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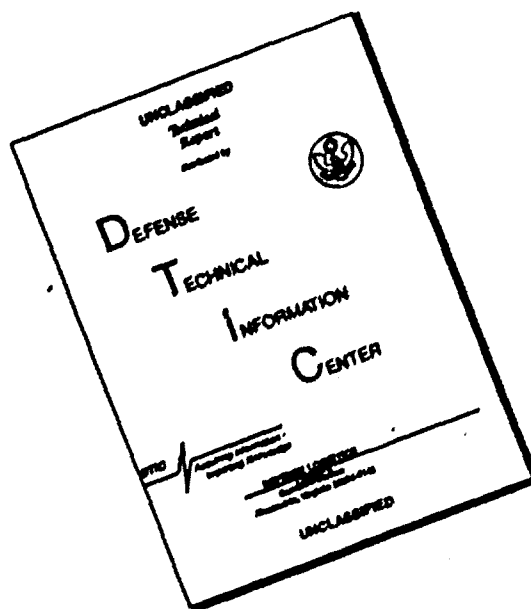
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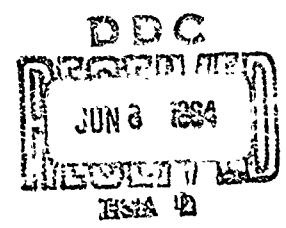
**CONFAC II
A GENERAL COMPUTER PROGRAM FOR THE
DETERMINATION OF RADIANT-INTERCHANGE
CONFIGURATION AND FORM FACTORS**

TECHNICAL DOCUMENTARY REPORT No. FDL-TDR-64-43

APRIL 1964

AIR FORCE FLIGHT DYNAMICS LABORATORY
RESEARCH AND TECHNOLOGY DIVISION
AIR FORCE SYSTEMS COMMAND
WRIGHT-PATTERSON AIR FORCE BASE, OHIO

Project No. 6146, Task No. 614618



(Prepared under Contract No. AF 33(657)-8953 by the
Space and Information Systems Division of
North American Aviation, Inc., Downey, California;
Kempton A. Toups, author)

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300 - May 1964 - 162-39-786

FOREWORD

This computer program is one of a series of digital computer programs developed as in-house effort in support of the Space Vehicle Thermal and Atmospheric Control Study. The study is sponsored by the Flight Dynamics Laboratory of the Research and Technology Division under Contract AF33(657)-S255 and is under the direction of W. Uhl of the Environmental Control Branch. R. E. Sexton of S&ID served as Project Manager of the study program. H. L. Nordwall reviewed and edited the contractor's report for publication as an FDL TDR.

The program described in this report represents the second stage in the development of a general configuration factor computer program. This report partly incorporates SID 62-393 (ASD TN 61-101), which describes CONFAC I, the first program developed under the Space Vehicle Thermal and Atmospheric Control Study.

This report may also be identified by Contractor's Report No. SID 63-1397.

ABSTRACT

A simple numerical method is derived for the determination of the geometric radiant-interchange factors used in radiant heat transfer and illumination. A FORTRAN II digital computer program utilizing this method is developed which provides a rapid and accurate means of computation of configuration and form factors. The source of flux may be any general plane polygon and the receiver may be any general plane or nonplanar polygon, the surface of an arbitrary polyhedron, or an arbitrary combination of such surfaces.

It is therefore possible to accurately determine configuration and form factors from a plane surface to another surface occluded by complex intervening surfaces. Form factors are computed rapidly -- averaging less than two seconds on the IBM 7094 for simple, unobstructed plane surfaces, and less than 30 seconds for simple polyhedra. Also, means are provided to internally generate a variety of regular polygons or polyhedra and to transform surface spatial coordinates for convenience of data entry and/or motion simulation. Simplicity of data entry, flexibility of application, and economy of operation are principal features of this program. Sample problems illustrating these important aspects are provided.

This report has been reviewed and is approved.



R. J. BAKER
Asst. for R&T
Vehicle Equipment Division
AF Flight Dynamics Laboratory

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NOMENCLATURE

A	Area
e	Exchange coefficient
c	Configuration factor (italicized)
f	Form factor (italicized)
h, k, l	Translation components
i, j, k	Unit vectors along the X-, Y-, Z-axis, respectively
O	Center of unit sphere, origin of coordinate system
R	Radius of sphere
S	Distance between two areas
X, Y, Z or x, y, z	Spatial coordinates of a point relative to X, Y, Z axis
α, β, γ	Direction angles of a line relative to X, Y, Z axis respectively
γ	Angle between Z axis and vector normal to plane
θ	Angle between two vectors
π	Numerical constant = 3.14159 +
ω	Solid angle

Subscripts

A, B, C	Points on an area
s	Sector
ΔA	Finite incremental area
dA	Differential area
$dA-A$	From a differential area to an area

NOMENCLATURE (cont'd)

Subscripts (cont'd)

- 1,2, Areas 1,2,
- 12 Area 1 to area 2
- ϵ Elliptical

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SECTION I

INTRODUCTION

The geometric form factor, f_{12} , is defined as the fraction of radiant energy emanating from finite surface A_1 which is intercepted by another surface A_2 .

$$f_{12} = \frac{\text{Flux received by finite surface } A_2}{\text{Flux emitted by finite surface } A_1} \quad (1)$$

The geometric configuration factor, C_{12} , is defined in a similar manner, except that the emitting surface is infinitesimal, (sometimes referred to as the point configuration factor),

$$C_{12} = \frac{\text{Flux received by finite surface } A_2}{\text{Flux emitted by infinitesimal surface } dA_1} \quad (2)$$

The subscripts denote the direction of flow of net flux; C_{12} and f_{12} pertain respectively to the configuration and form factor from surface A_1 to surface A_2 . It is assumed that each surface is isothermal and radiates diffusely, i.e., follows Lambert's cosine distribution law.

The "closed-form" determination of the configuration or form factor by classical integration techniques is impossible or impractical in most situations. Experimental techniques and devices have been reported in the literature (Reference 1), and probably the most useful is Pleijel's Globoscope (Reference 4). Experimental techniques produce only the configuration factor, however. Nonetheless, they are useful for many applications where only one or just a few configuration factors are required and nominal accuracy is sufficient.

However, if a large number of form factors are required in a short period of time, experimental techniques are not practical. This report presents a numerical method and a computer program which enables rapid and accurate computation of configuration and form factors between plane surfaces, and plane or solid surfaces. The source (surface 1) may be any general plane polygon; the receiver (surface 2) may be any arbitrarily oriented general plane or nonplanar polygon, the surface of an arbitrary solid, or an arbitrary combination of planes, nonplanes, or solids. Form factors (which nominally are derived from 625 configuration factors) are computed rapidly, averaging less than 2 seconds by IBM 7094 time for simple plane surfaces, and less than 30 seconds from simple plane surfaces to simple solids. Table 1 compares solutions obtained by CONFAC II to those given in Reference 1.

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Table 1, Comparison of Configuration and Form Factors Computed by CONFACII to Those Given in Reference 1

Configuration	Reference 1	Computer (Trapezoidal Rule)	
		24 x 24 grid	60 x 60 grid
P-1, X = 1, Y = 1	0.13853	0.138532	0.138532
X = 0.1, Y = 0.1	0.00314	0.003141	0.003141
X = 1, Y = 4	0.17527	0.175270	0.175270
X = 0.1, Y = 0.4	0.01147	0.011471	0.011471
X = 1, Y = ∞ *	0.17678	0.176777	0.176777
X = 0.1, Y = ∞ *	0.02488	0.024876	0.024876
P-2, $\theta = 30^\circ$, L = 0, N = 1	0.4665	0.466506	0.466506
$\theta = 30^\circ$, L = 1, N = 1	0.1759	0.175923	0.175923
$\theta = 30^\circ$, L = 0, N = 4	0.4665	0.466506	0.466506
$\theta = 30^\circ$, L = 4, N = 4	0.0964	0.096447	0.096447
$\theta = 120^\circ$, L = 0, N = 1	0.125	0.125000	0.125000
$\theta = 120^\circ$, L = 1, N = 1	0.0236	0.023554	0.023554
$\theta = 120^\circ$, L = 0, N = 4	0.125	0.125000	0.125000
$\theta = 120^\circ$, L = 4, N = 4	0.0077	0.007683	0.007683
**P-6, E = 1, D = 1	0.276	0.275	---
E = 1, D = 2	0.438	0.436	---
E = 1, D = ∞	0.500	0.498	---
E = 2, D = 1	0.724	0.722	---
E = 2, D = ∞	0.800	0.799	---
**P-8, D = 4, L = 2	0.08074	0.08055	---
D = 2, L = 4	0.24774	0.2472	---
A-1, X = 1, Y = 1	0.19982	0.19972	0.19981
X = 0.1, Y = 0.1	0.00316	0.00316	0.00316
X = 1, Y = 4	0.34596	0.34559	0.34590
X = 0.1, Y = 0.4	0.01207	0.01207	0.01207
X = 1, Y = ∞ *	0.41421	0.40549	0.41075
X = 0.1, Y = ∞ *	0.04988	0.04884	0.04946
A-2, $\theta = 30^\circ$, L = 1, N = 1	0.6202+	0.61769	0.61878
$\theta = 30^\circ$, L = 4, N = 4	0.3961+	0.39431	0.39450
$\theta = 120^\circ$, L = 1, N = 1	0.0870+	0.08665	0.08662
$\theta = 120^\circ$, L = 4, N = 4	0.0433+	0.04272	0.04235

* 10^8 was assumed to approximate ∞ for computer run

** 32 sided regular polygon used to simulate circular cross-section

+ These values were obtained by numerical integration across surface A_1 , according to Reference 1

The FORTRAN II Computer Program described herein, CONFAC II, is a follow-on development of an earlier version, CONFAC I (Reference 5). The original program has been extensively modified and significant improvements in the flexibility of application have been achieved. CONFAC I was developed principally to compute geometric form factors between plane surfaces; no application to nonplanar surfaces or bodies was originally intended. However, because of the particular analytical approach utilized and the data handling techniques developed, it was possible to use the basic plane-to-plane program to compute factors to nonplanar surfaces, provided proper restrictions were observed.

The principal similarities and differences between CONFAC I and CONFAC II are as follows:

1. Both CONFAC I and CONFAC II require that Surface 1 be a plane polygon; it may be arbitrarily oriented in the coordinate system in which it is described (entered) in data.
2. Both CONFAC I and CONFAC II specify that if Surface 2 is a plane polygon, it may be arbitrarily oriented with respect to Surface 1 and within its own coordinate system.
3. Both CONFAC I and CONFAC II require that, if Surface 2 is a nonplanar surface, then the surface boundaries must present a valid silhouette from any point on the active side of Surface 1.
4. CONFAC I specifies that no part of nonplanar Surface 2 may lie below the "horizon" of Surface 1 when viewed from the active side of Surface 1. CONFAC II does not require that all of a nonplanar Surface 2 appear above the horizon of Surface 1. CONFAC II will automatically bisect a nonplanar Surface 2 and compute the factor to only the part which Surface 1 "sees."
5. CONFAC I cannot, in general, be used to compute the factor to a solid surface. CONFAC II will compute the factor to arbitrary solid surfaces or regular solids such as parallelepipeds, cylinders, cones, etc., with the restriction that all of the surface must appear above the horizon of Surface 1. CONFAC I cannot, in general, be used to compute factors to surfaces which are occluded or "shadowed" in a varying manner by intervening surfaces; on the other hand, the factor in such instances can be determined by CONFAC II with few restrictions.
6. CONFAC I has only two principal classes of data -- surface data and surface transformation data. No distinction of data entry is made between plane and nonplane surfaces. Surface data is distinguished from transformation data by the position of the data name on the data name card. CONFAC II, however, utilizes nine data classifications, as follows:

Class 1 - Plane polygon, silhouette developed directly from data

Class 2 - Nonplane polygon, silhouette developed directly from data

Class 3 - Internally generated disk, silhouette developed directly from generated data

Class 4 - Plane polygon, silhouette internally developed

Class 5 - Nonplane surface or solid, silhouette internally developed

Class 6 - Internally generated regular disk or solid, silhouette internally developed

Class 7 - Sphere

Class 8 - Multisurface, silhouette internally developed from all surfaces taken together

Class 9 - Transformation data

7. CONFAC II incorporates a silhouette generator subroutine which is utilized when the factor to solids or, in certain cases, to non-solids is requested. The silhouette generator computes the perspective of Surface(s) 2 from preselected positions on Surface 1 from which configuration factors are computed.
8. CONFAC II incorporates an internal automatic surface generator which computes the surface boundary coordinates of regular plane and solid surfaces from input data specifications. This feature enables the analyst to create surfaces such as circular or elliptical disks, parallelepipeds, pyramids, cones, truncated cones, cylinders, etc. An endless variety of regular surfaces can be created by CONFAC II.
9. CONFAC II incorporates extremely fast computation of factors to a sphere which is arbitrarily oriented with respect to Surface 1.

SECTION II

ANALYTICAL PROCEDURES

CONFIGURATION AND FORM FACTOR

The general equation that must be solved in the determination of the radiant-interchange form factor is (see Figure 1)

$$f_{12} = \frac{1}{A_1} \iint_{A_1} \iint_{A_2} \frac{\cos \theta_1 \cos \theta_2 dA_2 dA_1}{\pi S^2} \quad (1)$$

The following part of the integrand is the factor from the elemental surface dA_1 to the total surface A_2 , referred to as the configuration factor or plane point factor, c_{12} .

$$c_{12} = \iint_{A_2} \frac{\cos \theta_1 \cos \theta_2}{\pi S^2} dA_2 \quad (2)$$

Therefore,

$$f_{12} = \frac{1}{A_1} \iint_{A_1} c_{12} dA_1 \quad (3)$$

A very simple geometric interpretation of Equation 2 is given by Nusselt. The principal value of the Nusselt concept is that the computational procedure is simplified and made more accurate by the fact that no mathematical or numerical integration is required to compute the configuration factor. However, the Nusselt method yields only the configuration factor from the elemental area dA_1 ; one must still integrate all such factors over surface A_1 to yield the form factor f_{12} as given in Equation 3.

The Nusselt concept utilizes a hemisphere of radius R constructed over the incremental plane area dA_1 , as shown in Figure 1. Every point defining the boundary of surface A_2 is projected radially to the hemisphere surface and then vertically downward to the plane of dA_1 , the equatorial plane of the hemisphere. The locus of all points thus projected encloses an area, A''_2 , on the hemisphere base. This area A''_2 , divided by the area of the base, is the configuration factor from dA_1 to A_2 .

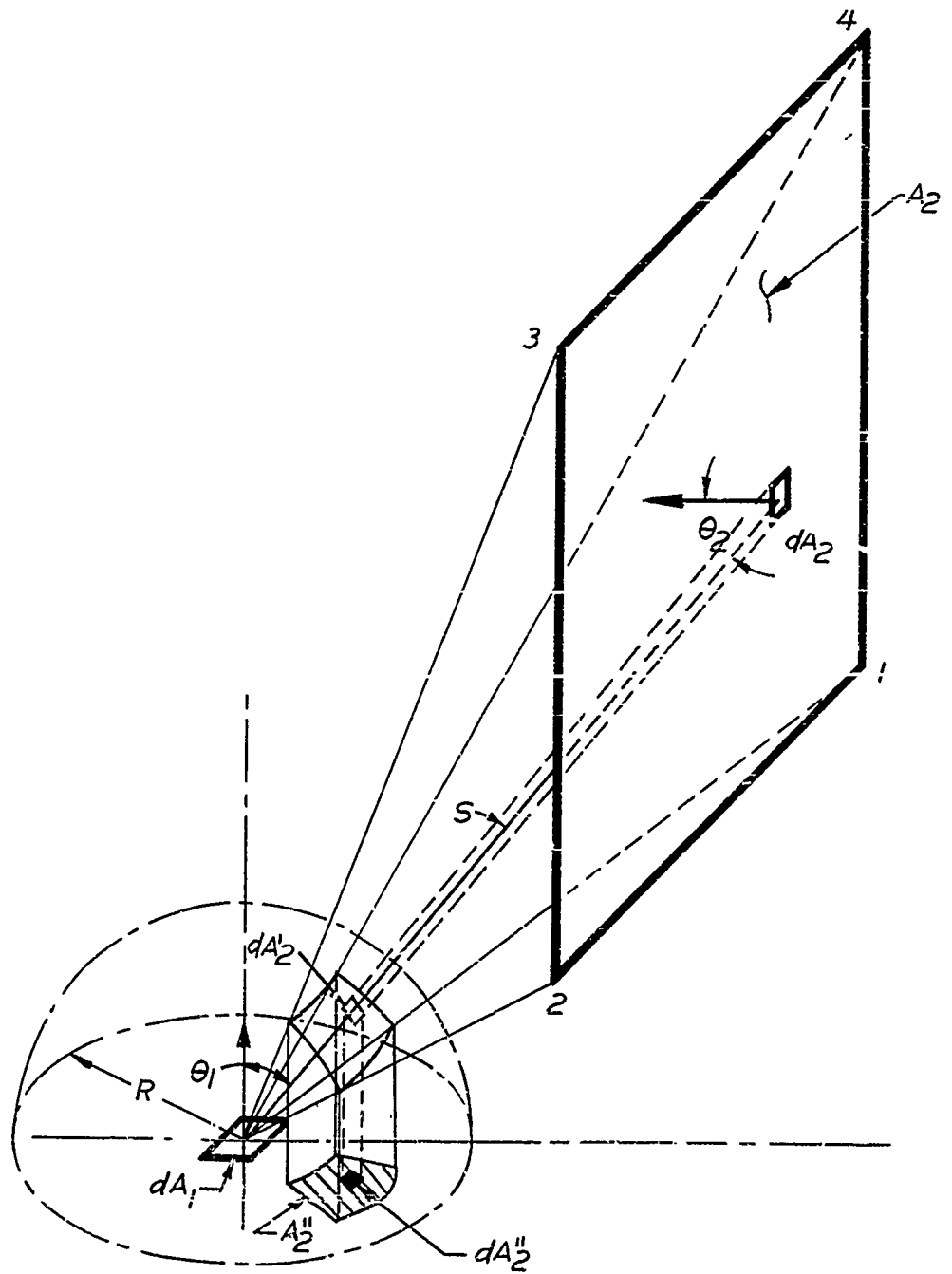


FIGURE 1. NUSSULT GEOMETRICAL RELATIONSHIPS

The validity of this conclusion can be demonstrated as follows. Note that the elemental area dA_2 is described in surface A_2 by the elemental solid angle $d\omega_1$, or

$$d\omega_1 = \frac{\cos \theta_2 dA_2}{S^2} \quad (4)$$

Similarly, on the sphere having radius R ,

$$d\omega_1 = \frac{dA_2'}{R^2} \quad (5)$$

Because dA_2'' is the projection of dA_2' on the hemisphere base,

$$dA_2' = \frac{dA_2''}{\cos \theta_1} \quad (6)$$

Inserting Equation 6 in Equation 5,

$$d\omega_1 = \frac{dA_2''}{R^2 \cos \theta_1} \quad (7)$$

The right side of Equation 4 appears explicitly in Equation 1 and, because Equation 7 is identical to Equation 4, Equation 2 becomes

$$c_{12} = \iint_{A_2} \frac{\cos \theta_1}{\pi} \left(\frac{dA_2''}{R^2 \cos \theta_1} \right) = \frac{\iint_{A_2} dA_2''}{\pi R^2} = \frac{A_2''}{\pi R^2}$$

For a sphere of unit radius (unit sphere),

$$c_{12} = \frac{A_2''}{\pi} \quad (8)$$

which completes the proof of Nusselt's method. By inserting Equation 8 in Equation 3, the original equation becomes greatly simplified; only one area integration is now required,

$$f_{12} = \frac{1}{A_1} \iint_{A_1} \frac{A_2''}{\pi} dA_1 \quad (9)$$

The computer program described herein solves Equation 9 numerically by successive algebraic evaluation of A_2'' at preselected points on Surface A_1 , with subsequent numerical integration to yield f_{12} , or

$$f_{12} = \frac{1}{A_1} \sum_{i=1}^N \sum_{j=1}^M \frac{A_2''}{\pi} \Delta A_1 \quad (10)$$

It should be emphasized that area A_2'' is, in fact, formed by the doubly projected silhouette of surface A_2 as it appears from dA_1 .

The element dA_1 is assumed to be oriented in the XY plane and at the origin of the coordinate system of Surface A_2 . The area A_2'' can be found from the line integral where $y_1 = F(x_1)$ is the locus of the boundary of A_2 ,

$$A_2'' = \frac{1}{2} \int_C (x_1 dy_1 - y_1 dx_1) \quad (11)$$

Let $z = F(x,y)$ be the locus of the silhouette of A_2 , and S the distance from dA_1 to the point (x,y,z) on the silhouette of A_2 .

$$S = \sqrt{x^2 + y^2 + z^2}$$

From similar triangles,

$$x_1 = \frac{x}{S}, \quad dx_1 = \frac{1}{S} dx + x d\left(\frac{1}{S}\right)$$

$$y_1 = \frac{y}{S}, \quad dy_1 = \frac{1}{S} dy + y d\left(\frac{1}{S}\right)$$

Inserting in Equation 11

$$A_2'' = \frac{1}{2} \int_C \frac{xdy - ydx}{S^2} \quad (12)$$

Equation 12 can be transposed to finite difference form by replacing the differentials with increments for numerical evaluation. Because of the problems of increment size control, it appears desirable to solve Equation 12 for a finite line segment in space and to allow the analyst to control accuracy of configuration factor computation by suitable selection of line segments describing Surface 2. If the surface is actually a polygon or polyhedra, the simulation is perfect; if the surface boundary is curved, like a disk, for example, the validity of the result is a function of the number of line segments used.

However, a much simpler and more easily understood geometric derivation, using the unit sphere, yields the result in superior computational form. Referring to Figure 2, note that the radial projection of line segment AB on the hemisphere surface forms the circular arc A'B'. Projection of A'B' to the base plane produces the elliptical arc A''B'', forming the elliptical section A''OB'' with the origin.

If all line segments describing Surface 2 are similarly projected, the area A_2'' will be formed by a closed series of elliptical arcs. Surface A_2 does not have to be a plane. Actually, the area A_2 results from the geometry of a silhouette; any surface or object projecting an identical silhouette in the same spatial position on the hemisphere surface will produce the same area A_2 and the same point factor.

Inspection reveals that the magnitude of area A_2'' can be determined by computing the area of each elliptical sector, properly signed, followed by an algebraic summation.

In Figure 2, the area of elliptical sector A_E is the projected area of circular sector A_S . If the angle between the plane of the circular sector A'OB' and the XY plane is γ , then

$$\cos \gamma = \frac{A_E}{A_S} \quad (13)$$

The area A_S is computed from the usual polar equation, with θ in radians,

$$A_S = \frac{1}{2} R^2 \theta$$

For the unit radius sphere,

$$A_S = \frac{\theta}{2} \quad (14)$$

Substituting Equation 14 in Equation 13, and solving for A_E ,

$$A_E = \frac{\theta}{2} \cos \gamma \quad (15)$$

For a polygon of N sides, the net area A_2'' is found by algebraic summation of all computed A_E .

$$\Lambda_2'' = \frac{1}{2} \left| \sum_{n=1}^N \theta_n \cos \gamma_n \right| \quad (16)$$

Substituting in Equation 8, we have

$$\epsilon_{12} = \frac{i}{2\pi} \left| \sum_{n=1}^N \theta_n \cos \gamma_n \right| \quad (17)$$

A general analytical derivation of this equation is given in Reference 3, and is reported to be originally developed by Omoto in 1924.

The absolute value notation will be explained later. The use of vector algebra greatly facilitates the computation of θ and $\cos \gamma$. Taking, for example, directed line segments of $\vec{OA}$ and $\vec{OB}$, the vector dot product is

$$\vec{OA} \cdot \vec{OB} = x_A x_B + y_A y_B + z_A z_B \quad (18)$$

The cross product $\vec{OA} \times \vec{OB}$ in determinant form is

$$\vec{OA} \times \vec{OB} = \begin{vmatrix} i & j & k \\ x_A & y_A & z_A \\ x_B & y_B & z_B \end{vmatrix}$$

which, upon expansion, becomes the normal vector $\vec{V}_N$,

$$\vec{V}_N = \vec{OA} \times \vec{OB} = (y_A z_B - z_A y_B)i + (x_B z_A - z_B x_A)j + (x_A y_B - x_B y_A)k \quad (19)$$

where i , j , and k are mutually orthogonal unit base vectors directed along the principal axes.

$\vec{V}_N$ is equal in magnitude to twice the area of the triangle AOB and is oriented normal to the plane of AOB so that the three vectors form a right-handed system. The magnitude is computed by the Pythagorean theorem,

$$|\vec{V}_N| = \sqrt{(y_A z_B - z_A y_B)^2 + (x_B z_A - x_A z_B)^2 + (x_A y_B - x_B y_A)^2} \quad (20)$$

The angle θ may be evaluated from either the dot or the cross product by use of inverse functions, specifically

$$\theta = \cos^{-1} \left[\frac{\vec{OA} \cdot \vec{OB}}{|\vec{OA}| |\vec{OB}|} \right] \text{ or } \sin^{-1} \left[\frac{|\vec{V}_N|}{|\vec{OA}| |\vec{OB}|} \right]$$

However, an overall economy of computation results from the use of the arctan function,

$$\theta = \tan^{-1} \left[\frac{|\vec{V}_N|}{\vec{OA} \cdot \vec{OB}} \right] \quad (21)$$

As noted earlier, the angle γ is defined as the angle between the plane of AOB and the XY plane. It is also the angle between the vector $\vec{V}_N$ and the Z axis; $\cos \gamma$ is therefore the direction cosine of $\vec{V}_N$ with respect to the Z axis. Using the Z component in Equation 19,

$$\cos \gamma = \frac{x_A y_B - x_B y_A}{|\vec{V}_N|} \quad (22)$$

If the numerator and denominator are both divided by 2,

$$\cos \gamma = \frac{\frac{x_A y_B - x_B y_A}{2}}{\frac{|\vec{V}_N|}{2}}$$

This shows that $\cos \gamma$ is also equal to the ratio of the signed projected area of triangle AOB on the XY plane and the plane area of triangle AOB.

In the right-handed system shown, $\cos \gamma$ is positive when the order of computation of the vectors in the cross product causes the normal vector $\vec{V}_N$ to point in the direction of the +Z axis ($0 < \gamma < 90$). The order in which one proceeds from point to point on the boundary of Surface 2 will sign each elliptical sector accordingly; however, because the sectors are summed algebraically, the same absolute magnitude will result regardless of order. Because the point factor is always a positive number, the order is computationally unimportant. Nevertheless, the program requires that data be entered in counterclockwise order for other reasons. This will be discussed in more detail later.

The relative ease with which the point factor can be computed is best illustrated by an example. Using the triangle shown in Figure 2, and starting with line segment AB, from Equation 18

$$\vec{OA} \cdot \vec{OB} = 1 + 3 + 9 = 13$$

from Equation 20

$$|\vec{V}_{AB}| = |\vec{OA} \times \vec{OB}| = \sqrt{(-6)^2 + 0 + (2)^2} = \sqrt{40}$$

From Equation 21

$$\theta_{AB} = \tan^{-1} \left[\frac{\sqrt{40}}{13} \right] \approx 0.453$$

From Equation 22

$$\cos \gamma_{AB} = \frac{2}{\sqrt{40}} = 0.316$$

Moving to BC,

$$\vec{OB} \cdot \vec{OC} = 3 + 3 + 9 = 15$$

$$|\vec{V}_{BC}| = \sqrt{6^2 + 6^2 + (-8)^2} = \sqrt{136}$$

$$\theta_{BC} = \tan^{-1} \left[\frac{\sqrt{136}}{15} \right] \approx 0.661$$

$$\cos \gamma_{BC} = \frac{-8}{\sqrt{136}} = -0.686$$

Finally, line segment $\vec{CA}$,

$$\vec{OC} \cdot \vec{OA} = 3 + 1 + 9 = 13$$

$$|\vec{VA}| = \sqrt{0^2 + 6^2 + (-2)^2} = \sqrt{40}$$

$$\theta_{CA} = \tan^{-1} \left(\frac{\sqrt{40}}{13} \right) \approx 0.453$$

$$\cos \gamma_{CA} = \frac{2}{\sqrt{40}} = 0.316$$

The configuration factor is, therefore, from Equation 17,

$$\begin{aligned} \epsilon_{12} &= \frac{1}{2\pi} \left| 2(0.453)(0.316) + (0.661)(-0.686) \right| \\ &= \frac{1}{2\pi} \left| -0.167 \right| \end{aligned}$$

$$\epsilon_{12} = 0.0266$$

Note the repetitive nature of the computation. Thus, all surfaces represented by straight line segments in space can be analyzed in the simple, direct manner shown.

COORDINATE TRANSFORMATION

The task of computing factors, even when simple "closed-form" solutions are available, is oftentimes laborious because the surfaces under consideration appear in difficult, skewed relative positions. A significant part of this effort has been eliminated by the program through the capability of general coordinate transformation (translation and/or rotation). Surface data may be entered for each surface using an individually convenient local origin. The surfaces may then be linked together by transforming one or both surfaces to a convenient third origin which is common to both surfaces. The fact that internally generated surfaces may also be transformed (excluding multisurfaces) makes this feature a very powerful tool.

Actually, two different types of coordinate transformation are used by the program. The transformation discussed in the prior paragraph is termed a "primary" transformation, and is under control of the user through transformation data entry. The second type of transformation is termed an "auxiliary" transformation, and is under internal program control only. An auxiliary transformation transforms the surface coordinates of both surfaces into a new coordinate system formed so that the XY plane of the coordinate system lies in the reference plane of one of the surfaces. The reference plane of a surface is the plane formed by the first, second and last point describing that surface. The origin of an auxiliary coordinate system is located at point 1 in the particular surface controlling the transformation. The X-axis is directed along the line segment formed by points 1 and 2. The surface unit orientation vector becomes the Z axis; the Y axis is computed orthogonal to the X and Z axes, thus locating the XY plane in the control surface reference plane.

The auxiliary transformation actually serves two purposes. First, it is utilized by Subroutine DOICU to facilitate reconstruction of the "seen" part of surfaces which are not entirely seen by the other surface. Secondly, the program requires that prior to computation of the configuration factors, Surface 1 must appear in the XY plane of the final coordinate system along with Surface 2 in its proper relative position. This is necessary to enable Subroutine MAP to select points on Surface 1 from which factors to Surface 2 may be directly computed, or from which silhouettes of Surface 2 may be generated and factors computed.

For example, suppose Figure 3 represents the surfaces of various items of equipment appearing in a compartment. The unprimed coordinate system shown may be conveniently chosen at a corner or axis of symmetry, perhaps as shown on a mechanical drawing. This system may not be convenient for data entry of the disk, however. The primed coordinate system with the origin at the center of the disk is the more logical choice in this case. The previously described surface generator will generate the disk about this origin. The disk data can then be transformed from the primed to the unprimed system by a primary transformation. The choice of generating the cube and transforming, or directly entering data from the unprimed system, is left to the user as it requires about equal effort both ways. The plate coordinates can be easily entered from the unprimed system. Now, suppose we desire the form factor from the disk to the plate. If the data are entered as discussed above (including the transformation data), the program will generate the disk and then primary transform disk coordinates to the unprimed system. Since the disk is bisected by the plate, an auxiliary transformation of all coordinates, both disk and plate, will be made from the unprimed to the quad-primed system. Now, that portion of the disk appearing above the active side of the plate will be determined, and an auxiliary transformation of the plate and the truncated disk will be made to the double primed coordinate system, i.e., the reference plane of the disk. The disk is now in a position for mapping, and the plate coordinates are proper for obtaining the configuration factors. A similar manipulation of surface data would be made to obtain the form factor to the cube with one exception - no truncation of the disk would occur and the auxiliary

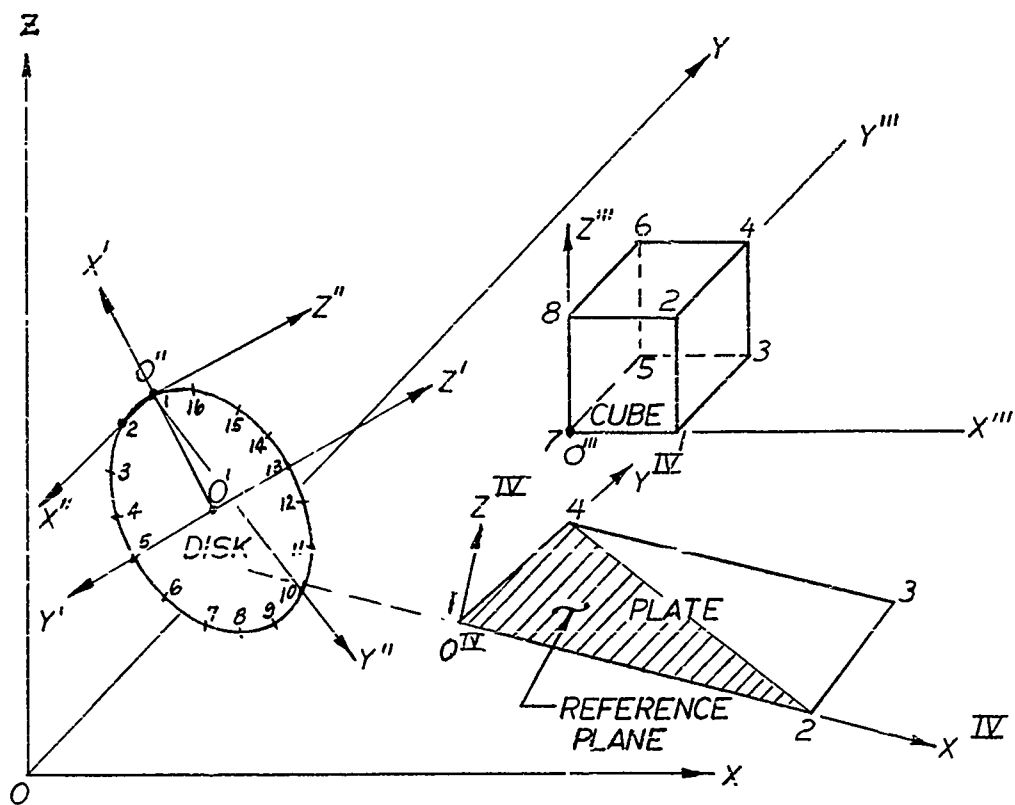


FIGURE 3. SURFACE COORDINATE TRANSFORMATION

transformation to the double-primed system would occur immediately after primary transformation.

The transformation technique utilized for a primary transformation differs from the customary method whereby "old" coordinates plus translation data and direction cosines or Euler angles are supplied, from which a "new" set of coordinates are derived. The program requires the coordinates of any three points (not in a line) measured from the new origin. These data are then used to derive direction cosines and translation terms, by which the old coordinates are then transformed to the new origin.

The reader may find it easier to visualize transformation in terms of the movement of the surfaces instead of the origins. In the case of the disk, again referring to Figure 3, we may say we generated the disk with its center at the origin of the unprimed system and in its XY plane, and then moved the surface to the position indicated by the primed system. This viewpoint appears more realistic when motion is simulated by transforming a surface along a particular path.

The mathematical treatment of primary and auxiliary transformation is presented in Appendix C.

SILHOUETTE GENERATOR

As noted in the introduction, CONFAC I cannot, in general, be used to compute the form factor to solid surfaces. Subroutine FACTOR requires a single array be made available containing the surface boundary points, and only those points, which, when taken in numerical sequence, form a valid silhouette of Surface 2 from a particular point in Surface 1. It is impossible to generally satisfy this requirement with a single input array if Surface 1 is finite and Surface 2 is arbitrarily nonplanar or solid. It is the function of the silhouette generator to determine which points in a given set of Surface 2 data form the silhouette from preselected viewpoints on Surface 1.

The silhouette generator computes the silhouette from the perspective of Surface 2 developed on the Z-unity ($Z = +1$) plane. The perspective on the Z-unity plane is the locus formed in the plane by the boundary of the solid angle subtended by Surface 2.

For example, the view of a cube from two positions on the XY plane is shown in Figure 4. The coordinates of each point in the Z-unity plane are derived in the following manner from the coordinates of its corresponding point on the cube. Note the triangle formed by the origin, point 2 in the cube, and point Q, the vertical projection of point 2 on the XY plane. A similar triangle is constructed from point 2' to point N. From similar triangles,

$$\frac{ON}{OQ} = \frac{Z_2}{Z_2'} \quad (22)$$

In like manner, using triangles RON and SOQ in the top view,

$$\frac{ON}{OO} = \frac{OR}{OS} = \frac{NR}{QS}$$

but $OR = X_2'$, $OS = X_2$, $NR = Y_2'$, $QS = Y_2$ and $Z_2' = 1$.

Therefore,

$$\frac{X_2'}{X_2} = \frac{Z_2'}{Z_2} = \frac{1}{Z_2}$$

$$X_2' = \frac{X_2}{Z_2} \quad (23)$$

and similarly,

$$Y_2' = \frac{Y_2}{Z_2} \quad (24)$$

This reduction to two dimensions results in considerable simplification. Given the coordinates (X, Y) and point connections data, it is possible to determine the line segments forming the silhouette by application of a simple criterion. At each point on the silhouette, those line segments forming the largest included angle define the silhouette. For example, at point 2' in the lower silhouette in Figure 4, vectors 2' - 3', 2' - 1' and 2' - 4' emerge from the point. Vectors 2' - 3' and 2' - 4' obviously form the silhouette, and can be numerically selected by applying the criterion.

Figure 5 shows the development of the Z-unity plane silhouette of a multisurface. In contrast to point D, Surfaces S2 and S3 appear separated in the silhouette when viewed from C.

Note the line connecting 4 to 7. This artifice - a "bridge" line - is utilized to cause the silhouette generator to include both surfaces in the silhouette, otherwise surface S3 would be ignored. Because the line has no width, it has no effect on the factor computation, but the silhouette generator follows the line as if it were a boundary of the multisurface S2 plus S3.

The distinguishing difference between the silhouettes shown in Figure 4 and Figure 5 is the fact that "crossover" occurs in Figure 5. The silhouette at a crossover is formed by intersecting line segments at a point between line segment extremities. The detection of such intersections, and the computation of the coordinates of the intersection, requires considerable analysis with resultant increased computer time. Because of this, silhouette analysis is termed "simple" if no investigation is made by the silhouette generator to detect crossovers, and "complex" when such is made. Only multisurface data (class 8) are run in the complex mode. All other surface data requiring the silhouette generator (classes 4, 5 and 6) are run in the simple mode.

SURFACE GENERATOR

The program cannot directly compute factors to curved surfaces or boundaries such as disks, cylinders, etc. A series of line segments must be substituted for a curved line. In general, the more line segments used, the more accurate the simulation. Because every surface point requires 3 coordinates (and connecting points data, when the silhouette must be computed), preparation and entry of data for even a modest simulation of a cylinder can involve a considerable amount of effort. The internal surface generator eliminates practically all of this effort.

The surface generator is used to create surfaces entered under data classes 3 or 6. Regular plane polygons are created under Class 3, but no connections data are generated. A regular plane polygon or solid surface, including connections data, is created under a class 6 entry.

The surface generator "creates" a surface in accordance with cross section specifications. The following information is required to create a class 3 surface:

1. Number of cross section division (sides) ≥ 3
2. Coordinates (X, Y, Z) of center of polygon
3. X-axis Radius
4. Y-axis Radius

Because a class 6 surface may have one or more cross sections, the following data are required:

1. Number of cross section division (sides) ≥ 3
2. Number of cross sections
3. Coordinates (X, Y, Z) of first cross section
4. X-axis Radius of first cross section
5. Y-axis Radius of first cross section

If more than one cross section is specified, the following data are required for each additional cross section: X-axis radius, Y-axis radius and Z-coordinate. All cross sections are created parallel to the XY plane of the generator coordinate system, and must be specified above the XY plane. Note that X, Y coordinates are required to locate the first cross section only. If more than one is specified, all are oriented along the same vertical centerline to the position specified by the respective Z coordinate.

The basic generating element is the ellipse. Because only complete polygons are generated, the total angle of 2π radians about the vertical centerline is divided by the number of sides specified to yield the unit parametric angle ϕ in the equations of the ellipse:

$$\phi = \frac{2\pi}{N}$$

$$X = (XR) \cos \phi$$

$$Y = (YR) \sin \phi$$

Instead of the conventional semi-major and semi-minor expressions, the terms "X-Radius" and "Y-Radius" are utilized - the larger of the two becomes the semi-major axis as shown in Figures 6 (a), (b), and (c). When $XR = YR$, the generating figure is circular and a regular polygon of N sides results. Notice that the generating figure always circumscribes the generated polygon. The radius vector always starts in the same relative position parallel to X-axis and moves counterclockwise about the vertical centerline of the generated cross section. Considerable computing time is saved by using $\sin(\phi + \beta)$, $\cos(\phi + \beta)$ trigonometric formulae for computation of X , Y after unit values are obtained by use of computer library functions.

Figure 6 (d) shows an eight-sided polygon elevated above the XY plane. Figure 6 (e) indicates the order in which point numbers are assigned to a solid surface. The first point is always assigned to the first coordinates in the first cross section. Numbers are assigned in numerical sequence vertically until the last cross section is numbered, for a particular value of ϕ ; the sequence is continued in similar manner with the first cross section and the next value of ϕ , until all points are defined.

Point connections data are also computed for each point for Class 6 surfaces. For example, in Figure 6 (e), points 2, 3 and 15 are computed for point 1; points 1, 4 and 16 are computed for point 2, etc. This information is used by the silhouette generator.

An example of the variety of objects which may be created by a few cards of specifications are shown in Figure 6 (f). The cone vertex is generated merely by specifying zero X-radius and Y-radius.

The internal surface generator also computes the surface area of the generated solid, if the cross sections are similar. Because the silhouette generator analyzes the solid figure, the total surface area is computed. For instance, the area of the prismatic cylinder shown in Figure 6 (c) would include the top and bottom polygons. The surface area computation analytical development is given in Appendix D.

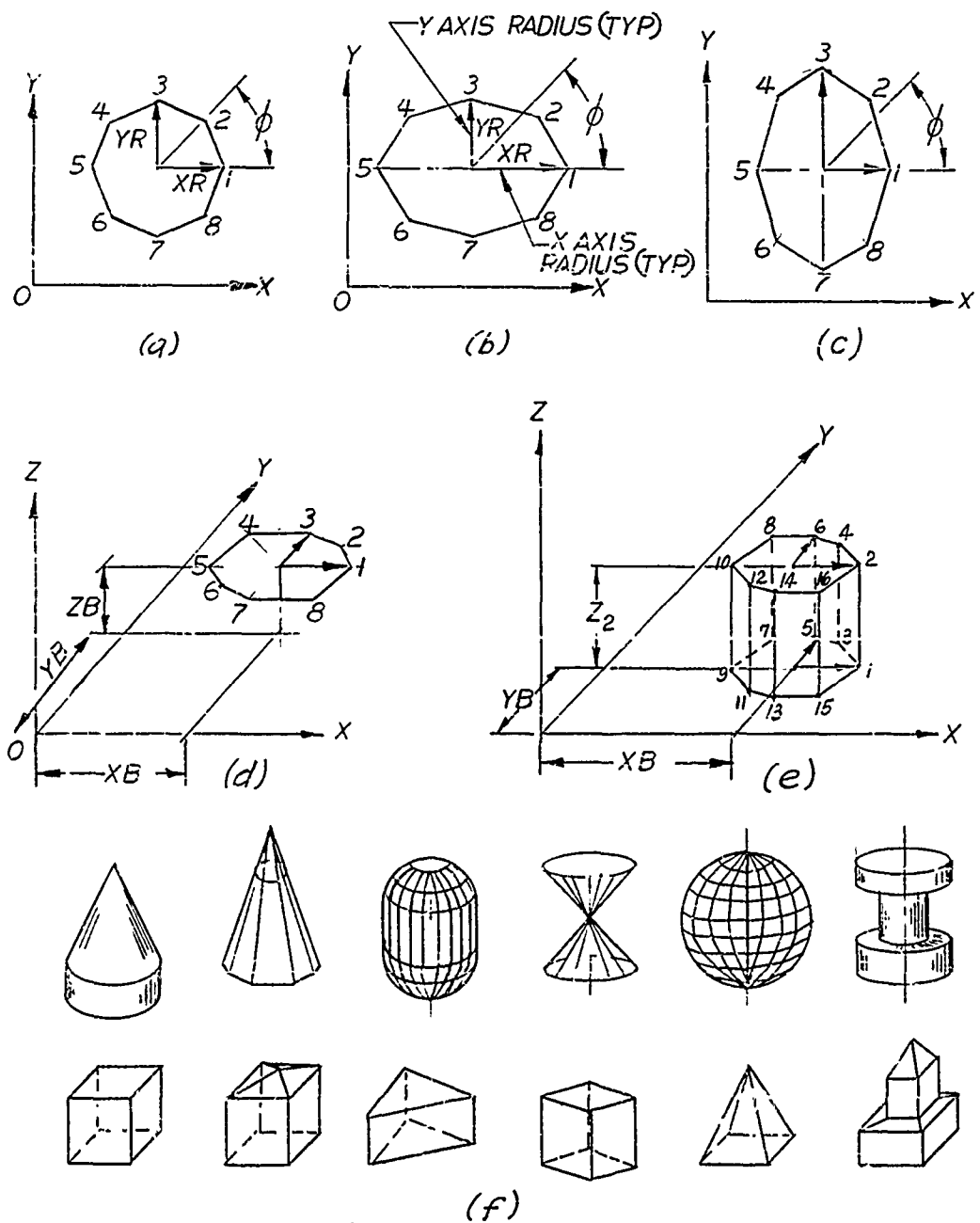


FIGURE 6. CONFAC II SURFACE GENERATOR

SECTION III

COMPUTER PROGRAM CONTENTS

PROGRAM DESCRIPTION

The program is written in IBM 7090 FORTRAN II source language. The source deck consists of the Main Program and Subroutines UNIVFC, TXFRM, COICU, MAP, SILFAC and FACTOR. An input-output tape compatibility Subroutine written in IBM 7090 (FAP) machine language is included. Algebraic routines required from library tape are SQRT (Square Root), ARCTAN (Inverse tangent trigonometric function), COS (Cosine trigonometric function), and SIN (Sine trigonometric function). The source programs are presently dimensioned so that a 32 K core size is required. NAA Library Subroutines COUNTV and TIMEV are also used by Subroutine SILFAC when operating in the NAA 7094 system.

Main Program

The functions performed by the Main Program are as follows:

1. Reads in surface, transformation and run data.
2. Processes input surface data and prints immediately upon completion. Run instruction data are read in and processed one card at a time and processed at once. No printout of the complete run instructions is given, as was in CONFAC I.
3. Selects the proper data for processing according to the run instructions.
4. Examines each run instruction and calls in proper subroutines for processing.
5. Prints diagnostic error indications when possible.
6. Prints standard or detailed output as indicated by run instructions.

Subroutine UNIVFC

This subroutine computes the components of a unit orientation vector normal to the reference plane formed by the first, second and last point in surface data classes 1, 3, 4 and plane 6. The cross product of vectors 1-2 and 1-last is computed and normalized. The vector is formed normal to point 1, and is located on the active side of the surface, thus orienting the surface.

It also computes a new fourth point normal to the new three points submitted in transformation data and an old fourth point normal to the old three points in the surface data to be transformed.

Subroutine TXFRM

The first section performs the auxiliary transformation. This transformation is used to reconstruct a surface which is bisected by the second surface. It also tests Surface 1 to determine if the reference plane is substantially in the XY plane of its coordinate system. If it is not, an auxiliary transformation is effected to move the surfaces to fulfill this requirement prior to computation of silhouettes or factors.

This subroutine also performs a primary transformation as indicated by P.U. instructions and transformation data. This transformation, if indicated for a surface, is accomplished prior to entry to subroutine DOICU so that tests of the surface "view" of each other occur in their transformed position(s).

Subroutine DOICU

The function of this subroutine is conveyed literally by its name DO-I-C-U. Given surfaces A1 and A2 with the "active" side of each surface identified by the surface orientation unit vector, the question is asked; Is all, part, or none of surface A1 "seen" by A2? Conversely, does A2 see all, none, or part of A1? This is accomplished by computing the vector dot product formed by the unit vector in one surface with the vector formed by point 1 in the first surface and each point in the other surface (See Figure 7). The sign of the dot product indicates whether the angle between the vectors is less than or greater than 90°, which reveals the position of the point relative to the plane of the viewing surface. In Figure 7 (a) the dot products from surface A1 to A2 are all positive, and conversely, all from A2 to A1 are likewise positive: A1 sees all of A2; A2 sees all of A1. However, in Figure 7 (b) all dot products from A2 to A1 are positive, but all from A1 to A2 are negative. Hence, in general, if all dot products from one surface to another are all negative, then the surfaces do not see each other, even though the converse products may be positive. There is also the trivial case where all products are zero, in which case the surfaces are in the same plane, and obviously again cannot see each other.

Figure 7 (c) shows a surface A2 bisecting surface A1. In this case, some of the dot products from A2 and A1 are positive and some negative. In Figure 7 (d) both A1 and A2 are bisected. Nonplanar surface A3 was added to show how it would be bisected by A1. Surface A3 has no orientation vector and thus no test is made of the view from this surface. The vertical dashed line in A2 represents how the plane 1-2-5-6 in A3 might bisect A2. DOICU will not detect this condition. If the configuration factor, C_{23} , were required, DOICU would properly bisect A3. However, if the factor to the concave side only is desired, an error would result because part of A2 sees the convex side of A3. This represents one of the limitations of CONFAC I which is carried over to CONFAC II.

If a surface is bisected, DOICU reconstructs the surface data to exclude the area not seen by the other surface. If point 1 in the original surface is

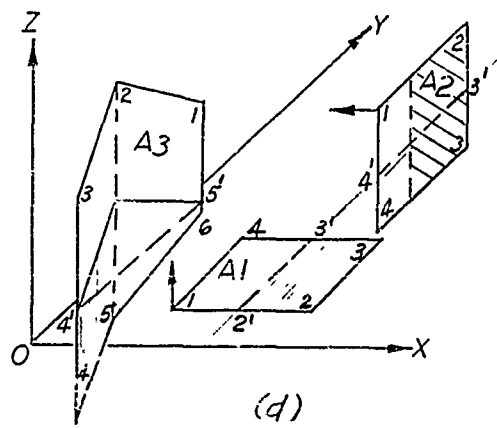
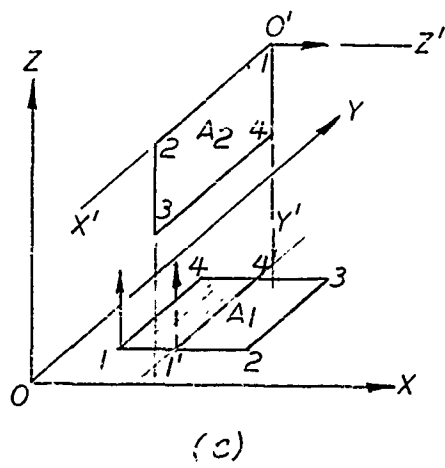
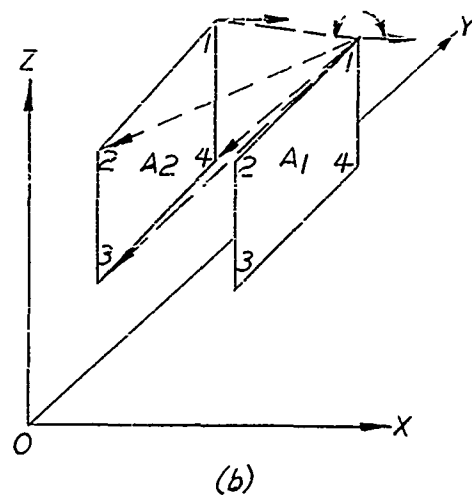
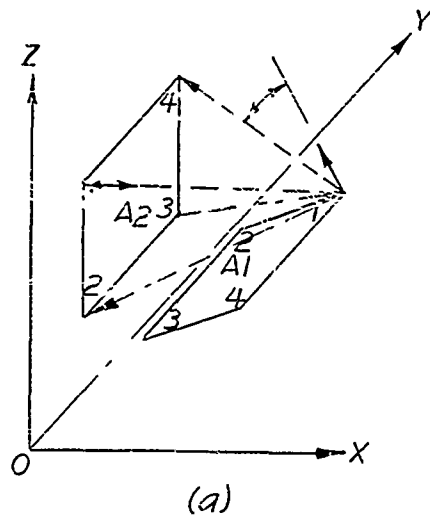


FIGURE 7. DOICU SURFACE ANALYSIS

removed as a result, a new orientation vector is created over the new point 1 as shown in Figure 7 (c). Notice that in reconstructing A3 [Figure 7 (d)], DOICU created the new array 1, 2, 3, 4', 5'. This "surface" is identical to the actual surface seen by A1 insofar as factor computation from A1 is concerned.

The bisection of a surface is done in a simple manner, with the aid of the auxiliary transformation capability. For example, in Figure 7 (c), the coordinates of both surfaces are transformed so that A2 lies in the XY plane of the auxiliary (primed) coordinate system. Each point in A1 is tested, in numerical order, until a change in the sign of the Z-coordinate occurs. The coordinates of the new points where the transition line segment crosses the X' Y' plane ($Z' = 0$) are obtained by computing X and Y intercepts of traces projected on X' Z', Y' Z' principal planes.

Subroutine MAP

The double integral in Equation (9) and its numerical counterpart in Equation (10) mathematically represent the volume under a surface defined by the configuration factor $c_{12} = f(X,Y)$. Subroutine MAP decides the location (X,Y) from which each factor to Surface 2 will be computed.

It is assumed that Surface 1, being classed as a plane, is a plane surface throughout. The program insures only that the reference plane of Surface 1 is in the XY plane of the final coordinate system. MAP will use the X,Y coordinates of all points, and assumes a value of 0 for all Z coordinates. This procedure cannot properly map a nonplanar surface.

Subroutine MAP determines the maximum Y coordinate and the minimum Y coordinate from among the points defining Surface 1 (Figure 8). The total vertical distance between Y_{max} and Y_{min} is divided into equal vertical increments, as specified by the run instructions. Then, horizontal lines are scribed across (parallel to X-axis) the surface at each vertical increment position, including Y_{max} and Y_{min} . The point at which a horizontal line intersects the left (toward the negative X direction) boundary of Surface 1 is termed "X-left" and the intersection on the right, "X-right". Each horizontal line segment thus created is termed a "mapping line". Each mapping line segment is also divided into an equal number of increments as specified by the run instructions. All mapping lines are divided into the same number of increments, not necessarily the same size of increment. Obviously, if Surface 1 converges to a point instead of a line at Y_{max} or Y_{min} , the horizontal increment is 0. A configuration factor is computed at each increment point along a mapping line, including X-left and X-right, which means the number of factors per line is one greater than the number of increments.

The number of increments is automatically set to 24 horizontal and 24 vertical, but can be separately specified by input data to 3, 6, 18, 24, 30, 36, 42, 48, 54, or 60. The details are discussed in Section IV.

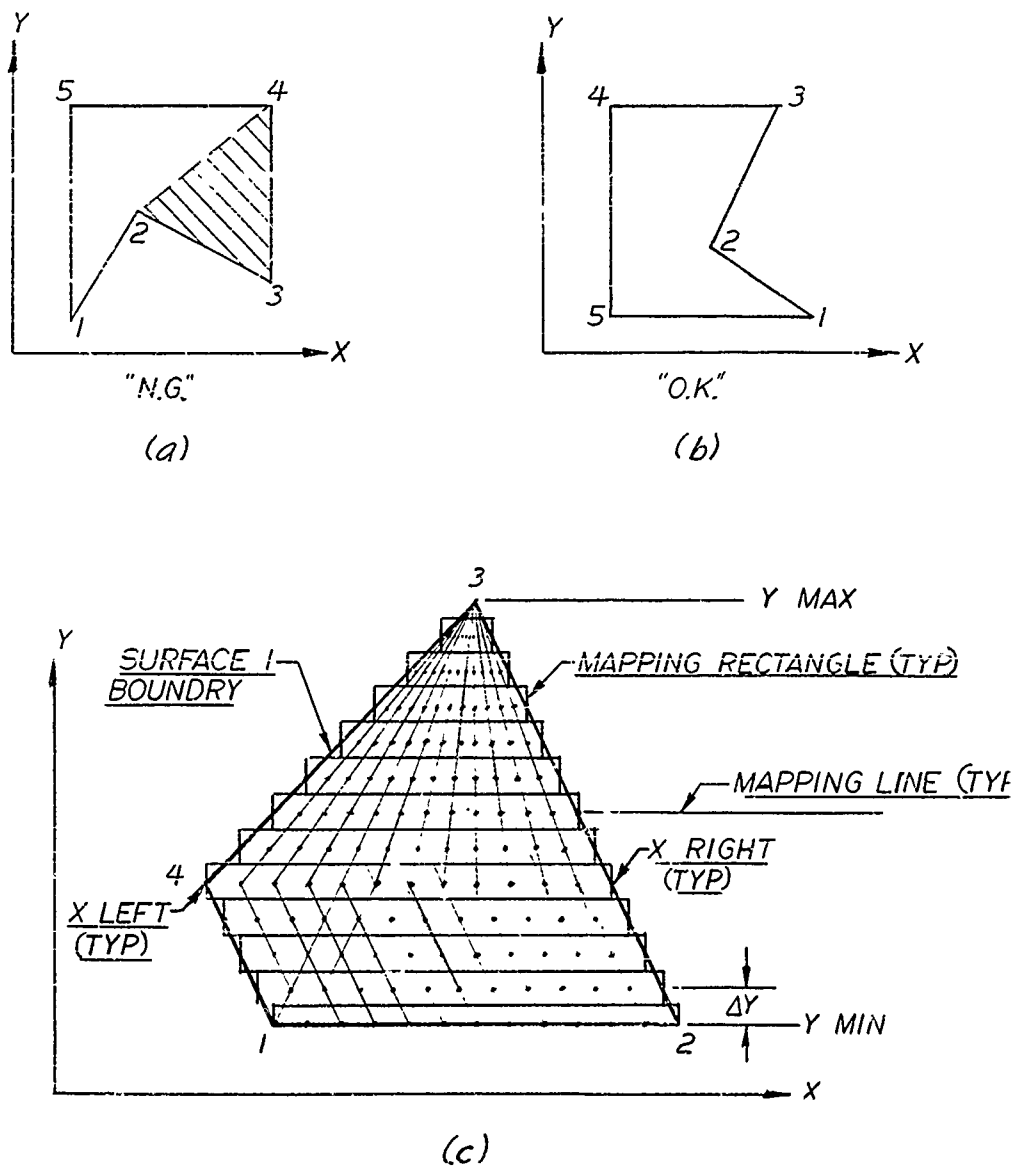


FIGURE 8. MAPPING PROCEDURE

A typical example of Surface 1 manning using a standard (24 x 24) increment is shown in Figure 8 (c). The manning area is also computed by Subroutine MAP, it is the sum of the rectangular areas formed by each manning line. A measure of form factor accuracy is the degree with which the manning area approximates the actual surface area.

Figure 8 (a) illustrates a Surface 1 orientation which cannot be satisfactorily manned because the crosshatched area is ignored. The program does not detect more than one left and one right intersection between a manning line and the surface boundary; therefore, point 3 is ignored. The same surface rotated sufficiently may be acceptable, however, clearing this restriction, as shown in Figure 8 (b).

Subroutine SILFAC

This subroutine computes the silhouette of Surface 2 which appears from the points selected on Surface 1 by Subroutine MAP, and then computes the configuration factor from this silhouette. After all configuration factors have been determined, the form factor is computed by numerical integration.

Surface data entered as Class 4, 5, 6, 7 or 8 is processed by SILFAC. Class 7 data, a sphere, is processed in this routine, but the silhouette generator is not utilized; a closed form solution is used instead (see Appendix E).

Classes 4, 5 and 6 are processed by the silhouette generator in the 'simple' mode; only those points given in connections data are analyzed to select the next point on the silhouette. Surfaces such as planes, cylinders, parallelpiped, etc. may be processed in the 'simple' mode.

Class 8, a multisurface, is the only class processed in the 'complex' mode. One or more (limitations on data are given at the end of this section and in Section IV) surfaces may be processed as a multisurface. Processing in the 'complex' mode is complicated because the computer must test all line segments in all surfaces (including the surface in which the segment appears) in order to select the next point forming the silhouette, or to compute the next point on the silhouette. This analysis is further complicated by ambiguities resulting from normal imprecision in input data and internal arithmetic roundoff, necessitating the use of numerous time consuming tolerance tests. Consequently, a factor computation in the 'complex' mode takes considerably longer than the 'simple' mode.

If a surface is processed as 'simple' when it should be 'complex', a wrong silhouette will be computed whenever a crossover (an intersection of two line segments) occurs. The configuration factor computed from that silhouette will be wrong.

It is possible to detect certain kinds of trouble in the silhouette generator from the detailed silhouette output which lists the points forming the

silhouette. Normally, the silhouette will start at the lowest leftmost point in the Z-unit plane perspective developed for the noted point in Surface 1, and move progressively from point to point in a counterclockwise manner, keeping the perspective area to the left. When a crossover occurs, the point is computed and assigned the next highest number in the silhouette array. For example, from point "n" in Figure 5, the silhouette derived in the correct mode would appear in the detailed silhouette output as "Line No., Point No., 1" 2" 9" 6" 5" 8" 10" 4" 1." However, if this problem were run as simple (both surfaces entered together as Class 4) instead, Surface 93 would be ignored because the crossover at point 9 would not be computed. The silhouette would appear normal, but actually be wrong, as follows:

Line No., Point No., 1" 2" 3" 4" 1"

A bad silhouette can sometimes be detected by the presence of internal "looming". Normally, a silhouette is completed by a return to the starting point. But, if, for some reason, a wrong path is chosen, it may loop a polygon within the perspective. Looming is characterized by the repeated appearance of the same sequence of numbers. No internal pattern recognition is attempted, the only detection is visual examination of the detailed output.

The coordinates of the silhouette on the $Z = 1$ plane are used directly for factor computation instead of the actual points on the surface in space. Because the Z - coordinate of each point is 1, the configuration factor equations for this special case can be simplified, and computing time reduced. SIMFAC, therefore, contains its own equations for configuration factor computation and numerical integration across Surface 1. The integration process is similar to the procedure given in Subroutine FACTOR. Subroutine FACTOR has been retained from COMFAC I for factor computations not utilizing the silhouette generator.

Subroutine FACTOR

This subroutine computes configuration factors from each point on Surface 1 selected by MAP to Surface 2. The exchange coefficient is computed by numerical integration of configuration factors across Surface 1, from which the form factor is finally derived as the area-weighted mean of all configuration factors.

Factors are computed for each point along each mapping line, moving from X-left to X-right, by translating the origin of the Surface 2 coordinate system in X. The analysis and equations are organized for minimum computational time; constants at each loop level are computed once prior to loop entry. Because the usual output desired is only the form factor, configuration factors never are not computed unless a detailed output is requested. A numerical integration of computed point function with respect to X is performed before proceeding to the next line. After all horizontal integrations are completed, these products are integrated with respect to Y, and divided by the mapping area computed in subroutine MAP.

A standard 24 X 24 grid results in 625 configuration factors to be computed. The question naturally arises as to whether this many configuration factors are actually required. If the configuration factor changes very little across Surface 1, then it is probably too many; but if there are sharp changes in the factor, and third place accuracy is desired, then it is probably sufficient. Contrary to off-hand expectations, a more sophisticated integration rule such as Simpson's or Weddle's is not as accurate as the trapezoidal rule for standard increments if the factor function alone changes rapidly. Weddle's rule was initially used which explains why the program increment control is in groups of six (except the initial 3 which is not in ONFAC I). If the factor varies smoothly, a 6 x 6 weddle's rule integration (49 factors) is probably as accurate as the standard 625 factors presently used by the trapezoidal rule. The time saved is appreciable when running many factors. If desired, Weddle's rule may be inserted in the source deck and compiled with no other changes required.

The form factor computed by the above is from that part of Surface 1 which "sees" Surface 2. If Surface 1 is bisected, then the computed factor must be reduced in proportion to the area reduction. This is required because the total active side of Surface 1 entered in data is considered the radiant surface.

GENERAL RULES AND RESTRICTIONS

The following general rules and restrictions must be observed for normal program operation:

1. All data must be derived from right-handed rectangular coordinate systems.
2. Points 1, 2 and the last point in plane surface input data (Class 1 and 4) must not form a straight line in space.
3. The active side of a plane or nonplanar surface is established by entering the boundary points in counterclockwise order, as they appear when facing the active side.
4. If the factor to a Class 2 (nonplanar) surface is required, only the active surfaces should be seen from any point on Surface 1, and they must also be seen from every point on Surface 1.
5. All surfaces used as Surface 2 which utilizes the silhouette generator (Classes 5, 6, 8, or 4 if included in Class 8) must appear above the plane of Surface 1, i.e., all Z - coordinates must be nonzero and positive, prior to factor computation.
6. A primary transformation of Class 8 data is not permitted. Also, no auxiliary transformation is permitted; Surface 1 must be in the XY plane of the Multisurface coordinate system as entered in data.
7. Detailed restrictions and limitations upon input data are given in Section IV.

SECTION IV

INPUT DATA

DATA SPECIFICATIONS AND SPECIFIC RESTRICTIONS

Input data consists of externally computed surface data, specifications for internally created surfaces, transformation data and run instructions (operator requests). Also title and comments cards may be entered as required.

Data type is classified by the use of an integer from 1 to 9 placed in column 1 of the data name card, followed by a 1 to 5 FORTRAN character name to provide data identity within each class. The classes of data are described below.

Class 1 - Plane Polygon

The X, Y, and Z coordinates of each point defining the surface boundary are required. Only one side of a single plane surface can be made active i.e., may interchange radiant flux with another surface. The active side is established in the following manner: Face or look at the desired active side, and select any point on the surface boundary as point number one. Proceeding in a counterclockwise direction about the boundary of the surface, select the remaining points in sequence. If this rule is followed, the surface will always be on the left when moving along the boundary.

