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ESTIMATED PERFORMANCE AND STABILITY AND CONTROL DATA FOR CORRELATION WITH XB-70-1 FLIGHT TEST DATA

John H. Wykes and Robert E. Lawrence

July 1971

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Prepared Under Contract NAS2-6037

NORTH AMERICAN ROCKWELL CORPORATION/LOS ANGELES DIVISION
LOS ANGELES, CALIFORNIA

For

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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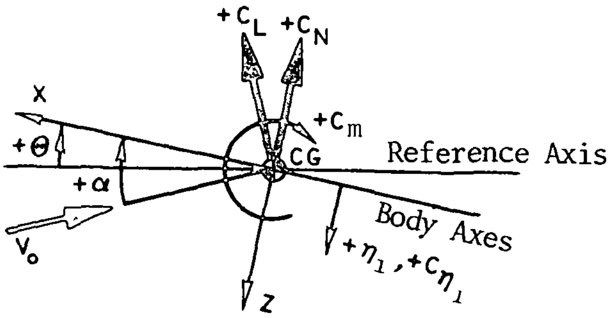

A dot over a quantity denotes the derivative with respect to time. A prime denotes differentiation with respect to the independent variable.

α	angle of attack, radian
δ_e	elevon deflection, radian
δ_c	canard deflection, radian
δ_d	bypass door deflection, radian
δ_T	wingtip deflection, degrees
η_i	generalized deflection for i th mode, feet
η_j	generalized deflection for j th mode, feet

Θ	angle of pitch, radian
ρ	air density, slug/feet^3
ϕ_i	normalized mode shape of i th mode
ω_i	natural frequency of i th mode, radians/second
ω	forcing frequency, radians/second
g	acceleration due to gravity, feet/second^2
g_s	structural damping coefficient
I_Y	pitching moment of inertia (body axis), slug - feet^2
M	Mach number
M_i	generalized mass of i th mode, $\iint \phi_i^2 (x,y) \Delta m(x,y)\, dxdy$, slugs
m	airplane total mass, slugs
W	airplane total weight, pounds
n_z	normal load factor
q	pitching velocity radians/second
q_o	dynamic pressure, pounds/feet^2
h_p	pressure altitude, feet

$\bar{c}_w$	wing mean aerodynamic chord, feet
S_w	wing area, feet^2
V_o	resultant velocity of the center of gravity
X,Z	body axes
Z	vertical deflection, feet
K_c	canard alone cantilevered flexible-to-rigid ratio
ℓ_T	distance between center of gravity and thrust axis, + down, feet
ℓ_{c1}	longitudinal distance between canard center of pressure and center of gravity, feet
ℓ_{c2}	longitudinal distance between 3/4 chord point on canard MAC and 3/4 chord point on wing MAC, feet; associated with canard downwash transport time lag
T_o	freestream ambient temperature, degrees
°F	degrees Fahrenheit
P_X/H_o	pressure ratio, local static pressure at station X over freestream total pressure
P_o	freestream static pressure, psia
P_t	local total pressure, psia
P_s	local static pressure, psia
A_o/A_c	mass flow ratio as represented by ratio of stream cross section at freestream conditions over inlet capture area

F_N	net thrust, pounds
D_A	additive drag, pounds
D_{BP}	bypass drag, pounds
D_{BLC}	BLC drag, pounds
F_{NL}	net propulsive effort, pounds
N	aerodynamic normal force referred to body Z-axis, pounds
Q_i	generalized force in i th mode, $\iint -N(x,y)\ \phi_i(x,y)\ dxdy$
T	thrust, pounds
$\left[L_h\right]_R$	real component of the generalized normal force due to plunging motion, pounds/foot
$\left[M_h\right]_R$	real component of the generalized pitching moment due to plunging motion, foot pounds/foot
$\left[Q_{ih}\right]_R$	real component of the generalized modal force due to plunging motion, pounds/foot
C_D	drag coefficient, $\frac{\text{Drag}}{q_o S_W}$
C_N	normal-force coefficient, $\frac{N}{S_W q_o}$
C_Z	$-\ C_N$

C_{N_q} change in normal-force coefficient due to pitching, $\dfrac{\partial C_N}{\partial \frac{q\bar{c}_w}{2V_o}}$, /radian

C_{N_α} normal-force curve slope, $\dfrac{\partial C_N}{\partial \alpha}$, /radian

$C_{N_{\dot{\alpha}}}$ change in normal-force coefficient due to rate of change of angle of attack, $\dfrac{\partial C_N}{\partial \frac{\dot{\alpha}\bar{c}_w}{2V_o}}$, /radian

C_{N_δ} change in normal-force coefficient due to control surface deflection, $\dfrac{\partial C_N}{\partial \delta}$, /radian

$C_{N_{\eta_i}}$ change in normal-force coefficient due to i th mode deflection, $\dfrac{\partial C_N}{\partial \eta_i}$, /feet

$C_{N_{\dot{\eta}_i}}$ change in normal-force coefficient due to rate of change of i th mode deflection, $\dfrac{\partial C_N}{\partial \frac{\eta_i}{V_o}}$

$C_{N(\alpha=0)}$ normal force coefficient at $\alpha=0°$

$C_{m(\alpha=0)}$ pitching moment coefficient at $\alpha=0°$

$C_{\eta_i(\alpha=0)}$ generalized force coefficient for $\alpha=0°$ loading

$C_{N(\alpha)}$ normal force coefficient as a nonlinear function of α; typical of callout of other nonlinear coefficient variations with α

$C_{N(\alpha_c)}$ canard normal force coefficient as a nonlinear function of α_c; typical of callout of other nonlinear coefficient variations with α_c

$C_{N(\alpha,\delta_e)}$ normal force coefficient as a nonlinear function of both α and δ_e; typical of callout of other nonlinear coefficient variations with α and δ_e

$C_{N(\delta_d)}$ normal force coefficient as a nonlinear function of δ_d; typical of callout of other nonlinear coefficient variations with δ_d

$C_{N(\alpha,\delta_c)}$ canard normal force coefficient as a nonlinear function of both α and δ_c; typical of callout of other nonlinear coefficients with α and δ_c

$(\ )_{WB}$ wing-body component of coefficient in parenthesis

$(\ )_C$ canard component of coefficient in parenthesis

$(\ )_I$ canard interference (acting on wing) component of coefficient in parenthesis

C_m pitching-moment coefficient, $\frac{\text{Pitching moment}}{q\bar{c}_w S_w}$

C_{m_q} change in pitching-moment coefficient due to pitching,

$$\frac{\partial C_m}{\partial \frac{q\bar{c}_w}{2V_o}}, \text{/radian}$$

C_{m_α} static longitudinal stability, $\frac{\partial C_m}{\partial \alpha}$, /radian

$C_{m_{\dot{\alpha}}}$ change in pitching-moment coefficient due to rate of change of angle of attack, $\frac{\partial C_m}{\partial \frac{\dot{\alpha}\bar{c}_w}{2V_o}}$, /radian

C_{m_δ} change in pitching-moment coefficient due to control surface deflection, $\frac{\delta C_m}{\partial \delta}$, /radian.

$C_{m_{\eta_i}}$ change in pitching-moment coefficient due to i th mode deflection, $\frac{\partial C_m}{\partial \eta_i}$, /feet.

$C_{m_{\dot{\eta}_i}}$ change in pitching-moment coefficient due to rate of change of i th mode deflection, $\frac{\partial C_m}{\partial \frac{\dot{\eta}_i}{V_o}}$

C_{η_i} generalized i th mode force coefficient, $\frac{Q_i}{S_w q_o}$

$C_{\eta_{i_{(\,)}}}$ $= \frac{\partial C_{\eta_i}}{\partial (\,)}$ generalized force coefficient due to variable,

$(\,) = \alpha, \left(\frac{\dot{\alpha}\bar{c}_w}{2V_o}\right), \left(\frac{q\bar{c}_v}{2V_o}\right), \delta_c, \delta_e$

$C_{\eta_{i_{\eta_j}}}$ change in generalized force coefficient due to j th mode deflection, $\frac{\partial C_{\eta_i}}{\partial \eta_j}$, /feet

$C_{\eta_i \dot{\eta}_j}$ change in generalized force coefficient due to rate of change of j th mode deflection, $\dfrac{\partial C_{\eta_i}}{\partial \dfrac{\dot{\eta}_j}{V_o}}$

A/P airplane

AICS Air Induction Control System

BDM Basic Data Manual

BP buttock plane

CP control point

CG center of gravity

ECS Environmental Control System

FS fuselage station

FACS Flight Augmentation Control System

GVT ground vibration test

ILAF Identically Located Accelerometer and Force

MAC mean aerodynamic chord

psia pounds per inch absolute

SAS Stability Augmentation System

NOTE: FACS and SAS are analogous

All other symbols defined as used

ESTIMATED PERFORMANCE AND STABILITY AND CONTROL DATA FOR CORRELATION WITH XB-70-1 FLIGHT TEST DATA

by John H. Wykes and Robert E. Lawrence*

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Los Angeles, California

SUMMARY

The results of a study program established by NASA to provide supporting information for correlation studies based on small-scale rigid-model wind tunnel test data and results from flight tests of the XB-70-1 airplane are reported. The ultimate objective of the overall program is to validate with flight results combined analytical and wind tunnel test techniques for determining performance and stability and control characteristics of flexible aircraft.

INTRODUCTION

The flight test program conducted by NASA on the XB-70-1 airplane has provided a unique opportunity to evaluate and validate state-of-the-art performance and stability and control prediction techniques for flexible aircraft. Rigid wind tunnel models having the deformed shape of a flexible aircraft flying at a specific altitude-speed condition show attractive potential for more accurately obtaining the effects of flexibility on drag characteristics for the design conditions. However, lift and moment characteristics as well as the drag at tunnel test conditions other than the design condition must be corrected for the effects of the built-in deformed shape to obtain vehicle characteristics valid for these nondesign flight conditions. In order to validate these techniques building on the extensive

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*Other key individuals who worked on the original XB-70 research and development program and who have contributed to this report are: Garth Parker, Aerodynamics; Gene C. Blecha, Aerodynamics; Kenneth F. Anderson, Aerodynamics; Ron K. Florance, Aerodynamics; Sidney Siegel, Dynamics Technology; Virginia L. Schaal, Dynamics Technology; Cecil A. Stephens, Mass Properties; George Wan, Thermodynamics; Marvin M. Fleishman, Induction System and Flow Compatibility; Warren D. Beaulieu, Propulsion System Performance.

analytical and test data available on the XB-70, NASA contracted with the North American Rockwell Corporation/Los Angeles Division to conduct a two-part program.

First, the NASA Flight Research Center entered into a contract (NAS4-1530) with North American Rockwell Corporation/Los Angeles Division which required the following:

1. Performing calculations essential to the definition of the geometrical shape of the flexible XB-70-1 airplane for a specific supersonic cruise condition.

2. Designing a wind tunnel model (designated the Deformed Model) which incorporated the geometric shape for the specified flight condition.

3. Building the Deformed Model.

The three tasks were completed and the model delivered to NASA Ames for wind tunnel testing to provide data for the objectives of the second part of the program effort.

The second part of the program, the details of which are the subject of this report, was accomplished under two main analytical tasks which were as foll

TASK - PERFORMANCE CORRELATION ANALYSES

The end products of this task were:

1. Trimmed airplane deformed shape and control deflections.

2. Flexible-to-rigid ratio correction data for longitudinal stability and control data for support of performance calculations.

3. Sensitivity effects of major aerodynamic parameters, thrust, and miscellaneous discharge airflow.

4. Compilation of miscellaneous information important to accurate performance calculations.

Data for ten flight conditions for which flight test data exist were generated under this task.

TASK II - LONGITUDINAL STABILITY AND CONTROL PARAMETER CORRELATION ANALYSES

The end product of these analyses were:

1. Trimmed airplane deformed shape and control deflections.

2. Flexible-to-rigid ratio correction data for longitudinal stability and control data.

3. Sensitivity effects of major aerodynamic parameters, thrust, and miscellaneous discharge airflow.

4. Assessment of previous and current flexible XB-70 analyses.

Data for six flight conditions for which flight test data existed, and one flight condition not having comparable flight test data, were generated under this task.

Both of these analytical tasks had two phases. Phase 1 was accomplished using the best available aerodynamic data existing at contract initiation; in Phase 2 a determination was made, based on the wind tunnel test results of the Deformed Model, whether the aerodynamic data used in Phase 1 calculation should be changed. Where changes were required, affected flight condition data were recalculated.

NASA currently plans to utilize the data presented in this report as part of additional in-house performance and stability and control analyses and correlations with flight test results of the XB-70-1.

FLIGHT CONDITIONS

The flight conditions for which detailed analyses were conducted during this study are presented in tables 1 and 2. These conditions were selected by NASA. Table 1 contains the flight conditions which were primarily oriented toward obtaining performance objectives; each case identification number of this table is prefaced by the letter P. Table 2 contains the flight conditions which were oriented primarily toward longitudinal stability and control objectives; each case identification number of this table is prefaced by the letter SC. This nomenclature is used extensively throughout the remainder of this report.

TABLE 1

PERFORMANCE TEST CONDITIONS FOR XB-70-1 AIRPLANE⁺

Case I.D.	Flight No.	Data Time	Mach No.	Altitude ft.	Weight lbs.	C.G. $\%\bar{C}_W$	Mass Distribution
P 1	81	2:47:35	0.76	25,750	316,100	23.5	As dictated by fuel loading relating to weight and center-of-gravity condition.
P 2	76	1:23:18	0.93	32,700	473,600	22.2	
P 3	76	2:14:16	1.18	33,750	335,800	21.9	
P 4	81	1:55:50	1.60	38,600	394,200	21.6	
P 5	79	1:53:47	1.67	42,000	372,700	22.1	
P 6	79	1:42:41	2.1	48,600	388,800	21.4	
P 7	67	2:11:59	2.15	57,600	349,600	22.4	
P 8	70	1:58:06	2.53	62,980	371,300	21.7	
P 9	82	1:50:47.5	2.50	61,625	376,400	21.6	
P 10	66	1:35:02	1.06	27,160	428,900	22.4	

Case I.D.	δ_{tips} deg.	δ_e deg.	δ_c deg.	n_Z g's	Bypass Door Position	Nose Ramp Position	P_o psi	T_o deg. R
P 1	0	2.7	2.26	1.0	Closed	Down	5.39	435
P 2	25	2.4	2.15	1.0	Closed	Down	4.00	429
P 3	25	10.9	0.90	1.0	3.23°	Down	3.71	420
P 4	65	9.7	1.14	1.0	3.27°	Down	2.97	377
P 5	65	9.3	1.38	1.0	2.80°	Down	2.52	386
P 6	65	6.2	1.98	1.0	7.40°	Down	1.81	380
P 7	65	3.7	2.59	1.0	6.78°	Down	1.17	374
P 8	65	3.2	2.82	1.0	1.80°	Up	.886	376
P 9	65	3.0	2.76	1.0	3.80°	Down	.947	381
P 10	25	12.4	.51	1.0	1.51°	Down	4.99	447

⁺ These data provided by NASA.

TABLE 2

STABILITY AND CONTROL TEST CONDITIONS FOR XB-70-1 AIRPLANE+

Case I.D.	Flight No.	Data Time	Mach No.	Altitude ft.	Weight lbs.	C.G. $\%\bar{C}_W$	Mass Distribution
SC 1	63	0:36:49	0.76	15,500	480,000	22.5	As dictated by fuel loading relating to weight and center-of-gravity condition.
SC 2	63	1:55:57	0.75	25,100	336,000	22.5	
SC 3	64	0:35:30	1.21	32,400	424,000	22.6	
SC 4	75	2:04:00.5	1.22	39,300	352,000	20.9	
SC 5	*	*	1.22	38,300	333,000	22.6	
SC 6	81	1:50:26	1.61	38,600	406,000	22.0	
SC 7	68	1:53:21	2.39	56,100	380,000	21.2	

Case I.D.	tips deg.	δ_e deg.	δ_c deg.	n_z g's	Bypass Door Position	Nose Ramp Position
SC 1	0	3.8	2.36	1.0	Closed	Down
SC 2	0	2.6	2.52	1.0	Closed	Down
SC 3	25	10.9	1.18	1.0	1.00°	Down
SC 4	25	6.7	1.73	1.0	1.00°	Down
SC 5	25	*	*	1.0	1.00°	Down
SC 6	65	10.2	1.26	1.0	3.50°	Down
SC 7	65	4.6	2.54	1.0	5.00°	Down

+ These data provided by NASA.

* Not an actual flight case.

ANALYTICAL AIRPLANE MODEL

This section details the physical description of the airplane model used in the analytical studies reported herein. Figure 1 presents a three view of the XB-70-1 airplane. A complete description of the XB-70-1 physical characteristics may be found in Appendix A.

Equations of Motion of the Flexible Airplane

A detailed treatment of the equations of motion used to describe the longitudinal motion of the flexible XB-70-1 used in the analytical studies is given in Appendix B. It will suffice here to mention that these equations include rigid body plunge and pitch modes and a number of symmetric structural modes (four or more).

The accuracy of the data required by these equations of motion determined the measure of success of the analytical portion of the study. The flow chart of figure 2 shows the sequence of analyses which were performed to achieve the desired objectives and will be helpful in understanding the following discussions.

Weight

The XB-70 empty weight data are believed to be quite accurate on the whole. As airplane parts were built, it was possible to weight components and continually upgrade original estimates. Thus, vehicle weight magnitudes and distributions continually changed to reflect vehicle status. This weight accounting procedure continued through the flight test stage. However, the magnitudes and distributions reflected in the estimated flexible airplane stability and control derivatives and trimmed airplane control deflections of reference 1 represent a set of data fixed in time. They were an integral part of the flexible airplane description which were not continually updated after the XB-70 development program was truncated. A review of the vehicle weight history through the flight test period shows that a considerable deviation from estimates developed as equipment was installed or removed, ballast added or removed, and vehicle structural repair undertaken. In the present program, the analytical data generated which are to be compared to flight test data have included these weight changes.

Thus, the first job of the present study was to check the no-fuel weight definition of the airplane for the flight cases listed in tables 1 and 2. The Mass Properties Group has maintained a running log of the changes affecting the basic empty weight of the airplane. A detailed breakdown of the weight onto a suitable grid was accomplished for the Flight 50 configuration. This grid breakdown allowed the Structural Dynamics Group to assess the basic airplane weight distribution relative to that of the airplane during the ground vibration tests. The weight records from Flight 50 to those required for this study were reviewed, and items over 50 pounds were noted as subtracting or adding to the Flight 50 weight status. From this effort, an up-to-date set of empty whole-vehicle weight and inertia characteristics (W, I_y) were determined along with a grid system of distributed weights for the individual flight cases.

The second job for the Mass Properties Group was the determination of the fuel loading for the required flight cases. Knowing the flight number and instant of time in flight, existing flight records provided fuel tank loading status, and the status of other consumables which allowed determination of total airplane weight, CG, and pitch inertia for each flight case.

The original data supplied by NASA was reduced from flight test records by NR. These techniques of data reduction were reviewed in light of the current program objectives and accuracy requirements. This review has resulted in some differences in weight and C.G. location over those in tables 1 and 2. These differences are compared in table 3. Some differences arose because of doubtful fuel readings; these were revised by considering the planned flight sequence and known deviations from this sequence on a reasonable estimate basis. The revised data were used in the analyses described herein.

Structural Mode Characteristics

Ground vibration tests to obtain structural symmetric and antisymmetric mode shapes provided a check on the combined structural-mass characteristics of the XB-70. Since, as discussed, a careful accounting of the weight changes has been accomplished, it is felt that the ground vibration test results are a good definition of the actual flight article structure.

The vehicle was shaken while the landing gear rested on air pillows of low natural frequency; no fuel was on board and several wingtip deflections were included. The raw test data were processed to remove gear restraints.

Table 4 compares the symmetric mode natural frequencies and generalized masses for several configuration weight combinations. As shown, the vehicle had higher vibration mode frequencies than calculated originally during the early development phase. These earlier modal descriptions are the ones reflected in the data of reference 1.

The Structural Dynamics Group took the new distributed and total weights and inertias for the basic empty-weight vehicle together with the specific flight condition distributed fuel loadings and obtained the symmetric structural mode data required for this study. Modal data for the cases required were generated through the use of the measured ground vibration test (GVT) modes, which were freed from ground support constraints and orthogonalized analytically. The GVT modes are based on a set of 97 control points (CP) distributed throughout the air vehicle. Masses for each of the cases were distributed to the set of 97 CP's in the form of coupled mass matrices by means of an existing program. This program provides for a matching of the shear, CG, and moment properties in local areas as well as for the total air vehicle.

Once the mass matrix was defined for a given case, the free-free modal vibration equations were set up and solved through an existing computer program. The program essentially replaced the structural stiffness distribution of the air vehicle by the generalized masses and the frequencies of the GVT modes. For each case, a coupled generalized mass matirx was calculated using the 97 CP mass matrix and 16 GVT modes. The program solves the eigenvalue problem for the 16th order matrices and then transforms the generalized coordinates back to the original 97 degrees of freedom.

Existing aeroelastic analyses digital programs require the use of 118 control points. An existing quasilinear interpolation program transformed the modal deflections at the GVT set of 97 control points to the required 118 points.

Under the XB-70 Flight Test Research Program (NASA Contract NASA-1175) and the supplemental program, Analytical Evaluation of ILAF Performance on the XB-70 Airplane (NASA Contract NAS4-1580), it was possible to examine and update the aerodynamics, weight, and structural mode characteristics reflecting the conditions of the airplane as actually flown in the manner identical to the approach employed in this study. Comparisons of analytical and flight test data for a number of actual cases flown were possible.

Some preliminary comparisons are shown in figures 3 through 5. These data are frequency response plots of the load factor at the pilot station due to excitation by the shaker vane located on the nose of the airplane just ahead of the cockpit. These data show that structural frequency and aerodynamic characteristics can be analytically predicted using the approaches utilized for this program. While these responses are dynamic in nature, they reflect the mass, structure, and aerodynamic characteristics which could also affect trimmed airplane static bending and control surface deflections.

The actual symmetric structural mode data generated for this program are presented in Appendix C.

Aerodynamics

The aerodynamic description of the XB-70 is the combined result of contributions from tests of several wind tunnel models in several facilities coupled with theoretical and empirical data. The description varied as a function of time as new data became available. An understanding of the aerodynamic characteristics of the XB-70 and the work accomplished under the present contract requires consideration of the aerodynamic status at three points in time as well as the data sources which contributed to the results. To aid in understanding the discussions which follow, table 5 provides a listing of these three data sets, where they were used, and the models and facilities from which data were acquired. It should be emphasized that at no time was the aerodynamic description a direct representation of a single wind tunnel test. Rather, it was always the coordinated combination of all available information.

The data set identified in the Basic Data Manual (BDM) was the official description of the airplane during the vehicle development period. Although a number of models were used during the program, Force Model 5, built to the airplane jig shape, was the primary source of test data on the final configuration. Due to truncation of the development program, some test results acquired late in the project, which were judged not to affect safety of flight, were not incorporated into the BDM. Also, during the later stages of the flight program, two wind tunnel tests of Force Model 5 were conducted by NASA in the Ames facility which were not incorporated into the BDM description.

The Phase 1 data set was derived by upgrading the BDM to reflect available test results noted above as having been omitted. The aeroelastic analyses which are necessary for flexible airplane studies require definition of the distribution characteristics (shape and magnitude) of the aerodynamic loads. Further, the load distributions must be balanced to the force data (i.e., they must agree with the force data in both normal force and pitching moment). The Phase 1 revision involved upgrading both force data and load distributions on an as-needed basis. Major effort centered around providing load distributions for the flight conditions of Tables 1 and 2. A significant contribution to the Phase 1 revision was accomplished under recent contracts to NASA/FRC (Contracts NAS4-1530 and NAS4-1580).

At the beginning of Phase 2 of the program, results of Ames wind tunnel tests of the Deformed Model became available. The Deformed Model was built to the 1g trim flight shape for performance case P8. Results of these tests were to be incorporated into the analysis as necessary to define the Phase 2 data set. As was expected, the primary difference between Force Model 5 and the Deformed Model appeared as $\Delta C_{N(\alpha=0)}$ and $\Delta C_{m(\alpha=0)}$ due to the difference in shape of the two models; however, in addition, some revisions of the aerodynamic representation have resulted from a review of the Deformed Model test data. A comparison of pertinent results from the two models is presented in a later section.

During Phase 1, significant revisions to the rigid-body aerodynamic force data were incorporated in three areas: elevon effectiveness, zero angle of attack, and the dynamic stability derivatives due to $\dot{\alpha}$ and q. During Phase 2, the elevon effectiveness data were again revised, airplane pitching moment data were modified and the effects of boundary layer bleed were investigated. Each of these areas will now be discussed separately.

BDM elevon data reflected the earlier nonsegmented configuration. During Phase 1, the elevon effectiveness in lift and pitching moment was revised to account for the segmented elevons of the flight vehicle based on limited wind tunnel test data from Force Model 5 at transonic and high supersonic speeds. This revision, illustrated at zero angle of attack in figures 6 and 7, was used in all Phase 1 analyses. The data indicated a change in the magnitude of the load without any alteration in its distribution shape. Tests of the Deformed Model were run with both slab and segmented elevons. Results of these tests showed the loss in control effectiveness due to segmentation was generally less than indicated by the earlier tests. The source of the discrepancy is attributed to excessive flexibility of the Force Model 5 elevon hinge brackets resulting from strain gage installations. The elevon effectiveness curves were modified to reflect the Deformed Model segmented elevon data during Phase 2 for use in the final airplane analyses. Figures 8 and 9 show the final segmented elevon effectiveness used in the study at zero angle of attack. BDM slab elevon curves are shown for comparison. The zero angle of attack data are shown for convenience of comparison; but for analyses conducted, angle of attack variations were included where pertinent.

Figures 10 and 11 illustrate the comparison with BDM curves of new values of $C_{N(\alpha=0)}$ and $C_{m(\alpha=0)}$ used in Phase 1. The new data at zero angle of attack were based on wind tunnel tests of Force Model 5 by NASA. These values reflect a shift in the entire normal force and pitching moment curves with no variation in lift curve slope or aerodynamic center. The load distributions at zero angle of attack were modified in both magnitude and shape to balance with the revised force data. In figures 12 and 13, the Phase 1 variations of complete airplane normal force and pitching moment coefficients with angle of attack are compared with Ames test results of Force Model 5 at selected Mach numbers for each of the three wing tip positions. The incremental difference at a representative trim normal force coefficient is noted on each curve whose Mach number is at or near one of the conditions of tables 1 and 2. The variation of these increments with Mach number is illustrated in figures 14 and 15. The comparisons of figure 12 show that minor differences exist in the variation of normal force coefficient and in nearly all cases the local slope at trim is the same for both curves. The pitching moment data of figure 13 show some very significant differences, both in shape and in magnitude at the trim conditions, although only small differences exist in the local slope at trim. Fortunately, the largest discrepancies occur at Mach numbers which do not correspond to the flight conditions of tables 1 and 2.

Although these Ames test data of Force Model 5 were available at the beginning of the program, it was but one of many sources of aerodynamic information on the XB-70-1. Phase 1 studies were conducted using aerodynamic representation which reflected the sum total of all available information, each part of which was weighed for its validity and applicability. During Phase 2, the excellent agreement of the Deformed Model data to the Ames data taken on Force Model 5 added new emphasis to the latter data set and led to the conclusion that the final aerodynamic model should reflect more directly the Ames test results. This conclusion was supported by an improved understanding of the relationship between the Ames test data, NR studies and the NASA performance analyses yet to be done.

A complete revision of the aerodynamic model to reflect the Ames data would have involved changing not only the force data but also the corresponding load distribution data, a task which was beyond the scope of the present program. It was concluded that the major effect to be accounted for was the incremental pitching moment difference at trim which was accomplished by shifting the Phase 1 curves to coincide with the Ames curve at the C_N for 1g trim. The normal force differences were concluded to be minor and ignored. This approach produced the correct rigid-body pitching moment at trim and, as indicated by figures 12 and 13, normal force and pitching moment slopes at trim which are very close to the Ames data. Some error remains in the aeroelastic description, but its impact is estimated to be small.

An investigation was made into the effect on trim of inlet boundary layer bleed through the "sugar scoop" exit on the bottom of the fuselage and through the diverter onto the wing upper surface. Detailed geometric and flow descriptions of these items may be found in the section entitled

Internal Aerodynamics. Two sources of data were available on the "sugar scoop." Reference 2 shows the effect of the actual size duct and a double size duct at M = 2.5 and 3.0. The double size duct was run with and without bleed airflow. Normal force and pitching moment due to airflow was found to be negligible, but the pitching moment due to the presence of the duct was significant. The Deformed Model was tested throughout the Mach range both with and without the "sugar scoop" duct. No airflow was present. The incremental pitching moment due to the duct is shown from both tests as a function of Mach number in figure 16. These data are included in the final estimate of the 1g trim characteristics. No structural mode excitation due to bleed was included due to lack of distribution definition; however, this omission is estimated to be very small.

The only known data on the diverter are from unpublished data from the Ames 103 test of Force Model 5. Comparison runs of diverter open and diverter closed were made only at M = 2.5 and 3.01. At M = 2.5 the increments due to the diverter are:

$$\Delta C_N = 0.008$$
$$\Delta C_m = -0.0004$$

Very similar values were found at M = 3.0. This effect was estimated to be worth $\Delta\delta_e$ of approximately +1/4 degree. Since no definition of diverter effects was available at other Mach numbers, these values have not been included in the analysis.

The effects of both deflection and airflow due to bypass door have been included in the force data and in the mode excitations. Although small, the effects of nose ramp position have also been included.

The generalized aerodynamic data determination for the structural mode forces used lifting surface theory programs (references 3, 4, 5 and 6); these digital programs were not used in the generation of the data in reference 1. Improved accuracy in the new data resulted. Correlations and adjustments to data levels were based on C_{L_α} test data.

Another area that was upgraded was that of the fuselage generalized forces. In the original analyses, a point load at the center of pressure for the rigid airplane loading was assumed. In this analysis, a modified slender body theory was used to obtain a distributed load for purposes of obtaining the modal generalized forces.

The dynamic stability derivatives C_{m_q} and $C_{m_{\dot{\alpha}}}$ reflected in the data of reference 1 were predicted based on theory and correlations with existing experimental data from similar component configurations. This approach was reevaluated during this study program and new data were generated as a result.

The rigid-body derivatives C_{m_q}, C_{N_q} and the companion structural mode generalized force derivatives $C_{n_{iq}}$ for the wing can be determined from either quasi-steady lifting surface theory or from unsteady lifting surface theory. These data for this program were calculated using state-of-the-art digital programs using the doublet lattice (subsonic Mach numbers) and Mach box (supersonic Mach numbers) lifting surface theories.

The canard surface effects on these derivatives are implicit in the equations of motion presented in Appendix B. The data for the canard increment associated with the data of reference 1 are given in figure 17.

The fuselage effects on these derivatives were determined using a modified slender body theory.

The $\dot{\alpha}$ derivatives $C_{m_{\dot{\alpha}}}$, $C_{N_{\dot{\alpha}}}$ and $C_{n_{i\dot{\alpha}}}$ for lifting surfaces are unique among the longitudinal-symmetric derivatives in that one must obtain them from unsteady lifting surface theory rather than quasi-steady theory. These data were obtained subsonically using the doublet lattice theory and supersonically from the Mach box theory. Given the dimensional generalized forces L_h, M_h and Q_{ih} at the frequency of oscillation ω, the required derivatives were obtained using the following reduction formulas:

$$C_{N_{\dot{\alpha}}} = + \frac{1}{\omega^2} \frac{1}{2\rho} \frac{8}{\bar{c}_W S_W} \left[L_h \right]_{real}$$

$$C_{m_{\dot{\alpha}}} = - \frac{1}{\omega^2} \frac{1}{2\rho} \frac{8}{\bar{c}_W^2 S_W} \left[M_h \right]_{real}$$

$$C_{\eta i_{\dot{\alpha}}} = - \frac{1}{\omega^2} \frac{1}{2\rho} \frac{8}{\bar{c}_W S_W} \left[Q_{ih} \right]_{real}$$

where: $\left[\quad \right]_{real}$ indicates the real component of the bracketed generalized force.

The similar lifting surface derivatives of the canard have been neglected as small; but the downwash-lag component of the canard influence is implicitly included in the equations of motion in Appendix B.

The $\dot{\alpha}$ derivatives for the fuselage were assumed negligible.

Figures 18 and 19 present the wing-body derivatives C_{N_q} and C_{m_q}, respectively, compatible with the information in reference 1 compared to more recent information. Two types of more recent information are shown; data generated for the study reported in reference 7 and data generated during this study. The data of reference 7 were generated using only unsteady aerodynamic lifting surface theories: subsonic kernel function or Mach box. As shown, all of the δ_T = 65° supersonic data generally agree, while there are significant differences at δ_T = 0°, and 25° in the subsonic region between reference 1 data and the more recent data. The most recent data are the more accurate since they are based on more valid theory.

The $C_{N_{\dot{\alpha}}}$ and $C_{m_{\dot{\alpha}}}$ derivatives for the wing-body reflected in reference 1 data are shown in figures 20 and 21 respectively. Also shown are the more recent data obtained in the same manner as the pitch derivatives just described. Significant differences exist at all δ_T positions and Mach numbers except above M =2.0 where the derivatives become insignificant.

These early estimates of reference 1 were made using the basic supersonic theories of references 8 and 9 but modifying the results by the projected planform aspect ratio and area when the wing tips were deflected. The results were extrapolated to the subsonic speeds using a wing lift curve slope variation with Mach number.

Some perspective to help evaluate the noted $\dot{\alpha}$ differences is provided by the data of figure 22. The XB-70-1 has an aspect ratio of 1.65 (δ_T=25°). Entering the curve shown for $C_{m_{\dot{\alpha}}}$ at this value produces a positive value for $C_{m_{\dot{\alpha}}}$ which is consistent with the early estimate. But note how little geometric change, tip deflection say, which could possibly affect apparent aspect ratio and thus the sense of this derivative for the XB-70-type wing configurations. In the supersonic speed range, the $\dot{\alpha}$ derivatives obtained using the Mach box theories of references 6 and 7 have some disagreement. These differences are attributed to the previously mentioned configuration sensitive aspects and the small magnitude of the derivatives, plus the fact that the Mach box theory of reference 6 has a more refined description of the main wing and deflected tip mutual interference effects. Because of the ability of the present state-of-the-art digital programs to reflect three dimensional effects (particular deflected tip effects), the results from these programs are believed more valid than the earlier analysis estimates.

Digital Program Analysis Techniques

Analyses of the XB-70-1 flexible airplane characteristics were accomplished using an extensive inter-related group of computer program referred to as the Seventeen-Degree-of-Freedom (17DOF) Analysis System. The system encompassed a wide range of capabilities in five rigid-body degrees of freedom including component build-up, moment reference transfer, steady-state trim, flexible-to-rigid ratio, and a variety of dynamic response parameters. Appropriate elements of this system were utilized in the present study. While much of the analysis is straightforward, the following highlights are useful to an understanding of the approach to the problem.

The XB-70 aerodynamic data due to rigid-body degrees of freedom are, for the most part, nonlinear. Recognition of nonlinearities is essential to accurate prediction of steady-state trim characteristics, but presents severe complications in the computation of dynamic response. Linear data are also of great importance in "quick-look" studies which are fundamental to the understanding of any given configuration. To satisfy these diverse requirements, the aerodynamic data are entered into the 17DOF programs in nonlinear form. The equations of motion are also written in terms of nonlinear aerodynamics as shown in Appendix B. Steady state 1g trim is computed by an iterative procedure using the nonlinear description. The calculation of the deformed shape of the flexible airplane is a standard part of the trim calculation.

After establishing the trim conditions, the aerodynamic data are linearized by taking the local slopes of the curves at the trim point. The linearized model is then used to determine dynamic response characteristics and to compute flexible-to-rigid ratios of the various aerodynamic parameters. The latter procedure is discussed in Appendix D. Note that both the dynamic response characteristics and the flexible-to-rigid ratios are valid only for small perturbations from the 1g trim condition. The analyses described above are normally accomplished for both the rigid and flexible airplane. All results, including the linearized aerodynamic data, are available in the program print-out.

The rigid-body aerodynamic data shown in Appendix E were obtained in the manner described above. Care must be taken to understand the procedure and avoid misuse of the quoted data. The following example is given to aid in such understanding. Plots showing the variation of normal force and pitching moment with angle of attack for the complete airplane at a representative flight condition are given in figure 23. The plots show the basic nonlinear curves, the calculated trim point, and the local slopes taken through the points at trim angle of attack. Of prime importance here is the fact that the extension of the linear slopes to zero angle of attack do not correspond to the actual (and quoted) values of $C_{N(\alpha=0)}$ and $C_{m(\alpha=0)}$. Thus although the tabulated values of C_{N_α} and C_{m_α} are correct for defining perturbation characteristics around the trim point, they cannot be properly used in conjunction with the listed values of $C_{N(\alpha=0)}$ and $C_{m(\alpha=0)}$ to describe pitching moment at the trim angle of attack.

This limitation generally applies to normal force and pitching moment variation with angle of attack for the wing-body and for the canard including canard interference. The difficulty does not apply to other aerodynamic parameters within the range of interest of this study.

One other feature of the quoted values of $C_{N(\alpha=0)}$ and $C_{m(\alpha=0)}$ needs clarification. No provision existed in the 17DOF program for separate inputs of items such as thrust, bleed, etc. To avoid costly reprogramming, all such effects for a particular case were combined with the zero angle of attack values and are included in the values listed in Appendix E.

Gearing Curve

On the XB-70 the elevon and canard control surfaces were interconnected to operate together. A schematic of the longitudinal control system arrangement is shown in figure 24. Without the Flight Augmentation Control System (FACS), the pilot column motion is mechanically connected to the canard and elevon actuation devices. Motion of the two surfaces with respect to each other is described by a linear gearing curve which is characterized by its slope and intercept, as illustrated in figure 25.

The pilot can trim the airplane through the trim actuator. With the control column force trimmed out, (that is, $X_t = X_c$, ignoring any friction in the system), the pilot could turn the FACS on at any time without inducing transients into the system because of the cancellation of the signals from the trim actuator (X_t) and the pilot column (X_c). With the FACS on, however, a signal can originate from X_c (column force not trimmed out, $X_t \neq X_c$) to cause an electrical signal to the elevon which is a function of the gain schedule, K_{h_p}. The canard has only a mechanical linkage and is not influenced by the FACS. Thus, with the airplane sitting on the ground, the control system can have a different gearing curve, FACS on and FACS off; with FACS on, the gearing will have a larger slope, $d\delta_e/d\delta_c$, intercepting the FACS off curve at the trim column position.

Under accelerated flight conditions, signals which are a function of load factor and pitch rate subtract from the pilot column signal in an approximate return to the FACS off gearing slope.

Figure 25 shows a curve of the design mechanical gearing and flight test measured data for two types of maneuvers; a 1g accelerated level flight case and a roller coaster case. As can be seen, the data exhibit nearly the same slope but are offset from the mechanical gearing by approximately -2° and +3° elevon deflection, respectively. Similar deviations are apparent in varying magnitude throughout the cases of tables 1 and 2. Two features of the control system appear to provide the explanation for these offsets. First, the gearing is between the canard and the average of the two No. 1 (inboard) segments. Due to the "piano key" variation between segments, the average deflection of all segments is rarely equal to the average of the two No. 1 segments. (The mismatch between adjacent segments which produces the "piano key" effect is mechanically limited to 1°.) The second explanation lies in an hysteresis characteristic which results from system friction. The following example will serve to demonstrate this feature.

The control system characteristics quoted in the example were obtained from reference 11. The friction band for the longitudinal control system is approximately 14 lbs. The feel spring is 14 lbs/in plus an increment due to the q-bellows differential pressure, ΔP_B. For the XB-70-1 at $\Delta P_B = 0$, the column force gradient is 14 lbs/in and increases to 22.2 lbs/in at M = 3.0 at 70,000 ft. In the control system schematic of figure 24, imagine that the 14 lbs of friction occurs in the line from the control column to the control surface actuators. Observe the 14 lbs/in feel spring to the left of the column. Assume that the pilot trims with the trim knob rather than the control column. Note here that X_t, the trim actuator input to FACS, moves with the trim knob but not with the column. Data to be shown later in the section entitled Flexible Airplane Longitudinal Characteristics show that δ_e for 1g trim increases positively as the transonic region is approached and decreases at higher supersonic Mach numbers.

Using the transonic acceleration of figure 25 as a sample, as the airplane accelerates, an incremental positive δ_e is required. The pilot moves the trim knob to obtain an incremental positive δ_e. Assume the points X_c and X_t are equal prior to movement of the trim knob. The trim actuator extends, increasing X_t causing a forward force on the control column. The trim displacement, X_t, increases 14 lbs/14 lbs/in = 1 inch to cause a force on the column equal to the friction in the longitudinal control system. The column displacement, X_c, is unchanged since the force due to the feel spring equals the friction in the system. With FACS on the δ_e due to the FACS servo is

$$\delta_s = \left\{(X_c - X_t)\ K_{x_p} - \left[(n_z - 1)\ K_{n_z} + qK_q\right]\right\} K_{h_p}.$$

Assume the airplane is near trim so that $[(n_z-1)\ K_{n_z}+qK_q\ ]\approx 0$ then $\delta_s = (-1.0)(4.65)(.45) = -2.09°$. The $K_{h_p}=.45$ was approximated from the curve on the right side of figure 24. This value of $\delta_e = -2.09°$ is approximately the offset shown on figure 25 for transonic acceleration at 35,000 ft.

By similar reasoning the value of δ_s for the M=2.5 roller coaster maneuver at 63,000 ft. is $(1.0)(4.65)(.65) = 3.02°$. The sign of the incremental elevon due to the friction band depends on whether an incremental postive or negative δ_e is required for trim.

Reference 11 may be consulted for further, more detailed descriptions of the control system. Those characteristics outlined above are believed to provide a logical explanation of the flight test control deflection data, thereby removing suspicion of the experimental values cast by the disagreement with the mechanical gearing curve. It was decided early in the program that the analytical studies should be based on a gearing curve parallel to the mechanical gearing but offset to pass through the flight-measured point for any given case. In view of the present understanding of the control system, that choice still provides the most proper and realistic representation.

The Deformed Model, which was designed under an earlier contract (NASA/FRC Contract NAS4-1530), was built to a 1g trim shape which was computed using the design gearing curve.

Flight Test Elevon Values

At each of the points specified in tables 1 and 2, control deflections have been determined from the flight test records for comparison with analytically predicted values. Several aspects of these flight test measurements are worthy of consideration.

As previously described, the canard and elevons are geared mechanically to move together according to the equation $\delta_e = 20 - 6.67\ \delta_c$. The performance cases of table 1 were flown with the FACS on and the pilot attempting to maintain steady flight. The stability and control points of table 2 were flown with both FACS off and hands off. As would be expected from the earlier discussion of gearing characteristics, the control deflections for all cases exhibit deviation of various amounts from the design gearing curve. Deviations of the performance cases are generally larger than those of the stability and control cases.

The elevons consist of twelve individual segments all of which operate with 0° wing tips; eight segments operate with wing tips folded. Quoted flight test values of elevon deflection are averages of all operating segments. Further insight into the elevon characteristics may be obtained from an examination of flight test time histories of elevon deflections. Figure 26 presents time histories of the individual segments over an 18 second time period in the vicinity of the data point for performance case P2. The data time of the point is indicated. The star denotes the average value of the eight operating segments at the data time quoted in table 1. Two features are readily apparent: first, steady-state conditions do not exist at the data time; and second, the relative positions of the segments are continually varying. This sample, chosen at random, is representative of the behavior at all of the data points of table 1.

To aid in evaluating the elevon characteristics, averages of the left hand segments, the right hand segments, and all segments were computed over approximately a ten second time interval in the vicinity of each data point. These averages are plotted as a function of time in figure 27. Although the individual segment behavior is lost in this form of presentation, the average values demonstrate considerable control motion just prior to the data time input which implies lateral motion of the vehicle.

Table 6 presents a summary of the elevon deflection characteristics for each of the ten performance cases. At the specified data time, the average deflections of the left hand segments, the right hand segments, and all segments are tabulated. These values may be read directly from the curves of figure 27 at the specified times. Also listed for each side is the maximum deviation of individual segments from the average value in both positive and negative directions. These deviations were taken at the flight test data point nearest to the specified time.

To provide an indication of the extent of control motion, a similar set of data is tabulated for a 6-second time interval. In each case the interval was selected to include five flight test data points immediately preceding the point time with the sixth point either at or slightly after the point time. The deflections listed are averaged over the 6-second time period. The deviations quoted are the average of the maximum deflections at each of the six data points.

The last column lists the original elevon deflection values from table 1. Comparison of these values with the data time averages and the six second averages provide some measure of the uncertainty which must be attached to the flight test deflections. The wide discrepancy for point P7 was the result of bad data which was later corrected by a second reduction of flight records. The data point average has therefore been substituted for the original value in the correlations of this study and the list of table 1. Agreement between the three columns for all other cases is within 1/2 degree.

This magnitude was not believed to be justification for revising the already completed analyses. Original elevon deflections, therefore, appear in all performance case correlations except for case P7.

A brief review of the canard deflection data revealed only minor variations with time during the intervals near the performance case data points. This is not unexpected since the FACS does not affect the canard position.

A similar check was made of the flight test data for the stability and control cases of table 2. With FACS off and hands off, both canard and elevon deflection values are essentially invariant during the 1g trim interval, making time histories superfluous. It was noted, however, that several of the original control deflection values were in error. The values listed in table 2 have been revised accordingly.

Judging by the flight records discussed above, the test technique of FACS off and hands off employed for the stability and control cases provided a well stabilized 1g trim condition. On the other hand, the FACS on and hands on approach used for the performance cases resulted in almost continuous control motion and in some cases noticable airplane motion. The analytical analyses assume stabilized 1g flight and in no way accounts for transient motions of the control surfaces or the airplane. Further, the analytical model assumes equal deflection of all elevon segments. The variation between segments, which is different for each point, is not represented. These factors should be kept in mind in the assessment of analytical/flight test performance correlations which are the final goal of the program.

Roller Coaster Flight Test Data

For performance cases P3 and P8 of table 1, estimates were made of the deformed shape under accelerated flight conditions. The flight conditions to which these shapes are to be related were obtained from roller coaster maneuvers performed after the 1g trim. The analytical study required knowledge of the airplane motion characteristics at the points of interest in addition to the usual weight and flight condition description. Table 7 presents a summary of both the accelerated flight condition data and the related 1g trim data from table 1.

Several aspects of these data should be noted. The analytical study assumed that the gross weight, center of gravity and weight distribution of the base trim case were still valid for the accelerated flight points. Similar assumptions apply to Mach number and altitude. This approach was necessary to avoid costly regeneration of modal and aerodynamic data which was beyond the scope of the present investigation. Mach number and altitude variations are small and probably do not introduce significant error. Considerable time lag between the 1g trim and the roller coaster maneuver did occur, particularly on Flight 70, which would result in an unknown charge in the weight characteristics.

Segments of time histories of flight-measured pitch rate, load factor and elevon deflection during the roller coaster maneuver are shown for Flights 1-76 and 1-70 in figures 28 and 29, respectively. The data time for both the high and low load factor cases are indicated. The time histories of both flights show a rather erratic variation of pitch rate. An average value was used in the analysis rather than the specific magnitude at the data time.

Control deflection values for the same time segments of the roller coaster maneuvers are plotted on the 1g trim gearing curves in figure 30. For case P8, the roller coaster control deflection values follow the gearing curve very closely. For case P3, the limited flight test data falls somewhat off the 1g gearing curve, suggesting a maneuver gearing of slightly different slope. While such a change in slope is possible with the FACS on (see discussion in section entitled Gearing Curve), it was decided to retain the 1g gearing in the analytical study.

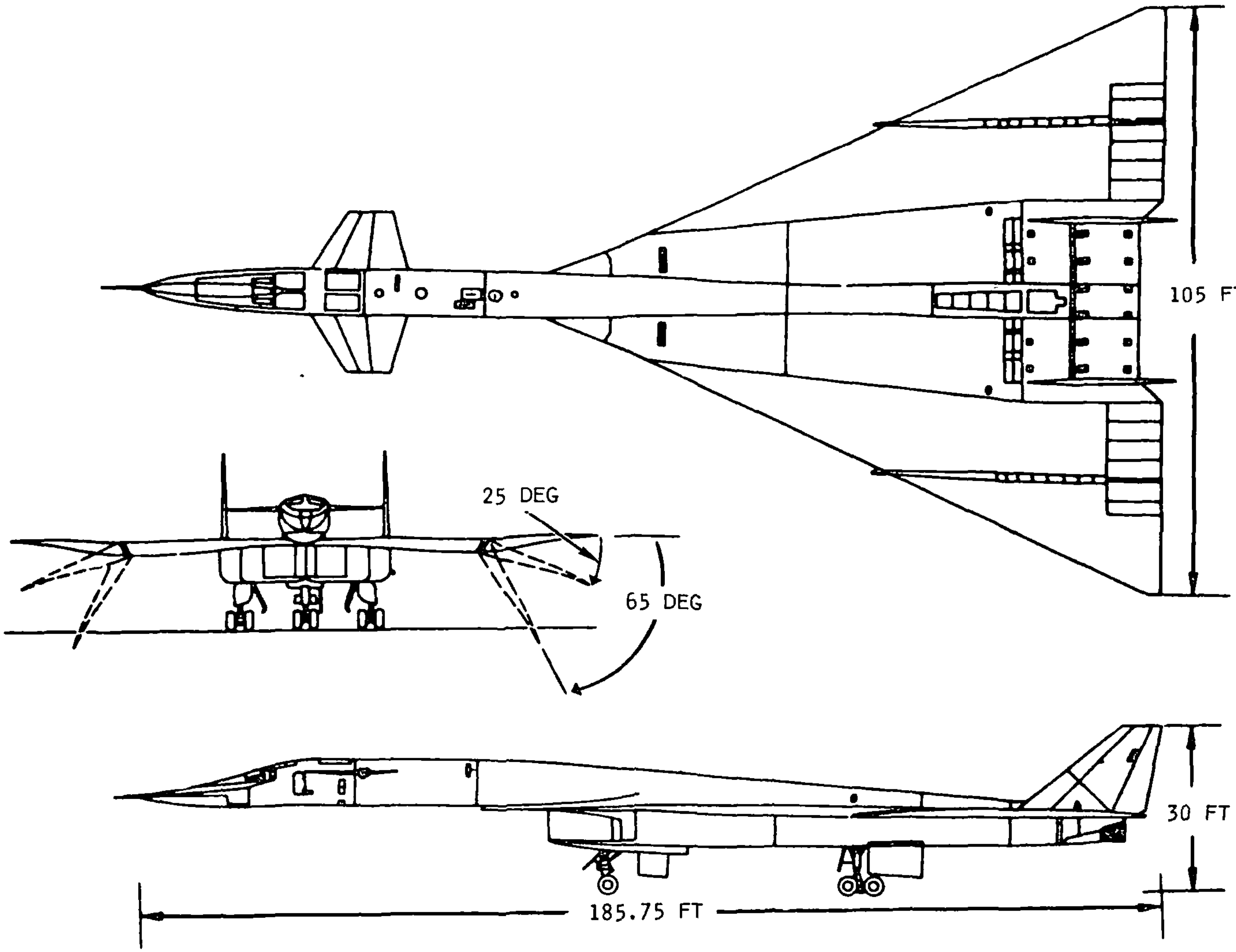


Figure 1.- XB-70-1 configuration.

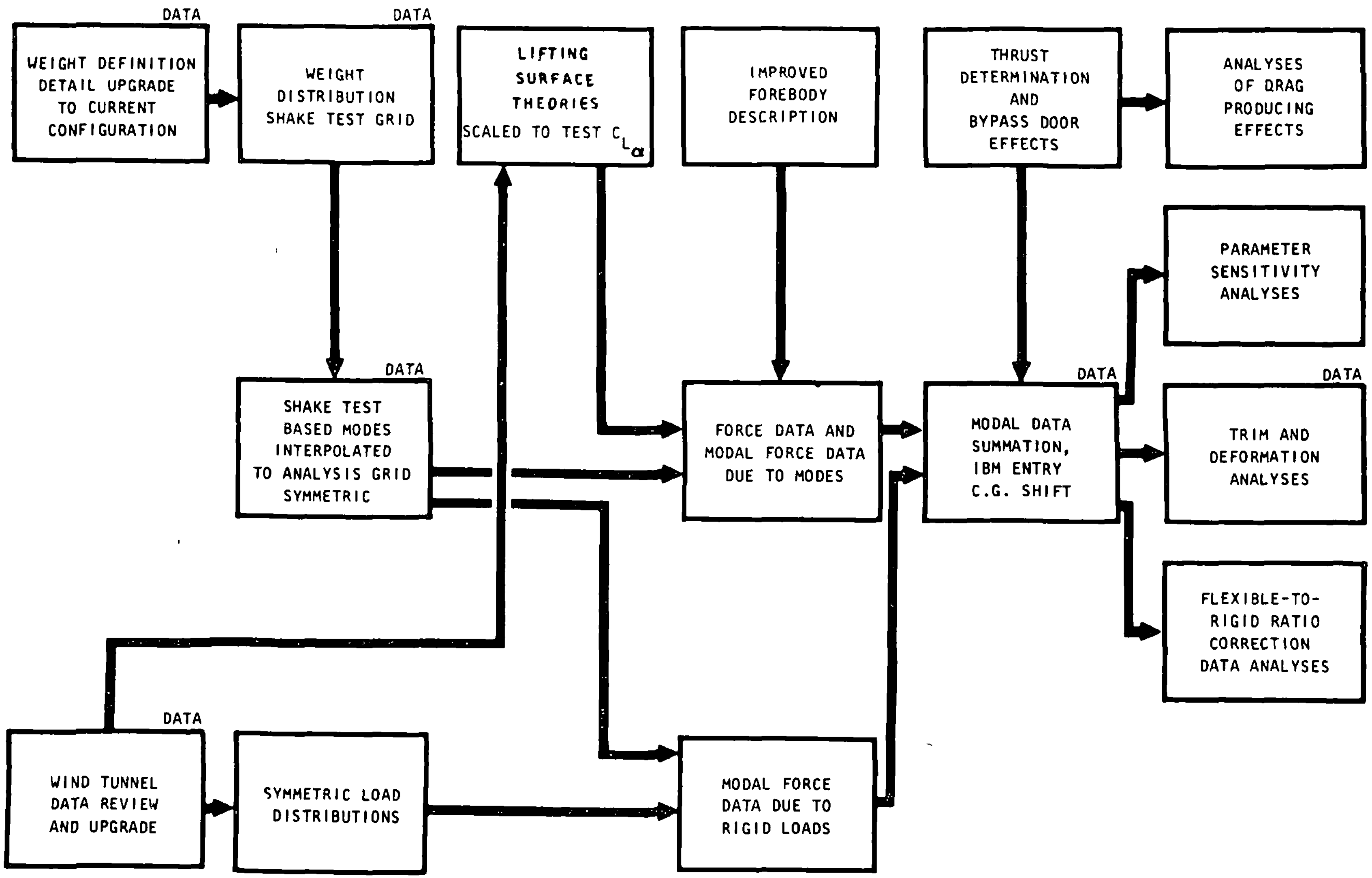


Figure 2.- Flow chart of analyses of trimmed flexible airplane

TABLE 3

COMPARISON OF INITIAL AND REVISED WEIGHT AND C.G. DETERMINATION

Case I.D.	Table 1 Data		Revised Data	
	Weight lbs.	C.G. $\%\bar{C}_W$	Weight lbs.	C.G. $\%\bar{C}_W$
P 1	316,100	23.5	318,394	24.1
P 2	473,600	22.2	480,310	21.9
P 3	335,800	21.9	344,450	22.3
P 4	394,200	21.6	400,104	21.7
P 5	372,700	22.1	387,309	22.0
P 6	388,800	21.4	392,409	21.1
P 7	349,600	22.4	353,535	21.1
P 8	371,300	21.7	376,516	21.8
P 9	376,400	21.6	381,591	21.6
P 10	428,900	22.4	436,975	22.3

Case I.D.	Table 2 Data		Revised Data	
	Weight lbs.	C.G. $\%\bar{C}_W$	Weight lbs.	C.G. $\%\bar{C}_W$
SC 1	480,000	22.5	480,425	22.1
SC 2	336,000	22.5	339,625	23.4
SC 3	424,000	22.6	423,474	22.8
SC 4	352,000	20.9	357,505	20.9
SC 5	333,000	22.6	338,505	22.6
SC 6	406,000	22.0	412,504	22.0
SC 7	380,000	21.2	385,155	21.2

TABLE 4

COMPARISON OF PREDICTED AND SHAKE TEST BASED SYMMETRIC MODAL CHARACTERISTICS

Configuration	Mode ID	Predicted		Based on Shake Test	
		ω_i rad/sec	M_i slugs Normalized At Point 118	ω_i rad/sec	M_i slugs Normalized At Point 118
5 percent fuel δ_{tip} = 25 degrees	1	13.80	578	16.95	665
	2	20.80	70	24.20	56
	3	29.50	5,600	39.90	70,800
	4	44.00	85	52.70	79
100 percent fuel δ_{tip} = 25 degrees	1	11.25	945	13.95	1,200
	2	19.10	96	22.60	78
	3	24.00	3,150	31.00	31,700
	4	32.10	219	41.20	9,150
5 percent fuel δ_{tip} = 65 degrees	1	13.90	2,190	16.85	1,790
	2	22.70	80	25.30	285
	3	29.40	1,428	39.90	32,400
	4	42.50	19	46.90	3.6
100 percent fuel δ_{tip} = 65 degrees	1	11.35	3,350	13.85	2,920
	2	20.50	138	23.70	38
	3	24.00	1,090	30.30	2,400
	4	32.30	331	42.90	7.2

O Flight test data (Flt 1-81 Pt 1), preliminary data reduction by NASA/FRC

——— Analytical data reflecting actual vehicle weight, shake test structural mode data, quasisteady aerodynamics, unsteady elevon aerodynamics

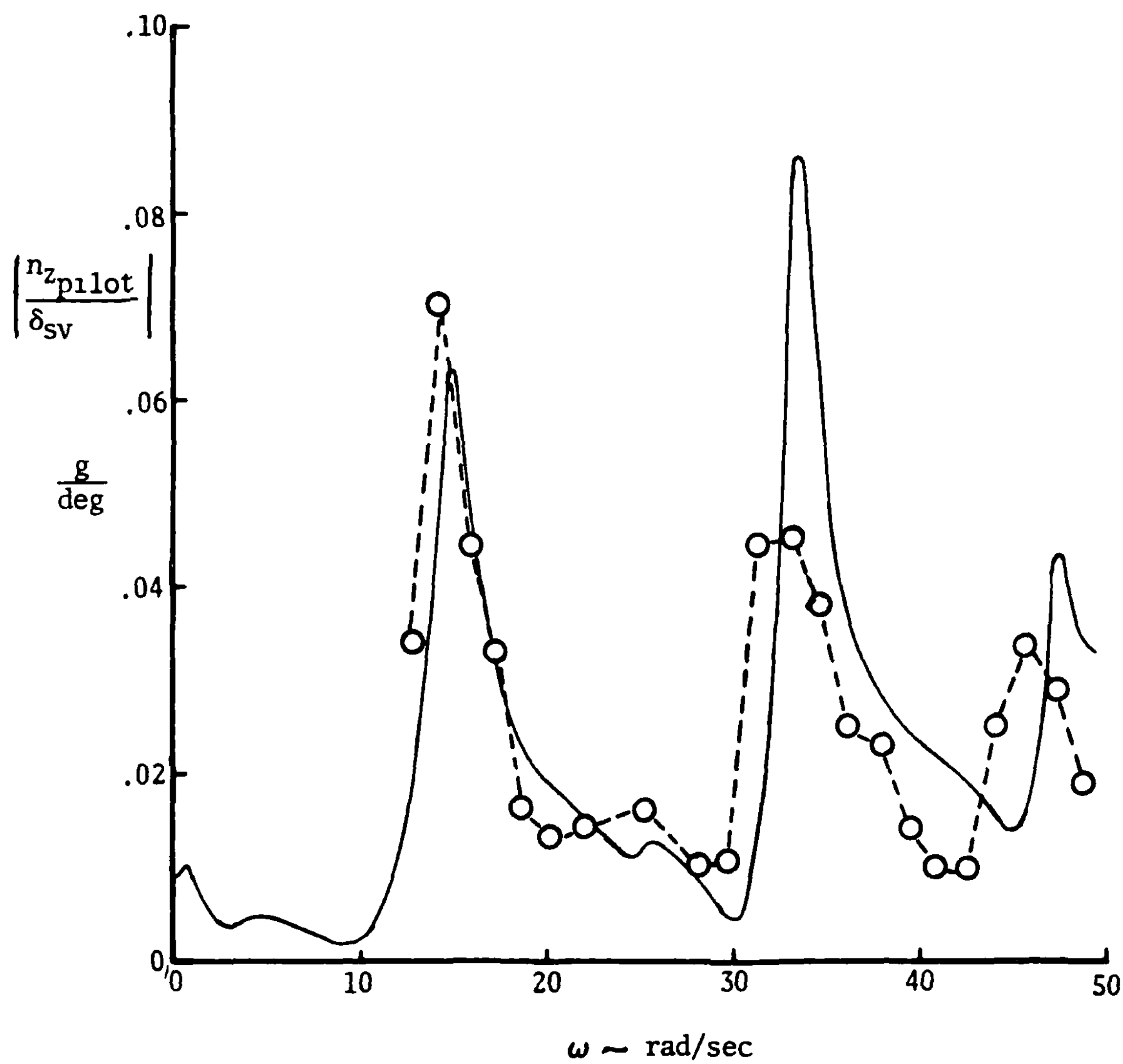


Figure 3.- Comparison of analytical and flight test measured load factor at pilot station due to shaker vane input, XB-70-1, medium weight, δ_T = 65°, M = 1.6, h_p = 40,000 ft., SAS on

O Flight test data (Flt 1-75), preliminary data reduction by NASA/FRC

—— Analytical data reflecting actual vehicle weight, shake test structural mode data, quasisteady response aerodynamics, unsteady elevon aerodynamics

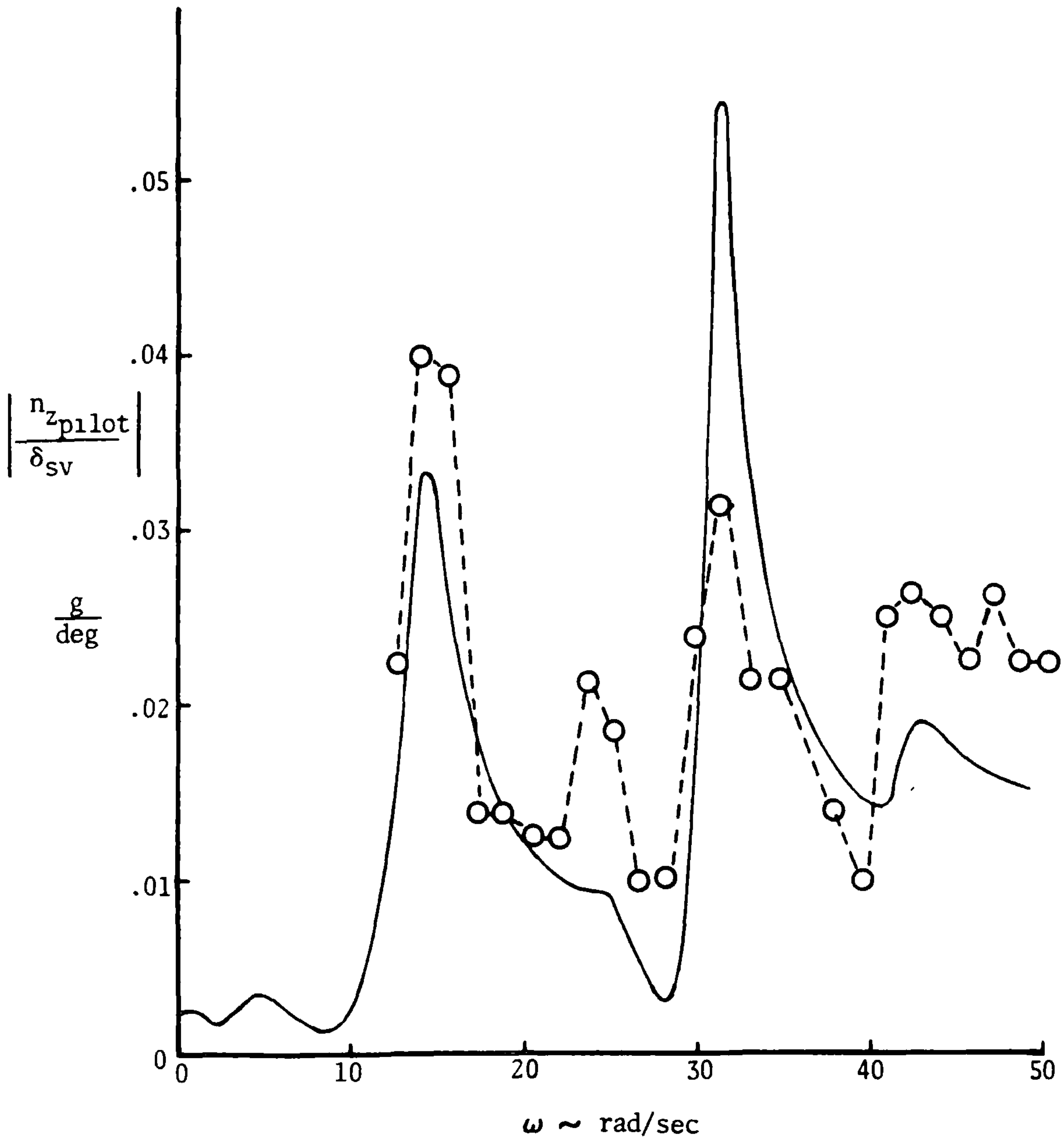


Figure 4.- Comparison of analytical and flight test measured load factor at pilot station due to shaker vane input, XB-70-1, heavy weight, δ_T = 25°, M = .90, h_p = 25,000 ft., SAS on

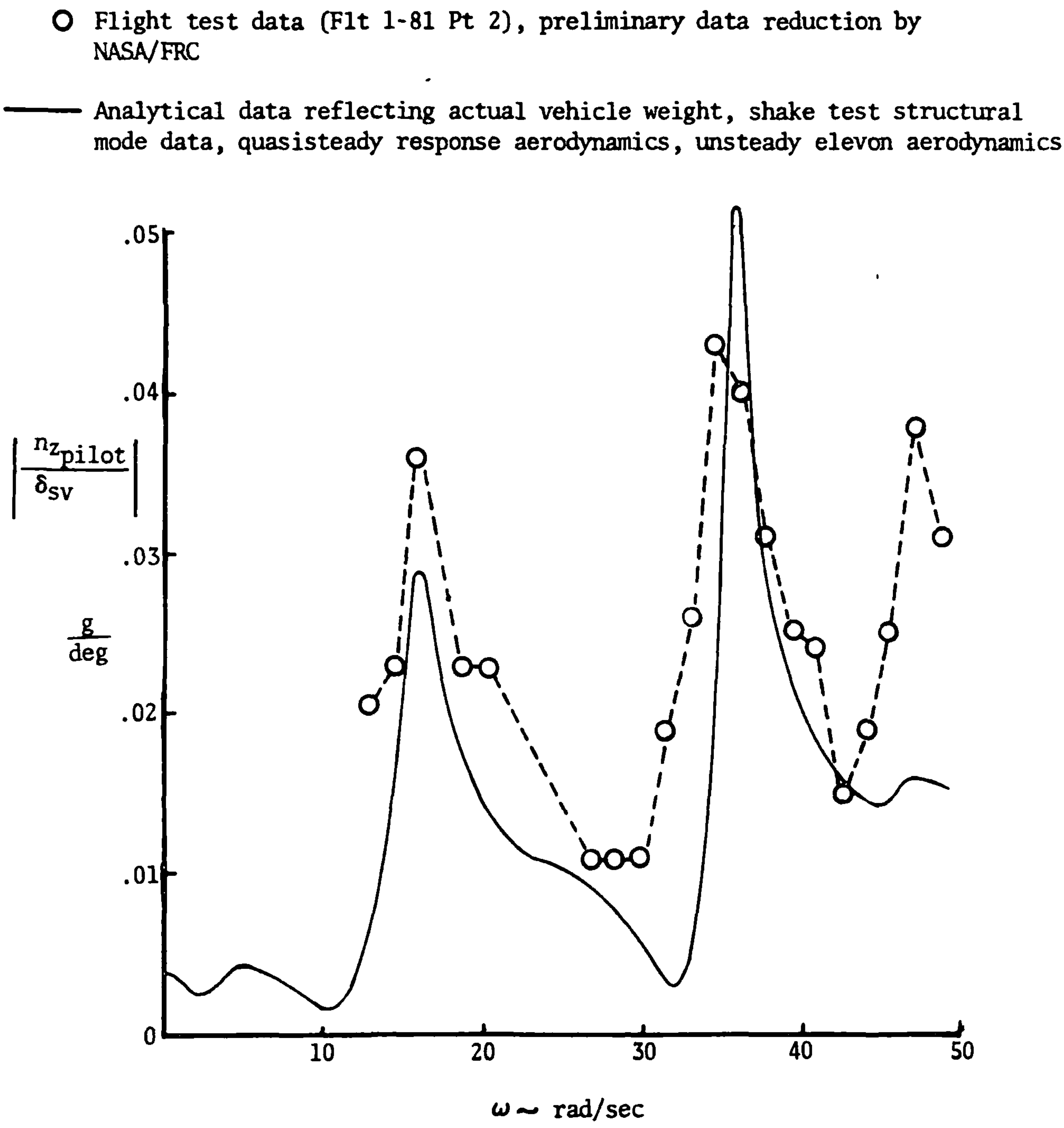


Figure 5.- Comparison of analytical and flight test measured load factor at pilot station due to shaker vane input, XB-70-1, light weight, δ_T = 25°, M = .90, h_p = 25,000 ft., SAS on

TABLE 5

IDENTIFICATION OF AERODYNAMIC DATA SETS AND SOURCES

Data Set	Where Used	Primary Wind Tunnel Model	Wind Tunnel Model Configuration	Test Data Source
1) Basic Data Manual (BDM)	A/P Development	Force Model 5	Jig-Shape	Various Tests in NR, NASA, CAL Facilities
2) Phase 1	Phase 1, Present Contract	Force Model 5	Jig-Shape	Above Plus Ames 252 Ames 322
3) Phase 2	Phase 2, Present Contract	Deformed Model	1g Trim Shape Performance Case P8	Above Plus Ames 521

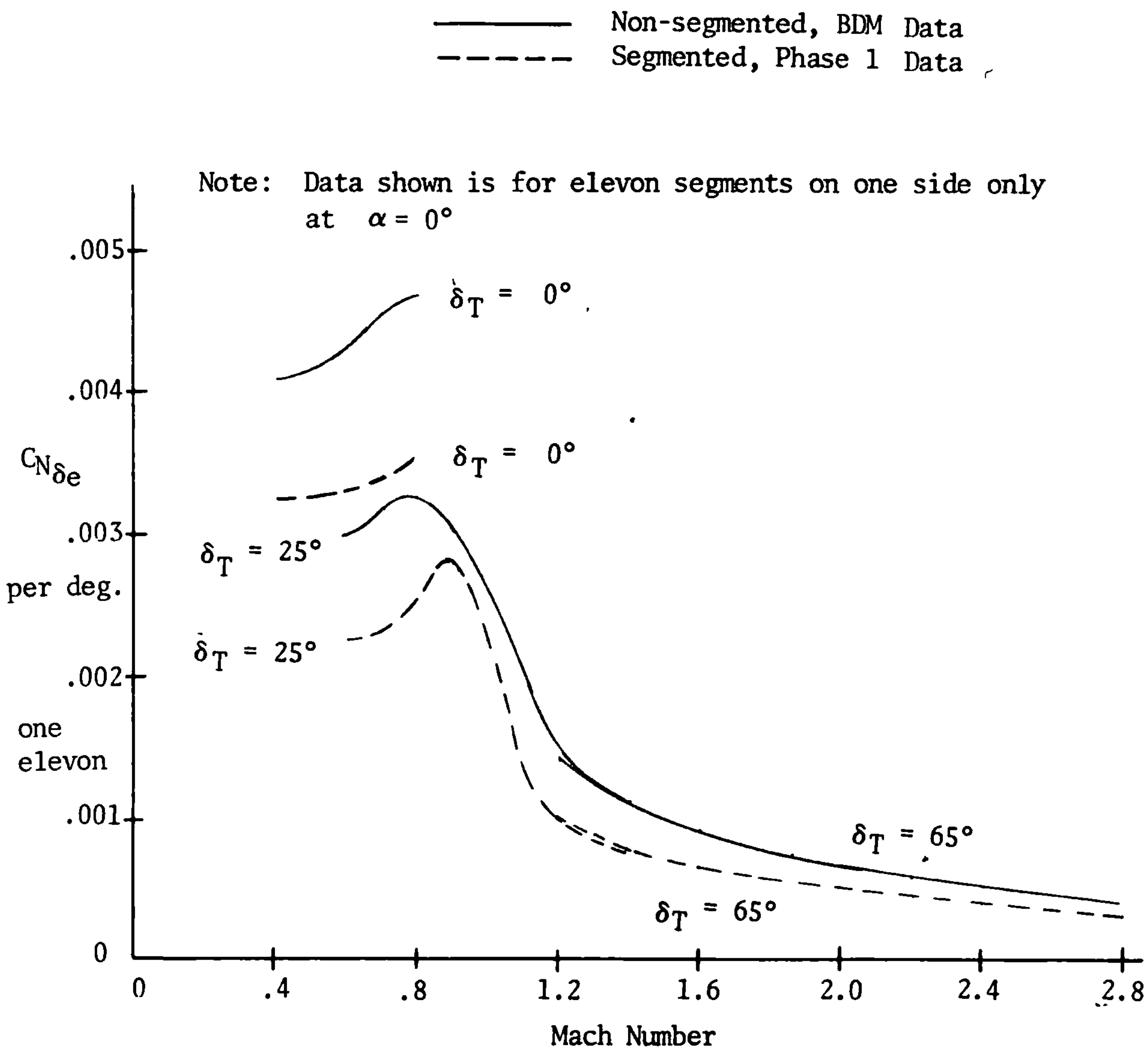


Figure 6.- Elevon effectiveness in normal force, Phase 1

Note: Data shown is for elevon segments on one side only at $\alpha = 0°$

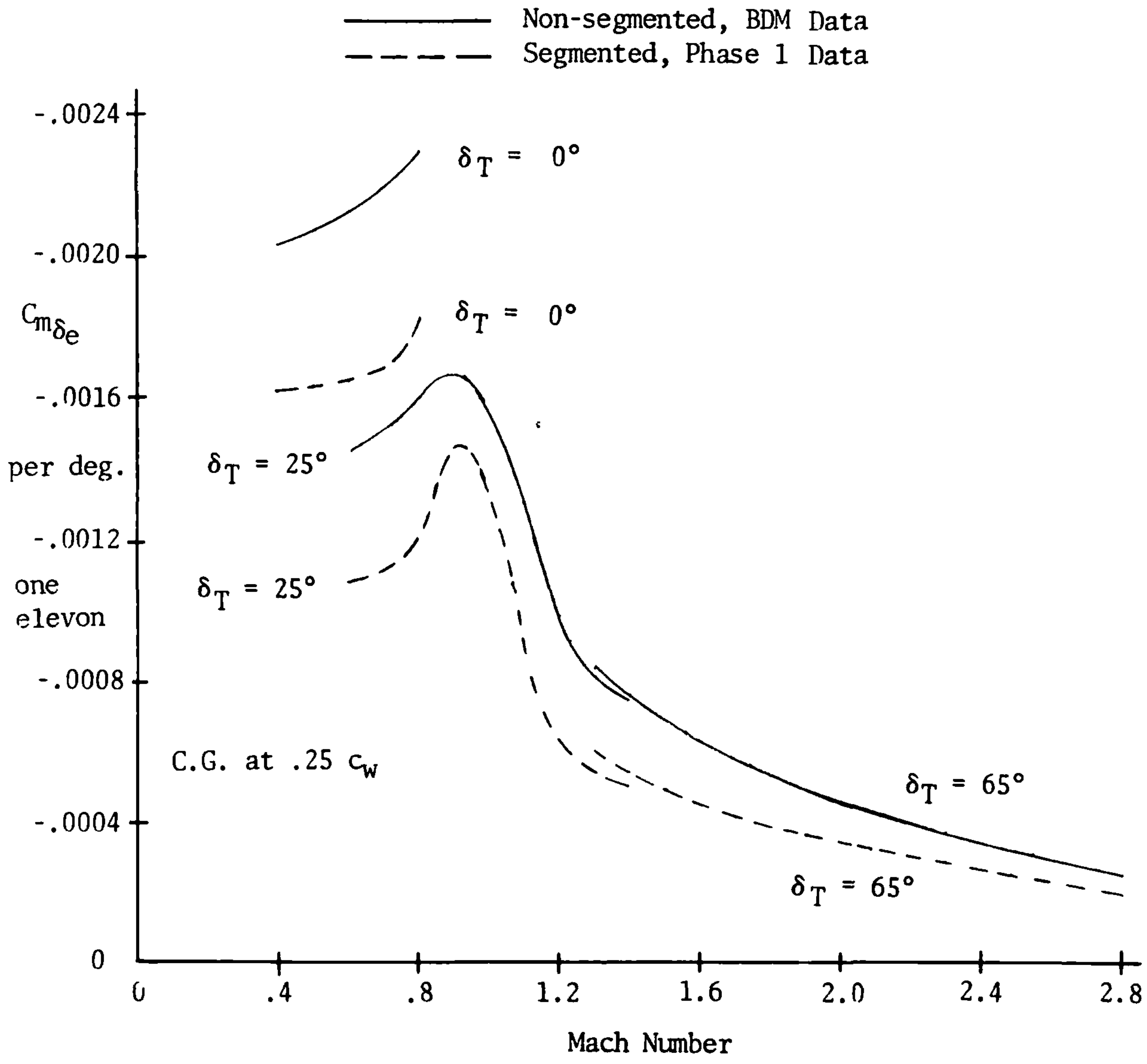


Figure 7.- Elevon effectiveness in pitching moment, Phase 1

Note: Data shown is for elevon segments on one side only at $\alpha = 0°$

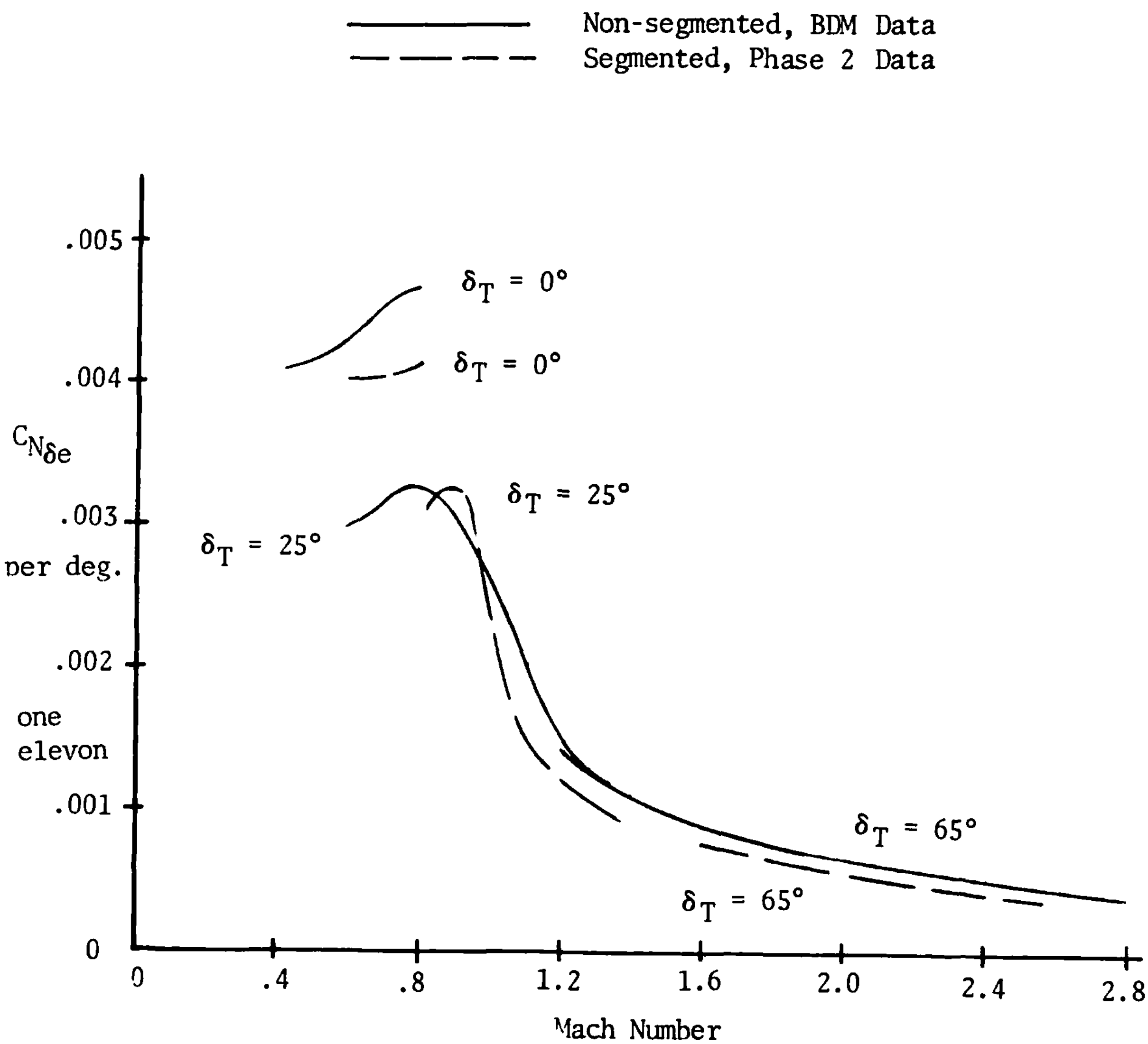


Figure 8.- Elevon effectiveness in normal force, Phase 2

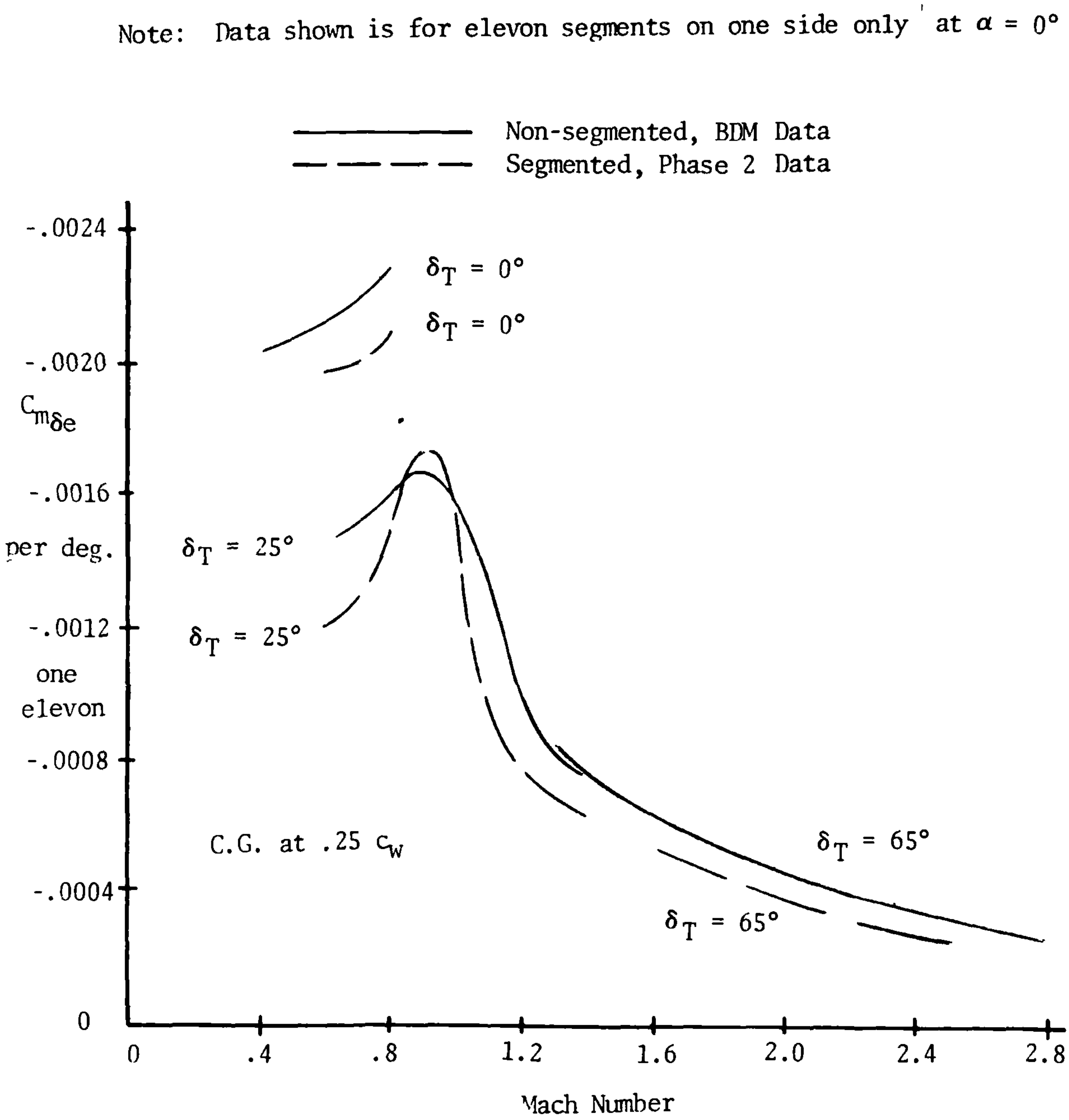


Figure 9.- Elevon effectiveness in pitching moment , Phase 2

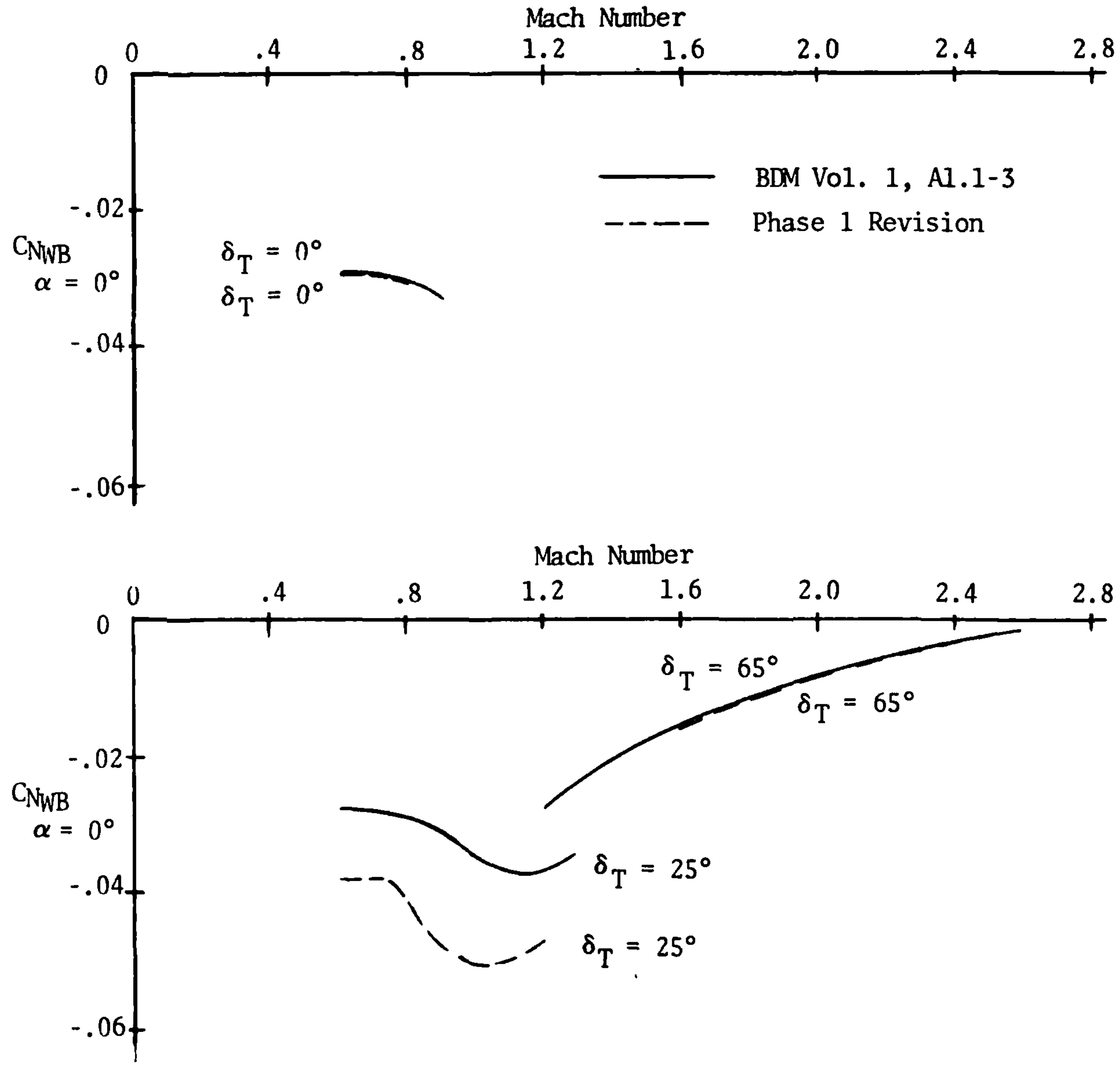
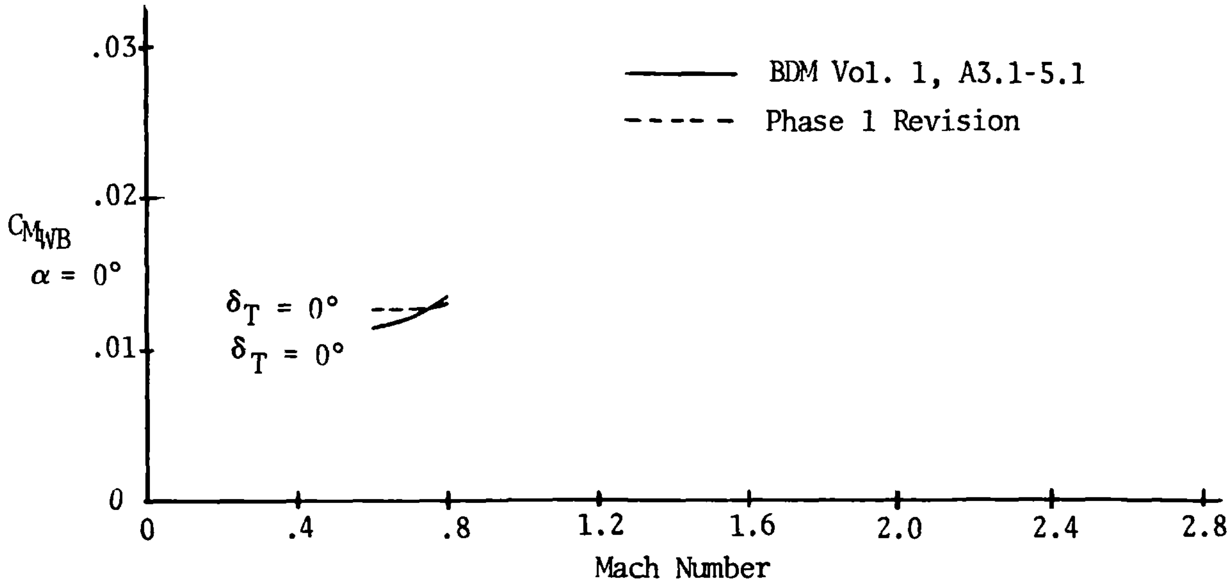


Figure 10.- Wing-body normal force coefficient at zero angle of attack



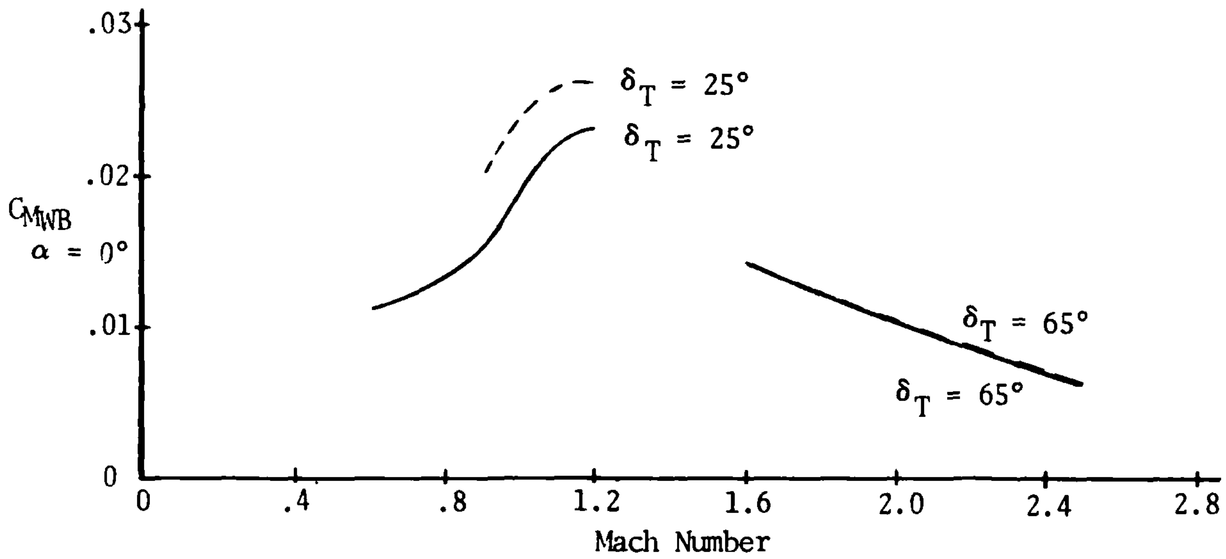
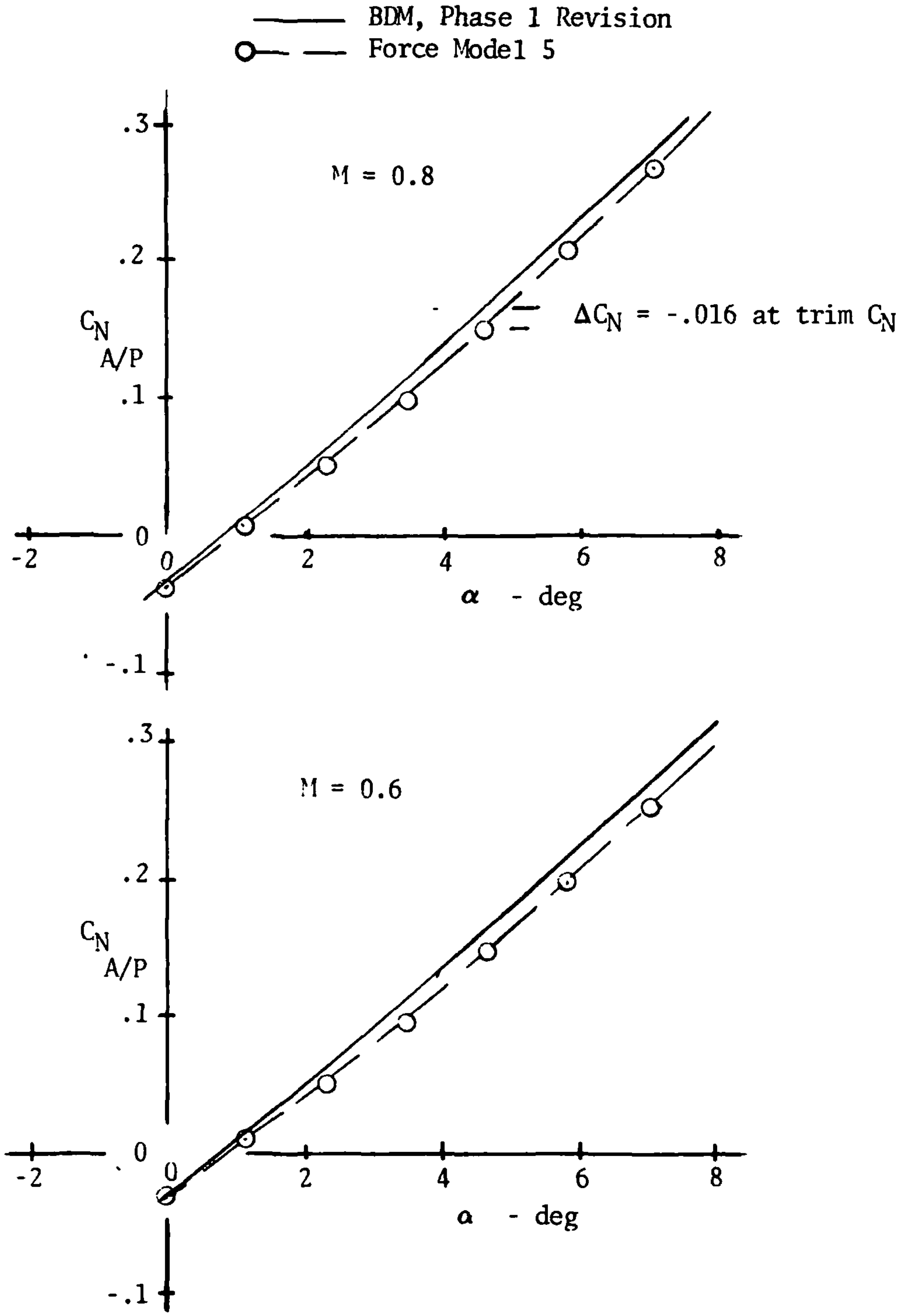
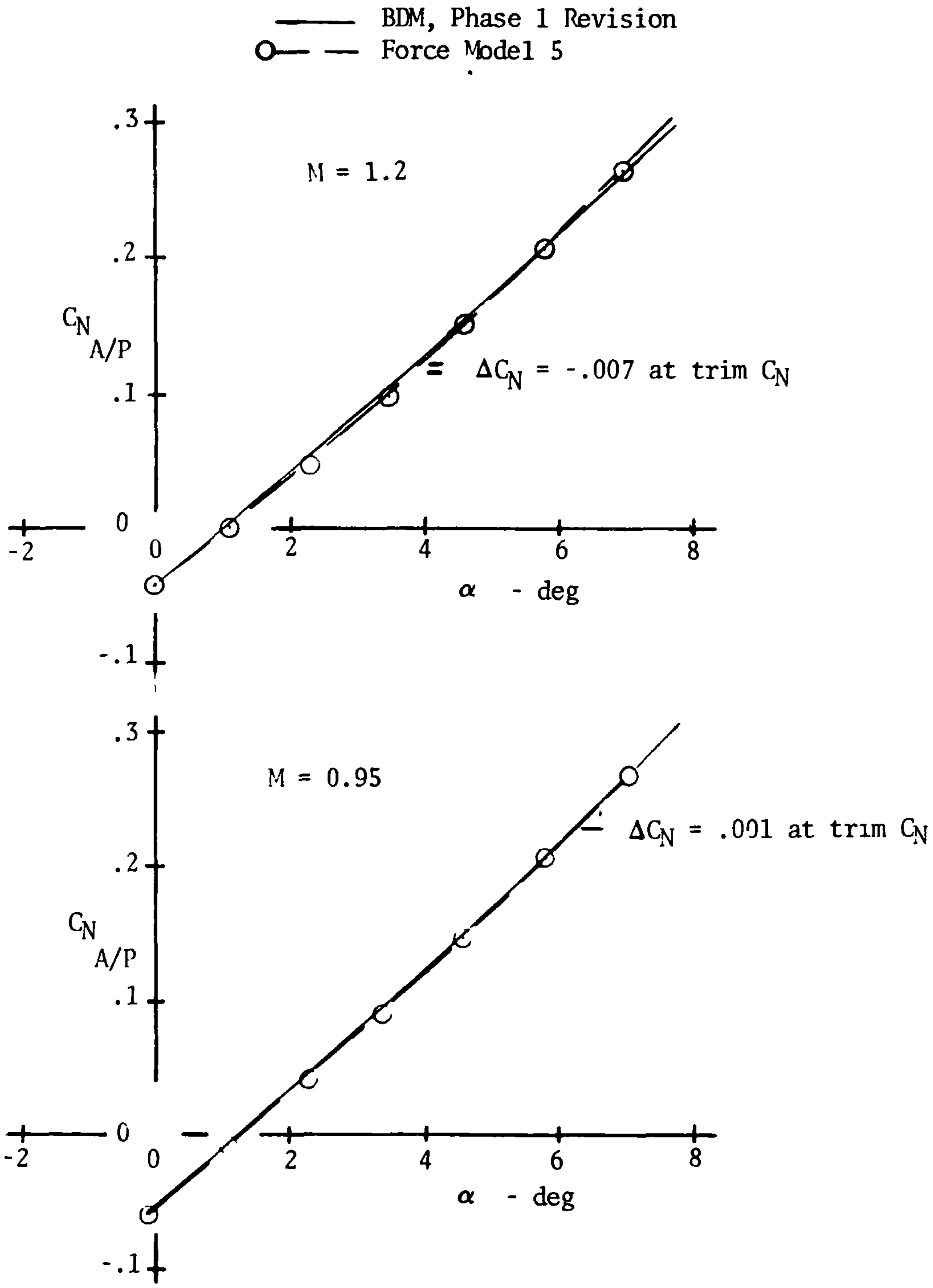


