

UNCLASSIFIED

AD 283 558

*Reproduced
by the*

**ARMED SERVICES TECHNICAL INFORMATION AGENCY
ARLINGTON HALL STATION
ARLINGTON 12, VIRGINIA**



UNCLASSIFIED

NOTICE: When government or other drawings, specifications or other data are used for any purpose other than in connection with a definitely related government procurement operation, the U. S. Government thereby incurs no responsibility, nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use or sell any patented invention that may in any way be related thereto.

62-4-6

283558

CATALOGED BY ASTIA
AD NO. _____

283 558

National Bureau of Standards Report

A MONTE CARLO COMPUTER PROGRAM FOR ASSESSING CW CASUALTY
RATES USING AN IBM 704 COMPUTER SYSTEM

by

William G. Hall
Jeanne M. Beiman

Final Report: (23 July 1959 - 3 February 1962)

Contract Agreement No. CP-0-405-992

ASTIA
RECEIVED
SEP 12 1962
RECEIVED
TISIA B

U. S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

ASTIA FOR OTS

Armed Services Technical Information
Agency Availability Notice

U. S. Government agencies may obtain copies of this report directly from Armed Services Technical Information Agency, Arlington Hall Station, ATTN: TIPCR, Arlington 12, Virginia. Other qualified ASTIA users should request through U. S. Army Chemical Research and Development Laboratories.

FOREWORD

Contract Agreement No. CP-O-405-992 was established between the Mathematics Branch, Weapons Research Division, Army Chemical Center, and the Computation Laboratory, National Bureau of Standards, on July 23, 1959. Extensions of the agreement to provide additional time and funds were made in December 1959, June 1960, September 1960, and January 1961. The work was completed in February 1962.

Notice

Reproduction of this document in whole or part is prohibited except with the permission of the issuing office; however, ASTIA is authorized to reproduce the document for U. S. Governmental purposes.

Disposition

When this document has served its purpose, DESTROY it. DO NOT return to U. S. Army Chemical Research and Development Laboratories.

CONTENTS

	Page
INTRODUCTION	3
BASIC ELEMENTS	4
MUNITION DISTRIBUTION	5
AGENT DISSEMINATION FUNCTION	6
PERSONNEL DISTRIBUTION AND BREATHING BEHAVIOR	9
DOSE RESPONSE FUNCTIONS	10
INTERNAL STATISTICS	11
USES	13

APPENDICES

I. OVERLAY PROGRAM	15
A. Description	15
B. Flow Charts and Code	22
C. Sample Problems	38
II. ANALYTIC DISSEMINATION PROGRAM	53
A. Description	53
B. Flow Chart and Code	58
C. Sample Problems	62

Introduction

The primary purpose of the project was the development of a computer program or complex of programs for an IBM 704 computer system to assess casualty rate resulting from attack of CW weapon systems.

The programs devised have the capability of accepting as input, or generating according to prescribed rules the following data directly associated with the casualty producing mechanisms.

- (i) CW munition impact distributions,
- (ii) CW munition unit concentration functions,
- (iii) Impact area geometric configurations,
- (iv) Target area personnel distributions,
- (v) Personnel breathing functions for various activity or work levels, and
- (vi) Personnel dose-response functions.

As a result of this input the program can assess casualties and express the results in several forms of output.

The general problem solved by the Monte Carlo technique can be stated: For a given CW attack on an area target with a specified CW toxic agent delivery weapon system, for a given distribution of target personnel performing at a specified activity level or work rate, find the expected distribution of casualties and the variance on this expected distribution over some specified time period.

The remaining sections of this report present the essential elements of the problem by first specifying the functions involved, and indicating how these functional relations are utilized to produce a solution.

Basic Elements

The information desired can be determined in terms of the following basic elements:

- (i) The equation describing the dissemination of agent from each munition,
- (ii) The position and arrival time of each munition,
- (iii) The distribution of personnel,
- (iv) The equations describing the breathing behavior of the personnel, and
- (v) The equations describing the biological effect of the agent or the dose-response functions.

Because of the probabilistic nature of the above basic elements, a Monte Carlo simulation was indicated. In general, Monte Carlo technique approximates a solution to a physical problem by means of statistical sampling. Since any of items (i) - (v) may in some cases be empirical*, it was desirable to maintain provision for optimal empirical data where applicable. This was done insofar as practicable. However, the complexity encountered in the physical, computational and statistical aspects of the problem did impose several important restrictions on the input parameters allowed by the model. Certain of these arise conceptually since the empirical data may contain implicit restrictions, but most come about for numerical or computational convenience.

*Empirical here and elsewhere in the report does not necessarily mean experimental, but rather data from some source outside the model.

Munition Distribution

The impact pattern distributions formed by weapon delivery systems fall into two general classes. First is the uniform class; a typical example of this distribution is the system consisting of large numbers of agent-filled bomblets released from a cluster or missile. Second is the class of elliptical normal distributions; a typical example of this group is toxic agent filled rocket systems. On the other hand impact co-ordinates can also be obtained directly from field tests.

In the Monte Carlo computer program, munition impact patterns may be either empirical or defined by specified functions over specified geometric regions. Allowable geometric configurations are rectangles and circles; Allowable impact distribution functions are uniform and circular or elliptical normal.

With respect to time, munition arrivals are either simultaneous or considered as successive sets of simultaneous arrivals occurring at specified discrete time increments. If the munition arrival points are empirical, they must lie within the prescribed configuration since many of the bookkeeping parameters are constructed as functions of the dimensions of the impact area. If the unit toxic agent dissemination function is empirical all arrival points whether read or computed are rounded to grid points.

Agent Dissemination Function

The agent dissemination function may be either empirical or analytical.

If empirical, each munition is assumed to produce a rectangular dosage pattern symmetric about the mean wind direction. Source strength, wind direction, and source strength decay are implied in this array by the values appearing and the mesh sizes assumed. The mesh sizes in the two directions may differ from each other, but both must remain of fixed size for any single computer run.

Although there are four types of agent dissemination, instantaneous and non-instantaneous for both point and volume sources, there is a single concentration function which represents all types.

The agent dissemination function defining the concentration of agent at point (X,Y) at time t for a single impact at point (ξ, η) is given, in terms of the differences;

$$x = X - \xi$$

$$y = Y - \eta$$

$$\chi(x,y,t) = \frac{2\lambda Q_0 [1 - a e^{-b(t - \frac{x}{u})}] e^{-[\frac{(\bar{u}t - x)^2}{k_x(t^\beta + \alpha_x)} + \frac{y^2}{k_y(t^\beta + \alpha_y)}]}}{\pi^{3/2} \sqrt{k_x k_y k_z (t^\beta + \alpha_x) (t^\beta + \alpha_y) (t^\beta + \alpha_z)}}$$

$$\chi(x,y,t) = 0 \quad \text{when } x < 0, t < 0.$$

The agent dissemination function defining the dosage at point (X,Y) over time interval [0,T] for a single impact at (ξ, η) is given by:

$$D(x,y,T) = \int_0^T \chi(x,y,t) dt$$

The integration is approximated by a saddle-point technique and becomes:

$$D(x,y,T) = \left\{ \frac{\lambda \bar{u}^{\beta-1} Q_0 [1 - a e^{-b(T - \frac{x}{\bar{u}})}] e^{-\left[\frac{\bar{u}^\beta y^2}{k_y(x^\beta + \alpha_y \bar{u}^\beta)} \right]} }{\pi \sqrt{k_y k_z (x^\beta + \alpha_y \bar{u}^\beta) (x^\beta + \alpha_z \bar{u}^\beta)}} \right\} \\ \left\{ \operatorname{erf} \left[(\bar{u} T - x) \sqrt{\frac{\bar{u}^\beta}{k_x(x^\beta + \alpha_x \bar{u}^\beta)}} \right] + \operatorname{erf} \left[x \sqrt{\frac{\bar{u}^\beta}{k_x(x^\beta + \alpha_x \bar{u}^\beta)}} \right] \right\}$$

$$\text{and } \operatorname{erf}(s) = \frac{2}{\sqrt{\pi}} \int_0^s e^{-z^2} dz$$

Case I

If, $\alpha_x = \alpha_y = \alpha_z = 0$, $a \neq 0$

Then: $\chi(x,y,t)$ and $D(x,y,T)$ represent non-instantaneous point source dissemination functions.

Case II

If $\alpha_x \neq 0$, $\alpha_y \neq 0$, $\alpha_z \neq 0$, $a \neq 0$

Then $\chi(x,y,t)$ and $D(x,y,T)$ represent non-instantaneous volume source dissemination functions.

Case III

If $a = 0$, $\alpha_x = \alpha_y = \alpha_z = 0$. Then $\chi(x,y,t)$ and $D(x,y,T)$ represent instantaneous point source dissemination functions.

Case IV

If $a = 0$, $\alpha_x \neq 0$, $\alpha_y \neq 0$, $\alpha_z \neq 0$

Then $\chi(x,y,t)$ and $D(x,y,T)$ represent instantaneous volume source dissemination functions:

$\chi(x,y,t)$ = concentration function

$D(x,y,T)$ = dosage function.

If any α_j , for $j = x, y$, or z , is zero then every α_j is zero.

If any α_j , is not zero, every α_j must be non zero.

Definition, units and ranges

λ = agent recovery factor, (a numeric; $0 < \lambda < 1$)

Q_0 = unit source strength (milligrams; $10 < Q_0 < 10^6$)

$\bar{u}$ = mean wind speed (meters/minute; $1 < u < 10^3$)

T = time (minutes; $0 < T \leq 30$)

t = time (minutes; $0 < t \leq T$)

β = a numeric (associated with wind stability; $-2 \leq \beta \leq 2$)

k_x, k_y, k_z = agent diffusion parameters

$$(1 \leq k_x \leq 10^3; \quad 0 < k_y \leq 10^3; \quad 0 < k_z < 10^3)$$

$\alpha_x, \alpha_y, \alpha_z$ = dimensions of volume source (meters; $0 \leq \alpha_j \leq 1.0$)

a, b = numerics, associated with decay of source strength.

$$(0 \leq a \leq 1.0; \quad 0 \leq b \leq 10.0)$$

$\chi(x,y,t)$ = concentration at (x,y) at time t , ($\frac{\text{milligrams}}{(\text{meter})^3}$)

$D(x,y,T)$ = dosage at (x,y) for time interval $(0,T)$, $\frac{\text{milligrams} \cdot \text{minutes}}{(\text{meter})^3}$

Personnel Distribution and Breathing Behavior

Personnel distribution on the target plane is either empirical or generated, where the generated distribution is uniform. Other distributions can be incorporated rather easily, but it was not clear that any gain would have been made in the realism of the model by so doing.

The average cumulative breathing function is computed by

$$B(T) = C_0 + C_1 T + C_2 T^2$$

where C_0 , C_1 , and C_2 are input parameters which are determined by the activity level of personnel involved.

For any particular computer run all personnel are assumed to be performing at the same activity level and hence have the same breathing function. The dose at a point (x,y,T) is defined as:

$$D(x,y,T) = \int_0^T B(t) \chi(x,y,t) dt \quad \text{and is approximated by}$$

$$D(x,y,T) = \bar{B}(T) D(x,y,T)$$

where:

$\bar{B}(T)$ = average cumulative breathing rate function.

Dose Response Functions

Three methods are available for evaluating the dose response or casualty probabilities. First the probability of a casualty P_c at a point (x,y) at time T is determined by means of a dose threshold D_0 . This method merely provides a yes-no casualty assessment for each point of the target sampled where people are assumed to be located. The number of such points with dose values $\geq D_0$ is divided by the total number of points to get the fraction of casualties for a single computer run.

A second method is to form a frequency distribution of dose values over the entire target area. This frequency dose distribution is then used to compute a casualty frequency distribution by multiplying the average dose value for each class interval by its frequency and using the product to compute P_c where

$$P_c(c,y,T) = \int_{-\infty}^{(a_0-5) + b_0 \ln D(x,y,T)} \frac{1}{\sqrt{2\pi}} e^{-\frac{z^2}{2}} dz$$

where a_0 and b_0 are parameters reflecting the virulence of the agent. A frequency distribution of P_c is then formed by counting points in the intervals

$$x < P_c \leq x + .05 \text{ where } x = n(.05) \text{ where } 0 < n \leq 19$$

A third method is to compute P_c at each point (x,y) for time T and tallying the P_c in the proper class interval.

In all cases the first five moments are computed using:

$$m_r = \frac{1}{N} \sum_{i=1}^N D_i^r$$

In cases two and three the first five moments are also calculated as follows:

$$m_r = \frac{1}{M} \sum_{i=1}^M P_{c_i}^r \quad \text{for } r = 1, 2, 3, 4, 5 \text{ where}$$

N is the number of dose values on the target, D_i is the dose at the i th target point, and M is the number of P_c values on the target or the frequencies in the P_c distribution.

Internal Statistics of Model

For the cases in which the agent dissemination function is not replaced by an empirical pattern, the program features a self-controlling mesh size provision. Subject to an arbitrary upper limit on the number of changes possible, the program will alter the density of points in the sampling grid until the arithmetic mean threshold criterion has been met. In practice this provides for successive iterations using a varying sample point density until the successive mean values of P_c have stabilized. For the empirical pattern case this feature is not applicable because of the intrinsic geometric restrictions. The same goal may be accomplished by manual intervention to the simulation and off-machine data manipulations.

Since in individual cases input distributions are transformed into output numbers, there must be run in any Monte Carlo scheme a sufficient number of cases for the output numbers themselves to form a stabilized distribution. A discussion of the statistical design of the input and the interpretation and validity of output is beyond the scope of this report. The program does provide a tool by which the effect of various parameters may be studied. A discussion of the internal statistical aspects of the problem is in order.

The random number generation is done by the usual multiplicative scheme using the largest power of five which can be held by the computer (5^{15}) as a multiplier. Each random number of the sequence is generated as the normalized low order part of the product of the multiplier times the unnormalized preceding number from the sequence. The sequence thus produced has a period of 2^{33} or about 10^{10} .

Uniformly distributed variables are then constructed as

$$V = R(V_{\max} - V_{\min}) + V_{\min}$$

where V is the random variable, $V_{\max}$ and $V_{\min}$ are upper and lower limits of the variable and R is a random number from the sequence normalized so that

$$0 < R < 1.$$

Normally distributed variables are constructed as

$$V = \left(\sum_{i=1}^{12} R_i - 6 \right) \sigma_v + V_0; \quad V_0 - 6\sigma_v \leq V \leq V_0 + 6\sigma_v$$

where V_0 is the mean value and R_1 is a normalized random number.

Since for some values a point can be properly within the distribution and outside the limits of regions specified elsewhere, the distribution actually used for calculations is that determined by the intersection of the specified distribution and the specified geometric configuration. An example is the point x, y in a circle in which

$$x_{\min} < x < x_{\max} \quad \text{and}$$

$$y_{\min} < y < y_{\max} \quad \text{but}$$

$$\sqrt{(x-x_0)^2 + (y-y_0)^2} > \frac{x_{\max} - x_{\min}}{2}$$

For convenience in recreating any particular machine run and as a protection from bias due to using too small a subset of the random number sequence, the last random number of the sequence is printed with the usual output from each problem. If another problem is begun immediately, the printed number may be ignored. If this was the last problem of the set or if manual intervention of the calculations was necessary, there is provision for reading in this "starting value" for the random number generator as an input parameter.

Uses

The random variates, impact locations and personnel distribution can be varied and the output studied to establish confidence bounds on the frequency distributions, P_c and the moments and to determine the number of machine runs required to produce statistical stability.

Once confidence bounds are established, the model may be used to study the influence of the individual characteristics of a CW weapons system. Parameters may be varied either individually or in subsets and the output used in the design of more efficient CW weapons systems.

Both the Overlay Program and the Analytic Dissemination Program were written in SAP language. These were assembled into machine language by BSBELL SAP 3-7 assembly system.

Pertinent manuals:

Bell Telephone Laboratory	BESYS2 Manual
National Bureau of Standards	BSBEL Manual
United Airlines	SAP 3-7 Manual
(SHARE 716)	
IBM Reference Manual	A22-6500-3

Appendix IA

Description of the Overlay Program

The program computes the dose or dosage at all points on a target plane as a result of an arbitrary number of munitions which are distributed within a geometric configuration or impact area on the plane.

Each munition is assumed to produce a rectangular unit dissemination pattern symmetric about the mean wind direction. This pattern is called the unit dissemination grid or udg. The wind direction is assumed to be parallel to the x axis and in the direction of increasing x. The input section of the routine takes advantage of the symmetry by reading only the half pattern and reflecting all entries except those for the center line.

The impact area may be either a circle or a rectangle, and munitions may be distributed within this area either with a uniform random or an elliptical normal distribution or they may be read. All munition co-ordinates are rounded toward the center of the impact area to a grid point. A point lying on the boundary of the impact area is considered within the area.

The target plane is constructed as a function of the dimensions of the udg and the impact area to be the minimum rectangle circumscribing all grid points which could be affected by any munition arriving in the impact area. The length of the target area is that of the impact area plus that of the udg; the width, that of the impact area plus twice the half width of the udg rounded to the next highest even number of grid points.

The memory map technique is used for the overlay. Half words (18 bits) are used for each target area grid point, and whole words (36 bits) are used for each point of the udg. Munitions are generated or read and overlaid singly so that the memory storage required is independent of the number of munitions. The maximum size of a problem which may be run is dependent only on the dimensions of the two grids.

If M is the length of the impact area,
N is the width of the impact area,
m is the length of the udg,
n is the width of the udg,

Δm is the length mesh size, and

Δn is the width mesh size,

a problem which may be run must satisfy the inequalities:

$$\frac{m \cdot n + \frac{1}{2} (M + m) (N + n + 3)}{\Delta m \cdot \Delta n} < 27564 \quad \text{and}$$

$$\frac{N + n + 3}{\Delta n} \leq 200 \quad \text{(this must be satisfied only if the target map is to be printed.)}$$

Because of timing, this program should be used instead of the analytic dissemination function program described in Appendix II if the product of the number of points on the target times the number of munitions is large (more than 300,000) and the dimensions are such that the two inequalities are satisfied.

Although 18 bits are used to represent each grid point, only 17 are available for storage of dose, dosage, or concentration. The leading bit is always used to indicate whether the point is inside or outside the impact area. The maximum permissible value is therefore $2^{17} - 1$ or 131,071. The routine substitutes this maximum value for any value calculated which exceeds the maximum. The allowable non-zero range is all integers less than 131,072; since this is a rather limited range, there is provision in the routine for scaling the input udg for internal calculations and restoring the scaling to that of the input for output. This device does not increase the precision of the calculations but does permit all problems to use the same scaling for all udg's without avoidable loss of precision. All calculations except the moments are done in fixed point arithmetic; the moments and target area sums are printed in floating point form.

The routine will operate on any 32K IBM 704 with at least two magnetic tape units and an on-line printer.

In:

All data input is from magnetic tape although it could be from cards with a change of two instructions. All data is in a card length format to conform to the requirements of the SHARE input subroutine used. The subroutine requires that columns 1-7 and column 11 be blank and that columns 8-10 be DEC. Columns 12-72 contain the data, each field an integer less than or equal to eleven digits in length with fields separated by commas; there may be no data following a blank column on

the card since the input routine controls on a blank as the end of an input record. Columns 73-80 are not read by the 704 so are normally used for information to facilitate card manipulation either manually or with EAM equipment. If the data required for a single item exceeds the sixty-one columns available on a single card, the remaining information may be put on a trailer card with the same format. Restrictions for a trailer card are that a field must not be split between two cards, and that a comma not be used following the last data field on the leading card. Multiple trailer cards may be used in the same manner. Since all input field lengths are variable, any type of input card described may actually be a group of two or more cards. The flow chart indicates the organization of the routine but does not approach an instruction by instruction paraphrase of the routine.

Input Cards:

I. Card 1 is the identification card.

- A. Field 1 is the udg identification number. It is not used by the routine except to print back for output identification.
- B. Field 2 is the number of x mesh points in the udg or the number of cards in the udg input.
- C. Field 3 is the number of y mesh points in the input (half) udg. Normally this is the number of fields on each of the udg cards, but it may be less than the number of fields if part of a larger udg is being used.
- D. Field 4 is the x mesh size of the udg.
- E. Field 5 is the y mesh size of the udg.
- F. Field 6 is the scaling factor used for the udg. It is the power of two by which the doses, dosages, or concentrations will be divided for the internal calculations.
- G. Field 7 is a dimension of the impact area; the radius, if the area is a circle; the x half length if the area is a rectangle. If negative, the absolute value is used as dimension and munitions are read.
- H. Field 8 is zero if the impact area is a circle; the y half length if the area is a rectangle.
- I. Field 9 is zero if the munition distribution is uniform, σ_x if distribution is normal.

- J. Field 10 is zero if the munition distribution is unifrom,
 σ_y if distribution is normal.
- K. Field 11 is the number of munitions; if negative, the absolute value is the number of munitions and the target map print is omitted.
- L. Field 12 is the number of replications.
- M. Field 13 is an exit parameter; zero if there is another problem to follow, one if this is the last problem.
- N. Field 14 is the number of class intervals for output. It must be a multiple of 10, greater than zero and less than or equal to 100.
- O. Field 15 is a random number starting value or zero. If zero, the existing random number (in computer memory) is not changed. If not zero, the field is used as a starting value. Normally the first problem of a set has a non zero value (from a previous run), and the remaining problems of the set have zeroes.
- P. Field 16 is the number of probit classes or zero if probit output is not used.
- II. Card 2 - These appear only if probit output is to be used. There are enough cards of this type to contain the number of fields specified in field 16 of card 1. These fields are doses which correspond to each of the probit classes in the same scaling as card 3's.
- III. Card 3 - There are as many of these as are indicated in field 2 of card 1. Each card represents the udg half pattern for an x value implied by the index of the card. The first card is for $x=0$ and the remaining for successive integral multiples of Δx . The first entry on each card represents $y=0$, and each of the remaining represents points both positive and negative successive integral multiples of Δy .
- IV. Card 4 - is used to check synchronization of dimensions of udg as specified by card 1 and as actually found by the routine in reading card 3's. It consists of ten fields of 99999.

- V. Card 5 - These appear only if munitions are to be read rather than generated. Each munition is read from a single card containing an x and a y co-ordinate. For each replication as specified on the identification card there must be a 0,0 card following the munition cards. Munitions lying outside the impact area are rejected; the number of munitions specified is overridden by the number encountered which are within the impact area. The only external manifestation of inconsistency between expected and found munitions occurs in the dose or dosage sums print where the two dose or dosage sums will differ.

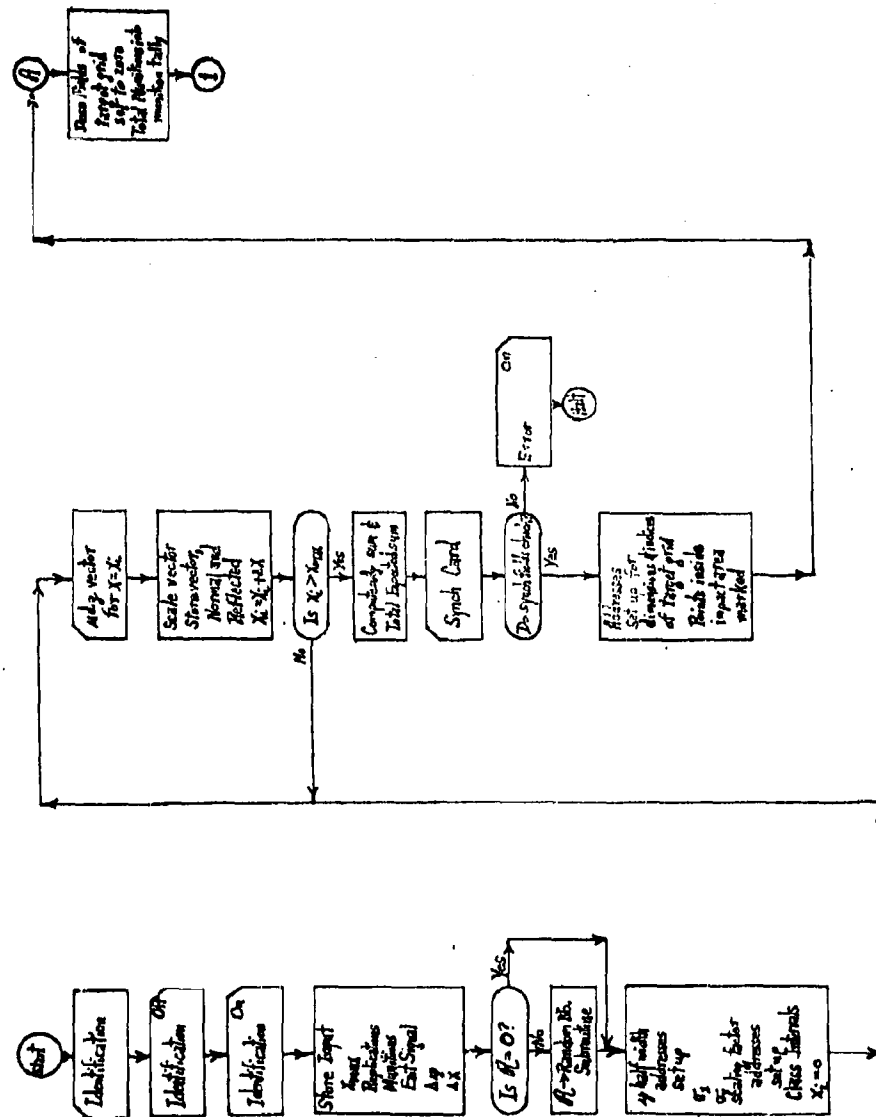
Output:

- I. On line (printer) output consists only of operator instructions which should be self-explanatory and of a print back of card 1 for every problem plus a single line print for each replication consisting of: RUN aOFb where a is replication index and b is total number of replications. If the synchronization card does not check at the end of udg input, there is a print of PATTERN IS WRONG and run will not continue.
- II. The off-line (magnetic tape) output is all on a single tape.
 - A. Card 1 is printed each time one is encountered as input preceded by the word INPUT.
 - B. There is an optional print of the dose or dosage map of the target area. This is controlled by the sign of field 11 of the identification card. The column vectors are printed by descending values of x from the maximum to zero. Within each column the entries are in order of descending y. With each column there is a print of the proper x value. To reduce printing volume the sign position of each element printed is used to indicate whether the point is inside or outside^b the impact area. A negative dose indicates that the point is inside the impact area.