The X, Y, and Z coordinates of each point are entered on the data cards in the above sequence, and each point is numbered internally according to its position in the data.

It is assumed that a Class 1 surface is a plane surface. No internal check is made to verify this (in contrast to CONFAC 1). If a substantially nonplanar surface is classed as a plane surface, serious errors in naming could result if used as Surface 1, or wrong factors computed if used as Surface 2.

No point connections data are entered under Class 1; the silhouette generator is not used.

Class 2 - Nonplanar Surface

Two or more plane surfaces, not in the same plane, adjoining or connected, and entered as one package is termed a nonplanar surface.

A Class 2 surface can be used as Surface 2 if the side of each facet selected as the active side, and only those sides, are seen from everywhere on the active side of Surface 1. The counterclockwise order of data

entry establishing the active side is also required as in Class 1, but no orientation vector is generated.

No connection data is required because the silhouette generator is not used.

Class 3 - Internally Generated Plane Polygon, No Connections Data

The internal surface generator will compute the coordinates of each point defining a plane polygon, parallel to the XY plane, with an orientation vector erected over point 1 and directed toward the +Z axis. A detailed description of the internal surface generator is given in Section II.

The data required for a Class 3 surface is:

No. of sides, $3 \leq N \leq 100$

X - Axis Radius

Y - Axis Radius

X, Y, and Z coordinates to center of polygon

A Class 3 surface is used in the same manner as a Class 1 surface. The same rules and restrictions apply.

Class 4 - Plane Polygon with Connections Data and Class 5 - Nonplanar Polygon or Solid Surface with Connections Data

A Class 4 surface is actually a Class 1 surface with connections data added making it possible for it to be processed with the silhouette generator. But, in general, no useful purpose is gained by the use of the silhouette generator to process a plane surface, unless combined with other surfaces. Therefore, a Class 4 surface is processed as a Class 1 surface, unless it is listed under a Class 8 entry.

A Class 5 surface is always processed in the simple mode by SILEAC unless listed under a Class 8 entry.

A maximum of 100 boundary points may be entered describing a Class 4 or 5 surface. Up to 4 connecting points for each boundary point may be entered. If more than four connecting points are required, one may enter more boundary data points having the same coordinates and connecting to each other, using the surplus (3) connections to satisfy the additional connections requirement. However, if more than two such identical boundary points are used, the surface cannot be processed in the simple mode. This restriction in most practical situations can be circumvented by separating the points slightly with little effect on the final form factor computed. If this cannot be done, the surface must be listed under a Class 8 name and processed in the complex mode.

Class 6 - Internally Generated Polygon or Polyhedron, Including Connections Data

A detailed description of the internal surface generator is given in Section II. A class 6 surface is always processed by SILFAC - in the simple mode if used directly, and complex if listed under Class 8. The data required to create a Class 6 surface are:

1. No. of cross sections
2. No. of cross sections divisions (sides)
3. Coordinates and generating radii of first cross section.
4. Z-coordinate and generating radii of additional cross sections, if any.

Attention is directed to general restrictions 4 and 5 in Section III.

Class 7 - Sphere

The radius and the X, Y, and Z coordinates of the sphere are required. A primary transformation of a sphere is pointless and therefore not permitted. Arbitrary orientation of both Surface 1 and sphere is allowed. One peculiarity exists which differs from the usual treatment of bisected surfaces. If the plane of Surface 1 bisects the sphere, the area of the spherical surface above the horizon of Surface 1 will be computed. Now the sphere cannot bisect Surface 1 in the usual sense, but it is possible a bisected sphere may be partly or totally inside the boundaries of Surface 1 - embedded in the surface. In this case, the program will merely assign a zero for the configuration factor when the viewpoint from Surface 1 is inside the sphere. This zero will be integrated as usual with the other factors computed along each scanning line. No computation of the Surface 1 area seeing the sphere is made, however, even though part of Surface 1 is not seen by the sphere.

Class 8 - Multisurface

A Multisurface consists of from one to eleven Class 4, 5, or 6 surfaces. A Class 8 surface, and only a Class 8 surface, is processed in the complex mode. The only data entry necessary to indicate the surfaces which comprise a Multisurface are the names assigned each surface.

Class 9 - Transformation Data

Transformation Data consists of the coordinates of three points in a surface, not in a straight line, derived from the "new" position of a surface which has been moved in its coordinate system. One may, with equal validity, interpret the transformation to mean that the origin of the coordinate system is being moved to a different position, and the data are the coordinates of

each point taken from the new origin. The three points selected need not be chosen or entered in any particular order, nor must the same points be used if more than one different primary transformation of the same surface is desired.

Run Instructions

Run instructions specify, for each factor desired, the following:

1. The name of Surface 1 (emitter)
2. The name of Surface 2 (receiver)
3. Transformation data name(s) for Surface 1 and/or 2, if required.
4. Whether a standard or detailed output is desired, by inserting code letter "D" for detailed output.
5. The horizontal and/or vertical divisions to be used in mapping surface 1. The major divisions which may be used are 6, 12, 18, 24, 30, 36, 42, 48, 54 and 60, but in run instructions these divisions are specified, respectively, by the integers 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10. A special division of 7 may be specified by the integer 11.

DATA DIMENSION RESTRICTIONS

1. A maximum of 100 boundary points (300 coordinates) for each surface entered as Class 1, 2, 4, and 5.
2. A maximum of 100 points, equivalent to 100 sides, generated by Class 3 data.
3. For Class 6 data, the number of sides plus one, times the number of cross sections, must not exceed 101 if plane, and 102 if non-planar.
4. The grand total of surfaces entered or generated by Class 4, 5 and 6 must not exceed 11.
5. The grand total of surfaces entered or generated by Classes 1, 2, 3, 4, 5 and 6 must not exceed 26. If a detailed silhouette output is requested, the grand total must not exceed 16.
6. The total number of Class 7 data must not exceed 9.
7. The total number of Class 8 data must not exceed 12.
8. The total number of Class 9 data must not exceed 10.

PROGRAM CONTROL

The program deck setup is shown in Figure 36. Note the presence of a "T" card immediately following the * DATA Card and the variable format. A "T" card has a "T" in column 1, and serves two purposes. Columns 2 - 72 may contain job title, name of programmer, etc. and will be printed in the output of input data and each factor result. The "T" card also initializes data storage locations, so that new input data can be read in. This means, however, that the old data is effectively wiped out, and is no longer available for fac or commutations, unless re-entered as input data. It is obviously unnecessary to use the "T" card unless all available locations are used up.

Actually, a "T" card does not necessarily have to follow the variable format unless one desires the title to be printed, because the data location counters are automatically initialized at the start of the program. But subsequent re-initialization can be accomplished only by a card with a "T" in column 1.

It appears desirable to have separate identification of the various factors commut¹, and a comments card has been provided for that purpose. The comments card has a "C" in column 1, and a comment may appear in columns 2 - 72. A comments card may be inserted between run instruction cards, and the line of comment given on the card will be printed below the title on all output thereafter, unless superseded by another comments card.

Comments output may be entirely suppressed by using another comments card containing blanks in columns 2 - 72.

FORMAT

All data may be entered on NAA FORTRAN Fixed 10 Decimal Data sheets. Each line represents 12 card columns with six lines per card, making a total of 72 card columns available for data entry. Columns 73 - 80 are used for card identification and/or numerical sequencing for sorting purposes.

Title Card

A title card is characterized by an alphabetical "T" placed in column 1. Columns 2 - 72 available for job identification, as shown on Figure 9.

Comments Card

A comments card is characterized by an alphabetical "C" placed in column 1. Columns 2 - 72 are available for run comments, as shown on Figure 9.

Surface and Transformation Data

All surface and transformation data is preceded by a name card uniquely identifying the data. A name consists of six FORTRAN characters (a computer "word") and always occupies the first six columns of the name card. The data

FORTRAN FIXED 10 DIGIT DECIMAL DATA			
DECK NO.	UNIT	PROGRAMMER'S I & TOPS	DATE 8/1/51 PAGE 1 OF 1 JOB NO.
1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20
21	22	23	24
25	26	27	28
29	30	31	32
33	34	35	36
37	38	39	40
41	42	43	44
45	46	47	48
49	50	51	52
53	54	55	56
57	58	59	60
61	62	63	64
65	66	67	68
69	70	71	72
73	74	75	76
77	78	79	80
81	82	83	84
85	86	87	88
89	90	91	92
93	94	95	96
97	98	99	100
101	102	103	104
105	106	107	108
109	110	111	112
113	114	115	116
117	118	119	120
121	122	123	124
125	126	127	128
129	130	131	132
133	134	135	136
137	138	139	140
141	142	143	144
145	146	147	148
149	150	151	152
153	154	155	156
157	158	159	160
161	162	163	164
165	166	167	168
169	170	171	172
173	174	175	176
177	178	179	180
181	182	183	184
185	186	187	188
189	190	191	192
193	194	195	196
197	198	199	200
201	202	203	204
205	206	207	208
209	210	211	212
213	214	215	216
217	218	219	220
221	222	223	224
225	226	227	228
229	230	231	232
233	234	235	236
237	238	239	240
241	242	243	244
245	246	247	248
249	250	251	252
253	254	255	256
257	258	259	260
261	262	263	264
265	266	267	268
269	270	271	272
273	274	275	276
277	278	279	280
281	282	283	284
285	286	287	288
289	290	291	292
293	294	295	296
297	298	299	300
301	302	303	304
305	306	307	308
309	310	311	312
313	314	315	316
317	318	319	320
321	322	323	324
325	326	327	328
329	330	331	332
333	334	335	336
337	338	339	340
341	342	343	344
345	346	347	348
349	350	351	352
353	354	355	356
357	358	359	360
361	362	363	364
365	366	367	368
369	370	371	372
373	374	375	376
377	378	379	380
381	382	383	384
385	386	387	388
389	390	391	392
393	394	395	396
397	398	399	400
401	402	403	404
405	406	407	408
409	410	411	412
413	414	415	416
417	418	419	420
421	422	423	424
425	426	427	428
429	430	431	432
433	434	435	436
437	438	439	440
441	442	443	444
445	446	447	448
449	450	451	452
453	454	455	456
457	458	459	460
461	462	463	464
465	466	467	468
469	470	471	472
473	474	475	476
477	478	479	480
481	482	483	484
485	486	487	488
489	490	491	492
493	494	495	496
497	498	499	500
501	502	503	504
505	506	507	508
509	510	511	512
513	514	515	516
517	518	519	520
521	522	523	524
525	526	527	528
529	530	531	532
533	534	535	536
537	538	539	540
541	542	543	544
545	546	547	548
549	550	551	552
553	554	555	556
557	558	559	560
561	562	563	564
565	566	567	568
569	570	571	572
573	574	575	576
577	578	579	580
581	582	583	584
585	586	587	588
589	590	591	592
593	594	595	596
597	598	599	600
601	602	603	604
605	606	607	608
609	610	611	612
613	614	615	616
617	618	619	620
621	622	623	624
625	626	627	628
629	630	631	632
633	634	635	636
637	638	639	640
641	642	643	644
645	646	647	648
649	650	651	652
653	654	655	656
657	658	659	660
661	662	663	664
665	666	667	668
669	670	671	672
673	674	675	676
677	678	679	680
681	682	683	684
685	686	687	688
689	690	691	692
693	694	695	696
697	698	699	700
701	702	703	704
705	706	707	708
709	710	711	712
713	714	715	716
717	718	719	720
721	722	723	724
725	726	727	728
729	730	731	732
733	734	735	736
737	738	739	740
741	742	743	744
745	746	747	748
749	750	751	752
753	754	755	756
757	758	759	760
761	762	763	764
765	766	767	768
769	770	771	772
773	774	775	776
777	778	779	780
781	782	783	784
785	786	787	788
789	790	791	792
793	794	795	796
797	798	799	800
801	802	803	804
805	806	807	808
809	810	811	812
813	814	815	816
817	818	819	820
821	822	823	824
825	826	827	828
829	830	831	832
833	834	835	836
837	838	839	840
841	842	843	844
845	846	847	848
849	850	851	852
853	854	855	856
857	858	859	860
861	862	863	864
865	866	867	868
869	870	871	872
873	874	875	876
877	878	879	880
881	882	883	884
885	886	887	888
889	890	891	892
893	894	895	896
897	898	899	900
901	902	903	904
905	906	907	908
909	910	911	912
913	914	915	916
917	918	919	920
921	922	923	924
925	926	927	928
929	930	931	932
933	934	935	936
937	938	939	940
941	942	943	944
945	946	947	948
949	950	951	952
953	954	955	956
957	958	959	960
961	962	963	964
965	966	967	968
969	970	971	972
973	974	975	976
977	978	979	980
981	982	983	984
985	986	987	988
989	990	991	992
993	994	995	996
997	998	999	1000

FIGURE 9. "T" and "C" Control Card Format

class, an integer from 1 to 9, must always be placed in column 1. The remainder of the name occupies columns 2 - 6, and it is important to note that a blank space is considered a character and a part of the name. For example, the name 1S1 is not the same as 1_S1 or 1__S1.

The next word on the name card, columns 7 - 12 must be left blank. The remainder of the name card, (columns 13 - 72) may be left blank or contents written to further identify the data, and will be printed out along with the name of the surface as part of the "Input Data" print out.

The data identified by the name card must follow the name card. There are seven different formats which must be adhered to in entering data.

Class 1 and 2

The number of points to be entered describing the surface appears on the first line, Figure 10, followed by the X, Y, and Z coordinates of each point in sequence. The order in which the points are selected in the surface is explained in detail in Section IV.

Class 3

The number of sides are entered on the first line, followed by the X, Y, and Z coordinates of the center of the internally generated polygon, the X-axis radius and the Y-axis radius as shown in Figure 11.

Class 4

The total number of points describing the surface are entered on the first line as shown in Figure 12. The X, Y, and Z coordinates of the first point follow on the next three lines. The fourth line, representing 12 columns, is divided into four equal parts of 3 columns each. Each point in the surface connecting to point 1 is entered, up to a maximum of four. The pattern is repeated for the remaining points describing the surfaces.

Class 6

The numbers of surface cross section boundary divisions (sides) is given on the first line as shown in Figure 13. The number of cross sections desired is specified on the second line, followed by the X, Y, and Z coordinates of the base (1st) cross section. The X-axis radius of the base cross section is given on the last line of the first card. The Y-axis radius is entered on the first line of the second card, followed by, if more than one cross section is specified, the following, repeated for each cross section. The height (Z-coordinate) of the cross section above the XY plane, the X-axis radius and the Y-axis.

FORTTRAN FIXED 10 DIGIT DECIMAL DATA

DECK NO.	FORM	PROGRAMMER	DATE	NAME	JOB NO.
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9
10	10	10	10	10	10
11	11	11	11	11	11
12	12	12	12	12	12
13	13	13	13	13	13
14	14	14	14	14	14
15	15	15	15	15	15
16	16	16	16	16	16
17	17	17	17	17	17
18	18	18	18	18	18
19	19	19	19	19	19
20	20	20	20	20	20
21	21	21	21	21	21
22	22	22	22	22	22
23	23	23	23	23	23
24	24	24	24	24	24
25	25	25	25	25	25
26	26	26	26	26	26
27	27	27	27	27	27
28	28	28	28	28	28
29	29	29	29	29	29
30	30	30	30	30	30
31	31	31	31	31	31
32	32	32	32	32	32
33	33	33	33	33	33
34	34	34	34	34	34
35	35	35	35	35	35
36	36	36	36	36	36
37	37	37	37	37	37
38	38	38	38	38	38
39	39	39	39	39	39
40	40	40	40	40	40
41	41	41	41	41	41
42	42	42	42	42	42
43	43	43	43	43	43
44	44	44	44	44	44
45	45	45	45	45	45
46	46	46	46	46	46
47	47	47	47	47	47
48	48	48	48	48	48
49	49	49	49	49	49
50	50	50	50	50	50
51	51	51	51	51	51
52	52	52	52	52	52
53	53	53	53	53	53
54	54	54	54	54	54
55	55	55	55	55	55
56	56	56	56	56	56
57	57	57	57	57	57
58	58	58	58	58	58
59	59	59	59	59	59
60	60	60	60	60	60
61	61	61	61	61	61
62	62	62	62	62	62
63	63	63	63	63	63
64	64	64	64	64	64
65	65	65	65	65	65
66	66	66	66	66	66
67	67	67	67	67	67
68	68	68	68	68	68
69	69	69	69	69	69
70	70	70	70	70	70
71	71	71	71	71	71
72	72	72	72	72	72
73	73	73	73	73	73
74	74	74	74	74	74
75	75	75	75	75	75
76	76	76	76	76	76
77	77	77	77	77	77
78	78	78	78	78	78
79	79	79	79	79	79
80	80	80	80	80	80
81	81	81	81	81	81
82	82	82	82	82	82
83	83	83	83	83	83
84	84	84	84	84	84
85	85	85	85	85	85
86	86	86	86	86	86
87	87	87	87	87	87
88	88	88	88	88	88
89	89	89	89	89	89
90	90	90	90	90	90
91	91	91	91	91	91
92	92	92	92	92	92
93	93	93	93	93	93
94	94	94	94	94	94
95	95	95	95	95	95
96	96	96	96	96	96
97	97	97	97	97	97
98	98	98	98	98	98
99	99	99	99	99	99
100	100	100	100	100	100

NOTE: 1) ALL DATA MUST BE ENTERED IN DECIMAL POINTS.
 2) DATA MUST BE ENTERED IN DECIMAL POINTS.
 3) DATA MUST BE ENTERED IN DECIMAL POINTS.

FIGURE 10. Class 1 and 2 Surface Input Data Format

FORTRAN F'XSD 10 DIGIT DECIMAL DATA				
DECK NO.	FORMAT	PROGRAMMER	E. A. TOPP	DATE 4/24/62
NO.	NUMBER	IDENTIFICATION	DESCRIPTION	DO NOT KEY PUNCH
1	1	1	NAME OF CLASS 3 SURFACE CODE 1-4	
2	2	2	TYPE "1" OR CODE 1 TO CREATE AS	
3	3	3	INTERNALLY GENERATED PLANE NUMBER	
4	4	4	NUMBER OF CODE "1" TO KEY IN SURFACE	
5	5	5	THE CODE "1" TO KEY IN SURFACE IDENTIFIER	
6	6	6	THE CODE "1" TO KEY IN SURFACE IDENTIFIER	
7	7	7	NO. OF SURFACE POINTS = 3	
8	8	8	COORDINATES OF CENTER	
9	9	9	1 = AFTER SURFACE	
10	10	10	1 = AFTER SURFACE	
11	11	11	1 = AFTER SURFACE	
12	12	12	1 = AFTER SURFACE	
13	13	13	1 = AFTER SURFACE	
14	14	14	1 = AFTER SURFACE	
15	15	15	1 = AFTER SURFACE	
16	16	16	1 = AFTER SURFACE	
17	17	17	1 = AFTER SURFACE	
18	18	18	1 = AFTER SURFACE	
19	19	19	1 = AFTER SURFACE	
20	20	20	1 = AFTER SURFACE	
21	21	21	1 = AFTER SURFACE	
22	22	22	1 = AFTER SURFACE	
23	23	23	1 = AFTER SURFACE	
24	24	24	1 = AFTER SURFACE	
25	25	25	1 = AFTER SURFACE	
26	26	26	1 = AFTER SURFACE	
27	27	27	1 = AFTER SURFACE	
28	28	28	1 = AFTER SURFACE	
29	29	29	1 = AFTER SURFACE	
30	30	30	1 = AFTER SURFACE	
31	31	31	1 = AFTER SURFACE	
32	32	32	1 = AFTER SURFACE	
33	33	33	1 = AFTER SURFACE	
34	34	34	1 = AFTER SURFACE	
35	35	35	1 = AFTER SURFACE	
36	36	36	1 = AFTER SURFACE	
37	37	37	1 = AFTER SURFACE	
38	38	38	1 = AFTER SURFACE	
39	39	39	1 = AFTER SURFACE	
40	40	40	1 = AFTER SURFACE	
41	41	41	1 = AFTER SURFACE	
42	42	42	1 = AFTER SURFACE	
43	43	43	1 = AFTER SURFACE	
44	44	44	1 = AFTER SURFACE	
45	45	45	1 = AFTER SURFACE	
46	46	46	1 = AFTER SURFACE	
47	47	47	1 = AFTER SURFACE	
48	48	48	1 = AFTER SURFACE	
49	49	49	1 = AFTER SURFACE	
50	50	50	1 = AFTER SURFACE	
51	51	51	1 = AFTER SURFACE	
52	52	52	1 = AFTER SURFACE	
53	53	53	1 = AFTER SURFACE	
54	54	54	1 = AFTER SURFACE	
55	55	55	1 = AFTER SURFACE	
56	56	56	1 = AFTER SURFACE	
57	57	57	1 = AFTER SURFACE	
58	58	58	1 = AFTER SURFACE	
59	59	59	1 = AFTER SURFACE	
60	60	60	1 = AFTER SURFACE	
61	61	61	1 = AFTER SURFACE	
62	62	62	1 = AFTER SURFACE	
63	63	63	1 = AFTER SURFACE	
64	64	64	1 = AFTER SURFACE	
65	65	65	1 = AFTER SURFACE	
66	66	66	1 = AFTER SURFACE	
67	67	67	1 = AFTER SURFACE	
68	68	68	1 = AFTER SURFACE	
69	69	69	1 = AFTER SURFACE	
70	70	70	1 = AFTER SURFACE	
71	71	71	1 = AFTER SURFACE	
72	72	72	1 = AFTER SURFACE	
73	73	73	1 = AFTER SURFACE	
74	74	74	1 = AFTER SURFACE	
75	75	75	1 = AFTER SURFACE	
76	76	76	1 = AFTER SURFACE	
77	77	77	1 = AFTER SURFACE	
78	78	78	1 = AFTER SURFACE	
79	79	79	1 = AFTER SURFACE	
80	80	80	1 = AFTER SURFACE	
81	81	81	1 = AFTER SURFACE	
82	82	82	1 = AFTER SURFACE	
83	83	83	1 = AFTER SURFACE	
84	84	84	1 = AFTER SURFACE	
85	85	85	1 = AFTER SURFACE	
86	86	86	1 = AFTER SURFACE	
87	87	87	1 = AFTER SURFACE	
88	88	88	1 = AFTER SURFACE	
89	89	89	1 = AFTER SURFACE	
90	90	90	1 = AFTER SURFACE	
91	91	91	1 = AFTER SURFACE	
92	92	92	1 = AFTER SURFACE	
93	93	93	1 = AFTER SURFACE	
94	94	94	1 = AFTER SURFACE	
95	95	95	1 = AFTER SURFACE	
96	96	96	1 = AFTER SURFACE	
97	97	97	1 = AFTER SURFACE	
98	98	98	1 = AFTER SURFACE	
99	99	99	1 = AFTER SURFACE	
100	100	100	1 = AFTER SURFACE	

FIGURE 11. Class 3 Surface Specifications Input Data Format

FORTTRAN FIXED 10 DIGIT DECIMAL DATA

DECK NO. 10001 PROGRAMMER E. A. TOOP DATE 4/11/53 PAGE 1 OF 1 JOB NO.

NUMBER	IDENTIFICATION	DESCRIPTION	DO NOT KEY PUNCH
1	1	NAME OF CLASS 4 OF 5 SURFACE, CODE 1 - 6	
2	2	CLASS 4 - PLATE NUMBER, USE "X" IN COL. 1	
3	3	CLASS 5 - ROUTE OR NUMBER OF ROAD, DIV. 1, IN 0-1	
4	4	INTERSECTION CODE, WILL BE BLANK	
5	5	THE CODE IS TO BE FOR LAMINATION IDENTIFICATION	
6	6	FOR COLS 70-80 FOR CARD 70, ALL CARDS	
7	7	NO. OF POINTS SURFACE 4 SURFACE	
8	8	COORDINATES OF FIRST SURFACE POINT	
9	9	COORDINATES OF SECOND SURFACE POINT	
10	10	COORDINATES OF THIRD SURFACE POINT	
11	11	COORDINATES OF FOURTH SURFACE POINT	
12	12	COORDINATES OF FIFTH SURFACE POINT	
13	13	COORDINATES OF SIXTH SURFACE POINT	
14	14	COORDINATES OF SEVENTH SURFACE POINT	
15	15	COORDINATES OF EIGHTH SURFACE POINT	
16	16	COORDINATES OF NINTH SURFACE POINT	
17	17	COORDINATES OF TENTH SURFACE POINT	
18	18	COORDINATES OF ELEVENTH SURFACE POINT	
19	19	COORDINATES OF TWELFTH SURFACE POINT	
20	20	COORDINATES OF THIRTEENTH SURFACE POINT	
21	21	COORDINATES OF FOURTEENTH SURFACE POINT	
22	22	COORDINATES OF FIFTEENTH SURFACE POINT	
23	23	COORDINATES OF SIXTEENTH SURFACE POINT	
24	24	COORDINATES OF SEVENTEENTH SURFACE POINT	
25	25	COORDINATES OF EIGHTEENTH SURFACE POINT	
26	26	COORDINATES OF NINETEENTH SURFACE POINT	
27	27	COORDINATES OF TWENTIETH SURFACE POINT	
28	28	COORDINATES OF TWENTY-FIRST SURFACE POINT	
29	29	COORDINATES OF TWENTY-SECOND SURFACE POINT	
30	30	COORDINATES OF TWENTY-THIRD SURFACE POINT	
31	31	COORDINATES OF TWENTY-FOURTH SURFACE POINT	
32	32	COORDINATES OF TWENTY-FIFTH SURFACE POINT	
33	33	COORDINATES OF TWENTY-SIXTH SURFACE POINT	
34	34	COORDINATES OF TWENTY-SEVENTH SURFACE POINT	
35	35	COORDINATES OF TWENTY-EIGHTH SURFACE POINT	
36	36	COORDINATES OF TWENTY-NINTH SURFACE POINT	
37	37	COORDINATES OF THIRTIETH SURFACE POINT	
38	38	COORDINATES OF THIRTY-FIRST SURFACE POINT	
39	39	COORDINATES OF THIRTY-SECOND SURFACE POINT	
40	40	COORDINATES OF THIRTY-THIRD SURFACE POINT	
41	41	COORDINATES OF THIRTY-FOURTH SURFACE POINT	
42	42	COORDINATES OF THIRTY-FIFTH SURFACE POINT	
43	43	COORDINATES OF THIRTY-SIXTH SURFACE POINT	
44	44	COORDINATES OF THIRTY-SEVENTH SURFACE POINT	
45	45	COORDINATES OF THIRTY-EIGHTH SURFACE POINT	
46	46	COORDINATES OF THIRTY-NINTH SURFACE POINT	
47	47	COORDINATES OF FORTY SURFACE POINT	
48	48	COORDINATES OF FORTY-FIRST SURFACE POINT	
49	49	COORDINATES OF FORTY-SECOND SURFACE POINT	
50	50	COORDINATES OF FORTY-THIRD SURFACE POINT	
51	51	COORDINATES OF FORTY-FOURTH SURFACE POINT	
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55	55	COORDINATES OF FORTY-EIGHTH SURFACE POINT	
56	56	COORDINATES OF FORTY-NINTH SURFACE POINT	
57	57	COORDINATES OF FIFTY SURFACE POINT	
58	58	COORDINATES OF FIFTY-FIRST SURFACE POINT	
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99	99	COORDINATES OF NINETY-SECOND SURFACE POINT	
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101	101	COORDINATES OF NINETY-FOURTH SURFACE POINT	
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172	172	COORDINATES OF ONE HUNDRED AND SIXTY-FIVE SURFACE POINT	
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174	174	COORDINATES OF ONE HUNDRED AND SIXTY-SEVEN SURFACE POINT	
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194	194	COORDINATES OF ONE HUNDRED AND EIGHTY-SEVEN SURFACE POINT	
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245	245	COORDINATES OF TWO HUNDRED AND THIRTEEN SURFACE POINT	
246	246	COORDINATES OF TWO HUNDRED AND THIRTEEN SURFACE POINT	
247	24		

FORTRAN FIXED 10 DIGIT DECIMAL DATA				
DECH NO. POINT	PROGRAMMER	DATE	PAGE	JOB NO.
NUMBER	IDENTIFICATION	DESCRIPTION	DO NOT KEY PUNCH	
1	1	NAME OF CLASS 6 SURFACE, CODE 1-6		
2	2	THE "X" PLANE, 1 FOR AN HORIZONTAL		
3	3	COMPUTED PLANE POSITION OF SOLID, WITH COORDINATE DATA		
4	4	HEIGHT, CODE 1-10 FOR AN UNIFORM SURFACE		
5	5	THE CODE 1-10 FOR AN UNIFORM SURFACE		
6	6	THE CODE 1-10 FOR AN UNIFORM SURFACE		
7	7	THE CODE 1-10 FOR AN UNIFORM SURFACE		
8	8	THE CODE 1-10 FOR AN UNIFORM SURFACE		
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93	93	THE CODE 1-10 FOR AN UNIFORM SURFACE		
94	94	THE CODE 1-10 FOR AN UNIFORM SURFACE		
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99	99	THE CODE 1-10 FOR AN UNIFORM SURFACE		
100	100	THE CODE 1-10 FOR AN UNIFORM SURFACE		

FIGURE 13. Class 6 Surface Specifications Input Data Format

Class 7

The sphere radius is entered on the first line, followed by the X, Y, and Z coordinates locating the center of the sphere as shown in Figure 14.

Class 8

The names of the surface (s) which are to be entered under this class are entered together on one card, without regard to order as shown in Figure 15. The card is usually divided into 12 words of six columns each. Each name to be entered must appear identically in a word-space as it appears in the word-space on the data name card.

Class 9

The first point to be transformed is entered on the first line, followed by the X, Y and Z coordinates of the "new" position of the point as shown in Figure 16. The second point to be transformed immediately follows on the fifth line followed by the X-coordinate of the new position of the second point, thus completing the first card. The Y and Z coordinates of the new position of the second point are entered on the first two lines of the second card, followed by the number of the third point to be transformed and its new X, Y, and Z coordinates.

All of the numbers entered in the above data may be entered as fixed or floating point numbers except connections data, which must be entered as decimal integers. If a decimal point is given (fractional numbers must have decimal points given), the floating number may be located anywhere in the field (line); if no decimal point is given, the number must be located to the extreme right of the field (no blanks to the right of the number).

Run Instructions

Six FORTRAN words comprise a set of run instructions; two sets may be entered on one card as shown in Figure 17. The first set starts at column 1 and the second set starts at column 37. Two words (12 columns) comprise one line on the data sheet. The name of the Surface 1 data is entered in the first word (columns 1 - 6) precisely as it appears in the first word of the surface data name card. The name of the Surface 2 data is entered in the second word (columns 8 - 12) precisely as it appears in the first word of the surface data name card. If a primary transformation of Surface 1 is desired, the desired transformation data name is entered in columns 13 - 18, otherwise, it is left blank. If a primary transformation of Surface 2 is desired, the name of the transformation data is entered in the fourth word, columns 19 - 24. If a detailed output is desired, the alphabetical character "D" is entered in column 27, or in column 31. If the "D" appears in either or both locations, a detailed output will result; if a blank is in both locations, a standard output will result. The horizontal naming division "integer" appears in column 30, unless the integer 10 or 11 is used, in which case columns 29 and 30 are utilized. The vertical naming division "integer" appears in column 36, un-

FORTRAN FIXED 10 DIGIT DECIMAL DATA			
DECK NO.	PROGRAM	DATE	PAGE
NO. 1	NO. 1	NO. 1	NO. 1
NUMBER	IDENTIFICATION	DESCRIPTION	DO NOT KEY PUNCH
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
10	10	10	10
11	11	11	11
12	12	12	12
13	13	13	13
14	14	14	14
15	15	15	15
16	16	16	16
17	17	17	17
18	18	18	18
19	19	19	19
20	20	20	20
21	21	21	21
22	22	22	22
23	23	23	23
24	24	24	24
25	25	25	25
26	26	26	26
27	27	27	27
28	28	28	28
29	29	29	29
30	30	30	30
31	31	31	31
32	32	32	32
33	33	33	33
34	34	34	34
35	35	35	35
36	36	36	36
37	37	37	37
38	38	38	38
39	39	39	39
40	40	40	40
41	41	41	41
42	42	42	42
43	43	43	43
44	44	44	44
45	45	45	45
46	46	46	46
47	47	47	47
48	48	48	48
49	49	49	49
50	50	50	50
51	51	51	51
52	52	52	52
53	53	53	53
54	54	54	54
55	55	55	55
56	56	56	56
57	57	57	57
58	58	58	58
59	59	59	59
60	60	60	60
61	61	61	61
62	62	62	62
63	63	63	63
64	64	64	64
65	65	65	65
66	66	66	66
67	67	67	67
68	68	68	68
69	69	69	69
70	70	70	70
71	71	71	71
72	72	72	72
73	73	73	73
74	74	74	74
75	75	75	75
76	76	76	76
77	77	77	77
78	78	78	78
79	79	79	79
80	80	80	80
81	81	81	81
82	82	82	82
83	83	83	83
84	84	84	84
85	85	85	85
86	86	86	86
87	87	87	87
88	88	88	88
89	89	89	89
90	90	90	90
91	91	91	91
92	92	92	92
93	93	93	93
94	94	94	94
95	95	95	95
96	96	96	96
97	97	97	97
98	98	98	98
99	99	99	99
100	100	100	100

FIGURE 14. Class 7 Sphere Specification Input Data Format

FORTRAN FIXED 10 DIGIT DECIMAL DATA

DECK NO. 00001 PROGRAMMER E. J. Topp DATE 12/11/51 PAGE 1 OF 1 JOB NO.

NUMBER	IDENTIFICATION	DESCRIPTION DO NOT KEY PUNCH
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
10	10	10
11	11	11
12	12	12
13	13	13
14	14	14
15	15	15
16	16	16
17	17	17
18	18	18
19	19	19
20	20	20
21	21	21
22	22	22
23	23	23
24	24	24
25	25	25
26	26	26
27	27	27
28	28	28
29	29	29
30	30	30
31	31	31
32	32	32
33	33	33
34	34	34
35	35	35
36	36	36
37	37	37
38	38	38
39	39	39
40	40	40
41	41	41
42	42	42
43	43	43
44	44	44
45	45	45
46	46	46
47	47	47
48	48	48
49	49	49
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57	57	57
58	58	58
59	59	59
60	60	60
61	61	61
62	62	62
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64	64	64
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66	66	66
67	67	67
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69	69	69
70	70	70
71	71	71
72	72	72
73	73	73
74	74	74
75	75	75
76	76	76
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78	78	78
79	79	79
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82	82	82
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84	84	84
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87	87	87
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91	91	91
92	92	92
93	93	93
94	94	94
95	95	95
96	96	96
97	97	97
98	98	98
99	99	99
100	100	100

FIGURE 15. Class 8 Multisurface Specifications Input Data Format

FORTRAN FIXED 10 DIGIT DECIMAL DATA				
DECK NO.	FORMAT	PROGRAMMER	DATE	JOB NO.
NUMBER	IDENTIFICATION	DESCRIPTION DO NOT KEY PUNCH		
1	1-10	TYPE OF CLASS 9 DATA CODE A - 6		
2	1-10	SUN. 1-10 BY A-1 2-10 TRANSFORMATION		
3	1-10	DATA		
4	1-10	IN POINTS CODE 7-12 MUST BE MARKED		
5	1-10	SUN. CODE 13-16 FOR AMPLITUDE RESPONSE		
6	1-10	SUN. CODE 17-20 FOR A-10 21-22 A-10 23-24 A-10 25-26 A-10 27-28 A-10 29-30 A-10		
7	1-10	FIRST POINT TO BE TRANSFORMED		
8	1-10	COORDINATES OF FIRST POINT FROM		
9	1-10	FROM POINT		
10	1-10	SECOND POINT TO BE TRANSFORMED		
11	1-10	COORDINATES OF SECOND POINT FROM REV. OF 101		
12	1-10	FROM POINT, etc.		
13	1-10	COORDINATES, etc.		
14	1-10	SUN. 13-16 DATA POINT FOR INITIAL POINT IN SET		
15	1-10	INITIAL POINT MAY BE OBTAINED BY SETTING		
16	1-10	TYPE OF POINT		
17	1-10	DATA POINT AS OBTAINED FROM A POINT-MARKED		
18	1-10	RE-TRANSFORM COORDINATE SYSTEM		

FIGURE 16. Class 9 Transformation Data Input Data Format

FORTTRAN FIXED 10 DIGIT DECIMAL DATA

DECK NO.	FOUNT	PROGRAMMER	DATE	CLASS	PAGE	OF	TOTAL
1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9
10	10	10	10	10	10	10	10
11	11	11	11	11	11	11	11
12	12	12	12	12	12	12	12
13	13	13	13	13	13	13	13
14	14	14	14	14	14	14	14
15	15	15	15	15	15	15	15
16	16	16	16	16	16	16	16
17	17	17	17	17	17	17	17
18	18	18	18	18	18	18	18
19	19	19	19	19	19	19	19
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21	21	21	21	21	21	21	21
22	22	22	22	22	22	22	22
23	23	23	23	23	23	23	23
24	24	24	24	24	24	24	24
25	25	25	25	25	25	25	25
26	26	26	26	26	26	26	26
27	27	27	27	27	27	27	27
28	28	28	28	28	28	28	28
29	29	29	29	29	29	29	29
30	30	30	30	30	30	30	30
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34	34	34	34	34	34	34	34
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36	36	36	36	36	36	36	36
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41	41	41	41	41	41	41	41
42	42	42	42	42	42	42	42
43	43	43	43	43	43	43	43
44	44	44	44	44	44	44	44
45	45	45	45	45	45	45	45
46	46	46	46	46	46	46	46
47	47	47	47	47	47	47	47
48	48	48	48	48	48	48	48
49	49	49	49	49	49	49	49
50	50	50	50	50	50	50	50
51	51	51	51	51	51	51	51
52	52	52	52	52	52	52	52
53	53	53	53	53	53	53	53
54	54	54	54	54	54	54	54
55	55	55	55	55	55	55	55
56	56	56	56	56	56	56	56
57	57	57	57	57	57	57	57
58	58	58	58	58	58	58	58
59	59	59	59	59	59	59	59
60	60	60	60	60	60	60	60
61	61	61	61	61	61	61	61
62	62	62	62	62	62	62	62
63	63	63	63	63	63	63	63
64	64	64	64	64	64	64	64
65	65	65	65	65	65	65	65
66	66	66	66	66	66	66	66
67	67	67	67	67	67	67	67
68	68	68	68	68	68	68	68
69	69	69	69	69	69	69	69
70	70	70	70	70	70	70	70
71	71	71	71	71	71	71	71
72	72	72	72	72	72	72	72
73	73	73	73	73	73	73	73
74	74	74	74	74	74	74	74
75	75	75	75	75	75	75	75
76	76	76	76	76	76	76	76
77	77	77	77	77	77	77	77
78	78	78	78	78	78	78	78
79	79	79	79	79	79	79	79
80	80	80	80	80	80	80	80
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82	82	82	82	82	82	82	82
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84	84	84	84	84	84	84	84
85	85	85	85	85	85	85	85
86	86	86	86	86	86	86	86
87	87	87	87	87	87	87	87
88	88	88	88	88	88	88	88
89	89	89	89	89	89	89	89
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91	91	91	91	91	91	91	91
92	92	92	92	92	92	92	92
93	93	93	93	93	93	93	93
94	94	94	94	94	94	94	94
95	95	95	95	95	95	95	95
96	96	96	96	96	96	96	96
97	97	97	97	97	97	97	97
98	98	98	98	98	98	98	98
99	99	99	99	99	99	99	99
100	100	100	100	100	100	100	100

FIGURE 17. Run Instructions Input Data Format

less the integer 10 or 11 is used, in which case columns 35 and 36 are utilized. If columns 29 and 30 are both blank, a standard integer 4 meaning 24 horizontal divisions of each naming line is used. If 35 and 36 are both blank, a standard vertical division of 24 will be used. The above format is repeated in the same manner, starting from column 37 on the fourth line, for the second set of run instructions on the card. There is no numerical limit to the number of run instructions which may be entered. The only requirement is, of course, that the data called for has been loaded in under the names used.

SECTION V

PROGRAM OUTPUT

Input data is processed and printed out prior to its use in factor computations for programmer verification. The orientation vector head end is also printed out for all plane surfaces, so that the "active" side used by the program is clearly shown. Class 3 and 6 specifications as read in are printed, along with the surface data generated by the specifications.

A standard "minimum" output is given when the code letter "D" does not appear in the run instructions, consisting of the following:

1. Run number
2. Run instructions
3. The computed form factor
4. The Surface 1 mapping area
5. The exchange coefficient (fA product)
6. The total area of Surface 1
7. If Surface 1 is bisected, the area seen by Surface 2
8. The total area of Surface 2, if Surface 2 area can be computed
9. If Surface 2 is bisected, the area seen by Surface 1, if that area can be computed
10. The time in seconds spent in Subroutine SHIFAC, if utilized

If a detailed output is requested, the minimum output plus the following is printed:

1. The final coordinates of Surface 1 and Surface 2 prior to computation of configuration factors.
2. The X-Left and X-Right coordinates for each Y division of Surface 1 mapping, including horizontal and vertical divisions used.
3. Each configuration factor computed. The output is given in groups of factors easily identified because the last factor in a group occupies a line by itself. Each group contains the configuration factors computed on a mapping line. The first factor in the group is that computed at Y-left and the last factor in the group is that

computed at X-right. The first group represents the first mapping line, the second group the second mapping line, etc.

4. If the silhouette generator was used, the silhouette computed for points selected on each mapping line is printed out. The first numeral given is the mapping line, the second is the point on the mapping line, moving from X-left to X-right. The numbers following represent the silhouette.

SECTION VI

REFERENCES

1. Hamilton, D. C. and W. R. Morgan. Radiant-Interchange Configuration Factors. National Advisory Committee for Aeronautics. NACA TN-2836 (1952).
2. Sokolnikoff, I. D., and R. M. Redheffer. Mathematics of Physics and Modern Engineering. New York: McGraw-Hill Book Company, Inc., (1958).
3. Moon, Parry. The Scientific Basis of Illuminating Engineering. New York: Dover Publications, Inc., (1961), pp. 312-318.
4. O'Brien, F. F. "Pictiel's Globoscone for Lighting Design;" Illuminating Engineering, Vol. LVIII, No. 3 (3 March 1963).
5. Towns, Kempton A. A General Computer Program for the Determination of Radiant-Interchange Configuration Factors. NAA S&ID, SID 62-393, ASD Technical Note ASD-TN-61-101 (ASTIA No. 403027), (March 1963).

APPENDIX A

SAMPLE PROBLEMS

A number of sample problems have been devised to illustrate the capabilities and limitations of CONFAC II. The examples are arranged roughly in order of complexity, beginning with simple plane surfaces and concluding with a complicated "intervening surface" problem involving plane and solid surfaces.

The surface configurations upon which the example problems are based are shown in accompanying illustrations. Each illustration is conveniently grouped separately with the problem description pertaining to the surfaces shown in the illustration, along with the input data sheets, run instructions, program output and a short discussion.

SAMPLE PROBLEM GROUP A

The surfaces shown in Figure 18 are similar to the examples given in CONFAC I. The added CONFAC II capability of bisecting a nonplanar surface is demonstrated. The data sheets are shown in Figure 19 and the results are presented in Figure 20.

Problem 1A

In Figure 18 (A1), the factor between the floor of a circular room (1FLOOR) and an adjacent wall (1WALL) is computed, using standard horizontal and vertical mapping divisions (24 x 24) on Surface 1. A detailed output is requested.

Note that because no primary or auxiliary transformation occurred, the floor coordinate system is the same as the input data (unrimed) coordinate system. The first mapping line starts at the origin and extends to point 1 in 1FLOOR.

Problem 2A

In Figure 18 (A1), any plane surface may be used as Surface 1 providing it has been properly entered in data prior to the factor request. To demonstrate, the wall (1WALL) now acts as Surface 1, and the factor to the floor (1FLOOR) is requested.

Note that Surface 1WALL is not in the X-Y plane of its input (unrimed) coordinate system. The program, therefore, had to perform an auxiliary transformation of both surfaces to the unrimed system shown, prior to factor computation, to get Surface 1 in the XY plane.

Problem 3A

In Figure 18 (A2), the factor from the floor (1FLOOR) to two adjacent walls taken together (2WALLS) is requested. This is a valid request because the boundary data describing 2WALLS form a valid silhouette of 2WALLS from any point on 1FLOOR. The factor should be twice that to one wall alone.

Problem 4A

The program cannot validly compute the factor from a nonplanar surface. A Class 2 surface is assumed nonplanar. The factor from 2WALLS to 1FLOOR is requested in order to elicit the diagnostic, warning the user of this error.

The program does not test the surface, as in CONFAC I. If a nonplanar surface is erroneously entered as a Class 1 surface, it will not be rejected if used as Surface 1 - the responsibility lay with the user to insure that Surface 1 is planar.

Problem 5A

In Figure 18 (A3), the necessity for proper order in data entry is emphasized. The wall data are deliberately entered in a clockwise direction (IWALLR) looking at the active surface, instead of counterclockwise. Hence, the orientation vector points in the wrong direction. The factor from IFLOOR to IWALLR is requested in order to elicit the diagnostic which alerts the user to a possible error.

Problem 6A

In Figure 15 (A4), CONFAC II has the capability of bisecting a nonplanar (Class 2) surface. The factor from IFLOOR to 2WALLZ, is requested, with a detailed output, to demonstrate this capability.

Subroutine LOGIC bisected 2WALLZ at the XY plane, and reconstructed the surface by eliminating points 2, 3, and 4, as shown, and creating new points 2', 3', 4' and 5'. The dashed line 2' 3' divides Surface 1 (IFLOOR) into triangular parts, designated A and B. The view of the reconstructed 2WALLZ from anywhere in area B reflects a valid silhouette in the proper counterclockwise order. When reconstructed 2WALLZ is viewed from area A, the points still form a valid silhouette, but the order is reversed. This means the computed configuration factor will be to the hemispherical space not occupied by 2WALLZ, and will be negative. So, subroutine FACTOR subtracts this factor from 1.0 to yield the correct factor to 2WALLZ.

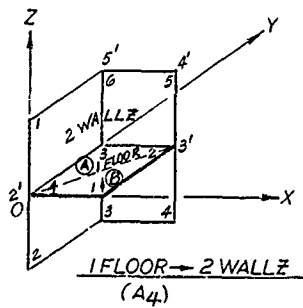
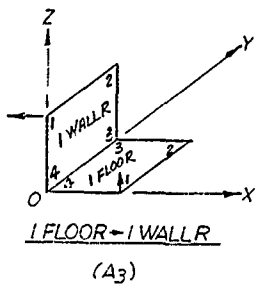
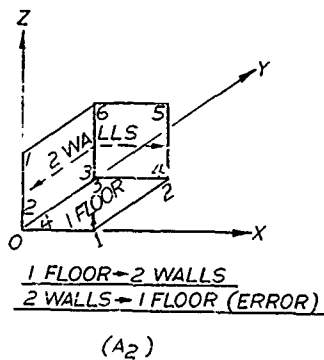
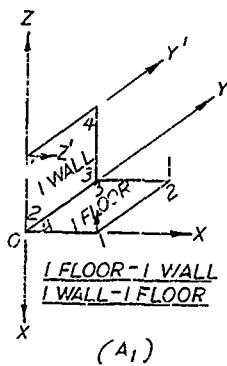


FIGURE 18. SAMPLE PROBLEMS - GROUP A

FORTRAN FIXED 10 DIGIT DECIMAL DATA

FORM NO. 570 PROGRAMMER E. T. 1021 DATE 11/1/53 PAGE 3 of 4 JOB NO. 2023-30

NUMBER	IDENTIFICATION	DESCRIPTION	DO NOT KEY PUNCH
1	0		
2	0		
3	0		
4	0		
5	0		
6	0		
7	0		
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12	0		
13	0		
14	0		
15	0		
16	0		
17	0		
18	0		
19	0		
20	0		
21	0		
22	0		
23	0		
24	0		
25	0		
26	0		
27	0		
28	0		
29	0		
30	0		
31	0		
32	0		
33	0		
34	0		
35	0		
36	0		
37	0		
38	0		
39	0		
40	0		
41	0		
42	0		
43	0		
44	0		
45	0		
46	0		
47	0		
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72	0		
73	0		
74	0		
75	0		
76	0		
77	0		
78	0		
79	0		
80	0		
81	0		
82	0		
83	0		
84	0		
85	0		
86	0		
87	0		
88	0		
89	0		
90	0		
91	0		
92	0		
93	0		
94	0		
95	0		
96	0		
97	0		
98	0		
99	0		
100	0		

FORTRAN FIXED 10 DIGIT DECIMAL DATA

FORM NO. 570 PROGRAMMER E. T. 1021 DATE 11/1/53 PAGE 4 of 4 JOB NO. 2023-30

NUMBER	IDENTIFICATION	DESCRIPTION	DO NOT KEY PUNCH
1	0		
2	0		
3	0		
4	0		
5	0		
6	0		
7	0		
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9	0		
10	0		
11	0		
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14	0		
15	0		
16	0		
17	0		
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19	0		
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21	0		
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23	0		
24	0		
25	0		
26	0		
27	0		
28	0		
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94	0		
95	0		
96	0		
97	0		
98	0		
99	0		
100	0		

FIGURE 19. Group A Sample Problems Input Data Code Sheets

DECK NO.	PROG NAME	DATE	PAGE 3 of 36	AS 3 80 2502-10
NUMBER	IDENTIFICATION	DESCRIPTION	DO NOT KEY PUNCH	
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2	0			
3	0			
4	0			
5	0			
6	0			
7	0			
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48	0			
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50	0			
51	0			
52	0			
53	0			
54	0			
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DOC NO	PROG. NAME	DATE	PAGE	JOB NO.
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FORTRAN FIXED 10 DIGIT DECIMAL DATA

DECK NO.	PROGRAMMER	DATE	PAGE 1 of 31	JOB NO. 225-10
NUMBER	IDENTIFICATION	DESCRIPTION	DO NOT KEY PUNCH	
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FORTRAN FIXED 10 DIGIT DECIMAL DATA

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FIGURE 19. Group A Sample Problems Input Data Code Sheets
(continued)

FORTRAN FIXED 10 DIGIT DECIMAL DATA

DECK NO. PROGRAMMER DATE PAGE 2 OF 26 JOB NO. 2107-2

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FORTRAN FIXED 10 DIGIT DECIMAL DATA

DECK NO. PROGRAMMER DATE PAGE 3 OF 26 JOB NO. 2107-2

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FIGURE 19. Group A Sample Problems Input Data Code Sheets
(continued)

NAA SPACE AND INFORMATION SYSTEMS DIVISION
T-1 PROJECT ADJUNCT-INTERCHANGE CONFIGURATION FACTOR PROGRAM

C O N F A C I

NAA COM-AC II REPORT SAMPLE PROBLEMS FROM FIG. 1A3--L.A.T.O.U.S. 11/1/63

I N P U T O A T A

```

***** DATA NAME= *IFLOOR * 1X1 SQUARE
POINT X Y Z POINT X Y Z
1 0.1000000E 01 0. 0.1000000E 01----(INTERNALLY GENERATED ORIENTATION VECTOR) Z
3 0. 0.1000000E 01 0. 0.1000000E 01 0. 0.1000000E 01 0. 0.1000000E 01 0.

***** DATA NAME= *SMALL * 1X1 SQUARE TOUCHING IN WALL
POINT X Y Z POINT X Y Z
1 0.1000000E 01 0. 0.1000000E 01----(INTERNALLY GENERATED ORIENTATION VECTOR) Z
3 0. 0.1000000E 01 0. 0.1000000E 01 0. 0.1000000E 01 0.1000000E 01 0.1000000E 01

***** DATA NAME= *SMALLER * SAME AS SMALL, BUT WITH DATA ENTERED CLOCKWISE
POINT X Y Z POINT X Y Z
1 0.1000000E 01 0. 0.1000000E 01----(INTERNALLY GENERATED ORIENTATION VECTOR) Z
3 0. 0.1000000E 01 0. 0.1000000E 01 0. 0.1000000E 01 0.1000000E 01 0.1000000E 01

***** DATA NAME= *SMALLS * SIDE AND BACK WALL TAKEN TOGETHER
POINT X Y Z POINT X Y Z
1 0. 0. 0.1000000E 01 0. 0.1000000E 01 0.1000000E 01 0.1000000E 01 0.
3 0.1000000E 01 0.1000000E 01 0.1000000E 01 0. 0.1000000E 01 0.1000000E 01 0.1000000E 01

```

FIGURE 20. Group A Sample Problems Program Results
(24 pages)

FORM FACTOR FROM SURFACE • FLOOR • TO SURFACE • WALL

THE MAPPING AREA = 1.0000000E 00 SQ UNITS

THE AREA OF SURFACE • 1 WALL • = 0.10000000 OF SQ UNITS.

THE FOLLOWING ARE THE (FINAL) SURFACE COORDINATES USED FOR THE FACTOR COMPUTATION=

65

POINT	X	Y	Z	POINT	X	Y	Z
1	0.100000E 01	0.	0.100000E 01	2	0.100000E 01	0.	0.
2	0.100000E 01	0.	0.	3	0.	0.	0.100000E 01
3	0.	0.	0.	4	0.	0.	0.

POINT	X	Y	Z	POINT	X	Y	Z
1	0.1000000E 01	0.	0.1000000E 01	1	0.1000000E 01	0.	0.1000000E 01
2	0.	0.	0.1000000E 01	2	0.	0.	0.1000000E 01
3	0.	0.	0.1000000E 01	3	0.	0.	0.1000000E 01
4	0.	0.	0.1000000E 01	4	0.	0.	0.1000000E 01

X=LEFT	X=RIGHT	Y	X=LEFT	X=RIGHT	Y
0.	0.1000000E 01	0.	0.	0.1000000E 01	0.4166667E-01
0.	0.1030000E 01	0.8333333E-01	0.	0.1000000E 01	0.1250000E-00

FIGURE 20. Group A Sample Problems Program Results
(continued)

0.	0.1000000E-01	0.1666667E-00	0.	0.1000000E-01	0.5893333E-00
0.	0.1000000E-01	0.2500000E-00	0.	0.1000000E-01	0.3986667E-00
0.	0.1000000E-01	0.3333333E-00	0.	0.1000000E-01	0.3750000E-00
0.	0.1000000E-01	0.5000000E-00	0.	0.1000000E-01	0.4583333E-00
0.	0.1000000E-01	0.5833333E-00	0.	0.1000000E-01	0.6250000E-00
0.	0.1000000E-01	0.7500000E-00	0.	0.1000000E-01	0.7083333E-00
0.	0.1000000E-01	0.8333333E-00	0.	0.1000000E-01	0.8750000E-00
0.	0.1000000E-01	0.9583333E-00	0.	0.1000000E-01	0.9583333E-00

NO. OF HORIZONTAL INCREMENTS: 24 NO. OF VERTICAL INCREMENTS: 24

THE FOLLOWING ARE PLANE ORIENT COMPRESSION FACTORS COMPUTED FOR THIS RUN
LOWEST GRID LINE FIRST, FROM X-LEFT TO X-RIGHT.

0.2500000E-00	0.238174E-00	0.2244698E-00	0.2147803E-00	0.2033431E-00	0.1921609E-00
0.1812784E-00	0.170741E-00	0.1605884E-00	0.1508443E-00	0.1412374E-00	0.1321577E-00
0.1377481E-00	0.1163187E-00	0.1088213E-00	0.1017688E-00	0.9516960E-01	0.8894905E-01
0.357342E-01	0.1773592E-01	0.7268377E-01	0.6769038E-01	0.6337979E-01	0.5952419E-01
0.5000000E-00	0.3627443E-00	0.2993818E-00	0.2647437E-00	0.2406935E-00	0.2156495E-00
0.5000000E-00	0.8750000E-00	0.1773888E-00	0.1652006E-00	0.1530019E-00	0.1433944E-00
0.1936074E-00	0.1274870E-00	0.1159889E-00	0.1061822E-00	0.9816192E-01	0.9198088E-01
0.5000000E-00	0.4135154E-00	0.3466933E-00	0.3098146E-00	0.2792845E-00	0.2496071E-00
0.2276412E-00	0.2091476E-00	0.1934455E-00	0.1798108E-00	0.1682784E-00	0.1589071E-00
0.4748498E-00	0.1323835E-00	0.1291622E-00	0.1145717E-00	0.1060798E-00	0.9860413E-01
0.5987112E-01	0.4930941E-01	0.7949021E-01	0.7395829E-01	0.6892256E-01	0.6427036E-01
0.5000000E-00	0.4396345E-00	0.3801883E-00	0.3358659E-00	0.3006194E-00	0.2713642E-00
0.1511731E-00	0.1396425E-00	0.1294811E-00	0.1189902E-00	0.1170305E-00	0.1163191E-00
0.956517E-01	0.8882340E-01	0.8221385E-01	0.7672328E-01	0.7137948E-01	0.6645787E-01
0.5000000E-00	0.44774637E-00	0.3900101E-00	0.3578012E-00	0.3211816E-00	0.2872326E-00
0.2447633E-00	0.2415963E-00	0.2216719E-00	0.2023584E-00	0.1827261E-00	0.1729326E-00
0.1468093E-00	0.1468093E-00	0.1355933E-00	0.1253344E-00	0.1159110E-00	0.1072811E-00
0.4739312E-01	0.4720705E-01	0.8542170E-01	0.7929282E-01	0.7366185E-01	0.6848631E-01

FIGURE 20. Group A Sample Problems Program Results
(continued)

0.1426349E-00	0.1333825E-00	0.12-316E-00	0.1145371E-00	0.1040789E-00	0.0860414E-01
0.0169544E-01	0.053021E-01	0.7945921E-01	0.739589E-01	0.489225E-01	0.447573E-01
0.200300E-00	0.367490E-00	0.293119E-00	0.264718E-00	0.246095E-00	0.221195E-00
0.203195E-00	0.190635E-00	0.173329E-00	0.165200E-00	0.153701E-00	0.141595E-00
0.182707E-00	0.143707E-00	0.115394E-00	0.108074E-00	0.1007129E-00	0.0936609E-01
0.072544E-01	0.048396E-01	0.761163E-01	0.710274E-01	0.663152E-01	0.619509E-01
0.376921E-01	0.430171E-00	0.226098E-00	0.214780E-00	0.203342E-00	0.192160E-00
0.161204E-00	0.100000E-00	0.060000E-00	0.050000E-00	0.040000E-00	0.030000E-00
0.124249E-00	0.116318E-00	0.108311E-00	0.100311E-00	0.092311E-00	0.084311E-00
0.0335081E-01	0.777359E-01	0.726377E-01	0.678038E-01	0.635597E-01	0.592849E-01
0.333940E-01					

FIGURE 20. Group A Sample Problems Program Results
(continued)

NAA CO-FAC II REPORT SAMPLE PROBLEMS FROM FIG. 1A3-K-A.TOWNS.11/1/63

```

RUN NO. 2 DATA USED FOR THIS RUN- *WALL *FLOOR.
      *D * *
THE FORM FACTOR FROM SURFACE *WALL * TO SURFACE *FLOOR * = 0.19936
THE EXCHANGE COEFFICIENT (FA) = 0.19936E-00 SQ UNITS
      * *
THE MAPPING AREA = 1.000000E 00 SQ UNITS
THE AREA OF SURFACE *WALL * = 0.100000E 01 SQ UNITS.
THE AREA OF SURFACE *FLOOR * = 0.100000E 01 SQ UNITS.
THE FOLLOWING ARE THE (FINAL) SURFACE COORDINATES USED FOR THE FACTOR COMPUTATION-

**** DATA NAME- *WALL *
POINT X Y Z PRINT X Y Z
1 -0. 0.100000E 01 0.100000E 01 0. 0.100000E 01 0.
3 0.100000E 01 0.100000E 01 0. 0.100000E 01 0.

**** DATA NAME- *FLOOR *
POINT X Y Z PRINT X Y Z
1 -0. 0.100000E 01 0.100000E 01 0. 0.100000E 01 0.
3 0.100000E 01 0.100000E 01 0. 0.100000E 01 0.

COORDINATES OF POINTS ON BOUNDARY OF SURF *WALL * FOR EACH Y INTERVAL
X-LEFT X-LEFT Y X-LEFT X-RIGHT Y
-0. 0.100000E 01 -0. 0.833333E-01 -0. 0.100000E 01 0.455667E-01
-0. 0.100000E 01 0.100000E 01 0.833333E-01 -0. 0.100000E 01 0.100000E 01

```

FIGURE 20. Group A Sample Problems Program Results
(continued)

-0.	0.1300000E-01	0.1666667E-00	-0.	0.1066730E-01	0.2083333E-00
-0.	0.1300000E-01	0.2500000E-00	-0.	0.1000000E-01	0.2916667E-00
-0.	0.1300000E-01	0.3333333E-00	-0.	0.1000000E-01	0.3750000E-00
-0.	0.1300000E-01	0.4166667E-00	-0.	0.1000000E-01	0.4583333E-00
-0.	0.1300000E-01	0.5000000E-00	-0.	0.1000000E-01	0.5416667E-00
-0.	0.1300000E-01	0.5833333E-00	-0.	0.1000000E-01	0.6250000E-00
-0.	0.1300000E-01	0.6666667E-00	-0.	0.1000000E-01	0.7083333E-00
-0.	0.1300000E-01	0.7500000E-00	-0.	0.1000000E-01	0.7916667E-00
-0.	0.1300000E-01	0.8333333E-00	-0.	0.1000000E-01	0.8750000E-00
-0.	0.1300000E-01	0.9166667E-00	-0.	0.1000000E-01	0.9583333E-00
-0.	0.1300000E-01	1.0000000E-00	-0.	0.1000000E-01	1.0416667E-00

NO. OF HORIZONTAL INCREMENTS= 24 NO. OF VERTICAL INCREMENTS= 24

THE FOLLOWING ARE PLANE POINT CONFIGURATION FACTORS COMPUTED FOR THIS RUN
LOWEST GRID LINE FIRST, FROM X=LEFT TO X=RIGHT.

