPU407
    1H IS IN ERROR )                                                           022950     SR-INPU408
800 FORMAT (A6,I2.2,2H27)                                                      022960     SR-INPU409
810 FORMAT (1H ,18HYOUR INPUT LINE : ,1X,80A1)                                 022970 THI SR-INPU410
820 FORMAT (1H ,58HSUPERSEDES ONE OF YOUR PREVIOUS INPUT LINES FOR THI         022980     SR-INPU411
    1S CASE )                                                                  022990     SR-INPU412
830 FORMAT (6X,I2,2X)                                                          023000     SR-INPU413
840 FORMAT (A3,A4,I3.3)                                                        023010     SR-INPU414
850 FORMAT (A6,I2.2,I2.2)                                                      023020     SR-INPU415
860 FORMAT (A5,I1,3HTRN,I1)                                                    023030     SR-INPU416
870 FORMAT (80A1)                                                             023040     SR-INPU417
880 FORMAT (1H ,80A1)                                                      F023050     SR-INPU418
890 FORMAT (1H ,71HNO ENDF CARD FOUND BUT ONE ASSUMED SINCE END OF INP         023060     SR-INPU419
    1UT FILE ENCOUNTERED )                                                 F023070     SR-INPU420
900 FORMAT (1H ,3HNO ,12H*FIRST CASE*,4H OR ,11H*NEXT CASE*,14H CARD           023080     SR-INPU421
    10UND---,15H* NEXT CASE,CD*,16H OPTION ASSUMED )                           023090     SR-INPU422
910 FORMAT (F10.4)                                                             023100     SR-INPU423
    END
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 55 Of 82)

```
      SUBROUTINE LOSCHK                                                  023120    SP-LOSCHK2
C                                                                        023130    SP-LOSCHK3
      COMMON /FLAG/ ENDREP, IDN, IPREPL, IDIGTL, IPRTY, IPNDOC, IT3FLG,  000300    CM+FLAG  2
     1 ENDFLG                                                            000310    CM+FLAG  3
      LOGICAL ENDFLG, ENDREP                                             000320    CM+FLAG  4
      COMMON /KTEST/ KTEST(20,6)                                         000490    CM+KTEST 2
      COMMON /RANDOC/ TCRIT, NPLOSR, PHGPLS(10), PPRLOS(10)              000620    CM+RANDOC2
      COMMON /RANDOM/ IR1, IR2, IR3, IR4, IF5, IR6, IR7, IR8, IF9, IP10, 000640    CM+RANDOM2
     1 IP11, IP12, IR13, IP14, IP15, IP16, IP17, IP18, IP19, IP20, IR21  000650    CM+RANDOM3
     2 , IP22, IR23, IP24, IP25, IP26, IP27, IP28                        000660    CM+RANDOM4
      COMMON /RANGF/ DTRNG, NXDRNG, VISLIM, PHGNOW                       000680    CM+RANGE 2
      REAL MXDRNG                                                        000690    CM+RANGE 3
      COMMON /RPLCTN/ KREP, NREP, KRF, NRF, NVEHKL                       000770    CM+RPLCTN2
      COMMON /TARGET/ TVEL, NVEHCL, DISRVH, ITGTTP, IMUTS, ITGTPS        001000    CM+TARGET2
      COMMON /TIME/ DUPLOS, TIMNOW, TOF, TBP, TIMPA, TIMPA1              001020    CM+TIME  2
C                                                                        023220    SP-LOSCH12
      KTEST(12,KRF)=KTEST(12,KRF)+1                                      023230    SP-LOSCH13
      IF (IRNDOC.EQ.1) GO TO 100                                         023240    SR-LOSCH14
      IF (TIMPA.LE.DUPLOS) GO TO 130                                     023250    SR-LOSCH15
C                                                                        023260    SR-LOSCH16
      IABPT=12                                                           023270    SP-LOSCH17
      CALL ABRTTL (IABPT)                                                023280    SR-LOSCH18
C                                                                        023290    SR-LOSCH19
      GO TO 130                                                          023300    SR-LOSCH20
C                                                                        023310    SR-LOSCH21
  100 XNV=NVEHCL-NVEHKL                                                  023320    SR-LOSCH22
      PHGNOW=AMAX1(0.0,DTRNG-TVEL*TIMPA)                                 023330    SR-LOSCH23
C                                                                        023340    SR-LOSCH24
      DO 110 I=1,NPLOSR                                                  023350    SP-LOSCH25
      IF (PHGNOW.LE.PHGPLS(I)) GO TO 120                                 023360    SP-LOSCH26
  110 CONTINUE                                                           023370    SR-LOSCH27
C                                                                        023380    SR-LOSCH28
      STOP ' IN LOSCHK: ERROR WITH RANDOM OCCURRENCE OPTION '            023390    SP-LOSCH29
C                                                                        023400    SR-LOSCH30
  120 PRLOS=PPRLOS(I)                                                    023410    SR-LOSCH31
      PRIV=1.-(1.-PRLOS)**XNV                                            023420    SR-LOSCH32
      RN18=URAN31(IR18)                                                  023430    SR-LOSCH33
      IF (RN18.LE.PRIV) GO TO 130                                        023440    SR-LOSCH34
C                                                                        023450    SP-LOSCH35
      IABPT=12                                                           023460    SR-LOSCH36
      CALL ABRTTL (IABPT)                                                023470    SR-LOSCH37
C                                                                        023480    SR-LOSCH38
  130 RETURN                                                             023490    SR-LOSCH39
C                                                                        023500    SR-LOSCH40
      END                                                                023510    SR-LOSCH41
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 56 OF 82)

```
      SUBROUTINE MINTRN                                                023530  SP-MINTRN2
C                                                                      023540  SR-MINTRN3
      COMMON /HIT/ INDFX(6,5,2), PFTBL(60,10,7), DLTT(6), PKTBL(10,2), 000410  CM+HIT   2
     1 NPNGTT, RNGTTF(20), TTF(3,20,2), NPNGPS, PNGPST(10), PSTTBL(10, 000420  CM+HIT   3
     2 3)                                                              000430  CM+HIT   4
      COMMON /KTEST/ KTEST(20,6)                                       000490  CM+KTEST 2
      COMMON /RANDOM/ IR1, IR2, IP3, IR4, IP5, IR6, IP7, IP8, IP9, IP10, 000640 CM+RANDOM2
     1 IP11, IR12, IP13, IP14, IP15, IF16, IP17, IP18, IR19, IP20, IP21 000650 CM+RANDOM3
     2 , IF22, IR23, IR24, IP25, IR26, IP27, IP28                      000660  CM+RANDOM4
      COMMON /RANGE/ DTPNG, MXDRNG, VISLIM, PNGNOW                     000680  CM+RANGE 2
      REAL MXDRNG                                                      000690  CM+RANGE 3
      COMMON /RPLCTN/ KREP, NREP, KPF, NRF, NVEHKL                     000770  CM+RPLCTN2
      COMMON /TARGET/ TVEL, NVEHCL, DISRVH, ITGTTP, IMUTS, ITGTPS      001000  CM+TARGET2
      COMMON /TIME/ DUPLOS, TIMNOW, TOF, TBP, TIMRA, TIMRA1            001020  CM+TIME  2
C                                                                      023620  SP-MINTR11
      DIMENSION PSTVAL(3)                                             023630  SP-MINTR12
C                                                                      023640  SR-MINTR13
      RNGNOW=AMAX1(0.0,DTRNG-TVEL*TIMRA)                               023650  SR-MINTR14
C                                                                      023660  SR-MINTR15
      DO 100 IJ=1,NRNGPS                                              023670  SP-MINTR16
      IF (RNGNOW.LT.RNGPST(IJ).OR.RNGPST(IJ+1).LE.PNGNOW) GO TO 100   023680  SR-MINTR17
      IPN=IJ                                                          023690  SP-MINTR18
      GO TO 110                                                        023700  SR-MINTR19
  100 CONTINUE                                                         023710  SR-MINTR20
      STOP ' IN MINTRN: FAILED TO BRACKET RANGE '                     023720  SR-MINTR21
  110 TFRAC=(RNGNOW-RNGPST(IPN))/(RNGPST(IPN+1)-RNGPST(IRN))           023730  SR-MINTR22
C                                                                      023740  SR-MINTR23
      DO 120 J=1,3                                                     023750  SP-MINTR24
      PSTVAL(J)=PSTTBL(IPN,J)+TFRAC*(PSTTBL(IPN+1,J)-PSTTBL(IPN,J))    023760  SR-MINTR25
  120 CONTINUE                                                         023770  SP-MINTR26
C                                                                      023780  SP-MINTR27
      RN19=URAN31(IR19)                                               023790  SR-MINTR28
      ITGTPS=0                                                         023800  SP-MINTR29
      IF (PSTVAL(1).LE.PN19) ITGTPS=1                                  023810  SR-MINTR30
      IF (PSTVAL(2)+PSTVAL(1).LE.PN19) ITGTPS=2                        023820  SP-MINTR31
C                                                                      023830  SR-MINTR32
      KTEST(16,KPF)=KTEST(16,KRF)+1                                    023840  SR-MINTR33
      IF (ITGTPS.NE.0) GO TO 130                                       023850  SR-MINTR34
C                                                                      023860  SR-MINTR35
      IABRT=16                                                         023870  SR-MINTR36
      CALL ABRTTL (IABRT)                                             023880  SP-MINTR37
C                                                                      023890  SR-MINTR38
  130 RETURN                                                           023900  SP-MINTR39
      END                                                              023910  SP-MINTR40
                                                                       023920  SR-MINTR41
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 57 OF 82)

```
00000000011111111112222222222333333333344444444445555555555666666666677777777778888888889  COLUMN NUMBERS
12345678901234567890123456789012345678901234567890123456789012345678901234567890  (READ VERTICALLY)

      SUBROUTINE NOREC                                                   023940    SP-NOREC  2
C                                                                        023950    SR-NOREC  3
      COMMON /ICODE/ ICODE                                               000450    CM+ICODE  2
C                                                                        023970    SP-NOREC  5
      WRITE (6,100) ICODE                                                023980    SP-NOREC  6
C                                                                        023990    SR-NOREC  7
      CALL SPRACE                                                        024000    SR-NOREC  8
C                                                                        024010    SR-NOREC  9
      STOP ' IN NOREC: ATTEMPTED TO READ NON-EXISTENT RECORD '           024020    SR-NOREC10
C                                                                        024030    SR-NOREC11
C                                                                        024040    SR-NOREC12
C *** F O R M A T   S T A T E M E N T S ***                              024050    SR-NOREC13
C                                                                        024060    SR-NOREC14
  100 FORMAT (1H ,38H INPUT ATTEMPTED TO READ RECORD NAMED ,A10,30H BUT  024070    SP-NOREC15
     1 NO SUCH RECORD WAS FOUND)                                         024080    SR-NOREC16
      END                                                                024090    SR-NOREC17

00000000011111111112222222222333333333344444444445555555555666666666677777777778888888889  COLUMN NUMBERS
12345678901234567890123456789012345678901234567890123456789012345678901234567890  (READ VERTICALLY)
```

LISTING D-1   FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 58 OF 82)

```
      SUBROUTINE OUTPUT                                               024110    SP-OUTPUT2
C                                                                     024120    SP-OUTPUT3
      COMMON /ABORT/ MABORT(20,6), MSABLM                             000110    CM+ABORT 2
      COMMON /ABRLBL/ ICABRT(3,19)                                    000130    CM+ABRLBL2
      COMMON /DDDF/ DFDOKL(10,3), NDFSP, NDOKIL, DOKILD               000250    CM+DDDF  2
      LOGICAL DOKILD                                                  000260    CM+DDDF  3
      COMMON /FLAG/ ENDFFP, IDN, IPPFPL, IDIGTL, IPRTY, IRNDOC, IT3FLG, 000300  CM+FLAG  2
     1 ENDFLG                                                         000310    CM+FLAG  3
      LOGICAL ENDFLG, ENDREP                                          000320    CM+FLAG  4
      COMMON /KTEST/ KTEST(20,6)                                      000490    CM+KTEST 2
      COMMON /RPLCTN/ KREP, NREP, KRF, NRF, NVEHKL                    000770    CM+RPLCTN2
      COMMON /RUNDAT/ DAT, TIM, NCASE, ICCPFG, IPPFG                  000840    CM+RUNDAT2
      COMMON /SCCSS/ PNDPEC(6)                                        000900    CM+SCCSS 2
      DIMENSION NKILL(6), OUT(6)                                      024210    SR-OUTPU12
      DIMENSION ABRPCT(20,6), NTEST(20,6), PASPCT(20,6)               024220    SR-OUTPU13
      DIMENSION PRBKO(6), PPBKAT(6), PRBKS(6)                         024230    SR-OUTPU14
      DIMENSION PRBLOS(6)                                             024240    SR-OUTPU15
                                                                      024250    SP-OUTPU16
C                                                                     024260    SP-OUTPU17
      DO 110 J=1,6                                                    024270    SR-OUTPU18
      NKILL(J)=0                                                      024280    SP-OUTPU19
      OUT(J)=0.0                                                      024290    SR-OUTPU20
      DO 100 I=1,20                                                   024300    SP-OUTPU21
      NTEST(I,J)=0                                                    024310    SR-OUTPU22
  100 CONTINUE                                                        024320    SR-OUTPU23
  110 CONTINUE                                                        024330    SR-OUTPU24
C                                                                     024340    SR-OUTPU25
      DO 120 I=1,19                                                   024350    SP-OUTPU26
      DO 120 J=1,6                                                    024360    SP-OUTPU27
      ABRPCT(I,J)=-1.0                                                024370    SR-OUTPU28
      IF (NREP.NE.0) ABRPCT(I,J)=100.*FLOAT(NABORT(I,J))/FLOAT(NREP)  024380    SR-OUTPU29
  120 CONTINUE                                                        024390    SR-OUTPU30
C                                                                     024400    SR-OUTPU31
      DO 150 J=1,6                                                    024410    SR-OUTPU32
      NTEST(1,J)=NREP                                                 024420    SR-OUTPU33
      DO 130 I=2,19                                                   024430    SR-OUTPU34
      NTEST(I,J)=NTEST(I-1,J)-NABORT(I-1,J)                           024440    SR-OUTPU35
  130 CONTINUE                                                        024450    SR-OUTPU36
      DO 140 I=1,19                                                   024460    SR-OUTPU37
      IF (NTEST(I,J).EQ.0) PASPCT(I,J)=-1.0                           024470    SP-OUTPU38
      IF (NTEST(I,J).NE.0) PASPCT(I,J)=100.*(1.-FLOAT(NABORT(I,J))    024480    SR-OUTPU39
     1 /FLOAT(NTEST(I,J)))                                            024490    SR-OUTPU40
  140 CONTINUE                                                        024500    SR-OUTPU41
  150 CONTINUE                                                        024510    SR-OUTPU42
C                                                                     024520    SR-OUTPU43
      IOCSN=NREP                                                      024530    SP-OUTPU44
      IATEHG=NTEST(8,1)                                               024540    SR-OUTPU45
      ISHOT=NTEST(12,1)                                               024550    SR-OUTPU46
C                                                                     024560    SR-OUTPU47
      DO 160 J=1,6                                                    024570    SR-OUTPU48
      NKILL(J)=NTEST(19,J)-NABORT(19,J)                               024580    SP-OUTPU49
      IF (PNDREC(J).NE.FLOAT(NKILL(J))) WRITE (6,300) J,PNDREC(J),NKILL( 024590  SP-OUTPU50
     1J)                                                              024600    SR-OUTPU51
  160 CONTINUE                                                        024610    SP-OUTPU52
C
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 59 OF 82)

D-61