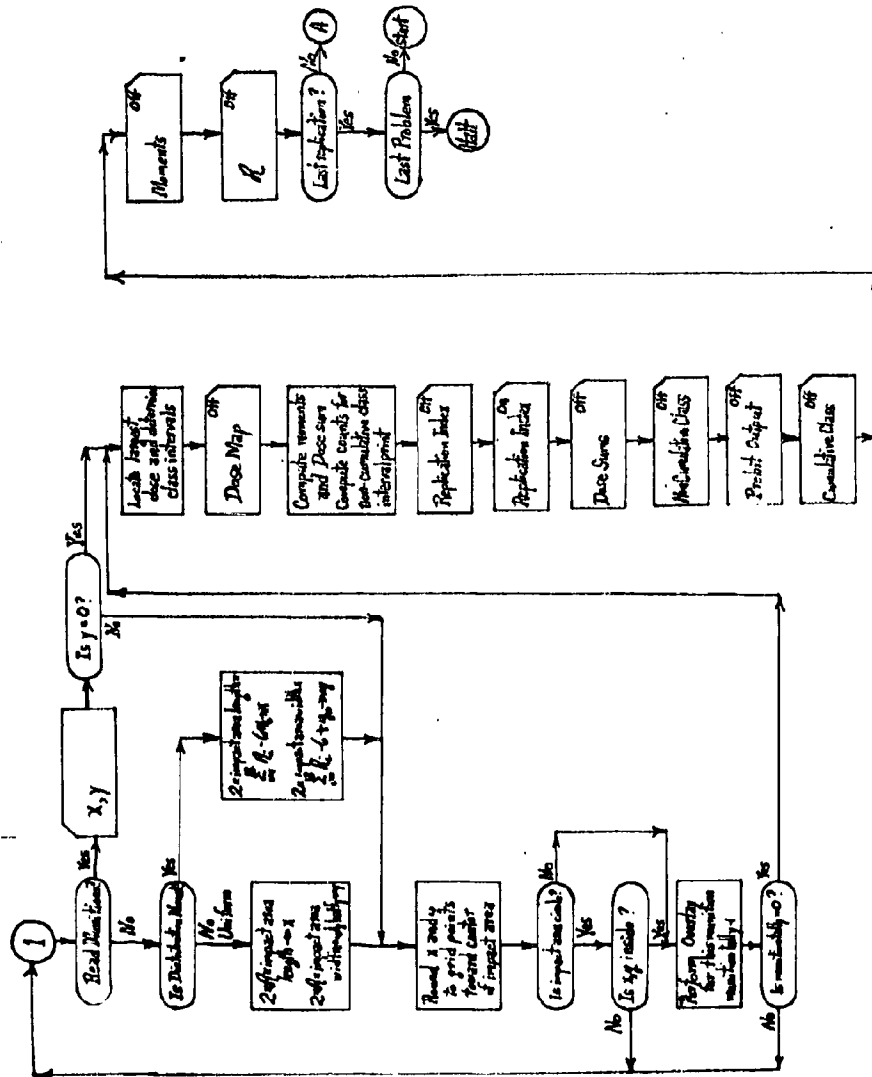
- C. A replication count is printed as RUN a OF b just as on line print where a is the replication index and b is the total number of replications.
- D. The dose or dosage sum print consists of the following sums:
1. The udg sum with internal scaling as an integer.
 2. The udg sum times the number of munitions with input-output scaling as a floating point number.
 3. The target sum with input-output scaling as a floating point number.
 4. (2) and (3) should be equal unless some point has accumulated more than the maximum permissible dose or dosage or munitions have been read and the number expected differed from the number found.
 5. The format: DOSE SUMS (1) (2) (3)
- E. Two sets of class interval counts are printed, perhaps separated by the probit output. The class intervals are determined by dividing the largest dose or dosage by the number of class intervals desired and constructing uniform increments equal to the quotient rounded to the next largest integer. The prints have identical format. In each case there is a one line print of class intervals, then a line with the count of grid points inside the impact area for each class interval; then the same counts for points outside the impact area. In both cases the counts are constructed by including in each interval all points which are greater than or equal to that interval but less than the next larger.
1. The first class interval print shows counts which are non-cumulative.
 2. The probit output.
 3. The second class interval print shows cumulative counts.
- F. The first five moments are printed in floating point as: MOMENTS ARE $M_1 M_2 M_3 M_4 M_5$. If any moment is $> 10^{38}$, it cannot be calculated properly, and some incorrect non-predictable number will be printed instead.
- G. The random number starting value for the next problem is printed at the end of each problem. This may be used to start

the next machine run if a break in the machine sequence is necessary.

FLOW CHART FOR OVERLAY PROGRAM PAGE 1



FLOW CHART FOR OVERLAY PROGRAM PAGE 2



BESYS 2: SAP 3-7 ASSEMBLY OF OVERLAY PROGRAM PAGE 1

JOB 04500 HALL W CHLMICAL WAKEFARE GENERALIZED OVERLAY
 PUNCH SAP
 ORG 224

45000002
 04500010

00340	0	07400	4	70010	BOX11	TSX	XINPUT,4	0,0,0	04500010
00341	0	00000	0	00000					04500012
00342	-1	01774	0	01755		MON	READ,0,READ+15		45000040
00343	-0	76000	0	00004		LHM			45000070
00344	0	07400	4	70007		TSX	OUTPUT,4		45000090
00345	0	00013	0	01671			ID,0,11		45000100
00346	-1	01774	0	01755		MON	READ,0,READ+15		04500120
00347	0	07400	4	70007		TSX	OUTPUT,4		45000140
00350	0	00011	0	01671			ID,0,9		45000160
00351	-1	01774	0	01755		MON	READ,0,READ+15		04500180
00352	-0	50000	0	01756		CAL	READ+1	PATTERN LENGTH	45000200
00353	0	40200	0	02054		SUB	IF		45000220
00354	0	60100	0	02015		STU	XMAX		45000240
00355	0	76700	0	00022		ALS	18		45000260
00356	0	62200	0	00501		STU	BOXR4	REPLICATIONS	45000280
00357	0	50000	0	01770		CLA	READ+11		45000300
00360	0	60100	0	02011		STU	RLP		45000320
00361	0	50000	0	01767		CLA	READ+10		04500340
00362	0	60100	0	02051		STU	OPUP		04500345
00363	0	76000	0	00003		SSP			04500350
00364	0	60100	0	02040		STU	MUN		45000360
00365	0	50000	0	01771		CLA	READ+12		45000380
00366	0	60100	0	02042		STU	NSIG		45000400
00367	0	50000	0	01761		CLA	READ+4	DELY	45000440
00370	0	60100	0	02027		STU	DLLY		45000460
00371	0	50000	0	01760		CLA	READ+3	DELY	45000480
00372	0	60100	0	02026		STU	DLLA		45000500
00373	0	50000	0	01773		CLA	READ+14		45000520
00374	0	10000	0	00376		TZL	*+2		45000540
00375	0	60100	0	01663		STU	BOXR4		45000560
00376	0	50000	0	01774		CLA	READ+15		04500564
00377	0	60100	0	02052		STU	PROB		04500566
00400	0	10000	0	00404		TZL	*+4		04500570
00401	0	07400	4	70010		TSX	XINPUT,4		04500574
00402	0	00000	0	00000			0,0,0		04500576
00403	-1	02123	0	02101		MON	PROT,0,PROT+18		45000580
00404	0	50000	0	01757		CLA	READ+1	Y HALF WIDTH	45000600
00405	0	60100	0	02037		STU	YIP		45000620
00406	0	40100	0	00342		ADM	BOX11+2		45000640
00407	0	62100	0	00470		STA	BOXR2		45000660
00410	0	40200	0	02054		SUB	IF		45000680
00411	0	76700	0	00022		ALS	18		45000700
00412	0	62200	0	00456		STU	BOXR1+3		45000720
00413	0	50000	0	02067		CLA	LSAC		45000740
00414	0	40200	0	02037		SUB	YIP		45000760
00415	0	62100	0	00472		STA	BOXR2+2		45000780
00416	0	62100	0	00473		STA	BOXR2+3		45000800
00417	0	50000	0	01764		CLA	READ+7		45000820
00420	0	60100	0	02044		STU	GSIG	***	45000840
00421	-0	10000	0	00423		INZ	*+2	INPUT AREA CONFIGURATION	45000860
00422	0	50000	0	01763		CLA	READ+6		45000880
00423	0	60200	0	02032		SLW	RY		04500890
00424	0	50000	0	01763		CLA	READ+6		45000900
00425	-0	12000	0	01637		IMI	ROMN		04500906
00426	0	50000	0	02077		LDU	NOP		04500912
00427	-0	60000	0	00732	RDG	STU	BOX61		04500918
00430	0	60200	0	02031		SLW	RX		04500924
00431	0	50000	0	02037		CLA	YIP		45000930
00432	0	40200	0	02054		SUB	IF		45000936
00433	0	40000	0	02037		ADD	YIP		45000942

BESYS 2, SAP 3-7 ASSEMBLY OF OVERLAY PROGRAM PAGE 2

00434	0	60100	0	02036	STU YT	45000920
00435	0	50000	0	01765	CLA READ+8	45000930
00436	0	60100	0	02043	STU SIGNA	45000940
00437	0	50000	0	01766	CLA READ+9	45000948
00440	0	60100	0	02046	STU SIGMAY	45000946
00441	0	50000	0	01762	CLA READ+5	45000950
00442	0	62100	0	00471	STA BOXK2+1	45000960
00443	0	62100	0	01227	STA BOXA6	45000962
00444	0	62100	0	01241	STA BOXA7	45000963
00445	0	62100	0	01177	STA BOXAA+2	45000964
00446	0	62100	0	01204	STA BOXAB+4	45000965
00447	0	62100	0	01147	STA BOXAN	45000966
00450	0	62100	0	00520	STA BOXT	45000967
00451	0	50000	0	01772	CLA READ+13	45000968
00452	0	60100	0	02045	STU NONTR	45000969
00453	0	53400	1	02053	BOXR1 LXA ZERO,1	45000970
00454	0	07400	4	70010	TSX XINPUT,4	45000980
00455	0	00000	0	00000	040,0	45000981
00456	-1	00000	0	01755	MON READ,0,**	45000982
00457	0	60000	0	01746	STZ COMMON	45000990
00460	-0	63400	1	01746	SXD COMMON,1	45001000
00461	-0	75400	0	00000	PXD	45001010
00462	0	56000	0	01746	LDW COMMON	45001020
00463	0	76500	0	00022	LRS 18	45001030
00464	0	20000	0	02036	MPY YT	45001040
00465	-0	60000	0	01747	STW COMMON+1	45001050
00466	0	53400	3	01747	LXA COMMON+1,3	45001060
00467	0	53400	4	02037	LXA YIP,4	45001070
00470	0	50000	4	00000	BOXR2 CLA **,4	45001080
00471	0	77100	0	00000	ARS **	45001090
00472	0	60100	2	00000	STO **,2	45001100
00473	0	60100	1	00000	STO **,1	45001110
00474	1	77777	1	00475	TXI **1,1,-1	45001120
00475	1	00001	2	00476	TXI **1,2,1	45001130
00476	2	00001	4	00470	TXI BOXR2,4,1	45001140
00477	-0	53400	1	01746	LXD COMMON,1	45001150
00500	1	00001	1	00501	TXI **1,1,1	45001160
00501	-3	00000	1	00474	BOXR4 TXI BOXR1+1,1,**	45001170
00502	0	50000	0	02015	CLA XMAX	45001180
00503	0	40000	0	02054	ADD 1F	45001190
00504	0	76500	0	00043	LRS 35	45001200
00505	0	20000	0	02036	MPY YT	45001210
00506	0	76300	0	00043	LRS 35	45001220
00507	0	73400	4	00000	PAX 0.4	45001230
00510	-0	75400	0	00000	PXD	45001240
00511	0	40000	4	70000	BOXS ADD 28672,4	45001250
00512	2	00001	4	00511	TXI *-1,4,1	45001260
00513	0	60100	0	02001	STU USUM	45001270
00514	0	56000	0	02001	LDW USUM	45001280
00515	0	20000	0	02040	MPY MUR	45001290
00516	-0	60000	0	02002	STW MSUM	45001300
00517	0	50000	0	02002	CLA MSUM	45001301
00520	0	76700	0	00000	BOXT ALS **	45001302
00521	-0	50100	0	02071	ORA FL2	45001303
00522	0	30000	0	02053	PAD ZERO	45001304
00523	0	60100	0	02002	STW MSUM	45001306
00524	0	07400	4	70010	TSX XINPUT,4	45001310
00525	0	00000	0	00000	040,0	45001311
00526	-1	01766	0	01755	MON READ,0,READY	45001312
00527	0	53400	4	02057	LXA 10F,4	45001320
00530	0	50000	0	00000	CLA 20	45001330
00531	0	40200	4	01757	SUM READ+10,4	45001340

BESYS 2, SAP 3-7 ASSEMBLY OF OVERLAY PROGRAM PAGE 3

00532	-0	10000	0	01634	INZ ERROR	TO ERROR	45001350
00533	2	00001	0	00530	YIX 2-3,4,1		45001360
00534	0	56000	0	02021	BOXRS LDG RX		45001370
00535	0	20000	0	02021	MPY RX		45001380
00536	-0	60000	0	02033	STQ RSQ		45001390
00537	0	50000	0	02054	CLA 1F		45001400
00540	0	60100	0	02010	STO REPC		45001410
00541	0	50000	0	02031	CLA RX		45001420
00542	0	76700	0	00001	ALS 1		45001430
00543	0	60100	0	02034	STO DIA	***	45001440
00544	0	50000	0	02032	CLA RY		45001442
00545	0	76700	0	00001	ALS 1		45001444
00546	0	60100	0	02035	STO DIAY		45001446
00547	0	50000	0	02037	CLA YIP		45001450
00550	0	40200	0	02054	SUB 1F		45001460
00551	0	76500	0	00043	LRS 35		45001470
00552	0	20000	0	02027	MPY DELY		45001480
00553	-0	60000	0	02017	STQ YMIN		45001500
00554	0	50000	0	02017	CLA YMIN		45001510
00555	0	40000	0	02032	ADD RY		45001520
00556	0	60100	0	02021	STO YU	X,Y OF IMPACT CENTER	45001530
00557	0	50000	0	02031	CLA RX		45001540
00560	0	60100	0	02020	STO XO		45001550
00561	0	50000	0	02015	CLA XMAX		45001560
00562	0	40000	0	02054	ADD 1F		45001570
00563	0	60100	0	01746	STO COMMON		45001580
00564	0	56000	0	01746	LDG COMMON		45001590
00565	0	20000	0	02036	MPY YT		45001600
00566	0	76300	0	00043	LLS 35		45001610
00567	0	60100	0	02016	STO MMAX		45001620
00570	-0	76000	0	00003	SSM		45001630
00571	0	40000	0	02067	ADD LSAD		45001640
00572	0	62100	0	00726	STA BOX21		45001650
00573	0	62100	0	01044	STA BOX06		45001660
00574	0	62100	0	01054	STA BOX0X		45001670
00575	0	62100	0	01072	STA BOX0C		45001680
00576	0	62100	0	01131	STA BOXA1		45001690
00577	0	62100	0	01135	STA BOXA2		45001700
00600	0	62100	0	01223	STA BOXA4		45001710
00601	0	62100	0	00636	STA BOX0R		04501711
00602	0	62100	0	01324	STA BOXA8		45001720
00603	0	62100	0	01330	STA BOXA5-1		45001721
00604	0	62100	0	01175	STA BOXAA		45001722
00605	0	62100	0	00674	STA BOX07		04501723
00606	0	62100	0	01337	STA BOXAL+1		04501724
00607	-0	75400	0	00000	PXD		45001730
00610	0	56000	0	02021	LDG YU		45001740
00611	0	22100	0	02027	DVP DELY		45001750
00612	-0	60000	0	02050	STQ Y		45001760
00613	0	50000	0	02050	CLA Y		45001770
00614	0	40000	0	02054	ADD 1F		45001780
00615	0	76700	0	00001	ALS 1		45001790
00616	0	60100	0	02013	STQ YDIM		45001800
00617	0	50000	0	02020	CLA XO		45001810
00620	0	40000	0	02031	ADD RX		45001820
00621	0	76500	0	00043	LRS 35		45001830
00622	0	22100	0	02026	DVP DELX		45001840
00623	-0	60000	0	02047	STQ X		45001850
00624	0	50000	0	02047	CLA X		45001860
00625	0	40000	0	02015	ADD XMAX		45001870
00626	0	40000	0	02054	ADD 1F		45001880
00627	0	60100	0	02012	STQ XDIM		45001890

RESYS 2, SAP 3-7 ASSEMBLY OF OVERLAY PROGRAM PAGE 4

00630	0	40000	0	02054	ADD 1F	***	45001900
00631	0	76500	0	00043	LRS 35		45001905
00632	0	20000	0	02013	MPY YDIM		45001910
00633	0	76500	0	00001	LRS 1		45001920
00634	-0	60000	0	02014	STQ TDIM		45001930
00635	0	53400	4	02014	LXA TDIM,4		1932
00636	0	60000	4	00000	BX10R STZ **4		1934
00637	2	00001	4	00636	TXI *-1,4,1		1936
00640	0	53400	4	02054	LXA 1F,4		45001940
00641	0	60000	0	02022	STZ XI		45001950
00642	0	60000	0	02023	BX103 STZ YI		45001960
00643	0	76000	0	00140	SLF		45001970
00644	0	53400	2	02013	LXA YDIM,2		45001980
00645	0	50000	0	02022	CLA XI		45001990
00646	0	40200	0	02020	SUB XO		45002000
00647	0	60100	0	01751	STQ COMMON+3	DELTA X	45002010
00650	0	50000	0	02044	CLA GSIG		45002020
00651	-0	10000	0	01616	TNZ BXREC	RECTANGLE	45002030
00652	0	56000	0	01751	LDW COMMON+3		45002040
00653	0	20000	0	01751	MPY COMMON+3		45002050
00654	-0	60000	0	01751	STQ COMMON+3		45002060
00655	0	50000	0	02044	BX106 CLA GSIG		04202060
00656	-0	10000	0	01616	TNZ BXREC		04202064
00657	0	50000	0	02021	CLA YO		04202066
00660	0	40200	0	02023	SUB YI		45002070
00661	0	60100	0	01752	STQ COMMON+4		45002080
00662	0	56000	0	01752	LDW COMMON+4		45002090
00663	0	20000	0	01752	MPY COMMON+4		45002100
00664	-0	60000	0	01752	STQ COMMON+4		45002110
00665	0	50000	0	01752	CLA COMMON+4		45002120
00666	0	40000	0	01751	ADD COMMON+3		45002130
00667	0	56000	0	02013	LDW KSW		45002140
00670	0	04000	0	00717	TLW BX108		45002150
00671	-0	50000	0	02072	BX102 CAL RHE		45002160
00672	-0	76000	0	00141	SLT 1		45002170
00673	-0	50000	0	02073	CAL LHI		45002180
00674	-0	60200	4	00000	BX107 ORS **4		04202190
00675	0	50000	0	02023	CLA YI		45002200
00676	0	40000	0	02021	ADD DELY		45002210
00677	0	60100	0	02023	STQ YI		45002220
00700	2	00001	2	00711	TXI BX104,2,1		45002230
00701	0	50000	0	02022	CLA XI		45002240
00702	0	40000	0	02026	ADD DELX		45002250
00703	0	60100	0	02022	STQ XI		45002260
00704	1	00001	4	00705	TXI *-1,4,1		45002270
00705	0	40200	0	02034	BX10X SUB DIA	***	45002280
00706	0	10000	0	00642	TZL BX103		45002290
00707	-0	12000	0	00642	IMI BX103		45002300
00710	0	02000	0	00723	TRA BX109		45002310
00711	-0	76000	0	00142	BX104 SLT 2		45002320
00712	0	02000	0	00714	TRA *-2		45002330
00713	1	00001	4	00655	TXI BX106,4,1		45002340
00714	0	76000	0	00141	SLN 1		45002350
00715	0	76000	0	00142	SLN 2		45002360
00716	0	02000	0	00655	TRA BX106		45002370
00717	-0	76000	0	00141	BX106 SLT 1		45002380
00720	0	76100	0	00000	ROP		45002390
00721	-0	75400	0	00000	EXD		45002400
00722	0	02000	0	00674	TRA BX107		45002410
00723	0	76000	0	00140	BX107 SLT		45002420
00724	0	13000	4	02014	LXA TDIM,4		45002430
00725	-0	50000	0	02074	CAL SIGRT		45002440

PAGE 5

00729	0	32000	4	000000	BOXZ1	ANS	**4					43002440
00730	0	50001	4	007226		TRX	*-1,4,1					45002430
00731	0	51400	4	02040		LXA	MUN,4					45002460
00731	-0	63400	4	12041		SXD	MUN,4					45002470
00732	0	02000	0	000000	BOXG1	TRA	**					04502480
00733	0	50000	0	02043		CLA	STOMA					04502485
00734	-0	10000	0	01550		TMZ	NNH					45002470
00735	0	07400	4	01553		TSX	RDN0,4					45002500
00736	0	20000	0	02034		MPY	GIA					45002510
00737	0	60100	0	02047		STO	X					45002520
00740	0	07400	4	01653		TSX	RDN0,4					45002530
00741	0	20000	0	02035		MPY	GIA					4540
00742	0	40000	0	02017		ADD	YMIN					45002550
00743	0	60100	0	02010		STO	Y					45002560
00744	0	50000	0	02054	BOXGR	CLA	1F					45002570
00745	0	60100	0	01746		STO	COMMON					45002580
00746	0	60100	0	01747		STO	COMMON+1					45002590
00747	0	50000	0	02047		CLA	X					45002600
00750	0	40200	0	02020		SUB	X0					45002610
00751	-0	12000	0	01542		TM1	BOXGA					45002620
00752	0	60100	0	01750	BOXG3	STO	COMMON+2					45002630
00753	0	56000	0	01750		LDQ	COMMON+2					45002640
00754	0	20000	0	01750		MPY	COMMON+2					45002650
00755	-0	60000	0	01750		STQ	COMMON+2					45002660
00756	0	50000	0	02020		CLA	Y					45002670
00757	0	40200	0	02021		SUB	Y0					45002680
00760	-0	12000	0	01545		TM1	BOXGB					45002690
00761	0	60100	0	01751	BOXG5	STO	COMMON+3					45002700
00762	0	50000	0	02044		CLA	GSIG					45002702
00763	-0	10000	0	00773		TMZ	BOXGX					45002705
00764	0	56000	0	01751		LDQ	COMMON+3					45002710
00765	0	20000	0	01751		MPY	COMMON+3					45002720
00766	-0	60000	0	01751		STQ	COMMON+3					45002730
00767	0	50000	0	01751		CLA	COMMON+3					45002740
00770	0	40000	0	01750		ADD	COMMON+2					45002750
00771	0	56000	0	02033		LDQ	R00					45002760
00772	0	04000	0	00732	BOXGA	TRD	BOXG1					45002770
00773	-0	75400	0	000000		PRD						45002780
00774	0	56000	0	02047		LDQ	X					45002790
00775	0	22100	0	02026		DVP	DELY					45002800
00776	-0	60000	0	01750		STQ	COMMON+2					45002810
00777	0	50000	0	01750		CLA	COMMON+2					45002820
01000	0	40000	0	01746		ADD	COMMON					