0.5573A20E-01	0.5922419E-01	0.6359978E-01	0.6798038E-01	0.7265577E-01	0.7773592E-01
0.6212661E-01	0.6894955E-01	0.7514905E-01	0.8107768E-01	0.8682112E-01	0.9238951E-01
0.6818278E-01	0.7494535E-01	0.8093455E-01	0.8674805E-01	0.9238951E-01	0.9777144E-01
0.7390000E-01	0.7993095E-01	0.8563195E-01	0.9103732E-01	0.9651645E-01	1.0195161E-01
0.7920442E-01	0.8493095E-01	0.9053095E-01	0.9603095E-01	1.0153095E-01	1.0693095E-01
0.8420442E-01	0.8993095E-01	0.9543095E-01	1.0093095E-01	1.0593095E-01	1.1093095E-01
0.8893095E-01	0.9443095E-01	0.9993095E-01	1.0493095E-01	1.0993095E-01	1.1493095E-01
0.9343095E-01	0.9893095E-01	1.0393095E-01	1.0893095E-01	1.1393095E-01	1.1893095E-01
0.9793095E-01	1.0343095E-01	1.0793095E-01	1.1243095E-01	1.1693095E-01	1.2143095E-01
1.0243095E-01	1.0793095E-01	1.1193095E-01	1.1593095E-01	1.1993095E-01	1.2393095E-01
1.0693095E-01	1.1193095E-01	1.1593095E-01	1.1993095E-01	1.2393095E-01	1.2793095E-01
1.1143095E-01	1.1593095E-01	1.1993095E-01	1.2393095E-01	1.2793095E-01	1.3193095E-01
1.1593095E-01	1.1993095E-01	1.2393095E-01	1.2793095E-01	1.3193095E-01	1.3593095E-01
1.2043095E-01	1.2443095E-01	1.2843095E-01	1.3243095E-01	1.3643095E-01	1.4043095E-01
1.2493095E-01	1.2893095E-01	1.3293095E-01	1.3693095E-01	1.4093095E-01	1.4493095E-01
1.2943095E-01	1.3343095E-01	1.3743095E-01	1.4143095E-01	1.4543095E-01	1.4943095E-01
1.3393095E-01	1.3793095E-01	1.4193095E-01	1.4593095E-01	1.4993095E-01	1.5393095E-01
1.3843095E-01	1.4243095E-01	1.4643095E-01	1.5043095E-01	1.5443095E-01	1.5843095E-01
1.4293095E-01	1.4693095E-01	1.5093095E-01	1.5493095E-01	1.5893095E-01	1.6293095E-01
1.4743095E-01	1.5143095E-01	1.5543095E-01	1.5943095E-01	1.6343095E-01	1.6743095E-01
1.5193095E-01	1.5593095E-01	1.5993095E-01	1.6393095E-01	1.6793095E-01	1.7193095E-01
1.5643095E-01	1.6043095E-01	1.6443095E-01	1.6843095E-01	1.7243095E-01	1.7643095E-01
1.6093095E-01	1.6493095E-01	1.6893095E-01	1.7293095E-01	1.7693095E-01	1.8093095E-01
1.6543095E-01	1.6943095E-01	1.7343095E-01	1.7743095E-01	1.8143095E-01	1.8543095E-01
1.6993095E-01	1.7393095E-01	1.7793095E-01	1.8193095E-01	1.8593095E-01	1.8993095E-01
1.7443095E-01	1.7843095E-01	1.8243095E-01	1.8643095E-01	1.9043095E-01	1.9443095E-01
1.7893095E-01	1.8293095E-01	1.8693095E-01	1.9093095E-01	1.9493095E-01	1.9893095E-01
1.8343095E-01	1.8743095E-01	1.9143095E-01	1.9543095E-01	1.9943095E-01	2.0343095E-01
1.8793095E-01	1.9193095E-01	1.9593095E-01	1.9993095E-01	2.0393095E-01	2.0793095E-01
1.9243095E-01	1.9643095E-01	2.0043095E-01	2.0443095E-01	2.0843095E-01	2.1243095E-01
1.9693095E-01	2.0093095E-01	2.0493095E-01	2.0893095E-01	2.1293095E-01	2.1693095E-01
2.0143095E-01	2.0543095E-01	2.0943095E-01	2.1343095E-01	2.1743095E-01	2.2143095E-01
2.0593095E-01	2.0993095E-01	2.1393095E-01	2.1793095E-01	2.2193095E-01	2.2593095E-01
2.1043095E-01	2.1443095E-01	2.1843095E-01	2.2243095E-01	2.2643095E-01	2.3043095E-01
2.1493095E-01	2.1893095E-01	2.2293095E-01	2.2693095E-01	2.3093095E-01	2.3493095E-01
2.1943095E-01	2.2343095E-01	2.2743095E-01	2.3143095E-01	2.3543095E-01	2.3943095E-01
2.2393095E-01	2.2793095E-01	2.3193095E-01	2.3593095E-01	2.3993095E-01	2.4393095E-01
2.2843095E-01	2.3243095E-01	2.3643095E-01	2.4043095E-01	2.4443095E-01	2.4843095E-01
2.3293095E-01	2.3693095E-01	2.4093095E-01	2.4493095E-01	2.4893095E-01	2.5293095E-01
2.3743095E-01	2.4143095E-01	2.4543095E-01	2.4943095E-01	2.5343095E-01	2.5743095E-01
2.4193095E-01	2.4593095E-01	2.4993095E-01	2.5393095E-01	2.5793095E-01	2.6193095E-01
2.4643095E-01	2.5043095E-01	2.5443095E-01	2.5843095E-01	2.6243095E-01	2.6643095E-01
2.5093095E-01	2.5493095E-01	2.5893095E-01	2.6293095E-01	2.6693095E-01	2.7093095E-01
2.5543095E-01	2.5943095E-01	2.6343095E-01	2.6743095E-01	2.7143095E-01	2.7543095E-01
2.5993095E-01	2.6393095E-01	2.6793095E-01	2.7193095E-01	2.7593095E-01	2.7993095E-01
2.6443095E-01	2.6843095E-01	2.7243095E-01	2.7643095E-01	2.8043095E-01	2.8443095E-01
2.6893095E-01	2.7293095E-01	2.7693095E-01	2.8093095E-01	2.8493095E-01	2.8893095E-01
2.7343095E-01	2.7743095E-01	2.8143095E-01	2.8543095E-01	2.8943095E-01	2.9343095E-01
2.7793095E-01	2.8193095E-01	2.8593095E-01	2.8993095E-01	2.9393095E-01	2.9793095E-01
2.8243095E-01	2.8643095E-01	2.9043095E-01	2.9443095E-01	2.9843095E-01	3.0243095E-01
2.8693095E-01	2.9093095E-01	2.9493095E-01	2.9893095E-01	3.0293095E-01	3.0693095E-01
2.9143095E-01	2.9543095E-01	2.9943095E-01	3.0343095E-01	3.0743095E-01	3.1143095E-01
2.9593095E-01	2.9993095E-01	3.0393095E-01	3.0793095E-01	3.1193095E-01	3.1593095E-01
3.0043095E-01	3.0443095E-01	3.0843095E-01	3.1243095E-01	3.1643095E-01	3.2043095E-01
3.0493095E-01	3.0893095E-01	3.1293095E-01	3.1693095E-01	3.2093095E-01	3.2493095E-01
3.0943095E-01	3.1343095E-01	3.1743095E-01	3.2143095E-01	3.2543095E-01	3.2943095E-01
3.1393095E-01	3.1793095E-01	3.2193095E-01	3.2593095E-01	3.2993095E-01	3.3393095E-01
3.1843095E-01	3.2243095E-01	3.2643095E-01	3.3043095E-01	3.3443095E-01	3.3843095E-01
3.2293095E-01	3.2693095E-01	3.3093095E-01	3.3493095E-01	3.3893095E-01	3.4293095E-01
3.2743095E-01	3.3143095E-01	3.3543095E-01	3.3943095E-01	3.4343095E-01	3.4743095E-01
3.3193095E-01	3.3593095E-01	3.3993095E-01	3.4393095E-01	3.4793095E-01	3.5193095E-01
3.3643095E-01	3.4043095E-01	3.4443095E-01	3.4843095E-01	3.5243095E-01	3.5643095E-01
3.4093095E-01	3.4493095E-01	3.4893095E-01	3.5293095E-01	3.5693095E-01	3.6093095E-01
3.4543095E-01	3.4943095E-01	3.5343095E-01	3.5743095E-01	3.6143095E-01	3.6543095E-01
3.4993095E-01	3.5393095E-01	3.5793095E-01	3.6193095E-01	3.6593095E-01	3.6993095E-01
3.5443095E-01	3.5843095E-01	3.6243095E-01	3.6643095E-01	3.7043095E-01	3.7443095E-01
3.5893095E-01	3.6293095E-01	3.6693095E-01	3.7093095E-01	3.7493095E-01	3.7893095E-01
3.6343095E-01	3.6743095E-01	3.7143095E-01	3.7543095E-01	3.7943095E-01	3.8343095E-01
3.6793095E-01	3.7193095E-01	3.7593095E-01	3.7993095E-01	3.8393095E-01	3.8793095E-01
3.7243095E-01	3.7643095E-01	3.8043095E-01	3.8443095E-01	3.8843095E-01	3.9243095E-01
3.7693095E-01	3.8093095E-01	3.8493095E-01	3.8893095E-01	3.9293095E-01	3.9693095E-01
3.8143095E-01	3.8543095E-01	3.8943095E-01	3.9343095E-01	3.9743095E-01	4.0143095E-01
3.8593095E-01	3.8993095E-01	3.9393095E-01	3.9793095E-01	4.0193095E-01	4.0593095E-01
3.9043095E-01	3.9443095E-01	3.9843095E-01	4.0243095E-01	4.0643095E-01	4.1043095E-01
3.9493095E-01	3.9893095E-01	4.0293095E-01	4.0693095E-01	4.1093095E-01	4.1493095E-01
3.9943095E-01	4.0343095E-01	4.0743095E-01	4.1143095E-01	4.1543095E-01	4.1943095E-01
4.0393095E-01	4.0793095E-01	4.1193095E-01	4.1593095E-01	4.1993095E-01	4.2393095E-01
4.0843095E-01	4.1243095E-01	4.1643095E-01	4.2043095E-01	4.2443095E-01	4.2843095E-01
4.1293095E-01	4.1693095E-01	4.2093095E-01	4.2493095E-01	4.2893095E-01	4.3293095E-01
4.1743095E-01	4.2143095E-01	4.2543095E-01	4.2943095E-01	4.3343095E-01	4.3743095E-01
4.2193095E-01	4.2593095E-01	4.2993095E-01	4.3393095E-01	4.3793095E-01	4.4193095E-01
4.2643095E-01	4.3043095E-01	4.3443095E-01	4.3843095E-01	4.4243095E-01	4.4643095E-01
4.3093095E-01	4.3493095E-01	4.3893095E-01	4.4293095E-01	4.4693095E-01	4.5093095E-01
4.3543095E-01	4.3943095E-01	4.4343095E-01	4.4743095E-01	4.5143095E-01	4.5543095E-01
4.3993095E-01	4.4393095E-01	4.4793095E-01	4.5193095E-01	4.5593095E-01	4.5993095E-01
4.4443095E-01	4.4843095E-01	4.5243095E-01	4.5643095E-01	4.6043095E-01	4.6443095E-01
4.4893095E-01	4.5293095E-01	4.5693095E-01	4.6093095E-01	4.6493095E-01	4.6893095E-01
4.5343095E-01	4.5743095E-01	4.6143095E-01	4.6543095E-01	4.6943095E-01	4.7343095E-01
4.5793095E-01	4.6193095E-01	4.6593095E-01	4.6993095E-01	4.7393095E-01	4.7793095E-01
4.6243095E-01	4.6643095E-01	4.7043095E-01	4.7443095E-01	4.7843095E-01	4.8243095E-01
4.6693095E-01	4.7093095E-01	4.7493095E-01	4.7893095E-01	4.8293095E-01	4.8693095E-01
4.7143095E-01	4.7543095E-01	4.7943095E-01	4.8343095E-01	4.8743095E-01	4.9143095E-01
4.7593095E-01	4.7993095E-01	4.8393095E-01	4.8793095E-01	4.9193095E-01	4.9593095E-01
4.8043095E-01	4.8443095E-01	4.8843095E-01	4.9243095E-01	4.9643095E-01	5.0043095E-01
4.8493095E-01	4.8893095E-01	4.9293095E-01	4.9693095E-01	5.0093095E-01	5.0493095E-01
4.8943095E-01	4.9343095E-01	4.9743095E-01	5.0143095E-01	5.0543095E-01	5.0943095E-01
4.9393095E-01	4.9793095E-01	5.0193095E-01	5.0593095E-01	5.0993095E-01	5.1393095E-01
4.9843095E-01	5.0243095E-01	5.0643095E-01	5.1043095E-01	5.1443095E-01	5.1843095E-01
5.0293095E-01	5.0693095E-01	5.1093095E-01	5.1493095E-01	5.1893095E-01	5.2293095E-01

0.14283492-C0	0.45316995-C0	0.1658290E-00	0.1700103-C0	0.336838E-00	0.206447E-00
0.2250505E-C0	0.2485091E-00	0.2737869E-00	0.1058147E-00	0.1426924E-00	0.413137E-00
0.5700201E-C0	0.6195098E-01	0.663191E-01	0.710372E-01	0.741143E-01	0.819792E-01
0.8705442E-C1	0.9736602E-01	0.1007149E-00	0.1080744E-00	0.115874E-00	0.123875E-00
0.1150318E-00	0.1231369E-00	0.1519020E-00	0.165208E-00	0.177394E-03	0.190639E-00
0.2231992E-C0	0.2274442E-00	0.4760079E-00	0.4267418E-00	0.2993620E-03	0.3627491E-00
0.5000000E-C0	0.5000000E-00	0.6510938E-01	0.679803E-C4	0.723657E-01	0.777359E-01
0.8151061E-01	0.872469E-01	0.910068E-00	0.910068E-00	0.910068E-00	0.910068E-00
0.1224682E-C0	0.1258571E-00	0.141179E-00	0.141179E-00	0.156213E-03	0.162187E-00
0.488186E-00	0.1121608E-00	0.2033451E-00	0.2147893E-00	0.226409E-03	0.238174E-00
0.8330000E-C0					

FIGURE 20. Group A Sample Problems Program Results
(continued)

FIGURE 20. Group A Sample Problems Program Results
(continued)

0.57844E-00	0.417350E-00	0.456784E-00	0.566174E-00	0.531204E-00	0.536320E-00
0.511642E-00	0.4765240E-00	0.478470E-00	0.700373E-00	0.680044E-00	0.675987E-00
0.28381E-00	0.316400E-00	0.718771E-00	0.700373E-00	0.680044E-00	0.675987E-00
0.604109E-00	0.327473E-00	0.718771E-00	0.700373E-00	0.680044E-00	0.675987E-00
0.601033E-00	0.5117073E-00	0.566647E-00	0.373762E-00	0.514933E-00	0.426977E-00
0.285374E-00	0.5160184E-00	0.5234621E-00	0.506668E-00	0.476834E-00	0.426977E-00
0.500000E-00	0.733714E-00	0.724639E-00	0.714780E-00	0.7031451E-00	0.632160E-00
0.621278E-00	0.6707421E-00	0.660584E-00	0.550844E-00	0.6415274E-00	0.632077E-00
0.581180E-00	0.660721E-00	0.660584E-00	0.550844E-00	0.6415274E-00	0.632077E-00
0.581180E-00	0.577735E-00	0.576688E-00	0.567766E-00	0.5591498E-00	0.588944E-00
0.305734E-00				0.5591498E-00	0.559244E-00

FIGURE 20. Group A Sample Problems Program Results
(continued)

NAA CONFAC II REPORT SAMPLE PROBLEMS FROM FIG. 1A) K_A TOUPS=1.1/63

RUN NO. 4 DATA USED FOR THIS RUN= *2MALLS*IFLOOR*
 *
 *
 *

A NONPLANAR SURFACE CANNOT BE USED AS SURFACE 1-THIS RUN ABORTED.

FIGURE 20. Group A Sample Problems Program Results
 (continued)

NAA COMPAC II REPORT SAMPLE PROBLEMS FROM FIG. (A)X-A-TOUPE:11/1/03

RUN NO. 5 DATA USED FOR THIS RUN- *IFLOOS*+HALL*
 * * *
 * * *

NOV. OF SURFACE *IFLOUP * IS SEEN BY SURFACE *HALL*
 IF THE ABOVE RESULT IS UNEXPECTED, OR NOT BECOME ALARMED- IT HAPPENS TO THE BEST OF CM- JUST CHECK YOUR
 DIRECTION SPECIALLY BE SURE THAT YOU ENTERED ALL POINTS IN COUNTERCLOCKWISE ORDER, AS THEY APPEAR WHEN
 FACING THE ACTIVE SIDE OF THE SURFACE, AND DERIVED FROM A RIGHT-HANDED COORDINATE SYSTEM.

FIGURE 20. Group A Sample Problems Program Results
 (continued)

MIA CONFAC II REPORT SAMPLE PROBLEMS FROM FIG. 1A1-KA-17C/P5,11/1/63

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RIV NO- 6 DATA USED FOR THIS RUN- *IFLOOR*2WALLZ*
      *D *
      *
THE FORM FACTOR FROM SURFACE *IFLOOR * TO SURF/CE *2WALLZ * = 0.39932
THE EXCHANGE COEFFICIENT (FA)- 0.39932E-00 50 UNITS
      *
THE AREA OF SURFACE *IFLOOR * = 0.1000000E 01 50 UNITS.
      *
ONLY A PART OF SURFACE *2WALLZ * SEES SURFACE *IFLOOR *
      *
THE FOLLOWING ARE THE (FINAL) SURFACE COORDINATES USED FOR THE FACTOR COMPUTA-ION-

```

```

***** DATA NAME- *IFLOOR *
POINT X Y Z POINT X Y Z
1 0.1000000E 01 0. 0.1000000E 01 0. 0.1000000E 01 0.1000000E 01 0.
3 0. 0.1000000E 01 0. 0.1000000E 01 0. 0.1000000E 01 0.
***** DATA NAME- *2WALLZ *
POINT X Y Z POINT X Y Z
1 0. 0.1000000E 01 0.1000000E 01 0. 0.1000000E 01 0.1000000E 01
3 0.1000000E 01 0.1000000E 01 0.1000000E 01 0.1000000E 01 0.1000000E 01
COORDINATES OF POINTS ON BOUNDARY OF SURF *IFLOOR * FOR EACH Y INTERVAL
X-LEFT X-RIGHT Y X-LEFT X-RIGHT Y

```

FIGURE 20. Group A Sample Problems Program Results
(continued)

0.	0.100000E 01	0.	0.833333E -01	0.	0.100000E 01	0.	0.116666E -01
0.	0.100000E 01	0.	0.166667E -01	0.	0.100000E 01	0.	0.166667E -01
0.	0.100000E 01	0.	0.250000E -01	0.	0.100000E 01	0.	0.250000E -01
0.	0.100000E 01	0.	0.333333E -01	0.	0.100000E 01	0.	0.333333E -01
0.	0.100000E 01	0.	0.416666E -01	0.	0.100000E 01	0.	0.416666E -01
0.	0.100000E 01	0.	0.500000E -01	0.	0.100000E 01	0.	0.500000E -01
0.	0.100000E 01	0.	0.583333E -01	0.	0.100000E 01	0.	0.583333E -01
0.	0.100000E 01	0.	0.666666E -01	0.	0.100000E 01	0.	0.666666E -01
0.	0.100000E 01	0.	0.750000E -01	0.	0.100000E 01	0.	0.750000E -01
0.	0.100000E 01	0.	0.833333E -01	0.	0.100000E 01	0.	0.833333E -01
0.	0.100000E 01	0.	0.916666E -01	0.	0.100000E 01	0.	0.916666E -01
0.	0.100000E 01	0.	1.000000E -01	0.	0.100000E 01	0.	1.000000E -01

NO. OF HORIZONTAL INCREMENTS= 24 NO. OF VERTICAL INCREMENTS= 24

THE FOLLOWING ARE PLANE POINT CONFIGURATION FACTORS COMPUTED FOR THIS RUN
 LONGEST GRID LINE FIRST, FROM A-LEFT TO X-RIGHT.

0.180734E-00	0.260374E-00	0.286302E-00	0.276701E-00	0.267071E-00	0.257534E-00
0.175112E-00	0.187289E-00	0.174173E-00	0.170949E-00	0.221136E-00	0.203440E-00
0.159489E-00	0.145093E-00	0.136413E-00	0.127901E-00	0.113551E-00	0.117248E-00
0.151694E-00	0.424699E-00	0.346432E-00	0.331108E-00	0.300182E-00	0.291907E-00
0.271835E-00	0.264047E-00	0.251095E-00	0.240744E-00	0.220155E-00	0.220271E-00
0.210379E-00	0.201426E-00	0.194221E-00	0.184620E-00	0.175315E-00	0.167277E-00
0.117426E-00	0.151935E-00	0.146029E-00	0.137489E-00	0.110589E-00	0.113902E-00
0.563598E-00	0.478349E-00	0.418149E-00	0.377194E-00	0.347446E-00	0.324321E-00
0.272677E-00	0.255274E-00	0.240280E-00	0.226291E-00	0.212620E-00	0.200471E-00
0.567920E-00	0.161053E-00	0.151071E-00	0.145337E-00	0.138451E-00	0.130849E-00
0.331401E-00	0.516693E-00	0.454465E-00	0.412585E-00	0.378912E-00	0.350305E-00
0.250944E-00	0.224503E-00	0.205416E-00	0.186448E-00	0.166148E-00	0.153157E-00
0.125901E-00	0.229503E-00	0.218600E-00	0.208196E-00	0.198246E-00	0.188438E-00
0.125901E-00	0.167631E-00	0.161818E-00	0.153443E-00	0.145337E-00	0.137489E-00
0.572685E-00	0.573484E-00	0.478419E-00	0.439536E-00	0.408740E-00	0.379008E-00

FIGURE 20. Group A Sample Problems Program Results
 (continued)

0.355423E-00	0.333750E-00	0.315651E-00	0.279112E-00	0.203768E-00	0.260507E-00
0.189702E-00	0.180163E-00	0.170843E-00	0.161810E-00	0.153071E-00	0.144602E-00
0.136413E-00	0.127085E-00	0.117820E-00	0.108590E-00	0.99337E-00	0.901831E-00
0.77725E-00	0.72085E-00	0.66220E-00	0.60370E-00	0.54530E-00	0.486881E-00
0.271704E-00	0.258377E-00	0.245754E-00	0.233732E-00	0.222227E-00	0.211601E-00
0.209884E-00	0.199169E-00	0.189162E-00	0.179861E-00	0.169523E-00	0.158935E-00
0.84155E-00	0.78436E-00	0.71164E-00	0.648159E-00	0.447950E-00	0.426068E-00
0.36878E-00	0.378097E-00	0.353347E-00	0.324848E-00	0.27294E-00	0.22174E-00
0.197885E-00	0.18784E-00	0.180762E-00	0.173943E-00	0.169292E-00	0.158483E-00
0.149685E-00	0.14087E-00	0.131805E-00	0.123301E-00	0.114459E-00	0.105159E-00
0.11942E-00	0.109517E-00	0.100322E-00	0.919638E-00	0.834278E-00	0.747654E-00
0.302378E-00	0.287549E-00	0.273520E-00	0.260398E-00	0.247338E-00	0.234951E-00
0.222074E-00	0.211601E-00	0.199754E-00	0.188639E-00	0.177810E-00	0.167278E-00
0.355146E-00	0.366963E-00	0.353309E-00	0.306729E-00	0.479599E-00	0.541204E-00
0.104378E-00	0.402091E-00	0.487609E-00	0.528889E-00	0.58094E-00	0.63234E-00
0.222074E-00	0.211601E-00	0.199754E-00	0.188639E-00	0.177810E-00	0.167278E-00
0.164314E-00	0.154297E-00	0.144179E-00	0.133910E-00	0.123510E-00	0.112955E-00
0.45393E-00	0.421607E-00	0.402313E-00	0.384408E-00	0.366313E-00	0.349451E-00
0.332333E-00	0.317256E-00	0.302278E-00	0.287460E-00	0.273874E-00	0.260198E-00
0.17175E-00	0.233712E-00	0.220853E-00	0.208196E-00	0.195779E-00	0.183602E-00
0.588213E-00	0.582687E-00	0.556746E-00	0.531405E-00	0.508719E-00	0.484461E-00
0.408195E-00	0.456257E-00	0.419409E-00	0.402374E-00	0.38792E-00	0.37192E-00
0.25872E-00	0.244756E-00	0.231406E-00	0.218609E-00	0.205269E-00	0.192213E-00
0.179225E-00	0.160703E-00	0.146239E-00	0.134233E-00	0.123510E-00	0.112955E-00
0.15531E-00	0.145803E-00	0.134993E-00	0.124602E-00	0.114602E-00	0.104744E-00
0.344224E-00	0.340367E-00	0.334786E-00	0.317855E-00	0.302103E-00	0.285489E-00
0.18763E-00	0.253376E-00	0.243901E-00	0.232524E-00	0.219224E-00	0.201168E-00
0.424686E-00	0.601203E-00	0.377866E-00	0.5550126E-00	0.340816E-00	0.310937E-00
0.100479E-00	0.458953E-00	0.450522E-00	0.437874E-00	0.417908E-00	0.392378E-00
0.238389E-00	0.271704E-00	0.250339E-00	0.240864E-00	0.225627E-00	0.210379E-00
0.192362E-00					

FIGURE 20. Group A Sample Problems Program Results
(continued)

0.632637E+00	0.610344E+00	0.388625E+00	0.368854E+00	0.545552E+00	0.524742E+00
0.394453E+00	0.380728E+00	0.364869E+00	0.340149E+00	0.334827E+00	0.317765E+00
0.301914E+00	0.282558E+00	0.269607E+00	0.253157E+00	0.236581E+00	0.220027E+00
0.203547E+00	0.182640E+00	0.173946E+00	0.167893E+00	0.159559E+00	0.150623E+00
0.119197E+00	0.100330E+00	0.096037E+00	0.092533E+00	0.087144E+00	0.082254E+00
0.411090E+00	0.396037E+00	0.382123E+00	0.368316E+00	0.350388E+00	0.334781E+00
0.211843E+00	0.201030E+00	0.183768E+00	0.180488E+00	0.169493E+00	0.162012E+00
0.035843E+00	0.030207E+00	0.011024E+00	0.091283E+00	0.514803E+00	0.532228E+00
0.319792E+00	0.212507E+00	0.040717E+00	0.038440E+00	0.363387E+00	0.461613E+00
0.334981E+00	0.317391E+00	0.279112E+00	0.280149E+00	0.260419E+00	0.240744E+00
0.220847E+00	0.143456E+00	0.046271E+00	0.039190E+00	0.593544E+00	0.567117E+00
0.454539E+00	0.314631E+00	0.314421E+00	0.049824E+00	0.442046E+00	0.466165E+00
0.450223E+00	0.434994E+00	0.419440E+00	0.403705E+00	0.387608E+00	0.370531E+00
0.323747E+00	0.333227E+00	0.315651E+00	0.295416E+00	0.274034E+00	0.251958E+00
0.670744E+00	2.657474E+00	0.134723E+00	0.616879E+00	0.599212E+00	0.581824E+00
0.564788E+00	0.544014E+00	0.531823E+00	0.515909E+00	0.500310E+00	0.485018E+00
0.371882E+00	0.354383E+00	0.341815E+00	0.329376E+00	0.317048E+00	0.304835E+00
0.371808E+00	0.356360E+00	0.343475E+00	0.331231E+00	0.288745E+00	0.264448E+00
0.237950E+00	0.044599E+00	0.049130E+00	0.030145E+00	0.613388E+00	0.504644E+00
0.590513E+00	0.574767E+00	0.544232E+00	0.534026E+00	0.510194E+00	0.504443E+00
0.492541E+00	0.475551E+00	0.460049E+00	0.445932E+00	0.430341E+00	0.413421E+00
0.672467E+00	0.654808E+00	0.634823E+00	0.644376E+00	0.647813E+00	0.612225E+00
0.581608E+00	0.561608E+00	0.561117E+00	0.552728E+00	0.538023E+00	0.524425E+00
0.464715E+00	0.444715E+00	0.440649E+00	0.435502E+00	0.424451E+00	0.412451E+00
0.220558E+00	0.203115E+00	0.153192E+00	0.133140E+00	0.305598E+00	0.291900E+00
0.257342E+00	0.094012E+00	0.074796E+00	0.057180E+00	0.545659E+00	0.467071E+00
0.703331E+00	0.684028E+00	0.672796E+00	0.657820E+00	0.645659E+00	0.625558E+00
0.516816E+00	0.514842E+00	0.506768E+00	0.491550E+00	0.476599E+00	0.464591E+00
0.447810E+00	0.440717E+00	0.430760E+00	0.379912E+00	0.347448E+00	0.309180E+00
0.717844E+00	0.702373E+00	0.686002E+00	0.671717E+00	0.657631E+00	0.643760E+00
0.632165E+00	0.616677E+00	0.603910E+00	0.591283E+00	0.578533E+00	0.566058E+00
0.552316E+00	0.544221E+00	0.534026E+00	0.521304E+00	0.507175E+00	0.494441E+00
0.470131E+00	0.460740E+00	0.447586E+00	0.431209E+00	0.377193E+00	0.331194E+00

FIGURE 20. Group A Sample Problems Program Results
(continued)

0.2767014E+00	0.7150972E+00	0.5923146E+00	0.6600028E+00	0.671794E+00	0.6500238E+00
0.7264088E+00	0.471972E+00	0.5923146E+00	0.6600028E+00	0.671794E+00	0.6500238E+00
0.5713490E+00	0.471972E+00	0.5923146E+00	0.6600028E+00	0.671794E+00	0.6500238E+00
0.5111628E+00	0.471972E+00	0.5923146E+00	0.6600028E+00	0.671794E+00	0.6500238E+00
0.2603708E+00	0.7264088E+00	0.5923146E+00	0.6600028E+00	0.671794E+00	0.6500238E+00
0.6010038E+00	0.7264088E+00	0.5923146E+00	0.6600028E+00	0.671794E+00	0.6500238E+00
0.6441968E+00	0.7264088E+00	0.5923146E+00	0.6600028E+00	0.671794E+00	0.6500238E+00
0.2603708E+00	0.7264088E+00	0.5923146E+00	0.6600028E+00	0.671794E+00	0.6500238E+00
0.7264088E+00	0.7264088E+00	0.5923146E+00	0.6600028E+00	0.671794E+00	0.6500238E+00
0.6010038E+00	0.7264088E+00	0.5923146E+00	0.6600028E+00	0.671794E+00	0.6500238E+00
0.6441968E+00	0.7264088E+00	0.5923146E+00	0.6600028E+00	0.671794E+00	0.6500238E+00
0.2603708E+00	0.7264088E+00	0.5923146E+00	0.6600028E+00	0.671794E+00	0.6500238E+00
0.1807342E+00	0.7264088E+00	0.5923146E+00	0.6600028E+00	0.671794E+00	0.6500238E+00

FIGURE 20. Group 1 Sample Problems Program Results
(continued)

SYNTH. PROBLEM GROUP B

The geometrical relationships used in this example are presented in Figure 21. The data sheets are shown in Figure 22 with results in Figure 23.

Problem 1B

The use of the surface generator and double bisection of surfaces is demonstrated. The plane Surface 1PLAT1 is entered as usual in the data, but the octagonal disk 3DISK is created by specifications to the surface generator. Note that no connections data are created for a Class 3 surface, but would be if the disk were named CDISK.

The double bisection is easily seen in side view of 1PLAT1 and 3DISK. The results of the factor request from 1PLAT1 and 3DISK is shown in Run #1 output, indicating the areas in each surface seen by the other. The number of points defining 3DISK has been reduced to 7 and reorganized because of the bisection, as seen along the dotted line.

Problem 2B

The converse factor, 3DISK to 1PLAT1, is requested as Run #2. Because the disk is now Surface 1, the final coordinate system in 3DISK is aligned so that the XY plane is the plane of the disk. Point 1 becomes the origin, and line segment 1-2 the X axis. Note that the exchange coefficients (FA) are very nearly equal, as they should be because of the reciprocity theorem.

Notice that the factor from one surface to the other along the line of bisection is, in reality, zero, but the output is, in some cases, non-zero though quite small (10^{-8} order of magnitude). This is caused by accumulated internal truncation error, and is not significant enough to warrant concern here. (This is not the case, however, with some silhouette generator computations).

Problem 3B

The capability of coordinate transformation is illustrated. Run #3 requests the factor from 1PLAT1 to 3DISK transformed to the position shown by the transformation data 9TDISK. The program detected, after transforming 3DISK, that it bisected 1PLAT1. As the output shows, the part of 1PLAT1 actually named was the trapezoid indicated in the top view, and in the output final coordinate data.

Problem 4B

It is quite feasible to generate or manually input a surface, transform the surface to a different location, and then ask for the factor between the original surface and the transformed surface. This is shown by Run #4, where 3DISK is used as Surface 1, and 3DISK transformed by 9TDISK is used as

Surface 2. The output shows a bisection of 3DISK, removing the 4th boundary point, and therefore adding a point to the final 3DISK surface boundaries, making it 9 instead of 8.

Problem 5B

The factor from the transformed disk, 3DISK9TDICK, to 1PLAT1 is requested as Run #5, demonstrating program flexibility in that Surface 1 is now transformed. The resulting exchange coefficient is very nearly equal to Run #3, as it should be.

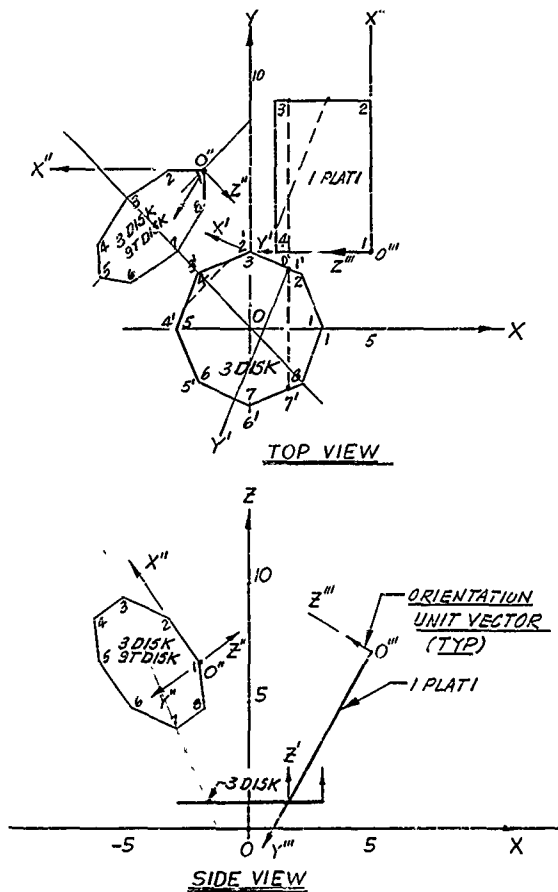


FIGURE 21. GROUP B SAMPLE PROBLEMS GEOMETRY

FORTRAN FIXED 10 DIGIT DECIMAL DATA

DECK NO. _____ PROGRAMMER _____ DATE _____ PAGE 3 of 3 JOB NO. 252-20

NUMBER	IDENTIFICATION	DESCRIPTION	DO NOT KEY PUNCH
1	0.00000000		
2	0.00000000		
3	0.00000000		
4	0.00000000		
5	0.00000000		
6	0.00000000		
7	0.00000000		
8	0.00000000		
9	0.00000000		
10	0.00000000		
11	0.00000000		
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13	0.00000000		
14	0.00000000		
15	0.00000000		
16	0.00000000		
17	0.00000000		
18	0.00000000		
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39	0.00000000		
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41	0.00000000		
42	0.00000000		
43	0.00000000		
44	0.00000000		
45	0.00000000		
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47	0.00000000		
48	0.00000000		
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94	0.00000000		
95	0.00000000		
96	0.00000000		
97	0.00000000		
98	0.00000000		
99	0.00000000		
100	0.00000000		

FORTRAN FIXED 10 DIGIT DECIMAL DATA

DECK NO. _____ PROGRAMMER _____ DATE _____ PAGE 10 of 31 JOB NO. 252-20

NUMBER	IDENTIFICATION	DESCRIPTION	DO NOT KEY PUNCH
1	0.00000000		
2	0.00000000		
3	0.00000000		
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99	0.00000000		
100	0.00000000		

FIGURE 22. Group B Sample Problems Input Data Code Sheets

FORTRAN FIXED 10 DIGIT DECIMAL DATA			
DECK NO.	PROGRAMMER	DATE	PAGE 11 OF 31 JOB NO. 250-30
NUMBER	IDENTIFICATION	DESCRIPTION	DO NOT KEY PUNCH
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FORTRAN FIXED 10 DIGIT DECIMAL DATA			
DECK NO.	PROGRAMMER	DATE	PAGE 12 OF 31 JOB NO. 250-30
NUMBER	IDENTIFICATION	DESCRIPTION	DO NOT KEY PUNCH
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FIGURE 22. Group B Sample Problems Input Data Code Sheets
(continued)

NRA SPACE AND INFORMATION SYSTEMS DIVISION
T-4 PROJECT AIRCRAFT-INTERFERENCE CONFIGURATION FACTOR PROGRAM

C O N F A C I

NRA COFAC II REPORT SAMPLE PROBLEMS FROM FIG. (8)-K₄10UP511/1/63

I N P L T D A T A

```

***** DATA NAME= *PLATE * A SKEWED RECTANGULAR SURFACE
POINT X Y Z POINT X Y Z
1 0.4131776 01 0.3000000 01 0.7450139 01---(INTERNALLY GENERATED ORIENTATION VECTORS)
2 0.4131776 01 0.3000000 01 0.7450139 01 0.7450139 01 0.7450139 01 0.7450139 01
3 0.4100000 01 0.4000000 01 0.4000000 01 0.4000000 01 0.4000000 01 0.4000000 01

```

```

***** DATA NAME= *3DISK * OCTAGONAL DISK
SURFACE SPECIFICATIONS=
NO OF X-SECTIONS = 1 NO OF Z-SECTION BOUNDARY DIVISIONS = 8
LOCATION OF VERTICAL CENTRALLINE, X= 0.
Y= 0.
X-SECTION NO. Y-RADIUS Y-AXIS RADIUS ELEVATION ABOVE XY PLANE
1 0.3000000 01 0.3000000 01 0.1000000 01

```

THE FOLLOWING INTERNALLY GENERATED SURFACE DATA RESULTED FROM THE ABOVE SPECIFICATIONS--

```

POINT X Y Z POINT X Y Z
1 0.5136000 01 0. 0.2000000 01---(INTERNALLY GENERATED ORIENTATION VECTORS)
2 0.5136000 01 0. 0.2000000 01 0.2000000 01 0.2000000 01 0.2000000 01
3 0.5879331 07 0.3000000 01 0.1000000 01 4 -0.2121320 01 0.2121320 01 0.1000000 01
4 -0.2121320 01 0.1000000 01 5 -0.2121320 01 0.2121320 01 0.1000000 01
5 -0.2121320 01 0.1000000 01 6 -0.2121320 01 0.2121320 01 0.1000000 01
6 -0.2121320 01 0.1000000 01 7 0.2121320 01 0.2121320 01 0.1000000 01
7 0.2121320 01 0.1000000 01 8 0.2121320 01 0.2121320 01 0.1000000 01

```

```

***** DATA NAME= *9DISK * TRANSFORMS 3DISK TO SKEWED POSITION IN II QUADRANT
TRANSFORMATION DATA=

```

FIGURE 23. Group B Sample Problems Program Results
(27 pages)

```

POINT      X      Y      Z      POINT      X      Y      Z
1 -0.193940E 01 0.618191E 01 0.459073E 01 1 -0.511130E 01 0.511130E 01 0.919616E 01
7 -0.360000E 01 0.300000E 01 0.400000E 01

```

FIGURE 23. Group 3 Sample Problems Program Results
(continued)

IMA CO IFAC II REPORT SAMPLE PROBLEMS FROM FIG. (P)-K.A.TIOPS-11/1/63

```

RUN NO. 1 CASE USED FOR THIS RUN= *PLAT1*JDISK *
          *0 *
          * *
          * *
THE FORM FACTOR FROM SURFACE *PLAT1 * TO SURFACE *JDISK * = 0.00994
THE EXCHANGE COEFFICIENT (EAF)= 0.46132E-00 SQ UNITS
          THE MAPPLE AREA = 0.4146303E 02 SQ UNITS
ONLY A PART OF SURFACE *PLAT1 * COMPRISING AN AREA OF 0.4146303E 02 SQ UNITS,
SEES SURFACE *JDISK
          THE AREA OF SURFACE *PLAT1 * = 0.4837355E 02 SQ UNITS.
ONLY A PART OF SURFACE *JDISK * COMPRISING AN AREA OF 0.2113364E 02 SQ UNITS,
SEES SURFACE *PLAT1
          THE AREA OF SURFACE *JDISK * = 0.2545586E 02 SQ UNITS.
THE FOLLOWING ARE THE GLOBAL SURFACE COORDINATES USED FOR THE FACTOR COMPUTATION=

***** DATA NAME= *PLAT1 *
POINT X Y Z POINT X Y Z
1 0. 0. 0. 0.100000E 01---(INTERNALLY GENERATED ORIENTATION VECTORS)
2 0. 0. 0. 0.600000E 01 0. 0.
3 0.000000E 01 0.600000E 01 0. 0. 0. 0.691050E 01 0.

***** DATA NAME= *JDISK *
POINT X Y Z POINT X Y Z
1 -0.405000E 01 0.405000E 01 0. 0. 0. 0.760015E 01 0.346312E 0.
2 0.405000E 01 0.405000E 01 0. 0. 0. 0.760015E 01 0.346312E 0.

```

FIGURE 23. Group B Sample Problems Program Results
(continued)

95

0.5855448E-2 0.5151125E-02 0.4881086E-02 0.4469793E-02 0.400717E-02 0.3175460E-02
0.35327E-01 0.280176E-01 0.260215E-01 0.2400110E-01 0.2205138E-01 0.2019840E-01
0.184462E-01 0.16814E-01 0.1515708E-01 0.138887E-01 0.1266438E-01 0.1144591E-01
0.1039358E-01 0.94614E-02 0.85935E-02 0.775481E-02 0.703184E-02 0.635508E-02
0.573071E-02 0.515011E-02 0.466979E-02 0.428887E-02 0.390768E-02 0.352649E-02
0.314530E-02 0.278395E-02 0.242270E-02 0.206145E-02 0.170020E-02 0.133895E-02
0.107770E-02 0.92552E-03 0.77327E-03 0.62102E-03 0.46877E-03 0.31652E-03
0.16427E-03 0.11202E-03 0.76797E-04 0.51572E-04 0.26347E-04 0.11121E-04
0.103750E-04 0.55725E-05 0.30500E-05 0.15275E-05 0.77500E-06 0.38250E-06
0.19125E-06 0.95625E-07 0.47812E-07 0.23906E-07 0.11953E-07 0.59765E-08
0.29875E-08 0.14937E-08 0.74687E-09 0.37343E-09 0.18671E-09 0.93355E-10
0.46675E-10 0.23337E-10 0.11668E-10 0.58340E-11 0.29170E-11 0.14585E-11
0.72750E-12 0.36375E-12 0.18187E-12 0.90937E-13 0.45468E-13 0.22734E-13
0.11367E-13 0.56834E-14 0.28417E-14 0.14208E-14 0.71040E-15 0.35520E-15
0.17760E-15 0.88800E-16 0.44400E-16 0.22200E-16 0.11100E-16 0.55500E-17
0.27750E-17 0.13875E-17 0.69375E-18 0.34687E-18 0.17343E-18 0.86715E-19
0.43356E-19 0.21678E-19 0.10839E-19 0.54195E-20 0.27097E-20 0.13548E-20
0.67642E-21 0.33821E-21 0.16910E-21 0.84550E-22 0.42275E-22 0.21137E-22
0.10568E-22 0.52840E-23 0.26420E-23 0.13210E-23 0.66050E-24 0.33025E-24
0.16512E-24 0.82560E-25 0.41280E-25 0.20640E-25 0.10320E-25 0.51600E-26
0.25800E-26 0.12900E-26 0.64500E-27 0.32250E-27 0.16125E-27 0.80625E-28
0.40156E-28 0.20078E-28 0.10039E-28 0.50195E-29 0.25097E-29 0.12548E-29
0.62742E-30 0.31371E-30 0.15685E-30 0.78425E-31 0.39212E-31 0.19606E-31
0.97506E-32 0.48753E-32 0.24376E-32 0.12188E-32 0.60940E-33 0.30470E-33
0.15235E-33 0.76175E-34 0.38087E-34 0.19043E-34 0.95215E-35 0.47607E-35
0.23803E-35 0.11901E-35 0.59505E-36 0.29752E-36 0.14876E-36 0.74380E-37
0.37190E-37 0.18595E-37 0.92975E-38 0.46487E-38 0.23243E-38 0.11621E-38
0.58106E-39 0.29053E-39 0.14526E-39 0.72630E-40 0.36315E-40 0.18157E-40
0.90785E-41 0.45392E-41 0.22696E-41 0.11348E-41 0.56740E-42 0.28370E-42
0.14185E-42 0.70925E-43 0.35462E-43 0.17731E-43 0.88655E-44 0.44327E-44
0.22163E-44 0.11081E-44 0.55405E-45 0.27702E-45 0.13851E-45 0.69255E-46
0.34627E-46 0.17313E-46 0.86565E-47 0.43282E-47 0.21641E-47 0.10820E-47
0.54050E-48 0.27025E-48 0.13512E-48 0.67560E-49 0.33780E-49 0.16890E-49
0.84450E-50 0.42225E-50 0.21112E-50 0.10556E-50 0.52780E-51 0.26390E-51
0.13195E-51 0.65975E-52 0.32987E-52 0.16493E-52 0.82465E-53 0.41232E-53
0.20616E-53 0.10308E-53 0.51540E-54 0.25770E-54 0.12885E-54 0.64425E-55
0.32212E-55 0.16106E-55 0.80530E-56 0.40265E-56 0.20132E-56 0.10066E-56
0.50330E-57 0.25165E-57 0.12582E-57 0.62910E-58 0.31455E-58 0.15727E-58
0.78635E-59 0.39317E-59 0.19658E-59 0.98290E-60 0.49145E-60 0.24572E-60
0.12286E-60 0.61430E-61 0.30715E-61 0.15357E-61 0.76785E-62 0.38392E-62
0.19196E-62 0.95980E-63 0.47990E-63 0.23995E-63 0.11997E-63 0.59985E-64
0.29992E-64 0.14996E-64 0.74980E-65 0.37490E-65 0.18745E-65 0.93725E-66
0.46862E-66 0.23431E-66 0.11715E-66 0.58575E-67 0.29287E-67 0.14643E-67
0.73217E-68 0.36608E-68 0.18304E-68 0.91520E-69 0.45760E-69 0.22880E-69
0.11440E-69 0.57200E-70 0.28600E-70 0.14300E-70 0.71500E-71 0.35750E-71
0.17875E-71 0.89375E-72 0.44687E-72 0.22343E-72 0.11171E-72 0.55855E-73
0.27927E-73 0.13963E-73 0.69815E-74 0.34907E-74 0.17453E-74 0.87265E-75
0.43632E-75 0.21816E-75 0.10908E-75 0.54540E-76 0.27270E-76 0.13635E-76
0.68175E-77 0.34087E-77 0.17043E-77 0.85215E-78 0.42607E-78 0.21303E-78
0.10651E-78 0.53255E-79 0.26627E-79 0.13313E-79 0.66565E-80 0.33282E-80
0.16641E-80 0.83205E-81 0.41602E-81 0.20801E-81 0.10400E-81 0.52000E-82
0.26000E-82 0.13000E-82 0.65000E-83 0.32500E-83 0.16250E-83 0.81250E-84
0.40625E-84 0.20312E-84 0.10156E-84 0.50780E-85 0.25390E-85 0.12695E-85
0.63475E-86 0.31737E-86 0.15868E-86 0.79340E-87 0.39670E-87 0.19835E-87
0.99175E-88 0.49587E-88 0.24793E-88 0.12396E-88 0.61980E-89 0.30990E-89
0.15495E-89 0.77475E-90 0.38737E-90 0.19368E-90 0.96840E-91 0.48420E-91
0.24210E-91 0.12105E-91 0.60525E-92 0.30262E-92 0.15131E-92 0.75655E-93
0.37827E-93 0.18913E-93 0.94565E-94 0.47282E-94 0.23641E-94 0.11820E-94
0.59100E-95 0.29550E-95 0.14775E-95 0.73875E-96 0.36937E-96 0.18468E-96
0.92340E-97 0.46170E-97 0.23085E-97 0.11542E-97 0.57710E-98 0.28855E-98
0.14427E-98 0.72135E-99 0.36067E-99 0.18033E-99 0.90165E-100 0.45082E-100
0.22541E-100 0.11270E-100 0.56350E-101 0.28175E-101 0.14087E-101 0.70435E-102
0.35217E-102 0.17608E-102 0.88040E-103 0.44020E-103 0.22010E-103 0.11005E-103
0.55025E-104 0.27512E-104 0.13756E-104 0.68780E-105 0.34390E-105 0.17195E-105
0.85975E-106 0.42987E-106 0.21493E-106 0.10746E-106 0.53730E-107 0.26865E-107
0.13432E-107 0.67160E-108 0.33580E-108 0.16790E-108 0.83950E-109 0.41975E-109
0.20987E-109 0.10493E-109 0.52465E-110 0.26232E-110 0.13116E-110 0.65580E-111
0.32790E-111 0.16395E-111 0.81975E-112 0.40987E-112 0.20493E-112 0.10246E-112
0.51210E-112 0.25605E-112 0.12802E-112 0.64010E-113 0.32005E-113 0.16002E-113
0.80010E-114 0.40005E-114 0.20002E-114 0.10001E-114 0.50000E-114 0.25000E-114
0.12500E-114 0.62500E-115 0.31250E-115 0.15625E-115 0.78125E-116 0.39062E-116
0.19531E-116 0.97656E-117 0.48828E-117 0.24414E-117 0.12207E-117 0.61035E-118
0.30517E-118 0.15258E-118 0.76290E-119 0.38145E-119 0.19072E-119 0.95360E-120
0.47680E-120 0.23840E-120 0.11920E-120 0.59600E-121 0.29800E-121 0.14900E-121
0.74500E-122 0.37250E-122 0.18625E-122 0.93125E-123 0.46562E-123 0.23281E-123
0.11640E-123 0.58200E-124 0.29100E-124 0.14550E-124 0.72750E-125 0.36375E-125
0.18187E-125 0.90937E-126 0.45468E-126 0.22734E-126 0.11367E-126 0.56834E-127
0.28417E-127 0.14208E-127 0.71040E-128 0.35520E-128 0.17760E-128 0.88800E-129
0.44400E-129 0.22200E-129 0.11100E-129 0.55500E-130 0.27750E-130 0.13875E-130
0.69375E-131 0.34687E-131 0.17343E-131 0.86715E-132 0.43356E-132 0.21678E-132
0.10839E-132 0.54195E-133 0.27097E-133 0.13548E-133 0.67642E-134 0.33821E-134
0.16910E-134 0.84550E-135 0.42275E-135 0.21137E-135 0.10568E-135 0.52840E-136
0.26420E-136 0.13210E-136 0.66050E-137 0.33025E-137 0.16512E-137 0.82560E-138
0.41280E-138 0.20640E-138 0.10320E-138 0.51600E-139 0.25800E-139 0.12900E-139
0.64500E-140 0.32250E-140 0.16125E-140 0.80625E-141 0.40156E-141 0.20078E-141
0.10039E-141 0.50195E-142 0.25097E-142 0.12548E-142 0.62742E-143 0.31371E-143
0.15685E-143 0.78425E-144 0.39212E-144 0.19606E-144 0.97506E-145 0.48753E-145
0.24376E-145 0.12188E-145 0.60940E-146 0.30470E-146 0.15235E-146 0.76175E-147
0.38087E-147 0.19043E-147 0.95215E-148 0.47607E-148 0.23803E-148 0.11901E-148
0.59505E-149 0.29752E-149 0.14876E-149 0.74380E-150 0.37190E-150 0.18595E-150
0.92975E-151 0.46487E-151 0.23243E-151 0.11621E-151 0.58106E-152 0.29053E-152
0.14526E-152 0.72630E-153 0.36315E-153 0.18157E-153 0.90785E-154 0.45392E-154
0.22696E-154 0.11348E-154 0.56740E-155 0.28370E-155 0.14185E-155 0.70925E-156
0.35462E-156 0.17731E-156 0.88655E-157 0.44327E-157 0.22163E-157 0.11081E-157
0.55405E-158 0.27702E-158 0.13851E-158 0.69255E-159 0.34627E-159 0.17313E-159
0.86565E-160 0.43282E-160 0.21641E-160 0.10820E-160 0.54050E-161 0.27025E-161
0.13512E-161 0.67560E-162 0.33780E-162 0.16890E-162 0.84450E-163 0.42225E-163
0.21112E-163 0.10556E-163 0.52780E-164 0.26390E-164 0.13195E-164 0.65975E-165
0.32987E-165 0.16493E-165 0.82465E-166 0.41232E-166 0.20616E-166 0.10308E-166
0.51540E-167 0.25770E-167 0.12885E-167 0.64425E-168 0.32212E-168 0.16106E-168
0.80530E-169 0.40265E-169 0.20132E-169 0.10066E-169 0.50330E-170 0.25165E-170
0.12582E-170 0.62910E-171 0.31455E-171 0.15727E-171 0.78635E-172 0.39317E-172
0.19658E-172 0.98290E-173 0.49145E-173 0.24572E-173 0.12286E-173 0.61430E-173
0.30715E-173 0.15357E-173 0.76785E-174 0.38392E-174 0.19196E-174 0.95980E-175
0.47990E-175 0.23995E-175 0.11997E-175 0.59985E-176 0.29992E-176 0.14996E-176
0.74980E-177 0.37490E-177 0.18745E-177 0.93725E-178 0.46862E-178 0.23431E-178
0.11715E-178 0.58575E-179 0.29287E-179 0.14643E-179 0.73217E-180 0.36608E-180
0.18304E-180 0.91520E-181 0.45760E-181 0.22880E-181 0.11440E-181 0.57200E-182
0.28600E-182 0.14300E-182 0.71500E-183 0.35750E-183 0.17875E-183 0.89375E-184
0.44687E-184 0.22343E-184 0.11171E-184 0.55855E-185 0.27927E-185 0.13963E-185
0.69815E-186 0.34907E-186 0.17453E-186 0.87265E-187 0.43632E-187 0.21816E-187
0.10908E-187 0.54540E-188 0.27270E-188 0.13635E-188 0.68175E-189 0.34087E-189
0.17043E-189 0.85215E-190 0.42607E-190 0.21303E-190 0.10651E-190 0.53255E-191
0.26627E-191 0.13313E-191 0.66565E-192 0.33282E-192 0.16641E-192 0.83205E-193
0.41602E-193 0.20801E-193 0.10400E-193 0.52000E-194 0.26000E-194 0.13000E-194
0.65000E-195 0.32500E-195 0.16250E-195 0.81250E-196 0.40625E-196 0.20312E-196
0.10156E-196 0.50780E-197 0.25390E-197 0.12695E-197 0.63475E-198 0.31737E-198
0.15868E-198 0.79340E-199 0.39670E-199 0.19835E-199 0.99175E-200 0.49587E-200
0.24793E-200 0.12396E-200 0.61980E-201 0.30990E-201 0.15495E-201 0.77475E-202
0.38737E-202 0.19368E-202 0.96840E-203 0.48420E-203 0.24210E-203 0.12105E-203
0.60525E-204 0.30262E-204 0.15131E-204 0.75655E-205 0.37827E-205 0.18913E-205
0.94565E-206 0.47282E-206 0.23641E-206 0.11820E-206 0.59100E-207 0.29550E-207
0.14775E-207 0.73875E-208 0.36937E-208 0.18468E-208 0.92340E-209 0.46170E-209
0.23085E-209 0.11542E-209 0.57710E-210 0.28855E-210 0.14427E-210 0.72135E-211
0.36067E-211 0.18033E-211 0.90165E-212 0.45082E-212 0.22541E-212 0.11270E-212
0.56350E-213 0.28175E-213 0.14087E-213 0.70435E-214 0.35217E-214 0.17608E-214
0.88040E-215 0.44020E-215 0.22010E-215 0.11005E-215 0.55025E-216 0.27512E-216
0.13756E-216 0.68780E-217 0.34390E-217 0.17195E-217 0.85975E-218 0.42987E-218
0.21493E-218 0.10746E-218 0.53730E-219 0.26865E-219 0.13432E-219 0.67160E-220
0.33580E-220 0.16790E-220 0.83950E-221 0.41975E-221 0.20987E-221 0.10493E-221
0.52465E-222 0.26232E-222 0.13116E-222 0.65580E-223 0.32790E-223 0.16395E-223
0.81975E-224 0.40987E-224 0.20493E-224 0.10246E-224 0.51210E-225 0.25605E-225
0.12802E-225 0.64010E-226 0.32005E-226 0.16002E-226 0.80010E-227 0.40005E-227
0.20002E-227 0.10001E-227 0.50000E-228 0.25000E-228 0.12500E-228 0.62500E-229
0.31250E-229 0.15625E-229 0.78125E-230 0.39062E-230 0.19531E-230 0.97656E-231
0.48828E-231 0.24414E-231 0.12207E-231 0.61035E-232 0.30517E-232 0.15258E-232
0.76290E-233 0.38145E-233 0.19072E-233 0.95360E-234 0.47680E-234 0.23840E-234
0.11920E-234 0.59600E-235 0.29800E-235 0.14900E-235 0.74500E-236 0.37250E-236
0.18625E-236 0.93125E-237 0.46562E-237 0.23281E-237 0.11640E-237 0.58200E-238
0.29100E-238 0.14550E-238 0.72750E-239 0.36375E-239 0.18187E-239 0.90937E-240
0.45468E-240 0.22734E-240 0.11367E-240 0.56834E-241 0.28417E-241 0.14208E-241
0.71040E-242 0.35520E-242 0.17760E-242 0.88800E-243 0.44400E-243 0.22200E-243
0.11100E-243 0.55500E-244 0.27750E-244 0.13875E-244 0.69375E-245 0.34687E-245
0.17343E-245 0.86715E-246 0.43356E-246 0.21678E-246 0.10839E-246 0.54195E-247
0.27097E-247 0.13548E-247 0.67642E-248 0.33821E-248 0.16910E-248 0.84550E-249
0.42275E-249 0.21137E-249 0.10568E-249 0.52840E-250 0.26420E-250 0.13210E-250
0.66050E-251 0.33025E-251 0.16512E-251 0.82560E-252 0.41280E-252 0.20640E-252
0.10320E-252 0.51600E-253 0.25800E-253 0.12900E-253 0.64500E-254 0.32250E-254
0.16125E-254 0.80625E-255 0.40156E-255 0.20078E-255 0.10039E-255 0.50195E-256
0.25097E-256 0.12548E-256 0.62742E-257 0.31371E-257 0.15685E-257 0.78425E-258
0.39212E-258 0.19606E-258 0.97506E-259 0.48753E-259 0.24376E-259 0.12188E-259
0.60940E-260 0.30470E-260 0.15235E-260 0.76175E-261 0.38087E-261 0.19043E-261
0.95215E-262 0.47607E-262 0.23803E-262 0.11901E-262 0.59505E-263 0.29752E-263
0.14876E-263 0.74380E-264 0.37190E-264 0.18595E-264 0.92975E-265 0.46487E-265
0.23243E-265 0.11621E-265 0.58106E-266 0.29053E-266 0.14526E-266 0.72630E-267
0.36315E-267 0.18157E-267 0.90785E-268 0.45392E-268 0.22696E-268 0.11348E-268
0.56740E-269 0.28370E-269 0.14185E-269 0.70925E-270 0.35462E-270 0.17731E-270
0.88655E-271 0.44327E-271 0.22163E-271 0.11081E-271 0.55405E-272 0.27702E-272
0.13851E-272 0.69255E-273 0.34627E

0.768914E-02	0.651846E-02	0.372389E-02	0.491255E-02	0.433970E-02	0.350114E-02
0.163304E-02	0.279164E-02	0.428147E-02	0.473242E-02	0.260263E-02	0.169387E-02
0.688902E-01	2.33E-03	0.431104E-01	0.345671E-01	0.278288E-01	0.225342E-01
0.163304E-02	0.163304E-02	0.431104E-01	0.491255E-02	0.670207E-02	0.755897E-02
0.623710E-02	0.337031E-02	0.456871E-02	0.181683E-02	0.161676E-02	0.144296E-04
0.263726E-02	0.232661E-02	0.204968E-02	0.181683E-02	0.161676E-02	0.144296E-04
0.163304E-02	0.448904E-02	0.371093E-01	0.287614E-01	0.244318E-01	0.170876E-01
0.141378E-01	0.111404E-02	0.933325E-02	0.762775E-02	0.633903E-02	0.512277E-02
0.141378E-01	0.141378E-02	0.120056E-02	0.480337E-02	0.242388E-02	0.240823E-02
0.882408E-02	2.1E-03	0.141378E-02	0.423608E-02	0.111521E-02	0.979216E-03
0.463393E-02	0.334498E-02	0.440331E-02	0.477089E-01	0.123533E-01	0.102780E-01
0.235119E-02	0.70E-03	0.171945E-02	0.447216E-02	0.123533E-01	0.102780E-01
0.356230E-03	0.835410E-03	0.7350130E-03	0.648329E-03	0.574472E-03	0.510864E-03
0.473239E-02	0.	0.	0.296449E-09	0.	0.222336E-08
0.	0.11E-7	0.	0.	0.	0.
0.	0.11E-7	0.	0.	0.	0.
0.	0.2444E-13	0.	0.133461E-08	0.	0.148224E-09

FIGURE 2). (Group 3 Sample Problems Program Results
(continued)

NAA CONFAC II REPORT SAMPLE PROBLEMS FROM FIG. (B)-K-A.TOUPO₅ 1.1/1/63

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RUN NO. 2 DATA USED FOR THIS RUN= *3DISK *1PLAT1*
          *O
          *
          *
THE FORM FACTOR FROM SURFACE *3DISK * TO SURFACE *1PLAT1 * = 0.01613
THE EXCHANGE COEFFICIENT (FAI)= 0.46198E+00 50 UNITS
THE MAPPI IC AREA = 0.2112591E 02 50 UNITS
ONLY A PART OF SURFACE *3DISK *, COMPRISING AN AREA OF 0.2111364E 02 50 UNITS,
SEES SURFACE *1PLAT1 *
THE AREA OF SURFACE *3DISK * = 0.2547584E 02 50 UNITS.
ONLY A PART OF SURFACE *1PLAT1 *, COMPRISING AN AREA OF 0.4146304E 02 50 UNITS,
SEES SURFACE *3DISK *
THE AREA OF SURFACE *1PLAT1 * = 0.4937355E 02 50 UNITS.
THE FOLLOWING ARE THE (FINAL) SURFACE COORDINATES USED FOR THE FACTOR COMPUTATION=

***** DATA NAME= *3DISK *
POINT O. X Y Z POINT X Y Z
1 O. 0. 0. 0.100000E 01--(INTERNALLY GENERATED ORIENTATION VECTOR)
2 0.1324901 01 0.1423588 01 0. 0.700000E 01 0.
3 0.1324901 01 0.1423588 01 0. 0.3344400E 01 0.3915892 01 0.
4 0.1324901 01 0.1423588 01 0. 0.3344400E 01 0.3915892 01 0.
5 0.1324901 01 0.1423588 01 0. 0.3344400E 01 0.3915892 01 0.
6 0.1324901 01 0.1423588 01 0. 0.3344400E 01 0.3915892 01 0.

***** DATA NAME= *1PLAT1 *
POINT X Y Z POINT X Y Z

```

FIGURE 23. Group B Sample Problems Program Results
(continued)

NAA CONPAC II REPORT SAMPLE PROBLEMS FROM FIG. (B)-A-A, 10UP5, 11/1/63

RUN NO. 3 DATA USED FOR THIS RUN- *PLATL=0101K *
*D * 9701SK *

THE FORM FACTOR FROM SURFACE *PLATL * TO SURFACE *JUSK 9701SK* = 0.03377
THE EXCHANGE COEFFICIENT (FA) = 0.12470E 01 50 UNITS

THE MAPPING AREA = 0.3686819E 02 SQ UNITS

ONLY A PART OF SURFACE *PLATL * IS COMPRISING AN AREA OF 0.3686761E 02 SQ UNITS.
SEE SURFACE *JUSK 9701SK*

THE AREA OF SURFACE *PLATL * = 0.4837355E 02 SQ UNITS.

THE AREA OF SURFACE *JUSK 9701SK* = 0.2545584E 02 SQ UNITS.

THE FOLLOWING ARE THE (F), (L) SURFACE COORDINATES USED FOR THE FACTOR COMPUTATION-

```

***** DATA NAME= *PLATL *
POINT  D.  X  Y  Z  POINT  D.  X  Y  Z  POINT  D.  X  Y  Z
1  0.  0.  0.  0.  1000000E 01 0.  0.  0.  0.  1000000E 01 0.  0.  0.  0.
2  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
3  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
5  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.

```

```

***** DATA NAME= *JUSK 9701SK*
POINT  D.  X  Y  Z  POINT  D.  X  Y  Z  POINT  D.  X  Y  Z
1  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
2  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
3  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
5  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
7  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.