```
      DO 170 J=1,6                                                       024620   SR-OUTPU53
      PRBKO(J)=-1.0                                                      024630   SR-OUTPU54
      PRBKAE(J)=-1.0                                                     024640   SP-OUTPU55
      PRBKS(J)=-1.0                                                      024650   SR-OUTPU56
      IF (IOCSN.NE.0) PPBKO(J)=100.*FLOAT(NKILL(J))/FLOAT(IOCSN)         024660   SR-OUTPU57
      IF (IATENG.NE.0) PPBKAE(J)=100.*FLOAT(NKILL(J))/FLOAT(IATENG)      024670   SP-OUTPU58
      IF (ISHOT.NE.0) PPRKS(J)=100.*FLOAT(NKILL(J))/FLOAT(ISHOT)         024680   SP-OUTPU59
  170 CONTINUE                                                           024690   SR-OUTPU60
C                                                                        024700   SR-OUTPU61
      PRBSO=-1.0                                                         024710   SP-OUTPU62
      PRBSAE=-1.0                                                        024720   SP-OUTPU63
      PRBAEN=-1.0                                                        024730   SP-OUTPU64
      IF (IOCSN.NE.0) PRBSO=100.*FLOAT(ISHOT)/FLOAT(IOCSN)              024740   SP-OUTPU65
      IF (IATENG.NE.0) PRBSAE=100.*FLOAT(ISHOT)/FLOAT(IATENG)          024750   SR-OUTPU66
      IF (IOCSN.NE.0) PRBAEN=100.*FLOAT(IATENG)/FLOAT(IOCSN)           024760   SR-OUTPU67
C                                                                        024770   SR-OUTPU68
      DO 180 J=1,6                                                       024780   SP-OUTPU69
      PRHLDS(J)=PASPCT(11,J)*PASPCT(12,J)/100.                          024790   SR-OUTPU70
  180 CONTINUE                                                           024800   SR-OUTPU71
C                                                                        024810   SR-OUTPU72
      DO 190 II=1,20                                                     024820   SR-OUTPU73
      LIMU=1                                                             024830   SR-OUTPU74
      IF (II.GT.MSABLM) LIMU=6                                          024840   SR-OUTPU75
      DO 190 JJ=1,LIMU                                                   024850   SR-OUTPU76
      IF (NTEST(II,JJ).EQ.KTEST(II,JJ)) GO TO 190                      024860   SR-OUTPU77
      IF (IFINDIC.EQ.1.AND.(II.EQ.4.OR.II.EQ.11).AND.KTEST(II,JJ).EQ.0) G024870   SP-OUTPU78
     10 TO 190                                                           024880   SP-OUTPU79
      WRITE (6,290) II,JJ                                               024890   SR-OUTPU80
      WRITE (6,310) ((KTEST(IL,JL),JL=1,6),IL=1,20)                    024900   SR-OUTPU81
      GO TO 200                                                          024910   SP-OUTPU82
  190 CONTINUE                                                           024920   SR-OUTPU83
  200 CONTINUE                                                           024930   SP-OUTPU84
C                                                                        024940   SP-OUTPU85
      PRDDKL=-1.0                                                        024950   SP-OUTPU86
      PRDDKC=-1.0                                                        024960   SR-OUTPU87
      IF (NREP.NE.0) PRDDKL=100.*FLOAT(NDOKIL)/FLOAT(NREP)              024970   SP-OUTPU88
      IF (NTEST(14,1).NE.0) PRDDKC=100.*(1.-FLOAT(NDOKIL)              024980   SP-OUTPU89
     1 /FLOAT(NTEST(14,1)))                                             024990   SP-OUTPU90
C                                                                        025000   SR-OUTPU91
      WRITE (6,320)                                                      025010   SP-OUTPU92
      WRITE (6,330) IOCSN                                               025020   SR-OUTPU93
C                                                                        025030   SR-OUTPU94
      DO 210 I=1,11                                                      025040   SR-OUTPU95
      X=ABPPCT(I,1)                                                      025050   SR-OUTPU96
      XDUT=FPRCNT(X,.TRUE.)                                            025060   SR-OUTPU97
      Y=PASPCT(I,1)                                                      025070   SP-OUTPU98
      YDUT=FPRCNT(Y,.TRUE.)                                            025080   SR-OUTPU99
      WRITE (6,340) I,(IDARPT(K,I),K=1,3),NABOPT(I,1),XOUT,NTEST(I,1), 025090   SR-OUTP100
     1 YOUT                                                             025100   SR-OUTP101
      IF (I.EQ.7) WRITE (6,390) IATENG                                 025110   SP-OUTP102
      IF (I.EQ.11) WRITE (6,400) ISHOT                                 025120   SR-OUTP103
  210 CONTINUE                                                           025130   SR-OUTP104
C                                                                        025140   SP-OUTP105
      WRITE (6,350)                                                      025150   SR-OUTP106
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 60 OF 82)

```
c
        DO 240 I=12,19
        DO 220 J=1,NRF
        X=ABRPCT(I,J)
        OUT(J)=FPRCNT(X,.TRUE.)
220     CONTINUE
        WRITE (6,360) I,(IDABPT(K,I),K=1,3),(NABORT(I,J),OUT(J),J=1,NRF)
        DO 230 J=1,NRF
        X=PASPCT(I,J)
        OUT(J)=FPRCNT(X,.TRUE.)
230     CONTINUE
        WRITE (6,370) (NTEST(I,J),OUT(J),J=1,NRF)
240     CONTINUE
c
        WRITE (6,380) (NKILL(J),J=1,NRF)
c
        DO 250 J=1,NRF
        X=PRBKO(J)
        OUT(J)=FPRCNT(X,.FALSE.)
250     CONTINUE
        WRITE (6,410) (OUT(I),I=1,NRF)
c
        DO 260 J=1,NRF
        X=PRBKAE(J)
        OUT(J)=FPRCNT(X,.FALSE.)
260     CONTINUE
        WRITE (6,420) (OUT(J),J=1,NRF)
c
        DO 270 J=1,NRF
        X=PRBKS(J)
        OUT(J)=FPRCNT(X,.FALSE.)
270     CONTINUE
        WRITE (6,430) (OUT(J),J=1,NRF)
c
        DO 280 J=1,NRF
        X=PRBLOS(J)
        OUT(J)=FPRCNT(X,.FALSE.)
280     CONTINUE
        WRITE (6,450) (OUT(J),J=1,NRF)
c
        XOUT=FPRCNT(PRBSD,.FALSE.)
        YOUT=FPRCNT(PRBSAE,.FALSE.)
        ZOUT=FPRCNT(PRBAEO,.FALSE.)
        WRITE (6,440) XOUT,YOUT,ZOUT
c
        XOUT=FPRCNT(PRDOKL,.TRUE.)
        YOUT=FPRCNT(PRDOKC,.TRUE.)
        WRITE (6,460) MDOKIL,XOUT,NTEST(14,1),YOUT
c
        RETURN
c
c
c *** F O R M A T   S T A T E M E N T S ***
```

```
025160   SP-OUTP107
025170   SR-OUTP108
025180   SR-OUTP109
025190   SR-OUTP110
025200   SR-OUTP111
025210   Q-OUTP112
025220   SR-OUTP113
025230   SR-OUTP114
025240   SR-OUTP115
025250   SR-OUTP116
025260   SR-OUTP117
025270   SR-OUTP118
025280   SR-OUTP119
025290   SR-OUTP120
025300   SR-OUTP121
025310   SR-OUTP122
025320   SR-OUTP123
025330   SR-OUTP124
025340   SR-OUTP125
025350   SR-OUTP126
025360   SR-OUTP127
025370   SP-OUTP128
025380   SR-OUTP129
025390   SR-OUTP130
025400   SR-OUTP131
025410   SP-OUTP132
025420   SR-OUTP133
025430   SR-OUTP134
025440   SR-OUTP135
025450   SR-OUTP136
025460   SR-OUTP137
025470   SP-OUTP138
025480   SP-OUTP139
025490   SR-OUTP140
025500   SR-OUTP141
025510   SR-OUTP142
025520   SP-OUTP143
025530   SP-OUTP144
025540   SR-OUTP145
025550   SR-OUTP146
025560   SP-OUTP147
025570   SR-OUTP148
025580   SR-OUTP149
025590   SR-OUTP150
025600   SP-OUTP151
025610   SP-OUTP152
025620   SP-OUTP153
025630   SR-OUTP154
025640   SR-OUTP155
025650   SR-OUTP156
025660   SR-OUTP157
025670   SP-OUTP158
025680   SP-OUTP159
025690   SR-OUTP160
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 61 OF 82)

```
  290 FORMAT (56H SERIOUS PROBLEM !  KTEST AND NTEST ARRAYS DO NOT AGREE025700  SR-OUTP161
       1.,4H II=,I5,4H JJ=,I5)                                            025710  SR-OUTP162
  300 FORMAT (1H ,24H IN OUTPUT. PROBLEM 1 J=,I5,9H  P.NDREC=,F5.0,8H  NK025720  SR-OUTP163
       1ILL=,I5)                                                          025730  SR-OUTP164
  310 FORMAT (1H ,12HKTEST ARRAY=,/,(1H ,6I10))                           025740  SR-OUTP165
  320 FORMAT (1H1,14X,14HCAUSE OF ABORT)                                  025750  SR-OUTP166
  330 FORMAT (50X,5H*****,1X,10HOCCASIONS ,1H(,I5,1H),6H *****)           025760  SR-OUTP167
  340 FORMAT (1H ,/,1H ,I2,3X,3A10,I7,1H(,A7,5X,25HNUMBER TESTED (% PASS025770  SR-OUTP168
       1ED):,I7,1H(,A7)                                                   025780  SR-OUTP169
  350 FORMAT (1H ,7X,14HROUND NUMBER :,23X,1H1,14X,1H2,14X,1H3,14X,1H4,1025790  SR-OUTP170
       14X,1H5,14X,1H6)                                                   025800  SR-OUTP171
  360 FORMAT (1H ,/,1H ,I2,3X,3A10,6(I7,1H(,A7))                          025810  SR-OUTP172
  370 FORMAT (8X,24HNUMBER TESTED (% PASSED),4X,6(I7,1H(,A7))             025820  SP-OUTP173
  380 FORMAT (1H ,/,15X,11H***** KILLS,5X,6(I10,I5),6H *****)             025830  SR-OUTP174
  390 FORMAT (1H ,/,45X,5H*****,1X,23HATTEMPTED ENGAGEMENTS  (,I5,7H) ***025840  SR-OUTP175
       1**)                                                               025850  SP-OUTP176
  400 FORMAT (1H ,/,53X,6H***** ,7HSHOTS (,I5,7H) *****)                  025860  SR-OUTP177
  410 FORMAT (1H ,/,8X,30HPROB(KILL/OCSN)=             ,1X,6(A10,5X))     025870  SP-OUTP178
  420 FORMAT (8X,30HPROB(KILL/ATMP ENG)=            ,1X,6(A10,5X))        025880  SR-OUTP179
  430 FORMAT (8X,30HPROB(KILL/SHOT)=               ,1X,6(A10,5X))         025890  SR-OUTP180
  440 FORMAT (8X,16HPROB(SHOT/OCSN)=,1X,A10,8X,20HPROB(SHOT/ATMP ENG)=,1025900  SP-OUTP181
       1X,A10,8X,20HPROB(ATMP ENG/OCSN)=,1X,A10)                          025910  SP-OUTP182
  450 FORMAT (8X,30HPROB(LOS)=                      ,1X,6(A10,5X))        025920  SR-OUTP183
  460 FORMAT (1H ,/,1H ,61HDESIGNATOR SURVIVABILITY:  CASES IN WHICH DESI025930  SR-OUTP184
       1GNATOR KILLED = ,I5,1H(,A7,5X,30HNUMBER TESTED (% NOT KILLED) =,I5025940  SR-OUTP185
       2,1H(,A7)                                                          025950  SR-OUTP186
       END                                                                025960  SP-OUTP187
```

LISTING D-1   FORTRAN LISTING OF COPE PROGRAM - CONT'D
(PAGE 62 OF 82)