BESYS 2. SAP 3-7 ASSEMBLY OF OVERLAY PROGRAM PAGE 6

01024	0	02000	0	01023	TRA BOX07	45003030
01025	0	56000	0	02055	BOX02 LDG 2F	45003040
01026	-0	60000	0	01746	STO COMMON	45003050
01027	0	02000	0	00752	TRA BOX03	45003060
01028	0	56000	0	02055	BOX04 LDG 2F	45003070
01031	0	60100	0	01747	STO COMMON+1	45003080
01032	0	02000	0	00761	TRA BOX05	45003090
01033	0	53400	2	02036	BOX07 LXA YT,2	45003100
01034	0	50000	0	01747	CLA COMMON+1	45003110
01035	0	40200	0	02037	SUB YIP	45003120
01036	0	40000	0	02055	ADD 2F	45003130
01037	0	76500	0	00001	LRS 1	45003140
01040	0	73400	4	00000	PAX 0,4	45003150
01041	0	50000	0	02025	CLA Y00	45003160
01042	0	76000	0	00001	LET	45003170
01043	0	76000	0	00141	SLN 1	45003180
01044	-0	50000	4	00000	BOX06 CAL ***,4	45003190
01045	-0	32000	0	02075	ANA SIGCH	45003200
01046	0	76500	0	00022	LRS 18	45003210
01047	0	60100	0	01750	STO COMMON+2	45003220
01050	-0	75400	0	00000	PXD	45003230
01051	0	76300	0	00022	LRS 18	45003240
01052	0	60100	0	01751	STO COMMON+3	45003250
01053	-0	50000	0	02074	CAL SIGBT	45003260
01054	-0	32000	4	00000	BOX0X ANA ***,4	45003270
01055	0	60200	0	01753	SLW COMMON+5	45003280
01056	0	50000	1	67777	CLA 26671,1	45003290
01057	-0	76000	0	00141	SLT 1	45003300
01060	0	02000	0	01113	TRA BOX01	45003310
01061	0	50000	1	67777	BOX02 CLA 26671,1	45003320
01062	0	40000	0	01751	ADD COMMON+3	45003330
01063	0	56000	0	02076	LDW MASK	45003340
01064	0	04000	0	01124	TLQ BOX03	45003350
01065	0	60100	0	01751	BOX04 STO COMMON+3	45003360
01066	0	50000	0	01750	CLA COMMON+2	45003370
01067	0	76700	0	00022	ALS 18	45003380
01070	-0	50100	0	01751	ORA COMMON+3	45003390
01071	-0	50100	0	01753	ORA COMMON+5	45003400
01072	0	60200	4	00010	BOX0C SLW ***,4	45003410
01073	1	00001	1	01074	TXI **1,1,1	45003420
01074	1	00001	4	01075	TXI **1,4,1	45003430
01075	2	00001	2	01044	TXI BOX06,2,1	45003440
01076	0	50000	0	01747	CLA COMMON+1	45003450
01077	0	40000	0	02013	ADD YDIM	45003460
01100	0	60100	0	01747	STO COMMON+1	45003470
01101	0	50000	0	01752	CLA COMMON+4	45003480
01102	0	40000	0	02054	ADD 1F	45003490
01103	0	60100	0	01752	STO COMMON+4	45003500
01104	0	73400	4	00000	PAX 0,4	45003510
01105	-3	00000	4	01033	BOX08 TXL BOX07,4,**	45003520
01106	-0	53400	4	02041	LXC HURC,4	45003530
01107	2	00001	4	01111	TXI BOX09,4,1	45003540
01110	0	02000	0	01126	TRA OUT	45003550
01111	-0	63400	4	02041	BOX09 SXG HURC,4	45003560
01112	0	02000	0	01732	TRA BOX01	45003570
01113	0	40000	0	01750	BOX01 ADD COMMON+2	45003580
01114	0	56000	0	02076	LDG MASK	45003590
01115	0	04000	0	01124	TLQ BOX0A	45003600
01116	0	60100	0	01750	BOX03 STO COMMON+2	45003610
01117	2	00001	2	01121	TXI **2,2,1	45003620
01120	0	02000	0	01066	TRA BOX04+1	45003630
01121	1	00001	1	01061	TXI BOX02,1,1	45003640

RESYS 2, SAP-3-7 ASSEMBLY OF OVERLAY PROGRAM PAGE 7

01122	0	50000	0	02076	BOX0A	CLA MASK		45003660
01123	0	02000	0	01116		TRA BOX03		45003670
01124	0	50000	0	02076	BOX0B	CLA MASK		45003680
01125	0	02000	0	01065		TRA BOX04		45003690
01126	0	53400	3	02014	OUT	LXA TDIM,3		45003700
01127	0	56000	0	02053		LDG ZERO		45003710
01130	0	50000	0	02076		CLA MASK		45003720
01131	-0	32000	1	00000	BOXA1	ANA **,1		45003730
01132	0	04000	0	01630		TLQ BOX01		45003740
01133	2	00001	1	01130		TIJ *-3,1,1		45003750
01134	0	76300	0	00022		LRS 18		45003760
01135	0	50000	2	00000	BOXA2	CLA **,2	***	45003770
01136	0	76000	0	00003		SEP		45003775
01137	0	04000	0	01632		TLQ BOX02		45003780
01140	2	00001	2	01135		TIJ *-3,2,1		45003790
01141	-0	75400	0	00000		PXD		45003800
01142	0	76500	0	00022		LRS 18		45003810
01143	0	22100	0	02045		DVP NONTR		45003820
01144	-0	60000	0	01746		STQ COMMON		45003830
01145	0	50000	0	01746		CLA COMMON		45003850
01146	0	40000	0	02054		ADD IF		04503855
01147	0	76700	0	00000	BOXAN	ALS **		04503860
01150	0	60100	0	02030		STQ DEL		45003870
01151	0	53400	1	02014		LXA TDIM,1		45003900
01152	0	60000	0	02003		STZ M1		45003910
01153	0	60000	0	02004		STZ M2		45003920
01154	0	60000	0	02005		STZ M3		45003930
01155	0	60000	0	02006		STZ M4		45003940
01156	0	60000	0	02007		STZ M5		45003950
01157	-0	50000	0	01215		CAL BOXAD		45003970
01160	0	40000	0	02013		ADD YDIM		45003980
01161	0	62100	0	01205		STA BOXAL		04503990
01162	0	40000	0	02054		ADD IF		04503995
01163	0	62100	0	01200		STA BOXA15		04504000
01164	0	40200	0	02055		SUB CF		04504010
01165	0	76700	0	00022		ALS 18		45004020
01166	0	62200	0	01215		STD BOXAD		45004030
01167	0	56000	0	02017		LDG XDIM		04504040
01170	0	20000	0	02026		MPY DELX		04504045
01171	-0	60000	0	02022		STG X1		04504050
01172	0	50000	0	02051		CLA OPOP		04504055
01173	-0	12000	0	01222		IMI BOXAA-1		04504066
01174	0	53400	2	02013		LXA YDIM,2		45004060
01175	0	50000	1	00000	BOXAA	CLA **,1		45004070
01176	0	76500	0	00022		LRS 18		45004080
01177	0	76700	0	00000		ALS **		45004090
01200	0	60100	2	00030	BOXAB	STQ OP+**,2		45004100
01201	-0	77300	0	00001		RGL 1		45004110
01202	-0	75400	0	00000		PXD		45004120
01203	0	76300	0	00021		LRS 17		45004130
01204	0	76700	0	00010		ALS **		45004140
01205	0	60100	2	00050	BOXAC	STQ OP+**,2		45004160
01206	1	77777	1	01207		TIJ *-1,1,-1		45004170
01207	2	00002	2	01175		TIJ BOXAA,2,2		04504180
01210	0	07400	4	70007		TSX OUTPUT,4		45004190
01211	0	00011	0	01675		XPR1,0,9		45004201
01212	-1	02022	0	02022		MOB A1,0,X1		45004210
01213	0	07400	4	70007		TSX OUTPUT,4		45004220
01214	0	00011	0	01677		XPR1,0,9		45004230
01215	-1	00030	0	70030	BOXAD	MOB OP+0,0,0+**		45004240
01216	0	50000	0	02042		CLA X1		45004250
01217	0	40200	0	02046		SUB DELX		45004260

BESYS 2, SAP 3-7 ASSEMBLY OF OVERLAY PROGRAM PAGE 8

01220	0	60100	0	02022	STQ K1		04504265
01221	3	00000	1	01174	TXH BOXAA-1,1,0		04504270
01222	0	53400	1	02014	LXA TDIM+1		04504275
01223	-0	50000	1	00000	BOXA4 CAL **1		45004280
01224	-0	32000	0	02075	ANA SIGCM		45004290
01225	0	10000	0	01331	TZL BOXA5		4300
01226	0	76500	0	00022	LRS 18	***	45004310
01227	0	76700	0	00000	BOXA6 ALS **		4312
01230	0	60100	0	01751	STQ COMMON+3		45004315
01231	-0	60000	0	01747	STQ COMMON+1		4318
01232	0	10000	0	01255	TZL **3	SKIP LEFT HALF	45004320
01233	-0	50100	0	02071	ORA FLZ		45004330
01234	0	30000	0	02053	FAD ZLRO		04504335
01235	0	60100	0	01746	STQ COMMON		45004340
01236	0	56000	0	01747	LDW COMMON+1		4445
01237	-0	75400	0	00000	PXD		45004350
01240	0	76300	0	00022	LRS 18	***	45004360
01241	0	76700	0	00000	BOXA7 ALS **		4362
01242	0	60100	0	01752	STQ COMMON+4		45004365
01243	0	10000	0	01246	TZL **3	***	45004370
01244	-0	50100	0	02071	ORA FLZ		45004375
01245	0	30000	0	02053	FAD ZLRO		04504385
01246	0	60100	0	01747	STQ COMMON+1		45004400
01247	0	76000	0	00140	STP		45004410
01250	0	56000	0	01746	BOXA9 CLA COMMON	***	45004420
01251	0	10000	0	01307	TZL BOXA3		45004430
01252	0	30000	0	02003	FAD M1		45004440
01253	0	60100	0	02003	STQ M1		45004450
01254	0	56000	0	01746	LDW COMMON		45004460
01255	0	26000	0	01746	FMP COMMON		45004470
01256	0	60100	0	11750	STQ COMMON+2		45004480
01257	0	30000	0	02004	FAD M2		45004490
01260	0	60100	0	02004	STQ M2		45004500
01261	0	56000	0	01746	LDW COMMON		45004510
01262	0	26000	0	01750	FMP COMMON+2		45004520
01263	0	60100	0	01750	STQ COMMON+2		45004530
01264	0	30000	0	02005	FAD M3		45004540
01265	0	60100	0	02005	STQ M3		45004550
01266	0	56000	0	01746	LDW COMMON		45004560
01267	0	26000	0	01750	FMP COMMON+2		45004570
01270	0	60100	0	01750	STQ COMMON+2		45004580
01271	0	30000	0	02006	FAD M4		45004590
01272	0	60100	0	02006	STQ M4		45004600
01273	0	56000	0	01746	LDW COMMON		45004610
01274	0	26000	0	01750	FMP COMMON+2		45004620
01275	0	30000	0	02007	FAD M5		45004630
01276	0	60100	0	02007	STQ M5		45004640
01277	-0	75400	0	00000	PXD		45004650
01300	0	56000	0	01751	LDW COMMON+3		45004660
01301	0	22100	0	02050	DVP IN L		45004670
01302	-0	60000	0	01751	STQ COMMON+3		45004680
01303	0	50000	0	01751	CLA COMMON+3		45004690
01304	0	76000	0	00006	COM		45004700
01305	0	40000	0	02054	ADD 1F		45004710
01306	-0	32000	0	02076	ANA MASK		04504725
01307	-0	76000	0	00141	BOXA3 SLT 1		45004730
01310	0	02000	0	01312	TRA **2		45004740
01311	0	02000	0	01322	TRA BOXAB-1		45004750
01312	0	76000	0	00141	SLT 1		45004760
01313	0	56000	0	02051	LDW ZLRO		4765
01314	0	76500	0	00021	LRS 17	31	04504770
01315	-0	60000	0	01753	STQ COMMON+3		45004780

BESYS 2: SAP 3-7 ASSEMBLY OF OVERLAY PROGRAM PAGE 9

01316	0	50000	0	01747	CLA COMMON+1	45004790
01317	0	50100	0	01746	STO COMMON	45004800
01320	0	50000	0	01752	CLA COMMON+4	45004810
01321	0	60100	0	01751	STO COMMON+3	45004820
01322	0	02000	0	01250	TRA BOXA9	45004830
01323	0	60100	0	01751	STO COMMON+3	45004840
01324	-0	50000	1	00000	BOXA8 CAL **+1	45004850
01325	-0	32000	0	02074	ANA SIGHT	45004860
01326	-0	50100	0	01751	ORA COMMON+3	45004870
01327	-0	50100	0	01753	ORA COMMON+5	45004880
01330	0	60200	1	00000	SLW **+1	45004890
01331	2	00001	1	01223	BOXA5 TIX BOXA4+1,1	4900
01332	0	53400	1	02063	LXA 200F,1	45004910
01333	0	60000	1	00340	STZ OP+200,1	45004920
01334	2	00001	1	01333	TIX **+1,1,1	45004930
01335	0	53400	2	02014	LXA 100M,2	45004940
01336	0	76000	0	00140	BOXA6 SLF	45004950
01337	0	50000	2	00300	CLA **+2	04504960
01340	0	73400	4	00000	PAX 0,4	45004970
01341	-0	73400	1	00000	PDX 0,1	45004980
01342	-0	12000	0	01344	TMI **+2	45004990
01343	0	76000	0	00141	SLN 1	45005000
01344	0	76500	0	00021	LRS 17	45005010
01345	0	76000	0	00001	LBT	45005020
01346	0	02000	0	01532	TRA BOXAF	45005030
01347	0	50000	0	02054	CLA IF	45005040
01350	0	40000	4	00030	ADD OP,4	04505050
01351	0	60100	4	00030	STO OP,4	04505060
01352	-0	76000	0	00141	BOXAH SLT 1	45005070
01353	0	02000	0	01536	TRA BOXAG	45005080
01354	0	50000	0	02054	CLA IF	45005090
01355	0	40000	1	00174	ADD OP+100,1	04505100
01356	0	60100	1	00174	STO OP+100,1	04505110
01357	2	00301	2	01336	TIX BOXAL,2,1	45005120
01360	0	76000	0	00140	SLF	45005123
01361	0	07400	4	70007	TSX OUTPUT,4	04505126
01362	0	00011	0	01712	RPPR,0,9	04505127
01363	-1	02011	0	02010	MON REPC,0,REP	04505128
01364	0	07400	4	70007	TSX OUTPUT,4	04505129
01365	0	00013	0	01723	ORPPR,0,11	04505130
01366	-1	02011	0	02010	MON REPC,0,REP	04505131
01367	0	07400	4	70007	TSX OUTPUT,4	04505132
01370	0	00011	0	01731	DOSE,0,9	04505133
01371	-1	02003	0	02001	MON USUM,0,M1	04505134
01372	0	50000	0	01715	BOXAK CLA PI	04505135
01373	0	60100	0	01412	STO BOXAI	45005140
01374	0	50000	0	01716	CLA PO	45005150
01375	0	60100	0	01415	STO BOXAI+3	45005160
01376	0	60200	0	01755	STZ READ	45005170
01377	0	53400	1	02045	LXA NONTR,1	5180
01400	0	53400	2	02057	LXA 10F,2	45005190
01401	0	50000	2	01767	BOXAJ CLA READ+10,2	45005200
01402	0	40000	0	02030	ADD DEL	45005210
01403	0	60100	2	01770	STO READ+11,2	45005220
01404	2	00001	2	01402	TIX **+2,2,1	45005230
01405	0	07400	4	70007	TSX OUTPUT,4	45005240
01406	0	00011	0	01701	INTR,0,9	45005250
01407	-1	01766	0	01755	MON READ,0,READ+9	45005260
01410	0	07400	4	70007	TSX OUTPUT,4	45005270
01411	0	00011	0	01704	INPR,1,0,9	45005280
01412	-1	00011	0	00000	BOXAI MON **+0,**+9	45005290
01413	0	07400	4	70007	TSX OUTPUT,4	45005300

BESYS 2: SAP 3-7 ASSEMBLY OF OVERLAY PROGRAM PAGE 10

01414	0	00011	0	01707	OUTPH,0,9	45005310
01415	-1	00155	0	00144	MON ***100,0,***+109	45005320
01416	0	50000	0	01412	CLA BOXA1	45005330
01417	0	40200	0	02070	SUB MOD	45005340
01420	0	60100	0	01412	STO BOXA1	45005350
01421	0	50000	0	01415	CLA BOXA1+3	45005360
01422	0	40200	0	02070	SUB MOD	45005370
01423	0	60100	0	01415	STO BOXA1+3	45005380
01424	0	50000	0	01767	CLA READ+10	45005390
01425	0	60100	0	01755	STO READ	45005400
01426	2	00012	1	01400	TIX BOXAJ-1,1,10	04505410
01427	-0	76000	0	00141	SLT 1	45005420
01430	0	02000	0	01432	TRA **2	45005430
01431	0	02000	0	01501	TRA BOXAM	45005440
01432	0	50000	0	02052	CLA PROR	45005441
01433	0	10000	0	01465	TZE DACC	04505442
01434	0	53400	1	02066	LXA ZOF,1	04505443
01435	0	60000	1	02001	STZ READ+20,1	04505444
01436	2	00001	1	01435	TIX *-1,1,1	04505445
01437	0	50000	0	00030	CLA OP	04505446
01440	0	40000	0	00174	ADD OP+100	04505447
01441	0	60100	0	01755	STO READ	04505448
01442	0	53400	1	02061	LXA 99F,1	04505449
01443	0	53400	2	02053	LXA ZERO,2	04505450
01444	0	50000	0	02030	CLA DEL	04505451
01445	0	77100	0	00001	ARS 1	04505452
01446	0	40000	0	02030	ADD DEL	04505453
01447	0	60100	0	02047	STO X	04505454
01450	0	34000	2	02101	CAS PROT,2	04505455
01451	1	77777	2	01450	TIX *-1,2,-1	04505456
01452	0	76100	0	00000	NOP	04505457
01453	0	50000	2	01756	CLA READ+1,2	04505458
01454	0	40000	1	00174	ADD OP+100,1	04505459
01455	0	40000	1	00340	ADD OP+200,1	04505460
01456	0	60100	2	01756	STO READ+1,2	04505461
01457	0	50000	0	02047	CLA X	04505462
01460	0	40000	0	02030	ADD DEL	04505463
01461	2	00001	1	01447	TIX Q,1,1	04505464
01462	0	07400	4	70007	LSX OUTPUT,4	04505465
01463	0	70011	0	01742	PROBIT,0,9	04505466
01464	-1	02000	0	01755	MON READ,0,READ+19	04505467
01465	0	76000	0	00141	DACC SLN 1	04505468
01466	0	53400	1	02061	LXA 99F,1	04505469
01467	0	53400	2	02053	LXA ZERO,2	45005470
01470	0	50000	2	00173	BOXAL CLA OP+99,2	45005480
01471	0	40000	2	00172	ADD OP+98,2	45005490
01472	0	60100	2	00172	STO OP+98,2	45005500
01473	0	50000	2	00357	CLA OP+199,2	45005510
01474	0	40000	2	00326	ADD OP+198,2	45005520
01475	0	60100	2	00336	STO OP+198,2	45005530
01476	1	00001	2	01477	TIX *-1,2,1	45005540
01477	2	00001	1	01470	TIX BOXAL,1,1	45005550
01500	0	02000	0	01372	TRA BOXAM	45005560
01501	0	50000	0	02014	BOXAM CLA TDIM	45005570
01502	0	76700	0	00001	ALS 1	45005580
01503	-0	50100	0	02071	ORA FLZ	45005590
01504	0	30000	0	02053	FAD ZERO	45005600
01505	0	60100	0	01746	STO COMMON	45005610
01506	0	53400	1	02056	LXA 5F,1	45005620
01507	0	50000	1	02010	CLA M1+5,1	45005630
01510	0	26100	0	01746	POP COMMON	45005640
01511	-0	60000	1	02010	STQ M1+5,1	45005650

BESYS 2, SAP 3-7 ASSEMBLY OF OVERLAY PROGRAM PAGE 11

01512	2	00001	1	01507	TIX *-3,1,1	45005660
01513	0	07400	4	70007	TSX OUTPUT,4	45005670
01514	0	00011	0	01717	MDM,0,9	45005680
01515	-1	02007	0	02003	MON M1,0,N5	45005690
01516	0	07400	4	70007	TSX OUTPUT,4	45005695
01517	0	00011	0	01736	RDP,0,9	45005696
01520	-1	01663	0	01663	MON RDNO+8,0,RDNO+8	04505697
01521	0	50000	0	02011	CLA REP	45005700
01522	0	40200	0	02010	SUB REPC	45005710
01523	0	10000	0	01530	TZE END	45005720
01524	0	50000	0	02010	CLA REPC	45005730
01525	0	40000	0	02054	ADD IF	45005740
01526	0	60100	0	02010	STU REPC	45005750
01527	0	02000	0	00723	TRA EXIO9	45005760
01530	0	10000	0	00340	END TZE BOX11	45005770
01531	0	07400	4	70022	TSX RETURN,4	45005780
01532	0	50000	0	02054	BOXAF CLA IF	45005790
01533	0	40000	4	00174	ADD OP+100,4	04505800
01534	0	60100	4	00174	STO OP+100,4	04505810
01535	0	02000	0	01352	TRA BOXAH	45005820
01536	0	50000	0	02054	BOXAG CLA IF	45005830
01537	0	40000	1	00030	ADD OP,1	04505840
01540	0	60100	1	00030	STO OP,1	04505850
01541	0	02000	0	01357	TRA BOXAH+5	45005860
01542	0	56000	0	02055	BOXGA LDQ 2F	45005870
01543	-0	60000	0	01746	STQ COMMON	45005880
01544	0	02000	0	00752	TRA BOXG3	45005890
01545	0	56000	0	02055	BOXGB LDQ 2F	45005900
01546	-0	60000	0	01747	STQ COMMON+1	45005910
01547	0	02000	0	00761	TRA BOXG5	45005920
01550	0	53400	1	02060	NMN LXA 12F,1	45005930
01551	0	60000	0	02047	STZ X	45005940
01552	0	60000	0	02050	STZ Y	45005950
01553	0	07400	4	01653	TSX RDNO,4	45005960
01554	-0	75400	0	00000	PXD	45005970
01555	0	76300	0	00022	LLS 18	45005980
01556	0	40000	0	02047	ADD X	45005990
01557	0	60100	0	02047	STU X	45006000
01560	0	07400	4	01653	TSX RDNO,4	45006010
01561	-0	75400	0	00000	PXD	45006020
01562	0	76300	0	00022	LLS 18	45006030
01563	0	40000	0	02050	ADD Y	45006040
01564	0	60100	0	02050	STU Y	45006050
01565	2	00001	1	01553	TIX NMN+3,1,1	45006060
01566	0	40200	0	02064	SUB GC	45006070
01567	0	76500	0	00037	LR5 31	45006080
01570	0	40000	0	02046	MPY SIGMAY	45006090
01571	0	76300	0	00015	LLS 13	04506100
01572	0	60100	0	01746	STU COMMON	6101
01573	0	76000	0	00003	SSP	6102
01574	0	40200	0	02032	SUB RY	6103
01575	0	10000	0	01577	TZE *+2	6104
01576	0	12000	0	00732	TPL BOXG1	6105
01577	0	50000	0	01746	CLA COMMON	6106
01600	0	40000	0	02021	ADD YO	6107
01601	0	60100	0	02050	STU Y	04506110
01602	0	50000	0	02047	CLA X	45006120
01603	0	40200	0	02064	SUB GC	45006130
01604	0	76500	0	00037	LR5 31	45006140
01605	0	40000	0	02043	MPY SIGMA	45006150
01606	0	76300	0	00015	LLS 13	04506160
01607	0	40000	0	02020	ADD XO	04506170

BESYS 2: SAP 3-7 ASSEMBLY OF OVERLAY PROGRAM PAGE 12

01610	0	60100	0	02047	STO X		04506170
01611	-0	12000	0	00732	TMI BOXG1		6174
01612	0	40200	0	02034	SUB DIA		6178
01613	0	10000	0	01615	TZE *+2		6180
01614	0	12000	0	00732	TPL BOXG1		6185
01615	0	02000	0	00744	TRA BOXGR		04506190
01616	0	50000	0	02031	BOXREC CLA RX		45006200
01617	0	40200	0	01751	SUB COMMON+3		45006210
01620	0	12000	0	01622	TPL *+2	POSSIBLY INSIDE	45006220
01621	0	02000	0	00717	TRA BX108		45006230
01622	0	50000	0	02023	CLA Y1		45006240
01623	0	40200	0	02021	SUB Y0		45006250
01624	0	76000	0	00003	SSP		04506255
01625	0	56000	0	02032	LDQ RY		45006260
01626	0	04000	0	00717	TLQ BX108	OUTSIDE	45006270
01627	0	02000	0	00671	TRA BX102	INSIDE	45006280
01630	0	76500	0	00043	BOXB1 LRS 35		45006290
01631	0	02000	0	01133	TRA BOXA1+2		45006300
01632	0	76500	0	00043	BOXB2 LRS 35		45006310
01633	0	02000	0	01140	TRA BOXA2+3		45006320
01634	0	07400	4	70013	ERROR TSX XPRINT,4		45006330
01635	-1	01731	0	01726	MON LRP,0,ERP+3		45006340
01636	0	07400	4	70024	TSX ENDJOB,4		45006350
01637	0	56000	0	02100	RDMN LDQ TRA		04506360
01640	0	76000	0	00003	SSP		04506370
01641	0	02000	0	00427	TRA ROG		04506380
01642	-0	53400	4	02041	RDMON LXD MUNC,4		04506390
01643	1	00001	4	01644	TXI *+1,4,1		04506400
01644	-0	63400	4	02041	SXD MUNC,4		04506401
01645	0	07400	4	70010	TSX XINPUT,4		04506410
01646	0	00000	0	00000	U,0,0		04506411
01647	-1	02050	0	02047	MON X,0,Y		04506412
01650	0	50000	0	02050	CLA Y		04506420
01651	0	10000	0	01126	TZL OUT		04506430
01652	0	02000	0	00744	TRA BOXGR		04506440
01653	0	56000	0	01663	RDMN LDQ RDNO+8	RANDOM	45007000
01654	0	20000	0	01664	MPY RDNO+9	NUMBER	45007001
01655	-0	60000	0	01663	STG RDNO+8	SUBROUTINE	45007002
01656	-0	50000	0	01662	CAL RDNO+7		45007003
01657	0	76300	0	00033	LLS 27		45007004
01660	0	76100	0	00000	NOF		45007005
01661	0	02000	0	01666	TRA RDNO+11		45007006
01662	0000000000000000				OC1 0000000000000000		45007007
01663	+343277244615				OC1 343277244615		45007008
01664	+343277244615				OC1 343277244615		45007009
01665	+2000000000000000				OC1 2000000000000000		45007010
01666	0	56000	0	02053	LDQ ZLRO		45007011
01667	0	76300	0	00032	LRS 26		45007012
01670	0	02000	4	00001	TRA 1,4		45007013
01671	740030013145				ID BCD 416HINPUT14ROUNTO,0001		04508000
01672	476463010445						
01673	067345010473						
01674	450634606000						
01675	740330000013				XPRT BCD 2(JHUX=N8)		45008001
01676	451034600000						
01677	7403300000100				YPRT BCD 2(JH 10N11)		45008002
01700	450101346060						
01701	7410300002343				INTR BCD 3(0H0CLAS5 10N11)		45008003
01702	216262606001						
01703	004501013460						
01704	7410300003145				INPRT BCD 3(0H 10N11)		45008004
01705	623164256001						