```

FIGURE 23. Group B Sample Problems Program Results
(continued)

COORDINATES OF POINTS ON BOUNDARY OF SURF				* FOR EACH Y INTERVAL			
X-LEFT	X-MID	X-RIGHT	Y	X-LEFT	X-RIGHT	Y	
0.0	0.000000E+01	0.071548E+00	0.0	0.000000E+01	0.071548E+00	0.0	
0.0	0.000000E+01	0.134710E+01	0.1	0.000000E+01	0.134710E+01	0.1	
0.0	0.000000E+01	0.201564E+01	0.2	0.000000E+01	0.201564E+01	0.2	
0.0	0.000000E+01	0.268418E+01	0.3	0.000000E+01	0.268418E+01	0.3	
0.0	0.000000E+01	0.335272E+01	0.4	0.000000E+01	0.335272E+01	0.4	
0.0	0.000000E+01	0.402126E+01	0.5	0.000000E+01	0.402126E+01	0.5	
0.0	0.000000E+01	0.468980E+01	0.6	0.000000E+01	0.468980E+01	0.6	
0.0	0.000000E+01	0.535834E+01	0.7	0.000000E+01	0.535834E+01	0.7	
0.0	0.000000E+01	0.602688E+01	0.8	0.000000E+01	0.602688E+01	0.8	
0.0	0.000000E+01	0.669542E+01	0.9	0.000000E+01	0.669542E+01	0.9	
0.0	0.000000E+01	0.736396E+01	1.0	0.000000E+01	0.736396E+01	1.0	
0.0	0.000000E+01	0.803250E+01	1.1	0.000000E+01	0.803250E+01	1.1	
0.0	0.000000E+01	0.870104E+01	1.2	0.000000E+01	0.870104E+01	1.2	
0.0	0.000000E+01	0.936958E+01	1.3	0.000000E+01	0.936958E+01	1.3	
0.0	0.000000E+01	1.003812E+01	1.4	0.000000E+01	1.003812E+01	1.4	
0.0	0.000000E+01	1.070666E+01	1.5	0.000000E+01	1.070666E+01	1.5	
0.0	0.000000E+01	1.137520E+01	1.6	0.000000E+01	1.137520E+01	1.6	
0.0	0.000000E+01	1.204374E+01	1.7	0.000000E+01	1.204374E+01	1.7	
0.0	0.000000E+01	1.271228E+01	1.8	0.000000E+01	1.271228E+01	1.8	
0.0	0.000000E+01	1.338082E+01	1.9	0.000000E+01	1.338082E+01	1.9	
0.0	0.000000E+01	1.404936E+01	2.0	0.000000E+01	1.404936E+01	2.0	
0.0	0.000000E+01	1.471790E+01	2.1	0.000000E+01	1.471790E+01	2.1	
0.0	0.000000E+01	1.538644E+01	2.2	0.000000E+01	1.538644E+01	2.2	
0.0	0.000000E+01	1.605498E+01	2.3	0.000000E+01	1.605498E+01	2.3	
0.0	0.000000E+01	1.672352E+01	2.4	0.000000E+01	1.672352E+01	2.4	
0.0	0.000000E+01	1.739206E+01	2.5	0.000000E+01	1.739206E+01	2.5	
0.0	0.000000E+01	1.806060E+01	2.6	0.000000E+01	1.806060E+01	2.6	
0.0	0.000000E+01	1.872914E+01	2.7	0.000000E+01	1.872914E+01	2.7	
0.0	0.000000E+01	1.939768E+01	2.8	0.000000E+01	1.939768E+01	2.8	
0.0	0.000000E+01	2.006622E+01	2.9	0.000000E+01	2.006622E+01	2.9	
0.0	0.000000E+01	2.073476E+01	3.0	0.000000E+01	2.073476E+01	3.0	
0.0	0.000000E+01	2.140330E+01	3.1	0.000000E+01	2.140330E+01	3.1	
0.0	0.000000E+01	2.207184E+01	3.2	0.000000E+01	2.207184E+01	3.2	
0.0	0.000000E+01	2.274038E+01	3.3	0.000000E+01	2.274038E+01	3.3	
0.0	0.000000E+01	2.340892E+01	3.4	0.000000E+01	2.340892E+01	3.4	
0.0	0.000000E+01	2.407746E+01	3.5	0.000000E+01	2.407746E+01	3.5	
0.0	0.000000E+01	2.474600E+01	3.6	0.000000E+01	2.474600E+01	3.6	
0.0	0.000000E+01	2.541454E+01	3.7	0.000000E+01	2.541454E+01	3.7	
0.0	0.000000E+01	2.608308E+01	3.8	0.000000E+01	2.608308E+01	3.8	
0.0	0.000000E+01	2.675162E+01	3.9	0.000000E+01	2.675162E+01	3.9	
0.0	0.000000E+01	2.742016E+01	4.0	0.000000E+01	2.742016E+01	4.0	
0.0	0.000000E+01	2.808870E+01	4.1	0.000000E+01	2.808870E+01	4.1	
0.0	0.000000E+01	2.875724E+01	4.2	0.000000E+01	2.875724E+01	4.2	
0.0	0.000000E+01	2.942578E+01	4.3	0.000000E+01	2.942578E+01	4.3	
0.0	0.000000E+01	3.009432E+01	4.4	0.000000E+01	3.009432E+01	4.4	
0.0	0.000000E+01	3.076286E+01	4.5	0.000000E+01	3.076286E+01	4.5	
0.0	0.000000E+01	3.143140E+01	4.6	0.000000E+01	3.143140E+01	4.6	
0.0	0.000000E+01	3.210000E+01	4.7	0.000000E+01	3.210000E+01	4.7	
0.0	0.000000E+01	3.276854E+01	4.8	0.000000E+01	3.276854E+01	4.8	
0.0	0.000000E+01	3.343708E+01	4.9	0.000000E+01	3.343708E+01	4.9	
0.0	0.000000E+01	3.410562E+01	5.0	0.000000E+01	3.410562E+01	5.0	
0.0	0.000000E+01	3.477416E+01	5.1	0.000000E+01	3.477416E+01	5.1	
0.0	0.000000E+01	3.544270E+01	5.2	0.000000E+01	3.544270E+01	5.2	
0.0	0.000000E+01	3.611124E+01	5.3	0.000000E+01	3.611124E+01	5.3	
0.0	0.000000E+01	3.677978E+01	5.4	0.000000E+01	3.677978E+01	5.4	
0.0	0.000000E+01	3.744832E+01	5.5	0.000000E+01	3.744832E+01	5.5	
0.0	0.000000E+01	3.811686E+01	5.6	0.000000E+01	3.811686E+01	5.6	
0.0	0.000000E+01	3.878540E+01	5.7	0.000000E+01	3.878540E+01	5.7	
0.0	0.000000E+01	3.945394E+01	5.8	0.000000E+01	3.945394E+01	5.8	
0.0	0.000000E+01	4.012248E+01	5.9	0.000000E+01	4.012248E+01	5.9	
0.0	0.000000E+01	4.079102E+01	6.0	0.000000E+01	4.079102E+01	6.0	
0.0	0.000000E+01	4.145956E+01	6.1	0.000000E+01	4.145956E+01	6.1	
0.0	0.000000E+01	4.212810E+01	6.2	0.000000E+01	4.212810E+01	6.2	
0.0	0.000000E+01	4.279664E+01	6.3	0.000000E+01	4.279664E+01	6.3	
0.0	0.000000E+01	4.346518E+01	6.4	0.000000E+01	4.346518E+01	6.4	
0.0	0.000000E+01	4.413372E+01	6.5	0.000000E+01	4.413372E+01	6.5	
0.0	0.000000E+01	4.480226E+01	6.6	0.000000E+01	4.480226E+01	6.6	
0.0	0.000000E+01	4.547080E+01	6.7	0.000000E+01	4.547080E+01	6.7	
0.0	0.000000E+01	4.613934E+01	6.8	0.000000E+01	4.613934E+01	6.8	
0.0	0.000000E+01	4.680788E+01	6.9	0.000000E+01	4.680788E+01	6.9	
0.0	0.000000E+01	4.747642E+01	7.0	0.000000E+01	4.747642E+01	7.0	
0.0	0.000000E+01	4.814496E+01	7.1	0.000000E+01	4.814496E+01	7.1	
0.0	0.000000E+01	4.881350E+01	7.2	0.000000E+01	4.881350E+01	7.2	
0.0	0.000000E+01	4.948204E+01	7.3	0.000000E+01	4.948204E+01	7.3	
0.0	0.000000E+01	5.015058E+01	7.4	0.000000E+01	5.015058E+01	7.4	
0.0	0.000000E+01	5.081912E+01	7.5	0.000000E+01	5.081912E+01	7.5	
0.0	0.000000E+01	5.148766E+01	7.6	0.000000E+01	5.148766E+01	7.6	
0.0	0.000000E+01	5.215620E+01	7.7	0.000000E+01	5.215620E+01	7.7	
0.0	0.000000E+01	5.282474E+01	7.8	0.000000E+01	5.282474E+01	7.8	
0.0	0.000000E+01	5.349328E+01	7.9	0.000000E+01	5.349328E+01	7.9	
0.0	0.000000E+01	5.416182E+01	8.0	0.000000E+01	5.416182E+01	8.0	
0.0	0.000000E+01	5.483036E+01	8.1	0.000000E+01	5.483036E+01	8.1	
0.0	0.000000E+01	5.549890E+01	8.2	0.000000E+01	5.549890E+01	8.2	
0.0	0.000000E+01	5.616744E+01	8.3	0.000000E+01	5.616744E+01	8.3	
0.0	0.000000E+01	5.683598E+01	8.4	0.000000E+01	5.683598E+01	8.4	
0.0	0.000000E+01	5.750452E+01	8.5	0.000000E+01	5.750452E+01	8.5	
0.0	0.000000E+01	5.817306E+01	8.6	0.000000E+01	5.817306E+01	8.6	
0.0	0.000000E+01	5.884160E+01	8.7	0.000000E+01	5.884160E+01	8.7	
0.0	0.000000E+01	5.951014E+01	8.8	0.000000E+01	5.951014E+01	8.8	
0.0	0.000000E+01	6.017868E+01	8.9	0.000000E+01	6.017868E+01	8.9	
0.0	0.000000E+01	6.084722E+01	9.0	0.000000E+01	6.084722E+01	9.0	
0.0	0.000000E+01	6.151576E+01	9.1	0.000000E+01	6.151576E+01	9.1	
0.0	0.000000E+01	6.218430E+01	9.2	0.000000E+01	6.218430E+01	9.2	
0.0	0.000000E+01	6.285284E+01	9.3	0.000000E+01	6.285284E+01	9.3	
0.0	0.000000E+01	6.352138E+01	9.4	0.000000E+01	6.352138E+01	9.4	
0.0	0.000000E+01	6.418992E+01	9.5	0.000000E+01	6.418992E+01	9.5	
0.0	0.000000E+01	6.485846E+01	9.6	0.000000E+01	6.485846E+01	9.6	
0.0	0.000000E+01	6.552700E+01	9.7	0.000000E+01	6.552700E+01	9.7	
0.0	0.000000E+01	6.619554E+01	9.8	0.000000E+01	6.619554E+01	9.8	
0.0	0.000000E+01	6.686408E+01	9.9	0.000000E+01	6.686408E+01	9.9	
0.0	0.000000E+01	6.753262E+01	10.0	0.000000E+01	6.753262E+01	10.0	

NO. OF HORIZONTAL INCREMENTS= 24 NO. OF VERTICAL INCREMENTS= 24

THE FOLLOWING ARE PLANE POINT CONVEGATION FACTORS COMPUTED FOR THIS RUN
LOWEST GRID LINE FIRST, FROM X-LEFT TO X-RIGHT.

0.550901E-01	0.551608E-01	0.552315E-01	0.553022E-01	0.553729E-01	0.554436E-01	0.555143E-01	0.555850E-01	0.556557E-01	0.557264E-01	0.557971E-01	0.558678E-01	0.559385E-01	0.560092E-01	0.560799E-01	0.561506E-01	0.562213E-01	0.562920E-01	0.563627E-01	0.564334E-01	0.565041E-01	0.565748E-01	0.566455E-01	0.567162E-01	0.567869E-01	0.568576E-01	0.569283E-01	0.569990E-01	0.570697E-01	0.571404E-01	0.572111E-01	0.572818E-01	0.573525E-01	0.574232E-01	0.574939E-01	0.575646E-01	0.576353E-01	0.577060E-01	0.577767E-01	0.578474E-01	0.579181E-01	0.579888E-01	0.580595E-01	0.581302E-01	0.582009E-01	0.582716E-01	0.583423E-01	0.584130E-01	0.584837E-01	0.585544E-01	0.586251E-01	0.586958E-01	0.587665E-01	0.588372E-01	0.589079E-01	0.589786E-01	0.590493E-01	0.591200E-01	0.591907E-01	0.592614E-01	0.593321E-01	0.594028E-01	0.594735E-01	0.595442E-01	0.596149E-01	0.596856E-01	0.597563E-01	0.598270E-01	0.598977E-01	0.599684E-01	0.600391E-01	0.601098E-01	0.601805E-01	0.602512E-01	0.603219E-01	0.603926E-01	0.604633E-01	0.605340E-01	0.606047E-01	0.606754E-01	0.607461E-01	0.608168E-01	0.608875E-01	0.609582E-01	0.610289E-01	0.610996E-01	0.611703E-01	0.612410E-01	0.613117E-01	0.613824E-01	0.614531E-01	0.615238E-01	0.615945E-01	0.616652E-01	0.617359E-01	0.618066E-01	0.618773E-01	0.619
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0.421232E-01	0.39555.9E-01	0.36981.8E-01	0.343686E-01	0.317754E-01	0.292359E-01
0.257579E-01	0.243761E-01	0.225002E-01	0.194674E-01	0.177559E-01	0.157836E-01
0.619521E-01	0.613471E-01	0.624665E-01	0.613979E-01	0.600560E-01	0.584791E-01
0.567262E-01	0.567302E-01	0.547094E-01	0.501230E-01	0.471280E-01	0.450248E-01
0.515750E-01	0.515750E-01	0.481567E-01	0.435755E-01	0.407995E-01	0.387825E-01
0.290347E-01	0.290347E-01	0.242064E-01	0.189001E-01	0.147995E-01	0.107995E-01
0.128777E-01	0.128777E-01	0.657892E-01	0.626511E-01	0.611923E-01	0.596312E-01
0.657892E-01	0.657892E-01	0.352786E-01	0.334839E-01	0.304270E-01	0.278424E-01
0.225719E-01	0.225719E-01	0.700903E-01	0.177695E-01	0.155389E-01	0.135158E-01
0.658580E-01	0.658580E-01	0.646267E-01	0.635212E-01	0.619004E-01	0.600930E-01
0.526584E-01	0.526584E-01	0.521502E-01	0.504218E-01	0.476113E-01	0.446440E-01
0.158086E-01	0.158086E-01	0.322025E-01	0.183719E-01	0.125098E-01	0.086742E-01
0.272976E-01	0.272976E-01	0.183680E-01	0.157689E-01	0.140978E-01	0.128414E-01
0.664401E-01	0.664401E-01	0.637421E-01	0.639192E-01	0.622044E-01	0.602160E-01
0.573653E-01	0.573653E-01	0.532469E-01	0.511131E-01	0.480649E-01	0.451138E-01
0.175361E-01	0.175361E-01	0.342469E-01	0.311131E-01	0.280649E-01	0.250127E-01
0.651644E-01	0.651644E-01	0.652.01E-01	0.637810E-01	0.619283E-01	0.597809E-01
0.547144E-01	0.547144E-01	0.518850E-01	0.488779E-01	0.456971E-01	0.424325E-01
0.358198E-01	0.358198E-01	0.325795E-01	0.282590E-01	0.241612E-01	0.214378E-01
0.175463E-01	0.175463E-01	0.144960E-01	0.116282E-01	0.104004E-01	0.084193E-02
0.660768E-01	0.660768E-01	0.647265E-01	0.630432E-01	0.610497E-01	0.587609E-01
0.517788E-01	0.517788E-01	0.504036E-01	0.476311E-01	0.445746E-01	0.413465E-01
0.157562E-01	0.157562E-01	0.127274E-01	0.103884E-01	0.824660E-02	0.659471E-02
0.641234E-01	0.641234E-01	0.627812E-01	0.615464E-01	0.595164E-01	0.570748E-01
0.543717E-01	0.543717E-01	0.514621E-01	0.449789E-01	0.415404E-01	0.380937E-01
0.345631E-01	0.345631E-01	0.276355E-01	0.243801E-01	0.211976E-01	0.181704E-01
0.179134E-01	0.179134E-01	0.101691E-01	0.772413E-02	0.585992E-02	0.399772E-02
0.448310E-02	0.448310E-02	0.641509E-01	0.592654E-01	0.573023E-01	0.547327E-01
0.612345E-01	0.612345E-01	0.618848E-01	0.615109E-01	0.611571E-01	0.607401E-01
0.578692E-01	0.578692E-01	0.555144E-01	0.531171E-01	0.506410E-01	0.480260E-01
0.315291E-01	0.315291E-01	0.743407E-02	0.556403E-02	0.336403E-02	0.154277E-02
0.999999E-01	0.999999E-01	0.59095.6E-01	0.572991E-01	0.5560078E-01	0.52644493E-01
0.631197E-01	0.631197E-01	0.591914E-01	0.572991E-01	0.5560078E-01	0.52644493E-01

FIGURE 23. Group B Sample Problems Program Results
(continued)

0.201026-E-04	0.193197-E-01	0.1884237E-01	0.178643E-01	0.171147E-01	0.163712E-01
0.153576E-01	0.147119-E-01	0.148477E-01	0.130473E-01	0.122020E-01	0.113642E-01
0.457555-E-02	0.431587E-02	0.475224E-02	0.485820E-02	0.497881E-02	0.509767E-02
0.457496E-02	0.433684E-02	0.475691E-02	0.485921E-02	0.497881E-02	0.509767E-02
0.111800E-01	0.107262E-01	0.140178E-01	0.134537E-01	0.128422E-01	0.122447E-01
0.111800E-01	0.107262E-01	0.140178E-01	0.134537E-01	0.128422E-01	0.122447E-01
0.735875E-02	0.710228E-02	0.150311E-02	0.140771E-02	0.132722E-02	0.124901E-02
0.393768E-02	0.377944E-02	0.284118E-02	0.196349E-02	0.137028E-02	0.651337E-03
0.103708E-01	0.102745E-01	0.970507E-02	0.934320E-02	0.891454E-02	0.841080E-02
0.805458E-02	0.763305E-02	0.190495E-02	0.675301E-02	0.513844E-02	0.312102E-02
0.273549E-02	0.266646E-02	0.182586E-02	0.139901E-02	0.118860E-03	0.312102E-02
0.443087E-02	0.414748E-02	0.380678E-02	0.342264E-02	0.322165E-02	0.311361E-02
0.346308E-02	0.294843E-02	0.272758E-02	0.215500E-02	0.148194E-02	0.135103E-02
0.164211E-02	0.130960E-02	0.109856E-02	0.823284E-03	0.440040E-03	0.274601E-03

FIGURE 23. Group B Sample Problems Program Results
(continued)

0.193185E-01	0.197327E-01	0.200644E-01	0.203893E-01	0.205977E-01	0.209514E-01
0.211729E-01	0.215302E-01	0.217633E-01	0.219991E-01	0.221427E-01	0.222996E-01
0.225274E-01	0.227567E-01	0.229775E-01	0.231912E-01	0.233977E-01	0.235972E-01
0.237904E-01	0.239967E-01	0.241912E-01	0.243845E-01	0.245766E-01	0.247675E-01
0.249445E-01	0.251344E-01	0.253228E-01	0.255106E-01	0.256978E-01	0.258844E-01
0.260705E-01	0.262565E-01	0.264418E-01	0.266265E-01	0.268106E-01	0.269941E-01
0.271775E-01	0.273628E-01	0.275475E-01	0.277316E-01	0.279151E-01	0.280981E-01
0.282815E-01	0.284652E-01	0.286485E-01	0.288313E-01	0.290136E-01	0.291954E-01
0.293768E-01	0.295595E-01	0.297418E-01	0.299236E-01	0.301049E-01	0.302857E-01
0.304665E-01	0.306468E-01	0.308267E-01	0.310061E-01	0.311851E-01	0.313636E-01
0.315427E-01	0.317215E-01	0.318998E-01	0.320776E-01	0.322550E-01	0.324319E-01
0.326085E-01	0.327848E-01	0.329606E-01	0.331359E-01	0.333107E-01	0.334850E-01
0.338595E-01	0.340338E-01	0.342076E-01	0.343809E-01	0.345537E-01	0.347260E-01
0.348980E-01	0.350693E-01	0.352396E-01	0.354089E-01	0.355782E-01	0.357475E-01
0.360965E-01	0.362648E-01	0.364326E-01	0.365999E-01	0.367667E-01	0.369330E-01
0.371895E-01	0.373558E-01	0.375216E-01	0.376869E-01	0.378517E-01	0.380160E-01
0.383800E-01	0.385433E-01	0.387061E-01	0.388684E-01	0.390302E-01	0.391915E-01
0.394522E-01	0.396135E-01	0.397743E-01	0.399346E-01	0.400944E-01	0.402537E-01
0.406135E-01	0.407728E-01	0.409316E-01	0.410900E-01	0.412479E-01	0.414053E-01
0.417624E-01	0.419198E-01	0.420767E-01	0.422332E-01	0.423892E-01	0.425447E-01
0.427000E-01	0.428553E-01	0.430101E-01	0.431644E-01	0.433182E-01	0.434715E-01
0.438265E-01	0.439798E-01	0.441326E-01	0.442850E-01	0.444369E-01	0.445883E-01
0.450900E-01	0.452414E-01	0.453923E-01	0.455428E-01	0.456928E-01	0.458423E-01
0.463965E-01	0.465465E-01	0.466960E-01	0.468450E-01	0.469935E-01	0.471415E-01
0.476480E-01	0.477955E-01	0.479425E-01	0.480890E-01	0.482350E-01	0.483805E-01
0.488360E-01	0.489815E-01	0.491265E-01	0.492710E-01	0.494150E-01	0.495585E-01
0.500520E-01	0.501955E-01	0.503385E-01	0.504810E-01	0.506230E-01	0.507645E-01
0.513040E-01	0.514455E-01	0.515865E-01	0.517270E-01	0.518670E-01	0.520065E-01
0.526480E-01	0.527875E-01	0.529265E-01	0.530650E-01	0.532030E-01	0.533405E-01
0.539840E-01	0.541215E-01	0.542585E-01	0.543950E-01	0.545310E-01	0.546665E-01
0.553040E-01	0.554395E-01	0.555745E-01	0.557090E-01	0.558430E-01	0.559765E-01
0.566960E-01	0.568295E-01	0.569625E-01	0.570950E-01	0.572270E-01	0.573585E-01
0.581440E-01	0.582755E-01	0.584065E-01	0.585370E-01	0.586670E-01	0.587965E-01
0.595440E-01	0.596735E-01	0.598025E-01	0.599310E-01	0.600590E-01	0.601865E-01
0.609840E-01	0.611115E-01	0.612385E-01	0.613650E-01	0.614910E-01	0.616165E-01
0.624640E-01	0.625895E-01	0.627145E-01	0.628390E-01	0.629630E-01	0.630865E-01
0.639640E-01	0.640875E-01	0.642105E-01	0.643330E-01	0.644550E-01	0.645765E-01
0.655840E-01	0.657055E-01	0.658265E-01	0.659470E-01	0.660670E-01	0.661865E-01
0.672440E-01	0.673635E-01	0.674825E-01	0.676010E-01	0.677190E-01	0.678365E-01
0.689840E-01	0.691015E-01	0.692185E-01	0.693350E-01	0.694510E-01	0.695665E-01
0.707440E-01	0.708595E-01	0.709745E-01	0.710890E-01	0.712030E-01	0.713165E-01
0.725840E-01	0.726975E-01	0.728105E-01	0.729230E-01	0.730350E-01	0.731465E-01
0.743640E-01	0.744755E-01	0.745865E-01	0.746970E-01	0.748070E-01	0.749165E-01
0.761440E-01	0.762535E-01	0.763625E-01	0.764710E-01	0.765790E-01	0.766865E-01
0.779640E-01	0.780715E-01	0.781785E-01	0.782850E-01	0.783910E-01	0.784965E-01
0.799640E-01	0.800695E-01	0.801745E-01	0.802790E-01	0.803830E-01	0.804865E-01
0.820840E-01	0.821875E-01	0.822905E-01	0.823930E-01	0.824950E-01	0.825965E-01
0.838440E-01	0.839455E-01	0.840465E-01	0.841470E-01	0.842470E-01	0.843465E-01
0.857440E-01	0.858435E-01	0.859425E-01	0.860410E-01	0.861390E-01	0.862365E-01
0.876840E-01	0.877815E-01	0.878785E-01	0.879750E-01	0.880710E-01	0.881665E-01
0.897440E-01	0.898395E-01	0.899345E-01	0.900290E-01	0.901230E-01	0.902165E-01
0.913640E-01	0.914575E-01	0.915505E-01	0.916430E-01	0.917350E-01	0.918265E-01
0.930840E-01	0.931755E-01	0.932665E-01	0.933570E-01	0.934470E-01	0.935365E-01
0.949640E-01	0.950535E-01	0.951425E-01	0.952310E-01	0.953190E-01	0.954065E-01
0.969640E-01	0.970515E-01	0.971385E-01	0.972250E-01	0.973110E-01	0.973965E-01
0.990440E-01	0.991295E-01	0.992145E-01	0.992990E-01	0.993830E-01	0.994665E-01
1.011640E-01	1.012475E-01	1.013305E-01	1.014130E-01	1.014950E-01	1.015765E-01
1.033240E-01	1.034055E-01	1.034865E-01	1.035670E-01	1.036470E-01	1.037265E-01
1.055240E-01	1.056035E-01	1.056825E-01	1.057610E-01	1.058390E-01	1.059165E-01
1.077640E-01	1.078415E-01	1.079185E-01	1.079950E-01	1.080710E-01	1.081465E-01
1.100440E-01	1.101195E-01	1.101945E-01	1.102690E-01	1.103430E-01	1.104165E-01
1.123640E-01	1.124375E-01	1.125105E-01	1.125830E-01	1.126550E-01	1.127265E-01
1.147240E-01	1.147955E-01	1.148665E-01	1.149370E-01	1.150070E-01	1.150765E-01
1.171240E-01	1.171935E-01	1.172625E-01	1.173310E-01	1.173990E-01	1.174665E-01
1.195640E-01	1.196315E-01	1.196985E-01	1.197650E-01	1.198310E-01	1.198965E-01
1.220440E-01	1.221095E-01	1.221745E-01	1.222390E-01	1.223030E-01	1.223665E-01
1.245640E-01	1.246275E-01	1.246905E-01	1.247530E-01	1.248150E-01	1.248765E-01
1.271240E-01	1.271855E-01	1.272465E-01	1.273070E-01	1.273670E-01	1.274265E-01
1.297240E-01	1.297835E-01	1.298425E-01	1.299010E-01	1.299590E-01	1.300165E-01
1.323640E-01	1.324215E-01	1.324785E-01	1.325350E-01	1.325910E-01	1.326465E-01
1.350440E-01	1.350995E-01	1.351545E-01	1.352090E-01	1.352630E-01	1.353165E-01
1.377640E-01	1.378175E-01	1.378705E-01	1.379230E-01	1.379750E-01	1.380265E-01
1.405240E-01	1.405755E-01	1.406265E-01	1.406770E-01	1.407270E-01	1.407765E-01
1.433640E-01	1.434135E-01	1.434625E-01	1.435110E-01	1.435590E-01	1.436065E-01
1.462440E-01	1.462915E-01	1.463385E-01	1.463850E-01	1.464310E-01	1.464765E-01
1.491640E-01	1.492095E-01	1.492545E-01	1.492990E-01	1.493430E-01	1.493865E-01
1.521240E-01	1.521675E-01	1.522105E-01	1.522530E-01	1.522950E-01	1.523365E-01
1.551240E-01	1.551655E-01	1.552065E-01	1.552470E-01	1.552870E-01	1.553265E-01
1.581640E-01	1.582035E-01	1.582425E-01	1.582810E-01	1.583190E-01	1.583565E-01
1.612440E-01	1.612815E-01	1.613185E-01	1.613550E-01	1.613910E-01	1.614265E-01
1.643640E-01	1.643995E-01	1.644345E-01	1.644690E-01	1.645030E-01	1.645365E-01
1.675240E-01	1.675575E-01	1.675905E-01	1.676230E-01	1.676550E-01	1.676865E-01
1.707240E-01	1.707555E-01	1.707865E-01	1.708170E-01	1.708470E-01	1.708765E-01
1.740040E-01	1.740335E-01	1.740625E-01	1.740910E-01	1.741190E-01	1.741465E-01
1.773240E-01	1.773515E-01	1.773785E-01	1.774050E-01	1.774310E-01	1.774565E-01
1.806840E-01	1.807095E-01	1.807345E-01	1.807590E-01	1.807830E-01	1.808065E-01
1.840840E-01	1.841075E-01	1.841305E-01	1.841530E-01	1.841750E-01	1.841965E-01
1.875240E-01	1.875455E-01	1.875665E-01	1.875870E-01	1.876070E-01	1.876265E-01
1.910040E-01	1.910235E-01	1.910425E-01	1.910610E-01	1.910790E-01	1.910965E-01
1.945240E-01	1.945415E-01	1.945585E-01	1.945750E-01	1.945910E-01	1.946065E-01
1.980840E-01	1.980995E-01	1.981145E-01	1.981290E-01	1.981430E-01	1.981565E-01
2.016840E-01	2.016975E-01	2.017105E-01	2.017230E-01	2.017350E-01	2.017465E-01
2.053240E-01	2.053355E-01	2.053465E-01	2.053570E-01	2.053670E-01	2.053765E-01
2.090040E-01	2.090135E-01	2.090225E-01	2.090310E-01	2.090390E-01	2.090465E-01
2.127240E-01	2.127315E-01	2.127385E-01	2.127450E-01	2.127510E-01	2.127565E-01
2.164840E-01	2.164895E-01	2.164945E-01	2.164990E-01	2.165030E-01	2.165065E-01
2.202840E-01	2.202875E-01	2.202905E-01	2.202930E-01	2.202950E-01	2.202965E-01
2.241240E-01	2.241255E-01	2.241265E-01	2.241270E-01	2.241275E-01	2.241280E-01
2.280040E-01	2.280035E-01	2.280025E-01	2.280010E-01	2.280000E-01	2.279985E-01
2.319240E-01	2.319215E-01	2.319185E-01	2.319150E-01	2.319110E-01	2.319065E-01
2.358840E-01	2.358795E-01	2.358745E-01	2.358690E-01	2.358630E-01	2.358565E-01
2.408840E-01	2.408775E-01	2.408705E-01	2.408630E-01	2.408550E-01	2.408465E-01
2.459240E-01	2.459155E-01	2.459065E-01	2.458970E-01	2.458870E-01	2.458765E-01
2.510040E-01	2.509935E-01	2.509825E-01	2.509710E-01	2.509590E-01	2.509465E-01
2.561240E-01	2.561115E-01	2.561085E-01	2.561050E-01	2.561010E-01	2.560965E-01
2.612840E-01	2.612695E-01	2.612645E-01	2.612590E-01	2.612530E-01	2.612465E-01
2.664840E-01	2.664675E-01	2.664605E-01	2.664530E-01	2.664450E-01	2.664365E-01
2.717240E-01	2.717055E-01	2.716965E-01	2.716870E-01	2.716770E-01	2.716665E-01
2.770040E-01	2.769835E-01	2.769725E-01	2.769610E-01	2.769490E-01	2.769365E-01
2.823240E-01	2.823015E-01	2.822885E-01	2.822750E-01	2.822610E-01	2.822465E-01
2.876840E-01	2.876595E-01	2.876445E-01	2.876290E-01	2.876130E-01	2.875965E-01
2.930840E-01	2.930575E-01	2.930405E-01	2.930230E-01	2.930060E-01	2.929885E-01
2.985240E-01	2.984955E-01	2.984765E-01	2.984570E-01	2.984370E-01	2.984165E-01
3.040040E-01	3.039735E-01	3.039525E-01	3.039310E-01	3.039090E-01	3.038865E-01
3.095240E-01	3.094915E-01	3.094685E-01	3.094450E-01	3.094210E-01	3.093965E-01
3.150840E-01	3.150495E-01	3.150			

NAA CONFAC II REPORT SAMPLE PROBLEMS FROM FIG. 10) * - A.T.O.U.P.S., 11/1/63

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RUN NO. 5 DATA USED FOR THIS RUN= *JOISK *IPLAT*
          *OTCIS* *
          *O
THE FORM FACTOR FROM SURFACE *JOISK *OTCIS* TO SURFACE *IPLAT* * = 0.04739
THE EXCHANGE COEFFICIENT (FA) = 0.120346 O1 50 UNITS
      THE MAPPING AREA = 0.2542277E 02 50 UNITS
THE AREA OF SURFACE *JOISK *OTCIS* = 6.2545584E 02 50 UNITS.
ONLY A PART OF SURFACE *IPLAT*
SEE SURFACE *JOISK *OTCIS* *, COMPARISING AN AREA OF 0.3688701E 02 50 UNITS.
THE AREA OF SURFACE *IPLAT* * = 0.4937335E 02 50 UNITS.

THE FOLLOWING ARE THE (FINAL) SURFACE COORDINATES USED FOR THE FACTOR COMPUTATION=

***** DATA NAME= *JOISK *OTCIS*
POINT 0. X Y Z POINT X Y Z
1 0. -0. -0. 2.100000E 01---INTERNALY GENERATED ORIENTATION VECTOR) Z
3 0.254964E 01 0.4223588E 01 0. 4 0.3919687E 01 0.3919687E 01 0.
5 0.254964E 01 0.4223588E 01 0. 6 0. 0. 0.5543275E 01 0.
7 -0.1623357E 01 0.3919687E 01 0. 8 -0.1623357E 01 0.1623357E 01 0.

***** DATA NAME= *IPLAT* *
POINT 0. X Y Z POINT X Y Z
1 -0.1608127E 01 -0.931003E 00 0.631531E 01---INTERNALY GENERATED ORIENTATION VECTOR) Z
3 -0.4051187E 01 -0.1418412E 01 0.639090E 01 2 -0.366493E 01 -0.597489E 01 0.277473E 0
5 -0.311556E 01 -0.334528E 01 0. 4 -0.717181E 01 0.254558E 01 0.
7 -0.171253E 01 0.311556E 01 0.444408E 00

```

FIGURE 13. Group B Sample Problems Program Results
(continued)

[illegible]

THE FOLLOWING ARE PLANE POINT CONFIGURATION FACTORS COMPUTED FOR THIS RUN
LOWEST GRID LINE FIRST, FROM X-LEFT TO X-RIGHT.

0.95333475E+01	0.92933374E+01	0.89923160E+01	0.87103105E+01	0.84483048E+01	0.82043000E+01
0.79742875E+01	0.77003000E+01	0.74476960E+01	0.72223105E+01	0.70143048E+01	0.68243000E+01
0.66542875E+01	0.64003000E+01	0.61676960E+01	0.60703105E+01	0.59503048E+01	0.58343000E+01
0.56442875E+01	0.54003000E+01	0.52226960E+01	0.51043105E+01	0.50043048E+01	0.49143000E+01
0.48542875E+01	0.46503000E+01	0.44706960E+01	0.43103105E+01	0.41643048E+01	0.40343000E+01
0.38842875E+01	0.37003000E+01	0.35376960E+01	0.33903105E+01	0.32543048E+01	0.31343000E+01
0.29342875E+01	0.27803000E+01	0.26476960E+01	0.25303105E+01	0.24243048E+01	0.23343000E+01
0.22042875E+01	0.20803000E+01	0.19776960E+01	0.18803105E+01	0.17943048E+01	0.17243000E+01
0.15942875E+01	0.14903000E+01	0.14076960E+01	0.13303105E+01	0.12643048E+01	0.12143000E+01
0.10942875E+01	0.10103000E+01	0.09376960E+01	0.08703105E+01	0.08143048E+01	0.07743000E+01
0.08042875E+01	0.07403000E+01	0.06876960E+01	0.06403105E+01	0.06043048E+01	0.05743000E+01
0.05342875E+01	0.04903000E+01	0.04576960E+01	0.04303105E+01	0.04043048E+01	0.03843000E+01
0.04742875E+01	0.04403000E+01	0.04176960E+01	0.04003105E+01	0.03843048E+01	0.03743000E+01
0.03642875E+01	0.03403000E+01	0.03276960E+01	0.03103105E+01	0.02943048E+01	0.02843000E+01
0.02742875E+01	0.02603000E+01	0.02476960E+01	0.02303105E+01	0.02143048E+01	0.02043000E+01
0.01942875E+01	0.01803000E+01	0.01776960E+01	0.01703105E+01	0.01643048E+01	0.01543000E+01
0.01442875E+01	0.01303000E+01	0.01276960E+01	0.01203105E+01	0.01143048E+01	0.01043000E+01
0.01042875E+01	0.00903000E+01	0.00876960E+01	0.00803105E+01	0.00743048E+01	0.00643000E+01
0.00742875E+01	0.00603000E+01	0.00576960E+01	0.00503105E+01	0.00443048E+01	0.00343000E+01
0.00442875E+01	0.00303000E+01	0.00276960E+01	0.00203105E+01	0.00143048E+01	0.00043000E+01
0.00142875E+01	0.00003000E+01	0.00000000E+01	0.00000000E+01	0.00000000E+01	0.00000000E+01

FIGURE 23. Group 3 Sample Problems Program Results
(continued)

0.1514432E-01	0.5415525E-01	0.6421239E-01	0.6335611E-01	0.5114125E-01	0.4919021E-01
0.1707508E-01	0.5580476E-01	0.6525247E-01	0.6413981E-01	0.5300217E-01	0.5276622E-01
0.1635981E-01	0.1027147E-00	0.5951011E-01	0.5493180E-01	0.5002212E-01	0.4954663E-01
0.1109347E-00	0.5631880E-01	0.6457132E-01	0.5146344E-01	0.4889560E-01	0.4846623E-01
0.1723233E-01	0.5631880E-01	0.6457132E-01	0.5146344E-01	0.4889560E-01	0.4846623E-01
0.4446521E-01	0.4232695E-01	0.6109590E-01	0.3882875E-01	0.3676205E-01	0.3369004E-01
0.1136352E-01	0.1312851E-01	0.5013544E-00	0.5576503E-01	0.5048345E-01	0.4951029E-01
0.4092113E-01	0.7642877E-01	0.7241408E-01	0.6832255E-01	0.6463317E-01	0.6116047E-01
0.2782126E-01	0.5481056E-01	0.5102549E-01	0.4953931E-01	0.4653161E-01	0.4422550E-01
0.1087114E-01	0.3986834E-01	0.3309382E-01	0.3257616E-01	0.3541394E-01	0.3253930E-01
0.1155538E-01	0.1097127E-00	0.1023784E-00	0.9622743E-01	0.9054078E-01	0.8913807E-01
0.1594504E-01	0.5271757E-01	0.4978200E-01	0.4662758E-01	0.4444640E-01	0.4188374E-01
0.1818811E-00	0.3741379E-01	0.3358723E-01	0.3348752E-01	0.3470647E-01	0.3053568E-01
0.1893121E-00	0.1092167E-00	0.1016450E-00	0.9620898E-01	0.9017814E-01	0.8453306E-01
0.2491631E-01	0.5029702E-01	0.4765711E-01	0.4460100E-01	0.4131031E-01	0.3753376E-01
0.2627723E-01	0.3549425E-01	0.3312167E-01	0.3183161E-01	0.2946661E-01	0.2781603E-01
0.1103939E-00	0.1034603E-00	0.9734502E-01	0.9140361E-01	0.8582190E-01	0.8058166E-01
0.1256007E-01	0.4312840E-01	0.4062537E-01	0.3818148E-01	0.3578282E-01	0.3340597E-01
0.3654444E-01	0.3412405E-01	0.3218971E-01	0.3038605E-01	0.2868600E-01	0.2710663E-01
0.2326007E-01	0.9772531E-01	0.9125440E-01	0.8651623E-01	0.8159384E-01	0.7659296E-01
0.2281020E-01	0.6771631E-01	0.6375532E-01	0.5998798E-01	0.5645551E-01	0.5313376E-01
0.3308483E-01	0.2714431E-01	0.2448370E-01	0.2182558E-01	0.1942868E-01	0.1718882E-01
0.2458928E-01	0.1311721E-01	0.1127488E-01	0.1295408E-01	0.1279328E-01	0.1264183E-01
0.2744455E-01	0.3107088E-01	0.2666917E-01	0.2171508E-01	0.1770312E-01	0.1281127E-01
0.2478475E-01	0.4450543E-01	0.4077943E-01	0.3670747E-01	0.3301575E-01	0.2928265E-01
0.3389462E-01	0.2109382E-01	0.2054335E-01	0.2070102E-01	0.2171600E-01	0.2571394E-01
0.2436888E-01	0.4611007E-01	0.3911842E-01	0.3702684E-01	0.3276495E-01	0.2819301E-01
0.4458822E-01	0.6139358E-01	0.3767644E-01	0.3450561E-01	0.3160571E-01	0.2873362E-01
0.3458820E-01	0.4340056E-01	0.4100136E-01	0.3862276E-01	0.3670008E-01	0.3470294E-01
0.3101160E-01	0.3105997E-01	0.2946071E-01	0.2784109E-01	0.2637531E-01	0.2499740E-01
0.2514623E-01	0.4078159E-01	0.7652825E-01	0.7124745E-01	0.6861509E-01	0.6494454E-01

FIGURE 23. Group B Sample Problems Program Results
(continued)

0.342553E-01	0.373614E-01	0.364815E-01	0.336076E-01	0.347138E-01	0.3388517E-01
0.330361E-01	0.322015E-01	0.333303E-01	0.305703E-01	0.297743E-01	0.2899237E-01
0.232258E-01	0.274710E-01	0.267307E-01	0.260158E-01	0.251099E-01	0.244224E-01
0.215050E-01	0.231336E-01	0.226550E-01	0.212889E-01	0.211406E-01	0.208283E-01
0.202815E-01	0.218764E-01	0.213019E-01	0.233975E-01	0.218192E-01	0.2119927E-01
0.355558E-01	0.278925E-01	0.262931E-01	0.268143E-01	0.278974E-01	0.271691E-01
0.277571E-01	0.278925E-01	0.262931E-01	0.268143E-01	0.278974E-01	0.271691E-01
0.233596E-01	0.227705E-01	0.222493E-01	0.211235E-01	0.211652E-01	0.207197E-01
0.202367E-01	0.207891E-01	0.204830E-01	0.201706E-01	0.203263E-01	0.207891E-01
0.242705E-01	0.277741E-01	0.272822E-01	0.267946E-01	0.251024E-01	0.2431237E-01
0.235398E-01	0.268915E-01	0.264594E-01	0.259730E-01	0.253275E-01	0.2476757E-01
0.201078E-01	0.177797E-01	0.178976E-01	0.136537E-01	0.209533E-01	0.2094797E-01
0.244431E-01	0.230488E-01	0.276926E-01	0.273176E-01	0.268406E-01	0.267175E-01
0.252195E-01	0.259227E-01	0.254522E-01	0.251010E-01	0.243893E-01	0.243784E-01
0.216339E-01	0.216339E-01	0.216339E-01	0.216339E-01	0.216339E-01	0.216339E-01
0.109986E-01	0.109986E-01	0.109986E-01	0.109986E-01	0.109986E-01	0.109986E-01

FIGURE 23. Group B Sample Problems Program Results
(continued)

SAMPLE PROBLEM GROUP C

The geometrical relationships for this sample problem are shown in Figure 24. The data sheets are presented in Figure 25 and the results are shown in Figure 26.

Problem 1C

In this problem, a solid surface which could not be created by the program surface generator is entered manually along with the necessary connections data. A cube with four truncated corners, named SCURF, is entered in data from a convenient location in its coordinate system, i.e., at the origin, as shown in Figure 24. Only three points were computed and entered as 9TCUBE transformation data to move the surface to the desired position shown over Surface 1, 1PLATS. The factor from 1PLATS to SCURF9TCUBE is requested as Run #1.

The silhouette generator was used to compute the silhouette from each point in 1PLATS, and because a detailed output was requested with 6 horizontal and 6 vertical divisions of 1PLATS, 49 silhouettes were computed as shown in Figure 26. The numbers following each identifying naming line and naming point number are the boundary point numbers which form the silhouette when connected together. It was not possible, since there are no crossovers in the silhouette, to run this problem in the simple mode in SILFAC at greater speed. The naming divisions were deliberately set at 6 x 6 to reduce the output, some experimentation is required to determine how many divisions are required to yield the factor to the accuracy desired.

Problem 2C

The silhouette generator requires that all points in Surface 2 be above the plane of Surface 1 when operating in either the simple or complex mode. A view of SCUBE in its original position from 1PLATS clearly shows part of SCUBE below the surface of 1PLATS; the run is therefore rejected with a diagnostic indicating this condition.

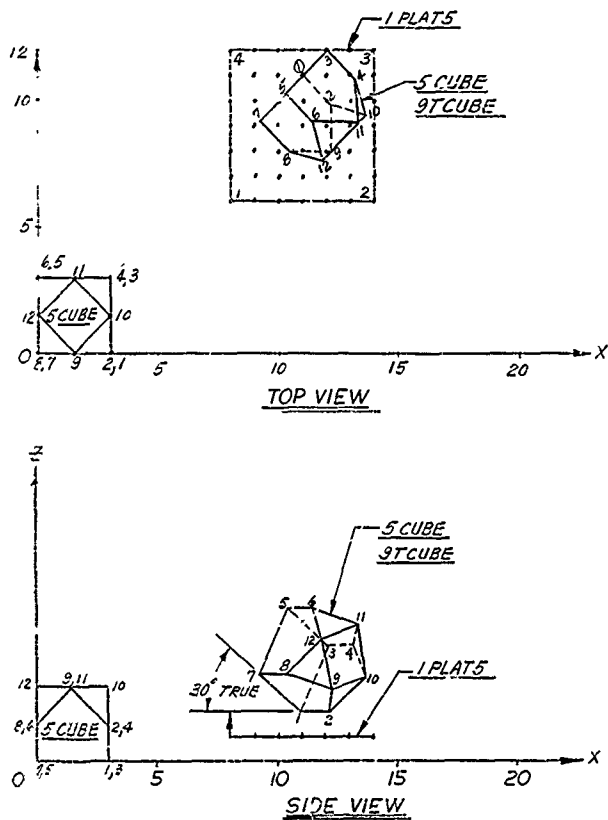


FIGURE 24. GROUP C SAMPLE PROBLEM'S GEOMETRY

FORTRAN FIXED 10 DIGIT DECIMAL DATA				
CODE NO.	PROGRAMMER	DATE	PAGE 11 of 36	JOB NO. 2470-30
NUMBER	IDENTIFICATION	DESCRIPTION	DO NOT KEY PUNCH	
1	1.0			
2	2.0			
3	3.0			
4	4.0			
5	5.0			
6	6.0			
7	7.0			
8	8.0			
9	9.0			
10	10.0			
11	11.0			
12	12.0			
13	13.0			
14	14.0			
15	15.0			
16	16.0			
17	17.0			
18	18.0			
19	19.0			
20	20.0			
21	21.0			
22	22.0			
23	23.0			
24	24.0			
25	25.0			
26	26.0			
27	27.0			
28	28.0			
29	29.0			
30	30.0			

FORTRAN FIXED 10 DIGIT DECIMAL DATA				
CODE NO.	PROGRAMMER	DATE	PAGE 11 of 36	JOB NO. 2470-30
NUMBER	IDENTIFICATION	DESCRIPTION	DO NOT KEY PUNCH	
1	1.0			
2	2.0			
3	3.0			
4	4.0			
5	5.0			
6	6.0			
7	7.0			
8	8.0			
9	9.0			
10	10.0			
11	11.0			
12	12.0			
13	13.0			
14	14.0			
15	15.0			
16	16.0			
17	17.0			
18	18.0			
19	19.0			
20	20.0			
21	21.0			
22	22.0			
23	23.0			
24	24.0			
25	25.0			
26	26.0			
27	27.0			
28	28.0			
29	29.0			
30	30.0			

FIGURE 25. Group C Sample Problems Input Data Code Sheets

FORTRAN FIXED 10 DIGIT DECIMAL DATA

DECK NO.	PROGRAMMER	DATE	PAGE 11 OF 20	JOB NO. 2416-10
NUMBER	IDENTIFICATION	DESCRIPTION	DO NOT KEY PUNCH	
1				
2				
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10				
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100				

FORTRAN FIXED 10 DIGIT DECIMAL DATA

DECK NO.	PROGRAMMER	DATE	PAGE 11 OF 20	JOB NO. 2416-10
NUMBER	IDENTIFICATION	DESCRIPTION	DO NOT KEY PUNCH	
1				
2				
3				
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11				
12				
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93				
94				
95				
96				
97				
98				
99				
100				

FIGURE 25. Group C Sample Problems Input Data Code Sheets
(continued)

FORTRAN FIXED 10 DIGIT DECIMAL DATA				
DECK NO.	PROGRAMMER	DATE	PAGE 22 of 36	JOB NO. 285-10
NUMBER	IDENTIFICATION	DESCRIPTION	DO NOT KEY PUNCH	
1	C			
2	C			
3	C			
4	C			
5	C			
6	C			
7	C			
8	C			
9	C			
10	C			
11	C			
12	C			
13	C			
14	C			
15	C			
16	C			
17	C			
18	C			
19	C			
20	C			
21	C			
22	C			
23	C			
24	C			
25	C			
26	C			
27	C			
28	C			
29	C			
30	C			
31	C			
32	C			
33	C			
34	C			
35	C			
36	C			
37	C			
38	C			
39	C			
40	C			
41	C			
42	C			
43	C			
44	C			
45	C			
46	C			
47	C			
48	C			
49	C			
50	C			
51	C			
52	C			
53	C			
54	C			
55	C			
56	C			
57	C			
58	C			
59	C			
60	C			
61	C			
62	C			
63	C			
64	C			
65	C			
66	C			
67	C			
68	C			
69	C			
70	C			
71	C			
72	C			
73	C			
74	C			
75	C			
76	C			
77	C			
78	C			
79	C			
80	C			
81	C			
82	C			
83	C			
84	C			
85	C			
86	C			
87	C			
88	C			
89	C			
90	C			
91	C			
92	C			
93	C			
94	C			
95	C			
96	C			
97	C			
98	C			
99	C			
100	C			

FIGURE 25. Group C Sample Problems Input Data Code Sheets
(continued)

NAA SPACE AND INFORMATION SYSTEMS DIVISION
 T-4 PROJECT RADIAN-INTERCHANGE CONFIGURATION FACTOR PROGRAM
 C O N F I
 NAA CGJFAC II REPORT SAMPLE PROBLEMS FROM FIG. (C)-K.A.T.O.U.S., 1/1/63
 I N P U T D A T A

***** DATA NAME= *1PLATS * 6X6 PLATE PARALLEL TO XY PLANE, Z=1
 POINT X Y Z POINT X Y Z
 1 0.8000000E 01 0.4000000E 01 0.2000000E 01 1 0.1400000E 01 0.1400000E 01 0.1400000E 01
 2 0.8000000E 01 0.4000000E 01 0.2000000E 01 2 0.1400000E 01 0.1400000E 01 0.1400000E 01
 3 0.8000000E 01 0.4000000E 01 0.2000000E 01 3 0.1400000E 01 0.1400000E 01 0.1400000E 01

***** DATA NAME= *SCURE * 3 UNITS ON A SIDE, WITH FOUR ADJACENT CORNERS INDICATED
 POINT X Y Z POINT X Y Z
 1 0.3000000E 01 0.3000000E 01 0.3000000E 01 1 0.3000000E 01 0.3000000E 01 0.3000000E 01
 2 0.3000000E 01 0.3000000E 01 0.3000000E 01 2 0.3000000E 01 0.3000000E 01 0.3000000E 01
 3 0.3000000E 01 0.3000000E 01 0.3000000E 01 3 0.3000000E 01 0.3000000E 01 0.3000000E 01
 4 0.3000000E 01 0.3000000E 01 0.3000000E 01 4 0.3000000E 01 0.3000000E 01 0.3000000E 01
 5 0.3000000E 01 0.3000000E 01 0.3000000E 01 5 0.3000000E 01 0.3000000E 01 0.3000000E 01
 6 0.3000000E 01 0.3000000E 01 0.3000000E 01 6 0.3000000E 01 0.3000000E 01 0.3000000E 01
 7 0.3000000E 01 0.3000000E 01 0.3000000E 01 7 0.3000000E 01 0.3000000E 01 0.3000000E 01
 8 0.3000000E 01 0.3000000E 01 0.3000000E 01 8 0.3000000E 01 0.3000000E 01 0.3000000E 01
 9 0.3000000E 01 0.3000000E 01 0.3000000E 01 9 0.3000000E 01 0.3000000E 01 0.3000000E 01
 10 0.3000000E 01 0.3000000E 01 0.3000000E 01 10 0.3000000E 01 0.3000000E 01 0.3000000E 01
 11 0.3000000E 01 0.3000000E 01 0.3000000E 01 11 0.3000000E 01 0.3000000E 01 0.3000000E 01
 12 0.3000000E 01 0.3000000E 01 0.3000000E 01 12 0.3000000E 01 0.3000000E 01 0.3000000E 01

POINT CONNECTING POINTS POINT CONNECTING POINTS POINT CONNECTING POINTS
 1 0.3000000E 01 0.3000000E 01 0.3000000E 01 1 0.3000000E 01 0.3000000E 01 0.3000000E 01
 2 0.3000000E 01 0.3000000E 01 0.3000000E 01 2 0.3000000E 01 0.3000000E 01 0.3000000E 01
 3 0.3000000E 01 0.3000000E 01 0.3000000E 01 3 0.3000000E 01 0.3000000E 01 0.3000000E 01
 4 0.3000000E 01 0.3000000E 01 0.3000000E 01 4 0.3000000E 01 0.3000000E 01 0.3000000E 01
 5 0.3000000E 01 0.3000000E 01 0.3000000E 01 5 0.3000000E 01 0.3000000E 01 0.3000000E 01
 6 0.3000000E 01 0.3000000E 01 0.3000000E 01 6 0.3000000E 01 0.3000000E 01 0.3000000E 01
 7 0.3000000E 01 0.3000000E 01 0.3000000E 01 7 0.3000000E 01 0.3000000E 01 0.3000000E 01
 8 0.3000000E 01 0.3000000E 01 0.3000000E 01 8 0.3000000E 01 0.3000000E 01 0.3000000E 01
 9 0.3000000E 01 0.3000000E 01 0.3000000E 01 9 0.3000000E 01 0.3000000E 01 0.3000000E 01
 10 0.3000000E 01 0.3000000E 01 0.3000000E 01 10 0.3000000E 01 0.3000000E 01 0.3000000E 01
 11 0.3000000E 01 0.3000000E 01 0.3000000E 01 11 0.3000000E 01 0.3000000E 01 0.3000000E 01
 12 0.3000000E 01 0.3000000E 01 0.3000000E 01 12 0.3000000E 01 0.3000000E 01 0.3000000E 01

***** DATA NAME= *SCURE * TRANSFORMS SCURE TO SKEWED POSITION IN 15° QUAD.
 TRANSFORMATION DATA
 POINT X Y Z POINT X Y Z
 1 0.1100000E 02 0.1100000E 02 0.2000000E 01 1 0.1200000E 02 0.999999E 01 0.200000E 01

FIGURE 26. Group C Sample Problems Program Results
 (7 pages)

7 0.9162683E 01 0.9.62683E 01 0.3500000E 0.

FIGURE 26. Group C Sample Problems Program Results
(continued)


```

1  1  9  10  1  3  1  7  8  9
2  2  9  2  1  3  1  7  8  9
3  3  9  2  1  3  1  7  8  9
4  4  9  2  1  3  1  7  8  9
5  5  9  2  1  3  1  7  8  9
6  6  9  2  1  3  1  7  8  9
7  7  9  2  1  3  1  7  8  9
8  8  9  2  1  3  1  7  8  9
9  9  9  2  1  3  1  7  8  9
10 10 9  2  1  3  1  7  8  9
11 11 9  2  1  3  1  7  8  9
12 12 9  2  1  3  1  7  8  9
13 13 9  2  1  3  1  7  8  9
14 14 9  2  1  3  1  7  8  9
15 15 9  2  1  3  1  7  8  9
16 16 9  2  1  3  1  7  8  9
17 17 9  2  1  3  1  7  8  9
18 18 9  2  1  3  1  7  8  9
19 19 9  2  1  3  1  7  8  9
20 20 9  2  1  3  1  7  8  9

```

TOTAL TIME IN SILFAC = 1.869 SECONDS.
 THE FURN FACTOR FROM SURFACE *PLATS * TO SURFACE *SCUBE 9TCUBE* = 0.20965
 THE EXCHANGE COEFFICIENT (FAI)* = 0.75432E 01 SQ UNITS

THE MAPPING AREA = 0.3600000E 02 SQ UNITS
 THE AREA OF SURFACE *PLATS * = 0.3600000E 02 SQ UNITS.
 THE AREA OF SL NITS.

THE FOLLOWING ARE THE (FINAL) SURFACE COORDINATES USED FOR THE FACTOR COMPUTATION-

```

***** DATA NAME= *PLATS *
POINT 3. X Y Z POINT X Y Z
1 3. 0. 0. 0.000000E 01---(INITIALLY ORIENTED ORIENTATION VECTOR)
2 3. 0.000000E 01 0.000000E 01 0.000000E 01
3 3. 0.000000E 01 0.000000E 01 0.000000E 01
4 3. 0.000000E 01 0.000000E 01 0.000000E 01

```

***** DATA NAME= *SCUBE 9TCUBE*

FIGURE 26. Group C Sample Problems Program Results
 (continued)

HAA CONFAC II REPORT SAMPLE PROBLEMS FROM FIG. (CI-K.A./JPS.11/1/63)

```

RUN NO. 2 DATA USED FOR THIS RUN *PLAYS*SCUBE *
      *0 1*
      *0 1*
MAPPING SURFACE 2 SILHOUETTE COMPUTED FROM MAPPING POINT SHOWN
LINE PT
SURF 2 HAS A 0 OR - 2-CD340 FEL TO SURF 1-THIS RUN ABORTED.

```

FIGURE 26. Group C Sample Problems Program Results
(continued)

NAA CONFAC II REPORT SAMPLE PROBLEMS FROM FIG. 1C)-K.A.-TOUPS.11/1/63

RUN NO. 3 DATA USED FOR THIS RUN- *SCUB *PLATIS*
* * * * *

A NONPLANAR SURFACE CANNOT BE USED AS SURFACE 1-THIS RUN ABORTED.

FIGURE 26. Group C Sample Problems Program Results
(continued)

SAMPLE PROBLEM GROUP D

The geometrical relationship for this sample problem are presented in Figure 27. The data sheets are shown in Figure 28 and the results are presented in Figure 29.

Problem 1D

The referenced figure, Figure 27, shows a truncated-cone-on-cylinder and a disk, skewed with respect to the cylinder-cone centerline. The cylinder-cone is created by the surface generator as GCYTR, a 32-sided solid in its final position in the unprimed coordinate system. The disk is also internally generated, but because the generator (in its present version) is limited to cross sections parallel to XY plane, the disk, ZDISK, had to be transformed to the skewed position by transformation data 9TDSKC. The results are shown in Figure 29. The simple mode was used for processing because no line segment crossovers are present, which enabled the use of transformations to construct the problem. The warning note concerning the difference between the mapping area and the actual 3DISK surface area is supplied to attract attention to possible errors in Surface 1 data entry or the choice of mapping increments. As indicated in the comments on Problem 1 of Sample Problem Group C, the coarse increment 6 x 6 was selected to reduce output. A finer increment should probably be used to insure accuracy to the third place, if such is desired. It must be emphasized that the form factor obtained in Run #1 is the factor to the solid figure, GCYLTR, which, of course, includes the bases. Since the factor to the skin is the desired number, it is necessary to subtract the factors to the ends. The upper end is obviously not seen ($f = 0$), so the factor to the base only must be obtained. The base is easily created by the surface generator (3DISKB), but it is created with the orientation vector pointing toward the +Z axis--the wrong way. It is necessary to turn it around by a primary transformation--(9TDSKB). Thus, the full capability of the primary transformation feature is utilized and exemplified, shown by Run #2. The factor to the skin of GCYLTR is obtained by subtracting the results of Run #2 from Run #1, or

$$f_{\text{skin}} = f_{\text{total}} - f_{\text{base}}$$

$$f = 0.18946 - 0.09955$$

$$f = .08991$$

The exchange coefficient is computed in a similar manner.

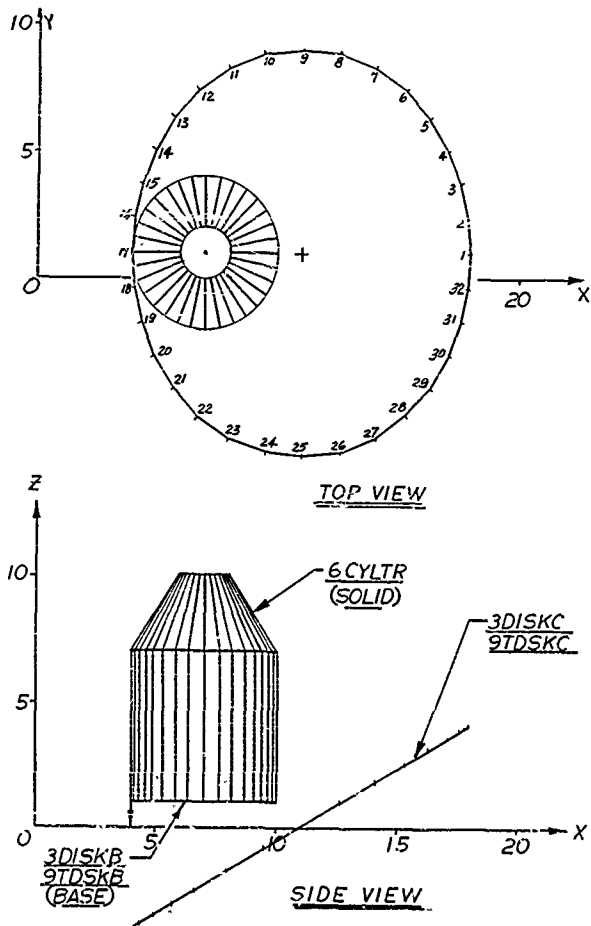


FIGURE 27. GROUP D SAMPLE PROBLEM'S GEOMETRY

FORTRAN FIXED 10 DIGIT DECIMAL DATA			
DECK NO.	PROGRAMMER	DATE	PAGE 37 OF 38 JOB NO. 252-72
NUMBER	IDENTIFICATION	DESCRIPTION	DO NOT KEY PUNCH
1	1	1	
2	2	2	
3	3	3	
4	4	4	
5	5	5	
6	6	6	
7	7	7	
8	8	8	
9	9	9	
10	10	10	
11	11	11	
12	12	12	
13	13	13	
14	14	14	
15	15	15	
16	16	16	
17	17	17	
18	18	18	
19	19	19	
20	20	20	
21	21	21	
22	22	22	
23	23	23	
24	24	24	
25	25	25	
26	26	26	
27	27	27	
28	28	28	
29	29	29	
30	30	30	
31	31	31	
32	32	32	
33	33	33	
34	34	34	
35	35	35	
36	36	36	
37	37	37	
38	38	38	
39	39	39	
40	40	40	
41	41	41	
42	42	42	
43	43	43	
44	44	44	
45	45	45	
46	46	46	
47	47	47	
48	48	48	
49	49	49	
50	50	50	
51	51	51	
52	52	52	
53	53	53	
54	54	54	
55	55	55	
56	56	56	
57	57	57	
58	58	58	
59	59	59	
60	60	60	
61	61	61	
62	62	62	
63	63	63	
64	64	64	
65	65	65	
66	66	66	
67	67	67	
68	68	68	
69	69	69	
70	70	70	
71	71	71	
72	72	72	
73	73	73	
74	74	74	
75	75	75	
76	76	76	
77	77	77	
78	78	78	
79	79	79	
80	80	80	
81	81	81	
82	82	82	
83	83	83	
84	84	84	
85	85	85	
86	86	86	
87	87	87	
88	88	88	
89	89	89	
90	90	90	
91	91	91	
92	92	92	
93	93	93	
94	94	94	
95	95	95	
96	96	96	
97	97	97	
98	98	98	
99	99	99	
100	100	100	

FORTRAN FIXED 10 DIGIT DECIMAL DATA			
DECK NO.	PROGRAMMER	DATE	PAGE 37 OF 38 JOB NO. 252-72
NUMBER	IDENTIFICATION	DESCRIPTION	DO NOT KEY PUNCH
1	1	1	
2	2	2	
3	3	3	
4	4	4	
5	5	5	
6	6	6	
7	7	7	
8	8	8	
9	9	9	
10	10	10	
11	11	11	
12	12	12	
13	13	13	
14	14	14	
15	15	15	
16	16	16	
17	17	17	
18	18	18	
19	19	19	
20	20	20	
21	21	21	
22	22	22	
23	23	23	
24	24	24	
25	25	25	
26	26	26	
27	27	27	
28	28	28	
29	29	29	
30	30	30	
31	31	31	
32	32	32	
33	33	33	
34	34	34	
35	35	35	
36	36	36	
37	37	37	
38	38	38	
39	39	39	
40	40	40	
41	41	41	
42	42	42	
43	43	43	
44	44	44	
45	45	45	
46	46	46	
47	47	47	
48	48	48	
49	49	49	
50	50	50	
51	51	51	
52	52	52	
53	53	53	
54	54	54	
55	55	55	
56	56	56	
57	57	57	
58	58	58	
59	59	59	
60	60	60	
61	61	61	
62	62	62	
63	63	63	
64	64	64	
65	65	65	
66	66	66	
67	67	67	
68	68	68	
69	69	69	
70	70	70	
71	71	71	
72	72	72	
73	73	73	
74	74	74	
75	75	75	
76	76	76	
77	77	77	
78	78	78	
79	79	79	
80	80	80	
81	81	81	
82	82	82	
83	83	83	
84	84	84	
85	85	85	
86	86	86	
87	87	87	
88	88	88	
89	89	89	
90	90	90	
91	91	91	
92	92	92	
93	93	93	
94	94	94	
95	95	95	
96	96	96	
97	97	97	
98	98	98	
99	99	99	
100	100	100	

FIGURE 28. Group D Sample Problems Input Data Code Sheets

FORTRAN FIXED 10 DIGIT DECIMAL DATA

DECK NO.	PROGRAMMER	DATE	PAGE 30 of 36	JOB NO. 2422-30
NUMBER	IDENTIFICATION	DESCRIPTION	DO NOT KEY PUNCH	
1.0				
2.0				
3.0				
4.0				
5.0				
6.0				
7.0				
8.0				
9.0				
10.0				
11.0				
12.0				
13.0				
14.0				
15.0				
16.0				
17.0				
18.0				
19.0				
20.0				

FORTRAN FIXED 10 DIGIT DECIMAL DATA

DECK NO.	PROGRAMMER	DATE	PAGE 31 of 36	JOB NO. 2422-30
NUMBER	IDENTIFICATION	DESCRIPTION	DO NOT KEY PUNCH	
1.0				
2.0				
3.0				
4.0				
5.0				
6.0				
7.0				
8.0				
9.0				
10.0				
11.0				
12.0				
13.0				
14.0				
15.0				
16.0				
17.0				
18.0				
19.0				
20.0				

FIGURE 28. Group D Sample Problems Input Data/Code Sheets
(continued)

NAA SPACE AND INFORMATION SYSTEMS DIVISION
 T-4 PROJECT RADIANT-INTERCHANGE CONFIGURATION FILE- PROGRAM
 C O H F A C I I
 NAA CONFAC II REPORT SAMPLE PROBLEMS FROM FIG. (D)-K.A.TODPS.11/1/65

INPUT DATA

```

***** DATA NAME= *30SKC      *      B UNIT RADIUS DISK
SURFACE SPECIFICATIONS-
NO OF X-SECTIONS = 1          NO OF X-SECTION BOUNDARY DIVISIONS = 32
LOCATION OF VERTICAL CENTERLINE, X= 0.      * Y= 0.
X-SECTION NO.    X-AXIS RADIUS    Y AXIS RADIUS    ELEVATION ABOVE XY .LANE
1                0.8000000E 01    0.4000000E 01    0.