Figure 11.- Wing-body pitching moment coefficient at zero angle of attack



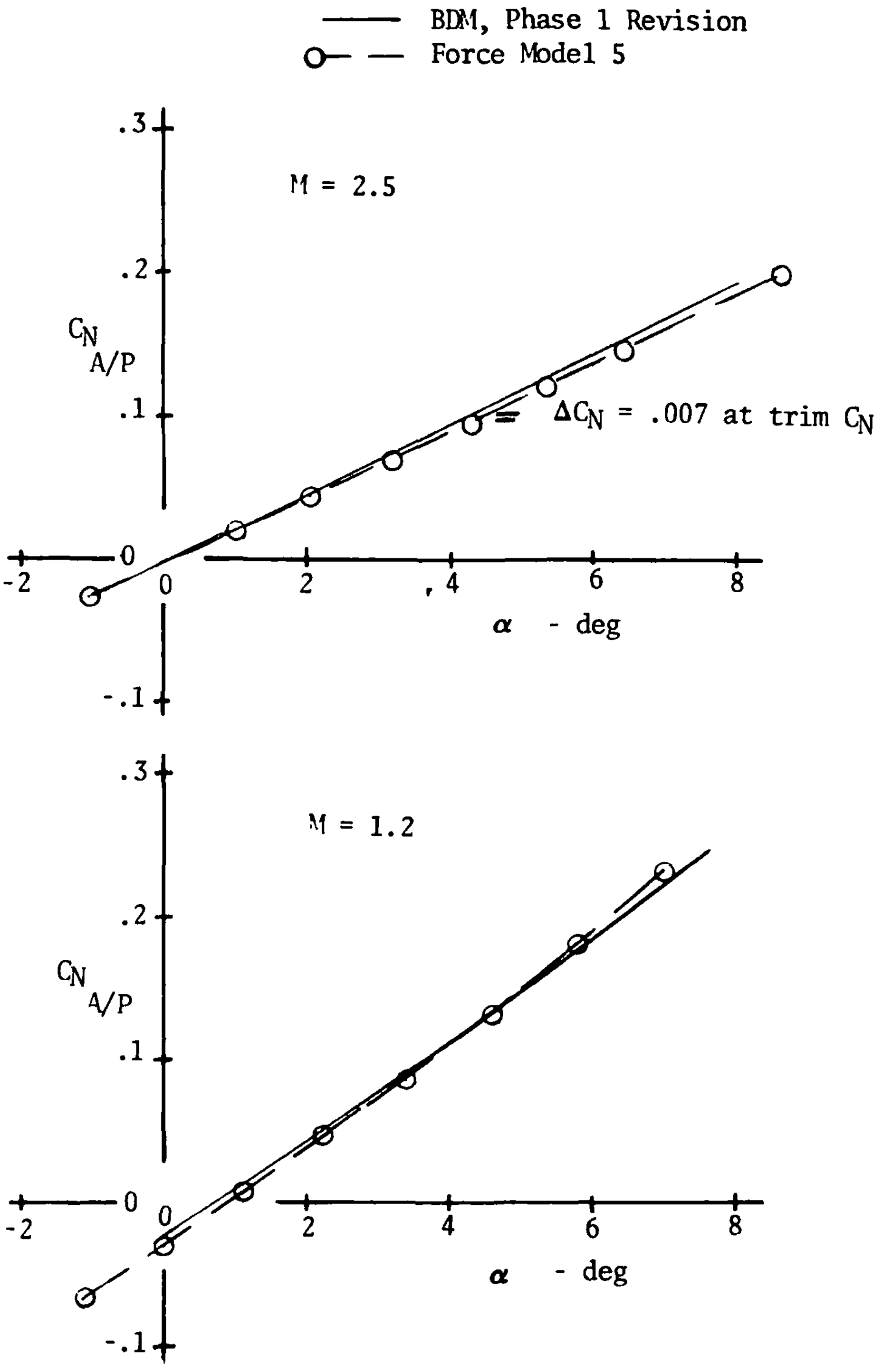
a) $\delta_T = 0°$

Figure 12.- Airplane normal force coefficient vs angle of attack



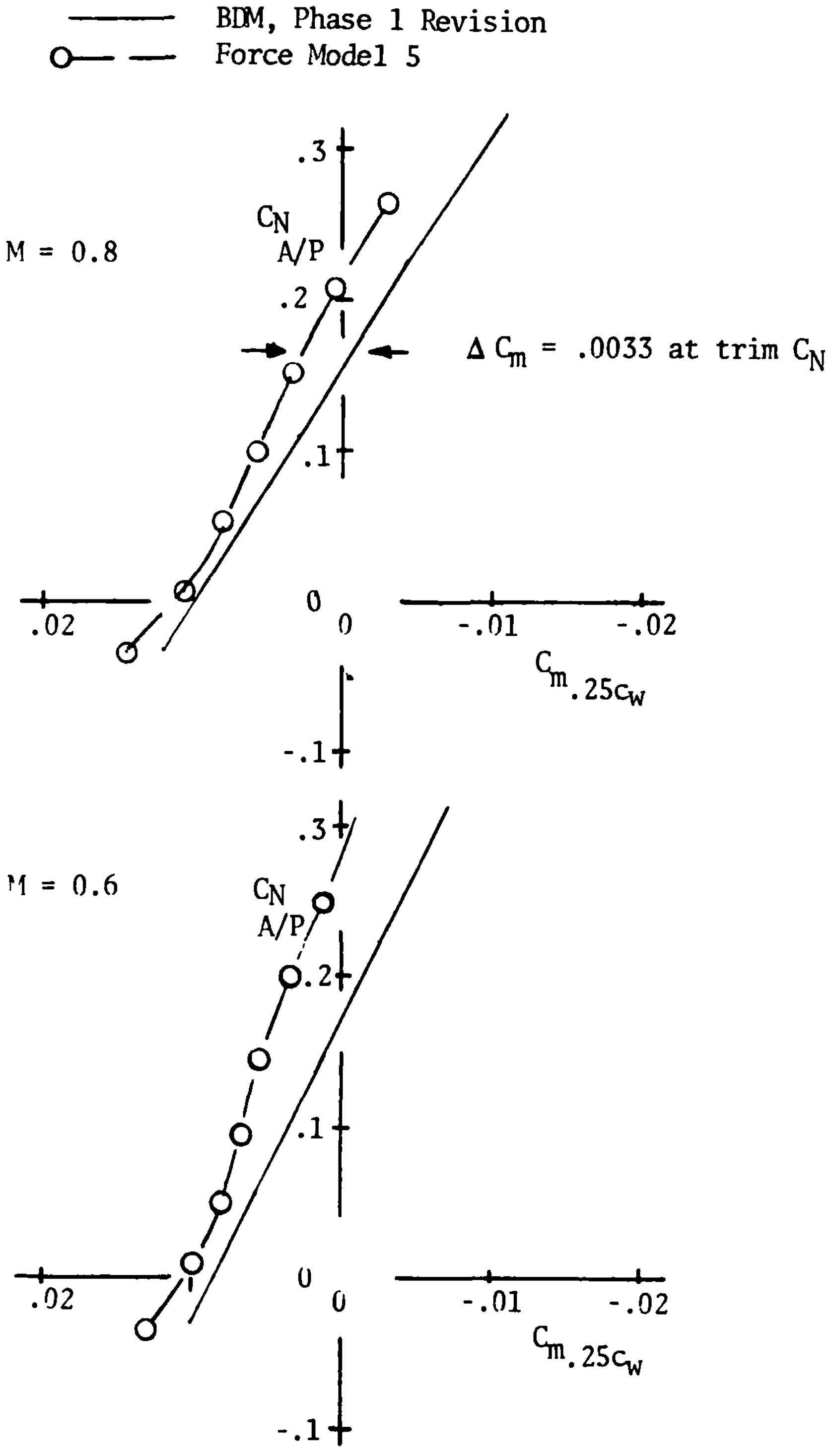
b) $\delta_T = 25°$

Figure 12.- Continued



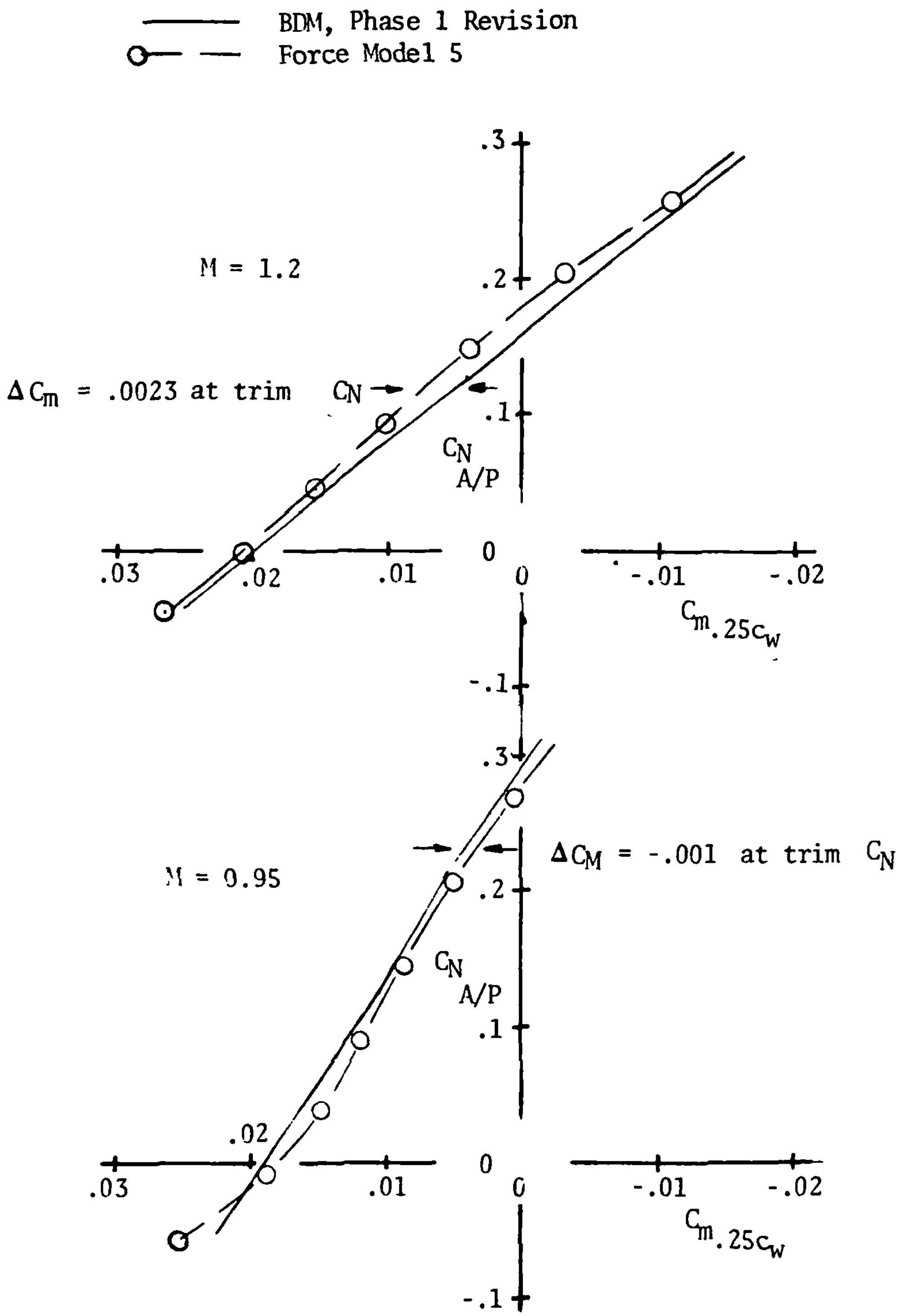
c) δ_T = 65°

Figure 12.- Concluded



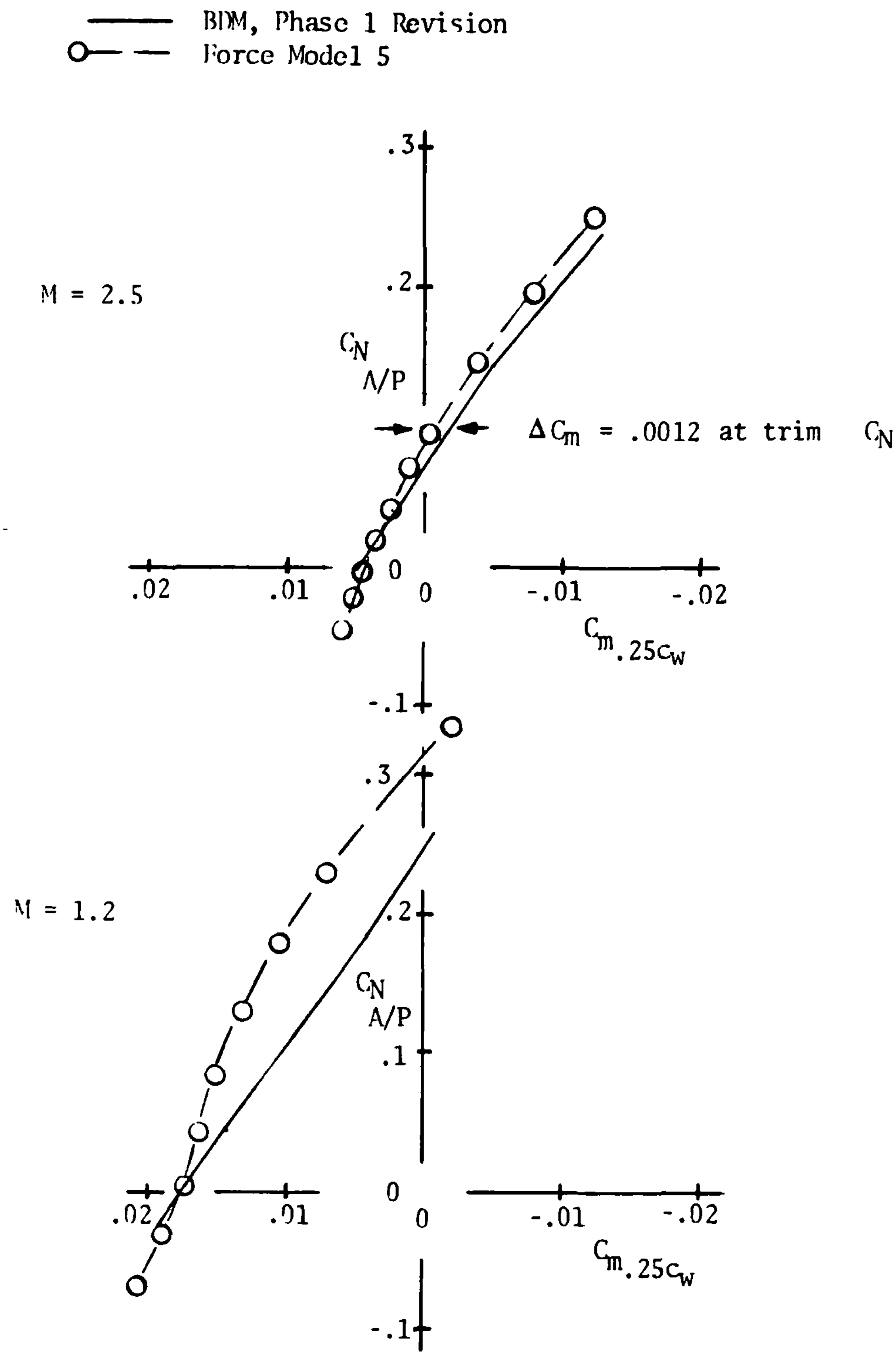
a) $\delta_T = 0°$

Figure 13.- Airplane normal force coefficient vs pitching moment coefficient



b) $\delta_T = 25°$

Figure 13.- Continued



c) δ_T = 65°

Figure 13. - Concluded

Increment = Force Model 5 - (BDM)

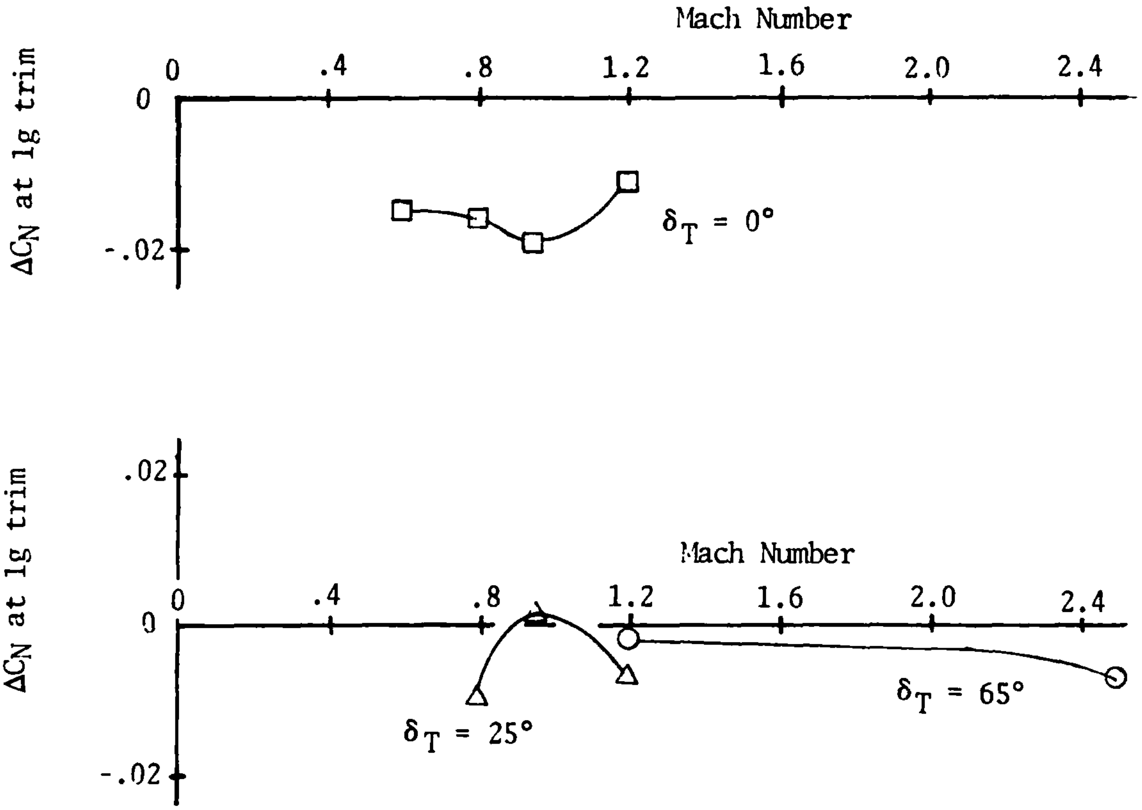
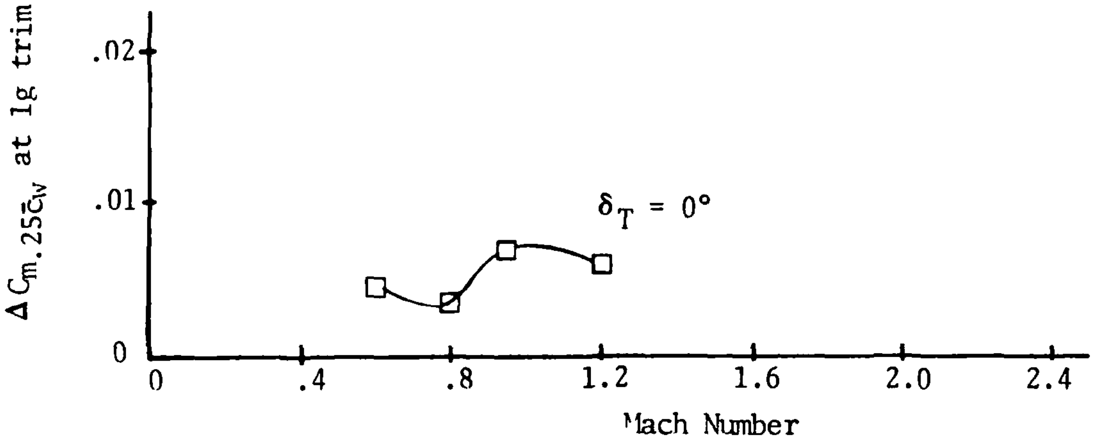


Figure 14.- Incremental difference in airplane normal force coefficient at 1g trim between Force Model 5 and BDM

Increment = Force Model 5 - (BDM)



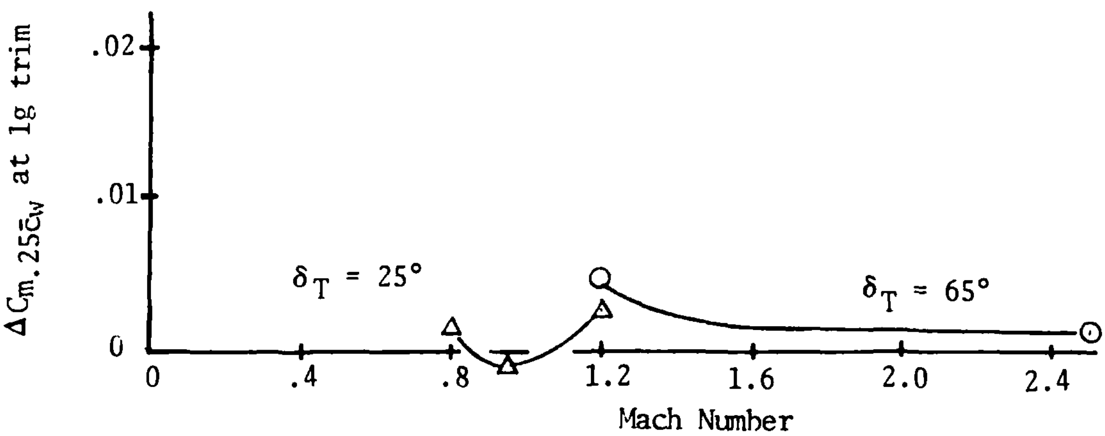


Figure 15.- Incremental difference in airplane pitching moment coefficient at 1g trim between Force Model 5 and BDM

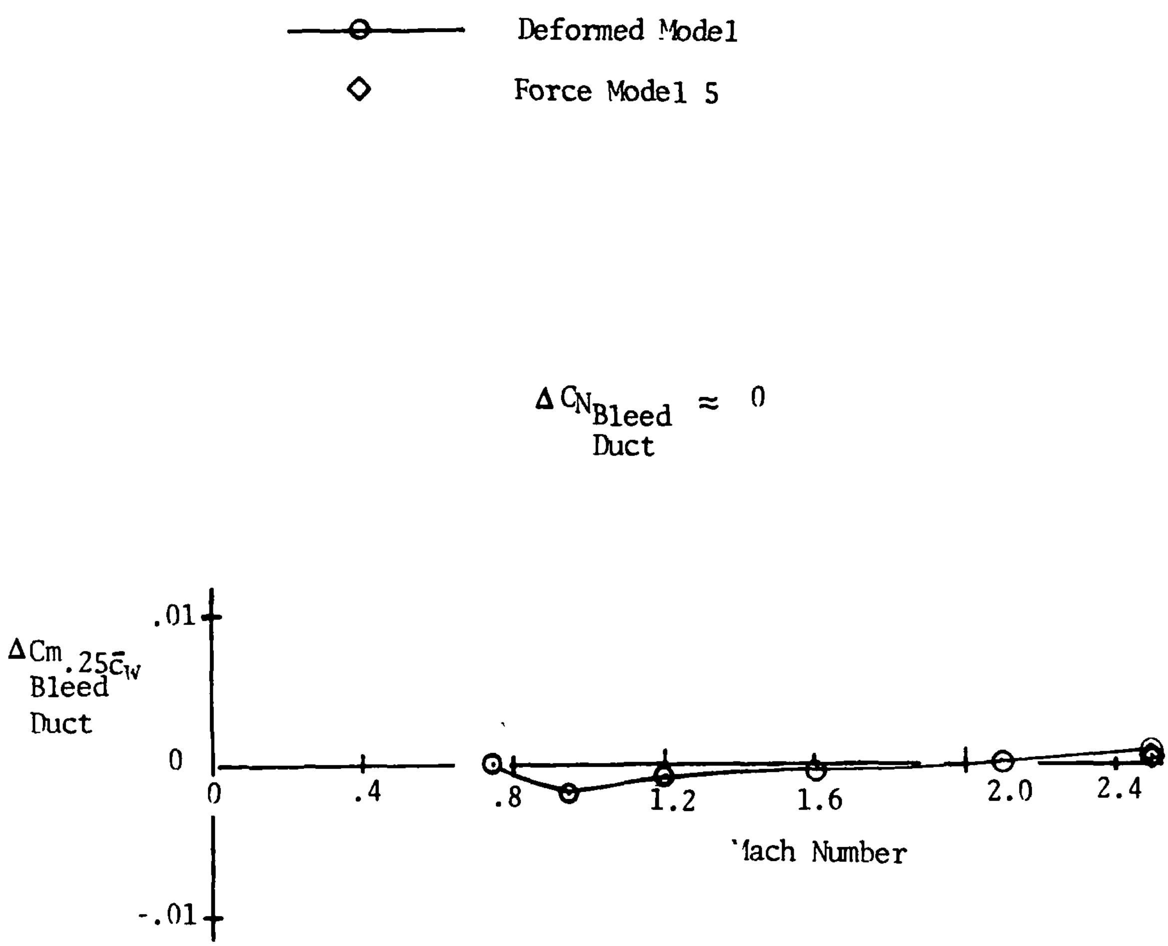
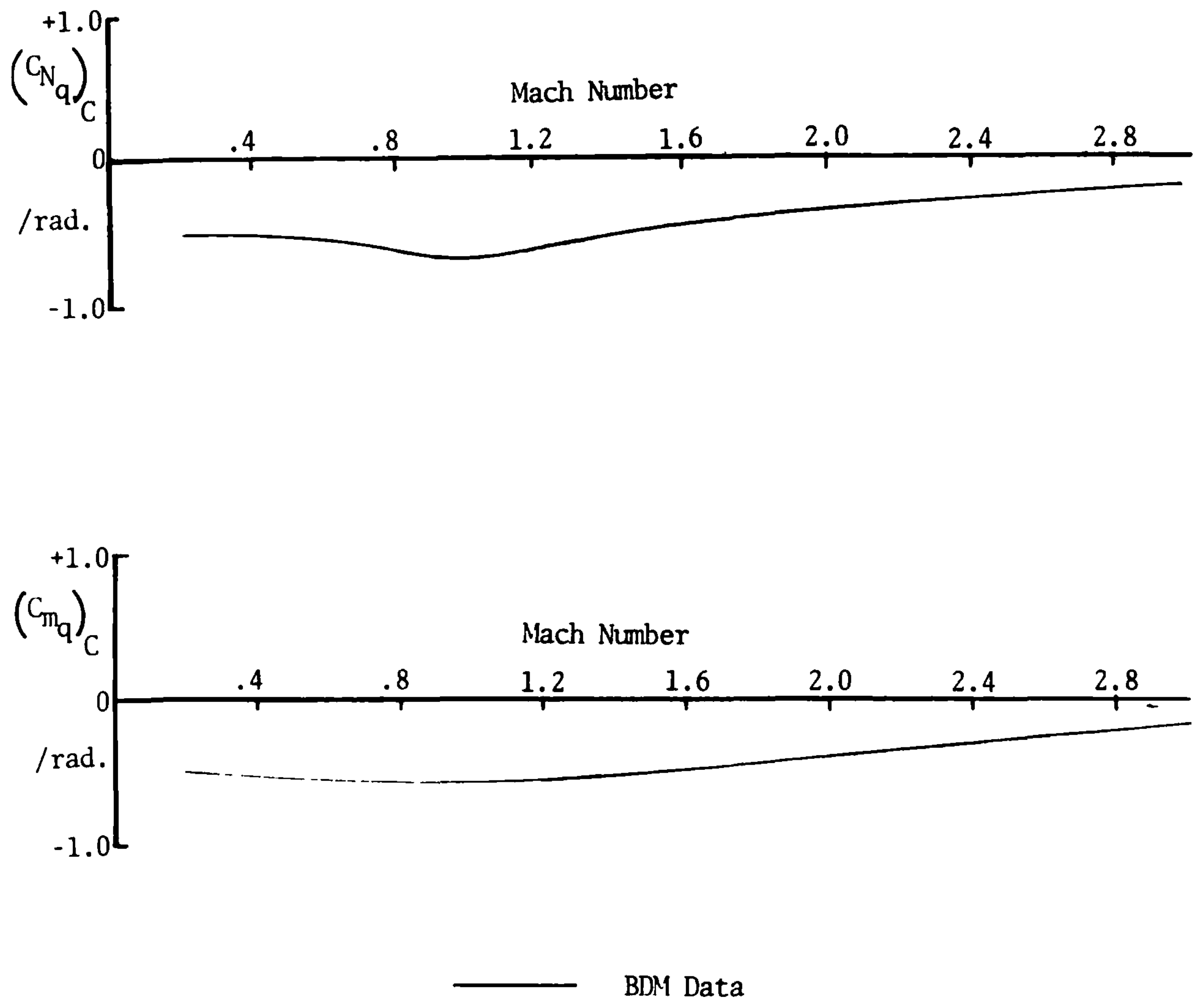
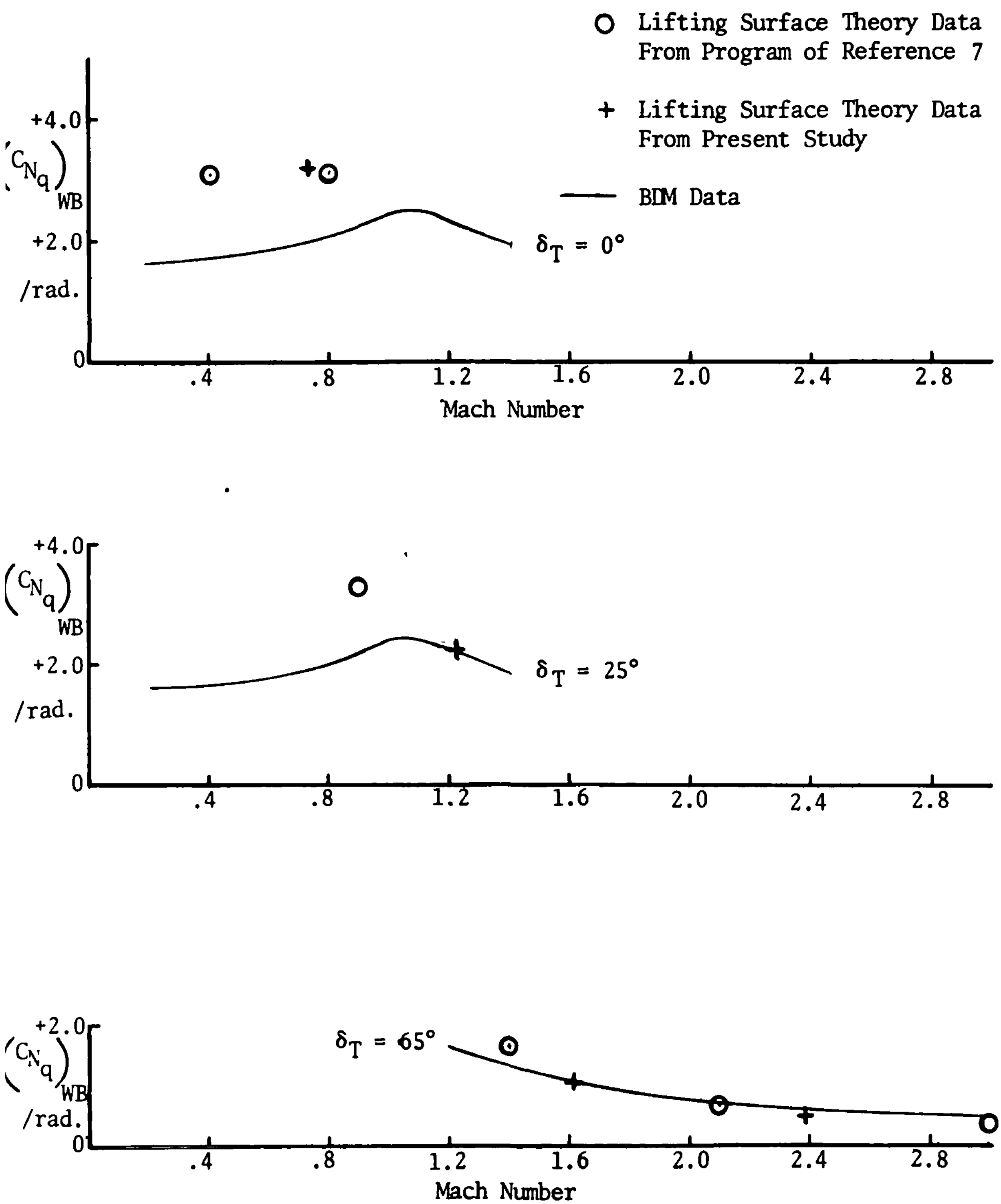


Figure 16.- Incremental airplane pitching moment coefficient due to bleed duct



Pitch and Moment Axis at .25 $\bar{c}_w$

Figure 17.- Normal force and pitching moment coefficient due to pitching, canard



Pitch Axis at $.25\bar{c}_W$

Figure 18.- Normal force coefficient due to pitching, wing-body

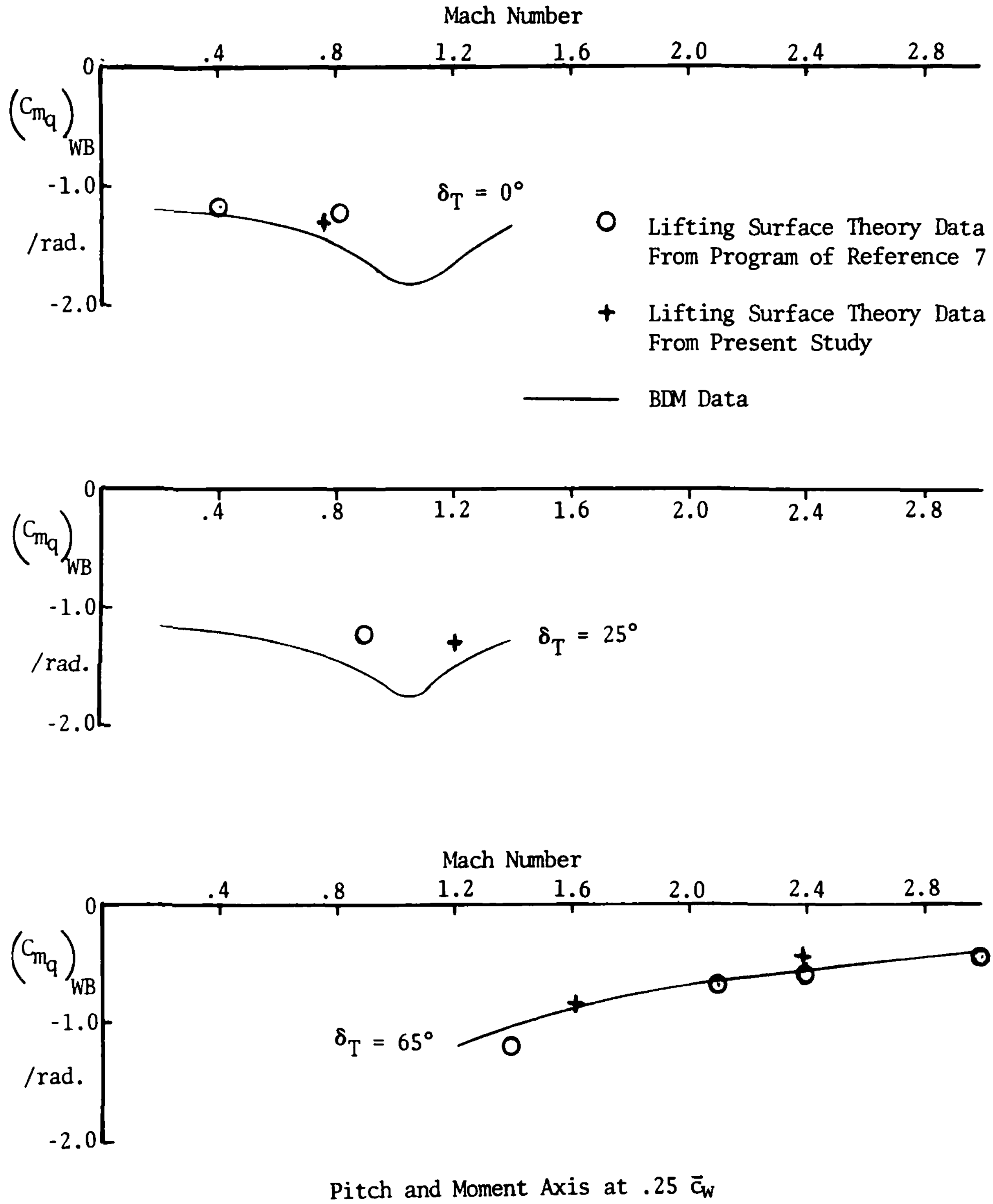


Figure 19.- Pitching moment coefficient due to pitching, wing-body

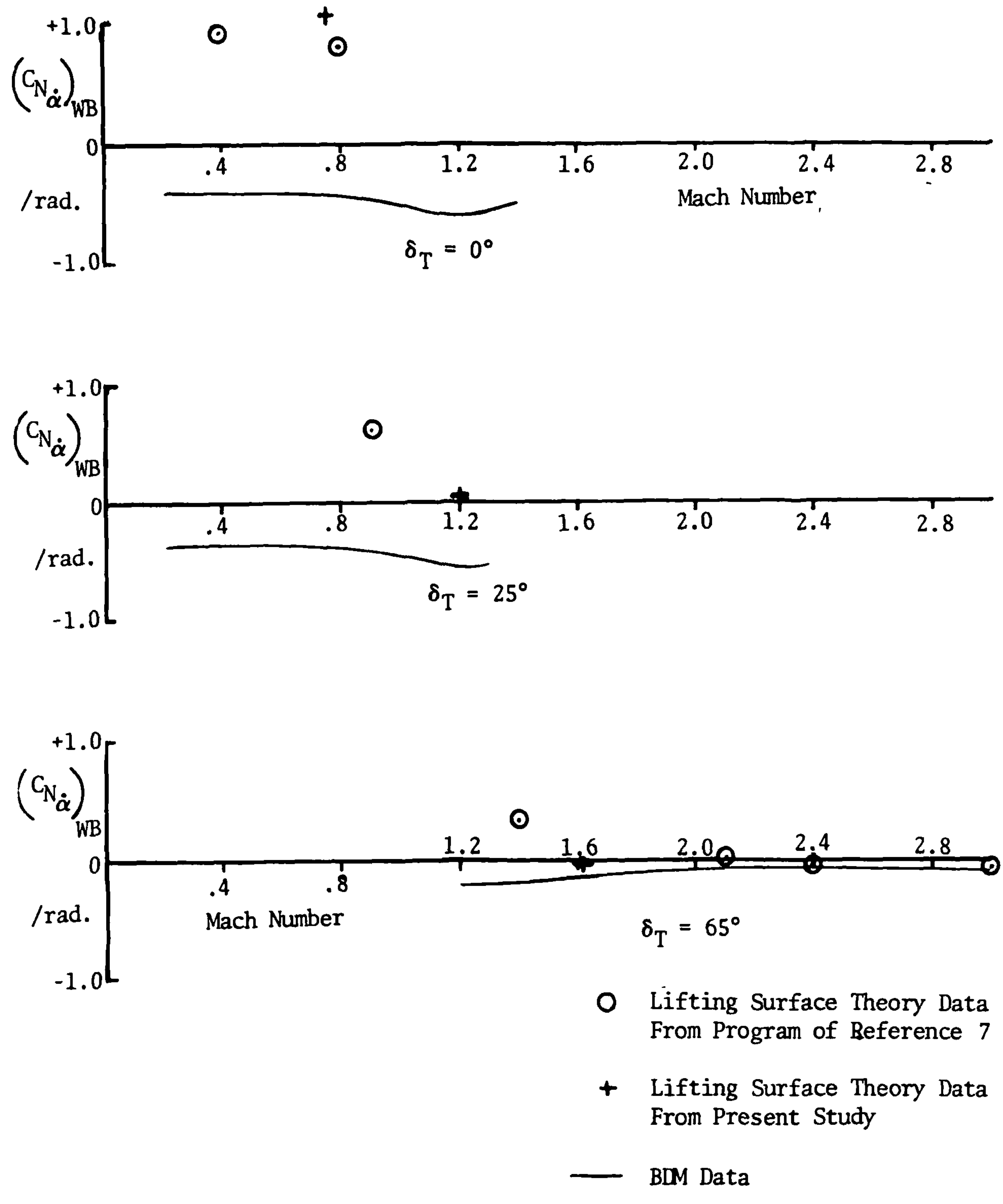


Figure 20.- Normal force coefficient due to vertical acceleration, wing-body

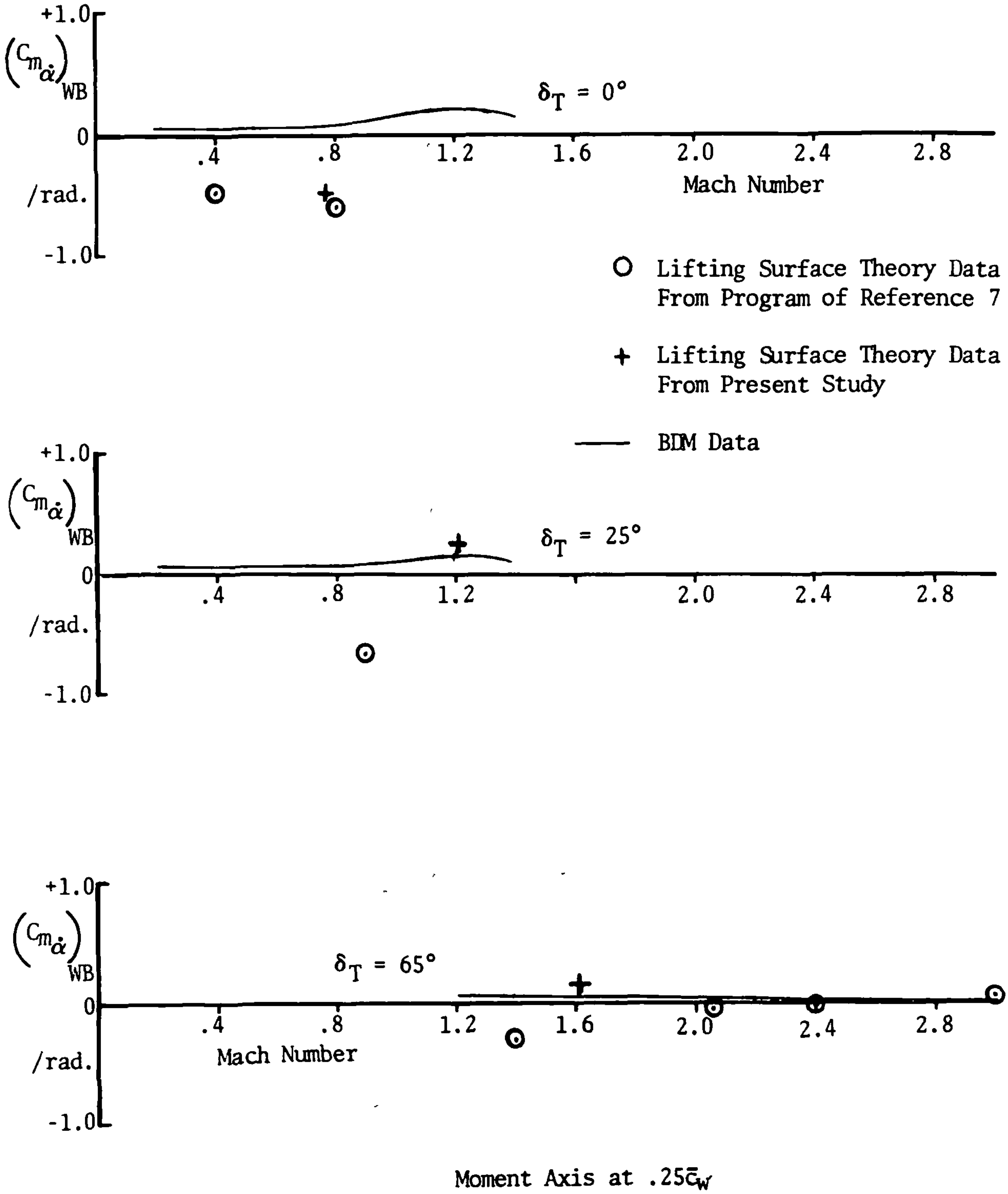
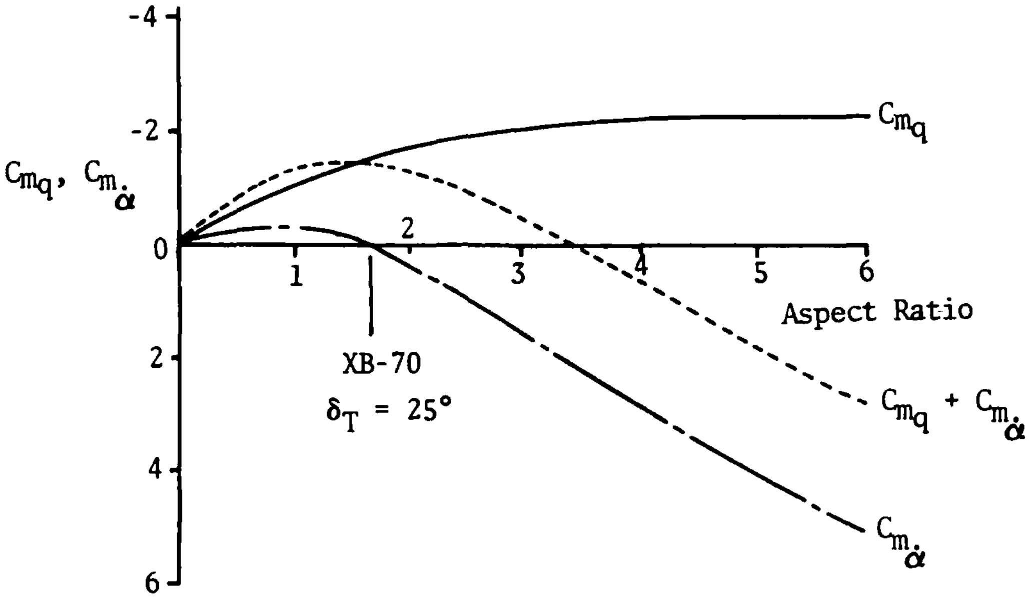


Figure 21.- Pitching moment coefficient due to vertical acceleration, wing-body

Data from reference 10



Pitch Axis at .25 $\bar{c}_w$

Figure 22.- C_{m_q} and $C_{m_{\dot{\alpha}}}$ for a delta wing at M = 1.2

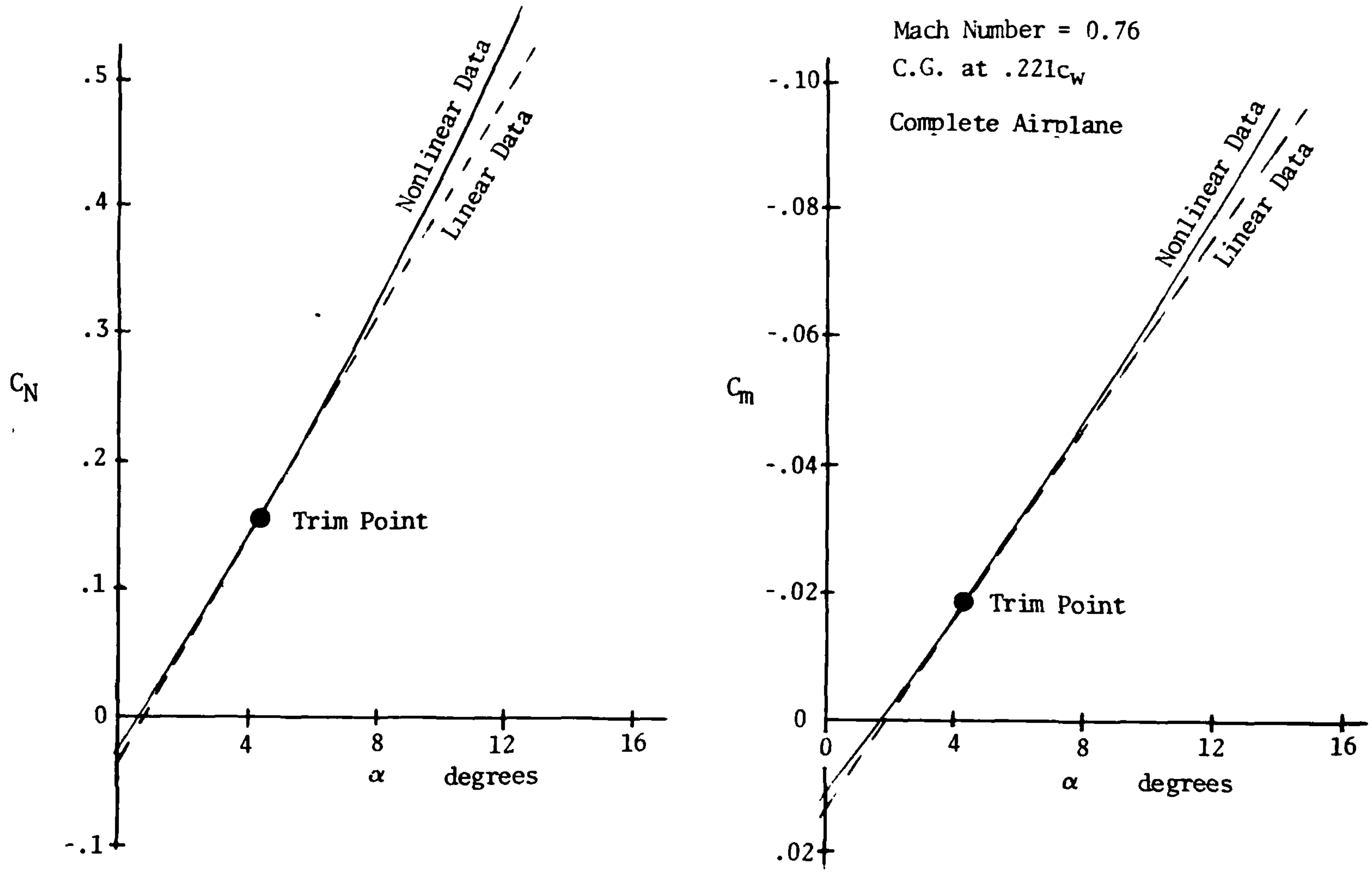
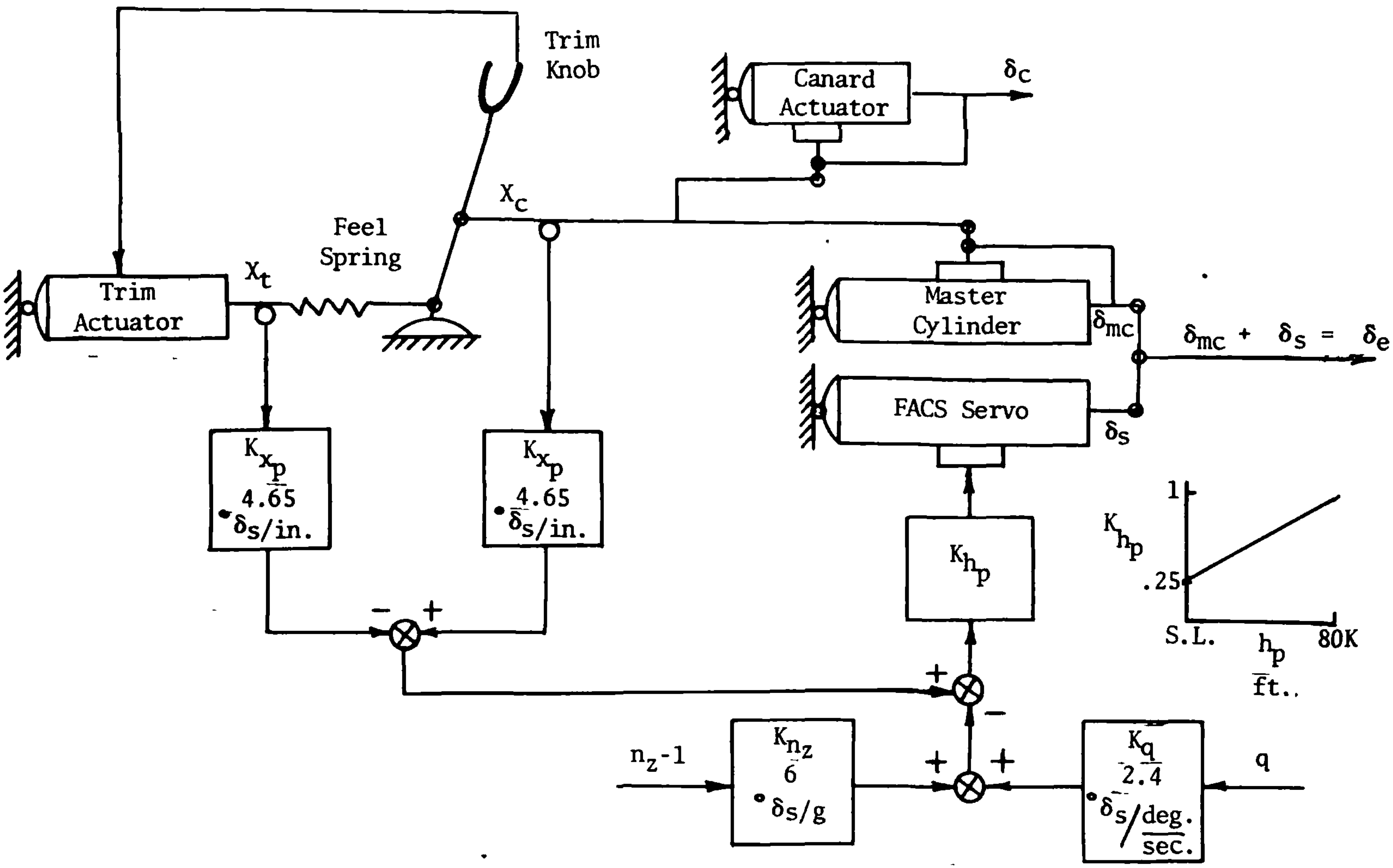


Figure 23.- Normal force and pitching moment coefficients vs angle of attack



$$\delta_s = \left\{ (X_c - X_t) K_{x_p} - \left[(n_z - 1) K_{n_z} + q K_q \right] \right\} K_{h_p}$$

Figure 24.- XB-70 longitudinal control system schematic

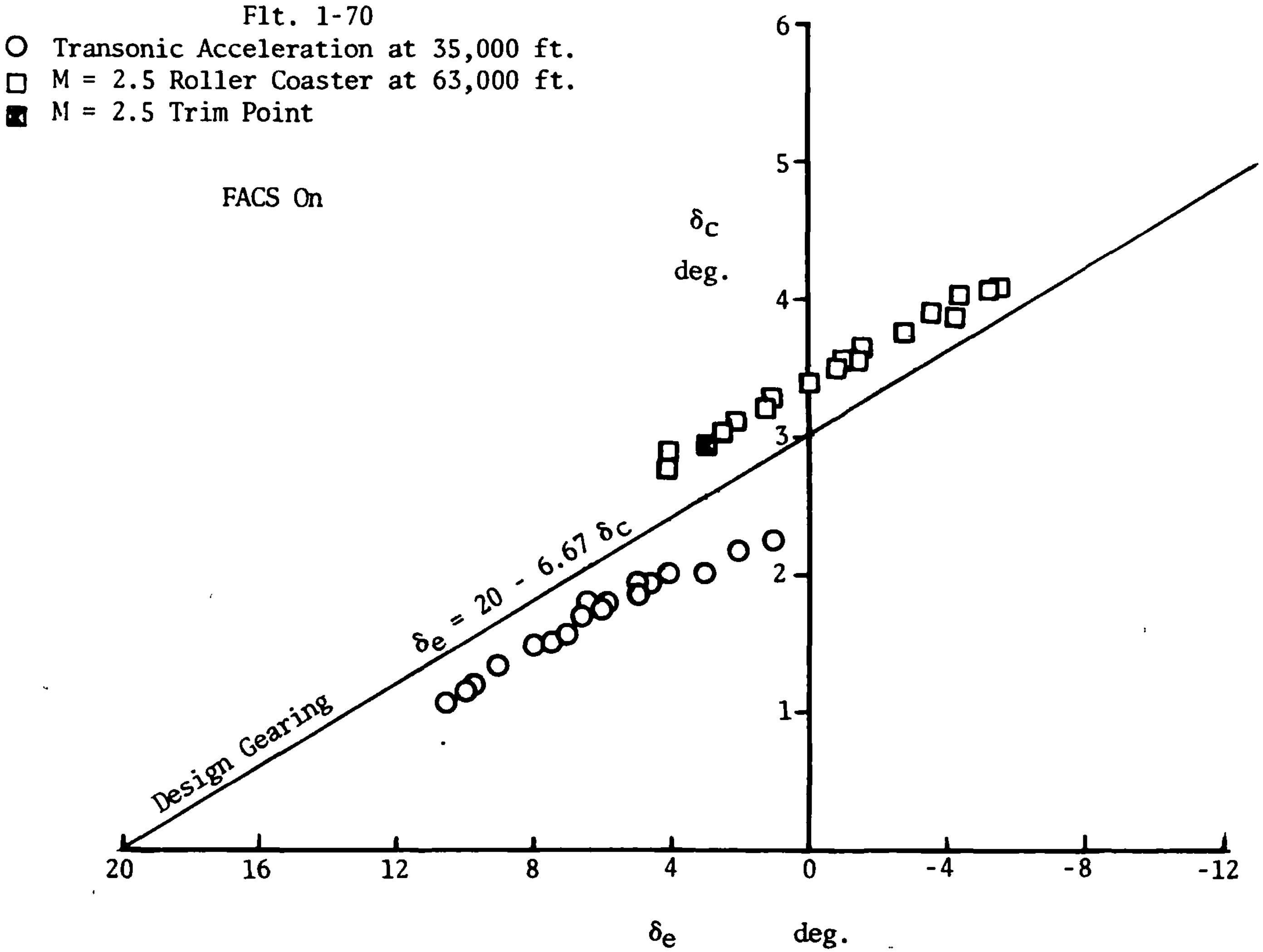


Figure 25.- Illustration of differences between design and flight-test-observed elevon-to-canard gearing.

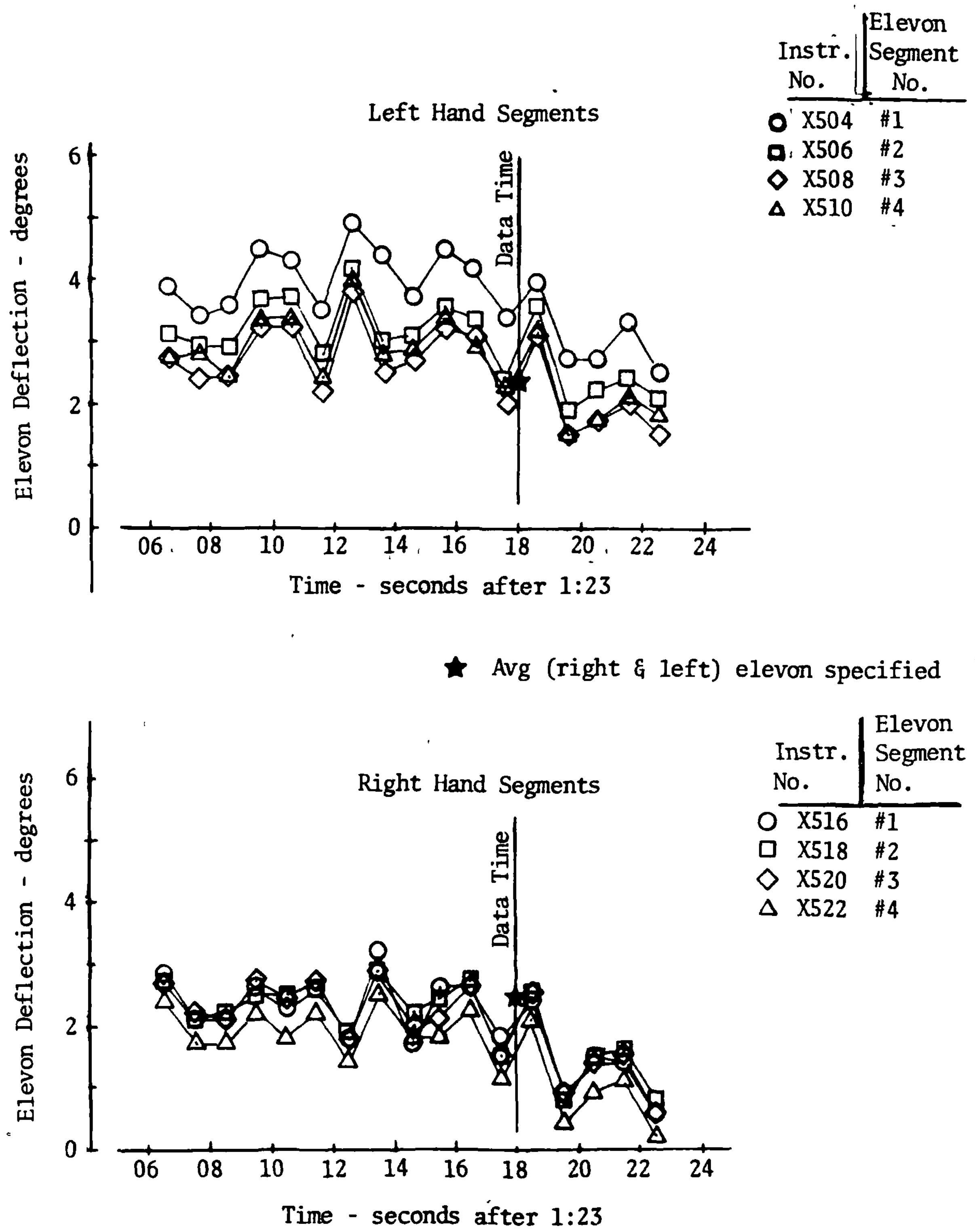
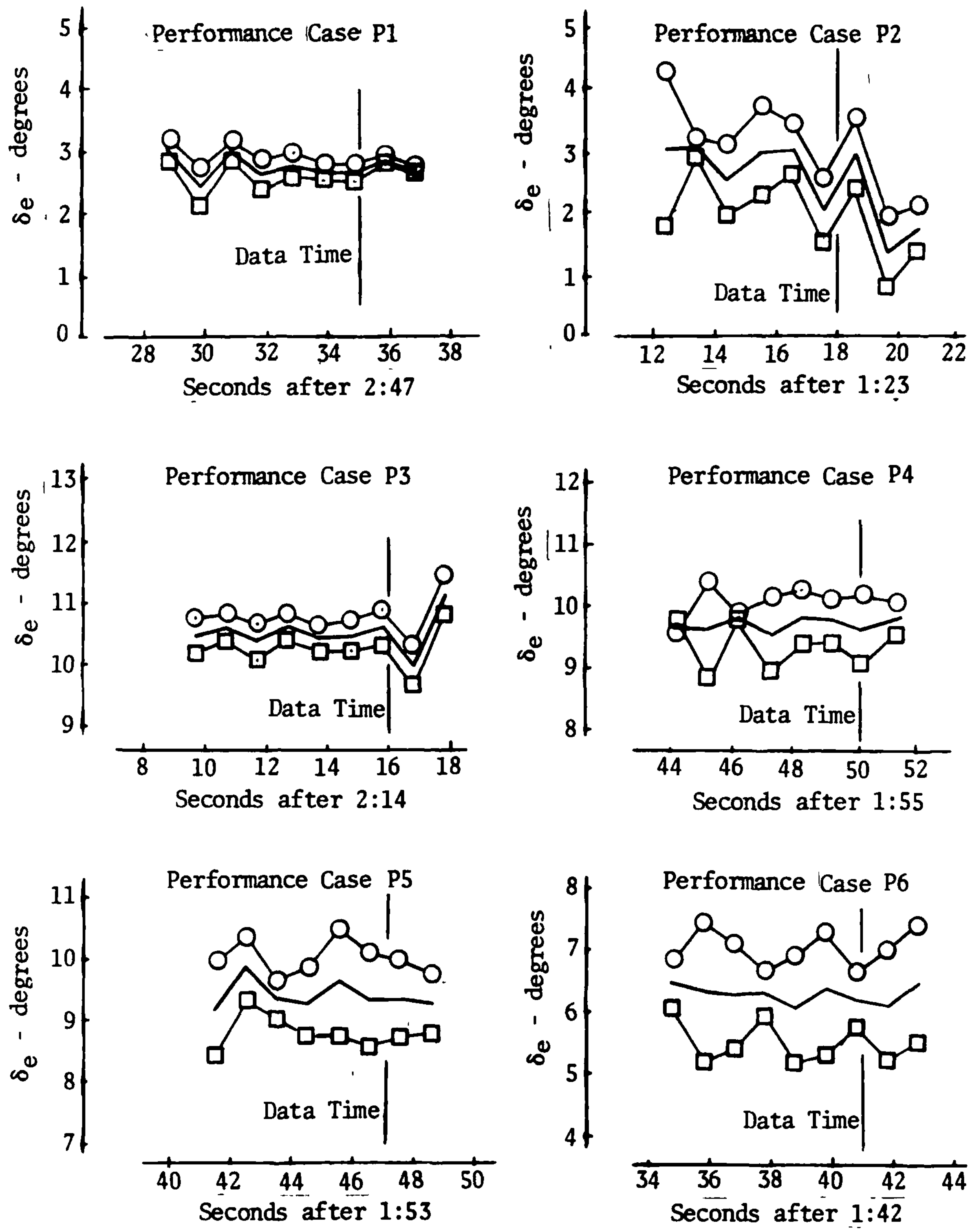


Figure 26.- Time histories of elevon segment deflection performance case P2, flt. 1-76



○ Avg of LH segments □ Avg of RH segments ——— Avg of all segments

Figure 27.- Time histories of elevon deflection

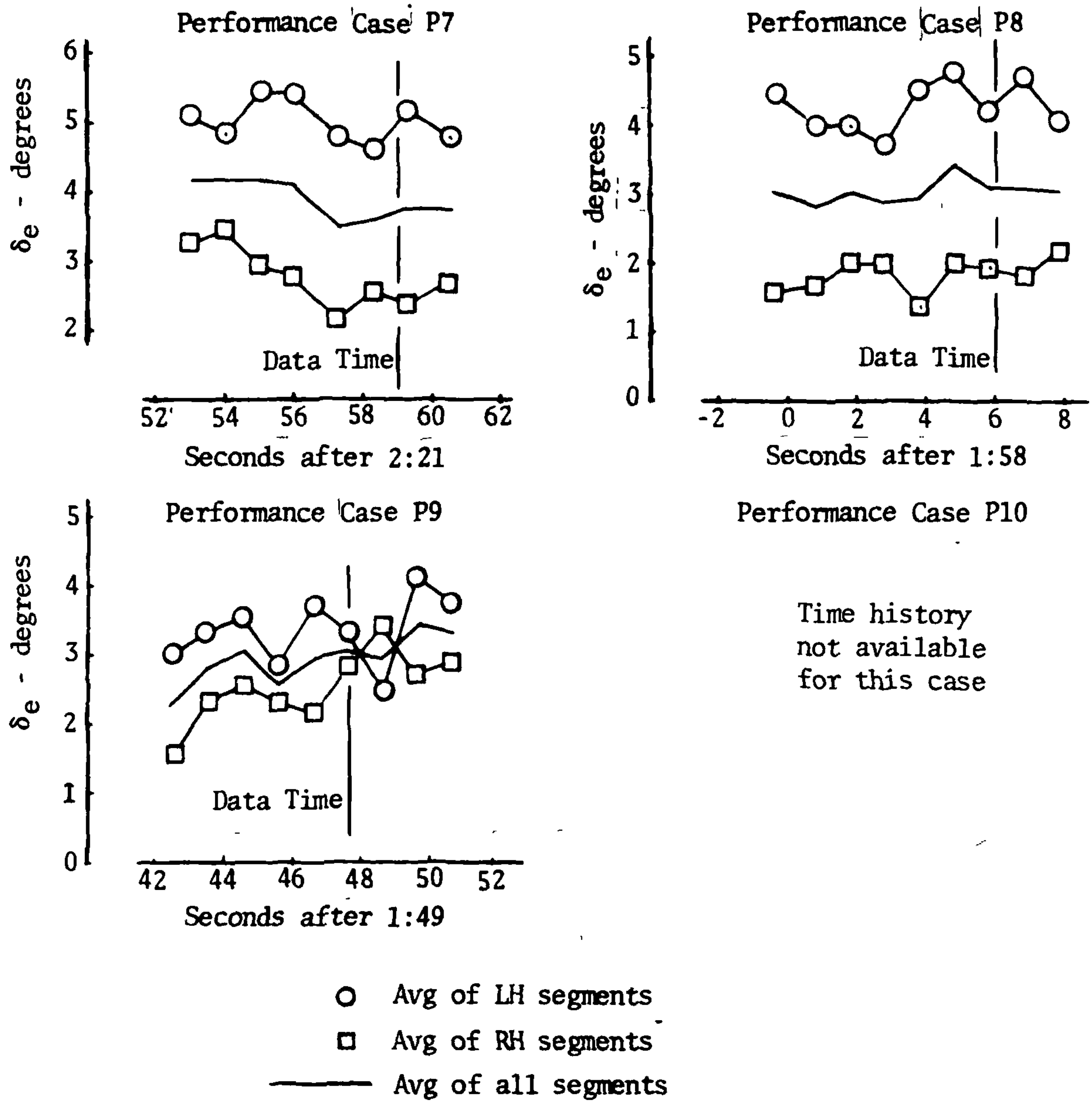


Figure 27.- Concluded

TABLE 6.- SUMMARY OF FLIGHT TEST ELEVON DEFLECTION CHARACTERISTICS

Case I.D.	δ_e At Data Time					δ_e Over 6 Seconds					Table 1 Avg δ_e
	LH Segments		RH Segements		LH+RH	LH Segments		RH Segments		LH+RH	
	Avg.	+/-*	Avg.	+/-*	Avg.	Avg.	+/-	Avg.	+/-	Avg.	
P1	2.78	.7/.3	2.5	.5/.3	2.64	2.88	.58/.37	2.58	.40/.42	2.73	2.7
P2	2.95	.8/.5	1.85	.3/.4	2.40	3.23	.78/.48	2.25	.27/.37	2.74	2.4
P3	10.70	.7/.5	10.15	.4/.2	10.42	10.64	.57/.37	10.11	.28/.18	10.38	10.9
P4	10.18	.8/.5	9.05	.1/.3	9.62	10.11	.68/.46	9.35	.21/.27	9.73	9.7
P5	10.02	.5/.4	8.66	.5/.3	9.34	10.06	.51/.43	8.86	.42/.28	9.46	9.3
P6	6.70	.3/.2	5.63	.4/.2	6.17	6.93	.22/.22	5.45	.28/.15	6.19	6.2
P7	5.00	.3/.3	2.40	.5/.6	3.70	5.04	.28/.25	2.69	.45/.50	3.87	8.0
P8	4.20	.6/.7	1.90	.7/1.0	3.05	4.99	.67/.73	1.85	.73/1.02	3.42	3.2
P9	3.35	.8/.9	2.45	.8/.9	2.90	3.30	.68/.65	2.27	.97/1.03	2.79	3.0
P10	13.1	.6/.5	12.03	.4/.6	12.57	--	--	--	--	--	12.4

*Deviations taken at nearest data point

TABLE 7.-

SUMMARY OF ROLLER COASTER MANEUVER DATA

Table I Case	Flight	Time hrs:min:sec	Mach No.	Altitude feet	Load Factor g's	Pitch Rate deg/sec	δ_e deg	δ_c deg
P3 1g Trim	1-76	2:14:16	1.18	33,750	1.0	0	10.9	.90
Low-g	1-76	2:15:49	1.15	33,950	.63	-.55	12.8	.41
High-g	1-76	2:16:08	1.17	32,756	1.48	.83	6.8	1.61
P8 1g Trim	1-70	1:58:06	2.53	62,980	1.0	0	3.2	2.82
Low-g	1-70	2:05:24.5	2.50	63,337	.81	-.18	4.6	2.70
High-g	1-70	2:05:44.5	2.56	63,476	1.52	.57	-5.2	4.07

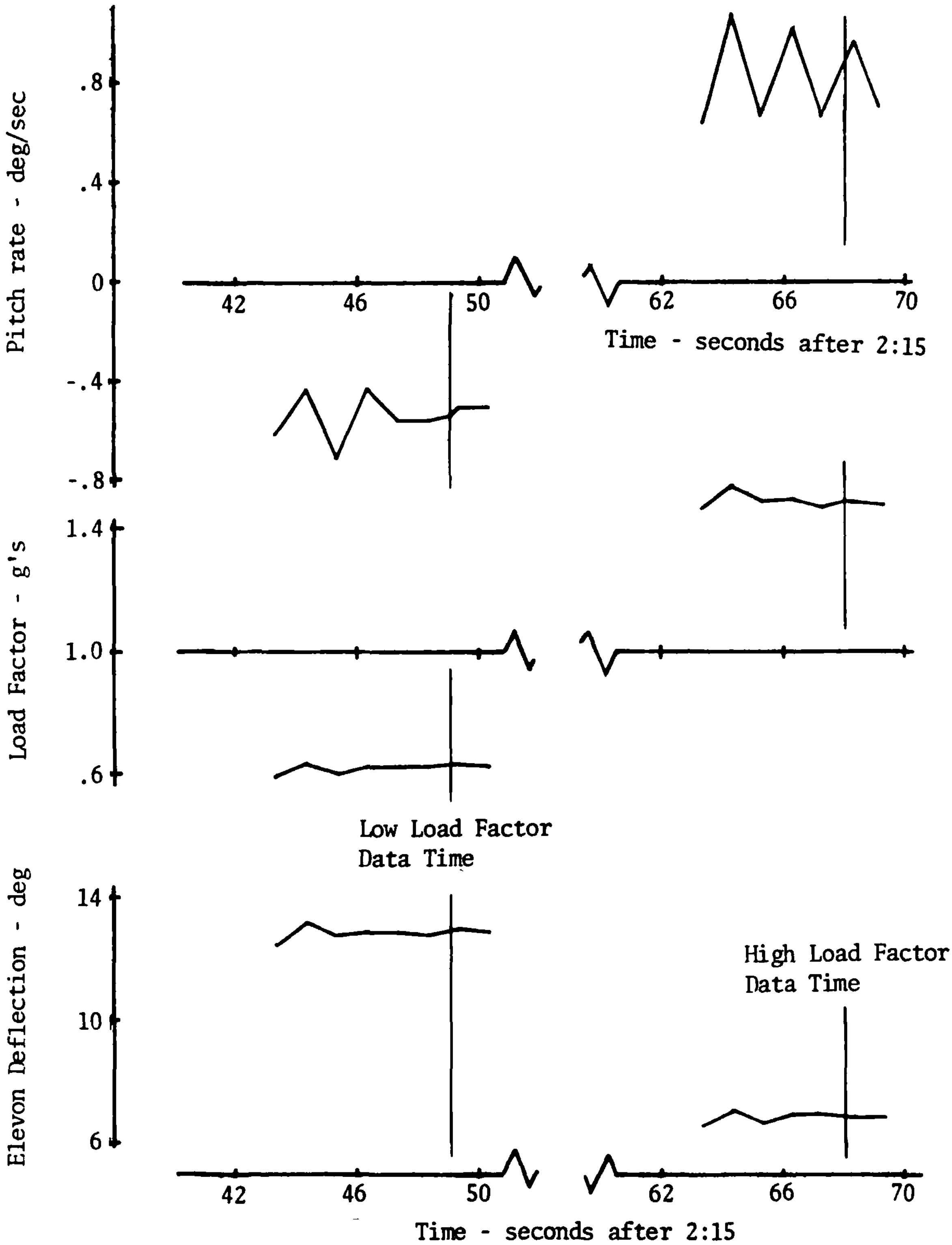


Figure 28.- Time history of a roller coaster maneuver - Flight 1-76
$M = 1.153$, $h_p = 33{,}910$ feet

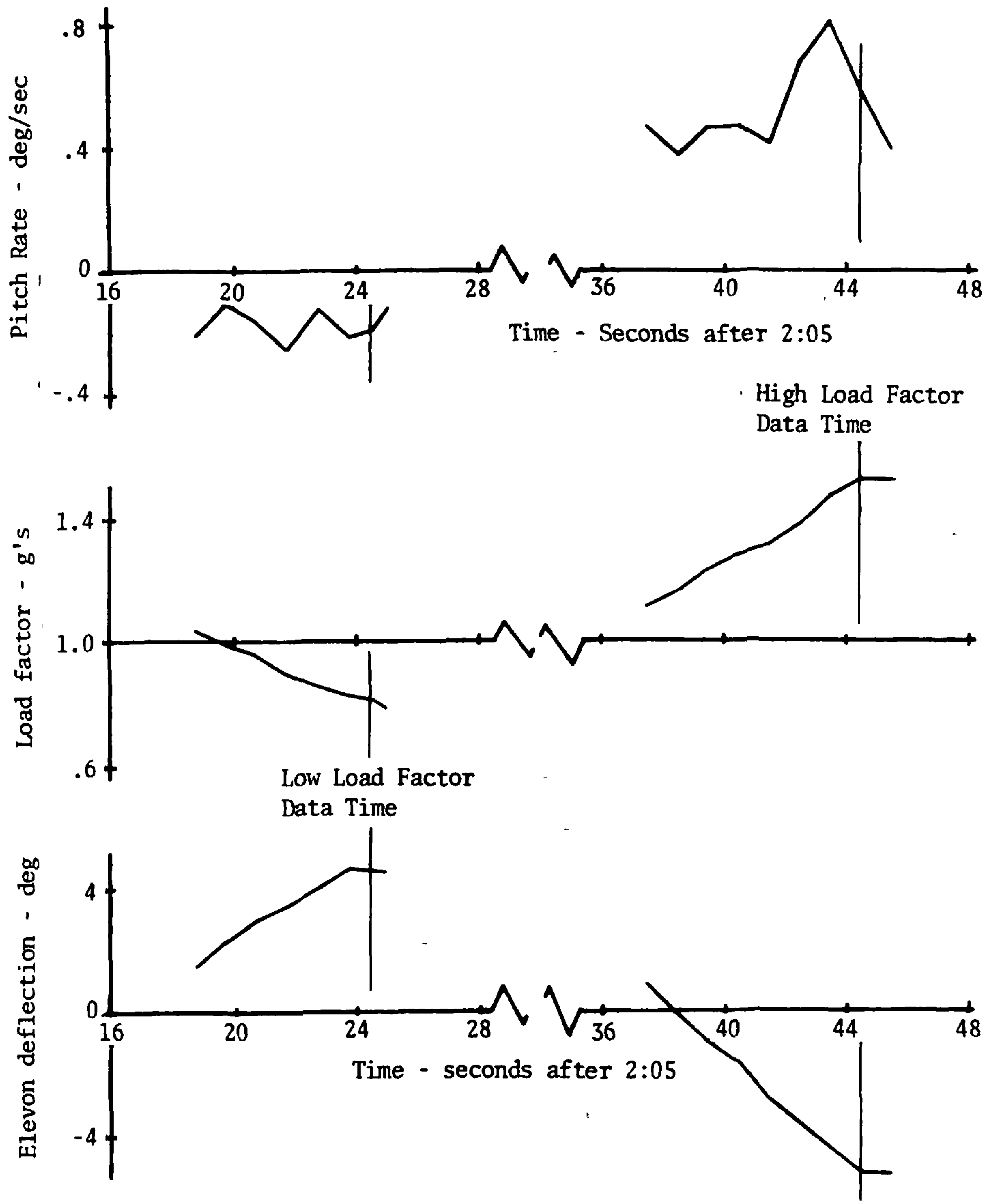


Figure 29.- Time history of a roller coaster maneuver, Flight 1-70, $M = 2.5$, $h_p = 63{,}337$ ft.

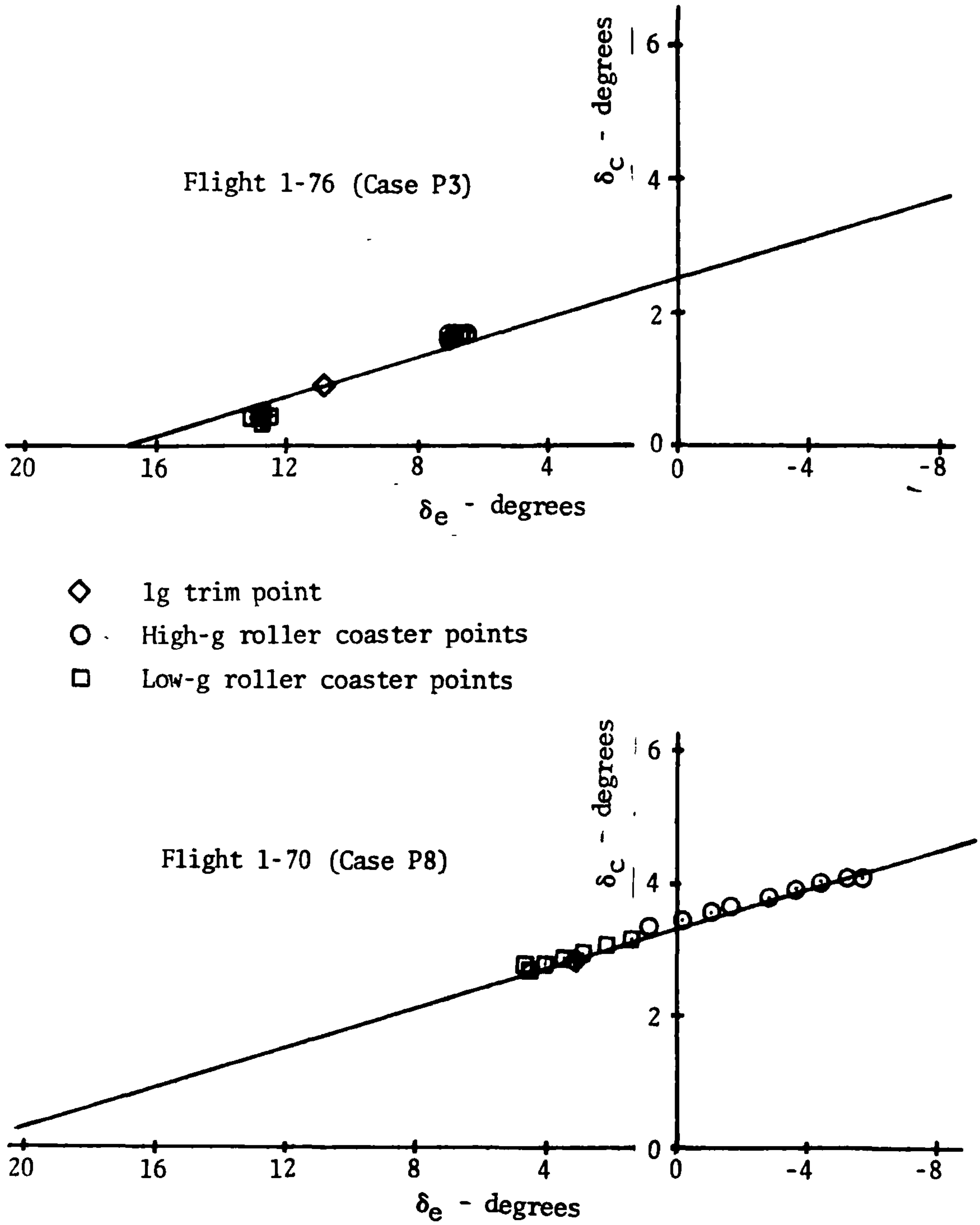


Figure 30.- Control gearing during roller coaster maneuver

FLEXIBLE AIRPLANE LONGITUDINAL CHARACTERISTICS

This section presents the results of analyses of the aircraft longitudinal flight characteristics for the seventeen conditions listed in tables 1 and 2.

Flexible Airplane Longitudinal Characteristics Summary

At each of the specified flight conditions, analyses of the longitudinal characteristics of the vehicle were accomplished based on the Phase 2 analytical model described in earlier sections. A summary of results for each case is presented in tables 8 through 25 . For convenience, pertinent configuration and flight condition details have been tabulated at the top of each page. A general description of the data format and characteristics will be followed by observations pertaining to specific cases.

The first block of data provides a comparison of 1g trim conditions. Computed angle of attack and control deflection data for both the rigid and flexible airplane are tabulated together with flight test control deflection values. No comparisons of angle of attack were required. The difference between α and α_C is the forebody slope at the canard due to structural deformation. Mode deflection values for the flexible airplane are also listed. These values, together with the mode shape data of Appendix C, were used to compute the deformed shape at 1g trim according to the equation:

$$Z(x,y) = \sum_{i=1}^{4} \phi_i(x,y)\eta_i$$

Values of Z(x,y) are tabulated in Appendix F. All trim data are for the quoted canard-to-elevon gearing curve which was defined to pass through the flight test values.

Force data obtained by linearization of the nonlinear aerodynamic characteristics at the trim point are presented in Appendix E. A discussion of the data and their interpretation and limitations may be found in the section entitled "Digital Program Analysis Techniques".

The second block of data is composed of flexible-to-rigid ratios of lift and pitching moment due to various aerodynamic loadings. Data are shown for component loadings as well as for total airplane. As an example, the load source in the second row is defined to be angle of attack, wing-body. The value in the lift column should be interpreted to be $C_{N_{\alpha Flex}}/C_{N_{\alpha Rigid}}$ of the wing-body; the value in the moment columns should be interpreted to be $C_{m_{\alpha Flex}}/C_{m_{\alpha Rigid}}$ of the wing-body. The fourth row provides corresponding values for the complete airplane. It should be noted that in computing component ratios, such as $(C_{N_{\alpha Flex}}/C_{N_{\alpha Rigid}})_{WB}$ that the rigid-body driving function is only the loading on the specified component, but structural deformation and the loading due to deformation are for the complete airplane. A detailed description of procedures for obtaining flexible-to-rigid ratios is presented in Appendix D.

The flexible-to-rigid ratios were computed for conditions at 1g trim, i.e., for the values of the aerodynamic derivatives tabulated in Appendix E. Strictly speaking, they are valid only for small perturbations around the 1g trim point. In practical usage, the limitation depends on the degree of nonlinearity of rigid parameter.

A word of explanation is appropriate for the canard lift ratios due to either angle of attack or deflection. The total load due to the canard is composed of two parts: The direct load acting on the canard itself, and the interference load acting on the wing. At subsonic and low supersonic speeds, the two lift components are nearly equal and opposite, although they both contribute to structural deformation. Since the base for the ratio is nearly zero, any small change in loading can produce a very large ratio.

Pitch rate derivative ratios are based on original BDM values for all performance cases but reflect upgraded lifting surface estimates for all stability and control cases. It is believed that the ratios would be only slightly influenced by the rigid data revision. Flexible-to-rigid ratios for $\dot{\alpha}$ terms are included only for the stability and control cases. Further discussion of the dynamic stability parameters is given in the section entitled Aerodynamics. Rigid values of $\dot{\alpha}$ and q parameters for the complete airplane are shown for the stability and control cases of table 2 in table E18 of Appendix E.

The third block of data on the summary sheets presents short period characteristics for both the rigid and flexible airplane. These data are a normal product of the computer program used for the trim analyses and are included for general information even though not requested as part of the study. The original BDM estimates of $\dot{\alpha}$ and q effects were used in these computations. The dynamic characteristics are based on linearized aerodynamics taken at the 1g trim point.

Table 15, performance case P8, presents data computed using a gearing curve through the flight test control deflection values and based on Phase 2 aerodynamics which are consistent with the other cases. Table 16 presents trim data for performance case P8 based on the design gearing and Phase 1 aerodynamics. These latter results came from the earlier study and were the basis for design of the deformed model.

No flight test control deflections were measured for stability and control case SC5, which is a hypothetical case based on actual flight records to define a realistic weight distribution at a desired gross weight and center of gravity combination. The gearing curve for SC5 was selected to agree with that of SC4.

It was determined late in the program that flight test control deflections for the stability and control cases of Table 2 required revision from the original values supplied by NASA. In keeping with the general philosophy of conducting the analytical studies using control gearing curves through the flight test points, revised estimates of the trim characteristics were needed to reflect the later experimental data. Since deformed shape definitions were not required for the stability and control cases, these corrections were made by hand using the relationships described in Appendix G. The mode deflection values have been deleted from the summary tables and the tabulation of deformed shape have been omitted from Appendix F. The original values of flexible-to-rigid ratios and short period characteristics have been retained in the summaries. The small changes in trim parameters were estimated to have small impact on these terms.

Canard Lift Coefficient at 1g Trim

Table 26 presents a tabulation of canard lift coefficient at 1g trim for each of the performance cases of Table 1. These data are provided to support estimation by NASA of flexible airplane drag characteristics from results of wind tunnel tests of the Deformed Model. The values represent the load acting on the flexible canard panel plus carry-over on the fuselage forebody, but do not include the interference load acting on the wing due to the presence of the canard. The data were read from nonlinear aerodynamic characteristics of the canard at values of α_c and δ_c for 1g trim and corrected for flexibility of the canard panel.

Correlations of Control Deflections

The comparison of flight test control deflections with analytical predictions are presented for performance cases in figure 31, and for stability and control cases in figure 32. These comparisons are shown on gearing curves of δ_e vs δ_c to aid in evaluating the agreement. The plots also serve to illustrate the deviation of the flight point gearing from the design gearing. Rigid airplane trim points have been included to indicate the extent of flexibility effects in trim. For performance case

P8, points are shown for both the flight point gearing and the design gearing. No flight test data are available for stability and control case SC5, which is a hypothetical case.

A summary of the analytical/flight test comparisons are presented as a function of Mach number in figure 33. The top graph shows both experimental and computed values, while the bottom shows the mismatch or difference between the flight test and analytical values. No points are shown for stability and control point SC5 because of the lack of flight data.

To illustrate the improvement derived from the present study, the mismatch of the original XB-70-1 data is indicated on figure 33, based on data from the summary plot of reference 12. Rather than discrete points, a narrow band has been used to indicate these results at the flight conditions of tables 1 and 2 since no convenient means exists for identifying gross weight/center of gravity conditions of reference 12 values.

With the exception of case P10, at M = 1.06, very significant improvement is observed for all the test points. In fact, nearly all predicted deflections are within ±1° of the measured values, which is probably close to the limiting accuracy of the flight test data. It is particularly interesting to note that the original diverging error at high supersonic speeds has been eliminated and the transonic mismatch has been minimized except for the point at M = 1.06. The difficulties in the latter case are attributed to the aerodynamic definition, reflecting the usual problems of transonic wind tunnel testing. In particular, the M = 1.06 deflection is sensitive to elevon effectiveness which exhibits a very steep slope in that region as shown in figure 9. The curve is faired somewhat arbitrarily through data points at M = .6, .8, .95, 1.2 and 1.4. A different fairing or a slight change in the Mach number of the test point could result in considerable change in $C_{m_{\delta_e}}$. Although their behavior is less radical, similar limitations apply to other aerodynamic parameters.

One of the most significant results which became apparant during the study was the trim sensitivity at supersonic speeds due to loss in control effectiveness. At M = 2.5, for instance, ΔC_m = .0007 is equivalent to 1° of (geared) elevon deflection. Magnitudes of this order are easily lost in testing and plotting accuracy unless great care is exercised. As an indication of the significance of this sensitivity, it was found that the boundary layer bleed (sugar scoop) on the bottom fuselage was worth 1° at M = 2.5, decreasing to ~.75° at the lower supersonic speeds. Boundary layer bleed flow through the diverter exiting on the wing upper surface was found to be worth .25° at M = 2.5. No evaluation was available at other Mach numbers.

1G Deformation Patterns

Isometric plots of wing-body deflections at 1g trim are presented in figures 34 through 43 for the performance cases of table 1. These plots are presented for a rapid assessment of the nature of the deformation pattern for each case. Tabulations of the deflection values are contained in Appendix F. Neither plots nor tabulations were required for the stability and control cases of table 2.

Characteristics During Roller Coaster Maneuvers

The characteristics presented in the preceding sections have all applied to conditions at or near 1g trim. Late in the program, a limited investigation was made at conditions significantly remote from 1g. Flight test data describing the variation with time of load factor, pitch rate, and control deflection during a roller coaster maneuver performed after the 1g trim point was provided by NASA for performance cases P3 and P8. A detailed discussion of this data is presented in the section entitled Roller Coaster Flight Test Data. One high load factor point and one low load factor point were selected by NASA for future performance analyses. These same points were used by NR as the basis for control deflection comparisons and deformation estimates.

For these analyses, load factor and pitch rate were specified and the solution defined the angle of attack, control deflection values, and deformation shape necessary to provide a balance at that instant of time. Values of load factor and pitch rate used in the analyses are listed in table 7.

Before presenting the results of these analyses, certain features should be explained. As shown in table 7, there are small variations in Mach number and altitude between the 1g trim points and the points of interest during the roller coasters. There was also approximately seven and a half minutes time delay between the 1g trim and the roller coaster points for case P8 (Flight 1-70) and nearly two minutes delay for case P3. The time lag means that somewhat different gross weight/center of gravity conditions existed during the roller coasters compared to the base case at trim for which weight and structural mode data had been developed. It is estimated that for case P8, between 7000 and 20,000 lbs. of fuel would have been burned during the 7-1/2-minute time interval. No such rapid estimate of center of gravity travel was possible. The effects of these variations have been ignored in the analyses which were conducted for weight and flight conditions of the base cases. The impact of these variations are estimated to be negligible with the possible exception of the center of gravity movement for case P8.

Figure 30 shows the control deflection values during the roller coaster maneuvers plotted on the 1g trim gearing curves for P3 and P8. The data for P8 follows the 1g gearing curve in slope with a slight offset in intercept, while that for P3 implies a small change in slope. It was decided to ignore these changes and retain the 1g gearing in these analyses so that the analytical estimates of load factor effects are compatible with the 1g trim results for each case. If desired, the effects of the change in gearing may be readily evaluated using the procedure derived in Appendix G.

Because of the differences described above, care should be exercised in relating these data to the flight test characteristics. The analytical results are probably best used to describe an incremental change from the 1g trim conditions.

Analytical estimates of angle of attack and control deflections are shown for the roller coaster points in table 27 for P3 and in table 28 for case P8. Flight test values of control deflection are listed for each case for comparison. No significant changes in flexible-to-rigid ratios from the 1g cases occurred.

Comparisons of analytical and flight test control deflections for P3 and P8 are shown on gearing plots in figure 44. The 1g trim comparisons are included for convenience.

Plots of the deformed shape of the wing-body are shown for P3 in figures 45 and 46, and for P8 in figures 47 and 48. These plots are included to provide ready visualization of the deformation. Tabulations of the deformation values may be found in Appendix H.