BESYS 2: SAP 3-7 ASSEMBLY OF OVERLAY PROGRAM PAGE 13

01706	004501013460				45008009
01707	741030604054	OUTPR BCD 3(8H OUTSIDE10N11)			
01710	630231242501				
01711	004501013460				
01712	740430015164	RPPK BCD 3(4H RUNN3,3H OFN3)			04508006
01713	454502730320				
01714	604626450334				
01715	-1 00041 0 00030	PI MON OP+0,OP+9			45008007
01716	-1 00209 0 00174	PO MON OP+100+0,OP+109			45008008
01717	740102300044	MON BCD 4(12H MOMENTS ARE5E20+8)			45008009
01720	464425656362				
01721	602151250525				
01722	020033103460				
01723	740430005164	URPPK BCD 3(4H RUNN3,3H OFN3)			04508010
01724	454503730310				
01725	604626450334				
01726	472103032554	ERP BCD 3(PATTERN IS WRONG			45008011
01727	456351626066				
01728	514645276060				
01729	740100306024	DOSE BCD 5(10H DOSE SUM5N10,2E20+8)			45008012
01732	466225006264				
01733	446245010073				
01734	022502063310				
01735	346060666060				
01736	740105305034	RDP BCD 4(15H RANDOM NUMBER=N12)			45008013
01737	214524464460				
01740	456446223551				
01741	134501023460				
01742	741030004751	PROBIT BCD 4(8H PROBIT 10N6,10N5)			04508014 *
01743	462231636001				
01744	004506730100				
01745	450334606366				
		ARRAY STORAGE			
	01746 COMMON BSS 1				45008200
	01755 READ BSS 20				45008201
02001	0 00000 0 00000	02001			04508202
02002	0 00000 0 00000	02002			45008203
02003	0 00000 0 00000	02003			45008204
02004	0 00000 0 00000	02004			45008205
02005	0 00000 0 00000	02005			45008206
02006	0 00000 0 00000	02006			45008207
02007	0 00000 0 00000	02007			45008208
02008	0 00000 0 00000	02008			45008209
02009	0 00000 0 00000	02009			45008210
02010	0 00000 0 00000	02010			45008211
02011	0 00000 0 00000	02011			45008212
		02011	PROT	13	04508213 *
					45008214
					45008215
					45008216
					45008217
					45008218
					45008219
					45008220
					45008221
					45008222
					45008223
					45008224
					45008225
					45008226
					45008227
					45008228
					45008229
					45008230
					45008231
					45008232
					45008233
					45008234
					45008235

BESYS 2, SAP 3-7 ASSEMBLY OF OVERLAY PROGRAM PAGE 14

02034	0 00000 0 00000	RY	45008326
02035	0 00000 0 00000	RSQ	45008327
02036	0 00000 0 00000	RIA	45008328
02037	0 00000 0 00000	RIAY	45008329
02038	0 00000 0 00000	YI	45008330
02039	0 00000 0 00000	YIP	45008331
02040	0 00000 0 00000	MUN	45008332
02041	0 00000 0 00000	MUNC	45008333
02042	0 00000 0 00000	NSIG	45008334
02043	0 00000 0 00000	SIGMA	45008335
02044	0 00000 0 00000	GSIG	45008336
02045	0 00000 0 00000	MONTR	45008337
	02046	SIGMA	45008338
	02047	0 00000 0 00000	0359
	02050	0 00000 0 00000	8340
	02051	0POP	04508341
	02052	PROB	04508342
		NONLIRIC CONSTANTS	45008343
02053	+000000000000	ZERO DEC 0	45008344
02054	+000000000001	1F DEC 1	45008345
02055	+000000000002	2F DEC 2	45008346
02056	+000000000003	3F DEC 3	45008347
02057	+000000000004	4F DEC 4	45008348
02058	+000000000005	5F DEC 5	45008349
02059	+000000000006	6F DEC 6	45008350
02060	+000000000007	7F DEC 7	45008351
02061	+000000000008	8F DEC 8	45008352
02062	+000000000009	9F DEC 9	45008353
02063	+000000000010	10F DEC 10	45008354
02064	+000000000011	11F DEC 11	45008355
02065	+000000000012	12F DEC 12	45008356
02066	+000000000013	13F DEC 13	45008357
02067	+000000000014	14F DEC 14	45008358
02068	+000000000015	15F DEC 15	45008359
02069	+000000000016	16F DEC 16	45008360
02070	+000000000017	17F DEC 17	45008361
02071	+000000000018	18F DEC 18	45008362
02072	+000000000019	19F DEC 19	45008363
02073	+000000000020	20F DEC 20	45008364
02074	+000000000021	21F DEC 21	45008365
02075	+000000000022	22F DEC 22	45008366
02076	+000000000023	23F DEC 23	45008367
02077	+000000000024	24F DEC 24	45008368
02078	+000000000025	25F DEC 25	45008369
02079	+000000000026	26F DEC 26	45008370
02080	+000000000027	27F DEC 27	45008371
02081	+000000000028	28F DEC 28	45008372
02082	+000000000029	29F DEC 29	45008373
02083	+000000000030	30F DEC 30	45008374
02084	+000000000031	31F DEC 31	45008375
02085	+000000000032	32F DEC 32	45008376
02086	+000000000033	33F DEC 33	45008377
02087	+000000000034	34F DEC 34	45008378
02088	+000000000035	35F DEC 35	45008379
02089	+000000000036	36F DEC 36	45008380
02090	+000000000037	37F DEC 37	45008381
02091	+000000000038	38F DEC 38	45008382
02092	+000000000039	39F DEC 39	45008383
02093	+000000000040	40F DEC 40	45008384
02094	+000000000041	41F DEC 41	45008385
02095	+000000000042	42F DEC 42	45008386
02096	+000000000043	43F DEC 43	45008387
02097	+000000000044	44F DEC 44	45008388
02098	+000000000045	45F DEC 45	45008389
02099	+000000000046	46F DEC 46	45008390
02100	+000000000047	47F DEC 47	45008391
02101	+000000000048	48F DEC 48	45008392
02102	+000000000049	49F DEC 49	45008393
02103	+000000000050	50F DEC 50	45008394
02104	+000000000051	51F DEC 51	45008395
02105	+000000000052	52F DEC 52	45008396
02106	+000000000053	53F DEC 53	45008397
02107	+000000000054	54F DEC 54	45008398
02108	+000000000055	55F DEC 55	45008399
02109	+000000000056	56F DEC 56	45008400
02110	+000000000057	57F DEC 57	45008401
02111	+000000000058	58F DEC 58	45008402
02112	+000000000059	59F DEC 59	45008403
02113	+000000000060	60F DEC 60	45008404
02114	+000000000061	61F DEC 61	45008405
02115	+000000000062	62F DEC 62	45008406
02116	+000000000063	63F DEC 63	45008407
02117	+000000000064	64F DEC 64	45008408
02118	+000000000065	65F DEC 65	45008409
02119	+000000000066	66F DEC 66	45008410
02120	+000000000067	67F DEC 67	45008411
02121	+000000000068	68F DEC 68	45008412
02122	+000000000069	69F DEC 69	45008413
02123	+000000000070	70F DEC 70	45008414
02124	+000000000071	71F DEC 71	45008415
02125	+000000000072	72F DEC 72	45008416
02126	+000000000073	73F DEC 73	45008417
02127	+000000000074	74F DEC 74	45008418
02128	+000000000075	75F DEC 75	45008419
02129	+000000000076	76F DEC 76	45008420
02130	+000000000077	77F DEC 77	45008421
02131	+000000000078	78F DEC 78	45008422
02132	+000000000079	79F DEC 79	45008423
02133	+000000000080	80F DEC 80	45008424
02134	+000000000081	81F DEC 81	45008425
02135	+000000000082	82F DEC 82	45008426
02136	+000000000083	83F DEC 83	45008427
02137	+000000000084	84F DEC 84	45008428
02138	+000000000085	85F DEC 85	45008429
02139	+000000000086	86F DEC 86	45008430
02140	+000000000087	87F DEC 87	45008431
02141	+000000000088	88F DEC 88	45008432
02142	+000000000089	89F DEC 89	45008433
02143	+000000000090	90F DEC 90	45008434
02144	+000000000091	91F DEC 91	45008435
02145	+000000000092	92F DEC 92	45008436
02146	+000000000093	93F DEC 93	45008437
02147	+000000000094	94F DEC 94	45008438
02148	+000000000095	95F DEC 95	45008439
02149	+000000000096	96F DEC 96	45008440
02150	+000000000097	97F DEC 97	45008441
02151	+000000000098	98F DEC 98	45008442
02152	+000000000099	99F DEC 99	45008443
02153	+000000000100	100F DEC 100	45008444
02154	+000000000101	101F DEC 101	45008445
02155	+000000000102	102F DEC 102	45008446
02156	+000000000103	103F DEC 103	45008447
02157	+000000000104	104F DEC 104	45008448
02158	+000000000105	105F DEC 105	45008449
02159	+000000000106	106F DEC 106	45008450
02160	+000000000107	107F DEC 107	45008451
02161	+000000000108	108F DEC 108	45008452
02162	+000000000109	109F DEC 109	45008453
02163	+000000000110	110F DEC 110	45008454
02164	+000000000111	111F DEC 111	45008455
02165	+000000000112	112F DEC 112	45008456
02166	+000000000113	113F DEC 113	45008457
02167	+000000000114	114F DEC 114	45008458
02168	+000000000115	115F DEC 115	45008459
02169	+000000000116	116F DEC 116	45008460
02170	+000000000117	117F DEC 117	45008461
02171	+000000000118	118F DEC 118	45008462
02172	+000000000119	119F DEC 119	45008463
02173	+000000000120	120F DEC 120	45008464
02174	+000000000121	121F DEC 121	45008465
02175	+000000000122	122F DEC 122	45008466
02176	+000000000123	123F DEC 123	45008467
02177	+000000000124	124F DEC 124	45008468
02178	+000000000125	125F DEC 125	45008469
02179	+000000000126	126F DEC 126	45008470
02180	+000000000127	127F DEC 127	45008471
02181	+000000000128	128F DEC 128	45008472
02182	+000000000129	129F DEC 129	45008473
02183	+000000000130	130F DEC 130	45008474
02184	+000000000131	131F DEC 131	45008475
02185	+000000000132	132F DEC 132	45008476
02186	+000000000133	133F DEC 133	45008477
02187	+000000000134	134F DEC 134	45008478
02188	+000000000135	135F DEC 135	45008479
02189	+000000000136	136F DEC 136	45008480
02190	+000000000137	137F DEC 137	45008481
02191	+000000000138	138F DEC 138	45008482
02192	+000000000139	139F DEC 139	45008483
02193	+000000000140	140F DEC 140	45008484
02194	+000000000141	141F DEC 141	45008485
02195	+000000000142	142F DEC 142	45008486
02196	+000000000143	143F DEC 143	45008487
02197	+000000000144	144F DEC 144	45008488
02198	+000000000145	145F DEC 145	45008489
02199	+000000000146	146F DEC 146	45008490
02200	+000000000147	147F DEC 147	45008491
02201	+000000000148	148F DEC 148	45008492
02202	+000000000149	149F DEC 149	45008493
02203	+000000000150	150F DEC 150	45008494
02204	+000000000151	151F DEC 151	45008495
02205	+000000000152	152F DEC 152	45008496
02206	+000000000153	153F DEC 153	45008497
02207	+000000000154	154F DEC 154	45008498
02208	+000000000155	155F DEC 155	45008499
02209	+000000000156	156F DEC 156	45008500
02210	+000000000157	157F DEC 157	45008501
02211	+000000000158	158F DEC 158	45008502
02212	+000000000159	159F DEC 159	45008503
02213	+000000000160	160F DEC 160	45008504
02214	+000000000161	161F DEC 161	45008505
02215	+000000000162	162F DEC 162	45008506
02216	+000000000163	163F DEC 163	45008507
02217	+000000000164	164F DEC 164	45008508
02218	+000000000165	165F DEC 165	45008509
02219	+000000000166	166F DEC 166	45008510
02220	+000000000167	167F DEC 167	45008511
02221	+000000000168	168F DEC 168	45008512
02222	+000000000169	169F DEC 169	45008513
02223	+000000000170	170F DEC 170	45008514
02224	+000000000171	171F DEC 171	45008515
02225	+000000000172	172F DEC 172	45008516
02226	+000000000173	173F DEC 173	45008517
02227	+000000000174	174F DEC 174	45008518
02228	+000000000175	175F DEC 175	45008519
02229	+00000		

SAMPLE INPUT FOR OVERLAY PROGRAM

DEC	1,5,3,2,1,0,6,3,0,0,-3,2,0,20,30517578123,5	CARD	1
DEC	1,40,80,120,160	CARD	2
DFC	200,190,180	CARD	3-1
DFC	150,140,130	CARD	3-2
DEC	100,90,80	CARD	3-3
DEC	60,50,40	CARD	3-4
DEC	10,6,0	CARD	3-5
DEC	99999,99999,99999,99999,99999,99999,99999,99999,99999,99999	CARD	4
DEC	1,5,3,2,1,0,-6,0,0,0,-3,2,0,40,0,4	CARD	1
DEC	1,20,80,190	CARD	2
DEC	200,190,180	CARD	3-1
DEC	150,140,130	CARD	3-2
DEC	100,90,80	CARD	3-3
DEC	60,50,40	CARD	3-4
DEC	10,6,0	CARD	3-5
DEC	99999,99999,99999,99999,99999,99999,99999,99999,99999,99999	CARD	4
DEC	6,6	CARD	5-1
DEC	14,7	CARD	5-1
DFC	10,6	CARD	5-6
DEC	0,0	CARD	5-7
DEC	6,6	CARD	5-1
DEC	6,7	CARD	5-2
DEC	6,8	CARD	5-3
DEC	8,6	CARD	5-4
DEC	10,6	CARD	5-6
DEC	14,6	CARD	5-7
DFC	0,0	CARD	5-9
DEC	1,5,3,2,1,0,-6,0,0,0,-3,2,0,40,0,0	CARD	1
DEC	200,190,180	CARD	3-1
DEC	150,140,130	CARD	3-2
DEC	100,90,80	CARD	3-3
DEC	60,50,40	CARD	3-4
DEC	10,6,0	CARD	3-5
DEC	99999,99999,99999,99999,99999,99999,99999,99999,99999,99999	CARD	4
DEC	6,7	CARD	5-1
DEC	8,8	CARD	5-2
DEC	6,8	CARD	5-4
DEC	8,6	CARD	5-6
DEC	2,6	CARD	5-5
DEC	2,11	CARD	5-6
DFC	0,0	CARD	5-7
DEC	1,10	CARD	5-1
DFC	5,6	CARD	5-2
DEC	3,5	CARD	5-3
DEC	10,4	CARD	5-4
DEC	9,6	CARD	5-5
DEC	8,13	CARD	5-6
DEC	11,10	CARD	5-7
DEC	0,0	CARD	5-8
DEC	1,5,3,2,1,0,6,3,0,0,3,2,0,50,30517578123,0	CARD	1
DEC	200,190,180	CARD	3-1
DFC	150,140,130	CARD	3-2
DFC	100,90,80	CARD	3-3
DEC	60,50,40	CARD	3-4
DEC	10,6,0	CARD	3-5
DEC	99999,99999,99999,99999,99999,99999,99999,99999,99999,99999	CARD	4
DEC	1,5,3,2,1,1,6,0,3,3,3,2,1,20,30517578123,0	CARD	1
DEC	200,190,180	CARD	3-1
DEC	150,140,130	CARD	3-2
DEC	100,90,80	CARD	3-3
DEC	60,50,40	CARD	3-4
DFC	10,6,0	CARD	3-5
DFC	99999,99999,99999,99999,99999,99999,99999,99999,99999,99999	CARD	4

MACHINE OUTPUT FROM OVERLAY PROGRAM FOR SAMPLE PROBLEMS PAGE 1

JOB 04500FV HALL W FINAL OVERLAY ROUTINE AUGUST 11, 1961

LOD 0

99.77

00403 OCT 802123002102

01443 OCT 053400202052

01450 OCT 034000202101

01454 OCT 040000100174

01742 OCT 741030004751

TRA

INPUT 1 5 3 3 1 0 6 3 0 0 3 2 0 20 30517570123 5

MACHINE OUTPUT FROM OVERLAY PROGRAM FOR SAMPLE PROBLEMS PAGE 2

RUN 1 OF 2
DOSE SUMS 2332 0.69960000E 04 0.69960000E 04

CLASS	0	24	48	72	96	120	144	168	192	216
INSIDE	20	0	0	2	1	9	1	9	2	0
OUTSIDE	84	3	2	1	3	1	0	1	0	0
CLASS	240	264	288	312	336	360	384	408	432	456
INSIDE	0	2	1	2	0	1	0	0	0	2
OUTSIDE	0	0	0	0	0	0	0	0	0	0
PROBIT	104	3	6	10	1	26	0	0	0	0
CLASS	0	24	48	72	96	120	144	168	192	216
INSIDE	49	29	29	29	26	25	20	19	10	8
OUTSIDE	95	11	8	6	5	2	1	1	0	0
CLASS	240	264	288	312	336	360	384	408	432	456
INSIDE	8	8	6	5	3	3	2	2	2	2
OUTSIDE	0	0	0	0	0	0	0	0	0	0

MOMENTS ARE 0.48583332E 02 0.11468111E 05 0.34291463E 07 0.12016983E 10 0.46980759E 12
RANDOM NUMBER= 16878292595

RUN 2 OF 2
DOSE SUMS 2332 0.69960000E 04 0.69960000E 04

CLASS	0	24	48	72	96	120	144	168	192	216
INSIDE	16	0	7	2	0	6	0	5	2	4
OUTSIDE	87	2	0	2	0	2	0	2	0	0
CLASS	240	264	288	312	336	360	384	408	432	456
INSIDE	0	0	1	4	0	1	0	0	0	1
OUTSIDE	0	0	0	0	0	0	0	0	0	0
PROBIT	103	2	11	8	0	26	0	0	0	0
CLASS	0	24	48	72	96	120	144	168	192	216
INSIDE	49	33	33	26	24	24	18	18	13	11
OUTSIDE	95	0	6	6	4	4	2	2	0	0
CLASS	240	264	288	312	336	360	384	408	432	456
INSIDE	7	7	7	6	2	2	1	1	1	1
OUTSIDE	0	0	0	0	0	0	0	0	0	0

MOMENTS ARE 0.48583332E 02 0.11179277E 05 0.31369839E 07 0.10010459E 10 0.34965611E 12
RANDOM NUMBER= 1218138651

MACHINE OUTPUT FROM OVERLAY PROGRAM FOR SAMPLE PROBLEMS PAGE 3

INPUT 1 5 3 2 1 0 -6 0 0 0 -3 2 0 40 0 4

RUN 1 OF 2 DOSE SUMS		2332	0.69960000E 04	0.46640000E 04																
CLASS	0	10	20	30	40	50	60	70	80	90										
INSIDE	40	0	0	0	0	0	0	0	0	0										
OUTSIDE	150	2	0	0	2	0	0	0	1	2										
CLASS	100	110	120	130	140	150	160	170	180	190										
INSIDE	0	0	0	1	0	0	0	1	2	2										
OUTSIDE	0	2	0	1	0	0	0	1	0	0										
CLASS	200	210	220	230	240	250	260	270	280	290										
INSIDE	0	0	0	0	0	0	0	2	0	2										
OUTSIDE	0	0	0	0	0	0	0	0	0	0										
CLASS	300	310	320	330	340	350	360	370	380	390										
INSIDE	0	0	0	0	0	0	0	2	0	2										
OUTSIDE	0	0	0	0	0	0	0	0	0	0										
PROBII	190	2	4	12	8	0	0	0	0	0										
CLASS	0	10	20	30	40	50	60	70	80	90										
INSIDE	55	15	15	15	15	15	15	15	15	14										
OUTSIDE	161	11	9	9	9	7	7	7	7	6										
CLASS	100	110	120	130	140	150	160	170	180	190										
INSIDE	14	14	14	14	13	13	13	13	12	10										
OUTSIDE	4	4	2	2	1	1	1	1	0	0										
CLASS	200	210	220	230	240	250	260	270	280	290										
INSIDE	8	8	8	8	8	8	8	8	6	6										
OUTSIDE	0	0	0	0	0	0	0	0	0	0										
CLASS	300	310	320	330	340	350	360	370	380	390										
INSIDE	4	4	4	4	4	4	4	4	2	2										
OUTSIDE	0	0	0	0	0	0	0	0	0	0										
MOMENTS ARE	0.21592592E 02	0.54517777E 04	0.16341232E 07	0.53696884E 09	0.18596196E 12															
RANDOM NUMBER=	1218130651																			

MACHINE OUTPUT FROM OVERLAY PROGRAM FOR SAMPLE PROBLEMS PAGE 4

RUN 2 OF 2											
DOSE SUMS		2332	0.699960000E 04			0.118600000E 05					
CLASS	0	23	46	69	92	115	138	161	184	207	
INSIDE	25	1	0	1	1	2	0	3	3	1	
OUTSIDE	151	1	1	2	0	1	2	1	2	0	
CLASS	230	253	276	299	322	345	368	391	414	437	
INSIDE	1	2	0	2	0	1	2	1	1	0	
OUTSIDE	0	0	0	0	0	0	0	0	0	0	
CLASS	460	483	506	529	552	575	598	621	644	667	
INSIDE	0	0	2	0	2	0	0	1	0	0	
OUTSIDE	0	0	0	0	0	0	0	0	0	0	
CLASS	690	713	736	759	782	805	828	851	874	897	
INSIDE	1	0	0	1	0	0	0	0	1	0	
OUTSIDE	0	0	0	0	0	0	0	0	0	0	
PROBIT	176	0	6	15	9	0	0	0	0	0	
CLASS	0	23	46	69	92	115	138	161	184	207	
INSIDE	55	30	29	29	28	27	25	25	22	19	
OUTSIDE	161	10	9	8	6	6	5	3	2	0	
CLASS	230	253	276	299	322	345	368	391	414	437	
INSIDE	18	17	15	15	13	13	12	10	9	8	
OUTSIDE	0	0	0	0	0	0	0	0	0	0	
CLASS	460	483	506	529	552	575	598	621	644	667	
INSIDE	8	8	8	6	6	4	4	4	3	3	
OUTSIDE	0	0	0	0	0	0	0	0	0	0	
CLASS	690	713	736	759	782	805	828	851	874	897	
INSIDE	3	2	2	2	1	1	1	1	1	0	
OUTSIDE	0	0	0	0	0	0	0	0	0	0	
MOMENTS ARE		0.53981481E 02		0.23600481E 05		0.13373762E 08		0.87451287E 10		0.62219984E 13	
RANDOM NUMBER=		1218138651									

MACHINE OUTPUT FROM OVERLAY PROGRAM FOR SAMPLE PROBLEMS PAGE 5

INPUT 1 3 3 2 1 0 -6 0 0 0 -3 2 0 40 0 0

RUN 1 OF 2
DOSE SUMS

2332 0.69960000E 04 0.13992000E 05

CLASS	0	16	32	48	64	80	96	112	128	144
INSIDE	13	0	0	0	0	1	1	1	2	1
OUTSIDE	143	0	3	5	2	4	0	0	1	0
CLASS	160	176	192	208	224	240	256	272	288	304
INSIDE	1	10	2	0	0	1	3	0	0	1
OUTSIDE	0	1	1	1	0	0	0	0	0	0
CLASS	320	336	352	368	384	400	416	432	448	464
INSIDE	3	2	2	3	0	1	0	0	1	0
OUTSIDE	0	0	0	0	0	0	0	0	0	0
CLASS	480	496	512	528	544	560	576	592	608	624
INSIDE	0	0	0	1	0	1	0	3	1	0
OUTSIDE	0	0	0	0	0	0	0	0	0	0
CLASS	0	16	32	48	64	80	96	112	128	144
INSIDE	55	42	42	42	42	42	41	40	39	37
OUTSIDE	161	18	18	15	10	8	4	4	4	3
CLASS	160	176	192	208	224	240	256	272	288	304
INSIDE	36	35	25	23	23	23	22	19	19	19
OUTSIDE	3	3	2	1	0	0	0	0	0	0
CLASS	320	336	352	368	384	400	416	432	448	464
INSIDE	18	15	13	11	8	8	7	7	7	6
OUTSIDE	0	0	0	0	0	0	0	0	0	0
CLASS	480	496	512	528	544	560	576	592	608	624
INSIDE	6	6	6	6	5	5	4	4	1	0
OUTSIDE	0	0	0	0	0	0	0	0	0	0