THE FOLLOWING INTERNALLY GENERATED SURFACE DATA RESULTED FROM THE ABOVE SPECIFICATIONS-
POINT  X      Y      Z      POINT  X      Y      Z
1 0.8000000E 01 0. 0.1000000E 01----(INTERNALLY GENERATED ORIENTATION VECTOR)
2 0.7391036E 01 0. 0.3601807E 01 0.
3 0.6551758E 01 0. 0.6551758E 01 0.
4 0.4444318E 01 0. 0.4444318E 01 0.
5 0.3084876E 01 0. 0.3084876E 01 0.
6 0.2002172E -07 0.1699999E 01 0.
7 0.1250284E -07 0.1000000E 01 0.
8 0.0730103E 01 0. 0.730103E 01 0.
9 0.0444432E 01 0. 0.4444318E 01 0.
10 0.0278462E 01 0. 0.278462E 01 0.
11 0.0150072E 01 0. 0.150072E 01 0.
12 0.0088443E 01 0. 0.0884432E 01 0.
13 0.0044443E 01 0. 0.0444432E 01 0.
14 0.0027846E 01 0. 0.0278462E 01 0.
15 0.0015007E 01 0. 0.0015007E 01 0.
16 0.0008844E 01 0. 0.0008844E 01 0.
17 0.0004444E 01 0. 0.0004444E 01 0.
18 0.0002784E 01 0. 0.0002784E 01 0.
19 0.0001500E 01 0. 0.0001500E 01 0.
20 0.0000884E 01 0. 0.0000884E 01 0.
21 0.0000444E 01 0. 0.0000444E 01 0.
22 0.0000278E 01 0. 0.0000278E 01 0.
23 0.0000150E 01 0. 0.0000150E 01 0.
24 0.0000088E 01 0. 0.0000088E 01 0.
25 0.0000044E 01 0. 0.0000044E 01 0.
26 0.0000027E 01 0. 0.0000027E 01 0.
27 0.0000015E 01 0. 0.0000015E 01 0.
28 0.0000008E 01 0. 0.0000008E 01 0.
29 0.0000004E 01 0. 0.0000004E 01 0.
30 0.0000002E 01 0. 0.0000002E 01 0.
31 0.7391036E 01 0. 0.3601807E 01 0.
32 0.6551758E 01 0. 0.6551758E 01 0.

```

FIGURE 29. Group D Sample Problems Program Results
 (14 pages)

```

**** DATA NAME= *GCYL*
SURFACE SPECIFICATIONS=
NO OF X-SECTIONS = 3          NO OF X-SECTION BOUNDARY DIVISIONS = 32
LOCATION OF VERTICAL CENTERLINE, X= 0.700000E 01, Y= 0.100000E 01
X-SECTION NO.      X-AXIS RADIUS      Y-AXIS RADIUS      ELEVATION ABOVE XY PLANE
1      0.400000E 01      0.300000E 01      0.100000E 01
2      0.400000E 01      0.300000E 01      0.700000E 01
3      0.100000E 01      0.100000E 01      0.100000E 02

THE FOLLOWING INTERNALLY GENERATED SURFACE DATA RESULTED FROM THE ABOVE SPECIFICATIONS-

PRINT      X      Y      Z      POINT
1 0.100000E 02 0.100000E 01 0.100000E 01 1
2 0.400000E 01 0.100000E 01 0.100000E 02 2
3 0.400000E 01 0.100000E 01 0.700000E 02 3
4 0.700000E 01 0.100000E 01 0.100000E 02 4
5 0.700000E 01 0.100000E 01 0.700000E 02 5
6 0.700000E 01 0.100000E 01 0.100000E 02 6
7 0.700000E 01 0.100000E 01 0.700000E 02 7
8 0.700000E 01 0.100000E 01 0.100000E 02 8
9 0.700000E 01 0.100000E 01 0.700000E 02 9
10 0.700000E 01 0.100000E 01 0.100000E 02 10
11 0.700000E 01 0.100000E 01 0.700000E 02 11
12 0.700000E 01 0.100000E 01 0.100000E 02 12
13 0.700000E 01 0.100000E 01 0.700000E 02 13
14 0.700000E 01 0.100000E 01 0.100000E 02 14
15 0.700000E 01 0.100000E 01 0.700000E 02 15
16 0.700000E 01 0.100000E 01 0.100000E 02 16
17 0.700000E 01 0.100000E 01 0.700000E 02 17
18 0.700000E 01 0.100000E 01 0.100000E 02 18
19 0.700000E 01 0.100000E 01 0.700000E 02 19
20 0.700000E 01 0.100000E 01 0.100000E 02 20
21 0.700000E 01 0.100000E 01 0.700000E 02 21
22 0.700000E 01 0.100000E 01 0.100000E 02 22
23 0.700000E 01 0.100000E 01 0.700000E 02 23
24 0.700000E 01 0.100000E 01 0.100000E 02 24
25 0.700000E 01 0.100000E 01 0.700000E 02 25
26 0.700000E 01 0.100000E 01 0.100000E 02 26
27 0.700000E 01 0.100000E 01 0.700000E 02 27
28 0.700000E 01 0.100000E 01 0.100000E 02 28
29 0.700000E 01 0.100000E 01 0.700000E 02 29
30 0.700000E 01 0.100000E 01 0.100000E 02 30
31 0.700000E 01 0.100000E 01 0.700000E 02 31
32 0.700000E 01 0.100000E 01 0.100000E 02 32
33 0.700000E 01 0.100000E 01 0.700000E 02 33
34 0.700000E 01 0.100000E 01 0.100000E 02 34
35 0.700000E 01 0.100000E 01 0.700000E 02 35
36 0.700000E 01 0.100000E 01 0.100000E 02 36
37 0.700000E 01 0.100000E 01 0.700000E 02 37
38 0.700000E 01 0.100000E 01 0.100000E 02 38
39 0.700000E 01 0.100000E 01 0.700000E 02 39
40 0.700000E 01 0.100000E 01 0.100000E 02 40
41 0.700000E 01 0.100000E 01 0.700000E 02 41
42 0.700000E 01 0.100000E 01 0.100000E 02 42
43 0.700000E 01 0.100000E 01 0.700000E 02 43
44 0.700000E 01 0.100000E 01 0.100000E 02 44
45 0.700000E 01 0.100000E 01 0.700000E 02 45
46 0.700000E 01 0.100000E 01 0.100000E 02 46
47 0.700000E 01 0.100000E 01 0.700000E 02 47
48 0.700000E 01 0.100000E 01 0.100000E 02 48
49 0.700000E 01 0.100000E 01 0.700000E 02 49
50 0.700000E 01 0.100000E 01 0.100000E 02 50
51 0.700000E 01 0.100000E 01 0.700000E 02 51
52 0.700000E 01 0.100000E 01 0.100000E 02 52
53 0.700000E 01 0.100000E 01 0.700000E 02 53
54 0.700000E 01 0.100000E 01 0.100000E 02 54
55 0.700000E 01 0.100000E 01 0.700000E 02 55
56 0.700000E 01 0.100000E 01 0.100000E 02 56
57 0.700000E 01 0.100000E 01 0.700000E 02 57
58 0.700000E 01 0.100000E 01 0.100000E 02 58
59 0.700000E 01 0.100000E 01 0.700000E 02 59
60 0.700000E 01 0.100000E 01 0.100000E 02 60
61 0.700000E 01 0.100000E 01 0.700000E 02 61
62 0.700000E 01 0.100000E 01 0.100000E 02 62
63 0.700000E 01 0.100000E 01 0.700000E 02 63
64 0.700000E 01 0.100000E 01 0.100000E 02 64
65 0.700000E 01 0.100000E 01 0.700000E 02 65
66 0.700000E 01 0.100000E 01 0.100000E 02 66
67 0.700000E 01 0.100000E 01 0.700000E 02 67
68 0.700000E 01 0.100000E 01 0.100000E 02 68
69 0.700000E 01 0.100000E 01 0.700000E 02 69
70 0.700000E 01 0.100000E 01 0.100000E 02 70
71 0.700000E 01 0.100000E 01 0.700000E 02 71
72 0.700000E 01 0.100000E 01 0.100000E 02 72
73 0.700000E 01 0.100000E 01 0.700000E 02 73
74 0.700000E 01 0.100000E 01 0.100000E 02 74
75 0.700000E 01 0.100000E 01 0.700000E 02 75
76 0.700000E 01 0.100000E 01 0.100000E 02 76
77 0.700000E 01 0.100000E 01 0.700000E 02 77
78 0.700000E 01 0.100000E 01 0.100000E 02 78
79 0.700000E 01 0.100000E 01 0.700000E 02 79
80 0.700000E 01 0.100000E 01 0.100000E 02 80
81 0.700000E 01 0.100000E 01 0.700000E 02 81
82 0.700000E 01 0.100000E 01 0.100000E 02 82
83 0.700000E 01 0.100000E 01 0.700000E 02 83
84 0.700000E 01 0.100000E 01 0.100000E 02 84
85 0.700000E 01 0.100000E 01 0.700000E 02 85
86 0.700000E 01 0.100000E 01 0.100000E 02 86
87 0.700000E 01 0.100000E 01 0.700000E 02 87
88 0.700000E 01 0.100000E 01 0.100000E 02 88
89 0.700000E 01 0.100000E 01 0.700000E 02 89
90 0.700000E 01 0.100000E 01 0.100000E 02 90
91 0.700000E 01 0.100000E 01 0.700000E 02 91
92 0.700000E 01 0.100000E 01 0.100000E 02 92
93 0.700000E 01 0.100000E 01 0.700000E 02 93
94 0.700000E 01 0.100000E 01 0.100000E 02 94
95 0.700000E 01 0.100000E 01 0.700000E 02 95
96 0.700000E 01 0.100000E 01 0.100000E 02 96
97 0.700000E 01 0.100000E 01 0.700000E 02 97
98 0.700000E 01 0.100000E 01 0.100000E 02 98
99 0.700000E 01 0.100000E 01 0.700000E 02 99
100 0.700000E 01 0.100000E 01 0.100000E 02 100

```

FIGURE 29. Group D Sample Problems Program Results
(continued)

137

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61 84. 0. 78. 60 82 85. 83. 79. 0 83 86. 84. 80. 82 88 86. 0. 81. 83
 62 88. 38. 82. 0 86 89. 81. 83. 85 87 90. 0. 84. 86 89 91. 89. 85. 90
 63 90. 0. 90. 82 94 91. 0. 91. 89 95 92. 88. 94 96 93. 89. 91
 95 0. 93. 95

***** DATA NAME= *DISK * BASE OF CYLINDER-CREATED WITH ACTIVE SIDE TOWARD +Z AXIS

SURFACE SPECIFICATIONS-

NO OF X-SECTIONS = 1

LOCATION OF VERTICAL CENTERLINE, X= 0. NO OF X-SECTION BOUNDARY DIVISIONS = 32

X-SECTION NO. X-AXIS RADIUS X-AXIS RADIUS Y= 0. ELEVATION ABOVE XY PLANE

1 0.1000000 01 0.1000000 01 0.1000000 01

THE FOLLOWING INTERNALLY GENERATED SURFACE DATA RESULTED FROM THE ABOVE SPECIFICATIONS-

POINT	X	Y	Z	POINT	X	Y	Z
1	0.100000	01	0.	33	0.271636	01	0.
2	0.271636	01	0.	34	0.271636	01	0.
3	0.271636	01	0.	35	0.271636	01	0.
4	0.271636	01	0.	36	0.271636	01	0.
5	0.271636	01	0.	37	0.271636	01	0.
6	0.271636	01	0.	38	0.271636	01	0.
7	0.271636	01	0.	39	0.271636	01	0.
8	0.271636	01	0.	40	0.271636	01	0.
9	0.271636	01	0.	41	0.271636	01	0.
10	0.271636	01	0.	42	0.271636	01	0.
11	0.271636	01	0.	43	0.271636	01	0.
12	0.271636	01	0.	44	0.271636	01	0.
13	0.271636	01	0.	45	0.271636	01	0.
14	0.271636	01	0.	46	0.271636	01	0.
15	0.271636	01	0.	47	0.271636	01	0.
16	0.271636	01	0.	48	0.271636	01	0.
17	0.271636	01	0.	49	0.271636	01	0.
18	0.271636	01	0.	50	0.271636	01	0.
19	0.271636	01	0.	51	0.271636	01	0.
20	0.271636	01	0.	52	0.271636	01	0.
21	0.271636	01	0.				
22	0.271636	01	0.				
23	0.271636	01	0.				
24	0.271636	01	0.				
25	0.271636	01	0.				
26	0.271636	01	0.				
27	0.271636	01	0.				
28	0.271636	01	0.				
29	0.271636	01	0.				
30	0.271636	01	0.				
31	0.271636	01	0.				

***** DATA NAME= *DISK * MOVES 3015AC TO SKINNED POSITION ON X-AXIS
 TRANSFORMATION DATA-

FIGURE 29. Group D Sample Problems Program Results
 (continued)

```

POINT  X      Y      Z      POINT  X      Y      Z
1  0.172800E 02  0.100000E 01  0.400000E 01  0.
25  0.100000E 02 -0.700000E 01  0.

```

```

***** DATA NAME= *OTDSK0 * FLIPS 3CISK0 AROUND SO THAT ACTIVE SIDE SEES 3DINCEOTDSK0

```

```

INFORMATION DATA-

```

```

POINT  X      Y      Z      POINT  X      Y      Z
1  0.400000E 01  0.100000E 01  0.100000E 01
25  0.700000E 01 -0.200000E 01  0.100000E 01

```

FIGURE 29. Group D Sample Problems Program Results
(continued)

NAA CONFAC II REPORT SAMPLE PROBLEMS FROM FIG. (DI)→A.TOURS.11/1/63

RUN NO.		I		DATA USED FOR THIS RUN		SURFACE 2 SILHOUETTE COMPUTED FROM MAPPING POINT SHOWN	
				ABSCISSA CYCLING		ABSCISSA CYCLING	
				00		00	
				10		10	
				00		00	
				10		10	
				00		00	
				10		10	
				00		00	
				10		10	
				00		00	
				10		10	
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FIGURE 29. Group D Sample Problems Program Results (continued)

6	1	73	76	79	82	85	88	91	94	97	100	103	106	109	112	115	118	121	124	127	130	133	136	139	142	145	148	151	154	157	160	163	166	169	172	175	178	181	184	187	190	193	196	199	202	205	208	211	214	217	220	223	226	229	232	235	238	241	244	247	250	253	256	259	262	265	268	271	274	277	280	283	286	289	292	295	298	301	304	307	310	313	316	319	322	325	328	331	334	337	340	343	346	349	352	355	358	361	364	367	370	373	376	379	382	385	388	391	394	397	400	403	406	409	412	415	418	421	424	427	430	433	436	439	442	445	448	451	454	457	460	463	466	469	472	475	478	481	484	487	490	493	496	499	502	505	508	511	514	517	520	523	526	529	532	535	538	541	544	547	550	553	556	559	562	565	568	571	574	577	580	583	586	589	592	595	598	601	604	607	610	613	616	619	622	625	628	631	634	637	640	643	646	649	652	655	658	661	664	667	670	673	676	679	682	685	688	691	694	697	700	703	706	709	712	715	718	721	724	727	730	733	736	739	742	745	748	751	754	757	760	763	766	769	772	775	778	781	784	787	790	793	796	799	802	805	808	811	814	817	820	823	826	829	832	835	838	841	844	847	850	853	856	859	862	865	868	871	874	877	880	883	886	889	892	895	898	901	904	907	910	913	916	919	922	925	928	931	934	937	940	943	946	949	952	955	958	961	964	967	970	973	976	979	982	985	988	991	994	997	1000
---	---	----	----	----	----	----	----	----	----	----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	------

TOTAL TIME IN SILFAC = 9.837 SECONDS.

THE FORM FACTOR FROM SURFACE *30ISK9TOS*G* TO SURFACE *6CYLR * = 0.18946

THE EXCHANGE COEFFICIENT (FA) = 0.378491 Q2 \$U UNITS

THE MAPPING AREA = 0.18940445 03 SQ UNITS

THE AREA OF SURFACE • 5DISK9YD5K0 • 0.1997725E 03 SQ UNITS.

THE AREA OF SURFACE OF CYLINDER = $0.1402026 \times 0.3 \times 0.14175$

WARNING-WARNING

THE MAPPING AREA IS MORE THAN 1 PERCENT DIFFERENT FROM THE AREA IN SURFACE *JOINSCTOSK* SEEN BY
 **. THIS MAY BE CAUSED BY WRONG SURFACE DATA ENTRY THE SURFACE BOUNDARY
 *CVLVR. A MAPPING LINE IN MORE THAN TWO PLACES, OR TO COARSE INCREMENTS. THE FACT MAY OF INCORRECT.

THE FOLLOWING ARE THE (FICIAL) SURFACE COORDINATES USED FOR THE FACTOR COMPUTATION-

DATA NAME= J3DISKC910SKC.

FIGURE 29. Group D Sample Problems Program Results
(continued)

LOWEST GRID LINE FIRST, FROM X-LEFT TO X-RIGHT.

0.705322E-01	0.712180E-01	0.715384E-01	0.716875E-01	0.716778E-01	0.715095E-01
0.713078E-01	0.958000E-01	0.110071E-00	0.128763E-00	0.117009E-00	0.971605E-01
0.782575E-01	0.121181E-00	0.181047E-00	0.217763E-00	0.184452E-00	0.122625E-00
0.796008E-01	0.143289E-00	0.261013E-00	0.363596E-00	0.276150E-00	0.152891E-00
0.779010E-01	0.155632E-00	0.305749E-00	0.552303E-00	0.369274E-00	0.167908E-00
0.815718E-01	0.430074E-00	0.237469E-00	0.319074E-00	0.210681E-00	0.155458E-00
0.965181E-01	0.116069E-00	0.115531E-00	0.116652E-00	0.117180E-00	0.116966E-00
0.112201E-00					
0.116100E-00					

FIGURE 29. Group D Sample Problems Program Results
(continued)

NMA CONTACT II REPORT SAMPLE PROBLEMS FROM FIG. 101-K.A.TROUPS.11/1/63

RUN NO. 2 DATA USED FOR THIS RUN- *DISKSCOTDSKC*
 DISKSCOTDSKC
 DISKSCOTDSKC
 DISKSCOTDSKC

THE FORM FACTOR FROM SURFACE *DISKSCOTDSKC* TO SURFACE *DISKSCOTDSKC* = 0.00955

THE EXCHANGE COEFFICIENT (FA) = 0.19888E 02 SQ UNITS

THE MAPPING AREA = 0.123045HE 03 SQ UNITS

ONLY A PART OF SURFACE *DISKSCOTDSKC*, COMPRISING AN AREA OF 0.13145HE 03 SQ UNITS,
 SEES SURFACE *DISKSCOTDSKC*

THE AREA OF SURFACE *DISKSCOTDSKC* = 0.1907725E 03 SQ UNITS.

THE AREA OF SURFACE *DISKSCOTDSKC* = 0.2809501E 02 SQ UNITS.

WARNING-
 THE MAPPING AREA IS MORE THAN 1 PERCENT DIFFERENT FROM THE AREA IN SURFACE *DISKSCOTDSKC* SEEN BY
 THE SURFACE *DISKSCOTDSKC* ITSELF. THIS IS DUE TO THE SURFACE *DISKSCOTDSKC* BEING
 CROSSED A MAPPING LINE IN MORE THAN TWO PLACES. OR TOO COARSE INCREMENTS. THE FACTOR MAY BE INCORRECT.

THE FOLLOWING ARE THE (FINAL) SURFACE COORDINATES USED FOR THE FACTOR COMPUTATION-

***** DATA NAME- *DISKSCOTDSKC*

POINT	X	Y	Z	POINT	X	Y	Z
1	0.	0.	0.	2	0.1000000E 01	0.0000000E 00	0.
2	0.0000000E 00	0.0000000E 00	0.	3	0.0000000E 00	0.0000000E 00	0.
3	0.0000000E 00	0.0000000E 00	0.	4	0.0000000E 00	0.0000000E 00	0.
4	0.0000000E 00	0.0000000E 00	0.	5	0.0000000E 00	0.0000000E 00	0.
5	0.0000000E 00	0.0000000E 00	0.	6	0.0000000E 00	0.0000000E 00	0.
6	0.0000000E 00	0.0000000E 00	0.	7	0.0000000E 00	0.0000000E 00	0.
7	0.0000000E 00	0.0000000E 00	0.	8	0.0000000E 00	0.0000000E 00	0.
8	0.0000000E 00	0.0000000E 00	0.	9	0.0000000E 00	0.0000000E 00	0.
9	0.0000000E 00	0.0000000E 00	0.	10	0.0000000E 00	0.0000000E 00	0.
10	0.0000000E 00	0.0000000E 00	0.	11	0.0000000E 00	0.0000000E 00	0.
11	0.0000000E 00	0.0000000E 00	0.	12	0.0000000E 00	0.0000000E 00	0.
12	0.0000000E 00	0.0000000E 00	0.	13	0.0000000E 00	0.0000000E 00	0.
13	0.0000000E 00	0.0000000E 00	0.	14	0.0000000E 00	0.0000000E 00	0.
14	0.0000000E 00	0.0000000E 00	0.	15	0.0000000E 00	0.0000000E 00	0.
15	0.0000000E 00	0.0000000E 00	0.	16	0.0000000E 00	0.0000000E 00	0.
16	0.0000000E 00	0.0000000E 00	0.	17	0.0000000E 00	0.0000000E 00	0.
17	0.0000000E 00	0.0000000E 00	0.	18	0.0000000E 00	0.0000000E 00	0.

FIGURE 29. Group D Sample Problems Program Results
 (continued)

10 -0.246270E 01 0.151400E 02 0.
21 -0.467722E 01 0.116011E 02 0.
20 -0.409612E 01 0.150168E 02 0.

***** DATA NAME= *SDISKVCISK*

```

PRINT X Y Z
1 0.447579E 01 0.072117E 01 0.150000E 02
2 0.400740E 01 0.050025E 01 0.436010E 01
3 0.447579E 01 0.072117E 01 0.150000E 02
4 0.400740E 01 0.050025E 01 0.436010E 01
5 0.447579E 01 0.072117E 01 0.150000E 02
6 0.400740E 01 0.050025E 01 0.436010E 01
7 0.428229E 01 0.455167E 01 0.346010E 01
8 0.428229E 01 0.455167E 01 0.346010E 01
9 0.428229E 01 0.455167E 01 0.346010E 01
10 0.428229E 01 0.455167E 01 0.346010E 01
11 0.428229E 01 0.455167E 01 0.346010E 01
12 0.428229E 01 0.455167E 01 0.346010E 01
13 0.428229E 01 0.455167E 01 0.346010E 01
14 0.428229E 01 0.455167E 01 0.346010E 01
15 0.428229E 01 0.455167E 01 0.346010E 01
16 0.428229E 01 0.455167E 01 0.346010E 01
17 0.428229E 01 0.455167E 01 0.346010E 01
18 0.428229E 01 0.455167E 01 0.346010E 01
19 0.428229E 01 0.455167E 01 0.346010E 01
20 0.428229E 01 0.455167E 01 0.346010E 01
21 0.428229E 01 0.455167E 01 0.346010E 01
22 0.428229E 01 0.455167E 01 0.346010E 01
23 0.428229E 01 0.455167E 01 0.346010E 01
24 0.428229E 01 0.455167E 01 0.346010E 01
25 0.428229E 01 0.455167E 01 0.346010E 01
26 0.428229E 01 0.455167E 01 0.346010E 01
27 0.428229E 01 0.455167E 01 0.346010E 01
28 0.428229E 01 0.455167E 01 0.346010E 01
29 0.428229E 01 0.455167E 01 0.346010E 01
30 0.428229E 01 0.455167E 01 0.346010E 01
31 0.428229E 01 0.455167E 01 0.346010E 01
32 0.428229E 01 0.455167E 01 0.346010E 01
33 0.428229E 01 0.455167E 01 0.346010E 01
34 0.428229E 01 0.455167E 01 0.346010E 01
35 0.428229E 01 0.455167E 01 0.346010E 01
36 0.428229E 01 0.455167E 01 0.346010E 01
37 0.428229E 01 0.455167E 01 0.346010E 01
38 0.428229E 01 0.455167E 01 0.346010E 01
39 0.428229E 01 0.455167E 01 0.346010E 01
40 0.428229E 01 0.455167E 01 0.346010E 01
41 0.428229E 01 0.455167E 01 0.346010E 01
42 0.428229E 01 0.455167E 01 0.346010E 01
43 0.428229E 01 0.455167E 01 0.346010E 01
44 0.428229E 01 0.455167E 01 0.346010E 01
45 0.428229E 01 0.455167E 01 0.346010E 01
46 0.428229E 01 0.455167E 01 0.346010E 01
47 0.428229E 01 0.455167E 01 0.346010E 01
48 0.428229E 01 0.455167E 01 0.346010E 01
49 0.428229E 01 0.455167E 01 0.346010E 01
50 0.428229E 01 0.455167E 01 0.346010E 01
51 0.428229E 01 0.455167E 01 0.346010E 01
52 0.428229E 01 0.455167E 01 0.346010E 01
53 0.428229E 01 0.455167E 01 0.346010E 01
54 0.428229E 01 0.455167E 01 0.346010E 01
55 0.428229E 01 0.455167E 01 0.346010E 01
56 0.428229E 01 0.455167E 01 0.346010E 01
57 0.428229E 01 0.455167E 01 0.346010E 01
58 0.428229E 01 0.455167E 01 0.346010E 01
59 0.428229E 01 0.455167E 01 0.346010E 01
60 0.428229E 01 0.455167E 01 0.346010E 01
61 0.428229E 01 0.455167E 01 0.346010E 01
62 0.428229E 01 0.455167E 01 0.346010E 01
63 0.428229E 01 0.455167E 01 0.346010E 01
64 0.428229E 01 0.455167E 01 0.346010E 01
65 0.428229E 01 0.455167E 01 0.346010E 01
66 0.428229E 01 0.455167E 01 0.346010E 01
67 0.428229E 01 0.455167E 01 0.346010E 01
68 0.428229E 01 0.455167E 01 0.346010E 01
69 0.428229E 01 0.455167E 01 0.346010E 01
70 0.428229E 01 0.455167E 01 0.346010E 01
71 0.428229E 01 0.455167E 01 0.346010E 01
72 0.428229E 01 0.455167E 01 0.346010E 01
73 0.428229E 01 0.455167E 01 0.346010E 01
74 0.428229E 01 0.455167E 01 0.346010E 01
75 0.428229E 01 0.455167E 01 0.346010E 01
76 0.428229E 01 0.455167E 01 0.346010E 01
77 0.428229E 01 0.455167E 01 0.346010E 01
78 0.428229E 01 0.455167E 01 0.346010E 01
79 0.428229E 01 0.455167E 01 0.346010E 01
80 0.428229E 01 0.455167E 01 0.346010E 01
81 0.428229E 01 0.455167E 01 0.346010E 01
82 0.428229E 01 0.455167E 01 0.346010E 01
83 0.428229E 01 0.455167E 01 0.346010E 01
84 0.428229E 01 0.455167E 01 0.346010E 01
85 0.428229E 01 0.455167E 01 0.346010E 01
86 0.428229E 01 0.455167E 01 0.346010E 01
87 0.428229E 01 0.455167E 01 0.346010E 01
88 0.428229E 01 0.455167E 01 0.346010E 01
89 0.428229E 01 0.455167E 01 0.346010E 01
90 0.428229E 01 0.455167E 01 0.346010E 01
91 0.428229E 01 0.455167E 01 0.346010E 01
92 0.428229E 01 0.455167E 01 0.346010E 01
93 0.428229E 01 0.455167E 01 0.346010E 01
94 0.428229E 01 0.455167E 01 0.346010E 01
95 0.428229E 01 0.455167E 01 0.346010E 01
96 0.428229E 01 0.455167E 01 0.346010E 01
97 0.428229E 01 0.455167E 01 0.346010E 01
98 0.428229E 01 0.455167E 01 0.346010E 01
99 0.428229E 01 0.455167E 01 0.346010E 01
100 0.428229E 01 0.455167E 01 0.346010E 01

```

COORDINATES OF POINTS ON BOUNDARY OF SURF *SDISKVCISK* FOR EACH Y INTERVAL

```

X-LEFT X-RIGHT Y X-LEFT X-RIGHT Y
-0. 0.447579E 01 0.072117E 01 0.150000E 02 0.447579E 01 0.072117E 01 0.150000E 02
-0.161003E 01 0.710321E 01 0.530762E 01 -0.161003E 01 0.710321E 01 0.530762E 01
-0.172017E 01 0.710321E 01 0.530762E 01 -0.172017E 01 0.710321E 01 0.530762E 01
-0.176008E 01 0.455167E 01 0.150220E 02 -0.176008E 01 0.455167E 01 0.150220E 02

```

NO. OF HORIZONTAL INCREMENTS= 6 NO. OF VERTICAL INCREMENTS= 6

THE FOLLOWING ARE PLATE POINT CONFIGURATION FACTORS COMPUTED FOR THIS RUN
LAST TWO LINE FIRST FROM X-LEFT TO X-RIGHT.

0.437270E-08 0.145607E-03 0.246096E-05 0.370251E-35 0.5002467E-02 0.6506831E-03

FIGURE 29. Group B Sample Problems Program Results
(continued)

C-7225304E-03	0.6225217E-02	0.1501604E-01	0.2430070E-01	0.3101249E-01	0.3531677E-01
C-7225304E-04	0.3716789E-01	0.1256211E-00	0.1871291E-00	0.1659108E-00	0.1140264E-00
C-7225304E-05	0.1034518E-00	0.4651275E-00	0.5049026E-00	0.3690750E-00	0.2116433E-00
C-7225304E-06	0.4496273E-01	0.2592187E-00	0.4122213E-00	0.3477228E-00	0.2200246E-00
C-7225304E-07	0.9057742E-02	0.5687003E-01	0.8732407E-01	0.1281245E-00	0.13242457E-00
C-7225304E-08	0.1210962E-01	0.1161268E-01	0.1573643E-01	0.1600811E-01	0.1863135E-01
C-7225304E-09					
C-7225304E-10					
C-7225304E-11					
C-7225304E-12					
C-7225304E-13					
C-7225304E-14					
C-7225304E-15					
C-7225304E-16					
C-7225304E-17					
C-7225304E-18					
C-7225304E-19					
C-7225304E-20					
C-7225304E-21					
C-7225304E-22					
C-7225304E-23					
C-7225304E-24					
C-7225304E-25					
C-7225304E-26					
C-7225304E-27					
C-7225304E-28					
C-7225304E-29					
C-7225304E-30					
C-7225304E-31					
C-7225304E-32					
C-7225304E-33					
C-7225304E-34					
C-7225304E-35					
C-7225304E-36					
C-7225304E-37					
C-7225304E-38					
C-7225304E-39					
C-7225304E-40					
C-7225304E-41					
C-7225304E-42					
C-7225304E-43					
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C-7225304E-76					
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C-7225304E-78					
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C-7225304E-81					
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C-7225304E-83					
C-7225304E-84					
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C-7225304E-88					
C-7225304E-89					
C-7225304E-90					
C-7225304E-91					
C-7225304E-92					
C-7225304E-93					
C-7225304E-94					
C-7225304E-95					
C-7225304E-96					
C-7225304E-97					
C-7225304E-98					
C-7225304E-99					
C-7225304E-100					

FIGURE 29. Group D Sample Problems Program Results
(continued)

SAMPLE PROBLEM GROUP E

The capability of obtaining form factors to spheres in any position relative to Surface 1 is demonstrated, Figure 30. Closed form configuration factor solutions are utilized, enabling very rapid computations. The data sheets are presented in Figure 31 and the results in Figure 32.

Problem 1E

The factor from a rectangle, 1PLAT8, to a sphere, 7SPH1, fully above the plane of 1PLAT8 (Case I) is requested as Run #1. The configuration factor solution in this case is extremely simple (see Appendix E), which, in addition to the coarse mapping of 1PLAT8, accounts for the short computational time.

Problem 2E

The factor from 1PLAT8 to 7SPH2 is requested. The sphere is the same size as 7SPH1, except part or the lower half of the sphere is below, and outside of, the surface of 1PLAT8 (Case II). The results are shown as Run #2.

Problem 3E

A larger sphere, 7SPH3, is located with part of the upper half of the sphere below the surface of 1PLAT8 (Case III). The results are shown as Run #3.

Problem 4E

The program will also compute the factor to a sphere which is embedded in Surface 1, illustrated by 7SPH2 and 1PLAT7. However, no attempt is made to determine what part of 1PLAT7 sees the sphere; when a mapping point on Surface 1 appears inside the sphere, a configuration factor of zero is returned and integrated along with the other computed factors. Therefore, in Run #4 we see no indication that 1PLAT7 is bisected by 7SPH2, although in reality it is. The problem is handled in this way because of the extreme complexity of the general determination of that part of Surface 1 not seen by the sphere.

Problem 5E

The trivial case of the sphere completely below Surface 1 is illustrated by Run #5.

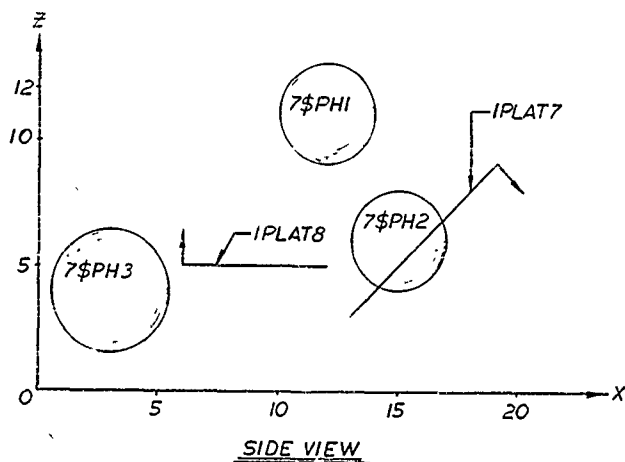
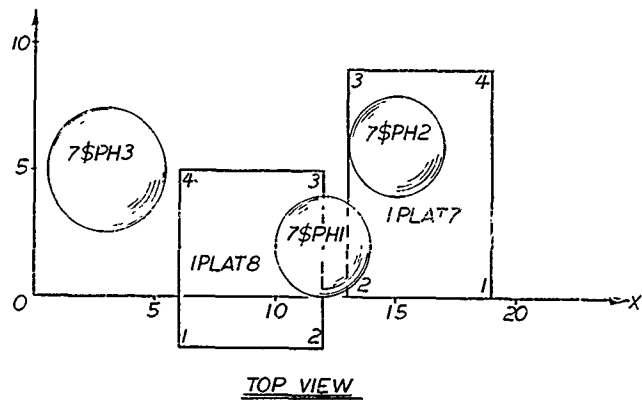


FIGURE 30. Group E Sample Problems Geometry

FORTRAN FIXED 10 DIGIT DECIMAL DATA

DECK NO.	PROGRAMMER	DATE	PAGE 33 of 34	JOB NO. 2222-30
NUMBER	IDENTIFICATION	DESCRIPTION	DO NOT KEY PUNCH	
1	0.0000000000			
2	0.0000000000			
3	0.0000000000			
4	0.0000000000			
5	0.0000000000			
6	0.0000000000			
7	0.0000000000			
8	0.0000000000			
9	0.0000000000			
10	0.0000000000			
11	0.0000000000			
12	0.0000000000			
13	0.0000000000			
14	0.0000000000			
15	0.0000000000			
16	0.0000000000			
17	0.0000000000			
18	0.0000000000			
19	0.0000000000			
20	0.0000000000			
21	0.0000000000			
22	0.0000000000			
23	0.0000000000			
24	0.0000000000			
25	0.0000000000			
26	0.0000000000			
27	0.0000000000			
28	0.0000000000			
29	0.0000000000			
30	0.0000000000			
31	0.0000000000			
32	0.0000000000			
33	0.0000000000			
34	0.0000000000			
35	0.0000000000			
36	0.0000000000			
37	0.0000000000			
38	0.0000000000			
39	0.0000000000			
40	0.0000000000			
41	0.0000000000			
42	0.0000000000			
43	0.0000000000			
44	0.0000000000			
45	0.0000000000			
46	0.0000000000			
47	0.0000000000			
48	0.0000000000			
49	0.0000000000			
50	0.0000000000			
51	0.0000000000			
52	0.0000000000			
53	0.0000000000			
54	0.0000000000			
55	0.0000000000			
56	0.0000000000			
57	0.0000000000			
58	0.0000000000			
59	0.0000000000			
60	0.0000000000			
61	0.0000000000			
62	0.0000000000			
63	0.0000000000			
64	0.0000000000			
65	0.0000000000			
66	0.0000000000			
67	0.0000000000			
68	0.0000000000			
69	0.0000000000			
70	0.0000000000			
71	0.0000000000			
72	0.0000000000			
73	0.0000000000			
74	0.0000000000			
75	0.0000000000			
76	0.0000000000			
77	0.0000000000			
78	0.0000000000			
79	0.0000000000			
80	0.0000000000			
81	0.0000000000			
82	0.0000000000			
83	0.0000000000			
84	0.0000000000			
85	0.0000000000			
86	0.0000000000			
87	0.0000000000			
88	0.0000000000			
89	0.0000000000			
90	0.0000000000			
91	0.0000000000			
92	0.0000000000			
93	0.0000000000			
94	0.0000000000			
95	0.0000000000			
96	0.0000000000			
97	0.0000000000			
98	0.0000000000			
99	0.0000000000			
100	0.0000000000			

FORTRAN FIXED 10 DIGIT DECIMAL DATA

DECK NO.	PROGRAMMER	DATE	PAGE 33 of 34	JOB NO. 2222-30
NUMBER	IDENTIFICATION	DESCRIPTION	DO NOT KEY PUNCH	
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2	0.0000000000			
3	0.0000000000			
4	0.0000000000			
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6	0.0000000000			
7	0.0000000000			
8	0.0000000000			
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16	0.0000000000			
17	0.0000000000			
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41	0.0000000000			
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43	0.0000000000			
44	0.0000000000			
45	0.0000000000			
46	0.0000000000			
47	0.0000000000			
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49	0.0000000000			
50	0.0000000000			
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52	0.0000000000			
53	0.0000000000			
54	0.0000000000			
55	0.0000000000			
56	0.0000000000			
57	0.0000000000			
58	0.0000000000			
59	0.0000000000			
60	0.0000000000			
61	0.0000000000			
62	0.0000000000			
63	0.0000000000			
64	0.0000000000			
65	0.0000000000			
66	0.0000000000			
67	0.0000000000			
68	0.0000000000			
69	0.0000000000			
70	0.0000000000			
71	0.0000000000			
72	0.0000000000			
73	0.0000000000			
74	0.0000000000			
75	0.0000000000			
76	0.0000000000			
77	0.0000000000			
78	0.0000000000			
79	0.0000000000			
80	0.0000000000			
81	0.0000000000			
82	0.0000000000			
83	0.0000000000			
84	0.0000000000			
85	0.0000000000			
86	0.0000000000			
87	0.0000000000			
88	0.0000000000			
89	0.0000000000			
90	0.0000000000			
91	0.0000000000			
92	0.0000000000			
93	0.0000000000			
94	0.0000000000			
95	0.0000000000			
96	0.0000000000			
97	0.0000000000			
98	0.0000000000			
99	0.0000000000			
100	0.0000000000			

FIGURE 31. Group E Sample Problems Input Data Code Sheets

FORTPAN FIXED 10 DIGIT DECIMAL DATA

DECK NO.	PROGRAMMER	DATE	PAGE 21 of 36	JOB NO. 2023 30
NUMBER	IDENTIFICATION	DESCRIPTION	DO NOT KEY PUNCH	
1.0				
2.0				
3.0				
4.0				
5.0				
6.0				
7.0				
8.0				
9.0				
10.0				
11.0				
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18.0				
19.0				
20.0				
21.0				
22.0				
23.0				
24.0				
25.0				
26.0				
27.0				
28.0				
29.0				
30.0				

FORTTRAN FIXED 10 DIGIT DECIMAL DATA

DECK NO.	PROGRAMMER	DATE	PAGE 21 of 36	JOB NO. 2023 30
NUMBER	IDENTIFICATION	DESCRIPTION	DO NOT KEY PUNCH	
1.0				
2.0				
3.0				
4.0				
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6.0				
7.0				
8.0				
9.0				
10.0				
11.0				
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24.0				
25.0				
26.0				
27.0				
28.0				
29.0				
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FIGURE 31. Group E Sample Problems Input Data Codo Sheets
(continued)

FORTRAN FIXED 10 DIGIT DECIMAL DATA

DECK NO. _____ PROGRAMMER _____ DATE _____ PAGE 35 OF 38 JOB NO. 2222-M

NUMBER	IDENTIFICATION	DESCRIPTION	DO NOT KEY PUNCH
1			
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100			

FIGURE 31. Group E Sample Problems Input Data Code Sheets
(continued)

NAA SPACE AND INFORMATION SYSTEMS DIVISION
T-4 PROJECT RADIANT-INTERCHANGE CONFIGURATION FACTOR PROGRAM
CONFAC II

NAA CONFAC II REPORT SAMPLE PROBLEMS FROM FIG. (E)-K-A-T-O-U-P-S, 11/11/63

INPUT DATA

```

***** DATA NAME= *IPLAT7 * SKETCHED RECTANGULAR PLATE IN 1ST QUADRANT.
POINT X Y Z POINT X Y Z
1 0.1970711E 02 0. 0.822491E 01-----INTERVALLY GENERATED ORIENTATION VECTOR) 2
2 0.1900000E 02 0. 0.903000E 01 0.190000E 02 0.190000E 01 0.400000E 01
3 0.1100000E 02 0.900000E 01 0.300000E 01 0.190000E 02 0.900000E 01 0.900000E 01

***** DATA NAME= *IPLAT8 * RECT PLATE PARALLEL TO XY PLANE, 1ST AND 4TH QUADRANTS.
POINT X Y Z POINT X Y Z
1 0.60000E 01 -0.20000E 01 0.60000E 01-----INTERVALLY GENERATED ORIENTATION VECTOR) 2
2 0.60000E 01 0.20000E 01 0.60000E 01 0.60000E 02 0.20000E 01 0.40000E 01
3 0.12000E 02 0.20000E 01 0.20000E 01 0.60000E 01 0.60000E 01 0.90000E 01

***** DATA NAME= *TSPH1
SPHERE SPECIFICATIONS-
RADIUS = 0.200000E 01
COORDINATES OF CENTER----- X = 0.100000E 02 Y = 0.200000E 01 Z = 0.110000E 02

***** DATA NAME= *TSPH2
SPHERE SPECIFICATIONS-
RADIUS = 0.200000E 01
COORDINATES OF CENTER----- X = 0.150000E 02 Y = 0.600000E 01 Z = 0.600000E 01

```

FIGURE 32. Group E Sample Problems Program Results
(13 pages)

```

***** DATA NAME= *TSPH3
SPHERE SPECIFICATIONS=
RADIUS = 0.250000E 01
CONSTANTS OF CENTER= X = 0.300000E 01 Y = 0.500000E 01 Z = 0.400000E 01

```

FIGURE 32. Group 2 Sample Problems Program Results
(continued)

NIA CONFAC II REPORT SAMPLE PROBLEMS FROM FIG. (E)-C.A.TROUPS.11/1/63

RUN N3. 1 DATA USED FOR THIS RUN: *PLATB*7SPH1 *
 D 1 1*

TOTAL TIME IS 15.64C = 0.021 SECONDS.
 THE FORM FACTOR FROM SURFACE *PLATB * TO SURFACE *7SPH1 * = 0.06310
 THE EXCHANGE COEFFICIENT (FA) = 0.28807E 01 SQ UNITS

THE MAPPING AREA = 0.4250000E 02 SQ UNITS

THE AREA OF SURFACE *PLATB * = 0.4200000E 02 SQ UNITS.

THE AREA OF SURFACE *7SPH1 * = 0.5026548E 02 SQ UNITS.

THE FOLLOWING ARE THE (F.L.I.A.L) SURFACE COORDINATES USED FOR THE FACTOR COMPUTATION:

```

***** DATA NAME= *PLATB1 *
POINT 0. X Y Z POINT X Y Z
1 0. 0. 0.1000000E 01 --- (INTERNALLY GENERATED ORIENTATION VECTOR)
2 0. 0. 0.0000000E 01 -D 0.
3 0.6000000E 01 0.7000000E 01 0. 0. 0.7000000E 01 0.

```

```

***** DATA NAME= *7SPH1 *
POINT 0. X Y Z POINT X Y Z
1 0.6000000E 01 0.4000000E 01 0.4000000E 01
2 0.6000000E 01 0.4000000E 01 0.4000000E 01
3 0.6000000E 01 0.4000000E 01 0.4000000E 01
4 0.6000000E 01 0.4000000E 01 0.4000000E 01
5 0.6000000E 01 0.4000000E 01 0.4000000E 01
6 0.6000000E 01 0.4000000E 01 0.4000000E 01
7 0.6000000E 01 0.4000000E 01 0.4000000E 01
8 0.6000000E 01 0.4000000E 01 0.4000000E 01
9 0.6000000E 01 0.4000000E 01 0.4000000E 01
10 0.6000000E 01 0.4000000E 01 0.4000000E 01
11 0.6000000E 01 0.4000000E 01 0.4000000E 01
12 0.6000000E 01 0.4000000E 01 0.4000000E 01
13 0.6000000E 01 0.4000000E 01 0.4000000E 01
14 0.6000000E 01 0.4000000E 01 0.4000000E 01
15 0.6000000E 01 0.4000000E 01 0.4000000E 01
16 0.6000000E 01 0.4000000E 01 0.4000000E 01
17 0.6000000E 01 0.4000000E 01 0.4000000E 01
18 0.6000000E 01 0.4000000E 01 0.4000000E 01
19 0.6000000E 01 0.4000000E 01 0.4000000E 01
20 0.6000000E 01 0.4000000E 01 0.4000000E 01
21 0.6000000E 01 0.4000000E 01 0.4000000E 01
22 0.6000000E 01 0.4000000E 01 0.4000000E 01
23 0.6000000E 01 0.4000000E 01 0.4000000E 01
24 0.6000000E 01 0.4000000E 01 0.4000000E 01
25 0.6000000E 01 0.4000000E 01 0.4000000E 01
26 0.6000000E 01 0.4000000E 01 0.4000000E 01
27 0.6000000E 01 0.4000000E 01 0.4000000E 01
28 0.6000000E 01 0.4000000E 01 0.4000000E 01
29 0.6000000E 01 0.4000000E 01 0.4000000E 01
30 0.6000000E 01 0.4000000E 01 0.4000000E 01
31 0.6000000E 01 0.4000000E 01 0.4000000E 01
32 0.6000000E 01 0.4000000E 01 0.4000000E 01
33 0.6000000E 01 0.4000000E 01 0.4000000E 01
34 0.6000000E 01 0.4000000E 01 0.4000000E 01
35 0.6000000E 01 0.4000000E 01 0.4000000E 01
36 0.6000000E 01 0.4000000E 01 0.4000000E 01
37 0.6000000E 01 0.4000000E 01 0.4000000E 01
38 0.6000000E 01 0.4000000E 01 0.4000000E 01
39 0.6000000E 01 0.4000000E 01 0.4000000E 01
40 0.6000000E 01 0.4000000E 01 0.4000000E 01
41 0.6000000E 01 0.4000000E 01 0.4000000E 01
42 0.6000000E 01 0.4000000E 01 0.4000000E 01
43 0.6000000E 01 0.4000000E 01 0.4000000E 01
44 0.6000000E 01 0.4000000E 01 0.4000000E 01
45 0.6000000E 01 0.4000000E 01 0.4000000E 01
46 0.6000000E 01 0.4000000E 01 0.4000000E 01
47 0.6000000E 01 0.4000000E 01 0.4000000E 01
48 0.6000000E 01 0.4000000E 01 0.4000000E 01
49 0.6000000E 01 0.4000000E 01 0.4000000E 01
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51 0.6000000E 01 0.4000000E 01 0.4000000E 01
52 0.6000000E 01 0.4000000E 01 0.4000000E 01
53 0.6000000E 01 0.4000000E 01 0.4000000E 01
54 0.6000000E 01 0.4000000E 01 0.4000000E 01
55 0.6000000E 01 0.4000000E 01 0.4000000E 01
56 0.6000000E 01 0.4000000E 01 0.4000000E 01
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58 0.6000000E 01 0.4000000E 01 0.4000000E 01
59 0.6000000E 01 0.4000000E 01 0.4000000E 01
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61 0.6000000E 01 0.4000000E 01 0.4000000E 01
62 0.6000000E 01 0.4000000E 01 0.4000000E 01
63 0.6000000E 01 0.4000000E 01 0.4000000E 01
64 0.6000000E 01 0.4000000E 01 0.4000000E 01
65 0.6000000E 01 0.4000000E 01 0.4000000E 01
66 0.6000000E 01 0.4000000E 01 0.4000000E 01
67 0.6000000E 01 0.4000000E 01 0.4000000E 01
68 0.6000000E 01 0.4000000E 01 0.4000000E 01
69 0.6000000E 01 0.4000000E 01 0.4000000E 01
70 0.6000000E 01 0.4000000E 01 0.4000000E 01
71 0.6000000E 01 0.4000000E 01 0.4000000E 01
72 0.6000000E 01 0.4000000E 01 0.4000000E 01
73 0.6000000E 01 0.4000000E 01 0.4000000E 01
74 0.6000000E 01 0.4000000E 01 0.4000000E 01
75 0.6000000E 01 0.4000000E 01 0.4000000E 01
76 0.6000000E 01 0.4000000E 01 0.4000000E 01
77 0.6000000E 01 0.4000000E 01 0.4000000E 01
78 0.6000000E 01 0.4000000E 01 0.4000000E 01
79 0.6000000E 01 0.4000000E 01 0.4000000E 01
80 0.6000000E 01 0.4000000E 01 0.4000000E 01
81 0.6000000E 01 0.4000000E 01 0.4000000E 01
82 0.6000000E 01 0.4000000E 01 0.4000000E 01
83 0.6000000E 01 0.4000000E 01 0.4000000E 01
84 0.6000000E 01 0.4000000E 01 0.4000000E 01
85 0.6000000E 01 0.4000000E 01 0.4000000E 01
86 0.6000000E 01 0.4000000E 01 0.4000000E 01
87 0.6000000E 01 0.4000000E 01 0.4000000E 01
88 0.6000000E 01 0.4000000E 01 0.4000000E 01
89 0.6000000E 01 0.4000000E 01 0.4000000E 01
90 0.6000000E 01 0.4000000E 01 0.4000000E 01
91 0.6000000E 01 0.4000000E 01 0.4000000E 01
92 0.6000000E 01 0.4000000E 01 0.4000000E 01
93 0.6000000E 01 0.4000000E 01 0.4000000E 01
94 0.6000000E 01 0.4000000E 01 0.4000000E 01
95 0.6000000E 01 0.4000000E 01 0.4000000E 01
96 0.6000000E 01 0.4000000E 01 0.4000000E 01
97 0.6000000E 01 0.4000000E 01 0.4000000E 01
98 0.6000000E 01 0.4000000E 01 0.4000000E 01
99 0.6000000E 01 0.4000000E 01 0.4000000E 01
100 0.6000000E 01 0.4000000E 01 0.4000000E 01

```

FIGURE 32. Group E Sample Problems Program Results (continued)

0. 0.6000000E 0. 0.2333333E 01 0. 0.6000000E 01 0.5000000E 01
 0. 0.6000000E 01 0.4666667E 01 0. 0.6000000E 01 0.3933333E 01
 0. 0.6000000E 01 0.7000000E 01

NO. OF HORIZONTAL INCREMENTS= 6 NO. OF VERTICAL INCREMENTS= 6

THE FOLLOWING ARE PLANE PRINT CONFIGURATION FACTORS COMPUTED FOR THIS RUN
 LOWEST GRID LINE FIRST, FROM X-LEFT TO X-RIGHT.

0.3007282E-01 0.3551048E-01 0.4280040E-01 0.5037517E-01 0.5727027E-01 0.6220101E-01
 0.4400387E-01 0.4184837E-01 0.5160394E-01 0.5215214E-01 0.7210618E-01 0.7943108E-01
 0.3223364E-01 0.4712000E-01 0.5919787E-01 0.7267287E-01 0.8577958E-01 0.9566443E-01
 0.9938667E-01 0.5006368E-01 0.6354500E-01 0.7884667E-01 0.9398584E-01 1.0556551E-01
 0.1099637E-01 0.4982959E-01 0.6319198E-01 0.7834117E-01 0.9330887E-01 0.1047442E-01
 0.392274E-01 0.4448105E-01 0.5826450E-01 0.7130197E-01 0.8405444E-01 0.9359800E-01
 0.364881E-01 0.4097927E-01 0.5037517E-01 0.6048123E-01 0.6977084E-01 0.7692624E-01
 0.372184E-01 0.4097927E-01 0.5037517E-01 0.6048123E-01 0.6977084E-01 0.7692624E-01

FIGURE 32. Group 3 Sample Problems Program Results
 (continued)

NAA CONFAC II REPORT SAMPLE PROBLEMS FROM FIG. (E)-K-A-TOUP'S,11/1/63

RUN NO. 2 DATA USED FOR THIS RUN- *IPLAT8 *TSPH2 *
 D 1 1*

TOTAL TIME IN SILFAC = 0.058 SECONDS.

THE FORM FACTOR FROM SURFACE *IPLAT8 * TO SURFACE *TSPH2 * = 0.31426

THE EXCHANGE COEFFICIENT (FA) = 0.59895E 00 SQ UNITS

THE MAPPING AREA = 0.420000E 02 SQ UNITS

THE AREA OF SURFACE *IPLAT8 * = 0.420000E 02 SQ UNITS.

ONLY A PART OF SURFACE *TSPH2 * COMPRISING AN AREA OF 0.376931E 02 SQ UNITS.
 SEES SURFACE *IPLAT8 *

THE AREA OF SURFACE *TSPH2 * = 0.5026548E 02 SQ UNITS.

THE FOLLOWING ARE THE (FINAL) SURFACE COORDINATES USED FOR THE FACTOR COMPUTATION-

***** DATA NAME- *IPLAT8 *

POINT	X	Y	Z	POINT	X	Y	Z
1	0.	-0.	0.	1	0.100000E 01	0.100000E 01	0.
2	0.600000E 01	0.700000E 01	0.	2	0.600000E 01	0.100000E 01	0.
3	0.600000E 01	0.700000E 01	0.	3	0.600000E 01	0.100000E 01	0.

***** DATA NAME- *TSPH2 *

POINT	X	Y	Z	POINT	X	Y	Z
1	0.900000E 01	0.800000E 01	0.100000E 01	1	0.900000E 01	0.800000E 01	0.100000E 01
2	0.900000E 01	0.800000E 01	0.100000E 01	2	0.900000E 01	0.800000E 01	0.100000E 01
3	0.900000E 01	0.800000E 01	0.100000E 01	3	0.900000E 01	0.800000E 01	0.100000E 01

COORDINATES OF POINTS ON BOUNDARY OF SURF *IPLAT8 * FOR EACH Y INTERVAL

FIGURE 32. Group 3 Sample Problems Program Results
 (continued)

	X-LEFT	X-RIGHT	Y	X-LEFT	X-RIGHT	Y
2.	0.600000E-01	0.600000E-01	0.233333E-01	0.	0.600000E-01	0.116666E-01
3.	0.600000E-01	0.600000E-01	0.466666E-01	0.	0.600000E-01	0.350000E-01
4.	0.600000E-01	0.600000E-01	0.700000E-01	0.	0.600000E-01	0.583333E-01

NO. OF HORIZONTAL INCREMENTS= 6 NO. OF VERTICAL INCREMENTS= 6

THE FOLLOWING ARE PLANE POINT CONFIGURATION FACTORS COMPUTED FOR THIS RUN
LOWEST GRID LINE FIRST, FROM X-LEFT TO X-RIGHT.

0.265334E-02	0.427480E-02	0.359177E-02	0.427204E-02	0.508021E-02	0.592181E-02
0.261723E-02	0.374276E-02	0.456101E-02	0.566616E-02	0.700287E-02	0.854221E-02
0.290842E-02	0.453304E-02	0.583173E-02	0.755584E-02	0.980659E-02	0.126333E-01
0.101774E-01	0.551498E-02	0.737242E-02	0.100292E-01	0.138269E-01	0.191558E-01
0.159234E-01	0.652568E-02	0.909130E-02	0.110394E-01	0.192640E-01	0.292897E-01
0.419331E-02	0.746092E-02	0.107423E-01	0.161638E-01	0.236495E-01	0.433351E-01
0.497234E-02	0.802771E-02	0.193474E-01	0.165889E-01	0.311208E-01	0.575082E-01
0.518210E-02					
0.523234E-02					
0.573354E-02					
0.121932E-02					

FIGURE 32. Group 2 Sample Problems Program Results
(continued)

ALA CONFAC II REPORT SAMPLE PROBLEMS FROM FIG. (E)-K.A.-LIPS,11/1/63

```

RUN NO. 3 DATA USED FOR THIS RUN- *PLATB *TSPH3 *
      *O 1* 1*

TOTAL TIME IN SELFAC = 0.058 SECONDS.
THE FIRM FACTOR FROM SURFACE *PLATB * TO SURFACE *TSPH3 * = 0.00502
THE EXCHANGE COEFFICIENT (FA) = 0.21089E-00 50 UNITS
      THE MAPPING AREA = 0.4200000E 02 50 UNITS
THE AREA OF SURFACE *PLATB * = 0.4200000E 02 50 UNITS.

ONLY A PART OF SURFACE *TSPH3 *
SEES SURFACE *PLATB *
      *% COMPRISING AN AREA OF 0.2356194E 02 50 UNITS.
THE AREA OF SURFACE *TSPH3 * = 0.1653982E 02 50 UNITS.

THE FOLLOWING ARE THE (FINAL) SURFACE COORDINATES USED FOR THE FACTOR COMPUTATION-

***** DATA NAME- *PLATB *
POINT 0. X -0. Y 0. Z 0. POINT X Y Z
      1 0. 0. 0. 0.1000000E 01---(INTERNALLY GENERATED ORIENTATION VECTOR)
      2 0. 0. 0. 0.6000000E 01 0. 0.
      3 0. 0. 0. 0.7000000E 02 0. 0.