TABLE 8.- FLEXIBLE AIRPLANE LONGITUDINAL CHARACTERISTICS SUMMARY PERFORMANCE CASE P1

Flight No. 81 Mach No. 0.76 Altitude 25,750 ft

Gross Weight 318,394 lbs C.G. $.241\bar{c}_W$ (FS 1613.0)

Tip Position 0 deg Bypass Doors 0 deg Ramp Down

Velocity 770 ft/sec Dynamic Pressure 308 lbs/ft^2

TRIM CONDITIONS

COMPUTED-RIGID	COMPUTED-FLEXIBLE		FLIGHT TEST
α = 4.16 deg	α = 4.18 deg	η_1 = -.1252 ft	
α_C = 4.16 deg	α_C = 4.25 deg	η_2 = -.5229 ft	
δ_C = 2.36 deg	δ_C = 2.25 deg	η_3 = .0036 ft	δ_C = 2.26 deg
δ_e = 2.07 deg	δ_e = 2.80 deg	η_4 = .0653 ft	δ_e = 2.70 deg

Gearing: $\delta_e = 17.77 - 6.67\ \delta_C$

FLEXIBLE-TO-RIGID RATIOS

	LIFT	MOMENT
At α = 0	.914	.912
Angle of attack, wing body	.997	.974
*Angle of attack, canard	-7.022	1.110
Angle of attack, airplane	.974	.824
*Canard deflection	-1.032	1.102
Elevon deflection	.835	.856
Geared control deflection	.848	.880
Pitch rate, wing-body	.795	.878
Pitch rate, airplane	.730	.881

*includes interference effects

SHORT PERIOD

	RIGID	FLEXIBLE
Frequency, ω, rad/sec	1.474	1.059
Damping ratio, ζ	.511	.300
Period, sec	4.960	6.221
Time to 1/2 amplitude, sec	.919	.351
Cycles to 1/2 amplitude	.185	.219

TABLE 9.- FLEXIBLE AIRPLANE LONGITUDINAL CHARACTERISTICS SUMMARY PERFORMANCE CASE P2

Flight No. 76 Mach No. 0.93 Altitude 32,700 ft

Gross Weight 480,310 lbs C.G. $.219\bar{c}_W$ (FS 1592.7)

Tip Position 25 deg Bypass Doors 0 deg Ramp Down

Velocity 914 ft/sec Dynamic Pressure 337 lbs/ft^2

TRIM CONDITIONS

COMPUTED-RIGID	COMPUTED-FLEXIBLE		FLIGHT TEST
α = 6.14 deg	α = 6.16 deg	η_1 = -.2016 ft	
α_C = 6.14 deg	α_C = 6.33 deg	η_2 = -.8186 ft	
δ_C = 2.36 deg	δ_C = 2.17 deg	η_3 = -.0137 ft	δ_C = 2.15 deg
δ_e = 1.01 deg	δ_e = 2.25 deg	η_4 = .1299 ft	δ_e = 2.4 deg

Gearing: $\delta_e = 16.73 - 6.67\,\delta_C$

FLEXIBLE-TO-RIGID RATIOS

	LIFT	MOMENT
At α = 0	.815	.752
Angle of attack, wing body	.978	.919
Angle of attack, canard	-36.447	1.149
Angle of attack, airplane	.952	.706
Canard deflection	-1.396	1.117
Elevon deflection	.782	.817
Geared control deflection	.799	.853
Pitch rate, wing-body	.767	.837
Pitch rate, airplane	.702	.840

*includes interference effects

SHORT PERIOD

	RIGID	FLEXIBLE
Frequency, ω, rad/sec	1.419	1.151
Damping ratio, ζ	.384	.444
Period, sec	4.795	6.092
Time to 1/2 amplitude, sec	1.271	1.355
Cycles to 1/2 amplitude	.265	.222

TABLE 10.- FLEXIBLE AIRPLANE LONGITUDINAL CHARACTERISTICS SUMMARY
PERFORMANCE CASE P3

Flight No. 76 Mach No. 1.18 Altitude 33,750 ft

Gross Weight 334,450 lbs C.G. $.223\bar{c}_w$ (FS 1596.4)

Tip Position 25 deg Bypass Doors 3.23 deg Ramp Down

Velocity = 1155 ft/sec Dynamic Pressure 516 lbs/ft^2

TRIM CONDITIONS

COMPUTED-RIGID	COMPUTED-FLEXIBLE		FLIGHT TEST
α = 3.15 deg	α = 3.17 deg	η_1 = -.0660 ft	
α_c = 3.15 deg	α_c = 3.25 deg	η_2 = -.3210 ft	
δ_c = 1.39 deg	δ_c = 1.02 deg	η_3 = .0047 ft	δ_c = .90 deg
δ_e = 7.62 deg	δ_e = 10.13 deg	η_4 = -.2559 ft	δ_e = 10.9 deg

Gearing: $\delta_e = 16.90 - 6.67\ \delta_c$

FLEXIBLE-TO-RIGID RATIOS

	LIFT	MOMENT
At α = 0	.778	.768
Angle of attack, wing body	.990	.939
* Angle of attack, canard	-6.771	1.220
Angle of attack, airplane	.958	.788
* Canard deflection	-2.700	1.216
Elevon deflection	.565	.595
Geared control deflection	.633	.732
Pitch rate, wing-body	.759	.794
Pitch rate, airplane	.680	.791

*includes interference effects

SHORT PERIOD

	RIGID	FLEXIBLE
Frequency, ω, rad/sec	2.382	2.08
Damping ratio, ζ	.332	.349
Period, sec	2.797	3.22
Time to 1/2 amplitude, sec	.876	.952
Cycles to 1/2 amplitude	.313	.296

TABLE 11.- FLEXIBLE AIRPLANE LONGITUDINAL CHARACTERISTICS SUMMARY PERFORMANCE CASE P4

Flight No. 81 Mach No. 1.60 Altitude 38,600 ft

Gross Weight 400,104 lbs C.G. $.217\bar{c}_W$ (FS 1590.2)

Tip Position 65 deg Bypass Doors 3.27 deg Ramp Down

Velocity 1549 ft/sec Dynamic Pressure 753 lbs/ft^2

TRIM CONDITIONS

COMPUTED-RIGID	COMPUTED-FLEXIBLE		FLIGHT TEST
α = 2.75 deg	α = 2.81 deg	η_1 = -.0720 ft	
α_c = 2.75 deg	α_c = 2.82 deg	η_2 = -.4211 ft	
δ_c = 1.28 deg	δ_c = .99 deg	η_3 = .0296 ft	δ_c = 1.14 deg
δ_e = 8.76 deg	δ_e = 10.72 deg	η_4 = .0201 ft	δ_e = 9.7 deg

Gearing: $\delta_e = 17.30 - 6.67\ \delta_c$

FLEXIBLE-TO-RIGID RATIOS

	LIFT	MOMENT
At α = 0	.889	.851
Angle of attack, wing body	1.018	1.026
* Angle of attack, canard	-.068	1.288
Angle of attack, airplane	.982	.819
* Canard deflection	-.053	1.259
Elevon deflection	.702	.744
Geared control deflection	.767	.871
Pitch rate, wing-body	.857	.890
Pitch rate, airplane	.701	.842

*includes interference effects

SHORT PERIOD

	RIGID	FLEXIBLE
Frequency, ω, rad/sec	1.933	1.703
Damping ratio, ζ	.255	.290
Period, sec	3.361	3.856
Time to 1/2 amplitude, sec	1.407	1.404
Cycles to 1/2 amplitude	.419	.364

TABLE 12.- FLEXIBLE AIRPLANE LONGITUDINAL CHARACTERISTICS SUMMARY PERFORMANCE CASE P5

Flight No. 79 Mach No. 1.67 Altitude 42,000 ft

Gross Weight 387,309 lbs C.G. $.220\bar{c}_w$ (FS 1592.9)

Tip Position 65 deg Bypass Doors 2.80 deg Ramp Down

Velocity 1617 ft/sec Dynamic Pressure 697 lbs/ft^2

TRIM CONDITIONS

COMPUTED-RIGID	COMPUTED-FLEXIBLE		FLIGHT TEST
α = 2.96 deg	α = 3.02 deg	η_1 = -.0658 ft	
α_c = 2.96 deg	α_c = 3.02 deg	η_2 = -.4251 ft	
δ_c = 1.51 deg	δ_c = 1.25 deg	η_3 = .0284 ft	δ_c = 1.38 deg
δ_e = 8.43 deg	δ_e = 10.20 deg	η_4 = -.0135 ft	δ_e = 9.3 deg

Gearing: $\delta_e = 18.50 - 6.67\ \delta_c$

FLEXIBLE-TO-RIGID RATIOS

	LIFT	MOMENT
At α = 0	.896	.906
Angle of attack, wing body	1.012	1.022
* Angle of attack, canard	.196	1.209
Angle of attack, airplane	.983	.873
* Canard deflection	.207	1.188
Elevon deflection	.743	.787
Geared control deflection	.800	.888
Pitch rate, wing-body	.867	.905
Pitch rate, airplane	.721	.874

*includes interference effects

SHORT PERIOD

	RIGID	FLEXIBLE
Frequency, ω, rad/sec	1.855	1.703
Damping ratio, ζ	.237	.256
Period, sec	3.487	3.817
Time to 1/2 amplitude, sec	1.574	1.588
Cycles to 1/2 amplitude	.451	.416

TABLE 13.- FLEXIBLE AIRPLANE LONGITUDINAL CHARACTERISTICS SUMMARY PERFORMANCE CASE P6

Flight No. 79 Mach No. 2.10 Altitude 48,600 ft

Gross Weight 392,409 lbs C.G. $.211\bar{c}_w$ (FS 1584.8)

Tip Position 65 deg Bypass Doors 7.40 deg Ramp Down

Velocity 2033 ft/sec Dynamic Pressure 804 lbs/ft^2

TRIM CONDITIONS

COMPUTED-RIGID	COMPUTED-FLEXIBLE		FLIGHT TEST
α = 2.99 deg	α = 2.97 deg	η_1 = .0894 ft	
α_c = 2.99 deg	α_c = 2.76 deg	η_2 = -.3523 ft	
δ_c = 1.91 deg	δ_c = 2.14 deg	η_3 = -.0139 ft	δ_c = 1.98 deg
δ_e = 6.66 deg	δ_e = 5.14 deg	η_4 = .0593 ft	δ_e = 6.2 deg

Gearing: $\delta_e = 19.40 - 6.67\,\delta_c$

FLEXIBLE-TO-RIGID RATIOS

	LIFT	MOMENT
At α = 0	.724	.699
Angle of attack, wing body	1.010	1.013
*Angle of attack, canard	.661	1.208
Angle of attack, airplane	.991	.889
*Canard deflection	.691	1.172
Elevon deflection	.785	.804
Geared control deflection	.806	.904
Pitch rate, wing-body	.897	.924
Pitch rate, airplane	.750	.888

*includes interference effects

SHORT PERIOD

	RIGID	FLEXIBLE
Frequency, ω, rad/sec	1.922	1.793
Damping ratio, ζ	.176	.188
Period, sec	3.320	3.568
Time to 1/2 amplitude, sec	2.053	2.052
Cycles to 1/2 amplitude	.618	.575

TABLE 14.- FLEXIBLE AIRPLANE LONGITUDINAL CHARACTERISTICS SUMMARY PERFORMANCE CASE P7

Flight No. 67 Mach No. 2.15 Altitude 57,600 ft

Gross Weight 353,535 lbs C.G. $.211\bar{c}_W$ (FS 1584.6)

Tip Position 65 deg Bypass Doors 6.78 deg Ramp Down

Velocity 2081 ft/sec Dynamic Pressure 548 lbs/ft^2

TRIM CONDITIONS

COMPUTED-RIGID	COMPUTED-FLEXIBLE		FLIGHT TEST
α = 3.99 deg	α = 3.97 deg	η_1 = .0447 ft	
α_C = 3.99 deg	α_C = 3.88 deg	η_2 = -.3749 ft	
δ_C = 2.61 deg	δ_C = 2.74 deg	η_3 = -.0225 ft	δ_C = 2.59 deg
δ_e = 3.54 deg	δ_e = 2.69 deg	η_4 = -.0061 ft	δ_e = 3.7 deg

Gearing: $\delta_e = 20.97 - 6.67\ \delta_C$

FLEXIBLE-TO-RIGID RATIOS

	LIFT	MOMENT
At α = 0	.801	.778
Angle of attack, wing body	1.005	1.004
* Angle of attack, canard	.782	1.135
Angle of attack, airplane	.993	.923
* Canard deflection	.790	1.123
Elevon deflection	.850	.861
Geared control deflection	.865	.934
Pitch rate, wing-body	.930	.947
Pitch rate, airplane	.829	.925

*includes interference effects

SHORT PERIOD

	RIGID	FLEXIBLE
Frequency, ω, rad/sec	1.733	1.645
Damping ratio, ζ	.142	.148
Period, sec	3.663	3.855
Time to 1/2 amplitude, sec	2.826	2.838
Cycles to 1/2 amplitude	.772	.736

TABLE 15.- FLEXIBLE AIRPLANE LONGITUDINAL CHARACTERISTICS SUMMARY PERFORMANCE CASE P8, FLIGHT TEST GEARING

Flight No. 70 Mach No. 2.53 Altitude 62,980 ft

Gross Weight 376,516 lbs C.G. $.218\bar{c}_w$ (FS 1591.0)

Tip Position 65 deg Bypass Doors 1.80 deg Ramp Up

Velocity 2450 ft/sec Dynamic Pressure 587 lbs/ft^2

TRIM CONDITIONS

COMPUTED-RIGID	COMPUTED-FLEXIBLE		FLIGHT TEST
α = 4.16 deg	α = 4.15 deg	η_1 = .0127 ft	
α_c = 4.16 deg	α_c = 4.16 deg	η_2 = -.3374 ft	
δ_c = 2.66 deg	δ_c = 2.72 deg	η_3 = -.0191 ft	δ_c = 2.82 deg
δ_e = 4.28 deg	δ_e = 3.89 deg	η_4 = -.0356 ft	δ_e = 3.20 deg

Gearing: $\delta_e = 22.00 - 6.67\ \delta_c$

FLEXIBLE-TO-RIGID RATIOS

	LIFT	MOMENT
At α = 0	.663	.802
Angle of attack, wing body	1.006	.998
* Angle of attack, canard	.871	1.111
Angle of attack, airplane	.997	.914
*Canard deflection	.872	1.097
Elevon deflection	.869	.869
Geared control deflection	.868	.940
Pitch rate, wing-body	.926	.937
Pitch rate, airplane	.825	.922

*includes interference effects

SHORT PERIOD

	RIGID	FLEXIBLE
Frequency, ω, rad/sec	1.466	1.399
Damping ratio, ζ	.122	.127
Period, sec	4.319	4.527
Time to 1/2 amplitude, sec	3.884	3.911
Cycles to 1/2 amplitude	.899	.864

TABLE 16.- FLEXIBLE AIRPLANE LONGITUDINAL CHARACTERISTICS SUMMARY PERFORMANCE CASE P8, DESIGN GEARING

TRIM CONDITIONS

COMPUTED-FLEXIBLE		FLIGHT TEST
α = 4.25 deg	η_1 = .0256 ft	
α_c = 4.26 deg	η_2 = -.3660 ft	
δ_c = 3.00 deg	η_3 = -.0228 ft	δ_c = 2.82 deg
δ_e = .025 deg	η_4 = -.0561 ft	δ_e = 3.20 deg

Gearing: $\delta_e = 20.0 - 6.67\ \delta_c$

TABLE 17.- FLEXIBLE AIRPLANE LONGITUDINAL CHARACTERISTICS SUMMARY
PERFORMANCE CASE P9

Flight No. 82 Mach No. 2.50 Altitude 61,625 ft

Gross Weight 381,591 lbs C.G. $.216\bar{c}_W$ (FS 1596.2)

Tip Position 65 deg Bypass Doors 3.80 deg Ramp Down

Velocity 2420 ft/sec Dynamic Pressure 611 lbs/ft^2

TRIM CONDITIONS

COMPUTED-RIGID	COMPUTED-FLEXIBLE		FLIGHT TEST
α = 4.04 deg	α = 4.03 deg	η_1 = .0154 ft	
α_C = 4.04 deg	α_C = 4.00 deg	η_2 = -.3743 ft	
δ_C = 2.54 deg	δ_C = 2.62 deg	η_3 = -.0197 ft	δ_C = 2.76 deg
δ_e = 4.44 deg	δ_e = 3.94 deg	η_4 = -.0238 ft	δ_e = 3.0 deg

Gearing: $\delta_e = 21.40 - 6.67\ \delta_C$

FLEXIBLE-TO-RIGID RATIOS

	LIFT	MOMENT
At α = 0	.645	.821
Angle of attack, wing body	1.005	1.003
*Angle of attack, canard	.865	1.112
Angle of attack, airplane	.996	.925
*Canard deflection	.875	1.093
Elevon deflection	.865	.865
Geared control deflection	.961	.936
Pitch rate, wing-body	.947	.961
Pitch rate, airplane	.854	.939

*includes interference effects

SHORT PERIOD

	RIGID	FLEXIBLE
Frequency, ω, rad/sec	1.497	1.441
Damping ratio, ζ	.124	.129
Period, sec	4.229	4.398
Time to 1/2 amplitude, sec	3.726	3.720
Cycles to 1/2 amplitude	.881	.846

TABLE 18.- FLEXIBLE AIRPLANE LONGITUDINAL CHARACTERISTICS SUMMARY PERFORMANCE CASE P10

Flight No. 66 Mach No. 1.06 Altitude 27,160 ft

Gross Weight 436,975 lbs C.G. $.223\bar{c}_w$ (FS 1596.2)

Tip Position 25 deg Bypass Doors 1.51 deg Ramp Down

Velocity 1067 ft/sec Dynamic Pressure 563 lbs/ft^2

TRIM CONDITIONS

COMPUTED-RIGID	COMPUTED-FLEXIBLE		FLIGHT TEST
α = 3.50 deg	α = 3.51 deg	η_1 = -.1173 ft	
α_c = 3.50 deg	α_c = 3.59 deg	η_2 = -.7058 ft	
δ_c = 1.66 deg	δ_c = 1.52 deg	η_3 = -.0034 ft	δ_c = .51 deg
δ_e = 4.74 deg	δ_e = 5.65 deg	η_4 = .1458 ft	δ_e = 12.4 deg

Gearing: $\delta_e = 15.80 - 6.67\ \delta_c$

FLEXIBLE-TO-RIGID RATIOS

	LIFT	MOMENT
At α = 0	.681	.625
Angle of attack, wing body	.981	.942
* Angle of attack, canard	-84.988	1.300
Angle of attack, airplane	.939	.702
* Canard deflection	-6.101	1.269
Elevon deflection	.627	.675
Geared control deflection	.681	.770
Pitch rate, wing-body	.650	.743
Pitch rate, airplane	.549	.734

*includes interference effects

SHORT PERIOD

	RIGID	FLEXIBLE
Frequency, ω, rad/sec	2.145	1.745
Damping ratio, ζ	.392	.435
Period, sec	3.183	3.999
Time to 1/2 amplitude, sec	.825	.913
Cycles to 1/2 amplitude	.259	.228

TABLE 19.- FLEXIBLE AIRPLANE LONGITUDINAL CHARACTERISTICS SUMMARY
STABILITY AND CONTROL CASE SC1

Flight No. 63 Mach No. 0.76 Altitude 15,500 ft

Gross Weight 480,425 lbs C.G. $.221\bar{c}_W$ (FS 1593.9)

Tip Position 0 deg Bypass Doors 0 deg Ramp Down

Velocity 802 ft/sec Dynamic Pressure 473 lbs/ft^2

TRIM CONDITIONS

COMPUTED-RIGID	COMPUTED-FLEXIBLE	FLIGHT TEST
α = 4.34 deg	α = 4.38 deg	
α_C = 4.34 deg	α_C = 4.63 deg	
δ_C = 2.70 deg	δ_C = 2.45 deg	δ_C = 2.36 deg
δ_e = 1.57 deg	δ_e = 3.21 deg	δ_e = 3.80 deg

Gearing: $\delta_e = 19.54 - 6.67\ \delta_C$

FLEXIBLE-TO-RIGID RATIOS

	LIFT	MOMENT
At α = 0	.918	.852
Angle of attack, wing body	.990	.941
*Angle of attack, canard	-11.98	1.201
Angle of attack, airplane	.954	.717
*Canard deflection	-2.154	1.183
Elevon deflection	.738	.774
Geared control deflection	.759	.813
Pitch rate, wing-body	.898	.880
Pitch rate, airplane	.837	.860
Alpha dot, wing-body	.946	.952
Alpha dot, airplane	.933	.954

*includes interference effects

SHORT PERIOD

	RIGID	FLEXIBLE
Frequency, ω, rad/sec	1.714	1.452
Damping ratio, ζ	.450	.515
Period, sec	4.104	5.048
Time to 1/2 amplitude, sec	.899	.926
Cycles to 1/2 amplitude	.219	.183

TABLE 20.- FLEXIBLE AIRPLANE LONGITUDINAL CHARACTERISTICS SUMMARY STABILITY AND CONTROL CASE SC2

Flight No. 63 Mach No. 0.75 Altitude 25,100 ft

Gross Weight 339,625 lbs C.G. $.234\bar{c}_W$ (FS 1606.9)

Tip Position 0 deg Bypass Doors 0 deg Ramp Down

Velocity 762 ft/sec Dynamic Pressure 308 lbs/ft^2

TRIM CONDITIONS

COMPUTED-RIGID	COMPUTED-FLEXIBLE	FLIGHT TEST
α = 4.62 deg	α = 4.64 deg	
α_c = 4.62 deg	α_c = 4.70 deg	
δ_c = 2.64 deg	δ_c = 2.52 deg	δ_c = 2.52 deg
δ_e = 1.80 deg	δ_e = 2.62 deg	δ_e = 2.60 deg

Gearing: $\delta_e = 19.41 - 6.67\ \delta_c$

FLEXIBLE-TO-RIGID RATIOS

	LIFT	MOMENT
At α = 0	.882	.843
Angle of attack, wing body	.987	.943
*Angle of attack, canard	-7.538	1.124
Angle of attack, airplane	.963	.760
*Canard deflection	-1.020	1.115
Elevon deflection	.844	.861
Geared control deflection	.858	.885
Pitch rate, wing-body	.927	.916
Pitch rate, airplane	.885	.906
Alpha dot, wing-body	.986	.988
Alpha dot, airplane	.970	1.000

*includes interference effects

SHORT PERIOD

	RIGID	FLEXIBLE
Frequency, ω, rad/sec	1.447	1.283
Damping ratio, ζ	.490	.540
Period, sec	4.982	5.816
Time to 1/2 amplitude, sec	.977	1.000
Cycles to 1/2 amplitude	.196	.172

TABLE 21.- FLEXIBLE AIRPLANE LONGITUDINAL CHARACTERISTICS SUMMARY
STABILITY AND CONTROL CASE SC3

Flight No. 64 Mach No. 1.21 Altitude 32,400 ft

Gross Weight 423,474 lbs C.G. $.228\bar{c}_w$ (FS 1600.8)

Tip Position 25 deg Bypass Doors 1.00 deg Ramp Down

Velocity 1191 ft/sec Dynamic Pressure 578 lbs/ft^2

TRIM CONDITIONS

COMPUTED-RIGID	COMPUTED-FLEXIBLE	FLIGHT TEST
α = 3.52 deg	α = 3.54 deg	
α_c = 3.52 deg	α_c = 3.55 deg	
δ_c = 1.79 deg	δ_c = 1.52 deg	δ_c = 1.18 deg
δ_e = 6.78 deg	δ_e = 8.67 deg	δ_e = 10.9 deg

Gearing: $\delta_e = 18.77 - 6.67\,\delta_c$

FLEXIBLE-TO-RIGID RATIOS

	LIFT	MOMENT
At $\alpha = 0$	.700	.672
Angle of attack, wing body	.975	.906
*Angle of attack, canard	-6.218	1.290
Angle of attack, airplane	.935	.700
*Canard deflection	-2.820	1.289
Elevon deflection	.601	.659
Geared control deflection	.696	.807
Pitch rate, wing-body	.667	.653
Pitch rate, airplane	.571	.667
Alpha dot, wing-body	72.545	.238
Alpha dot, airplane	10.50	.251

*includes interference effects

SHORT PERIOD

	RIGID	FLEXIBLE
Frequency, ω, rad/sec	2.310	1.896
Damping ratio, ζ	.304	.336
Period, sec	2.855	3.518
Time to 1/2 amplitude, sec	.987	1.089
Cycles to 1/2 amplitude	.346	.310

TABLE 22.- FLEXIBLE AIRPLANE LONGITUDINAL CHARACTERISTICS SUMMARY
STABILITY AND CONTROL CASE SC4
(Not actual flight case)

Mach No. 1.22 Altitude 39,300 ft

Gross Weight 357,505 lbs C.G. $.209c_W$ (FS 1582.7)

Tip Position 25 deg Bypass Doors 1.00 deg Ramp Down

Velocity 1181 ft/sec Dynamic Pressure 424 lbs/ft^2

TRIM CONDITIONS

COMPUTED-RIGID	COMPUTED-FLEXIBLE	FLIGHT TEST
α = 4.12 deg	α = 4.11 deg	
α_c = 4.12 deg	α_c = 4.13 deg	
δ_c = 2.20 deg	δ_c = 2.07 deg	δ_c = 1.73 deg
δ_e = 3.54 deg	δ_e = 4.43 deg	δ_e = 6.7 deg

Gearing: $\delta_e = 18.23 - 6.67\ \delta_c$

FLEXIBLE-TO-RIGID RATIOS

	LIFT	MOMENT
At $\alpha = 0$	.756	.734
Angle of attack, wing body	.983	.926
*Angle of attack, canard	-3.114	1.229
Angle of attack, airplane	.951	.780
*Canard deflection	-1.579	1.221
Elevon deflection	.707	.749
Geared control deflection	.781	.859
Pitch rate, wing-body	.755	.746
Pitch rate, airplane	.680	.752
Alpha dot, wing-body	57.975	.348
Alpha dot, airplane	8.22	.347

*includes interference effects

SHORT PERIOD

	RIGID	FLEXIBLE
Frequency, ω, rad/sec	2.183	1.906
Damping ratio, ζ	.275	.292
Period, sec	2.994	3.448
Time to 1/2 amplitude, sec	1.153	1.245
Cycles to 1/2 amplitude	.385	.361

TABLE 23.- FLEXIBLE AIRPLANE LONGITUDINAL CHARACTERISTICS SUMMARY
STABILITY AND CONTROL CASE SC5

Flight No. 75 Mach No. 1.22 Altitude 38,300 ft

Gross Weight 338,505 lbs C.G. $.226\bar{c}_W$ (FS 1599.1)

Tip Position 25 deg Bypass Doors 1.00 deg Ramp Down

Velocity 1181 ft/sec Dynamic Pressure 444 lbs/ft^2

TRIM CONDITIONS

COMPUTED-RIGID	COMPUTED-FLEXIBLE	FLIGHT TEST
α = 3.69 deg	α = 3.68 deg	
α_C = 3.69 deg	α_C = 3.73 deg	
δ_C = 1.79 deg	δ_C = 1.66 deg	
δ_e = 6.27 deg	δ_e = 7.15 deg	

Gearing: $\delta_e = 18.23 - 6.67\ \delta_C$

FLEXIBLE-TO-RIGID RATIOS

	LIFT	MOMENT
At $\alpha = 0$	.740	.728
Angle of attack, wing body	.980	.928
*Angle of attack, canard	-4.396	1.225
Angle of attack, airplane	.947	.773
*Canard deflection	-1.921	1.224
Elevon deflection	.695	.744
Geared control deflection	.773	.858
Pitch rate, wing-body	.766	.751
Pitch rate, airplane	.688	.757
Alpha dot, wing-body	56.786	.416
Alpha dot, airplane	8.3	.414

*includes interference effects

SHORT PERIOD

	RIGID	FLEXIBLE
Frequency, ω, rad/sec	2.214	1.927
Damping ratio, ζ	.295	.312
Period, sec	2.970	3.432
Time to 1/2 amplitude, sec	1.062	1.153
Cycles to 1/2 amplitude	.358	.336

TABLE 24.- FLEXIBLE AIRPLANE LONGITUDINAL CHARACTERISTICS SUMMARY
STABILITY AND CONTROL CASE SC6

Flight No. 81 Mach No. 1.61 Altitude 38,600 ft

Gross Weight 412,504 lbs C.G. $.220\bar{c}_w$ (FS 1593.2)

Tip Position 65 deg Bypass Doors 3.50 deg Ramp Down

Velocity 1559 ft/sec Dynamic Pressure 763 lbs/ft^2

TRIM CONDITIONS

COMPUTED-RIGID	COMPUTED-FLEXIBLE	FLIGHT TEST
α = 2.90 deg	α = 2.97 deg	
α_c = 2.90 deg	α_c = 2.99 deg	
δ_c = 1.56 deg	δ_c = 1.16 deg	δ_c = 1.26 deg
δ_e = 8.22 deg	δ_e = 10.81 deg	δ_e = 10.20 deg

Gearing: $\delta_e = 18.60 - 6.67\ \delta_c$

FLEXIBLE-TO-RIGID RATIOS

	LIFT	MOMENT
At α = 0	.903	.844
Angle of attack, wing body	1.018	1.019
*Angle of attack, canard	-.031	1.284
Angle of attack, airplane	.983	.803
*Canard deflection	-.010	1.255
Elevon deflection	.689	.736
Geared control deflection	.753	.865
Pitch rate, wing-body	.819	.838
Pitch rate, airplane	.662	.801
Alpha dot, wing-body	-.925	.357
Alpha dot, airplane	-1.22	.357

*includes interference effects

SHORT PERIOD

	RIGID	FLEXIBLE
Frequency, ω, rad/sec	1.910	1.658
Damping ratio, ζ	.254	.292
Period, sec	3.401	3.963
Time to 1/2 amplitude, sec	1.430	1.435
Cycles to 1/2 amplitude	.421	.357

TABLE 25.- FLEXIBLE AIRPLANE LONGITUDINAL CHARACTERISTICS SUMMARY
STABILITY AND CONTROL CASE SC7

Flight No. 68 Mach No. 2.39 Altitude 56,100 ft

Gross Weight 385,155 lbs C.G. $.212\bar{c}_W$ (FS 1585.6)

Tip Position 65 deg Bypass Doors 5.00 deg Ramp Down

Velocity 2314 ft/sec Dynamic Pressure 728 lbs/ft^2

TRIM CONDITIONS

COMPUTED-RIGID	COMPUTED-FLEXIBLE	FLIGHT TEST
α = 3.48 deg	α = 3.45 deg	
α_c = 3.48 deg	α_c = 3.43 deg	
δ_c = 2.39 deg	δ_c = 2.52 deg	δ_c = 2.54 deg
δ_e = 5.62 deg	δ_e = 4.72 deg	δ_e = 4.60 deg

Gearing: $\delta_e = 21.55 - 6.67\ \delta_c$

FLEXIBLE-TO-RIGID RATIOS

	LIFT	MOMENT
At $\alpha = 0$	.732	.742
Angle of attack, wing body	1.007	.990
*Angle of attack, canard	.809	1.141
Angle of attack, airplane	.995	.885
*Canard deflection	.827	1.118
Elevon deflection	.834	.835
Geared control deflection	.836	.919
Pitch rate, wing-body	.911	.926
Pitch rate, airplane	.758	.904
Alpha dot, wing-body	—	—
Alpha dot, airplane	1.090	.878

*includes interference effects

SHORT PERIOD

	RIGID	FLEXIBLE
Frequency, ω, rad/sec	1.672	1.568
Damping ratio, ζ	.145	.154
Period, sec	3.799	4.055
Time to 1/2 amplitude, sec	2.870	2.869
Cycles to 1/2 amplitude	.756	.707

TABLE 26

CANARD NORMAL FORCE COEFFICIENT AT 1G TRIM

These data based on wing area, 6297.8 ft^2

Case I.D.	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10
$C_{N(\alpha_c)}$ Rigid	.01600	.02610	.01220	.00920	.00940	.00580	.00840	.00770	.00750	.01400
$C_{N(\delta_c)}$ Rigid	.00683	.00712	.00305	.00244	.00300	.00410	.00521	.00429	.00411	.00475
$C_{N(\alpha_c)} + C_{N(\delta_c)}$ Rigid	.02283	.03322	.01525	.01164	.01240	.00990	.01361	.01199	.01161	.01875
$C_{N(\alpha_c)} + C_{N(\delta_c)}$ Flex.	.02320	.03395	.01565	.01180	.01250	.00990	.01356	.01190	.01151	.01962

Note: C_N values read at α_c and δ_c for flexible airplane 1g trim, where $\alpha_c = \alpha_A + \Sigma \phi_{ic} \; \eta_i$. Flexibility indication in table refers to canard panel only.

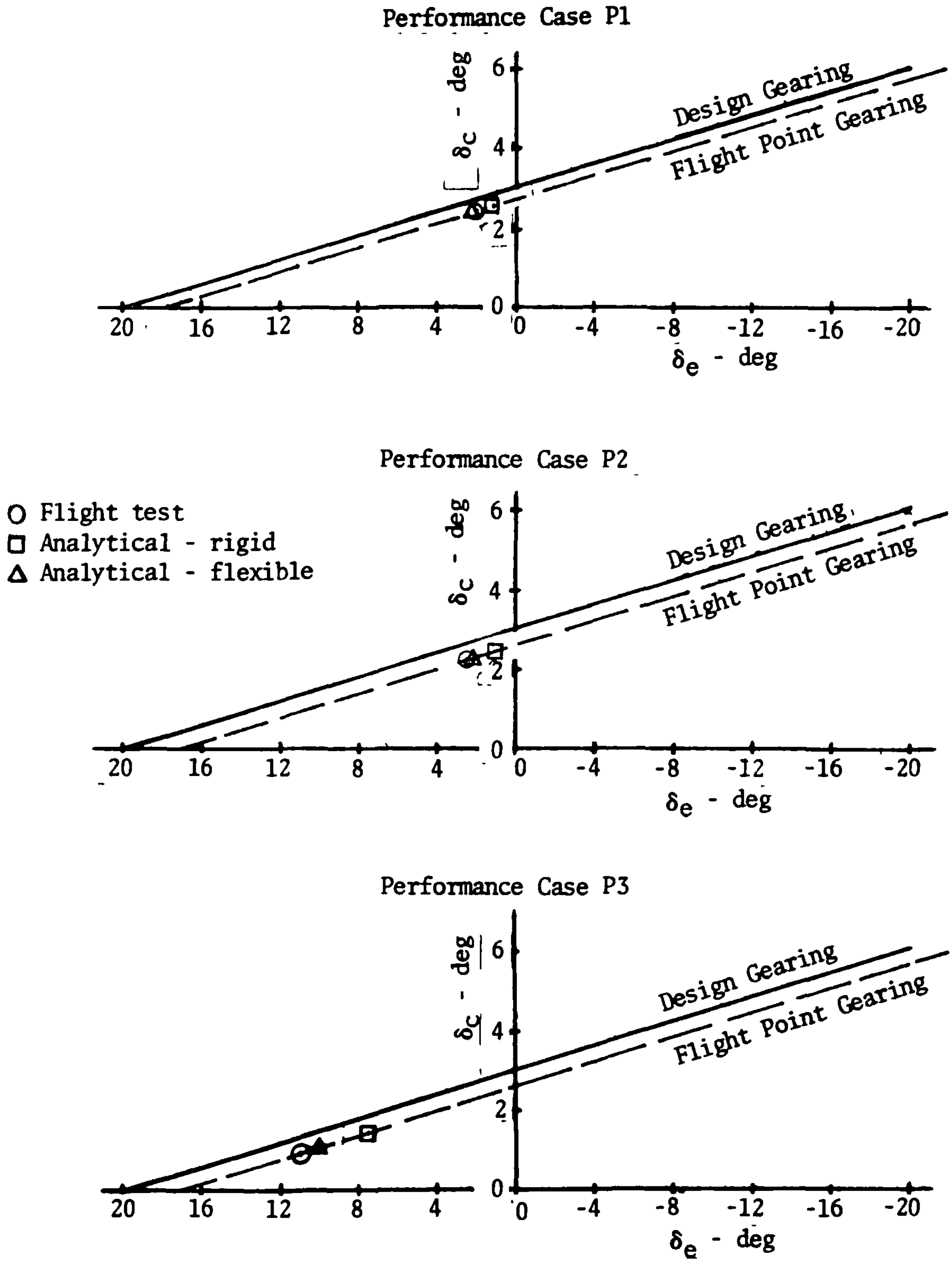
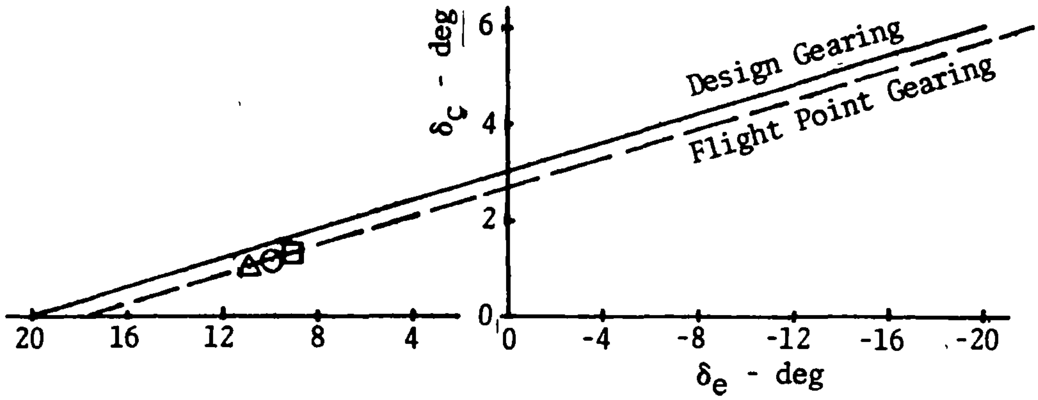
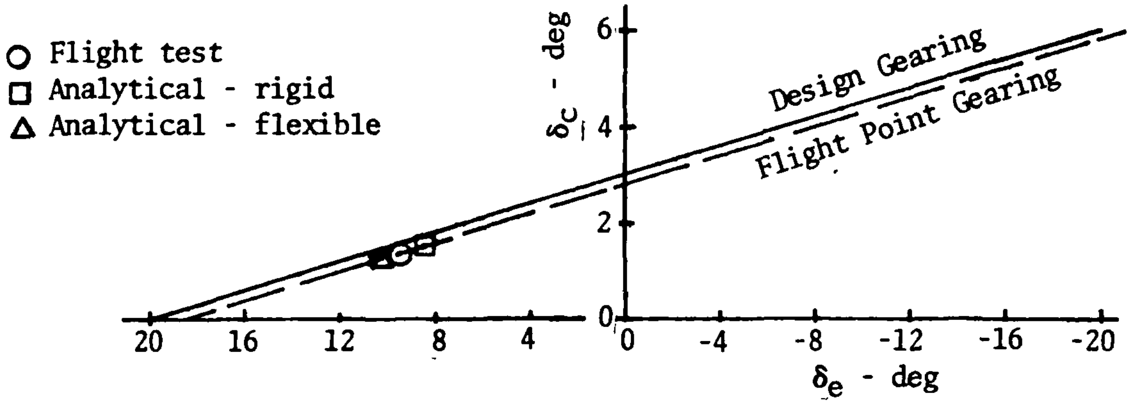


Figure 31.- Comparison of flight test control deflections with analytical predictions, performance cases

Performance Case P4



Performance Case P5



Performance Case P6

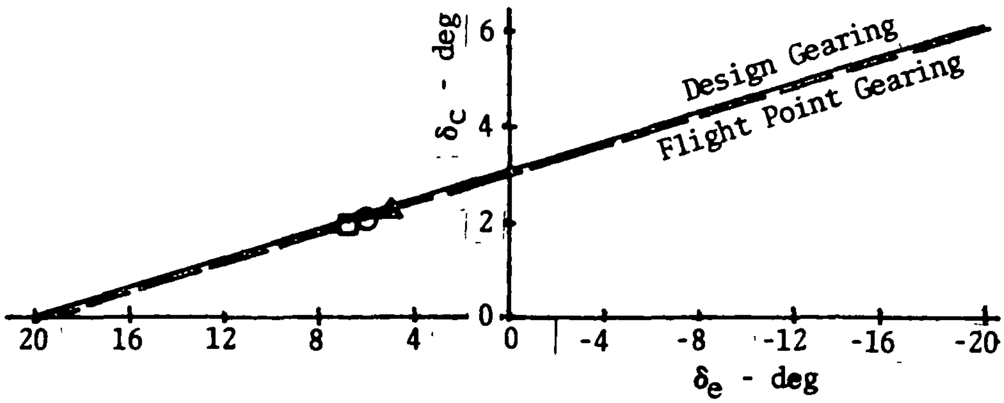


Figure 31.- Continued

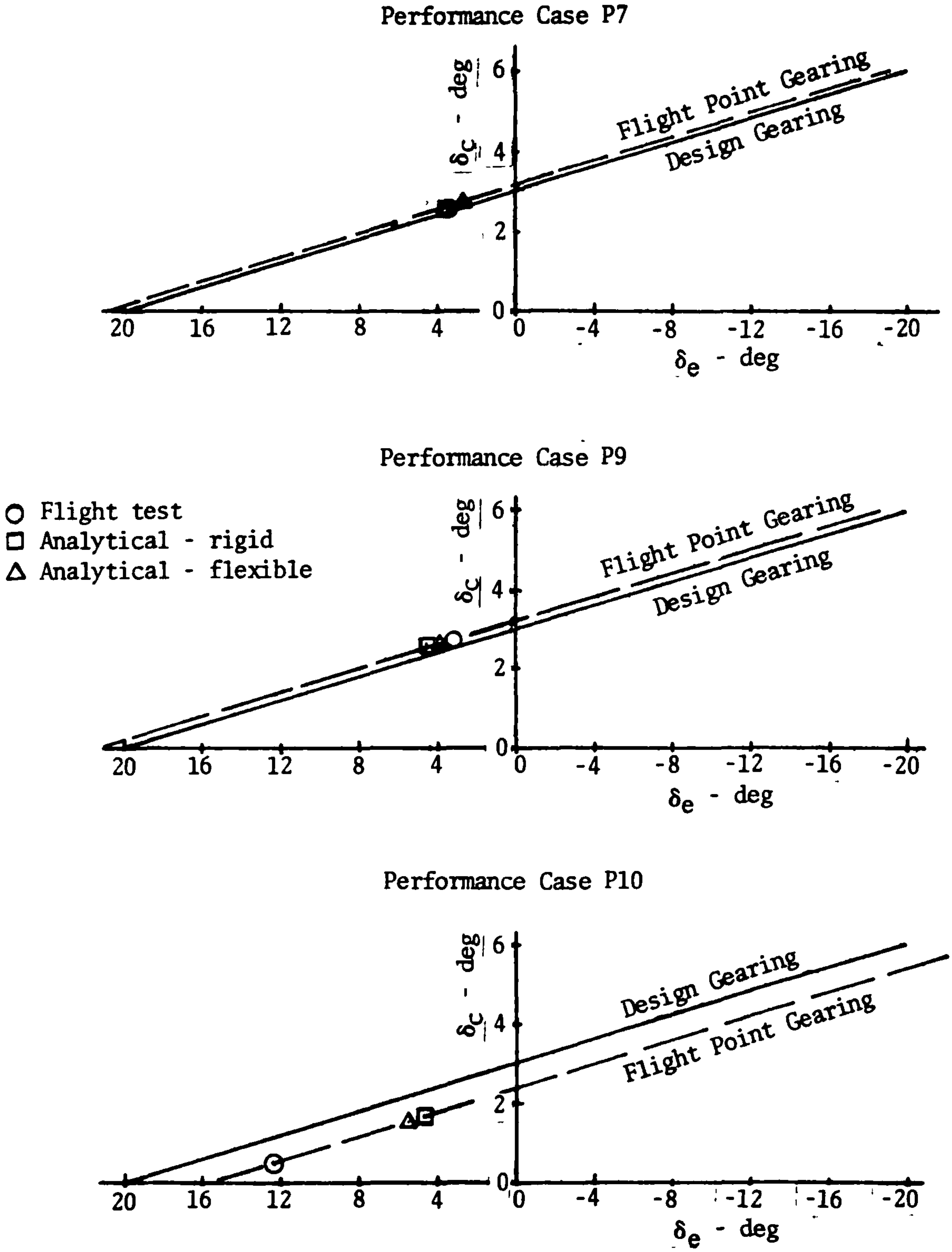


Figure 31.- Continued

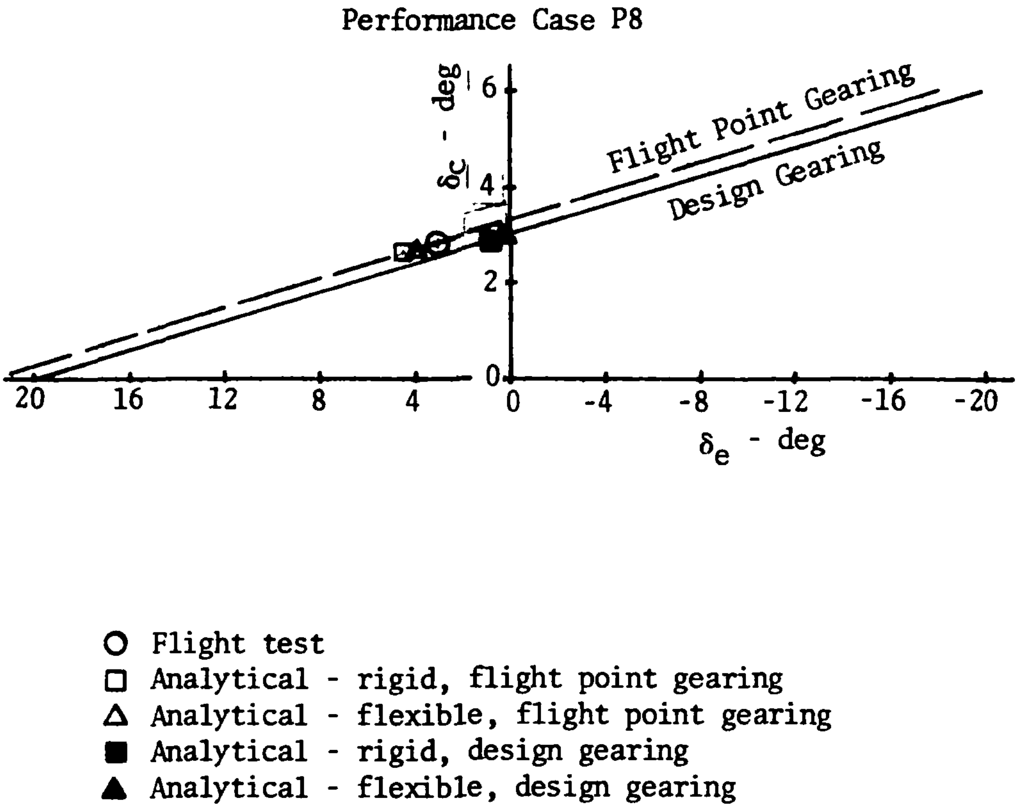


Figure 31.- Concluded

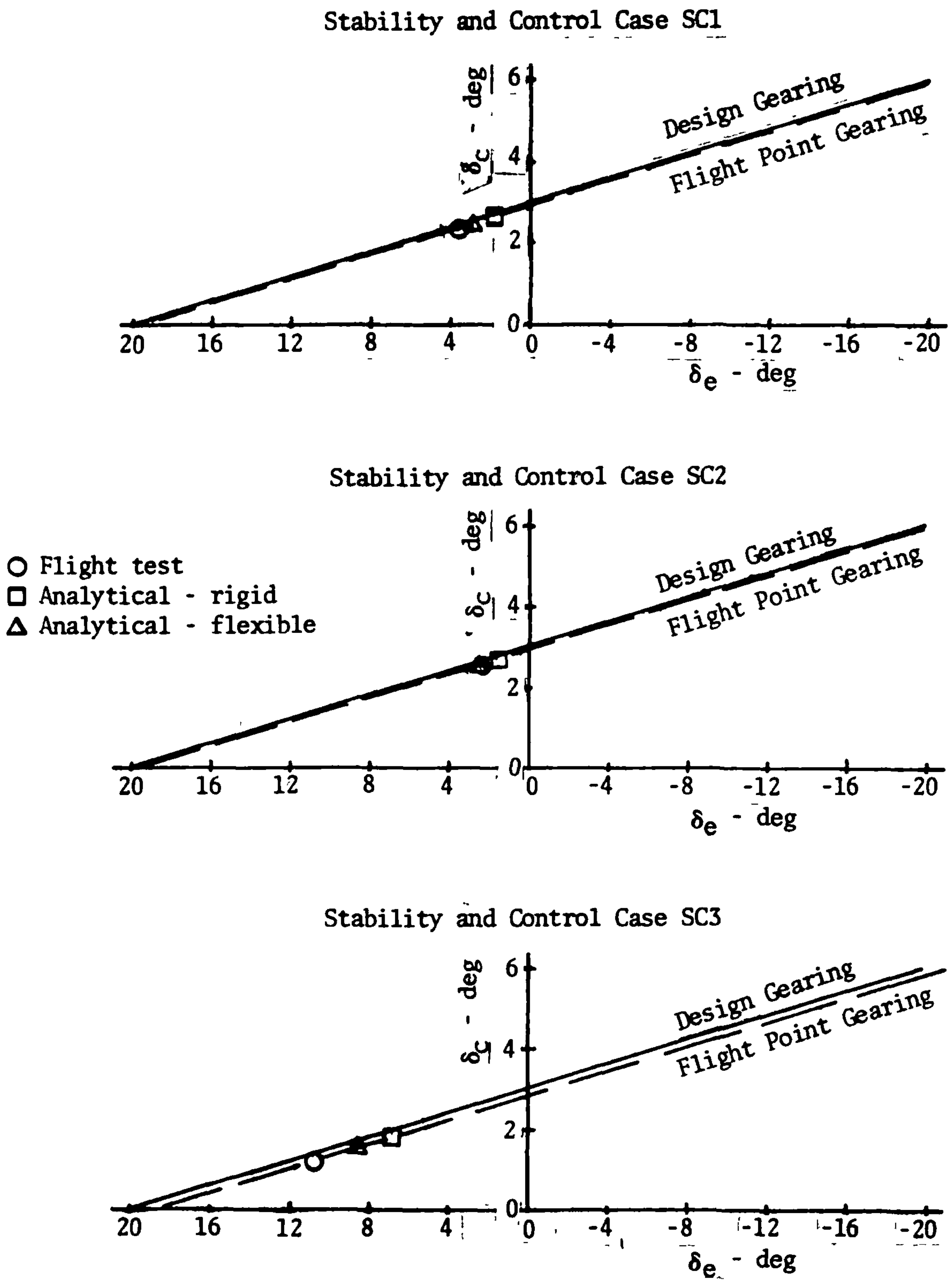


Figure 32.- Comparison of flight test control deflections with analytical predictions, stability and control cases

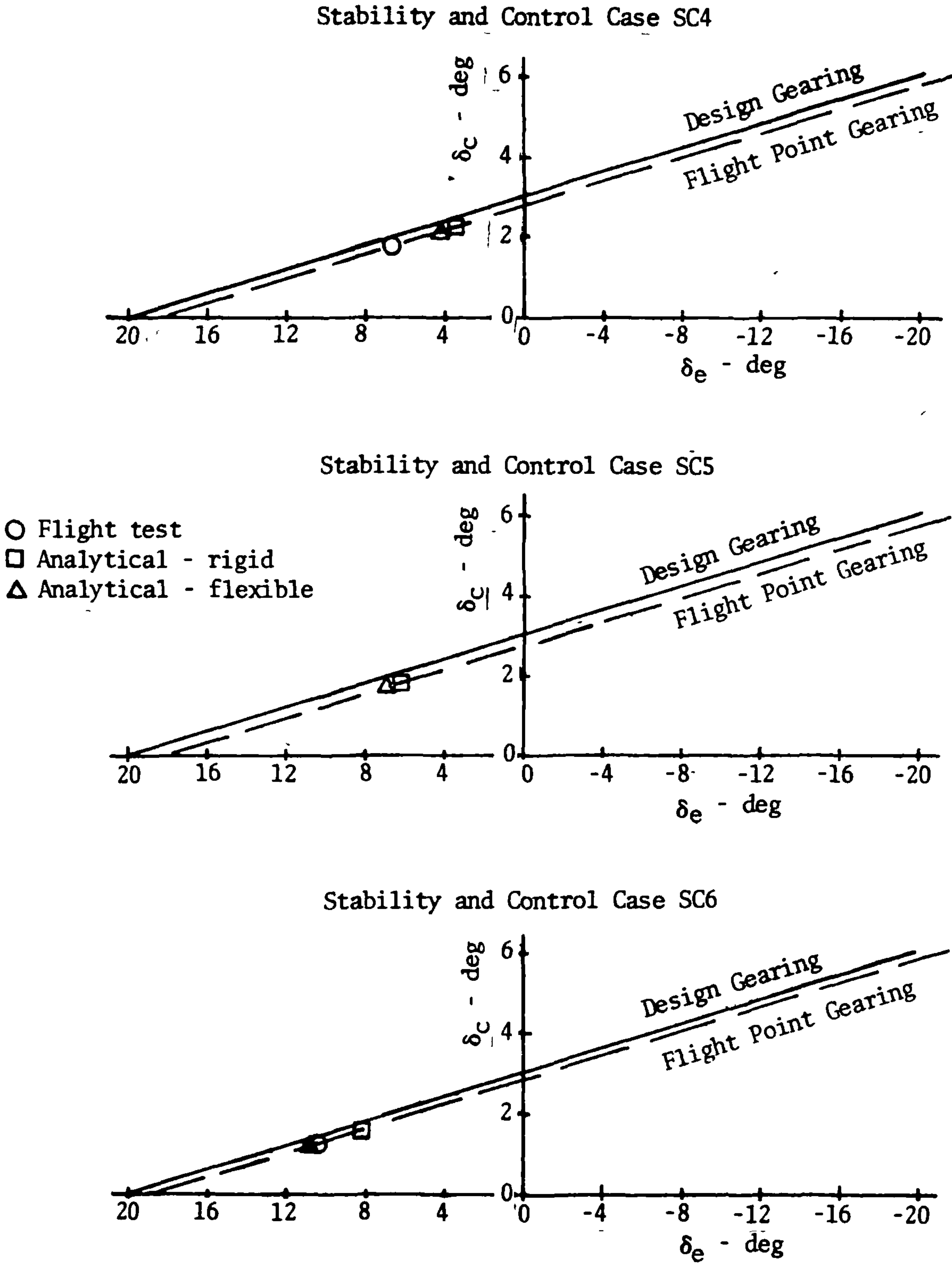
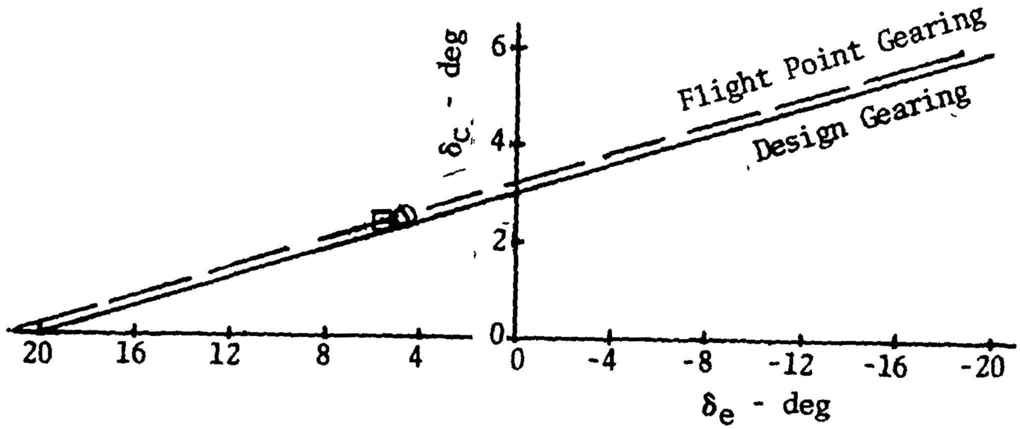


Figure 32.- Continued

Stability and Control Case SC7



○ Flight test
□ Analytical - rigid
△ Analytical - flexible

Figure 32.- Concluded

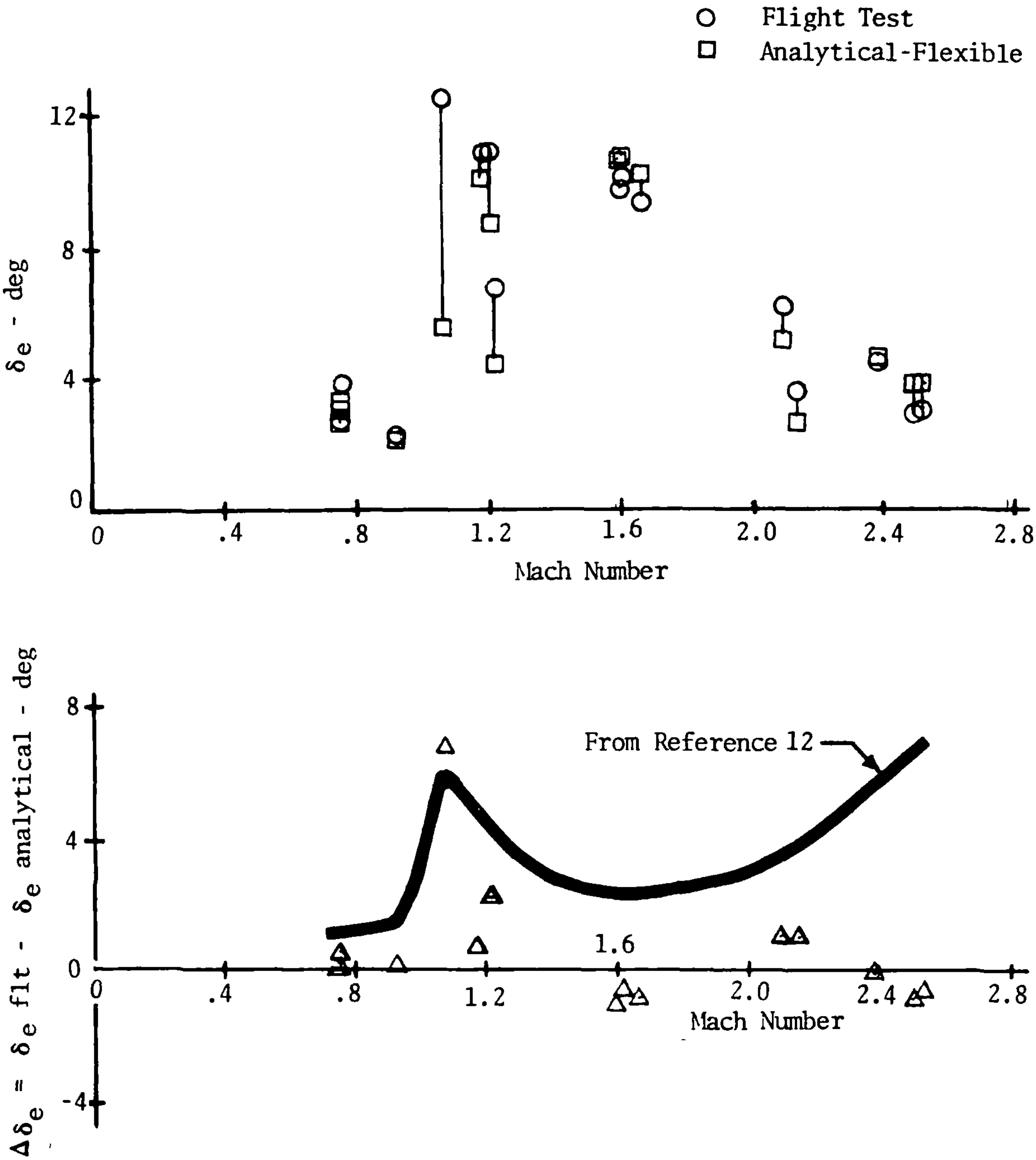
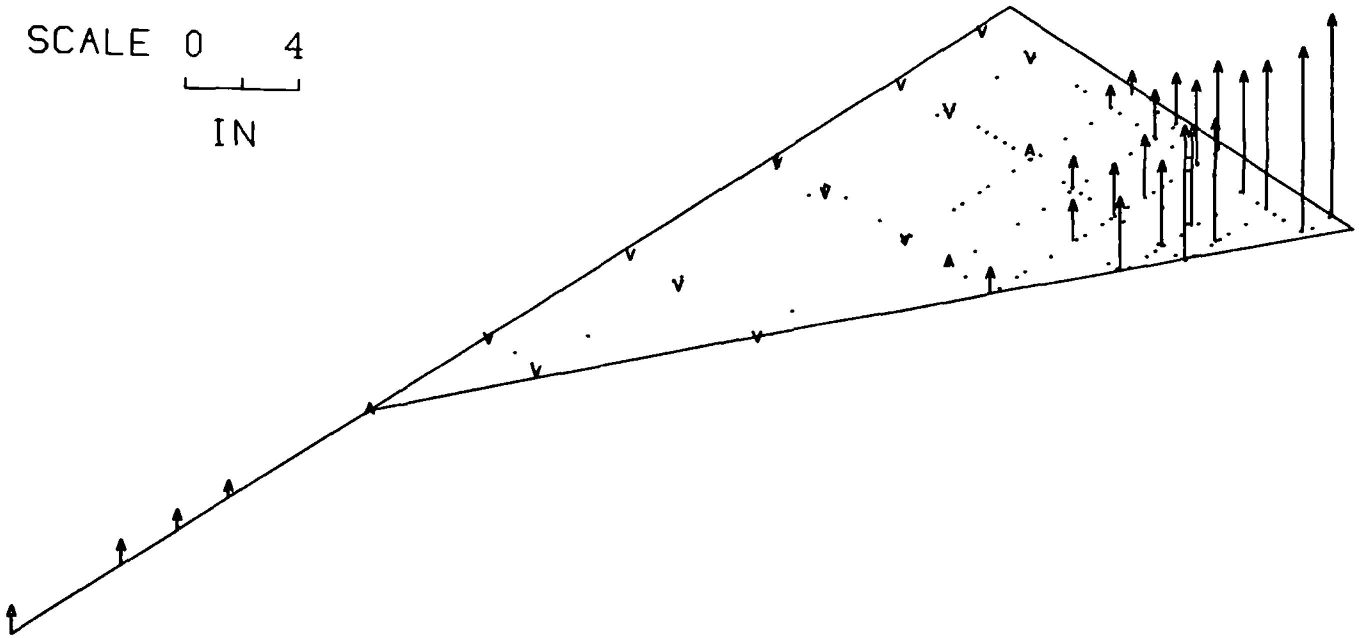


Figure 33. - Summary of analytical vs flight test elevon deflection comparisons



WT.	=318394	TIP DEF =	0.00
MN. =	0.76	ALT. =	25750
DE. =	2.79	DC . =	2.24
ALPHA=	4.18	ALPHA C =	4.25
C.G. =	24.10	D.PRESS.=	307.6

Figure 34.- Wing-body deformation pattern at 1G trim, performance case P1

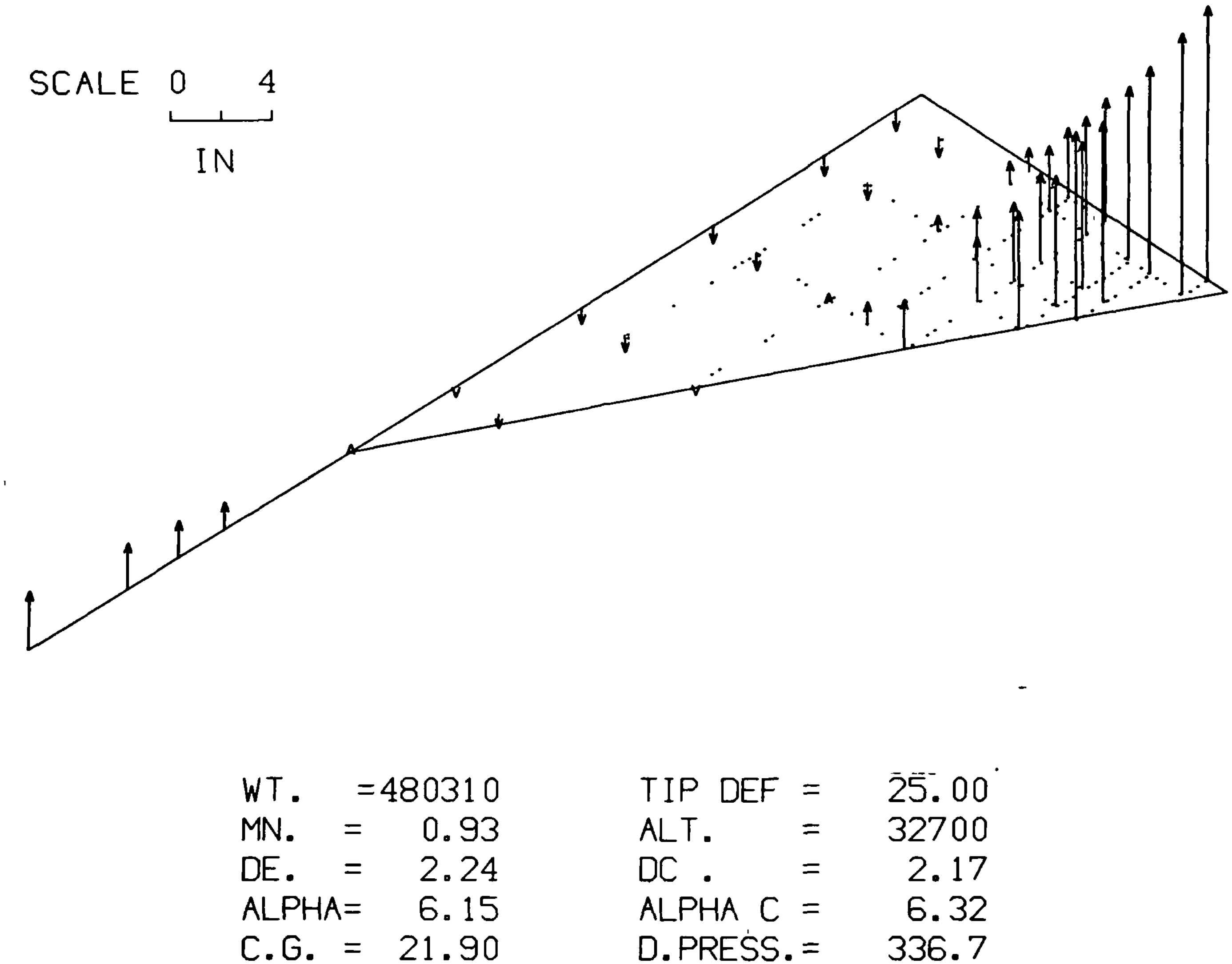
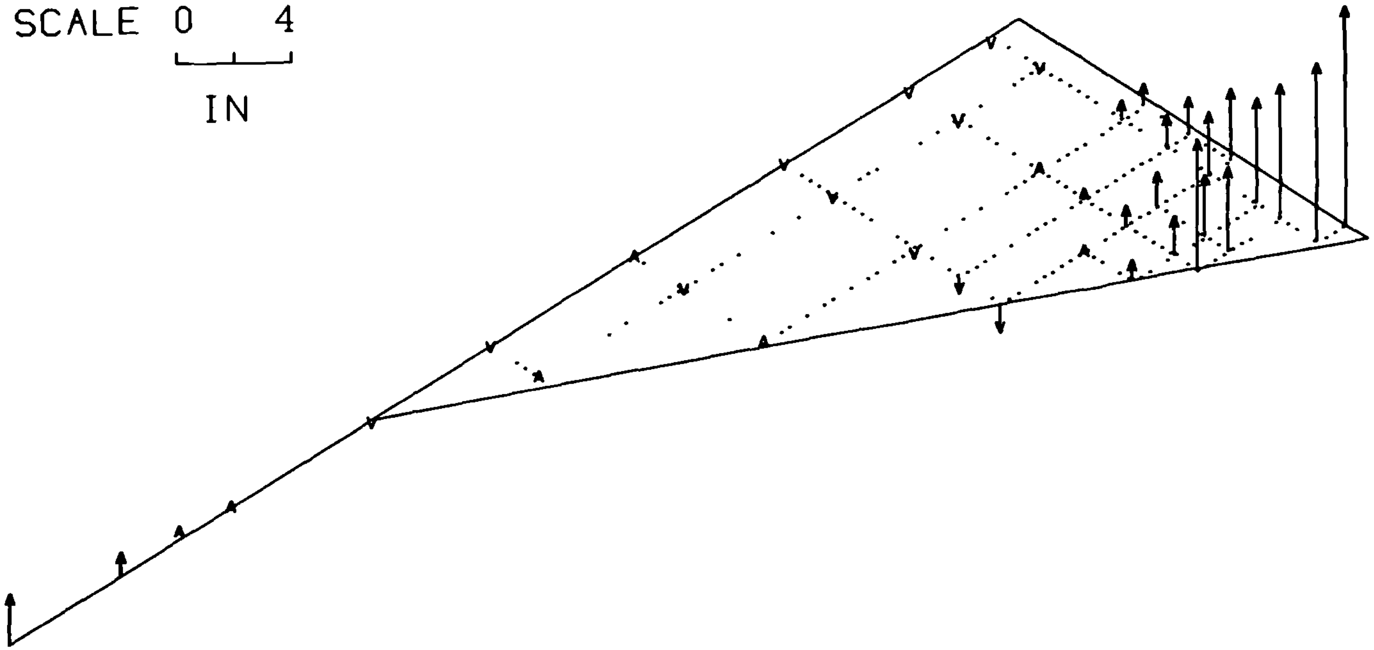
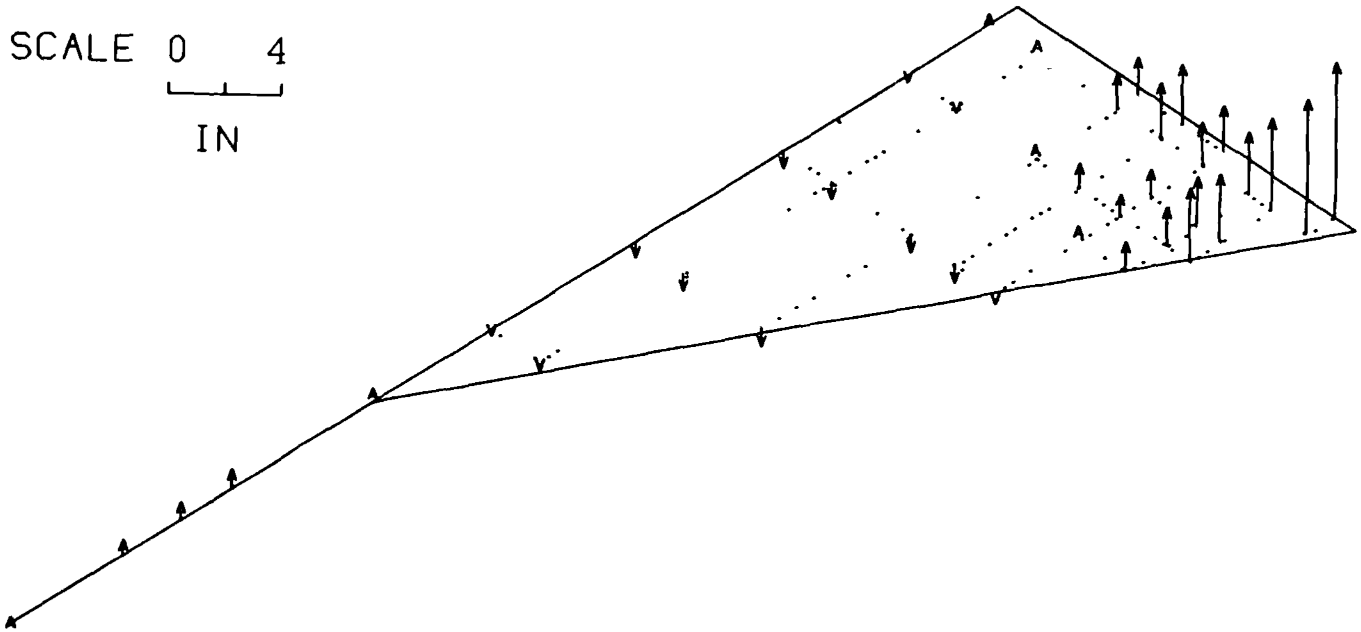


Figure 35.- Wing-body deformation pattern at 1G trim, performance case P2



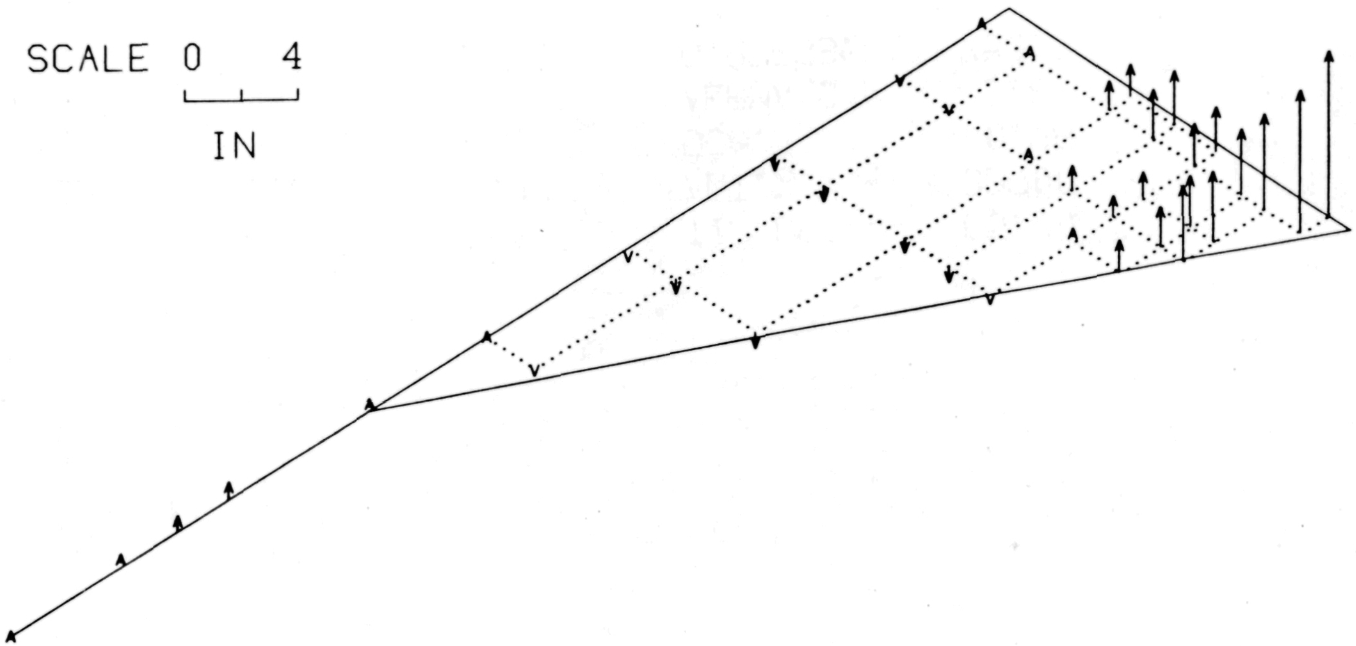
WT.	=344450	TIP DEF =	25.00
MN. =	1.18	ALT. =	33750
DE. =	10.13	DC . =	1.01
ALPHA=	3.16	ALPHA C =	3.24
C.G. =	22.30	D.PRESS.=	516.2

Figure 36.- Wing-body deformation pattern at 1G trim, performance case P3



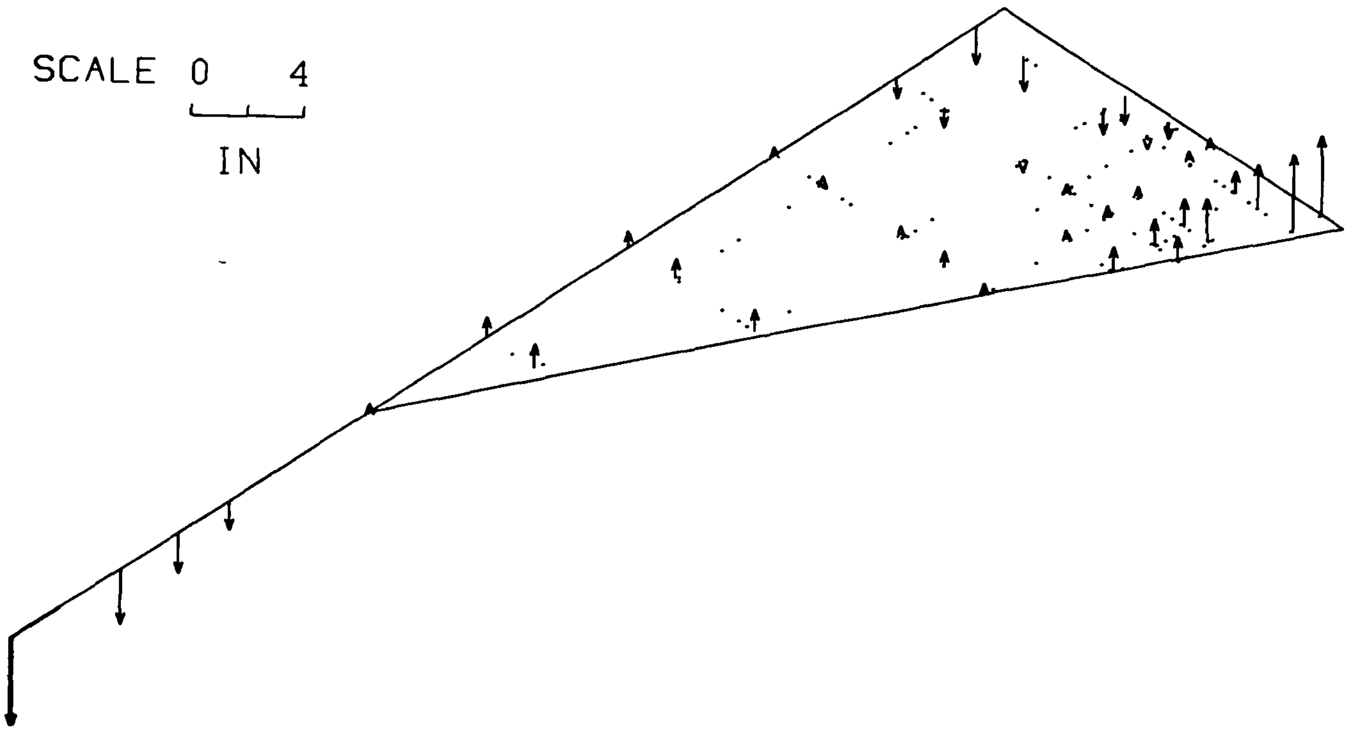
WT.	=400104	TIP DEF =	65.00
MN. =	1.60	ALT. =	38600
DE. =	10.72	DC . =	0.98
ALPHA=	2.81	ALPHA C =	2.81
C.G. =	21.70	D.PRESS.=	753.2

Figure 37.- Wing-body deformation pattern at 1G trim, performance case P4



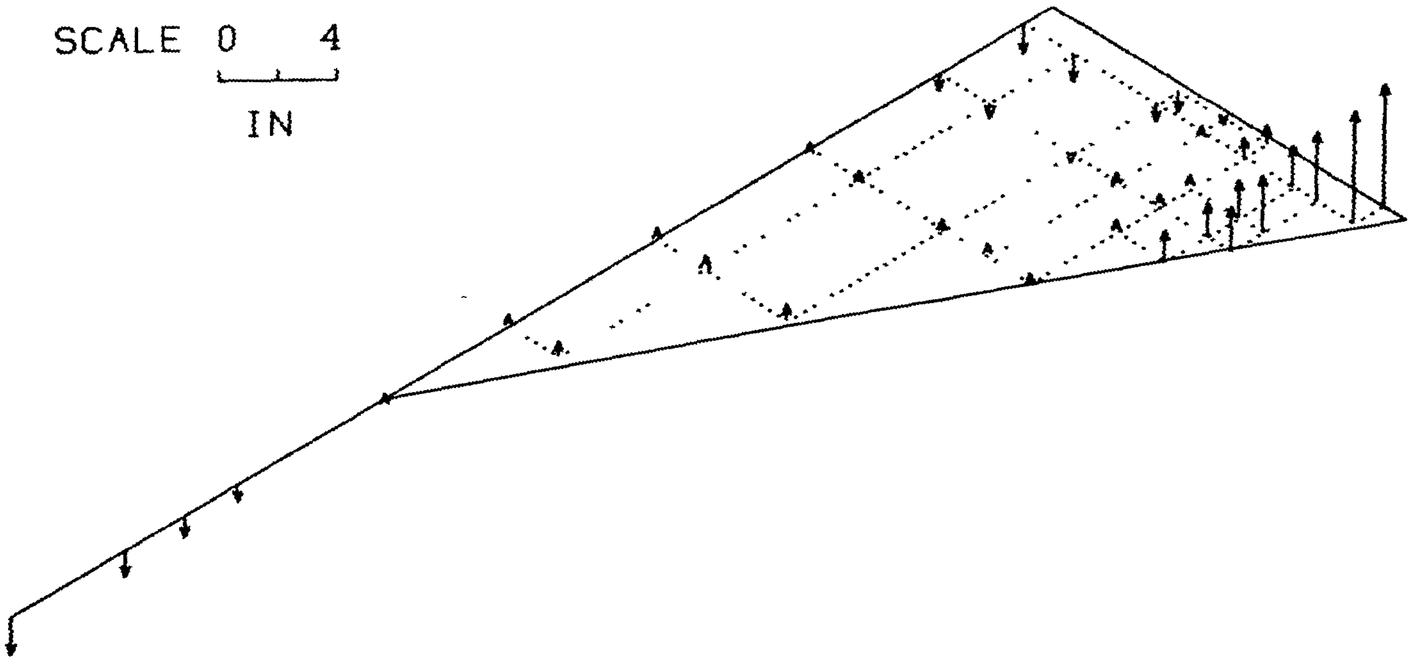
WT.	=387309	TIP DEF =	65.00
MN.	= 1.67	ALT. =	42000
DE.	= 10.20	DC . =	1.24
ALPHA=	3.01	ALPHA C =	3.02
C.G.	= 22.00	D.PRESS.=	697.3

Figure 38.- Wing-body deformation pattern at 1G trim, performance case P5



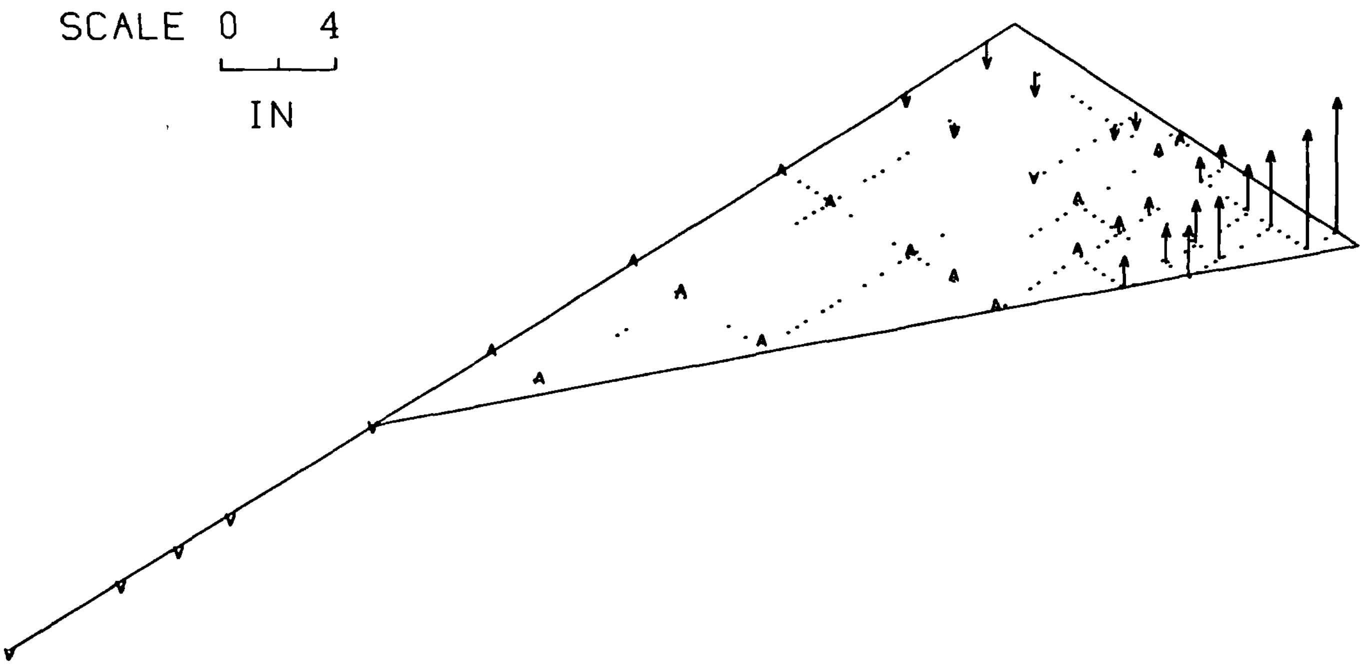
WT.	=392409	TIP DEF =	65.00
MN. =	2.10	ALT. =	48600
DE. =	5.14	DC . =	2.13
ALPHA=	2.96	ALPHA C =	2.75
C.G. =	21.10	D.PRESS.=	804.0

Figure 39.- Wing-body deformation pattern at 1G trim, performance case P6



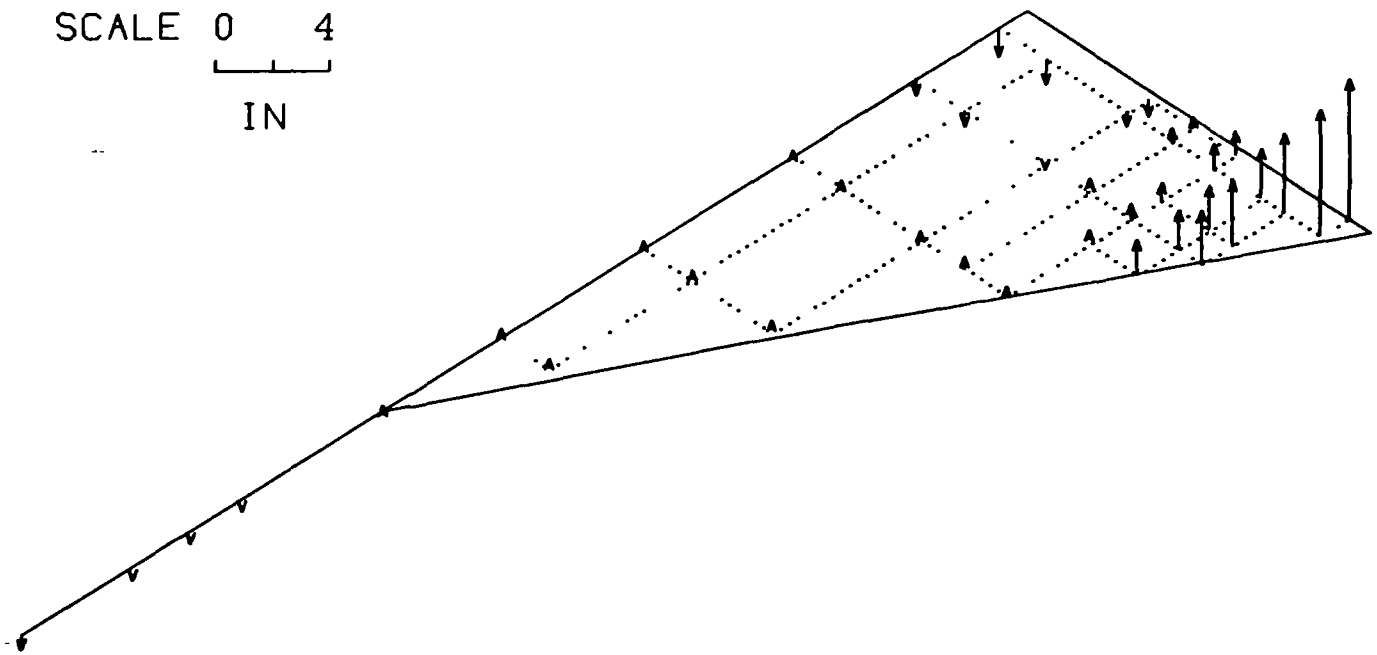
WT.	=353535	TIP DEF =	65.00
MN. =	2.15	ALT. =	57600
DE. =	2.68	DC . =	2.74
ALPHA=	3.97	ALPHA C =	3.87
C.G. =	21.10	D.PRESS.=	548.0

Figure 40.- Wing-body deformation pattern at 1G trim, performance case P7



WT.	=376516	TIP DEF =	65.00
MN. =	2.53	ALT. =	62980
DE. =	3.88	DC . =	2.71
ALPHA=	4.15	ALPHA C =	4.15
C.G. =	21.70	D.PRESS.=	586.8

Figure 41.- Wing-body deformation pattern at 1G trim, performance case P8



WT.	=381591	TIP DEF =	65.00
MN. =	2.50	ALT. =	61625
DE. =	3.94	DC . =	2.61
ALPHA=	4.03	ALPHA C =	3.99
C.G. =	21.60	D.PRESS.=	611.3

Figure 42.- Wing-body deformation pattern at 1G trim, performance case P9

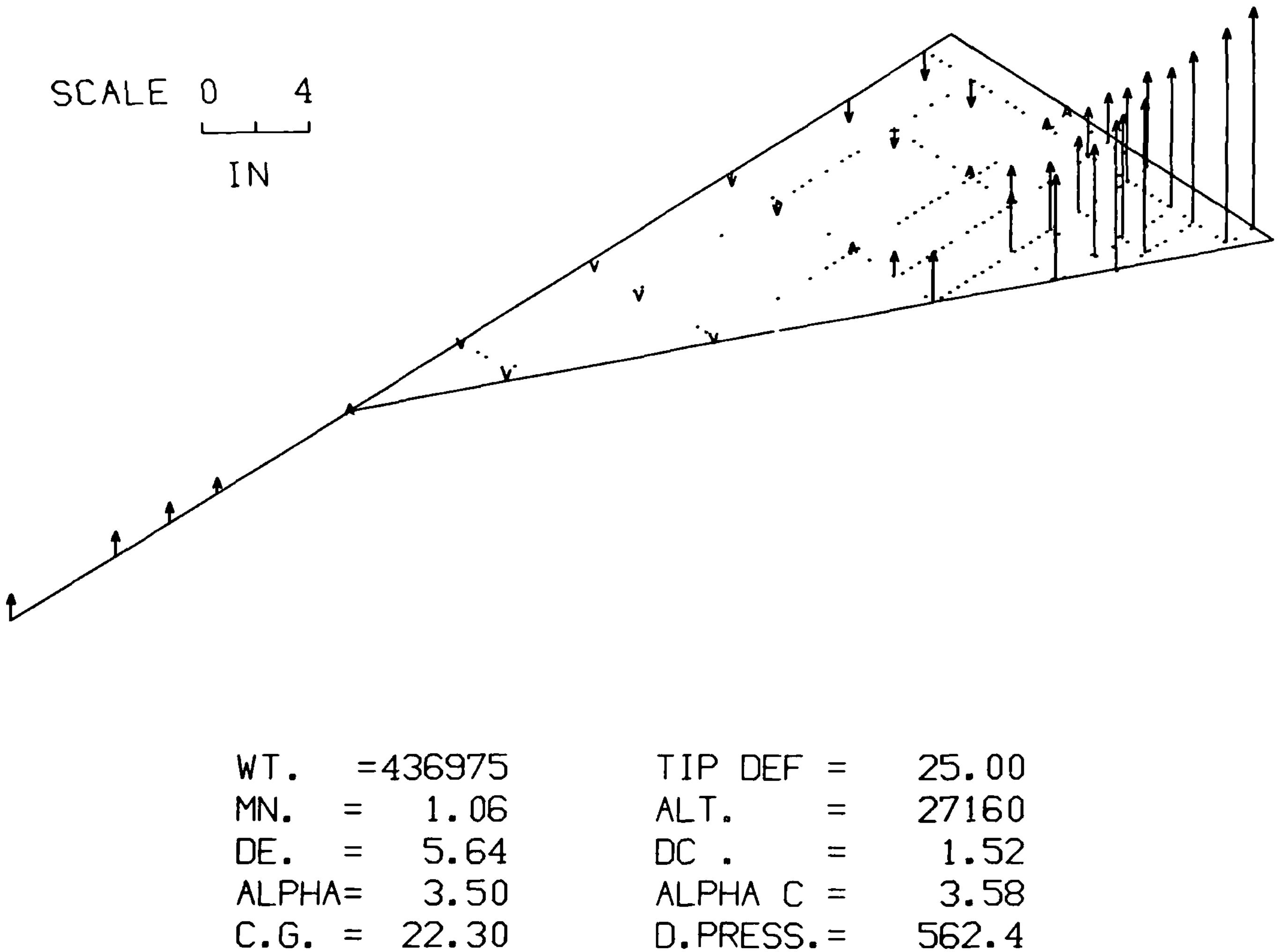


Figure 43.- Wing-body deformation pattern at 1G trim, performance case P10

TABLE 27.- ANGLE OF ATTACK AND CONTROL DEFLECTION CHARACTERISTICS DURING ROLLER COASTER MANEUVER FOR CASE P3

Flight No. 76 Data time 2:15:49 N_Z = 0.63G

COMPUTED-RIGID	COMPUTED-FLEXIBLE		FLIGHT TEST
α = 2.03 deg	α = 2.07 deg	η_1 = -.0076 ft	
α_c = 2.08 deg	α_c = 2.15 deg	η_2 = .0001 ft	
δ_c = 0.81 deg	δ_c = 0.40 deg	η_3 = -.0058 ft	δ_c = 0.41 deg
δ_e = 11.50 deg	δ_e = 14.26 deg	η_4 = -.4511 ft	δ_e = 12.80 deg

Gearing: δ_e = 16.90-6.67 δ_c

Flight No. 76 Data time 2:16:8 N_Z = 1.48G

COMPUTED-RIGID	COMPUTED-FLEXIBLE		FLIGHT TEST
α = 4.56 deg	α = 4.56 deg	η_1 = -.1435 ft	
α_c = 4.50 deg	α_c = 4.65 deg	η_2 = -.7346 ft	
δ_c = 2.12 deg	δ_c = 1.77 deg	η_3 = .0180 ft	δ_c = 1.61 deg
δ_e = 2.79 deg	δ_e = 5.07 deg	η_4 = -.0109 ft	δ_e = 6.8 deg

Gearing: δ_e = 16.90 -6.67 δ_c

TABLE 28.- ANGLE OF ATTACK AND CONTROL DEFLECTION CHARACTERISTICS DURING ROLLER COASTER MANEUVER FOR CASE P8

Flight No. 70 Data time 2:05:24.5 N_Z = 0.81G

COMPUTED-RIGID	COMPUTED-FLEXIBLE		FLIGHT TEST
α = 3.33 deg	α = 3.32 deg	η_1 = .0192 ft	
α_C = 3.33 deg	α_C = 3.29 deg	η_2 = -.2546 ft	
δ_C = 2.26 deg	δ_C = 2.33 deg	η_3 = -.0105 ft	δ_C = 2.70 deg
δ_e = 6.92 deg	δ_e = 6.44 deg	η_4 = .0044 ft	δ_e = 4.60 deg

Gearing: $\delta_e = 22.00 - 6.67\ \delta_C$

Flight No. 70 Data time 2:05:44.5 N_Z = 1.52G

COMPUTED-RIGID	COMPUTED-FLEXIBLE		FLIGHT TEST
α = 6.53 deg	α = 6.50 deg	η_1 = -.0053 ft	
α_C = 6.51 deg	α_C = 6.60 deg	η_2 = -.5610 ft	
δ_C = 3.81 deg	δ_C = 3.83 deg	η_3 = -.0431 ft	δ_C = 4.07 deg
δ_e = -3.39 deg	δ_e = -3.52 deg	η_4 = -.1507 ft	δ_e = -5.20 deg

Gearing: $\delta_e = 22.00 - 6.67\ \delta_C$

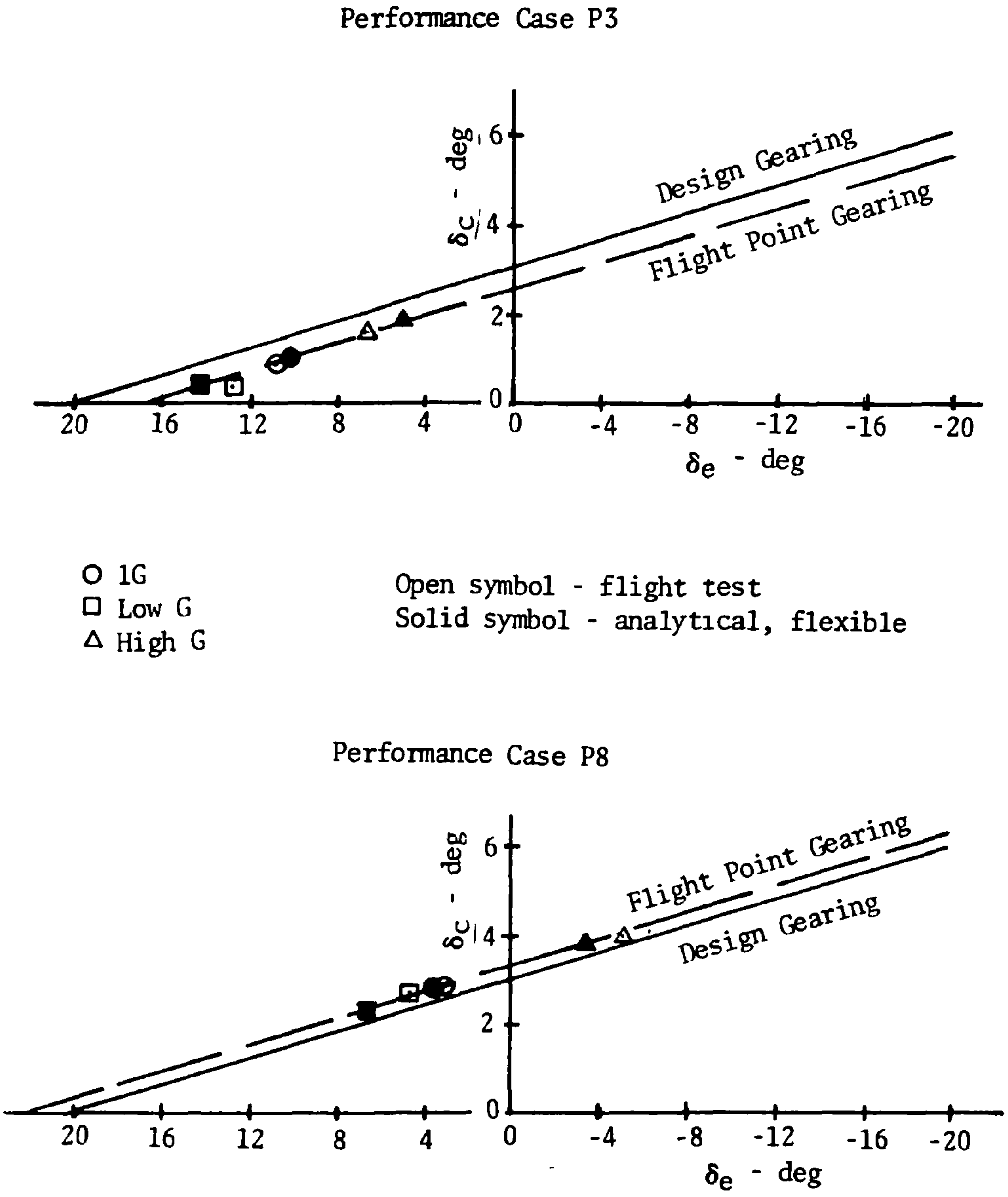
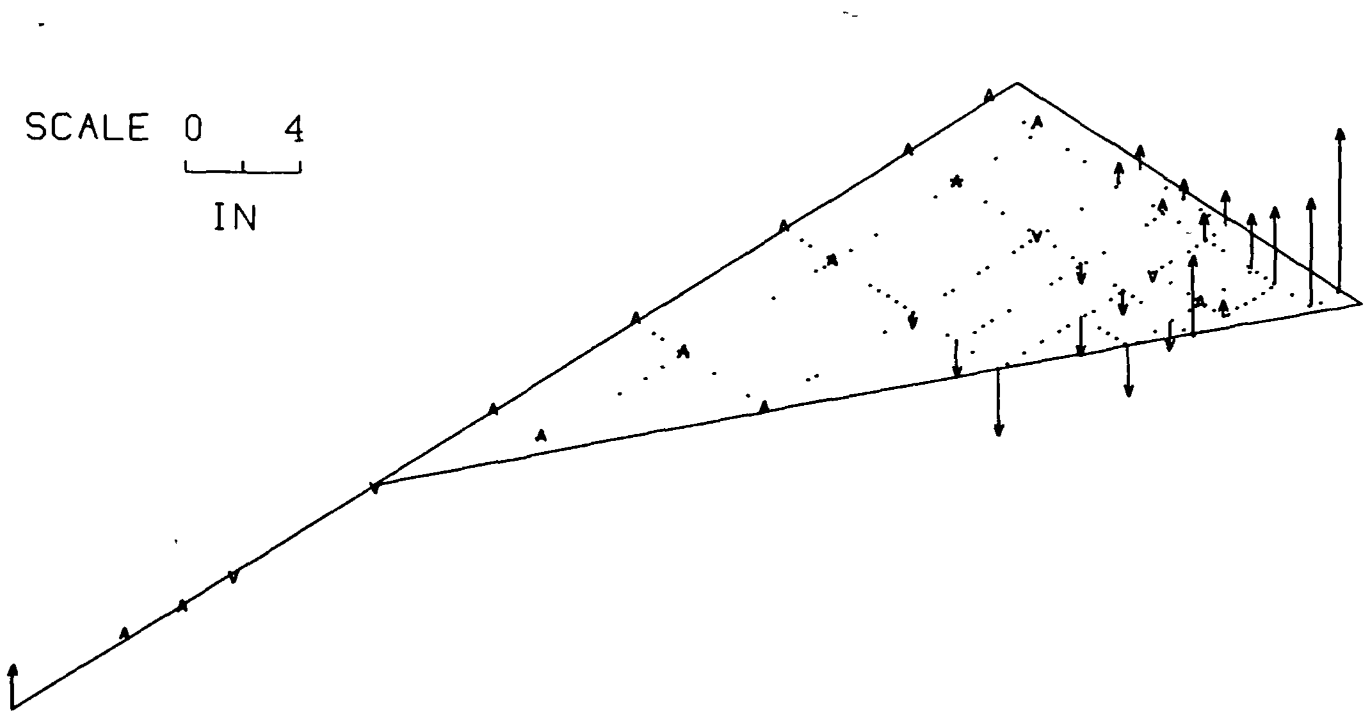
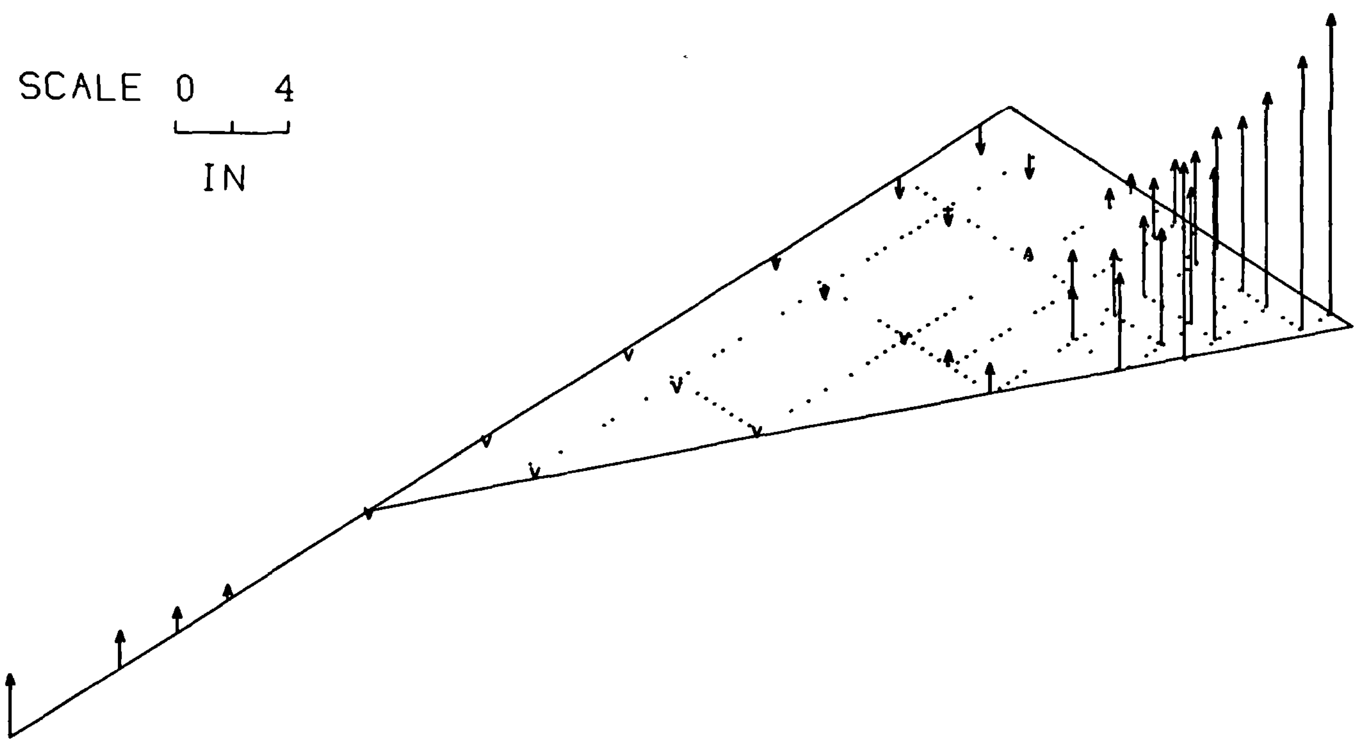


Figure 44.- Comparison of flight test control deflections with analytical predictions during roller coaster maneuvers



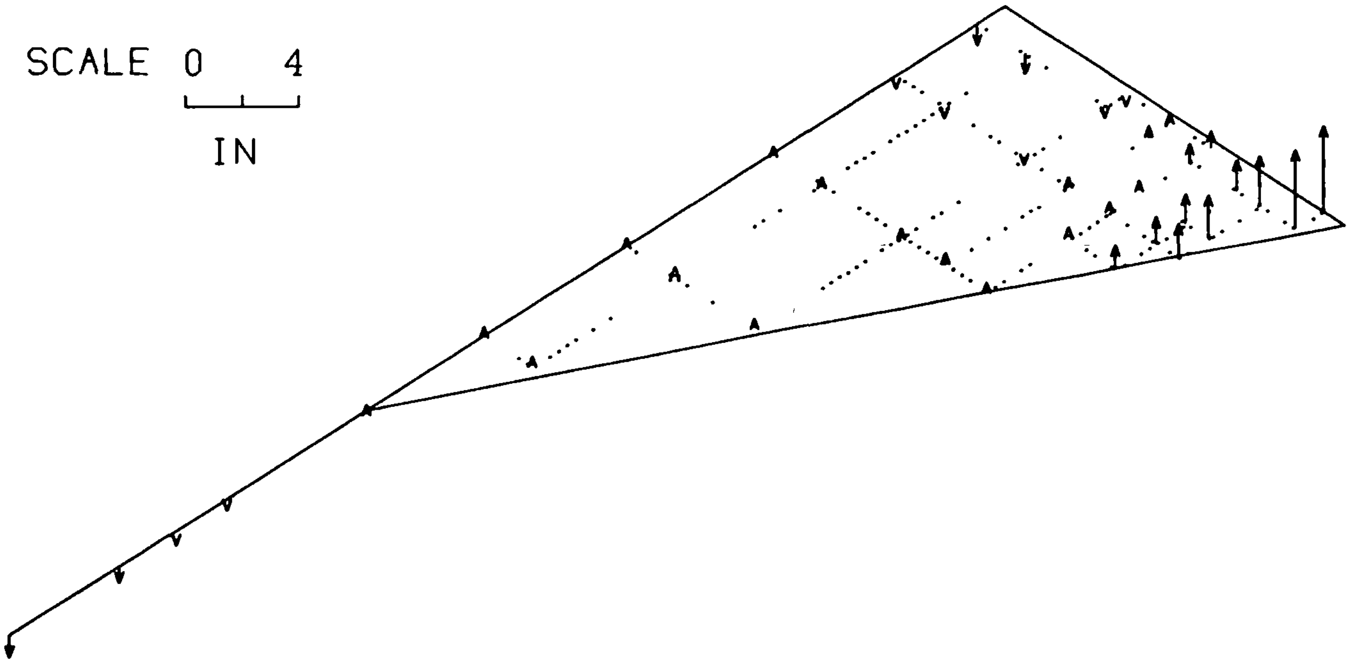
WT.	=344450	TIP DEF =	25.00
MN. =	1.18	ALT. =	33750
DE. =	14.25	DC . =	0.39
ALPHA=	2.07	ALPHA C =	2.14
C.G. =	22.30	D.PRESS.=	516.2

Figure 45.- Wing-body deformation pattern at n_z = 0.63g, roller coaster maneuver following performance case P3



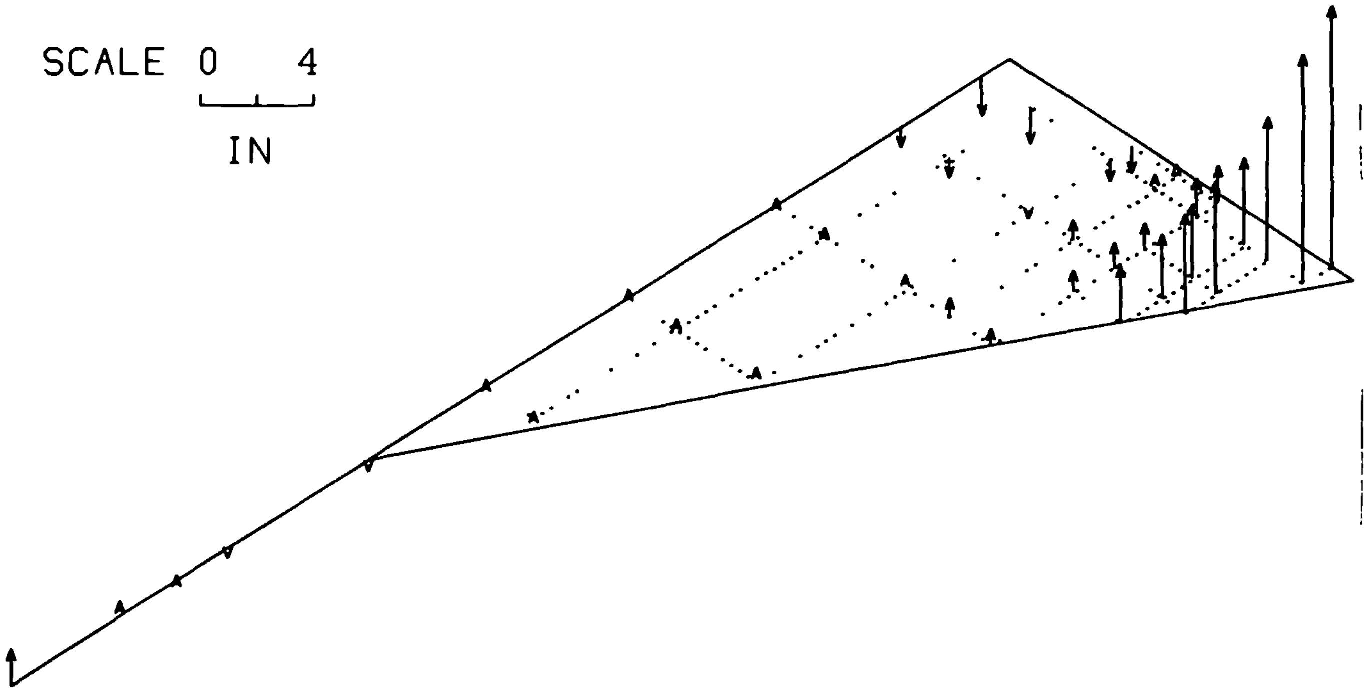
WT.	=344450	TIP DEF =	25.00
MN. =	1.18	ALT. =	33750
DE. =	5.07	DC . =	1.77
ALPHA=	4.55	ALPHA C =	4.64
C.G. =	22.30	D.PRESS.=	516.2

Figure 46.- Wing-body deformation pattern at n_z = 1.48g, roller coaster maneuver following performance case P3



WT.	=376516	TIP DEF =	65.00
MN. =	2.53	ALT. =	62980
DE. =	6.43	DC . =	2.33
ALPHA=	3.32	ALPHA C =	3.28
C.G. =	21.70	D.PRESS.=	586.8

Figure 47.- Wing-body deformation pattern at n_z = 0.81g, roller coaster maneuver following performance case P8



WT.	=376516	TIP DEF =	65.00
MN.	= 2.53	ALT. =	62980
DE.	=- 3.52	DC . =	3.82
ALPHA=	6.49	ALPHA C =	6.59
C.G.	= 21.70	D.PRESS.=	586.8

Figure 48.- Wing-body deformation pattern at n_z = 1.52g, roller coaster maneuver following performance case P8

SENSITIVITY STUDIES

This section presents the results of an investigation of the effect of variation of various parameters on the trim and deformation characteristics of the XB-70-1. One subsonic and one supersonic case, P1 and P9, respectively, were selected for these analyses. The investigation was conducted during Phase 1 of the program and was not revised for changes in the aerodynamic representation made during Phase 2.