MOMENTS ARE 0.6411111E 02
RANDOM NUMBER= 1218138651

0.2205222E 02

0.94159760E 07

0.45754527E 10

0.23992750E 13

MACHINE OUTPUT FROM OVERLAY PROGRAM FOR SAMPLE PROBLEMS PAGE 6

RUN 2 OF 2	DOSE SUMS	2332	0.69960000E 04	0.16323999E 05							
CLASS	0	33	66	99	132	165	198	231	264	297	
INSIDE	25	1	1	2	0	6	2	0	1	1	
OUTSIDE	149	4	2	1	0	1	1	1	0	2	
CLASS	330	363	396	429	462	495	528	561	594	627	
INSIDE	0	2	0	1	0	1	1	0	1	1	
OUTSIDE	0	0	0	0	0	0	0	0	0	0	
CLASS	660	693	726	759	792	825	858	891	924	957	
INSIDE	1	0	0	1	0	1	1	0	2	0	
OUTSIDE	0	0	0	0	0	0	0	0	0	0	
CLASS	990	1023	1056	1089	1122	1155	1188	1221	1254	1287	
INSIDE	0	0	0	1	1	0	0	0	0	1	
OUTSIDE	0	0	0	0	0	0	0	0	0	0	
CLASS	0	33	66	99	132	165	198	231	264	297	
INSIDE	55	30	29	28	26	26	20	18	13	17	
OUTSIDE	161	12	8	6	5	5	4	3	2	2	
CLASS	330	363	396	429	462	495	528	561	594	627	
INSIDE	16	16	14	14	13	13	12	11	11	10	
OUTSIDE	0	0	0	0	0	0	0	0	0	0	
CLASS	660	693	726	759	792	825	858	891	924	957	
INSIDE	9	8	8	8	7	7	6	5	5	3	
OUTSIDE	0	0	0	0	0	0	0	0	0	0	
CLASS	990	1023	1056	1089	1122	1155	1188	1221	1254	1287	
INSIDE	3	3	3	3	2	1	1	1	1	1	
OUTSIDE	0	0	0	0	0	0	0	0	0	0	
MOMENTS ARE 0.75574073E 02 0.51506407E 05 0.45316290E 08 0.44741935E 11 0.47057766E 14											
RANDOM NUMBER= 1218138651											

MACHINE OUTPUT FROM OVERLAY PROGRAM FOR SAMPLE PROBLEMS PAGE 7

INPUT	1	5	2	2	1	0	6	3	0	0	3	2	0	50	30517578123	0
X=	22															
	0		0		0		0		0		0		0		0	0
	0		0		0		0		0		0		0		0	0
X=	20															
	0		0		0		0		0		0		0		0	0
	0		0		0		0		0		0		0		0	0
X=	18															
	0		0		0		0		0		0		0		0	0
	0		0		0		0		0		0		0		0	0
X=	16															
	0		0		0		0		6		10		12		10	6
	0		0		0		0		6		10		12		10	6
X=	14															
	0		0		0		40		50		100		100		100	50
	0		0		0		40		50		100		100		100	50
X=	12															
	0		0		0		-86		-100		-106		-180		-180	-90
	0		0		0		-86		-100		-106		-180		-180	-90
X=	10															
	0		0		0		-180		-200		-330		-320		-280	-140
	0		0		0		-180		-200		-330		-320		-280	-140
X=	8															
	0		0		0		-270		-290		-470		-460		-380	-190
	0		0		0		-270		-290		-470		-460		-380	-190
X=	6															
	0		0		0		130		-140		-150		-140		-130	-0
	0		0		0		130		-140		-150		-140		-130	-0
X=	4															
	0		0		0		180		-190		-200		-190		-180	-0
	0		0		0		180		-190		-200		-190		-180	-0
X=	2															
	0		0		0		-0		-0		-0		-0		-0	-0
	0		0		0		-0		-0		-0		-0		-0	-0
X=	0															
	0		0		0		-0		-0		-0		-0		-0	-0
	0		0		0		-0		-0		-0		-0		-0	-0

MACHINE OUTPUT FROM OVERLAY PROGRAM FOR SAMPLE PROBLEMS PAGE 8

RUN 1 OF 2											
DOSE SUMS 2332 0.69960000E 04 0.69960000E 04											
CLASS	0	10	20	30	40	50	60	70	80	90	
INSIDE	20	0	0	0	0	0	0	0	2	1	
OUTSIDE	81	3	0	0	3	2	0	0	1	0	
CLASS	100	110	120	130	140	150	160	170	180	190	
INSIDE	1	0	0	2	3	1	0	0	6	3	
OUTSIDE	3	0	0	1	0	0	0	0	1	0	
CLASS	200	210	220	230	240	250	260	270	280	290	
INSIDE	2	0	0	0	0	0	0	1	1	1	
OUTSIDE	0	0	0	0	0	0	0	0	0	0	
CLASS	300	310	320	330	340	350	360	370	380	390	
INSIDE	0	0	1	1	0	0	0	0	1	0	
OUTSIDE	0	0	0	0	0	0	0	0	0	0	
CLASS	400	410	420	430	440	450	460	470	480	490	
INSIDE	0	0	0	0	0	0	1	1	0	0	
OUTSIDE	0	0	0	0	0	0	0	0	0	0	
CLASS	0	10	20	30	40	50	60	70	80	90	
INSIDE	40	29	29	29	29	29	29	29	29	27	
OUTSIDE	95	14	11	11	11	8	6	6	6	5	
CLASS	100	110	120	130	140	150	160	170	180	190	
INSIDE	25	25	25	25	23	20	19	19	19	13	
OUTSIDE	5	2	2	2	1	1	1	1	1	0	
CLASS	200	210	220	230	240	250	260	270	280	290	
INSIDE	10	8	8	8	8	8	8	8	7	6	
OUTSIDE	0	0	0	0	0	0	0	0	0	0	
CLASS	300	310	320	330	340	350	360	370	380	390	
INSIDE	5	5	5	4	3	3	3	3	3	2	
OUTSIDE	0	0	0	0	0	0	0	0	0	0	
CLASS	400	410	420	430	440	450	460	470	480	490	
INSIDE	2	2	2	2	2	2	2	1	0	0	
OUTSIDE	0	0	0	0	0	0	0	0	0	0	
MOMENTS ARE 0.46583332E 02 0.11468111E 05 0.34291463E 07 0.12016983E 10 0.46580759E 12											
RANDOM NUMBER= 16878292595											

MACHINE OUTPUT FROM OVERLAY PROGRAM FOR SAMPLE PROBLEMS PAGE 9

X=	22	0	0	0	0	0	0	0	0	0	0
X=	20	0	0	0	0	0	0	0	0	0	0
X=	18	0	0	0	0	0	0	0	0	0	0
X=	16	0	0	0	0	0	0	0	0	0	0
X=	14	0	0	0	0	0	6	10	6	0	0
X=	12	0	0	0	-6	-50	-56	-60	-56	-30	-6
X=	10	0	0	40	-50	-140	-140	-180	-140	-140	-50
X=	8	0	0	80	-90	-230	-230	-310	-230	-230	-90
X=	6	0	0	120	-140	-330	-330	-460	-330	-330	-140
X=	4	0	0	180	-190	-200	-190	-360	-190	-200	-190
X=	2	0	0	0	-0	-0	-0	-0	-0	-0	-0
X=	0	0	0	0	-0	-0	-0	-0	-0	-0	-0

MACHINE OUTPUT FROM OVERLAY PROGRAM FOR SAMPLE PROBLEMS PAGE 10

RUN 2 OF 2	DOSE SURS	2332	0.69960000E 04	0.69960000E 04																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
------------	-----------	------	----------------	----------------	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

MACHINE OUTPUT FROM OVERLAY PROGRAM FOR SAMPLE PROBLEMS PAGE 11

INPUT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	30517578125	0
X= 22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
X= 20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
X= 18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
X= 16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	10
X= 14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	66	76
X= 12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
X= 10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
X= 8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
X= 6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
X= 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
X= 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
X= 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

MACHINE OUTPUT FROM OVERLAY PROGRAM FOR SAMPLE PROBLEMS PAGE 12

RUN 1 OF 2 DOSE SUMS	1166	0.69960000E 04	0.69960000E 04							
CLASS	0	26	52	78	104	130	156	182	208	234
INSIDE	26	0	0	1	0	1	2	0	2	0
OUTSIDE	151	3	3	0	1	0	2	1	0	0
CLASS	260	286	312	338	364	390	416	442	468	494
INSIDE	0	3	1	1	2	2	0	2	2	0
OUTSIDE	0	0	0	0	0	0	0	0	0	0
CLASS	0	26	52	78	104	130	156	182	208	234
INSIDE	55	19	19	19	18	18	17	15	15	13
OUTSIDE	161	10	7	4	4	3	3	1	0	0
CLASS	260	286	312	338	364	390	416	442	468	494
INSIDE	13	13	10	9	8	6	4	4	2	0
OUTSIDE	0	0	0	0	0	0	0	0	0	0
MOMENTS ARE	0.32388888E 02	0.10555814E 05	0.39489160E 07	0.15839713E 10	0.66305223E 12					
RANDOM NUMBER=	23553561645									

MACHINE OUTPUT FROM OVERLAY PROGRAM FOR SAMPLE PROBLEMS PAGE 13

X=	22	0	0	0	0	0	0	0	0	0	0
X=	20	0	0	0	0	0	0	0	0	0	0
X=	18	0	0	0	0	0	0	0	0	0	0
X=	16	0	0	0	0	0	0	0	0	0	0
X=	14	0	0	0	0	0	0	0	0	0	0
X=	12	0	0	0	40	50	50	50	80	90	-110
X=	10	0	0	0	80	90	-100	-90	-160	-170	-190
X=	8	0	0	0	130	-140	-150	-140	-260	-270	-290
X=	6	0	0	0	-180	-190	-200	-190	-360	-370	-390
X=	4	0	0	0	-0	-0	-0	-0	-0	-0	-0
X=	2	0	0	0	-0	-0	-0	-0	-0	-0	-0
X=	0	0	0	0	0	0	0	0	0	0	-0

MACHINE OUTPUT FROM OVERLAY PROGRAM FOR SAMPLE PROBLEMS PAGE 14

RUN 2 OF 2 DOSE SUMS	1146	0.69960000E 04	0.69960000E 04								
CLASS	0	20	40	60	80	100	120	140	160	180	
INSIDE	27	0	0	0	2	2	1	3	3	6	
OUTSIDE	149	0	4	1	5	1	1	0	0	0	
CLASS	200	220	240	260	280	300	320	340	360	380	
INSIDE	1	0	0	3	2	0	0	0	3	2	
OUTSIDE	0	0	0	0	0	0	0	0	0	0	
CLASS	0	20	40	60	80	100	120	140	160	180	
INSIDE	55	28	28	28	28	26	24	23	20	17	
OUTSIDE	161	12	12	8	7	2	1	0	0	0	
CLASS	200	220	240	260	280	300	320	340	360	380	
INSIDE	11	10	10	10	7	5	5	5	5	2	
OUTSIDE	0	0	0	0	0	0	0	0	0	0	
MOMENTS ARE	0.32388888E 02	0.74798888E 04	0.21079493E 07	0.66567219E 09	0.22468800E 12						
RANDOM NUMBER=	4945649805										
	END OF JOB										

JOB 04500FV HALL W FINAL OVE350320

CC

04500FV HALL W FINAL OVE ON350320 OFF350445 AS TIME CC

Appendix 2A

Description of Program Using Analytic Dissemination Function

The function of the program can be told quite briefly. Into a rectangular target area of arbitrary dimensions munitions are distributed in any one of three ways, viz., their co-ordinates may be read in, or they may be generated in either a uniform random or an elliptical normal pattern. At each point of a sampling grid, which normally is superimposed upon the target area, the total dosage is computed, using the equation

$$D(x,y,T) = \left\{ \lambda \bar{u}^{\beta-1} Q_0 [1 - a e^{-b(T - \frac{x}{\bar{u}})}] e^{-\left[\frac{\bar{u}^\beta y^2}{k_y (x^\beta + \alpha_y \bar{u}^\beta)} \right]} \right. \\ \left. \left\{ \operatorname{erf} \left[(\bar{u} T - x) \sqrt{\frac{\bar{u}^\beta}{k_x (x^\beta + \alpha_x \bar{u}^\beta)}} \right] + \operatorname{erf} \left[x \sqrt{\frac{\bar{u}^\beta}{k_x (x^\beta + \alpha_x \bar{u}^\beta)}} \right] \right\} \right\}$$

Dosage is converted to dose by the application of a breathing function and the probability of a casualty, P_c , is assayed by means of an arbitrary dose threshold or by employing the probit method.

When the probit method is used the program scores the P_c values in a sixteen-bar histogram and also computes the first five moments at the P_c distribution.

Several important program controls should be discussed at this point. The parameter ITRAT, when larger than one, causes the entire program to be repeated until this parameter is counted down to one or until the control exercised by the parameter EPS (ϵ) intervenes. Prior to each iteration the parameters SUMX and SUMY are augmented by the parameters DELSK and DELSY respectively, thus increasing the density of points in the sampling grid. The parameter EPS, when zero, sends the program to the dose threshold scheme of casualty determination.

Whenever the arithmetic mean of P_c for an iteration is different from that for the previous iteration by an amount less than EPS, the run is terminated, final prints of histogram and moments are made, and the next run is sought. If all iterations called for are done and the EPS criterion has not been met, the last two moments sets are printed.

All doses and P_c will be printed if PROPT is other than zero. This parameter is also consulted in order to guarantee the printing of the histogram

and moments when certain paths are traversed.

When N is one, a single munition is placed at zero, zero and the dose along each ordinate is printed in fixed point, scaled so that the largest dose will not equal or exceed 2^{17} nor be smaller than zero. This output is then useful as a udg for the overlay program.

A starting random number may be introduced in octal form into the cell RANDM. If this cell is set to zero, the program assumes the starting random number is already present.

Input is of the variable field type terminated with a TRA 3,4 instruction card. Any number of runs may be placed consecutively. Termination of operation must be accomplished by reading an N of zero followed by TRA 3,4. No other parameters need be input. When munitions are to be read, their coordinates in alternating X and Y are placed immediately after the TRA 3,4 card for the basic parameters and their loading is terminated with TRA 3,4. Errors will result if there are not exactly N coordinate sets.

Output begins with a verification print of the input parameters and continues with a print of the last random number used, if munitions were generated, and the locations of munitions. The numbers of X and Y points in the sampling grid are given next followed by optional dose and P_c print. The P_c values are printed only when the probit method is used in their determination. Finally there is printed the appropriate summary information, such as the histogram and moments.

The breathing function $B(T)$ is currently being computed from the formula $B(T) = C_0 + C_1 T + C_2 T^2$

Following is a list of the 34 input parameters, whose functions are indicated. An asterisk identifies those quantities which must be in fixed point, and the dagger the one parameter which must be in octal form when used at all. All other numbers must be in floating point, i.e., must have a decimal point unless they are zero.

* N	Number of munitions
* CHOOZ	0: Read, 1: Uniform random, 2: Elliptical normal
AZRO	Minimum x coordinates of target
AONE	Maximum x coordinate of target
BZRO	Minimum y coordinates of target
BONE	Maximum y coordinates of target
A	The "a" of dissemination equation
B	The "b" of dissemination equation

ALFX	These are the subscripted
ALFY	alpha quantities of
ALFZ	the dosage equation
KX	K sub x
KY	K sub y
LMKZ	Lambda over square root of K sub z
BETA	Beta
U	U
QZRQ	Q sub zero
T	Time
CZERO	Breathing function parameter
CONE	Breathing function parameter
BZRO	B sub zero of probit formula
AZRO5	A sub zero minus 5 of probit formula
XZRO	Minimum x coordinate of sampling grid
YZRO	Minimum y coordinate of sampling grid
XMAX	Maximum x coordinate of sampling grid
YMAX	Maximum y coordinate of sampling grid
*SUMX	Number of sampling ordinates
*SUMY	Number of sampling abscissae
*DELSX	Increment to SUMX on iterations
*DELSY	Increment to SUMY on iterations
*TTRAT	Number of iterations of the run
EPS	Epsilon, the arithmetic mean threshold criterion
*PROPT	0: No dose print, 1: Print dose
+RANDM	Starting random number
FCPWR	Width parameter ⁽¹⁾

(1) The "width" on which the histogram counts are made is governed by FCPWR. This fractionation of the interval from zero to one is the inverse of two to the power stored in FCPWR. This power can be any number zero to nine inclusive, thus the interval can range from one to 1/512. Changes in FCPWR must be made in binary.

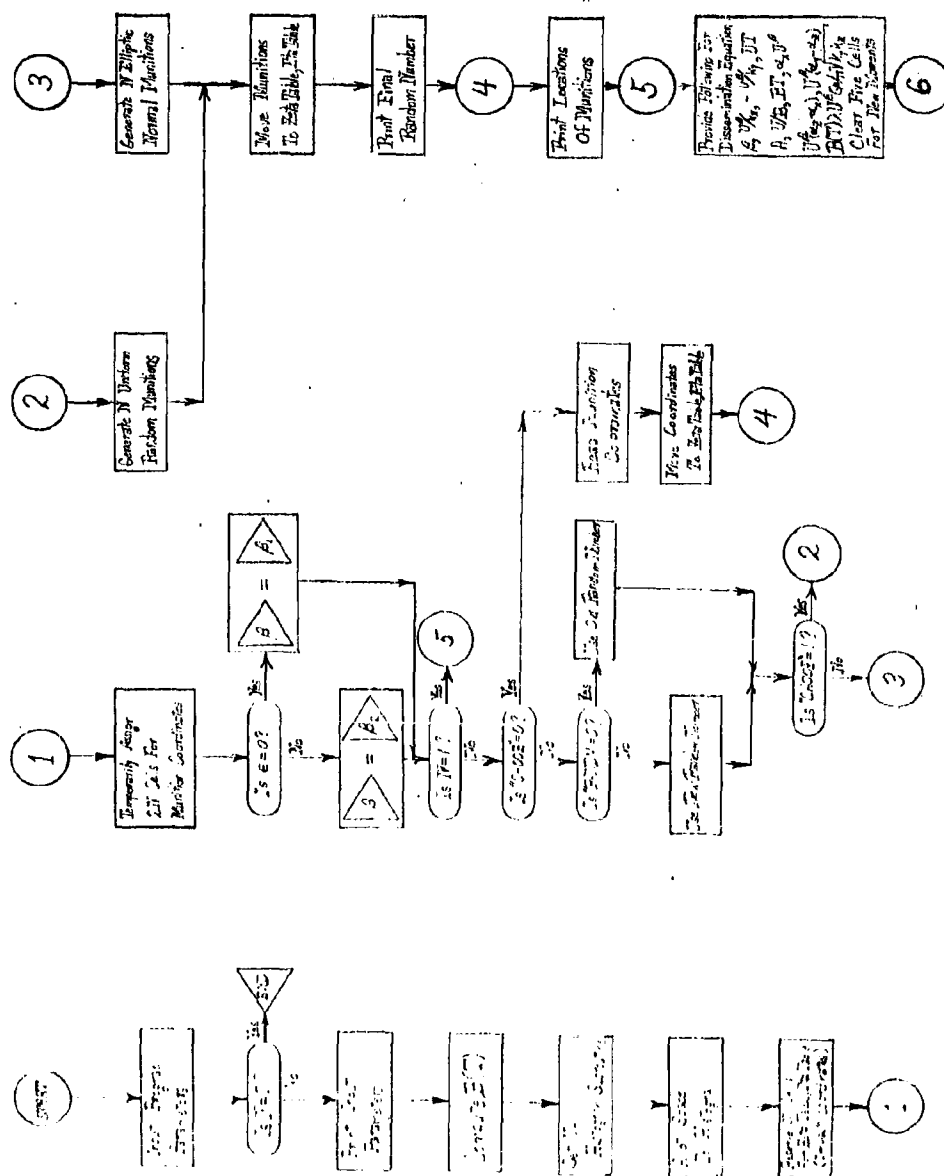
Appendix 2C

Sample Data

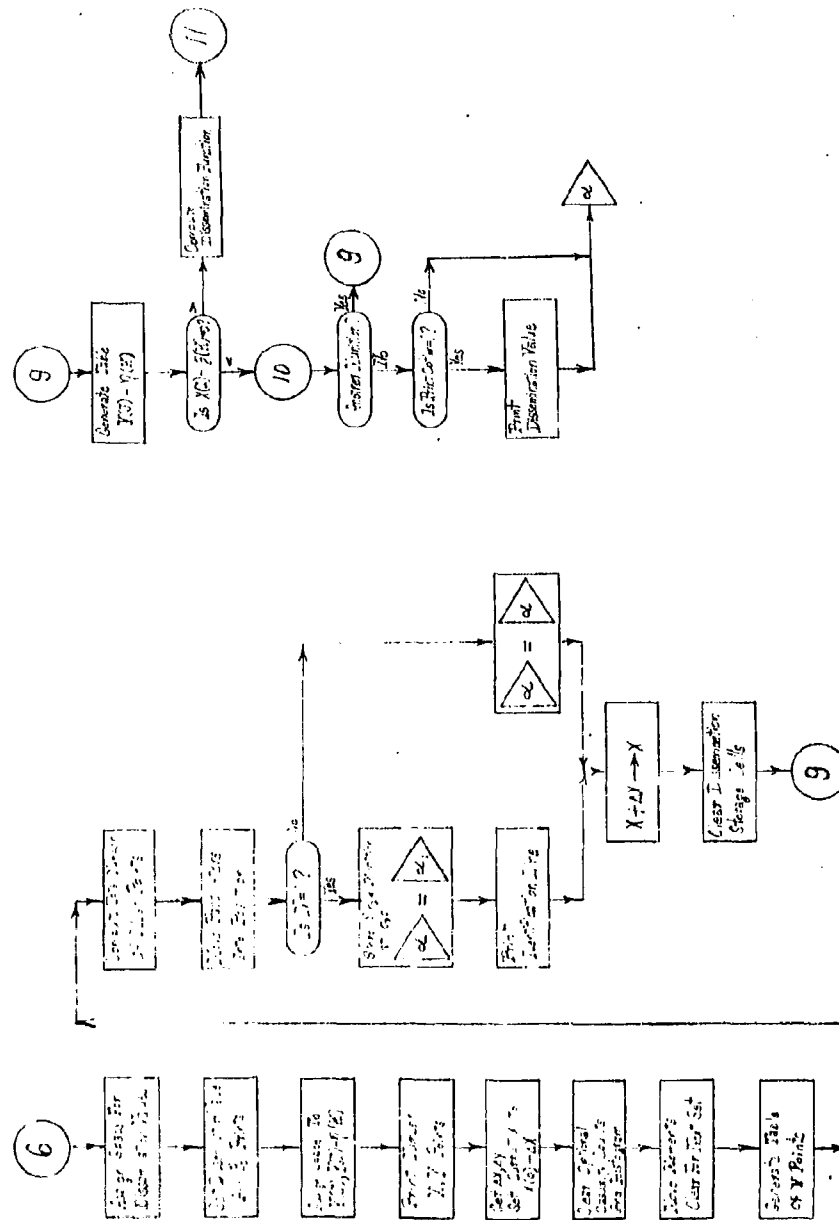
Data card formats for three typical runs are given below. The first run requires two munitions to be read in, the second is a one-munition run for generating a unit dissemination grid, and the third requests generation of 25 munitions distributed in an elliptical normal pattern. Note the dummy run which serves to terminate operation.