***** DATA NAME- *TSPH3 *
POINT 0. X Y Z
      1 -0.3000000E 01 0.7000000E 01 -0.1000000E 01 POINT X Y Z
      COORDINATES OF POINTS ON BOUNDARY OF SURF *PLATB * FOR EACH Y INTERVAL

```

FIGURE 32. Group E Sample Problems Program Results
(continued)

	X-LEFT	X-RIGHT	Y	X-LEFT	X-RIGHT	Y
0*	0.6000000E 01	0*	0*	0.6000000E 01	0.1166667E 01	
0*	0.6000000E 01	0*	0.2333333E 01	0.6000000E 01	0.1166667E 01	
0*	0.6000000E 01	0.4444444E 01	0*	0.6000000E 01	0.5000000E 01	
0*	0.6000000E 01	0.4444444E 01	0*	0.6000000E 01	0.5000000E 01	
0*	0.6000000E 01	0.7000000E 01	0*	0.6000000E 01	0.5833333E 01	

NO. OF HORIZONTAL INCREMENTS= 6 NO. OF VERTICAL INCREMENTS= 4

THE FOLLOWING ARE PLANE POINT CONFIGURATION FACTORS COMPUTED FOR THIS RUN
LOWEST GRID LINE FIRST, FROM X-LEFT TO X-RIGHT.

0.21144515E+02	0.15894935E-02	0.11284948E-02	0.10335305E-02	0.61816631E-03
0.61818785E-03	0.22524446E-02	0.11302942E-02	0.10330060E-02	
0.61818785E-03	0.42236464E-02	0.21280395E-02	0.10332033E-02	
0.62527132E-02	0.32333434E-02	0.27280395E-02	0.12071444E-02	
0.98160705E-03	0.77788525E-02	0.30803375E-02	0.21271252E-02	
0.11150757E-02	0.46622137E-02	0.30803375E-02	0.12071444E-02	
0.11150757E-02	0.12329935E-01	0.39076005E-02	0.17027325E-02	
0.40189461E-02	0.43637547E-02	0.39076005E-02	0.15179888E-02	
0.40189461E-02	0.40015666E-02	0.25530044E-02	0.17527117E-02	
0.11348592E-02	0.47453368E-02	0.44080547E-02	0.28818809E-02	
0.11348592E-02	0.18384931E-01	0.46078821E-02	0.19474317E-02	
0.11348592E-02	0.18384931E-01	0.46078821E-02	0.30074165E-02	

FIGURE 32. Group E Sample Problems Program Results
(continued)

NAA CONFAC II REPORT SAMPLE PROBLEMS FROM FIG. (E)-X.A.TOU<11/1/63

RUN NO. 4 DATA USED FOR THIS RUN- *IPLAT7*7SPH2 *
0 3 3

TOTAL TIME IN SILENCE = 0.393 SECONDS.

THE FORN FACTOR FROM SURFACE *IPLAT7 * TO SURFACE *7SPH2 * = 0.02446

THE EXCHANGE COEFFICIENT (FA) = 0.186832 01 SQ UNITS

THE MAPPING AREA = 0.7636752E 02 SQ UNITS

THE AREA OF SL-FAVE *IPLAT7 * = 0.7636752E 02 SQ UNITS.

ONLY A PART OF SURFACE *7SPH2 * COMPRISING AN AREA OF 0.1624699E 02 SQ UNITS.

SEES SURFACE *IPLAT7 *

THE AREA OF SURFACE *7SPH2 * = 0.5026548E 02 SQ UNITS.

THE FOLLOWING ARE THE (FIAL) SURFACE COORDINATES USED FOR THE FACTOR COMPUTATION-

```

***** DATA NAME= *IPLAT7 *
POINT 0. X -0. Y 0.9999999E 00---(INTERNALLY GENERATED ORIENTATION VECTOR) Z
1 -0. -0. 0. 0.8485281E 01 0.8485281E 01 -0. 0.
3 0.8485281E 01 0.8485281E 01 0.8485281E 01 0.8485281E 01 0.8485281E 01 0.
***** DATA NAME= *7SPH2 *
POINT 1 X 0.4949747E 01 Y 0.5099999E 01 Z -0.7070509E 00 POINT A Y Z
COORDINATES OF POINTS ON BOUNDARY OF SURF *IPLAT7 * FOR EACH Y INTERVAL

```

FIGURE 32. Group 3 Sample Problems Program Results
(continued)

0.1116397E-C0	C.7366526E-01	0.4717632E-01	0.3059036E-01	0.4040013E-01	0.1-04648E-01
0.377269E-C2	0.4744630E-02	0.6155096E-02	0.4118316E-02	0.148811E-01	0.140248E-01
0.403102E-C1	0.277861E-01	0.371203E-01	0.4480520E-01	0.358155E-01	0.140248E-01
0.469510E-01	0.3712062E-01	0.277866E-01	0.2031023E-01	0.148028E-01	0.108843E-01
0.322088E-C2	0.466008E-02	0.5123229E-02	0.45251123E-02	0.6375639E-02	0.107805E-01
0.139556E-C1	0.175374E-01	0.2153340E-01	0.2513747E-01	0.2734619E-01	0.2734619E-01
0.652511E-C2	0.2153340E-01	0.175374E-01	0.1385566E-04	0.1079036E-01	0.837580E-02

Figure 32. Group E Sample Problems Program Results
(continued)

NAA CONFAC II REPORT SAMPLE PROBLEMS FROM FIG. 1E)-K.A.YOUPS.11/1/63

A.JY NO. 5 DATA USED FOR THIS RUN= *PLATT7*TSPIH *
 * * * * *
 NONE OF SURFACE *PLATT7 * IS SEEN BY SURFACE *TSPIH *
 IF THE ABOVE RESULT IS UNEXPECTED, DO NOT BECOME ALARMED. IT HAPPENS TO THE BEST OF US. JUST CHECK YOUR
 DATA-ESPECIALLY BE SURE THAT COORDINATE ANGLES ARE CORRECT. ALSO, BE SURE THAT THE SURFACE IS FACING THE
 ACTIVE SIDE OF THE SURFACE, AND DERIVED FROM A RIGHT-HANDED COORDINATE SYSTEM.

Figure 32. Group E Sample Problems Program Results
(continued)

SAMPLE PROBLEM GROUP F

The capability of computing factors to surfaces which are occluded by intervening surfaces is demonstrated as shown in Figure 33. The data sheets are presented in Figure 34 and the results in Figure 35.

Problem 1F

The factor from IPLA10 to IPLA9 is desired with surface IPLA11 intervening. The surface SCOPLA, representing the boundary points of IPLA9 including connections, and the boundary points of IPLA11 including connections is entered in data. Because the silhouette is complex, the surface SCOPLA must be reentered as SCOPLA to enable the silhouette generator to operate in the complex mode. The factor to SCOPLA from IPLA10 is requested as Run #1. Then, the factor from IPLA10 to IPLA11 is requested as Run #2. The factor from IPLA10 to IPLA9 is merely the difference between the two,

$$f = 0.26787 - 0.20146$$

$$f = 0.06641$$

Problem 2F

This problem also illustrates the capability of determining factors to occluded surfaces, but data is entered and handled in a different manner. The factor from IPLA10 to 6PIPE2 is desired, taking into account the flux interceded by SPIPE1.

The coordinates defining 6PIPE2 are internally generated. SPIPE1 is entered manually, and the two surfaces are combined for complex processing as 820FEN.

Notice that SPIPE1 includes a line segment--a "bridge" line--connecting point 7 in SPIPE1 to 6PIPE2. If this line or any other suitably oriented line serving the purpose were not present, then the silhouette generator would not include 6PIPE2 in any of the silhouettes computed from points on mapping lines 6 and 7 on IPLA10. The line does not have to actually be in any surface--it need only appear to intersect both surfaces in the silhouette.

The form factor to 820FEN is 0.28139 (Run #3); to SPIPE1 alone is 0.21556 (Run #4); therefore, the form factor to 6PIPE2 is the difference or 0.06583.

Problem 3F

This problem illustrates improper use of the program, and in particular, the silhouette generator. The factor from IPLA12 to SCOPLA is requested as Run #5. Note that the data SCOPLA is in reality two surfaces. These surfaces when viewed from IPLA10 or IPLA12 present a complex silhouette, and therefore, must be processed in the complex mode. However, when a class 4, 5 or 6 surface is specified as Surface 2, the simple mode is always used. The

silhouette generator consequently saw only IPLA11 sometimes and only IPLA9 sometimes; this condition would not be relieved by use of a bridge line, because the total silhouette is complex, and must be processed as complex.

Problem 4F

When a class 8 surface is used as Surface 2, Surface 1 must be in the XY plane of the Surface 2 coordinate system, with its orientation vector pointing toward the +Z axis. The results of Run #6 show the diagnostic resulting from a request for the factor from IPLA12 to SCOPLA.

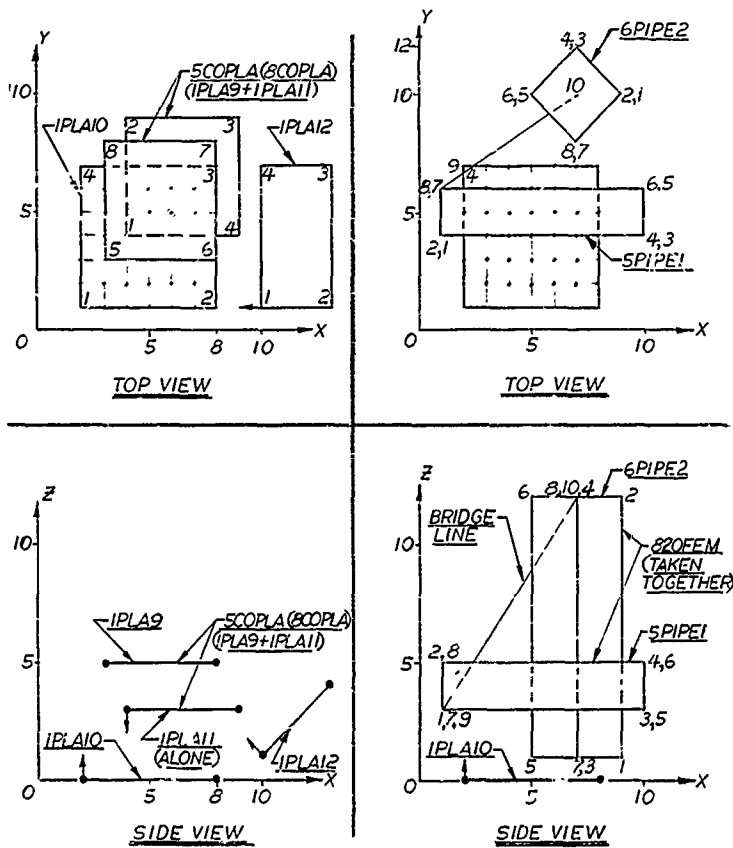


FIGURE 33. Group F Sample Problems Geometry

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Figure 34. Group F Sample Problems Input Data Code Sheets
(continued)

FORTRAN FIXED 10 DIGIT DECIMAL DATA

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94	P 1.1.2			
95	P 1.1.2			
96	P 1.1.2			
97	P 1.1.2			
98	P 1.1.2			
99	P 1.1.2			
100	P 1.1.2			

Figure 34. Group F Sample Problems Input Data Code Sheets
(continued)

FORTRAN: FIXED 10 DIGIT DECIMAL DATA

DECK NO. _____ PROGRAMMER _____ DATE _____ PAGE 33 of 36 JOB NO. 257-10

NUMBER	IDENTIFICATION	DESCRIPTION	DO NOT KEY PUNCH
1 0			
2 0			
3 0			
4 0			
5 0			
6 0			
7 0			
8 0			
9 0			
10 0			
11 0			
12 0			
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96 0			
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100 0			

FORTRAN: FIXED 10 DIGIT DECIMAL DATA

DECK NO. _____ PROGRAMMER _____ DATE _____ PAGE 34 of 36 JOB NO. 257-10

NUMBER	IDENTIFICATION	DESCRIPTION	DO NOT KEY PUNCH
1 0			
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99 0			
100 0			

Figure 34. Group F Sample Problems Input Data Code Sheets
(continued)

FORTRAN FIXED 10 DIGIT DECIMAL DATA			
DECK NO.	PROGRAMMER	DATE	PAGE 31 of 31 JOB NO. 222-32
NUMBER	IDENTIFICATION	DESCRIPTION	DO NOT KEY PUNCH
1			
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FORTRAN FIXED 10 DIGIT DECIMAL DATA			
DECK NO.	PROGRAMMER	DATE	PAGE 32 of 32 JOB NO. 222-32
NUMBER	IDENTIFICATION	DESCRIPTION	DO NOT KEY PUNCH
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Figure 34. Group F Sample Problems Input Data Code Sheets
(continued)

NAA SPACE AND INFORMATION SYSTEMS DIVISION
NAA PROJECT RADIANT-INTERFERENCE CONFIGURATION FACTOR PROGRAM

C O N F A C I I

NAA CONFAC II REPORT SAMPLE PROBLEMS FROM FIG. (F)-K.A.T.O.U.P.S., 11/1/63

I N P U T D A T A

***** DATA NAME= *IPLA10 * 6X6 PLATE IN XY PLANE

POINT	X	Y	Z	INTERVALLY GENERATED ORIENTATION VECTOR	Z
1	0.3000000E 01	0.1000000E 01	0.1000000E 01	0.1000000E 01	0.1000000E 01
2	0.2000000E 01	0.1000000E 01	0.1000000E 01	0.1000000E 01	0.1000000E 01
3	0.4000000E 01	0.7000000E 01	0.1000000E 01	0.1000000E 01	0.1000000E 01

***** DATA NAME= *IPLA11 * 5X5 SQUARE, Z=3, LOOKING AT IPLA10

POINT	X	Y	Z	INTERVALLY GENERATED ORIENTATION VECTOR	Z
1	0.4000000E 01	0.4000000E 01	0.3000000E 01	0.3000000E 01	0.3000000E 01
2	0.4000000E 01	0.4000000E 01	0.3000000E 01	0.3000000E 01	0.3000000E 01
3	0.4000000E 01	0.4000000E 01	0.3000000E 01	0.3000000E 01	0.3000000E 01

***** DATA NAME= *SCOPLA * IPLA11 COMBINED WITH IPLA0

POINT	X	Y	Z	INTERVALLY GENERATED ORIENTATION VECTOR	Z
1	0.4000000E 01	0.4000000E 01	0.3000000E 01	0.3000000E 01	0.3000000E 01
2	0.4000000E 01	0.4000000E 01	0.3000000E 01	0.3000000E 01	0.3000000E 01
3	0.4000000E 01	0.4000000E 01	0.3000000E 01	0.3000000E 01	0.3000000E 01
4	0.4000000E 01	0.4000000E 01	0.3000000E 01	0.3000000E 01	0.3000000E 01
5	0.4000000E 01	0.4000000E 01	0.3000000E 01	0.3000000E 01	0.3000000E 01
6	0.4000000E 01	0.4000000E 01	0.3000000E 01	0.3000000E 01	0.3000000E 01
7	0.4000000E 01	0.4000000E 01	0.3000000E 01	0.3000000E 01	0.3000000E 01
8	0.4000000E 01	0.4000000E 01	0.3000000E 01	0.3000000E 01	0.3000000E 01

POINT	CONNECTING POINTS	POINT	CONNECTING POINTS	POINT	CONNECTING POINTS
1	2, 4, 6, 8	2	1, 3, 5, 7	3	2, 4, 6, 8
4	1, 3, 5, 7	5	2, 4, 6, 8	6	1, 3, 5, 7
7	2, 4, 6, 8	8	1, 3, 5, 7	8	2, 4, 6, 8

***** DATA NAME= *IPLA12 *

Figure 35. Group F Sample Problems Program Results
(18 pages)

SHEARED RECTANGLE LOOKING AT SCOPLA

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POINT X Y Z POINT X Y Z
1 0.9208931 01 0.1000000 01 0.1700075 01 0.1000000 01 0.1000000 01 0.1000000 01
2 0.1000000 02 0.1000000 01 0.1000000 01 0.1000000 01 0.1000000 01 0.1000000 01
3 0.1300000 02 0.7500000 01 0.4000000 01 0.1000000 02 0.7000000 01 0.1000000 01

```

***** DATA NAME= *SPEP1 * HORIZONTAL PARALLELEPIPED WITH LINE P-100E TO SPIPEZ

```

POINT X Y Z POINT X Y Z
1 0.1000000 01 0.4000000 01 0.1000000 01 0.4000000 01 0.4000000 01 0.5000000 01
2 0.1000000 02 0.4000000 01 0.1000000 02 0.4000000 01 0.4000000 01 0.5000000 01
3 0.1000000 03 0.4000000 01 0.1000000 03 0.4000000 01 0.4000000 01 0.5000000 01
4 0.1000000 04 0.4000000 01 0.1000000 04 0.4000000 01 0.4000000 01 0.5000000 01
5 0.1000000 05 0.4000000 01 0.1000000 05 0.4000000 01 0.4000000 01 0.5000000 01
6 0.1000000 06 0.4000000 01 0.1000000 06 0.4000000 01 0.4000000 01 0.5000000 01
7 0.1000000 07 0.4000000 01 0.1000000 07 0.4000000 01 0.4000000 01 0.5000000 01
8 0.1000000 08 0.4000000 01 0.1000000 08 0.4000000 01 0.4000000 01 0.5000000 01
9 0.1000000 09 0.4000000 01 0.1000000 09 0.4000000 01 0.4000000 01 0.5000000 01
10 0.1000000 10 0.4000000 01 0.1000000 10 0.4000000 01 0.4000000 01 0.5000000 01

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POINT CONNECTING POINTS POINT CONNECTING POINTS POINT CONNECTING POINTS
1 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023 1024 1025 1026 1027 1028 1029 1030 1031 1032 1033 1034 1035 1036 1037 1038 1039 1040 1041 1042 1043 1044 1045 1046 1047 1048 1049 1050 1051 1052 1053 1054 1055 1056 1057 1058 1059 1060 1061 1062 1063 1064 1065 1066 1067 1068 1069 1070 1071 1072 1073 1074 1075 1076 1077 1078 1079 1080 1081 1082 1083 1084 1085 1086 1087 1088 1089 1090 1091 1092 1093 1094 1095 1096 1097 1098 1099 1100 1101 1102 1103 1104 1105 1106 1107 1108 1109 1110 1111 1112 1113 1114 1115 1116 1117 1118 1119 1120 1121 1122 1123 1124 1125 1126 1127 1128 1129 1130 1131 1132 1133 1134 1135 1136 1137 1138 1139 1140 1141 1142 1143 1144 1145 1146 1147 1148 1149 1150 1151 1152 1153 1154 1155 1156 1157 1158 1159 1160 1161 1162 1163 1164 1165 1166 1167 1168 1169 1170 1171 1172 1173 1174 1175 1176 1177 1178 1179 1180 1181 1182 1183 1184 1185 1186 1187 1188 1189 1190 1191 1192 1193 1194 1195 1196 1197 1198 1199 1200 1201 1202 1203 1204 1205 1206 1207 1208 1209 1210 1211 1212 1213 1214 1215 1216 1217 1218 1219 1220 1221 1222 1223 1224 1225 1226 1227 1228 1229 1230 1231 1232 1233 1234 1235 1236 1237 1238 1239 1240 1241 1242 1243 1244 1245 1246 1247 1248 1249 1250 1251 1252 1253 1254 1255 1256 1257 1258 1259 1260 1261 1262 1263 1264 1265 1266 1267 1268 1269 1270 1271 1272 1273 1274 1275 1276 1277 1278 1279 1280 1281 1282 1283 1284 1285 1286 1287 1288 1289 1290 1291 1292 1293 1294 1295 1296 1297 1298 1299 1300 1301 1302 1303 1304 1305 1306 1307 1308 1309 1310 1311 1312 1313 1314 1315 1316 1317 1318 1319 1320 1321 1322 1323 1324 1325 1326 1327 1328 1329 1330 1331 1332 1333 1334 1335 1336 1337 1338 1339 1340 1341 1342 1343 1344 1345 1346 1347 1348 1349 1350 1351 1352 1353 1354 1355 1356 1357 1358 1359 1360 1361 1362 1363 1364 1365 1366 1367 1368 1369 1370 1371 1372 1373 1374 1375 1376 1377 1378 1379 1380 1381 1382 1383 1384 1385 1386 1387 1388 1389 1390 1391 1392 1393 1394 1395 1396 1397 1398 1399 1400 1401 1402 1403 1404 1405 1406 1407 1408 1409 1410 1411 1412 1413 1414 1415 1416 1417 1418 1419 1420 1421 1422 1423 1424 1425 1426 1427 1428 1429 1430 1431 1432 1433 1434 1435 1436 1437 1438 1439 1440 1441 1442 1443 1444 1445 1446 1447 1448 1449 1450 1451 1452 1453 1454 1455 1456 1457 1458 1459 1460 1461 1462 1463 1464 1465 1466 1467 1468 1469 1470 1471 1472 1473 1474 1475 1476 1477 1478 1479 1480 1481 1482 1483 1484 1485 1486 1487 1488 1489 1490 1491 1492 1493 1494 1495 1496 1497 1498 1499 1500 1501 1502 1503 1504 1505 1506 1507 1508 1509 1510 1511 1512 1513 1514 1515 1516 1517 1518 1519 1520 1521 1522 1523 1524 1525 1526 1527 1528 1529 1530 1531 1532 1533 1534 1535 1536 1537 1538 1539 1540 1541 1542 1543 1544 1545 1546 1547 1548 1549 1550 1551 1552 1553 1554 1555 1556 1557 1558 1559 1560 1561 1562 1563 1564 1565 1566 1567 1568 1569 1570 1571 1572 1573 1574 1575 1576 1577 1578 1579 1580 1581 1582 1583 1584 1585 1586 1587 1588 1589 1590 1591 1592 1593 1594 1595 1596 1597 1598 1599 1600 1601 1602 1603 1604 1605 1606 1607 1608 1609 1610 1611 1612 1613 1614 1615 1616 1617 1618 1619 1620 1621 1622 1623 1624 1625 1626 1627 1628 1629 1630 1631 1632 1633 1634 1635 1636 1637 1638 1639 1640 1641 1642 1643 1644 1645 1646 1647 1648 1649 1650 1651 1652 1653 1654 1655 1656 1657 1658 1659 1660 1661 1662 1663 1664 1665 1666 1667 1668 1669 1670 1671 1672 1673 1674 1675 1676 1677 1678 1679 1680 1681 1682 1683 1684 1685 1686 1687 1688 1689 1690 1691 1692 1693 1694 1695 1696 1697 1698 1699 1700 1701 1702 1703 1704 1705 1706 1707 1708 1709 1710 1711 1712 1713 1714 1715 1716 1717 1718 1719 1720 1721 1722 1723 1724 1725 1726 1727 1728 1729 1730 1731 1732 1733 1734 1735 1736 1737 1738 1739 1740 1741 1742 1743 1744 1745 1746 1747 1748 1749 1750 1751 1752 1753 1754 1755 1756 1757 1758 1759 1760 1761 1762 1763 1764 1765 1766 1767 1768 1769 1770 1771 1772 1773 1774 1775 1776 1777 1778 1779 1780 1781 1782 1783 1784 1785 1786 1787 1788 1789 1790 1791 1792 1793 1794 1795 1796 1797 1798 1799 1800 1801 1802 1803 1804 1805 1806 1807 1808 1809 1810 1811 1812 1813 1814 1815 1816 1817 1818 1819 1820 1821 1822 1823 1824 1825 1826 1827 1828 1829 1830 1831 1832 1833 1834 1835 1836 1837 1838 1839 1840 1841 1842 1843 1844 1845 1846 1847 1848 1849 1850 1851 1852 1853 1854 1855 1856 1857 1858 1859 1860 1861 1862 1863 1864 1865 1866 1867 1868 1869 1870 1871 1872 1873 1874 1875 1876 1877 1878 1879 1880 1881 1882 1883 1884 1885 1886 1887 1888 1889 1890 1891 1892 1893 1894 1895 1896 1897 1898 1899 1900 1901 1902 1903 1904 1905 1906 1907 1908 1909 1910 1911 1912 1913 1914 1915 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932 1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950 1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042 2043 2044 2045 2046 2047 2048 2049 2050 2051 2052 2053 2054 2055 2056 2057 2058 2059 2060 2061 2062 2063 2064 2065 2066 2067 2068 2069 2070 2071 2072 2073 2074 2075 2076 2077 2078 2079 2080 2081 2082 2083 2084 2085 2086 2087 2088 2089 2090 2091 2092 2093 2094 2095 2096 2097 2098 2099 2100 2101 2102 2103 2104 2105 2106 2107 2108 2109 2110 2111 2112 2113 2114 2115 2116 2117 2118 2119 2120 2121 2122 2123 2124 2125 2126 2127 2128 2129 2130 2131 2132 2133 2134 2135 2136 2137 2138 2139 2140 2141 2142 2143 2144 2145 2146 2147 2148 2149 2150 2151 2152 2153 2154 2155 2156 2157 2158 2159 2160 2161 2162 2163 2164 2165 2166 2167 2168 2169 2170 2171 2172 2173 2174 2175 2176 2177 2178 2179 2180 2181 2182 2183 2184 2185 2186 2187 2188 2189 2190 2191 2192 2193 2194 2195 2196 2197 2198 2199 2200 2201 2202 2203 2204 2205 2206 2207 2208 2209 2210 2211 2212 2213 2214 2215 2216 2217 2218 2219 2220 2221 2222 2223 2224 2225 2226 2227 2228 2229 2230 2231 2232 2233 2234 2235 2236 2237 2238 2239 2240 2241 2242 2243 2244 2245 2246 2247 2248 2249 2250 2251 2252 2253 2254 2255 2256 2257 2258 2259 2260 2261 2262 2263 2264 2265 2266 2267 2268 2269 2270 2271 2272 2273 2274 2275 2276 2277 2278 2279 2280 2281 2282 2283 2284 2285 2286 2287 2288 2289 2290 2291 2292 2293 2294 2295 2296 2297 2298 2299 2300 2301 2302 2303 2304 2305 2306 2307 2308 2309 2310 2311 2312 2313 2314 2315 2316 2317 2318 2319 2320 2321 2322 2323 2324 2325 2326 2327 2328 2329 2330 2331 2332 2333 2334 2335 2336 2337 2338 2339 2340 2341 2342 2343 2344 2345 2346 2347 2348 2349 2350 2351 2352 2353 2354 2355 2356 2357 2358 2359 2360 2361 2362 2363 2364 2365 2366 2367 2368 2369 2370 2371 2372 2373 2374 2375 2376 2377 2378 2379 2380 2381 2382 2383 2384 2385 2386 2387 2388 2389 2390 2391 2392 2393 2394 2395 2396 2397 2398 2399 2400 2401 2402 2403 2404 2405 2406 2407 2408 2409 2410 2411 2412 2413 2414 2415 2416 2417 2418 2419 2420 2421 2422 2423 2424 2425 2426 2427 2428 2429 2430 2431 2432 2433 2434 2435 2436 2437 2438 2439 24
```

```

POINT CONNECTING POINTS  POINT CONNECTING POINTS  POINT CONNECTING POINTS  POINT
1 3, 2, 1, 0 2 4, 0, 8, 1 3 1, 8, 5, 0 8
5 7, 6, 5, 0 6 8, 0, 6, 5 7 1, 8, 5, 0 8
CONNECTIONS POINTS
***** DATA NAME= *SCOPLA * TO RUN SCOPLA IN COMPLEX MODE IN SILFAC
MULTISURFACE DATA=
SCOPLA, * * * * *
***** DATA NAME= *SOFEM * SPIPEL COMBINED WITH SPIPE2
MULTISURFACE DATA=
SPIPEL, SPIPE2, * * * * *

```

Figure 35. Group F Sample Problems Program Results
(continued)

MAPING
LINE PI 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50

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0.200000E 01 0.400000E 01 0.100000E 01 0.800000E 01 0.400000E 01
 0.200000E 01 0.800000E 01 0.200000E 01 0.200000E 01 0.200000E 01
 0.200000E 01 0.800000E 01 0.200000E 01 0.200000E 01 0.200000E 01

NO. OF HORIZONTAL INCREMENTS= 6 NO. OF VERTICAL INCREMENTS= 6

THE FOLLOWING ARE PLATE POINT CONFIGURATION FACTORS COMPUTED FOR THIS RUN
 LONGEST GRID LINE FIRST, FROM X-LEFT TO X-RIGHT.

0.8549479E-01	0.1051000E-00	0.1227140E-00	0.1340877E-00	0.1377212E-00	0.1318940E-00
0.1107000E-00	0.1200000E-00	0.1698500E-00	0.1804679E-00	0.1958415E-00	0.1802831E-00
0.1407000E-00	0.1200000E-00	0.1244727E-00	0.2251131E-00	0.2678113E-00	0.2602939E-00
0.1200000E-00	0.2244727E-00	0.2770939E-00	0.3186091E-00	0.3440795E-00	0.3393076E-00
0.2260000E-00	0.2751131E-00	0.3180091E-00	0.3718197E-00	0.4070079E-00	0.4058596E-00
0.2550000E-00	0.3440795E-00	0.3440795E-00	0.4070079E-00	0.4406145E-00	0.4406036E-00
0.1800000E-00	0.4070079E-00	0.4070079E-00	0.4070079E-00	0.4406145E-00	0.4406036E-00
0.1958415E-00	0.4406145E-00	0.4406145E-00	0.4406145E-00	0.4406145E-00	0.4406036E-00
0.5020000E-00	0.4406145E-00	0.4406145E-00	0.4406145E-00	0.4406145E-00	0.4406036E-00
0.1802831E-00	0.4406145E-00	0.4406145E-00	0.4406145E-00	0.4406145E-00	0.4406036E-00
0.1318940E-00	0.4406145E-00	0.4406145E-00	0.4406145E-00	0.4406145E-00	0.4406036E-00

Figure 35. Group F Sample Problems Program Results
 (continued)

NAA CONFAC II REPORT SAMPLE PROFILES FROM FIG. (F)-X-A-10UPS,11/ /63

RUN NO. 3 DATA USED FOR THIS RUN- *IPLAIO=IPLAII*
 *
 D 1
 * 1*

TR- FORM FACTOR FROM SURFACE *IPLAIC * TO SURFACE *IPLAII * = 0.21136

THE EXCHANGE COEFFICIENT (FA) = 0.76688E 01 SQ UNITS

THE MAPPING AREA = 0.3600000E 02 SQ UNITS

THE AREA OF SURFACE *IPLAIO * = 0.3603000E 02 SQ UNITS.

THE AREA OF SURFACE *IPLAII * = 0.2500000E 02 SQ UNITS.

THE FOLLOWING ARE THE FINAL SURFACE COORDINATES USED FOR THE FACTOR COMPUTATION-

***** DATA NAME= *IPLAIO *
 POINT X Y Z
 1 0.2000000E 01 0.1000000E 01 0.1000000E 01
 2 0.8000000E 01 0.1000000E 01 0.
 3 0.8000000E 01 0.7000000E 01 0.
 POINT X Y Z
 1 0.2000000E 01 0.1000000E 01 0.1000000E 01
 2 0.8000000E 01 0.1000000E 01 0.
 3 0.8000000E 01 0.7000000E 01 0.

***** DATA NAME= *IPLAII *
 POINT X Y Z
 1 0.2000000E 01 0.1000000E 01 0.1000000E 01
 2 0.8000000E 01 0.1000000E 01 0.1000000E 01
 3 0.8000000E 01 0.7000000E 01 0.1000000E 01
 COORDINATES OF POINTS ON BOUNDARY OF SURF *IPLAIO * FOR EACH Y INTERVAL
 X-LEFT X-RIGHT X-LEFT X-RIGHT
 1 0.2000000E 01 0.8000000E 01 0.1000000E 01 0.2000000E 01
 2 0.2000000E 01 0.8000000E 01 0.1000000E 01 0.2000000E 01
 3 0.2000000E 01 0.8000000E 01 0.1000000E 01 0.2000000E 01

Figure 35. Group F Sample Problems Program Results
 (continued)

0.2571121E-01	0.3431846E-01	0.4483769E-01	0.5340227E-01	0.5840757E-01	0.5840757E-01
0.3592287E-01	0.5572648E-01	0.7195049E-01	0.8390831E-01	0.1043506E-01	0.1043506E-01
0.5557888E-01	0.8671652E-01	1.1254042E-01	0.1324489E-01	0.1830053E-01	0.1830053E-01
1.1624595E-01	0.2559100E-01	0.1204627E-01	0.2559100E-01	0.2910538E-01	0.2910538E-01
0.9584331E-01	0.1616426E-01	0.2255910E-01	0.3356941E-01	0.3927640E-01	0.3927640E-01
0.4303786E-01	0.1805555E-01	0.2910538E-01	0.5927666E-01	0.4490515E-01	0.4490515E-01
0.3927640E-01	0.1805555E-01	0.2910538E-01	0.3927666E-01	0.4490515E-01	0.4490515E-01
0.3927640E-01	0.1805555E-01	0.2910538E-01	0.3927666E-01	0.4490515E-01	0.4490515E-01

[illegible]

Figure 35. Group F Sample Problems Program Results
(continued)

```

5 7 2 3 5 10 12 11 13 15 20 9 1 15 16 22 9 1
6 1 1 3 5 10 20 7 21 14 17 11 13 15 16 22 9 1
6 3 1 3 5 10 20 7 21 14 17 11 13 15 16 22 9 1
6 4 1 3 5 10 20 7 21 14 17 11 13 15 16 22 9 1
6 6 1 3 5 10 20 7 21 14 17 11 13 15 16 22 9 1
6 7 1 3 5 10 20 7 21 14 17 11 13 15 16 22 9 1
7 2 1 3 5 10 20 18 17 11 13 21 14 16 22 9 1
7 3 1 3 5 6 8 7 19 18 17 11 13 15 16 20 9 1
7 4 1 3 5 6 8 7 19 18 17 11 13 15 16 20 9 1
7 6 1 3 5 6 8 7 19 18 17 11 13 15 16 20 9 1
7 7 1 3 5 6 8 7 19 18 17 11 13 15 16 20 9 1

```

TOTAL TIME IN SILFAL = 15.570 SECONDS.

THE FORM FACTOR FROM SURFACE *IPLAIG * TO SURFACE *020FEW * = C.228/50

THE EXCHANGE COEFFICIENT (EFA3) = 0.10171E 02 50 UNITS

THE MAPPING AREA = C.9400002L 02 50 UNITS

THE AREA OF SURFACE *IPLAID * = C.3600000E 02 50 UNITS.

THE FOLLOWING ARE THE IFINAL SURFACE COORDINATES USED FOR THE FACTOR COMPUTATION-

```

***** DATA NAME= *IPLAID *
POINT X Y Z POINT X Y Z
1 0.100000E 01 0.100000E 01 0.100000E 01-- (INTERNALLY GENERATED ORIENTATION VECTOR)
2 0.200000E 01 0.200000E 01 0.200000E 01
3 0.300000E 01 0.300000E 01 0.300000E 01
CG3800000E OF POINTS ON BOUNDARY OF SURF *IPLAID * F3P EACH Y INTERVAL
X-LEFT X-RIGHT Y X-LEFT X-RIGHT Y
3.2000000E 01 0.8000000E 01 0.1000000E 01 0.2000000E 01 0.2000000E 01

```

Figure 35. Group F Sample Problems Program Results
(continued)

0.200000E 01 0.800000E 01 0.300000E 01 0.800000E 01 0.800000E 01
 0.200000E 01 0.800000E 01 0.300000E 01 0.800000E 01 0.800000E 01
 0.200000E 01 0.800000E 01 0.300000E 01 0.800000E 01 0.800000E 01

NO. OF HORIZONTAL INCREMENTS= 6 NO. OF VERTICAL INCREMENTS= 6

THE FOLLOWING ARE PLANE POINT CONFIGURATION FACTORS COMPUTED FOR THIS RUN
 LOWEST GRID LINE FIRST, FROM X-LEFT TO X-RIGHT.

C.114500E-00	0.132940E-00	0.185780E-00	0.152594E-00	0.153566E-00	0.188571E-00
C.117206E-00	0.175869E-00	0.193505E-00	0.202820E-00	0.264508E-00	0.198287E-00
C.189841E-00	0.227935E-00	0.280959E-00	0.231754E-00	0.204209E-00	0.257809E-00
C.190098E-00	0.267809E-00	0.295793E-00	0.311554E-00	0.317054E-00	0.311072E-00
C.268113E-00	0.516139E-00	0.587205E-00	0.380329E-00	0.394524E-00	0.594036E-00
C.282804E-00	0.318606E-00	0.389205E-00	0.365615E-00	0.380977E-00	0.378775E-00
C.368885E-00	0.301833E-00	0.350173E-00	0.584522E-00	0.340277E-00	0.386827E-00
C.353877E-00					
C.280051E-00					
C.362801E-00					

Figure 35. Group F Sample Problems Program Results
 (continued)


```

5 7 1 3 7 1 1
6 2 1 3 3 0 8 7 1
0 7 1 3 3 0 8 7 1
0 7 1 3 3 0 8 7 1
0 6 1 3 3 0 8 7 1
0 7 1 3 3 0 8 7 1
7 1 1 3 3 0 8 7 1
7 2 1 3 3 0 8 7 1
7 3 1 3 3 0 8 7 1
7 4 1 3 3 0 8 7 1
7 5 1 3 3 0 8 7 1
7 6 1 3 3 0 8 7 1
7 7 1 3 3 0 8 7 1

```

TOTAL TIME IN SILENCE = 1.464 SECONDS.

THE FORM FACTOR FROM SURFACE *IPLAID * TO SURFACE *SPIPEL * = 0.42472

L-N EXCHANGE COEFFICIENT (FAS) = 0.77299E 01 SC UNITS

THE MAPPING AREA = 0.3650000E 02 SQ UNITS

THE AREA OF SURFACE *IPLAID * = 0.3650000E 02 SQ UNITS.

THE FOLLOWING ARE THE (FINAL) SURFACE COORDINATES USED FOR THE FACTOR COMPUTATION*

```

***** DATA NAME= *IPLAID *
POINT X Y Z POINT X Y Z
1 0.20000E 01 0.10000E 01 0.10000E 01 --- (INTERNALLY GENERATED ORIENTATION VECTORS)
2 0.20000E 01 0.10000E 01 0.10000E 01
3 0.2000000E 01 0.2000000E 01 0.
***** DATA NAME= *SPIPEL *

```

Figure 35. Group F Sample Problems Program Results
(continued)

```

POINT      X      Y      Z      POINT      X      Y      Z
1 0.00000E 01 0.00000E 01 2 0.100000E 01 0.40000E 01 0.50000E 01
3 0.10000E 02 0.30000E 01 3 0.20000E 01 0.60000E 01 0.50000E 01
5 0.20000E 03 0.50000E 01 5 0.30000E 01 0.90000E 01 0.50000E 01
7 0.30000E 04 0.70000E 01 7 0.40000E 01 1.20000E 01 0.50000E 01
9 0.40000E 05 0.90000E 01 9 0.50000E 01 1.50000E 01 0.50000E 01
11 0.50000E 06 1.10000E 01 11 0.60000E 01 1.80000E 01 0.50000E 01
13 0.60000E 07 1.30000E 01 13 0.70000E 01 2.10000E 01 0.50000E 01
15 0.70000E 08 1.50000E 01 15 0.80000E 01 2.40000E 01 0.50000E 01
17 0.80000E 09 1.70000E 01 17 0.90000E 01 2.70000E 01 0.50000E 01
19 0.90000E 10 1.90000E 01 19 1.00000E 01 3.00000E 01 0.50000E 01
21 1.00000E 11 2.10000E 01 21 1.10000E 01 3.30000E 01 0.50000E 01
23 1.10000E 12 2.30000E 01 23 1.20000E 01 3.60000E 01 0.50000E 01
25 1.20000E 13 2.50000E 01 25 1.30000E 01 3.90000E 01 0.50000E 01
27 1.30000E 14 2.70000E 01 27 1.40000E 01 4.20000E 01 0.50000E 01
29 1.40000E 15 2.90000E 01 29 1.50000E 01 4.50000E 01 0.50000E 01
31 1.50000E 16 3.10000E 01 31 1.60000E 01 4.80000E 01 0.50000E 01
33 1.60000E 17 3.30000E 01 33 1.70000E 01 5.10000E 01 0.50000E 01
35 1.70000E 18 3.50000E 01 35 1.80000E 01 5.40000E 01 0.50000E 01
37 1.80000E 19 3.70000E 01 37 1.90000E 01 5.70000E 01 0.50000E 01
39 1.90000E 20 3.90000E 01 39 2.00000E 01 6.00000E 01 0.50000E 01
41 2.00000E 21 4.10000E 01 41 2.10000E 01 6.30000E 01 0.50000E 01
43 2.10000E 22 4.30000E 01 43 2.20000E 01 6.60000E 01 0.50000E 01
45 2.20000E 23 4.50000E 01 45 2.30000E 01 6.90000E 01 0.50000E 01
47 2.30000E 24 4.70000E 01 47 2.40000E 01 7.20000E 01 0.50000E 01
49 2.40000E 25 4.90000E 01 49 2.50000E 01 7.50000E 01 0.50000E 01
51 2.50000E 26 5.10000E 01 51 2.60000E 01 7.80000E 01 0.50000E 01
53 2.60000E 27 5.30000E 01 53 2.70000E 01 8.10000E 01 0.50000E 01
55 2.70000E 28 5.50000E 01 55 2.80000E 01 8.40000E 01 0.50000E 01
57 2.80000E 29 5.70000E 01 57 2.90000E 01 8.70000E 01 0.50000E 01
59 2.90000E 30 5.90000E 01 59 3.00000E 01 9.00000E 01 0.50000E 01
61 3.00000E 31 6.10000E 01 61 3.10000E 01 9.30000E 01 0.50000E 01
63 3.10000E 32 6.30000E 01 63 3.20000E 01 9.60000E 01 0.50000E 01
65 3.20000E 33 6.50000E 01 65 3.30000E 01 9.90000E 01 0.50000E 01
67 3.30000E 34 6.70000E 01 67 3.40000E 01 1.02000E 01 0.50000E 01
69 3.40000E 35 6.90000E 01 69 3.50000E 01 1.05000E 01 0.50000E 01
71 3.50000E 36 7.10000E 01 71 3.60000E 01 1.08000E 01 0.50000E 01
73 3.60000E 37 7.30000E 01 73 3.70000E 01 1.11000E 01 0.50000E 01
75 3.70000E 38 7.50000E 01 75 3.80000E 01 1.14000E 01 0.50000E 01
77 3.80000E 39 7.70000E 01 77 3.90000E 01 1.17000E 01 0.50000E 01
79 3.90000E 40 7.90000E 01 79 4.00000E 01 1.20000E 01 0.50000E 01
81 4.00000E 41 8.10000E 01 81 4.10000E 01 1.23000E 01 0.50000E 01
83 4.10000E 42 8.30000E 01 83 4.20000E 01 1.26000E 01 0.50000E 01
85 4.20000E 43 8.50000E 01 85 4.30000E 01 1.29000E 01 0.50000E 01
87 4.30000E 44 8.70000E 01 87 4.40000E 01 1.32000E 01 0.50000E 01
89 4.40000E 45 8.90000E 01 89 4.50000E 01 1.35000E 01 0.50000E 01
91 4.50000E 46 9.10000E 01 91 4.60000E 01 1.38000E 01 0.50000E 01
93 4.60000E 47 9.30000E 01 93 4.70000E 01 1.41000E 01 0.50000E 01
95 4.70000E 48 9.50000E 01 95 4.80000E 01 1.44000E 01 0.50000E 01
97 4.80000E 49 9.70000E 01 97 4.90000E 01 1.47000E 01 0.50000E 01
99 4.90000E 50 9.90000E 01 99 5.00000E 01 1.50000E 01 0.50000E 01
101 5.00000E 51 1.01000E 01 101 5.10000E 01 1.53000E 01 0.50000E 01
103 5.10000E 52 1.03000E 01 103 5.20000E 01 1.56000E 01 0.50000E 01
105 5.20000E 53 1.05000E 01 105 5.30000E 01 1.59000E 01 0.50000E 01
107 5.30000E 54 1.07000E 01 107 5.40000E 01 1.62000E 01 0.50000E 01
109 5.40000E 55 1.09000E 01 109 5.50000E 01 1.65000E 01 0.50000E 01
111 5.50000E 56 1.11000E 01 111 5.60000E 01 1.68000E 01 0.50000E 01
113 5.60000E 57 1.13000E 01 113 5.70000E 01 1.71000E 01 0.50000E 01
115 5.70000E 58 1.15000E 01 115 5.80000E 01 1.74000E 01 0.50000E 01
117 5.80000E 59 1.17000E 01 117 5.90000E 01 1.77000E 01 0.50000E 01
119 5.90000E 60 1.19000E 01 119 6.00000E 01 1.80000E 01 0.50000E 01
121 6.00000E 61 1.21000E 01 121 6.10000E 01 1.83000E 01 0.50000E 01
123 6.10000E 62 1.23000E 01 123 6.2000
```

[illegible]
$$N = \frac{C}{\Delta \text{ HORIZONTAL INCREMENTS}} = \Delta \text{ NO. OF VERTICAL INCREMENTS} = \delta$$

THE FOLLOWING ARE PLANE POINT CONFIGURATION FACTORS COMPUTED FOR THIS RUN
LOWEST GRID LINE FIRST. FROM X-LEFT TO X-RIGHT.

[illegible]

Figure 35. Group F Sample Problems Program Results
(continued)

NAA CONVAC II REPORT SAMPLE PROBLEMS FROM FIG. 43-A...TODS.11/1/63

RUN NO. 5 DATA USED FOR THIS RUN= *PLA12+SCOLA*
+0 1+ 1+

SURFACE 2 SILHOUETTE COMPUTED FROM MAPPING POINT SHOW

MAPPING	5	0	7	0	5
LINE	5	0	7	0	5
PT	5	0	7	0	5
1	5	0	7	0	5
2	5	0	7	0	5
3	5	0	7	0	5
4	5	0	7	0	5
5	5	0	7	0	5
6	5	0	7	0	5
7	5	0	7	0	5
8	5	0	7	0	5
9	5	0	7	0	5
10	5	0	7	0	5
11	5	0	7	0	5
12	5	0	7	0	5
13	5	0	7	0	5
14	5	0	7	0	5
15	5	0	7	0	5
16	5	0	7	0	5
17	5	0	7	0	5
18	5	0	7	0	5
19	5	0	7	0	5
20	5	0	7	0	5
21	5	0	7	0	5
22	5	0	7	0	5
23	5	0	7	0	5
24	5	0	7	0	5
25	5	0	7	0	5
26	5	0	7	0	5
27	5	0	7	0	5
28	5	0	7	0	5
29	5	0	7	0	5
30	5	0	7	0	5
31	5	0	7	0	5
32	5	0	7	0	5
33	5	0	7	0	5
34	5	0	7	0	5
35	5	0	7	0	5
36	5	0	7	0	5
37	5	0	7	0	5
38	5	0	7	0	5
39	5	0	7	0	5
40	5	0	7	0	5
41	5	0	7	0	5
42	5	0	7	0	5
43	5	0	7	0	5
44	5	0	7	0	5
45	5	0	7	0	5
46	5	0	7	0	5
47	5	0	7	0	5
48	5	0	7	0	5
49	5	0	7	0	5
50	5	0	7	0	5
51	5	0	7	0	5
52	5	0	7	0	5
53	5	0	7	0	5
54	5	0	7	0	5
55	5	0	7	0	5
56	5	0	7	0	5
57	5	0	7	0	5
58	5	0	7	0	5
59	5	0	7	0	5
60	5	0	7	0	5
61	5	0	7	0	5
62	5	0	7	0	5
63	5	0	7	0	5
64	5	0	7	0	5
65	5	0	7	0	5
66	5	0	7	0	5
67	5	0	7	0	5
68	5	0	7	0	5
69	5	0	7	0	5
70	5	0	7	0	5
71	5	0	7	0	5
72	5	0	7	0	5
73	5	0	7	0	5
74	5	0	7	0	5
75	5	0	7	0	5
76	5	0	7	0	5
77	5	0	7	0	5
78	5	0	7	0	5
79	5	0	7	0	5
80	5	0	7	0	5
81	5	0	7	0	5
82	5	0	7	0	5
83	5	0	7	0	5
84	5	0	7	0	5
85	5	0	7	0	5
86	5	0	7	0	5
87	5	0	7	0	5
88	5	0	7	0	5
89	5	0	7	0	5
90	5	0	7	0	5
91	5	0	7	0	5
92	5	0	7	0	5
93	5	0	7	0	5
94	5	0	7	0	5
95	5	0	7	0	5
96	5	0	7	0	5
97	5	0	7	0	5
98	5	0	7	0	5
99	5	0	7	0	5
100	5	0	7	0	5

Figure 35. Group F Sample Problems Program Results
(continued)

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NAA CONFAC II REPORT SAMPLE PROBLEMS FROM FIG. (F)-K.A.TOU'S 11/1/68

PUN NO. 6 DATA USED FOR THIS RUN- *IPLA12*SCPLA*
 *
 D 1
 * 1*

SURFACE 1 MUST BE IN THE XY PLANE OF ITS CS WHEN SURFACE 2 IS CLASS B-THIS PUN ABORTED.

Figure 35. Group F Sample Problems Program Results
 (continued)

APPENDIX B

PROGRAM DECK SETUP, LISTINGS, AND MAPS

The program deck arrangement shown in Figure 36 contains a main program and six subprograms which are listed in this appendix. A listing of the main program, 7J360, is shown in Figure 37 followed by a map of the core storage locations in Figure 38.

The first subprogram in the deck setup is subroutine UNIVFC which is shown in Figure 39 and the map of core storage in Figure 40. The transformation subroutine, TAPRJ, is presented in Figure 41 and the map of core storage in Figure 42. The listing and map of subroutine DOICU is presented in Figures 43 and 44. The listing and map of subroutine MAP, is presented in Figure 45 and 46. The listing of the subroutine FACTOR is presented in Figure 47 and the map of core storage in Figure 48. Subroutine SILFAC listing and core storage is shown in Figure 49. Figure 51 shows the variable formats used by this program.

This IBM FORTRAN II program uses two input-output statements which must be modified for computing systems other than the NAA Monitor, FIB III, system. These are

```
READ N, List
```

```
PRINT N, List
```

A convenient FAP assembled program is included which will convert the READ-PRINT statement to,

```
READ INPUT TAPE 5, N, List
```

```
WRITE OUTPUT TAPE 6, N, List
```

This assembly is listed in Figure 52. The convert to any other computing system using peripheral equipment and not using the same tape designations, the last three EOU cards are simply changed to read

```
MIN EOU A (Input statement tape number)
```

```
MAX EOU B (Output statement tape number)
```

```
MPUNCH EOU C (Punch statement tape number)
```

For computing centers using attached printing equipment, the FAP assembly can be removed and the program will execute in that system.

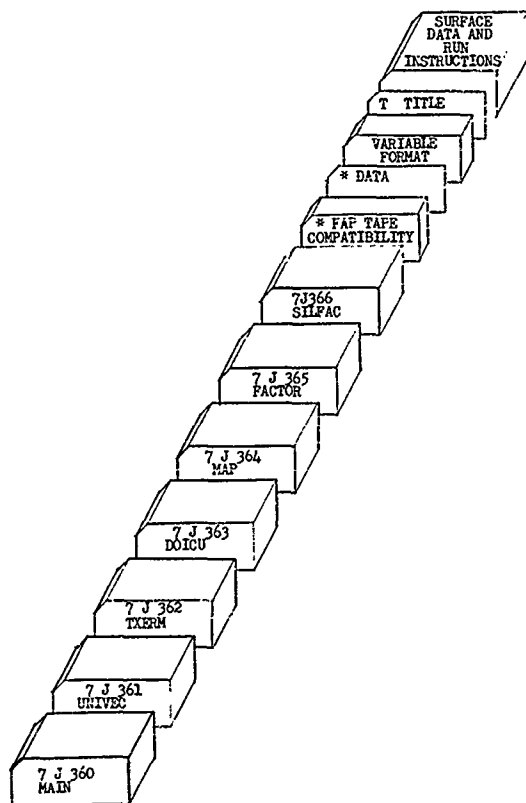


FIGURE 36. PROGRAM DECK SETUP

```

C CONFAC IL MAIN PROG--ANALYSIS AND PROG BY K.A.TOUPE,MAIL SID,1/1/63 36000000
C THIS MAIN PROGRAM CONTROLS THE COMPUTATION OF CONFIGURATION AND TORSION 36000000
C OF POLYMER CHAINS. IT CALCULATES THE COORDINATES OF ALL ATOMS IN THE 36000000
C FOURTAN SUBROUTINES USED ARE SINGCOS AND SORD. COMPACTOR, AND SIFPAC36000000
C C LIBRARY SUBROUTINES ARE SINGCOS AND SORD. COMPACTOR, AND SIFPAC36000000
C C ARE COMPARED WITH STATEMENTS ARE SINGCOS AND SORD. COMPACTOR, AND SIFPAC36000000
C C ARE COMPARED WITH STATEMENTS ARE SINGCOS AND SORD. COMPACTOR, AND SIFPAC36000000
C C TIMING PAR SUBROUTINES COUNTRY AND TIME LINE. THESE ONLY THE STATEMENTS 36000000
C C SEE MAIL SPACE AND INFORMATION SYSTEMS REPORT 52. 63-1397 FOR DETAILS 36000000
C DIMENSION F(12,12),F1(12,12),F2(12,12),F3(12,12),F4(12,12),F5(12,12) 36000000
C 1,F(12,12),F6(12,12),F7(12,12),F8(12,12),F9(12,12),F10(12,12),F11(12,12) 36000000
C 2,F12(12,12),F13(12,12),F14(12,12),F15(12,12),F16(12,12),F17(12,12),F18(12,12) 36000000
C 3,F19(12,12),F20(12,12),F21(12,12),F22(12,12),F23(12,12),F24(12,12),F25(12,12) 36000000
C 4,F26(12,12),F27(12,12),F28(12,12),F29(12,12),F30(12,12),F31(12,12),F32(12,12) 36000000
C 5,F33(12,12),F34(12,12),F35(12,12),F36(12,12),F37(12,12),F38(12,12),F39(12,12) 36000000
C 6,F40(12,12),F41(12,12),F42(12,12),F43(12,12),F44(12,12),F45(12,12),F46(12,12) 36000000
C 7,F47(12,12),F48(12,12),F49(12,12),F50(12,12),F51(12,12),F52(12,12),F53(12,12) 36000000
C 8,F54(12,12),F55(12,12),F56(12,12),F57(12,12),F58(12,12),F59(12,12),F60(12,12) 36000000
C 9,F61(12,12),F62(12,12),F63(12,12),F64(12,12),F65(12,12),F66(12,12),F67(12,12) 36000000
C 10,F68(12,12),F69(12,12),F70(12,12),F71(12,12),F72(12,12),F73(12,12),F74(12,12) 36000000
C 11,F75(12,12),F76(12,12),F77(12,12),F78(12,12),F79(12,12),F80(12,12),F81(12,12) 36000000
C 12,F82(12,12),F83(12,12),F84(12,12),F85(12,12),F86(12,12),F87(12,12),F88(12,12) 36000000
C 13,F89(12,12),F90(12,12),F91(12,12),F92(12,12),F93(12,12),F94(12,12),F95(12,12) 36000000
C 14,F96(12,12),F97(12,12),F98(12,12),F99(12,12),F100(12,12),F101(12,12),F102(12,12) 36000000
C 15,F103(12,12),F104(12,12),F105(12,12),F106(12,12),F107(12,12),F108(12,12),F109(12,12) 36000000
C 16,F110(12,12),F111(12,12),F112(12,12),F113(12,12),F114(12,12),F115(12,12),F116(12,12) 36000000
C 17,F117(12,12),F118(12,12),F119(12,12),F120(12,12),F121(12,12),F122(12,12),F123(12,12) 36000000
C 18,F124(12,12),F125(12,12),F126(12,12),F127(12,12),F128(12,12),F129(12,12),F130(12,12) 36000000
C 19,F131(12,12),F132(12,12),F133(12,12),F134(12,12),F135(12,12),F136(12,12),F137(12,12) 36000000
C 20,F138(12,12),F139(12,12),F140(12,12),F141(12,12),F142(12,12),F143(12,12),F144(12,12) 36000000
C 21,F145(12,12),F146(12,12),F147(12,12),F148(12,12),F149(12,12),F150(12,12),F151(12,12) 36000000
C 22,F152(12,12),F153(12,12),F154(12,12),F155(12,12),F156(12,12),F157(12,12),F158(12,12) 36000000
C 23,F159(12,12),F160(12,12),F161(12,12),F162(12,12),F163(12,12),F164(12,12),F165(12,12) 36000000
C 24,F166(12,12),F167(12,12),F168(12,12),F169(12,12),F170(12,12),F171(12,12),F172(12,12) 36000000
C 25,F173(12,12),F174(12,12),F175(12,12),F176(12,12),F177(12,12),F178(12,12),F179(12,12) 36000000
C 26,F180(12,12),F181(12,12),F182(12,12),F183(12,12),F184(12,12),F185(12,12),F186(12,12) 36000000
C 27,F187(12,12),F188(12,12),F189(12,12),F190(12,12),F191(12,12),F192(12,12),F193(12,12) 36000000
C 28,F194(12,12),F195(12,12),F196(12,12),F197(12,12),F198(12,12),F199(12,12),F200(12,12) 36000000
C 29,F201(12,12),F202(12,12),F203(12,12),F204(12,12),F205(12,12),F206(12,12),F207(12,12) 36000000
C 30,F208(12,12),F209(12,12),F210(12,12),F211(12,12),F212(12,12),F213(12,12),F214(12,12) 36000000
C 31,F215(12,12),F216(12,12),F217(12,12),F218(12,12),F219(12,12),F220(12,12),F221(12,12) 36000000
C 32,F222(12,12),F223(12,12),F224(12,12),F225(12,12),F226(12,12),F227(12,12),F228(12,12) 36000000
C 33,F229(12,12),F230(12,12),F231(12,12),F232(12,12),F233(12,12),F234(12,12),F235(12,12) 36000000
C 34,F236(12,12),F237(12,12),F238(12,12),F239(12,12),F240(12,12),F241(12,12),F242(12,12) 36000000
C 35,F243(12,12),F244(12,12),F245(12,12),F246(12,12),F247(12,12),F248(12,12),F249(12,12) 36000000
C 36,F250(12,12),F251(12,12),F252(12,12),F253(12,12),F254(12,12),F255(12,12),F256(12,12) 36000000
C 37,F257(12,12),F258(12,12),F259(12,12),F260(12,12),F261(12,12),F262(12,12),F263(12,12) 36000000
C 38,F264(12,12),F265(12,12),F266(12,12),F267(12,12),F268(12,12),F269(12,12),F270(12,12) 36000000
C 39,F271(12,12),F272(12,12),F273(12,12),F274(12,12),F275(12,12),F276(12,12),F277(12,12) 36000000
C 40,F278(12,12),F279(12,12),F280(12,12),F281(12,12),F282(12,12),F283(12,12),F284(12,12) 36000000
C 41,F285(12,12),F286(12,12),F287(12,12),F288(12,12),F289(12,12),F290(12,12),F291(12,12) 36000000
C 42,F292(12,12),F293(12,12),F294(12,12),F295(12,12),F296(12,12),F297(12,12),F298(12,12) 36000000
C 43,F299(12,12),F300(
```

Figure 37. Main Program Listing

36004000

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Figure 37. Main Program Listing
(continued)

73300 COMPAC II-MAIN PROG-ANALYSIS AND PROG BY K.A.TOURP, NAA SIO, 11/1/63 11/08/63 PAGE 5

```

12200 F1(101-FILLID)
C SELECT REMAINDER FOR ERROR PRINTOUT AND TERMINATE JOB
C READ REMAINDER OF THIS SURFACE DATA
12400 W/CONNECTION DATA
      F5,P1(3),2(1),((P(K,M),1,3,M-3,NP)
      GO TO 22200
C READ CLASS 5 DATA-INTERNAL PLANE POLYGON-CONSTANT SILUET BOUNDARY PTS.
13000 W/CONNECTION DATA
      F5, SILUET,10(1,1),10(1,1),10(1,1)
C PRINT SPECIFICATIONS
      H5ID=SID
      GO TO 10500
C READ DATA FOR A PLANE SURFACE W/CONNECTION DATA-CLASS 4
14000 W/CONNECTION DATA
C READ DATA FOR A NO-PLANAR SURFACE W/CONNECTION DATA-CLASS 5
C ADVANCE COUNTER LOCATING CONNECTIONS DATA
15000 IF(41C-1)13114500,14600,14500
14500 PRINT
      F37
      GO TO 13400
C READ SURFACE DATA LOCATION TO CONNECTIONS
C READ REFERENCE
14600 AC(11)=IC
C READ SENSE LIGHT 1
14700 W/CONNECTION DATA
C BOUNDARY LINE 01
      READ
      F0,PH,(P(1,1),M+1,3),(MP(M,1,1C),M+1,4),P1,30(1,1),PH
      GO TO 11400
C TEST AGAINST MAX ALLOWABLE
C IF(50P11-100)115200,15200,112200
C READ REMAINDER OF DATA IF MAX NO. OF POINTS IS NOT EXCEEDED
15200 W/CONNECTION DATA
      READ
      F7,P1(2,2),1,1,P(3,2,1),((P(M,2,1C),M+1,4),
      GO TO 114000
C READ CLASS 6 DATA TO GENERATE A PLANE POLYGON OR MULTIFACETED SURFACE
W/CONNECTION DATA
16000 SENSE LIGHT 1

```

Figure 37. Main Program Listing
(continued)

Figure 37. Main Program Listing
(continued)

[illegible]

Figure 37. Main Program Listing
(continued)

Figure 37. Main Program Listing
(continued)

```

22306  CUNVAL IF MAIN PROG-ANALYSIS AND PRG6 BY K.A.TOUPS, NHA SIO, 11/21/68
C PLU. LOCATION INDICATES THE WORD IS NOT IN DICTIONARY-PRINT ERROR#36047000
C C.F. LOCATION OF NAME IN ARRAY
36047100
36047200
36047300
36047400
36047500
36047600
36047700
36047800
36047900
36048000
36048100
36048200
36048300
36048400
36048500
36048600
36048700
36048800
36048900
36049000
36049100
36049200
36049300
36049400
36049500
36049600
36049700
36049800
36049900
36050000
36050100
36050200
36050300
36050400
36050500
36050600
36050700
36050800
36050900
36051000
36051100
36051200
36051300
36051400
36051500
36051600
36051700
36051800
36051900
36052000
36052100
36052200
36052300
36052400
36052500
36052600
36052700
36052800
36052900
36053000
36053100
36053200
36053300
36053400
36053500
36053600
36053700
36053800
36053900
36054000
36054100
36054200
36054300
36054400
36054500
36054600
36054700
36054800
36054900
36055000
36055100
36055200
36055300
36055400
36055500
36055600
36055700
36055800
36055900
36056000
36056100
36056200
36056300
36056400
36056500
36056600
36056700
36056800
36056900
36057000
36057100
36057200
36057300
36057400
36057500
36057600
36057700
36057800
36057900
36058000
36058100
36058200
36058300
36058400
36058500
36058600
36058700
36058800
36058900
36059000
36059100
36059200
36059300
36059400
36059500
36059600
36059700
36059800
36059900
36060000
36060100
36060200
36060300
36060400
36060500
36060600
36060700
36060800
36060900
36061000
36061100
36061200
36061300
36061400
36061500
36061600
36061700
36061800
36061900
36062000
36062100
36062200
36062300
36062400
36062500
36062600
36062700
36062800
36062900
36063000
36063100
36063200
36063300
36063400
36063500
36063600
36063700
36063800
36063900
36064000
36064100
36064200
36064300
36064400
36064500
36064600
36064700
36064800
36064900
36065000
36065100
36065200
36065300
36065400
36065500
36065600
36065700
36065800
36065900
36066000
36066100
36066200
36066300
36066400
36066500
36066600
36066700
36066800
36066900
36067000
36067100
36067200
36067300
36067400
36067500
36067600
36067700
36067800
36067900
36068000
36068100
36068200
36068300
36068400
36068500
36068600
36068700
36068800
36068900
36069000
36069100
36069200
36069300
36069400
36069500
36069600
36069700
36069800
36069900
36070000
36070100
36070200
36070300
36070400
36070500
36070600
36070700
36070800
36070900
36071000
36071100
36071200
36071300
36071400
36071500
36071600
36071700
36071800
36071900
36072000
36072100
36072200
36072300
36072400
36072500
36072600
36072700
36072800
36072900
36073000
36073100
36073200
36073300
36073400
36073500
36073600
36073700
36073800
36073900
36074000
36074100
36074200
36074300
36074400
36074500
36074600
36074700
36074800
36074900
36075000
36075100
36075200
36075300
36075400
36075500
36075600
36075700
36075800
36075900
36076000
36076100
36076200
36076300
36076400
36076500
36076600
36076700
36076800
36076900
36077000
36077100
36077200
36077300
36077400
36077500
36077600
36077700
36077800
36077900
36078000
36078100
36078200
36078300
36078400
36078500
36078600
36078700
36078800
36078900
36079000
36079100
36079200
36079300
36079400
36079500
36079600
36079700
36079800
36079900
36080000
36080100
36080200
36080300
36080400
36080500
36080600
36080700
36080800
36080900
36081000
36081100
36081200
36081300
36081400
36081500
36081600
36081700
36081800
36081900
36082000
36082100
36082200
36082300
36082400
36082500
36082600
36082700
36082800
36082900
36083000
36083100
36083200
36083300
36083400
36083500
36083600
36083700
36083800
36083900
36084000
36084100
36084200
36084300
36084400
36084500
36084600
36084700
36084800
36084900
36085000
36085100
36085200
36085300
36085400
36085500
36085600
36085700
36085800
36085900
36086000
36086100
36086200
36086300
36086400
36086500
36086600
36086700
36086800
36086900
36087000
36087100
36087200
36087300
36087400
36087500
36087600
36087700
36087800
36087900
36088000
36088100
36088200
36088300
36088400
36088500
36088600
36088700
36088800
36088900
36089000
36089100
36089200
36089300
36089400
36089500
36089600
36089700
36089800
36089900
36090000
36090100
36090200
36090300
36090400
36090500
36090600
36090700
36090800
36090900
36091000
36091100
36091200
36091300
36091400
36091500
3609160
```

Figure 37. Main Program Listing
(continued)

Figure 37. Main Program Listing
(continued)

00895091

Figure 37. Main Program Listing
(continued)

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Figure 37. Main Program Listing
(continued)

STORAGE NOT USED BY PROGRAM

DEC	GCT	DEC	GCT
4006 07646		14613 34425	

STORAGE LOCATIONS FOR VARIABLES APPEARING IN COMMON STATEMENTS

DEC	GCT	DEC	GCT	DEC	GCT
AMAP 13169 35501		AREA 21067 31113		AREAX 21011 31023	
C2 21945 32671		C3 21795 32443		CL 21014 37414	
FO 12102 31126		FOK 15746 35216		OP 15179 35317	
F 13160 35514		FV 14950 35146		INC 14449 14471	
AD 22154 33212		KP 15492 36204		KX 15492 36205	
MS965 15023 35257		CL 15152 35152		MD 15152 35152	
NOL 21157 31245		NCL5 15178 35182		NDA 22100 33124	
NOM 21102 32176		NON 22114 33142		ND3 15168 35503	
MS10 22101 31125		NVP 21104 31750		NDC 15168 35503	
NV 15182 35516		MSL 23217 61201		NDC 31113 30915	
AV 20968 31006		NVL 15191 35215		NITILE 21293 51455	
TON 22114 33142		SL 21693 32275		PP 32761 37461	
TS 20987 30273		TS10 22101 33125		PP 32761 37461	
		VA 22094 33116		TDA 22100 53124	
		Y 15368 36010		Y 16154 37432	

STORAGE LOCATIONS FOR VARIABLES APPEARING IN DIMENSION AND EQUIVALENCE STATEMENTS

F0 3993 07631		F10 3777 07701		F12 3741 07235	
F1 3993 07631		F11 3753 07251		F13 3741 07235	
F17 3659 07125		F18 3657 07111		F16 3681 07615	
F20 3621 07045		F21 3597 07015		F23 3773 08765	
F24 3647 06531		F22 3665 07001		F27 3651 08551	
F30 3345 06421		F25 3609 06411		F28 3651 08551	
F34 3249 06261		F26 3647 06411		F33 3271 06311	
F42 4006 07845		F31 3321 06371		F37 3202 06202	
		F35 3237 06245		F38 3202 06202	
		F36 3214 06210		F39 3202 06202	
		F37 3214 06210		F40 3202 06202	
		F38 3214 06210		F41 3202 06202	
		F39 3214 06210		F42 3202 06202	
		F40 3214 06210		F43 3202 06202	
		F41 3214 06210		F44 3202 06202	
		F42 3214 06210		F45 3202 06202	
		F43 3214 06210		F46 3202 06202	
		F44 3214 06210		F47 3202 06202	
		F45 3214 06210		F48 3202 06202	
		F46 3214 06210		F49 3202 06202	
		F47 3214 06210		F50 3202 06202	
		F48 3214 06210		F51 3202 06202	
		F49 3214 06210		F52 3202 06202	
		F50 3214 06210		F53 3202 06202	
		F51 3214 06210		F54 3202 06202	
		F52 3214 06210		F55 3202 06202	
		F53 3214 06210		F56 3202 06202	
		F54 3214 06210		F57 3202 06202	
		F55 3214 06210		F58 3202 06202	
		F56 3214 06210		F59 3202 06202	
		F57 3214 06210		F60 3202 06202	
		F58 3214 06210		F61 3202 06202	
		F59 3214 06210		F62 3202 06202	
		F60 3214 06210		F63 3202 06202	
		F61 3214 06210		F64 3202 06202	
		F62 3214 06210		F65 3202 06202	
		F63 3214 06210		F66 3202 06202	
		F64 3214 06210		F67 3202 06202	
		F65 3214 06210		F68 3202 06202	
		F66 3214 06210		F69 3202 06202	
		F67 3214 06210		F70 3202 06202	
		F68 3214 06210		F71 3202 06202	
		F69 3214 06210		F72 3202 06202	
		F70 3214 06210		F73 3202 06202	
		F71 3214 06210		F74 3202 06202	
		F72 3214 06210		F75 3202 06202	
		F73 3214 06210		F76 3202 06202	
		F74 3214 06210		F77 3202 06202	
		F75 3214 06210		F78 3202 06202	
		F76 3214 06210		F79 3202 06202	
		F77 3214 06210		F80 3202 06202	
		F78 3214 06210		F81 3202 06202	
		F79 3214 06210		F82 3202 06202	
		F80 3214 06210		F83 3202 06202	
		F81 3214 06210		F84 3202 06202	
		F82 3214 06210		F85 3202 06202	
		F83 3214 06210		F86 3202 06202	
		F84 3214 06210		F87 3202 06202	
		F85 3214 06210		F88 3202 06202	
		F86 3214 06210		F89 3202 06202	
		F87 3214 06210		F90 3202 06202	
		F88 3214 06210		F91 3202 06202	
		F89 3214 06210		F92 3202 06202	
		F90 3214 06210		F93 3202 06202	
		F91 3214 06210		F94 3202 06202	
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		F101 3214 06210		F104 3202 06202	
		F102 3214 06210		F105 3202 06202	
		F103 3214 06210		F106 3202 06202	
		F104 3214 06210		F107 3202 06202	
		F105 3214 06210		F108 3202 06202	
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		F107 3214 06210		F110 3202 06202	
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		F109 3214 06210		F112 3202 06202	
		F110 3214 06210		F113 3202 06202	
		F111 3214 06210		F114 3202 06202	
		F112 3214 06210		F115 3202 06202	
		F113 3214 06210		F116 3202 06202	
		F114 3214 06210		F117 3202 06202	
		F115 3214 06210		F118 3202 06202	
		F116 3214 06210		F119 3202 06202	
		F117 3214 06210		F120 3202 06202	
		F118 3214 06210		F121 3202 06202	
		F119 3214 06210		F122 3202 06202	
		F120 3214 06210		F123 3202 06202	
		F121 3214 06210		F124 3202 06202	
		F122 3214 06210		F125 3202 06202	
		F123 3214 06210		F126 3202 06202	
		F124 3214 06210		F127 3202 06202	
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		F130 3214 06210		F133 3202 06202	
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		F132 3214 06210		F135 3202 06202	
		F133 3214 06210		F136 3202 06202	
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		F136 3214 06210		F139 3202 06202	
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		F139 3214 06210		F142 3202 06202	
		F140 3214 06210		F143 3202 06202	
		F141 3214 06210		F144 3202 06202	
		F142 3214 06210		F145 3202 06202	
		F143 3214 06210		F146 3202 06202	
		F144 3214 06210		F147 3202 06202	
		F145 3214 06210		F148 3202 06202	
		F146 3214 06210		F149 3202 06202	
		F147 3214 06210		F150 3202 06202	
		F148 3214 06210		F151 3202 06202	
		F149 3214 06210		F152 3202 06202	
		F150 3214 06210		F153 3202 06202	
		F151 3214 06210		F154 3202 06202	
		F152 3214 06210		F155 3202 06202	
		F153 3214 06210		F156 3202 06202	
		F154 3214 06210		F157 3202 06202	
		F155 3214 06210		F158 3202 06202	
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		F157 3214 06210		F160 3202 06202	
		F158 3214 06210		F161 3202 06202	
		F159 3214 06210		F162 3202 06202	
		F160 3214 06210		F163 3202 06202	
		F161 3214 06210		F164 3202 06202	
		F162 3214 06210		F165 3202 06202	
		F163 3214 06210		F166 3202 06202	
		F164 3214 06210		F167 3202 06202	
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		F166 3214 06210		F169 3202 06202	
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		F169 3214 06210		F172 3202 06202	
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		F172 3214 06210		F175 3202 06202	
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		F184 3214 06210		F187 3202 06202	
		F185 3214 06210		F188 3202 06202	
		F186 3214 06210		F189 3202 06202	
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		F188 3214 06210		F191 3202 06202	
		F189 3214 06210		F192 3202 06202	
		F190 3214 06210		F193 3202 06202	
		F191 3214 06210		F194 3202 06202	
		F192 3214 06210		F195 3202 06202	
		F193 3214 06210		F196 3202 06202	
		F194 3214 06210		F197 3202 06202	
		F195 3214 06210		F198 3202 06202	
		F196 3214 06210		F199 3202 06202	
		F197 3214 06210		F200 3202 06202	
		F198 3214 06210		F201 3202 06202	
		F199 3214 06210		F202 3202 06202	
		F200 3214 06210		F203 3202 06202	
		F201 3214 06210		F204 3202 06202	
		F202 3214 06210		F205 3202 06202	
		F203 3214 06210		F206 3202 06202	
		F204 3214 06210		F207 3202 06202	
		F205 3214 06210		F208 3202 06202	
		F206 3214 06210		F209 3202 06202	
		F207 3214 06210		F210 3202 06202	