```
      SUBROUTINE PECHK                                                      025980      SR-PECHK  2
                                                                            025990      SR-PECHK  3
C
      COMMON /FLAG/ ENDREP, IDN, IPREPL, IDIGTL, IPPTY, IPNDNC, IT3FLG,     000300      CM+FLAG   2
     1 ENDFLG                                                               000310      CM+FLAG   3
      LOGICAL ENDFLG, ENDREP                                                000320      CM+FLAG   4
      COMMON /HIT/ INDFX(6,5,2), PFTRL(60,10,7), DLTT(6), PKTBL(10,2),      000410      CM+HIT    2
     1 NRNGIT, RNGTTF(20), TTF(3,20,2), NPNGPS, RNGPST(10), PSTTRL(10,      000420      CM+HIT    3
     2 3)                                                                   000430      CM+HIT    4
      COMMON /KTEST/ KTEST(20,6)                                            000490      CM+KTEST  2
      COMMON /RANDOM/ IP1, IP2, IP3, IP4, IP5, IP6, IP7, IP8, IP9, IP10,    000640      CM+RANDOM2
     1 IP11, IP12, IP13, IP14, IP15, IP16, IP17, IP18, IP19, IP20, IP21     000650      CM+RANDOM3
     2 , IP22, IP23, IP24, IP25, IP26, IP27, IP28                           000660      CM+RANDOM4
      COMMON /RANGE/ DTRNG, MXDPNG, VISLIM, PNGNDW                          000680      CM+RANGE  2
      REAL MXDRNG                                                           000690      CM+RANGE  3
      COMMON /RPLCTN/ KREP, NREP, KRF, NRF, NVEHKL                          000770      CM+RPLCTN2
      COMMON /RSPTIM/ BATRTM(3), XNVADF(2), DUM1, RCSPTM(2,2), XMTTIM(2,    000790      CM+RSPTIM2
     1 2), TMFAN(2,2), TSIGMA(2,2), DETTMA(10,2), NDT, TRAPRY(3,2),         000800      CM+RSPTIM3
     2 PRSPTM, TRBAR, PPSDT, PFSVT, ALPHA(2,2), BFTA(2,2), DETTIM,          000810      CM+RSPTIM4
     3 IDSGTP, RUMC, PCRMSG, PRDDW                                          000820      CM+RSPTIM5
      COMMON /TARGET/ TVEL, NVEHCL, DISRVH, ITGTTP, IMUTS, ITGTPS           001000      CM+TARGET2
      COMMON /TIME/ DIPLOS, TIMNOW, TOF, TBR, TIMPA, TIMRA1                 001020      CM+TIME   2
      COMMON /WEATIR/ PRCLCG, PRCFLS(2), PRGCFL(11,2), W(6,11,2),           001060      CM+WEATHR2
     1 VIS(11), CLOUD(6), NCC, NVL, PASQL(6), WNDSPD(3,31), HUMID(2),       001070      CM+WEATHR3
     2 WSUM(2), WCFSUM(2), ICC, IVL                                         001080      CM+WEATHR4
                                                                            026100      SP-PECHK 14
                                                                            026110      SR-PECHK 15
      RNGK=RNGNDW/1000.                                                     026120      SR-PECHK 16
C                                                                           026130      SR-PECHK 17
C                                                                           026140      SR-PECHK 18
      T1=FLOAT(KRF-1)*TBR-FLOAT(NVEHCL-1)*DISBVH/TVEL                       026150      SR-PECHK 19
      T2=TIMRA1-DETTIM-TRBAR                                                026160      SR-PECHK 20
      T3=0.0                                                                026170      SR-PECHK 21
      IF (IPREPL.EQ.1.AND.IT3FLG.EQ.1) T3=TRBAR+DETTIM-RUMC/TVEL            026180      SR-PECHK 22
      DELTAT=T1+T2+T3                                                       026190      SR-PECHK 23
      IF (DELTAT.LE.0.0) DELTAT=0.0                                         026200      SR-PECHK 24
C                                                                           026210      SR-PECHK 25
      IMUTS=1                                                               026220      SR-PECHK 26
      IF (DELTAT.LE.0.0) IMUTS=2                                            026230      SR-PECHK 27
C                                                                           026240      SP-PECHK 28
C     FIND IRNG1 AND IRNG2 WHICH BRACKET RNGK.                              026250      SR-PECHK 29
C     IF RNGK<1, IPNG1=IPNG2=1; IF PNGK>7, IPNG1=IPNG2=7.                   026260      SR-PECHK 30
C     OTHERWISE, IRNG1 <= PNGK < IRNG2.                                     026270      SR-PECHK 31
C     IPNG1 AND IRNG2 WILL BE USED IN INTERPOLATING IN PETBL.              026280      SR-PECHK 32
C                                                                           026290      SR-PECHK 33
      IRNG1=MIN1(RNGK,7.0)                                                  026300      SR-PECHK 34
      IRNG1=MAX0(1,IRNG1)                                                   026310      SR-PECHK 35
      IPNG2=IRNG1+1                                                         026320      SR-PECHK 36
      IF (RNGK.LT.1.0.OR.IRNG1.EQ.7) IRNG2=IRNG1                            026330      SR-PECHK 37
      TF=AMAX1(RNGK-FLOAT(IRNG1),0.0)                                       026340      SR-PECHK 38
      IF (TF.EQ.0.0) GO TO 100                                              026350      SP-PECHK 39
      TF=TF/(FLOAT(IRNG2)-FLOAT(IPNG1))                                     026360      SR-PECHK 40
  100 IF (IMUTS.NE.2) GO TO 110                                             026370      SR-PECHK 41
C                                                                           026380      SP-PECHK 42
      IDELTT=1                                                              026390      SP-PECHK 43
      II=INDEX(ICC,IDELTT,IMUTS)
      IVLA=MINO(IVL,10)
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D
(PAGE 63 OF 82)

```
      PE1=PETBL(II,IVLA,IRNG1)                                               026400   SR-PECHK44
      PE2=PETBL(II,IVLA,IRNG2)                                               026410   SR-PECHK45
      PE=PE1+TF*(PE2-PE1)                                                    026420   SR-PECHK46
      GO TO 140                                                             026430   SR-PECHK47
C                                                                            026440   SR-PECHK48
C  BRACKET DELTAT WITH DLTT VALUES CORRESPONDING TO IDELT1 AND IDELT2        026450   SR-PECHK49
C                                                                            026460   SR-PECHK50
  110 DO 120 I=1,NDT                                                         026470   SR-PECHK51
      IF (DELTAT.LT.DLTT(I).OR.DELTAT.GE.DLTT(I+1)) GO TO 120                026480   SR-PECHK52
      IDELT1=I                                                               026490   SR-PECHK53
      IDELT2=I+1                                                             026500   SR-PECHK54
      GO TO 130                                                             026510   SR-PECHK55
  120 CONTINUE                                                               026520   SR-PECHK56
      STOP ' IN PECHK: FAILED TO BRACKET DELTA T '                          026530   SR-PECHK57
C                                                                            026540   SR-PECHK58
C  PERFORM A TWO DIMENSIONAL FOUR-POINT INTERPOLATION USING TWO RANGE        026550   SR-PECHK59
C  POINTS FOR EACH OF TWO DELAY TIME VALUES.                                 026560   SR-PECHK60
C                                                                            026570   SR-PECHK61
  130 FDT=DELTAT-DLTT(IDELT1)                                                026580   SP-PECHK62
      FDT2=FDT/(DLTT(IDELT2)-DLTT(IDELT1))                                   026590   SP-PECHK63
      FDT1=1.0-FDT2                                                          026600   SR-PECHK64
      TF2=TF                                                                 026610   SR-PECHK65
      TF1=1.0-TF2                                                            026620   SR-PECHK66
      II1=INDEX(ICC,IDELT1,IMUTS)                                            026630   SR-PECHK67
      II2=INDEX(ICC,IDELT2,IMUTS)                                            026640   SR-PECHK68
      IVLA=MINO(10,IVL)                                                      026650   SR-PECHK69
      PET1R1=PETBL(II1,IVLA,IRNG1)                                           026660   SP-PECHK70
      PET1R2=PETBL(II1,IVLA,IRNG2)                                           026670   SR-PECHK71
      PET2R1=PETBL(II2,IVLA,IRNG1)                                           026680   SR-PECHK72
      PET2R2=PETBL(II2,IVLA,IRNG2)                                           026690   SR-PECHK73
      IF (IDELT2.EQ.6) PET2P1=0.0                                            026700   SR-PECHK74
      IF (IDELT2.EQ.6) PET2R2=0.0                                            026710   SP-PECHK75
      PE=FDT1*TF1*PET1R1+FDT1*TF2*PET1R2+FDT2*TF1*PET2R1+FDT2*TF2*PET2R2026720 2026R 2026R   SR-PECHK76
C                                                                            026730   SR-PECHK77
  140 RN22=URAN31(IR22)                                                      026740   SP-PECHK78
      KTEST(17,KRF)=KTEST(17,KRF)+1                                          026750   SR-PECHK79
      IF (RN22.LE.PE) GO TO 150                                              026760   SR-PECHK80
C                                                                            026770   SP-PECHK81
      IABRT=17                                                               026780   SP-PECHK82
      CALL ABRTL (IABRT)                                                     026790   SR-PECHK83
C                                                                            026800   SR-PECHK84
  150 RETURN                                                                 026810   SR-PECHK85
      END                                                                    026820   SR-PECHK86
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 64 OF 82)

```fortran
      SUBROUTINE PENAME (TP,IDT,VEL,GTR,REFL,ANGLET,DEFB,TGTHD,SK,SEN,
     1 IDCODE)
C
      COMMON /XVALUE/ XVALUE(8,9,2)
      DIMENSION AVALUE(9), NP(9)
C
C
      AVALUE(1)=TP
      AVALUE(2)=IDT
      AVALUE(3)=VEL
      AVALUE(4)=GTR
      AVALUE(5)=REFL
      AVALUE(6)=ANGLET
      AVALUE(7)=DEFB
      AVALUE(8)=TGTHD
      AVALUE(9)=SKSEN
C
      DO 110 J=2,9
      DO 100 I=1,8
      IF (ABS(AVALUE(J)-XVALUE(I,J,1)).GT..0001) GO TO 100
      NP(J)=XVALUE(I,J,2)+.5
      GO TO 110
100   CONTINUE
      STOP ' IN PENAME: ERROR NUMBER 1 '
110   CONTINUE
C
      DO 120 J=2,9
      IF (NP(J).GE.8) STOP ' IN PENAME: ERROR NUMBER 2 '
120   CONTINUE
C
      IF (TP.LE.0.0.OR.TP.GE.999.5) STOP ' IN PENAME: ERROR NUMBER 3 '
      NCODE=TP+.50
C
      DO 130 J=2,9
130   NCODE=8*NCODE+NP(J)
C
      ENCODE (10,170,IDCODE) NCODE
C
      RETURN
C
C
      ENTRY PEIDNT
C
      DECODE (10,180,IDCODE) NCODE
C
      DO 140 J=2,9
      NP(11-J)=MOD(NCODE,8)
      NCODE=NCODE/8
140   CONTINUE
C
      NP(1)=NCODE
C
      DO 160 J=2,9
```

026840	SR-PENAME2
026850	SR-PENAME3
026860	SR-PENAME4
001100	CM+XVALUE2
026880	SR-PENAME6
026890	SR-PENAME7
026900	SP-PENAME8
026910	SR-PENAME9
026920	SR-PENAM10
026930	SR-PENAM11
026940	SR-PENAM12
026950	SR-PENAM13
026960	SP-PENAM14
026970	SR-PENAM15
026980	SP-PENAM16
026990	SR-PENAM17
027000	SR-PENAM18
027010	SP-PENAM19
027020	SR-PENAM20
027030	SR-PENAM21
027040	SR-PENAM22
027050	SR-PENAM23
027060	SR-PENAM24
027070	SR-PENAM25
027080	SR-PENAM26
027090	SR-PENAM27
027100	SR-PENAM28
027110	SR-PENAM29
027120	SR-PENAM30
027130	SR-PENAM31
027140	SR-PENAM32
027150	SR-PENAM33
027160	SR-PENAM34
027170	SR-PENAM35
027180	SR-PENAM36
027190	SR-PENAM37
027200	SR-PENAM38
027210	SR-PENAM39
027220	SR-PENAM40
027230	SR-PENAM41
027240	SR-PENAM42
027250	SR-PENAM43
027260	SR-PENAM44
027270	SR-PENAM45
027280	SR-PENAM46
027290	SR-PENAM47
027300	SR-PENAM48
027310	SR-PENAM49
027320	SR-PENAM50
027330	SR-PENAM51
027340	SP-PENAM52
027350	SR-PENAM53
027360	SR-PENAM54
027370	SR-PENAM55

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 65 OF 82)

```
      DO 150 I=1,8
      IF (ABS(FLOAT(HP(J))-XVALUE(I,J,2)).GT..0001) GO TO 150
      AVALUE(J)=XVALUE(I,J,1)                           027380    SR-PENAM56
      GO TO 160                                         027390    SR-PENAM57
  150 CONTINUE                                          027400    SR-PENAM58
      STOP ' IN PENAME (REIDHT): ERROR NUMBER 4 '       027410    SP-PENAM59
  160 CONTINUE                                          027420    SP-PENAM60
C                                                       027430    SR-PENAM61
      AVALUE(1)=NCODE                                   027440    SR-PENAM62
C                                                       027450    SR-PENAM63
      TR=AVALUE(1)                                      027460    SP-PENAM64
      IDT=AVALUE(2)                                     027470    SR-PENAM65
      VFL=AVALUE(3)                                     027480    SP-PENAM66
      GTR=AVALUE(4)                                     027490    SP-PENAM67
      REFL=AVALUE(5)                                    027500    SP-PENAM68
      ANGLFT=AVALUE(6)                                  027510    SR-PENAM69
      DEFB=AVALUE(7)                                    027520    SR-PENAM70
      TGTHD=AVALUE(8)                                   027530    SR-PENAM71
      SKSEN=AVALUE(9)                                   027540    SR-PENAM72
C                                                       027550    SR-PENAM73
      RETURN                                            027560    SP-PENAM74
C                                                       027570    SR-PENAM75
C                                                       027580    SR-PENAM76
C  * * *   F O R M A T   S T A T E M E N T S   * * *    027590    SR-PENAM77
C                                                       027600    SR-PENAM78
  170 FORMAT (4HPE20,R6)                                027610    SR-PENAM79
  180 FORMAT (4X,P6)                                    027620    SR-PENAM80
      END                                               027630    SR-PENAM81
                                                        027640    SR-PENAM82
                                                        027650    SR-PENAM83
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D
(PAGE 66 OF 82)

```
      SUBROUTINE PKCHK                                                          027670   SR-PKCHK  2
C                                                                              027680   SR-PKCHK  3
      COMMON /HIT/ INDEX(6,5,2), PETBL(60,10,7), DLTT(6), PKTBL(10,2),          000410   CM+HIT    2
     1 NRNGTT, RNGTTF(20), TTF(3,20,2), NRNGPS, RNGPST(10), PSTTBL(10,          000420   CM+HIT    3
     2 3)                                                                       000430   CM+HIT    4
      COMMON /KTEST/ KTEST(20,6)                                                000490   CM+KTEST  2
      COMMON /RANDOM/ IR1, IR2, IP3, IP4, IP5, IR6, IR7, IR8, IR9, IR10,        000640   CM+RANDOM2
     1 IR11, IR12, IP13, IP14, IP15, IR16, IR17, IP18, IP19, IP20, IR21         000650   CM+RANDOM3
     2 , IR22, IR23, IR24, IR25, IR26, IP27, IP28                               000660   CM+RANDOM4
      COMMON /RPLCTN/ KREP, NREP, KRF, NRF, NVEHKL                              000770   CM+RPLCTN2
      COMMON /SCCSS/ PNDREC(6)                                                  000900   CM+SCCSS  2
      COMMON /TARGET/ TVEL, NVEHICL, DISRVH, ITGTTP, IMUTS, ITGTPS              001000   CM+TARGET2
C                                                                              027750   SR-PKCHK10
      PK=PKTBL(ITGTTP,ITGTPS)                                                   027760   SR-PKCHK11
      RN21=URAN31(IR21)                                                         027770   SR-PKCHK12
      KTEST(19,KRF)=KTEST(19,KRF)+1                                             027780   SR-PKCHK13
      IF (PN21.LE.PK) GO TO 100                                                 027790   SR-PKCHK14
C                                                                              027800   SR-PKCHK15
      IABRT=19                                                                  027810   SR-PKCHK16
      CALL ABRTTL (IABRT)                                                       027820   SR-PKCHK17
      GO TO 110                                                                 027830   SR-PKCHK18
C                                                                              027840   SR-PKCHK19
  100 RNDREC(KRF)=RNDRFC(KRF)+1.0                                               027850   SR-PKCHK20
      NVEHKL=MINO(NVEHKL+1,NVEHICL)                                             027860   SR-PKCHK21
C                                                                              027870   SR-PKCHK22
  110 RETURN                                                                    027880   SR-PKCHK23
C                                                                              027890   SR-PKCHK24
      END                                                                       027900   SR-PKCHK25
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 67 OF 82)

```
0000000001111111111222222222233333333334444444444555555555566666666667777777777888888889  COLUMN NUMBERS
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890  (READ VERTICALLY)

      SUBROUTINE PPLOT                                                027920  SR-PPLOT 2
C                                                                     027930  SR-PPLOT 3
      COMMON /PUNDAT/ DAT, TIM, NCASE, ICCPFG, IPPFG                  000840  CM+RUNDAT2
C                                                                     027950  SR-PPLOT 5
      DIMENSION CM(10)                                                027960  SR-PPLOT 6
C                                                                     027970  SR-PPLOT 7
      ENCODE (100,100,CM(1) )NCASE,IPPFG                              027980  SR-PPLOT 8
      CALL COMMNT (CM,10,.FALSE.,.FALSE.)                             027990  SR-PPLOT 9
      RETURN                                                          028000  SR-PPLOT10
C                                                                     028010  SR-PPLOT11
C                                                                     028020  SR-PPLOT12
C  ***  F O R M A T   S T A T E M E N T S  ***                        028030  SR-PPLOT13
C                                                                     028040  SR-PPLOT14
100 FORMAT (1H ,19H IN PPLOT FOR CASE ,I2,13H WITH IPPFG= ,I1,23H .   N028050  SR-PPLOT15
   10 PLOT PRODUCED . )                                               028060  SR-PPLOT16
      END                                                             028070  SR-PPLOT17

0000000001111111111222222222233333333334444444444555555555566666666667777777777888888889  COLUMN NUMBERS
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890  (READ VERTICALLY)