Effect of Number of Modes

The computer programs used for analysis of the XB-70 contained provisions for four symmetric structural modes. It was concluded from studies made during the early development stage that four modes represented a reasonable balance between accuracy of structural representation and analysis time and cost. Modification of that system of programs under the present contract to accept more than four modes was considered impractical. The influence of number of modes was therefore investigated using an alternate program which can accept large numbers of modes but which is limited to linear aerodynamic data.

Linearized data for nine wing-body symmetric structural modes were developed for use in this program for performance cases P1 and P9. The linearization philosophy is discussed in an earlier section entitled Digital Program Analysis Techniques. Variations of flexible-to-rigid ratios and 1g trim characteristics as a function of number of modes are shown for P1 and P9 in figures 49 and 50. Discussion of the philosophy and procedure involved in the flexible-to-rigid ratios may be found in the section entitled Flexible Airplane Longitudinal Characteristics and in Appendix D. Figure 49a illustrates the effect of number of modes on flexible-to-rigid ratios of normal force and pitching moment coefficients due to angle of attack for the subsonic case, P1. Data are shown for individual components and for the complete airplane. The plots show only slight variation for the canard and canard interference components while rather large variations exist for the wing-body component and the complete airplane. An evaluation of the representation in the primary analysis methods may be suggested by a comparison of values at four modes with those at nine modes. While such an evaluation is undoubtedly valid for an individual parameter, it is not conclusive for airplane behavior as will be demonstrated in later paragraphs.

Flexible-to-rigid ratios of normal force and pitching moment coefficients due to control deflection are presented in figure 49b. Ratios are shown for the canard, elevon and geared controls. With the exception of the canard-plus-interference normal force ratio, only moderate variation is apparent from two to nine modes. Four modes would appear to be a fortunate choice for the canard term. However, as was described in an earlier section, the canard load and canard interference load are nearly equal and opposite. Thus, very large excursions of this ratio represent no significant change in airplane lift coefficient.

Figure 49c shows the effect of number of modes on the flexible-to-rigid ratios at zero angle of attack for P1. Four modes appears to be an inadequate representation for these terms. Again, however, their influence on complete airplane behavior should be the basis for final judgement. Figure 49d shows the effects of number of modes on pitching velocity terms for the same cases. Only moderate variation of either the wing-body component or the complete airplane is apparent from two to nine modes.

An equivalent set of data to that described above is presented in figure 50 for the supersonic case, P9. The trends of these curves are generally similar; however, less severe variations with number of modes are apparent. Four modes would appear to be a reasonable choice for most parameters.

Figure 51 illustrates the effect of number of modes on 1g trim characteristics for the subsonic case, P1. Since these trim calculations were obtained from linearized aerodynamic data, the trim values would not agree with those of the previous section which were obtained from the actual nonlinear aerodynamics. (See the discussion in Digital Program Analysis Techniques). Also, the sensitivity studies are based on Phase 1 aerodynamics while the final 1g trim data was based on aerodynamic characteristics which were revised during Phase 2. These limitations have no significant influence on the variation with number of modes and the results are plotted in incremental form to eliminate confusion. The variation of $\Delta\delta_e$ at trim is seen to be moderate. The value at four modes is only slightly different from that at nine modes, despite the rather large variations in the flexible-to-rigid ratios due to angle of attack and at zero angle of attack.

Figure 52 shows the effect of number of modes on 1g trim characteristics for the supersonic case, P9. In this instance, five or more modes represent a definite improvement over the four mode representation despite the fact that the flexible-to-rigid ratios showed less influence of number of modes than appeared for the subsonic case.

The variation of angle of attack at trim with number of modes was insignificant for both the subsonic and the supersonic case.

Summary of Sensitivity Studies

A summary of the effects of parametric variations on 1g trim characteristics is given in table 29 for the subsonic case, P1, and in table 30 for the supersonic case, P9. The tables list the parameter varied and the amount and direction of the variation. The effects of the variation at 1g trim are listed as incremental changes to the trim variables from the base case, P1 or P9. Corresponding incremental changes in deformation are tabulated in Appendix I.

For the most part, the data are self-explanatory. Bypass door variation was omitted for P1 since the doors do not operate at subsonic speeds. Similarly, the effect of incremental wing tip variation about the tips up position was assessed to be insignificant. The effect of gross weight was studied for the supersonic case by imposing a uniform percentage increase to retain the same weight distribution. By holding the distribution of mass (weight) unchanged, the mode shapes which were computed for the basic P9 case were still valid. The natural frequencies and generalized masses of the modes were corrected to the new gross weight by

$$\omega_{i\,New} = \omega_{i\,Old} \sqrt{\frac{(\text{Weight})_{Old}}{(\text{Weight})_{New}}}$$

and

$$(\text{Gen. Mass})_{New} = (\text{Gen. Mass})_{Old} \frac{(\text{Weight})_{New}}{(\text{Weight})_{Old}}$$

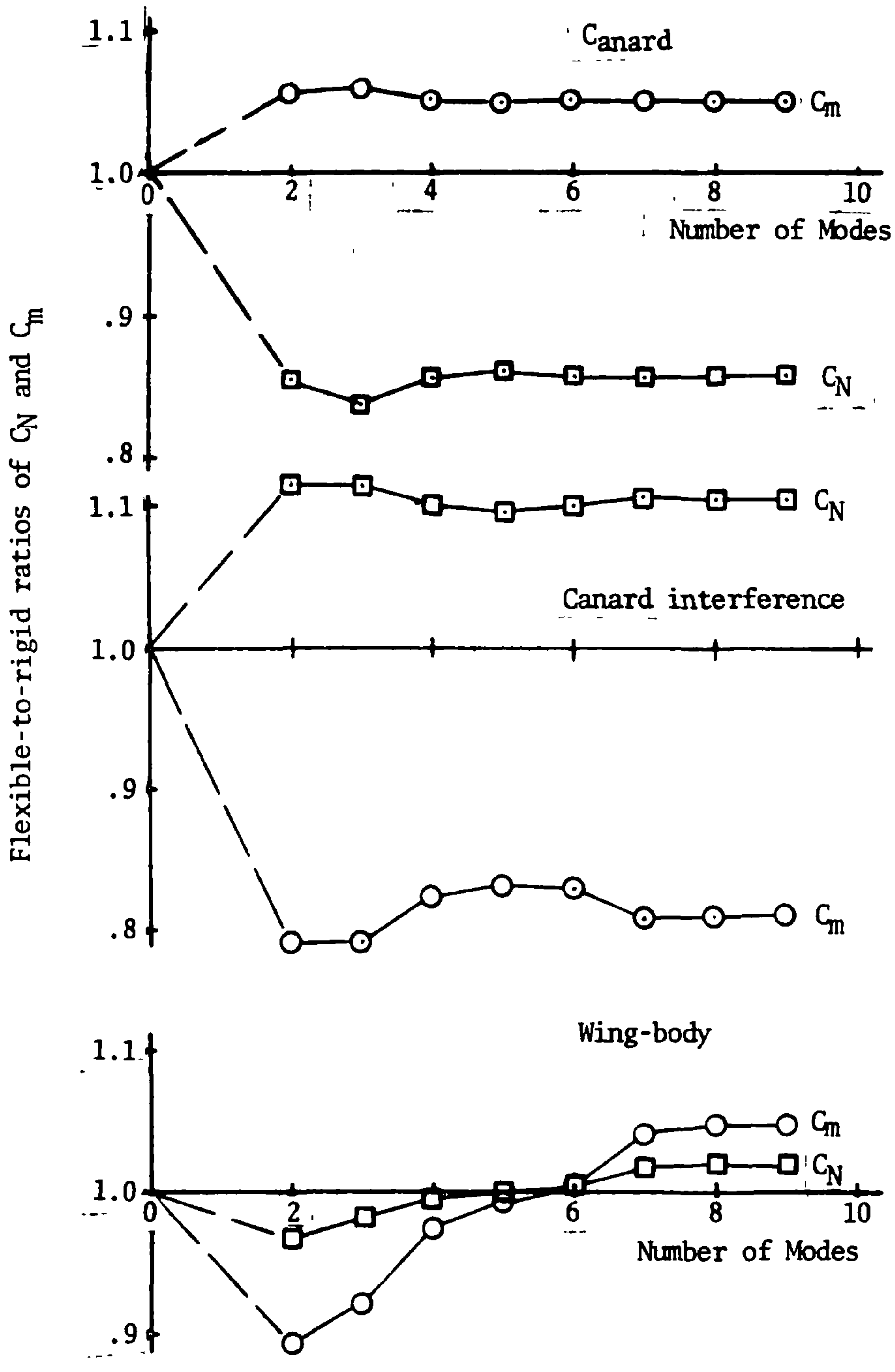
The magnitude of the change was selected to make the new weight equal to the gross weight of performance case P4 by request of NASA.

Some effort was devoted to studies aimed at extracting gross weight and center of gravity effects from pairs of cases from tables 1 and 2 at a given Mach number. Very limited success was achieved in this effort due to the confusion arising from simultaneous differences of gross weight, center of gravity, and dynamic pressure, and little hope is offered for obtaining useful results from this approach.

In addition to the Phase 1 studies, boundary layer bleed effects were investigated during Phase 2. For case P9, the presence of the bleed duct on the bottom of the fuselage was found to be equivalent to $\delta_e \approx +1°$ at 1g trim. The effect of airflow through the duct was found to be insignificant. The diverter bleed which exits on the wing upper surface was determined to cause approximately +1/4° at 1g trim. For the subsonic case, P1, the lower bleed duct was found to have no effect. There was no data available for the diverter bleed at that Mach number.

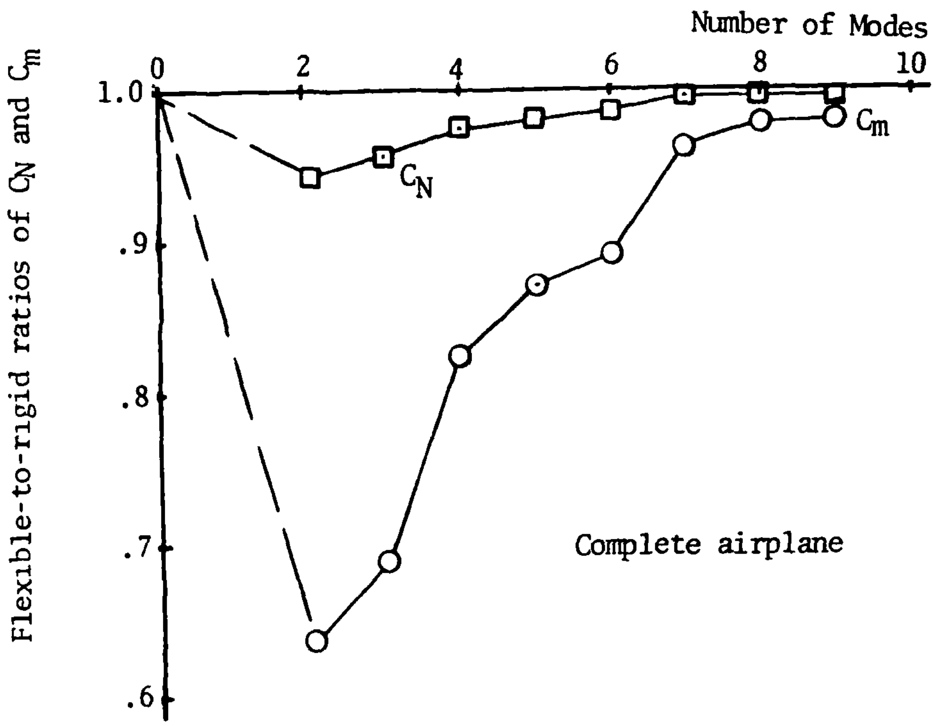
Significance of Sensitivity Studies on Analytical vs Flight Test Correlations

Comparison of tables 29 and 30 show that the control deflections at 1g trim for the supersonic case are far more sensitive to the parametric variations than those of the subsonic case, due primarily to the much lower control effectiveness at supersonic speeds. This behavior is interesting when one recalls that the original comparisons of flight test and analytical elevon deflections of figure 33 show reasonably good agreement at subsonic speeds and a mismatch at supersonic speeds which increases with increasing Mach number. Results of the present study show very good agreement between flight test and analysis with the exception of the transonic case at M = 1.06. Small variations in folding wing tip position, bypass doors, gross weight, c.g. position (C_{m_α}) and flight condition (dynamic pressure) are suggested as very possible sources of the small mismatch which remains. The sensitivity results show all of these parameters to have strong influence on the control requirements at 1g while the experimental determination of their values is subject to some accuracy limitations. In the supersonic region, elevon effectiveness has little influence due to the domination of the canard control power, although the control gearing is still significant due to the relative positioning of the canard and elevons.



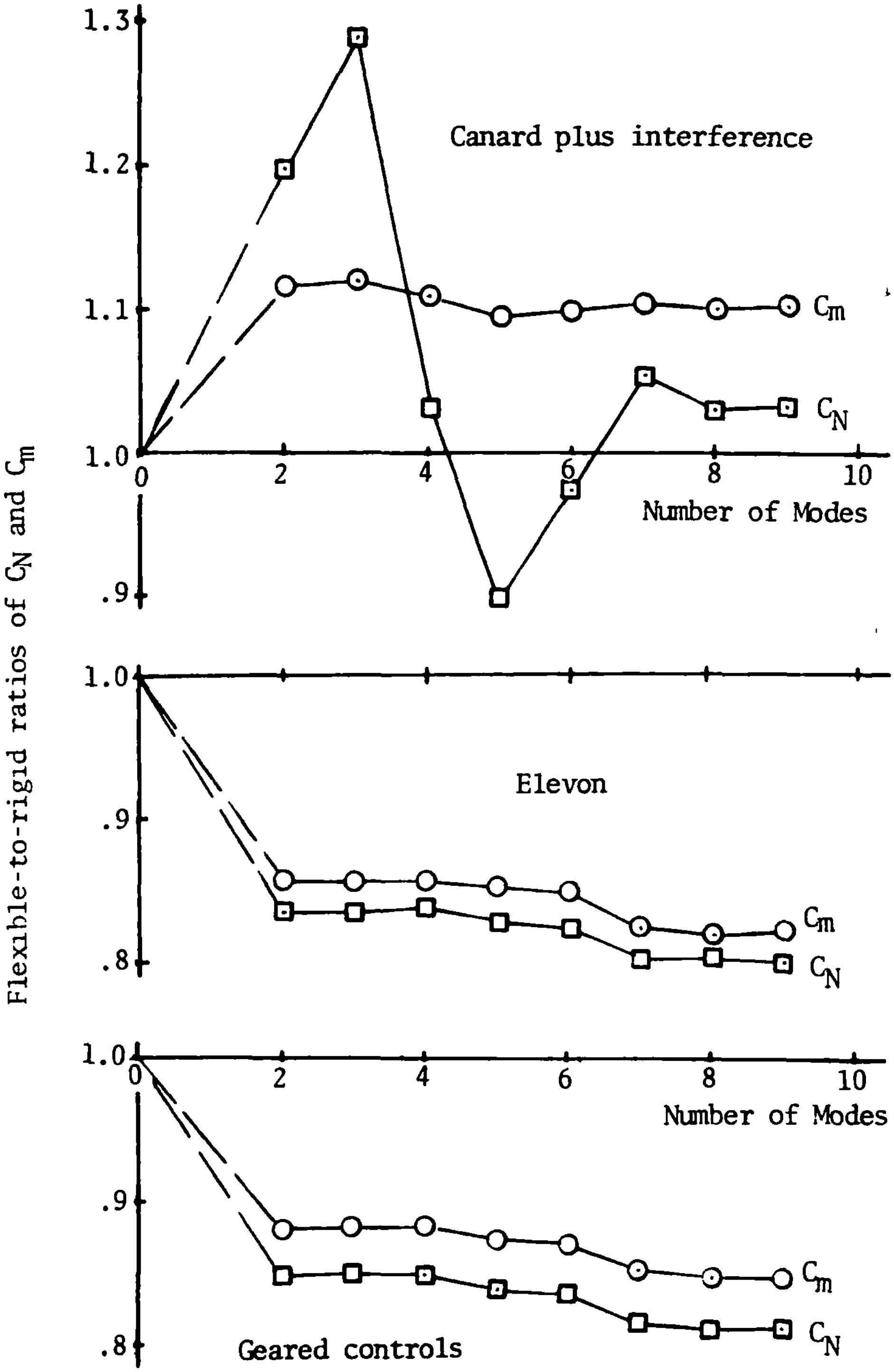
a) Loadings Due to Angle of Attack

Figure 49.- Effect of number of modes on flexible-to-rigid ratios of normal force and pitching moment, performance case P1



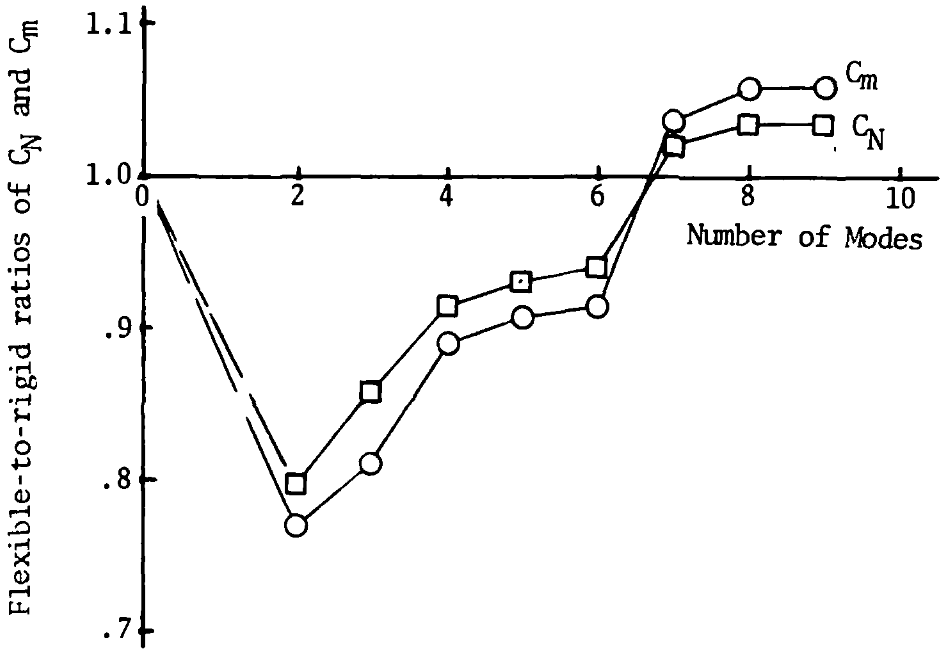
a) Loadings Due to Angle of Attack - Continued

Figure 49.- Continued



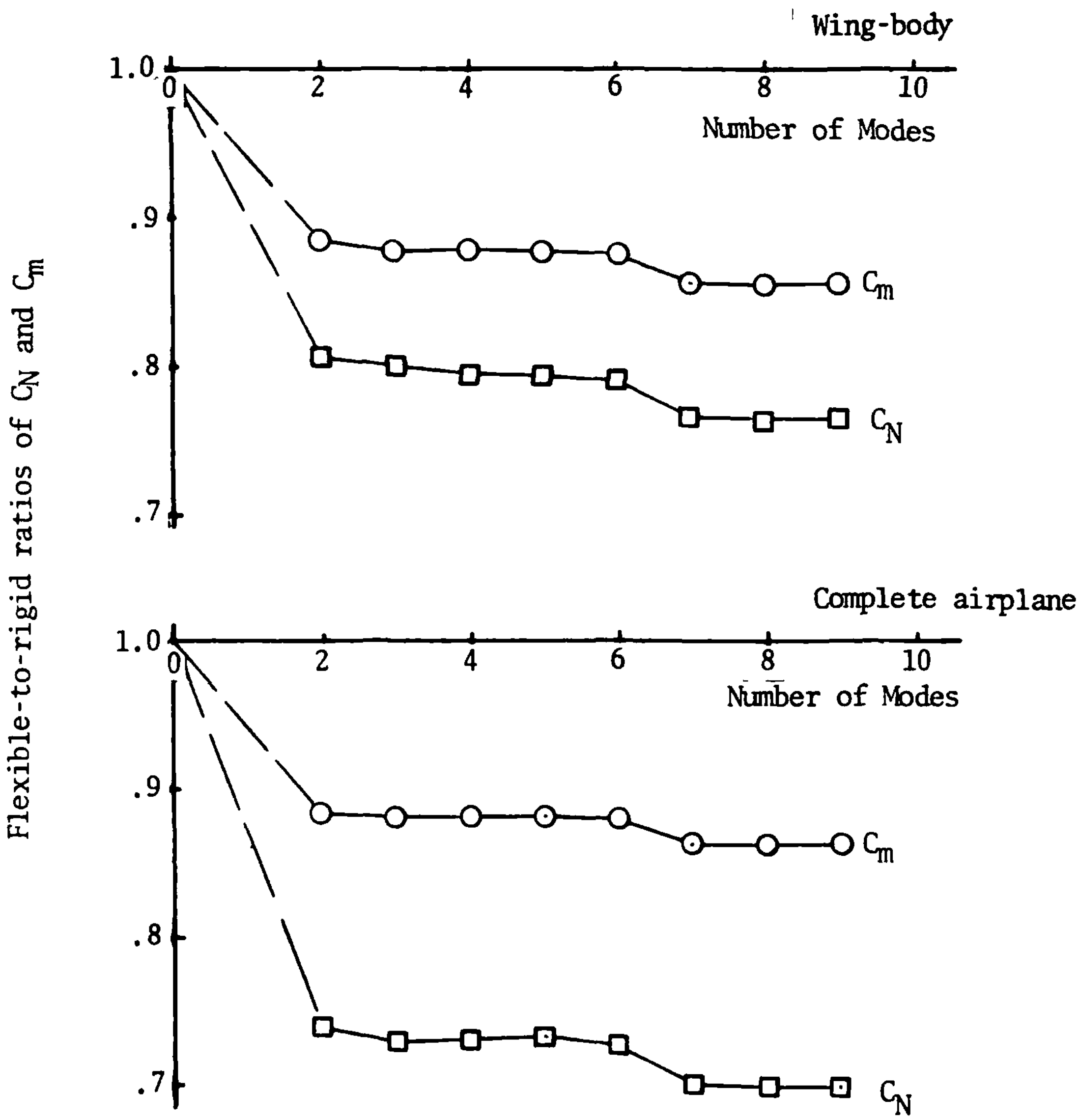
b) Loadings Due to Control Deflection

Figure 49.- Continued



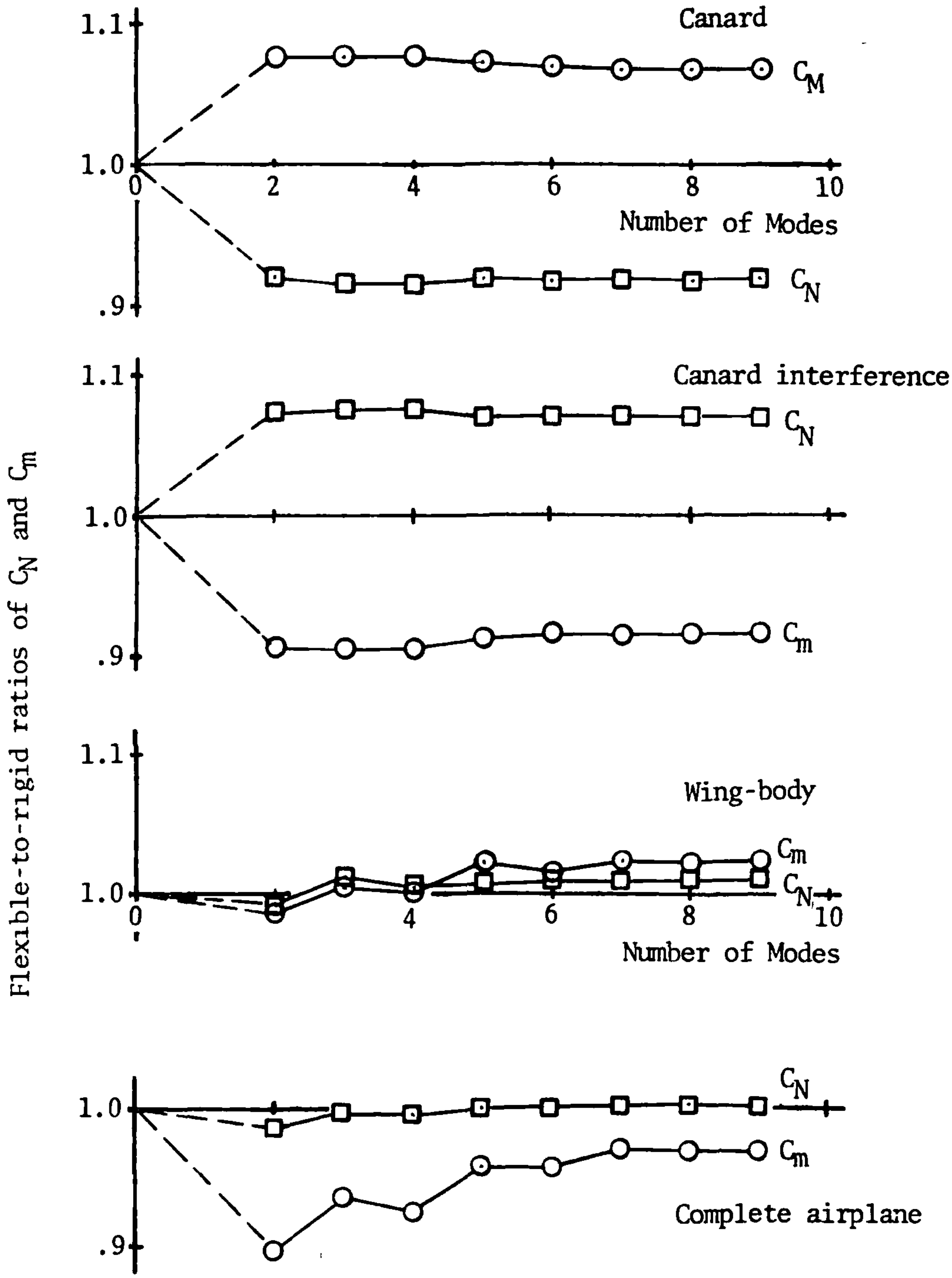
c) Loading at Zero Angle of Attack, Wing-Body

Figure 49.- Continued



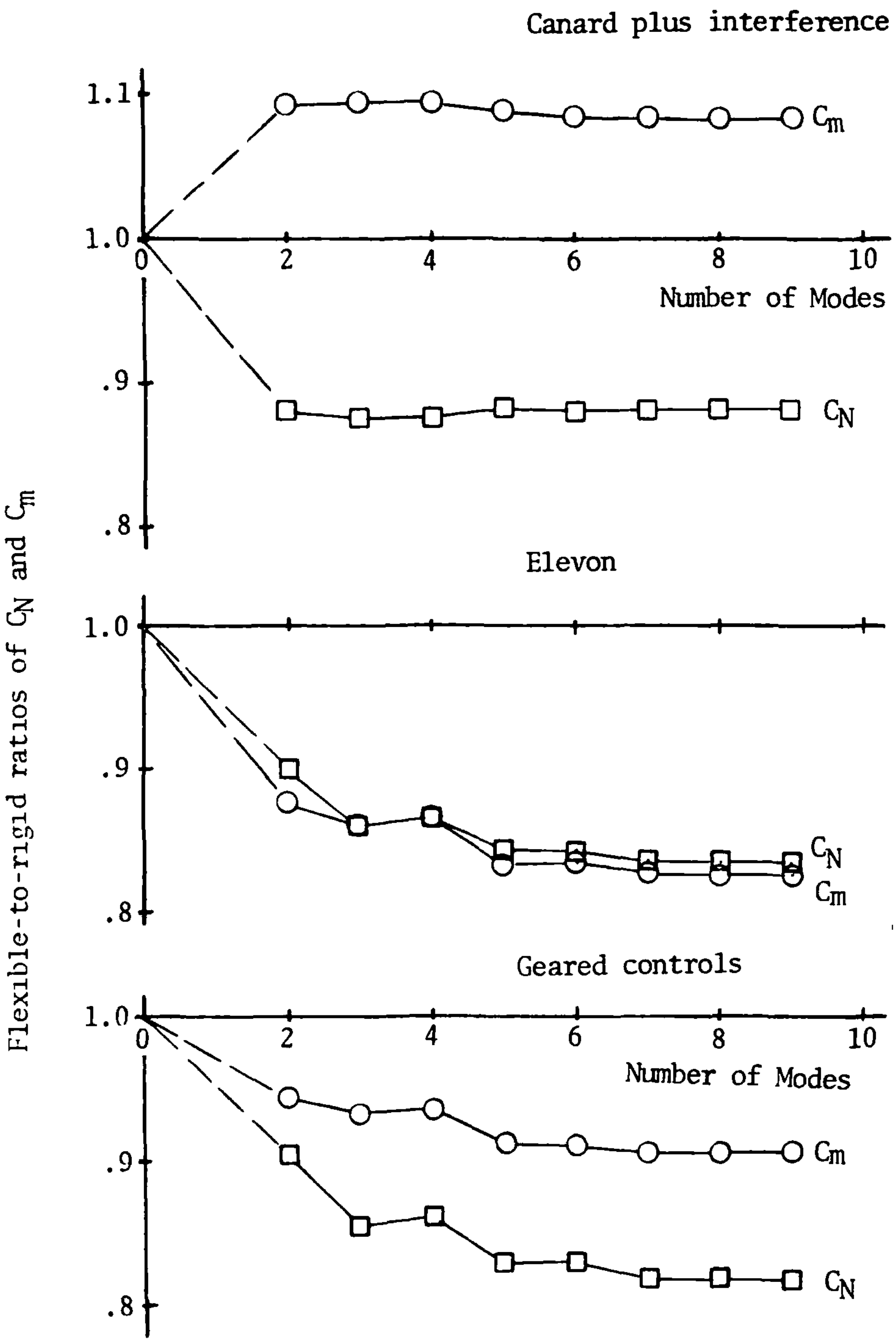
d) Loading Due to Pitching Velocity

Figure 49.- Concluded



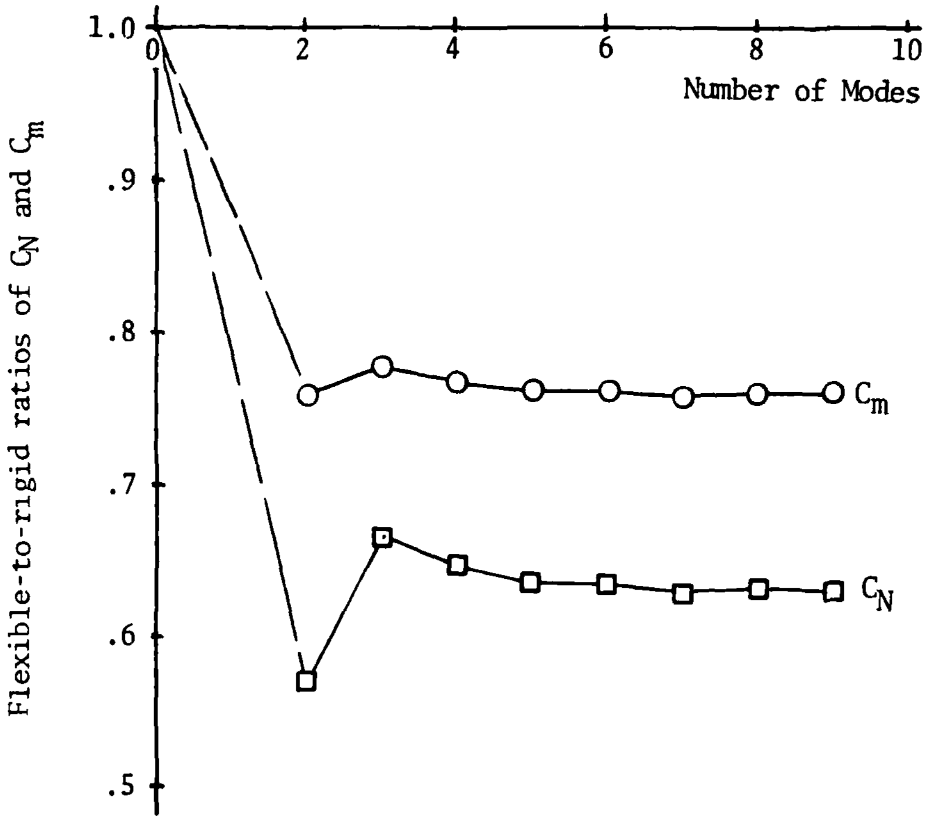
a) Loadings Due to Angle of Attack

Figure 50.- Effect of number of modes on flexible-to-rigid ratios of normal force and pitching moment coefficient, performance case P9



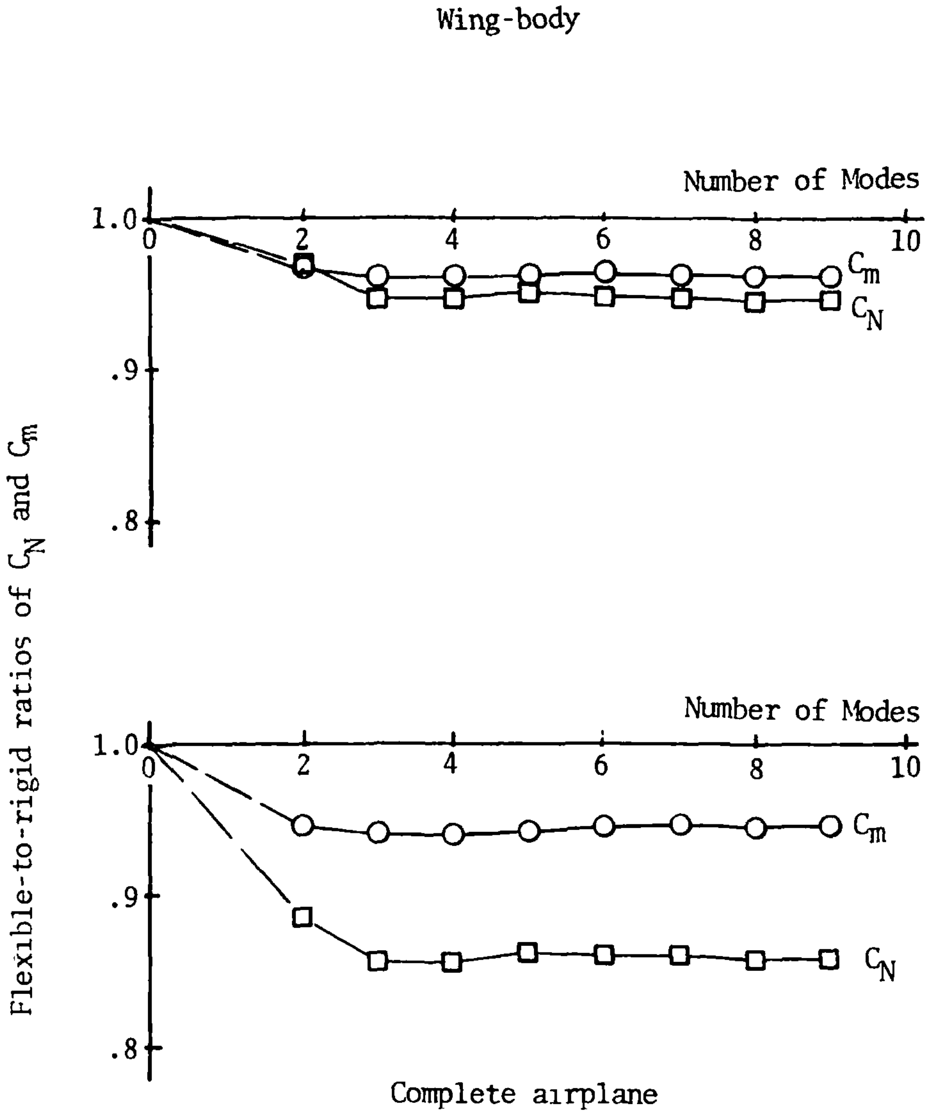
b) Loadings Due to Control Deflection

Figure 50.- Continued



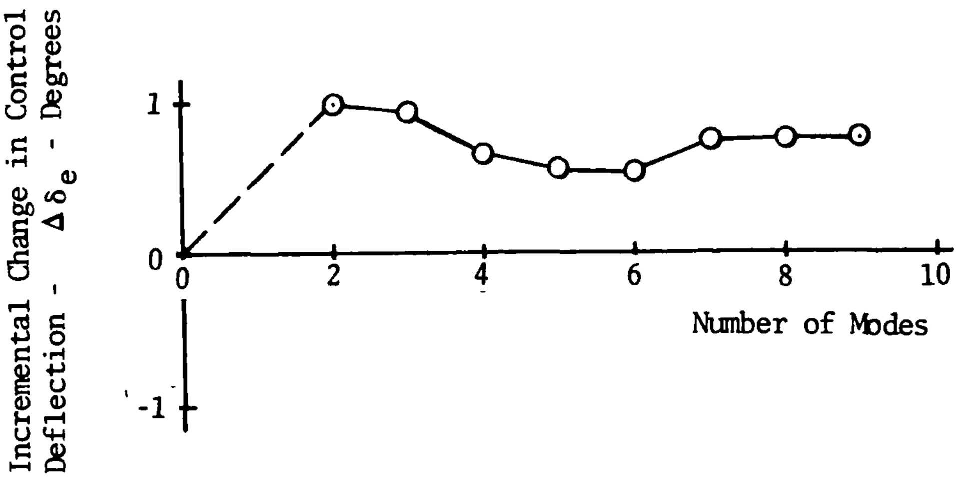
c) Loading at Zero Angle of Attack, Wing-Body

Figure 50.- Continued



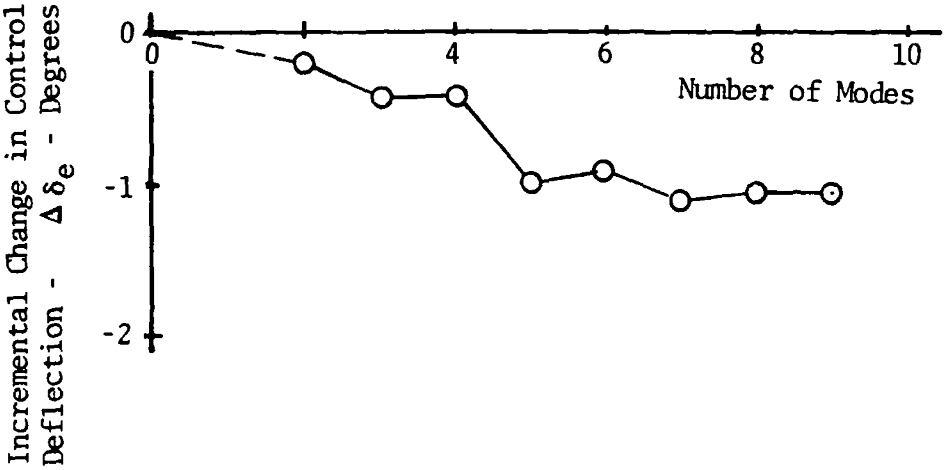
d) Loadings Due to Pitching Velocity

Figure 50.- Concluded



Note: Change in angle of attack with number of modes is less than .05 degree for all cases

Figure 51.- Effect of number of modes on 1G trim characteristics, performance case P1



NOTE: Change in angle of attack with number of modes is less than .05 degree for all cases

Figure 52.- Effect of number of modes on 1G trim characteristics, performance case P9

TABLE 29.- EFFECTS OF PARAMETRIC VARIATIONS ON TRIM CHARACTERISTICS
PERFORMANCE CASE P1

Parameter Varied	Amount of Variation	Effect of Variation						
		$\Delta\alpha$	$\Delta\delta e$	$\Delta\delta c$	$\Delta\eta_1$	$\Delta\eta_2$	$\Delta\eta_3$	$\Delta\eta_4$
Number of modes	5 modes added	-.011	.099	-.015	—	—	—	—
Thrust	35,527 lb decrease	.020	-.131	.019	.0021	.0009	.0002	.0006
Bypass doors	None							
$C_{N_{\ell e}}$, $C_{m_{\delta e}}$	10% increase	-.004	-.178	.026	-.0012	.0001	.0000	.0000
C_{N_α} wing-body	10% increase	-.422	.280	-.042	.0070	-.0052	.0001	-.0036
C_{M_α} wing-body	10% increase	.125	-.839	.125	.0134	.0057	.0009	.0040
$C_{N_{\alpha c}}$, $C_{m_{\alpha c}}$	10% increase	-.118	.587	-.088	-.0148	.0053	-.0011	-.0027
$C_{N_{\delta c}}$, $C_{m_{\delta c}}$	10% increase	-.052	.261	-.039	-.0066	.0023	-.0005	-.0012
Dynamic pressure	50 psf decrease	.829	-.659	.098	.0100	-.0469	.0041	.0110
Gross weight	None							
Control gearing	+1° δ_e shift	-.019	.138	.129	-.0055	.0005	-.0002	-.0001
Wing tip deflection	None							

Note: $\Delta\alpha$, $\Delta\delta e$, $\Delta\delta c$ - deg
$\Delta\eta_i$ - ft

TABLE 30.- EFFECTS OF PARAMETRIC VARIATIONS ON TRIM CHARACTERISTICS
PERFORMANCE CASE P9

Parameter Varied	Amount of Variation	Effect of Variation						
		$\Delta\alpha$	$\Delta\delta e$	$\Delta\delta c$	$\Delta\eta_1$	$\Delta\eta_2$	$\Delta\eta_3$	$\Delta\eta_4$
Number of modes	5 modes added	-.012	-.670	.100	—	—	—	—
Thrust	60,690 lb decrease	.012	-.649	.097	.0015	.0034	-.0006	-.0029
Bypass doors	3.8° decrease	-.087	-.940	.140	.0041	.0209	-.0004	-.0009
$C_{N\delta e}$, $C_{m\delta e}$	10% increase	-.001	-.045	.006	-.0002	.0000	.0000	.0002
$C_{N\alpha}$ (wing-body)	10% increase	-.365	1.182	-.178	.0023	-.0126	.0009	.0047
$C_{M\alpha}$ (wing-body)	10% increase	.051	-2.669	.400	.0063	.0137	-.0026	-.0121
$C_{N\alpha c}$, $C_{m\alpha c}$	10% increase	-.053	1.354	-.204	-.0071	-.0005	.0016	.0073
$C_{N\delta c}$, $C_{m\delta c}$	10% increase	-.033	.838	-.126	-.0044	-.0003	.0010	.0045
Dynamic pressure	50 psf decrease	.386	-1.220	.183	-.0049	.0134	-.0023	-.0149
Gross weight (uniform)	18,513 lb increase	.211	-.699	.104	-.0015	-.0247	-.0025	-.0102
Control gearing	-1° δ_e shift	.014	-.413	-.089	.0024	.0003	-.0005	-.0021
Wing tip fold angle	2° decrease to 63°	.018	-.649	.097	-.0027	-.0313	-.0011	-.0135

Note: $\Delta\alpha$, $\Delta\delta e$, $\Delta\delta c$ - deg
$\Delta\eta_i$ - ft

DEFORMED MODEL WIND TUNNEL TEST RESULTS

This section presents a comparison of data obtained from wind tunnel tests of the Deformed Model with corresponding information from Force Model 5. It also outlines procedures for estimating airplane drag from the Deformed Model test data with the aid of flexible airplane characteristics defined in this report.

Comparison of Deformed Model and Force Model 5 Data

During Phase 2 of the study, a comparison was made of the results of wind tunnel tests of the Deformed Model (see figure 53) with those from earlier tests of Force Model 5. The comparison was intended to isolate major differences attributable to the difference in shape of the models and was not meant to provide a detailed correlation of all aspects of the data. Significant differences evolving from these correlations were to be incorporated into the analytical evaluation of airplane characteristics. Those aspects of the Deformed Model results which impinged on final aerodynamic definition used in these analyses have previously been discussed in the section entitled Aerodynamics. Drag was not considered in the comparisons.

Correlations between Force Model 5 and the Deformed Model are made on the basis of direct comparison of wind tunnel test results for the complete airplane configuration with segmented elevons. One specific test (Ames 29) which was conducted during the airplane development period was used as the primary data source for Force Model 5.

As expected, the major difference in the aerodynamic characteristics of Force Model 5 and the Deformed Model appeared as an incremental shift of the normal force and pitching moment curves. Throughout the angle of attack range of interest, the curves from the two models are essentially parallel. Some differences are apparent at high angle of attack, but these are of no consequence to the present study. Comparisons of data from the two models are shown for each wing tip position at selected Mach numbers in figures 54 and 55. Normal force coefficient versus angle of attack curves are shown for the complete airplane configuration in figure 54. The corresponding variations of curves of pitching moment coefficient as a function of normal force coefficient are presented in figure 55.

Since the force curves from the two models are essentially parallel, their comparison may be conveniently summarized in terms of the values at zero angle of attack. Comparisons of $C_{N(\alpha=0)}$ and $C_{m(\alpha=0)}$ versus Mach number are shown in figures 56 and 57, respectively. The symbols shown on these plots represent test data.

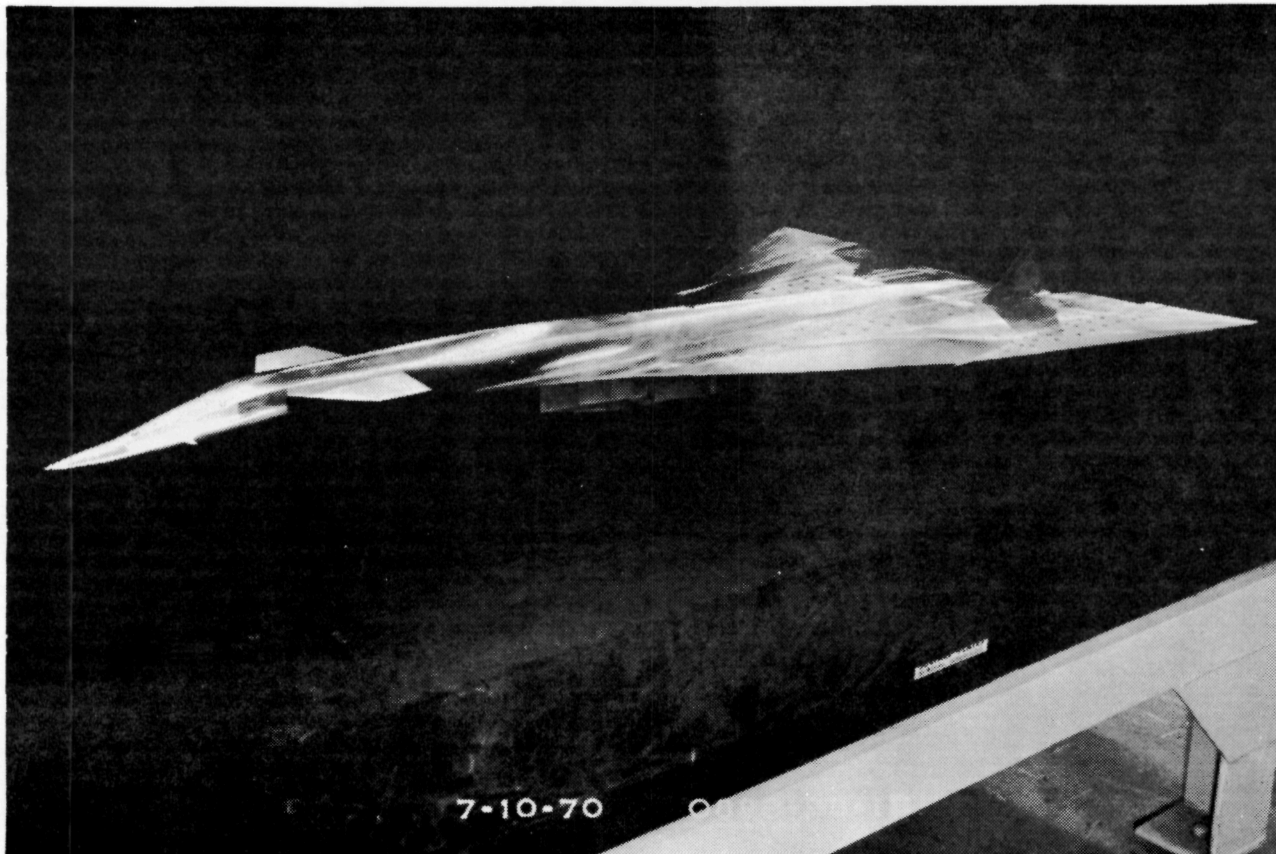
The incremental differences between the two models at zero angle of attack represent the normal force and pitching moment of the complete airplane due to the structural deformation which was built into the Deformed Model. These differences are plotted as a function of Mach number in figures 58 and 59. At several points, theoretical estimates were made of the normal force and pitching moment due to the incremental deformation of the Deformed Model, using the Etkin Program (reference 3) in the supersonic regime and the Vortex-Lattice Program (reference 4) at subsonic speeds. Theoretical loads were estimated for the wing-afterbody and canard components and combined for comparison with the increments from tunnel data. Forces acting on the forebody were assumed to be negligible. Loads acting on the wing due to downwash from the canard were not estimated due to the difficulties involved but are estimated to be small. Theoretical estimates are shown on figures 58 and 59 by symbols while the test data is represented by lines. Agreement with test results in the supersonic region is excellent, while the correlation at subsonic speeds is poor. However, in evaluating the comparison of theoretical and test results, note the expanded scales. The incremental normal force and pitching moment values are very small due to the small amount of deformation built into the Deformed Model.

Comparisons with theory were also made on the basis of wing-body and canard components. The difference between Force Model 5 and the Deformed Model canard input increments are plotted at the top of figures 60 and 61. The normal force and pitching moment curves for the wing-body plotted at the bottom of figures 60 and 61 were obtained by subtracting the canard increments from the airplane values of figures 58 and 59. The previously described analytical estimates for canard and wing-body normal force and pitching moment coefficients at zero angle of attack have been plotted on figures 60 and 61. Note again that the experimental data are for the canard plus interference while the theoretical estimates are for the canard only. As was the case for the complete airplane configuration, good agreement is evident for the wing-body in the supersonic range and poor correlation is apparent at subsonic speeds. Remembering that the effects of canard downwash tend to cancel out the loading acting on the canard itself at subsonic and transonic speeds, the agreement between test and theory is good throughout for the canard. The component data indicate that the discrepancy at subsonic speeds must be attributed to the wing-body rather than the canard. It is also pertinent to note test data show that canard interference effects on the wing-afterbody are negligible between $M = 2.5$ to 3.0.

In evaluating the comparison of theoretical and test results, note the expanded scales. Due to the airplane characteristics at the model design case, the incremental deformation built into the Deformed Model was very small. The differences in normal force and pitching moment coefficient between the two models is correspondingly small, with the result that the correlations, both good and bad, are not entirely conclusive.

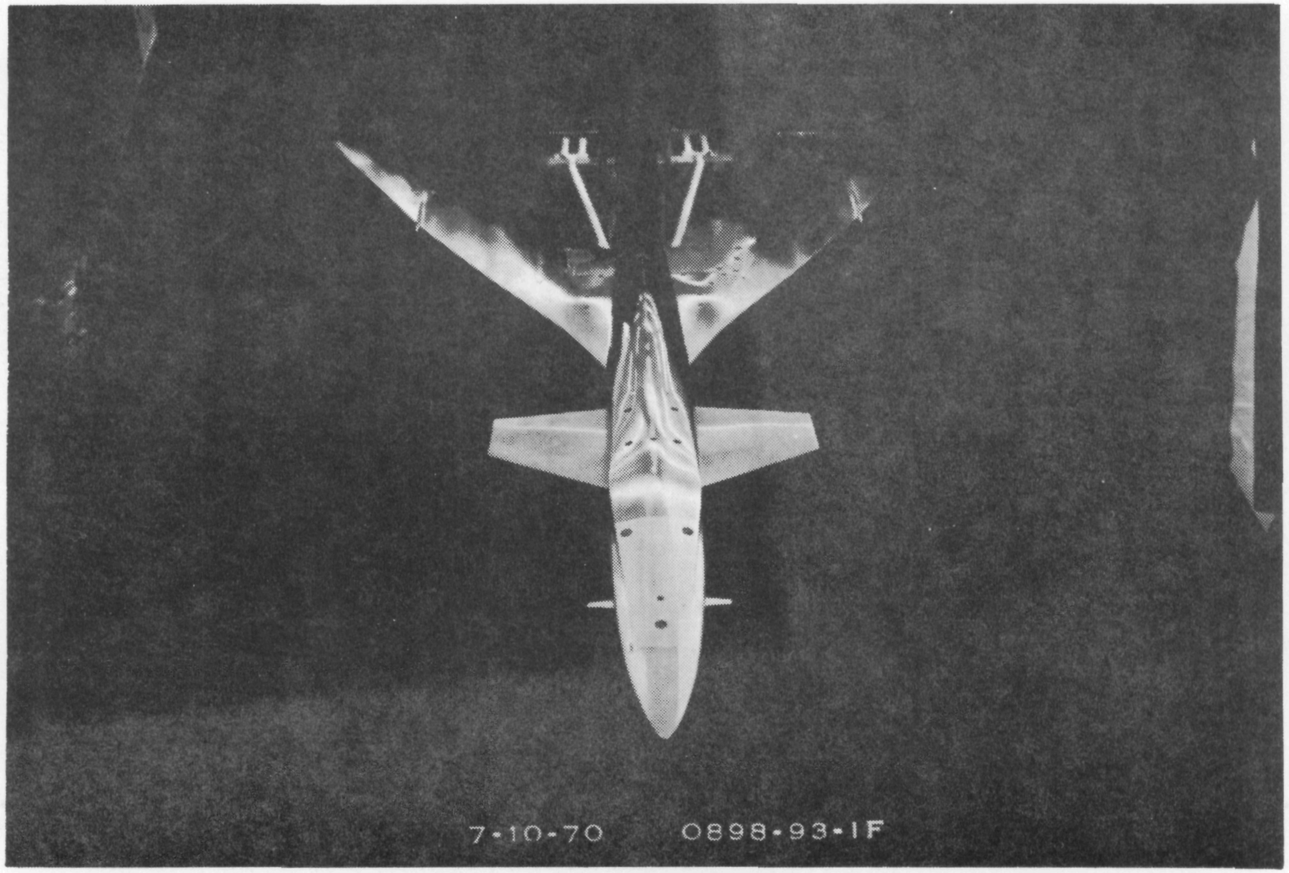
Procedures for Estimating Airplane Drag from Deformed Model Test Results

At a later time, NASA will use Deformed Model wind tunnel results in conjunction with flexible airplane analyses provided in this report to estimate drag and performance characteristics of the XB-70 airplane for comparison with flight test results. A discussion of recommended procedures for this purpose is provided in Appendix J.



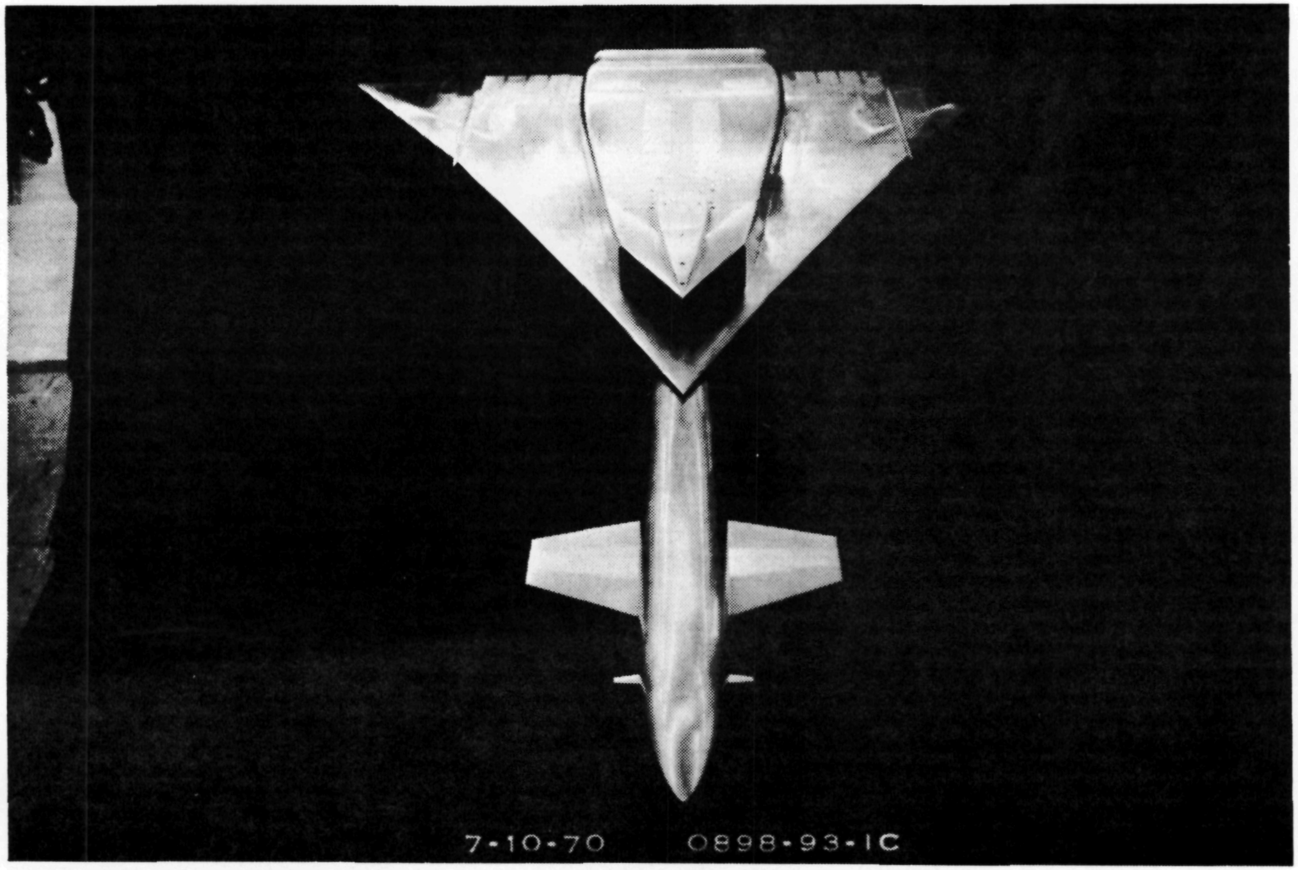
a) Top Three Quarter View

Figure 53.- XB-70-1 .03 scale deformed model



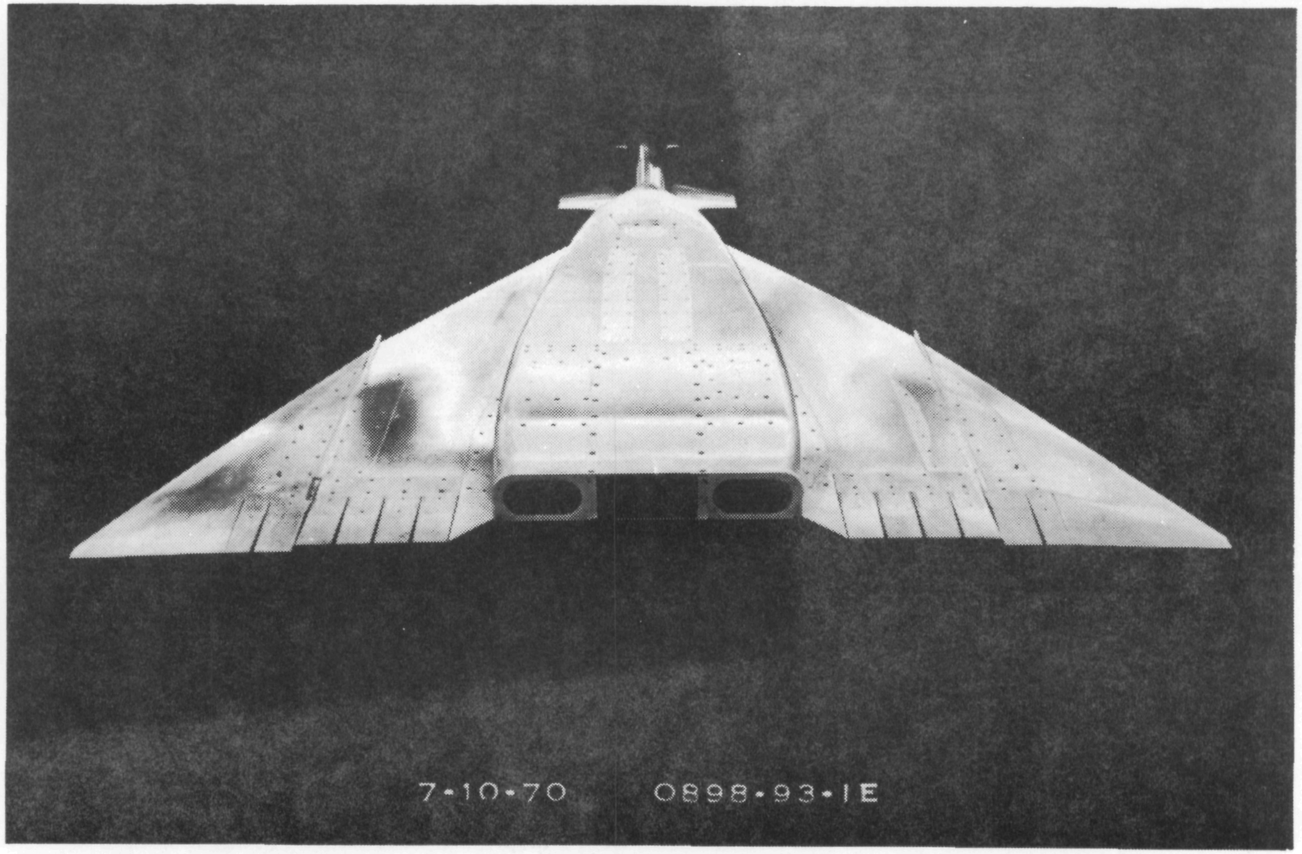
b) Top Front View

Figure 53.- Continued



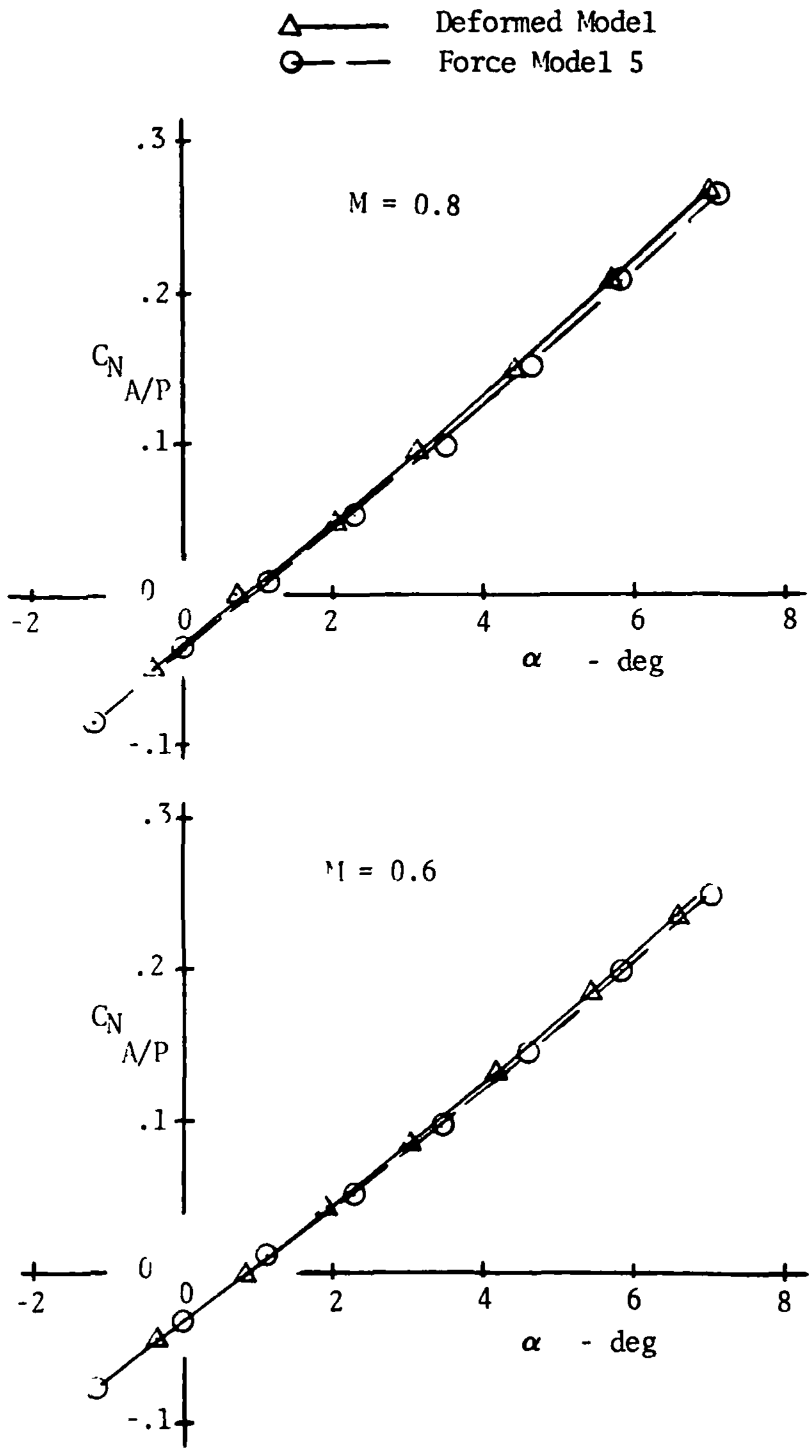
c) Bottom Front View

Figure 53.- Continued



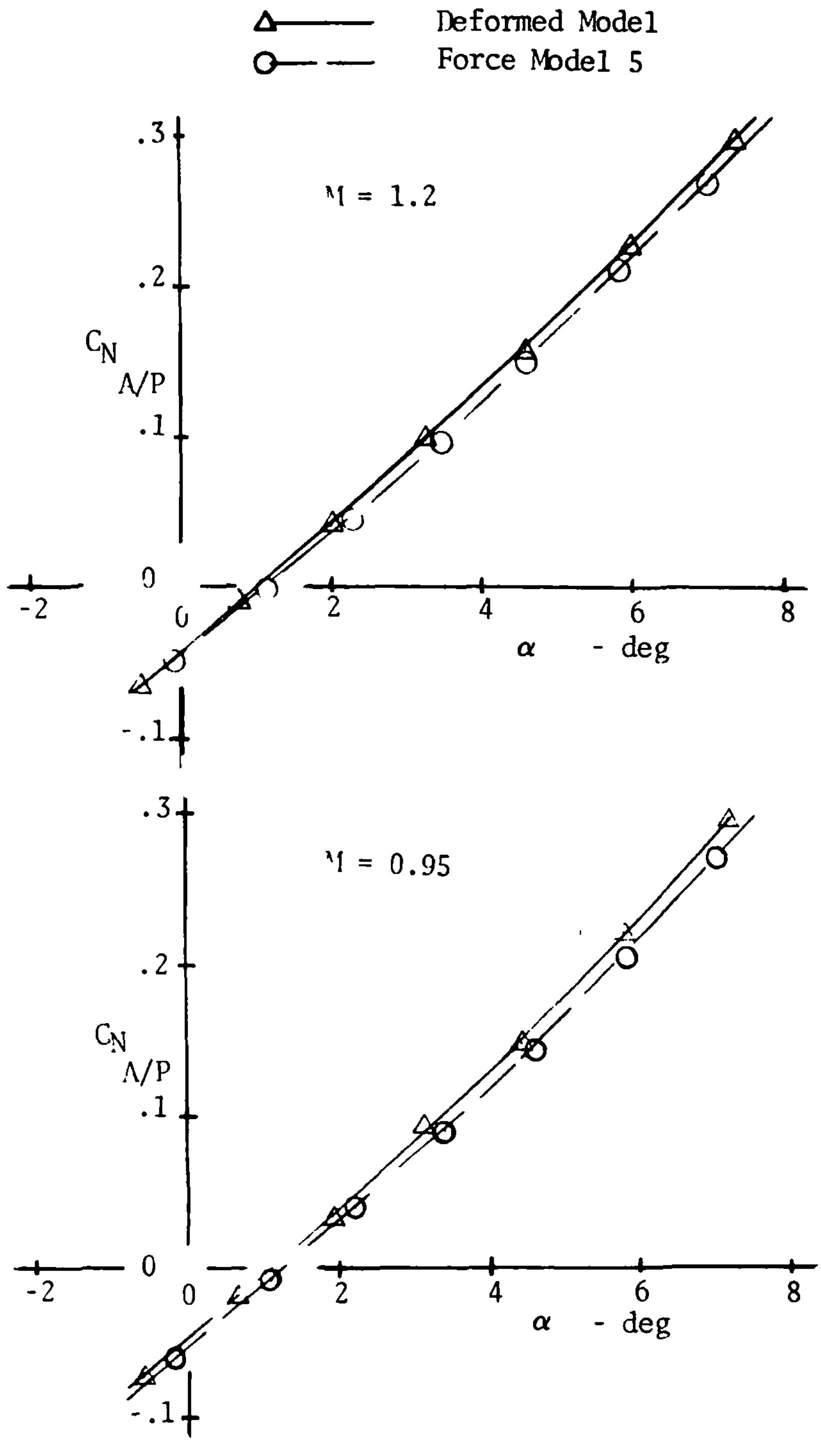
d) Bottom Aft View

Figure 53.- Concluded



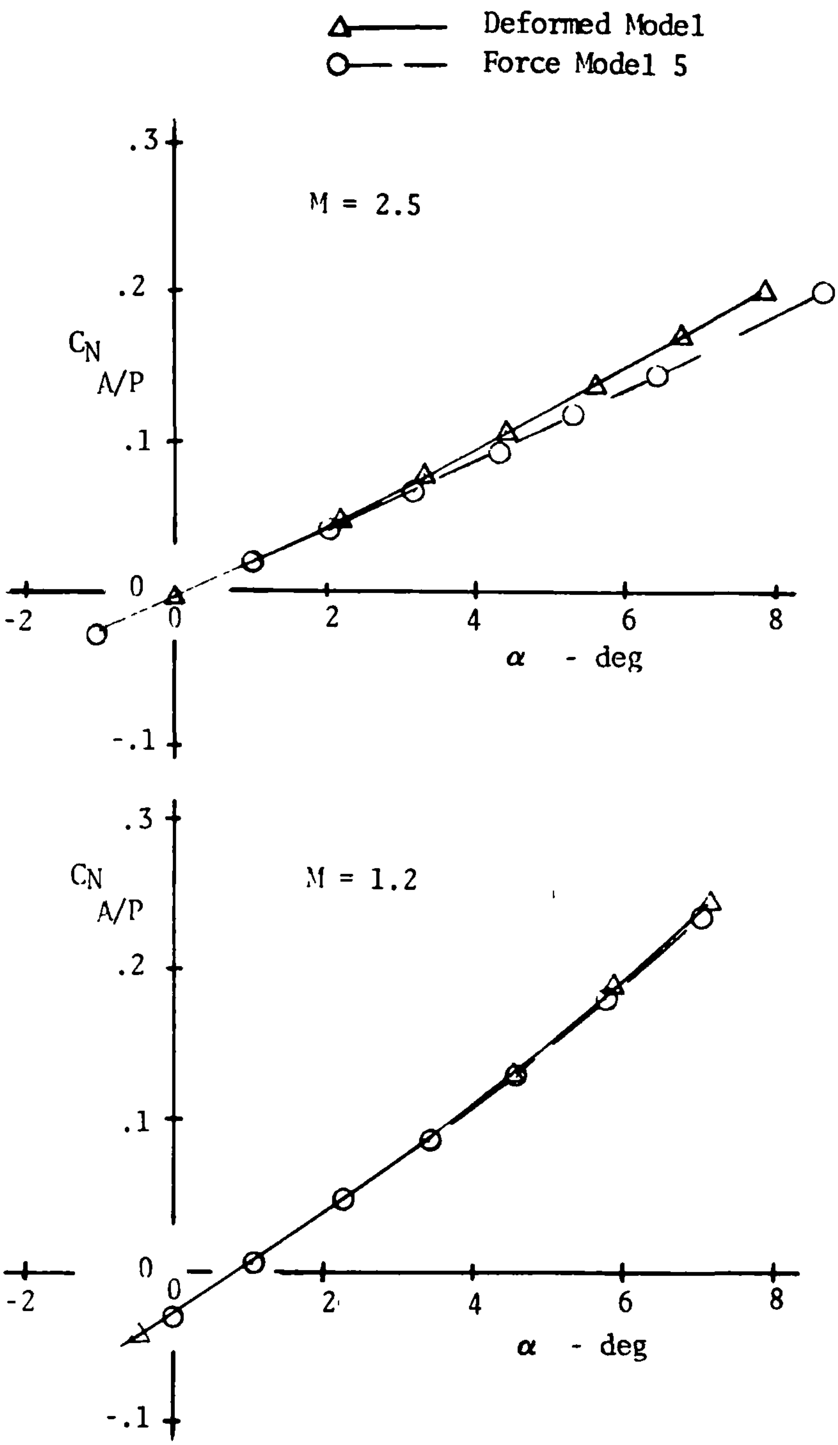
a) $\delta_T = 0°$

Figure 54.- Airplane normal force coefficient vs angle of attack



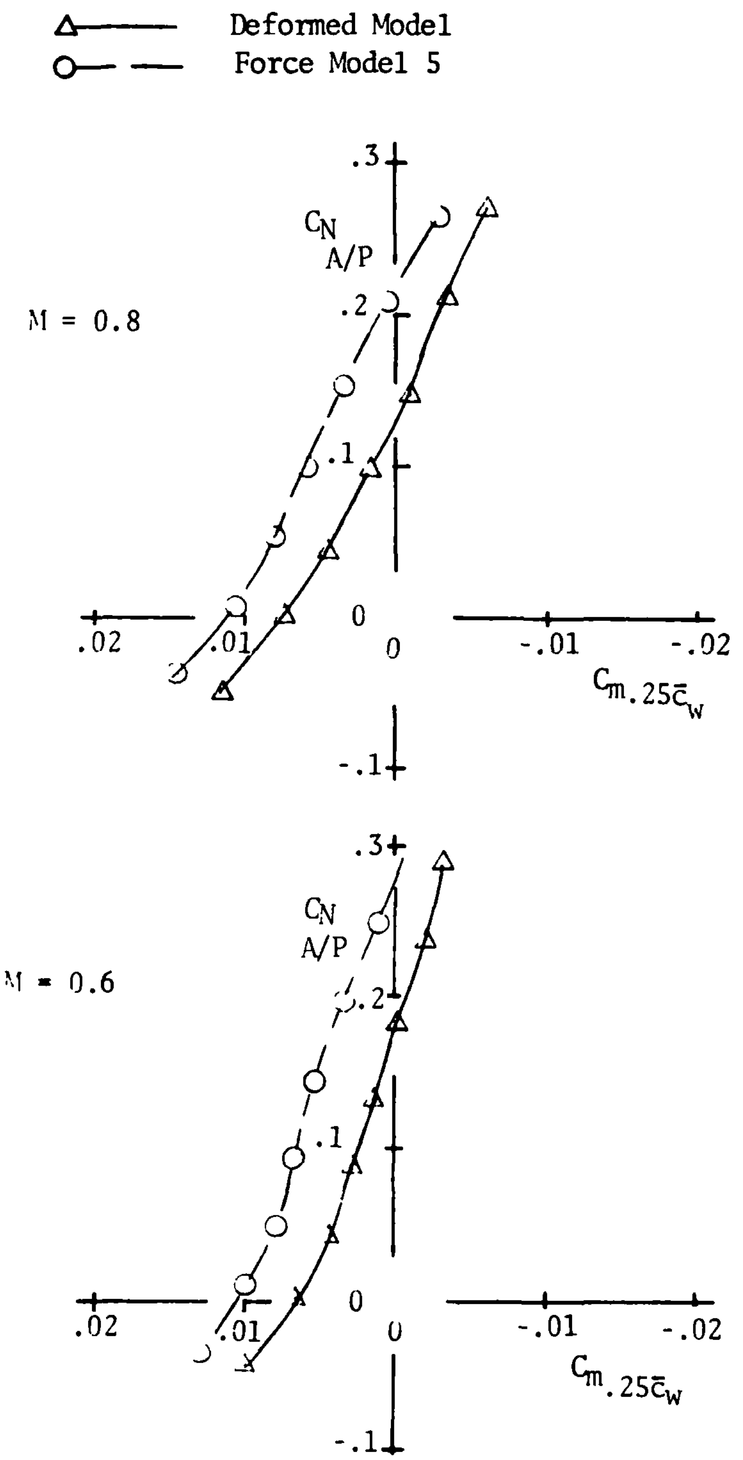
b) $\delta_T = 25°$

Figure 54.- Continued



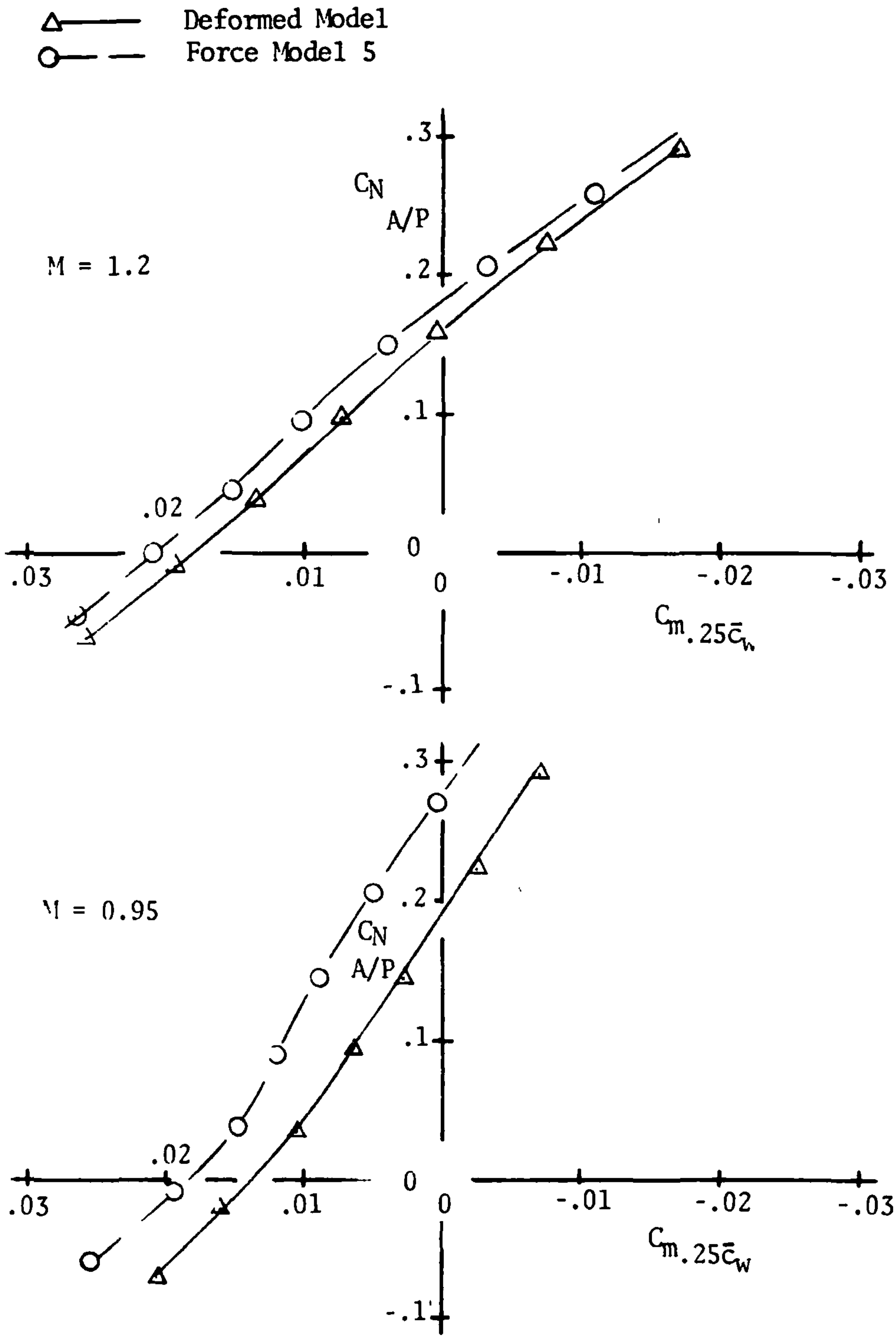
c) $\delta_T = 65°$

Figure 54.- Concluded



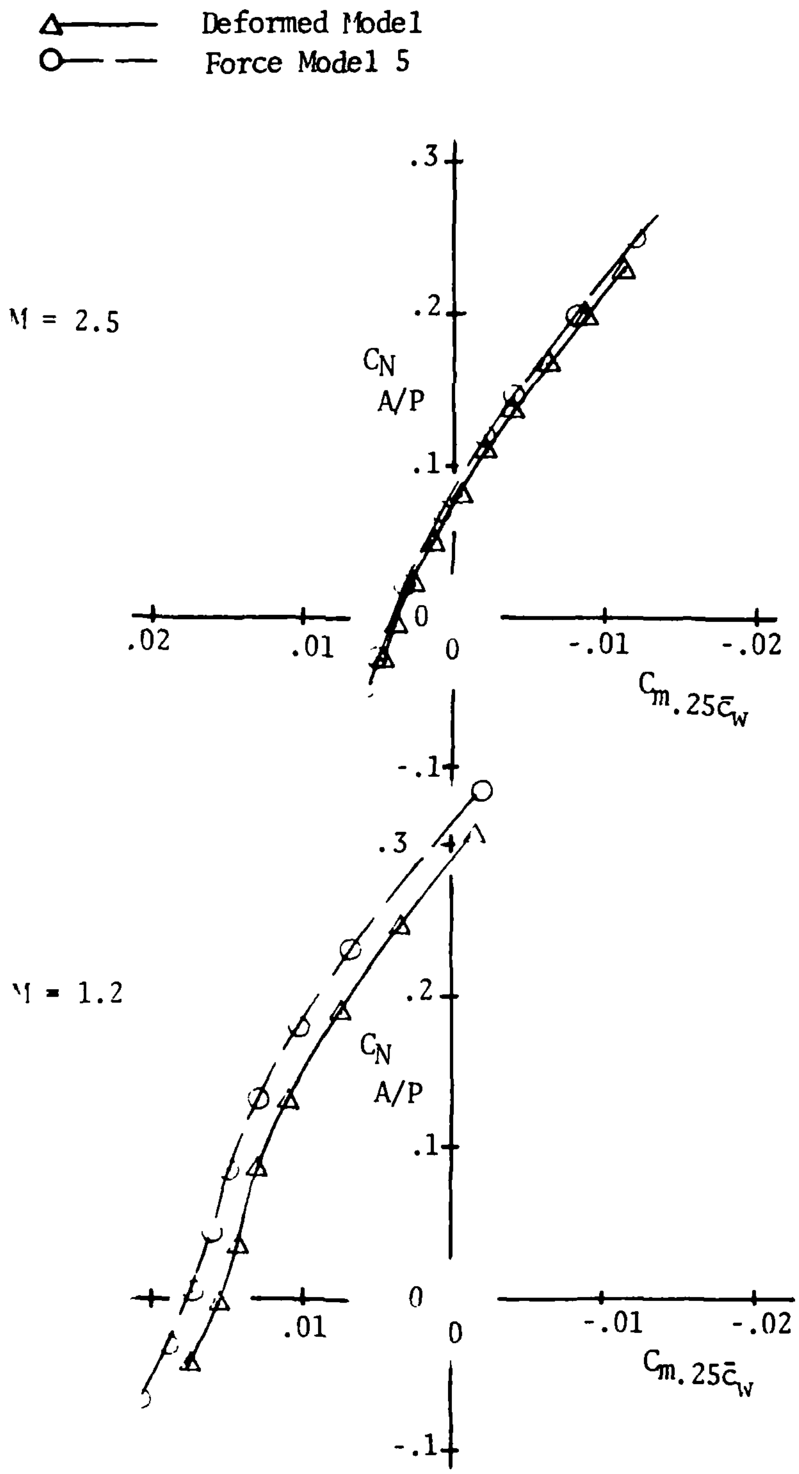
a) $\delta_T = 0°$

Figure 55. - Airplane normal force coefficient vs pitching moment coefficient



b) δ_T = 25°

Figure 55.- Continued



c) δ_T = 65°

Figure 55.- Concluded

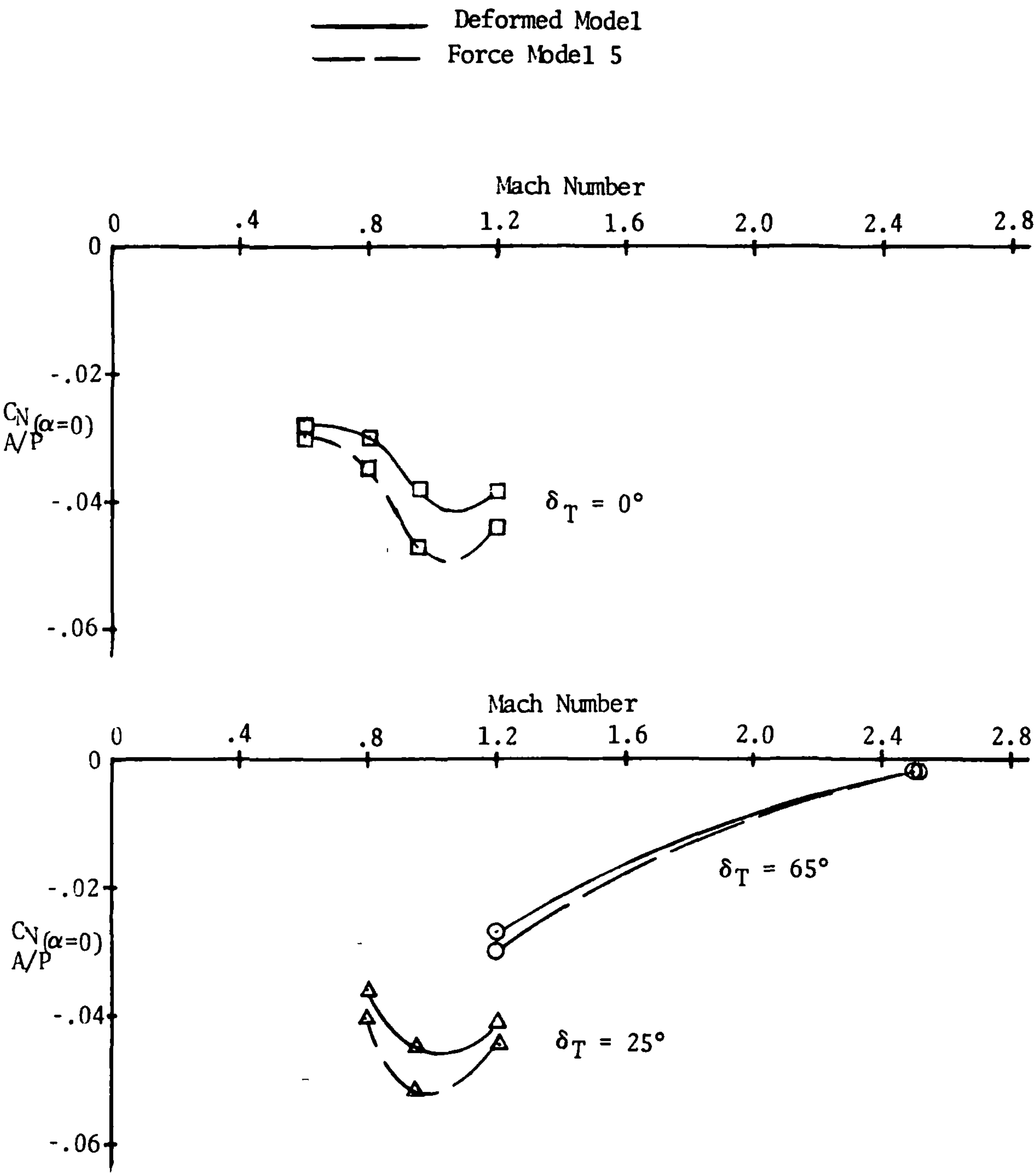


Figure 56.- Airplane normal force coefficient at zero angle of attack.