C11G1	3085 06015	C11G1	3086 06016	C1201	3097 06017	C1209	3088 06020
C120P	3089 06021	C126G	3090 06022	C1201	3091 06023	C120J	3092 06024
C1112	311 00777	C1118	3095 31123	C1118	3095 31123	C1118	3095 31123
C1112F	957 01675	C112U	1183 02237	C1131	1201 02363	C113V	1515 01753
C1115G	2009 03213	C114U	1095 02602	C114U	1095 02602	C114U	1095 02602
C1213F	1472 02700	C123U	1478 02706	C124F	1724 03274	C1251	1974 03666
C123M	1988 03704	C1264	2112 04100	C1269	2135 04127	C126A	2150 04162
C1265	2253 04365	C1270	2560 05000	C1278	2588 05034	C1282	2638 05116
C1281	2821 05405	C1312	510 00776	C1318	594 01132	C1320	745 01681
C1313	2008 05130	C136F	2216 04250	C138E	2320 05406	C1407	705 00312
C1404	221 00335	C142L	1077 02065	C143F	1376 02549	C1440	1539 03003
C1422	1867 05113	C1453	2012 03250	C1454	2425 03750	C1470	2311 04412
C1473	2491 04673	C1479	2563 05003	C147R	2586 05032	C1503	201 00311
C1512	508 00774	C152F	1956 01674	C1540	1538 03002	C1547	1577 03051
C152L	1976 01670	C1555	2030 03767	C1603	198 00306	C1604	220 00334
C162L	1076 02064	C164F	1723 03273	C1659	2013 03735	C1665	2292 04364
C170F	1732 03271	C170U	1400 03445	C1750	2007 03727	C1767	2215 02747
E10	576 00602	E134	1277 02375	E135	1281 02401	E137	1298 02422
E138	1313 02441	E13F	1409 02601	E13M	1418 02612	E140	1537 03001
E13E	1927 03697	E161	2246 04306	E177	2412 04554	E17M	2222 04732
E170	2562 05012	E17P	2567 05007	E17Q	2513 05015	E17R	2590 05036

LOCATIONS OF NAMES IN TRANSFER VECTOR

DEC	001	DEC	002	DEC	003	DEC	004
COS	14 00012	ORICU	15 00017	EXIT	7 00007	FACT04	14 00070
HAP	14 00016	SILFAC	15 00017	SIN	9 00011	SORT	11 00013
PERM	12 00014	UNIVEC	8 00010	ICSWH	1 00001	151CT	5 00005
LS-PM	4 00004	IRMI	3 00003	3L11	2 00002	1310;	6 00006

Figure 38. Main Program Core Storage Map
(continued)

COS FORM (SPH)	DSICH UNITEC	ENTRY POINTS TO SUBROUTINES NOT OUTPUT FROM LIBRARY				SRT (SRT)
		EXIT (CMP)	FACTOR (FEL)	MAP (MPT)	SELEC (SEL)	
EXTERNAL FORMULA NUMBERS WITH CORRESPONDING INTERNAL FORMULA NUMBERS AND ACTUAL LOCATIONS						
EFV	IFN	LDC	IFN	LDC	IFN	LDC
100	18	00340	2500	19	00342	1000
200	18	00340	2500	19	00342	1000
300	34	00456	4000	36	00463	4100
400	34	00456	4000	36	00463	4100
500	34	00456	4000	36	00463	4100
600	34	00456	4000	36	00463	4100
700	34	00456	4000	36	00463	4100
800	34	00456	4000	36	00463	4100
900	34	00456	4000	36	00463	4100
1000	34	00456	4000	36	00463	4100
1100	34	00456	4000	36	00463	4100
1200	34	00456	4000	36	00463	4100
1300	34	00456	4000	36	00463	4100
1400	34	00456	4000	36	00463	4100
1500	34	00456	4000	36	00463	4100
1600	34	00456	4000	36	00463	4100
1700	34	00456	4000	36	00463	4100
1800	34	00456	4000	36	00463	4100
1900	34	00456	4000	36	00463	4100
2000	34	00456	4000	36	00463	4100
2100	34	00456	4000	36	00463	4100
2200	34	00456	4000	36	00463	4100
2300	34	00456	4000	36	00463	4100
2400	34	00456	4000	36	00463	4100
2500	34	00456	4000	36	00463	4100
2600	34	00456	4000	36	00463	4100
2700	34	00456	4000	36	00463	4100
2800	34	00456	4000	36	00463	4100
2900	34	00456	4000	36	00463	4100
3000	34	00456	4000	36	00463	4100
3100	34	00456	4000	36	00463	4100
3200	34	00456	4000	36	00463	4100
3300	34	00456	4000	36	00463	4100
3400	34	00456	4000	36	00463	4100
3500	34	00456	4000	36	00463	4100
3600	34	00456	4000	36	00463	4100
3700	34	00456	4000	36	00463	4100
3800	34	00456	4000	36	00463	4100
3900	34	00456	4000	36	00463	4100
4000	34	00456	4000	36	00463	4100
4100	34	00456	4000	36	00463	4100
4200	34	00456	4000	36	00463	4100
4300	34	00456	4000	36	00463	4100
4400	34	00456	4000	36	00463	4100
4500	34	00456	4000	36	00463	4100
4600	34	00456	4000	36	00463	4100
4700	34	00456	4000	36	00463	4100
4800	34	00456	4000	36	00463	4100
4900	34	00456	4000	36	00463	4100
5000	34	00456	4000	36	00463	4100
5100	34	00456	4000	36	00463	4100
5200	34	00456	4000	36	00463	4100
5300	34	00456	4000	36	00463	4100
5400	34	00456	4000	36	00463	4100
5500	34	00456	4000	36	00463	4100
5600	34	00456	4000	36	00463	4100
5700	34	00456	4000	36	00463	4100
5800	34	00456	4000	36	00463	4100
5900	34	00456	4000	36	00463	4100
6000	34	00456	4000	36	00463	4100
6100	34	00456	4000	36	00463	4100
6200	34	00456	4000	36	00463	4100
6300	34	00456	4000	36	00463	4100
6400	34	00456	4000	36	00463	4100
6500	34	00456	4000	36	00463	4100
6600	34	00456	4000	36	00463	4100
6700	34	00456	4000	36	00463	4100
6800	34	00456	4000	36	00463	4100
6900	34	00456	4000	36	00463	4100
7000	34	00456	4000	36	00463	4100
7100	34	00456	4000	36	00463	4100
7200	34	00456	4000	36	00463	4100
7300	34	00456	4000	36	00463	4100
7400	34	00456	4000	36	00463	4100
7500	34	00456	4000	36	00463	4100
7600	34	00456	4000	36	00463	4100
7700	34	00456	4000	36	00463	4100
7800	34	00456	4000	36	00463	4100
7900	34	00456	4000	36	00463	4100
8000	34	00456	4000	36	00463	4100
8100	34	00456	4000	36	00463	4100
8200	34	00456	4000	36	00463	4100
8300	34	00456	4000	36	00463	4100
8400	34	00456	4000	36	00463	4100
8500	34	00456	4000	36	00463	4100
8600	34	00456	4000	36	00463	4100
8700	34	00456	4000	36	00463	4100
8800	34	00456	4000	36	00463	4100
8900	34	00456	4000	36	00463	4100
9000	34	00456	4000	36	00463	4100
9100	34	00456	4000	36	00463	4100
9200	34	00456	4000	36	00463	4100
9300	34	00456	4000	36	00463	4100
9400	34	00456	4000	36	00463	4100
9500	34	00456	4000	36	00463	4100
9600	34	00456	4000	36	00463	4100
9700	34	00456	4000	36	00463	4100
9800	34	00456	4000	36	00463	4100
9900	34	00456	4000	36	00463	4100
10000	34	00456	4000	36	00463	4100

Figure 38. Main Program Core Storage Map
(continued)

JF360	CONVEX II: MAIN PROG-ANALYSIS AND PROG BY K.A.TROUPS-NAA STD., 11/1/63										02/06/64		PAGE 22	
	266232	420	04101	264932	421	04107	265332	423	04115	267232	126	04124		
	266232	431	04130	264932	439	04145	265332	441	04153	267232	126	04136		
	266232	442	04143	264932	449	04156	265332	451	04166	267232	126	04146		
	266232	453	04130	264932	460	04130	265332	462	04136	267232	126	04156		
	266232	464	04130	264932	469	04130	265332	470	04136	267232	126	04166		
	266232	475	04130	264932	482	04130	265332	485	04136	267232	126	04176		
	266232	486	04130	264932	495	04130	265332	498	04136	267232	126	04186		
	266232	496	04130	264932	505	04130	265332	508	04136	267232	126	04196		
	266232	507	04130	264932	516	04130	265332	519	04136	267232	126	04206		
	266232	520	04130	264932	529	04130	265332	532	04136	267232	126	04216		
	266232	531	04130	264932	540	04130	265332	543	04136	267232	126	04226		
	266232	544	04130	264932	553	04130	265332	556	04136	267232	126	04236		
	266232	557	04130	264932	566	04130	265332	569	04136	267232	126	04246		
	266232	570	04130	264932	579	04130	265332	582	04136	267232	126	04256		
	266232	581	04130	264932	590	04130	265332	593	04136	267232	126	04266		
	266232	594	04130	264932	603	04130	265332	606	04136	267232	126	04276		
	266232	607	04130	264932	616	04130	265332	619	04136	267232	126	04286		
	266232	620	04130	264932	629	04130	265332	632	04136	267232	126	04296		
	266232	633	04130	264932	642	04130	265332	645	04136	267232	126	04306		
	266232	646	04130	264932	655	04130	265332	658	04136	267232	126	04316		
	266232	659	04130	264932	668	04130	265332	671	04136	267232	126	04326		
	266232	674	04130	264932	683	04130	265332	686	04136	267232	126	04336		
	266232	687	04130	264932	696	04130	265332	699	04136	267232	126	04346		
	266232	700	04130	264932	709	04130	265332	712	04136	267232	126	04356		
	266232	713	04130	264932	722	04130	265332	725	04136	267232	126	04366		
	266232	726	04130	264932	735	04130	265332	738	04136	267232	126	04376		
	266232	739	04130	264932	748	04130	265332	751	04136	267232	126	04386		
	266232	752	04130	264932	761	04130	265332	764	04136	267232	126	04396		
	266232	765	04130	264932	774	04130	265332	777	04136	267232	126	04406		
	266232	778	04130	264932	787	04130	265332	790	04136	267232	126	04416		
	266232	789	04130	264932	798	04130	265332	801	04136	267232	126	04426		
	266232	802	04130	264932	811	04130	265332	814	04136	267232	126	04436		
	266232	815	04130	264932	824	04130	265332	827	04136	267232	126	04446		
	266232	828	04130	264932	837	04130	265332	840	04136	267232	126	04456		
	266232	839	04130	264932	848	04130	265332	851	04136	267232	126	04466		
	266232	852	04130	264932	861	04130	265332	864	04136	267232	126	04476		
	266232	865	04130	264932	870	04130	265332	873	04136	267232	126	04486		
	266232	874	04130	264932	883	04130	265332	886	04136	267232	126	04496		
	266232	887	04130	264932	896	04130	265332	899	04136	267232	126	04506		
	266232	900	04130	264932	909	04130	265332	912	04136	267232	126	04516		
	266232	913	04130	264932	922	04130	265332	925	04136	267232	126	04526		
	266232	926	04130	264932	935	04130	265332	938	04136	267232	126	04536		
	266232	939	04130	264932	948	04130	265332	951	04136	267232	126	04546		
	266232	952	04130	264932	961	04130	265332	964	04136	267232	126	04556		
	266232	965	04130	264932	974	04130	265332	977	04136	267232	126	04566		
	266232	978	04130	264932	987	04130	265332	990	04136	267232	126	04576		
	266232	989	04130	264932	998	04130	265332	1001	04136	267232	126	04586		
	266232	1002	04130	264932	1011	04130	265332	1014	04136	267232	126	04596		
	266232	1015	04130	264932	1024	04130	265332	1027	04136	267232	126	04606		
	266232	1028	04130	264932	1037	04130	265332	1040	04136	267232	126	04616		
	266232	1039	04130	264932	1048	04130	265332	1051	04136	267232	126	04626		
	266232	1052	04130	264932	1061	04130	265332	1064	04136	267232	126	04636		
	266232	1065	04130	264932	1074	04130	265332	1077	04136	267232	126	04646		
	266232	1078	04130	264932	1087	04130	265332	1090	04136	267232	126	04656		
	266232	1089	04130	264932	1098	04130	265332	1101	04136	267232	126	04666		
	266232	1102	04130	264932	1111	04130	265332	1114	04136	267232	126	04676		
	266232	1115	04130	264932	1124	04130	265332	1127	04136	267232	126	04686		
	266232	1128	04130	264932	1137	04130	265332	1140	04136	267232	126	04696		
	266232	1139	04130	264932	1148	04130	265332	1151	04136	267232	126	04706		
	266232	1152	04130	264932	1161	04130	265332	1164	04136	267232	126	04716		
	266232	1165	04130	264932	1174	04130	265332	1177	04136	267232	126	04726		
	266232	1178	04130	264932	1187	04130	265332	1190	04136	267232	126	04736		
	266232	1189	04130	264932	1198	04130	265332	1201	04136	267232	126	04746		
	266232	1202	04130	264932	1211	04130	265332	1214	04136	267232	126	04756		
	266232	1215	04130	264932	1224	04130	265332	1227	04136	267232	126	04766		
	266232	1228	04130	264932	1237	04130	265332	1240	04136	267232	126	04776		
	266232	1239	04130	264932	1248	04130	265332	1251	04136	267232	126	04786		
	266232	1252	04130	264932	1261	04130	265332	1264	04136	267232	126	04796		
	266232	1265	04130	264932	1274	04130	265332	1277	04136	267232	126	04806		
	266232	1278	04130	264932	1287	04130	265332	1290	04136	267232	126	04816		
	266232	1289	04130	264932	1298	04130	265332	1301	04136	267232	126	04826		
	266232	1302	04130	264932	1311	04130	265332	1314	04136	267232	126	04836		
	266232	1315	04130	264932	1324	04130	265332	1327	04136	267232	126	04846		
	266232	1328	04130	264932	1337	04130	265332	1340	04136	267232	126	04856		
	266232	1339	04130	264932	1348	04130	265332	1351	04136	267232	126	04866		
	266232	1352	04130	264932	1361	04130	265332	1364	04136	267232	126	04876		
	266232	1365	04130	264932	1374	04130	265332	1377	04136	267232	126	04886		
	266232	1378	04130	264932	1387	04130	265332	1390	04136	267232	126	04896		
	266232	1389	04130	264932	1398	04130	265332	1401	04136	267232	126	04906		
	266232	1402	04130	264932	1411	04130	265332	1414	04136	267232	126	04916		
	266232	1415	04130	264932	1424	04130	265332	1427	04136	267232	126	04926		
	266232	1428	04130	264932	1437	04130	265332	1440	04136	267232	126	04936		
	266232	1439	04130	264932	1448	04130	265332	1451	04136	267232	126	04946		
	266232	1452	04130	264932	1461	04130	265332	1464	04136	267232	126	04956		
	266232	1465	04130	264932	1474	04130	265332	1477	04136	267232	126	04966		
	266232	1478	04130	264932	1487	04130	265332	1490	04136	267232	126	04976		
	266232	1489	04130	264932	1498	04130	265332	1501	04136	267232	126	04986		
	266232	1502	04130	264932	1511	04130	265332	1514	04136	267232	126	04996		
	266232	1515	04130	264932	1524	04130	265332	1527	04136	267232	126	05006		
	266232	1528	04130	264932	1537	04130	265332	1540	04136	267232	126	05016		
	266232	1539	04130	264932	1548	04130	265332	1551	04136	267232	126	05026		
	266232	1552	04130	264932	1561	04130	265332	1564	04136	267232	126	05036		
	266232	15												

[illegible]

Figure 39. Subroutine UNIVC Listing

STORAGE NOT USED BY PROGRAM		
DEC	OCF	DEC
206 00316	14637 34455	
STORAGE LOCATIONS FOR VARIABLES APPEARING IN COMMON STATEMENTS		
DEC	OCF	DEC
ANAP 15169 35501	AREA 21087 51113	AREA 21087 51113
OT 22102 51176	DX 15246 35616	OT 15179 35513
FMP 16115 37387	FM 15011 35263	FM 15180 35514
15493 38208	LD 16129 37401	LI 16121 37391
MP 20942 50716	MDL 15167 35477	MSNGS 15023 35287
MOA 22160 51126	MOG 15169 35496	NOT 22102 51126
15493 38203	MSC 21213 51335	MMN 21093 52275
NHL 15183 35517	NMS 16418 40042	NSID 21101 51125
NP 15493 38203	NTI 15169 35477	NP 22102 51126
15493 38203	PE 32263 77451	NP 32288 77486
PAF 16151 37427	RX 21009 51021	RY 20948 51006
15493 38203	TD 16150 37427	TX 15169 35496
VA 32995 30112	Y 16159 37432	XI 15169 35496
YI 15368 36010	Y 14769 34681	ZS 20987 50773
STORAGE LOCATIONS FOR VARIABLES APPEARING IN DIMENSION AND EQUIVALENCE STATEMENTS		
DEC	OCF	DEC
D 205 00315		
STORAGE LOCATIONS FOR VARIABLES NOT APPEARING IN COMMON, DIMENSION, OR EQUIVALENCE STATEMENTS		
DEC	OCF	DEC
11 199 00307	VL 198 00306	
LOCATIONS FOR OTHER SYMBOLS NOT APPEARING IN SOURCE PROGRAM		
DEC	OCF	DEC
CL 22102 51126	DA 22102 51126	CL 22102 51126
FAF 15165 35521	FI 14900 35146	FI 14900 35146
LI 16121 37391	LP 16123 37393	LP 16123 37393
NCL 15178 35512	NH 15184 35520	NH 15184 35520
NP 21101 51155	NP 21101 51155	NP 21101 51155
NSI 15181 35515	PI 14274 37632	PI 14274 37632
SC 21609 52275	SL 21609 52275	SL 21609 52275
TNI 15184 35520	TNI 15184 35520	TNI 15184 35520
VL 14789 35031	VL 14789 35031	VL 14789 35031

Figure 40. Subroutine UNIVG Core Storage Map

73361 UNIVET(C)NFC IISANALYSIS AND PROGRAMMING BY K.A.TOUSSA,MASSIO,11/1/63 11/07/73 PAGE 3

DEC	OC	DEC	OC	DEC	OC	DEC	OC
13	189 00275	21	178 00262	61	183 00257	C11C0	193 00301
14	190 00276	22	179 00263	62	184 00258	C11C0	194 00302
15	191 00277	23	180 00264	63	185 00259	C11C0	195 00303
16	192 00278	24	181 00265	64	186 00260	C11C0	196 00304
17	193 00279	25	182 00266	65	187 00261	C11C0	197 00305
18	194 00280	26	183 00267	66	188 00262	C11C0	198 00306
19	195 00281	27	184 00268	67	189 00263	C11C0	199 00307
20	196 00282	28	185 00269	68	190 00264	C11C0	200 00308
21	197 00283	29	186 00270	69	191 00265	C11C0	201 00309
22	198 00284	30	187 00271	70	192 00266	C11C0	202 00310
23	199 00285	31	188 00272	71	193 00267	C11C0	203 00311
24	200 00286	32	189 00273	72	194 00268	C11C0	204 00312
25	201 00287	33	190 00274	73	195 00269	C11C0	205 00313
26	202 00288	34	191 00275	74	196 00270	C11C0	206 00314
27	203 00289	35	192 00276	75	197 00271	C11C0	207 00315
28	204 00290	36	193 00277	76	198 00272	C11C0	208 00316
29	205 00291	37	194 00278	77	199 00273	C11C0	209 00317
30	206 00292	38	195 00279	78	200 00274	C11C0	210 00318
31	207 00293	39	196 00280	79	201 00275	C11C0	211 00319
32	208 00294	40	197 00281	80	202 00276	C11C0	212 00320
33	209 00295	41	198 00282	81	203 00277	C11C0	213 00321
34	210 00296	42	199 00283	82	204 00278	C11C0	214 00322
35	211 00297	43	200 00284	83	205 00279	C11C0	215 00323
36	212 00298	44	201 00285	84	206 00280	C11C0	216 00324
37	213 00299	45	202 00286	85	207 00281	C11C0	217 00325
38	214 00300	46	203 00287	86	208 00282	C11C0	218 00326
39	215 00301	47	204 00288	87	209 00283	C11C0	219 00327
40	216 00302	48	205 00289	88	210 00284	C11C0	220 00328
41	217 00303	49	206 00290	89	211 00285	C11C0	221 00329
42	218 00304	50	207 00291	90	212 00286	C11C0	222 00330
43	219 00305	51	208 00292	91	213 00287	C11C0	223 00331
44	220 00306	52	209 00293	92	214 00288	C11C0	224 00332
45	221 00307	53	210 00294	93	215 00289	C11C0	225 00333
46	222 00308	54	211 00295	94	216 00290	C11C0	226 00334
47	223 00309	55	212 00296	95	217 00291	C11C0	227 00335
48	224 00310	56	213 00297	96	218 00292	C11C0	228 00336
49	225 00311	57	214 00298	97	219 00293	C11C0	229 00337
50	226 00312	58	215 00299	98	220 00294	C11C0	230 00338
51	227 00313	59	216 00300	99	221 00295	C11C0	231 00339
52	228 00314	60	217 00301	100	222 00296	C11C0	232 00340
53	229 00315	61	218 00302	101	223 00297	C11C0	233 00341
54	230 00316	62	219 00303	102	224 00298	C11C0	234 00342
55	231 00317	63	220 00304	103	225 00299	C11C0	235 00343
56	232 00318	64	221 00305	104	226 00300	C11C0	236 00344
57	233 00319	65	222 00306	105	227 00301	C11C0	237 00345
58	234 00320	66	223 00307	106	228 00302	C11C0	238 00346
59	235 00321	67	224 00308	107	229 00303	C11C0	239 00347
60	236 00322	68	225 00309	108	230 00304	C11C0	240 00348
61	237 00323	69	226 00310	109	231 00305	C11C0	241 00349
62	238 00324	70	227 00311	110	232 00306	C11C0	242 00350
63	239 00325	71	228 00312	111	233 00307	C11C0	243 00351
64	240 00326	72	229 00313	112	234 00308	C11C0	244 00352
65	241 00327	73	230 00314	113	235 00309	C11C0	245 00353
66	242 00328	74	231 00315	114	236 00310	C11C0	246 00354
67	243 00329	75	232 00316	115	237 00311	C11C0	247 00355
68	244 00330	76	233 00317	116	238 00312	C11C0	248 00356
69	245 00331	77	234 00318	117	239 00313	C11C0	249 00357
70	246 00332	78	235 00319	118	240 00314	C11C0	250 00358
71	247 00333	79	236 00320	119	241 00315	C11C0	251 00359
72	248 00334	80	237 00321	120	242 00316	C11C0	252 00360
73	249 00335	81	238 00322	121	243 00317	C11C0	253 00361
74	250 00336	82	239 00323	122	244 00318	C11C0	254 00362
75	251 00337	83	240 00324	123	245 00319	C11C0	255 00363
76	252 00338	84	241 00325	124	246 00320	C11C0	256 00364
77	253 00339	85	242 00326	125	247 00321	C11C0	257 00365
78	254 00340	86	243 00327	126	248 00322	C11C0	258 00366
79	255 00341	87	244 00328	127	249 00323	C11C0	259 00367
80	256 00342	88	245 00329	128	250 00324	C11C0	260 00368
81	257 00343	89	246 00330	129	251 00325	C11C0	261 00369
82	258 00344	90	247 00331	130	252 00326	C11C0	262 00370
83	259 00345	91	248 00332	131	253 00327	C11C0	263 00371
84	260 00346	92	249 00333	132	254 00328	C11C0	264 00372
85	261 00347	93	250 00334	133	255 00329	C11C0	265 00373
86	262 00348	94	251 00335	134	256 00330	C11C0	266 00374
87	263 00349	95	252 00336	135	257 00331	C11C0	267 00375
88	264 00350	96	253 00337	136	258 00332	C11C0	268 00376
89	265 00351	97	254 00338	137	259 00333	C11C0	269 00377
90	266 00352	98	255 00339	138	260 00334	C11C0	270 00378
91	267 00353	99	256 00340	139	261 00335	C11C0	271 00379
92	268 00354	100	257 00341	140	262 00336	C11C0	272 00380
93	269 00355	101	258 00342	141	263 00337	C11C0	273 00381
94	270 00356	102	259 00343	142	264 00338	C11C0	274 00382
95	271 00357	103	260 00344	143	265 00339	C11C0	275 00383
96	272 00358	104	261 00345	144	266 00340	C11C0	276 00384
97	273 00359	105	262 00346	145	267 00341	C11C0	277 00385
98	274 00360	106	263 00347	146	268 00342	C11C0	278 00386
99	275 00361	107	264 00348	147	269 00343	C11C0	279 00387
100	276 00362	108	265 00349	148	270 00344	C11C0	280 00388
101	277 00363	109	266 00350	149	271 00345	C11C0	281 00389
102	278 00364	110	267 00351	150	272 00346	C11C0	282 00390
103	279 00365	111	268 00352	151	273 00347	C11C0	283 00391
104	280 00366	112	269 00353	152	274 00348	C11C0	284 00392
105	281 00367	113	270 00354	153	275 00349	C11C0	285 00393
106	282 00368	114	271 00355	154	276 00350	C11C0	286 00394
107	283 00369	115	272 00356	155	277 00351	C11C0	287 00395
108	284 00370	116	273 00357	156	278 00352	C11C0	288 00396
109	285 00371	117	274 00358	157	279 00353	C11C0	289 00397
110	286 00372	118	275 00359	158	280 00354	C11C0	290 00398
111	287 00373	119	276 00360	159	281 00355	C11C0	291 00399
112	288 00374	120	277 00361	160	282 00356	C11C0	292 00400
113	289 00375	121	278 00362	161	283 00357	C11C0	293 00401
114	290 00376	122	279 00363	162	284 00358	C11C0	294 00402
115	291 00377	123	280 00364	163	285 00359	C11C0	295 00403
116	292 00378	124	281 00365	164	286 00360	C11C0	296 00404
117	293 00379	125	282 00366	165	287 00361	C11C0	297 00405
118	294 00380	126	283 00367	166	288 00362	C11C0	298 00406
119	295 00381	127	284 00368	167	289 00363	C11C0	299 00407
120	296 00382	128	285 00369	168	290 00364	C11C0	300 00408
121	297 00383	129	286 00370	169	291 00365	C11C0	301 00409
122	298 00384	130	287 00371	170	292 00366	C11C0	302 00410
123	299 00385	131	288 00372	171	293 00367	C11C0	303 00411
124	300 00386	132	289 00373	172	294 00368	C11C0	304 00412
125	301 00387	133	290 00374	173	295 00369	C11C0	305 00413
126	302 00388	134	291 00375	174	296 00370	C11C0	306 00414
127	303 00389	135	292 00376	175	297 00371	C11C0	307 00415
128	304 00390	136	293 00377	176	298 00372	C11C0	308 00416
129	305 00391	137	294 00378	177	299 00373	C11C0	309 00417
130	306 00392	138	295 00379	178	300 00374	C11C0	310 00418
131	307 00393	139	296 00380	179	301 00375	C11C0	311 00419
132	308 0						

[illegible]

Figure 41. Subroutine TXFRM Listing

[illegible]

Figure 41. Subroutine TXFRM Listing
(continued)

STORAGE NOT USED BY PROGRAM

DEC OCT
702 01276

DEC OCT
14637 34455

STORAGE LOCATIONS FOR VARIABLES APPEARING IN COMMON STATEMENTS

ANAP 15169 35501	DEC OCT	AREA 21067 51113	DEC OCT	AREAK 21011 51023	DEC OCT	C1 21074 53116
C2 21045 52071	DEC OCT	C3 21795 52443	DEC OCT	CL 16140 37414	DEC OCT	DK 21154 52212
DM 16119 37269	DEC OCT	FM 15011 32243	DEC OCT	FD 15180 35212	DEC OCT	EV 14955 35144
IM- 14649 34471	DEC OCT	KC 20976 50760	DEC OCT	VD 22154 53212	DEC OCT	KP 14992 36204
MP 20842 30215	DEC OCT	MD 15162 34497	DEC OCT	MSNS 15021 37247	DEC OCT	NCL 15123 31773
ADA 22100 53124	DEC OCT	MDC 22112 53140	DEC OCT	NUL 21157 51245	DEC OCT	NON 22114 53142
MO 15168 35500	DEC OCT	ND 15494 38206	DEC OCT	NOT 22102 53126	DEC OCT	NPI 15186 35520
MP 13491 36203	DEC OCT	NSC 21413 51335	DEC OCT	MSIO 22101 53125	DEC OCT	NVL 15181 35515
NSM 21269 51425	DEC OCT	NTILF 21493 51435	DEC OCT	NVI 15182 35516	DEC OCT	NVL 15181 35515
PA 16154 40106	DEC OCT	PA 16154 40106	DEC OCT	PA 16154 40106	DEC OCT	PA 16154 40106
SP 16445 40075	DEC OCT	FOA 22120 53124	DEC OCT	ZDV 22114 53142	DEC OCT	SL 31655 52242
VI 15368 36210	DEC OCT	Y 16146 34432	DEC OCT	ZS 25947 50102	DEC OCT	SL 31655 52242
						X 14889 35051

STORAGE LOCATIONS FOR VARIABLES APPEARING IN DIMENSION AND EQUIVALENCE STATEMENTS

CO5A 686 01256	DEC OCT	DI 677 01245	DEC OCT	R 698 01272	DEC OCT	T 701 01275
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STORAGE LOCATIONS FOR VARIABLE'S NOT APPEARING IN COMMON, DIMENSION, OR EQUIVALENCE STATEMENTS:

A 668 01236	DEC OCT	B 657 01273	DEC OCT	CD 666 01212	DEC OCT	C 666 01225
D 664 01230	DEC OCT	DV 655 01227	DEC OCT	E 662 01226	DEC OCT	F 661 01225
J2 660 01224	DEC OCT	J 659 01223	DEC OCT	KM 658 01222	DEC OCT	K 657 01221
M 656 01220	DEC OCT	NC 655 01217	DEC OCT	N 654 01216	DEC OCT	

Figure 42. Subroutine TXFRM Core Storage Map

LOCATIONS FOR OTHER SYMBOLS NOT APPEARING IN SOURCE PROGRAM

DEC	OCT	DEC	OCT	DEC	OCT
11 613 01145	21 595 01123	31 904 01134	41 805 01137		
A1121 626 01162	A1122 627 01163	C1124 628 01164	C1125 629 01165		
C1126 630 01166	C1127 631 01167	C1128 632 01168	C1129 633 01169		
C1130 634 01170	C1131 635 01171	C1132 636 01172	C1133 637 01173		
C1134 638 01174	C1135 639 01175	C1136 640 01176	C1137 641 01177		
C1138 642 01178	C1139 643 01179	C1140 644 01180	C1141 645 01181		
C1142 646 01182	C1143 647 01183	C1144 648 01184	C1145 649 01185		
C1146 650 01186	C1147 651 01187	C1148 652 01188	C1149 653 01189		
C1150 654 01190	C1151 655 01191	C1152 656 01192	C1153 657 01193		
C1154 658 01194	C1155 659 01195	C1156 660 01196	C1157 661 01197		
C1158 662 01198	C1159 663 01199	C1160 664 01200	C1161 665 01201		
C1162 666 01202	C1163 667 01203	C1164 668 01204	C1165 669 01205		
C1166 670 01206	C1167 671 01207	C1168 672 01208	C1169 673 01209		
C1170 674 01210	C1171 675 01211	C1172 676 01212	C1173 677 01213		
C1174 678 01214	C1175 679 01215	C1176 680 01216	C1177 681 01217		
C1178 682 01218	C1179 683 01219	C1180 684 01220	C1181 685 01221		
C1182 686 01222	C1183 687 01223	C1184 688 01224	C1185 689 01225		
C1186 690 01226	C1187 691 01227	C1188 692 01228	C1189 693 01229		
C1190 694 01230	C1191 695 01231	C1192 696 01232	C1193 697 01233		
C1194 698 01234	C1195 699 01235	C1196 700 01236	C1197 701 01237		
C1198 702 01238	C1199 703 01239	C1200 704 01240	C1201 705 01241		
C1202 706 01242	C1203 707 01243	C1204 708 01244	C1205 709 01245		
C1206 710 01246	C1207 711 01247	C1208 712 01248	C1209 713 01249		
C1210 714 01250	C1211 715 01251	C1212 716 01252	C1213 717 01253		
C1214 718 01254	C1215 719 01255	C1216 720 01256	C1217 721 01257		
C1218 722 01258	C1219 723 01259	C1220 724 01260	C1221 725 01261		
C1222 726 01262	C1223 727 01263	C1224 728 01264	C1225 729 01265		
C1226 730 01266	C1227 731 01267	C1228 732 01268	C1229 733 01269		
C1230 734 01270	C1231 735 01271	C1232 736 01272	C1233 737 01273		
C1234 738 01274	C1235 739 01275	C1236 740 01276	C1237 741 01277		
C1238 742 01278	C1239 743 01279	C1240 744 01280	C1241 745 01281		
C1242 746 01282	C1243 747 01283	C1244 748 01284	C1245 749 01285		
C1246 750 01286	C1247 751 01287	C1248 752 01288	C1249 753 01289		
C1250 754 01290	C1251 755 01291	C1252 756 01292	C1253 757 01293		
C1254 758 01294	C1255 759 01295	C1256 760 01296	C1257 761 01297		
C1258 762 01298	C1259 763 01299	C1260 764 01300	C1261 765 01301		
C1262 766 01302	C1263 767 01303	C1264 768 01304	C1265 769 01305		
C1266 770 01306	C1267 771 01307	C1268 772 01308	C1269 773 01309		
C1270 774 01310	C1271 775 01311	C1272 776 01312	C1273 777 01313		
C1274 778 01314	C1275 779 01315	C1276 780 01316	C1277 781 01317		
C1278 782 01318	C1279 783 01319	C1280 784 01320	C1281 785 01321		
C1282 786 01322	C1283 787 01323	C1284 788 01324	C1285 789 01325		
C1286 790 01326	C1287 791 01327	C1288 792 01328	C1289 793 01329		
C1290 794 01330	C1291 795 01331	C1292 796 01332	C1293 797 01333		
C1294 798 01334	C1295 799 01335	C1296 800 01336	C1297 801 01337		
C1298 802 01338	C1299 803 01339	C1300 804 01340	C1301 805 01341		
C1302 806 01342	C1303 807 01343	C1304 808 01344	C1305 809 01345		
C1306 810 01346	C1307 811 01347	C1308 812 01348	C1309 813 01349		
C1310 814 01350	C1311 815 01351	C1312 816 01352	C1313 817 01353		
C1314 818 01354	C1315 819 01355	C1316 820 01356	C1317 821 01357		
C1318 822 01358	C1319 823 01359	C1320 824 01360	C1321 825 01361		
C1322 826 01362	C1323 827 01363	C1324 828 01364	C1325 829 01365		
C1326 830 01366	C1327 831 01367	C1328 832 01368	C1329 833 01369		
C1330 834 01370	C1331 835 01371	C1332 836 01372	C1333 837 01373		
C1334 838 01374	C1335 839 01375	C1336 840 01376	C1337 841 01377		
C1338 842 01378	C1339 843 01379	C1340 844 01380	C1341 845 01381		
C1342 846 01382	C1343 847 01383	C1344 848 01384	C1345 849 01385		
C1346 850 01386	C1347 851 01387	C1348 852 01388	C1349 853 01389		
C1350 854 01390	C1351 855 01391	C1352 856 01392	C1353 857 01393		
C1354 858 01394	C1355 859 01395	C1356 860 01396	C1357 861 01397		
C1358 862 01398	C1359 863 01399	C1360 864 01400	C1361 865 01401		
C1362 866 01402	C1363 867 01403	C1364 868 01404	C1365 869 01405		
C1366 870 01406	C1367 871 01407	C1368 872 01408	C1369 873 01409		
C1370 874 01410	C1371 875 01411	C1372 876 01412	C1373 877 01413		
C1374 878 01414	C1375 879 01415	C1376 880 01416	C1377 881 01417		
C1378 882 01418	C1379 883 01419	C1380 884 01420	C1381 885 01421		
C1382 886 01422	C1383 887 01423	C1384 888 01424	C1385 889 01425		
C1386 890 01426	C1387 891 01427	C1388 892 01428	C1389 893 01429		
C1390 894 01430	C1391 895 01431	C1392 896 01432	C1393 897 01433		
C1394 898 01434	C1395 899 01435	C1396 900 01436	C1397 901 01437		
C1398 902 01438	C1399 903 01439	C1400 904 01440	C1401 905 01441		
C1402 906 01442	C1403 907 01443	C1404 908 01444	C1405 909 01445		
C1406 910 01446	C1407 911 01447	C1408 912 01448	C1409 913 01449		
C1410 914 01450	C1411 915 01451	C1412 916 01452	C1413 917 01453		
C1414 918 01454	C1415 919 01455	C1416 920 01456	C1417 921 01457		
C1418 922 01458	C1419 923 01459	C1420 924 01460	C1421 925 01461		
C1422 926 01462	C1423 927 01463	C1424 928 01464	C1425 929 01465		
C1426 930 01466	C1427 931 01467	C1428 932 01468	C1429 933 01469		
C1430 934 01470	C1431 935 01471	C1432 936 01472	C1433 937 01473		
C1434 938 01474	C1435 939 01475	C1436 940 01476	C1437 941 01477		
C1438 942 01478	C1439 943 01479	C1440 944 01480	C1441 945 01481		
C1442 946 01482	C1443 947 01483	C1444 948 01484	C1445 949 01485		
C1446 950 01486	C1447 951 01487	C1448 952 01488	C1449 953 01489		
C1450 954 01490	C1451 955 01491	C1452 956 01492	C1453 957 01493		
C1454 958 01494	C1455 959 01495	C1456 960 01496	C1457 961 01497		
C1458 962 01498	C1459 963 01499	C1460 964 01500	C1461 965 01501		
C1462 966 01502	C1463 967 01503	C1464 968 01504	C1465 969 01505		
C1466 970 01506	C1467 971 01507	C1468 972 01508	C1469 973 01509		
C1470 974 01510	C1471 975 01511	C1472 976 01512	C1473 977 01513		
C1474 978 01514	C1475 979 01515	C1476 980 01516	C1477 981 01517		
C1478 982 01518	C1479 983 01519	C1480 984 01520	C1481 985 01521		
C1482 986 01522	C1483 987 01523	C1484 988 01524	C1485 989 01525		
C1486 990 01526	C1487 991 01527	C1488 992 01528	C1489 993 01529		
C1490 994 01530	C1491 995 01531	C1492 996 01532	C1493 997 01533		
C1494 998 01534	C1495 999 01535	C1496 1000 01536	C1497 1001 01537		
C1498 1002 01538	C1499 1003 01539	C1500 1004 01540	C1501 1005 01541		
C1502 1006 01542	C1503 1007 01543	C1504 1008 01544	C1505 1009 01545		
C1506 1010 01546	C1507 1011 01547	C1508 1012 01548	C1509 1013 01549		
C1510 1014 01550	C1511 1015 01551	C1512 1016 01552	C1513 1017 01553		
C1514 1018 01554	C1515 1019 01555	C1516 1020 01556	C1517 1021 01557		
C1518 1022 01558	C1519 1023 01559	C1520 1024 01560	C1521 1025 01561		
C1522 1026 01562	C1523 1027 01563	C1524 1028 01564	C1525 1029 01565		
C1526 1030 01566	C1527 1031 01567	C1528 1032 01568	C1529 1033 01569		
C1530 1034 01570	C1531 1035 01571	C1532 1036 01572	C1533 1037 01573		
C1534 1038 01574	C1535 1039 01575	C1536 1040 01576	C1537 1041 01577		
C1538 1042 01578	C1539 1043 01579	C1540 1044 01580	C1541 1045 01581		
C1542 1046 01582	C1543 1047 01583	C1544 1048 01584	C1545 1049 01585		
C1546 1050 01586	C1547 1051 01587	C1548 1052 01588	C1549 1053 01589		
C1550 1054 01590	C1551 1055 01591	C1552 1056 01592	C1553 1057 01593		
C1554 1058 01594	C1555 1059 01595	C1556 1060 01596	C1557 1061 01597		
C1558 1062 01598	C1559 1063 01599	C1560 1064 01600	C1561 1065 01601		
C1562 1066 01602	C1563 1067 01603	C1564 1068 01604	C1565 1069 01605		
C1566 1070 01606	C1567 1071 01607	C1568 1072 01608	C1569 1073 01609		
C1570 1074 01610	C1571 1075 01611	C1572 1076 01612	C1573 1077 01613		
C1574 1078 01614	C1575 1079 01615	C1576 1080 01616	C1577 1081 01617		
C1578 1082 01618	C1579 1083 01619	C1580 1084 01620	C1581 1085 01621		
C1582 1086 01622	C1583 1087 01623	C1584 1088 01624	C1585 1089 01625		
C1586 1090 01626	C1587 1091 01627	C1588 1092 01628	C1589 1093 01629		
C1590 1094 01630	C1591 1095 01631	C1592 1096 01632	C1593 1097 01633		
C1594 1098 01634	C1595 1099 01635	C1596 1100 01636	C1597 1101 01637		
C1598 1102 01638	C1599 1103 01639	C1600 1104 01640	C1601 1105 01641		
C1602 1106 01642	C1603 1107 01643	C1604 1108 01644	C1605 1109 01645		
C1606 1110 01646	C1607 1111 01647	C1608 1112 01648	C1609 1113 01649		
C1610 1114 01650	C1611 1115 01651	C1612 1116 01652	C1613 1117 01653		
C1614 1118 01654	C1615 1119 01655	C1616 1120 01656	C1617 1121 01657		
C1618 1122 01658	C1619 1123 01659	C1620 1124 01660	C1621 1125 01661		
C1622 1126 01662	C1623 1127 01663	C1624 1128 01664	C1625 1129 01665		
C1626 1130 01666	C1627 1131 01667	C1628 1132 01668	C1629 1133 01669		
C1630 1134 01670	C1631 1135 01671	C1632 1136 01672	C1633 1137 01673		
C1634 1138 01674	C1635 1139 01675	C1636 1140 01676	C1637 1141 01677		
C1638 1142 01678	C1639 1143 01679	C1640 1144 01680	C1641 1145 01681		
C1642 1146 01682	C1643 1147 01683	C1644 1148 01684	C1645 1149 01685		
C1646 1150 01686	C1647 1151 01687	C1648 1152 01688	C1649 1153 01689		
C1650 1154 01690	C1651 1155 01691	C1652 115			

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C DIRECTION=K4C11 ANALYSIS AND PROGRAMING BY K.A.TUPINS,NKASD1,11/1/63
SUBROUTINE UICUO
C THIS SUBROUTINE DETERMINES WHETHER ONE SURFACE SEE EACH OTHER IN
C THIS SURFACE AREA. THE SURFACE AREA IS THE AREA OF THE SURFACE
C C THE POSITION OF EACH SURFACE WHICH IS SEEN BY THE OTHER
C DIMENSION MATEC(3),MATEC1(3),MATEC2(3),MATEC3(3),MATEC4(3),
C MATEC5(3),MATEC6(3),MATEC7(3),MATEC8(3),MATEC9(3),MATEC10(3),
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C MATEC431(3),MATEC432(3),MATEC433(3),MATEC434(3),MATEC435(3),
C MATEC436(3),
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Figure 43. Subroutine DOICU Listing

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Figure 43. Subroutine DOICU Listing
(continued)

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C PRCEED TO RESCT SURFACE KL IF REQUIRED
15700 IF(LI(KL))16000,7000,34000
C PICKUP SUBSCRIPTS OF SURFACES IN ARRAY P
16000 IS=1;M=1;N=1;JL=1
C TEST Z-COORDINATES OF SURFACE KL. COMPUTE X,Y AT TRANSITION AND REINJ=36312200
C 8th POINTS ABOVE HORIZON.
SENSE LIGHT 0
DO 22000 N=1,NP
C IF 1ST POINT IS HORIZON, USE THE POINT. TURN ON SLL IF ZERO.
IF(P13,M,JL)171000,18000,14000
C IF NEXT POINT IS - OR 0 CONTINUE. IF *GO TO COMPUTE X,Y AT HORIZON.
IF(P13,M+1,JL)20000,22000,21000
C ADVANCE TO THE NEXT SUBSCRIPT TO NEW POSITION IN KP OF ARRAY P.
19000 GOTO 2
19000 GOTO 2
PI3,M,KL)=PI1,M,JL
PI3,M,KL)=PI1,M,JL
C TEST IF END OF SURFACE. IF YES, GO TO 21500. IF NO, GO TO 20000.
C GO TO CONTINUE THE LOOP TO PICKUP ON NEXT GO ROUND.
IF (PI13,M+1,JL)20000,22000,21000
C IF END OF SURFACE POINT WAS NOT ZERO, THE VALUE OF X,Y AT THE HORIZON MUST
C BE COMPUTED.
20000 IF(SENSE LIGHT)132000,21000
C COMPUTE X,Y AT HORIZON(=0) FROM TRACE OF LINE SEGMENT M=M+1 ON XZ AND
C YZ PLANS.
ZG=PI13,M,JL)/PI13,M+1,JL=PI13,M,JL
21500 PI13,M,KL)=PI13,M,JL)-C*(PI1,M+1,JL)-PI1,M,JL)
C ADVANCE TO NEXT SURFACE.
22000 GOTO 16000
C COMPUTE UNIT VECTOR COMPONENTS FROM OLD SURFACE. JLL AND
C USE THE HORIZON UNIT VECTOR. IN ARRAY M, AND PUT IN AREA COMP.
C DIFFER- ADD POINT *+1 EQUAL TO POINT 1 FOR USE LATER
36311700
36311800
36311900
36312000
36312100
36312200
36312300
36312400
36312500
36312600
36312700
36312800
36312900
36313000
36313100
36313200
36313300
36313400
36313500
36313600
36313700
36313800
36313900
36314000
36314100
36314200
36314300
36314400
36314500
36314600
36314700
36314800
36314900
36315000
36315100
36315200
36315300
36315400
36315500

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Figure 4.3. Subroutine MOICU Listing
(continued)

[illegible]

Figure 43. Subroutine DOICU Listing
(continued)

STORAGE NOT USED BY PROGRAM

DEC OCT
831 01477 14437 34451

STORAGE LOCATIONS FOR VARIABLES APPEARING IN COMMON STATEMENTS

DEC OCT	DEC OCT	DEC OCT	DEC OCT	DEC OCT
ANAP 21045 32571	ARCA 21093 5443	AREX 21140 37413	CL 21154 33112	CT
C2 21045 32571	C3 21093 5443	CL 21140 37414	C4 21154 33112	
DT 22102 33126	DX 13446 35616	UY 13179 35513	FA 13185 35511	
EM 14449 34477	EM 14449 34477	NO 21154 33112	GA 13485 35511	
EX 12493 34205	LO 16129 37401	LI 18121 37171	KD 15492 36206	
MP 22042 32076	MOL 13172 35179	45LL 18121 37171	LP 16123 37173	
NO 15168 35500	ND 15494 34206	NUT 22102 33116	MCN 22116 33142	
NH 12183 35217	NMS 16418 40042	NO 21093 52275	NMI 15184 35140	
NS 12183 35217	NT 16418 40042	NO 21093 52275	NMI 15184 35140	
NSM 21264 31425	NTITLE 21293 51455	NO 21093 52275	NMI 15184 35140	
PAF 16151 37427	PP 22061 37461	NO 21093 52275	NMI 15184 35140	
SP 14446 34075	RA 14446 34075	NO 21093 52275	NMI 15184 35140	
VA 21094 33116	TDA 22000 33124	NO 21093 52275	NMI 15184 35140	
YI 13368 36015	Y 14769 34661	NO 21093 52275	NMI 15184 35140	

STORAGE LOCATIONS FOR VARIABLES NOT APPEARING IN COMMON, DIMENSION, OR EQUIVALENCE STATEMENTS

DEC OCT	DEC OCT	L'C	DEC OCT
C5 830 01476	DC 829 01475	DL 829 01474	DP 827 01473
DY 826 01472	DY 825 01471	DY 824 01470	DP 823 01467
JP 818 01466	KL 817 01465	KL 816 01464	JP 815 01463
NI 814 01456	NZ 813 01455	PL 812 01454	ZC 811 01453

LOCATIONS FOR OTHER SYMBOLS NOT APPEARING IN SOURCE PROGRAM

Figure 44. Subroutine DOICU Core Storage Map

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15300	34 00427	15400	56 00440	15500	59 00461	15600	90 00483
15400	51 00471	15500	58 00459	15600	60 00482	15700	61 00483
15500	62 00472	15600	71 00474	15700	72 00475	15800	73 00476
15600	82 00470	15700	84 00472	15800	85 00473	15900	86 00474
15700	97 01041	15800	98 01042	15900	99 01043	16000	100 01044
15800	104 01045	15900	105 01046	16000	106 01047	16100	107 01048
15900	108 01049	16000	109 01050	16100	110 01051	16200	111 01052
16000	112 01053	16100	113 01054	16200	114 01055	16300	115 01056
16100	116 01057	16200	117 01058	16300	118 01059	16400	119 01060
16200	120 01061	16300	121 01062	16400	122 01063	16500	123 01064
16300	124 01065	16400	125 01066	16500	126 01067	16600	127 01068
16400	128 01069	16500	129 01070	16600	130 01071	16700	131 01072
16500	132 01073	16600	133 01074	16700	134 01075	16800	135 01076
16600	136 01077	16700	137 01078	16800	138 01079	16900	139 01080
16700	140 01081	16800	141 01082	16900	142 01083	17000	143 01084
16800	144 01085	16900	145 01086	17000	146 01087	17100	147 01088
16900	148 01089	17000	149 01090	17100	150 01091	17200	151 01092
17000	152 01093	17100	153 01094	17200	154 01095	17300	155 01096
17100	156 01097	17200	157 01098	17300	158 01099	17400	159 01100
17200	160 01101	17300	161 01102	17400	162 01103	17500	163 01104
17300	164 01105	17400	165 01106	17500	166 01107	17600	167 01108
17400	168 01109	17500	169 01110	17600	170 01111	17700	171 01112
17500	172 01113	17600	173 01114	17700	174 01115	17800	175 01116
17600	176 01117	17700	177 01118	17800	178 01119	17900	179 01120
17700	180 01121	17800	181 01122	17900	182 01123	18000	183 01124
17800	184 01125	17900	185 01126	18000	186 01127	18100	187 01128
17900	188 01129	18000	189 01130	18100	190 01131	18200	191 01132
18000	192 01133	18100	193 01134	18200	194 01135	18300	195 01136
18100	196 01137	18200	197 01138	18300	198 01139	18400	199 01140
18200	200 01141	18300	201 01142	18400	202 01143	18500	203 01144
18300	204 01145	18400	205 01146	18500	206 01147	18600	207 01148
18400	208 01149	18500	209 01150	18600	210 01151	18700	211 01152
18500	212 01153	18600	213 01154	18700	214 01155	18800	215 01156
18600	216 01157	18700	217 01158	18800	218 01159	18900	219 01160
18700	220 01161	18800	221 01162	18900	222 01163	19000	223 01164
18800	224 01165	18900	225 01166	19000	226 01167	19100	227 01168
18900	228 01169	19000	229 01170	19100	230 01171	19200	231 01172
19000	232 01173	19100	233 01174	19200	234 01175	19300	235 01176
19100	236 01177	19200	237 01178	19300	238 01179	19400	239 01180
19200	240 01181	19300	241 01182	19400	242 01183	19500	243 01184
19300	244 01185	19400	245 01186	19500	246 01187	19600	247 01188
19400	248 01189	19500	249 01190	19600	250 01191	19700	251 01192
19500	252 01193	19600	253 01194	19700	254 01195	19800	255 01196
19600	256 01197	19700	257 01198	19800	258 01199	19900	259 01200
19700	260 01201	19800	261 01202	19900	262 01203	20000	263 01204
19800	264 01205	19900	265 01206	20000	266 01207	20100	267 01208
19900	268 01209	20000	269 01210	20100	270 01211	20200	271 01212
20000	272 01213	20100	273 01214	20200	274 01215	20300	275 01216
20100	276 01217	20200	277 01218	20300	278 01219	20400	279 01220
20200	280 01221	20300	281 01222	20400	282 01223	20500	283 01224
20300	284 01225	20400	285 01226	20500	286 01227	20600	287 01228
20400	288 01229	20500	289 01230	20600	290 01231	20700	291 01232
20500	292 01233	20600	293 01234	20700	294 01235	20800	295 01236
20600	296 01237	20700	297 01238	20800	298 01239	20900	299 01240
20700	300 01241	20800	301 01242	20900	302 01243	21000	303 01244
20800	304 01245	20900	305 01246	21000	306 01247	21100	307 01248
20900	308 01249	21000	309 01250	21100	310 01251	21200	311 01252
21000	312 01253	21100	313 01254	21200	314 01255	21300	315 01256
21100	316 01257	21200	317 01258	21300	318 01259	21400	319 01260
21200	320 01261	21300	321 01262	21400	322 01263	21500	323 01264
21300	324 01265	21400	325 01266	21500	326 01267	21600	327 01268
21400	328 01269	21500	329 01270	21600	330 01271	21700	331 01272
21500	332 01273	21600	333 01274	21700	334 01275	21800	335 01276
21600	336 01277	21700	337 01278	21800	338 01279	21900	339 01280
21700	340 01281	21800	341 01282	21900	342 01283	22000	343 01284
21800	344 01285	21900	345 01286	22000	346 01287	22100	347 01288
21900	348 01289	22000	349 01290	22100	350 01291	22200	351 01292
22000	352 01293	22100	353 01294	22200	354 01295	22300	355 01296
22100	356 01297	22200	357 01298	22300	358 01299	22400	359 01300
22200	360 01301	22300	361 01302	22400	362 01303	22500	363 01304
22300	364 01305	22400	365 01306	22500	366 01307	22600	367 01308
22400	368 01309	22500	369 01310	22600	370 01311	22700	371 01312
22500	372 01313	22600	373 01314	22700	374 01315	22800	375 01316
22600	376 01317	22700	377 01318	22800	378 01319	22900	379 01320
22700	380 01321	22800	381 01322	22900	382 01323	23000	383 01324
22800	384 01325	22900	385 01326	23000	386 01327	23100	387 01328
22900	388 01329	23000	389 01330	23100	390 01331	23200	391 01332
23000	392 01333	23100	393 01334	23200	394 01335	23300	395 01336
23100	396 01337	23200	397 01338	23300	398 01339	23400	399 01340
23200	400 01341	23300	401 01342	23400	402 01343	23500	403 01344
23300	404 01345	23400	405 01346	23500	406 01347	23600	407 01348
23400	408 01349	23500	409 01350	23600	410 01351	23700	411 01352
23500	412 01353	23600	413 01354	23700	414 01355	23800	415 01356
23600	416 01357	23700	417 01358	23800	418 01359	23900	419 01360
23700	420 01361	23800	421 01362	23900	422 01363	24000	423 01364
23800	424 01365	23900	425 01366	24000	426 01367	24100	427 01368
23900	428 01369	24000	429 01370	24100	430 01371	24200	431 01372
24000	432 01373	24100	433 01374	24200	434 01375	24300	435 01376
24100	436 01377	24200	437 01378	24300	438 01379	24400	439 01380
24200	440 01381	24300	441 01382	24400	442 01383	24500	443 01384
24300	444 01385	24400	445 01386	24500	446 01387	24600	447 01388
24400	448 01389	24500	449 01390	24600	450 01391	24700	451 01392
24500	452 01393	24600	453 01394	24700	454 01395	24800	455 01396
24600	456 01397	24700	457 01398	24800	458 01399	24900	459 01400
24700	460 01401	24800	461 01402	24900	462 01403	25000	463 01404
24800	464 01405	24900	465 01406	25000	466 01407	25100	467 01408
24900	468 01409	25000	469 01410	25100	470 01411	25200	471 01412
25000	472 01413	25100	473 01414	25200	474 01415	25300	475 01416
25100	476 01417	25200	477 01418	25300	478 01419	25400	479 01420
25200	480 01421	25300	481 01422	25400	482 01423	25500	483 01424
25300	484 01425	25400	485 01426	25500	486 01427	25600	487 01428
25400	488 01429	25500	489 01430	25600	490 01431	25700	491 01432
25500	492 01433	25600	493 01434	25700	494 01435	25800	495 01436
25600	496 01437	25700	497 01438	25800	498 01439	25900	499 01440
25700	500 01441	25800	501 01442	25900	502 01443	26000	503 01444
25800	504 01445	25900	505 01446	26000	506 01447	26100	507 01448
25900	508 01449	26000	509 01450	26100	510 01451	26200	511 01452
26000	512 01453	26100	513 01454	26200	514 01455	26300	515 01456
26100	516 01457	26200	517 01458	26300	518 01459	26400	519 01460
26200	520 01461	26300	521 01462	26400	522 01463	26500	523 01464
26300	524 01465	26400	525 01466	26500	526 01467	26600	527 01468</

73364 MAP ICDIFAC I11 ANALYSIS AND PROGRAMMING BY K.A.TOUPS,MAASIO,11/1/63

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C MAP SUBROUTINE MAP
C GIVEN THE COORDINATES OF THE SURFACE FROM WHICH THE FACTOR IS DESIRED,36400100
C THIS SUBROUTINE COMPUTES THOSE POINTS ON THE SURFACE FROM WHICH THE
C SAME SURFACE FACTOR COULD BE COMPUTED.
C NAME DIMENSION NTITLE(24),NSM(63),TON(17),NON(12),NCLS(5),MSC(58),
1A(4150),NOL(56),NOP(34),P(3),I(2),Z(11),OX(11),AY(11),AC(13),MS(400700)
2A(400700),N(400700),NS(400700),NSC(400700),NOL(400700),NOP(400700),
3P(13),I(3),Z(4),V(3),PA(11),CL(11),NDA(16),TDA(6),LDT(6),LPT(2),L(12),
4AREAR(2),INCL(2),PHI(2),Z(1),X(1),Y(1),Z(1),X(1),Y(1),Z(1),X(1),Y(1),Z(1),
5NS(1),N(1),NS(1),N(1),NS(1),N(1),NS(1),N(1),NS(1),N(1),NS(1),N(1),NS(1),N(1),
6SL(14),I(2),V(1),I(2),V(1),I(2),V(1),I(2),V(1),I(2),V(1),I(2),V(1),I(2),V(1),
EQUVALENCE (P,P(1)),I(2),I(2),I(2),I(2),I(2),I(2),I(2),I(2),I(2),I(2),I(2),I(2),
1NDA(1),NS(1),P(1),P(1),P(1),P(1),P(1),P(1),P(1),P(1),P(1),P(1),P(1),P(1),P(1),
2CONAN NTITLE,NSM,NSC,NOL,P,PA,PHI,AREAR,INCL,PHI,AREAR,INCL,PHI,AREAR,INCL,PHI,
3AAS,PHI,INCL,PHI,INCL,PHI,INCL,PHI,INCL,PHI,INCL,PHI,INCL,PHI,INCL,PHI,INCL,PHI,
4NS,NSC,NOL,NOP,PA,PHI,AREAR,INCL,PHI,AREAR,INCL,PHI,AREAR,INCL,PHI,AREAR,INCL,PHI,
5V,PA,PHI,AREAR,INCL,PHI,AREAR,INCL,PHI,AREAR,INCL,PHI,AREAR,INCL,PHI,AREAR,INCL,PHI,
6SET UP HORIZONTAL AND VERTICAL INCREMENTS
C CONVERT INCREMENT NO INTO NO OF INCREMENTS
10 NHI=2
20 CO TO 30
30 NHI=NHI+6
40 IF(LD(4)-11150,40,50)
50 NHI=LD(4)+6
60 NHI=NHI+1
70 NHI=NHI+1
C DETERMINE THE SUBSCRIPTS OF THE COORDINATES HAVING THE MIN AND THE MAX
C VALUES
VMAX=-1.E+30
VMIN=1.E+30
DO 200 K=1,NP
111PE=ND(3)+VMIN/110,110,120

```

Figure 45. Subroutine MAP Listing

```

110 YHINP(12,K,MC)
120 YHINP(12,K,MC)=YHAXI(200,200,175)
130 YHINP(12,K,MC)=YHAXI(200,200,175)
140 YHINP(12,K,MC)=YHAXI(200,200,175)
150 YHINP(12,K,MC)=YHAXI(200,200,175)
160 YHINP(12,K,MC)=YHAXI(200,200,175)
170 YHINP(12,K,MC)=YHAXI(200,200,175)
180 YHINP(12,K,MC)=YHAXI(200,200,175)
190 YHINP(12,K,MC)=YHAXI(200,200,175)
200 YHINP(12,K,MC)=YHAXI(200,200,175)
210 YHINP(12,K,MC)=YHAXI(200,200,175)
220 YHINP(12,K,MC)=YHAXI(200,200,175)
230 YHINP(12,K,MC)=YHAXI(200,200,175)
240 YHINP(12,K,MC)=YHAXI(200,200,175)
250 YHINP(12,K,MC)=YHAXI(200,200,175)
260 YHINP(12,K,MC)=YHAXI(200,200,175)
270 YHINP(12,K,MC)=YHAXI(200,200,175)
280 YHINP(12,K,MC)=YHAXI(200,200,175)
290 YHINP(12,K,MC)=YHAXI(200,200,175)
300 YHINP(12,K,MC)=YHAXI(200,200,175)
310 YHINP(12,K,MC)=YHAXI(200,200,175)
320 YHINP(12,K,MC)=YHAXI(200,200,175)
330 YHINP(12,K,MC)=YHAXI(200,200,175)
340 YHINP(12,K,MC)=YHAXI(200,200,175)
350 YHINP(12,K,MC)=YHAXI(200,200,175)
360 YHINP(12,K,MC)=YHAXI(200,200,175)
370 YHINP(12,K,MC)=YHAXI(200,200,175)
380 YHINP(12,K,MC)=YHAXI(200,200,175)
390 YHINP(12,K,MC)=YHAXI(200,200,175)
400 YHINP(12,K,MC)=YHAXI(200,200,175)
410 YHINP(12,K,MC)=YHAXI(200,200,175)
420 YHINP(12,K,MC)=YHAXI(200,200,175)
430 YHINP(12,K,MC)=YHAXI(200,200,175)
440 YHINP(12,K,MC)=YHAXI(200,200,175)
450 YHINP(12,K,MC)=YHAXI(200,200,175)
460 YHINP(12,K,MC)=YHAXI(200,200,175)
470 YHINP(12,K,MC)=YHAXI(200,200,175)
480 YHINP(12,K,MC)=YHAXI(200,200,175)
490 YHINP(12,K,MC)=YHAXI(200,200,175)
500 YHINP(12,K,MC)=YHAXI(200,200,175)
510 YHINP(12,K,MC)=YHAXI(200,200,175)
520 YHINP(12,K,MC)=YHAXI(200,200,175)
530 YHINP(12,K,MC)=YHAXI(200,200,175)
540 YHINP(12,K,MC)=YHAXI(200,200,175)
550 YHINP(12,K,MC)=YHAXI(200,200,175)
560 YHINP(12,K,MC)=YHAXI(200,200,175)
570 YHINP(12,K,MC)=YHAXI(200,200,175)
580 YHINP(12,K,MC)=YHAXI(200,200,175)
590 YHINP(12,K,MC)=YHAXI(200,200,175)
600 YHINP(12,K,MC)=YHAXI(200,200,175)
610 YHINP(12,K,MC)=YHAXI(200,200,175)
620 YHINP(12,K,MC)=YHAXI(200,200,175)
630 YHINP(12,K,MC)=YHAXI(200,200,175)
640 YHINP(12,K,MC)=YHAXI(200,200,175)
650 YHINP(12,K,MC)=YHAXI(200,200,175)
660 YHINP(12,K,MC)=YHAXI(200,200,175)
670 YHINP(12,K,MC)=YHAXI(200,200,175)
680 YHINP(12,K,MC)=YHAXI(200,200,175)
690 YHINP(12,K,MC)=YHAXI(200,200,175)
700 YHINP(12,K,MC)=YHAXI(200,200,175)
710 YHINP(12,K,MC)=YHAXI(200,200,175)
720 YHINP(12,K,MC)=YHAXI(200,200,175)
730 YHINP(12,K,MC)=YHAXI(200,200,175)
740 YHINP(12,K,MC)=YHAXI(200,200,175)
750 YHINP(12,K,MC)=YHAXI(200,200,175)
760 YHINP(12,K,MC)=YHAXI(200,200,175)
770 YHINP(12,K,MC)=YHAXI(200,200,175)
780 YHINP(12,K,MC)=YHAXI(200,200,175)
790 YHINP(12,K,MC)=YHAXI(200,200,175)
800 YHINP(12,K,MC)=YHAXI(200,200,175)
810 YHINP(12,K,MC)=YHAXI(200,200,175)
820 YHINP(12,K,MC)=YHAXI(200,200,175)
830 YHINP(12,K,MC)=YHAXI(200,200,175)
840 YHINP(12,K,MC)=YHAXI(200,200,175)
850 YHINP(12,K,MC)=YHAXI(200,200,175)
860 YHINP(12,K,MC)=YHAXI(200,200,175)
870 YHINP(12,K,MC)=YHAXI(200,200,175)
880 YHINP(12,K,MC)=YHAXI(200,200,175)
890 YHINP(12,K,MC)=YHAXI(200,200,175)
900 YHINP(12,K,MC)=YHAXI(200,200,175)
910 YHINP(12,K,MC)=YHAXI(200,200,175)
920 YHINP(12,K,MC)=YHAXI(200,200,175)
930 YHINP(12,K,MC)=YHAXI(200,200,175)
940 YHINP(12,K,MC)=YHAXI(200,200,175)
950 YHINP(12,K,MC)=YHAXI(200,200,175)
960 YHINP(12,K,MC)=YHAXI(200,200,175)
970 YHINP(12,K,MC)=YHAXI(200,200,175)
980 YHINP(12,K,MC)=YHAXI(200,200,175)
990 YHINP(12,K,MC)=YHAXI(200,200,175)

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Figure 45. Subroutine MAP Listing (continued)

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Figure 45. Subroutine MAP Listing
(continued)

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C101	487 00767	C1102	488 00750	C1101	489 00751	C1102	490 00752		
C103	491 00753	C1201	492 00754	C1202	493 00755	C1203	494 00756		
D101	303 00463	D1111	359 00547	D1200	124 00174	D1201	221 00135		
D102	303 00457	D1112	359 00548	D1404	173 00255	D1410	292 00444		
D112	303 00457	D1114	311 00467	D1504	172 00254	D1510	292 00444		
D118	347 00533	D1210	281 00443	D1504	172 00254	D1510	292 00444		
D119	347 00533	E101	214 00351	E102	122 00172	E103	140 00214		
E101	145 00221	E104	214 00351	E105	122 00172	E106	140 00214		
E102	145 00221	E107	214 00351	E108	122 00172	E109	140 00214		