LISTING D-1  FORTRAN LISTING OF COPE PROGRAM - CONT'D
(PAGE 68 OF 82)
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D-70

```
      SUBROUTINE PSMOKF                                                   028090  SR-PSMOKE2
C                                                                         028100  SR-PSMOKE3
C                                                                         028110  SR-PSMOKE4
      COMMON /SMOKED/ SMK2(3,3,2), SMK5(3,3,2), FRONT, NSMK2, NSMK5,      000920  CM+SMOKED2
     1 PSMKKL                                                             000930  CM+SMOKED3
      COMMON /WEATHR/ PRCLCG, PRCFLS(2), PRGCFL(11,2), W(6,11,2),         001060  CM+WEATHR2
     1 VIS(11), CLOUD(6), NCC, NIVL, PASQI(6), WNDSPD(3,3), HUMID(2),     001070  CM+WEATHR3
     2 WSUM(2), WCFSUM(2), ICC, IVL                                       001080  CM+WEATHR4
      PSMKKL=0.0                                                          028140  SR-PSMOKE7
C                                                                         028150  SR-PSMOKE8
      DO 100 I=1,3                                                        028160  SR-PSMOKE9
      JEND=1                                                              028170  SR-PSMOK10
      IF (I.EQ.2) JEND=3                                                  028180  SR-PSMOK11
      DO 100 J=1,JEND                                                     028190  SR-PSMOK12
      DO 100 K=1,2                                                        028200  SR-PSMOK13
      VSMK=FLOAT(NSMK2)/SMK2(I,J,K)+FLOAT(NSMK5)/SMK5(I,J,K)              028210  SR-PSMOK14
      VSMK=AMIN1(FRONT,VSMK)                                              028220  SR-PSMOK15
      PASQT=PASQL(2*I-1)+PASQL(2*I)                                       028230  SR-PSMOK16
      PSMKKL=PSMKKL+PASQT*WNDSPD(I,J)*HUMID(K)*VSMK                       028240  SR-PSMOK17
  100 CONTINUE                                                            028250  SR-PSMOK18
C                                                                         028260  SR-PSMOK19
      PSMKKL=PSMKKL/FRONT                                                 028270  SR-PSMOK20
C                                                                         028280  SR-PSMOK21
      RETURN                                                              028290  SR-PSMOK22
      END                                                                 028300  SR-PSMOK23
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 69 OF 82)

```
C     SUBROUTINE REINTZ                                                   028320  SR-REINTZ2
C                                                                         028330  SR-REINTZ3
      COMMON /ABORT/ NABORT(20,6), MSABLM                                 000110  CM+ABORT 2
      COMMON /KTEST/ KTEST(20,6)                                          000490  CM+KTEST 2
      COMMON /RANDOM/ IP1, IP2, IP3, IP4, IP5, IP6, IP7, IP8, IP9, IP10,  000640  CM+RANDOM2
     1 IP11, IP12, IP13, IP14, IP15, IP16, IP17, IP18, IP19, IP20, IP21,  000650  CM+RANDOM3
     2 , IP22, IP23, IP24, IP25, IP26, IP27, IP28                         000660  CM+RANDOM4
      COMMON /RPLCTN/ KREP, NREP, KRF, NRF, NVEHKL                        000770  CM+RPLCTN2
      COMMON /SCCSS/ RNDRFC(6)                                            000900  CM+SCCSS 2
C                                                                         028390  SR-REINTZ9
      DIMENSION IR(28)                                                    028400  SR-REINT10
C                                                                         028410  SR-REINT11
      EQUIVALENCE (IR(1),IP1)                                             028420  SR-REINT12
C                                                                         028430  SR-REINT13
      DO 100 IKTEST=1,20                                                  028440  SR-REINT14
      DO 100 JKTEST=1,6                                                   028450  SR-REINT15
  100 KTEST(IKTEST,JKTEST)=0                                              028460  SR-REINT16
      DO 120 J=1,NRF                                                      028470  SR-REINT17
      RNDRFC(J)=0.0                                                       028480  SR-REINT18
      DO 110 I=1,20                                                       028490  SR-REINT19
      NABORT(I,J)=0                                                       028500  SR-REINT20
  110 CONTINUE                                                            028510  SR-REINT21
  120 CONTINUE                                                            028520  SR-REINT22
C                                                                         028530  SR-REINT23
      K=1                                                                 028540  SR-REINT24
      M=2**25                                                             028550  SR-REINT25
      DO 130 I=1,28                                                       028560  SR-REINT26
      K=MOD(8*K,29)                                                       028570  SR-REINT27
      IR(I)=2*(M*K/29)+1                                                  028580  SR-REINT28
  130 CONTINUE                                                            028590  SR-REINT29
C                                                                         028600  SR-REINT30
      IF (IPPINT.EQ.0) WRITE (8,140) (IP(I),I=1,28)                       028610  SR-REINT31
      IPRINT=1                                                            028620  SR-REINT32
      RETURN                                                              028630  SR-REINT33
C                                                                         028640  SR-REINT34
C     *** F O R M A T   S T A T E M E N T S ***                           028650  SR-REINT35
C                                                                         028660  SR-REINT36
  140 FORMAT (1H ,21HRANDOM NUMBER SEEDS :,/,(10I10))                     028670  SR-REINT37
      END                                                                 028680  SR-REINT38
                                                                          028690  SR-REINT39
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D
(PAGE 70 OF 82)

```
      SUBROUTINE RNDREL                                             028710    SR-RNDREL2
                                                                    028720    SR-RNDREL3
C                                                                             CM+KTEST 2
      COMMON /KTEST/ KTEST(20,6)                                   000490    CM+KTEST 2
      COMMON /MISC/ DDAP.PK, PDSTKL, RELIF                         000540    CM+MISC  2
      COMMON /RANDOM/ IP1, IP2, IR3, IP4, IP5, IP6, IP7, IR8, IP9, IR10,000640 CM+RANDOM2
     1 IP11, IP12, IP13, IP14, IP15, IP 16, IP17, IP18, IP19, IR20, IR21000650 CM+RANDOM3
     2 , IR22, IR23, IR24, IR25, IR26, IP27, IR28                  000660    CM+RANDOM4
      COMMON /RPLCTN/ KRFP, NPEP, KRF, NRF, NVEHKL                 000770    CM+RPLCTN2
                                                                    028770    SR-RNDREL8
C                                                                   028780    SR-RNDREL9
      RN17=UPAN31(IP17)                                             028790    SP-RNDRE10
C                                                                   028800    SR-RNDRE11
      KTEST(15,KRF)=KTEST(15,KRF)+1                                 028810    SR-RNDRE12
      IF (RN17.LE.RELIF) GO TO 100                                  028820    SR-RNDRE13
C                                                                   028830    SP-RNDRE14
      IABRT=15                                                      028840    SP-RNDRE15
      CALL ABRTTL (IABRT)                                           028850    SR-RNDRE16
C                                                                   028860    SP-RNDRE17
  100 RETURN                                                        028870    SR-RNDRE18
C                                                                   028880    SR-RNDRE19
      END
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 71 OF 82)

```
00000000011111111112222222222333333333344444444445555555555666666666677777777778888888889   COLUMN NUMBERS
12345678901234567890123456789012345678901234567890123456789012345678901234567890             (READ VERTICALLY)

       SUBROUTINE RNGCHK                                         028900      SP-RNGCHK2
C                                                                028910      SP-RNGCHK3
       COMMON /KTEST/ KTEST(20,6)                                000490      CM+KTEST 2
       COMMON /RANGE/ DTRNG, MXDRNG, VISLIM, PNGNOW              000680      CM+RANGE 2
       REAL MXDRNG                                               000690      CM+RANGE 3
       COMMON /RPLCTN/ KREP, NREP, KPF, MPF, NVEHKL              000770      CM+RPLCTN2
C                                                                028950      SR-RNGCHK7
       KTEST(3,KPF)=KTEST(3,KPF)+1                               028960      SP-RNGCHK8
       IF (DTRNG.LE.MXDRNG) GO TO 100                            028970      SP-RNGCHK9
C                                                                028980      SR-RNGCH10
       IABRT=3                                                   028990      SR-RNGCH11
       CALL ABRTTL (IARRT)                                       029000      SP-RNGCH12
C                                                                029010      SR-RNGCH13
   100 RETURN                                                    029020      SR-RNGCH14
C                                                                029030      SP-RNGCH15
       END                                                       029040      SR-RNGCH16

00000000011111111112222222222333333333344444444445555555555666666666677777777778888888889   COLUMN NUMBERS
12345678901234567890123456789012345678901234567890123456789012345678901234567890             (READ VERTICALLY)


            LISTING D-1  FORTRAN LISTING OF COPE PROGRAM - CONT'D

                              (PAGE 72 OF 82)
```

```
      SUBROUTINE SEPREC (A,N1,B,N2,N3)
C
      COMMON /COMENT/ CMENT(13,20), COMBUF(13), ICMNT, NTRC
      COMMON /LOGFLG/ FIRSTL, SEQNML, SPCL(70), SHRTEC, FTSILL
      LOGICAL FIRSTL, SEQNML, SPCL, SHRTEC, FTSILL
      COMMON /SYMBOL/ BLANK, DECPNT, ALFBET(27), ANUMBP(11), SEP(5),
     1 DOLLAR
      DIMENSION A(N1), B(N2,N3), NCPR(10)
      DIMENSION NC(80), PB(80,10)
      DIMENSION CM(10)
C
      DO 100 I=1,10
100   CONTINUE
      DO 110 I=1,80
110   NC(I)=0
      DO 120 I=1,N2
      DO 120 J=1,N3
120   B(I,J)=BLANK
      DO 130 I=1,80
      DO 130 J=1,10
130   PB(I,J)=BLANK
      DO 140 I=1,10
140   NCPR(I)=0
C
      DO 150 I=1,N1
150   NC(I)=IDCHAR(A,N1,I)
      DO 170 I=1,N1
      IF (NC(I).NE.5) GO TO 170
      NC(I)=3
      DO 160 J=1,10
160   NC(I+J)=1
      GO TO 180
170   CONTINUE
180   CONTINUE
C
      IF (.NOT.FIRSTL) GO TO 220
      FIRSTL=.FALSE.
      DO 190 I=73,78
      IF (NC(I).NE.0) GO TO 250
190   CONTINUE
      DO 200 I=63,72
      IF (NC(I).NE.3) GO TO 250
200   CONTINUE
      DO 210 I=79,80
      IF (NC(I).NE.3) GO TO 250
210   CONTINUE
      SEQNML=.TRUE.
      ENCODE (120,350,CM(1) )
      CALL COMMNT (CM,10,.FALSE.,.TRUE.)
      ENCODE (120,360,CM(1) )
      CALL COMMNT (CM,10,.FALSE.,.TRUE.)
      GO TO 230
220   IF (.NOT.SEQNML) GO TO 250
230   DO 240 I=73,78
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 73 OF 82)

```
      NC(I)=3
240 CONTINUE                                                         029580  SR-SEPRE54
250 CONTINUE                                                         029590  SR-SEPRE55
C                                                                    029600  SR-SEPRE56
C   SEPARATE RECORDS ON INPUT CARD.                                  029610  SR-SEPRE57
C                                                                    029620  SR-SEPRE58
      I=1                                                            029630  SR-SEPRE59
      IW=0                                                           029640  SR-SEPRE60
      IX=0                                                           029650  SR-SEPRE61
      J=0                                                            029660  SR-SEPRE62
      LSTCMA=0                                                       029670  SR-SEPRE63
260 IF (I.GT.N1) GO TO 320                                           029680  SR-SEPRE64
      IF (NC(I).NE.3.OR.IW.NE.IX) GO TO 280                          029690  SR-SEPRE65
270 I=I+1                                                            029700  SR-SEPRE66
      GO TO 260                                                      029710  SR-SEPRE67
280 IF (NC(I).EQ.3.OR.NC(I).EQ.4.OR.IW.NE.IX) GO TO 290             029720  SR-SEPRE68
      IW=IW+1                                                        029730  SR-SEPRE69
      J=0                                                            029740  SR-SEPRE70
      GO TO 310                                                      029750  SR-SEPRE71
290 IF (NC(I).NE.4) GO TO 310                                        029760  SR-SEPRE72
      IF (I.NE.(LSTCMA+1)) GO TO 300                                 029770  SR-SEPRE73
      IW=IW+1                                                        029780  SR-SEPRE74
300 IX=IW                                                            029790  SR-SEPRE75
      LSTCMA=I                                                       029800  SR-SEPRE76
      GO TO 270                                                      029810  SR-SEPRE77
310 IF (NC(I).EQ.3) GO TO 270                                        029820  SR-SEPRE78
      J=J+1                                                          029830  SR-SEPRE79
      PB(J,IW)=A(I)                                                  029840  SR-SEPRE80
      NCPP(IW)=NCPP(IW)+1                                            029850  SR-SEPRE81
      GO TO 270                                                      029860  SR-SEPRE82
320 CONTINUE                                                         029870  SR-SEPRE83
      NPE=IW                                                         029880  SR-SEPRE84
      IF (NPE.GE.0.AND.NPE.LE.10) GO TO 330                          029890  SR-SEPRE85
      STOP ' IN SEPREC: ERROR NUMBER 1 '                            029900  SR-SEPRE86
C                                                                    029910  SR-SEPRE87
C   ENCODE RECORDS INTO B ARRAY .                                    029920  SR-SEPRE88
C                                                                    029930  SR-SEPRE89
330 CONTINUE                                                         029940  SR-SEPRE90
      DO 340 I=1,NPE                                                 029950  SR-SEPRE91
      KCHAR=NCPP(I)                                                  029960  SR-SEPRE92
      ENCODE (80,370,B(1,I) )(PB(J,I),J=1,KCHAR)                    029970  SR-SEPRE93
340 CONTINUE                                                         029980  SR-SEPRE94
C                                                                    029990  SR-SEPRE95
      RETURN                                                         030000  SR-SEPRE96
C                                                                    030010  SR-SEPRE97
C                                                                    030020  SR-SEPRE98
C *** F O R M A T   S T A T E M E N T S ***                         030030  SR-SEPRE99
C                                                                    030040  SR-SEPR100
350 FORMAT (92H YOU HAVE SEQUENCE NUMBERS IN COLUMNS  73-78 OF TAPES. 030050  SR-SEPR101
    1 THEY WILL BE REMOVED BY THE PROGRAM.)                          030060  SR-SEPR102
360 FORMAT (91H HOWEVER, IF THE TEMPORARY OPTION WAS USED TO READ IN A 030070  SR-SEPR103
    1NY DATA, THE RESULTS MAY BE SUSPECT.)                           030080  SR-SEPR104
370 FORMAT (80A1)                                                    030090  SR-SEPR105
      END                                                            030100  SR-SEPR106
                                                                     030110  SR-SEPR107
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 74 OF 82)