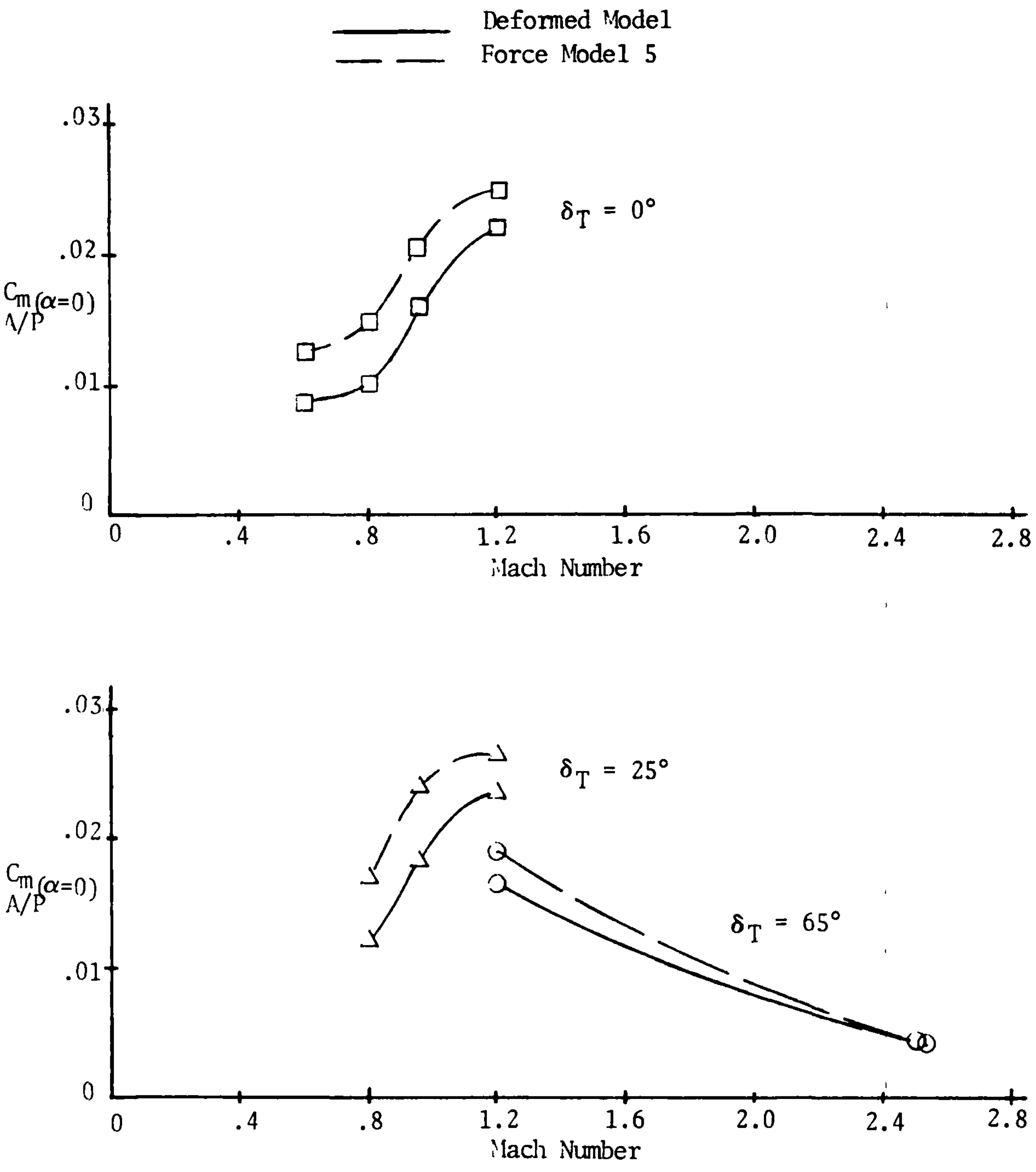


Figure 57.- Airplane pitching moment coefficient at zero angle of attack

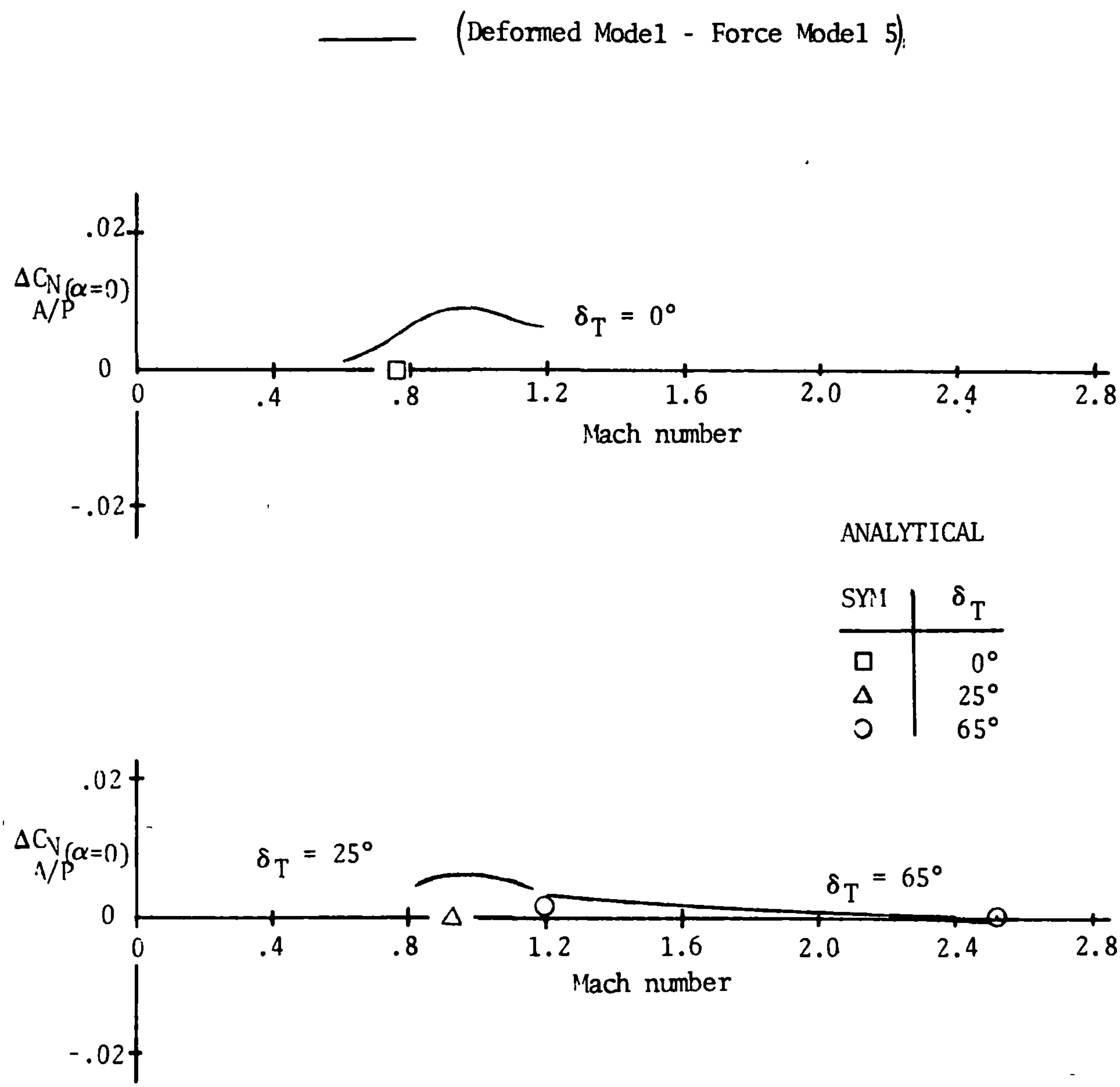


Figure 58.- Incremental airplane normal force coefficient at zero angle of attack due to deformed shape

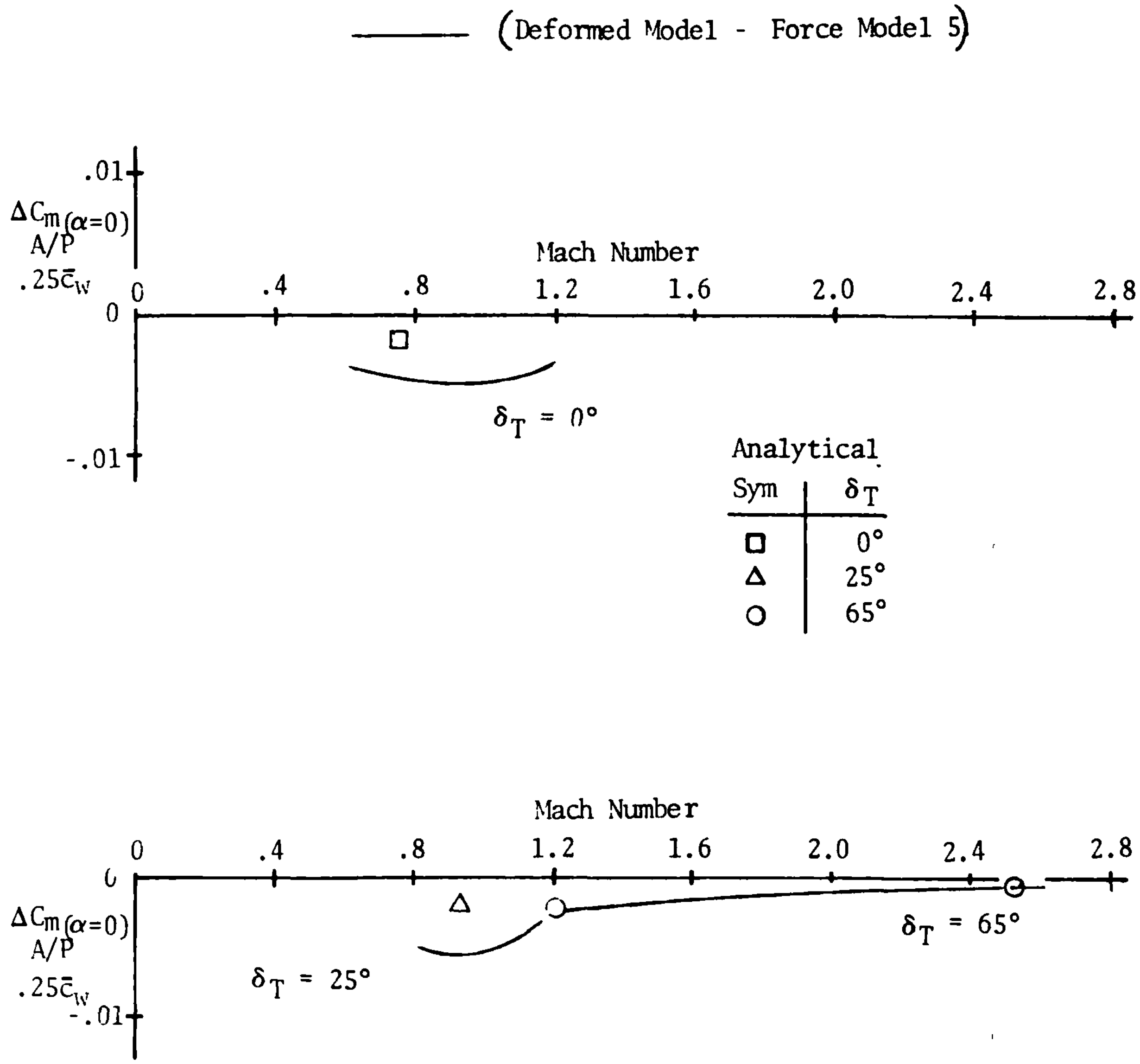


Figure 59.- Incremental airplane pitching moment coefficient at zero angle of attack due to deformed shape

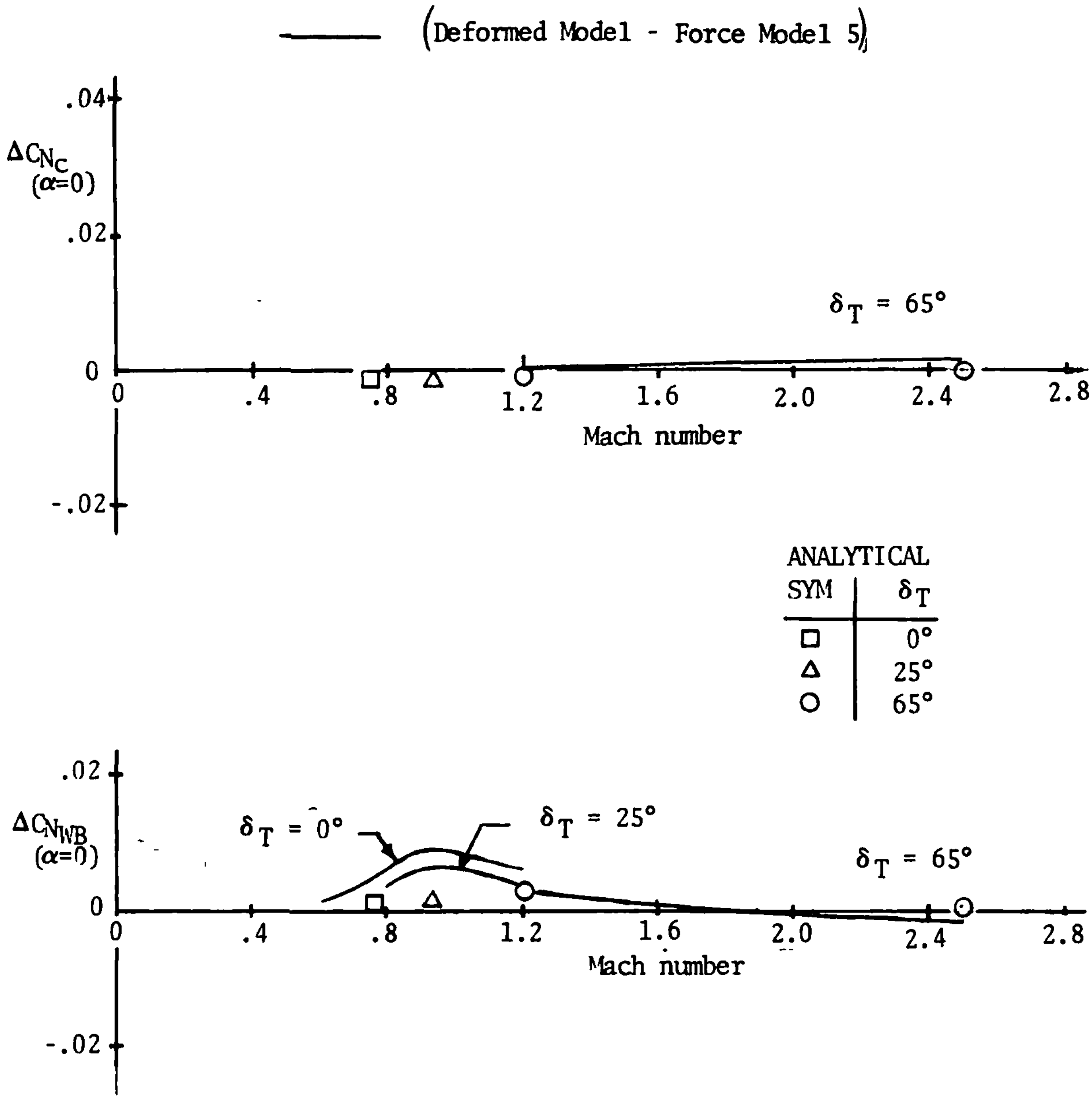


Figure 60.- Incremental wing-body and canard normal force coefficient at zero angle of attack due to deformed shape

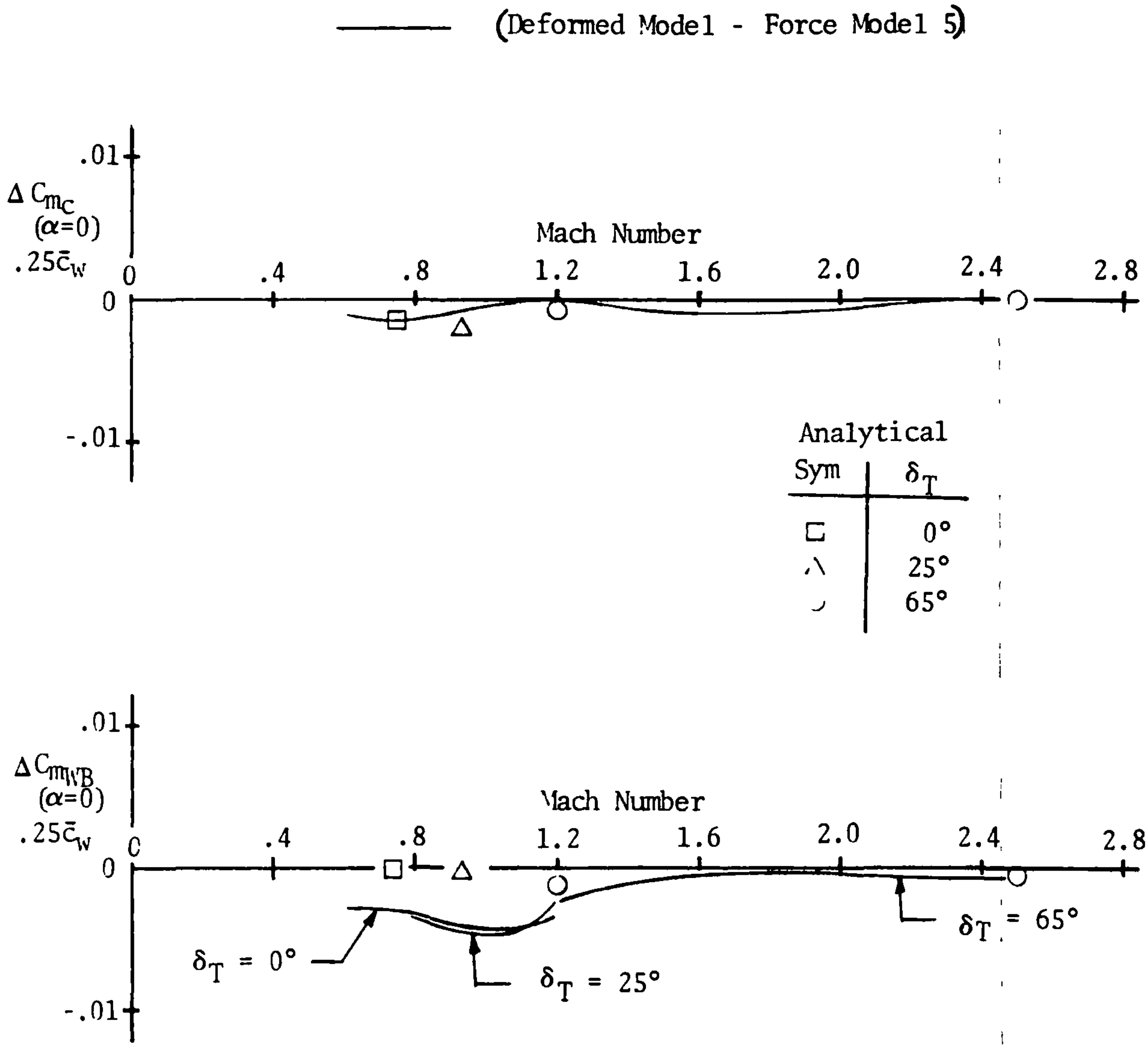


Figure 61.- Incremental wing-body and canard pitching moment coefficient at zero angle of attack due to deformed shape

EXTERNAL PROTUBERANCES AND SURFACE IMPERFECTIONS

Numerous differences exist between the XB-70-1 air vehicle presented in the three view of figure 1 and the Deformed Model which has been tested to supply drag and stability and control data for this study program. Figures 62 through 80 present external protuberances which were on the air vehicle for flights 63 through 82 but are not on the model. These figures describe the protuberances, give their dimensions, and locate them on the air vehicle relative to fuselage station, buttock plane and water line. It should be noted that some of the items are present only on certain flights. Where this is the case, the specific flights are noted on the figures.

Figure 62 presents the air vehicle nose boom with attached pitot-static tube and angles of attack and angle of sideslip vanes. (The details of the boom itself are those which were included in the early drag estimate and flown by the Air Force; a somewhat different boom was used during flight testing by NASA.) A second (standby) angle of sideslip vane mounted on the fuselage nose is shown in figure 63. Pressure probes for the flight control system "Q" bellows and total temperature probes appear in figures 64 through 66. IFF, TACAN, UHF and telemetry antennas are shown in figures 67 through 69.

Air vehicle boundary layer studies were conducted as well as other investigations that required specific externally-mounted devices. Boundary layer rakes and Preston probes mounted on the air vehicle are shown in figures 70 through 74. A boundary layer separation wall and aft facing step are presented in figures 75 and 76.

Other than specific protuberances added to the air vehicle, some differences exist between the basic air vehicle and the Deformed Model. The bomb bay doors and tracks of the air vehicle which are not simulated on the model are described in figures 77a and 77b with the doors in the forward position, as flown on all flights. Also, three fixed fairings for environmental control outlets that are not on the model are described in figures 78 through 80. In addition to the above, there are about 450 small compartment and equipment drain holes of 1/4 to 3/8 in. diameter along the length of the lower fuselage and duct and the lower wing surface. Three one inch diameter environmental control water drain holes are on the bottom fuselage between fuselage stations 662 and 845. A two inch diameter ammonia exit hole is on the upper right hand shoulder at station 855.

Three small retractable anti-collision lights are mounted on the air vehicle. They were extended for subsonic and retracted for supersonic flight. One is on the top air vehicle centerline at fuselage station 755, and the other two are on the left and right hand sides of the lower fuselage, outboard of the weapons bay (B.P. 83.7) at fuselage station 1500. Each light is cylindrical, four and one-half inches in diameter, and when extended is four inches outside the moldline.

Numerous patches and doublers used for structural modification are on the air vehicle. They bulge slightly outward and most are faired smoothly into the basic air vehicle surface. A total of about 110 patches and doublers are distributed throughout. They appear in many different sizes from about 9 to 1400 square inches and have various shapes. Most are rectangular with a 3 to 8 inch width, and approximately 80 percent of these have the longer dimension perpendicular to the airstream. Generally, the thicknesses vary from 1/64 to 1/8 inch with the average being 1/32 inch. If more detailed information is desired, the air vehicle can be inspected at the Air Force Museum at Wright-Patterson Air Force Base, Ohio.

About 25 rather prominent 1/2 inch diameter fasteners which protrude 1/8 inch out from the skin are located on top of the air vehicle at fuselage station 1900 ahead of the right vertical tail.

Other vehicle differences from the model are skin waviness, small shallow dent-like depressions, and indentations made by chipping off of paint. There are seven "waves", four on one side and three on the other of the engine compartment in the vicinity of fuselage station 2100. The waves are about 30 inches long and run diagonally along the duct sides with a wave length approximating 18 inches. The depth is 1/4 inch. They were observed in the static condition, and their appearance in flight is unknown. The dent-like depressions number 22 and roughly measure 4 x 4 inches, are 1/8 inch deep, and run along the lower right shoulder of the fuselage between fuselage stations 550 and 830. Paint had chipped off the air vehicle from time to time, and, although repainted, the condition for specific flights is not known. Generally, the indentations from chipping were 1/32 inch deep, and at the time of observance most of the chipping appeared on the aft and lower portion of the air vehicle. The air vehicle also had many cover plates, an assembly drawing of which is presented in figure 81.

The magnitude of the drag associated with various external items are illustrated in table 31 and figures 82 through 86 for the design mission. Table 31 presents a tabulation of the drag contributed by a number of external items and the total drag is plotted as a function of Mach number on figure 82. The pressure drag on the forward face of the forward bypass doors is shown as a function of Mach number on figure 83. This drag is dependent upon door deflection which in turn is a function of Mach number, altitude and power setting. The maximum and military power data represent the door deflections used during acceleration and climb and the idle power data are representative of descent operation. The door deflections used are shown as a dashed line on figures 84a and 84b. Bypass air and boundary layer bleed air discharging into the airstream contribute drag as shown on figure 85. The drag due to boundary layer bleed exit III was included in the base pressure drag and was very small (about 1% of the exit flow and thus about 3% of base drag). The drag of figure 85 represents the interaction between the exit airflow and the freestream. Figure 86 presents the estimated drag of ECS outlets.

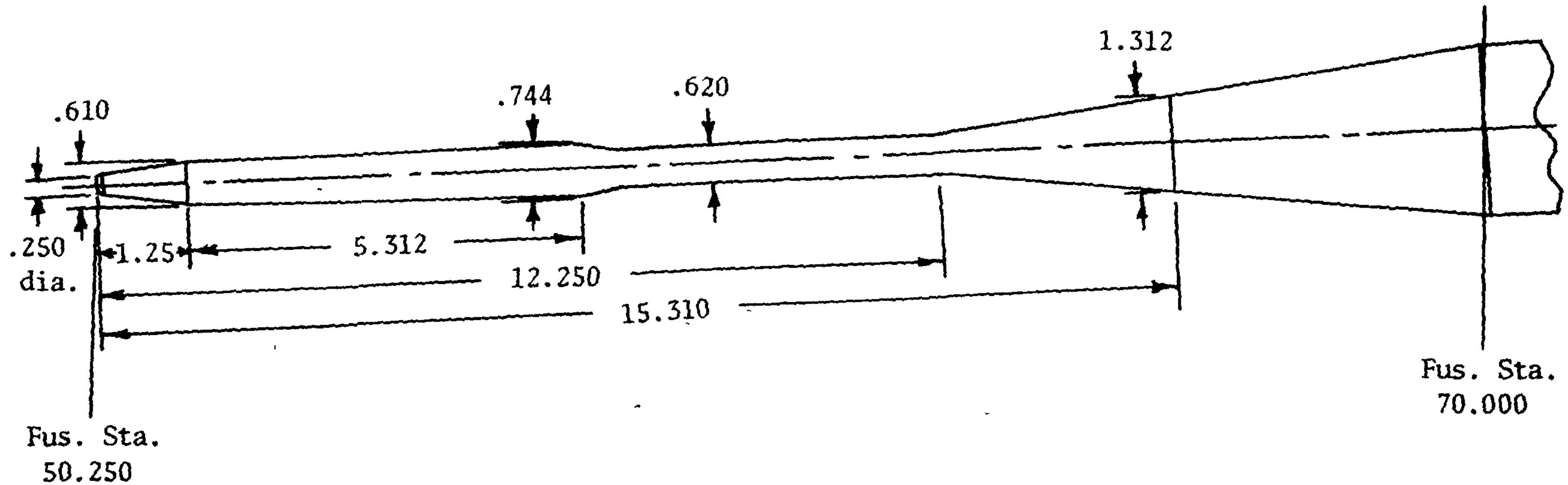
The bypass drag items discussed in the previous paragraph were determined for the nominal flight schedule indicated in figure 84. The corresponding estimated drag for these same items are tabulated in table 32 for the performance flight conditions of table 1.

The incremental drag due to boundary layer diverter flow which was not included in figure 85 data is presented in table 33 for the performance flight conditions.

Drags of the various external items were estimated using the NR Aerodynamic Manual and reference 13 as the primary source of data. In addition, the drag of the blade antennas was checked against test data contained in references 14 and 15. The drags of the temperature probes were obtained from Rosemount Engineering Company Bulletin Number 7597.

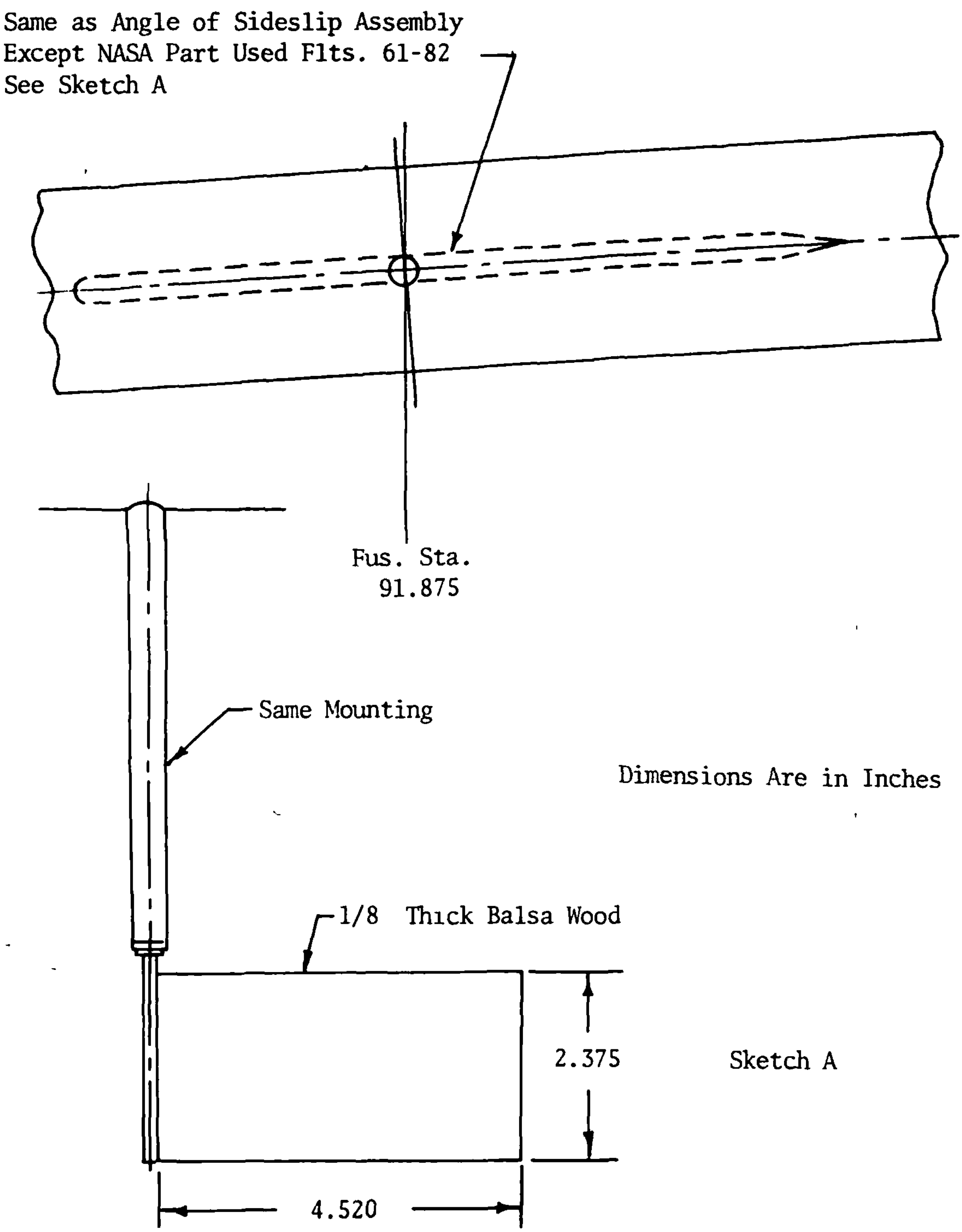
References 16 through 23 contain emperical equations from which the procedure for estimation of flow interaction was derived. This procedure provides an estimate of lift, drag, and pitching moment characteristics for both bypass and boundary layer bleed flow interaction with free stream. (Note that the drag discussed in this section is the result of interaction of exiting airflows mixing with the ambient air. Momentum losses are accounted for in the section entitled Internal Aerodynamics).

Dimensions Are in Inches



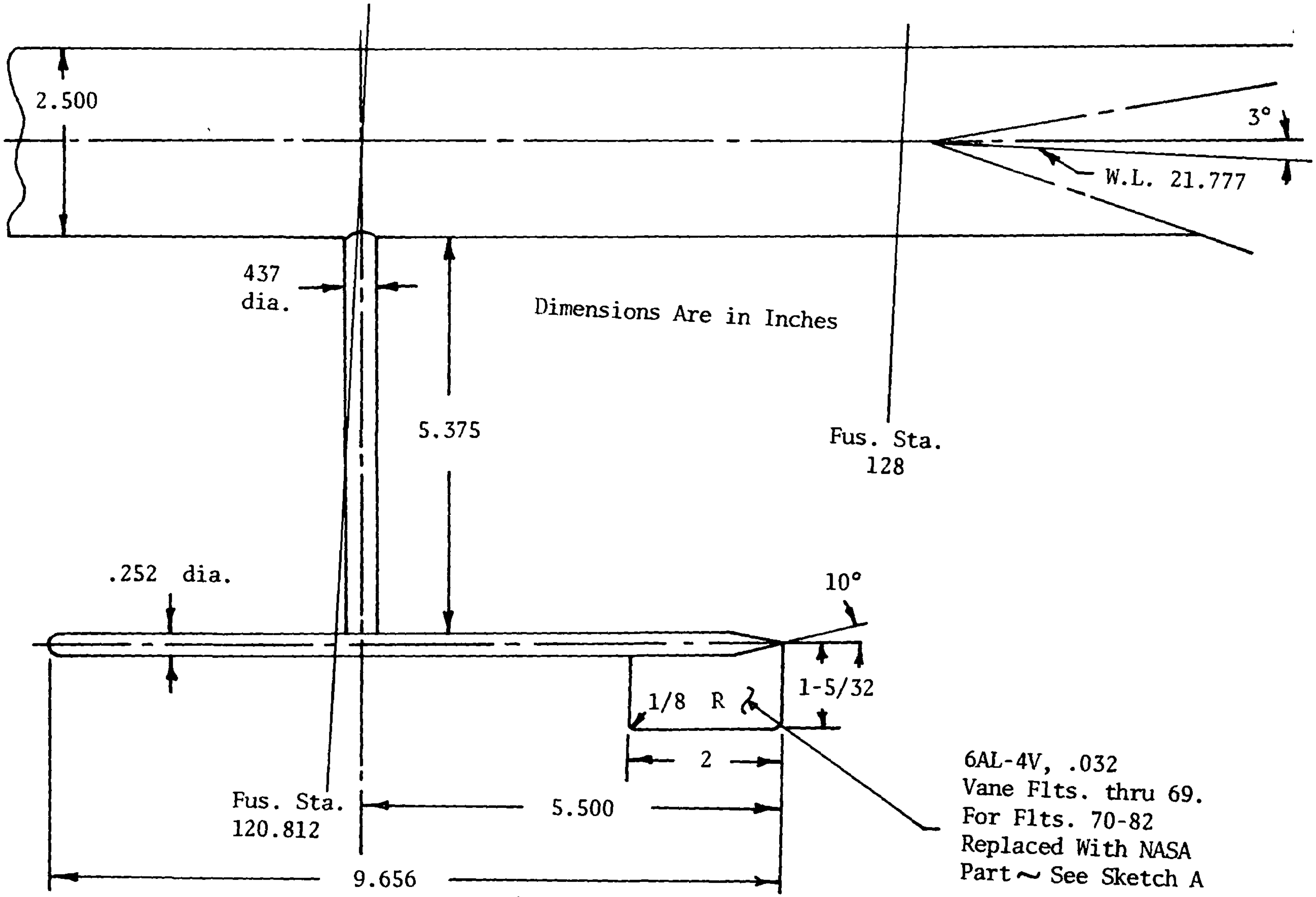
a) Pitot-Static Tube

Figure 62.- Nose boom details



b) Angle of Attack Vane Location

Figure 62.- Continued



c) Sideslip Vane Location

Figure 62.- Concluded

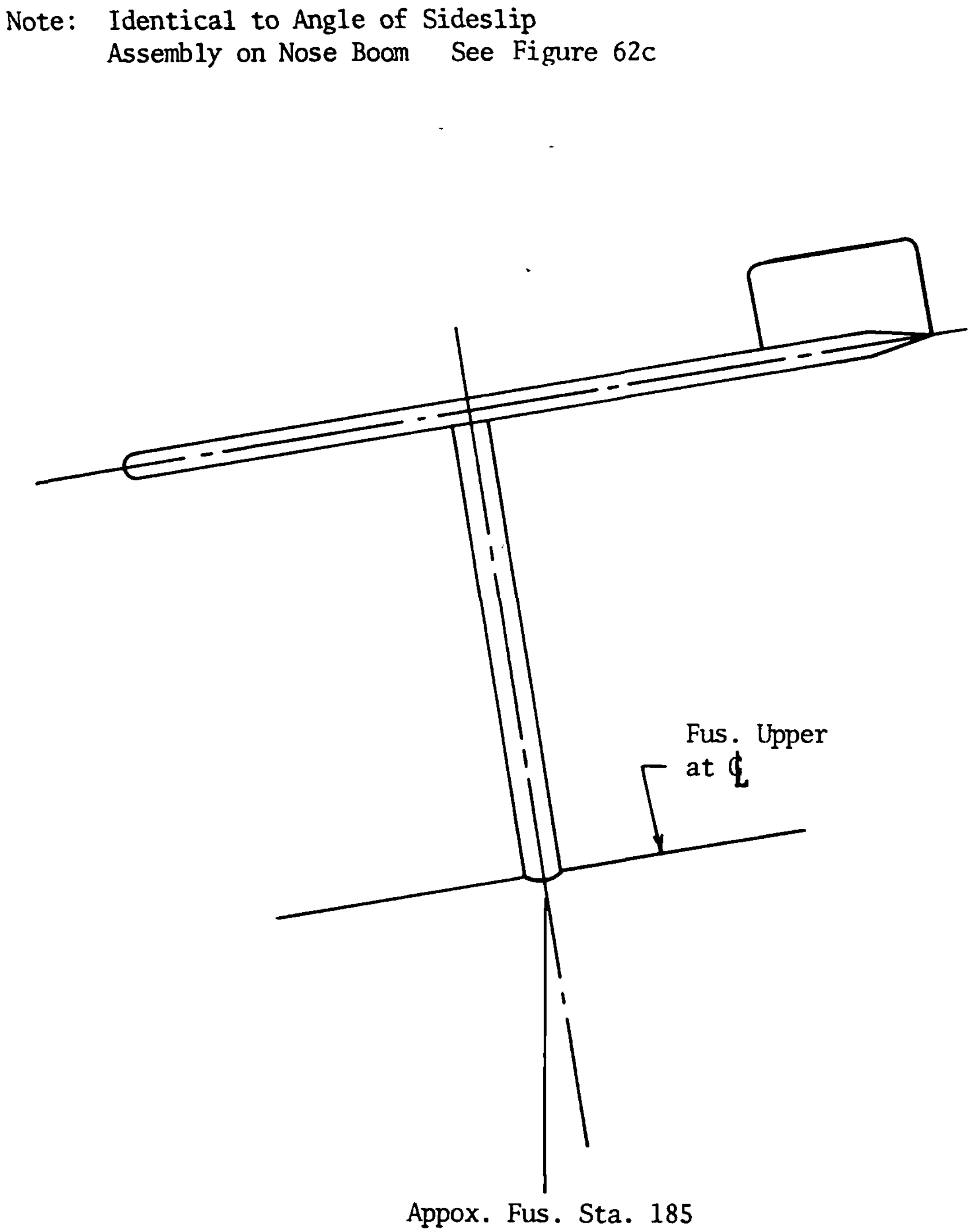


Figure 63.- Second (standby) angle of sideslip assembly

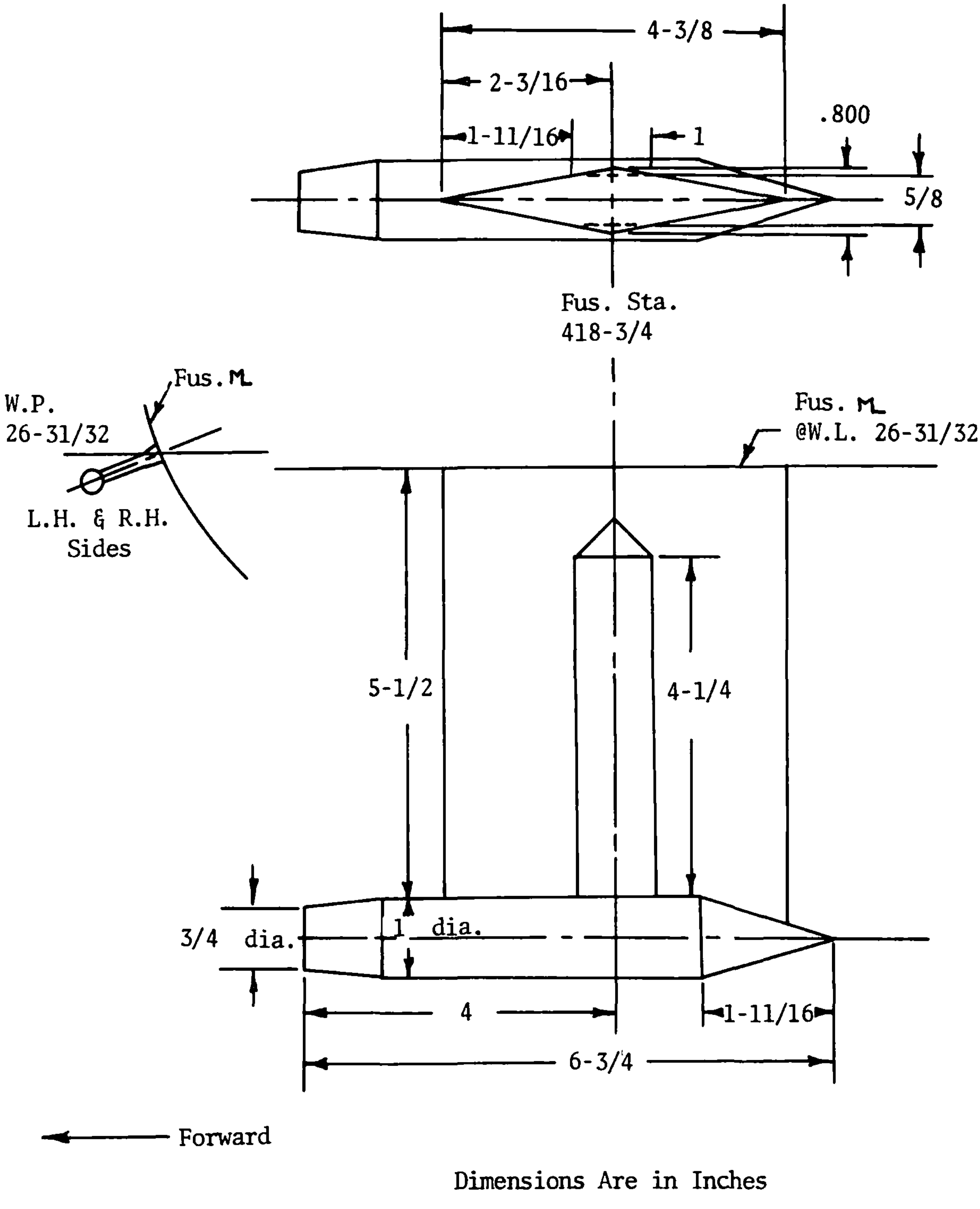


Figure 64.- Probe-total pressure (2)

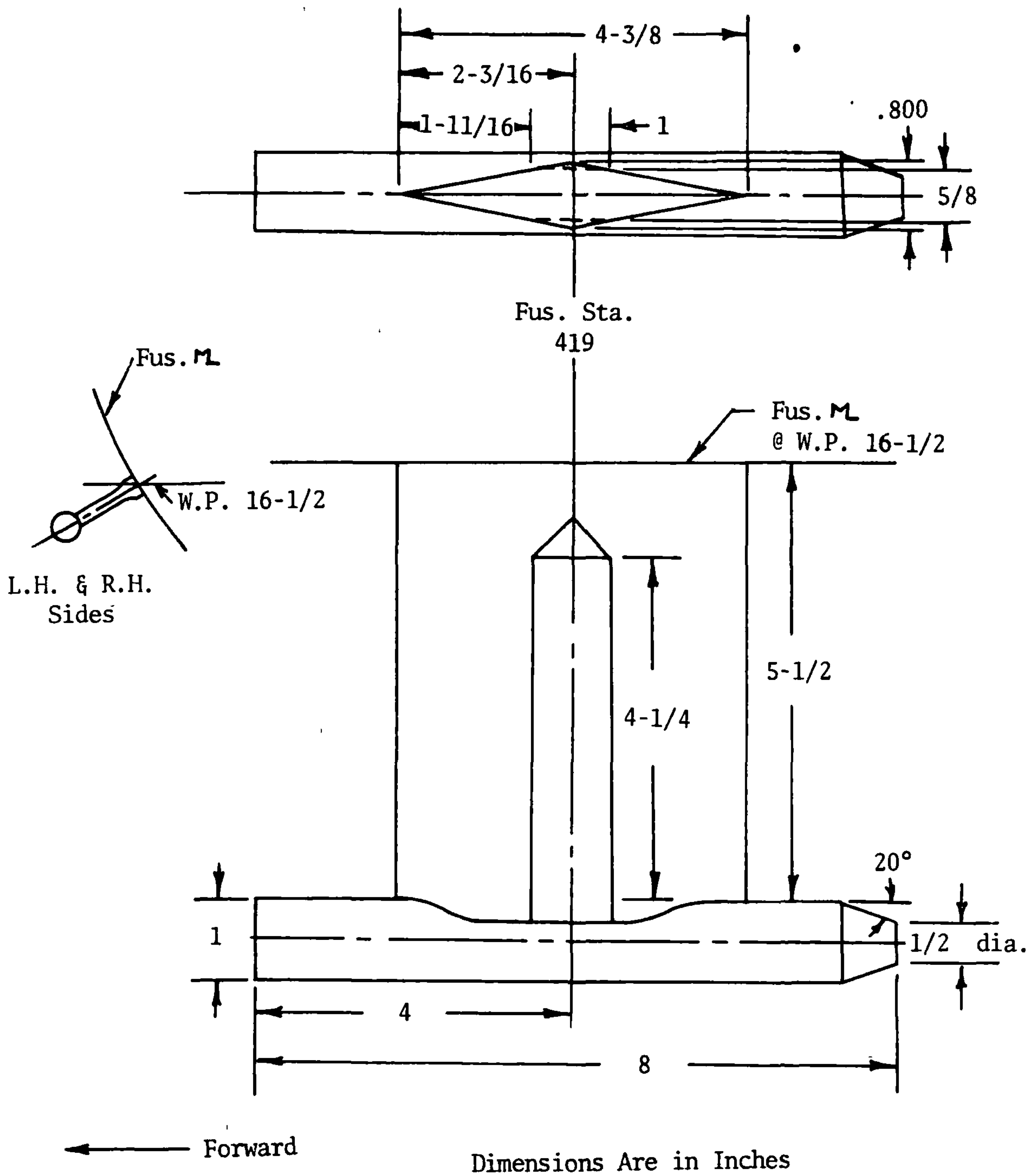


Figure 65. - Probe-static pressure (2)

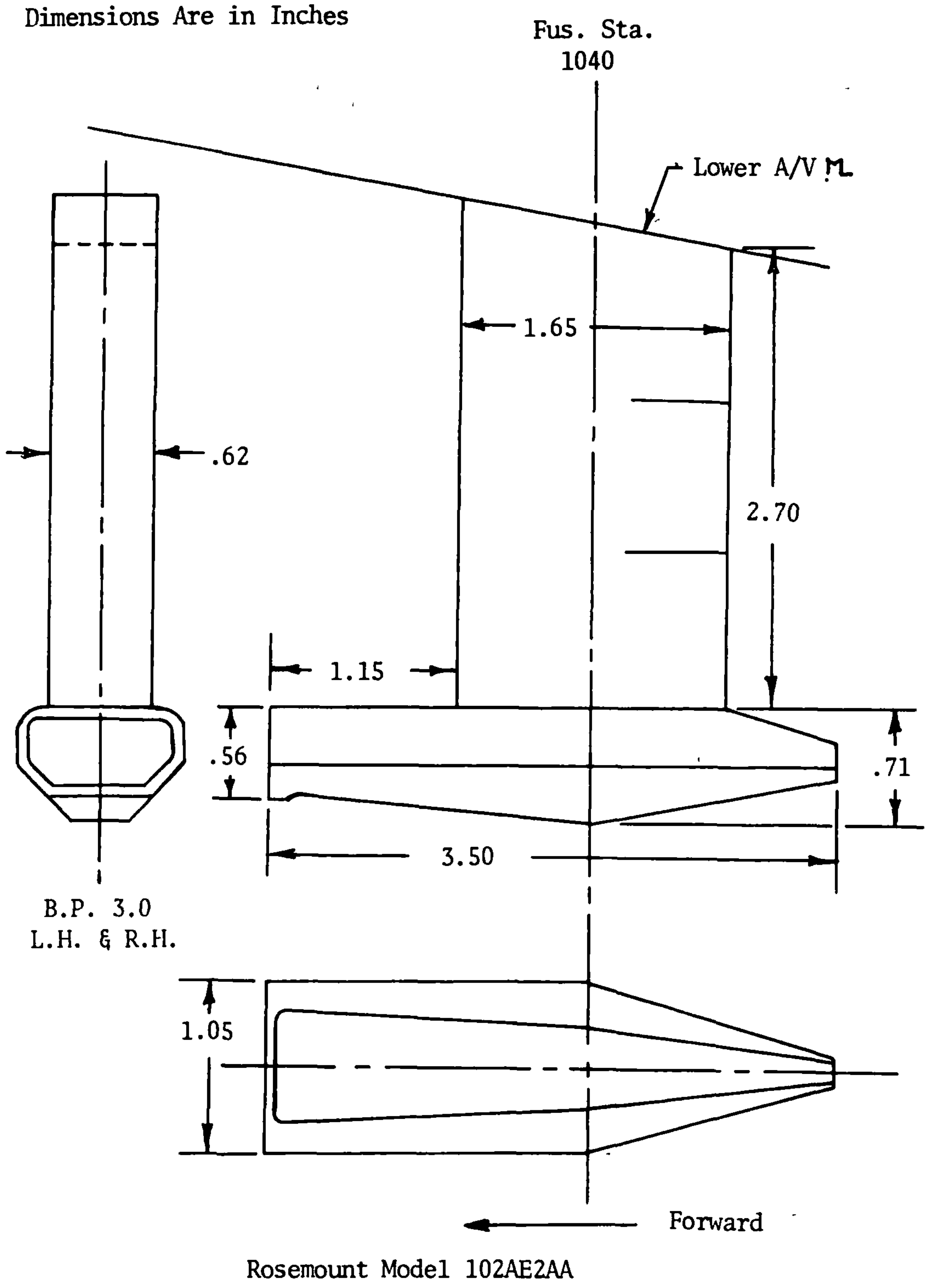
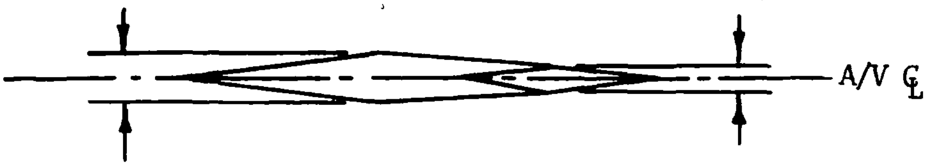
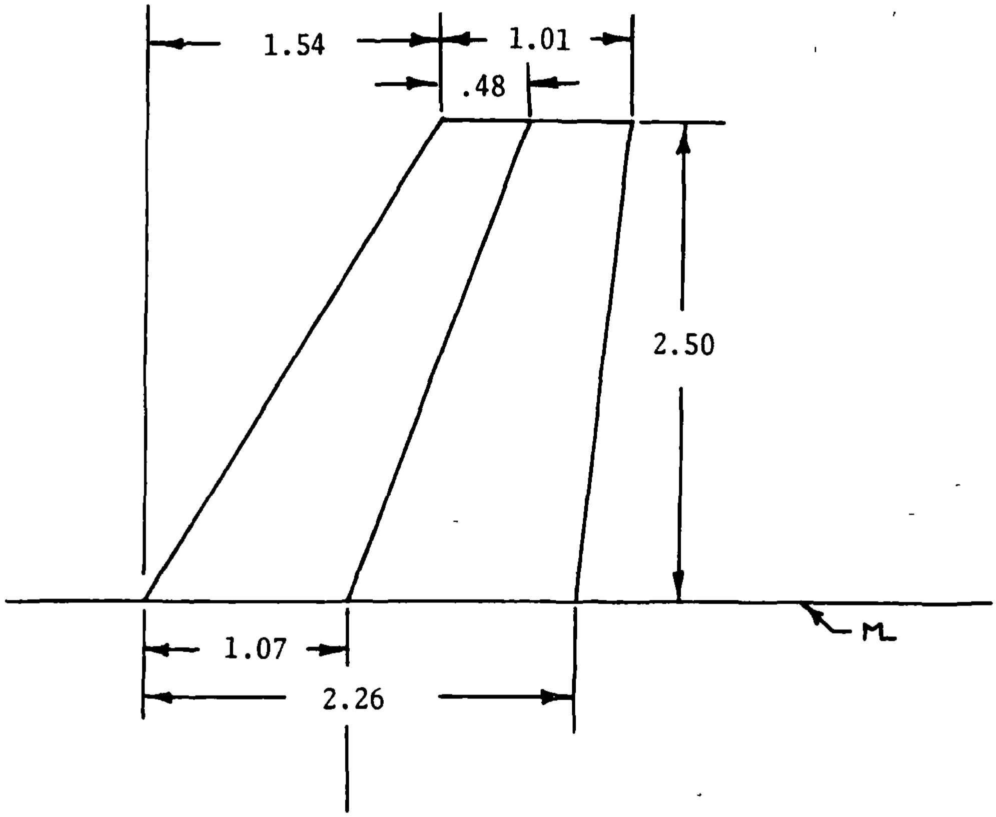


Figure 66.- Total temperature probes (2)



Dimensions Are in Inches



Fus. Sta. 655 Lower A/V ℄ A/G (IFF) Antenna
Fus. Sta. 637 Upper A/V ℄ A/G (IFF) Antenna
Fus. Sta. 550 Lower A/V ℄ Tacan Antenna
Fus. Sta. 800 Upper A/V ℄ Tacan Antenna

Figure 67.- IFF and TACAN antennas (2)

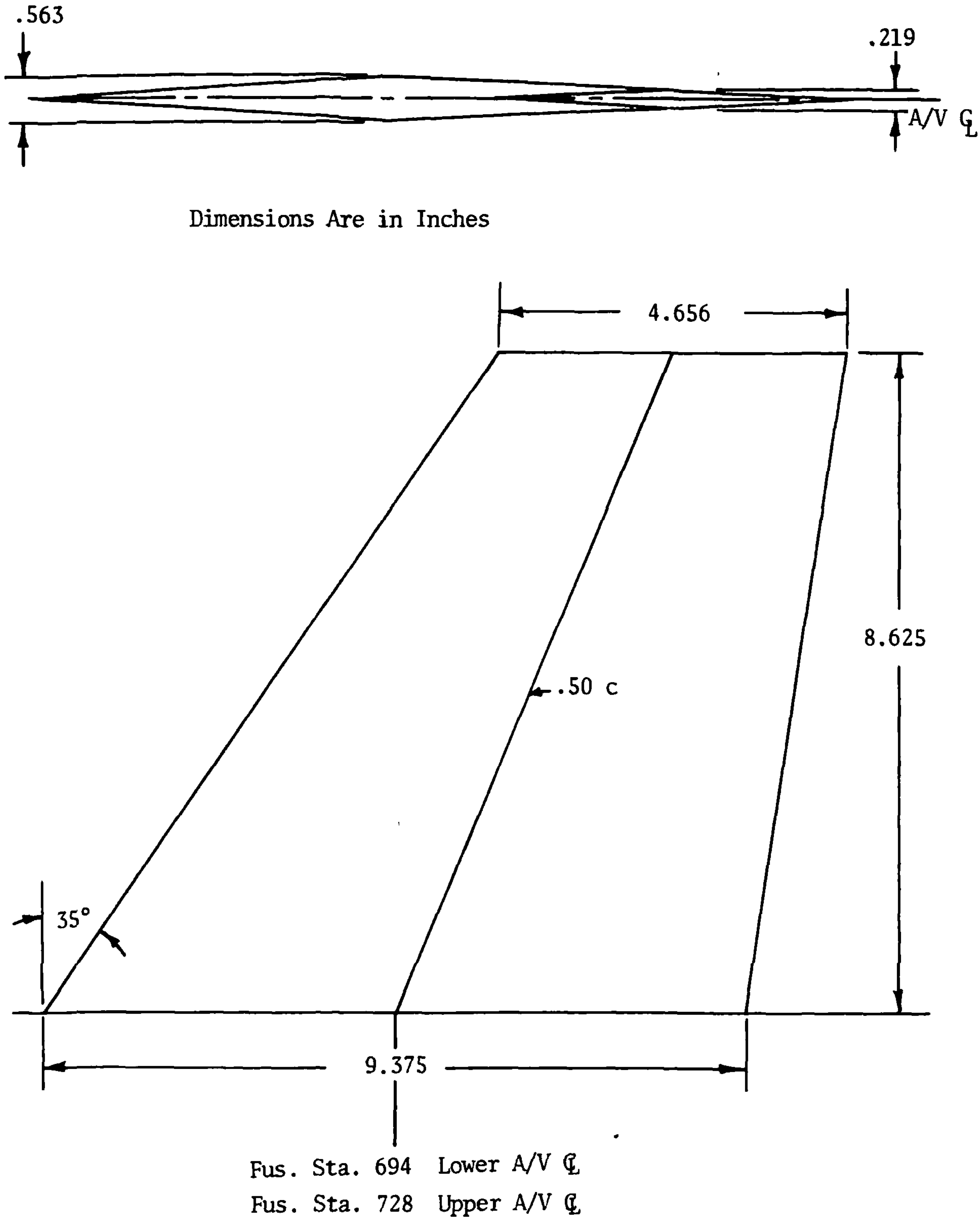


Figure 68.- UHF communications antennas (2)

Dimensions Are in Inches

1 @ Fus. Sta. 1350, B.P. 20, R.H.

2 @ Fus. Sta. 1576.5, B.P. 48.687, L.H. & R.H.

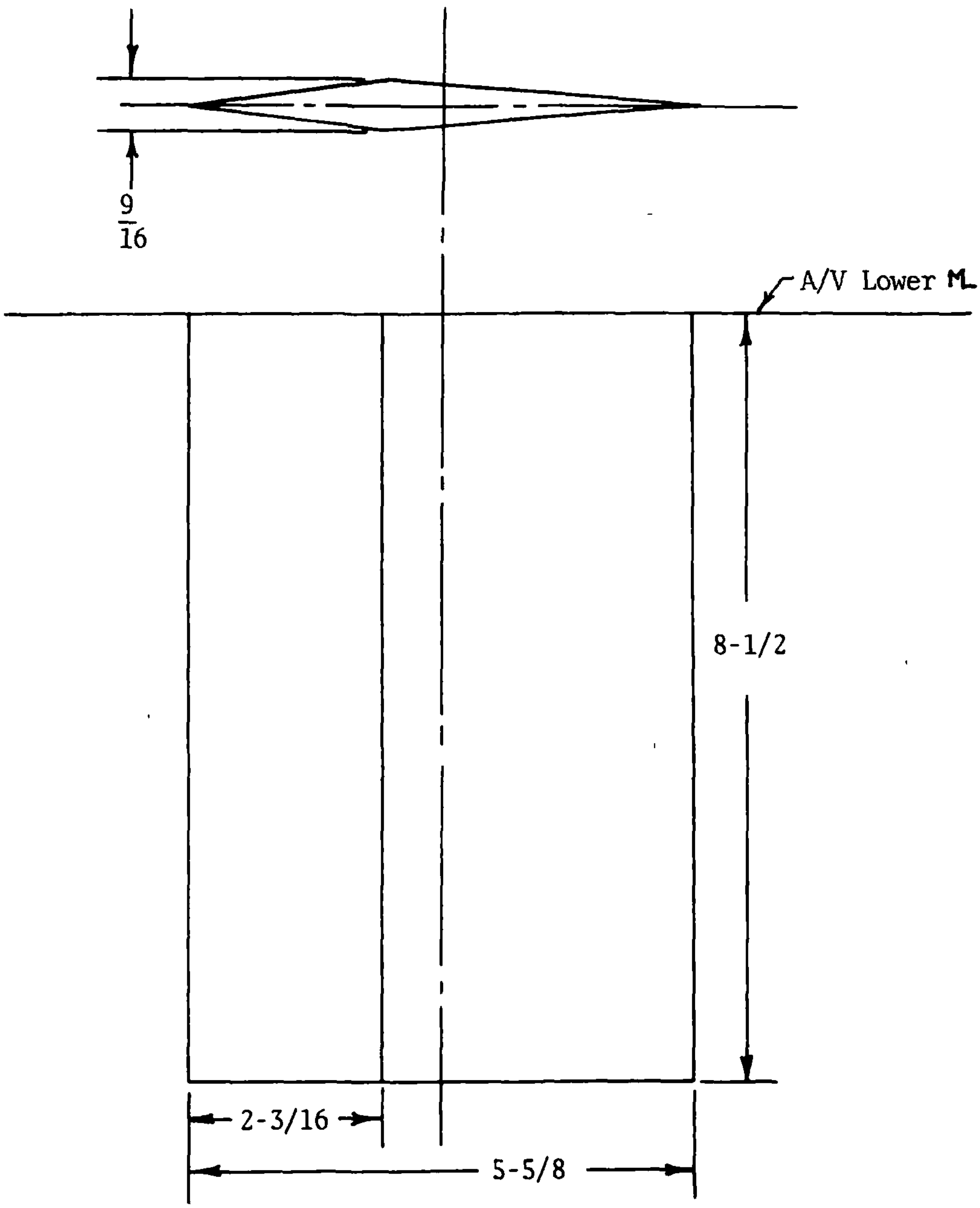


Figure 69. - Telemetry antennas (3)

Dimensions Are in Inches

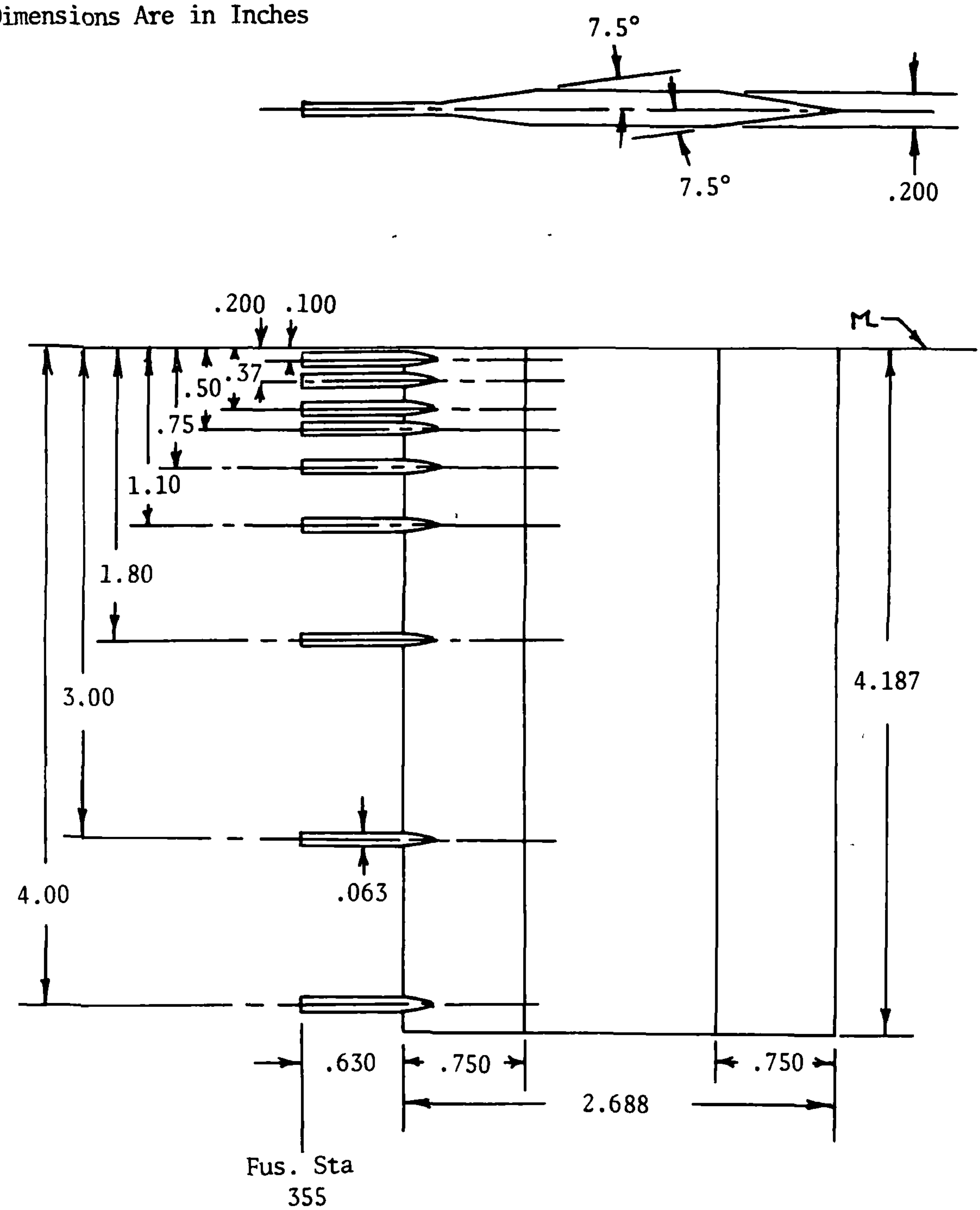


Figure 70.- Boundary layer rake, fuselage bottom ℄ , Flts. 63-74

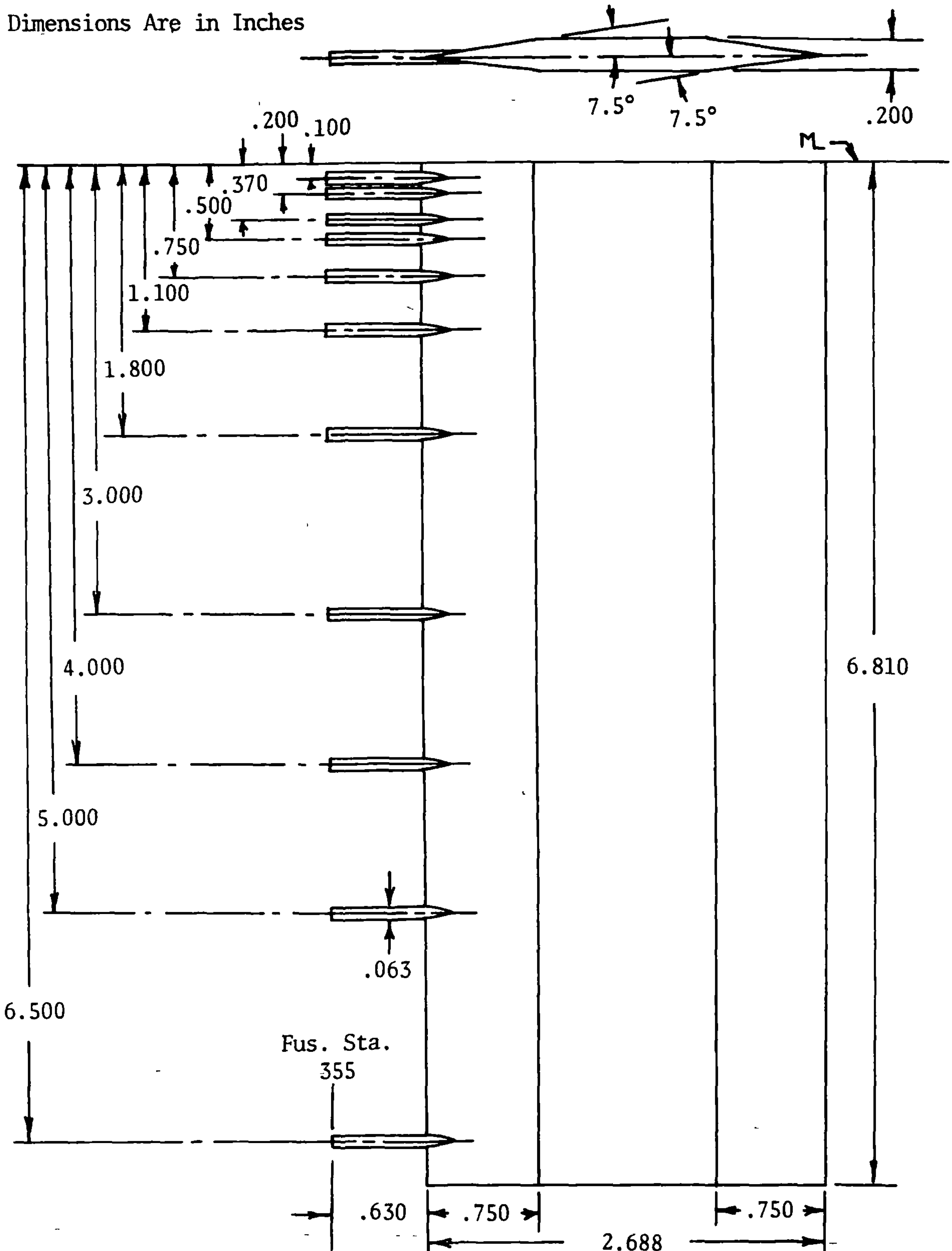


Figure 71.- Boundary layer rake, fuselage bottom ℄ , Flts. 74-82

Dimensions Are in Inches

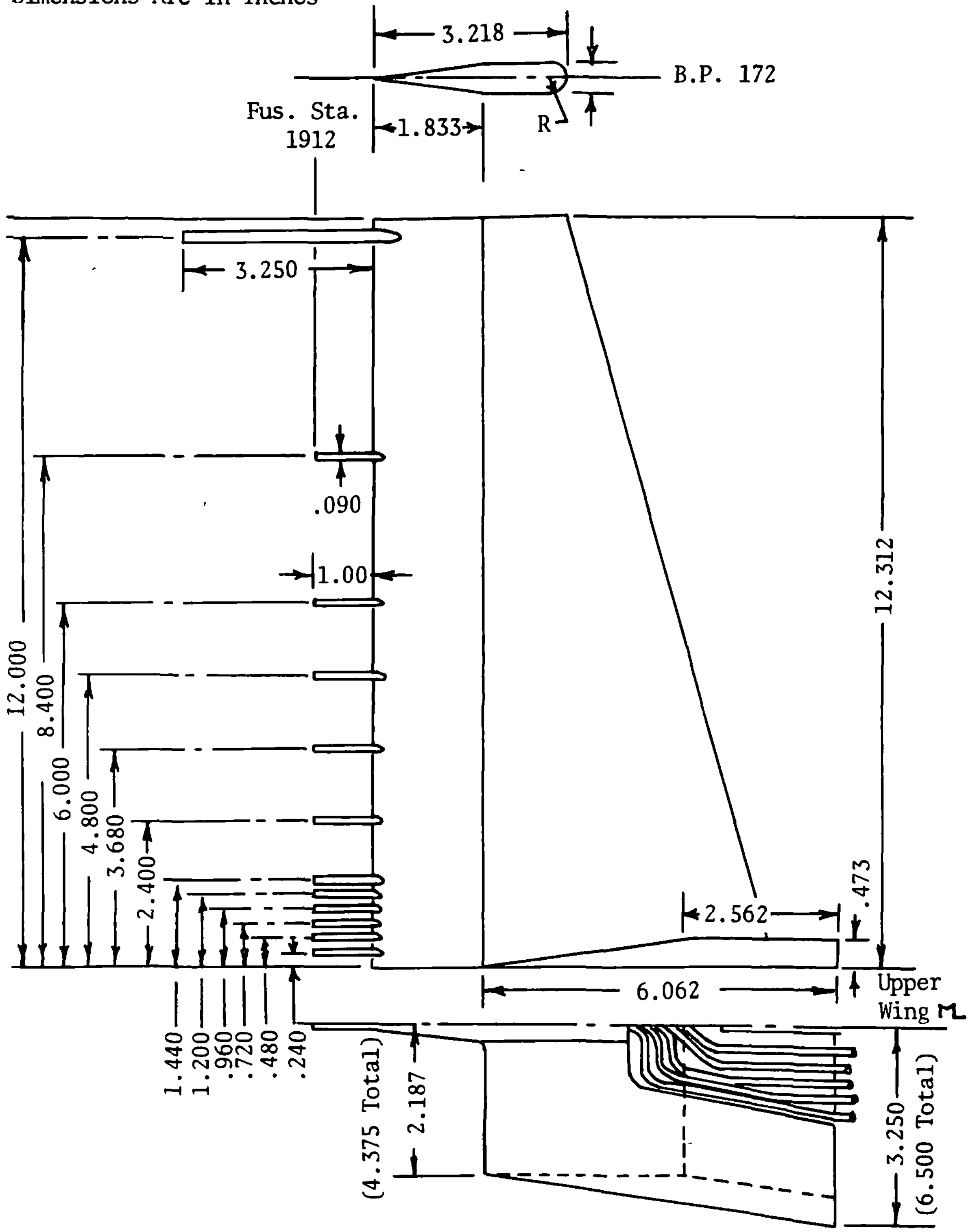


Figure 72.- Boundary layer rake, R.H. wing upper surface

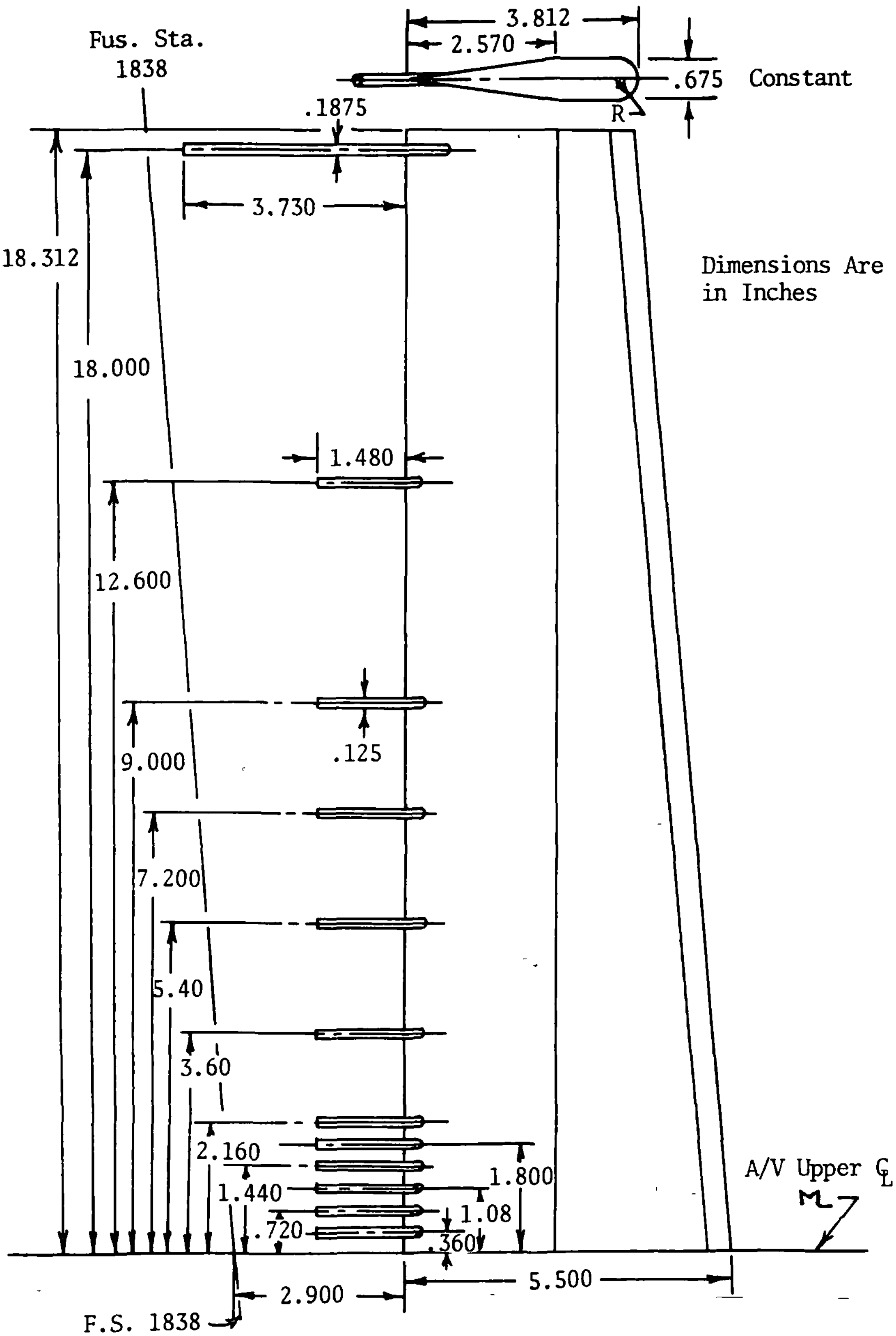


Figure 73. - Boundary layer rake, air vehicle upper ℄

Dimensions Are in Inches

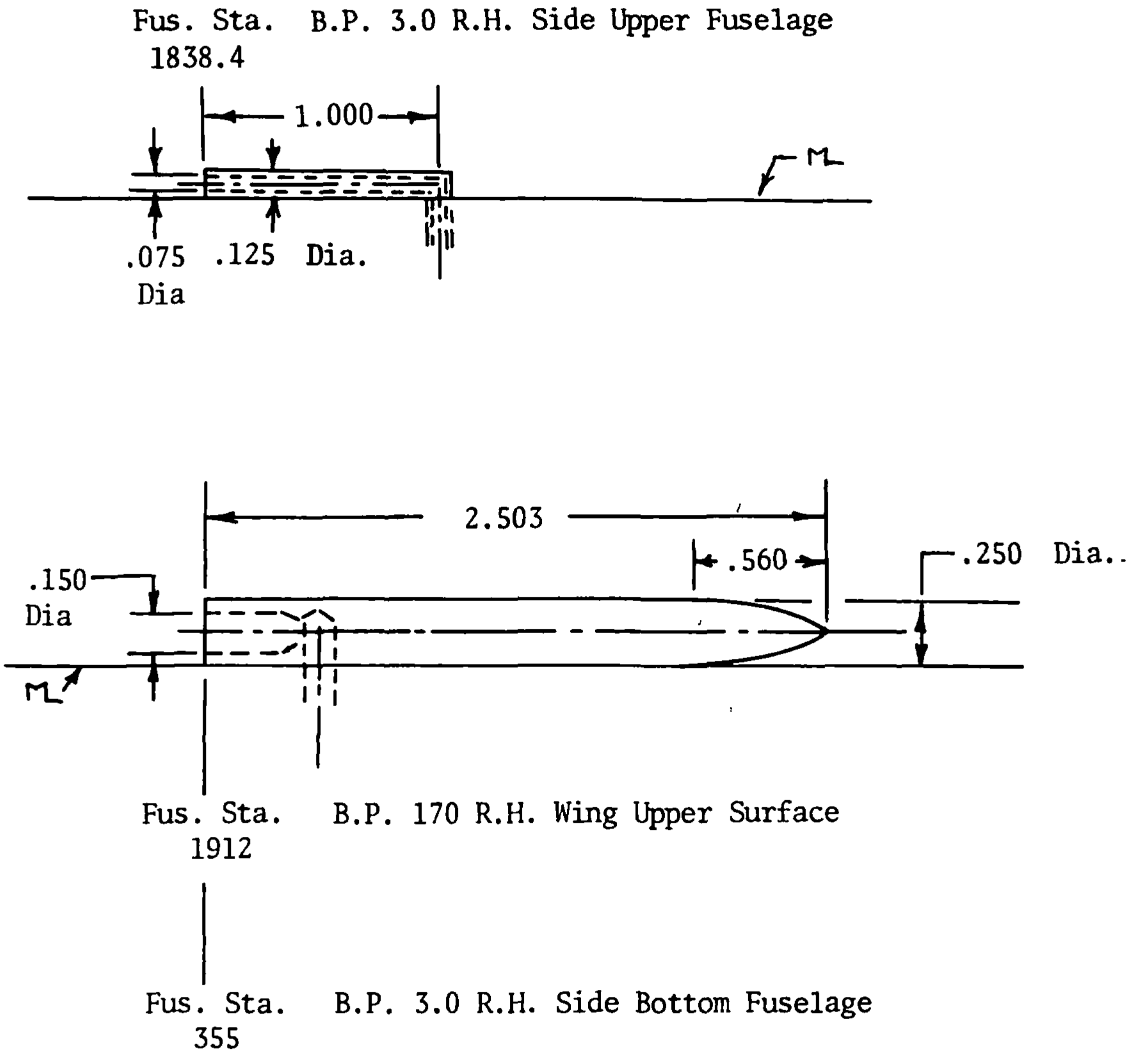


Figure 74.- Preston probes (3)

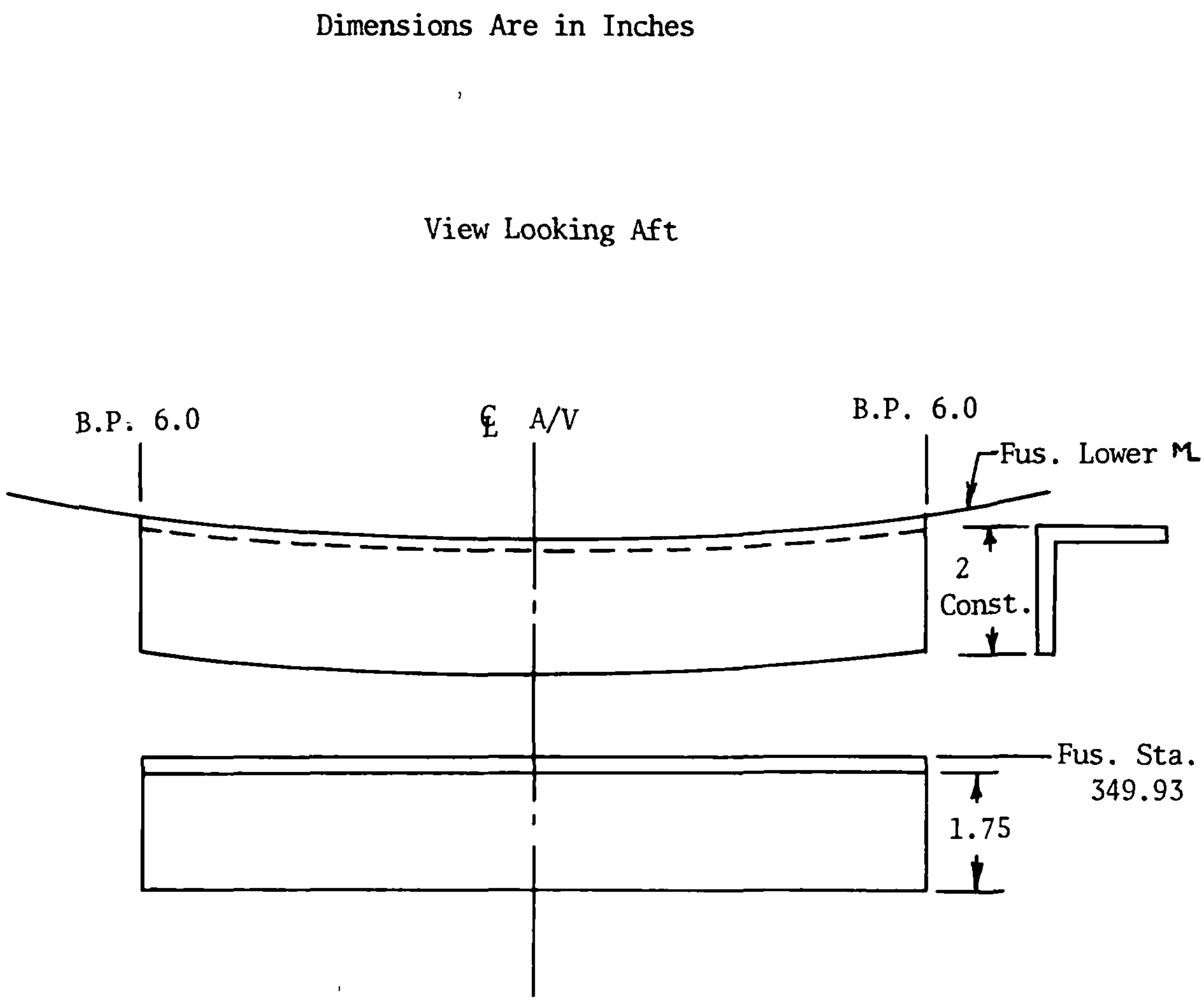


Figure 75. - Boundary layer separation wall, Flts. 74-75

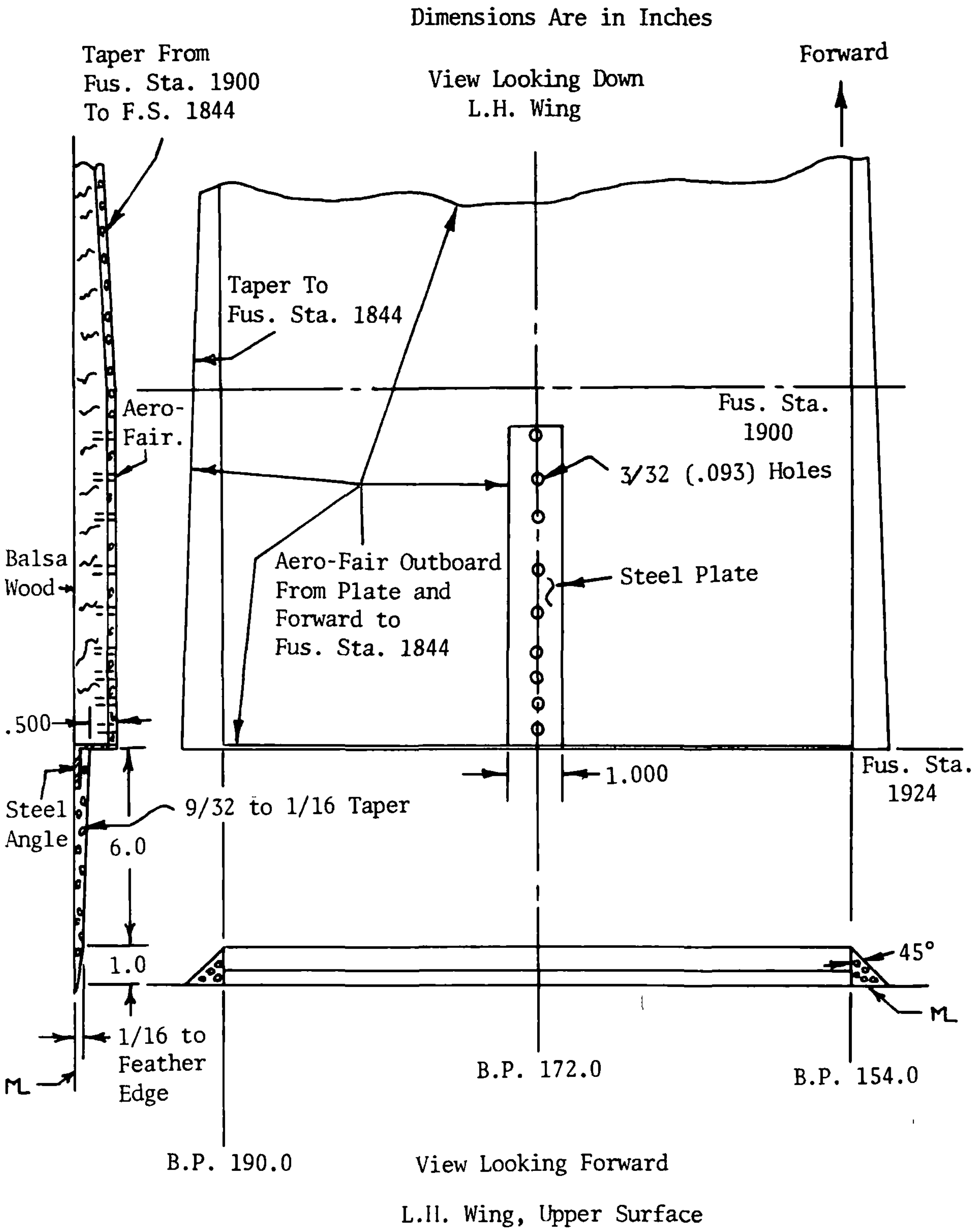
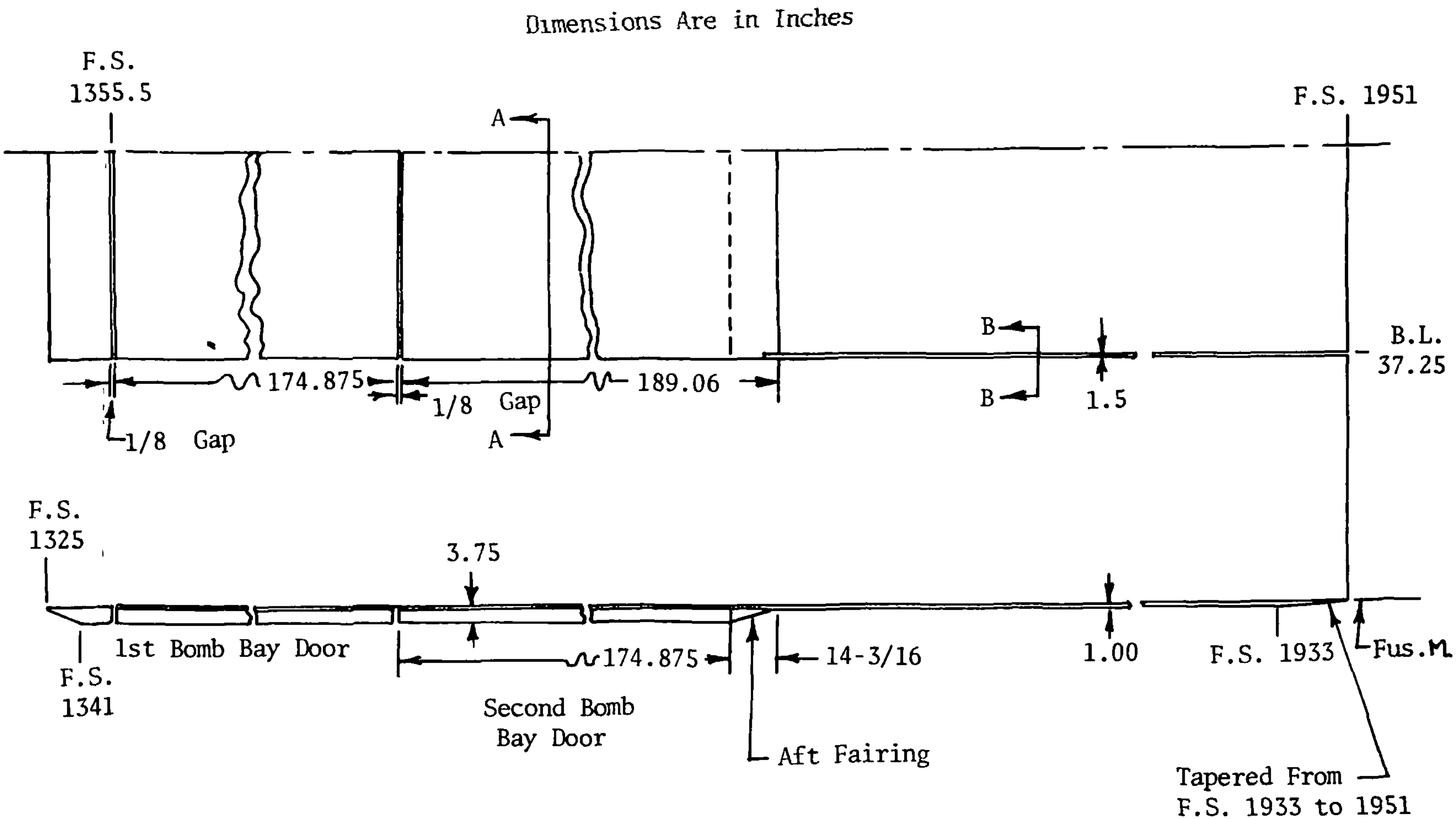


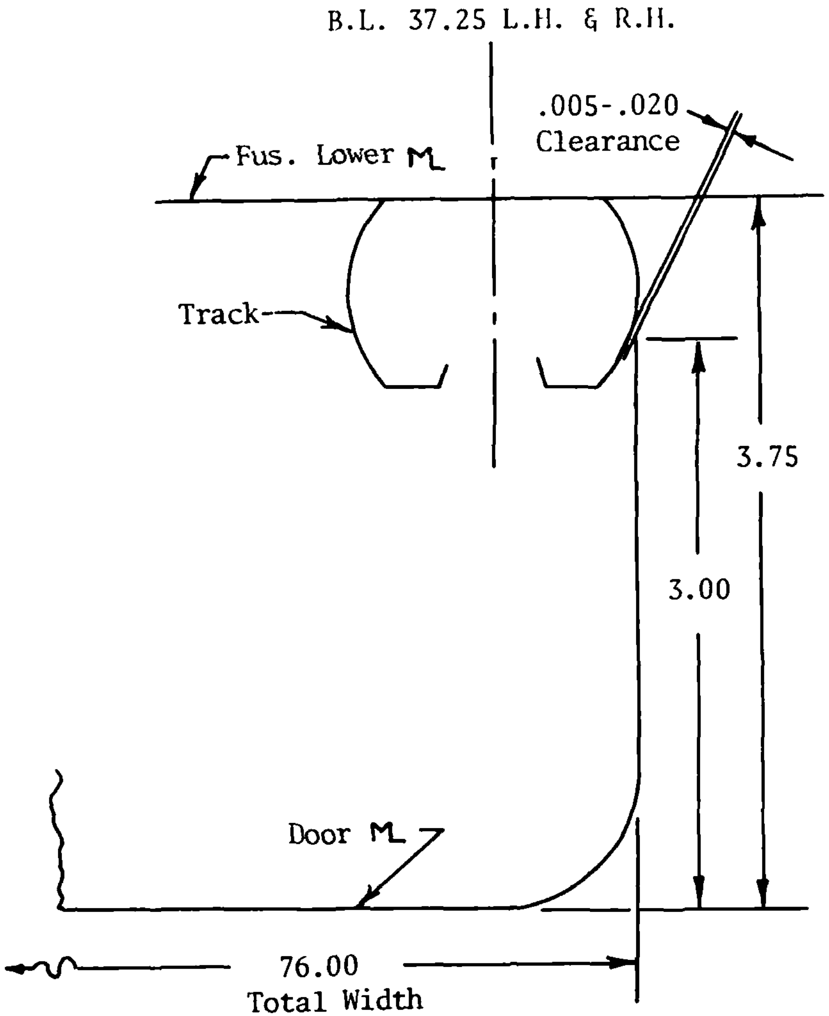
Figure 76.- Aft facing step, Flts. 79-82



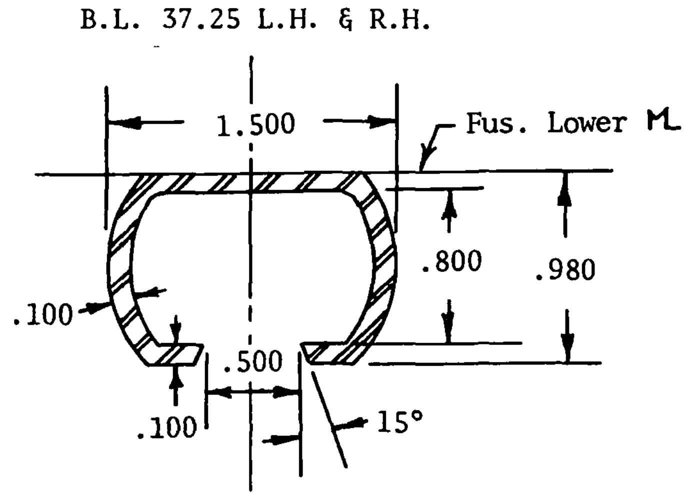
a) General Description

Figure 77.- Bomb bay doors and track

Dimensions Are in Inches



Section A-A
(Full Size)



Section B-B
(Full Size)

b) Details

Figure 77.- Concluded

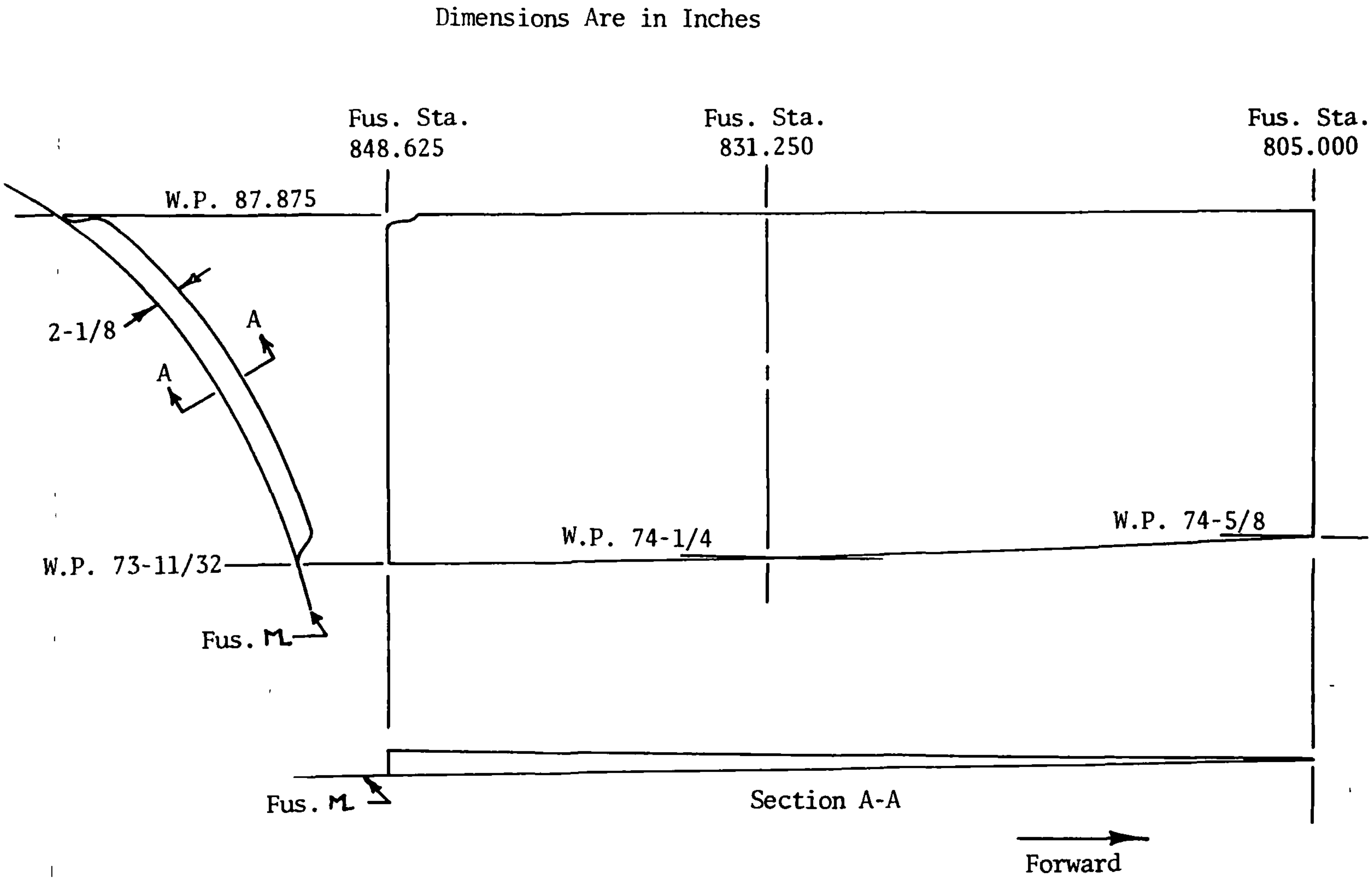


Figure 78.- Fairing-environment systems overboard outlet, right hand

Dimensions Are in Inches

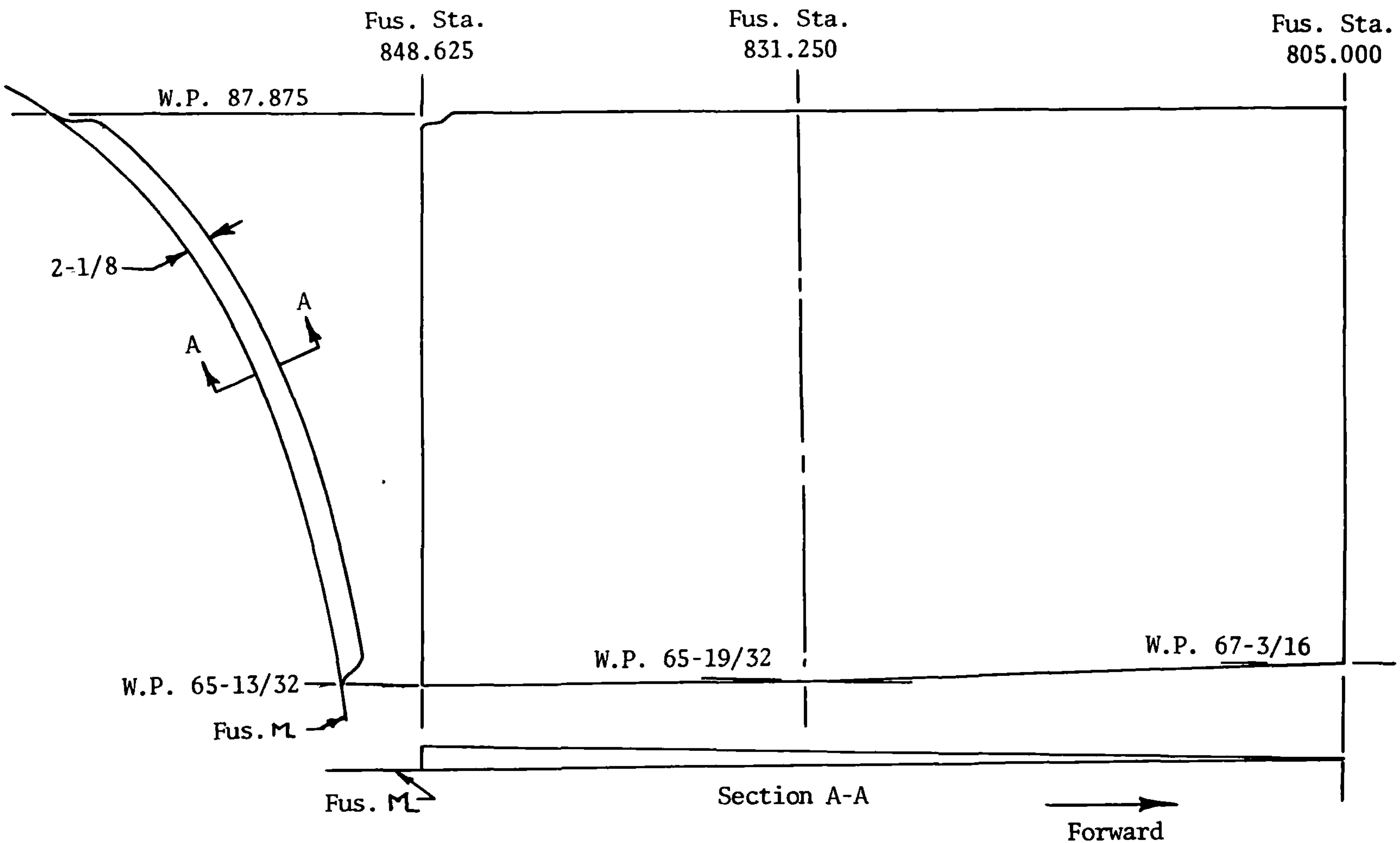


Figure 79.- Fairing-environment systems overboard outlet, left hand

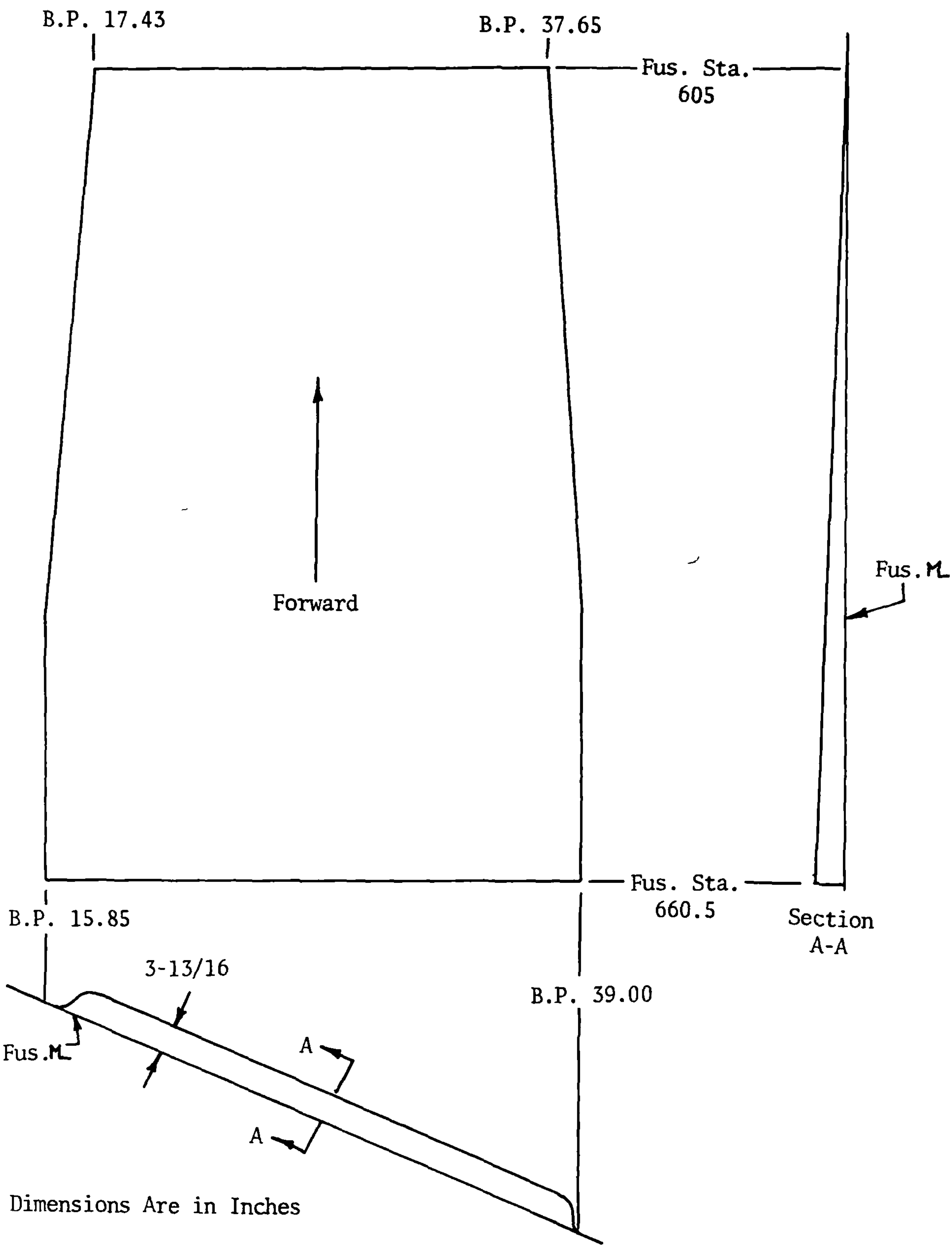


Figure 80.- Fairing, duct-safety valve overboard dump

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Figure 81 Cover assembly – fuselage, complete

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[redacted]

25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15

[redacted]

Next page is:

Figure 81 – Concluded

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DRAWINGS REFERENCED ABOVE ARE THE SEPARATE COVER INSTALLATION DWGS OF THE INDIVIDUAL SECTIONS OF THE FUSELAGE AS INDICATED.