EXTERNAL FORMULA NUMBERS WITH CORRESPONDING INTERNAL FORMULA NUMBERS AND TOTAL LOCATIONS

EFN	IFN	LOC	IFN	LOC	IFN	LOC	IFN	LOC
50	7 00032	20	10 00041	40	12 00052			
100	24 00117	20	16 00046	110	22 00133			
120	24 00117	20	16 00046	110	22 00133			
225	31 00162	210	35 00207	240	38 00219			
250	31 00162	210	35 00207	240	38 00219			
300	45 00264	290	41 00217	245	42 00216			
360	60 00467	600	61 00412	440	58 00376			
400	60 00467	600	61 00412	440	58 00376			
460	60 00467	720	67 00464	540	68 00470			
500	60 00467	720	67 00464	540	68 00470			
560	60 00467	720	67 00464	540	68 00470			
600	60 00467	720	67 00464	540	68 00470			
660	60 00467	720	67 00464	540	68 00470			
720	60 00467	720	67 00464	540	68 00470			
780	60 00467	720	67 00464	540	68 00470			
840	60 00467	720	67 00464	540	68 00470			
900	60 00467	720	67 00464	540	68 00470			

Figure 16. Subroutine MAP Core Storage Listing
(continued)

[illegible]

Figure 47. Subroutine FACTOR Listing

```

C ZERO OUT COMPUTATIONAL ERROR
      F1=0.0
      F2=0.0
      F3=0.0
      F4=0.0
      F5=0.0
      F6=0.0
      F7=0.0
      F8=0.0
      F9=0.0
      F10=0.0
      F11=0.0
      F12=0.0
      F13=0.0
      F14=0.0
      F15=0.0
      F16=0.0
      F17=0.0
      F18=0.0
      F19=0.0
      F20=0.0
      F21=0.0
      F22=0.0
      F23=0.0
      F24=0.0
      F25=0.0
      F26=0.0
      F27=0.0
      F28=0.0
      F29=0.0
      F30=0.0
      F31=0.0
      F32=0.0
      F33=0.0
      F34=0.0
      F35=0.0
      F36=0.0
      F37=0.0
      F38=0.0
      F39=0.0
      F40=0.0
      F41=0.0
      F42=0.0
      F43=0.0
      F44=0.0
      F45=0.0
      F46=0.0
      F47=0.0
      F48=0.0
      F49=0.0
      F50=0.0
      F51=0.0
      F52=0.0
      F53=0.0
      F54=0.0
      F55=0.0
      F56=0.0
      F57=0.0
      F58=0.0
      F59=0.0
      F60=0.0
      F61=0.0
      F62=0.0
      F63=0.0
      F64=0.0
      F65=0.0
      F66=0.0
      F67=0.0
      F68=0.0
      F69=0.0
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      F968=0.0
      F969=0.0
      F970=0.0
      F971=0.0
      F972=0.0
      F973=0.0
      F974=0.0
      F975=0.0
      F976=0.0
      F977=0.0
      F978=0.0
      F979=0.0
      F980=0.0
      F981=0.0
      F982=0.0
      F983=0.0
      F984=0.0
      F985=0.0
      F986=0.0
      F987=0.0
      F988=0.0
      F989=0.0
      F990=0.0
      F991=0.0
      F992=0.0
      F993=0.0
      F994=0.0
      F995=0.0
      F996=0.0
      F997=0.0
      F998=0.0
      F999=0.0
      F1000=0.0

```

Figure 47. Subroutine FACOR Listing (continued)

36507900

Figure 47. Subroutine FACTOR Listing
(continued)

73365 FACTORCONFACT III ANALYSIS AND PROGRAMMING BY K.A.L.O.U.P.S. HAASTO, 11/17/63 11/07/73 PAGE 4

```

974 CONTINUE
C DO 10 987
C MOVE THE CURVE THE POSITION OF THE POINT RELATIVE TO SURFACE 21 TO
C THE RIGHT AN INCREMENT AND CONTINUE
972 DO 975 J=1,ML
975 CALL MAP(J,JJ-DXIK)
987 CONTINUE
C INTEGRATE THE FUNCTION FH ALONG THE HORIZONTAL GRIC
988 DO 990 I=2,NMI
989 FV(I)=FV(I)+F(H(I)+F(H(ML))/2,1-DXIK)
990 CONTINUE
C INTEGRATE THE FUNCTION FV ALONG THE VERTICAL. DIVIDE BY 2 TO CONVERT
C FH TO AREA BY PI TO CONVERT M.I.D. TO REGULATION FACTOR, AND BY
C THE MAPPING AREA TO YIELD THE FORM FACTOR.
1000 F=0.0
DO 1005 K=2,NVI
1005 F=0.5*(F+(FV(I)+FV(MV))/2,1-DY/ANAP /6.2831853
C IF A PART OF SURFACE 1 IS SHADOWNED, THE FACTOR MUST BE REDUCED TO
C REFLECT THIS.
IF (I(1)) 11000,1500,1500
1000 F=F*0. AREA(I)/AREA(J)
C COMPUTE THE PRODUCT OF THE FORM FACTOR X AREA PRODUCT
1500 FAP=F*AREA(J)
2000 RETURN
END

```

35511800
35511900
35512000
35512100
35512200
35512300
35512400
35512500
35512600
35512700
35512800
35512900
35513000
35513100
35513200
35513300
35513400
35513500
35513600
35513700
35513800
35513900
35514000
35514100
35514200

Figure 47. Subroutine FACTOR Listing
(continued)

01210 287 00137 01210 330 00134 01210 340 00134 01210 350 00134
 01210 313 00171 01210 330 00134 01210 340 00134 01210 350 00134
 01210 313 00171 01210 330 00134 01210 340 00134 01210 350 00134
 01210 313 00171 01210 330 00134 01210 340 00134 01210 350 00134
 01210 313 00171 01210 330 00134 01210 340 00134 01210 350 00134

LOCATIONS OF NAMES IN TRANSFER VECTOR

DEC OCT SORT DEC OCT
 01210 313 00171 01210 330 00134 01210 340 00134 01210 350 00134
 01210 313 00171 01210 330 00134 01210 340 00134 01210 350 00134
 01210 313 00171 01210 330 00134 01210 340 00134 01210 350 00134
 01210 313 00171 01210 330 00134 01210 340 00134 01210 350 00134
 01210 313 00171 01210 330 00134 01210 340 00134 01210 350 00134

ENTRY POINTS TO SUBROUTINES NOT OUTPUT FROM LIBRARY

DEC OCT SORT DEC OCT
 01210 313 00171 01210 330 00134 01210 340 00134 01210 350 00134
 01210 313 00171 01210 330 00134 01210 340 00134 01210 350 00134
 01210 313 00171 01210 330 00134 01210 340 00134 01210 350 00134
 01210 313 00171 01210 330 00134 01210 340 00134 01210 350 00134
 01210 313 00171 01210 330 00134 01210 340 00134 01210 350 00134

EXTERNAL FORMULA NUMBERS WITH CORRESPONDING INTERNAL FORMULA NUMBERS AND SOCIAL LOCATIONS

EFN IFN LOC EFN IFN LOC EFN IFN LOC EFN IFN LOC
 01210 313 00171 01210 330 00134 01210 340 00134 01210 350 00134
 01210 313 00171 01210 330 00134 01210 340 00134 01210 350 00134
 01210 313 00171 01210 330 00134 01210 340 00134 01210 350 00134
 01210 313 00171 01210 330 00134 01210 340 00134 01210 350 00134
 01210 313 00171 01210 330 00134 01210 340 00134 01210 350 00134

245

Figure 4.6. Subroutine FACTOR Core Storage Map (continued)

[illegible]

36604000

35637900

Subroutine :
(continued)

C IF NOT CLASS B SURFACE, THE FOLLOWING LINE ELEMENTS ARE NOT NEEDED

Figure 49. Subroutine SILFAC Listing
(continued)

73366 SILFACONFAC II ANALYSIS AND PROGRAMMING BY K.A.T.O.P.S.NAAZID,11/1/63 11/04/63 PAGE 6

```

370 JFIMG1375,400,375
C COMPUTE INTERCEPT BASED ON PNT TO INCREASE COMPUTATIONAL ACCURACY
1200 JFIMG1375,400,375
1250 JFIMG1375,400,375
1300 JFIMG1375,400,375
1350 JFIMG1375,400,375
1400 JFIMG1375,400,375
1450 JFIMG1375,400,375
1500 JFIMG1375,400,375
1550 JFIMG1375,400,375
1600 JFIMG1375,400,375
1650 JFIMG1375,400,375
1700 JFIMG1375,400,375
1750 JFIMG1375,400,375
1800 JFIMG1375,400,375
1850 JFIMG1375,400,375
1900 JFIMG1375,400,375
1950 JFIMG1375,400,375
2000 JFIMG1375,400,375
2050 JFIMG1375,400,375
2100 JFIMG1375,400,375
2150 JFIMG1375,400,375
2200 JFIMG1375,400,375
2250 JFIMG1375,400,375
2300 JFIMG1375,400,375
2350 JFIMG1375,400,375
2400 JFIMG1375,400,375
2450 JFIMG1375,400,375
2500 JFIMG1375,400,375
2550 JFIMG1375,400,375
2600 JFIMG1375,400,375
2650 JFIMG1375,400,375
2700 JFIMG1375,400,375
2750 JFIMG1375,400,375
2800 JFIMG1375,400,375
2850 JFIMG1375,400,375
2900 JFIMG1375,400,375
2950 JFIMG1375,400,375
3000 JFIMG1375,400,375
3050 JFIMG1375,400,375
3100 JFIMG1375,400,375
3150 JFIMG1375,400,375
3200 JFIMG1375,400,375
3250 JFIMG1375,400,375
3300 JFIMG1375,400,375
3350 JFIMG1375,400,375
3400 JFIMG1375,400,375
3450 JFIMG1375,400,375
3500 JFIMG1375,400,375
3550 JFIMG1375,400,375
3600 JFIMG1375,400,375
3650 JFIMG1375,400,375
3700 JFIMG1375,400,375
3750 JFIMG1375,400,375
3800 JFIMG1375,400,375
3850 JFIMG1375,400,375
3900 JFIMG1375,400,375
3950 JFIMG1375,400,375
4000 JFIMG1375,400,375
4050 JFIMG1375,400,375
4100 JFIMG1375,400,375
4150 JFIMG1375,400,375
4200 JFIMG1375,400,375
4250 JFIMG1375,400,375
4300 JFIMG1375,400,375
4350 JFIMG1375,400,375
4400 JFIMG1375,400,375
4450 JFIMG1375,400,375
4500 JFIMG1375,400,375
4550 JFIMG1375,400,375
4600 JFIMG1375,400,375
4650 JFIMG1375,400,375
4700 JFIMG1375,400,375
4750 JFIMG1375,400,375
4800 JFIMG1375,400,375
4850 JFIMG1375,400,375
4900 JFIMG1375,400,375
4950 JFIMG1375,400,375
5000 JFIMG1375,400,375
5050 JFIMG1375,400,375
5100 JFIMG1375,400,375
5150 JFIMG1375,400,375
5200 JFIMG1375,400,375
5250 JFIMG1375,400,375
5300 JFIMG1375,400,375
5350 JFIMG1375,400,375
5400 JFIMG1375,400,375
5450 JFIMG1375,400,375
5500 JFIMG1375,400,375
5550 JFIMG1375,400,375
5600 JFIMG1375,400,375
5650 JFIMG1375,400,375
5700 JFIMG1375,400,375
5750 JFIMG1375,400,375
5800 JFIMG1375,400,375
5850 JFIMG1375,400,375
5900 JFIMG1375,400,375
5950 JFIMG1375,400,375
6000 JFIMG1375,400,375
6050 JFIMG1375,400,375
6100 JFIMG1375,400,375
6150 JFIMG1375,400,375
6200 JFIMG1375,400,375
6250 JFIMG1375,400,375
6300 JFIMG1375,400,375
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6400 JFIMG1375,400,375
6450 JFIMG1375,400,375
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6800 JFIMG1375,400,375
6850 JFIMG1375,400,375
6900 JFIMG1375,400,375
6950 JFIMG1375,400,375
7000 JFIMG1375,400,375
7050 JFIMG1375,400,375
7100 JFIMG1375,400,375
7150 JFIMG1375,400,375
7200 JFIMG1375,400,375
7250 JFIMG1375,400,375
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7400 JFIMG1375,400,375
7450 JFIMG1375,400,375
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7600 JFIMG1375,400,375
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7850 JFIMG1375,400,375
7900 JFIMG1375,400,375
7950 JFIMG1375,400,375
8000 JFIMG1375,400,375
8050 JFIMG1375,400,375
8100 JFIMG1375,400,375
8150 JFIMG1375,400,375
8200 JFIMG1375,400,375
8250 JFIMG1375,400,375
8300 JFIMG1375,400,375
8350 JFIMG1375,400,375
8400 JFIMG1375,400,375
8450 JFIMG1375,400,375
8500 JFIMG1375,400,375
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8600 JFIMG1375,400,375
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9250 JFIMG1375,400,375
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9400 JFIMG1375,400,375
9450 JFIMG1375,400,375
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9650 JFIMG1375,400,375
9700 JFIMG1375,400,375
9750 JFIMG1375,400,375
9800 JFIMG1375,400,375
9850 JFIMG1375,400,375
9900 JFIMG1375,400,375
9950 JFIMG1375,400,375
1000 JFIMG1375,400,375

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Figure 49. Subroutine SILFAC Listing
(continued)

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110 MLEP=NP
115 IF (SENSE LIGHT 2)
120 SENSE LIGHT 2
125 SENSE LIGHT 2
130 SENSE LIGHT 2
135 SENSE LIGHT 2
140 IF (SENSE LIGHT 2)
145 IF (SENSE LIGHT 2)
150 IF (SENSE LIGHT 2)
155 IF (SENSE LIGHT 2)
160 IF (SENSE LIGHT 2)
165 IF (SENSE LIGHT 2)
170 IF (SENSE LIGHT 2)
175 IF (SENSE LIGHT 2)
180 IF (SENSE LIGHT 2)
185 IF (SENSE LIGHT 2)
190 IF (SENSE LIGHT 2)
195 IF (SENSE LIGHT 2)
200 IF (SENSE LIGHT 2)
205 IF (SENSE LIGHT 2)
210 IF (SENSE LIGHT 2)
215 IF (SENSE LIGHT 2)
220 IF (SENSE LIGHT 2)
225 IF (SENSE LIGHT 2)
230 IF (SENSE LIGHT 2)
235 IF (SENSE LIGHT 2)
240 IF (SENSE LIGHT 2)
245 IF (SENSE LIGHT 2)
250 IF (SENSE LIGHT 2)
255 IF (SENSE LIGHT 2)
260 IF (SENSE LIGHT 2)
265 IF (SENSE LIGHT 2)
270 IF (SENSE LIGHT 2)
275 IF (SENSE LIGHT 2)
280 IF (SENSE LIGHT 2)
285 IF (SENSE LIGHT 2)
290 IF (SENSE LIGHT 2)
295 IF (SENSE LIGHT 2)
300 IF (SENSE LIGHT 2)
305 IF (SENSE LIGHT 2)
310 IF (SENSE LIGHT 2)
315 IF (SENSE LIGHT 2)
320 IF (SENSE LIGHT 2)
325 IF (SENSE LIGHT 2)
330 IF (SENSE LIGHT 2)
335 IF (SENSE LIGHT 2)
340 IF (SENSE LIGHT 2)
345 IF (SENSE LIGHT 2)
350 IF (SENSE LIGHT 2)
355 IF (SENSE LIGHT 2)
360 IF (SENSE LIGHT 2)
365 IF (SENSE LIGHT 2)
370 IF (SENSE LIGHT 2)
375 IF (SENSE LIGHT 2)
380 IF (SENSE LIGHT 2)
385 IF (SENSE LIGHT 2)
390 IF (SENSE LIGHT 2)
395 IF (SENSE LIGHT 2)
400 IF (SENSE LIGHT 2)
405 IF (SENSE LIGHT 2)
410 IF (SENSE LIGHT 2)
415 IF (SENSE LIGHT 2)
420 IF (SENSE LIGHT 2)
425 IF (SENSE LIGHT 2)
430 IF (SENSE LIGHT 2)
435 IF (SENSE LIGHT 2)
440 IF (SENSE LIGHT 2)
445 IF (SENSE LIGHT 2)
450 IF (SENSE LIGHT 2)
455 IF (SENSE LIGHT 2)
460 IF (SENSE LIGHT 2)
465 IF (SENSE LIGHT 2)
470 IF (SENSE LIGHT 2)
475 IF (SENSE LIGHT 2)
480 IF (SENSE LIGHT 2)
485 IF (SENSE LIGHT 2)
490 IF (SENSE LIGHT 2)
495 IF (SENSE LIGHT 2)
500 IF (SENSE LIGHT 2)
505 IF (SENSE LIGHT 2)
510 IF (SENSE LIGHT 2)
515 IF (SENSE LIGHT 2)
520 IF (SENSE LIGHT 2)
525 IF (SENSE LIGHT 2)
530 IF (SENSE LIGHT 2)
535 IF (SENSE LIGHT 2)
540 IF (SENSE LIGHT 2)
545 IF (SENSE LIGHT 2)
550 IF (SENSE LIGHT 2)
555 IF (SENSE LIGHT 2)
560 IF (SENSE LIGHT 2)
565 IF (SENSE LIGHT 2)
570 IF (SENSE LIGHT 2)
575 IF (SENSE LIGHT 2)
580 IF (SENSE LIGHT 2)
585 IF (SENSE LIGHT 2)
590 IF (SENSE LIGHT 2)
595 IF (SENSE LIGHT 2)
600 IF (SENSE LIGHT 2)
605 IF (SENSE LIGHT 2)
610 IF (SENSE LIGHT 2)
615 IF (SENSE LIGHT 2)
620 IF (SENSE LIGHT 2)
625 IF (SENSE LIGHT 2)
630 IF (SENSE LIGHT 2)
635 IF (SENSE LIGHT 2)
640 IF (SENSE LIGHT 2)
645 IF (SENSE LIGHT 2)
650 IF (SENSE LIGHT 2)
655 IF (SENSE LIGHT 2)
660 IF (SENSE LIGHT 2)
665 IF (SENSE LIGHT 2)
670 IF (SENSE LIGHT 2)
675 IF (SENSE LIGHT 2)
680 IF (SENSE LIGHT 2)
685 IF (SENSE LIGHT 2)
690 IF (SENSE LIGHT 2)
695 IF (SENSE LIGHT 2)
700 IF (SENSE LIGHT 2)
705 IF (SENSE LIGHT 2)
710 IF (SENSE LIGHT 2)
715 IF (SENSE LIGHT 2)
720 IF (SENSE LIGHT 2)
725 IF (SENSE LIGHT 2)
730 IF (SENSE LIGHT 2)
735 IF (SENSE LIGHT 2)
740 IF (SENSE LIGHT 2)
745 IF (SENSE LIGHT 2)
750 IF (SENSE LIGHT 2)
755 IF (SENSE LIGHT 2)
760 IF (SENSE LIGHT 2)
765 IF (SENSE LIGHT 2)
770 IF (SENSE LIGHT 2)
775 IF (SENSE LIGHT 2)
780 IF (SENSE LIGHT 2)
785 IF (SENSE LIGHT 2)
790 IF (SENSE LIGHT 2)
795 IF (SENSE LIGHT 2)
800 IF (SENSE LIGHT 2)
805 IF (SENSE LIGHT 2)
810 IF (SENSE LIGHT 2)
815 IF (SENSE LIGHT 2)
820 IF (SENSE LIGHT 2)
825 IF (SENSE LIGHT 2)
830 IF (SENSE LIGHT 2)
835 IF (SENSE LIGHT 2)
840 IF (SENSE LIGHT 2)
845 IF (SENSE LIGHT 2)
850 IF (SENSE LIGHT 2)
855 IF (SENSE LIGHT 2)
860 IF (SENSE LIGHT 2)
865 IF (SENSE LIGHT 2)
870 IF (SENSE LIGHT 2)
875 IF (SENSE LIGHT 2)
880 IF (SENSE LIGHT 2)
885 IF (SENSE LIGHT 2)
890 IF (SENSE LIGHT 2)
895 IF (SENSE LIGHT 2)
900 IF (SENSE LIGHT 2)
905 IF (SENSE LIGHT 2)
910 IF (SENSE LIGHT 2)
915 IF (SENSE LIGHT 2)
920 IF (SENSE LIGHT 2)
925 IF (SENSE LIGHT 2)
930 IF (SENSE LIGHT 2)
935 IF (SENSE LIGHT 2)
940 IF (SENSE LIGHT 2)
945 IF (SENSE LIGHT 2)
950 IF (SENSE LIGHT 2)
955 IF (SENSE LIGHT 2)
960 IF (SENSE LIGHT 2)
965 IF (SENSE LIGHT 2)
970 IF (SENSE LIGHT 2)
975 IF (SENSE LIGHT 2)
980 IF (SENSE LIGHT 2)
985 IF (SENSE LIGHT 2)
990 IF (SENSE LIGHT 2)
995 IF (SENSE LIGHT 2)

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Figure 49. Subroutine SILFAC Listing
(continued)

[illegible]

Subroutine SIFAC Listing
(continued)

663	IFABSF5(FVAL,NA,NPPI)-VAL(J,11)-2.5999,167+4,800,800	36331000
664	XA=Z(NPPI)	36331120
665	GA=NPPI	36331140
666	GA=V(1)	36331160
667	XA=V(1)-V(LJ,NPPI)/ZC	36331180
670	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36331400
671	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36331420
672	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36331440
673	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36331460
674	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36331480
675	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36331500
676	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36331520
677	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36331540
678	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36331560
679	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36331580
680	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36331600
681	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36331620
682	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36331640
683	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36331660
684	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36331680
685	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36331700
686	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36331720
687	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36331740
688	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36331760
689	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36331780
690	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36331800
691	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36331820
692	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36331840
693	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36331860
694	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36331880
695	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36331900
696	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36331920
697	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36331940
698	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36331960
699	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36331980
700	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36332000
701	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36332020
702	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36332040
703	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36332060
704	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36332080
705	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36332100
706	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36332120
707	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36332140
708	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36332160
709	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36332180
710	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36332200
711	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36332220
712	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36332240
713	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36332260
714	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36332280
715	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36332300
716	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36332320
717	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36332340
718	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36332360
719	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36332380
720	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36332400
721	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36332420
722	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36332440
723	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36332460
724	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36332480
725	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36332500
726	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36332520
727	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36332540
728	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36332560
729	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36332580
730	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36332600
731	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36332620
732	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36332640
733	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36332660
734	IFABSF5(FIXA)-1.E-03,2400,2400,2500	36332680
735	IFABSF5(FIXA)-1.E-03,240	

Subroutine SLIFAC Listing
(continued)


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904 CONTINUE
902 IF (M305,803,805)
903 GO TO 835
805 M=1
      IF (M450,4550,4560)
806 X=X(NPP)
807 Y=Y(NPP)
808 IF (M450,810,2600)
809 IF (M450,810,810)
810 IF (M450,810,810)
811 IF (M450,810,810)
812 IF (M450,810,810)
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998 IF (M450,810,810)
999 IF (M450,810,810)
1000 IF (M450,810,810)

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Figure 49. Subroutine SILFAC Listing
(continued)

STORAGE LOCATIONS FOR VARIABLES APPEARING IN DIMENSION AND EQUIVALENCE STATEMENTS			
DECL	DECL	DECL	DECL
Q11	3559 01017	NP	3519 04273
MJM	3559 01017	N5	3519 04273
XV	3259 04273	VV	3219 04271

STORAGE LOCATIONS FOR VARIABLES NOT APPEARING IN DIMENSION, OR EQUIVALENCE STATEMENTS			
DECL	DECL	DECL	DECL
ALPHA	3311 04453	BETA	3351 04461
DELTA	3311 04453	DELTA	3351 04461
DELTA	3311 04453	DELTA	3351 04461
DELTA	3311 04453	DELTA	3351 04461

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IO 4383 04447	F52 2342 04440	F53 2341 04445	IO 2340 04444
IR 4385 04437	F51 2339 04436	JX 2335 04435	IR 2331 04434
KK 4331 04433	K 2330 04432	L 2329 04431	LT 2321 04430
LL 4333 04427	MEAR 2332 04426	NH 2321 04421	NO 2320 04420
NLP 4319 04417	AL 2218 04416	NLS 2317 04415	NOP 2311 04414
NPC 4313 04413	MPP 2314 04412	NPX 2313 04411	PSMR 2312 04410
PAK 2367 04403	RSOZ 2306 04402	SLR 2305 04401	TOL 2304 04400
TEL2 2303 04377	TOL3 2302 04376	TOL4 2301 04375	TOL 2300 04374
TEL2 2303 04377	TEL4 2302 04376	VAR 2299 04369	XT 2292 04364
XD 4291 04363	XA 2294 04362	XB 2293 04365	XT 2292 04364
XIN 4287 04357	XE 2290 04360	XF 2289 04361	XG 2268 04360
YIN 4287 04357	YMH 2286 04356	YPM 2285 04357	YR 2284 04355
ZSC 2279 04347	YMH 2286 04356	YR 2284 04355	YSPZ 2280 04350

SYMBOLS AND LOCATIONS FOR SOURCE PROGRAM FORMAT STATEMENTS

EFN	LOC	EFN	LOC	EFN	LOC
4110P	1999 04086	8145B	5000 04266	8145I	5010 04216
LOCATIONS FOR OTHER SYMBOLS NOT APPEARING IN SOURCE PROGRAM					
UEC	QCT	UEC	QCT	UEC	QCT
11 2231 04267	21 2055 04067	31 2068 04024	61 2069 04021		
A11C2 2055 03643	A11C3 1868 03600	A11C4 1981 03615	A11C5 1994 03712		
A11C7 2005 04277	A11C8 2007 04278	A11C9 2010 04279	A11C0 2013 04280		
C1C1 2239 04277	C1C2 2240 04274	C1C3 2237 04225	C1C4 2238 04276		
C1C5 2239 04277	C1C6 2240 04300	C1C7 2241 04301	C1C8 2242 04302		
C1C9 2243 04303	C1C0 2244 04304	C1C1 2245 04305	C1C2 2246 04306		
C1C3 2251 04313	C1C4 2252 04314	C1C5 2253 04315	C1C6 2254 04316		
C1C7 2255 04317	C1C8 2256 04320	C1C9 2257 04321	C1C0 2258 04322		
C1C1 2263 04322	C1C2 2264 04323	C1C3 2265 04324	C1C4 2266 04325		
C1C5 2267 04333	C1C6 2268 04334	C1C7 2269 04335	C1C8 2270 04336		
C1C9 2271 04337	C1C0 2272 04340	C1C1 2273 04341	C1C2 2274 04342		
C1C3 2275 04343	C1C4 2276 04344	C1C5 2277 04345	C1C6 2278 04346		

Figure 50. Subroutine SIFAC Core Storage Map
(continued)

[illegible]

LOCATIONS OF NAMES IN TRANSFER VECTOR

A	TATIMEY	2	OCT 6 0000Z	COUNTY 6 0000Z	DUMP (FIL)	UFC 4 0000Z	OCT 0 0000Z	DUMP (SPH)	UFC 3 0000Z	COPY	OEC 1 0000Z
ENTRY PRINTS TO SUBROUTINES NOT OUTPUT FROM LIBRARY~											
YAN	COUNTY	DUMP	SORT	TIMEY	(FIL)	(SCH)					

Figure 50. Subroutine SIIFAC Core Storage Map
(continued)

7300 SILFACICNFAC III ANALYSIS AND PROGRAMMING BY K.A.TOUPI, MARSID:11/1763 11/09/83 PAGE 19
 4500 318 02614 4500 321 02637 935 321 02642 860 324 02645
 4510 319 02615 4510 322 02638 940 322 02639 880 325 02648
 4520 320 02616 4520 323 02639 910 323 02640 900 326 02649
 4530 321 02617 4530 324 02640 920 324 02641 920 327 02650
 4540 322 02618 4540 325 02641 930 325 02642 940 328 02651
 4550 323 02619 4550 326 02642 940 326 02643 950 329 02652
 4560 324 02620 4560 327 02643 950 327 02644 960 330 02653
 4570 325 02621 4570 328 02644 960 328 02645 970 331 02654
 4580 326 02622 4580 329 02645 970 329 02646 980 332 02655
 4590 327 02623 4590 330 02646 980 330 02647 990 333 02656
 4600 328 02624 4600 331 02647 990 331 02648 1000 334 02657
 4610 329 02625 4610 332 02648 1000 332 02649 1010 335 02658
 4620 330 02626 4620 333 02649 1010 333 02650 1020 336 02659
 4630 331 02627 4630 334 02650 1020 334 02651 1030 337 02660
 4640 332 02628 4640 335 02651 1030 335 02652 1040 338 02661
 4650 333 02629 4650 336 02652 1040 336 02653 1050 339 02662
 4660 334 02630 4660 337 02653 1050 337 02654 1060 340 02663
 4670 335 02631 4670 338 02654 1060 338 02655 1070 341 02664
 4680 336 02632 4680 339 02655 1070 339 02656 1080 342 02665
 4690 337 02633 4690 340 02656 1080 340 02657 1090 343 02666
 4700 338 02634 4700 341 02657 1090 341 02658 1100 344 02667
 4710 339 02635 4710 342 02658 1100 342 02659 1110 345 02668
 4720 340 02636 4720 343 02659 1110 343 02660 1120 346 02669
 4730 341 02637 4730 344 02660 1120 344 02661 1130 347 02670
 4740 342 02638 4740 345 02661 1130 345 02662 1140 348 02671
 4750 343 02639 4750 346 02662 1140 346 02663 1150 349 02672
 4760 344 02640 4760 347 02663 1150 347 02664 1160 350 02673
 4770 345 02641 4770 348 02664 1160 348 02665 1170 351 02674
 4780 346 02642 4780 349 02665 1170 349 02666 1180 352 02675
 4790 347 02643 4790 350 02666 1180 350 02667 1190 353 02676
 4800 348 02644 4800 351 02667 1190 351 02668 1200 354 02677
 4810 349 02645 4810 352 02668 1200 352 02669 1210 355 02678
 4820 350 02646 4820 353 02669 1210 353 02670 1220 356 02679
 4830 351 02647 4830 354 02670 1220 354 02671 1230 357 02680
 4840 352 02648 4840 355 02671 1230 355 02672 1240 358 02681
 4850 353 02649 4850 356 02672 1240 356 02673 1250 359 02682
 4860 354 02650 4860 357 02673 1250 357 02674 1260 360 02683
 4870 355 02651 4870 358 02674 1260 358 02675 1270 361 02684
 4880 356 02652 4880 359 02675 1270 359 02676 1280 362 02685
 4890 357 02653 4890 360 02676 1280 360 02677 1290 363 02686
 4900 358 02654 4900 361 02677 1290 361 02678 1300 364 02687
 4910 359 02655 4910 362 02678 1300 362 02679 1310 365 02688
 4920 360 02656 4920 363 02679 1310 363 02680 1320 366 02689
 4930 361 02657 4930 364 02680 1320 364 02681 1330 367 02690
 4940 362 02658 4940 365 02681 1330 365 02682 1340 368 02691
 4950 363 02659 4950 366 02682 1340 366 02683 1350 369 02692
 4960 364 02660 4960 367 02683 1350 367 02684 1360 370 02693
 4970 365 02661 4970 368 02684 1360 368 02685 1370 371 02694
 4980 366 02662 4980 369 02685 1370 369 02686 1380 372 02695
 4990 367 02663 4990 370 02686 1380 370 02687 1390 373 02696
 5000 368 02664 5000 371 02687 1390 371 02688 1400 374 02697
 5010 369 02665 5010 372 02688 1400 372 02689 1410 375 02698
 5020 370 02666 5020 373 02689 1410 373 02690 1420 376 02699
 5030 371 02667 5030 374 02690 1420 374 02691 1430 377 02700
 5040 372 02668 5040 375 02691 1430 375 02692 1440 378 02701
 5050 373 02669 5050 376 02692 1440 376 02693 1450 379 02702
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 5160 384 02680 5160 387 02703 1550 387 02704 1560 390 02713
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 5200 388 02684 5200 391 02707 1590 391 02708 1600 394 02717
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 5710 439 02735 5710 442 02758 2100 442 02759 2110 445 02768
 5720 440 02736 5720 443 02759 2110 443 02760 2120 446 02769
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 5740 442 02738 5740 445 02761 2130 445 02762 2140 448 02771
 5750 443 02739 5750 446 02762 2140 446 02763 2150 449 02772
 5760 444 02740 5760 447 02763 2150 447 02764 2160 450 02773
 5770 445 02741 5770 448 02764 2160 448 02765 2170 451 02774
 5780 446 02742 5780 449 02765 2170 449 02766 2180 452 02775
 5790 447 02743 5790 450 02766 2180 450 02767 2190 453 02776
 5800 448 02744 5800 451 02767 2190 451 02768 2200 454 02777
 5810 449 02745 5810 452 02768 2200 452 02769 2210 455 02778
 5820 450 02746 5820 453 02769 2210 453 02770 2220 456 02779
 5830 451 02747 5830 454 02770 2220 454 02771 2230 457 02780
 5840 452 02748 5840 455 02771 2230 455 02772 2240 458 02781
 5850 453 02749 5850 456 02772 2240 456 02773 2250 459 02782
 5860 454 02750 5860 457 02773 2250 457 02774 2260 460 02783
 5870 455 02751 5870 458 02774 2260 458 02775 2270 461 02784
 5880 456 02752 5880 459 02775 2270 459 02776 2280 462 02785
 5890 457 02753 5890 460 02776 2280 460 02777 2290 463 02786
 5900 458 02754 5900 461 02777 2290 461 02778 2300 464 02787
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 6080 476 02772 6080 479 02795 2470 479 02796 2480 482 02805
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 6100 478 02774 6100 481 02797 2490 481 02798 2500 484 02807
 6110 479 02775 6110 482 02798 2500 482 02799 2510 485 02808
 6120 480 02776 6120 483 02799 2510 483 02800 2520 486 02809
 6130 481 02777 6130 484 02800 2520 484 02801 2530 487 02810
 6140 482 02778 6140 485 02801 2530 485 02802 2540 488 02811
 6150 483 02779 6150 486 02802 2540 486 02803 2550 489 02812
 6160 484 02780 6160 487 02803 2550 487 02804 2560 490 02813
 6170 485 02781 6170 488 02804 2560 488 02805 2570 491 02814
 6180 486 02782 6180 489 02805 2570 489 02806 2580 492 02815
 6190 487 02783 6190 490 02806 2580 490 02807 2590 493 02816
 6200 488 02784 6200 491 02807 2590 491 02808 2600 494 02817
 6210 489 02785 6210 492 02808 2600 492 02809 2610 495 02818
 6220 490 02786 6220 493 02809 2610 493 02810 2620 496 02819
 6230 491 02787 6230 494 02810 2620 494 02811 2630 497 02820
 6240 492 02788 6240 495 02811 2630 495 02812 2640 498 02821
 6250 493 02789 6250 496 02812 2640 496 02813 2650 499 02822
 6260 494 02790 6260 497 02813 2650 497 02814 2660 500 02823
 6270 495 02791 6270 498 02814 2660 498 02815 2670 501 02824
 6280 496 02792 6280 499 02815 2670 499 02816 2680 502 02825
 6290 497 02793 6290 500 02816 2680 500 02817 2690 503 02826
 6300 498 02794 6300 501 02817 2690 501 02818 2700 504 02827
 6310 499 02795 6310 502 02818 2700 502 02819 2710 505 02828
 6320 500 02796 6320 503 02819 2710 503 02820 2720 506 02829
 6330 501 02797 6330 504 02820 2720 504 02821 2730 507 02830
 6340 502 02798 6340 505 02821 2730 505 02822 2740 508 02831
 6350 503 02799 6350 506 02822 2740 506 02823 2750 509 02832
 6360 504 02800 6360 507 02823 2750 507 02824 2760 510 02833
 6370 505 02801 6370 508 02824 2760 508 02825 2770 511 02834
 6380 506 02802 6380 509 02825 2770 509 02826 2780 512 02835
 6390 507 02803 6390 510 02826 2780 510 02827 2790 513 02836
 6400 508 02804 6400 511 02827 2790 511 02828 2800 514 02837
 6410 509 02805 6410 512 02828 2800 512 02829 2810 515 02838
 6420 510 02806 6420 513 02829 2810

		2/14/74	PAGE 1
* 7090 FORTRAN INPUT-OUTPUT COMPATIBILITY ROUTINE CAUSES			
* 'READ N, LIST' TO BE EXECUTED AS 'READ INPUT TAPE			00000003.
* 'WRITE OUTPUT TAPE M2, N, LIST, AND PUNCH N, LIST'			00000004.
* TO BE EXECUTED AS 'WRITE OUTPUT TAPE M3, M, LIST'			00000005.
* WHEN N IS SYSTEM NUMBER OF INPUT TAPE AND			00000007.
* M2 AND M3 ARE LOGICAL TAPE NUMBERS			00000008.
* FOR PERIPHERAL INPUT, OUTPUT AND PUNCHING RESPECTIVELY.			00000010.
* WRITTEN BY G. W. GEORGE, NORTH AMERICAN AVIATION, INC.			00000011.
* SPACE AND INFORMATION SYSTEMS DIVISION, DOWNEY, CALIF.			00000013.
* ENTRY (CSH)			00000014.
* ENTRY (SPH)			00000015.
* ENTRY (SCH)			00000017.
TRANSFER VECTOR			
00000	74472623460	(TSH)	
00001	74472623460	(STH)	
00002	0560 00 0 00010	(CSH) CAL	00000018.
00003	0020 00 0 00000	(CSH) TRA	00000019.
00004	0020 00 0 00011	(SPH) CAL	00000020.
00005	0020 00 0 00011	(SCH) CAL	00000021.
00006	0550 00 0 00012	(SCH) CAL	00000022.
00007	0020 00 0 00001	TRA	00000023.
00008	0020 00 0 00000	M1	00000024.
00009	0020 00 0 00000	M2	00000025.
00010	0020 00 0 00000	M3	00000026.
00011	0 30016 0 00000	P1E	00000027.
00012	0 30016 0 00000	P2E	00000028.
00013	00005	P1N EQU	00000029.
00014	00005	P2N EQU	00000030.
00015	00016	NPUNCH EQU	00000031.
00016		END	00000032.

Figure 51. FAP Input-Output Compatibility Subroutine Listing

PAGE 2

PGST PROCESSOR ASSEMBLY DATA

REFERENCES TO DEFINED SYMBOLS				
10	M2	2		
11	M2	4		
12	M3	6		
5	P1N	10	13	
6	MOUT	11	13	
2	(CSH)			
8	(SCH)			
4	(SPN)			
1	(STH)			
10	(TSH)	5	7	
16	MUNCH	3		
		12	1	

NO ERROR IN ABOVE ASSEMBLY.

Figure S1. FAP Input-Output Compatibility Subroutine Listing
(Continued)

Figure 52. Variable Format

[illegible]

APPENDIX C

COORDINATE TRANSFORMATION

PRIMARY TRANSFORMATION

As indicated in Section II, the surface coordinate transformation technique employed by the program does not require transformation parameters such as direction cosines, Euler angles and translation terms to be entered as input data to the program for transformation purposes. Instead, the x , y and z coordinates of three points, not in a line, are given from the new origin, or to the new position of the surface. These data are then used to derive the rotational and translation terms required to transform the remaining surface data to the new origin or surface position.

The classical equations for transformation of rectangular coordinates in space are employed for both primary and auxiliary transformation. The new x , y and z coordinates in terms of the old coordinates are:

$$x = x' \cos \alpha_1 + y' \cos \alpha_2 + z' \cos \alpha_3 + H \quad (1)$$

$$y = x' \cos \beta_1 + y' \cos \beta_2 + z' \cos \beta_3 + L \quad (2)$$

$$z = x' \cos \gamma_1 + y' \cos \gamma_2 + z' \cos \gamma_3 + K \quad (3)$$

Note that there are 9 unknown direction cosines and 3 translation terms, or a total of 12 unknowns. It is clear that the coordinates of four points from the new origin are required if these equations are to be used directly to determine the unknown parameters.

It can be shown, however, that the coordinates of three points (not in a line) are sufficient and necessary to fix the position of a surface in any rectangular coordinate system. It appears, therefore, that another point must be made available for solution of the above equations, or another technique developed which directly requires only three points. Investigation of the latter yielded a complex, difficult to program, solution. On the other hand, solution of the classical equations is straightforward, but requires the extra point (not in the plane of the other three). Rather than require the user to supply the extra point in data, it was decided to generate the point as a unit normal vector above the second point given in transformation data. This extra point must, of course, be generated in both old and new coordinate systems.

Figure 53 depicts a primary transformation of Surface A from the old (primed) to the new (unprimed) coordinate system. Note that the primary transformation shown affects only one surface, whereas both surfaces are involved in the auxiliary transformation, which will be discussed in more



detail later in this Appendix. The angles (α , β and γ) shown in Equations 1, 2 and 3 are related in the following manner with the primed and unprimed coordinate axes shown in Figure 53:

$$\alpha_1 = \angle O'X'OX, \alpha_2 = \angle O'Y'OX, \alpha_3 = \angle O'Z'OX$$

$$\beta_1 = \angle O'X'OY, \beta_2 = \angle O'Y'OY, \beta_3 = \angle O'Z'OY$$

$$\gamma_1 = \angle O'X'OZ, \gamma_2 = \angle O'Y'OZ, \gamma_3 = \angle O'Z'OZ$$

Given the coordinates of points 2, 5 and 6 in Surface A, and the generated point U, from both the old and new coordinate systems, we may write four independent equations similar to Equation 1. Using Equation 1, the resulting set of equations in x is:

$$x_2 = x_2' \cos \alpha_1 + y_2' \cos \alpha_2 + z_2' \cos \alpha_3 + H \quad (4)$$

$$x_5 = x_5' \cos \alpha_1 + y_5' \cos \alpha_2 + z_5' \cos \alpha_3 + H \quad (5)$$

$$x_6 = x_6' \cos \alpha_1 + y_6' \cos \alpha_2 + z_6' \cos \alpha_3 + H \quad (6)$$

$$x_U = x_U' \cos \alpha_1 + y_U' \cos \alpha_2 + z_U' \cos \alpha_3 + H \quad (7)$$

We may similarly write two more sets of equations in y and z similar to Equations 2 and 3, for a total of twelve independent equations. Each set of four simultaneous equations is solved by Cramer's Rule (Reference 2) for the unknown direction cosines relating the old y' and z' axes to the new x, y and z axes.

For example, using the set developed above for Equation 1 (Equations 4, 5, 6 and 7), the coefficient determinant D is

$$D = \begin{vmatrix} x_2' & y_2' & z_2' & 1 \\ x_5' & y_5' & z_5' & 1 \\ x_6' & y_6' & z_6' & 1 \\ x_U' & y_U' & z_U' & 1 \end{vmatrix} \quad (8)$$

By Cramer's Rule, we successively replace the elements in each column of the set with the respective element on the left of each equation in the set. For example, the solution for $\cos \alpha_2$ is:

$$\cos \alpha_2 = \frac{\begin{vmatrix} x_2' & x_2 & z_2' & 1 \\ x_5' & x_5 & z_5' & 1 \\ x_6' & x_6 & z_6' & 1 \\ x_U' & x_U & z_U' & 1 \end{vmatrix}}{D} \quad (9)$$

and similarly,

$$\cos \alpha_3 = \frac{\begin{vmatrix} x_2' & y_2' & x_2 & 1 \\ x_5' & y_5' & x_5 & 1 \\ x_6' & y_6' & x_6 & 1 \\ x_U' & y_U' & x_U & 1 \end{vmatrix}}{D} \quad (10)$$

The above process is repeated for the solution of $\cos \beta_2$, $\cos \beta_3$, $\cos \gamma_2$, and $\cos \gamma_3$, using the sets developed for y and z . The coefficient determinant is the same for all sets, because the coefficients of the unknowns in all sets are identical.

To increase computational efficiency, repeated factors in the expanded determinants are computed only once for each set. Also, considerable economy results in computing the unknown direction cosines $\cos \alpha_1$, $\cos \beta_1$, $\cos \gamma_1$, as the cross product of the corresponding direction cosines of the other (y and z) axes:

$$\cos \alpha_1 = \cos \beta_2 \cos \gamma_3 - \cos \gamma_2 \cos \beta_3 \quad (11)$$

$$\cos \beta_1 = \cos \gamma_2 \cos \alpha_3 - \cos \alpha_2 \cos \gamma_3 \quad (12)$$

$$\cos \gamma_1 = \cos \alpha_2 \cos \beta_3 - \cos \beta_2 \cos \alpha_3 \quad (13)$$

The translation components H , L and K are computed by substituting the coordinates of the point below point U in the surface to be transformed into Equations 1, 2 and 3, along with the known values of direction cosines. For the Surface A shown in Figure 53, using point 5,

$$H = x_5 - x_5' \cos \alpha_1 - y_5' \cos \alpha_2 - z_5' \cos \alpha_3 \quad (14)$$

$$L = y_5 - x_5' \cos \beta_1 - y_5' \cos \beta_2 - z_5' \cos \beta_3 \quad (15)$$

$$K = z_5 - x_5' \cos \gamma_1 - y_5' \cos \gamma_2 - z_5' \cos \gamma_3 \quad (16)$$

The program now transforms all point coordinates in Surface A from the old to the new system by direct substitution in Equations 1, 2 and 3.

The method outlined above will always perform the transformation desired, providing the three points selected are (1) sufficiently separated in space, (2) accurately computed, and (3) do not form a straight line in space. Because the fourth point U is always computed outside the plane of the other three, the coefficient determinant D can never be 0. Hence, by Cramer's Rule, a unique solution must always exist.

AUXILIARY TRANSFORMATION

An auxiliary transformation transforms the coordinates of both surfaces into the reference plane of a specified surface--the "Control" surface. In Figure 53, Surface A is the control surface; the auxiliary transformation depicted transforms both Surface A and B from the unprimed (old) system to the double-primed (new) system. In general, the origin O" in the control surface is always point 1 in the control surface coordinate array. It may not always be the first point entered in input surface data; if a bisection of the surface occurs, and the original point 1 is not seen by the other surface (assumed planar), then a new point 1 will be computed. The new point will be used as the origin O". The same processing occurs for internally generated surfaces. Only surfaces classed as plane surfaces may be control surfaces, i.e., Classes 1, 3, 4 and planar 6. For example, if both Surface A and B in Figure 53 are plane and bisect each other, two auxiliary transformations would occur to facilitate surface reconstruction. Actually, if Surface A were entered as Surface 1, the first auxiliary transformation to occur would be to point 1 in Surface B, rather than Surface A. This would not occur, however, if Surface A were not bisected by Surface B. In any case, the last transformation always is to point 1 in Surface 1, so that mapping and factor computation may proceed forthwith.

The processing of an auxiliary transformation differs from the primary transformation because unknowns may be more readily computed from available data. Equations 1, 2 and 3 are rewritten for the auxiliary old and new coordinate systems,

$$x'' = x \cos \alpha_1 + y \cos \alpha_2 + z \cos \alpha_3 + H'' \quad (17)$$

$$y'' = x \cos \beta_1 + y \cos \beta_2 + z \cos \beta_3 + L'' \quad (18)$$

$$z'' = x \cos \gamma_1 + y \cos \gamma_2 + z \cos \gamma_3 + K'' \quad (19)$$

The angles are defined as follows, referring to Figure 53:

$$\alpha_1 = \angle OXO''X'', \alpha_2 = \angle OYO''X'', \alpha_3 = \angle ZOZO''X''$$

$$\beta_1 = \angle OXO''Y'', \beta_2 = \angle OYO''Y'', \beta_3 = \angle ZOZO''Y''$$

$$\gamma_1 = \angle OXO''Z'', \gamma_2 = \angle OYO''Z'', \gamma_3 = \angle ZOZO''Z''$$

Because the $O''X''$ axis in the new system is directed along the line segment formed by the first and second point in the control surface, the direction cosines related to that axis are readily computed.

The length of line $\overline{12}$ in Surface A is

$$LS_{12} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2},$$

and the direction cosines relating the new $O''X''$ axis to the old OX , OY and OZ axes are:

$$\cos \alpha_1 = (x_2 - x_1)/LS_{12} \quad (20)$$

$$\cos \alpha_2 = (y_2 - y_1)/LS_{12} \quad (21)$$

$$\cos \alpha_3 = (z_2 - z_1)/LS_{12} \quad (22)$$

Because the new $O''Z''$ axis is directed along the surface unit orientation vector (point O above Surface A) the cosines relating that axis to the old OX , OY and OZ axes are

$$\cos \gamma_1 = x_0 - x_1 \quad (23)$$

$$\cos \gamma_2 = y_0 - y_1 \quad (24)$$

$$\cos \gamma_3 = z_0 - z_1 \quad (25)$$

The remaining direction cosines are computed by cross products of the X'' and Z'' axis unit base vectors (direction cosines).

$$\cos \beta_1 = \cos \gamma_2 \cos \alpha_3 - \cos \alpha_2 \cos \gamma_3 \quad (26)$$

$$\cos \beta_2 = \cos \alpha_1 \cos \gamma_3 - \cos \gamma_1 \cos \alpha_3 \quad (27)$$

$$\cos \beta_3 = \cos \gamma_1 \cos \alpha_2 - \cos \alpha_1 \cos \gamma_2 \quad (28)$$

The unknown translation terms are determined from Equations 17, 18 and 19 for point 1 in Surface A ($x_1^i = 0$, $y_1^i = 0$, $z_1^i = 0$).

$$H'' = -x_1 \cos \alpha_1 - y_1 \cos \alpha_2 - z_1 \cos \alpha_3 \quad (29)$$

$$L'' = -x_1 \cos \beta_1 - y_1 \cos \beta_2 - z_1 \cos \beta_3 \quad (30)$$

$$K'' = -x_1 \cos \gamma_1 - y_1 \cos \gamma_2 - z_1 \cos \gamma_3 \quad (31)$$

The program now transforms all coordinates in Surface A and Surface B to the new system by using Equations 17, 18 and 19.

APPENDIX D

COMPUTATION OF SURFACE AREA OF INTERNALLY GENERATED SURFACES

In Figure 54, View J-J shows a view of the surface of a right elliptical cone between the two arbitrary cross-sections indicated in the isometric sketch of the cone. Because the program internal surface generator uses the elliptical cross-section as the basic generating element, elemental surface areas such as $ABCD$ in Figure 54 are trapezoids having, in general, unequal nonparallel sides. Also, because each elemental surface is developed by equal elliptical ~~parametric~~ angles, one need compute the area of only one elemental surface for each pair of cross-sections (providing, of course, the cross-sections are similar).

The plane area of trapezoid $ABCD$ is

$$A_T = \frac{1}{2} h (L_1 + L_2). \quad (1)$$

L_1 and L_2 are readily computed from the X, Y coordinates of points A, B, C and D :

$$L_1 = \sqrt{(X_C - X_A)^2 + (Y_C - Y_A)^2} \quad (2)$$

$$L_2 = \sqrt{(X_D - X_B)^2 + (Y_D - Y_B)^2} \quad (3)$$

The trapezoid height h is computed indirectly from the projected area A_p of the trapezoid on the XY plane in the following manner:

$$h = \sqrt{h_p^2 + Z^2} \quad (4)$$

where h_p is the projected length of trapezoid height h , and Z is the distance between cross-sections.

The projected area of $ABCD$ is:

$$A_p = \frac{1}{2} h_p (L_1 + L_2). \quad (5)$$

Solving for h_p in Equation 5:

$$h_p = \frac{2 A_p}{(L_1 + L_2)} \quad (6)$$

The area A_p is computed from the trapezoid (X, Y) coordinates in the following manner:

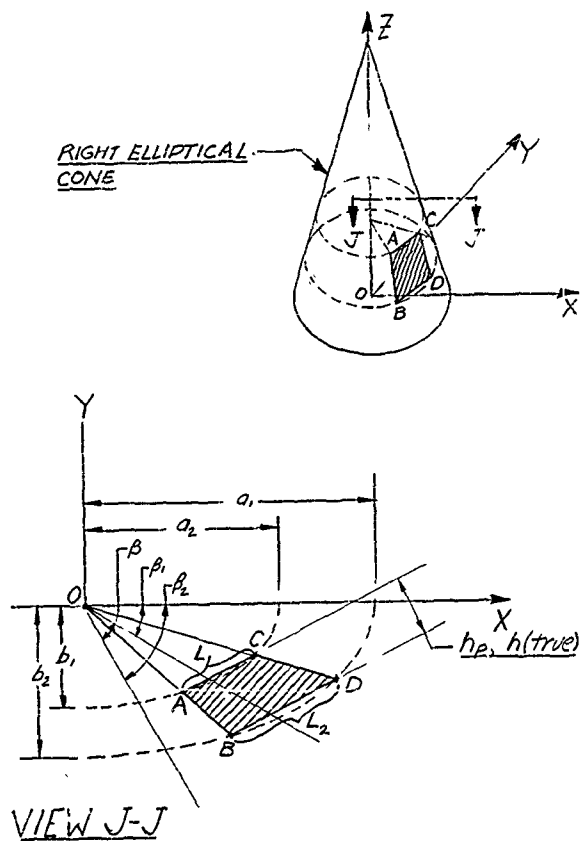


Figure 54. Surface Area Geometry of Internally Generated Polyhedra

Noting triangles BOD and AOC

$$A_p = \text{Area } \triangle BOD - \text{Area } \triangle AOC \quad (7)$$

It is desirable for computational efficiency to compute A_p using known parameters. In this case, $\sin \beta$ is known and is used. The parametric equations of the ellipse are:

$$x = a \cos \theta \quad (8)$$

$$y = b \sin \theta \quad (9)$$

where a is the semi-major axis, b is the semi-minor axis and θ is the parametric angle. In Figure 54, angle β_1 defines points A and B and angle β_2 defines points C and D. Angle $\beta = \beta_2 - \beta_1$.

The area of triangle AOC can be computed by vector cross products,

$$A_{AOC} = \frac{1}{2} (X_A Y_C - X_C Y_A) \quad (10)$$

From Equations 8 and 9 for the parametric angles β_1 and β_2 defining points A and C,

$$X_A = a_1 \cos \beta_1, Y_A = b_1 \sin \beta_1 \quad (11)$$

$$X_C = a_1 \cos \beta_2, Y_C = b_1 \sin \beta_2 \quad (12)$$

Substituting Equations 11 and 12 in Equation 10,

$$\begin{aligned} A_{AOC} &= \frac{1}{2} a_1 b_1 (\cos \beta_1 \sin \beta_2 - \cos \beta_2 \sin \beta_1) \\ A_{AOC} &= \frac{1}{2} a_1 b_1 \sin (\beta_2 - \beta_1) \\ A_{AOC} &= \frac{1}{2} a_1 b_1 \sin \beta \end{aligned} \quad (13)$$

A similar derivation is developed to obtain the area of triangle BOD.

$$A_{BOD} = \frac{1}{2} a_2 b_2 \sin \beta \quad (14)$$

Substituting Equations 13 and 14 in Equation 7,

$$A_p = \frac{1}{2} \sin \beta (a_2 b_2 - a_1 b_1) \quad (15)$$

Substituting Equation 15 into Equation 6,

$$h_p = \frac{2 \left[\frac{1}{2} \sin \beta (a_2 b_2 - a_1 b_1) \right]}{I_1 + I_2} \quad (16)$$

Substituting Equation 16 into Equation 4,

$$h = \sqrt{\left[\frac{\sin \beta (a_2 b_2 - a_1 b_1)}{L_1 + L_2} \right]^2 + z^2} \quad (17)$$

Finally, substituting Equation 17 into Equation 1,

$$A_T = \frac{L_1 + L_2}{2} \sqrt{\left[\frac{\sin \beta (a_2 b_2 - a_1 b_1)}{L_1 + L_2} \right]^2 + z^2}$$

Rearranging terms,

$$A_T = \frac{1}{2} \sqrt{[\sin \beta (a_2 b_2 - a_1 b_1)]^2 + [z (L_1 + L_2)]^2} \quad (18)$$

The total surface area is computed by repeated evaluation of Equation 18 for the particular surface generated.

APPENDIX E

DERIVATION OF CONFIGURATION FACTOR TO A SPHERE

The analytic solution of the configuration factor to a sphere depends upon the position of the sphere relative to the plane of Surface 1. This is clearly demonstrated geometrically by using the Nusselt unit sphere projection as shown in Figure 55. Three unique solutions are apparent from the five different sphere positions; Ib and IIIa represent "limit" values in each case. The unit sphere projections (crosshatched areas) shown in the lower part of Figure 55 correspond respectively to sphere positions (not to scale) depicted in the upper half. Case I results when the sphere is above (Ia) and/or touching (Ib) the plane of Surface 1. The locus on the Nusselt hemisphere base is an ellipse, and varies from a circle (when the sphere is vertically over the point O) to the single tangency position shown in Ib. When the sphere goes below the plane of Surface 1, the Case II locus appears, and is formed by the ellipse boundary on the left and the unit circle boundary on the right.

The locus projected on the unit sphere surface is a circle, in every case. The radius, b , of the circle becomes the semi-major axis of the projected ellipse. By similar triangles,

$$\frac{b}{1} = \frac{R}{D}$$

$$b = \frac{R}{D} \quad (1)$$

where D = distance from center of sphere to origin of unit sphere and R is the sphere radius. The semi-minor axis, a , of the ellipse is the projection on the unit circle of b ; again by similar triangles,

$$\frac{a}{b} = \frac{R}{D}$$

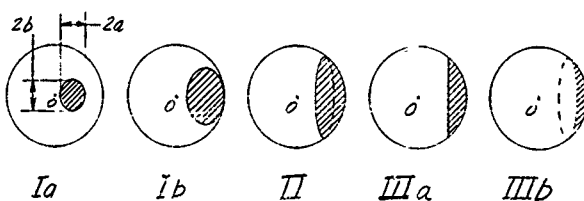
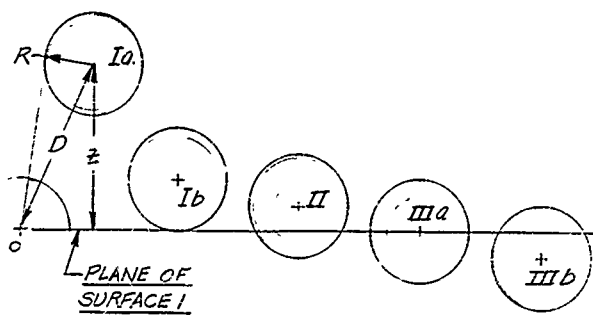
$$a = b \frac{R}{D} = \frac{R^2}{D^2}$$

$$\text{or} \quad (2)$$

The area of the ellipse is

$$A = \pi ab = \pi \frac{R^2}{D^2} \quad (3)$$

The configuration factor for Case I is the area of the ellipse divided by the area of the unit radius circle,



NUSSELT UNIT SPHERE PROJECTIONS
(NOT TO ANY SCALE)

Figure 55. Areas Involved in Configuration Factor to Spheres

$$c_I = \frac{R^2 Z}{D^3}, \quad Z \geq R \quad (L)$$

NUSSELT UNIT
CIRCLE

By inspection,

$$A_{ACB} = A_{AOB} - A_{CO'OB} - A_{CO'B} \quad (5)$$

Area AOB is a sector of the unit circle, $R = 1$,

$$A_{AOB} = \frac{1}{2} R^2 \theta = \frac{1}{2} \theta \quad (6)$$

Given h , the distance between centers O and O' , and Y_C , the value of y at the tangency point between the ellipse and the circle, the area of the triangle $OO'C$ is

$$A_{0103} = \frac{1}{2} = \bar{x}_c \quad (7)$$

The area CO'B is an elliptical sector defined by the parametric angle ϕ at (x_c, y_c) the point of tangency,

$$A_{CO'B} = \frac{ab}{2} \phi \quad (8)$$

Inserting Equations 6, 7 and 8 into Equation 5,

$$A_{ACB} = \frac{1}{2} (\phi - by_c - ab\phi) \quad (9)$$

The unknowns b , h , y_c and ϕ must be evaluated in terms of N , Z and D . The tangency point x_c, y_c is determined as follows. The equation of the ellipse when translated a distance h in the x direction from the origin O is

$$\frac{(x-h)^2}{a^2} + \frac{y^2}{b^2} = 1 \quad (10)$$

The equation of the unit circle is

$$x^2 + y^2 = 1 \quad (11)$$

At the intersection point the slopes are equal. Taking the first derivative of Equation 10,

$$\frac{2}{a^2} (x-h) dx + \frac{2y}{b^2} dy = 0$$

Rearranging,

$$\frac{dy}{dx} = \frac{b^2}{2y} \left[\frac{2}{a^2} (h-x) \right] = -\frac{b^2}{a^2} \frac{(h-x)}{y} \quad (12)$$

The slope at any point x, y on the circle is:

$$\frac{dy}{dx} = -\frac{x}{y} \quad (13)$$

Equating Equations 12 and 13,

$$\frac{b^2}{a^2} \frac{(h-x)}{y} = -\frac{x}{y}$$

Solving for h , at $x = x_c$ and $y = y_c$,

$$h = x_c \frac{(y_c^2 - a^2)}{b^2} \quad (14)$$

Substituting Equation 14 into Equation 10,

$$\frac{\left[x_c - x_c \frac{(b^2 - a^2)}{b^2} \right]^2}{a^2} + \frac{y_c^2}{b^2} = 1$$

Reducing and rearranging terms, and solving simultaneously with Equation 11:

$$\left(\frac{a}{b}\right)^2 x_c^2 + y_c^2 = b^2 \quad (15)$$

$$x_c^2 + y_c^2 = 1$$

Subtracting Equation 11 from Equation 15,

$$x_c^2 \left[\left(\frac{a}{b}\right)^2 - 1 \right] = b^2 - 1$$

Solving for x_c ,

$$x_c^2 = \frac{b^2 - 1}{\left(\frac{a}{b}\right)^2 - 1} \quad (16)$$

$$x_c = b \sqrt{\frac{1 - b^2}{b^2 - a^2}} \quad (17)$$

Solving for y_c in Equation 11,

$$y_c = \sqrt{1 - x_c^2} \quad (18)$$

Substituting Equation 1 and 2 into Equation 17,

$$x_c = \sqrt{\frac{R^2 - D^2}{Z^2 - D^2}} \quad (19)$$

Substituting Equation 1, 2 and 16 into Equation 18,

$$y_c = \sqrt{\frac{Z^2 - R^2}{Z^2 - D^2}} \quad (20)$$

The angle ϕ may be defined as

$$\phi = \tan^{-1} \frac{y_c}{x_c} = \tan^{-1} \frac{y_c}{\sqrt{b^2 - y_c^2}} \quad (21)$$

Substituting Equation 1 and 20 into Equation 21,

$$\phi = \tan^{-1} \left[\frac{D}{|Z|} \cdot \sqrt{\frac{Z^2 - R^2}{R^2 - D^2}} \right] \quad (22)$$

The angle θ may be defined as

$$\theta = \tan^{-1} \frac{y_c}{x_c} \quad (23)$$

Substituting Equations 19 and 20 into Equation 23,

$$\theta = \tan^{-1} \sqrt{\frac{Z^2 - R^2}{R^2 - D^2}} \quad (24)$$

Substituting Equations 1, 2 and 19 into Equation 14,

$$h = \frac{D^2 - Z^2}{D^2} \sqrt{\frac{R^2 - D^2}{Z^2 - D^2}} \quad (25)$$

The parameter hy_c in Equation 9 is evaluated by multiplying Equations 20 and 25,

$$\begin{aligned} hy_c &= \left[\frac{D^2 - Z^2}{D^2} \sqrt{\frac{R^2 - D^2}{Z^2 - D^2}} \right] \frac{Z^2 - R^2}{Z^2 - D^2} \\ hy_c &= \frac{\sqrt{D^2 - R^2} \cdot \sqrt{R^2 - Z^2}}{D^2} \\ hy_c &= \left(\frac{D^2 - R^2}{D^2} \right) \sqrt{\frac{R^2 - Z^2}{D^2 - R^2}} \end{aligned} \quad (26)$$

Let $\alpha = D^2 - R^2$ (27)

and $\beta = \sqrt{\frac{R^2 - Z^2}{\alpha}}$ (28)

Substituting Equations 27 and 28 into Equations 22, 24 and 26, respectively,

$$\phi = \tan^{-1} \left[\frac{D}{2R} \beta \right] \quad (29)$$

$$\theta = \tan^{-1} \beta \quad (30)$$

and $hy_c = \frac{\alpha \beta}{D^2}$ (31)

Finally, substitute Equations 29, 30 and 31 into 9; the actual area projected on the hemisphere base is twice Area ACB and is divided by the base area to yield the configuration factor.

$$C_{III} = \frac{1}{\pi} \left[\left(\tan^{-1} \beta \right) - \frac{R^2 Z}{D^3} \left(\tan^{-1} \frac{\beta D}{|Z|} \right) - \frac{\beta}{Z} \right] \quad (2)$$

where

$$\alpha = D^2 - R^2$$

$$\beta = \sqrt{\frac{R^2 - Z^2}{\alpha}}, \quad Z \leq 0 \text{ and } Z^2 \leq R^2$$

By inspection of Figure 55, the projected area for Case II is the sum of the ellipse evaluated by the Case I formula and the crescent shaped area determined by the Case III formula,

$$C_{II} = C_I + C_{III}, \quad 0 < Z < R \quad (3)$$

In summary, referring to Figure 55,

$$C_I = \frac{R^2 Z}{D^3}, \quad Z \geq R$$

$$C_{III} = \frac{1}{\pi} \left[\left(\tan^{-1} \beta \right) - \frac{R^2 Z}{D^3} \left(\tan^{-1} \frac{\beta D}{|Z|} \right) - \frac{\beta}{Z} \right]$$

where

$$\alpha = D^2 - R^2, \quad \beta = \sqrt{\frac{R^2 - Z^2}{\alpha}},$$

$$Z \leq 0, \quad Z^2 \leq R^2$$

$$C_{II} = C_I + C_{III}, \quad 0 < Z < R$$