```
      SUBROUTINE SMOKE                                               030130  SR-SMOKE  2
C                                                                    030140  SP-SMOKE  3
      COMMON /KTEST/ KTEST(20,6)                                     000490  CM+KTEST  2
      COMMON /RANDOM/ IP1, IR2, IR3, IR4, IP5, IR6, IR7, IR8, IR9, IR10, IP21  000640  CM+RANDOM2
     1 IR11, IR12, IP13, IR14, IP15, IR16, IP17, IP18, IP19, IP20, IP21        000650  CM+RANDOM3
     2 , IR22, IR23, IR24, IR25, IR26, IP27, IR28                    090660  CM+RANDOM4
      COMMON /RPLCTN/ KREP, NREP, KRF, NRF, NVEHKL                   000770  CM+RPLCTN2
      COMMON /SMOKED/ SMK2(3,3,2), SMK5(3,3,2) FRONT, NSMK2, NSMK5,  000920  CM+SMOKED2
     1 PSMKKL                                                        000930  CM+SMOKED3
      COMMON /WEATHR/ PPCLCG, PRCFLS(2), PRGCFL(11,2), W(6,11,2),    001060  CM+WEATHR2
     1 VIS(11), CLOUD(6), NCC, NVL, PASOL(6), WNDSPD(3,3), HUMID(2), 001070  CM+WEATHR3
     2 WSUM(2), WCFSUM(2), ICC, IVL                                  0010R0  CM+WEATHP4
C                                                                    030200  SP-SMOKE  9
      KTEST(5,KRF)=KTEST(5,KRF)+1                                    030210  SP-SMOKE10
      RN13=UPAN31(IP13)                                              030220  SR-SMOKE11
      IF (RN13.GT.PSMKKL) GO TO 100                                  030230  SR-SMOKE12
C                                                                    030240  SR-SMOKE13
      IABRT=5                                                        030250  SP-SMOKE14
      CALL ABRTTL (IABRT)                                            030260  SR-SMOKE15
C                                                                    030270  SR-SMOKE16
  100 RETURN                                                         0302R0  SR-SMOKE17
C                                                                    030290  SR-SMOKE18
      END                                                            030300  SR-SMOKE19
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 75 OF 82)

```
00000000011111111112222222222333333333344444444445555555555666666666677777777778888888889
12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789

      SUBROUTINE SMPLCD (A,ND1,ND2,NRS,NDR,IRNDM,XSMPL,ICLASS)              030320   SR-SMPLCD2
C                                                                          030330   SR-SMPLCD3
C                                                                          030340   SR-SMPLCD4
      DIMENSION A(ND1,ND2)                                                 030350   SR-SMPLCD5
C                                                                          030360   SR-SMPLCD6
C                                                                          030370   SR-SMPLCD7
      ICLASS=0                                                             030380   SR-SMPLCD8
      RN=URAN31(IRNDM)                                                     030390   SR-SMPLCD9
      IF (RN.LT.1.0) GO TO 100                                            030400   SR-SMPLC10
      WRITE (6,130) RN                                                     030410   SR-SMPLC11
      CALL STRACE                                                          030420   SR-SMPLC12
      STOP ' IN SMPLCD: RANDOM NUMBER TOO LARGE '                         030430   SR-SMPLC13
C                                                                          030440   SR-SMPLC14
  100 CONTINUE                                                             030450   SR-SMPLC15
      NDRM1=NDR-1                                                          030460   SR-SMPLC16
      DO 110 I=1,NDRM1                                                     030470   SR-SMPLC17
      IF (A(I,1).LE.RN.AND.RN.LT.A(I+1,1)) GO TO 120                       030480   SR-SMPLC18
  110 CONTINUE                                                             030490   SR-SMPLC19
C                                                                          030500   SR-SMPLC20
      CALL STRACE                                                          030510   SR-SMPLC21
      STOP ' IN SMPLCD: FAILED TO BRACKET RANDOM NUMBER '                  030520   SR-SMPLC22
C                                                                          030530   SR-SMPLC23
  120 XSMPL=A(I,NRS)+(RN-A(I,1))*(A(I+1,NRS)-A(I,NRS))/(A(I+1,1)-A(I,1))   030540   SR-SMPLC24
      ICLASS=I                                                             030550   SR-SMPLC25
C                                                                          030560   SR-SMPLC26
      RETURN                                                               030570   SR-SMPLC27
C                                                                          030580   SR-SMPLC28
C                                                                          030590   SR-SMPLC29
C *** F O R M A T   S T A T E M E N T S ***                                030600   SR-SMPLC30
C                                                                          030610   SR-SMPLC31
  130 FORMAT (1H ,59H IN SMPLCD WITH RANDOM NUMBER GREATER THAN 1.0,       030620   SP-SMPLC32
     1    RN = ,F10.7)
      END
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 76 OF 82)

```
      SUBROUTINE TIMCHK                                          030640    SR-TIMCHK2
C                                                                030650    SR-TIMCHK3
      COMMON /FLAG/ ENDPEP, IDM, IPPEPL, IDIGTL, IPPTY, IPNDOC, IT3FLG,  000300    CM*FLAG  2
    1 ENDFLG                                                     000310    CM*FLAG  3
      LOGICAL ENDFLG, ENDRFP                                     000320    CM*FLAG  4
      COMMON /KTEST/ KTEST(20,6)                                 0P0490    CM*KTEST 2
      COMMON /RPLCTN/ KPEP, NPEP, KPF, NRF, NVEHKL               000770    CM*RPLCTN2
      COMMON /TIME/ DUPLDS, TIMNOW, TOF, TBR, TIMFA, TIMRA1      001020    CM*TIME  2
C                                                                030700    SP-TIMCHK8
      KTEST(11,KPF)=KTEST(11,KPF)+1                              030710    SR-TIMCHK9
      IF (TIMNOW.LT.DUPLDS) GO TO 100                            030720    SR-TIMCH10
C                                                                030730    SR-TIMCH11
      IABPT=11                                                   030740    SR-TIMCH12
      CALL ABRTTL (IABPT)                                        030750    SR-TIMCH13
C                                                                030760    SR-TIMCH14
  100 RETURN                                                     030770    SR-TIMCH15
C                                                                030780    SP-TIMCH16
      END                                                        030790    SR-TIMCH17
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 77 OF 82)

```
       SUBROUTINE TITLE                                    030810   SR-TITLE  2
C                                                          030820   SR-TITLE  3
       COMMON /RUNDAT/ DAT, TIM, NCASE, ICCPFG, IPPFG      000840   CM+RUNDAT2
       COMMON /STITLE/ SLVERS, VERDAT(2)                   000950   CM+STITLE2
C                                                          030850   SR-TITLE  6
       CALL DATE (DAT)                                     030860   SR-TITLE  7
       CALL TIME (TIM)                                     030870   SR-TITLE  8
C                                                          030880   SR-TITLE  9
       WRITE (6,150)                                       030890   SR-TITLE10
       WRITE (6,160)                                       030900   SR-TITLE11
       DO 100 I=1,4                                        030910   SR-TITLE12
       WRITE (6,170)                                       030920   SR-TITLE13
  100  CONTINUE                                            030930   SR-TITLE14
       WRITE (6,180)                                       030940   SR-TITLE15
       DO 110 I=1,8                                        030950   SR-TITLE16
       WRITE (6,170)                                       030960   SR-TITLE17
  110  CONTINUE                                            030970   SP-TITLE18
       WRITE (6,190)                                       030980   SR-TITLE19
       WRITE (6,170)                                       030990   SP-TITLE20
       WRITE (6,200)                                       031000   SR-TITLE21
       WRITE (6,170)                                       031010   SR-TITLE22
       WRITE (6,210)                                       031020   SR-TITLE23
       WRITE (6,170)                                       031030   SR-TITLE24
       WRITE (6,220)                                       031040   SR-TITLE25
       WRITE (6,170)                                       031050   SP-TITLE26
       WRITE (6,230)                                       031060   SR-TITLE27
       WRITE (6,170)                                       031070   SR-TITLE28
       WRITE (6,240)                                       031080   SP-TITLE29
       WRITE (6,170)                                       031090   SR-TITLE30
       WRITE (6,250)                                       031100   SR-TITLE31
       DO 120 I=1,11                                       031110   SR-TITLE32
       WRITE (6,170)                                       031120   SR-TITLE33
  120  CONTINUE                                            031130   SP-TITLE34
       WRITE (6,260)                                       031140   SR-TITLE35
       WRITE (6,170)                                       031150   SR-TITLE36
       WRITE (6,270)                                       031160   SR-TITLE37
       WRITE (6,170)                                       031170   SR-TITLE38
       WRITE (6,280)                                       031180   SR-TITLE39
       WRITE (6,170)                                       031190   SP-TITLE40
       WRITE (6,290)                                       031200   SR-TITLE41
       DO 130 I=1,5                                        031210   SR-TITLE42
       WRITE (6,170)                                       031220   SR-TITLE43
  130  CONTINUE                                            031230   SR-TITLE44
       WRITE (6,300) SLVERS,VERDAT(1),VERDAT(2)            031240   SR-TITLE45
       WRITE (6,170)                                       031250   SR-TITLE46
       WRITE (6,310) DAT,TIM                               031260   SR-TITLE47
       DO 140 I=1,5                                        031270   SR-TITLE48
       WRITE (6,170)                                       031280   SR-TITLE49
  140  CONTINUE                                            031290   SR-TITLE50
       WRITE (6,160)                                       031300   SR-TITLE51
       RETURN                                              031310   SR-TITLE52
C                                                          031320   SP-TITLE53
C                                                          031330   SP-TITLE54
C  *** FORMAT STATEMENTS ***                               031340   SR-TITLE55
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 78 OF 82)

```
C
150 FORMAT (1H1)
160 FORMAT (1H ,13(10H**********))
170 FORMAT (1H ,128X,1H*)
180 FORMAT (1H ,19X,89HC O P P E R H E A D   O P E R A T I O N A L    031390
      1 P E R F O R M A N C E   E V A L U A T I O N,20X,1H*)
190 FORMAT (1H ,32X,29H-PROGRAM BY RICHARD SANDMEYER,67X,1H*)
200 FORMAT (1H ,37X,42H-MODEL DEVELOPMENT AND DATA COLLECTION BY:,
     154X,1H*)
210 FORMAT (1H ,1H*,34X,14HDAVID BARNHART,8X,15HJULIAN CHEPNICK,5X,15H
     1DIANA FREDERICK,37X,1H*)
220 FORMAT (1H ,1H*,34X,17HRICHARD SANDMEYER,5X,15HRICHARD SCUNGIO,5X,
     114HMICHAEL STARKS,38X,1H*)
230 FORMAT (1H ,1H*,34X,13HEDWARD STAUCH,9X,11HANNTE YOUNG,61X,1H*)
240 FORMAT (1H ,1H*,32X,38H-BASED ON A PROPOSAL BY HERBERT FALLIN,58X,
     11H*)
250 FORMAT (1H ,1H*,32X,48H-DONE AT THE REQUEST OF DAVID HARDISON (DUS
     1A-OP),48X,1H*)
260 FORMAT (1H ,1H*,36X,53HUNITED STATES ARMY MATERIEL SYSTEMS ANALYSI
     1S ACTIVITY,36X,1H*)
270 FORMAT (1H ,1H*,51X,23HGROUND WARFARE DIVISION,54X,1H*)
280 FORMAT (1H ,1H*,47X,31HSUPPORT WEAPONS ANALYSIS BRANCH,50X,1H*)
290 FORMAT (1H ,1H*,50X,26HSYSTEMS EVALUATION SECTION,52X,1H*)
300 FORMAT (1H ,1H*,40X,13HCOPE VERSION ,F3.1,15H CURRENT AS OF ,2A10,
     137X,1H*)
310 FORMAT (1H ,1H*,42X,16HTHIS RUN DONE ON,A10,7HAT TIME,A10,43X,1H*)
    END
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM – CONT'D
(PAGE 79 OF 82)

D-81

```
00000000011111111112222222222333333333344444444445555555555666666666677777777778888888889    COLUMN NUMBERS
12345678901234567890123456789012345678901234567890123456789012345678901234567890    (READ VERTICALLY)

        SUBROUTINE USET                                                  031630    SR-USET   2
                                                                         031640    SR-USET   3
C
        COMMON /DVALUE/ D(70), DPRT, DDT, DIDN, DIDIGT, DSMK(2)           000280    CM+DVALUE2
        COMMON /LOGFLG/ FIRSTL, SEQNML, SPCL(70), SHRTEC, FTSILL          000510    CM+LOGFLG2
        LOGICAL FIRSTL, SEQNML, SPCL, SHRTEC, FTSILL                      000520    CM+LOGFLG3
        COMMON /OVER/ INVER(70)                                           000560    CM+OVER   2
        COMMON /UVALUE/ U(70), UPRT, UDT, UIDN, UIDIGT, USMK(2)           001040    CM+UVALUE2
C                                                                         031690    SP-USET   8
        DO 100 I=1,70                                                     031700    SP-USET   9
        U(I)=D(I)                                                        031710    SR-USET  10
        INVER(I)=0                                                        031720    SR-USET  11
        SPCL(I)=.FALSE.                                                   031730    SR-USET  12
  100   CONTINUE                                                          031740    SP-USET  13
C                                                                         031750    SR-USET  14
        UPRT=DPRT                                                         031760    SP-USET  15
        UDT=DDT                                                           031770    SR-USET  16
        UIDN=DIDN                                                         031780    SR-USET  17
        UIDIGT=DIDIGT                                                     031790    SR-USET  18
        USMK(1)=DSMK(1)                                                   031800    SP-USET  19
        USMK(2)=DSMK(2)                                                   031810    SR-USET  20
        FTSILL=.TRUE.                                                     031820    SP-USET  21
C                                                                         031830    SP-USET  22
        RETURN                                                           031840    SR-USET  23
        END                                                              031850    SR-USET  24

00000000011111111112222222222333333333344444444445555555555666666666677777777778888888889    COLUMN NUMBERS
12345678901234567890123456789012345678901234567890123456789012345678901234567890    (READ VERTICALLY)


        LISTING D-1  FORTRAN LISTING OF COPE PROGRAM - CONT'D
                         (PAGE 80 OF 82)
```

D-82

```
00000000011111111112222222222333333333344444444445555555555666666666677777777778888888889   COLUMN NUMBERS
12345678901234567890123456789012345678901234567890123456789012345678901234567890   (READ VERTICALLY)

      SUBROUTINE VISCHK                                                            031870   SR-VISCHK2
C                                                                                  031880   SR-VISCHK3
      COMMON /KTEST/ KTEST(20,6)                                                   000490   CM+KTEST  2
      COMMON /RANGE/ DTRNG, MXDRNG, VISLIM, RNGNOW                                 000680   CM+RANGE  2
      REAL MXDRNG                                                                  000690   CM+RANGE  3
      COMMON /RPLCTN/ KREP, NREP, KRF, NRF, NVEHKL                                 000770   CM+RPLCTN2
C                                                                                  031920   SR-VISCHK7
      KTEST(2,KRF)=KTEST(2,KRF)+1                                                  031930   SR-VISCHK8
      IF (DTRNG.LE.1000.*VISLIM) GO TO 100                                         031940   SR-VISCHK9
C                                                                                  031950   SR-VISCH10
      IABRT=2                                                                      031960   SR-VISCH11
      CALL ARRTL (IARFT)                                                           031970   SR-VISCH12
C                                                                                  031980   SR-VISCH13
  100 RETURN                                                                       031990   SR-VISCH14
C                                                                                  032000   SR-VISCH15
      END                                                                          032010   SR-VISCH16

00000000011111111112222222222333333333344444444445555555555666666666677777777778888888889   COLUMN NUMBERS
12345678901234567890123456789012345678901234567890123456789012345678901234567890   (READ VERTICALLY)
```

LISTING D-1   FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 81 OF 82)

D-83

```
      SUBROUTINE WARNDO                                                      032030    SR-WARND02
C                                                                            032040    SR-WARND03
      COMMON /FLAG/ ENDREP, ION, IPREPL, IDIGTL, IPRTY, IRNDOC, IT3FLG,      000300    CM+FLAG  2
    1 ENDFLG                                                                 000310    CM+FLAG  3
      LOGICAL ENDFLG, ENDREP                                                 000320    CM+FLAG  4
      COMMON /KTEST/ KTEST(20,6)                                             090490    CM+KTEST 2
      COMMON /FANDOM/ IR1, IR2, IP3, IP4, IP5, IR6, IP7, IR8, IP9, IR10,     000640    CM+RANDOM2
    1 IR11, IP12, IP13, IP14, IP15, IP16, IP17, IP1A, IP19, IR20, IR21       000650    CM+RANDOM3
    2 , IR22, IR23, IR24, IR25, IR26, IR27, IR28                             000660    CM+RANDOM4
      COMMON /RPLCTN/ KPEP, NRFP, KRF, NRF, NVEHKL                           000770    CM+RPLCTN2
      COMMON /RSPTIM/ RATPIM(3), XMVADF(2), DUM1, RCSPTM(2,2), XMTITM(2,      000790    CM+RSPTIM2
    1 2), TMEAN(2,2), TSIGMA(2,2), DETTMA(10,2), NDT, TRARRY(3,2),           000800    CM+RSPTIM3
    2 PRSPTM, TRBAR, PRSDT, PRSVT, ALPHA(2,2), BETA(2,2), DETTIM,            000810    CM+RSPTIM4
    3 IDSGTP, RUMC, PCRMSG, PRDOW                                            000820    CM+RSPTIM5
      COMMON /TIME/ DUPLOS, TIMNOW, TOF, TBR, TIMPA, TIMRA1                   001020    CM+TIME  2
C                                                                            032110    SR-WARND10
      KTEST(13,KRF)=KTEST(13,KRF)+1                                         032120    SR-WARND11
      IF (KRF.GT.1) GO TO 100                                               032130    SR-WARND12
      TIMRA1=TIMRA                                                          032140    SR-WARND13
      RN16=URAN31(IR16)                                                     032150    SR-WARND14
      IF (RN16.LE.PRDOW) GO TO 100                                          032160    SR-WARND15
C                                                                            032170    SR-WARND16
      IABRT=13                                                              032180    SR-WARND17
      CALL ABRTTL (IABRT)                                                   032190    SR-WARND18
C                                                                            032200    SR-WARND19
  100 RETUPN                                                                032210    SR-WARND20
C                                                                            032220    SR-WARND21
      END                                                                   032230    SR-WARND22
```