4. ACCESS DOORS ATTACHED BY THE USE OF LD 111-0018 OR LD 112-0041 TAPERED ALIGNING BOLTS MUST BE INSTALLED SO THAT THE BOLTS ARE INSERTED IN A PROGRESSIVE MANNER WITHOUT REGARD TO A SET INDEXING POINT SO AS TO REMOVE STRUCTURAL DROOP ACROSS THE ACCESS OPENING.

3. ALL DOORS SHOWN ARE ON BOTH LH & RH SIDES OF FUSELAGE UNLESS OTHERWISE INDICATED.

2. DOORS USAGES INDICATED AND IDENTIFICATION NUMBERS ARE PER MARKINGS DRAWINGS NO'S 259-000010, 259-000011 EXCEPT AS CODED THUS: (3)

1. DOORS REFERENCED ARE APPLICABLE TO A/V'S 1, 2 & 3 EXCEPT AS CODED THUS:
(1) A/V NO. 1 ONLY
(2) A/V NO. 2 & SUBS

NOTE:

QTY REQD	QTY REQD	PART NUMBER	DESC.	MATERIAL	SIZE	ZONE	MATL SPEC	LINE
								014
								013
								012
								011
								010
								009
								008
								007
								006
								005
								004
								003
	1	259-300600	FUSELAGE			4		002
		259-310000	ASSEMBLY					001

LIST OF MATERIAL

QTY PER END ITEM	USED ON	NEXT ASSY
1	XB-70	259-300000

APPLICATION

FASTENER CODING

(1) DASH NUMBERS FOR RIVET DIA, LENGTH, OR GRIP ARE OBTAINED FROM RIVET DRAWINGS.
(2) MANUFACTURED RIVET HEADS ARE UNDERSTOOD TO BE ON THE NEAR SIDE OF THE DRAWING, UNLESS AN "F" IS SHOWN IN THE NORTHEAST QUADRANT OF THE CODE. SHEETS ARE NUMBERED AWAY FROM THE MANUFACTURED HEAD, SHEET ONE BEING ADJACENT TO THE HEAD.
(3) FLUSH RIVETING OPERATIONS
D - DIMPLE SHEET 1; C - COUNTERSINK SHEET 1
D2 - DIMPLE SHEET 1 & 2; DC - DIMPLE SHEET 1; SUB-COUNTERSINK SHEET 2
D3 - DIMPLE SHEET 1, 2, & 3; D2C - DIMPLE SHEETS 1, & 2; SUB-COUNTERSINK SHEET 3
D4 - DIMPLE SHEET 1, 2, 3, & 4; D3C - DIMPLE SHEETS 1, 2 & 3; SUB-COUNTERSINK SHEET 4

CONVENTIONAL AND BLIND RIVETS SHALL BE INSTALLED PER NAA SPECIFICATION LA 0101-004.
HI-SHEAR RIVETS, BOLTS, NUTS, SCREWS AND STUDS SHALL BE INSTALLED PER NAA SPECIFICATION LA 0101-001.

DRILLED HOLE TOLERANCES
.040 TO .1285 +.002 -.001
.136 TO .228 +.003 -.001
.234 TO 1/2 +.004 -.001
33/64 TO 3/4 +.005 -.001
49/64 TO 1 +.007 -.001
1-1/64 TO 2 +.010 -.001

TOLERANCES EXCEPT AS NOTED: ANGLES ±1/2°, FRACTIONS ±1/32, DECIMALS ±.010
SURFACE ROUGHNESS PER MIL-STD-10 (FA5-219)
HEAT TREAT
FINISH 259-000024
INSPECT PER MIL-I-6870, LA 0601-007 CLASS 1

DATE 10-5-60
DR BY BAUGHMAN
CHK BY WASELUK 10-6-60
APPD BY J.W.
APPD BY W.D. MOCK
PERSP E. WILLES

COVER ASSEMBLY - FUSELAGE, COMPLETE (PERSP.)

NORTH AMERICAN AVIATION, INC.
ENGINEERING
INTERNATIONAL AIRPORT
LOS ANGELES 9, CALIF.

DWG. SIZE J | CODE IDENT 43999 | 259-310000 | SHEET 1 OF 1 | SCALE NONE | WT

[redacted] [redacted]

NORTH AMERICAN ROCKWELL CORPORATION
LOS ANGELES DIVISION

TABLE 31.- MISCELLANEOUS EXTERNAL DRAG ITEMS

Item	Factor	ΔC_D									
		Mach No.									
		0	.4	.8	1.1	1.2	1.6	2.0	2.4	2.8	3.0
Nose Boom	$x10^5$	.1000	.0995	.0942	.089	.0873	.0807	.0746	.0690	.0640	.0617
2 UHF Antennas	$x10^5$	.145	.145	.147	.575	.584	.530	.482	.450	.428	.420
2 Tacan/IFF Antennas	$x10^6$	.450	.443	.430	.863	.840	.700	.580	.505	.465	.450
Temp. Probe	$x10^5$	.110	.127	.225	.300	.303	.267	.243	.225	.211	.204
Wing Tip Lights	$x10^5$	0	0	0	.027	.040	.076	.096	.106	.109	.113
Anti-collision Lights	$x10^4$	.084	.084	.113	.166	0	0	0	0	0	0
Surface Imperfections	$x10^5$	.86	.86	.86	.86	.86	.86	.86	.86	.86	.86
IR Domes	$x10^4$	0	0	0	.087	.113	.128	.115	.108	.106	.105
Lower Fwd. Protuberance	$x10^3$	0	0	0	.1100	.071	.046	.040	.0355	.032	.030
Bomb Bay Rails	$x10^4$	.135	.135	.135	.135	.135	.135	.135	.135	.135	.135
Fuel Vents	$x10^5$	.05	.05	.05	.05	.05	.05	.05	.05	.05	.05
De-icing Ducts	$x10^5$	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06
Environ. System Fixed Outlets	$x10^4$	.10	.10	.10	.75	.70	.35	.27	.20	.15	.13
Total	$x10^3$	.0456	.0458	.0496	.2443	.1865	.1272	.1035	.0985	.0894	.0851

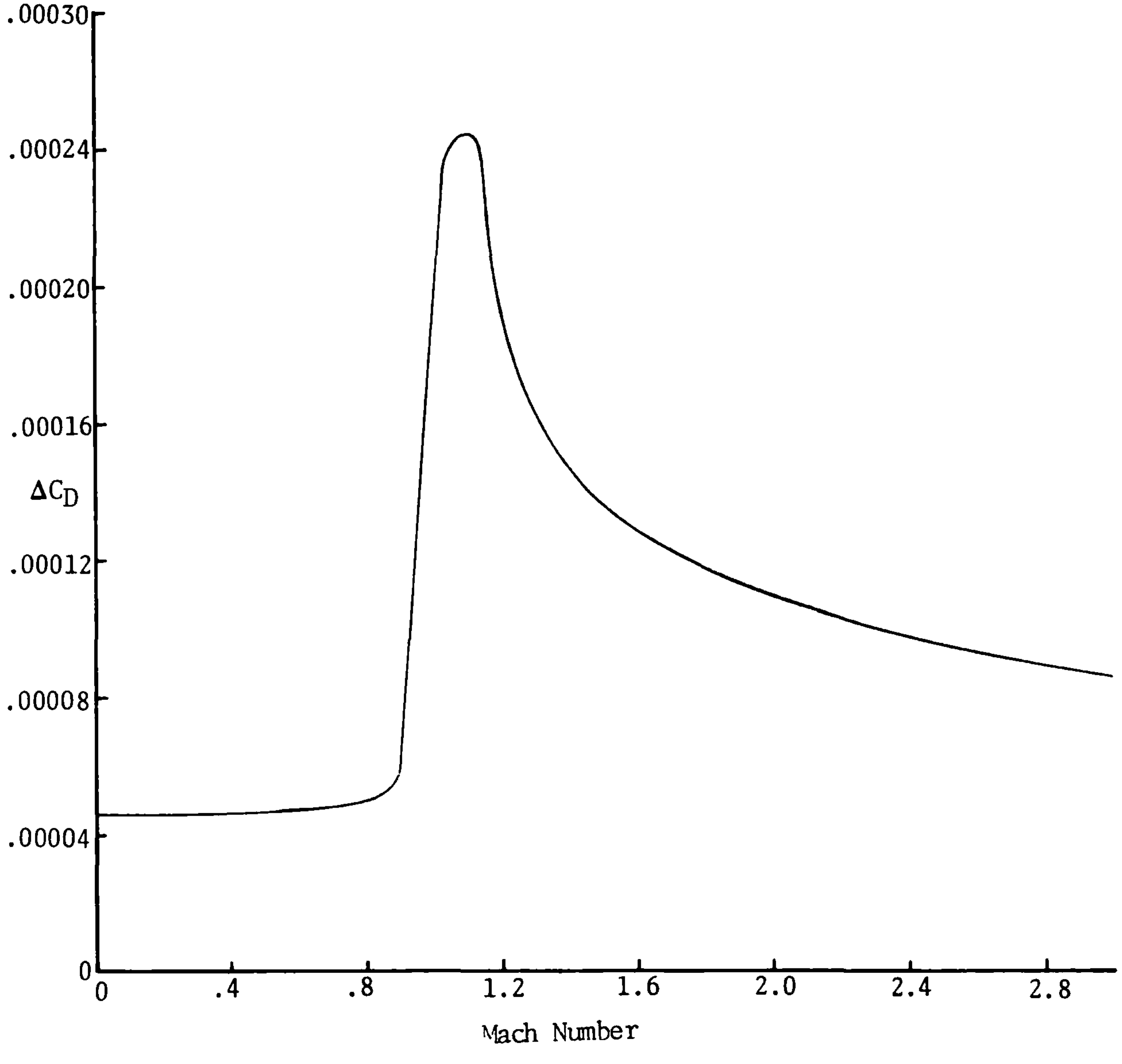
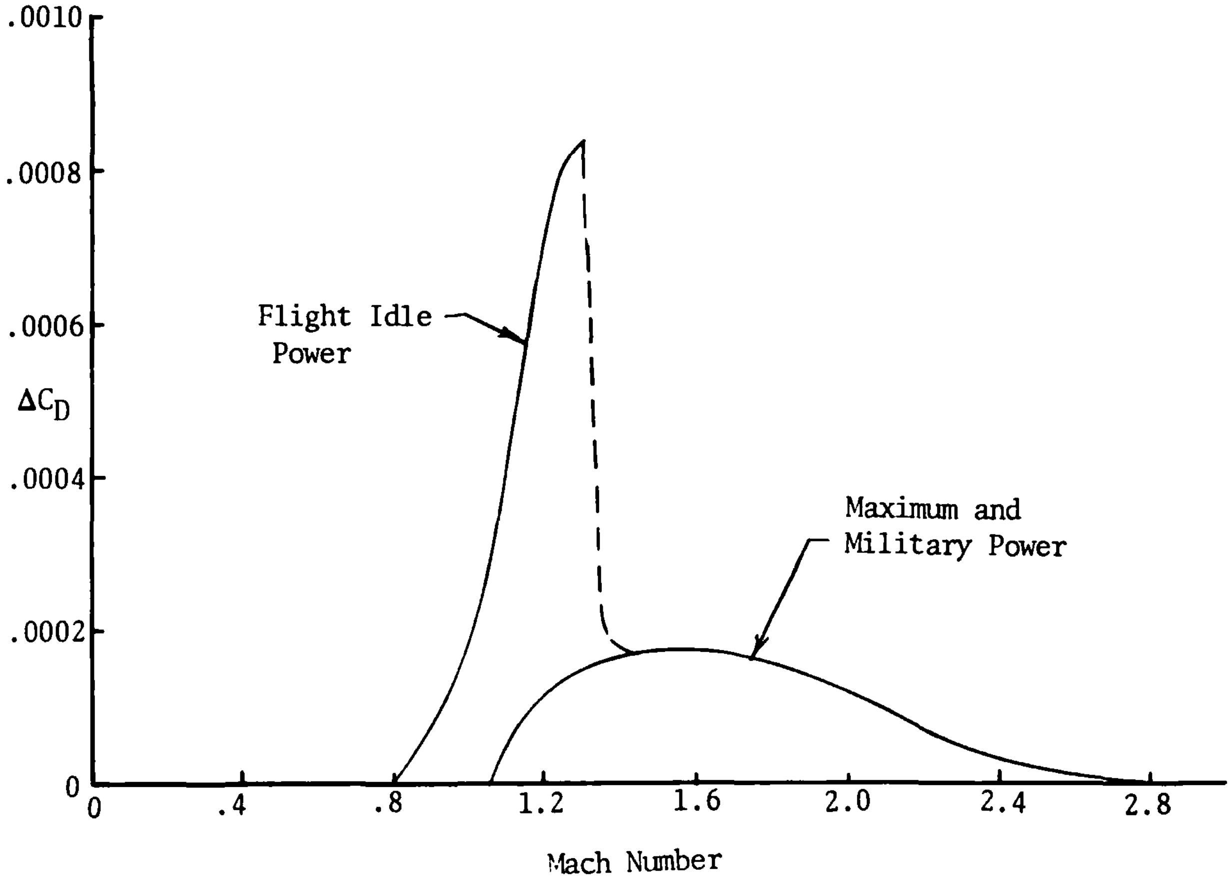
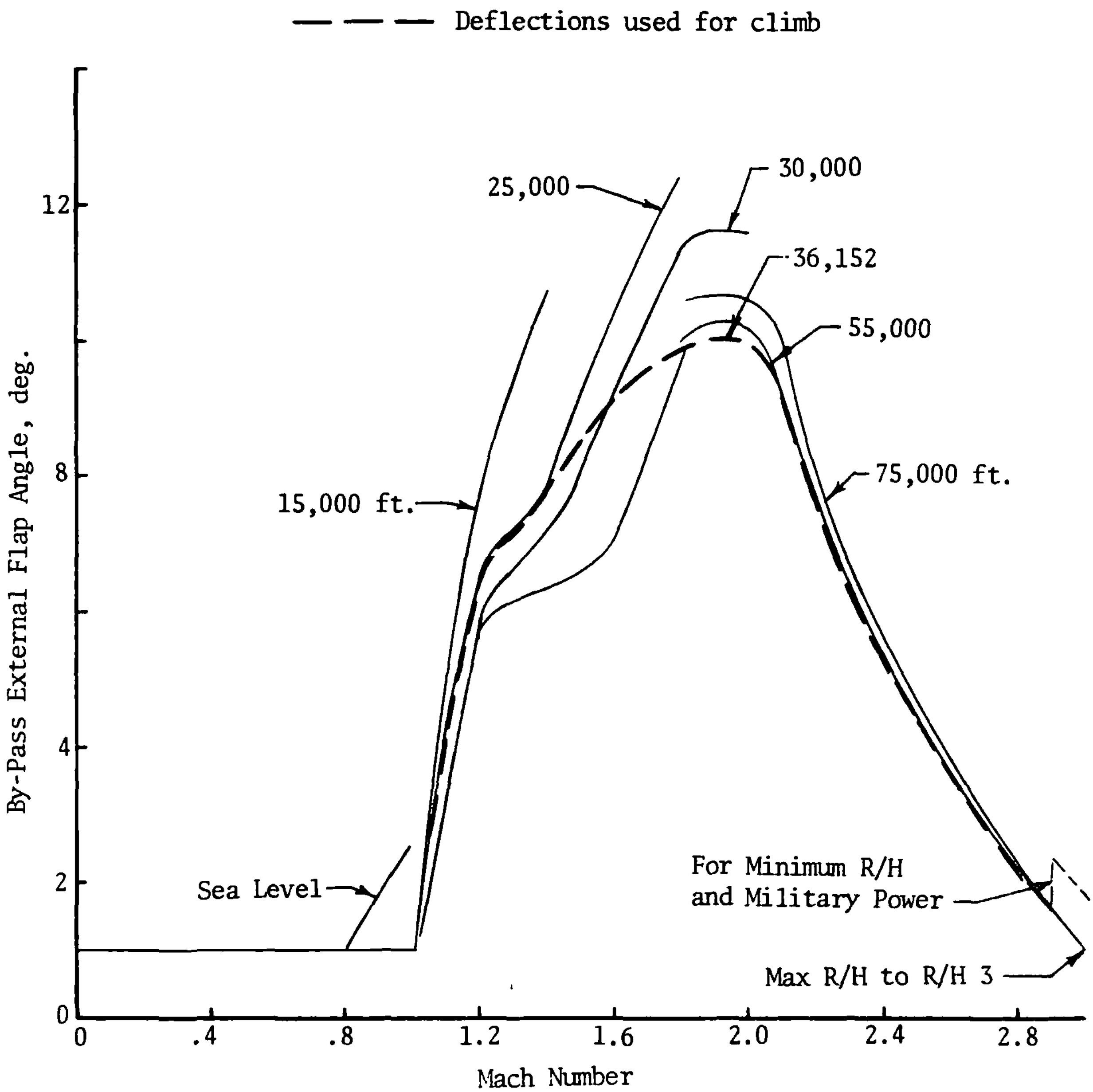


Figure 82.- Effect of Mach number on the drag coefficient increment due to external items and surface irregularities



Note: Due to pressure on forward face of forward bypass doors; effect of exiting airflow not included. Total vehicle.

Figure 83.- Effect of Mach number on the incremental drag coefficient due to bypass doors, design mission

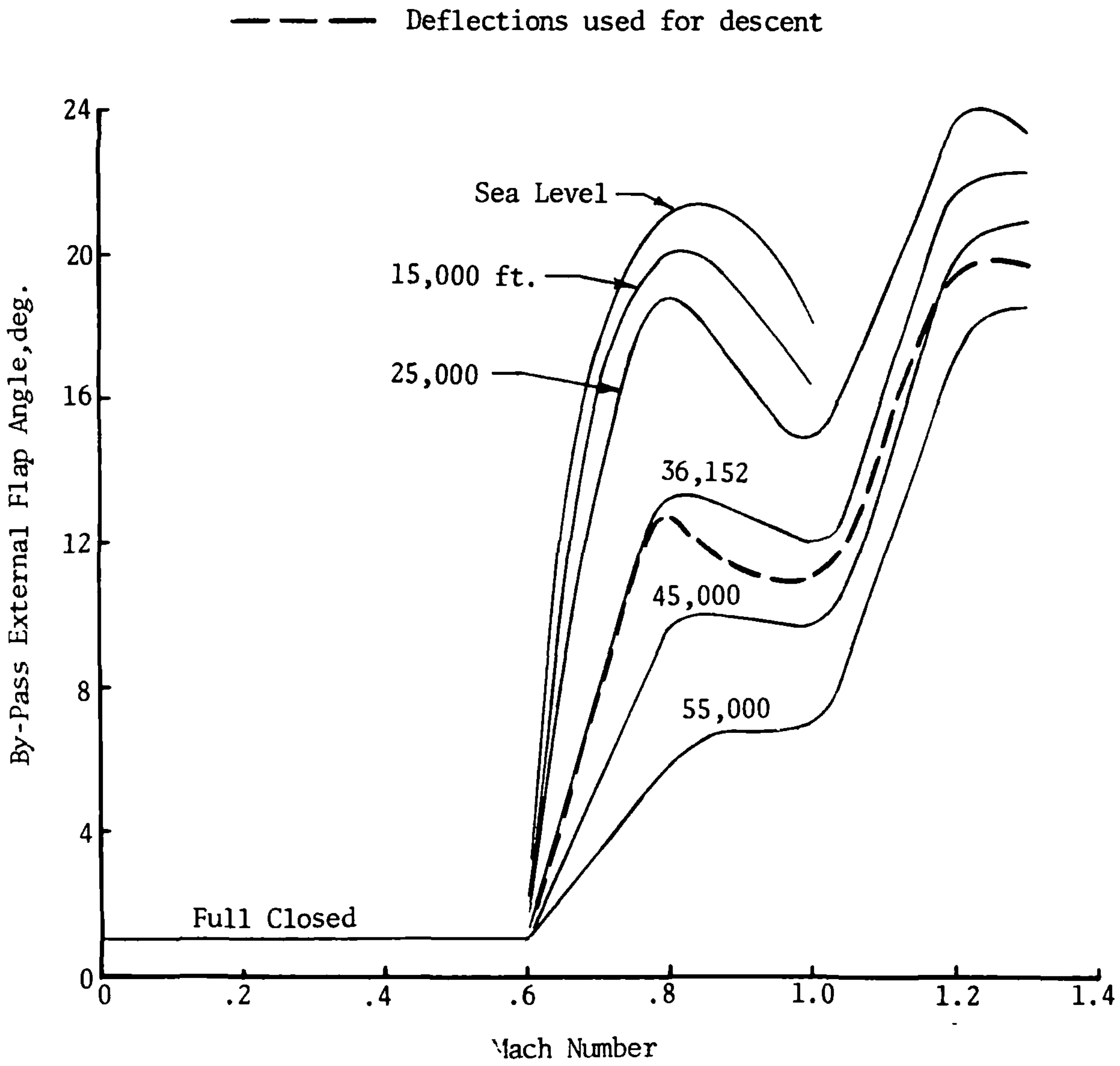


ARDC Model Atmosphere

a) Military and Normal Powers

Figure 84.- Bypass external flap angle vs. Mach number, design mission

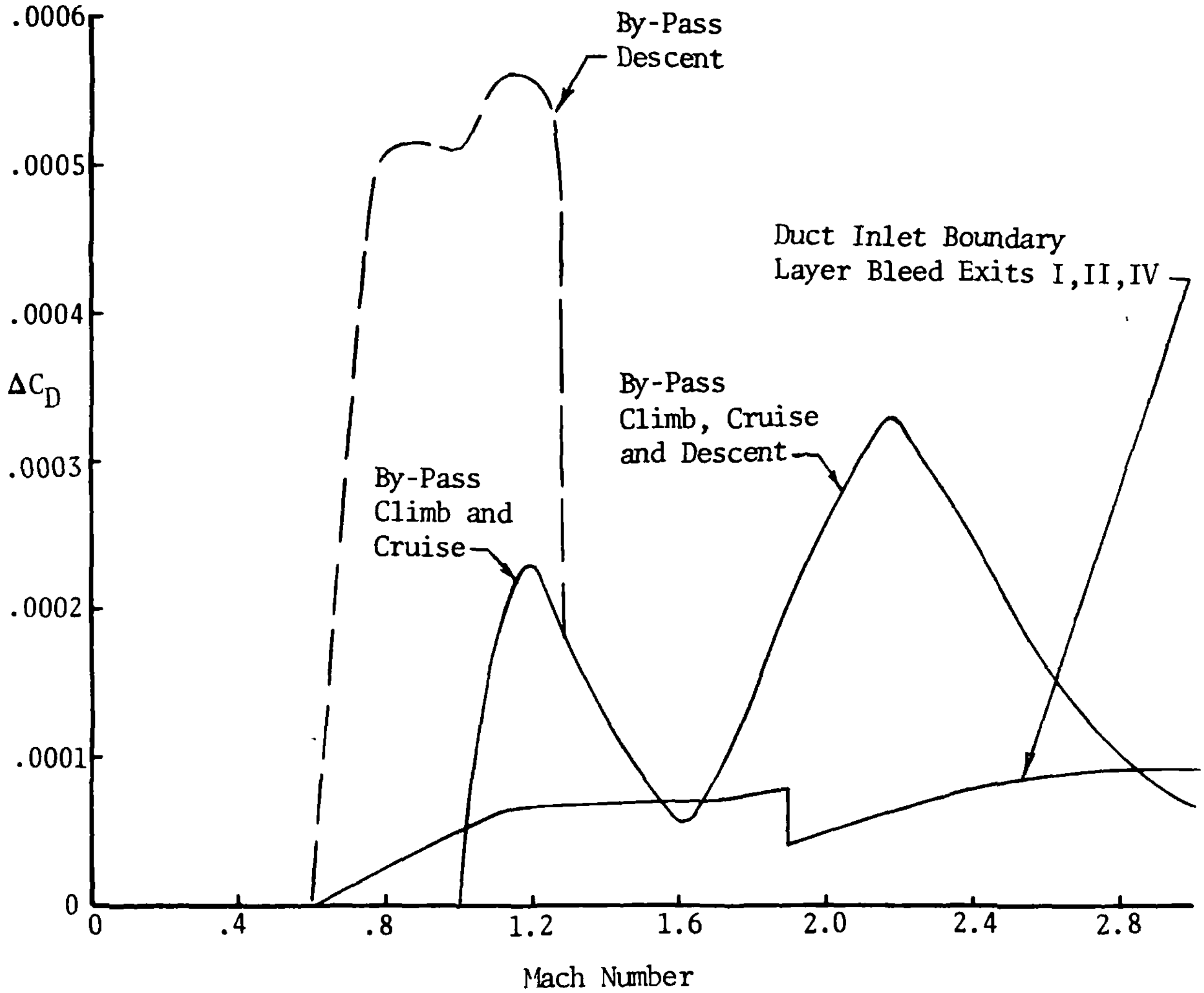
Note: 100% RPM lockup above Mach 1.3;
use military power flap angles
for Mach numbers 1.3 and above



ARDC Model Atmosphere

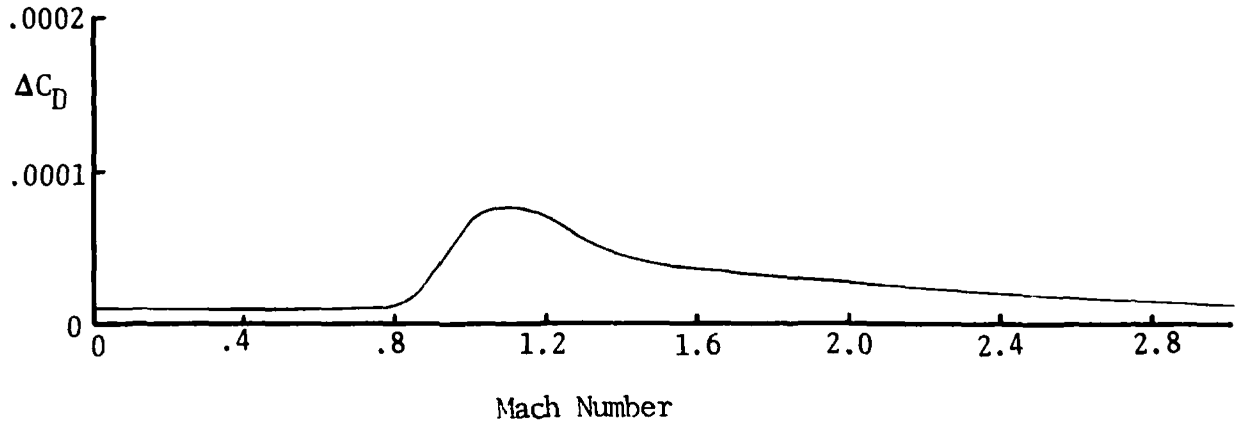
b) Flight Idle Power

Figure 84.- Concluded



Note: Does not include momentum loss; total vehicle

Figure 85.- Effect of Mach number on the drag coefficient increments due to overboard air discharge, design mission



Note: Estimated data. Does not include momentum loss, mixing only

Figure 86.- Effect of Mach number on the drag coefficient increment due to the environmental control system overboard outlets

TABLE 32

DRAG COEFFICIENTS DUE TO BYPASS DOORS AND OVERBOARD AIR DISCHARGE AT PERFORMANCE FLIGHT CONDITIONS

Case I.D.	ΔC_D		
	Bleed Exits	By-Pass Doors	Total
P1	.00003	0	.00003
P2	.00005	0	.00005
P3	.00005	.00017	.00022
P4	.00007	.00006	.00013
P5	.00008	.00005	.00013
P6	.00005	.00050	.00055
P7	.00006	.00037	.00043
P8	.00007	.00014	.00021
P9	.00005	.00002	.00007
P10	.00009	.00008	.00017

Note: Estimated data. Does not include momentum loss, mixing only

TABLE 33

INCREMENTAL DRAG DUE TO DIVERTER BLEED
AT PERFORMANCE FLIGHT CONDITIONS

Case I.D.	ΔC_D
P1	.00031
P2	.00030
P3	.00026
P4	.00021
P5	.00017
P6	.00023
P7	.00013
P8	.00014
P9	.00016
P10	.00023

Note: Estimated data. Does not include momentum loss, mixing only

INTERNAL AERODYNAMICS

Propulsion system performance was requested for 10 specific flight conditions as enumerated in table 1. The measured parameters were reduced by the contractor's Flight Test Data Reduction IBM Program. The estimated data such as thrust, bypass drag, BLC drag, and inlet-wing boundary layer diverter drag based on the measured flight test parameters are summarized in table 34. Additive drag was based on theoretical and empirical data.

The following series of tables are also based on flight test measured parameters.

Table 35 presents the detailed data for the Boundary Layer Control (BLC) System including: compartment and exit pressures, airflow, inlet and exit momentum, exit Mach number. Figure 87 identifies the various compartments.

Tables 36 and 37 present the following detailed data for the Bypass System: plenum and exit pressures, airflow, inlet and exit momentum, exit door angle. Figure 87 identifies the various exit doors.

Table 38 presents the following detailed data for the Inlet-Wing Boundary Layer Diverter System: diverter total and static pressures, airflow, inlet and exit momentum, exit Mach number. Figure 88 shows the diverter exit flow angle. Figure 89 presents the flow area through the diverter. Figures 90 and 91 show typical exit pressure profiles at the inboard and outboard rake locations respectively.

In table 39 the inlet mass flow ratios are shown and are broken down into engine primary and secondary flow, bypass and bleed.

Thrust data required for the stability and control flight cases of table 2 are presented in table 40. These particular flight test points were not reduced; therefore it was necessary to estimate the thrust from the calculated airplane drag at these conditions. Airplane drags were based on wind tunnel test data available as a function of Mach number, altitude, and lift coefficient. Bleed and bypass flows were for the design mission rather than the exact flight case. However, these thrust data were used only for computing 1g trim characteristics, which are relatively insensitive to thrust variations.

No duct leakage tests were made on the flight test airplane, and all performance data assumes no leakage through the duct seals, the auxiliary inlet, or the bypass. Any leakage through the movable ramp joints is into the BLC compartments and is accounted for as bleed flow.

A complete description of instrumentation (including installation drawings) used on the flight test airplane is given in reference 24.

The airflow calculations for the bypass, diverter and bleed zones I, II and IV were based on measured exit conditions during flight test. The secondary airflow and bleed zone III airflow were obtained from a combination of calibrated duct flows prior to flight test and measured parameters during flight. The in-flight thrust was calculated by the method discussed in reference 25. The bypass drag, diverter drag and bleed drag were calculated from the difference in momentum between freestream and exit conditions. The additive drag was based on theoretical and empirical data and measured inlet mass flow ratios. An inlet drag model was never tested during the wind tunnel program for this air vehicle.

A brief discussion of the air induction system and some comparisons between flight data and model test data are presented in reference 26. A complete summary of the flight test data on the Air Induction System is presented in reference 27. Reference 28 presents large scale model data on inlet recovery, bleed flow, bypass flow and inlet mass flow ratios obtained during testing at AEDC.

The geometric requirements for air induction system, the inlet bleed system, the bypass system, and the inlet-wing boundary layer diverter are presented in reference 29.

Theoretical additive drag shown in figure 92 for supersonic Mach numbers was computed using the equations presented in figure 93.

At subsonic and low supersonic Mach numbers a portion of the additive drag or spillage momentum loss is recovered in the form of favorable pressures on the cowl and other air vehicle surfaces. The theoretical additive drag has been reduced, therefore, by an empirical factor, K_{ADD}. K_{ADD} as a function of freestream Mach number is presented in figure 94 along with data from the 0.03 and 0.04 XB-70 force model tests.

The values in the tables were obtained from the printout of the IBM program. The number of digits tabulated do not indicate the accuracy of the flight test instrumentation.

TABLE 34

THRUST AND INLET DRAG DATA

Note: Estimated based on flight test data except for D_A which is based on theoretical and empirical data

Case I.D.	F_N	L/H Inlet D_A	L/H Inlet D_{BP}	L/H Inlet D_{BLC}	R/H Inlet D_A	R/H Inlet D_{BP}	R/H Inlet D_{BLC}	F_{NE}	L/H Inlet B.L. Diverter Drag
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
P 1	37799	68.9	0	1472.2	79.3	0	Assumed Same as L/H	34707	107.2
P 2	56362	286.0	0	1059.1	292.7	0		53653	105.5
P 3	77854	1679.6	356.8	3599.1	1670.4	372.5		66576	118.5
P 4	93937	6914.1	259.3	4748.7	6741.3	294.0		70211	105.4
P 5	83627	6896.4	192.0	4319.8	6805.2	220.6		60873	258.5
P 6	78906	1314.4	1174.1	2167.7	1314.4	1136.3		68324	162.1
P 7	58876	773.8	769.2	1879.7	773.8	803.2		51996	160.8
P 8	54721	288.7	285.9	1951.3	288.7	268.2		49687	110.0
P 9	66043	327.7	771.3	1623.5	327.7	680.8		60689	122.0
P 10	101224	890.4	358.2	3541.7	901.0	372.9		91618	98.7

TABLE 35

BLC DATA - LEFT INLET

Note: Flight test based data

Case I.D.	Compartment P_S/P_O					Exit P_S/P_O	
	Compartment No.					Comp. No.	
	I	II	III	IV-A	IV-B	I	II
P 1	.9818	1.0300	1.0065	1.0192	1.0384	.9617	1.0041
P 2	1.0086	1.0107	1.0341	1.0782	1.1201	.9586	1.0073
P 3	1.0852	1.1223	1.0252	1.2512	1.3220	.9797	1.0892
P 4	1.2417	1.4690	1.7334	1.9711	2.2069	1.0695	1.3333
P 5	1.3239	1.8358	1.9733	2.2880	2.5211	1.0818	1.4546
P 6	1.4018	1.6198	1.9013	2.3746	2.4774	1.1065	1.3202
P 7	1.3911	1.6294	1.8443	3.6260	2.6749	1.1401	1.3043
P 8	1.2908	2.1771	4.7403	2.8020	4.1839	1.1460	1.7055
P 9	1.4038	2.0159	2.8164	2.9245	3.9566	1.1561	1.5788
P 10	1.0718	1.0265	1.0768	1.2641	1.2466	.9769	.9946

Airflow					
Compartment No.					
I	II	III	IV-A	IV-B	Total
lb/sec	lb/sec	lb/sec	lb/sec	lb/sec	lb/sec
4.0147	20.61	26.0177	1.2498	1.4752	41.8820
3.6924	13.61	28.4074	1.8363	1.8988	36.7774
5.3988	28.75	37.4318	2.9332	2.7687	60.6106
5.9786	34.3073	52.9979	4.3771	4.0961	78.1966
5.1078	31.6998	50.2254	4.1980	3.8663	72.7749
3.8144	17.1416	32.3325	2.8660	2.4992	44.2837
1.6450	17.0378	20.4778	2.8162	1.7365	34.6066
1.3740	11.3242	36.2092	1.5049	1.8782	36.2031
2.4014	12.3761	22.8506	1.6761	1.8953	31.0438
5.6051	19.8602	51.5808	3.9993	3.2317	61.6552

Table 35.- Concluded

Case I.D.	Inlet Momentum, Compartment No. I	II	III	IV-A	IV-B	Exit Momentum, Compartment No. I	II	III	IV-A	IV-B
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
P 1	94.3	483.1	610.7	29.4	34.7	18.1	73.1	-1002.	6.6	11.0
P 2	104.3	524.2	802.9	51.9	53.6	21.3	55.2	-214.9	19.6	24.8
P 3	196.6	1033.4	1363.3	106.8	100.8	51.0	387.4	-3333.0	55.3	58.0
P 4	281.1	1613.2	2491.6	205.8	192.6	75.2	551.8	-3415.8	143.3	143.7
P 5	252.7	2450.4	2484.7	207.7	191.3	67.3	1585.4	-2508.5	154.0	148.7
P 6	237.3	1087.3	2011.3	178.3	155.5	60.6	434.3	-761.4	117.2	104.3
P 7	104.2	1079.2	1296.5	178.4	110.0	17.4	430.3	-594.0	135.5	75.3
P 8	103.5	852.6	2727.0	113.3	141.4	19.0	238.6	-609.0	72.9	102.7
P 9	180.0	927.6	1702.7	125.6	142.1	52.4	285.9	340.3	82.5	102.3
P 10	189.9	672.7	1768.5	135.5	109.5	42.1	146.7	-3038.8	77.9	61.1

Exit Mach Number, Compartment No. I	II	III	IV-A	IV-B
.1370	.1195	.0256	.1651	.2325
.1730	.1234	.0366	.3298	.4058
.2747	.4087	.0669	.5750	.6443
.3570	.4603	.1339	1.0	1.0
.3647	.5615	.1494	1.0	1.0
.4037	.6571	.1330	1.0	1.0
.2649	.6546	.1262	1.0	1.0
.3174	.4898	.2613	1.0	1.0
.5075	.5393	.1550	1.0	1.0
.2156	.2120	.0646	.5885	.5701

Next page is:

Figure 87 – BLC compartment and bypass door identifications

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COMPARTMENT II
COMPARTMENT I
B-B
COMPARTMENT IVA
COMPARTMENT IVB
VIEW A-A
LOOKING UP & AFT
AIRFLOW FROM BLEED COMPT. #4
B.L.B. AFT CHECK VALVE-CLOSED
B.L.B. FWD CHECK VALVE-CLOSED
B.L.B. DIVERTER VALVE-OPEN
PLENUM BYPASS DOORS-CLOSED
ENGINE EJECTOR NOZZLE
ENGINE SHROUD
BYPASS PLENUM VALVES-CLOSED
GROUND COOLING DOORS-OPEN
LOW SPEED CONDITION
REGIME I COOLING
BLEED COMPT #2
BLEED COMPT #1
#1 RAMP
B.L.B. FWD CHECK VALVE-CLOSED
PLENUM BYPASS DOORS-OPEN
B.L.B. DIVERTER VALVE ACTUATOR
B.L.B. VALVE-OPEN
B.L.B. AFT CHECK VALVE-OPEN
BYPASS DOOR IDENTIFICATION NO.
YJ93-GE-3 ENGINE
ALTERNATE B.L.B. AIR OVERBOARD DISCHARGE DUCT
ENGINE MOUNTED SHROUD
SHROUD TO FUSELAGE SECONDARY AIR SEAL
GROUND COOLING DOORS-CLOSED
ACCELERATION CONDITION
REGIME II COOLING
BYPASS PLENUM VALVES-OPEN
PLENUM #3 AIR LEAKAGE EXIT
#3 PLENUM EXIT DOORS
FORWARD PLENUM DIVIDER CURTAIN
#1 PLENUM EXIT PORT
#2 RAMP
#1 RAMP
#3 VARIABLE RAMP
#3 REGION COWL WALL
#4 RAMP
COMPARTMENT III
CRUISE CONDITION
REGIME III COOLING
LIST OF MATERIAL
PART NUMBER
MATERIAL
SIZE
MATL SPEC
USED ON
NEXT ASSY
APPLICATION
FASTENER CODES
DRILLED HOLE TOLERANCES
DATE 3-9-60
DR BY MALIS'S
CHK BY
APPD BY
AIR INDUCTION SECONDARY AIRFLOW & BLEED SYSTEMS (PERSPECTIVE)
NORTH AMERICAN AVIATION, INC.
ENGINEERING
INTERNATIONAL AIRPORT
LOS ANGELES 45, CALIF.
DWG SIZE J
259-940014
SHEET OF
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TABLE 36.- BYPASS DATA - LEFT INLET

Note: Flight test based data

Case I.D.	Inlet Momentum						Exit Momentum					
	Door No.						Door No.					
	1	2	3	4	5	6	1	2	3	4	5	6
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
P 1	0	0	0	0	0	0	0	0	0	0	0	0
P 2	0	0	0	0	0	0	0	0	0	0	0	0
P 3	178.9	146.0	384.1	388.6	405.6	378.4	150.0	120.6	317.1	324.0	319.4	293.9
P 4	262.1	267.6	678.9	740.1	710.1	668.4	242.0	246.7	626.2	683.2	654.8	614.8
P 5	266.9	234.2	615.1	543.0	684.4	644.0	248.6	218.5	575.4	512.1	639.7	601.3
P 6	818.7	771.5	1838.8	1949.7	2150.3	2333.0	714.7	675.9	1621.5	1725.0	1891.7	2059.2
P 7	500.5	508.8	1226.7	1237.8	1318.6	1457.6	438.8	444.1	1076.1	1086.5	1151.1	1284.3
P 8	224.6	283.6	796.1	779.6	981.7	708.6	208.9	259.0	733.5	717.8	901.8	667.2
P 9	660.0	587.5	1163.4	1295.0	1455.6	1282.2	570.4	509.0	1028.7	1139.5	1283.0	1141.7
P 10	107.7	108.7	296.6	320.6	228.3	192.4	81.9	82.7	226.1	250.9	141.7	112.8

Exit Door Angle					
Door No.					
1	2	3	4	5	6
deg.	deg.	deg.	deg.	deg.	deg.
0	0	0	0	0	0
0	0	0	0	0	0
4.22	3.30	3.44	3.25	2.74	2.45
3.22	3.31	3.25	3.46	2.52	2.32
3.37	2.92	2.91	2.36	2.46	2.27
8.63	7.98	7.62	7.55	7.12	7.41
7.15	7.50	7.28	7.01	6.39	6.44
1.55	2.00	1.89	1.88	1.90	1.25
5.69	4.99	3.52	3.86	3.58	2.96
1.98	2.01	1.98	2.22	1.09	0.89

Table 36.- Concluded

Case I.D.	Plenum P_S/H_O Door No. 1	2	3	4	5	6	Exit Pt/Po Door No. 1	2	3	4	5	6
P 1	.8328	.8505	.8440	.8323	.8359	.8376	1.2079	1.1976	1.2319	1.2233	1.2167	1.2128
P 2	.7991	.8028	.8116	.8015	.8008	.8090	1.3352	1.3432	1.3779	1.4060	1.3518	1.3581
P 3	.7596	.7937	.7774	.7537	.7862	.8014	1.8097	1.8248	1.8153	1.8523	1.7689	1.7766
P 4	.7780	.8128	.7870	.7665	.7961	.8063	3.3392	3.3294	3.3312	3.3542	3.2813	3.2630
P 5	.7976	.8291	.8045	.7829	.8088	.8199	3.7559	3.7285	3.7609	3.8021	3.6999	3.6688
P 6	.7131	.7745	.7437	.6927	.7229	.7426	6.5456	6.5380	6.7604	6.9152	6.5076	6.7464
P 7	.6789	.7378	.7070	.6565	.6877	.7100	7.0240	6.8945	7.1009	7.0460	6.5782	7.0832
P 8	.7653	.7878	.7695	.7586	.7470	.7556	14.2879	13.8373	14.9003	14.6748	14.3253	14.5092
P 9	.7222	.7542	.7328	.7159	.7136	.7264	12.5772	12.5296	13.0985	13.0719	12.6297	12.6992
P 10	.8068	.8351	.8178	.8028	.8343	.8380	1.6646	1.6589	1.6710	1.6598	1.6322	1.6555

Airflow Door No. 1	2	3	4	5	6	Total
lb/sec	lb/sec	lb/sec	lb/sec	lb/sec	lb/sec	lb/sec
0	0	0	0	0	0	0
0	0	0	0	0	0	0
4.9137	4.0091	10.5474	10.6696	11.1382	10.3911	51.6691
5.5745	5.6913	14.4374	15.7389	15.1008	14.2143	70.7572
5.3959	4.7340	12.4342	10.9775	13.8352	13.0193	60.3960
13.1600	12.4021	29.5593	31.3240	34.5671	37.5040	158.5346
7.9011	8.0327	19.3662	19.5425	20.8182	23.0116	98.6722
2.9828	3.7662	10.5731	10.3547	13.0390	9.4117	50.1276
8.8050	7.8376	15.5212	17.2775	19.4199	17.1067	85.9679
3.1812	3.2082	8.7560	9.4655	6.7398	5.6785	37.0294

TABLE 37.- BYPASS DATA - RIGHT INLET

Note: Flight test based data

Case I.D.	Inlet Momentum						Exit Momentum					
	Door No.						Door No.					
	1	2	3	4	5	6	1	2	3	4	5	6
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
P 1	0	0	0	0	0	0	0	0	0	0	0	0
P 2	0	0	0	0	0	0	0	0	0	0	0	0
P 3	160.7	151.3	413.6	418.2	428.1	419.3	133.3	125.4	344.6	351.6	335.6	328.2
P 4	308.6	291.0	762.0	769.3	804.2	762.8	283.6	267.7	700.1	709.4	740.9	702.1
P 5	260.0	237.1	685.8	695.0	737.4	705.2	242.3	221.2	638.9	650.0	689.3	658.2
P 6	724.0	700.2	1848.7	1897.7	2261.9	2309.2	636.8	617.0	1629.7	1681.8	1991.6	2048.8
P 7	484.9	465.8	1189.1	1175.6	1595.2	1592.5	425.8	408.6	1045.1	1034.9	1382.9	1402.7
P 8	382.7	334.9	848.2	685.1	695.4	699.6	342.9	301.5	777.6	636.6	657.1	662.1
P 9	562.2	460.7	1207.7	1078.6	1354.6	1327.5	488.1	404.9	1065.3	960.4	1206.4	1185.4
P 10	105.2	108.3	249.7	256.8	228.8	232.1	79.5	82.3	180.1	186.8	137.8	141.5

Exit Door Angle					
Door No.					
1	2	3	4	5	6
deg.	deg.	deg.	deg.	deg.	deg.
0	0	0	0	0	0
0	0	0	0	0	0
3.72	3.44	3.80	3.57	2.65	2.55
3.88	3.64	3.80	3.63	2.69	2.51
3.27	2.96	3.38	3.25	2.45	2.32
7.32	7.00	7.68	7.26	6.96	6.48
6.84	6.64	6.96	6.50	7.61	6.50
2.77	2.46	2.04	1.62	1.13	1.12
4.71	3.74	3.70	3.06	2.93	2.81
1.94	2.00	1.63	1.69	1.00	1.00

Table 37.- Concluded

Case I.D.	Airflow						
	Door No.						
	1	2	3	4	5	6	Total
	lb/sec	lb/sec	lb/sec	lb/sec	lb/sec	lb/sec	lb/sec
P 1	0	0	0	0	0	0	0
P 2	0	0	0	0	0	0	0
P 3	4.4123	4.1541	11.3580	11.4830	11.7539	11.5147	54.6760
P 4	6.5624	6.1890	16.2043	16.3608	17.1017	16.2212	78.6393
P 5	5.2562	4.7930	13.8643	14.0495	14.9069	14.2553	67.1253
P 6	11.6386	11.2555	29.7187	30.5059	36.3598	37.1211	156.5994
P 7	7.6551	7.3537	18.7739	18.5608	25.1848	25.1414	102.6697
P 8	5.0835	4.4475	11.2660	9.0997	9.2359	9.2918	48.4244
P 9	7.5001	6.1962	16.1130	14.3898	18.0729	17.7105	79.9324
P 10	3.1052	3.1976	7.3705	7.5808	6.7556	6.8521	34.8618

TABLE 38.- LEFT INLET BOUNDARY LAYER DIVERTER DATA

Note: Flight test based data

Case I.D.	Inboard		Outboard					
	P_t/P_o	P_s/P_o	P_t/P_o	P_s/P_o	Airflow	Exit Mach No.	Inlet Momentum	Exit Momentum
					lb/sec		lbs.	lbs.
P 1	1.3050	1.0274	1.3080	1.0319	20.5729	.5245	483.2	107.2
P 2	1.3856	1.0606	1.3777	1.0724	18.5675	.6201	524.6	419.1
P 3	1.8170	1.2436	1.8210	1.2853	34.2000	.7481	881.3	762.8
P 4	2.8921	1.0625	2.7729	1.0535	29.1722	1.0985	1360.7	1255.3
P 5	2.9412	1.3768	2.8685	1.3686	30.6122	1.0996	1510.3	1252.8
P 6	4.3178	1.8772	4.4295	1.7722	15.8166	1.3260	1100.8	937.8
P 7	6.7863	1.4827	6.7863	1.5831	15.7140	1.3333	995.3	834.5
P 8	6.6136	1.9056	6.6631	1.8998	17.5101	1.4678	1320.3	1210.3
P 9	5.7289	2.1964	6.3445	2.2946	26.5759	1.9543	1268.1	1146.1
P 10	1.6719	1.2657	1.6719	1.3763	23.5508	.5384	797.8	699.1

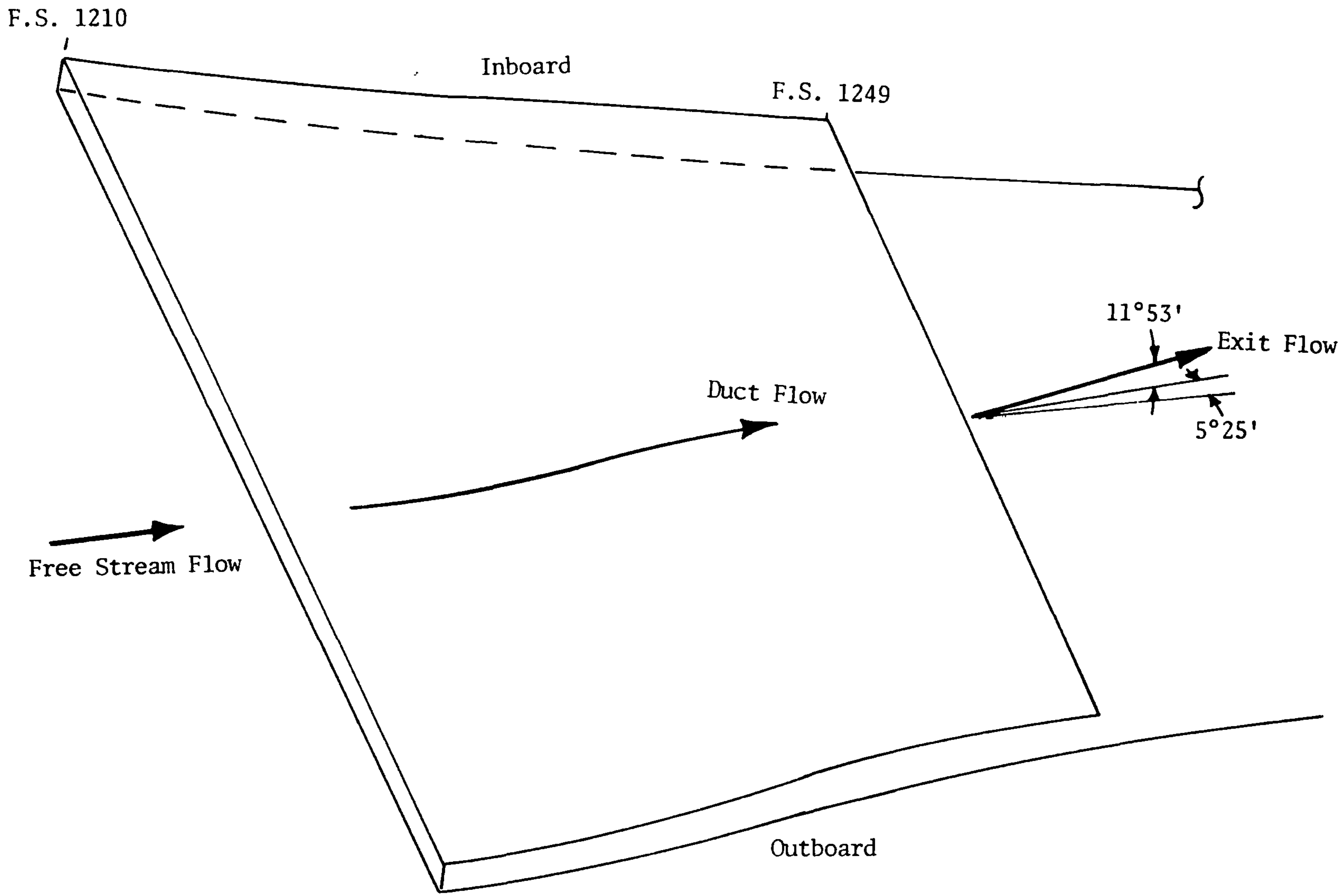


Figure 88.- Boundary layer diverter exit flow angles

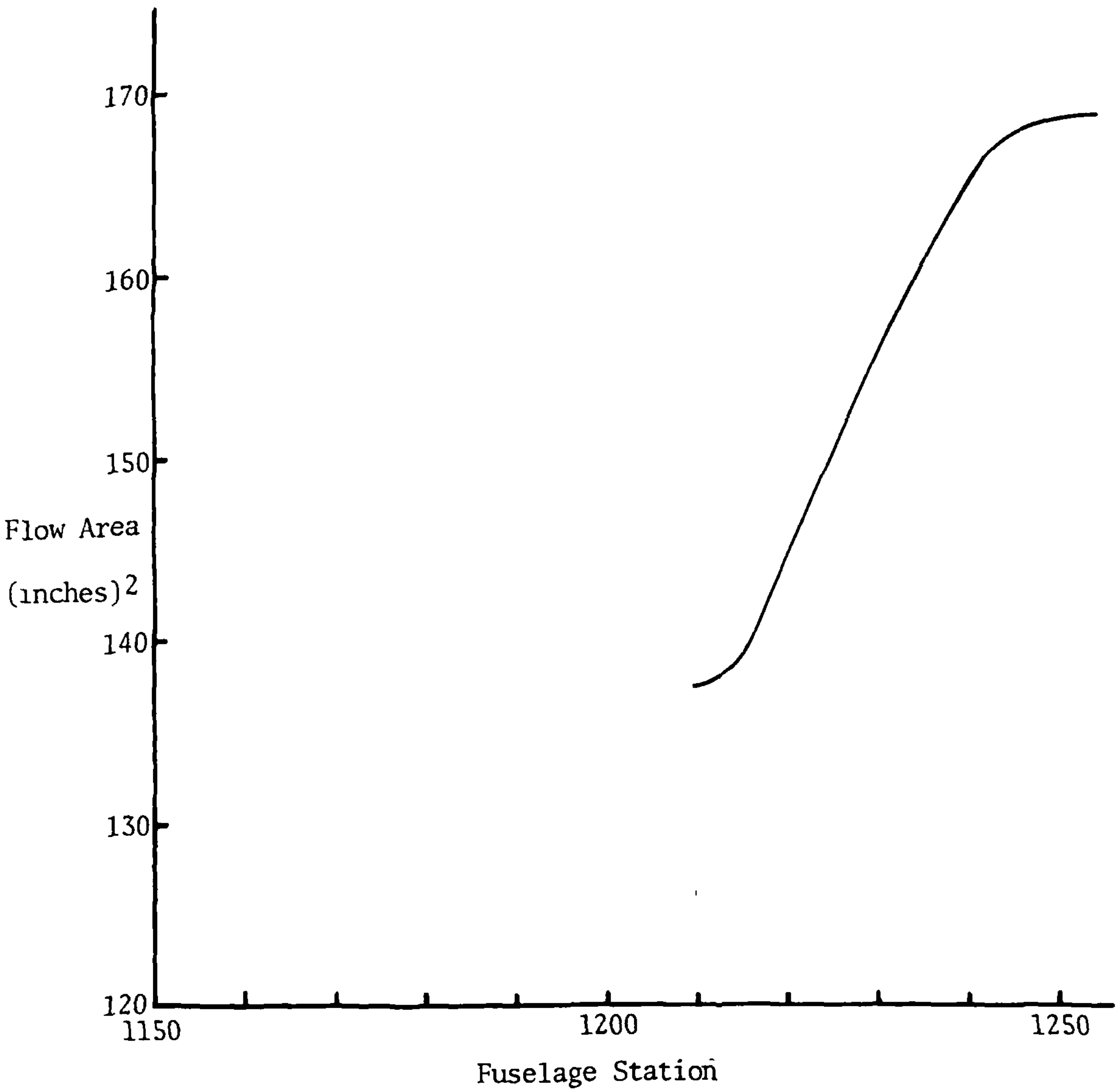


Figure 89.- Boundary layer diverter flow area vs. fuselage station

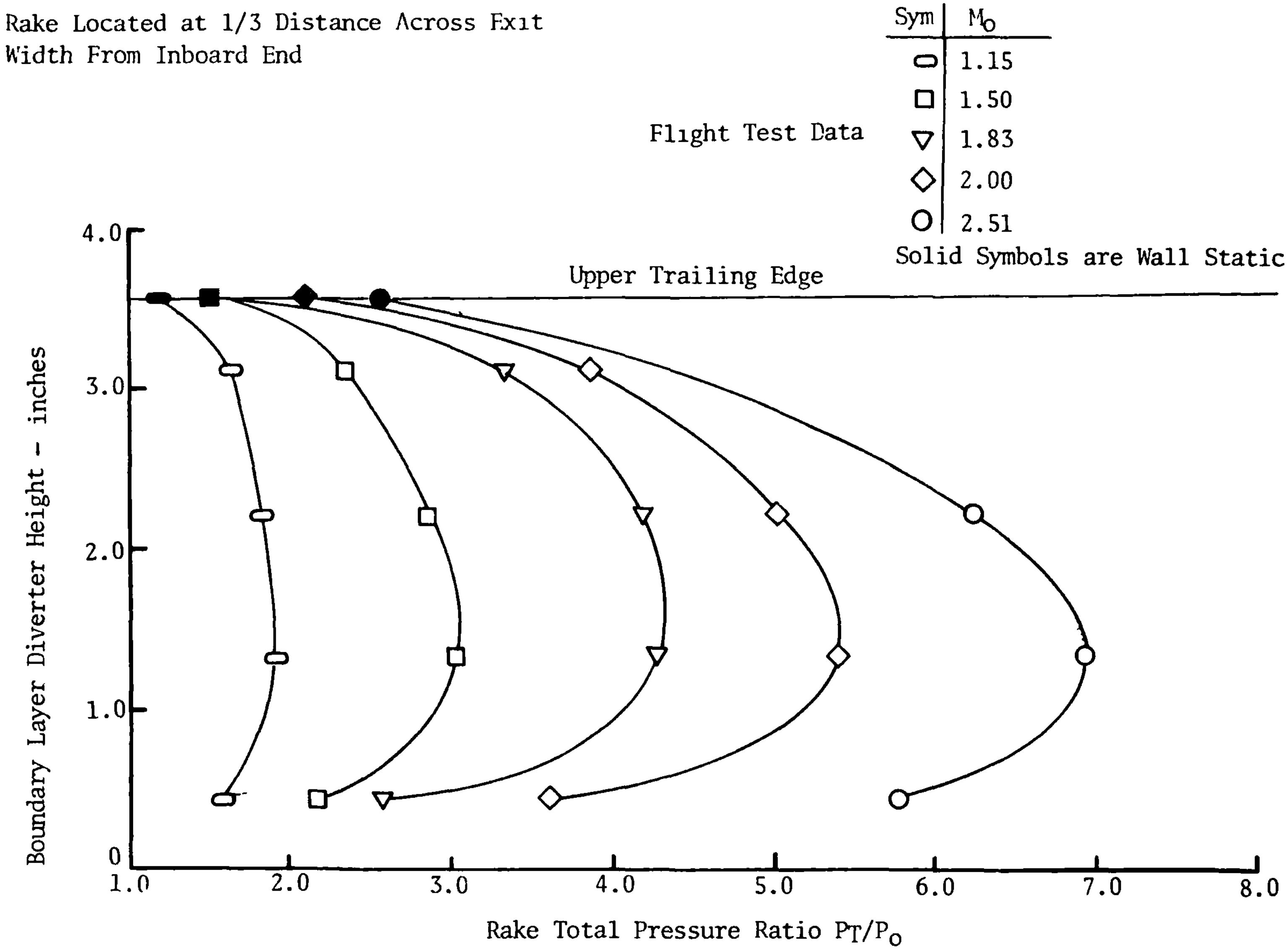


Figure 90.- Boundary layer diverter pressure profile at inboard rake location

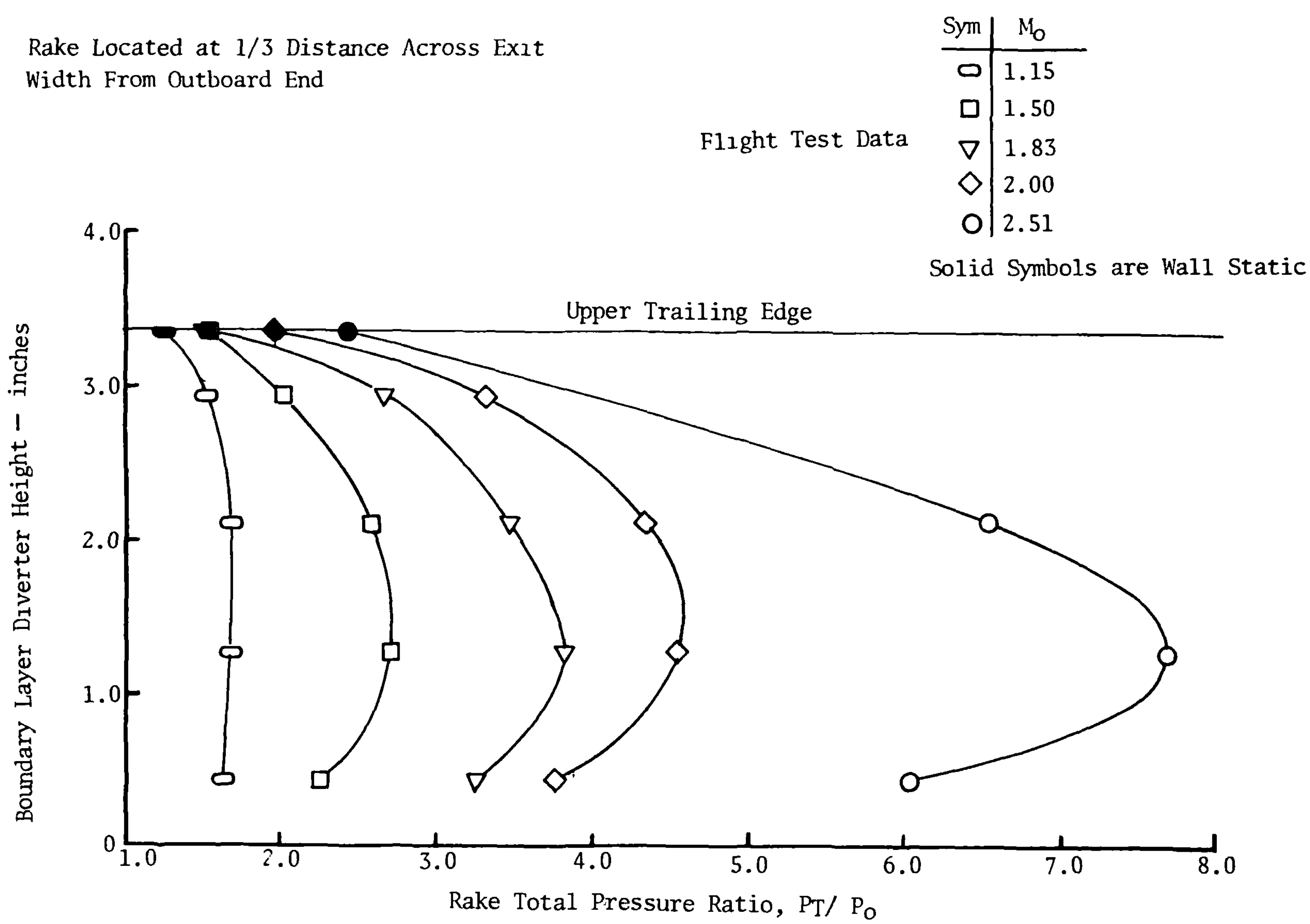


Figure 91.- Boundary layer diverter pressure profile at outboard rake location

TABLE 39

MASS FLOW RATIOS

Note: Flight test based data

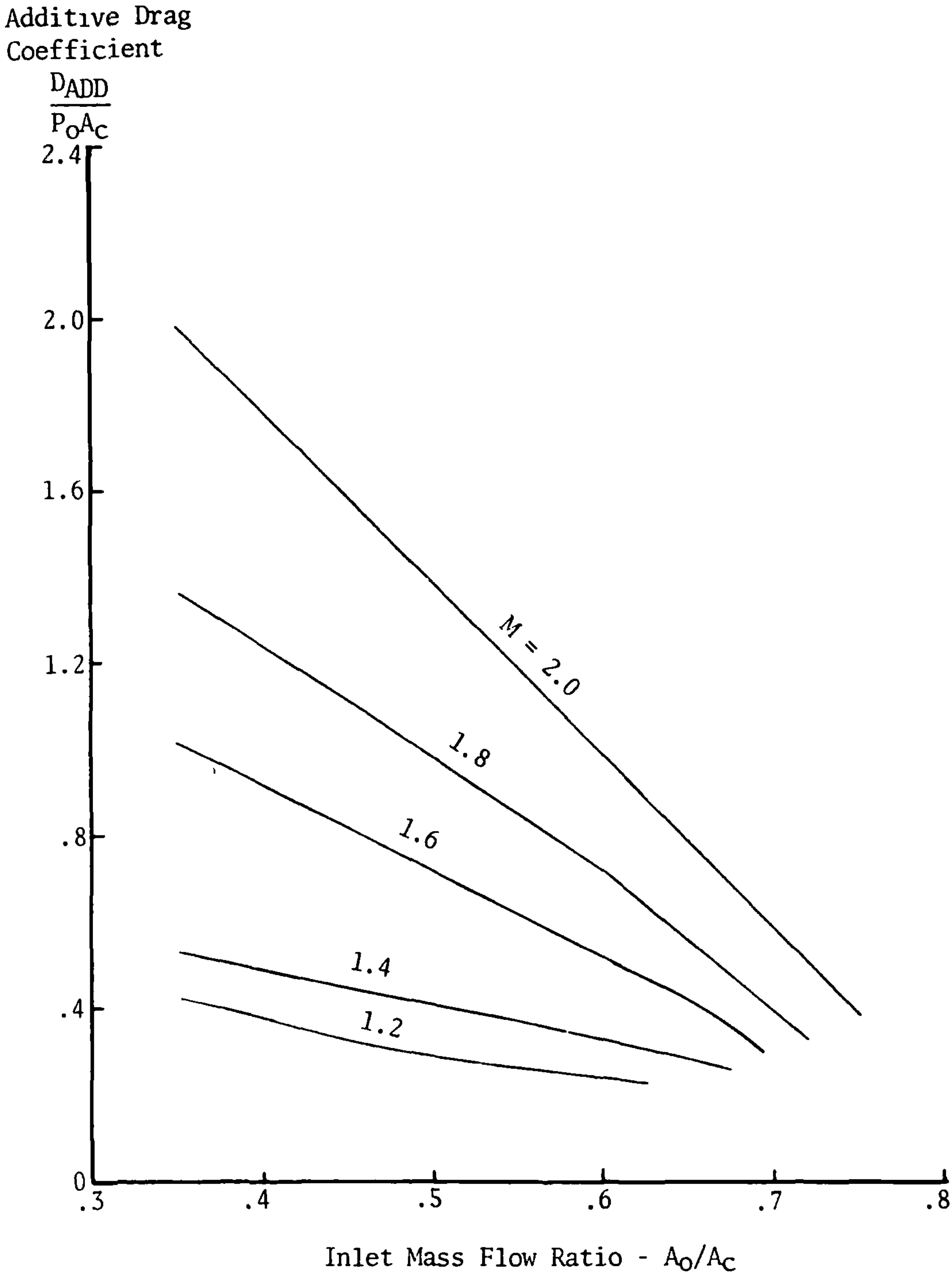
	Left Inlet A_o/A_c				
Case I.D.	Engine	Secondary	Bypass	Bleed	Total
P 1	.4203	.0381	0	.0347	.4930
P 2	.4055	.0355	0	.0371	.4671
P 3	.4033	.0388	.0476	.0553	.5381
P 4	.4662	.0586	.0565	.0625	.6438
P 5	.4749	.0610	.0554	.0859	.6772
P 6	.5373	.0663	.1585	.0527	.8419
P 7	.5276	.0666	.1476	.0518	.7935
P 8	.6479	.0794	.0836	.0604	.8713
P 9	.6108	.0792	.1369	.0494	.8763
P 10	.3945	.0367	.0290	.0483	.5085

TABLE 40

THRUST DATA FOR STABILITY AND CONTROL CASES

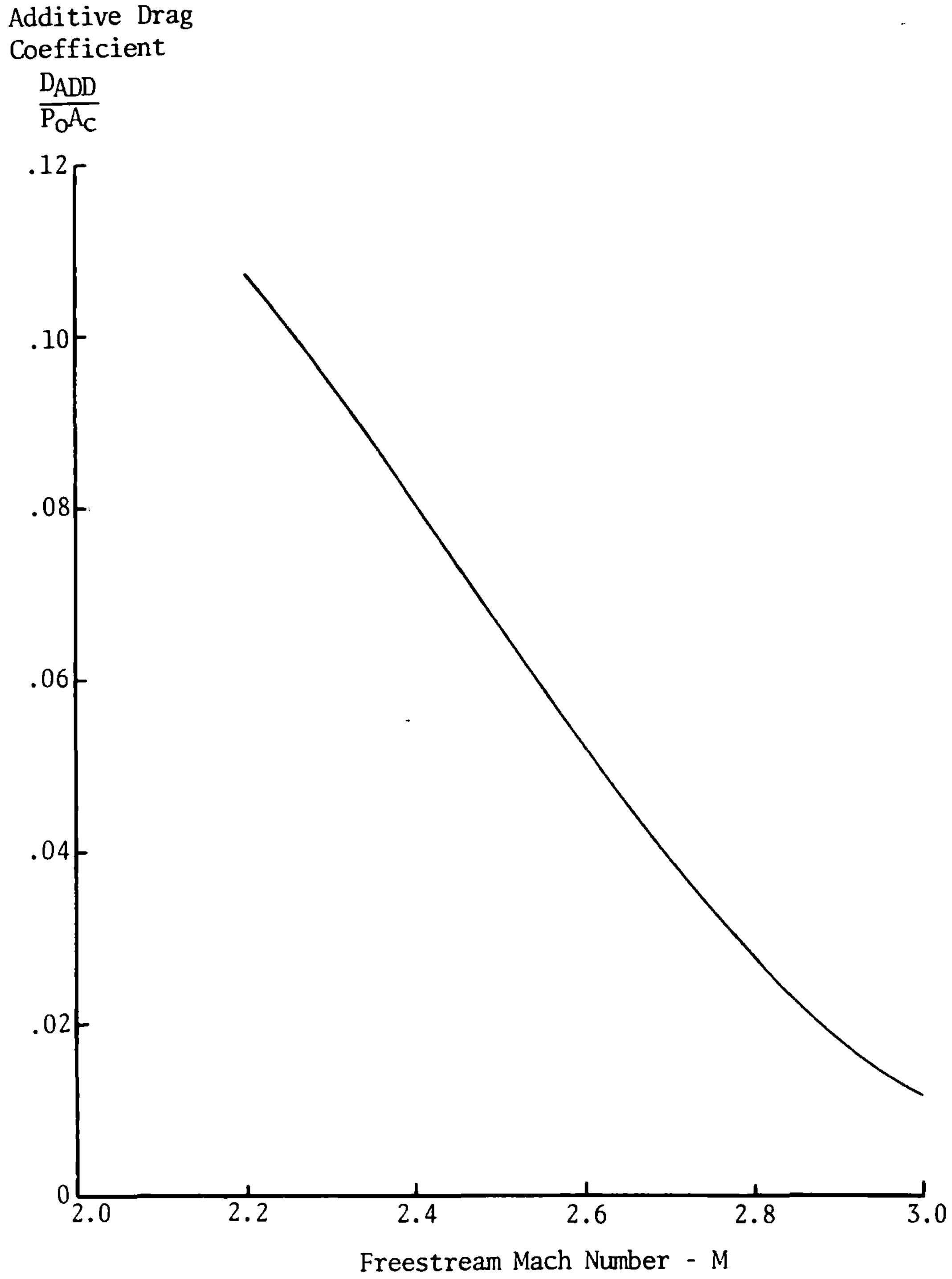
Note: Estimated for airplane drag data

Case I.D.	F_{NE} lbs.
SC 1	47,088
SC 2	33,267
SC 3	82,338
SC 4	54,929
SC 5	57,097
SC 6	68,666
SC 7	51,269



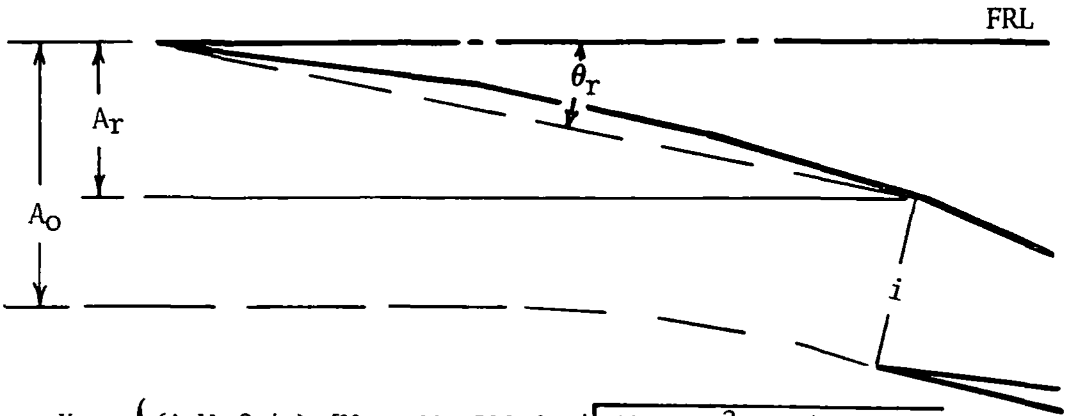
a) Supersonic Unstarted Inlet

Figure 92.- Theoretical additive drag coefficient



b) Supersonic Started Inlet

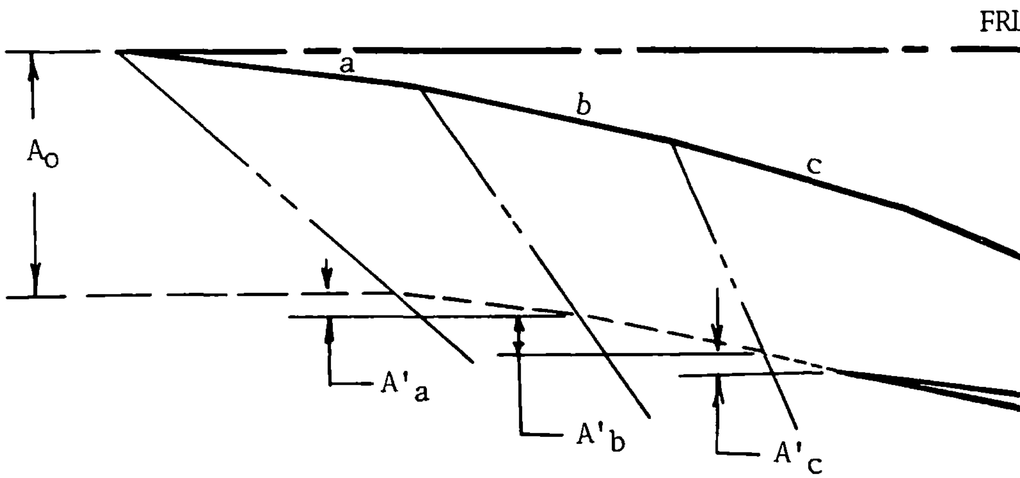
Figure 92.- Concluded



$$D_{ADD} = K_{ADD} \left\{ (A_o V_o \rho_o / g) \left[V_o - M_1 \cos \theta_r \sqrt{49.0188^2 \, T_{to} / (T_{ti}/T_i)} \right] - (P_1 - P_o) A_1 \cos \theta_r - A_r K_r (P_i - P_o)/2 \right\}$$

Note: K_r assumed equal to 1

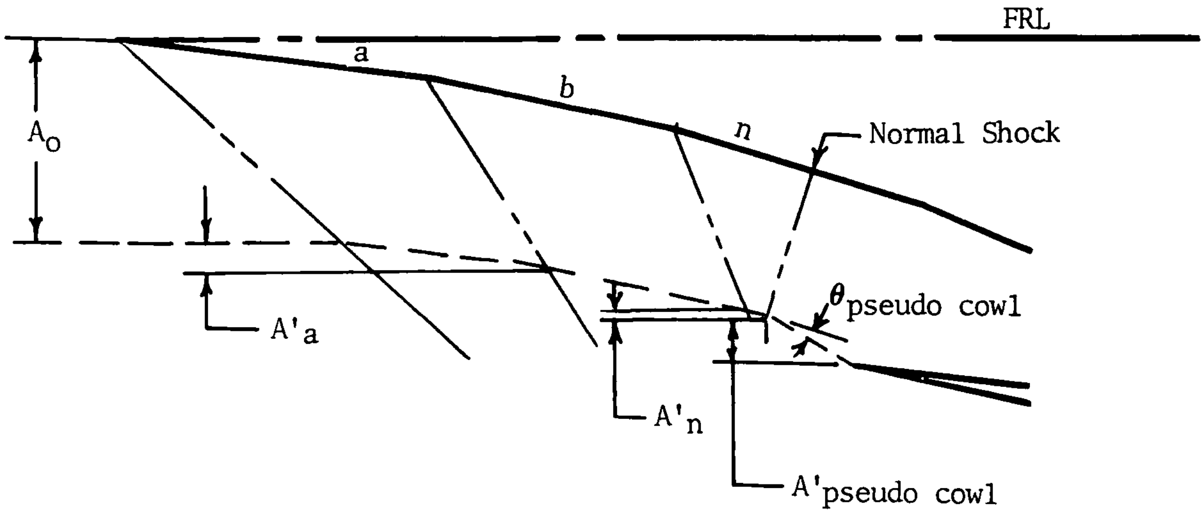
a) Subsonic



$$D_{ADD} = K_{ADD} \left\{ (P_a - P_o) A'_a + (P_b - P_o) A'_b + (P_c - P_o) A'_c \right\}$$

b) Supersonic Started Inlet

Figure 93.- Theoretical additive drag calculation

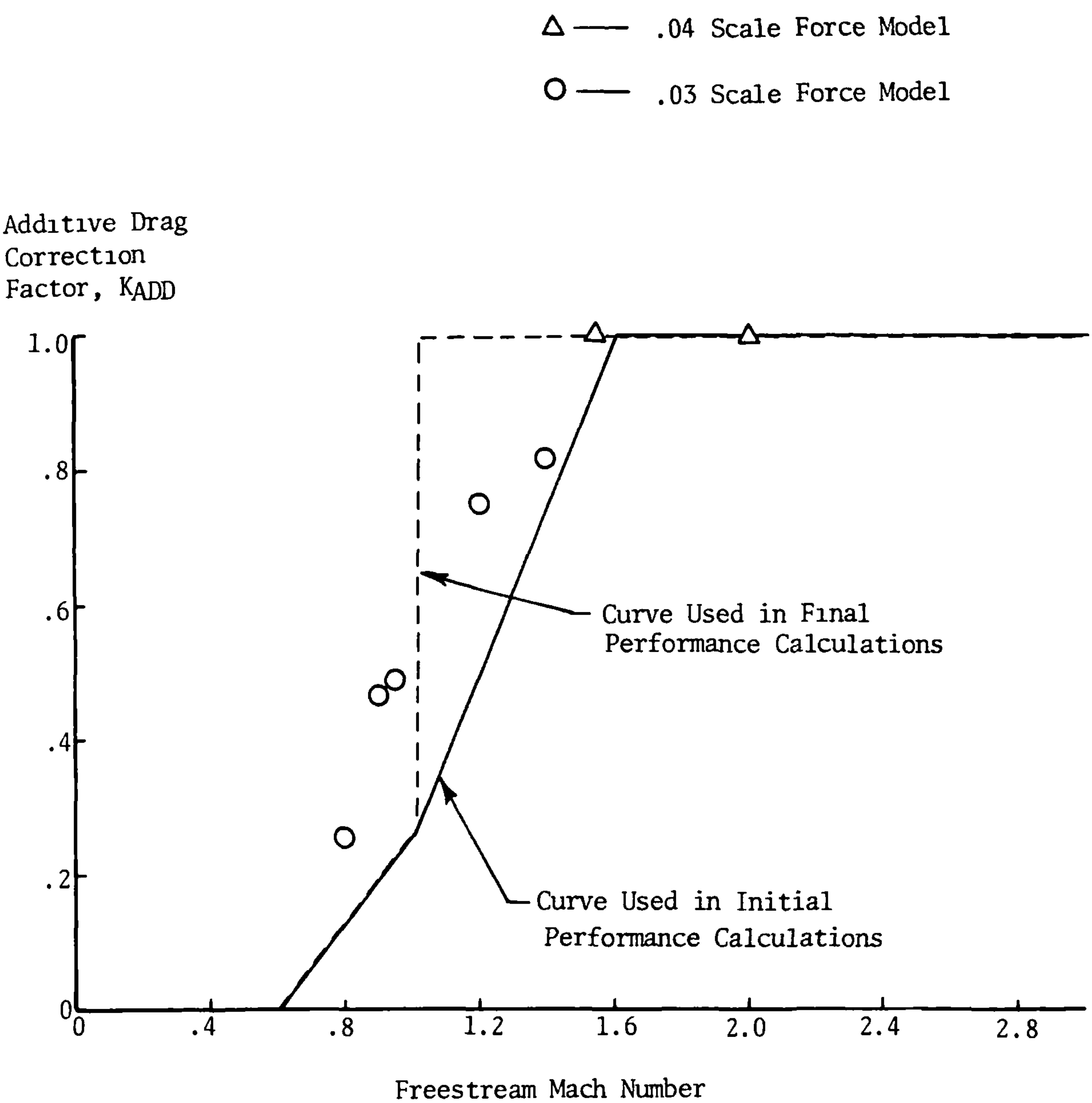


$$D_{ADD} = K_{ADD} \left\{ (P_a - P_o)A'_a + \ . \ . \ . + (P_n - P_o)A'_n + (P_{pseudo} - P_o)A'_{pseudo} \right\}$$

Ramp n is the ramp on which the normal shock occurs. The normal shock is assumed to be located at the intersection of the stagnation streamline and a pseudo cowl. The angle of the pseudo cowl relative to ramp n is the maximum angle that will sustain an oblique shock.

c) Supersonic Unstarted Inlet

Figure 93.- Concluded



Test data shown were obtained after the curves shown were determined and indicate the general validity of the curves.

Figure 94.- Additive drag correction factor

ENVIRONMENTAL CONTROL SYSTEM (ECS) OVERBOARD EXITS AND DRAINS

The environmental control systems of the air vehicle discharge air, water, and expended coolants (ammonia, steam, and nitrogen), from various outlets and as leakage from compartments. A summary of the outlets and leakage areas is shown on table 41 . The configuration of the outlets is shown in figures 95, 96 and 97.

The flight conditions evaluated for outlet discharge and compartment leakage are those of table 1 . Flight test data are not available for all of the applicable parameters. Analytical values were used to complete the data presented in tables 42 and 43 for outlet discharge and compartment leakage.

Preflight analyses of the environmental control system flows of air, water, and other expended coolants for the air vehicle were determined parametrically whenever possible as a function of air vehicle altitude. There is some variation due to differences in environmental temperatures due to the Mach range of the flight envelope. The temperatures and pressures of the air, water, and expended coolants discharge overboard are a function of altitude and Mach number of the flight condition.

The estimated engine extraction airflow for the various environmental control system elements is shown in figure 98 based on performance during normal operation. The flash tank water consumption is shown on figure 99 . The figures are further discussed in the sections that describe where they are discharged overboard.

The outlet pressure shown on table 42 was the only one available from flight test data. It is based on the flight test parameter located in the RH ECS discharge outlet (Outlet B). The following describes each of the outlets and summarizes the discharge flows.

Outlet A is the lefthand ECS outlet. It is used to discharge engine bleed air from the freon compressor turbine drive, steam from the flash tank, and engine bleed air from the flash tank ejector.

The flow rates in table 42 for the freon compressor turbine and flash tank ejector are based on analytical studies and summarized in figure 98. The flash boiler steam rate is from figure 99 . The temperatures and pressures are based on flight test data.

During preflight analysis at conditions above 40,000 feet the steam discharge temperature was assumed to correspond to the boiling temperature of water at the outlet pressure. The outlet pressure was based on wind tunnel model tests for a ramp step outlet. Below 40,000 feet an air ejector is used to depress the boiling temperature in the flash tank. The temperature is a function of engine bleed air pressure and steam flow rate.

The discharge air temperature was based on the performance of the turbine powered freon compressor. This could be estimated by assuming adiabatic expansion of the engine air across a 75 percent efficient turbine.

Outlet B is the right-hand ECS outlet. It is used to discharge steam from the engine bleed air water boiler, the emergency ram air/water boiler, and the recirculation air water boiler. The bleed air boiler steam rate in table 42 is based on figure 100.

The outlet pressure during preflight analysis was based on wind tunnel model tests for ramp step outlet. The steam temperature was assumed to be the boiling temperature of water at the outlet pressure. The ram/recirculation air water boiler steam rates, temperatures, and pressures are based on flight test data.

Outlet C is the pressure regulator and safety valve outlet. It is used to discharge the difference in cabin leakage and makeup air supplied during normal system operation.

The ventilation and makeup air to the cabin is controlled by an inflow pressure regulator using cabin pressure as a control parameter and will normally vary from 8 to 10.5 lbs/min. The cabin is unpressurized from sea level to 8,000 feet and maintains an isobaric pressure altitude of 8,000 feet to maximum flight altitude. For preflight analysis, the cabin is assumed controlled to 70°F and cabin discharge at the pressure regulators is 100°F.

An effective structural cabin leakage area of 0.284 square inches was calculated from leakage tests performed late in 1957. The structural air leakage from the cabin is shown in table 43 based on flight test cabin pressure and temperature. The total cabin makeup air was determined from performance curves. The difference in makeup air and cabin leakage is shown in table 42 as discharge from Outlet C.

Outlet D is the ammonia boiler outlet. Ammonia is used as backup refrigeration (in event of freon refrigeration malfunction) and is not normally used during steady state flight. No ammonia was used during the flight conditions studied.

The estimated ground utilization rate, when ammonia is used for ground cooling, is 5.5 lbs/min. The in-flight usage rate is 5.2 lbs/min when required for cooling in event of freon refrigeration malfunction. The total capacity of the ammonia tank is approximately 500 lbs.

Outlet E is the ECS equipment cooling airflow outlet. The flow rates shown in table 43 are from performance curves based on flight data. The air is discharged into the ECS compartment and exits overboard via the 1/4 inch air space on the left and right ramp step outlets, A and B.

The ECS equipment cooling airflow is controlled by an inflow regulator. The flow rate varies from 8.5 to 10.5 lbs/min. The air is discharged into an unpressurized compartment assumed to be at ambient pressure. The temperature of the air leaving the compartment is assumed to be equivalent to local skin temperature.

Outlet F is the cabin heater engine bleed air discharge. The values shown on table 42 are based on flight data and component performance curves. Engine bleed air is used to heat the airflow for the crew members by an air-to-air heat exchanger.

Outlet G is the fuel water boiler discharge. It is used during descent to maintain the fuel below the engine limit of 260°F during deceleration. The fuel did not reach the temperature required to actuate the water boiler during the flights studied.

Outlet H is the water drain for the ram/recirculation air water boiler. The ram/recirculation air water boiler is supplied with a continuous water flow of 2.5 pounds per minute above Mach 1.7. This operation required action by the crew and will be assumed "on" for flights above Mach 1.7. The water is supplied to absorb heat from the cabin recirculation air loop to reduce the heat load on the freon refrigeration unit. The water boiled off and discharged as steam is included in the discharge from Outlet B in table 42 . The overflow water in excess of that converted to steam is shown in table 42 for Outlet H.

Weapons Bay leakage is described in table 41. The AICS and flight test instrumentation packages are located in the weapons bay with self-contained cooling and pressurization systems. The equipment is cooled by recirculating nitrogen gas which in turn is cooled by injection of liquid nitrogen into the recirculating stream. The nitrogen gas, resulting from evaporation of the liquid nitrogen provides the necessary makeup gas for normal leakage and pressurization. The packages are nominally pressurized to 8,000 feet, 10.9 psia. The nitrogen gas leaks from the AICS and flight test packages into the weapons bay. The nitrogen mixes with the air in the bay and leaks overboard. The weapons bay door has seals at both ends; however, on each side of the door a clearance of 0.005 to 0.020 inches is allowed between the door track and door. The weapons bay is approximately 347 inches in length. The average nitrogen usage from the two packages obtained from flight test was from 2 to 4.5 pounds per minute, for an average of 3 pounds per minute. The data was compiled from 20 of the earlier flights. There was no record of liquid nitrogen usage available for the specific flights called out in table 1 . The weapons bay flight data are shown in table 43.

The preflight estimates on the usage rate of liquid nitrogen was 5.8 lbs/min during the maximum cooling and pressurization demands of the AICS and flight test packages. The expended coolant mixes in the weapons bay and exhausts overboard at local skin temperature and pressure.

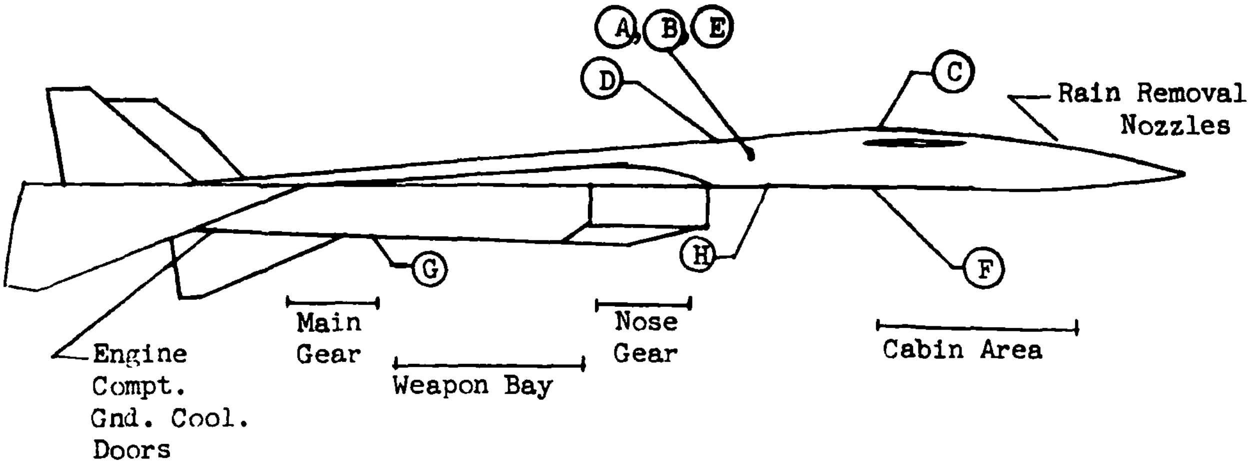
The Engine Compartment has 18 ground cooling doors, 3 per engine, to provide engine compartment cooling during ground operation and low-speed flight. The doors are on the bottom of the fuselage and allow inflow of ambient air, induced by the pumping action of the engine ejector nozzle. These doors are spring-loaded open and require no direct control from a control unit. During the flight conditions of table 1 , these doors are closed. However, there is no special care in assuring that the doors provide an air tight seal. The doors are held closed by the pressure of the engine secondary airflow induced in flight. The metal doors close onto a metal door frame. Each of the ground cooling doors has a periphery of approximately 69 inches. These doors are on the engine access doors as shown in figure 101. There is also potential leakage from each of the six engine access foors. The engine compartment pressure and temperature shown on table 43 are flight data. No leakages were assumed for preflight analysis.

Windshield Rain Removal Nozzles are on the movable ramp immediately forward of the movable windshield at sta 359. Each of the two nozzles has a six square inch flow area. No rain removal flow was required during the flight conditions studied. The nozzle configuration is shown on figure 97. The estimated airflow when selected by the crew is shown on figure 98.

Landing Gear Compartment doors are shown on figures 102 and 103. The compartments are conditioned by ethylene glycol cooled panels. There is no discharge of coolants to or from these compartments. It is conceivable to have an induced flow in and out of the compartments due to the difference in aerodynamic pressures from one end of the door to the other. The fuselage station location of the landing gear doors are shown on figures 102 and 103. No leakages were assumed for preflight analyses.

The Flood Flow Scoop is the only external inlet for the ECS and is described in figure 104. The flood flow scoop is normally flush with the mold line of the fuselage. It is only extended out during certain cabin pressurization or cooling emergencies requiring ram air. No emergency requiring the use of this scoop was encountered during the flight conditions listed in table 1 .

TABLE 41.- ECS OVERBOARD OUTLETS SUMMARY



Outlet	Location Fus. Sta	Reference Dwg. No.	Flow Area	Discharge Media	Type Outlet
A	850 LH	259-312515	40 in^2	Air, Steam	Ramp Step
B	850 RH	259-312516	25	Steam	Ramp Step
C	655 RH	259-312345	75	Air	Ramp Step
D	852 RH	259-533598	0.78	Ammonia Vapor	Flush
E	850 LH & RH	259-312515 259-312516	8	Air	Ramp Step (1)
F	611 Bottom	259-534119	1.5	Air	Flush
G	1803 Bottom	259-533847	3.7	Steam	Flush
H	846 Bottom	278-534481	0.12	Water	Flush
Cabin Area	369.5/605	---	0.28	Air	Structural Leakage
Weapon Bay	1357/1704	259-634001	(2)	Gaseous Nitrogen	Door Leakage
Engine Compt.	2028/2102	259-321248 259-320010	(3)	Air	Gnd. Cooling Door Leakage
Rain Rem. Nozzle	259 LH & RH	259-533016	12	Air	Flush
Nose Gear	1137/1285	259-340031	---	---	Door Leakage
Main Gear	1720/1834	259-333001	---	---	Door Leakage

Note: (1) Air space to prevent structural overheat provides area.
(2) Clearance between door and door track.
(3) Unsealed metal to metal closure.