DEC	2, 0, 0, 63.0, 0, 34.0, 0, 1.0, 0, 0, 0
DEC	79.183, 195.782, .112, 1.75, 120.0, 1.0, 2.0
DEC	.5, 0, 1.0, -4.0, 0, 0, 63.0, 34.0, 64, 35
DEC	0, 0, 1, .0001, 1.0
TRA	3,4
DEC	30.0, 32.0, 40.0, 32.0
TRA	3,4
DEC	1, 0, 0, 63.0, 0, 34.0, 0, 1.0, 0, 0, 0
DEC	79.183, 195.782, .112, 1.75, 120.0, 1.0, 2.0
DEC	15, 0, 0, 0, 0, 0, 63.0, 34.0, 64, 35
DEC	0, 0, 1, 0, 0, 0
TRA	3,4
DEC	25, 2, 0, 850.0, 0, 850.0, .53, 2.9, .29
DEC	.018, .0014, 175.0, 95010, .107, 1.5, 134.0
DEC	34890.7, .05, 1.61968, 0, 1.0, -4.0, 0, 0
DEC	850.0, 850.0, 26, 26, 5, 5, 2, .00001, 1
OCT	343277244615
TRA	3,4
DEC	0
TRA	3,4
REM	END OF JOB

FLOW CHART FOR ANALYTIC DISSEMINATION FUNCTION PROGRAM PAGE 1

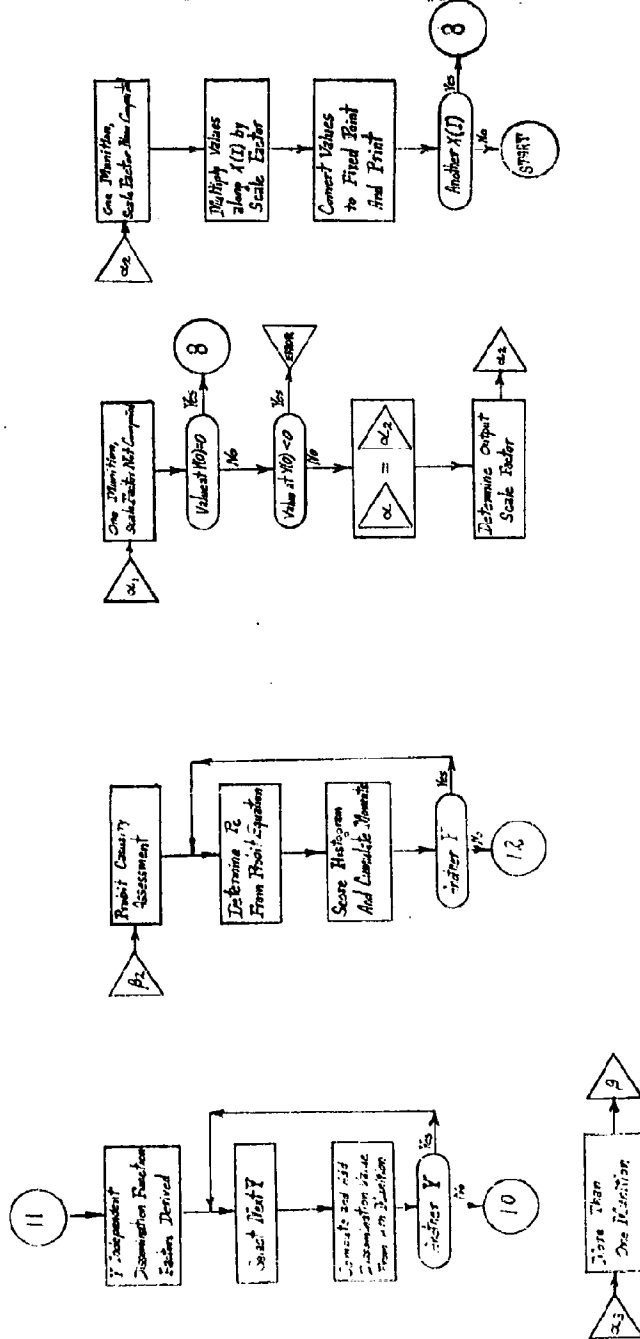


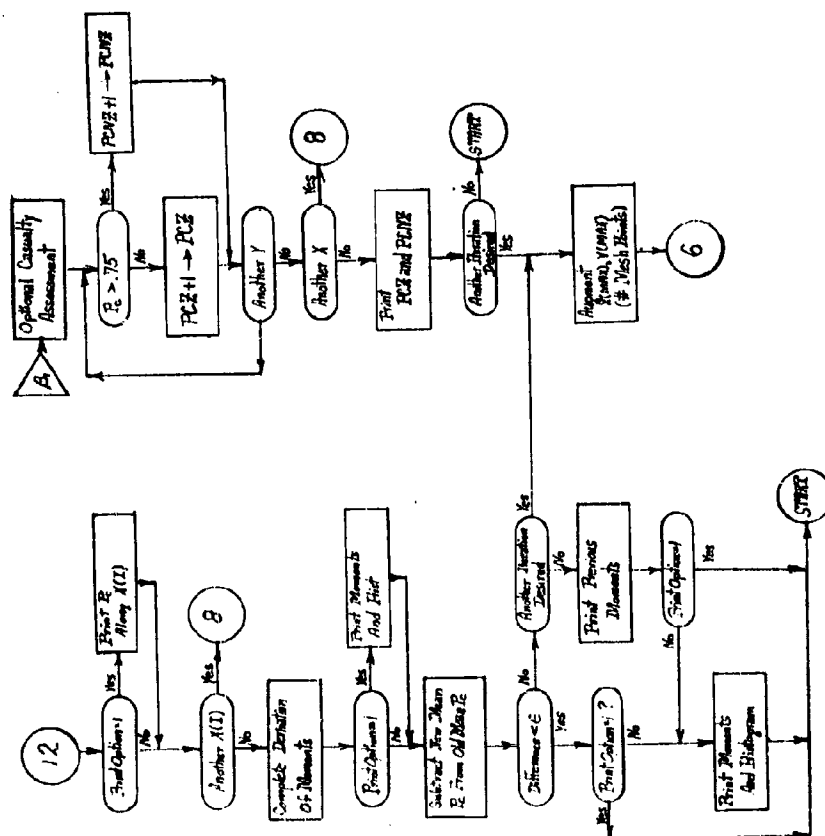
FLOW CHART FOR ANALYTIC DISCRIMINATION FUNCTION PROGRAM PAGE 2



FLOW CHART FOR ANALYTIC DISSEMINATION FUNCTION PROGRAM

PAGE 3





BESTS 2: SAP 3-7 ASSEMBLY OF ANALYTIC DISSEMINATION FUNCTION PROGRAM PAGE 1

01000	0	07400	4	70010	START	ORG 512 TSX XINPUT,4	INPUT PROGRAM	45000
01001	0	00000	0	00000		0:0:0	PARAMETERS	45000
01002	-1	67077	0	67000		MON N:0:N+63		45000
01003	0	50000	0	67000	NADDR	CLA N		45000
01004	-0	10000	0	01006		TN2 **2		45000
01005	0	07400	4	70024		TSX ENDJOB,4		45000
01006	0	07400	4	70013		TSX XPRINT,4	FORM SKIP	45000
01007	0	02411	0	02411		PZE FORM,0:FORM		45000
01010	0	07400	4	70007		TSX OUTPUT,4	PRINT PROGRAM	45000
01011	0	00011	0	02501		FORM1,0:9	PARAMETERS	45000
01012	-1	67041	0	67000		MON N:0:RANDOM		45000
01013	0	07400	4	02102		TSX BRFA,4	EXIT TO GET BIT)	04502
01014	0	60100	0	02370		STO BSUBT		04502
01015	0	50000	0	02316		CLA NINE	SET UP HISTOGRAM	45000
01016	0	40200	0	02372		SUB FCPWR	SUBROUTINE	45000
01017	0	76700	0	00011		ALS 9		45000
01020	0	60100	0	02356		STO ADING		45000
01021	0	76700	0	00022		ALS 18		45000
01022	0	40000	0	02336		ADD EXPO		45000
01023	0	60100	0	02355		STO FIXER		45000
01024	0	50000	0	02372		CLA FCPWR		45000
01025	0	62100	0	01027		STA **2		45000
01026	0	50000	0	02313		CLA ONE		45000
01027	0	76700	0	00000		ALS **		45000
01030	0	60100	0	02346		STO FCNDX		45000
01031	0	40200	0	02313		SUD ONE		45000
01032	0	60100	0	02375		STO TEMPA		45000
01033	0	76700	0	00022		ALS 18		45000
01034	0	40000	0	02355		ADD FIXER		45000
01035	0	62200	0	01417		STD FCA		45000
01036	0	50000	0	02375		CLA TEMPA	GET INTERVAL SIZE	45000
01037	0	40000	0	02313		ADD ONE	FOR HISTOGRAM	45000
01040	0	40000	0	02335		ADD FLOTR		45000
01041	0	30000	0	02335		FAD FLOTR		45000
01042	0	60100	0	02376		STO TEMPB		45000
01043	0	80000	0	02322		CLA ONEF		45000
01044	0	24100	0	02376		FDP TEMPB		45000
01045	-0	60000	0	02361		STQ CUT		45000
01046	0	50000	0	01003		CLA NADDR	BEGIN ALLOCATION	45000
01047	-0	32000	0	02333		ANA MASK	OF UPPER MEMORY	45000
01050	0	62100	0	01465		STA CLRFC	WITH ASSIGNMENT	45000
01051	0	40200	0	02313		SUB ONE	OF SPACE TO	45000
01052	0	60100	0	02360		STO CHNTAD	HISTOGRAM	45000
01053	0	73400	4	00000		PAX 0:4		45000
01054	-0	63400	4	01673		SXD FCD,4		45000
01055	-0	63400	4	01774		SXD FCE,4		45000
01056	0	40000	0	02356		ADD ADING		45000
01057	0	62100	0	01621		STA FCB		45000
01060	0	62100	0	01623		STA FCC		45000
01061	0	50000	0	02360		CLA CHNTAD		45000
01062	0	40200	0	02375		SUB TEMPA		45000
01063	0	62100	0	01673		STA FCD		45000
01064	0	62100	0	01774		STA FCL		45000
01065	0	62100	0	01567		STA ZTBLA	ADDRESS PLUS ONE	45000
01066	0	62100	0	01213		STA ZTBLD	OF ZETA TABLE	45000
01067	0	62100	0	01153		STA ZTULC		45000
01070	0	62100	0	01270		STA ZTULD		45000
01071	0	62100	0	01540		STA ZTULE		45000
01072	0	40200	0	67000		SUB N		45000
01073	0	62100	0	01562		STA ETBLA	ADDRESS PLUS ONE	45000
01074	0	62100	0	01231		STA ETULU	OF LTA TABLE	45000

RESYS 2. SAP 3-7 ASSEMBLY OF ANALYTIC DISSEMINATION FUNCTION PROGRAM PAGE 2

01075	0	62100	0	01156	STA ETBLC		
01076	0	62100	0	01277	STA ETBLD		45000
01077	0	62100	0	01541	STA ETBLE		45000
01100	0	40200	0	67000	SUB N		45000
01101	0	60100	0	02360	STO CRNTAD		45000
01102	0	62100	0	01212	STA RNA		45000
01103	0	62100	0	01230	STA RNB	ADDRESS PLUS ONE OF	45000
01104	0	62100	0	01267	STA RNC	MUNITION LOCATIONS	45000
01105	0	62100	0	01276	STA RND		45000
01106	0	62100	0	01152	STA MTBLA		45000
01107	0	62100	0	01155	STA MTBLD		45000
01110	0	73400	4	00000	PAX 0,4		45000
01111	-0	63400	4	01145	SXD MUNIN,4		45000
01112	1	77777	4	01113	TXI *+1,4,1		45000
01113	-0	63400	4	01111	SXD MLOC,4		45000
01114	0	40200	0	67000	SUB N		45000
01115	0	40200	0	67000	SUB N		45000
01116	0	62100	0	01311	STA MLOC		45000
01117	0	62100	0	01145	STA MUNIN		45000
01120	0	50000	0	67037	CLA EPS		45000
01121	0	10000	0	01124	TZL *+3	CHOOSE REGULAR OR	45000
01122	0	50000	0	02342	CLA NOP	OPTIONAL CASUALTY	45000
01123	0	02000	0	01125	TRA *+2	DETERMINATION.	45000
01124	0	50000	0	02337	CLA RELA		45000
01125	0	60100	0	01577	STO OPTPC		45000
01126	0	53400	4	67000	LXA N,4		45000
01127	-0	63400	4	02345	SXD KNDX,4	SET INDEX TO	45000
01130	0	50000	0	67003	CLA AONL	MUNITIONS	45000
01131	0	30200	0	67002	FSH AZRO		45000
01132	0	60100	0	02352	STO XSPAN		45000
01133	0	50000	0	67005	CLA BOML	STORE DIMENSIONS	45000
01134	0	30200	0	67004	FSH BZRO	OF IMPACT AREA	45000
01135	0	60100	0	02353	STO YSPAN		45000
01136	0	50000	0	67000	CLA N		45000
01137	0	40200	0	02313	SUB ONL		45000
01140	0	10000	0	01312	TZL MLOC+1		45000
01141	0	50000	0	67001	CLA CHOC2		45000
01142	-0	10000	0	01162	FNZ GENMU	TEST WHETHER	45000
01143	0	07400	4	70010	TSX XINPUT,4	MUNITIONS READ	45000
01144	0	00000	0	00000	0,0,0	OR GENERATED	45000
01145	-1	00000	0	00000	MUNIN MON *+0,0,0		45000
01146	0	50000	0	67000	CLA N		45000
01147	0	76700	0	00001	ALS 1		45000
01150	0	73400	4	00000	PAX 0,4		45000
01151	0	53400	1	67000	LXA N,1		45000
01152	0	50000	4	00000	MTBLA CLA *+4		45000
01153	0	60100	1	00000	ZTB' JTG *+1	MOVE COORDINATES	45000
01154	1	77777	4	01155	TXI *+1,4,1	OF MUNITIONS TO	45000
01155	0	50000	4	00000	MTBLB CLA *+4	LTA-LTA TABLES	45000
01156	0	60100	1	00000	ETBLC STO *+1		45000
01157	1	77777	4	01160	TXI *+1,4,1		45000
01160	2	00001	1	01152	TXI MTBLA,1,1		45000
01161	0	02000	0	01305	TRA PHHUN		45000
01162	0	76000	0	00140	GENMU SLF		45000
01163	0	40200	0	02313	SUB ONL		45000
01164	-0	10000	0	01106	FNZ *+2	SENSE LIGHT ON	45000
01165	0	76000	0	00141	SLN 1	FOR UNIFORM RANDOM	45000
01166	0	50000	0	67041	CLA RANDM		45000
01167	0	10000	0	01171	TZL *+2		45000
01170	0	60100	0	02361	STO HLWHN		45000
01171	0	50000	0	67000	CLA N		45000
01172	0	76700	0	00001	ALS 1		45000

BESYS 2: SAP 3-7 ASSEMBLY OF ANALYTIC DISSEMINATION FUNCTION PROGRAM PAGE 3

01173	0	73400	4	00000	PAX 0.4		45000
01174	0	53400	1	87000	LXA N.1		45000
01175	-0	76000	0	00141	SLT 1		45000
01176	-3	00014	0	01235	XII TXL ELIPS,0.12		45000
01177	0	56000	0	02367	GENRN LDQ NEWRN		45000
01200	0	20000	0	02334	MPY VPOWR	GENERATE RANDOM	45000
01201	-0	60000	0	02367	STQ NEWRN	NUMBERS AND	45000
01202	0	50000	0	02367	CLA NEWRN	FORM UNIFORMLY	45000
01203	0	77100	0	00010	ARS 8	DISTRIBUTED	45000
01204	0	40000	0	02336	ADD EXPO	SET OF IMPACTS	45000
01205	0	30000	0	02336	FAD EXPO		45000
01206	0	60100	0	02375	STQ TEMPA		45000
01207	0	56000	0	02375	LDQ TEMPA		45000
01210	0	26000	0	02352	FMP XSPAN		45000
01211	0	30000	0	67002	FAD AZRO		45000
01212	0	60100	4	00000	RNA STQ **,4		45000
01213	0	60100	1	00000	ZTBLB STQ **,1		45000
01214	1	77777	4	01215	TXI **,4,-1		45000
01219	0	56000	0	02367	LDQ NEWRN		45000
01216	0	20000	0	02334	MPY VPOWR		45000
01217	-0	60000	0	02367	STQ NEWRN		45000
01220	0	50000	0	02367	CLA NEWRN		45000
01221	0	77100	0	00010	ARS 8		45000
01222	0	40000	0	02336	ADD EXPO		45000
01223	0	30000	0	02336	FAD EXPO		45000
01224	0	60100	0	02375	STQ TEMPA		45000
01225	0	56000	0	02375	LDQ TEMPA		45000
01226	0	26000	0	02353	FMP YSPAN		45000
01227	0	30000	0	67004	FAD UZRO		45000
01230	0	60100	4	00000	RNB STQ **,4		45000
01231	0	60100	1	00000	ETBLB STQ **,1		45000
01232	1	77777	4	01233	TXI **,4,-1		45000
01233	2	00001	1	01177	TIX GLNNN,1,1		45000
01234	0	02000	0	01302	TRA FINRN		45000
01235	-0	53400	2	01176	ELIPS LXD XII,2	FORM ELLIPTICAL	45000
01236	0	60000	0	02373	STZ RXSUM	NORMAL DISTRIBUTION	45000
01237	0	60000	0	02374	STZ RYSUM		45000
01240	0	56000	0	02367	RNSUM LDQ NEWRN		45000
01241	0	20000	0	02334	MPY VPOWR		45000
01242	-0	60000	0	02367	STQ NEWRN		45000
01243	0	50000	0	02367	CLA NEWRN		45000
01244	0	77100	0	00010	ARS 8		45000
01245	0	40000	0	02336	ADD EXPO		45000
01246	0	30000	0	02336	FAD EXPO		45000
01247	0	30000	0	02336	FAD EXPO		45000
01250	0	60100	0	02373	STQ RXSUM	SUM 12 RN	45000
01251	0	56000	0	02367	LDQ NEWRN		45000
01252	0	20000	0	02334	MPY VPOWR		45000
01253	-0	60000	0	02367	STQ NEWRN		45000
01254	0	50000	0	02367	CLA NEWRN		45000
01255	0	77100	0	00010	ARS 8		45000
01256	0	40000	0	02336	ADD EXPO		45000
01257	0	30000	0	02336	FAD EXPO		45000
01260	0	30000	0	02374	FAD RYSUM		45000
01261	0	60100	0	02374	STQ RYSUM	SUM 12 RN	45000
01262	2	00001	2	01240	TIX RNSUM,2,1		45000
01263	0	50000	0	02373	CLA RXSUM		45000
01264	0	24100	0	02377	FDP TWLLV		45000
01265	0	26000	0	02352	FMP XSPAN		45000
01266	0	30000	0	67002	FAD AZRO		45000
01267	0	60100	4	00000	RNL STQ **,4	STORE ZLTA FOR PRINT	45000
01270	0	60100	1	00000	ZTBLD STQ **,1	STORE ZLTA IN ZTBL	45000

BESYS 2: MAP 3-7 ASSEMBLY OF ANALYTIC DISSEMINATION FUNCTION PROGRAM PAGE 4

01271	1	77777	4	01272	TXI **1,4,-1	45000
01272	0	50000	0	02374	CLA RYSUM	45000
01273	0	24100	0	02327	FDP TWELV	45000
01274	0	26000	0	02353	FMP YSPAN	45000
01275	0	30000	0	67004	FAD UZRO	45000
01276	0	60100	4	00000	RND STO **4	45000
01277	0	60100	1	00000	ETBLD STO **1	45000
01300	1	77777	4	01301	TXI **1,4,-1	45000
01301	2	00001	1	01235	TXI ELIPS,1,1	45000
01302	0	07400	4	70007	FINRN TSX OUTPUT,4	45000
01303	0	00011	0	02677	FORML,0,9	45000
01304	-1	02367	0	02367	MON NEWRN,0,NEWRN	45000
01305	0	07400	4	70013	PRMUN TSX XPRINT,4	45000
01306	0	02665	0	02662	PZE FORMJ,0,FORMJ+3	45000
01307	0	07400	4	70007	TSX OUTPUT,4	45000
01310	0	00011	0	02666	FORML,0,9	45000
01311	-1	00000	0	00000	MLOC MON **0,**	45000
01312	0	56000	0	02352	LDO XSPAN	45000
01313	0	26000	0	02353	FMP YSPAN	45000
01314	0	60100	0	02354	STO TARGA	45000
01315	0	02000	0	01316	TRA **1	45000
01316	0	50000	0	67016	CLA BETA	45000
01317	0	60100	0	01516	STO SUTNA+3	45000
01320	0	50000	0	67017	CLA U	45000
01321	0	07400	4	67106	TSX LOG,4	45000
01322	0	76500	0	00043	LRS 35	45000
01323	0	26000	0	67016	FMP BETA	45000
01324	0	07400	4	67101	TSX EXP,4	45000
01325	0	60100	0	02362	STO UBETA	45000
01326	0	24100	0	67013	FDP KX	45000
01327	-0	60000	0	01524	STO SUTNA+9	45000
01330	0	50200	0	02362	CLS UBETA	45000
01331	0	24100	0	67014	FDP KY	45000
01332	-0	60000	0	01522	STO SUTNA+7	45000
01333	0	56000	0	67017	LDO U	45000
01334	0	26000	0	67021	FMP T	45000
01335	0	60100	0	01525	STO SUTNA+10	45000
01336	0	50000	0	67006	CLA A	45000
01337	0	60100	0	01526	STO SUTNA+11	45000
01340	0	50000	0	67017	CLA U	45000
01341	0	24100	0	67017	FDP R	45000
01342	-C	60000	0	01527	STO SUTNA+12	45000
01343	0	56000	0	67007	LDO D	45000
01344	0	26000	0	67021	FMP T	45000
01345	0	60100	0	01530	STO SUTNA+13	45000
01346	0	56000	0	67010	LDO ALFX	45000
01347	0	26000	0	02362	FMP UBETA	45000
01350	0	60100	0	01517	STO SUTNA+4	45000
01351	0	56000	0	67012	LDO ALFZ	45000
01352	0	26000	0	02362	FMP UBETA	45000
01353	0	30200	0	01517	FSB SUTNA+4	45000
01354	0	60100	0	01520	STO SUTNA+5	45000
01355	0	56000	0	67011	LDO ALFY	45000
01356	0	26000	0	02362	FMP UBETA	45000
01357	0	30200	0	01520	FSB SUTNA+5	45000
01360	0	30200	0	01517	FSB SUTNA+4	45000
01361	0	60100	0	01521	STO SUTNA+6	45000
01362	0	50000	0	67014	CLA KY	45000
01363	0	07400	4	67107	TSX SORT,4	45000
01364	0	24100	0	67015	FDP LHKZ	45000
01365	0	26000	0	02324	FMP PI	45000
01366	0	24100	0	02362	FDP UBETA	45000

DESYS 2: SAP 3-7 ASSEMBLY OF ANALYTIC DISSEMINATION FUNCTION PROGRAM PAGE 5

01367	0	26000	0	67017	FMP U		45000
01370	0	60100	0	02375	STO TEMPA		45000
01371	0	50000	0	67020	CLA QZRO		45000
01372	0	24100	0	02375	FDP TEMPA		45000
01373	0	26000	0	02370	FMP BSUBT	BREATHING FUNCTION	
01374	0	60100	0	01523	STO SUTNA+8		
01375	0	53400	4	02315	LXA FIVE+4	CLEAR MOMENTS	45000
01376	0	60000	4	02411	STZ NEWN+4		45000
01377	2	00001	4	01376	TIX *-1+4+1		45000
01400	0	50000	0	02360	RENTN CLA CRNTAD	RL ENTER TO ALLOCATE	45000
01401	0	62100	0	01555	STA DTBLA	MEMORY TO ACCORD	45000
01402	0	62100	0	01600	STA STEP4	WITH NEW S(X) AND	45000
01403	0	62100	0	01614	STA DTBLD	S(Y), AND GENERATE	04502
01404	0	62100	0	01625	STA DTBLE	NEW PARAMETERS	45000
01405	0	62100	0	01635	STA DTBLF		
01406	0	60100	0	01515	STO SUTNA+2		
01407	0	73400	4	00000	PAX 0+4		45000
01410	1	77777	4	01411	TXI *-1+4+1		45000
01411	-0	63400	4	01761	SXD DPRTA+4		45000
01412	-0	63400	4	01765	SXD MPRTA+4		45000
01413	0	40200	0	67033	SUB SUMY		45000
01414	0	62100	0	01761	STA DPRTA		45000
01415	0	62100	0	01765	STA MPRTA		45000
01416	0	62100	0	01563	STA YDIFA		45000
01417	0	60100	0	01514	STO SUTNA+1		45000
01420	0	40200	0	67033	SUB SUMY		45000
01421	0	62100	0	01561	STA YTBLA		45000
01422	0	62100	0	01500	STA YTBLO		45000
01423	0	53400	4	67033	LXA SUMY+4		45000
01424	-0	63400	4	02344	SXD YNDX+4		45000
01425	0	07400	4	70007	TSX OUTPUT+4	PRINT NUMBER OF	
01426	0	00011	0	02710	FORMM+0+9	VALUES OF X AND Y	
01427	-1	67033	0	67032	MON SUMX+0+SUMY		
01430	0	50000	0	67032	CLA SUMX	COMPUTE DELTA X	45000
01431	0	40200	0	02313	SUB ONE	AND DELTA Y	45000
01432	0	40000	0	02335	ADD FLOTR		45000
01433	0	30000	0	02335	FAD FLOTR		45000
01434	0	60100	0	02375	STU TEMPA		45000
01435	0	50000	0	67030	CLA XMAX		45000
01436	0	30200	0	67026	FSB XZKO		45000
01437	0	24100	0	02375	FDP TEMPA		45000
01440	-0	60000	0	02350	STQ INCRX		45000
01441	0	50000	0	67033	CLA SUMY		45000
01442	0	40200	0	02313	SUB ONE		45000
01443	0	40000	0	02335	ADD FLOTR		45000
01444	0	30000	0	02335	FAD FLOTR		45000
01445	0	60100	0	02375	STU TEMPA		45000
01446	0	50000	0	67031	CLA YMAX		45000
01447	0	30200	0	67027	FSB YZKO		45000
01450	0	24100	0	02375	FDP TEMPA		45000
01451	-0	60000	0	02351	STQ INCKY		45000
01452	0	50000	0	67026	CLA XZKO		45000
01453	0	30200	0	67030	FSB YZKO		45000
01454	0	60100	0	02357	STQ INCKX	INITIALIZE CURRENT X	45000
01455	0	56000	0	02340	LDA INCKX		45000
01456	0	26000	0	02351	FMP INCKY		45000
01457	0	60100	0	02375	STU TEMPA		45000
01460	0	24100	0	02354	FDP TEMPA		45000
01461	-0	60000	0	02363	STQ COLFF	PARAMETERS FOR	45000
01462	0	60000	0	02365	STZ PC7	OPTIONAL DUSE	45000
01463	0	60000	0	02364	STZ PC47	CALCULATION	45000
01464	0	53400	4	02346	LXA FCDX+4		45000