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 82 OF 82)

```
FIRST CASE
$$$ THIS COMMENT WILL APPEAR ON THE $$$ COMMENT PAGE
WEATHER,JUNE,0600
ACQRNGDIST,CLOSE
PLOT,PRINTER,ON
END
NEXT CASE,DR
DESIGTYPE,MULF
RESPTIME,PARAM,150,N
CONTROL,ECHO,LONG
PLOT,PRINTER,OFF
$ THE OVERRIDE CARD WHICH FOLLOWS OVERRIDES THE NORMAL CHOICE OF
$ PE DATA WITH THE PE DATA RECORD NAMED PEOOA)AAJS
$ NOTE THE USE OF THE $ BEFORE THE RECORD NAME
OVERRIDE,PEDATA,$PFOOA)AAJS
END
NEXT CASE,RD
W,D,2200
LOSMODE,RD
$ THE NEXT CARD SIGNALS FORMATTED DATA IS TO BE READ INTO RANDOM
$ OCCURRENCE DATA BLOCK
TEMP,PODIST
     5
    15.0
1000.0    1500.0    2000.0    3000.0    7000.0
   .6       .5        .4        .3        .2
$$ THIS COMMENT WILL BE PRINTED ON CASE 3 HEADING PAGE
TARGET TYPE,4
DEFLCSUPPP,NONE
RUHC,200
SMOKF,SMKRNDS,200,400
TBR,10
NUMVEHTGT,6
DISTRVEH,50
FHU
NEXT CASE ,RD
REFLECTIVITY,.3
SMOKF,PERSMOKE,.15
DUST,.20
PRORDNWAPN,.8
ANGLE T,60
ENDF
```

LISTING D-2   SAMPLE INPUT FOR COPE

```
JOB CARD.    CHANGE THIS CARD TO CONFORM TO INSTALLATION USAGE.
ACCOUNT CARD.    CHANGE THIS CARD TO CONFORM TO INSTALLATION USAGE.
COMMENT.    THE NEXT CARD DECLARES TAPE5 TO HAVE RECORD TYPE Z AND 80 CHARACTERS
COMMENT.    PER LINE(RECORD).
FILE,TAPE5,RT=Z,FL=80,BT=C.
COMMENT.    THE NEXT STATEMENT OBTAINS A COPY OF THE COPE INPUT AND PUTS IT IN
COMMENT.    A LOCAL FILE NAMED TAPE5.
GETPF,TAPE5,COPESAMPLEINPUT,ID=SANDMEYER,ST=MFA.
COMMENT.    THE NEXT STATEMENT CAUSES TAPE5 (COPE INPUT) TO BF LISTED.    THIS IS
COMMENT.    OFTEN A WISE PRECAUTION FOR CHECKING PURPOSES.
COPYSRF,TAPE5.
REWIND,TAPE5.
COMMENT.    THE NEXT STATEMENT ATTACHES THE PREVIOUSLY COMPILED (IN ANOTHER JOB)
COMMENT.    OBJECT CODE FOR THE COPE PROGRAM.
ATTACH,LGO,COPESAMPLEBINARY,ID=SANDMEYER.
COMMENT.    THE NEXT STATEMENT ATTACHES THE COPE "DATA BASE" FILE (TAPE11) WHICH
COMMENT.    WAS CREATED AND MODIFIED BY VARIOUS PREPROCESSOR RUNS (PAM & PREPMS)
ATTACH,TAPE11,SAMPLETAPE11,ID=SANDMEYER.
COMMENT.    THE NEXT TWO CARDS ATTACH THE INTERNATIONAL MATHEMATICAL AND
COMMENT.    STATISTICAL LIBRARY (IMSL) AND DECLARE IT TO RE A LIBRARY TO BE
COMMENT.    USED IN SATISFYING EXTERNAL REFERENCES IN THE COPE PROGRAM.
ATTACH,IMSL.
LIBRARY,IMSL.
COMMENT.    THE NEXT CARD DECLARES TAPE8 TO HAVE RECORD TYPE Z AND 140 CHARACTERS
COMMENT.    PER LINE.    THIS IS DONE BECAUSE TAPE8 IS TO BE SAVED ON THE "FRONT
COMMENT.    END" COMPUTER WHERE RECORD TYPE Z IS THE DEFAULT RECORD TYPE.
FILE,TAPE8,RT=Z,FL=140,BT=C.
COMMENT.    THE NEXT STATEMENT LOADS AND EXECUTES THE COPE PROGRAM USING TAPE5 AS
COMMENT.    INPUT.
LGO(TAPE5)
COMMENT.    THE NEXT STATEMENT SAVES A COPY OF TAPE8 (COPE AUXILIARY OUTPUT)
COMMENT.    ON THE "FRONT END" COMPUTER.    THIS TAPE8 IS USED TO PRODUCE THE
COMMENT.    LISTINGS OF SECTION 7.6 OF THE COPE DOCUMENTATION.
SAVEPF,TAPE8,COPEAUXOUTPUT,ID=SANDMEYER,ST=MFA.
COMMENT.    END OF JOB
```

LISTING D-3   SAMPLE RUNSTREAM FOR COPE

D-86

```
FIRST CASE
$$$ THIS COMMENT WILL APPEAR ON THE $$$ COMMENT PAGE
WEATHER,JUNE,0600
ACQRNGDIST,CLOSE
PLOT,PRINTER,ON
END
NEXT CASE,DR
DESIGTYPE,MULE
RESPTIME,PARAM,150,N
CONTROL,ECHO,LONG
PLOT,PRINTER,OFF
$ THE OVERRIDE CARD WHICH FOLLOWS OVERRIDES THE NORMAL CHOICE OF
$ PE DATA WITH THE PE DATA RECORD NAMED PEOOAJAAJS
$ NOTE THE USE OF THE $ BEFORE THE RECORD NAME
OVERRIDE,PEDATA,$PEOOAJAAJS
END
NEXT CASE,PD
W,D,2200
LOSMODE,RD
$ THE NEXT CARD SIGNALS FORMATTED DATA IS TO BE READ INTO RANDOM
$ OCCURRENCE DATA BLOCK
TEMP,PODIST
     5
    15.0     1500.0     2000.0     3000.0     7000.0
  1000.0         .5         .4         .3         .2
         .6                                         
$$ THIS COMMENT WILL BE PRINTED ON CASE 3 HEADING PAGE.
TARGET TYPE,4
DFIRESUPPR,NONE
RUMC,200
SMOKE,SMKRNDS,200,400
TBR,10
NUMVEHTGT,6
DISTBVEH,50
END
NEXT CASE ,RD
REFLECTIVITY,.3
SMOKE,PRBSMOKE,.15
DUST,.20
PROBDOWARNJ.R
ANGLE T,60
ENDF
```

LISTING D-4   SAMPLE OUTPUT FROM COPE

(PAGE 1 OF 11)

```
***************************************************************************
*                                                                         *
*   C O P P E R H E A D   O P E R A T I O N A L   P E R F O R M A N C E   E V A L U A T I O N
*                                                                         *
*                                                                         *
*        -PROGRAM BY RICHARD SANDMEYER                                     *
*                                                                         *
*        -MODEL DEVELOPMENT AND DATA COLLECTION BY:                        *
*                                                                         *
*         DAVID BARNHART      JULIAN CHERNICK      DIANA FREDERICK         *
*                                                                         *
*         RICHARD SANDMEYER   RICHARD SCUNGIO      MICHAEL STARKS          *
*                                                                         *
*         EDWARD STAUCH       ANNIE YOUNG                                  *
*                                                                         *
*        -BASED ON A PROPOSAL BY HERBERT FALLIN                            *
*                                                                         *
*        -DONE AT THE REQUEST OF DAVID HARDISON (DUSA-OR)                  *
*                                                                         *
*                                                                         *
*        UNITED STATES ARMY MATERIEL SYSTEMS ANALYSIS ACTIVITY            *
*                                                                         *
*               GROUND WARFARE DIVISION                                    *
*                                                                         *
*               SUPPORT WEAPONS ANALYSIS BRANCH                            *
*                                                                         *
*               SYSTEMS EVALUATION SECTION                                 *
*                                                                         *
*                                                                         *
*        COPE VERSION 6.2 CURRENT AS OF 6 MARCH 1980                       *
*                                                                         *
*        THIS RUN DONE ON 08/14/80 AT TIME 15.41.16.                       *
*                                                                         *
***************************************************************************
```

LISTING D-4 SAMPLE OUTPUT FROM COPE

(PAGE 2 OF 11)

$$$ $$$ $$$ $$$ $$$ $$$ $$$ $$$ $$$ COMMENTS FOR THIS SET OF CASES $$$ $$$ $$$ $$$ $$$ $$$ $$$ $$$ $$$

** USER ** THIS COMMENT WILL APPEAR ON THE $$$ COMMENT PAGE

LISTING D-4   SAMPLE OUTPUT FROM COPE

(PAGE 3 OF 11)

```
* * * * * * * * * * * * * * * * *   C A S E   N U M B E R   1   * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *

NUMBER OF REPLICATIONS=10000

*********************************        ***********************************************        *****************************************
*                               *        *                                           *        *                                       *
*            TARGET             *        *      DETECT, COMMD, AND PROC TIMES         *        *                WEATHER                *
*                               *        *                                           *        *                                       *
* TYPE  1                       *        * PRIORITY PRE-PLANNED TARGET                *        * MONTH OF JUN                          *
* NUMBER OF VEHICLES=10         *        * DIGITAL COMMD                              *        * TIME OF DAY: 0600                     *
* MEAN DISTANCE BETWEEN VEHICLES= 61.M * * DAY TIME                                  *        *                                       *
* TARGET VELOCITY=3. M/SEC      *        * NOMINAL RESPONSE TIME=106. SEC            *        *****************************************
* TARGET HEADING= 0. DEGREES    *        * PROB SUCCESSFUL DIGITAL TRAN= .915        *        *                                       *
* TARGET'S REFLECTIVITY= .10    *        * PROB CORRECT MESSAGE =  .975              *        *            TERRAIN AND LOS            *
*                               *        * PROB DO WARNED TO LASE =  .975            *        *                                       *
*********************************        ***********************************************        * CLOSE TERRAIN                         *
*                               *        *                                           *        * CONTINUOUS LOS ("SHOOTING GALLERY")   *
*          FIRING INFO          *        *              DESIGNATOR                    *        *                                       *
*                               *        *                                           *        *****************************************
* NUMBER OF ROUNDS PER ENGAGEMENT= 6 *   * TYPE  1                                    *        *                                       *
* ROUND RELIABILITY= .96        *        * MAXIMUM DESIGNATOR RANGE=7000. M          *        *              OBSCURANTS               *
* TIME BETWEEN ROUNDS= 20. SEC  *        * BAIL-OUT RANGE=1000. M                    *        *                                       *
* TIME OF FLIGHT= 31.0 SEC      *        * DESIGNATOR AT VANTAGE POINT               *        * PROB SMOKE KILLS MISSION= .75         *
* NOMINAL GUN-TARGET RANGE= 8. KM *      *********************************************        * VOLUME OF SMOKE FIRED: 484 +  846     *
* ANGLE T= 25. DEGREES          *        *                                           *        * PROB DUST KILLS MISSION= .37          *
* DEFLECTION BIAS= 0. METERS    *        *         DESIGNATOR SUPPRESSED             *        *                                       *
*                               *        *                                           *        *****************************************
*********************************        * PROB SUPPRESSED BY INDIRECT FIRE=.01 *
*                               *        * PROB SUPPRESSED BY DIRECT FIRE: HIGH *
*            MISC               *        *********************************************
*                               *
* DELTA T3 ASSUMED TO BE ZERO   *
* SEEKER SENSITIVITY= 60. JOULES/M**2 *
*                               *
***************************************

$$  $$  $$  $$  $$  $$  $$  $$  $$  $$       C O M M E N T S       $$  $$  $$  $$  $$  $$  $$  $$  $$  $$

** COPE **  IO PLOT FOR CASE  1 WITH IPRFG= 1 .  NO PLOT PRODUCED .
```

LISTING D-4 SAMPLE OUTPUT FROM COPE

(PAGE 4 OF 11)

CAUSE OF ABORT

***** OCCASIONS (10000) *****

#	CAUSE OF ABORT		
1	DESIGNATOR IN INDIRECT FIRE	84(0.84%)	NUMBER TESTED (% PASSED): 10000(99.16%)
2	TARGET BEYOND VISIBILITY RANGE	415(4.15%)	NUMBER TESTED (% PASSED): 9916(95.81%)
3	TARGET BEYOND DESIGNATOR RANGE	0(0.00%)	NUMBER TESTED (% PASSED): 9501(100.0%)
4	TARGET NOT DETECTED	0(0.00%)	NUMBER TESTED (% PASSED): 9501(100.0%)
5	SMOKE KILLED MISSION	7123(71.23%)	NUMBER TESTED (% PASSED): 9501(25.03%)
6	DUST KILLED MISSION	807(8.87%)	NUMBER TESTED (% PASSED): 2378(62.70%)
7	DESIGNATOR BAILED-OUT PRE-COMM	484(4.84%)	NUMBER TESTED (% PASSED): 1491(67.54%)

***** ATTEMPTED ENGAGEMENTS (1007) *****

#			
8	COMMO OUT (BOTH VOICE & DIGTL)	70(0.70%)	NUMBER TESTED (% PASSED): 1007(93.05%)
9	ERROR IN TRANSMISSION	21(0.21%)	NUMBER TESTED (% PASSED): 937(97.76%)
10	DESIGNATOR BAILED-OUT POST-COM	1591(1.59%)	NUMBER TESTED (% PASSED): 916(82.64%)
11	LOS LOST - NO FIRING	55(0.55%)	NUMBER TESTED (% PASSED): 757(92.73%)

***** SHOTS (702) *****

ROUND NUMBER :