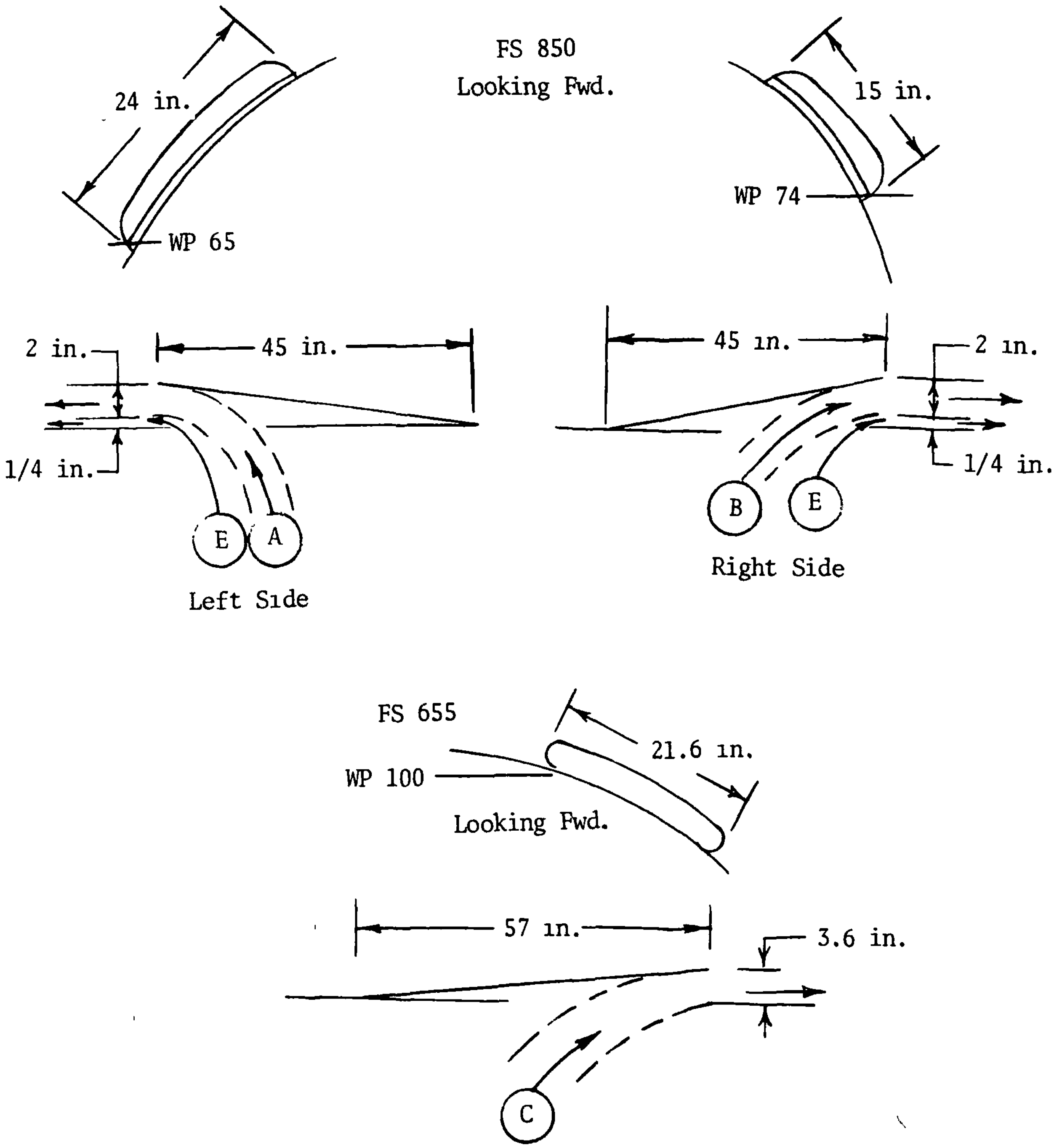


Figure 95.- Ramp step outlets

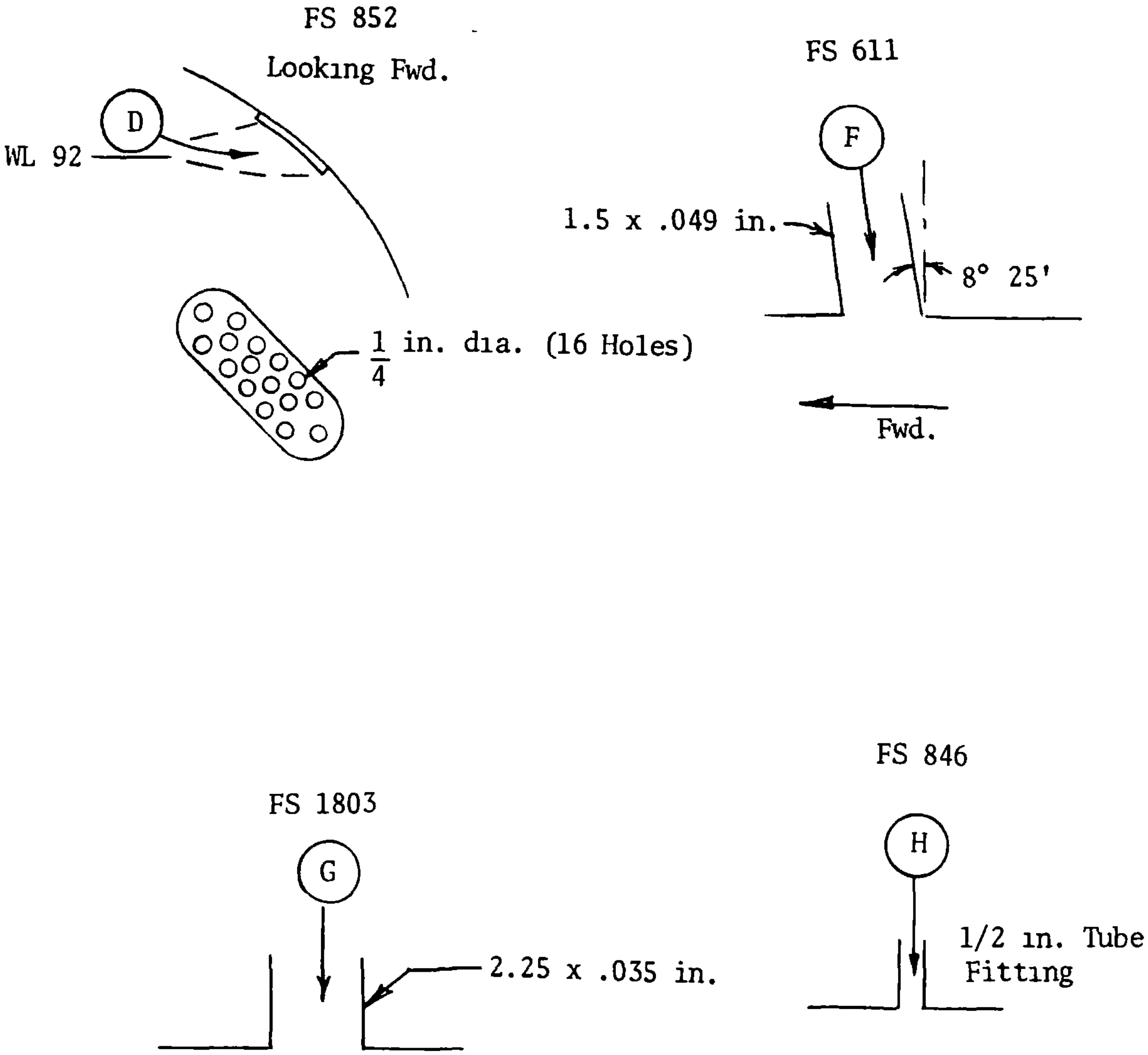


Figure 96.- Flush outlets

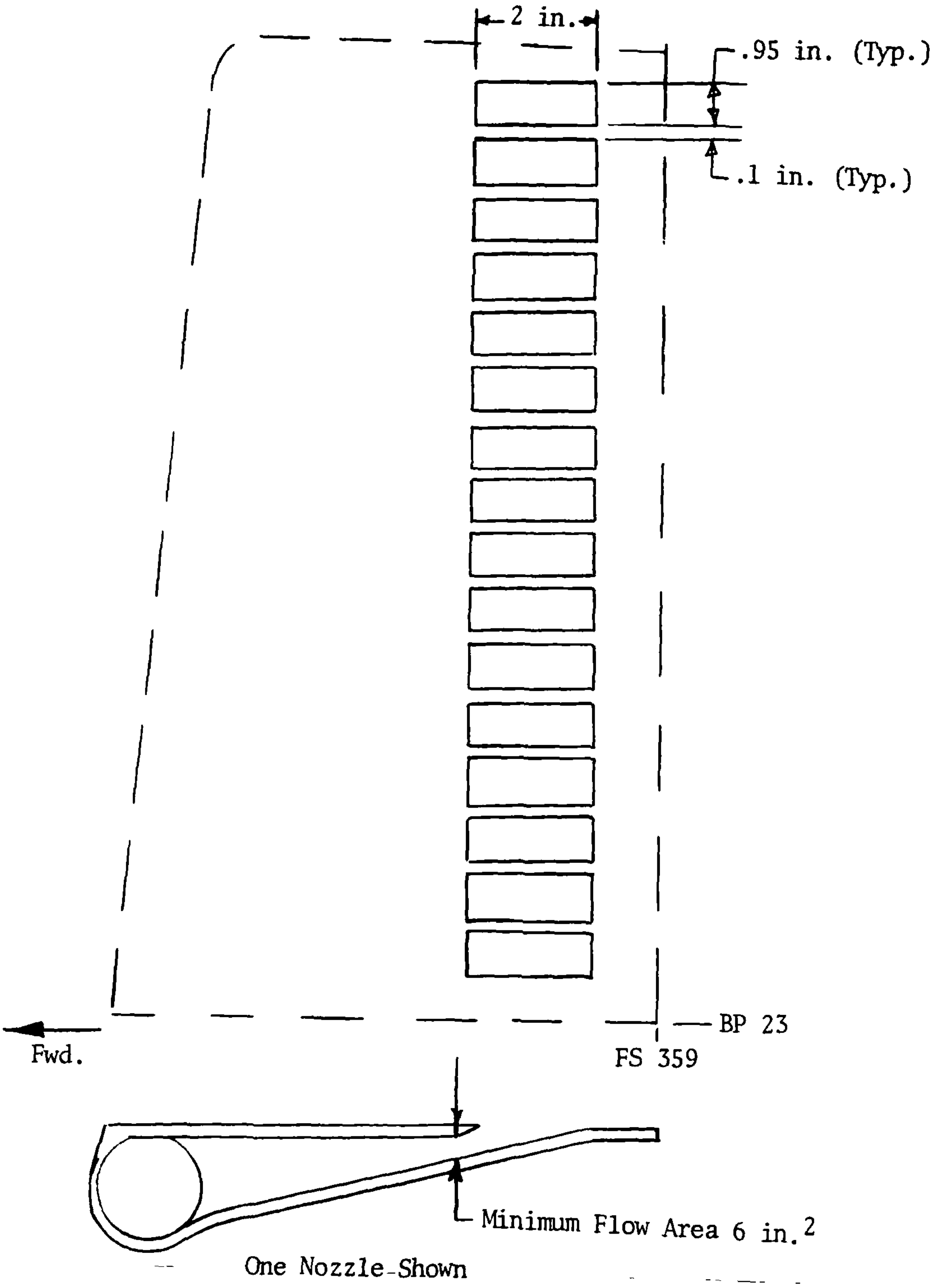


Figure 97.- Windshield rain removal nozzle

TABLE 42

SUMMARY - ECS OVERBOARD OUTLETS
FLOW RATES, TEMPERATURES, PRESSURES

Case I.D.	Press. at Outlet psia	Outlet A Air Flow lb./min.	Outlet A Air Temp. °F	Outlet A Steam Flow lb./min.	Outlet A Steam Temp. °F	Outlet B Steam Flow lb./min.	Outlet B Steam Temp. °F
P 1	6	78	263	6.1	126	1	170
P 2	4.5	60	273	6.2	130	1	158
P 3	4.6	59	302	6.7	126	1.5	159
P 4	4.3	52	303	6.8	114	2	156
P 5	3.7	47	312	6.6	126	2.1	150
P 6	2.5	28	276	6.0	122	3.1	134
P 7	1.0	26	172	4.9	90	2.6	102
P 8	0.6	20	133	4.0	81	4.7	86
P 9	1.0	20	210	4.1	89	4.0	102
P 10	4.3	72	299	6.3	125	1.5	156

Outlet C Air Flow lb./min.	Outlet C Air Temp. °F	Outlet F Air Flow lb./min.	Outlet F Air Temp. °F	Outlet H Water Flow lb./min.	Outlet H Water Temp. °F
5	89	2	180	0	---
5.1	114	0	---	0	---
5.1	105	0	---	0	---
5.1	91	2	260	0	---
5.1	105	0	---	0	---
5.1	101	0	---	1.8	122
5.1	93	2	370	2.5	90
5.1	99	0	---	1.0	81
5.2	87	0	---	1.7	89
5.1	105	2	260	0	---

Note: The ammonia boiler (Outlet D) and the fuel water boiler (Outlet G) were off for the flights analyzed.

TABLE 43

SUMMARY - COMPARTMENT LEAKAGE
FLOW RATES, TEMPERATURES, PRESSURES

Case I.D.	ECS Compartment Air (Outlet E)			Cabin Air		
	Flow lb./min.	Temp. °F	Compt. Press. psia	Flow lb./min.	Temp. °F	Compt. Press. psia
P 1	10	30	5.2	4	57	10
P 2	10	30	3.8	4.2	75	10.7
P 3	10	60	3.4	4.2	61	10.7
P 4	10	80	2.5	4	59	10.3
P 5	10	110	2.2	4.5	61	11.5
P 6	10	120	1.6	4.5	61	11.5
P 7	10	185	1.2	4.2	65	10.7
P 8	10	190	0.9	4.1	65	10.6
P 9	10	308	1.0	4.2	65	10.9
P 10	10	60	4.5	4.2	70	10.7

Weapon Bay Nitrogen			Engine Compt. Air	
Flow lb./min.	Temp. °F	Compt. Press. psia	Temp. °F	Compt. Press. psia
3	30	5.2	186	6.37
3	30	3.8	419	6.14
3	60	3.4	415	8.13
3	80	2.5	336	13.21
3	110	2.2	368	12.36
3	120	1.6	448	13.51
3	185	1.2	474	19.91
3	190	0.9	547	20.07
3	308	1.0	608	15.02
3	60	4.5	346	14.05

Note: The windshield rain removal system was off and the cabin air flood flow scoop was closed for the flights analyzed.

Note: (1) Normally off-selected on if rain or ice on windshield, 2 nozzles
(2) Flash tank ejector on below 40,000 feet, off above 40,000 feet
(3) Cabin make-up air off for ground operation

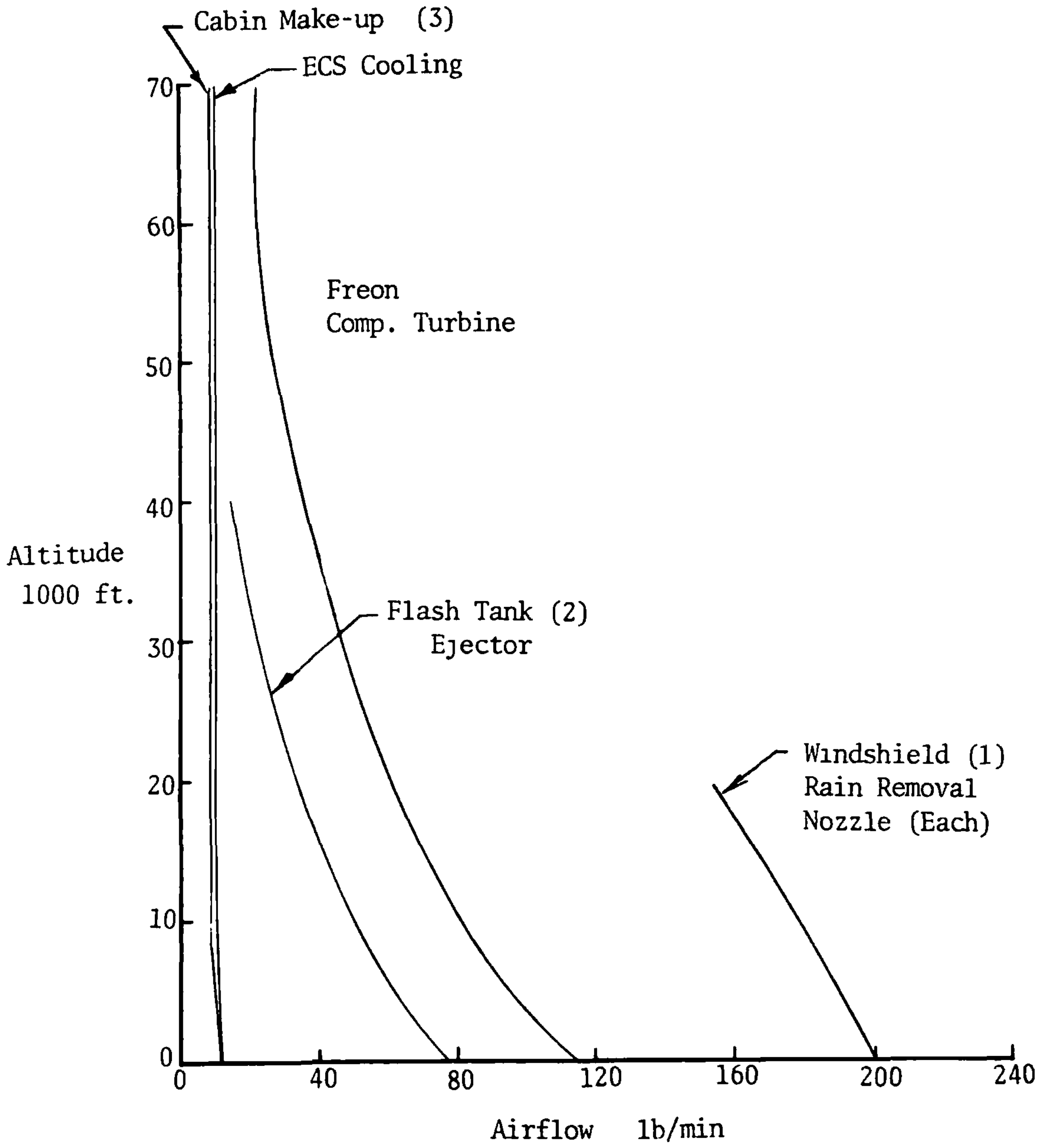


Figure 98.- Estimated engine extraction airflow

Note: (1) Ammonia System Off
(2) Ejector on Below 40,000 Feet, off Above 40,000 Feet.
(3) Recirc. Air Operation

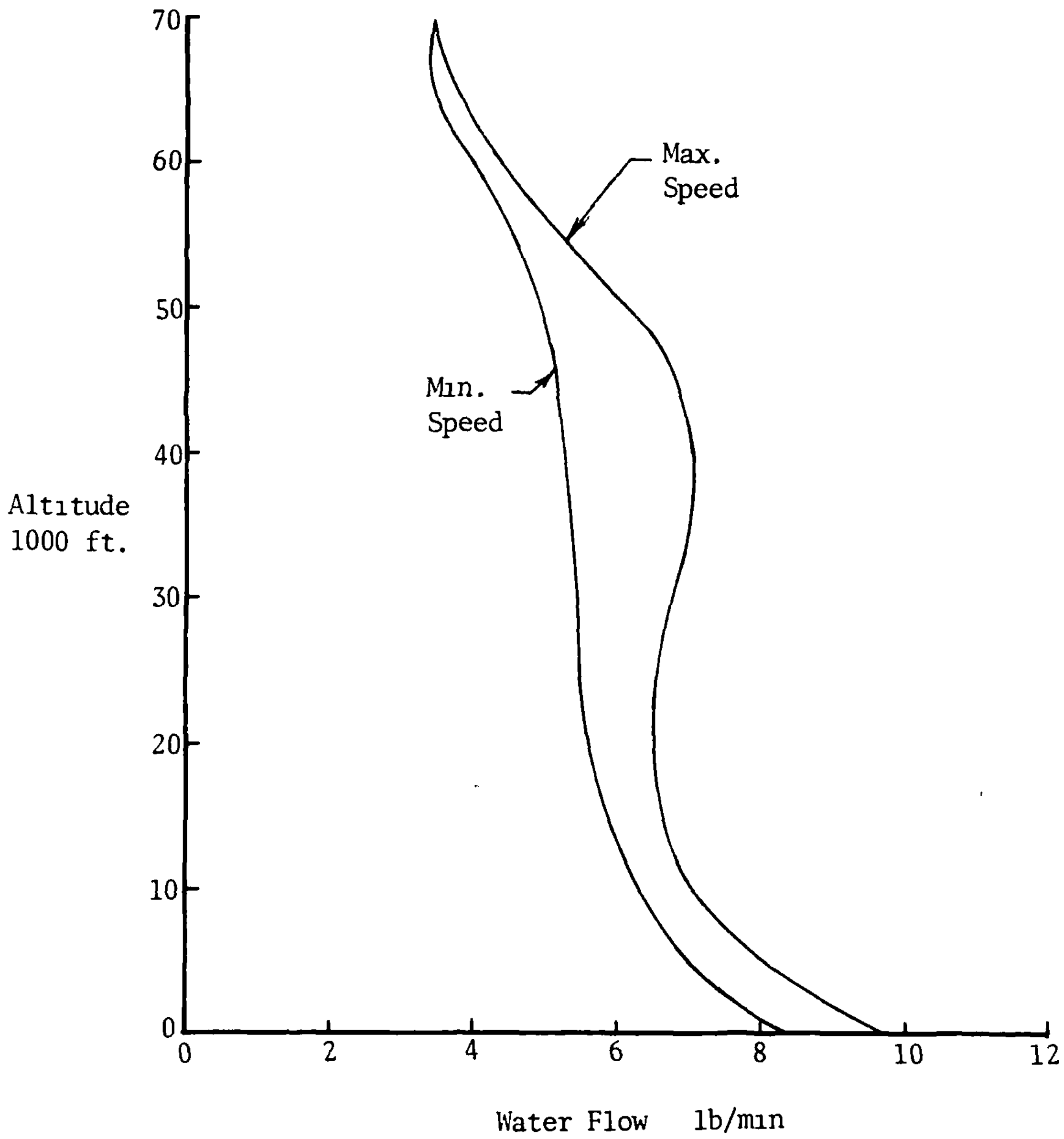


Figure 99.- Flash tank water consumption envelope

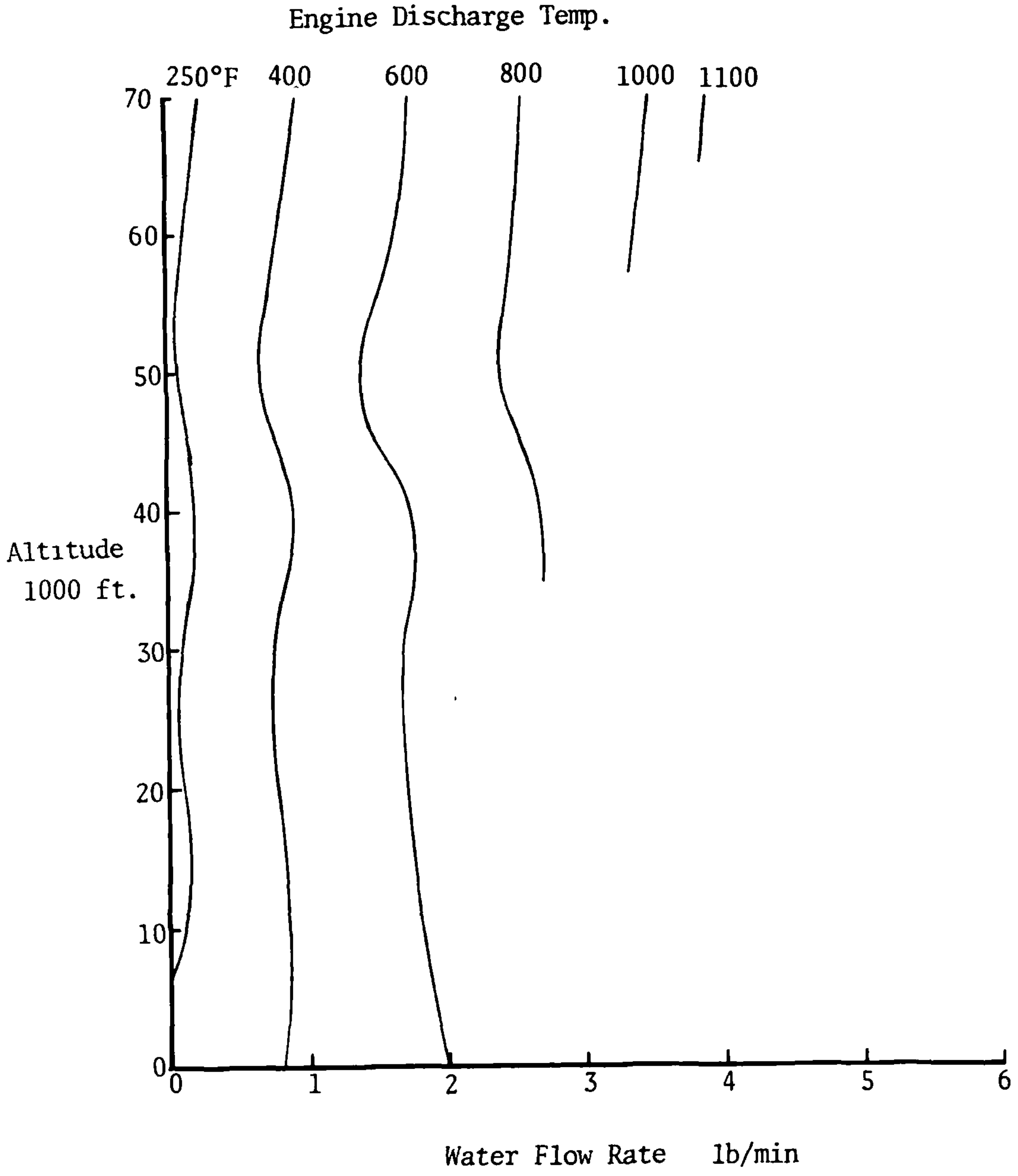


Figure 100.- Bleed air boiler-approximate water consumption envelope

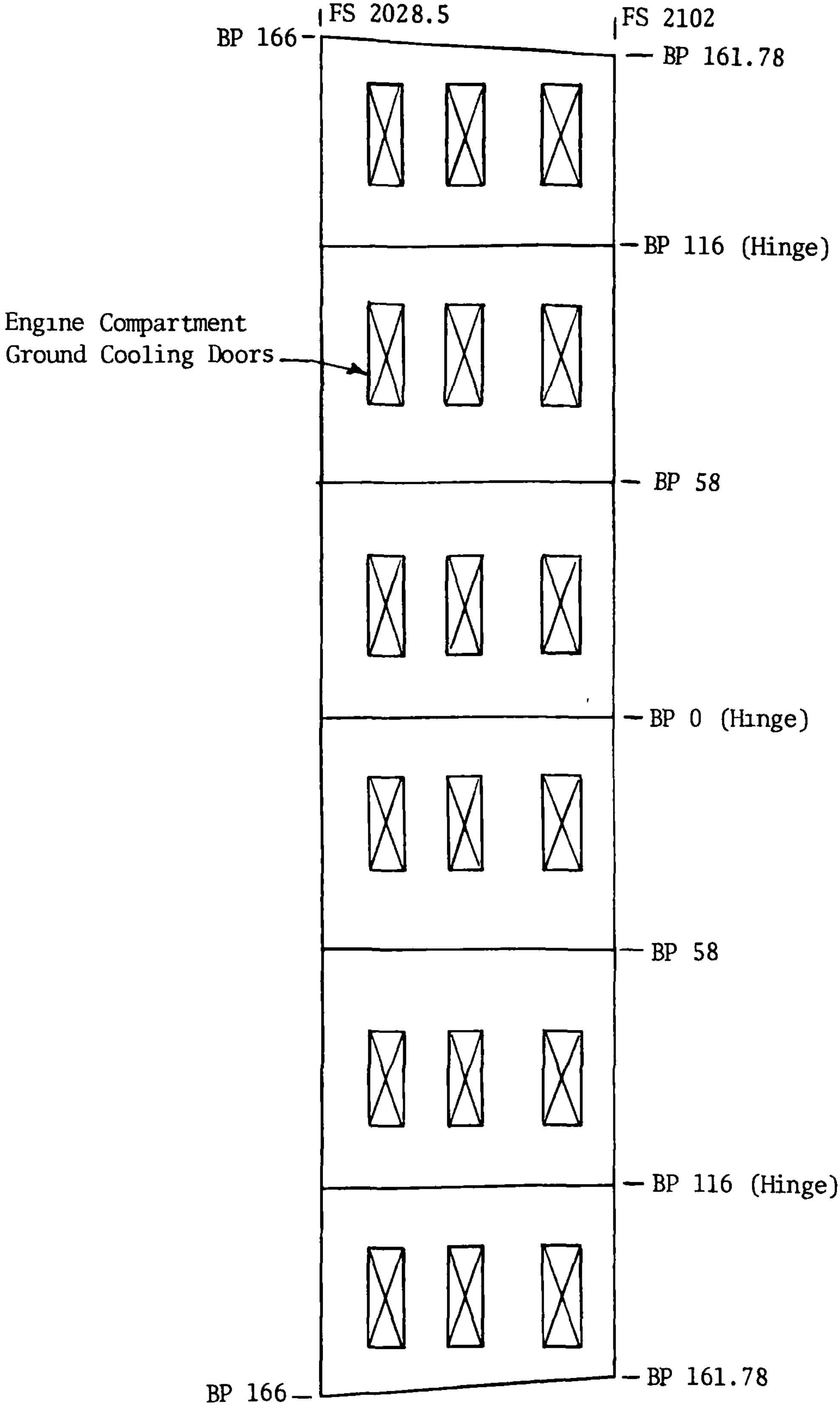


Figure 101.- Engine access doors

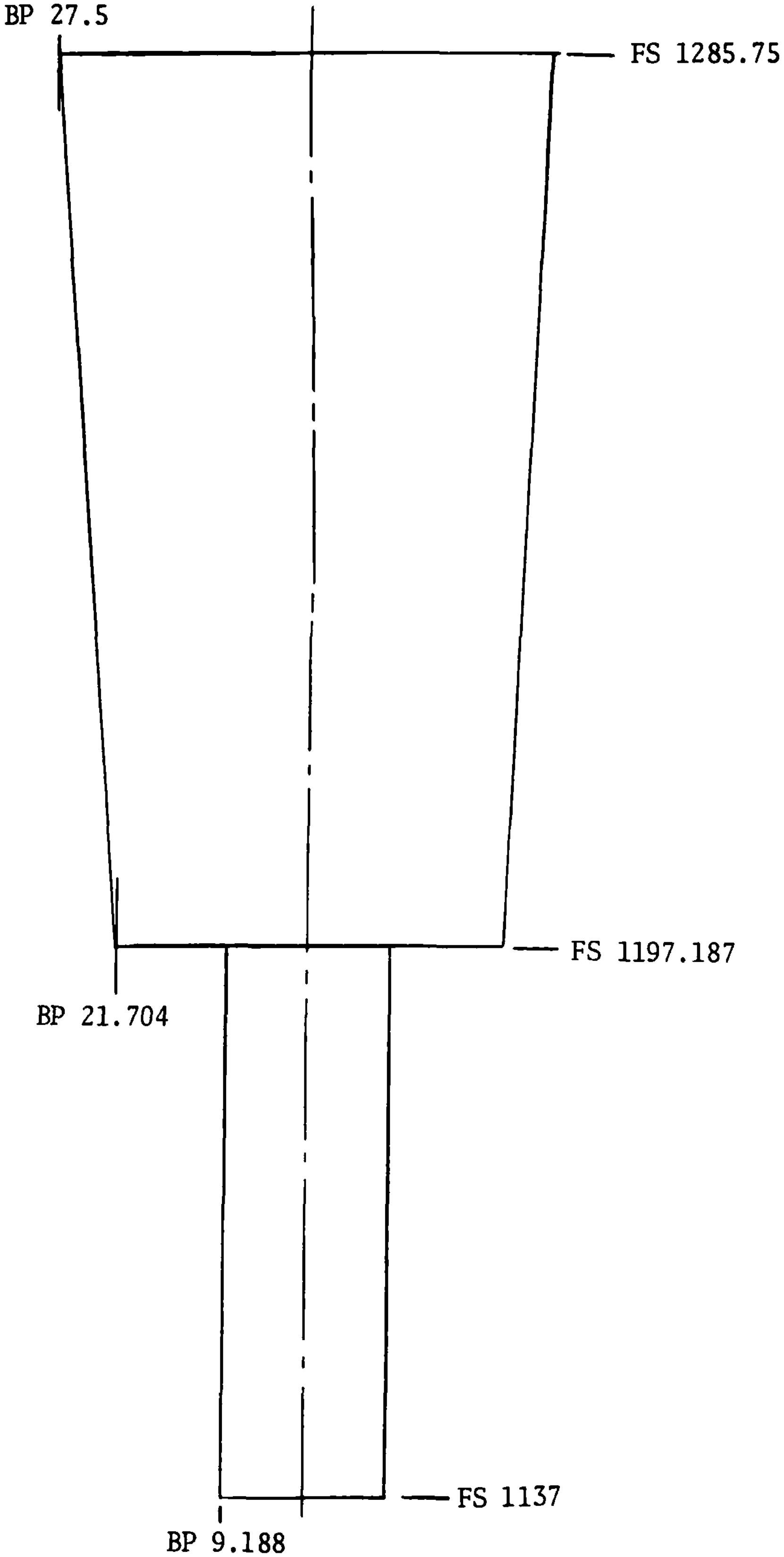
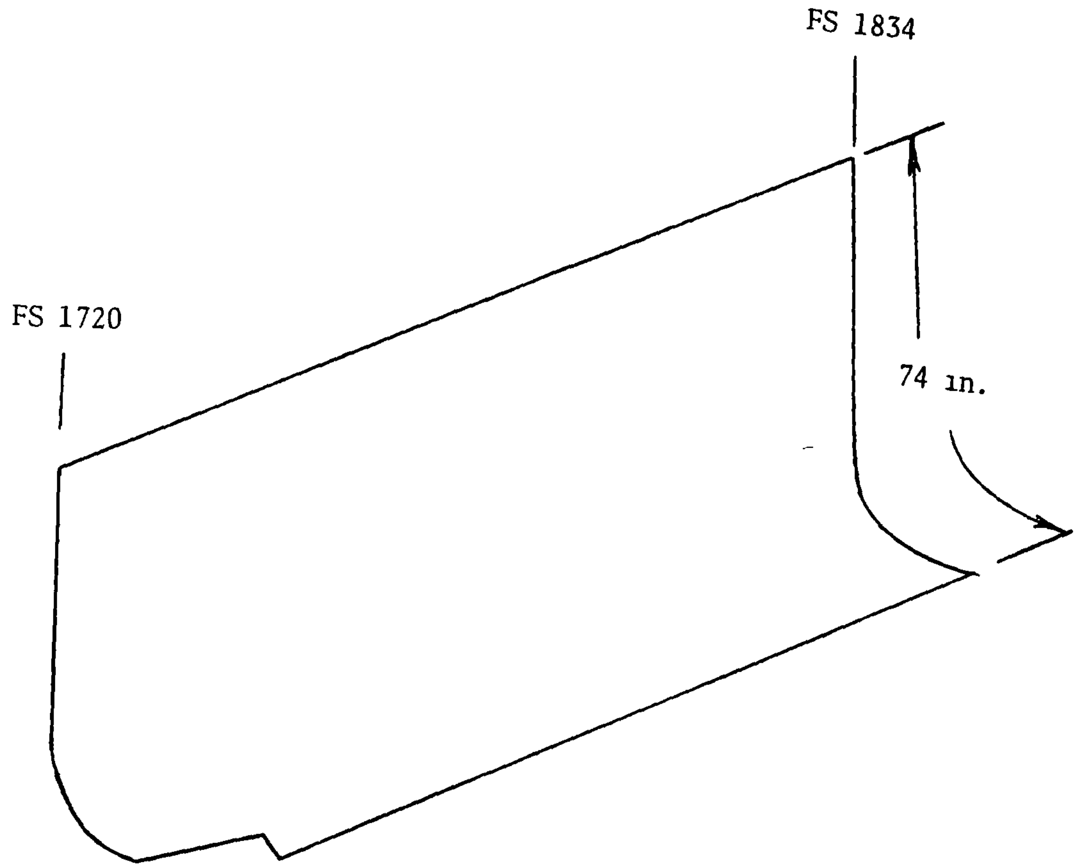


Figure 102.-Nose landing gear door



RH Shown, LH Opposite

Figure 103.- Main landing gear door

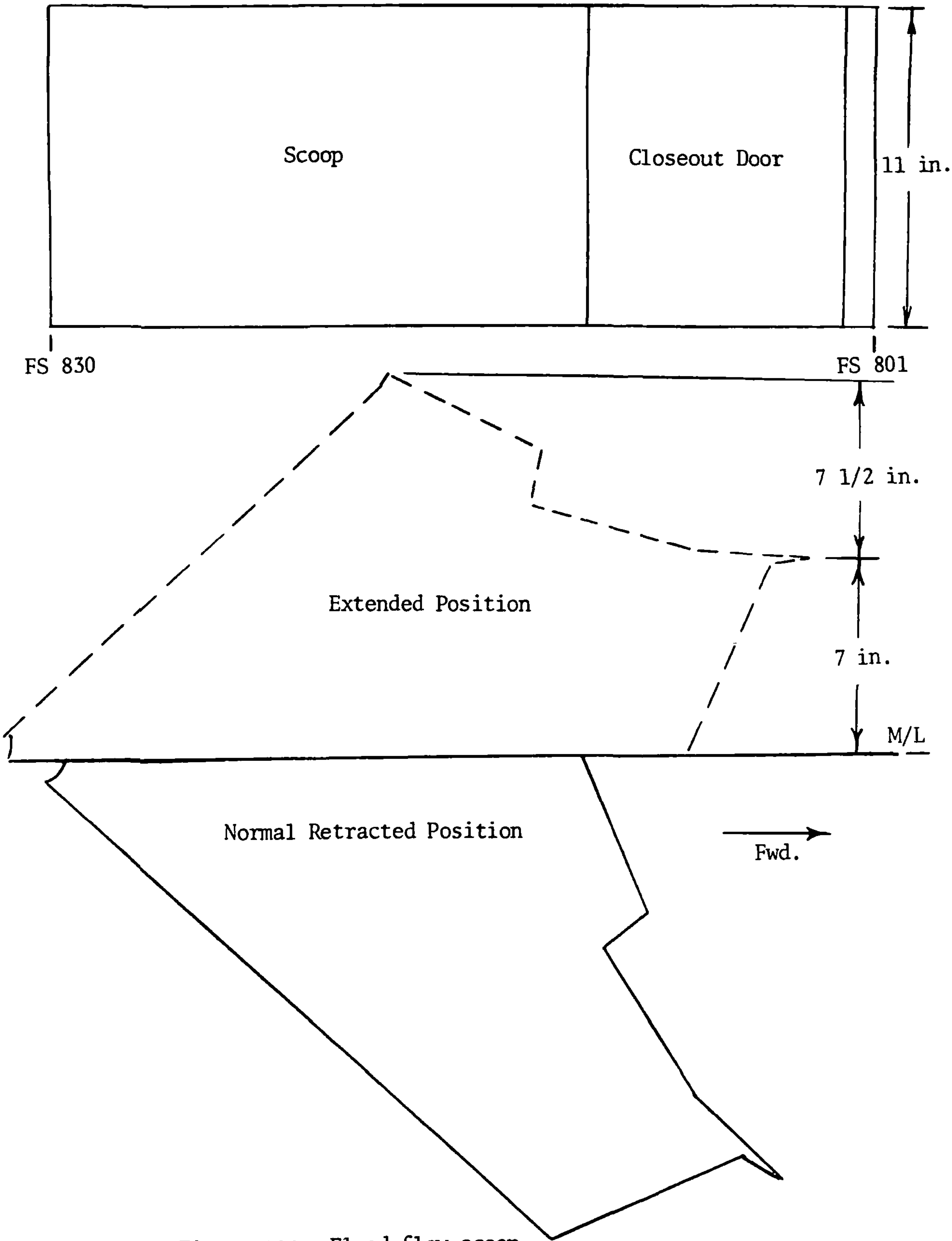


Figure 104.- Flood flow scoop

CONCLUDING REMARKS

Because of the extensive nature of the preceding sections of the report, it is appropriate to emphasize important study findings at this point.

The prime result is the demonstration that the overall knowledge and techniques exist for predicting the longitudinal stability and control and trimmed shape characteristics of a large flexible air vehicle in the subsonic through supersonic flight ranges.

Contributing to the good correlations with flight test data obtained during this study was the use of ground shake test modal data modified by an accurate accounting of the weight at the flight conditions for which correlations were desired. Also contributing to the good correlations were more accurate definitions of the segmented elevon effectiveness, the $\alpha = 0°$ normal forces and moments, and the nonlinear variations in the pitching moment curves. The wind tunnel test of the Deformed Model conducted by Ames contributed significantly to these more accurate definitions. Accurate aerodynamic data acquisition through the transonic range between M = .95 to M = 1.20 was and remains a problem.

It is important to highlight the fact that cumulative impact of all of the individually small discharge flows on normal force and pitching moment characteristics were important throughout the Mach number range of interest for the XB-70.

A fact which needs to be more widely appreciated is that supersonic flight cases require increased aerodynamic data accuracy proportional to the Mach number beyond M = 1.0. Numerically small C_N and C_m increments due to such phenomena as the previously described discharge flow become increasingly important in describing vehicle trim characteristics.

The Deformed Model defined and tested during this program had built into it the flexible shape existing at M = 2.53 and h_p = 62,980 ft. This incremental deformation was relatively small and produced small normal force and pitching moment coefficient increments when tested over the subsonic to supersonic Mach number range. In order to economically use the concept of a deformed model, it must be shown that it is possible to analytically extract the deformation increment effect (which is valid only at one flight condition) from the test data at off-design conditions. It was not conclusively demonstrated during this research study that this could be done accurately because of the relatively small deformation of the model. Therefore, it is recommended that additional studies be conducted in this technical area to more conclusively demonstrate the validity of the approach.

APPENDIX A

GEOMETRIC CHARACTERISTICS OF THE XB-70-1 AIRPLANE

The physical characteristics of the XB-70-1 airplane are presented in table A1.

TABLE A1

GEOMETRIC CHARACTERISTICS OF THE XB-70-1 AIRPLANE

Total wing -	
Total area (includes 2482.34 sq ft covered by fuselage but not 33.53 sq ft of wing ramp area), sq ft	6,297.8
Span, ft	105
Aspect ratio	1.751
Taper ratio	0.019
Dihedral angle, deg	0
Root chord (wing station 0), ft	117.76
Tip chord (wing station 630 in.) ft	2.19
Mean aerodynamic chord (wing station 213.85 in.), in.	942.38
Fuselage station of 25-percent wing mean aerodynamic chord, in.	1,621.22
Sweepback angle, deg:	
Leading edge	65.57
25-percent element	58.79
Trailing edge	0
Incidence angle, deg:	
Root (fuselage juncture)	0
Tip (fold line and outboard)	-2.60
Airfoil section:	
Root to wing station 186 in. (thickness-chord ratio, 2 percent)	0.30 to 0.70 HEX (MOD)
Wing station 460 in. to 630 in. (thickness-chord ratio, 2.5 percent)	0.30 to 0.70 HEX (MOD)
Inboard wing -	
Area (includes 2482.34 sq ft covered by fuselage but not 33.53 sq ft wing ramp area), sq ft	5,256.0
Span, ft	63.44

TABLE A1. - Continued

GEOMETRIC CHARACTERISTICS OF THE XB-70-1 AIRPLANE

Aspect ratio	0.766
Taper ratio	0.407
Dihedral angle, deg	0
Root chord (wing station 0), ft	117.76
Tip chord (wing station 380.62 in.) ft	47.94
Mean aerodynamic chord (wing station 163.58 in.), in.	1053
Fuselage station of 25-percent wing mean aerodynamic chord, in.	1,538.29
Sweepback angle, deg:	
Leading edge	65.57
25-percent element	58.75
Trailing edge	0
Airfoil section:	
Root (thickness-chord ratio, 2 percent)	0.30 to 0.70 HEX (MOD)
Tip (thickness-chord ratio, 2.4 percent)	0.30 to 0.70 HEX (MOD)
Mean camber (leading edge), deg:	
Butt plane 0	0.15
Butt plane 107 in.	4.40
Butt plane 153 in.	3.15
Butt plane 257 in.	2.33
Butt plane 367 in. to tip	0

Outboard wing -

Area (one side only), sq ft	520.90
Span, ft.	20.78
Aspect ratio	0.829
Taper ratio	0.046
Dihedral angle, deg	0
Root chord (wing station 380.62 in.), ft	47.94
Tip chord (wing station 630 in.), ft	2.19
Mean aerodynamic chord (wing station 467.37 in.), in.	384.25
Sweepback angle, deg:	
Leading edge	65.57
25-percent element	58.79
Trailing edge	0

TABLE A1. - Continued

GEOMETRIC CHARACTERISTICS OF THE XB-70-1 AIRPLANE

Airfoil section:		
Root (thickness-chord ratio, 2.4 percent)	0.30 to 0.70 HEX (MOD)	
Tip (Thickness-chord ratio, 2.5 percent)	0.30 to 0.70 HEX (MOD)	
Down deflection from wing reference plane, deg	0, 25, 65	
Skewline of tip fold, deg:		
Leading edge in	1.5	
Leading edge down	3	
Wingtip area in wing reference plane (one side only), sq ft:		
Rotated down 25 deg	472.04	
Rotated down 65 deg	220.01	

	Wingtips Up	Wingtips Down
Elevons (data for one side):		
Total area aft of hinge line, sq ft	197.7	135.26
Span, ft	20.44	13.98
Inboard chord (equivalent), in.	116	116
Outboard chord (equivalent), in.	116	116
Sweepback angle of hinge line, deg	0	0
Deflection, deg:		
As elevator		-25 to 15
As aileron with elevators at ±15 deg or less		-15 to 15
As aileron with elevators at -25 deg		-5 to 5
Total		-30 to 30

Canard -	
Area (includes 150.31 sq ft covered by fuselage), sq ft	415.59
Span, ft	28.81
Aspect ratio	1.997
Taper ratio	0.388
Dihedral angle, deg	0
Root chord (canard station 0), ft	20.79
Tip chord (canard station 172.86 in.), ft	8.06
Mean aerodynamic chord (canard station 73.71 in.), in.	184.3
Fuselage station of 25-percent canard mean aerodynamic chord, in.	553.73

TABLE A1. - Continued

GEOMETRIC CHARACTERISTICS OF THE XB-70-1 AIRPLANE

Sweepback angle, deg:	
Leading edge	31.70
25-percent element	21.64
Trailing edge	-14.91
Incidence angle (nose up), deg	0 to 6
Airfoil section:	
Root (thickness-chord ratio 2.5 percent)	0.34 to 0.66 HEX (MOD)
Tip (thickness-chord ratio 2.52 percent)	0.34 to 0.66 HEX (MOD)
Ratio of canard area to wing area	0.066
Canard flap (one of two):	
Area (aft of hinge line), sq ft	54.69
Ratio of flap area to canard semiarea	0.263
Vertical tail (one of two) -	
Area (includes 8.96 sq ft blanketed area), sq ft	233.96
Span, ft	15
Aspect ratio	1
Taper ratio	0.30
Root chord (vertical-tail station 0), ft	23.08
Tip chord (vertical-tail station 180 in.), ft	6.92
Mean aerodynamic chord (vertical-tail station 73.85 in.), in.	197.40
Fuselage station of 25-percent vertical-tail mean aerodynamic chord, in.	2,188.50
Sweepback angle, deg:	
Leading edge	51.77
25-percent element	45
Trailing edge	10.89
Airfoil section:	
Root (thickness-chord ratio 3.75 percent)	0.30 to 0.70 HEX (MOD)
Tip (thickness-chord ratio 2.5 percent)	0.30 to 0.70 HEX (MOD)
Cant angle, deg	0
Ratio vertical tail to wing area	0.037
Rudder travel, deg:	
With gear extended	±12
With gear retracted	±3

TABLE A1. - Concluded

GEOMETRIC CHARACTERISTICS OF THE XB-70-1 AIRPLANE

Fuselage (includes canopy) -	
Length, ft	185.75
Maximum depth (fuselage station 878 in.), in.	106.92
Maximum breadth (fuselage station 855 in.), in.	100
Side area, sq ft	939.72
Planform area, sq ft	1,184.78
Center of gravity:	
Forward limit, percent mean aerodynamic chord	19.0
Aft limit, percent mean aerodynamic chord	25.0
Duct -	
Length, ft	104.84
Maximum depth (fuselage station 1375 in.), in.	90.75
Maximum breadth (fuselage station 2100 in.), in.	360.70
Side area, sq ft	716.66
Planform area, sq ft	2,342.33
Inlet captive area (each), sq in	5,600
Surface areas (net wetted), sq ft:	
Fuselage and canopy	2,871.24
Duct	4,956.66
Wing, wing tips, and wing ramp	7,658.44
Vertical tails (two)	936.64
Canard	530.83
Tail pipes	340.45
Total	17,294.26
Engines	6 YJ93-GE-3
Landing gear -	
Tread, ft	23.17
Wheelbase, in.	554.50
Tire size:	
Main gear (8)	40 x 17.5-18
Nose gear (2)	40 x 17.5-18

APPENDIX B

FLEXIBLE AIRPLANE EQUATIONS OF MOTION

The longitudinal-symmetric equations of motion, as used in this study for the flexible XB-70, are presented in this appendix in Table B1. The equations shown are for the longitudinal-rigid-body plunge and pitch modes and four symmetric structural modes of the complete vehicle. The airplane rigid aerodynamic data and airplane response parameters are in a body reference axes system; the structural mode data and structural response parameters are in the principal body axes system. It has been assumed that:

1. Airspeed (V_O) is constant.

2. Angle of attack (α) is small.

3. Angle of pitch (θ) is small.

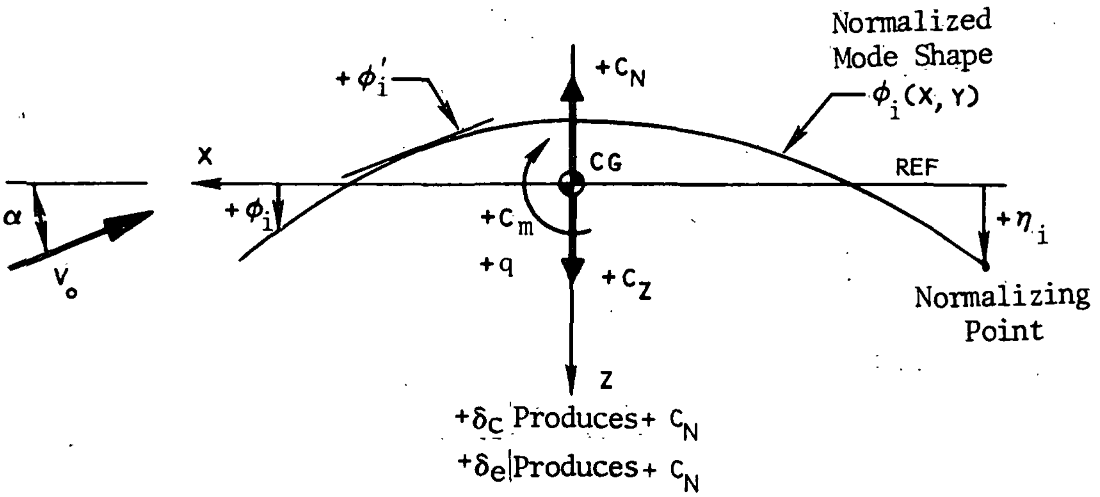
4. The rigid-body modes and structural modes are orthogonal.

5. Canard surface aerodynamic data are modified by a flexible-to-rigid ratio (K_C).

6. Canard aerodynamics have been separated from the wing body aerodynamics in the table B1 equations.

The units for the equations shown are ft, lb, rad, and sec. (m, I_y, $M_i \sim$ slugs)

Force, moments, and deflection senses are indicated in the following sketch:



The rigid-body modes of motion of pitch and plunge referred to in the previous paragraph may be thought of as representing the whole vehicle motion or motion of the axis system X - Z in the sketch shown. The structural modes may be thought of as incremental structural motions referenced to the moving rigid-body axis system X - Z.

The canard's first natural frequency (approximately 9.0 cps) was judged to be high enough above the whole vehicle structural natural frequencies (four modes) used in the basic analytical model that its flexibility effects could be represented by a simple quasi-steady flexible-to-rigid ratio, K_c, of the cantilevered surface instead of additional dynamic structural modes.

In Table B1, the moment arm ℓ_{c_1} is the distance from the center of gravity to the canard center of pressure. The distance ℓ_{c2} is associated with the time lag that it takes the downwash due to the canard lift acting at a given instant of time to reach the wing and influence its lift (time = $\frac{\ell_{c_2}}{V_o}$). The distance is related to the 3/4 chord point on the canard as well as the wing since in simple lifting line subsonic theory, the upwash (net angle of attack) acting at this point determines the lift generated.

The List of Symbols section contains complete definitions of the terms of the equations; however, in addition to the above sketch, it is worthwhile to mention here certain key items. In the use of the equations of motions in this study the normal force coefficient, C_N, may be assumed to be equal to the lift coefficient, C_L. The equations have been written to emphasize the nonlinear character of the aerodynamic data of the XB-70-1. The digital analyses programs used during this study can accommodate these nonlinear aerodynamic characteristics. The nonlinearities have been indicated by putting the parameter against which the coefficient varies in a subscripted parenthesis. Thus the usual linearized normal force curve input would appear as $C_{N_\alpha}\alpha$ but the equivalent nonlinear input would appear as $C_{N(\alpha)}$. Two parameters in the subscripted parentheses would indicate a nonlinear variation of the coefficient as a function of the two parameters.

The thrust input appears only in the moment equation and is assumed of negligible impact in the other equations.

No attempt has been made here to derive the equations of motion. The equations as shown should be recognizable by those familiar with the dynamics of flexible vehicles. Those desiring additional enlightenment are referred to an aeroelastic text such as reference 30 .

LOS ANGELES DIVISION
NORTH AMERICAN ROCKWELL CORPORATION

TABLE B1.- EQUATIONS OF MOTION FOR LONGITUDINAL RIGID-BODY AND SYMMETRIC STRUCTURAL MODES

Total Vehicle, Body Axes
Units: ft., lbs., rad., sec.

Rigid-Body Plunge Mode

$$\dot{\alpha} = + q + \left(\frac{g}{V_0}\right)\cos\Theta - \left(\frac{q_0 S_w}{m V_0}\right)\Big\{ \left(C_{N_{(\alpha=0)}}\right)_{WB} + \left(C_{N_{(\alpha)}}\right)_{WB} + K_c\Big[\left(C_{N_{(\alpha_c)}}\right)_C + \left(C_{N_{(\alpha_c)}}\right)_I + \left(C_{N_{(\alpha_c)}}\right)_I\left(\frac{l_{c_2}}{V_0}\right)\left(-\dot{\alpha}_c\right)\Big] + \left(C_{N_{\dot{\alpha}}}\right)_{WB}\left(\frac{\dot{\alpha}\bar{c}_w}{2V_0}\right)$$

$$+ \left(C_{N_q}\right)_{WB}\left(\frac{q\bar{c}_w}{2V_0}\right) + K_c\Big[C_{N_{(\alpha,\delta_c)}} + \left(C_{N_{(\alpha,\delta_c)}}\right)_I\Big] + C_{N_{(\alpha,\delta_e)}} + C_{N_{(\delta_d)}} + \left(C_{N_{\eta_1}}\right)_{WB}\eta_1 + \left(C_{N_{\eta_2}}\right)_{WB}\eta_2 + \left(C_{N_{\eta_3}}\right)_{WB}\eta_3$$

$$+ \left(C_{N_{\eta_4}}\right)_{WB}\eta_4 + \left(C_{N_{\dot{\eta}_1}}\right)_{WB}\left(\frac{\dot{\eta}_1}{V_0}\right) + \left(C_{N_{\dot{\eta}_2}}\right)_{WB}\left(\frac{\dot{\eta}_2}{V_0}\right) + \left(C_{N_{\dot{\eta}_3}}\right)_{WB}\left(\frac{\dot{\eta}_3}{V_0}\right) + \left(C_{N_{\dot{\eta}_4}}\right)_{WB}\left(\frac{\dot{\eta}_4}{V_0}\right)\Big\}$$

Canard Angle of Attack

$$\alpha_c = \alpha - \left(\frac{l_{c_1}}{V_0}\right)q - \Big[\eta_1\phi_1' + \eta_2\phi_2' + \eta_3\phi_3' + \eta_4\phi_4' + \left(\frac{\dot{\eta}_1}{V_0}\right)\phi_1 + \left(\frac{\dot{\eta}_2}{V_0}\right)\phi_2 + \left(\frac{\dot{\eta}_3}{V_0}\right)\phi_3 + \left(\frac{\dot{\eta}_4}{V_0}\right)\phi_4\Big]_{\text{AT CANARD STATION}}$$

$$\dot{\alpha}_c = \dot{\alpha} - \left(\frac{l_{c_1}}{V_0}\right)\dot{q} - \Big[\dot{\eta}_1\phi_1' + \dot{\eta}_2\phi_2' + \dot{\eta}_3\phi_3' + \dot{\eta}_4\phi_4'\Big]_{\text{AT CANARD STATION}}$$

Rigid-Body Pitch Mode

$$\dot{q} = + \left(\frac{q_0 S_w \bar{c}_w}{I_Y}\right)\Big\{\left(C_{m_{(\alpha=0)}}\right)_{WB} + \left(C_{m_{(\alpha)}}\right)_{WB} + K_c\Big[\left(C_{m_{(\alpha_c)}}\right)_C + \left(C_{m_{(\alpha_c)}}\right)_I + \left(C_{m_{(\alpha_c)}}\right)_I\left(\frac{l_{c_2}}{V_0}\right)\left(-\dot{\alpha}_c\right)\Big] + \left(C_{m_{\dot{\alpha}}}\right)_{WB}\left(\frac{\dot{\alpha}\bar{c}_w}{2V_0}\right)$$

$$+ \left(C_{m_q}\right)_{WB}\left(\frac{q\bar{c}_w}{2V_0}\right) + K_c\Big[C_{m_{(\alpha,\delta_c)}} + C_{m_{(\alpha,\delta_c)_I}}\Big] + C_{m_{(\alpha,\delta_e)}} + C_{m_{(\delta_d)}} + \left(C_{m_{\eta_1}}\right)_{WB}\eta_1 + \left(C_{m_{\eta_2}}\right)_{WB}\eta_2 + \left(C_{m_{\eta_3}}\right)_{WB}\eta_3$$

$$+ \left(C_{m_{\eta_4}}\right)_{WB}\eta_4 + \left(C_{m_{\dot{\eta}_1}}\right)_{WB}\left(\frac{\dot{\eta}_1}{V_0}\right) + \left(C_{m_{\dot{\eta}_2}}\right)_{WB}\left(\frac{\dot{\eta}_2}{V_0}\right) + \left(C_{m_{\dot{\eta}_3}}\right)_{WB}\left(\frac{\dot{\eta}_3}{V_0}\right) + \left(C_{m_{\dot{\eta}_4}}\right)_{WB}\left(\frac{\dot{\eta}_4}{V_0}\right)\Big\} + T\,l_T$$

TABLE B1.- Concluded

Symmetric Structural Modes

Written for mode i coupled to modes 1 through 4

$$\ddot{\eta}_i = -g_s\omega_i\dot{\eta}_i - \omega_i^2\eta_i + \left(\frac{q_o S_w}{M_i}\right)\Bigg\{\left(C_{\eta_{i(\alpha=0)}}\right)_{WB} + \left(C_{\eta_{i(\alpha)}}\right)_{WB} + K_c\left[\left(C_{\eta_{i(\alpha_c)}}\right)_C + \left(C_{\eta_{i(\alpha_c)}}\right)_I + \left(C_{\eta_{i(\alpha_c)}}\right)_I\left(\frac{\ell_3}{V_o}\right)\left(-\dot{\alpha}_c\right)\right]$$

$$+ \left(C_{\eta_{i\dot{\alpha}}}\right)_{WB}\left(\frac{\dot{\alpha}\bar{c}_w}{2V_o}\right) + \left(C_{\eta_{iq}}\right)_{WB}\left(\frac{q\bar{c}_w}{2V_o}\right) + K_c\left[C_{\eta_{i(\alpha,\delta_c)}} + \left(C_{\eta_{i(\alpha,\delta_c)}}\right)_I\right] + C_{\eta_{i(\alpha,\delta_e)}} + C_{\eta_{i(\delta_d)}} + \left(C_{\eta_{i\eta_1}}\right)_{WB}\eta_1$$

$$+ \left(C_{\eta_{i\eta_2}}\right)_{WB}\eta_2 + \left(C_{\eta_{i\eta_3}}\right)_{WB}\eta_3 + \left(C_{\eta_{i\eta_4}}\right)_{WB}\eta_4 + \left(C_{\eta_{i\dot{\eta}_1}}\right)_{WB}\left(\frac{\dot{\eta}_1}{V_o}\right) + \left(C_{\eta_{i\dot{\eta}_2}}\right)_{WB}\left(\frac{\dot{\eta}_2}{V_o}\right) + \left(C_{\eta_{i\dot{\eta}_3}}\right)_{WB}\left(\frac{\dot{\eta}_3}{V_o}\right) + \left(C_{\eta_{i\dot{\eta}_4}}\right)_{WB}\left(\frac{\dot{\eta}_4}{V_o}\right)\Bigg\}$$

APPENDIX C

SYMMETRIC STRUCTURAL MODE CHARACTERISTICS

The control point geometry for the 97 point ground vibration test (GVT) modal data is shown in figure C1. The similar control point geometry for the 118 point modal data is given in figure C2. Point 93 in the 97 point GVT grid set modes is the normalizing point, while point 118 is the normalizing point for the 118 point grid set modes.

The 118 point grid was obtained by interpolating from the 97 point GVT grid and renormalizing to point 118 from point 93. Linear interpolation between points was used. However, the interpolation scheme separates the wing surface proper from the elevon surfaces. Because of this, no fairing of lines occurs across the elevon hinge line. This interpolation to the 118 point grid system was done because most existing XB-70 aerodynamic digital programs utilize this larger grid system. It was judged more efficient to use existing programs than to reprogram to the 97 point grid system. These existing digital programs utilize only deflection data with mode slope data being determined from internal curve fit routines. Since the linear interpolation scheme can distort slopes in some instances, slope data required for other than aerodynamic purposes were obtained using manual techniques. The 118 point data used in the present study contain only those modes which are primarily wing-body (WF) modes in the 97 point grid system. These modes are identified in tables C1 through C17. Modal frequencies and generalized masses are contained in these tables also.

The actual mode shape data tabulated against the control point number for all cases studied are presented in tables C18 through C34. Conversion of deflection data from the 97 point GVT grid system to the 118 point grid system may be accomplished by considering the definition of generalized mass. For a given mode, the generalized mass $M_i = \iint \phi_i^2 \, m(x,y) dxdy$. By equating generalized masses for a given mode in the 97 point grid system and the 118 point grid system a factor can be obtained for scaling the 97 point grid system deflections to obtain the corresponding 118 point deflections.

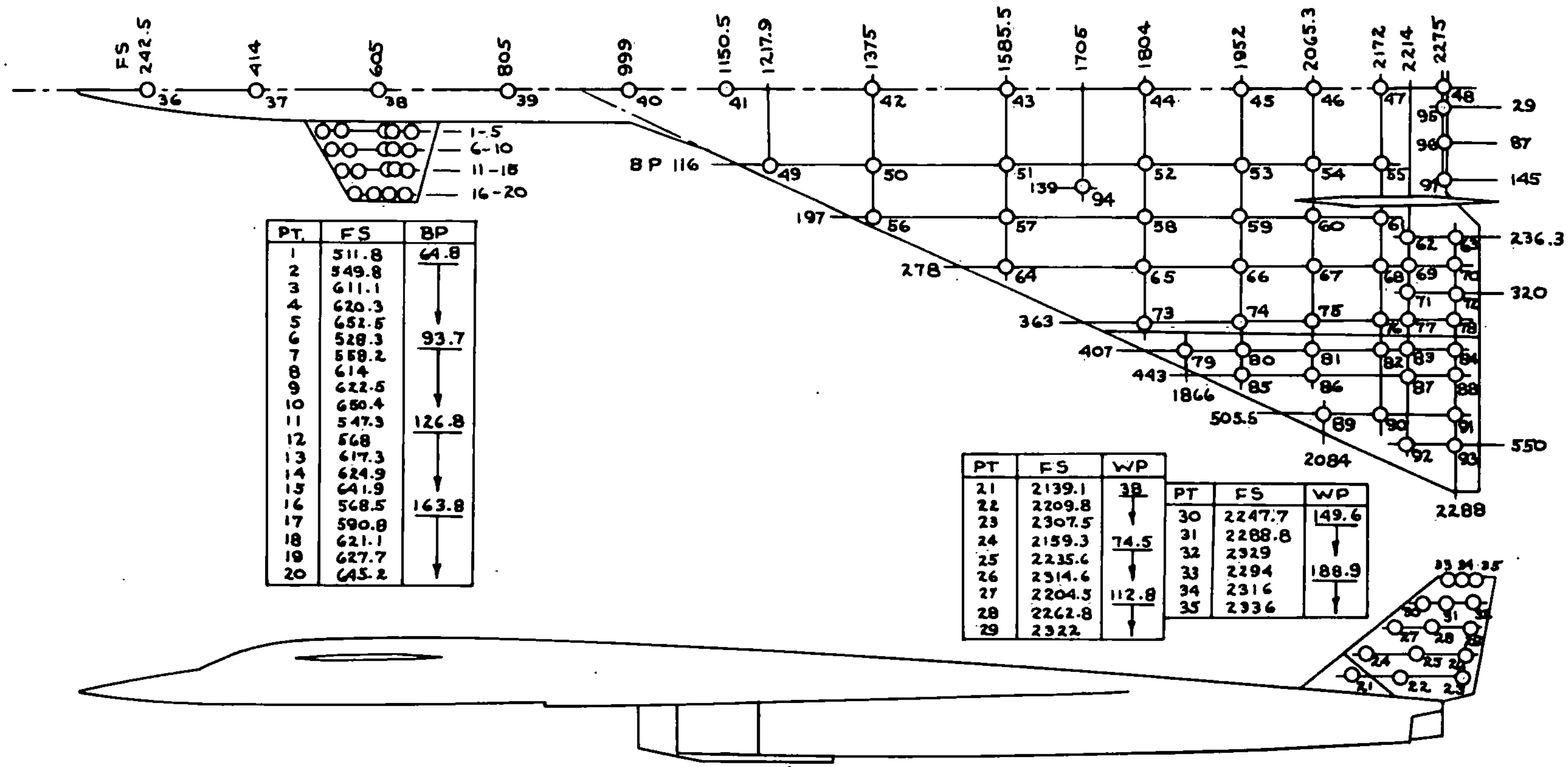
$$(M_i)_{118} = (\text{Factor})^2 (M_i)_{97}$$

Since the mass distributions are identical:

$$\iint (\phi_i)^2_{118} dxdy = \iint (\text{Factor})^2 (\phi_i)^2_{97} dxdy$$

Thus: $\text{Factor} = \sqrt{\dfrac{(M_i)_{118}}{(M_i)_{97}}}$; $[\phi_i(x,y)]_{118} = \text{Factor} \; [\phi_i(x,y)]_{97}$

One must also remember the deflection at the normalizing point of a given mode is +1.0; this fact may flip the deflection sense on some modes going from one grid system to the other.



PT.	FS	BP
1	511.8	64.8
2	549.8	
3	611.1	
4	620.3	
5	652.5	
6	528.3	93.7
7	558.2	
8	614	
9	622.5	
10	650.4	
11	547.3	126.8
12	568	
13	617.3	
14	624.9	
15	641.9	
16	568.5	163.8
17	590.8	
18	621.1	
19	627.7	
20	645.2	

PT	FS	WP
21	2139.1	38
22	2209.8	
23	2307.5	
24	2159.3	74.5
25	2235.6	
26	2314.6	
27	2204.5	112.8
28	2262.8	
29	2322	

PT	FS	WP
30	2247.7	149.6
31	2288.8	
32	2329	
33	2294	188.9
34	2316	
35	2336	

Figure C1.- XB-70 ground vibration test 97 control point geometry
Symmetric modes

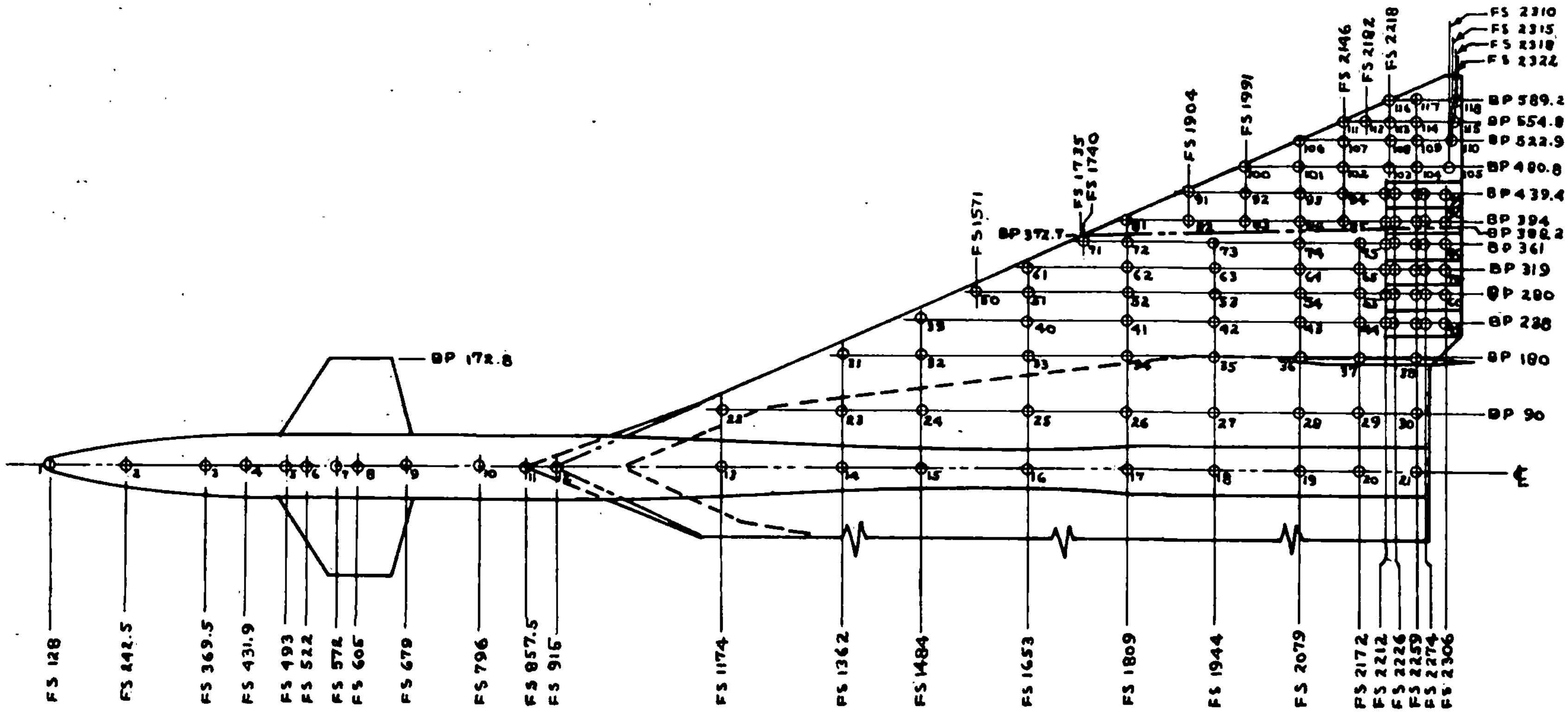


Figure C2.- XB-70 interpolated modes 118 control point geometry
Symmetric modes

TABLE C1

XB-70-1 SYMMETRIC FREE-FREE VACUUM VIBRATION MODE CHARACTERISTICS FOR FLIGHT 81

Case P 1, $\delta_T = 0°$, Wt. = 318,394 Lbs., CG at FS 1613.0

Mode No.	Mode* Description	Frequency Hz.	Generalized Mass**	
			97 GVT Pts.	118 Interpolated Pts.
1	WF 1	2.5142	0.16842×10^5	0.11639×10^5
2	WF 2	3.7938	0.17235×10^4	0.11666×10^4
3	WF 3	5.8607	0.13756×10^6	0.32919×10^5
4	V 1	6.1585	0.11239×10^7	0.14703×10^6
5	WF 4	7.4515	0.18685×10^4	0.81519×10^3
6	WF 5	8.7733	0.16793×10^4	0.49177×10^3
7	C 1	9.7143	0.56774×10^5	0.12680×10^5
8	WF 6	10.9919	0.28034×10^6	0.17814×10^6
9	WF 7	15.4636	0.77915×10^4	0.81923×10^4
10	WF 8	20.5074	0.66577×10^4	0.29527×10^3
11	V 2	22.7555	0.93964×10^5	0.24721×10^5
12	WF 9	24.9837	0.35556×10^5	0.11531×10^5
13	V 3	26.6855	0.27362×10^6	0.17672×10^6
14	C 2	27.1282	0.14844×10^5	0.35529×10^4
15	C 3	40.3858	0.28585×10^7	0.15807×10^6
16	C 4	52.0646	0.47760×10^7	0.18733×10^7

* WF refers to wing-fuselage
V refers to vertical stabilizer
C refers to canard

** For 1/2 air vehicle in units of pounds. Normalizing point CP 93 for the 97 GVT points and CP 118 for the 118 analytical points.

TABLE C2

XB-70-1 SYMMETRIC FREE-FREE VACUUM VIBRATION MODE CHARACTERISTICS FOR FLIGHT 76

Case P 2, δ_T = 25°, Wt. = 480,310 Lbs., CG at FS 1592.7

Mode No.	Mode* Description	Frequency Hz.	Generalized Mass** 97 GVT Pts.	Generalized Mass** 118 Interpolated Pts.
1	WF 1	2.2842	0.23697×10^5	0.16571×10^5
2	WF 2	3.5522	0.22173×10^4	0.15550×10^4
3	WF 3	5.0521	0.32483×10^6	0.31050×10^6
4	V 1	5.9936	0.14805×10^5	0.54333×10^4
5	WF 4	6.6255	0.24034×10^4	0.12203×10^4
6	WF 5	7.9502	0.13929×10^4	0.46207×10^3
7	C 1	9.3050	0.24148×10^5	0.81367×10^4
8	WF 6	10.0612	0.47859×10^6	0.38308×10^8
9	WF 7	14.7562	0.92504×10^4	0.11363×10^5
10	WF 8	19.6524	0.48135×10^4	0.27233×10^3
11	V 2	22.1061	0.29422×10^5	0.14913×10^6
12	WF 9	24.6419	0.22559×10^5	0.66330×10^4
13	V 3	26.3814	0.23632×10^5	0.67143×10^4
14	C 2	26.7133	0.55963×10^6	0.68287×10^5
15	C 3	40.3134	0.22964×10^7	0.11869×10^6
16	C 4	52.0609	0.49609×10^7	0.20565×10^7

* WF refers to wing-fuselage
V refers to vertical stabilizer
C refers to canard

** For 1/2 air vehicle in units of pounds. Normalizing point CP 93 for the 97 GVT points and CP 118 for the 118 analytical points.

TABLE C3

XB-70-1 SYMMETRIC FREE-FREE VACUUM VIBRATION MODE CHARACTERISTICS FOR FLIGHT 76

Case P 3, δ_T = 25°, Wt. = 344,450 Lbs., CG at FS 1596.4

Mode No.	Mode* Description	Frequency Hz.	Generalized Mass**	
			97 GVT Pts.	118 Interpolated Pts.
1	WF 1	2.4511	0.18778×10^5	0.13029×10^5
2	WF 2	3.7099	0.18977×10^4	0.12979×10^4
3	WF 3	5.5731	0.64685×10^6	0.12240×10^6
4	V 1	6.0596	0.65026×10^5	0.18305×10^5
5	WF 4	7.1850	0.18395×10^4	0.82866×10^3
6	WF 5	8.4739	0.15968×10^4	0.49442×10^3
7	C 1	9.6624	0.11146×10^6	0.25202×10^5
8	WF 6	10.6627	0.14096×10^7	0.64273×10^7
9	WF 7	15.0464	0.81860×10^4	0.90770×10^4
10	WF 8	20.1082	0.57457×10^4	0.28161×10^3
11	V 2	22.5622	0.58789×10^5	0.46868×10^5
12	WF 9	24.8784	0.29247×10^5	0.93883×10^4
13	V 3	26.6570	0.67874×10^5	0.25607×10^5
14	C 2	26.8634	0.21018×10^5	0.51384×10^4
15	C 3	40.3584	0.27194×10^7	0.14785×10^6
16	C 4	52.0636	0.48673×10^7	0.19334×10^7

* WF refers to wing-fuselage
V refers to vertical stabilizer
C refers to canard

** For 1/2 air vehicle in units of pounds. Normalizing point CP 93 for the 97 GVT points and CP 118 for the 118 analytical points.

TABLE C4

XB-70-1 SYMMETRIC FREE-FREE VACUUM VIBRATION MODE CHARACTERISTICS FOR FLIGHT 81

Case P 4, δ_T = 65°, Wt. = 400,104 Lbs., CG at FS 1590.2

Mode No.	Mode* Description	Frequency Hz.	Generalized Mass**	
			97 GVT Pts.	118 Interpolated Pts.
1	WF 1	2.3508	0.54306×10^5	0.35249×10^5
2	WF 2	3.7740	0.19430×10^4	0.10436×10^4
3	WF 3	5.1369	0.85773×10^5	0.47735×10^5
4	V 1	5.8832	0.76839×10^4	0.30476×10^4
5	WF 4	6.9670	0.11077×10^4	0.48820×10^3
6	WF 5	7.4106	0.24449×10^5	0.69322×10^4
7	C 1	8.9232	0.13997×10^5	0.14491×10^5
8	WF 6	10.9262	0.27863×10^8	0.30646×10^5
9	WF 7	16.1715	0.19413×10^4	0.30055×10^3
10	WF 8	19.0497	0.52588×10^5	0.58467×10^3
11	V 2	23.0036	0.49328×10^6	0.88537×10^5
12	WF 9	25.2768	0.40688×10^7	0.99017×10^5
13	V 3	26.1666	0.35571×10^7	0.22091×10^6
14	C 2	26.6059	0.36562×10^8	0.13976×10^5
15	C 3	40.7944	0.22391×10^9	0.78384×10^7
16	C 4	52.8770	0.13340×10^9	0.43574×10^7

* WF refers to wing-fuselage
V refers to vertical stabilizer
C refers to canard

** For 1/2 air vehicle in units of pounds. Normalizing point CP 93 for the 97 GVT points and CP 118 for the 118 analytical points.

TABLE C5

XB-70-1 SYMMETRIC FREE-FREE VACUUM VIBRATION MODE CHARACTERISTICS FOR FLIGHT 79

Case P 5, δ_T = 65°, Wt. = 387,309 Lbs., CG at FS 1592.9

Mode No.	Mode* Description	Frequency Hz.	Generalized Mass**	
			97 GVT Pts.	118 Interpolated Pts.
1	WF 1	2.3498	0.53100×10^5	0.34394×10^5
2	WF 2	3.7928	0.19066×10^4	0.10243×10^4
3	WF 3	5.2758	0.56759×10^5	0.31438×10^5
4	V 1	5.8929	0.86061×10^4	0.33487×10^4
5	WF 4	6.9994	0.10745×10^4	0.46420×10^3
6	WF 5	7.6698	0.11167×10^6	0.24867×10^5
7	C 1	9.0232	0.12743×10^5	0.13217×10^5
8	WF 6	11.0196	0.57497×10^7	0.26822×10^5
9	WF 7	16.2353	0.19509×10^4	0.29516×10^3
10	WF 8	19.1016	0.60735×10^5	0.60937×10^3
11	V 2	23.0047	0.49249×10^6	0.86178×10^5
12	WF 9	25.2794	0.38780×10^7	0.10335×10^6
13	V 3	26.1682	0.34825×10^7	0.22822×10^6
14	C 2	26.6106	0.46353×10^8	0.14108×10^5
15	C 3	40.8048	0.21350×10^9	0.88233×10^7
16	C 4	52.8774	0.13590×10^9	0.44428×10^7

* WF refers to wing-fuselage
V refers to vertical stabilizer
C refers to canard

** For 1/2 air vehicle in units of pounds. Normalizing point CP 93 for the 97 GVT points and CP 118 for the 118 analytical points.

TABLE C6

XB-70-1 SYMMETRIC FREE-FREE VACUUM VIBRATION MODE CHARACTERISTICS FOR FLIGHT 79

Case P 6, δ_T = 65°, Wt. = 392,409 Lbs., CG at FS 1584.8

Mode No.	Mode* Description	Frequency Hz.	Generalized Mass**	
			97 GVT Pts.	118 Interpolated Pts.
1	WF 1	2.3535	0.54506×10^5	0.35369×10^5
2	WF 2	3.7796	0.19299×10^4	0.10363×10^4
3	WF 3	5.2050	0.63460×10^5	0.35710×10^5
4	V 1	5.8873	0.81081×10^4	0.31851×10^4
5	WF 4	6.9875	0.10761×10^4	0.46758×10^3
6	WF 5	7.6194	0.80421×10^5	0.18474×10^5
7	C 1	8.9857	0.13175×10^5	0.13884×10^5
8	WF 6	10.9875	0.56397×10^7	0.27365×10^5
9	WF 7	16.2090	0.19465×10^4	0.29663×10^3
10	WF 8	19.0834	0.57597×10^5	0.60137×10^3
11	V 2	23.0042	0.49250×10^6	0.87418×10^5
12	WF 9	25.2791	0.39451×10^7	0.10175×10^6
13	V 3	26.1680	0.34515×10^7	0.23049×10^6
14	C 2	26.6099	0.42511×10^8	0.14003×10^5
15	C 3	40.7990	0.20530×10^9	0.81038×10^7
16	C 4	52.8773	0.13749×10^9	0.44090×10^7

* WF refers to wing-fuselage
V refers to vertical stabilizer
C refers to canard

** For 1/2 air vehicle in units of pounds. Normalizing point CP 93 for the 97 GVT points and CP 118 for the 118 analytical points.

TABLE C7

XB-70-1 SYMMETRIC FREE-FREE VACUUM VIBRATION MODE CHARACTERISTICS FOR FLIGHT 67

Case P 7, δ_T = 65°, Wt. = 353,535 Lbs., CG at FS 1584.6

Mode No.	Mode* Description	Frequency Hz.	Generalized Mass** 97 GVT Pts.	Generalized Mass** 118 Interpolated Pts.
1	WF 1	2.4037	0.51682×10^5	0.33595×10^5
2	WF 2	3.8440	0.17818×10^4	0.95691×10^3
3	WF 3	5.4479	0.58037×10^5	0.31239×10^5
4	V 1	5.9184	0.11664×10^5	0.43498×10^4
5	WF 4	7.0620	0.10842×10^4	0.46010×10^3
6	WF 5	7.8321	0.13682×10^6	0.33732×10^5
7	C 1	9.1351	0.10902×10^5	0.10138×10^5
8	WF 6	11.1031	0.44382×10^9	0.32783×10^5
9	WF 7	16.3413	0.19774×10^4	0.29060×10^3
10	WF 8	19.1791	0.70149×10^5	0.63342×10^3
11	V 2	23.0065	0.49432×10^6	0.82902×10^5
12	WF 9	25.2833	0.37339×10^7	0.11094×10^6
13	V 3	26.1702	0.33563×10^7	0.23698×10^6
14	C 2	26.6188	0.55162×10^8	0.14380×10^5
15	C 3	40.8154	0.16024×10^9	0.11512×10^8
16	C 4	52.8779	0.14216×10^9	0.46603×10^7

* WF refers to wing-fuselage
V refers to vertical stabilizer
C refers to canard

** For 1/2 air vehicle in units of pounds. Normalizing point CP 93 for the 97 GVT points and CP 118 for the 118 analytical points.

TABLE C8

XB-70-1 SYMMETRIC FREE-FREE VACUUM VIBRATION MODE CHARACTERISTICS FOR FLIGHT 70

Case P 8, $\delta_T = 65°$, Wt. = 376,516 Lbs., CG at FS 1591.0

Mode No.	Mode* Description	Frequency Hz.	Generalized Mass**	
			97 GVT Pts.	118 Interpolated Pts.
1	WF 1	2.3375	0.52600×10^5	0.34006×10^5
2	WF 2	3.7862	0.19226×10^4	0.10315×10^4
3	WF 3	5.3208	0.10500×10^6	0.60444×10^5
4	V 1	5.8867	0.79278×10^4	0.31313×10^4
5	WF 4	6.9817	0.10788×10^4	0.47108×10^3
6	WF 5	7.6901	0.52259×10^5	0.13096×10^5
7	C 1	8.9730	0.13814×10^5	0.15128×10^5
8	WF 6	11.0874	0.39025×10^7	0.25221×10^5
9	WF 7	16.2308	0.19384×10^4	0.29241×10^3
10	WF 8	19.1510	0.64059×10^5	0.61785×10^3
11	V 2	23.0067	0.48913×10^6	0.82422×10^5
12	WF 9	25.2852	0.37280×10^7	0.11090×10^6
13	V 3	26.1701	0.33475×10^7	0.24308×10^6
14	C 2	26.6226	0.62466×10^8	0.14226×10^5
15	C 3	40.8089	0.17412×10^9	0.93370×10^7
16	C 4	52.8778	0.14406×10^9	0.45083×10^7

* WF refers to wing-fuselage
V refers to vertical stabilizer
C refers to canard

** For 1/2 air vehicle in units of pounds. Normalizing point CP 93 for the 97 GVT points and CP 118 for the 118 analytical points.

TABLE C9

XB-70-1 SYMMETRIC FREE-FREE VACUUM VIBRATION MODE CHARACTERISTICS FOR FLIGHT 82

Case P 9, δ_T = 65°, Wt. = 381,309 Lbs., CG at FS 1589.2

Mode No.	Mode* Description	Frequency Hz.	Generalized Mass**	
			97 GVT Pts.	118 Interpolated Pts.
1	WF 1	2.3621	0.53776×10^5	0.34843×10^5
2	WF 2	3.7792	0.19363×10^4	0.10395×10^4
3	WF 3	5.2651	0.93683×10^5	0.53084×10^5
4	V 1	5.8843	0.77344×10^4	0.30619×10^4
5	WF 4	6.9729	0.10847×10^4	0.47470×10^3
6	WF 5	7.5801	0.44009×10^5	0.11431×10^5
7	C 1	8.9506	0.13895×10^5	0.14656×10^5
8	WF 6	11.0179	0.27673×10^8	0.28934×10^5
9	WF 7	16.2111	0.19372×10^4	0.29423×10^3
10	WF 8	19.1123	0.61024×10^5	0.61009×10^3
11	V 2	23.0052	0.49313×10^6	0.86053×10^5
12	WF 9	25.2810	0.38978×10^7	0.10336×10^6
13	V 3	26.1690	0.34133×10^7	0.23255×10^6
14	C 2	26.6115	0.46442×10^8	0.14039×10^5
15	C 3	40.8053	0.18980×10^9	0.89845×10^7
16	C 4	52.8775	0.13952×10^9	0.44598×10^7

* WF refers to wing-fuselage
V refers to vertical stabilizer
C refers to canard

** For 1/2 air vehicle in units of pounds. Normalizing point CP 93 for the 97 GVT points and CP 118 for the 118 analytical points.

TABLE C10

XB-70-1 SYMMETRIC FREE-FREE VACUUM VIBRATION MODE CHARACTERISTICS FOR FLIGHT 66

Case P 10, δ_T = 25°, Wt. = 436,975 Lbs., CG at FS 1596.2

Mode No.	Mode* Description	Frequency Hz.	Generalized Mass**	
			97 GVT Pts.	118 Interpolated Pts.
1	WF 1	2.3449	0.22140×10^5	0.15444×10^5
2	WF 2	3.5848	0.21683×10^4	0.15122×10^4
3	WF 3	5.1608	0.13942×10^7	0.42273×10^7
4	V 1	6.0053	0.18140×10^5	0.64146×10^4
5	WF 4	6.7452	0.21306×10^4	0.10529×10^4
6	WF 5	8.0341	0.14477×10^4	0.47366×10^3
7	C 1	9.4516	0.46190×10^5	0.14186×10^5
8	WF 6	10.2047	0.63374×10^6	0.96015×10^{11}
9	WF 7	14.9589	0.87993×10^4	0.99475×10^4
10	WF 8	19.6931	0.49385×10^4	0.27280×10^3
11	V 2	22.2300	0.32730×10^5	0.11322×10^6
12	WF 9	24.6922	0.23299×10^5	0.69838×10^4
13	V 3	26.4447	0.22396×10^5	0.64155×10^4
14	C 2	26.7203	0.31599×10^6	0.45931×10^5
15	C 3	40.3240	0.23019×10^7	0.12020×10^6
16	C 4	52.0624	0.50116×10^7	0.21165×10^7

* WF refers to wing-fuselage
V refers to vertical stabilizer
C refers to canard

** For 1/2 air vehicle in units of pounds. Normalizing point CP 93 for the 97 GVT points and CP 118 for the 118 analytical points.

TABLE C11

XB-70-1 SYMMETRIC FREE-FREE VACUUM VIBRATION MODE CHARACTERISTICS FOR FLIGHT 63

Case SC 1, $\delta_T = 0°$, Wt. = 480,425 Lbs., CG at FS 1593.9

Mode No.	Mode* Description	Frequency Hz.	Generalized Mass**	
			97 GVT Pts.	118 Interpolated Pts.
1	WF 1	2.2940	0.23866×10^5	0.16679×10^5
2	WF 2	3.6118	0.20411×10^4	0.14186×10^4
3	WF 3	5.0595	0.15739×10^6	0.12297×10^6
4	V 1	6.0072	0.21134×10^5	0.72354×10^4
5	WF 4	6.7391	0.23304×10^4	0.11585×10^4
6	WF 5	8.0921	0.14669×10^4	0.47183×10^3
7	C 1	9.3665	0.19334×10^5	0.60157×10^4
8	WF 6	10.0762	0.20039×10^6	0.31901×10^6
9	WF 7	14.8513	0.88921×10^4	0.10779×10^5
10	WF 8	19.7754	0.49310×10^4	0.27678×10^3
11	V 2	22.3180	0.40415×10^5	0.44503×10^5
12	WF 9	24.7003	0.23449×10^5	0.74783×10^4
13	V 3	26.4425	0.22471×10^5	0.66233×10^4
14	C 2	26.7170	0.35105×10^6	0.49762×10^5
15	C 3	40.3209	0.23675×10^7	0.11849×10^6
16	C 4	52.0604	0.48481×10^7	0.20079×10^7

* WF refers to wing-fuselage
V refers to vertical stabilizer
C refers to canard

** For 1/2 air vehicle in units of pounds. Normalizing point CP 93 for the 97 GVT points and CP 118 for the 118 analytical points.

TABLE C12

XB-70-1 SYMMETRIC FREE-FREE VACUUM VIBRATION MODE CHARACTERISTICS FOR FLIGHT 63

Case SC 2, $\delta_T = 0°$, Wt. = 339,625 Lbs., CG at FS 1606.9

Mode No.	Mode* Description	Frequency Hz.	Generalized Mass**	
			97 GVT Pts.	118 Interpolated Pts.
1	WF 1	2.4648	0.19021×10^5	0.13180×10^5
2	WF 2	3.7594	0.17682×10^4	0.12003×10^4
3	WF 3	5.7243	0.13627×10^7	0.30821×10^9
4	V 1	6.0722	0.84864×10^5	0.22306×10^5
5	WF 4	7.7493	0.12556×10^4	0.51950×10^3
6	WF 5	8.6436	0.27725×10^4	0.76091×10^3
7	C 1	9.6744	0.10773×10^6	0.22048×10^5
8	WF 6	10.8707	0.25229×10^7	0.40768×10^6
9	WF 7	15.9614	0.78898×10^4	0.71434×10^4
10	WF 8	20.2117	0.62122×10^4	0.28864×10^3
11	V 2	22.7861	0.94364×10^5	0.21369×10^5
12	WF 9	24.9610	0.35009×10^5	0.12293×10^5
13	V 3	26.6805	0.19358×10^6	0.10477×10^6
14	C 2	27.0119	0.16857×10^5	0.42196×10^4
15	C 3	40.3747	0.29103×10^7	0.15277×10^6
16	C 4	52.0646	0.48732×10^7	0.19448×10^7

* WF refers to wing-fuselage
V refers to vertical stabilizer
C refers to canard

** For 1/2 air vehicle in units of pounds. Normalizing point CP 93 for the 97 GVT points and CP 118 for the 118 analytical points.

TABLE C13

XB-70-1 SYMMETRIC FREE-FREE VACUUM VIBRATION MODE CHARACTERISTICS FOR FLIGHT 75

Case SC 3, δ_T = 25°, Wt. = 423,474 Lbs., CG at FS 1600.8

Mode No.	Mode* Description	Frequency Hz.	Generalized Mass**	
			97 GVT Pts.	118 Interpolated Pts.
1	WF 1	2.3539	0.22297×10^5	0.15522×10^5
2	WF 2	3.5947	0.21456×10^4	0.14960×10^4
3	WF 3	5.2312	0.14201×10^8	0.11223×10^7
4	V 1	6.0127	0.20577×10^5	0.70786×10^4
5	WF 4	6.7756	0.20626×10^4	0.10078×10^4
6	WF 5	8.0407	0.14781×10^4	0.48244×10^3
7	C 1	9.4476	0.44353×10^5	0.13774×10^5
8	WF 6	10.1913	0.57887×10^6	0.31372×10^9
9	WF 7	14.8637	0.90509×10^4	0.10759×10^5
10	WF 8	19.7064	0.48305×10^4	0.27133×10^3
11	V 2	22.2611	0.34610×10^5	0.77593×10^5
12	WF 9	24.6987	0.23379×10^5	0.73659×10^4
13	V 3	26.4481	0.22269×10^5	0.66381×10^4
14	C 2	26.7205	0.31027×10^6	0.46539×10^5
15	C 3	40.3323	0.22941×10^7	0.12544×10^6
16	C 4	52.0628	0.49664×10^7	0.20891×10^7

* WF refers to wing-fuselage
V refers to vertical stabilizer
C refers to canard

** For 1/2 air vehicle in units of pounds. Normalizing point CP 93 for the 97 GVT points and CP 118 for the 118 analytical points.

TABLE C14

XB-70-1 SYMMETRIC FREE-FREE VACUUM VIBRATION MODE CHARACTERISTICS FOR FLIGHT 64

Case SC 4, δ_T = 25°, Wt. = 357,505 Lbs., CG at FS 1582.7

Mode No.	Mode* Description	Frequency Hz.	Generalized Mass**	
			97 GVT Pts.	118 Interpolated Pts.
1	WF 1	2.4246	0.20065×10^5	0.13955×10^5
2	WF 2	3.6844	0.19354×10^4	0.13258×10^4
3	WF 3	5.4497	0.10841×10^7	0.83233×10^7
4	V 1	6.0395	0.46718×10^5	0.13861×10^5
5	WF 4	7.3363	0.15138×10^4	0.66536×10^3
6	WF 5	8.4114	0.19311×10^4	0.58619×10^3
7	C 1	9.6370	0.15376×10^6	0.33798×10^5
8	WF 6	10.6060	0.64629×10^9	0.35020×10^6
9	WF 7	15.2220	0.85128×10^4	0.92189×10^4
10	WF 8	19.9763	0.55471×10^4	0.27874×10^3
11	V 2	22.5173	0.51771×10^5	0.52103×10^5
12	WF 9	24.8439	0.27834×10^5	0.88885×10^4
13	V 3	26.6326	0.40819×10^5	0.13726×10^5
14	C 2	26.8072	0.28914×10^5	0.68018×10^4
15	C 3	40.3477	0.26526×10^7	0.14316×10^6
16	C 4	52.0634	0.49375×10^7	0.19955×10^7

* WF refers to wing-fuselage
V refers to vertical stabilizer
C refers to canard

** For 1/2 air vehicle in units of pounds. Normalizing point CP 93 for the 97 GVT points and CP 118 for the 118 analytical points.

TABLE C15

XB-70-1 SYMMETRIC FREE-FREE VACUUM VIBRATION MODE CHARACTERISTICS FOR FLIGHT 75

Case SC 5, δ_T = 25°, Wt. = 338,505 Lbs., CG at FS 1599.1

Mode No.	Mode* Description	Frequency Hz.	Generalized Mass** 97 GVT Pts.	Generalized Mass** 118 Interpolated Pts.
1	WF 1	2.4542	0.18526×10^5	0.12870×10^5
2	WF 2	3.7188	0.18760×10^4	0.12811×10^4
3	WF 3	5.6536	0.64910×10^7	0.34897×10^6
4	V 1	6.0646	0.69191×10^5	0.19199×10^5
5	WF 4	7.4201	0.15681×10^4	0.68240×10^3
6	WF 5	8.4878	0.18657×10^4	0.56293×10^3
7	C 1	9.6696	0.13408×10^6	0.29007×10^5
8	WF 6	10.7327	0.65619×10^8	0.58907×10^6
9	WF 7	15.2525	0.83782×10^4	0.89607×10^4
10	WF 8	20.1358	0.58920×10^4	0.28240×10^3
11	V 2	22.5707	0.55888×10^5	0.55849×10^5
12	WF 9	24.8846	0.29413×10^5	0.92452×10^4
13	V 3	26.6600	0.75363×10^5	0.28576×10^5
14	C 2	26.8784	0.20103×10^5	0.48505×10^4
15	C 3	40.3660	0.28139×10^7	0.15431×10^6
16	C 4	52.0639	0.48520×10^7	0.19098×10^7

* WF refers to wing-fuselage
V refers to vertical stabilizer
C refers to canard

** For 1/2 air vehicle in units of pounds. Normalizing point CP 93 for the 97 GVT points and CP 118 for the 118 analytical points.

TABLE C16

XB-70-1 SYMMETRIC FREE-FREE VACUUM VIBRATION MODE CHARACTERISTICS FOR FLIGHT 81

Case SC 6, $\delta_T = 65°$, Wt. = 412,504 Lbs., CG at FS 1593.2

Mode No.	Mode* Description	Frequency Hz.	Generalized Mass**	
			97 GVT Pts.	118 Interpolated Pts.
1	WF 1	2.3344	0.56385×10^5	0.36650×10^5
2	WF 2	3.7686	0.19483×10^4	0.10474×10^4
3	WF 3	5.0627	0.13466×10^6	0.71557×10^5
4	V 1	5.8793	0.73007×10^4	0.29234×10^4
5	WF 4	6.9261	0.12902×10^4	0.58704×10^3
6	WF 5	7.2172	0.59048×10^4	0.20467×10^4
7	C 1	8.8764	0.15023×10^5	0.15374×10^5
8	WF 6	10.7981	0.11713×10^8	0.41145×10^5
9	WF 7	16.1188	0.19388×10^4	0.30591×10^3
10	WF 8	19.0084	0.46104×10^5	0.56243×10^3
11	V 2	23.0026	0.48765×10^6	0.89359×10^5
12	WF 9	25.2742	0.40803×10^7	0.96996×10^5
13	V 3	26.1652	0.36428×10^7	0.21165×10^6
14	C 2	26.6018	0.34551×10^8	0.14011×10^5
15	C 3	40.7919	0.20745×10^9	0.79572×10^7
16	C 4	52.8767	0.13005×10^9	0.43276×10^7

* WF refers to wing-fuselage
V refers to vertical stabilizer
C refers to canard

** For 1/2 air vehicle in units of pounds. Normalizing point CP 93 for the 97 GVT points and CP 118 for the 118 analytical points.

TABLE C17

XB-70-1 SYMMETRIC FREE-FREE VACUUM VIBRATION MODE CHARACTERISTICS FOR FLIGHT 68

Case SC 7, δ_T = 65°, Wt. = 385,155 lbs., CG at FS 1585.6

Mode No.	Mode* Description	Frequency Hz.	Generalized Mass**	
			97 GVT Pts.	118 Interpolated Pts.
1	WF 1	2.3667	0.53642×10^5	0.34758×10^5
2	WF 2	3.7800	0.19320×10^4	0.10370×10^4
3	WF 3	5.2282	0.93895×10^5	0.54159×10^5
4	V 1	5.8850	0.78080×10^4	0.30879×10^4
5	WF 4	6.9744	0.10886×10^4	0.47675×10^3
6	WF 5	7.5601	0.38074×10^5	0.10161×10^5
7	C 1	8.9445	0.13941×10^5	0.14570×10^5
8	WF 6	11.0015	0.11073×10^9	0.29978×10^5
9	WF 7	16.2095	0.19380×10^4	0.29499×10^3
10	WF 8	19.1021	0.60044×10^5	0.60786×10^3
11	V 2	23.0044	0.49530×10^6	0.87923×10^5
12	WF 9	25.2799	0.39841×10^7	0.10054×10^6
13	V 3	26.1690	0.34555×10^7	0.22364×10^6
14	C 2	26.6104	0.40416×10^8	0.13938×10^5
15	C 3	40.8029	0.21173×10^9	0.75176×10^7
16	C 4	52.8774	0.13583×10^9	0.43509×10^7

* WF refers to wing-fuselage
V refers to vertical stabilizer
C refers to canard

** For 1/2 air vehicle in units of pounds. Normalizing point CP 93 for the 97 GVT points and CP 118 for the 118 analytical points.