RESYS 2: SAP 3-7 ASSEMBLY OF ANALYTIC DISSEMINATION FUNCTION PROGRAM PAGE 6

01465	0	60000	4	00000	CLRFC	STZ **1,4	CLEAR COUNTS	45000
01466	2	00001	4	01465		TIX **1,4,1	IN HISTOGRAM	45000
01467	0	53400	4	02315		LXA FIVE,4		45000
01470	0	50000	4	02411	CLRM	CLA NEWM,4	MOVE MOMENTS AND	45000
01471	0	60100	4	02404		STO OLDN,4	CLEAR FOR NEXT SET	45000
01472	0	60000	4	02411		STZ NEWM,4		45000
01473	2	00001	4	01470		TIX CLRM,4,1		45000
01474	-0	53400	4	02344		LXD YNDX,4		45000
01475	0	50000	0	67027		CLA Y2R0		45000
01476	0	02000	0	01500		TRA **2		45000
01477	0	30000	0	02351		FAD INCRX		45000
01500	0	60100	4	00000	YTBLS	STO **1,4	STORE Y TABLE	45000
01501	2	00001	4	01477		TIX **2,4,1		45000
01502	0	56000	0	67032		LDO SUMX	COMPUTE M	45000
01503	0	20000	0	67033		MPY SUMY		45000
01504	-0	60000	0	02375		STO TEMPA		45000
01505	0	50000	0	02375		CLA TEMPA		45000
01506	0	40000	0	02335		ADD FLOTR		45000
01507	0	30000	0	02335		FAD FLOTR		45000
01510	0	60100	0	02347		STO IJFLT		45000
01511	0	02000	0	01512	SUTBR	TRA SUTN1		
01512	0	07400	4	02114	SUTN1	TSX SSUT,4		
01513	0	02000	0	01531	SUTNA	TRA TESTN		45000
				01514	SPAR	BSS 13		
01531	0	50000	0	67000	TESTN	CLA N		45000
01532	0	40200	0	02313		SUB ONE		45000
01533	0	10000	0	01537		TZE TNA		45000
01534	0	50000	0	02342		CLA NOP		04502
01535	0	60100	0	01575		STO DPRTN		04502
01536	0	02000	0	01546		TRA GO		45000
01537	0	53400	1	02313	TNA	LXA ONE,1		
01540	0	60000	1	00000	ZTBLE	STZ **1	PLACE MUNITION	
01541	0	60000	1	00000	ETBLE	STZ **1	AT ZERO, ZERO	
01542	0	50000	0	02340		CLA RELC		45000
01543	0	60100	0	01575		STO DPRTN		04502
01544	0	07400	4	70013		TSX XPRINT,4		45000
01545	0	02740	0	02727		PZE FORMN,0,FORMN+9		45000
01546	0	53400	1	67032	GO	LXA SUMX,1		
01547	0	02000	0	01550		TRA NEWX		45000
01550	-0	63400	1	02343	NEWX	SXD XNDX,1		
01551	0	50000	0	02350		CLA INCRX		04502
01552	0	30000	0	02357		FAD CRNTX	STORE NEW X(1)	45000
01553	0	60100	0	02357		STO CRNTX		45000
01554	-0	53400	1	02344		LXD YNDX,1		45000
01555	0	60000	1	00000	DTBLA	STZ **1	CLEAR DUST CELLS	45000
01556	2	00001	1	01555		TIX **1,1,1		45000
01557	-0	53400	1	02345		LXD KNDX,1		45000
01560	-0	53400	2	02344	STEPS	LXD YNDX,2		45000
01561	0	50000	2	00000	YTBLS	CLA **2	GENERATE TABLE	45000
01562	0	30200	1	00000	ETBLS	FSB **1	OF Y(J1-LTA(K)	45000
01563	0	60100	2	00000	YDIFA	STO **2	IF CONSTANT,J RUNS)	45000
01564	2	00001	2	01561		TIX YTBLS,2,1		45000
01565	-0	53400	2	02344		LXD YNDX,2		45000
01566	0	50000	0	02357		CLA CRNTX	EXIT WITH X(1)=ZETA(K)	45000
01567	0	30200	1	00000	ZTBLS	FSB **1	IN ACCUMULATOR TO	45000
01570	-0	12000	0	01572		TMI **2	GET DOST ALONG X(1)	
01571	0	07400	4	02163		TSX DOST,4	DUE TO MUNITION K,	45000
01572	2	00001	1	01560		TIX STEPS,1,1	NEW MUNITION	
01573	0	50000	0	67040		CLA PROPT	TEST FOR DOST PRINT	45000
01574	-0	10000	0	01750		TNZ DPRTN		04502
01575	0	76100	0	00000	DPRTN	NOP	TO FIXPT FOR 1 MUNITION	04502
01576	-0	53400	1	02344		LXD YNDX,1		04502

RESYS 2- SAP 3-7 ASSEMBLY OF ANALYTIC DISSEMINATION FUNCTION PROGRAM PAGE 7

01577	0	76100	0	00000	OPTPC	NOP		OR TRA OPT4	45000
01600	0	50000	1	00000	STEP4	CLA **4			45000
01601	0	10000	0	01600		TZE FADAZ			04502
01602	0	07400	4	67106		TSX LOG4		COMPUTE P(C)	45000
01603	0	60100	0	02375		STO TEMPA			45000
01604	0	56000	0	02375		LDW TEMPA			45000
01605	0	26000	0	67024		FMP BZLRO			45000
01606	0	30000	0	67025	FADAZ	FAD AZRO5			04502
01607	-0	76000	0	00004		LFM			45000
01610	0	07400	4	02762		TSX ERF454			
01611	-0	76000	0	00002		LFM			04502
01612	0	10000	0	01614		TZL DTULD			
01613	0	40200	0	02317		SUB MPTWO			04502
01614	0	60100	1	00000	DTBLD	STO **1			04502
01615	-0	30000	0	02355	STEP5	UFA FIXLR		SCORE IN HISTOGRAM	04502
01616	-0	73400	4	00000		PDX 04			45000
01617	-3	05000	4	01621	FCA	TXL **244**			45000
01620	0	07400	4	70026		TSX LRRUMP4		P(C) EXCLUDES 1	45000
01621	0	50000	4	00000	FCU	CLA **4			45000
01622	0	40000	0	02313		ADD ONL		PLUS ADDRESS OF LOWEST	45000
01623	0	60100	4	00000	FCC	STO **4		PROBABILITY COUNTER	45000
01624	0	53400	4	02315	STEP6	LXA FIVL4		GENERATE MOMENTS	45000
01625	0	50000	1	00000	DTBLE	CLA **1			04502
01626	0	10000	0	01622		TZL CYCL+1			04502
01627	0	02000	0	01636		TRA DTULF+1			04502
01630	0	50000	0	02375	HOBT	CLA TEMPA			
01631	0	40200	0	02321		SUB NAG			
01632	0	12000	0	01634		TPL DTULF-1			
01633	0	02000	0	01641		TRA CYCL			
01634	0	56000	0	02375		LDW TEMPA			45000
01635	0	26000	1	00000	DTBLF	FMP **1			45000
01636	0	60100	0	02375		STO TEMPA			45000
01637	0	30000	4	02411		FAD NLWM4			45000
01640	0	60100	4	02411		STO NLWM4			45000
01641	2	00001	4	01630	CYCL	TIX MONT4+1			45000
01642	2	00001	1	01600		TIX STEP4+1			45000
01643	0	50000	0	67040		CLA PROPT			45000
01644	-0	10000	0	01763		TNZ PPRAT		PRINT OPTION P(C)	45000
01645	-0	53400	1	02343	PPRTN	LXD ZHUX+1			45000
01646	0	00001	1	01550		TIX NLWM+1			45000
01647	0	53400	4	02315		LXA FIVL4			45000
01650	0	50000	4	02411		CLA NLWM4			45000
01651	0	24100	0	02347		FDP LJEFT			45000
01652	-0	60000	4	02411		STO NLWM4			45000
01653	0	00001	0	01763		TIX **1			45000
01654	0	50000	0	67040		CLA PROPT		TO PRINT P(H),M(R)	45000
01655	-0	10000	0	01767		TNZ PROPT			45000
01656	0	53400	4	02315	PPRTN	LXA FIVL4			45000
01657	0	50000	4	02404		CLA OLDR4			45000
01660	0	30200	4	02411		TSX NLWM4			45000
01661	0	76000	0	00003	SSP			TEST ARITHMETIC MEAN	45000
01662	0	20200	0	67047		FMP EPS		THRESHOLD CRITERION	45000
01663	0	12000	0	01700		TPL STEP7			45000
01664	0	50000	0	67040		CLA PROPT			45000
01665	-0	10000	0	01000		TNZ START			45000
01666	0	07400	4	70007	OUTA	TSX OUT OUT4			45000
01667	0	00011	0	02412		FORMA049			45000
01670	-1	02561	0	02461		MOH CUT4CUT			45000
01671	0	07400	4	70007		TSX OUT OUT4			45000
01672	0	00011	0	02427		FORMA049			45000
01673	-1	00000	0	00000	FCU	MOH **049		FREQUENCY COUNT	45000
01674	0	07400	4	70007		TSX OUT OUT4		AND MOMENTS PRINT	45000

RESYS 2: SAP 3-7 ASSEMBLY OF ANALYTIC DISSEMINATION FUNCTION PROGRAM PAGE 8

01675	0	00011	0	02433	FORMC:0,9	45000
01676	-1	02410	0	02404	MON NEWM=8:0;NEWM=1	45000
01677	0	02000	0	01000	TRA START	45000
01700	0	50000	0	67036	STEP7 CLA ITRAT	
01701	0	40200	0	02313	SUB ONE	45000
01702	0	60100	0	67036	STO ITRAT	
01703	-0	10000	0	01741	TNZ NHANS	45000
01704	0	07400	4	70013	TSX XPRINT,4	45000
01705	0	02452	0	02445	PZE FORME:0,FORME+8	45000
01706	0	07400	4	70007	TSX OUTPUT,4	45000
01707	0	00011	0	02440	FORMD:0,9	45000
01710	-1	02403	0	02377	MON OLDM=5:0;OLDM=1	45000
01711	0	50000	0	67040	CLA PROMT	45000
01712	0	10000	0	01666	TZE OUTA	45000
01713	0	02000	0	01000	TRA START	45000
01714	0	50000	1	00000	OPT4 CLA **1	(DTABL)
01715	0	40200	0	02323	SUB PT75	OPTIONAL CASUALTY
01716	0	12000	0	01724	TPL **6	DETERMINATION
01717	0	50000	0	02365	CLA PC2	45000
01720	0	40000	0	02313	ADD ONE	45000
01721	0	60100	0	02365	STO PC2	45000
01722	2	00001	1	01714	TIX OPT4,1,1	45000
01723	0	02000	0	01730	TRA XTEST	45000
01724	0	50000	0	02364	CLA PCNZ	45000
01725	0	40000	0	02313	ADD ONL	45000
01726	0	60100	0	02364	STO PCNZ	45000
01727	2	00001	1	01714	TIX OPT4,1,1	45000
01730	-0	53400	1	02343	XTEST LXD XNDX,1	45000
01731	2	00001	1	01550	TIX NEWX,1,1	45000
01732	0	07400	4	70007	TSX OUTPUT,4	45000
01733	0	00011	0	02453	FORMF:0,9	45000
01734	-1	02365	0	02363	MON COEFF:0,PC2	
01735	0	50000	0	67036	CLA ITRAT	
01736	0	40200	0	02313	SUB ONE	45000
01737	0	60100	0	67036	STO ITRAT	
01740	0	10000	0	01000	TZL START	45000
01741	0	50000	0	67032	NHANS CLA SUMX	45000
01742	0	40000	0	67034	ADD DELSX	45000
01743	0	60100	0	67032	STO SUMX	45000
01744	0	50000	0	67033	CLA SUMY	45000
01745	0	40000	0	67035	ADD DELSY	45000
01746	0	60100	0	67033	STO SUMY	45000
01747	0	02000	0	01400	TRA RENTR	45000
					PRINT OPTIONS	45000
01750	0	50200	0	02393	DPRTI CLS XNDX	PRINT DOST
01751	0	77100	0	00022	ARS 18	45000
01752	0	40000	0	67032	ADD SUMX	45000
01753	0	60100	0	02366	STO NETX	45000
01754	0	07400	4	70007	TSX OUTPUT,4	45000
01755	0	00011	0	02467	FORMG:0,9	45000
01756	-1	02366	0	02366	MON NETX:0,NETX	45000
01757	0	07400	4	70007	TSX OUTPUT,4	45000
01760	0	00011	0	02474	FORMH:0,9	45000
01761	-1	00000	0	00000	DPRTA MON **0,**	(DTABL-J);(DTABL-1)
01762	0	02000	0	01575	TRA DPRTN	45000
01763	0	07400	4	70007	PPRNT TSX OUTPUT,4	PRINT PSUBC
01764	0	00011	0	02474	FORMH:0,9	45000
01765	-1	00000	0	00000	PPRTA MON **0,**	(DTABL-J);(DTABL-1)
01766	0	02000	0	01645	TRA PPRTN	45000
01767	0	07400	4	70007	PRFM TSX OUTPUT,4	PRINT FREQUENCY
01770	0	00011	0	02412	FORMA:0,9	COUNT AND MOMENTS
01771	-1	02361	0	02361	MON CUT:0,CUT	45000

BESYS 2, SAP 3-7 ASSEMBLY OF ANALYTIC DISSEMINATION FUNCTION PROGRAM PAGE 9

01772	0	07400	4	70007	TSX	OUTPUT,4		45000
01773	0	00011	0	02427		FORMB,0.9		45000
01774	-1	00000	0	00000	FGE	MON **0,**	COUNT	45000
01775	0	07400	4	70007	TSX	OUTPUT,4		
01776	0	00011	0	02433		FORMC,0.9		45000
01777	-1	02410	0	02404	MON	NEWM-5,0,NEWM-1		04502
02000	0	02000	0	01656	TRA	FMRTN		45000
						PRINT IN FIXED POINT		04502
02001	-0	50000	0	01559	FIXPT	CAL DTBLA		04502
02002	0	62100	0	02055	STA	FIXPG		04502
02003	0	62100	0	02063	STA	FIXPH		04502
02004	0	40200	0	67033	SUB	SUMY		04502
02005	0	62100	0	02006	STA	FIXPA		04502
02006	-0	50000	0	00000	FIXPA	CAL **	GET SCALE FACTOR	04502
02007	0	19000	0	02077	TZE	FIXPK+1		04502
02010	0	12000	0	02012	TPL	*+2		04502
02011	0	07400	4	70024	TSX	ENDJOB,4		04502
02012	0	60100	0	02375	STO	TEMPA		04502
02013	0	50000	0	02341	CLA	RELD		04502
02014	0	60100	0	01575	STO	DPRTN		04502
02015	0	50000	0	01761	CLA	DPRTA		04502
02016	0	60100	0	02076	STO	FIXPK		04502
02017	0	50000	0	02375	CLA	TEMPA		04502
02020	0	34000	0	02331	CAS	LIMIT		04502
02021	0	02000	0	02036	TRA	FIXPG		04502
02022	0	76100	0	00000	NOP			04502
02023	0	50000	0	02322	CLA	ONLF		04502
02024	0	60100	0	02371	STO	MPYER		04502
02025	0	56000	0	02375	FIXPB	LDQ TEMPA		04502
02026	0	26000	0	02326	FMP	TENF		04502
02027	0	60100	0	02375	STO	TEMPA		04502
02030	0	40200	0	02331	SUB	LIMIT		04502
02031	0	17000	0	02051	TPL	FIXPE		
02032	0	56000	0	02371	LDQ	MPYER		04502
02033	0	26000	0	02326	FMP	TENF		04502
02034	0	60100	0	02371	STO	MPYER		04502
02035	0	02000	0	02025	TRA	FIXPB		04502
02036	0	50000	0	02320	FIXPC	CLA TENTH		04502
02037	0	60100	0	02371	STO	MPYER		04502
02040	0	56000	0	02375	FIXPD	LDQ TEMPA		04502
02041	0	26000	0	02320	FMP	TENTH		04502
02042	0	60100	0	02375	STO	TEMPA		04502
02043	0	40200	0	02331	SUB	LIMIT		04502
02044	-0	12000	0	02051	THI	FIXPL		04502
02045	0	56000	0	02371	LDQ	MPYER		04502
02046	0	26000	0	02320	FMP	TENTH		04502
02047	0	60100	0	02371	STO	MPYER		04502
02050	0	02000	0	02040	TRA	FIXPD		04502
02051	0	07400	4	70007	FIXPE	TSX OUTPUT,4	PRINT SCALE FACTOR	04502
02052	0	00011	0	02741		FORMO,0.9		04502
02053	-1	02371	0	02371	MON	MPYER,0,MPYER		04502
02054	-0	53400	1	02344	FIXPF	LDQ YNDX,1		04502
02055	0	56000	1	00000	FIXPG	LDQ **1		04502
02056	0	26000	0	02371	FMP	MPYER		04502
02057	-0	30000	0	02335	UFA	FLOTR	SCALE TO POWER OF TEN NEXT BELOW 2**17 AND FIX	04502
02060	-0	77300	0	00010	RQL	8		
02061	0	76000	0	00010	RND			
02062	-0	32000	0	02332	ANA	HASKA		
02063	0	60100	1	00000	FIXPH	STO **1		04502
02064	2	00001	1	02059	TIX	FIXPG,1,1		04502
02065	0	50200	0	02343	CLS	XNDX		04502
02066	0	77100	0	00022	ARS	18		04502

BESYS 2- SAP 3-7 ASSEMBLY OF ANALYTIC DISSEMINATION FUNCTION PROGRAM PAGE 10

02067	0	40000	0	67032	ADD SUMX	04502	
02070	0	60100	0	02366	STO NETX	04502	
02071	0	07400	4	70007	TSX OUTPUT,4	04502	
02072	0	00011	0	02467	FORMG,0,9	04502	
02073	-1	02366	0	02366	MON NETX,0,NETX	04502	
02074	0	07400	4	70007	TSX OUTPUT,4	04502	
02075	0	00011	0	02751	FORMP,0,9	04502	
02076	-1	00000	0	00000	FIXPK MON **,0,**	04502	
02077	-0	53400	1	02343	LXD XNDX,1	04502	
02100	2	00001	1	01550	TIX NEWX,1,1	04502	
02101	0	02000	0	01000	TRA START	04502	
					BREATHING FUNCTION	04502	
02102	0	56000	0	67022	BRFA LDQ CZERO	04502	
02103	0	26000	0	67021	FMP T	04502	
02104	0	60100	0	02375	STO TEMPA	04502	
02105	0	56000	0	57021	LDQ T	04502	
02106	0	26000	0	67021	FMP T	04502	
02107	0	60100	0	02376	STO TEMPB	04502	
02110	0	56000	0	02376	LDQ TEMPB	04502	
02111	0	26000	0	67023	FMP CONE	04502	
02112	0	30000	0	02375	FAD TEMPA	04502	
02113	0	02000	4	00001	TRA 1,4	04502	
					TRANSFER PARAMETERS NEEDED BY	45000	
					SUTTON EQUATION SUBROUTINE	45000	
02114	-0	63400	4	02136	SSUT SXD SAVIV,4	45000	
02115	0	50000	4	00002	CLA 2,4	45000	
02116	0	62100	0	02272	STA RUNY	45000	
02117	0	62100	0	02274	STA RUNY+2	45000	
02120	0	50000	4	00003	CLA 3,4	45000	
02121	0	62100	0	02305	STA SUMD	45000	
02122	0	62100	0	02306	STA SUMD+1	45000	
02123	1	77760	4	02124	TXI *-1,4,-16	45000	
02124	-0	75400	4	00000	PXD 0,4	45000	
02125	0	76000	0	00006	COM	45000	
02126	0	77100	0	00022	ARS 18	45000	
02127	0	62100	0	02131	STA *-2	45000	
02130	0	53400	4	02136	LXA SAVIV,4	45000	
02131	0	50000	4	00000	CLA **,4	45000	
02132	0	60100	4	02152	STO BT+1,4	45000	
02133	2	00001	4	02131	TIX *-2,4,1	45000	
02134	-0	53400	4	02136	LXD SAVIV,4	45000	
02135	0	02000	4	00001	TRA 1,4	45000	
02136	0	00000	0	00013	SAVIV HTR 11,0,0	45000	
					SUTTON EQUATION PARAMETERS	45000	
A	02137	0	00000	0	00000	SBETA HTR	BETA
A	02140	0	00000	0	00000	ALFXU HTR	ALF(X)(U**BETA)
A	02141	0	00000	0	00000	ALFZU HTR	ALF(Z)(U**BETA)
A	02142	0	00000	0	00000	ALFYU HTR	ALF(Y)(U**BETA)
A	02143	0	00000	0	00000	UOVKY HTR	-(U**BETA)/K(Y)
A	02144	0	00000	0	00000	PREFX HTR	CONSTANT MULTIPLIER
A	02145	0	00000	0	00000	UOVXX HTR	(U**BETA)/K(X)
A	02146	0	00000	0	00000	UT HTR	U*T
A	02147	0	00000	0	00000	AYL HTR	A
A	02150	0	00000	0	00000	UOVRO HTR	U/U
A	02151	0	00000	0	00000	BT HTR	U*T
						SUTTON EQUATION VARIABLES	45000
A	02152	0	00000	0	00000	XDIFF HTR	X(I)-Z(I)ATK
A	02153	0	00000	0	00000	ERRF HTR	ERR SURT,ATC
A	02154	0	00000	0	00000	SQRFA HTR	DIRECT RADICAND
A	02155	0	00000	0	00000	SQRFD HTR	SINISTER RADICAND
A	02156	0	00000	0	00000	EXPF HTR	EXPONENT FACTOR
A	02157	0	00000	0	00000	PART HTR	Y-INDEPENDENT PARTS

BESYS 2: SAP 3-7 ASSEMBLY OF ANALYTIC DISSEMINATION FUNCTION PROGRAM PAGE 11

A	02160	0	00000	0	00000	ERFB HTR	RIGHT HAND ERF	45000
A	02161	0	00000	0	00000	RETNX HTR	SAVE INDEX 4	45000
A	02162	0	00000	0	00000	STEMP HTR	UTILITY CELL	45000
						SUTTON EQUATION SOLUTION FOR ALL Y(I)		
						FOR A GIVEN X(I); K; TSX DOSE,4 WITH		
						X(I)-ZETA(K) IN ACC AND Y(J)-ETA(K) TABULATED.		
						REGISTERS ONE AND TWO ARE SET FOR USE		
	02163	-0	61400	4	02161	DOSE SXD RETNX,4	X MINUS ZETA IN ACC.	45000
	02164	0	60100	0	02152	STO XDIFF	REGS 1:2 FUNCTIONAL	45000
	02165	0	10000	0	02173	TZE DOSE+8		
	02166	0	07400	4	67106	TSX LOG,4		45000
	02167	0	60100	0	02162	STO STEMP		45000
	02170	0	56000	0	02162	LDQ STEMP		45000
	02171	0	26000	0	02137	FMP SBETA		45000
	02172	0	07400	4	67101	TSX EXP,4		45000
	02173	0	30000	0	02140	FAD ALFXU		45000
	02174	0	60100	0	02153	STO ERFF	TERM FOR ERF SQRT	45000
	02175	0	30000	0	02141	FAD ALFZU		45000
	02176	0	60100	0	02154	STO SQRF8		45000
	02177	0	30000	0	02142	FAD ALFYU		45000
	02200	0	60100	0	02155	STO SQRF8	DERIVE FACTOR FOR	45000
	02201	0	24100	0	02143	FDP UOVKY	RIGHT HAND EXP.	45000
	02202	-0	60000	0	02156	STQ EXPF		45000
	02203	0	56000	0	02154	LDQ SQRF8		45000
	02204	0	26000	0	02155	FMP SQRF8		45000
	02205	0	07400	4	67107	TSX SQRT,4	GET SQUARE ROOT	45000
	02206	0	24100	0	02144	FDP PREFIX	BEGIN LEFT BRACE	45000
	02207	-0	60000	0	02157	STQ PART		45000
	02210	0	50000	0	02145	CLA UOVXX		45000
	02211	0	24100	0	02153	FDP ERFF		45000
	02212	-0	60000	0	02162	STQ STEMP		45000
	02213	0	50000	0	02162	CLA STEMP		45000
	02214	0	07400	4	67107	TSX SQRT,4		45000
	02215	0	60100	0	02153	STO ERFF		45000
	02216	0	56000	0	02153	LDQ ERFF		45000
	02217	0	26000	0	02152	FMP XDIFF		45000
	02220	-0	76000	0	00004	LFM		
	02221	0	40200	0	02325	SUB ERFT		
	02222	-0	12000	0	02225	TMI #43		
	02223	0	50000	0	02322	CLA ONLF		
	02224	0	02000	0	02227	TRA #43		
	02225	0	40000	0	02325	ADD ERFT		
	02226	0	07400	4	02755	TSX LRF,4		45000
	02227	0	60100	0	02160	STO LRF8		45000
	02230	0	50000	0	02146	CLA UT		45000
	02231	0	30200	0	02152	FSD XDIFF		45000
	02232	0	60100	0	02162	STO STEMP		45000
	02233	0	56000	0	02162	LDQ STEMP		45000
	02234	0	26000	0	02153	FMP ERFF		45000
	02235	0	76000	0	00003	SFP		
	02236	0	40200	0	02325	SUB ERFT		
	02237	-0	12000	0	02242	TMI #43		
	02240	0	50000	0	02322	CLA ONLF		
	02241	0	02000	0	02244	TRA #43		
	02242	0	40000	0	02325	ADD ERFT		
	02243	0	07400	4	02755	TSX LRF,4		45000
	02244	-0	76000	0	00002	LFM		
	02245	0	30000	0	02160	FAD LRFU		45000
	02246	0	24100	0	02157	FDP PART		45000
	02247	-0	60000	0	02157	STQ PART		45000
	02250	0	50000	0	02147	CLA AYE		45000
	02251	0	10000	0	02272	TZE RUNY		45000