#		1	2	3	4	5	6
12	LOS LOST DURING MISSION	30(0.30%)	62(0.62%)	96(0.96%)	151(1.51%)	242(2.42%)	345(3.45%)
	NUMBER TESTED (% PASSED)	702(95.73%)	702(91.17%)	702(86.32%)	702(78.49%)	702(65.53%)	702(50.85%)
13	DESIGNATOR NOT WARNED IN TIME	15(0.15%)	0(0.00%)	0(0.00%)	0(0.00%)	0(0.00%)	0(0.00%)
	NUMBER TESTED (% PASSED)	672(97.77%)	640(100.0%)	606(100.0%)	551(100.0%)	460(100.0%)	357(100.0%)
14	DESIGNATOR IN DIRECT FIRE	176(1.76%)	173(1.73%)	194(1.94%)	183(1.83%)	164(1.64%)	144(1.44%)
	NUMBER TESTED (% PASSED)	657(73.21%)	640(72.97%)	606(67.99%)	551(66.79%)	460(64.35%)	357(59.66%)
15	ROUND RELIABILITY FAILURE	20(0.20%)	16(0.16%)	15(0.15%)	16(0.16%)	9(0.09%)	13(0.13%)
	NUMBER TESTED (% PASSED)	481(95.84%)	467(96.57%)	412(96.36%)	368(95.65%)	296(96.96%)	213(93.90%)
16	TARGET OBSCURED BY MINI-TERRN	54(0.54%)	61(0.61%)	83(0.83%)	55(0.55%)	46(0.46%)	29(0.29%)
	NUMBER TESTED (% PASSED)	461(88.29%)	451(86.47%)	397(79.09%)	352(84.38%)	287(83.97%)	200(85.50%)
17	ROUND DID NOT ENGAGE TARGET	1(0.01%)	1(0.01%)	4(0.04%)	2(0.02%)	0(0.00%)	0(0.00%)
	NUMBER TESTED (% PASSED)	407(99.75%)	300(99.74%)	314(98.73%)	297(99.33%)	241(100.0%)	171(100.0%)
18	ROUND ENGAGED BUT DID NOT HIT	105(1.05%)	83(0.83%)	74(0.74%)	54(0.54%)	43(0.43%)	49(0.49%)
	NUMBER TESTED (% PASSED)	406(74.14%)	389(78.66%)	310(76.13%)	295(81.69%)	241(82.16%)	171(71.35%)
19	ROUND HIT BUT DID NOT KILL	156(1.56%)	159(1.59%)	104(1.04%)	128(1.28%)	96(0.96%)	64(0.64%)
	NUMBER TESTED (% PASSED)	301(48.17%)	306(48.04%)	236(55.93%)	241(46.89%)	198(51.52%)	122(47.54%)

***** KILLS

	1	2	3	4	5	6
KILLS	145	147	132	113	102	58 *****
PROB(KILL/OCSN)=	1.45%	1.47%	1.32%	1.13%	1.02%	.58%
PROB(KILL/ATMP ENG)=	14.40%	14.60%	13.11%	11.22%	10.13%	5.76%
PROB(KILL/SHOT)=	20.66%	20.94%	18.80%	16.10%	14.53%	8.26%
PROB(LOS)=	88.77%	84.54%	18.05%	72.79%	60.77%	47.16%

PPROB(SHOT/OCSN)=   7.02%   PROB(SHOT/ATMP ENG)= 69.71%   PROB(ATMP ENG/OCSN)= 10.07%   NUMBER TESTED (% NOT KILLED) = 657(78.54%)

DESIGNATOR SURVIVABILITY: CASES IN WHICH DESIGNATOR KILLED = 1411(1.41%)

LISTING D-4 SAMPLE OUTPUT FROM COPE

(PAGE 5 OF 11)

```
* * * * * * * * * * * * * * * * * * * * *   C A S E   N U M B E R   2   * * * * * * * * * * * * * * * * * * * * * * * *
```

NUMBER OF REPLICATIONS=10000

```
***************************            ************************************
*                         *            *                                  *
*         TARGET          *            *      DETECT, COMMO, AND PROC TIMES *
*                         *            *                                  *
* TYPE  1                 *            * PARAMETERIZED RESPONSE TIME=150. SEC *
* NUMBER OF VEHICLES=10   *            * PRIORITY PRE-PLANNED TARGET       *
* MEAN DISTANCE BETWEEN VEHICLES= 61.M *  * DIGITAL COMMO                   *
* TARGET VELOCITY=2. M/SEC *           * NIGHT TIME                        *
* TARGET HEADING= 0. DEGREES *         * NOMINAL RESPONSE TIME=181. SEC    *
* TARGET'S REFLECTIVITY= .10 *         * PROB SUCCESSFUL DIGITAL TRAN= .915 *
***************************            * PROB CORRECT MESSAGE = .975       *
                                       * PROB DO WARNED TO LASE = .975     *
***************************            ************************************
*                         *
*       FIRING INFO       *            ************************************
*                         *            *                                  *
* NUMBER OF ROUNDS PER ENGAGEMENT= 6 * *          DESIGNATOR              *
* ROUND RELIABILITY= .96  *            *                                  *
* TIME BETWEEN ROUNDS= 20. SEC *       * TYPE 2                           *
* TIME OF FLIGHT= 31.0 SEC *           * MAXIMUM DESIGNATOR RANGE=2600. M  *
* NOMINAL GUN-TARGET RANGE=  8. KM *   * BAIL-OUT RANGE=1000. M           *
* ANGLE T=.25. DEGREES    *            * DESIGNATOR AT VANTAGE POINT      *
* DEFLECTION BIAS=  0. METERS *        ************************************
***************************

***************************            ************************************
*                         *            *                                  *
*         MISC            *            *      DESIGNATOR SUPPRESSED        *
*                         *            *                                  *
* DELTA T3 ASSUMED TO BE ZERO *        * PROB SUPPRESSED BY INDIRECT FIRE=.01 *
* SEEKER SENSITIVITY= 60. JOULES/M**2 * * PROB SUPPRESSED BY DIRECT FIRE: HIGH *
***************************            ************************************
```

```
***************************
*                         *
*       WEATHER           *
*                         *
* MONTH OF JUN            *
* TIME OF DAY: 0600       *
***************************

***************************
*                         *
*     TERRAIN AND LOS     *
*                         *
* CLOSE TERRAIN           *
* CONTINUOUS LOS ("SHOOTING GALLERY") *
***************************

***************************
*                         *
*       OBSCURANTS        *
*                         *
* PROB SMOKE KILLS MISSION= .75 *
* VOLUME OF SMOKE FIRED:  484 +   846 *
* PROB DUST KILLS MISSION= .37  *
***************************
```

```
$$  $$  $$  $$  $$  $$  $$  $$  $$  $$  $$  $$  $$  $$  $$  $$  $$  $$          C O M M E N T S          $$  $$  $$  $$  $$  $$  $$  $$  $$  $$

** COPE **   CHOICE OF NIGHT TIME FOR RESPONSE TIME DATA IS INCONSISTENT WITH TIME OF 0600 FOR WEATHER DATA
** COPE **   RECORD NAMED: PEOOAJAAJS USED TO OVERRIDE FOR PEDATA
** COPE **   PEDATA FOR: TP=106. DT=1 VEL=5. GTP= 8. REFL= .10 ANGLET= 25. DEFB= 0. TGTHD= 0. SKSEN=60.
```

LISTING D-4   SAMPLE OUTPUT FROM COPE

(PAGE 6 OF 11)

CAUSE OF ABORT

***** OCCASIONS (10000) *****

1	DESIGNATOR IN INDIRECT FIRE	NUMBER TESTED (% PASSED): 84(0.84%) 10000(99.16%)
2	TARGET BEYOND VISIBILITY RANGE	NUMBER TESTED (% PASSED): 415(4.15%) 9916(95.81%)
3	TARGET BEYOND DESIGNATOR RANGE	NUMBER TESTED (% PASSED): 2460(24.60%) 9501(74.11%)
4	TARGET NOT DETECTED	NUMBER TESTED (% PASSED): 0(0.00%) 7041(100.0%)
5	SMOKE KILLED MISSION	NUMBER TESTED (% PASSED): 5254(52.54%) 7041(25.38%)
6	DUST KILLED MISSION	NUMBER TESTED (% PASSED): 665(6.65%) 1787(62.79%)
7	DESIGNATOR BAILED-OUT PRE-COMM	NUMBER TESTED (% PASSED): 554(5.54%) 1122(50.62%)

***** ATTEMPTED ENGAGEMENTS (568) *****

8	COMMO OUT (BOTH VOICE & DIGTL)	NUMBER TESTED (% PASSED): 39(0.39%) 568(93.13%)
9	ERROR IN TRANSMISSION	NUMBER TESTED (% PASSED): 14(0.14%) 529(97.35%)
10	DESIGNATOR BAILED-OUT POST-COM	NUMBER TESTED (% PASSED): 87(0.87%) 515(83.11%)
11	LOS LOST - NO FIRING	NUMBER TESTED (% PASSED): 0(0.00%) 428(100.0%)

***** SHOTS (428) *****

ROUND NUMBER :

		1	2	3	4	5	6
12	LOS LOST DURING MISSION NUMBER TESTED (% PASSED)	0(0.00%) 428(100.0%)	0(0.00%) 428(100.0%)	0(0.00%) 428(100.0%)	0(0.00%) 428(100.0%)	0(0.00%) 428(100.0%)	0(0.00%) 428(100.0%)
13	DESIGNATOR NOT WARNED IN TIME NUMBER TESTED (% PASSED)	10(0.10%) 428(97.66%)	0(0.00%) 428(100.0%)	0(0.00%) 428(100.0%)	0(0.00%) 428(100.0%)	0(0.00%) 428(100.0%)	0(0.00%) 428(100.0%)
14	DESIGNATOR IN DIRECT FIRE NUMBER TESTED (% PASSED)	172(1.72%) 418(58.85%)	189(1.89%) 428(55.84%)	210(2.10%) 428(50.93%)	228(2.28%) 428(46.73%)	257(2.57%) 428(39.95%)	265(2.65%) 428(38.08%)
15	ROUND RELIABILITY FAILURE NUMBER TESTED (% PASSED)	11(0.11%) 246(95.53%)	0(0.09%) 239(96.23%)	8(0.08%) 218(96.33%)	7(0.07%) 200(96.50%)	4(0.04%) 171(97.66%)	5(0.05%) 163(96.93%)
16	TARGET OBSCURED BY MINI-TERRN NUMBER TESTED (% PASSED)	27(0.27%) 235(88.51%)	31(0.31%) 230(86.52%)	37(0.37%) 210(82.38%)	30(0.30%) 193(84.46%)	19(0.19%) 167(88.62%)	18(0.18%) 158(88.61%)
17	ROUND DID NOT ENGAGE TARGET NUMBER TESTED (% PASSED)	2(0.02%) 208(99.04%)	1(0.01%) 199(99.50%)	0(0.00%) 173(100.0%)	2(0.02%) 163(98.77%)	0(0.00%) 148(100.0%)	2(0.02%) 140(98.57%)
18	ROUND ENGAGED BUT DID NOT HIT NUMBER TESTED (% PASSED)	36(0.36%) 206(82.52%)	33(0.33%) 198(83.33%)	24(0.24%) 173(86.13%)	23(0.23%) 161(85.71%)	19(0.19%) 148(87.16%)	21(0.21%) 138(84.78%)
19	ROUND HIT BUT DID NOT KILL NUMBER TESTED (% PASSED)	78(0.78%) 170(54.12%)	82(0.82%) 165(50.30%)	88(0.88%) 149(40.94%)	75(0.75%) 138(45.65%)	56(0.56%) 129(56.59%)	66(0.66%) 117(43.59%)

***** KILLS

	92	83	61	63	73	51 *****
PROB(KILL/OCSN)=	.92%	.83%	.61%	.63%	.73%	.51%
PROB(KILL/ATMP ENG)=	16.20%	14.61%	10.74%	11.09%	12.85%	8.98%
PROB(KILL/SHOT)=	21.50%	19.39%	14.25%	14.72%	17.06%	11.92%
PROB(LOS)=	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

PROB(SHOT/ATMP ENG)= 75.35%   PROB(SHOT/OCSN)= 4.28%   PROB(ATMP ENG/OCSN)= 5.68%

DESIGNATOR SURVIVABILITY: CASES IN WHICH DESIGNATOR KILLED = 184(1.84%)   NUMBER TESTED (% NOT KILLED) = 418(55.98%)

LISTING D-4   SAMPLE OUTPUT FROM COPE
(PAGE 7 OF 11)

D-93

```
* * * * * * * * * * * * * * * * * * * * * * * * * * *   C A S E   N U M B E R   3   * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *

NUMBER OF REPLICATIONS=10000

**************************************      *************************************      ***********************
*                                    *      *                                   *      *                     *
*              TARGET                *      *    DETECT, COMMO, AND PROC TIMES   *      *       WEATHER        *
*                                    *      *                                   *      *                     *
* TYPE  4                            *      * PRIORITY PRE-PLANNED TARGET        *      * MONTH OF DEC        *
* NUMBER OF VEHICLES= 6              *      * DIGITAL COMMO                      *      * TIME OF DAY: 2200   *
* MEAN DISTANCE BETWEEN VEHICLES= 50.M *    * DAY TIME                          *      *                     *
* TARGET VELOCITY=3. M/SEC           *      * NOMINAL RESPONSE TIME=106. SEC     *      ***********************
* TARGET HEADING= 0. DEGREES         *      * PROB SUCCESSFUL DIGITAL TRAN= .915 *
* TARGET'S REFLECTIVITY= .10         *      * PROB CORRECT MESSAGE = .975        *      ***********************
*                                    *      * PROB DO WARNED TO LASE = .975      *      *                     *
**************************************      *                                   *      *   TERRAIN AND LOS    *
                                            *************************************      *                     *
**************************************      *                                   *      * AVERAGE TERRAIN      *
*                                    *      *           DESIGNATOR              *      * BROKEN LOS ("RANDOM OCCURRENCE") *
*          FIRING INFO               *      *                                   *      *                     *
*                                    *      * TYPE  1                           *      ***********************
* NUMBER OF ROUNDS PER ENGAGEMENT= 6 *      * MAXIMUM DESIGNATOR RANGE=7000. M   *      ***********************
* ROUND RELIABILITY= .96             *      * BAIL-OUT RANGE=1000. M             *      *                     *
* TIME BETWEEN ROUNDS= 10. SEC       *      * DESIGNATOR AT VANTAGE POINT        *      *      OBSCURANTS     *
* TIME OF FLIGHT= 31.0 SEC           *      *                                   *      *                     *
* NOMINAL GUN-TARGET RANGE=  8. KM    *      *************************************      * PROB SMOKE KILLS MISSION= .22 *
* ANGLE T= 25. DEGREES               *      *                                   *      * VOLUME OF SMOKE FIRED: 200 + 400 *
* DEFLECTION BIAS=  0. METERS         *      *   DESIGNATOR SUPPRESSED           *      * PROB DUST KILLS MISSION= .37 *
*                                    *      *                                   *      *                     *
**************************************      * PROB SUPPRESSED BY INDIRECT FIRE=.01 *    ***********************
                                            * PROB SUPPRESSED BY DIRECT FIRE: NONE *
**************************************      *                                   *
*                                    *      *************************************
*              MISC                  *
*                                    *
* DELTA T3 NOT ASSUMED ZERO          *
* PUMC= 200.M                        *
* SEEKER SENSITIVITY= 60. JOULES/M**2 *
*                                    *
**************************************

$$ $$ $$ $$ $$ $$ $$ $$ $$ $$ $$ $$       C O M M E N T S       $$ $$ $$ $$ $$ $$ $$ $$ $$ $$ $$ $$ $$

** USER ** THIS COMMENT WILL BE PRINTED ON CASE 3 HEADING PAGE
** COPE ** CHOICE OF DAY TIME     FOR RESPONSE TIME DATA IS INCONSISTENT WITH TIME OF 2200 FOR WEATHER DATA
** COPE ** TEMPORARY OPTION IN EFFECT FOR RDDATA
```

LISTING D-4   SAMPLE OUTPUT FROM COPE

(PAGE 8 OF 11)

CAUSE OF ABORT

***** OCCASIONS (10000) *****

1 DESIGNATOR IN INDIRECT FIRE	NUMBER TESTED (% PASSED):	84(0.84%)
2 TARGET BEYOND VISIBILITY RANGE	NUMBER TESTED (% PASSED):	1641(16.41%) 9916(83.45%)
3 TARGET BEYOND DESIGNATOR RANGE	NUMBER TESTED (% PASSED):	0(0.00%) 8275(100.0%)
4 TARGET NOT DETECTED	NUMBER TESTED (% PASSED):	0(0.00%) 8275(100.0%)
5 SMOKE KILLED MISSION	NUMBER TESTED (% PASSED):	1853(18.53%) 8275(77.61%)
6 DUST KILLED MISSION	NUMBER TESTED (% PASSED):	2396(23.96%) 6422(62.69%)
7 DESIGNATOR BAILED-OUT PRE-COMM	NUMBER TESTED (% PASSED):	588(5.88%) 4026(85.39%)

***** ATTEMPTED ENGAGEMENTS (3438) *****

8 COMMO OUT (BOTH VOICE & DIGTL)	NUMBER TESTED (% PASSED):	273(2.73%) 3438(92.06%)
9 ERROR IN TRANSMISSION	NUMBER TESTED (% PASSED):	83(0.83%) 3165(97.38%)
10 DESIGNATOR BAILED-OUT POST-COM	NUMBER TESTED (% PASSED):	237(2.37%) 3082(92.31%)
11 LOS LOST - NO FIRING	NUMBER TESTED (% PASSED):	0(0.00%) 2845(100.0%)

***** SHOTS (2845) *****

ROUND NUMBER :

	1	2	3	4	5	6
12 LOS LOST DURING MISSION NUMBER TESTED (% PASSED)	531(5.31%) 2845(81.34%)	562(5.62%) 2845(80.25%)	60(6.00%) 2845(78.91%)	660(6.60%) 2845(76.80%)	715(7.15%) 2845(74.87%)	785(7.85%) 2845(72.41%)
13 DESIGNATOR NOT WARNED IN TIME NUMBER TESTED (% PASSED)	60(0.60%) 2314(97.41%)	0(0.00%) 2283(100.0%)	0(0.00%) 2245(100.0%)	0(0.00%) 2185(100.0%)	0(0.00%) 2130(100.0%)	0(0.00%) 2060(100.0%)
14 DESIGNATOR IN DIRECT FIRE NUMBER TESTED (% PASSED)	0(0.00%) 2254(100.0%)	0(0.00%) 2283(100.0%)	0(0.00%) 2245(100.0%)	0(0.00%) 2185(100.0%)	0(0.00%) 2130(100.0%)	0(0.00%) 2060(100.0%)
15 ROUND RELIABILITY FAILURE NUMBER TESTED (% PASSED)	92(0.92%) 2254(95.92%)	75(0.75%) 2283(96.71%)	89(0.89%) 2245(96.04%)	85(0.85%) 2185(96.11%)	87(0.87%) 2130(95.92%)	80(0.80%) 2060(96.12%)
16 TARGET OBSCURED BY MINI-TERRN NUMBER TESTED (% PASSED)	376(3.76%) 2162(82.61%)	382(3.82%) 2208(82.70%)	384(3.84%) 2156(82.19%)	351(3.51%) 2100(83.29%)	317(3.17%) 2043(84.48%)	327(3.27%) 1980(83.48%)
17 ROUND DID NOT ENGAGE TARGET NUMBER TESTED (% PASSED)	124(1.24%) 1786(93.06%)	166(1.66%) 1826(90.91%)	180(1.80%) 1772(89.84%)	184(1.84%) 1749(89.48%)	209(2.09%) 1726(87.89%)	242(2.42%) 1653(85.36%)
18 ROUND ENGAGED BUT DID NOT HIT NUMBER TESTED (% PASSED)	424(4.24%) 1662(74.40%)	428(4.28%) 1660(74.22%)	414(4.14%) 1592(73.99%)	367(3.67%) 1565(76.55%)	387(3.87%) 1517(74.49%)	345(3.45%) 1411(75.55%)
19 ROUND HIT BUT DID NOT KILL NUMBER TESTED (% PASSED)	228(2.28%) 1238(81.58%)	265(2.65%) 1232(78.49%)	228(2.28%) 1178(80.65%)	224(2.24%) 1198(81.30%)	217(2.17%) 1130(80.80%)	226(2.26%) 1066(78.80%)

***** KILLS *****

	1	2	3	4	5	6
	1010	967	950	974	913	840 *****
PROB(KILL/OCSN)=	10.10%	9.67%	9.50%	9.74%	9.13%	8.40%
PROB(KILL/ATMP ENG)=	29.30%	28.13%	27.63%	28.33%	26.56%	24.43%
PROB(KILL/SHOT)=	35.50%	33.90%	33.39%	34.24%	32.09%	29.53%
PROB(LOS)=	81.34%	80.25%	78.91%	76.80%	74.87%	72.41%

PROB(SHOT/OCSN)= 28.45%   PROB(SHOT/ATMP ENG)= 82.75%   PROB(ATMP ENG/OCSN)= 34.38%

DESIGNATOR SURVIVABILITY: CASES IN WHICH DESIGNATOR KILLED = 0(0.00%)   NUMBER TESTED (% NOT KILLED) = 2254(100.0%)

LISTING D-4 SAMPLE OUTPUT FROM COPE

(PAGE 9 OF 11)

```
* * * * * * * * * * * * * * * * * * * * * * C A S E   N U M B E R   4 * * * * * * * * * * * * * * * * * * * * * * * * *
*                                                                                                                   *
NUMBER OF REPLICATIONS=10000

********************************************        **********************************************************
*                                          *        *                                                        *
*              TARGET                      *        *         DETECT, COMMD, AND PROC TIMES                  *
*                                          *        *                                                        *
* TYPE  1                                  *        * PRIORITY PRE-PLANNED TARGET                            *
* NUMBER OF VEHICLES=10                    *        * DIGITAL COMMD                                          *
* MEAN DISTANCE BETWEEN VEHICLES= 61.M     *        * DAY TIME                                               *
* TARGET VELOCITY=5. M/SEC                 *        * NOMINAL RESPONSE TIME=106. SEC                         *
* TARGET HEADING= 0. DEGREES               *        * PROB SUCCESSFUL DIGITAL TRAN= .915                     *
* TARGET'S REFLECTIVITY= .30               *        * PROB CORRECT MESSAGE =  .975                           *
*                                          *        * PROB DO WARNED TO LASE =  .800                         *
********************************************        *                                                        *
*                                          *        **********************************************************
*              FIRING INFO                 *        *                                                        *
*                                          *        *              DESIGNATOR                                *
* NUMBER OF ROUNDS PER ENGAGEMENT= 6       *        *                                                        *
* ROUND RELIABILITY= .96                   *        * TYPE  1                                                *
* TIME BETWEEN ROUNDS= 20. SEC             *        * MAXIMUM DESIGNATOR RANGE=7000. M                       *
* TIME OF FLIGHT= 31.0 SEC                 *        * BAIL-OUT RANGE=1000. M                                 *
* NOMINAL GUN-TARGET RANGE=  8. KM         *        * DESIGNATOR AT VANTAGE POINT                            *
* ANGLE T=.60. DEGREES                     *        *                                                        *
* DEFLECTION BIAS=  0. METERS              *        **********************************************************
*                                          *        *                                                        *
********************************************        *              DESIGNATOR SUPPRESSED                     *
*                                          *        *                                                        *
*              MISC                        *        * PROB SUPPRESSED BY INDIRECT FIRE=.01 *                 *
*                                          *        * PROB SUPPRESSED BY DIRECT FIRE: HIGH *                 *
* DELTA T3 ASSUMED TO BE ZERO              *        **********************************************************
* SEEKER SENSITIVITY= 60. JOULES/M**2      *
*                                          *
********************************************
```

```
**********************************************************
*                                                        *
*                   WEATHER                              *
*                                                        *
* MONTH OF JUN                                           *
* TIME OF DAY: 1400                                      *
*                                                        *
**********************************************************
*                                                        *
*              TERRAIN AND LOS                           *
*                                                        *
* AVERAGE TERRAIN                                        *
* CONTINUOUS LOS ("SHOOTING GALLERY")                    *
*                                                        *
**********************************************************
*                                                        *
*                 OBSCURANTS                             *
*                                                        *
* PROB SMOKE KILLS MISSION= .15                          *
* PROB DUST KILLS MISSION= .20                           *
*                                                        *
**********************************************************
```

LISTING D-4 SAMPLE OUTPUT FROM COPE

(PAGE 10 OF 11)

D-96

CAUSE OF ABORT

***** OCCASIONS (10000) *****

#	CAUSE OF ABORT		NUMBER TESTED (% PASSED):
1	DESIGNATOR IN INDIRECT FIRE	NUMBER TESTED (% PASSED):	84(0.84%) 10000(99.16%)
2	TARGET BEYOND VISIBILITY RANGE	NUMBER TESTED (% PASSED):	116(1.16%) 9916(98.83%)
3	TARGET BEYOND DESIGNATOR RANGE	NUMBER TESTED (% PASSED):	0(0.00%) 9800(100.0%)
4	TARGET NOT DETECTED	NUMBER TESTED (% PASSED):	268(2.68%) 9800(97.27%)
5	SMOKE KILLED MISSION	NUMBER TESTED (% PASSED):	1440(14.40%) 9532(84.89%)
6	DUST KILLED MISSION	NUMBER TESTED (% PASSED):	1636(16.36%) 8092(79.78%)
7	DESIGNATOR BAILED-OUT PRE-COMM	NUMBER TESTED (% PASSED):	758(7.58%) 6456(88.26%)

***** ATTEMPTED ENGAGEMENTS (5698) *****

#	CAUSE OF ABORT		NUMBER TESTED (% PASSED):
8	COMMO OUT (BOTH VOICE & DIGTL)	NUMBER TESTED (% PASSED):	474(4.74%) 5698(91.68%)
9	ERROR IN TRANSMISSION	NUMBER TESTED (% PASSED):	150(1.50%) 5224(97.13%)
10	DESIGNATOR BAILED-OUT POST-COM	NUMBER TESTED (% PASSED):	558(5.58%) 5074(89.00%)
11	LOS LOST - NO FIRING	NUMBER TESTED (% PASSED):	851(8.51%) 4516(81.16%)

***** SHOTS (3665) *****

ROUND NUMBER :

#		1	2	3	4	5	6
12	LOS LOST DURING MISSION — NUMBER TESTED (% PASSED)	583(5.83%)	1058(10.58%)	1529(15.29%)	2008(20.08%)	2388(23.88%)	2679(26.79%)
		3665(84.09%)	3665(71.13%)	3665(58.28%)	3665(45.21%)	3665(34.84%)	3665(26.90%)
13	DESIGNATOR NOT WARNED IN TIME — NUMBER TESTED (% PASSED)	598(5.98%)	0(0.00%)	0(0.00%)	0(0.00%)	0(0.00%)	0(0.00%)
		3082(80.60%)	2607(100.0%)	2136(100.0%)	1657(100.0%)	1277(100.0%)	986(100.0%)
14	DESIGNATOR IN DIRECT FIRE — NUMBER TESTED (% PASSED)	303(3.03%)	385(3.85%)	357(3.57%)	318(3.18%)	280(2.80%)	219(2.19%)
		2484(87.80%)	2607(85.23%)	2136(83.29%)	1657(80.81%)	1277(78.07%)	986(77.79%)
15	ROUND RELIABILITY FAILURE — NUMBER TESTED (% PASSED)	99(0.99%)	75(0.75%)	82(0.82%)	58(0.58%)	31(0.31%)	26(0.26%)
		2181(95.46%)	2222(96.62%)	1779(95.39%)	1339(95.67%)	997(96.89%)	767(96.61%)
16	TARGET OBSCURED BY MINI-TERRN — NUMBER TESTED (% PASSED)	358(3.58%)	392(3.92%)	303(3.03%)	218(2.18%)	154(1.54%)	137(1.37%)
		2082(82.80%)	2147(81.74%)	1697(82.14%)	1281(82.98%)	966(84.06%)	741(81.51%)
17	ROUND DID NOT ENGAGE TARGET — NUMBER TESTED (% PASSED)	7(0.07%)	6(0.06%)	6(0.06%)	5(0.05%)	5(0.05%)	8(0.08%)
		1724(99.50%)	1755(99.66%)	1394(99.57%)	1063(99.53%)	812(99.38%)	604(98.68%)
18	ROUND ENGAGED BUT DID NOT HIT — NUMBER TESTED (% PASSED)	503(5.03%)	502(5.02%)	399(3.99%)	261(2.61%)	211(2.11%)	158(1.58%)
		1717(70.70%)	1749(71.30%)	1388(71.25%)	1058(75.33%)	807(73.85%)	596(73.49%)
19	ROUND HIT BUT DID NOT KILL — NUMBER TESTED (% PASSED)	636(6.36%)	626(6.26%)	504(5.04%)	384(3.84%)	280(2.80%)	202(2.02%)
		1214(47.61%)	1247(49.80%)	989(49.04%)	797(51.82%)	596(53.02%)	438(53.88%)

***** KILLS	578	621	485	413	316	236 *****
PROB(KILL/OCSN)=	5.78%	6.21%	4.85%	4.13%	3.16%	2.36%
PROB(KILL/ATMP ENG)=	10.14%	10.90%	8.51%	7.25%	5.55%	4.14%
PROB(KILL/SHOT)=	15.77%	16.94%	13.23%	11.27%	8.62%	6.44%
PROB(LOS)=	68.25%	57.73%	47.30%	36.69%	28.28%	21.83%

PROB(SHOT/ATMP ENG)= 64.32%   PROB(ATMP ENG/OCSN)= 56.98%

PROB(SHOT/OCSN)= 36.65%

DESIGNATOR SURVIVABILITY: CASES IN WHICH DESIGNATOR KILLED = 241(2.41%)   NUMBER TESTED (% NOT KILLED) = 2484(90.30%)

LISTING D-4   SAMPLE OUTPUT FROM COPE

(PAGE 11 OF 11)

APPENDIX E

NOTATIONAL CONVENTIONS

In chapters 4, 5, and 14 of this report, the content of input cards is sometimes displayed with underlining. This underlining serves only to distinguish that which goes on the card itself from the remainder of the text; no actual underlining is punched on any of the input cards themselves.

Items which are displayed in capital letters (with underlining) in the description of a card type are to be copied literally, letter-for-letter onto the input card of that type. Items displayed in lower case letters represent positions on the card at which substitutions are to be made either from a list of allowed alternatives listed (in capital letters) in the descriptive text or by supplying an appropriate numerical value. In the lists of character strings allowed as substitutions for option words, only the underlined (capital) characters are used.

Similary, in chapter 7 where various messages and error prints are described, the capitalized, underlined part is printed as shown (but without the underlining) whereas the lower case part describes or substitutes for text which may vary from occasion to occasion.

APPENDIX F

GLOSSARY OF ABBREVIATIONS

BCS Battery Computer System

CDC Control Data Corporation

COPE (1) Combat Operational Performance Evaluation
(2) COPPERHEAD Operational Performance Evaluation

DMD Digital Message Device

D.O., DO (1) Designator Operator
(2) DO as in FORTRAN DO-LOOP

DT II Development Test II

FDC Fire Direction Center

GLLD Ground Laser Location Designator

HE High Explosive

IMSL International Mathematical and Statistical Library

LDWSS Laser Designator Weapon System Simulation

LOS Line-of-Sight

LTD Laser Target Designator

MULE Modular Unit Laser Equipment

OT II Operational Test II

PAM Probability of Acquisition and Maneuver

PE Probability of (Seeker) Engagement

PRBLOS Probability of Line-of-Sight

PREPMS Preprocessor of Mass Storage File

TLE Target Location Error

USAFAS US Army Field Artillery School

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This report had some influence on the modeling of multi-vehicle targets in PAM and COPE.

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