BESYS 2, SAP 3-7 ASSEMBLY OF ANALYTIC DISSEMINATION FUNCTION PROGRAM PAGE 12

02252	0	50000	0	02152	CLA XDIFF	DERIVE LEFT-HAND	45000
02253	0	24100	0	02150	FDP UOVRB	EXPONENTIAL	45000
02254	-0	60000	0	02162	STO STMP		45000
02255	0	50000	0	02162	CLA STMP		45000
02256	0	30200	0	02191	FSD ST		45000
02257	0	12000	0	02272	TPL RUNY		45000
02260	0	07400	4	67101	TSX EXP*4		
02261	0	60100	0	02162	STO STMP		
02262	0	56000	0	02162	LDQ STMP		
02263	0	26000	0	02147	FMP AYE		
02264	0	76000	0	00002	CHS		45000
02265	0	30000	0	02322	FAD ONLF		45000
02266	0	60100	0	02162	STO STMP		45000
02267	0	56000	0	02162	LDQ STMP	Y-INDEPENDENT PART	45000
02270	0	26000	0	02157	FMP PART	OF EQUATION STORED	45000
02271	0	60100	0	02157	STO PART	TIME ABOUT .0215 SEC.	45000
02272	0	50000	2	00000	CLA **2		45000
02273	0	24100	0	02156	FDP EXPF		
02274	0	26000	2	00000	FMP **2	COMPUTE DOSAGE	
02275	0	34000	0	02330	CAS SATYM	AT EACH Y(I) FOR THIS	
02276	0	76100	0	00000	NOP	MUNITION AND ADD	
02277	0	02000	0	02301	TRA **2	TO TOTAL TIME FOR	
02300	0	02000	0	02307	TRA SUMD*2	EACH Y ABOUT .0034	
02301	0	07400	4	67101	TSX EXP*4		
02302	0	60100	0	02162	STO STMP		
02303	0	56000	0	02162	LDQ STMP		
02304	0	26000	0	02157	FMP PART		
02305	0	30000	2	00000	FAD **2		
02306	0	60100	2	00000	STU **2		
02307	2	00001	2	02272	TIX RUNY*2.1		
02310	-0	53400	4	02181	LXD RELX*4		45000
02311	0	02000	4	00001	TRA 1*4	TO GET NEXT K ON X	45000
					CONSTANTS AND RELADS		45000
02312	+000000000000			ZERO	DEC 0		45000
02313	+000000000001			ONE	DEC 1		45000
02314	+000000000004			FOUR	DEC 4		45000
02315	+000000000005			FIVE	DEC 5		45000
02316	+000600000011			NINE	DEC 9		45000
02317	+001000000000			HP140	DEC 100		45000
02320	+175631463146			TENTH	DEC 0.1		04502
02321	+110560736521			MAG	DEC 1.0E-17		
02322	+201400000000			ONEF	DEC 1.0		45000
02323	+200600000000			PT75	DEC .75		45000
02324	+202622077324			PI	DEC 3.14159265		45000
02325	+202761146314			EXP1	DEC .17		
02326	+204500000000			TENF	DEC 10.0		04502
02327	+204600000000			TWELV	DEC 12.0		45000
02330	-206740000000			SKITYM	DEC -60.0		
02331	+221777777777			LIMIT	DEC 221777777777		04502
02332	+000000377777			MASKA	DEC 000000377777		04502
02333	+000000077777			MASK	DEC 000000077777		45000
02334	+343277244615			VPCWR	DEC 343277244615		45000
02335	+233000000000			FLUTH	DEC 233000000000		45000
02336	2 00000 0 00000			EXPO	TIX 0.0		45000
02337	0 02000 0 01714			RELA	TRA OPT4		45000
02340	0 02000 0 02001			RELX	TRA FIXPT		04502
02341	0 02000 0 02054			RELD	TRA FIXPT		04502
02342	0 76100 0 00000			NOP	NOP		
					PROGRAM-GENERATED PARAMETERS		45000
02343	0 00000 0 00000			KNUX			45000
02344	0 00000 0 00000			YNUX			45000
02345	0 00000 0 00000			KNUX			45000

RESYS 2. SAP 3-7 ASSEMBLY OF ANALYTIC DISSEMINATION FUNCTION PROGRAM PAGE 17

02346	0	00000	0	00000	FCNDX		45000
02347	0	00000	0	00000	IJFLT	M IN FLOATING	45000
02350	0	00000	0	00000	INCRX	DELTA X	45000
02351	0	00000	0	00000	INCRY	DELTA Y	45000
02352	0	00000	0	00000	XSPAN	DIMENSIONS OF	45000
02353	0	00000	0	00000	YSPAN	IMPACT AREA	45000
02354	0	00000	0	00000	TARGA	AREA OF TARGET	45000
02355	0	00000	0	00000	FIXER		45000
02356	0	00000	0	00000	ADINC		45000
02357	0	00000	0	00000	CRNTX		45000
02360	0	00000	0	00000	CRNTD	HISTOGRAM INTERVAL	45000
02361	0	00000	0	00000	CUT	UBETA	45000
02362	0	00000	0	00000	UBETA	U(XI*U(YI)/TIAI	45000
02363	0	00000	0	00000	COEFF	(COLF,PCZ,AND PCNZ	45000
02364	0	00000	0	00000	PCNZ	ORDERED FOR PRINT)	45000
02365	0	00000	0	00000	PCZ	X SUBSCRIPT FOR PRINT	45000
02366	0	00000	0	00000	NETX	CURRENT RANDOM NO.	45000
02367	0	00000	0	00000	NEWRN	BREATHING FUNCTION	45000
02370	0	00000	0	00000	BSUBT	SCALE FACTOR	04502
02371	0	00000	0	00000	MPYER	HISTOGRAM FRACTIONATION	
02372	+	0000000000004			FCPWR DEC 4		
02373	0	00000	0	00000	RXSUM		
02374	0	00000	0	00000	RYSUM		45000
02375	0	00000	0	00000	TEMPA		45000
02376	0	00000	0	00000	TEMPB		45000
				02404	GLDM RES 5		45000
				02411	NEWN RES 5		45000
02411	016060606060				FORM BCD 11		45000
02412	740600300060				FORMA BCD 66000 DISTRIBUTION OF PLOT, ORDERED		45000
02413	243162635131						
02414	226563314665						
02415	604626604774						
02416	233473604651						
02417	242551252460						
02420	464525606346						
02421	607125514673						
02422	602163603145						
02423	632551652143						
02424	626046260147						
02425	012501033305						
02426	346060606060						
02427	740430006001				FORMA BCD 44000 16.77(2) 104733		45000
02430	06430761740.						
02431	306060010645						
02432	073434606060						
02433	740104300060				FORMA BCD 54140 NEW MOMENTS-14514451		45000
02434	457566604446						
02435	442545636240						
02436	014705250104						
02437	330534606050						
02440	740104300060				FORMA BCD 54140 OLD FORECAST-15.14451		45000
02441	464324604446						
02442	442545636240						
02443	014705250104						
02444	330534606050						
02445	0060211316.				FORMA BCD 60 ANTIMETRIC MEAN CRITERION NOT MET		45000
02446	306060010645						
02447	604324604446						
02450	735134606051						
02451	314040044546						
02452	632551652143						
02453	740104300060				FORMA BCD 54140 NUMBER TIMES FORECAST-15.14451		45000

PSYCH 2- SAP 3-7 ASSEMBLY OF ANALYTIC DISSEMINATION FUNCTION PROGRAM PAGE 14

02454	45644422251		
02455	606331442562		
02456	604762642223		
02457	130147012501		
02460	023304734507		
02461	610206200060	BCD 6/26HO NUMBER TIMES PSUBC= ZERON7)	45000
02462	456444222551		
02463	606331442562		
02464	604762642223		
02465	136071255146		
02466	450734600060		
02467	740105300060	FORM BCD 5(15HO DOSE ALONG XINS,IN)	45000
02470	244667556021		
02471	434667556021		
02472	744105301130		
02473	342460600060		
02474	740230000001	FORM BCD 5(2HO 1P9L12.4/12) 6L12.4)	45000
02475	471125010233		
02476	046174023060		
02477	601125010233		
02500	044346000060		
02501	740111000060	FORM BCD 7(19HO NUMBER MORTIFICATIONS=53.9H OPTION=41.7H	45000
02502	456444222551		
02503	604464653163		
02504	314667556021		
02505	027311300060		
02506	464763314643		
02507	404501720730		
02510	601021740034	BCD 6 4101P11.3.7H 411P11.3.7H 0	45000
02511	130147012501		
02512	013303707301		
02513	606021740134		
02514	132101013803		
02515	7307306060.2		
02516	740034133001	BCD 5(10P11.3.7H 411P11.3.7H 45011.3	45000
02517	013303707301		
02520	606021740134		
02521	132101013803		
02522	610430600060		
02523	132101013803		
02524	7404206060.2	BCD 5.7H 45011.3.7H 411P11.3.7H 45011.3	45000
02525	132101013803		
02526	610101306060		
02527	714347702174		
02530	67341370101		
02531	310370601010		
02532	606021740134	BCD 6 4101P11.3.7H 411P11.3.7H 45011.3	45000
02533	217470341301		
02534	010130673061		
02535	013303707301		
02536	4730.17471		
02537	132101013803		
02540	6107306060	BCD 6/7H 4101P11.3.7H 411P11.3.7H 45011.3	45000
02541	7467341301		
02542	013303707301		
02543	81004770621		
02544	132101013803		
02545	310370601010		
02546	434667556021	BCD 6/7H 4101P11.3.7H 411P11.3.7H 45011.3	45000
02547	606021740134		
02548	434667556021		
02549	7467341301		

BESYS 2: SAP 3-7 ASSEMBLY OF ANALYTIC DISSEMINATION FUNCTION PROGRAM PAGE 15

02552	013303610730		
02553	606022256321		
02554	132501003302	BCD 6=E10.2,4H U=E11.3,7H Q(0)=E14.6/4H	
02555	730430606064		
02556	132501013303		
02557	730730606050		
02560	740034132501		
02561	043306610430		
02562	606063132501	BCD 8 T=E11.3,7H G(0)=E12.4,6H C(1)=E12.4/13H SMAL	
02563	013303730730		
02564	606023740034		
02565	132501023304		
02566	730630602374		
02567	013413250102		
02570	330461010330		
02571	606062442143		
02572	436022740034	BCD 6L B(0)=E11.3,15H SMALL A(0)=E11.3	45000
02573	132501013303		
02574	730105306060		
02575	624421434360		
02576	217400344005		
02577	132501013303		
02600	610730606067	BCD 6/7H X(0)=E11.3,7H Y(0)=E11.3,9H X	45000
02601	740034132501		
02602	013303730730		
02603	606070740034		
02604	132501013303		
02605	731130606067		
02606	744421673413	BCD 6(MAX)=E11.3,9H Y(MAX)=E11.3/10H TO	45000
02607	250101330373		
02610	113060607074		
02611	442167341325		
02612	010133036101		
02613	003060606346		
02614	632143606713	BCD 6TAL X=N4,10H TOTAL Y=N4,9H INCR X=	45000
02615	450473010030		
02616	606063466321		
02617	436070134504		
02620	731130606031		
02621	452391606713		
02622	450373113060	BCD 7N3,9H INCR Y=N3,22H NO. INCREMENTATIONS=	45000
02623	603145235160		
02624	701345037302		
02625	023060604546		
02626	336031422351		
02627	254425456321		
02630	633146456213		
02631	450261010030	BCD 7N2/10H EPSILON=E11.3,15H PRINT OPTION=N2	45000
02632	606025476231		
02633	434645132501		
02634	013303730105		
02635	306060475131		
02636	456360464763		
02637	314645134502		
02640	730205306060	BCD 9,25H STARTING RANDOM NUMBER=1013	45000
02641	626321516331		
02642	452760512145		
02643	244644604564		
02644	442225511301		
02645	460103346060		
02646	606060606060		
02647	606060606060		

RESYS 2, SAP 3-7 ASSEMBLY OF ANALYTIC DISSEMINATION FUNCTION PROGRAM PAGE 16...

02650	606060606060		
02651	606060606060	BCD 9	
02652	606060606060		
02653	606060606060		
02654	606060606060		
02655	606060606060		
02656	606060606060		
02657	606060606060		
02660	606060606060		
02661	606060606060		
02662	006044644531	FORMJ BCD 40 MUNITIONS LOCATED AT-	
02663	633146455260		
02664	434623216325		
02665	246021634060		
02666	740230606001	FORMK BCD 9(2H 1P1E11.3,E11.3,E13.3,E11.3,E13.3,E11.3)	45000
02667	470125010133		
02670	037301250101		
02671	330373250103		
02672	330373250101		
02673	330373250103		
02674	330373250101		
02675	330334606060		
02676	606060606060		
02677	740211300060	FORML BCD 9(29H0 LAST RANDOM NUMBER USED WAS1013)	45000
02700	432162636051		
02701	214524464460		
02702	456444222551		
02703	606462252460		
02704	662162014601		
02705	033460606060		
02706	606060606060		
02707	606060606060		
02710	740106300060	FORMM BCD 6(16H0 THIS RUN USES N3,17H VALUES OF	
02711	633031626051		
02712	644560646225		
02713	626045037301		
02714	073060652143		
02715	642562604626		
02716	606760214524	BCD 9 X AND N3,12H VALUES OF Y)	
02717	604503730102		
02720	306065214364		
02721	256260462660		
02722	703460606060		
02723	606060606060		
02724	606060606060		
02725	606060606060		
02726	606060606060		
02727	006062472523	FORMN BCD 50 SPECIAL ONL-MUNITION RUN FOR	04502
02730	312143604645		
02731	254044644531		
02732	633146456051		
02733	644560264651		
02734	603145476463	BCD 5 INPUT TO OVERLAY PROGRAM	04502
02735	606246604665		
02736	255143217060		
02737	475146275121		
02740	446060606060		
02741	740302300060	FORMO BCD 6(32H0 DOSES HAVE BEEN MULTIPLIED BY	04502
02742	244662256260		
02743	702165256022		
02744	252545604464		
02745	436331474331		

```
BCD 21P1E8.1)
FORMP BCD 4(2H0 9N7/(2H 9N7))
```

04202

02754	546000000000	ERF	ERF SUBROUTINE	ERROR FUNCTION ENTRY
02755	0 76000 0 00003	ERF	SSP	
02756	0 60100 0 03052		STO COMMON+1	
02757	0 50000 0 03034		CLA ERF+47	
02760	0 60100 0 03024		STO ERF+39	
02761	0 02000 0 02776		TRA ERF+17	
02762	0 12000 0 02770		TPL ERF+11	NORMAL FREQUENCY FUNCTION ENTRY
02763	0 76000 0 00003		SSP	
02764	0 60100 0 03052		STO COMMON+1	
02765	0 50000 0 03025		CLA ERF+40	
02766	0 60100 0 03024		STO ERF+39	
02767	0 02000 0 02773		TRA ERF+14	
02770	0 60100 0 03052		STO COMMON+1	
02771	0 50000 0 03026		CLA ERF+41	
02772	0 60100 0 03024		STO ERF+39	
02773	0 56000 0 03052		LDQ COMMON+1	
02774	0 26000 0 03047		FMP ERF+58	
02775	0 60100 0 03052		STO COMMON+1	
02776	-0 63400 4 03025		SXD ERF+40.4	
02777	0 14000 0 03000		TOV ERF+19	
03000	-0 53400 4 03026		LXD ERF+41.4	
03001	0 60000 0 03051		STZ COMMON	
03002	0 56000 0 03051		LDQ COMMON	
03003	0 26000 0 03052		FMP COMMON+1	
03004	0 30000 4 03046		FAD ERF+57.4	
03005	0 60100 0 03051		STO COMMON	
03006	2 00001 4 03002		TIX ERF+21.4.1	
03007	0 14000 0 03035		TOV ERF+44	
03010	-0 53400 4 03050		LXD ERF+59.4	
03011	0 56000 0 03051		LDQ COMMON	
03012	0 26000 0 03051		FMP COMMON	
03013	0 60100 0 03051		STO COMMON	
03014	2 00007 4 03011		TIX ERF+20.4.2	
03015	0 14000 0 03035		TOV ERF+48	
03016	0 50000 0 03045		CLA ERF+56	
03017	0 24000 0 03051		FDM COMMON	
03020	-0 60000 0 03051		STO COMMON	
03021	0 30000 0 03045		CLA ERF+50	
03022	0 30200 0 03051		FSD COMMON	
03023	-0 53400 4 03025		LXD ERF+40.4	
03024	0 76100 0 00000		NOP	
03025	1 00000 0 03027		TXI ERF+42.1.0	
03026	1 00007 0 03030		TXI ERF+43.1.1	
03027	0 76000 0 00002		CHS	
03030	0 30000 0 03045		FAD ERF+56	
03031	0 60100 0 03051		STO COMMON	
03032	0 56000 0 03051		LDQ COMMON	
03033	0 26000 0 03046		FMP ERF+57	
03034	0 02000 4 00001		TRA 1.4	
03035	0 50000 0 03045		CLA ERF+56	
03036	0 02000 0 03023		TRA ERF+38	
03037	+162251175471		DEC 60000430636.4000/76267.4.0001.0.014.0.007.02.72	
03040	+165442000705			
03041	+164476640071			
03042	+172457619506			

45000
LRF 20013
LRF 20014
LRF 20015
LRF 20016
LRF 20017
LRF 20018
LRF 20019
LRF 20020
LRF 20021
LRF 20022
LRF 20023
LRF 20024
LRF 20025
LRF 20026
LRF 20027
LRF 20028
LRF 20029
LRF 20030
LRF 20031
LRF 20032
LRF 20033
LRF 20034
LRF 20035
LRF 20036
LRF 20037
LRF 20038
LRF 20039
LRF 20040
LRF 20041
LRF 20042
LRF 20043
LRF 20044
LRF 20045
LRF 20046
LRF 20047
LRF 20048
LRF 20049
LRF 20050
LRF 20051
LRF 20052
LRF 20053
LRF 20054
LRF 20055
LRF 20056
LRF 20057
LRF 20058
LRF 20059
LRF 20060
LRF 20061
LRF 20062
LRF 20063

BESYS 2: SAP 3-7 ASSEMBLY OF ANALYTIC DISSEMINATION FUNCTION PROGRAM PAGE 18

DEC .0422820123,.0705230784,1..5..70710678

ERF20064

03043 +174532277472
 03044 +175440671472
 03045 +201400000000
 03046 +200400000000
 03047 +200552023631
 03050 0 00010 0 00000

HTR 0,0,8

ERF20065

03051 COMMON

BSS 2

INPUT PARAMET AS

ORG 28160

45000

45000

45000

67000 0 00000 0 00000 N
 67001 0 00000 0 00000 CHOCZ
 67002 0 00000 0 00000 AZRO
 67003 0 00000 0 00000 ADNE
 67004 0 00000 0 00000 BZRO
 67005 0 00000 0 00000 BONE
 67006 0 00000 0 00000 A
 67007 0 00000 0 00000 B
 67010 0 00000 0 00000 ALFX
 67011 0 00000 0 00000 ALFY
 67012 0 00000 0 00000 ALFZ
 67013 0 00000 0 00000 KX
 67014 0 00000 0 00000 KY
 67015 0 00000 0 00000 LMKZ
 67016 0 00000 0 00000 BETA
 67017 0 00000 0 00000 U
 67020 0 00000 0 00000 QZRO
 67021 0 00000 0 00000 T
 67022 0 00000 0 00000 CZERO
 67023 0 00000 0 00000 COME
 67024 0 00000 0 00000 BZERO
 67025 0 00000 0 00000 AZRO5
 67026 0 00000 0 00000 XZRO
 67027 0 00000 0 00000 YZRO
 67030 0 00000 0 00000 XMAX
 67031 0 00000 0 00000 YMAX
 67032 0 00000 0 00000 SUMX
 67033 0 00000 0 00000 SUMY
 67034 0 00000 0 00000 DELSX
 67035 0 00000 0 00000 DELSY
 67036 0 00000 0 00000 ITRAT
 67037 0 00000 0 00000 EPS
 67040 0 00000 0 00000 PROPT
 67041 0 00000 0 00000 RANDM

67100 PACKG EQU 28224
 67101 EXP EQU PACKG+1
 67106 LOG EQU PACKG+6
 67107 SQRT EQU PACKG+7
 01000 END START

NUMBER MUNITIONS
 O=READ, 1 OR 2= GENERATE
 AZRO THROUGH BONE
 ARE COORDINATES
 USED TO DEFINE
 TARGET CONFIGURATION
 A
 B
 ALPHA(X)
 ALPHA(Y)
 ALPHA(Z)
 K(X)
 K(Y)
 LAMBDA/SQRT(K(Z))
 ULTA
 U
 Q(0)
 TIME
 PARAMETERS FOR
 BREATHING FUNCTION
 (0) FOR P(C)COMP.
 A(0)-5 FOR P(C)COMP.
 X(0)
 Y(0)
 X(MAX)
 Y(MAX)
 TOTAL X POINTS
 TOTAL Y POINTS
 INCREMENT TO TOTAL X
 INCREMENT TO TOTAL Y
 NUMBER ITERATIONS
 EPSILON
 0=NO PRINT OPTIONS
 STARTING RANDOM NO.

45000

45000

45000

45000

45000

45000

45000

45000

45000

45000

45000

45000

45000

45000

45000

04502

04502

45000

45000

45000

45000

45000

45000

45000

45000

45000

45000

45000

45000

45000

45000

45000

45000

SHARE ASSEMBLER STATISTICS

TAPE	TOTAL	1 FAIL	2 FAIL	3 FAIL	4 FAIL
INP	905	0	0	0	0
LIR	0	0	0	0	0
COL	905	0	0	0	0

NUMBER OF ON-LINE INPUT RECORDS 0

NUMBER OF OFF-LINE PRINT RECORDS 1111

USCORN-901-00

NUMBER OF SYMBOLS: DEF 241,DEFOP 0,UNDEF 0

04502,LL LAMIN J

04502,LL OFF028561 AS TIME028559 AS

79

UNCLASSIFIED

AD _____ Accession No. _____
National Bureau of Standards, Washington 25, D. C.
A MONTE CARLO COMPUTER PROGRAM FOR
ASSESSING CW CASUALTY RATES USING AN IBM 704
COMPUTER SYSTEM - W. G. Hall and J. M. Beiman

This report presents a method of machine computation of casualties from CW munitions using a Monte Carlo Method. A mathematical description of the problem is presented; computer flow charts, programs, and sample problems are included

UNCLASSIFIED

CW Casualty
Assessment

Simulation

UNCLASSIFIED

AD _____ Accession No. _____
National Bureau of Standards, Washington 25, D. C.
A MONTE CARLO COMPUTER PROGRAM FOR
ASSESSING CW CASUALTY RATES USING AN IBM 704
COMPUTER SYSTEM - W. G. Hall and J. M. Beiman

This report presents a method of machine computation of casualties from CW munitions using a Monte Carlo Method. A mathematical description of the problem is presented; computer flow charts, programs, and sample problems are included.

UNCLASSIFIED

CW Casualty
Assessment

Simulation

UNCLASSIFIED

AD _____ Accession No. _____
National Bureau of Standards, Washington 25, D. C.
A MONTE CARLO COMPUTER PROGRAM FOR
ASSESSING CW CASUALTY RATES USING AN IBM 704
COMPUTER SYSTEM - W. G. Hall and J. M. Beiman

This report presents a method of machine computation of casualties from CW munitions using a Monte Carlo Method. A mathematical description of the problem is presented; computer flow charts, programs, and sample problems are included.

UNCLASSIFIED

CW Casualty
Assessment

Simulation

UNCLASSIFIED

UNCLASSIFIED