TABLE C18.- SYMMETRIC STRUCTURAL MODES, CASE P1

CP \ Mode	1		2		3		4		5		6	
1	62900385	0	-61236272	-1	-31526119	-1	43629970	0	-17415053	-1	12343837	0
2	55918793	0	-41230220	-1	22701699	0	-46794905	0	-59538963	-1	10169820	0
3	44787649	0	-20767332	-1	73461025	0	-19550537	1	-96506603	-1	69393103	-1
4	43177715	0	-21656847	-1	80022027	0	-21284100	1	-11331583	0	81365264	-1
5	38220171	0	-35466555	-1	11494494	1	-30447354	1	-15349883	0	86708579	-1
6	62100758	0	-56655369	-1	78827117	-1	-17578059	0	-10030382	0	53330213	-1
7	56156171	0	-40232049	-1	46525157	0	-12599663	1	-12900419	0	46257989	-1
8	44789014	0	-21813682	-1	84768031	0	-23505625	1	-17448867	0	49447654	-1
9	43419502	0	-22460758	-1	93186120	0	-25719867	1	-18990682	0	59516381	-1
10	38446104	0	-35747170	-1	12232905	1	-33063350	1	-20400240	0	35392080	-1
11	61039066	0	-50809534	-1	32580663	0	-11606864	1	-19780924	0	-30161768	-1
12	56334201	0	-37652251	-1	65393683	0	-19873395	1	-20173368	0	-34773039	-1
13	45679905	0	-23750420	-1	96599342	0	-28263927	1	-23115575	0	-41113674	-1
14	43793079	0	-24922796	-1	10431516	1	-30021968	1	-23303556	0	-42232851	-1
15	38684317	0	-37238371	-1	13592454	1	-37304640	1	-24880066	0	-43898494	-1
16	60234060	0	-46785691	-1	61352158	0	-21309175	1	-29587901	0	-13630036	0
17	53899144	0	-31278091	-1	91446105	0	-29152459	1	-30700280	0	-13549578	0
18	45463897	0	-27692873	-1	11459792	1	-34975197	1	-32219944	0	-13583338	0
19	44131999	0	-28244908	-1	11967938	1	-36497782	1	-31473222	0	-16091600	0
20	39742440	0	-38965344	-1	13986745	1	-41616778	1	-29944051	0	-22040615	0
21	46195833	-1	39414752	-1	13252276	1	49824055	1	-58805633	-1	-10032360	0
22	27636623	-1	40132584	-1	16485243	1	60959752	1	-47213483	-1	-85540513	-1
23	28577916	-3	87712593	-1	56906558	1	20669486	2	-89817796	-1	-63319743	-1
24	97479073	-1	78123237	-1	30683181	1	11271070	2	-11203479	0	-16642054	0
25	62966490	-1	10238912	0	42480347	1	15320184	2	-78345684	-1	-11680472	0
26	28181682	-1	15216688	0	78691503	1	28030998	2	-14652432	0	-84750567	-1
27	13095112	0	13373123	0	51160344	1	17950717	2	-98951138	-1	-16549692	0
28	96725088	-1	16816209	0	72592831	1	25527704	2	-14670408	0	-14638206	0
29	60574875	-1	22841871	0	11301780	2	39582838	2	-26146377	0	-10397351	0
30	16229717	0	19676393	0	86693198	1	29530960	2	-18138672	0	-17376151	0
31	12978968	0	22882412	0	10791282	2	36792496	2	-26080065	0	-14591807	0
32	96984392	-1	28653175	0	14739053	2	50391639	2	-39334953	0	-10094374	0
33	19523460	0	27486367	0	14656673	2	49270251	2	-36303272	0	-17111287	0
34	16378991	0	30530116	0	16466685	2	55114243	2	-44138042	0	-14149578	0
35	14528959	0	35537092	0	20692372	2	70334908	2	-61392269	0	-17801177	0
36	12503638	1	-13915964	0	-36752770	1	97750481	1	31882053	0	-26672616	0

TABLE C18.- Continued

	1		2		3		4		5		6	
37	84778426	0	-74756915	-1	-13613092	1	32500000	1	26736801	-1	-27656021	-1
38	41994946	0	-20545079	-1	54690925	0	-13858126	1	-73095741	-1	11396474	0
39	11380289	-1	30592238	-1	13558746	1	-34691277	1	-88227855	-1	84609199	-1
40	-22256335	0	52713447	-1	12400465	1	-32071997	1	-44841666	-1	-29927338	-2
41	-30473071	0	51451853	-1	81459060	0	-21013291	1	-33326187	-2	-56051656	-1
42	-32049834	0	30923471	-1	14040658	0	-31321323	0	60986382	-1	-76447985	-1
43	-25917625	0	20261015	-2	-35798107	0	99450197	0	61428811	-1	-37384830	-1
44	-12938348	0	-33747438	-1	-45359791	0	13999655	1	48455726	-1	14283228	-1
45	37515106	-2	-66615731	-1	-10718113	0	71625015	0	32803986	-1	44664042	-1
46	15769130	0	-96007261	-1	31911431	0	-10302930	0	17672485	-1	63618618	-1
47	30909982	0	-12574380	0	94641209	0	-12081346	1	14134570	-1	92947272	-1
48	46782439	0	-15462382	0	16551048	1	-24654359	1	19846458	-1	12750733	0
49	-41074225	0	55298290	-1	52361169	0	-13875805	1	66445911	-1	-12273690	0
50	-39273582	0	36021801	-1	56535529	-1	-19289662	0	46785527	-1	-83506951	-1
51	-32133231	0	54834133	-2	-43192776	0	11869253	1	39007114	-1	-53459627	-2
52	-15737514	0	-32101229	-1	-52385469	0	15347199	1	59172390	-2	60235809	-1
53	13693955	-1	-60424047	-1	-15766115	0	76762333	0	-74756731	-2	85206802	-1
54	17360219	0	-83020051	-1	29241326	0	-27096298	0	13804045	-2	49667677	-1
55	33405682	0	-11062544	0	87221910	0	-15342551	1	38975338	-1	-19833491	-1
56	-43675868	0	48232011	-1	-13906518	0	38260899	0	91454403	-1	-11112153	0
57	-32463217	0	16756151	-1	-53581927	0	13877640	1	-35741414	-2	41984980	-1
58	-15260773	0	-15534836	-1	-57842971	0	16705248	1	-29628925	-1	12417529	0
59	18333377	-1	-42114558	-1	-19739611	0	81158600	0	-17140153	-1	98955041	-1
60	18413585	0	-47390749	-1	20047750	0	-19204007	0	23909034	-1	19703535	-1
61	37100348	0	-47311926	-1	70897084	0	-18337249	1	45080182	-1	-11676961	0
62	49911933	0	-97456962	-2	88563065	0	-28182528	1	55561557	-1	-23419327	0
63	63693549	0	-77013683	-2	12739067	1	-41354744	1	12295165	0	-39503042	0
64	-35552230	0	54423475	-1	-69923285	0	17854186	1	-34344946	-1	11883004	0
65	-16257642	0	18942682	-1	-10246383	1	21308852	1	-18303268	0	15105644	0
66	41938372	-1	31104654	-1	-70944947	0	94171493	0	-17803662	0	49974635	-1
67	23861863	0	39231834	-1	-17925767	0	-48876074	0	-11338230	0	-50286962	-1
68	42942221	0	59290972	-1	35002855	0	-20769354	1	-78531684	-2	-24081771	0
69	50082830	0	64040525	-1	62944928	0	-29278311	1	27355892	-1	-32049171	0
70	63780704	0	77214909	-1	89579277	0	-41849239	1	10915675	0	-51391775	0
71	50965869	0	13858213	0	32357537	0	-29035711	1	-24479223	-1	-38026801	0
72	65930943	0	16484570	0	59251439	0	-41312329	1	73561071	-1	-59611886	0
73	-10510476	0	66028615	-1	-17122954	1	25939592	1	-41958947	0	15531862	0

TABLE C18.- Continued

	1		2		3		4		5		6	
74	94331100	-1	10517544	0	-12050531	1	98541773	0	-35945708	0	27706424	-2
75	28390766	0	15957474	0	-65335852	0	-52747326	0	-25191978	0	-10770636	0
76	47888822	0	21360414	0	-10829199	0	-20629836	1	-81514094	-1	-29923505	0
77	55384532	0	23458731	0	92481232	-1	-26978894	1	-31370653	-1	-37027138	0
78	69822752	0	27255103	0	36696290	0	-35993640	1	80404949	-1	-57587659	0
79	10039657	-2	11972125	0	-13722328	1	21404247	1	-58691575	0	13888272	0
80	10854782	0	16791210	0	-14995654	1	12199285	1	-44065432	0	16825322	-1
81	29705705	0	23735287	0	-94888526	0	15322443	-1	-25231600	0	-94749687	-1
82	50609896	0	32407059	0	-30714749	0	-15038726	1	-35988193	-1	-20657846	0
83	59138156	0	35366389	0	-53892757	-1	-19266907	1	52993811	-1	-21839930	0
84	74631457	0	41415818	0	51892844	0	-26498653	1	21424246	0	-28360073	0
85	16899234	0	22972294	0	-17959329	1	15735002	1	-50737034	0	35723187	-1
86	33934991	0	31081866	0	-12387309	1	47122000	0	-26627234	0	-80058171	-1
87	63748480	0	48313381	0	-93841481	-1	-16537839	1	11170960	0	-91878156	-1
88	79515645	0	58563941	0	48332945	0	-23669420	1	36341543	0	40268283	-1
89	46632331	0	49403801	0	-13426334	1	17980646	0	-27498106	0	-38759652	-1
90	64924909	0	61730129	0	-64723914	0	-30501550	0	70468273	-1	58589157	-1
91	88514485	0	82332044	0	53329795	0	-52390231	0	74638229	0	41352092	0
92	81305331	0	87009796	0	-77817814	-1	57951781	0	46548072	0	51390982	0
93	99999999	0	99999999	0	99999998	0	99999999	0	99999999	0	99999999	0
94	-25880935	0	12672418	-2	-62501725	0	16614513	1	94855419	-2	44455647	-1
95	45222567	0	-15662955	0	15957986	1	-25876420	1	28747948	-2	74991240	-1
96	45794111	0	-15501217	0	15558045	1	-27808393	1	43671538	-1	-15068160	-1
97	46584101	0	-14408006	0	15377731	1	-31714924	1	65171205	-1	-96142157	-1

TABLE C18.- Continued

	7		8		9		10		11		12	
1	52153271	0	-21242345	1	45966296	-1	-37866598	0	-93225038	0	-66769729	0
2	76115214	0	-24139997	1	39904959	-1	-29433651	0	-35780242	0	-40530536	0
3	87839726	0	-25750425	1	19053868	-1	-85371498	-1	59517404	0	68446545	-1
4	10538685	1	-29720203	1	93569476	-2	-58818119	-1	82648187	0	11705168	0
5	11870856	1	-36002812	1	36541752	-2	-38936590	-1	96862187	0	14431306	0
6	33065658	1	-39383949	1	66999453	-1	-41215916	0	-76295239	0	-62655345	0
7	35354801	1	-40915999	1	63351902	-1	-31940882	0	-25619096	0	-39008121	0
8	39953637	1	-45522188	1	37409508	-1	-10309810	0	65071575	0	12791549	0
9	41259035	1	-47572945	1	26526504	-1	-72443906	-1	76694348	0	22283784	0
10	43954982	1	-49759064	1	27935734	-1	-21851063	-1	85297770	0	30253485	0
11	70990045	1	-68273313	1	11141977	0	-42401675	0	-56189697	0	-51172008	0
12	73497468	1	-70360211	1	12431743	0	-34410140	0	-18195621	0	-32779406	0
13	80898917	1	-74224020	1	11325945	0	-94839693	-1	84889697	0	31687997	0
14	82259835	1	-75874331	1	11174211	0	-45883765	-1	10286212	1	43037730	0
15	86786463	1	-80999851	1	10522455	0	61990112	-1	12696723	1	63370226	0
16	12644086	2	-10218775	2	16523449	0	-29580376	0	-18836001	0	-15729518	0
17	12771265	2	-10282842	2	16482947	0	-19248729	0	17965791	0	47113602	-1
18	12994086	2	-10294979	2	15158544	0	23068167	-2	10533383	1	56777784	0
19	13211197	2	-10524437	2	16878075	0	36911135	-1	12198107	1	70182285	0
20	13712647	2	-10737837	2	20767262	0	14460202	0	16158598	1	10665227	1
21	-16867189	0	-75904229	0	-16756389	-1	12111878	0	16194431	1	72861095	0
22	-42045368	-1	-37824570	0	-55592961	-1	37976093	0	43586214	1	-45300113	0
23	-60412412	-1	25504674	0	-13321352	0	41106267	0	57273434	1	-10534107	2
24	-16690835	0	-13074314	1	-79548963	-1	49073222	0	50795954	1	18627465	1
25	-34765111	-1	-38708024	0	-95520346	-1	60712559	0	69267204	1	-10833734	1
26	-41039707	-1	24362271	0	-28199927	-1	21696348	0	51561350	1	-10754869	2
27	-83479447	-1	-87278228	0	-24321868	0	99907225	0	11174903	2	28616608	1
28	-89513472	-1	-21972164	0	-99539448	-1	60264723	0	69673362	1	-41284217	0
29	-12962724	0	25070114	0	17500265	0	-48560371	0	-30043079	1	-81609545	1
30	-15495675	0	-58112562	0	-22632447	0	63196176	0	66200399	1	66416202	1
31	-15707945	0	-15497639	0	59860779	-1	-18207521	0	-27056700	1	37664999	1
32	-25868530	0	15198584	0	36242061	0	-14458631	1	-15954490	2	-13522180	1
33	-38731817	0	-47753809	0	13140767	0	-81554345	0	-11342938	2	13747981	2
34	-35557318	0	-21316645	0	43612914	0	-18172188	1	-23078738	2	12180540	2
35	-56223724	0	20667750	-1	44383722	0	-22397847	1	-27567625	2	92282787	1
36	88388926	0	46446763	1	23674604	-2	39409240	0	-21585752	0	-60279593	-1

TABLE C18.- Continued

	7		8		9		10		11		12	
37	-39065380	0	-28800016	0	54149545	-1	-22281528	0	-29226648	0	-87645726	-2
38	-63698830	0	-12968280	1	-40599084	-1	-53445200	-1	25771873	0	41956568	-1
39	-50677224	0	-23822746	0	-57875232	-1	17509579	0	51130199	-1	21387067	-1
40	-31023629	-1	10778577	1	39253315	-1	72781144	-1	-14665730	0	-95449021	-1
41	31398144	0	19502696	1	38568202	-1	-22372024	-1	-41898775	0	-15435028	0
42	83953049	-1	90382396	0	21866459	-1	-56252175	-1	28903913	0	23778599	-1
43	-10278992	0	-29273149	0	-23759092	-2	-25827801	-1	21871500	0	95161459	-1
44	-21630833	0	-10724940	1	-83662851	-1	-19327761	-1	-10706150	0	-18993563	-1
45	-21111330	0	-91628351	0	-27888861	-1	21277056	-2	-70610233	-1	32209375	-2
46	75083420	-1	56654165	0	-80831438	-2	89537025	-1	38319996	0	83290674	-1
47	67653956	0	33620726	1	22688717	-1	23008992	0	-47675632	0	-14329568	-1
48	13517269	1	64106690	1	98491965	-1	48311068	0	-50331311	-2	35875941	0
49	15023702	0	96424152	0	-51395981	-1	67501501	-1	-73386630	0	-97548251	-1
50	33028645	0	80686853	0	-60195263	-1	49996798	-1	33669485	0	24964153	0
51	14177714	0	-73475300	0	-86013047	-1	21544184	-1	11269766	0	10639382	0
52	-73245608	-1	-14307297	1	-10042919	0	25301326	-1	-20140775	0	-43926850	-1
53	-18346296	0	-10645557	1	-66669328	-1	12499830	-1	-26699508	-1	-56016460	-2
54	-11098142	0	-31824657	0	-50612190	-1	-82238635	-1	12684940	0	-20206115	-1
55	11089632	0	10469131	1	-48802621	-1	-22897561	0	74244991	-1	-79221723	-1
56	29281898	0	78582859	0	-23928768	0	14729403	0	-18301316	1	-33596664	0
57	28188146	0	-75169532	0	11119958	0	-45492013	-1	-56468844	0	-24241960	0
58	-92545730	-1	-10758216	1	52567117	-1	24407724	-1	-52613828	0	-21973954	0
59	-16219006	0	-98284160	0	-43303396	-1	63856683	-1	-32903184	0	-13080404	0
60	-10071297	-2	-75762632	0	-27861899	-1	-25661895	-2	15764926	-1	-73498588	-1
61	-25509804	0	-88186685	0	65724610	-1	-16319966	0	34142510	0	85341096	-1
62	-45470088	0	-20265918	1	50196038	0	21236547	0	-32482622	0	-46952126	-1
63	-78751830	0	-45425440	1	59882025	0	71449928	0	-13165544	1	-40478816	-1
64	47304254	0	-20084404	0	40195437	0	-38104161	-1	-10794630	1	-39251656	0
65	91398827	-1	84882713	0	45382189	0	-40946814	-1	-73963277	0	-40631311	0
66	-64342543	-1	16204040	0	-36088982	-1	13051932	0	35300178	0	18326156	0
67	-21803440	0	-89856649	0	-43953105	-1	21033385	0	38013162	0	23622500	0
68	-44666627	0	-17053115	1	22825797	0	31106193	0	14453852	0	18989952	0
69	-54377743	0	-24447134	1	45207495	0	47606794	0	45231607	-1	25212633	0
70	-89903496	0	-46768020	1	15101811	1	15597332	1	12454851	1	15944099	1
71	-60741320	0	-26117143	1	47607708	0	56619017	0	-25412229	0	14391332	0
72	-87030199	0	-53395928	1	16590749	1	22495959	1	-26693391	1	47092629	0
73	11242823	0	27553700	1	10637961	1	-18108965	0	79027459	0	-27871849	-1

TABLE C18.- Continued

	7		8		9		10		11		12	
74	-20097145	-2	19870831	1	-12456663	0	17510430	0	62610858	0	37282685	0
75	-11040462	0	28555778	0	-25769304	0	34148405	0	34334661	0	33371957	0
76	-38821079	0	-19006216	1	12923903	0	36302308	0	-79639960	0	-12508010	0
77	-57772516	0	-25650189	1	46639180	0	55694681	0	-12328517	1	-23906283	0
78	-81500919	0	-54290972	1	17462714	1	22496662	1	-53949429	1	-25296331	1
79	37182911	0	47550118	1	31254631	0	-10799277	0	48106436	0	14505602	0
80	23532495	0	29437872	1	-42818112	0	19545742	0	32023562	0	42470871	0
81	76366657	-1	12217090	1	-77624309	0	76327404	-1	-26671015	0	28430767	-1
82	-21659367	0	-13958574	1	-79021400	-1	44119544	-1	-50729618	0	-12482247	0
83	-26650244	0	-19548420	1	42193505	0	-11263708	0	-14488239	1	-59897569	0
84	-57002331	0	-39419362	1	23683891	1	-65030746	0	-13543793	2	-78323660	1
85	43316282	0	40234891	1	-92906083	0	26128206	-1	-81780141	0	12136781	-2
86	27063294	0	19453678	1	-12701674	1	-15743286	0	-59190341	0	-53050842	-1
87	-68406857	-1	-12197030	1	24396053	0	-71930448	0	-52693914	0	-60618880	0
88	-39021486	0	-20202870	1	33015649	1	-27212613	1	41230707	1	-17107458	0
89	45776602	0	23067498	1	-21584383	1	-71791535	0	-21160922	0	-35341598	0
90	40110461	0	15966493	1	-11829537	1	-11121883	1	11287955	0	-60728778	0
91	-11570971	0	27111193	0	22672881	1	-12938146	1	44952766	1	14942345	1
92	10002676	1	18388515	1	-12784401	1	-93199219	0	-44918366	0	-99286416	0
93	99999999	0	99999999	0	99999999	0	99999999	0	99999998	0	99999998	0
94	11987391	0	-12962262	1	-11390335	0	24101516	-1	-28312471	0	-54777366	-1
95	10961089	1	59440536	1	69321339	-1	34469839	0	-32952434	0	13052467	0
96	60646823	0	39760519	1	32454090	-1	-67292449	-1	-50746511	-1	89338874	-1
97	32943460	-1	87808127	0	24204718	-1	-27914292	0	99854985	-1	69743661	-1

TABLE C18.- Continued

	13		14		15		16	
1	-26772462	2	16723477	1	65643616	2	-77216086	2
2	-19770403	2	13285139	1	32488784	2	-31702711	2
3	53615615	1	-44816247	0	23302779	2	42516318	0
4	10360749	2	-87519335	0	40172545	2	63450011	1
5	20056133	2	-17553527	1	10322858	3	11077257	3
6	-26200683	2	16720448	1	51974584	2	-65685038	2
7	-19120362	2	12877455	1	31917767	2	-35426772	2
8	61177959	1	-43618817	0	34016759	2	-21854660	2
9	11310868	2	-79906338	0	48015199	2	-25729052	2
10	20096778	2	-15153401	1	94128966	2	-11017864	2
11	-26436036	2	18539845	1	23137870	2	33676041	2
12	-20357387	2	15000478	1	24601101	2	47101243	2
13	93418532	1	-47418914	0	10303880	2	-30238920	2
14	15248608	2	-88534575	0	15813597	2	-67364185	2
15	24973432	2	-15313341	1	25897599	2	-14986678	3
16	-20449060	2	17784320	1	-68472176	2	22943711	3
17	-11674700	2	12052893	1	-71290261	2	14853074	3
18	10439291	2	-22717480	0	-67130091	2	-37281721	2
19	15221398	2	-49811008	0	-73754639	2	-67524273	2
20	25984532	2	-10209187	1	-11146726	3	-13526420	3
21	-89672688	0	-44906063	0	-21772428	0	-98686010	-1
22	-17968556	1	-10126643	1	-64923398	0	-27207275	0
23	31619273	1	17434602	1	-69261492	0	-13875757	0
24	-30973168	1	-16473830	1	-72782991	0	-38498806	0
25	-24636537	1	-13543294	1	-91659982	0	-36496225	0
26	44115062	1	26270992	1	-27022366	0	-10843660	0
27	-70102468	1	-40177376	1	-19772950	1	-65140422	0
28	-28278429	1	-15688484	1	-93933344	0	-30892976	0
29	74259478	1	45012309	1	13055517	1	32534784	0
30	-82457227	1	-50194611	1	-19884207	1	-47400988	0
31	-90651319	0	-51162784	0	37532607	0	10599067	0
32	89232476	1	52333635	1	28809782	1	86183796	0
33	-36711099	1	-23677749	1	78849066	0	49491268	0
34	42584424	1	25478240	1	36453440	1	11268192	1
35	57088929	1	28109195	1	31502967	1	12531729	1
36	12111078	0	-15884898	0	98421800	0	40188832	0

TABLE C18.- Continued

	13		14		15		16	
37	49821993	0	10782790	-1	-19909594	1	44847984	0
38	24811632	0	25803759	-1	-25464578	1	37173709	0
39	54473921	-1	20306258	-1	-16738383	1	34904107	0
40	-15827342	0	-10163747	0	-66314000	0	55131893	-1
41	-20329951	0	-14636025	0	71858243	-1	-11602581	0
42	-42968587	-1	-77706782	-2	27213969	0	59490866	-1
43	11679749	0	89154881	-1	18966786	0	13256826	0
44	59895427	-1	-19342908	-1	-14305517	0	13934659	0
45	72476295	-1	48858900	-2	-25907544	0	14071484	0
46	-96327729	-2	42955829	-1	31385436	-1	76432113	-1
47	-95618337	-1	69629091	-3	73644541	0	-60125598	-1
48	10332850	0	39703516	0	18660592	1	-17046709	0
49	-60181045	-1	-35750384	-1	44601152	0	-27992775	-1
50	14758813	0	27874985	0	79135249	0	-17016930	0
51	58451265	-1	12013427	0	28964845	0	-17938305	0
52	-19964353	-1	-38029917	-1	-21832183	0	-76939033	-1
53	34664428	-1	-11381555	-1	-41935130	0	73401575	-1
54	43967058	-3	-41170204	-1	-42326406	0	59635366	-1
55	-55284356	-1	-10224362	0	-20795317	0	-72596341	-2
56	-17611734	0	-22339191	0	78892868	0	-10280280	0
57	-27976687	0	-24237723	0	-66392750	-1	-39338008	0
58	-16843389	0	-23225899	0	-47972012	0	-15341319	-1
59	-92725104	-1	-13902458	0	-46295026	0	57775205	-1
60	-11950946	0	-90947457	-1	-27289684	0	-12284075	0
61	13053415	0	10271813	0	-28771378	0	-22672971	-2
62	-38766949	-1	25435558	-1	-10451659	0	-76422273	-1
63	14869086	-1	17101123	0	18122246	0	-16790366	0
64	-39208281	0	-38055075	0	-80206259	-1	-43869113	0
65	-36556845	0	-44992793	0	-36873255	0	-39776368	-1
66	13974398	0	19036106	0	12550581	0	22823186	-1
67	17712532	0	27529006	0	92250577	-1	-33807645	-1
68	14809388	0	26804832	0	31107532	0	-10286118	-1
69	18844699	0	37039107	0	50245295	0	-62691234	-1
70	14064538	1	19501030	1	24716783	1	10019625	0
71	71104633	-1	27743063	0	62807696	0	-10933530	0
72	44683797	0	96660760	0	26567748	1	-13789152	0
73	-11275552	0	-13863777	0	-16144576	0	35494462	-1

TABLE C18.- Concluded

	13		14		15		16	
74	32936498	0	40355353	0	64394753	0	11554583	0
75	24978485	0	41011082	0	66108678	0	-56259073	-1
76	-12174400	0	-50403008	-2	36760933	0	-21886830	0
77	-22531367	0	-94368296	-1	43571164	0	-15895443	0
78	-32107090	1	-25715909	1	86864721	-1	-65170675	0
79	12933489	0	11867204	0	44159492	0	24315641	-1
80	42773369	0	50574502	0	10002861	1	17863491	-1
81	55776898	-1	92795277	-1	54228711	0	-90222729	-1
82	-58095703	-1	-39110899	-1	14578854	0	-21327360	0
83	-42284680	0	-52211293	0	-36941103	0	-29401721	0
84	-75535793	1	-83288474	1	-65568942	1	-13502889	1
85	14867854	0	99687529	-1	80356028	0	-66243054	-1
86	93825929	-1	32077053	-1	55525960	0	-15025043	0
87	-40752669	0	-63252531	0	-98261599	0	-30629627	0
88	54194264	-1	-54274952	0	-33087061	1	-25884737	0
89	-23754623	0	-37324741	0	-20559799	0	-34366524	0
90	-43199908	0	-73643437	0	-96216355	0	-17917219	0
91	19209056	1	13984980	1	-41453944	0	10393510	1
92	-91138377	0	-12369071	1	-14685664	1	-87254394	-1
93	99999998	0	99999999	0	99999999	0	99999999	0
94	-69959274	-1	-39039574	-1	75047874	-2	-25233322	0
95	-44047323	-1	15583527	0	14736500	1	-83613436	-1
96	73818844	-1	10721363	0	70370379	0	13801170	-2
97	16196190	0	10501710	0	-14981536	0	-17099658	-1

TABLE C19.- SYMMETRIC STRUCTURAL MODES, CASE P2

CP \ Mode	1		2		3		4		5		6	
1	84695421	0	-95119357	-1	71537264	0	62499078	-1	-15854158	-1	97564561	-1
2	76718900	0	-68277650	-1	26956138	0	13542354	-1	-52493052	-1	83914960	-1
3	63861155	0	-37845195	-1	-59485916	0	-43363879	-1	-85432719	-1	67085938	-1
4	62057105	0	-38078630	-1	-67857754	0	-51313945	-1	-10197014	0	76847773	-1
5	56321177	0	-47578128	-1	-12618812	1	-87862268	-1	-14274564	0	83804209	-1
6	83582989	0	-84254361	-1	47174060	0	-57130139	-3	-76702583	-1	31874994	-1
7	76682654	0	-60322361	-1	-16187853	0	-37508223	-1	-10353554	0	32221924	-1
8	63709757	0	-35147439	-1	-75859510	0	-80386495	-1	-14696731	0	39741808	-1
9	62138350	0	-34589104	-1	-88304154	0	-89592255	-1	-16265943	0	48081656	-1
10	56332217	0	-43970698	-1	-14076452	1	-11466238	0	-17616139	0	30436124	-1
11	82177804	0	-70274223	-1	19406948	-1	-74965742	-1	-14578292	0	-44330018	-1
12	76639960	0	-52282354	-1	-49911826	0	-89965442	-1	-14884906	0	-41904974	-1
13	64461457	0	-32586556	-1	-98684184	0	-11857562	0	-17605011	0	-43838602	-1
14	62315105	0	-32913606	-1	-11071590	1	-12147111	0	-17794774	0	-43842469	-1
15	56437001	0	-41392319	-1	-16267363	1	-13905635	0	-19495157	0	-43102897	-1
16	80690174	0	-57189141	-1	-50097456	0	-14091524	0	-20983284	0	-14365397	0
17	73461956	0	-35796372	-1	-96906532	0	-15946097	0	-22094638	0	-13746093	0
18	63937945	0	-29545334	-1	-13354839	1	-17732569	0	-23777539	0	-13563333	0
19	62398211	0	-29157399	-1	-14409458	1	-18102898	0	-22741403	0	-15458211	0
20	57320410	0	-36333955	-1	-18480495	1	-19392357	0	-20851271	0	-20025756	0
21	50615281	-1	40423847	-1	-21172962	0	65565500	0	-95508800	-1	-97151463	-1
22	28744684	-1	40027067	-1	-30967246	0	82789795	0	-10038890	0	-89289098	-1
23	-10797285	-1	77973591	-1	-11732099	1	28568647	1	-30175987	0	-11936009	0
24	10488699	0	78583625	-1	-56457940	0	15289974	1	-20572138	0	-17152791	0
25	61658562	-1	99187933	-1	-85576941	0	21231350	1	-22380504	0	-14170808	0
26	15123615	-1	14206997	0	-16723716	1	39022250	1	-43086290	0	-15908310	0
27	13467057	0	13209510	0	-11380316	1	25125585	1	-26615996	0	-18626105	0
28	91990047	-1	16312599	0	-16023439	1	35677677	1	-39654512	0	-19777439	0
29	43672527	-1	21588068	0	-25019132	1	55317716	1	-66195723	0	-21323073	0
30	15979973	0	19244785	0	-21449938	1	41752636	1	-47139169	0	-22846151	0
31	11996650	0	22217702	0	-26335783	1	51881973	1	-62983335	0	-23454728	0
32	75894657	-1	27409730	0	-35280388	1	70885865	1	-90748926	0	-24686040	0
33	18287015	0	26452231	0	-37866968	1	69777132	1	-86303804	0	-29420181	0
34	14483645	0	29394824	0	-42633892	1	78087828	1	-10051740	1	-29353846	0
35	11752850	0	33900804	0	-51513848	1	98797558	1	-13318876	1	-37982055	0
36	15511142	1	-21539159	0	60235193	1	31255446	0	34280249	0	-27998693	0

TABLE C19.- Continued

	1		2		3		4		5		6	
37	10999914	1	-12058410	0	26148693	1	75377719	-1	43959744	-1	-42429842	-1
38	61044642	0	-41258696	-1	-25663776	0	-19422337	-1	-74593500	-1	10348308	0
39	14132503	0	27139929	-1	-15906138	1	-73305348	-1	-93858016	-1	91865153	-1
40	-13652725	0	54213098	-1	-15453336	1	-66777083	-1	-45478277	-1	18700157	-1
41	-24311740	0	51190059	-1	-98300287	0	-37315230	-1	-51218428	-3	-32294131	-1
42	-28078642	0	22154158	-1	19573542	-1	22039401	-1	67910733	-1	-54668584	-1
43	-23349844	0	-12980940	-1	75305134	0	51208549	-1	67848742	-1	-30767669	-1
44	-11655855	0	-50107297	-1	78814197	0	65864149	-1	51418143	-1	82158485	-2
45	78526040	-2	-78291529	-1	73314547	-1	55480701	-1	29249974	-1	34581400	-1
46	15559003	0	-10062694	0	-80688326	0	42993991	-1	51867113	-2	48547995	-1
47	29678780	0	-12058377	0	-20322345	1	41203472	-1	-13842434	-1	70382026	-1
48	44572449	0	-13379193	0	-33868710	1	42273303	-1	-26655352	-1	96115900	-1
49	-36236137	0	50958268	-1	-52496148	0	-37330751	-2	77222933	-1	-83315714	-1
50	-35751847	0	27335843	-1	17432082	0	11677255	-1	55186678	-1	-64364953	-1
51	-29910926	0	-10394707	-1	95135838	0	51275223	-1	44191883	-1	-81698286	-2
52	-14504432	0	-49246691	-1	96909316	0	54793640	-1	65408799	-2	41024176	-1
53	19851225	-1	-72073445	-1	20104407	0	42161359	-1	-12039721	-1	64458969	-1
54	17472474	0	-87129173	-1	-75663063	0	23705191	-1	-25983502	-2	41632348	-1
55	32818254	0	-10568125	0	-19795026	1	12923300	-1	35667455	-1	-67492994	-2
56	-40514723	0	35589651	-1	52040183	0	45923658	-1	10371825	0	-84559943	-1
57	-30224270	0	17329455	-3	11788045	1	42209663	-1	-22077168	-3	26654399	-1
58	-14004339	0	-32445315	-1	11342627	1	52434594	-1	-34055118	-1	90203691	-1
59	24842571	-1	-53022658	-1	29987697	0	40882085	-1	-20569971	-1	76073715	-1
60	18651361	0	-50703947	-1	-57785758	0	30533516	-1	29220862	-1	22474083	-1
61	37287891	0	-39016477	-1	-17297012	1	-27390089	-1	67844971	-1	-72425180	-1
62	50711375	0	72253807	-2	-21831233	1	-79438187	-1	97753964	-1	-15363897	0
63	64930751	0	16152091	-1	-30303573	1	-11012601	0	18670155	0	-26237023	0
64	-33612705	0	37760024	-1	15744200	1	50425773	-1	-35962676	-1	85204009	-1
65	-14924021	0	72528212	-2	17904991	1	-39947708	-1	-18485111	0	92184342	-1
66	55006350	-1	29040273	-1	10179626	1	-89305632	-1	-15979334	0	21801695	-1
67	25159715	0	45599951	-1	-50711455	-1	-99965153	-1	-80118248	-1	-38388231	-1
68	44127805	0	76533959	-1	-12192239	1	-11714781	0	48196733	-1	-16581674	0
69	51260253	0	86553377	-1	-18010602	1	-13508051	0	92252909	-1	-22009785	0
70	65551756	0	10909950	0	-25185019	1	-18700706	0	19067105	0	-36031716	0
71	52519172	0	16548404	0	-13216388	1	-19324007	0	61634419	-1	-26701444	0
72	68152438	0	20314950	0	-20359263	1	-23549168	0	17841468	0	-42117539	0
73	-81726251	-1	62516984	-1	27429955	1	-20492468	0	-40960980	0	68214164	-1

TABLE C19.- Continued

	1		2		3		4		5		6	
74	11529857	0	11364775	0	16711386	1	-23284528	0	-31974065	0	-33086386	-1
75	30395350	0	17718044	0	66430213	0	-21795801	0	-18905939	0	-91329885	-1
76	49800533	0	23999039	0	-40794485	0	-18920939	0	10890029	-1	-20576780	0
77	57288631	0	26554500	0	-82425985	0	-19189548	0	69940918	-1	-25114141	0
78	72031530	0	31252624	0	-14652491	1	-19154752	0	20076623	0	-38954002	0
79	25772793	-1	12363057	0	28386767	1	-32840366	0	-56022836	0	41378309	-1
80	13179900	0	18087251	0	21911282	1	-28005233	0	-39047002	0	-28876316	-1
81	31798249	0	25578642	0	12701256	1	-20042830	0	-17713401	0	-78899015	-1
82	52692509	0	34928839	0	22793402	0	-11957817	0	61975965	-1	-12131646	0
83	61028959	0	38049136	0	-15930918	0	-69737731	-1	15395282	0	-11276357	0
84	75486445	0	44498806	0	-10402640	1	50958893	-1	32756346	0	-11182007	0
85	19701731	0	24557901	0	27048809	1	-30733572	0	-44419860	0	-17732564	-1
86	36325273	0	33038465	0	18305763	1	-19430620	0	-17722861	0	-65828696	-1
87	65490358	0	50994731	0	25892711	0	17081554	-1	21800302	0	63475643	-2
88	80317734	0	51092170	0	-37217595	0	19235622	0	45719838	0	16139037	0
89	49585133	0	52121045	0	22537343	1	-18329322	0	-15332320	0	-11557941	-1
90	66957505	0	64238898	0	15099578	1	71270257	-1	18474087	0	12158385	0
91	88799697	0	83586698	0	53855047	0	59325437	0	80641724	0	49876014	0
92	82351018	0	88435252	0	17292405	1	50901537	0	54790784	0	54939395	0
93	99999999	0	99999998	0	99999999	0	99999999	0	99999999	0	99999998	0
94	-24307702	0	-16444028	-1	12467032	1	54810400	-1	14380509	-1	28532989	-1
95	43072890	0	-13983061	0	-33597614	1	11371197	-1	-35015543	-1	55026200	-1
96	44015801	0	-13989762	0	-33432369	1	37607618	-2	23234977	-1	-55545004	-2
97	45458741	0	-13015371	0	-33173442	1	-19105397	-1	65337933	-1	-56028403	-1

TABLE C19.- Continued

	7		8		9		10		11		12	
1	38121147	-1	-29594967	1	89189473	-1	-30364224	0	-47087112	0	-29299988	0
2	86715691	-1	-33390499	1	73167314	-1	-24388566	0	-14065138	0	-15974041	0
3	68381043	-1	-44814900	1	40629902	-1	-10424893	0	33795630	0	-20277972	-1
4	10293127	0	-52048937	1	33696556	-1	-91259154	-1	44260446	0	-44765073	-1
5	68874049	-1	-61978303	1	35622885	-1	-99310687	-1	47911995	0	-11296733	0
6	12168722	1	-95384737	1	10962176	0	-32890232	0	-37051868	0	-27559423	0
7	12795279	1	-10264784	2	95597577	-1	-26050734	0	-78856110	-1	-15782090	0
8	14127553	1	-11723769	2	57594290	-1	-10866706	0	39302697	0	37799187	-1
9	14477633	1	-12190054	2	45829247	-1	-89964199	-1	45358304	0	78513301	-1
10	15368603	1	-12970327	2	48044357	-1	-62463534	-1	47908171	0	78542680	-1
11	27643153	1	-18910460	2	15874303	0	-33047738	0	-22109760	0	-17688980	0
12	28410847	1	-19562128	2	16665114	0	-26863373	0	88287078	-3	-84369386	-1
13	31333952	1	-21468335	2	14061655	0	-84050861	-1	54592270	0	18804832	0
14	31750598	1	-21390615	2	13872298	0	-48433208	-1	63809033	0	23081162	0
15	33194703	1	-23270843	2	13141956	0	32147207	-1	76866906	0	32567530	0
16	51447312	1	-31702063	2	20476680	0	-20063948	0	42182957	-1	82070347	-1
17	51750364	1	-32117830	2	19750402	0	-12421762	0	24300587	0	15946881	0
18	52603613	1	-32536792	2	17044627	0	22131750	-1	71760769	0	40488428	0
19	53330356	1	-33247015	2	18877826	0	49772107	-1	81671664	0	48206330	0
20	55367402	1	-34369729	2	22277639	0	14170467	0	10674297	1	71763373	0
21	-21704041	0	-55556015	0	-13596836	-1	81107743	-1	84653934	0	22395697	0
22	-10110753	0	-36339213	0	-62181371	-1	27983458	0	20384040	1	-11140437	1
23	-27794328	-1	36253735	0	-13069402	0	29552392	0	20140588	1	-79919044	1
24	-31462087	0	-11623998	1	-84751236	-1	36215663	0	25712302	1	33302125	0
25	-11481435	0	-38728752	0	-11048614	0	46062632	0	32455313	1	-19630888	1
26	-29918649	-1	27504569	0	-30527551	-1	15813851	0	18637129	1	-78236150	1
27	-22781742	0	-85548877	0	-27045849	0	75085539	0	54687068	1	-25198005	0
28	-13898828	0	-18574437	0	-12031079	0	46081404	0	33149208	1	-15224715	1
29	-83544233	-1	34259796	0	18299977	0	-35598881	0	-17454477	1	-44515805	1
30	-23280912	0	-49802245	0	-23905086	0	46115540	0	33786390	1	27994455	1
31	-16948620	0	-10148004	0	58481745	-1	-12735842	0	-10387919	1	29676987	1
32	-16564655	0	34231643	0	39971079	0	-10810890	1	-75569564	1	22585358	1
33	-33719613	0	-10041179	0	15437191	0	-60557388	0	-46627460	1	10843869	2
34	-27888147	0	49915894	-1	47330403	0	-13314246	1	-10111801	2	12363418	2
35	-36103122	0	55531101	0	52141145	0	-17133261	1	-12775049	2	10740906	2
36	12895726	1	45725818	1	-38640356	-1	39455919	0	-23512135	0	-12513966	0

TABLE C19.- Continued

	7		8		9		10		11		12	
37	-15288816	0	73153904	0	77557123	-1	-18537621	0	-15164470	0	43344017	-1
38	-53752912	0	-63148567	0	-29116667	-1	-72459332	-1	17428786	0	32631333	-1
39	-42034341	0	-20882911	0	-76593968	-1	11209908	0	68925410	-1	29113897	-1
40	-11040601	-1	34981921	0	72655621	-2	42964811	-1	-51292491	-1	-48213285	-1
41	30727001	0	84023567	0	50797376	-1	-19364479	-1	-20499686	0	-64144689	-1
42	97314741	-1	52015301	0	38577199	-2	-35401330	-1	19569320	0	18034377	-1
43	-10186592	0	-83002321	-1	12325972	-2	-12356857	-1	16368620	0	84715841	-1
44	-21466256	0	-48980518	0	-62873932	-1	-19203392	-1	-61522410	-1	-14312121	-1
45	-16708645	0	-30597325	0	-86015037	-2	-24974227	-2	-33886983	-1	66179038	-2
46	19425618	0	68384246	0	-20583041	-1	77816834	-1	21993061	0	31321044	-1
47	89164149	0	24285251	1	-36939479	-1	20692511	0	-25233898	0	42015471	-1
48	16544413	1	42848439	1	-31167031	-1	45176242	0	11369982	0	38451094	0
49	78049095	-1	20732529	0	-71146093	-1	53756507	-1	-37106551	0	96663713	-2
50	19454744	0	-49124002	-1	-92134457	-1	58351747	-1	28322235	0	24242218	0
51	-38178619	-1	-96186618	0	-83997670	-1	25205737	-1	10477987	0	10138061	0
52	-18394684	0	-11082510	1	-80049701	-1	12355813	-1	-12197288	0	-34624077	-1
53	-16719653	0	-52595101	0	-50957764	-1	18078536	-4	-19504176	-1	-12951572	-1
54	-23115697	-1	79995908	-1	-42704990	-1	-79530059	-1	59951593	-1	-36531143	-1
55	27289919	0	10416530	1	-54845205	-1	-19558121	0	24239299	-1	-72226863	-1
56	16824675	0	40488830	-1	-25038356	0	11327210	0	-10484975	1	-13925754	0
57	57548995	-1	-11553141	1	12793716	0	-40167620	-1	-33526995	0	-16720791	0
58	-12477210	0	-68552178	0	74004421	-1	88622331	-2	-33094273	0	-16943186	0
59	-14226735	0	-48158872	0	-26389937	-1	35538818	-1	-21799560	0	-11450151	0
60	-30143267	-1	-52514870	0	-11034136	-1	-19830230	-1	-20087559	-1	-92488341	-1
61	-19814159	0	-31738964	0	92286428	-1	-16158298	0	21379234	0	54455244	-1
62	-46794334	0	-11346756	1	56552165	0	12380821	0	-16652204	0	-31621307	-1
63	-10180970	1	-31517283	1	71326471	0	50600942	0	-70815797	0	32243932	-1
64	26066123	0	-83781585	0	41856018	0	-27314599	-1	-61665318	0	-23613231	0
65	25582756	0	91506105	0	44797780	0	-50741414	-1	-46847174	0	-30765626	0
66	39852110	-1	29336557	0	-67184195	-1	75465457	-1	21757861	0	12193620	0
67	-19804571	0	-54529814	0	-51463750	-1	12581755	0	23797890	0	15509792	0
68	-44685778	0	-95750790	0	25844494	0	19583152	0	11345110	0	12839235	0
69	-60905830	0	-15417735	1	50301164	0	32769751	0	91090481	-1	19935032	0
70	-11190473	1	-30772089	1	15858140	1	12561059	1	11730327	1	14370808	1
71	-68322940	0	-15968525	1	52745341	0	37588969	0	-11205332	0	10018178	0
72	-12142448	1	-38434534	1	17783477	1	17582524	1	-12564491	1	63675676	0
73	55551264	0	27409139	1	10122991	1	-16013280	0	49121773	0	-42793459	-1

TABLE C19.- Continued

	7		8		9		10		11		12	
74	29240738	0	17510578	1	-21442422	0	88753752	-1	39283670	0	27307876	0
75	-22198107	-1	18475867	0	-31392983	0	20027998	0	20820915	0	22514580	0
76	-46775890	0	-14090193	1	15921924	0	19056415	0	-49792983	0	-11965970	0
77	-65571376	0	-15971618	1	52711063	0	34299012	0	-74402106	0	-19312807	0
78	-11525635	1	-38532213	1	19619200	1	15250750	1	-36727133	1	-22999823	1
79	90624987	0	38973400	1	17816579	0	-13542398	0	30085965	0	12114516	0
80	52363492	0	21566647	1	-55677791	0	91262556	-1	21876428	0	34592963	0
81	18765033	0	72502056	0	-85439437	0	-38617420	-1	-23893498	0	-32967770	-1
82	-29417259	0	-11390210	1	-61992944	-1	-62531909	-1	-33771251	0	-12598524	0
83	-35657541	0	-13989158	1	49355256	0	-19263998	0	-91452976	0	-46535036	0
84	-59394912	0	-20244419	1	28168917	1	-88857426	0	-93302314	1	-66051943	1
85	76365000	0	27737244	1	-10834181	1	-84978005	-1	-54823194	0	15263964	-1
86	37723222	0	10420432	1	-13749389	1	-24571568	0	-46510363	0	-86993400	-1
87	-12208318	0	-91569463	0	30276950	0	-67578616	0	-40334843	0	-52197173	0
88	-15326072	0	-67089458	-1	35110543	1	-21573485	1	26011162	1	-17587421	0
89	49753031	0	85358707	0	-22914583	1	-75414405	0	-41530437	0	-46536231	0
90	47636023	0	86595270	0	-12301187	1	-10184645	1	-18184044	0	-65084036	0
91	29784550	0	19865474	1	23441285	1	-88502822	0	31957196	1	13981881	1
92	93320842	0	53980394	0	-13091583	1	-81380137	0	-56550080	0	-98143444	0
93	99999999	0	99999999	0	99999999	0	99999999	0	99999999	0	99999999	0
94	-89370447	-1	-13715191	1	-99157262	-1	14355414	-1	-16262256	0	-31985297	-1
95	14491635	1	42021487	1	-41726423	-1	31729212	0	-12794900	0	18413416	0
96	92306131	0	30750955	1	-29468353	-1	-36952995	-1	21298786	-1	13410239	0
97	19423583	0	92037179	0	25655112	-1	-23837626	0	99364944	-1	97629298	-1

TABLE C19.- Continued

	13		14		15		16	
1	-11338672	1	39378642	2	58852252	2	-78595403	2
2	-77904820	0	29260697	2	29172404	2	-32265261	2
3	13888923	0	-81135754	1	21062105	2	43619927	0
4	25747098	0	-15706203	2	36192712	2	64858302	1
5	47970505	0	-30508681	2	92670173	2	11298291	3
6	-10921494	1	38584819	2	46500407	2	-66825679	2
7	-75298212	0	28286322	2	28568068	2	-36025132	2
8	23195962	0	-90371013	1	30553862	2	-22218195	2
9	43819652	0	-16778473	2	43111575	2	-26153470	2
10	71142963	0	-30013891	2	84421213	2	-11101877	2
11	-97912954	0	39258652	2	20493797	2	34441247	2
12	-69879539	0	30393496	2	21820161	2	48119503	2
13	51103122	0	-13472435	2	91615288	1	-30745008	2
14	73897893	0	-22229007	2	14133162	2	-68577527	2
15	11456106	1	-36573370	2	23242814	2	-15265055	3
16	-49105119	0	31058903	2	-61788050	2	23387701	3
17	-12953473	0	18116670	2	-64226136	2	15141180	3
18	79994772	0	-14447276	2	-60344782	2	-37968427	2
19	10354672	1	-21402740	2	-66265326	2	-68798789	2
20	16360219	1	-36374259	2	-10000244	3	-13738723	3
21	-87657509	0	-26963510	0	-22552754	0	-10319778	0
22	-15056902	1	-45246933	0	-53361858	0	-28832002	0
23	41849081	1	21462526	1	-52741156	0	-15400005	0
24	-29251899	1	-95036460	0	-64214081	0	-40762786	0
25	-19847516	1	-49876936	0	-75109247	0	-39234627	0
26	53879001	1	28453645	1	-25603447	0	-11867391	0
27	-65496904	1	-24508256	1	-15887009	1	-70596187	0
28	-24021175	1	-70608293	0	-76312897	0	-33723478	0
29	77443575	1	36771822	1	96386134	0	35073701	0
30	-82791228	1	-33098006	1	-15043178	1	-51620287	0
31	-12969528	1	-71893756	0	31807895	0	11339951	0
32	80822701	1	30635481	1	22883789	1	93357311	0
33	-52258065	1	-32782421	1	73080056	0	52201205	0
34	21331435	1	-46251087	-1	29318934	1	12122678	1
35	35553527	1	-23549318	0	26846382	1	13588128	1
36	-18923579	0	-61860894	0	50408828	0	46690210	0

TABLE C19.- Continued

	13		14		15		16	
37	98366431	-1	-55976459	0	-17795229	1	44157657	0
38	48956640	-1	-25745865	0	-20428052	1	33042605	0
39	35440235	-1	-49357191	-1	-12223264	1	31845805	0
40	-54229495	-1	-21767606	-1	-40497049	0	47896945	-1
41	-63187335	-1	-26669293	-1	16221515	0	-10639559	0
42	25133185	-3	28394619	-1	23138159	0	65438326	-1
43	86633925	-1	50960542	-1	13579484	0	12971370	0
44	-10898621	-1	-97535340	-1	-11383335	0	12643296	0
45	10597183	-1	-60587833	-1	-18871068	0	12457924	0
46	67126984	-3	75038436	-1	63434117	-1	63962652	-1
47	34065144	-1	14056744	0	73039893	0	-55733828	-1
48	38130869	0	71508592	0	16734232	1	-15351932	0
49	43431347	-1	37893391	-1	44126800	0	-15854392	-1
50	25864056	0	41182183	0	63676903	0	-16680498	0
51	10728018	0	20205818	0	23568208	0	-19124005	0
52	-33908045	-1	-29855538	-1	-14904334	0	-98131567	-1
53	-15563424	-1	-53202524	-1	-30741332	0	50785097	-1
54	-46758924	-1	-86373890	-1	-32170284	0	43070998	-1
55	-81775385	-1	-14115900	0	-15698566	0	-10411866	-1
56	-83150345	-1	-17145520	0	75218116	0	-86389276	-1
57	-17680348	0	-10282735	0	11728425	-1	-40309897	0
58	-18142949	0	-23709436	0	-31164237	0	-34664746	-1
59	-12410810	0	-16461222	0	-31057513	0	37671499	-1
60	-11014133	0	-58021096	-1	-19681446	0	-13563527	0
61	73013911	-1	29531007	-1	-29093670	0	-19007849	-2
62	11649992	-2	47084223	-1	-94613371	-1	-55188252	-1
63	12989911	0	26907577	0	17941194	0	-13350375	0
64	-24054619	0	-19921652	0	53400761	-1	-49161234	0
65	-33915731	0	-44125238	0	-19972485	0	-36634445	-1
66	12415835	0	17783341	0	84610870	-1	17736257	-1
67	17269824	0	27765259	0	34990299	-1	-35548345	-1
68	16474623	0	27003776	0	18690140	0	11769889	-1
69	25453914	0	42708911	0	34307651	0	-31660887	-1
70	16303037	1	22009293	1	18342537	1	15908143	0
71	15691835	0	34233505	0	44160509	0	-65319601	-1
72	86044705	0	13570688	1	22707178	1	-43997334	-1
73	-98709535	-1	-15270086	0	-15460490	0	60540504	-1

TABLE C19.- Concluded

	13		14		15		16	
74	29380831	0	33524374	0	44374802	0	13015573	0
75	26034133	0	40633892	0	45836400	0	-39713901	-1
76	-69695863	-1	96174740	-2	25010671	0	-17892542	0
77	-13692943	0	-56185487	-1	33833130	0	-10388834	0
78	-25150914	1	-18199805	1	63322359	0	-53695527	0
79	11665997	0	46201992	-1	30771504	0	52996335	-1
80	39702047	0	43007746	0	72235606	0	36525129	-1
81	-19023865	-2	-12635712	-1	35790697	0	-71353344	-1
82	-82331245	-1	-11386976	0	25247308	-1	-17804288	0
83	-42820473	0	-60526357	0	-33043751	0	-24407570	0
84	-70898036	1	-30734884	1	-41971501	1	-12030599	1
85	74225489	-1	-62827707	-1	60166208	0	-43693630	-1
86	-35097526	-1	-17257715	0	33205640	0	-13226196	0
87	-52313665	0	-83370598	0	-90997984	0	-26501011	0
88	-27561388	0	-97754879	0	-31699126	1	-19244453	0
89	-47066556	0	-68323900	0	-35357898	0	-33902711	0
90	-70564758	0	-11066232	1	-96009406	0	-16025317	0
91	14689464	1	79913277	0	-77961751	0	10870479	1
92	-11269827	1	-15030512	1	-11578927	1	-94027010	-1
93	99999999	0	99999998	0	99999999	0	99999999	0
94	-29012176	-1	38728778	-1	35427847	-1	-27033744	0
95	17648235	0	38765844	0	13528322	1	-63325709	-1
96	14461436	0	15764096	0	62812459	0	15527948	-1
97	13161333	0	47057439	-1	-13496402	0	-16105776	-1

TABLE C20.- SYMMETRIC STRUCTURAL MODES, CASE P3

CP \ Mode	1		2		3		4		5		6	
1	69669748	0	-72619383	-1	-51731161	0	13010902	0	-11503394	-1	11102874	0
2	62274769	0	-50243617	-1	18971082	0	14676799	-2	-49568101	-1	93062356	-1
3	50426787	0	-26457513	-1	15263092	1	-18426769	0	-82671155	-1	65717628	-1
4	48718945	0	-27094433	-1	16823926	1	-20400599	0	-97895803	-1	76898344	-1
5	43378445	0	-39614365	-1	25783063	1	-31262475	0	-13525391	0	81476515	-1
6	68760500	0	-66471061	-1	-19900819	0	20975993	-1	-83749361	-1	57830053	-1
7	62398425	0	-47771044	-1	80148155	0	-10762215	0	-10933926	0	54225307	-1
8	50356162	0	-26861655	-1	17747640	1	-23882441	0	-15016445	0	60350777	-1
9	48883460	0	-27155675	-1	19839211	1	-26424642	0	-16430612	0	70173040	-1
10	43549780	0	-39392187	-1	27343056	1	-34797191	0	-17730979	0	48858701	-1
11	67604234	0	-58566153	-1	44967533	0	-12882058	0	-16718494	0	-46919070	-2
12	62523191	0	-43863297	-1	12708373	1	-21317796	0	-16944540	0	-66123874	-2
13	51248669	0	-28100369	-1	20477159	1	-30744526	0	-19518049	0	-79651802	-2
14	49253069	0	-28989733	-1	22343245	1	-32374049	0	-19661418	0	-86349536	-2
15	43792291	0	-40420213	-1	30174411	1	-39619698	0	-21080714	0	-88825834	-2
16	66536854	0	-52671858	-1	11556849	1	-25980202	0	-24868834	0	-79413377	-1
17	59828924	0	-35503245	-1	19114939	1	-34369523	0	-25803738	0	-76701861	-1
18	50940007	0	-30726428	-1	24852136	1	-40614158	0	-27197206	0	-75260130	-1
19	49544149	0	-31016835	-1	26200396	1	-42490860	0	-26432690	0	-98061154	-1
20	44950632	0	-41015230	-1	31479389	1	-48272536	0	-24943103	0	-15133867	0
21	48504051	-1	39936860	-1	11412826	1	14413730	1	-65896831	-1	-10184846	0
22	28587812	-1	40080505	-1	14523105	1	17770929	1	-58210074	-1	-87353928	-1
23	-35381603	-2	84001702	-1	51198188	1	60788206	1	-13253967	0	-81264832	-1
24	10125942	0	78387501	-1	27193121	1	32876573	1	-13014711	0	-17151984	0
25	63458914	-1	10113099	0	38357713	1	45135031	1	-10786669	0	-12523851	0
26	23855126	-1	14830386	0	71959161	1	82906498	1	-20196702	0	-10705488	0
27	13364846	0	13289269	0	47593765	1	53264037	1	-13254630	0	-17374283	0
28	96034713	-1	16606577	0	67288459	1	75729210	1	-19556766	0	-16214433	0
29	54723599	-1	22406242	0	10498387	2	11756079	2	-33625976	0	-13650598	0
30	16242003	0	19471251	0	83077590	1	88354496	1	-23684332	0	-19167605	0
31	12669362	0	22600246	0	10310564	2	11002862	2	-32910599	0	-17279203	0
32	88941109	-1	28181569	0	14024446	2	15056838	2	-48543027	0	-14533978	0
33	19073523	0	27042949	0	14217560	2	14786294	2	-45462726	0	-21113671	0
34	15634021	0	30062623	0	16010017	2	16559210	2	-54215375	0	-18937442	0
35	13393552	0	34892749	0	19851647	2	21023828	2	-74096881	0	-24042707	0
36	13579769	1	-16615549	0	-95664958	1	11280041	1	29225836	0	-24622237	0

TABLE C20.- Continued

	1		2		3		4		5		6	
37	93099636	0	-89922522	-1	-36785815	1	35071557	0	25486444	-1	-33640090	-1
38	47615816	0	-27021631	-1	10450925	1	-11341145	0	-64348352	-1	10080686	0
39	44077377	-1	29946941	-1	30840746	1	-33765004	0	-77068706	-1	79529705	-1
40	-20523911	0	53344578	-1	28148032	1	-31199344	0	-36023798	-1	45331552	-2
41	-29540595	0	51034529	-1	17627027	1	-19187809	0	22898034	-2	-41656834	-1
42	-31801029	0	27476290	-1	75802360	-1	90885683	-2	62773668	-1	-68594629	-1
43	-26169382	0	-38903266	-2	-11419014	1	14677018	0	62370571	-1	-38980244	-1
44	-13725610	0	-41157499	-1	-13208869	1	19817474	0	49451194	-1	65588254	-2
45	-85079701	-2	-73874768	-1	-37592862	0	13575515	0	33173666	-1	37998511	-1
46	14192352	0	-10278154	0	77246382	0	65365315	-1	16478587	-1	65279773	-1
47	28803708	0	-13164499	0	24006325	1	-91149022	-2	97287568	-2	10887409	0
48	44149615	0	-15957576	0	42218382	1	-91429108	-1	11110109	-1	15884199	0
49	-40498457	0	54085805	-1	10146809	1	-11171035	0	69742935	-1	-11133669	0
50	-39183555	0	32854320	-1	-14147559	0	10455489	-1	49826181	-1	-75488155	-1
51	-32531275	0	-54819178	-3	-13697002	1	16938370	0	41973009	-1	-10125235	-1
52	-16587299	0	-39509238	-1	-15177344	1	20565725	0	94184011	-2	48701901	-1
53	18225134	-2	-67532330	-1	-50088502	0	13079029	0	-45626208	-2	75902741	-1
54	15924175	0	-89238476	-1	74750222	0	21352036	-1	32252240	-2	49390648	-1
55	31663470	0	-11582422	0	23229442	1	-99501796	-1	37949696	-1	-56204072	-2
56	-43622701	0	44580822	-1	-66668071	0	87397500	-1	93295998	-1	-10369124	0
57	-32885249	0	10883979	-1	-16444879	1	18328826	0	14605069	-2	35857865	-1
58	-16142655	0	-22709699	-1	-16785610	1	22195652	0	-24778945	-1	11066124	0
59	67011098	-2	-48796969	-1	-60160691	0	13206073	0	-13085245	-1	89768546	-1
60	17115479	0	-52945283	-1	52552935	0	22133592	-1	26969229	-1	21476143	-1
61	35806413	0	-50261312	-1	20389769	1	-20416163	0	48722693	-1	-10248583	0
62	48941015	0	-96915565	-2	26649776	1	-37363092	0	60424150	-1	-21390758	0
63	62992653	0	-54099538	-2	38181207	1	-55635054	0	12729456	0	-37352048	0
64	-36094302	0	48906052	-1	-21115821	1	23302314	0	-27905898	-1	11206164	0
65	-17161900	0	13639298	-1	-26642379	1	17457413	0	-17263595	0	14526038	0
66	33181849	-1	27929523	-1	-16420500	1	-52762571	-2	-16354003	0	50925904	-1
67	23035567	0	37963206	-1	-16283785	0	-16561404	0	-99072653	-1	-42649867	-1
68	42216152	0	60663052	-1	13683069	1	-36042153	0	36230754	-2	-21954639	0
69	49393832	0	66879255	-1	21611450	1	-46863201	0	37720142	-1	-29513484	0
70	63449331	0	83090620	-1	30513337	1	-67477359	0	11297467	0	-48478728	0
71	50534869	0	14408229	0	15265975	1	-55000555	0	-76222608	-2	-34968643	0
72	65936595	0	17424550	0	24270455	1	-74984522	0	83096063	-1	-56325865	0
73	-11102706	0	63638736	-1	-41119491	1	44535550	-1	-39972717	0	15947793	0

TABLE C20.- Continued

	1		2		3		4		5		6	
74	88751979	-1	10583961	0	-26067489	1	-16174822	0	-33369718	0	16267509	-1
75	27944800	0	16285576	0	-11073021	1	-31604048	0	-22482995	0	-87603972	-1
76	47649560	0	21954076	0	39398262	0	-47337458	0	-57343768	-1	-26881436	0
77	55216884	0	24197073	0	96975881	0	-55065688	0	-90389802	-2	-33619677	0
78	69991383	0	28381183	0	18023552	1	-67332237	0	95388432	-1	-53907016	0
79	-35691147	-2	12122458	0	-42453566	1	-12626107	0	-55486050	0	15476004	0
80	10545093	0	17075947	0	-32617461	1	-19608094	0	-40780064	0	35238018	-1
81	29543329	0	24170613	0	-18569071	1	-26339899	0	-21999792	0	-69324006	-1
82	50696187	0	33069035	0	-23498669	0	-36493699	0	-81659115	-2	-17512603	0
83	59231494	0	36067083	0	36306036	0	-36413611	0	77460438	-1	-18392506	0
84	74542841	0	42340058	0	16953233	1	-32929875	0	23183931	0	-24118611	0
85	16823041	0	23381441	0	-39313218	1	-20028051	0	-46652291	0	59994917	-1
86	33993578	0	31593110	0	-25664327	1	-23014586	0	-22763946	0	-49478437	-1
87	63912436	0	49069357	0	97922896	-1	-26072550	0	14099837	0	-54177559	-1
88	79454134	0	59213621	0	12446547	1	-16157347	0	37789911	0	86415871	-1
89	47106305	0	50258739	0	-27958336	1	-27705670	0	-22125322	0	13754619	-2
90	65312137	0	62487669	0	-14083401	1	-85169459	-1	11160629	0	10151867	0
91	88593263	0	82686962	0	67843211	0	40393993	0	75090549	0	44543504	0
92	91594392	0	87493886	0	-78647376	0	44141651	0	49940576	0	54325955	0
93	99999999	0	99999998	0	99999999	0	99999999	0	99999999	0	99999999	0
94	-26542879	0	-54673193	-2	-18249308	1	21430169	0	14339191	-1	34884194	-1
95	42636669	0	-16098259	0	41449349	1	-14306241	0	-42479928	-2	10674487	0
96	43448004	0	-15933719	0	41045873	1	-19316750	0	37705099	-1	14134330	-1
97	44575695	0	-14774079	0	41324637	1	-28040756	0	62562250	-1	-74506253	-1

TABLE C20.- Continued

	7		8		9		10		11		12	
1	60156214	0	-51374921	1	60102017	-1	-33273863	0	-78355643	0	-54497857	0
2	93336464	0	-59585761	1	50093784	-1	-26457922	0	-30495953	0	-32427686	0
3	11045471	1	-64930078	1	26303933	-1	-97545555	-1	47166857	0	38850023	-1
4	13277023	1	-74879029	1	17428731	-1	-78135469	-1	64786355	0	61648138	-1
5	14895979	1	-90339348	1	14675874	-1	-72937625	-1	74833190	0	55919868	-1
6	44301156	1	-10222619	2	82110303	-1	-36383684	0	-63999286	0	-50984945	0
7	47465299	1	-10778005	2	75166237	-1	-28688733	0	-21626592	0	-31157260	0
8	53644365	1	-12165828	2	44989570	-1	-10804249	0	52588303	0	98584576	-1
9	55339752	1	-12727062	2	33628292	-1	-83670713	-1	62073885	0	17497027	0
10	59110439	1	-13355507	2	36664172	-1	-46571861	-1	69115520	0	22861180	0
11	96188560	1	-18077716	2	13039748	0	-37296075	0	-45495078	0	-39779522	0
12	99602518	1	-18723898	2	14250053	0	-30520536	0	-13534774	0	-24332099	0
13	10971543	2	-20019559	2	12681247	0	-94633154	-1	71388874	0	27724969	0
14	11153312	2	-20460931	2	12558266	0	-53568677	-1	86084096	0	36687044	0
15	11760538	2	-21862927	2	12002565	0	38805192	-1	10649741	1	53384232	0
16	17225056	2	-27739422	2	18572612	0	-24804536	0	-10536629	0	-70913493	-1
17	17398387	2	-28042346	2	18337384	0	-16094501	0	20134896	0	95148286	-1
18	17704059	2	-28280966	2	16552513	0	44960963	-2	92091181	0	52041646	0
19	18005104	2	-28830079	2	18407200	0	33428086	-1	10651178	1	63621871	0
20	18713150	2	-29433129	2	22355722	0	12781837	0	14175392	1	96053347	0
21	-22676630	0	-14197536	1	-15541364	-1	93735427	-1	12810650	1	53812328	0
22	-48479559	-1	-68741992	0	-56222776	-1	31632859	0	33189630	1	-68723808	0
23	-81658288	-1	58447767	0	-12764322	0	34575219	0	39899435	1	-94720615	1
24	-22921764	0	-25414120	1	-80157347	-1	40791152	0	39739353	1	12844904	1
25	-40949730	-1	-70022457	0	-97425292	-1	51319481	0	52706141	1	-13878072	1
26	-49696275	-1	53571735	0	-26984707	-1	18017671	0	35948624	1	-95398706	1
27	-11337750	0	-16867845	1	-24591285	0	83858069	0	86377124	1	16878995	1
28	-10724313	0	-34220319	0	-10375672	0	51063878	0	53266783	1	-80958500	0
29	-16259684	0	53530729	0	17301353	0	-40718345	0	-25106779	1	-66899100	1
30	-20028726	0	-10821915	1	-22432149	0	52289645	0	52155061	1	51414159	1
31	-19408847	0	-26928319	0	57079074	-1	-14944035	0	-19326667	1	34261398	1
32	-33689120	0	27413443	0	36373804	0	-12143365	1	-12206819	2	-12635108	-1
33	-51591014	0	-89087524	0	13500411	0	-68540390	0	-82536752	1	12497487	2
34	-46556959	0	-45404443	0	43513469	0	-15148724	1	-17183997	2	12090633	2
35	-72852101	0	12315613	0	45470803	0	-18963014	1	-20865935	2	96404225	1
36	15044950	1	11317366	2	-72524326	-2	39318958	0	-18164322	0	-82092994	-1

TABLE C20.- Continued

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37	-53103305	0	-12125979	0	59735149	-1	-20282494	0	-24345701	0	84570904	-2
38	-97119823	0	-31326755	1	-38840345	-1	-62761820	-1	20792105	0	38461436	-1
39	-74321767	0	-11726400	1	-66206516	-1	14097911	0	74271139	-1	29061894	-1
40	14064622	-2	16908025	1	26630924	-1	51726659	-1	-80879531	-1	-69287228	-1
41	53206372	0	36920204	1	73768540	-1	-27786322	-1	-29991828	0	-11182184	0
42	16756553	0	18084035	1	15273716	-1	-54950912	-1	25400278	0	27816765	-1
43	-15877408	0	-58391777	0	-34494197	-2	-23344245	-1	18769631	0	91433699	-1
44	-36293979	0	-21869626	1	-78422924	-1	-18185761	-1	-10274047	0	-23739015	-1
45	-35010630	0	-18644867	1	-23401628	-1	19756428	-2	-72349916	-1	-24538819	-2
46	11277510	0	11955755	1	-14360782	-1	84649262	-1	29667785	0	60429973	-1
47	10646261	1	69235869	1	94968512	-3	22294285	0	-36856849	0	47889549	-2
48	21231571	1	13125221	2	52166339	-1	46935752	0	73901322	-1	37424746	0
49	27663789	0	18121610	1	-55196986	-1	52648150	-1	-53894468	0	-51511845	-1
50	50188561	0	14336654	1	-71932443	-1	45286653	-1	32463708	0	25367420	0
51	14497056	0	-17660030	1	-88170343	-1	21492474	-1	10053062	0	10247691	0
52	-19772722	0	-31576566	1	-97941078	-1	23490530	-1	-18554898	0	-48946648	-1
53	-33166927	0	-23119868	1	-65451019	-1	10720467	-1	-46524916	-1	-16565720	-1
54	-17094219	0	-61528330	0	-48824944	-1	-79605605	-1	75623321	-1	-32006165	-1
55	23657303	0	24277213	1	-45883441	-1	-21629573	0	37275833	-1	-78692524	-1
56	45303942	0	15071909	1	-23897593	0	12997578	0	-14442174	1	-26520197	0
57	32767311	0	-19060651	1	10867180	0	-38882787	-1	-47425551	0	-21890134	0
58	-23007349	0	-24830556	1	50024844	-1	25570635	-1	-46161724	0	-21051864	0
59	-30266107	0	-21663798	1	-42976206	-1	56417268	-1	-29739930	0	-13392924	0
60	-25331652	-1	-15206782	1	-22270353	-1	-10569477	-1	-11753541	-1	-86047126	-1
61	-30793521	0	-13657378	1	79349470	-1	-17075477	0	28134545	0	74396626	-1
62	-57225074	0	-34180402	1	52469424	0	15893032	0	-21369833	0	-37015504	-1
63	-10722646	1	-83532481	1	64533518	0	59915806	0	-95138404	0	-10304587	-1
64	58942924	0	-88803701	0	39097429	0	-23321780	-1	-88643021	0	-33888178	0
65	11547086	0	15781730	1	42567939	0	-31528026	-1	-64135818	0	-37415391	0
66	-82680883	-1	25662231	0	-62672843	-1	10836637	0	28300203	0	15860573	0
67	-28905147	0	-17145794	1	-54676112	-1	16757009	0	32564257	0	20580588	0
68	-54965757	0	-28302439	1	23711974	0	24398244	0	17440869	0	17247635	0
69	-67785762	0	-41771519	1	46874272	0	38898668	0	13036232	0	24114522	0
70	-11892530	1	-82901903	1	15229949	1	13869598	1	13512147	1	15632908	1
71	-74064224	0	-44093885	1	48939065	0	45878047	0	-10862781	0	13775388	0
72	-11369634	1	-95169512	1	16830566	1	19960907	1	-18160075	1	54952949	0
73	25520378	0	57160221	1	99542717	0	-15787339	0	61759878	0	-24026393	-1

TABLE C20.- Continued

	7		8		9		10		11		12	
74	11954553	0	41387119	1	-18119160	0	13804407	0	52462737	0	33999902	0
75	-51393192	-1	77119889	0	-29099728	0	27119862	0	31427544	0	29707513	0
76	-43763393	0	-31956697	1	13478753	0	27072297	0	-59493849	0	-11836175	0
77	-69385404	0	-42938880	1	48156488	0	44237019	0	-92112783	0	-21481454	0
78	-10505996	1	-95278545	1	18060888	1	19491979	1	-43725778	1	-24436438	1
79	71939876	0	96746273	1	21827211	0	-10587935	0	37677126	0	14422107	0
80	48770116	0	59590179	1	-49921892	0	15267382	0	28385768	0	39890137	0
81	24193068	0	26345508	1	-80998262	0	21643993	-1	-22977765	0	43370093	-2
82	-21715003	0	-23322930	1	-75119524	-1	-16054594	-1	-38802876	0	-12174270	0
83	-29410128	0	-32579849	1	44354563	0	-15860479	0	-11628911	1	-54602923	0
84	-69628544	0	-62150990	1	25158320	1	-71983578	0	-11523493	2	-74146457	1
85	80884608	0	80895463	1	-10053212	1	-13278466	-1	-68697162	0	32006083	-2
86	53821774	0	40278592	1	-13075441	1	-19801074	0	-51969709	0	-70775648	-1
87	-34222217	-1	-19515913	1	26434723	0	-70804875	0	-47201696	0	-57115880	0
88	-51239993	0	-27733510	1	33415468	1	-24854834	1	32919198	1	-13407533	0
89	80946058	0	45014439	1	-21925005	1	-73471036	0	-31537615	0	-40511472	0
90	66436819	0	33576269	1	-11850846	1	-10728790	1	-55243861	-1	-62815819	0
91	-26589583	0	12593172	1	22777394	1	-11274821	1	38107045	1	14912047	1
92	12899884	1	30476936	1	-12633577	1	-87201260	0	-55634385	0	-10054821	1
93	99999999	0	99999998	0	99999998	0	99999998	0	99999999	0	99999999	0
94	76343677	-1	-29867238	1	-11357905	0	22815247	-1	-24438129	0	-53440241	-1
95	17751949	1	12327949	2	30660975	-1	33282729	0	-21420589	0	15499563	0
96	10539960	1	85185425	1	16517160	-1	-56669571	-1	-13773935	-1	10961350	0
97	16473424	0	22481646	1	34482408	-1	-26771930	0	93414016	-1	81279051	-1

TABLE C20.- Continued

	13		14		15		16	
1	-11756689	2	40374793	1	64039931	2	-77919651	2
2	-86397656	1	30750212	1	31722280	2	-31993296	2
3	23010653	1	-92351660	0	22807601	2	42765175	0
4	44382864	1	-17979889	1	39257957	2	64105583	1
5	85701990	1	-35364763	1	10073593	3	11185670	3
6	-11490406	2	39858654	1	50673354	2	-66276586	2
7	-83532278	1	29777717	1	31136477	2	-35744910	2
8	26668308	1	-97008934	0	33212755	2	-22050038	2
9	49331508	1	-17877307	1	46865136	2	-25955905	2
10	87208755	1	-32752459	1	91832909	2	-11083926	2
11	-11513717	2	41933149	1	22487829	2	34025344	2
12	-88340097	1	33068583	1	23926028	2	47575916	2
13	41670164	1	-12803614	1	10027321	2	-30511636	2
14	67431837	1	-22112812	1	15409630	2	-67987641	2
15	11002296	2	-37097642	1	25267483	2	-15127041	3
16	-87379347	1	36014447	1	-66926417	2	23161437	3
17	-48931714	1	22562346	1	-69638133	2	14993553	3
18	48023236	1	-11190755	1	-65531103	2	-37644266	2
19	69193014	1	-18071723	1	-71988031	2	-68176573	2
20	11728030	2	-32642525	1	-10874442	3	-13657783	3
21	-77528768	0	-52615535	0	-22271046	0	-99635164	-1
22	-15120869	1	-10797441	1	-59700658	0	-28098260	0
23	30618435	1	22438438	1	-63058215	0	-14612888	0
24	-26718818	1	-18651691	1	-69310242	0	-39507817	0
25	-20435723	1	-14327095	1	-83878768	0	-38043564	0
26	42024561	1	31826088	1	-25921548	0	-11474349	0
27	-61004940	1	-44335438	1	-18081086	1	-68129132	0
28	-23823183	1	-16860114	1	-85242793	0	-32597673	0
29	67403171	1	50961171	1	11725591	1	33792900	0
30	-74041764	1	-55941978	1	-17908514	1	-49770707	0
31	-90577416	0	-67534264	0	35832352	0	10837848	0
32	77274650	1	56790805	1	26281578	1	90075121	0
33	-37435721	1	-29771819	1	74975704	0	51011284	0
34	32395420	1	23285913	1	33456098	1	11730216	1
35	43743059	1	27977631	1	29159349	1	13125992	1
36	-45626743	-1	-20196605	0	80677336	0	42763104	0

TABLE C20.- Continued

	13		14		15		16	
37	24953619	0	-16196620	-1	-19616422	1	45213663	0
38	13232926	0	83172343	-2	-23770947	1	35667967	0
39	50409803	-1	23431415	-1	-14640861	1	33138593	0
40	-95368660	-1	-71522067	-1	-48477724	0	41566705	-1
41	-12784579	0	-10204004	0	20003116	0	-12416594	0
42	-12298482	-1	54872345	-2	31097844	0	58219929	-1
43	10028040	0	84890420	-1	17451985	0	13652942	0
44	11042960	-1	-32370448	-1	-16754569	0	14551675	0
45	29090546	-1	-81185466	-2	-27137284	0	14544833	0
46	28417742	-2	31038982	-1	32580085	-1	76496953	-1
47	-26728174	-1	21372086	-1	77627924	0	-63766768	-1
48	27613917	0	43018164	0	19056607	1	-18250822	0
49	-90422901	-2	-28773980	-2	52058913	0	-29384911	-1
50	22221266	0	29175541	0	79413343	0	-17358312	0
51	86449764	-1	12024380	0	26727230	0	-17880040	0
52	-37358824	-1	-47248931	-1	-23699941	0	-73566040	-1
53	-99772747	-3	-26198950	-1	-42375242	0	75883518	-1
54	-30613154	-1	-52893980	-1	-41553154	0	61221314	-1
55	-76299958	-1	-10099739	0	-18636775	0	-64340693	-2
56	-15243127	0	-18738586	0	82111904	0	-96883281	-1
57	-23833377	0	-21778581	0	-46152529	-1	-39176292	0
58	-19445700	0	-22983559	0	-46256539	0	-11567838	-1
59	-12165212	0	-14858455	0	-45270613	0	61427952	-1
60	-11538022	0	-10082574	0	-27633661	0	-11887224	0
61	10310745	0	86317126	-1	-30650892	0	61563061	-2
62	-67990973	-2	17143488	-1	-11698615	0	-55564498	-1
63	91448882	-1	15360082	0	14145843	0	-13452204	0
64	-33732151	0	-33110968	0	-32656126	-1	-48608920	0
65	-37377427	0	-42116607	0	-32004981	0	-32954928	-1
66	14466159	0	16831905	0	92004265	-1	27793267	-1
67	19644489	0	24289687	0	46846599	-1	-24863791	-1
68	18450207	0	23744760	0	25294479	0	10259309	-1
69	25856682	0	34184606	0	43538063	0	-36880417	-1
70	16243137	1	18910180	1	22521550	1	14274527	0
71	15574627	0	24768594	0	55364554	0	-77285890	-1
72	72448327	0	95606822	0	25175413	1	-73688193	-1
73	-98221614	-1	-11039722	0	-13438151	0	43591409	-1

TABLE C20.- Concluded

	13		14		15		16	
74	33998688	0	37230476	0	58480623	0	12254776	0
75	29306658	0	36744681	0	58761809	0	-44013110	-1
76	-72499841	-1	-27838168	-1	31162571	0	-19014074	0
77	-15702379	0	-10946034	0	38933220	0	-12137869	0
78	-28076859	1	-25195867	1	25789819	0	-57352024	0
79	13727405	0	12806281	0	44070724	0	27107392	-1
80	44036378	0	47298253	0	92410066	0	22750366	-1
81	44012172	-1	52467110	-1	47588116	0	-79726874	-1
82	-59225633	-1	-61756577	-1	87754516	-1	-18953549	0
83	-44161611	0	-50860076	0	-37332772	0	-26235376	0
84	-75578263	1	-80189303	1	-57929679	1	-12578408	1
85	11397363	0	75181598	-1	75310017	0	-61678610	-1
86	31245641	-1	-12645105	-1	47270257	0	-14213141	0
87	-49377151	0	-61765979	0	-97209917	0	-28353159	0
88	-16192050	0	-44405989	0	-32405563	1	-23468096	0
89	-35880530	0	-43698143	0	-27094969	0	-34425632	0
90	-59969699	0	-76029440	0	-97050231	0	-17369441	0
91	16693067	1	14146497	1	-51158893	0	10537666	1
92	-10728080	1	-12403753	1	-13856169	1	-92939274	-1
93	99999999	0	99999999	0	99999999	0	99999999	0
94	-56058963	-1	-39251431	-1	-13013618	-1	-25003500	0
95	87293702	-1	18965953	0	15291390	1	-91634554	-1
96	11216775	0	12855688	0	74137386	0	-23829243	-2
97	13936877	0	10828670	0	-12996327	0	-15768121	-1

TABLE C21.- SYMMETRIC STRUCTURAL MODES, CASE P4

CP \ Mode	1		2		3		4		5		6	
1	12606833	1	-56672439	-1	46829268	0	-14756079	-3	-17986834	-1	26705837	0
2	11126504	1	-44369229	-1	29565564	0	-22370619	-1	-48053919	-1	34676171	0
3	88017926	0	-23141746	-1	-40131159	-1	-35711036	-1	-74464387	-1	45418617	0
4	84568043	0	-17686261	-1	-95514890	-1	-41931034	-1	-86135380	-1	51353221	0
5	73876488	0	-93465049	-2	-27798718	0	-43007857	-1	-98844561	-1	59523988	0
6	12320964	1	-47281390	-1	66455539	0	-12232798	0	-16106299	0	57060061	0
7	11203749	1	-37203445	-1	56529459	0	-13976399	0	-18589105	0	67342691	0
8	89507605	0	-18176517	-1	22405580	0	-15995434	0	-22766080	0	86893545	0
9	86978805	0	-14006802	-1	17369731	0	-16135297	0	-23013094	0	86664595	0
10	77136961	0	-47803792	-2	56930517	-1	-17153650	0	-25357351	0	99376935	0
11	11977336	1	-35444418	-1	10156310	1	-28981631	0	-35721917	0	10137508	1
12	11243094	1	-27901104	-1	99163135	0	-30463147	0	-37715742	0	10945239	1
13	94056935	0	-10911653	-1	63133217	0	-33285796	0	-42864516	0	12809674	1
14	90503943	0	-69408228	-2	55581249	0	-33850693	0	-43993577	0	13272356	1
15	80726919	0	22219898	-3	49290868	0	-35173934	0	-46712169	0	14702621	1
16	11773129	1	-22107617	-1	15613028	1	-51531808	0	-62542759	0	16428372	1
17	10963962	1	-13236632	-1	14861396	1	-52013566	0	-63857774	0	17457158	1
18	97319896	0	-16409958	-2	11269471	1	-52796348	0	-66587205	0	18852047	1
19	94787229	0	29661544	-2	10485625	1	-53936394	0	-68092349	0	18911026	1
20	88067511	0	73825667	-2	97113409	0	-55493990	0	-71609186	0	19626757	1
21	82530357	-1	23509082	-1	34004566	-1	44151130	0	-12704415	0	-26944537	0
22	52716332	-1	55180324	-1	24482037	0	55824744	0	-12182127	0	-24763582	0
23	40774042	-1	10861769	0	75590044	0	19348324	1	-35451283	0	-47568287	0
24	18469907	0	84165745	-1	31603768	0	10006208	1	-26624385	0	-51765987	0
25	88694714	-1	12161372	0	63662347	0	14322431	1	-27827079	0	-46934947	0
26	62556747	-1	18146118	0	11758608	1	26709978	1	-46642707	0	-64124535	0
27	23740180	0	14229911	0	60642390	0	15951324	1	-34537341	0	-57915525	0
28	14213394	0	18855450	0	95325619	0	24533027	1	-44073969	0	-63974400	0
29	10363464	0	25687797	0	16683954	1	38341271	1	-64781799	0	-85261051	0
30	28279238	0	22971432	0	10747253	1	28938895	1	-50418825	0	-71553320	0
31	19910580	0	27569328	0	14554819	1	36333408	1	-59797768	0	-78672524	0
32	13923926	0	35252703	0	22061361	1	49732341	1	-79827129	0	-99690797	0
33	35316188	0	35566004	0	19372542	1	48874066	1	-80500963	0	-10238229	1
34	27210722	0	39268078	0	23267080	1	54929363	1	-88455597	0	-10939438	1
35	18790091	0	51346628	0	30385614	1	69952287	1	-10977833	1	-13278723	1
36	24627727	1	-19151091	0	31415240	1	-67190495	-1	93103933	-1	-12817984	1

TABLE C21.- Continued

	1		2		3		4		5		6	
37	16141733	1	-97440980	-1	12127968	1	-13082153	-1	38033749	-1	-32586736	0
38	86656267	0	-29346033	-1	-18283390	0	32550258	-1	41521593	-2	29872371	0
39	18481360	0	25285172	-1	-89787411	0	41545048	-1	-72773698	-2	38661267	0
40	-31692475	0	48924443	-1	-87125149	0	23754782	-1	-39637077	-2	12643902	0
41	-48220353	0	46442331	-1	-49371050	0	-14321152	-1	-15387369	-1	-42563994	-1
42	-50859090	0	21487843	-1	30795933	-1	-15499930	-1	74755606	-2	-28370949	0
43	-42544558	0	-13483580	-1	37922541	0	-69212756	-2	15546414	-1	-26814535	0
44	-22259159	0	-46509333	-1	47819935	0	22382620	-1	25540523	-1	-11225764	0
45	39508739	-2	-74865920	-1	17403997	0	63699991	-1	35309414	-1	34983939	-1
46	22494091	0	-10066554	0	-31277718	0	11951682	0	51508521	-1	19729364	0
47	43960631	0	-13455494	0	-85175370	0	18454397	0	67453284	-1	43256205	0
48	64027722	0	-17000360	0	-14173069	1	24169941	0	79459003	-1	59588358	0
49	-64392292	0	45169520	-1	-17224297	0	-53386557	-1	-21843074	-1	-33178458	0
50	-63414402	0	25806033	-1	18731441	0	-34452129	-1	-33887506	-3	-34781871	0
51	-52597557	0	-77545425	-2	56902999	0	-74739156	-2	20059094	-1	-26483519	0
52	-26127980	0	-41502020	-1	54916485	0	25963088	-1	28065465	-1	-57044278	-1
53	14168697	-1	-67744156	-1	16413529	0	61489545	-1	34076085	-1	81313990	-1
54	23106821	0	-84290171	-1	-31955652	0	83609259	-1	35352752	-1	69715963	-1
55	47077652	0	-10621553	0	-89557237	0	10738527	0	34069069	-1	45705874	-1
56	-66448226	0	28160831	-1	29001525	0	-22088589	-1	94292249	-2	-32054440	0
57	-50875121	0	-38465454	-2	68316754	0	-17363738	-1	49637079	-2	-84874019	-1
58	-22649070	0	-31121282	-1	68424355	0	53449800	-2	67185307	-2	17041738	0
59	26088838	-1	-46818691	-1	27385618	0	22894155	-1	83387604	-2	14617393	0
60	25570090	0	-39541074	-1	-23596647	0	19328377	-1	31409455	-2	-41983051	-1
61	50708468	0	-31413509	-1	-81323467	0	78395749	-3	-83500820	-2	-32888152	0
62	71584320	0	17740246	-1	-10976744	1	-74464120	-1	-45394784	-1	-63979358	0
63	85596251	0	14800876	-1	-16914141	1	-10570514	0	-57839625	-1	-11400923	1
64	-53636378	0	22875633	-2	10442721	1	-44569394	-1	-39844270	-1	44835037	0
65	-23763137	0	-13612278	-1	10966472	1	-29756400	-1	-34164327	-1	66729744	0
66	49707683	-1	94967485	-2	55962584	0	-44338213	-1	-39005965	-1	41978406	0
67	36139772	0	46576994	-1	-32987559	-1	-77868317	-1	-50747436	-1	43291488	-1
68	65617124	0	80787309	-1	-68912585	0	-12955830	0	-71575159	-1	-48291990	0
69	77071067	0	93354136	-1	-98598196	0	-15399639	0	-81505927	-1	-74805794	0
70	97863227	0	98294099	-1	-15779568	1	-21018852	0	-10258257	0	-13644915	1
71	87457671	0	18624207	0	-83993805	0	-24583487	0	-11728785	0	-90922455	0
72	10595218	1	20799141	0	-13646923	1	-30261015	0	-13525659	0	-15513518	1
73	-23875935	0	19496517	-1	16877727	1	-93870430	-1	-11289711	0	15260123	1

TABLE C21.- Continued

	1		2		3		4		5		6	
74	12125276	0	11761083	0	99903187	0	-14232061	0	-10517687	0	88085701	0
75	44027052	0	17837612	0	31065128	0	-13095767	0	-99620673	-1	20322952	0
76	80034588	0	24938277	0	-35337583	0	-24533453	0	-10796550	0	-59014946	0
77	92955196	0	27205384	0	-62663931	0	-26355911	0	-10780067	0	-87049469	0
78	11517768	1	33252796	0	-11253979	1	-34594734	0	-12968521	0	-16441071	1
79	-16738884	-1	48169248	-1	86379382	0	-53328200	-1	-66372948	-1	11526001	1
80	94392300	-1	99926912	-1	61141599	0	-67185796	-1	-49235142	-1	72463651	0
81	25663697	0	15455779	0	35333929	0	-81071256	-1	-31065712	-1	27034922	0
82	41066549	0	19589809	0	92884407	-1	-81113929	-1	-49854323	-2	-21079886	0
83	48297794	0	22137919	0	-53853778	-1	-67671246	-1	17111429	-1	-40159146	0
84	57547273	0	25399974	0	-31280629	0	-69940237	-1	14757073	-1	-71967075	0
85	12899485	0	17660732	0	85323785	0	-85565479	-1	-51816184	-1	92741928	0
86	31598051	0	25560549	0	68420958	0	-10739781	0	-27597304	-1	38683707	0
87	57023169	0	36795275	0	27225756	0	46236327	-1	13879021	0	-13243053	0
88	69924350	0	43453249	0	24093729	-1	17364253	0	28973088	0	-21900400	0
89	39197950	0	39389356	0	10573030	1	15377626	-1	91862568	-1	66390624	0
90	57040627	0	51049481	0	83439321	0	18573397	0	26416821	0	41761320	0
91	88726900	0	67806601	0	50885304	0	63544151	0	67155537	0	27958398	0
92	74285805	0	85727968	0	12173955	1	55869687	0	62973903	0	76123128	0
93	99999998	0	99999998	0	99999999	0	99999993	0	99999999	0	99999999	0
94	-40203384	0	-25037678	-1	63946582	0	-14208206	-2	17834458	-1	-16759736	0
95	63697690	0	-13901616	0	-13315642	1	19771884	0	53962731	-1	60093695	0
96	64299078	0	-13464368	0	-13040316	1	15012222	0	35609461	-1	29328030	0
97	64608292	0	-99615991	-1	-12271172	1	72881846	-1	36823358	-2	-36566044	-1

TABLE C21.- Continued

	7		8		9		10		11		12	
1	52840884	0	14237211	2	40246313	-1	-68067626	0	-87610805	0	-92336777	1
2	65123735	0	13442298	2	26605358	-1	-42345700	0	-61254305	0	-67119793	1
3	73630272	0	11680924	2	-11567992	-1	93356681	-1	81628128	-1	15214287	1
4	83207798	0	11848829	2	-19669459	-1	18613864	0	20829505	0	31445601	1
5	94227930	0	13121535	2	-43196719	-1	38476491	0	45079015	0	62319290	1
6	17132642	1	-94087083	1	10620914	0	-26525239	0	-72207938	0	-85642099	1
7	18190229	1	-99730175	1	83170534	-1	-53243148	-1	-47180172	0	-60589282	1
8	20260798	1	-13769556	2	30589257	-1	44460659	0	22103293	0	21973059	1
9	20526279	1	-14548220	2	21591605	-1	52629651	0	34110086	0	38175469	1
10	22536492	1	-16492939	2	-58821517	-2	71828992	0	56082829	0	65556064	1
11	33583502	1	-42470643	2	18149757	0	29435537	0	-51833950	0	-79646965	1
12	34805493	1	-44455711	2	15966437	0	45518699	0	-32947451	0	-59281468	1
13	37839232	1	-53041359	2	98906586	-1	97570077	0	43548984	0	36017867	1
14	38715754	1	-53639503	2	84502723	-1	10700159	1	57044092	0	54216456	1
15	41105301	1	-58114779	2	56064303	-1	12652514	1	79860068	0	83423736	1
16	56919077	1	-92844769	2	26308812	0	12074109	1	-81452665	-1	-53438710	1
17	57645655	1	-94076276	2	22348852	0	13591871	1	16590912	0	-24564831	1
18	58752454	1	-97512957	2	16387635	0	15688235	1	70421455	0	45545449	1
19	60154449	1	-10030125	3	15627956	0	17674949	1	82739539	0	60865252	1
20	63085607	1	-10890881	3	13891842	0	20204729	1	11243035	1	95156120	1
21	-33502727	-1	75483754	0	-10090409	-1	-27432559	0	31015641	1	96375914	1
22	-70270095	-2	78513351	0	17846796	-1	-41555912	0	11554867	2	40047539	1
23	-14220974	0	33969886	1	17522041	-1	-45996113	0	22762123	2	-95602995	2
24	-72137930	-1	12813583	1	-19925069	-1	-75581046	0	11097654	2	27836726	2
25	-52712360	-1	11642539	1	35369457	-1	-70086386	0	18342391	2	19894591	1
26	-15469432	0	30257656	1	25070336	-1	-25006348	0	19305176	2	-10428326	3
27	-58082900	-1	65450888	0	-72419254	-2	-13701590	1	27047716	2	52821784	2
28	-10293223	0	16008071	1	45310802	-1	-70540625	0	17858106	2	86870558	1
29	-22171099	0	32971139	1	15167458	-1	54858728	0	-49815025	1	-97463194	2
30	-96383364	-1	20066328	0	-19621164	-1	-10219397	1	15269441	2	90600714	2
31	-14185852	0	11076325	1	20941521	-1	20866512	0	-96237282	1	33411935	2
32	-28391703	0	34238431	1	-14592847	-1	17250243	1	-41749248	2	-49926554	2
33	-23313627	0	75638395	0	-99016320	-1	75478962	0	-36614359	2	12521758	3
34	-27187445	0	11348005	1	-61108779	-1	21147008	1	-68969441	2	76186039	2
35	-39487486	0	32266280	1	-58727643	-1	28285040	1	-74150820	2	47014400	2
36	-57274947	0	-63239682	2	57937714	-1	10299662	1	73516677	0	28096701	1

TABLE C21.- Continued

	7		8		9		10		11		12	
37	-11915331	0	40588493	1	33341006	-1	-60051536	0	-49400329	0	-16958595	1
38	32500105	-1	24422397	2	-47934210	-1	-21891573	0	-14830985	0	-58777150	0
39	-50668910	-1	14974676	2	-56362647	-1	28301424	0	28995660	0	10604037	1
40	-93649554	-1	-49302490	1	76481353	-2	14750921	0	87753413	-1	20658003	0
41	-12077954	0	-16307560	2	64027254	-1	-27500181	0	-10263891	0	-95946196	-2
42	-14723832	-1	-70471335	1	16465250	-1	-40312931	-1	-94383930	-1	-38545080	0
43	79464392	-1	42259625	1	-61163129	-2	66836056	-1	11195475	-1	29324751	-1
44	15382071	0	11389346	2	-30173164	-1	21120544	0	13873195	0	40113210	0
45	14405040	0	10393911	2	-14057302	-2	14917867	0	54383194	-1	-67753187	-1
46	64485785	-1	50376360	0	64728122	-1	23355934	0	10371703	0	-17666025	-1
47	-11583476	0	-22486896	2	11204972	0	32489732	0	22276850	0	32146329	0
48	-20761563	0	-35750055	2	11115685	0	41819405	0	37340282	-1	-11730321	1
49	-46436066	-1	-13369112	2	-24180090	-2	-13036644	0	-23300053	0	-96032483	0
50	26600471	-1	-88690183	1	-18706225	-1	-18391147	-1	-12230861	0	-60645071	0
51	11012121	0	13280720	1	-35293487	-1	91414656	-1	45905584	-1	95991270	-1
52	14886956	0	11893984	2	-25387723	-1	80250882	-1	14064613	0	61637075	0
53	80319218	-1	11631630	2	-93821296	-2	-21585209	-1	70361543	-1	32231445	0
54	55551773	-1	37817626	1	-46547706	-1	-79401241	-1	-11417542	0	-76911550	0
55	-26464028	-2	-16264634	2	-97635074	-1	-16342798	0	-13464097	0	-88111243	0
56	77564934	-1	-12935585	2	-53724691	-1	55572892	-1	-14784430	0	-10465882	1
57	82180285	-1	-38556617	1	-50689307	-1	-19428833	-1	26765508	-1	75460142	-1
58	-35430568	-2	88366715	1	-74945137	-2	-10198284	0	78673995	-1	54051726	0
59	86251600	-2	10752598	2	10975472	-1	-10269447	0	51438545	-1	45068703	0
60	74916799	-1	28396950	1	14618798	-2	-99128531	-1	-33144621	-1	27888820	-1
61	76323501	-1	-22229732	1	-69200552	-1	-12479714	0	-58320566	-1	36679480	-1
62	11096808	0	-27407151	1	-55559465	-1	-24231550	0	59328649	-2	10269859	1
63	25797427	0	-46910989	1	-64477673	-2	-13293527	1	-81857237	-1	29534990	1
64	-35806514	-1	-22474230	2	-70643531	-1	-13654159	0	-44877724	0	-29039064	1
65	-18255385	0	47756436	0	46716372	-1	-38528158	0	-51863949	-1	16060835	0
66	-17231223	0	47453820	1	67634989	-1	-13050048	0	-10920438	-1	20130863	0
67	-11226288	0	50744998	1	63820057	-1	-35723008	-2	-38530663	-1	10624781	0
68	77501359	-2	18340485	1	91915338	-1	-50572252	-1	22382930	0	22571763	1
69	75868983	-1	20796215	1	11496730	0	37729338	-1	11847755	0	17078248	1
70	24597425	0	48657027	1	41330037	0	-84359058	0	17161939	1	14055952	2
71	32658064	-1	99399939	1	10480579	0	-10785355	-1	-17675703	0	27484561	0
72	25966798	0	12977024	2	53237153	0	-21532457	0	61191378	0	66508858	1
73	-46443316	0	-21868267	2	11256603	0	-50173953	0	-21684886	0	-68962118	0

TABLE C21.- Continued

	7		8		9		10		11		12	
74	-44652641	0	-69593253	1	41304930	-1	15638974	-1	36736679	-1	90787803	-1
75	-31691929	0	15917158	1	22227502	-1	17521334	0	29854950	-1	20130576	0
76	-33914868	-1	78168549	1	50474291	-1	30811567	0	-87323963	-1	-13126181	0
77	23318666	-1	10558446	2	91604305	-1	31248535	0	-15984317	0	-31259058	0
78	28630817	0	20487965	2	44377329	0	98608912	-1	-32937465	0	27777388	0
79	-68351599	0	-66629569	1	-13345487	0	27137972	0	17073336	0	-15154478	0
80	-47504826	0	-38952164	1	-17879015	0	30548236	0	17665941	0	-45857529	-1
81	-23836202	0	-52580027	1	-25431728	0	43439995	0	20309465	0	-49023071	-1
82	13973178	0	-62060094	1	-15086282	0	-21919149	0	-25864433	0	-13095307	1
83	30045574	0	-32649325	1	-67660614	-1	-10556471	1	-21253676	1	-10929008	2
84	64861044	0	-29993103	0	23852740	0	-52285337	1	-24013721	2	-13574937	3
85	-55843348	0	-10820826	2	-45303256	0	77489803	0	39589203	0	-18781355	0
86	-23541504	0	-11734083	2	-60070079	0	77341607	0	37064102	0	-36114139	0
87	41818189	0	-14135119	2	-26520399	0	-26523902	1	-77396476	0	-84241432	0
88	10725802	1	-71272107	1	84099702	0	-21966481	2	-17506531	1	30219719	2
89	-63969764	-1	-30834626	2	-12868600	1	12369651	1	84703230	0	-24260568	0
90	36457866	0	-29258761	2	-99799025	0	-38908227	0	43501426	0	15997655	0
91	10791485	1	-73384125	1	61139511	0	-62595695	1	-31539897	0	75856400	1
92	72756500	0	-30568536	2	-85579244	0	34111747	0	99091355	0	64571713	0
93	99999999	0	99999999	0	99999999	0	99999999	0	99999999	0	99999999	0
94	15966203	0	98576796	1	-42036713	-1	80664444	-1	93411454	-1	39013473	0
95	-24283741	0	-37923753	2	84247387	-1	32554161	0	22980925	0	21023164	0
96	-14068040	0	-32923938	2	-90595525	-2	94157392	-2	-74634903	-1	-91776070	0
97	-50614742	-1	-25553568	2	-54538360	-1	-21422339	0	-24154191	0	-12240319	1

TABLE C21.- Continued

	13		14		15		16	
1	-94567442	2	-82702013	2	-60201487	3	40928329	3
2	-70547062	2	-62691755	2	-30332361	3	15373777	3
3	20179313	2	19209234	2	-20533367	3	-36143155	1
4	38967523	2	36548939	2	-35132331	3	-36151827	2
5	75755706	2	70992858	2	-90056418	3	-59086217	3
6	-92905262	2	-84055386	2	-48015074	3	34780047	3
7	-68083142	2	-62897156	2	-29720937	3	18750976	3
8	23143866	2	19462534	2	-29849265	3	11261743	3
9	42353472	2	37380763	2	-41886855	3	13150913	3
10	75299141	2	68349336	2	-81956271	3	52371017	2
11	-95331618	2	-90806906	2	-22293271	3	-17723195	3
12	-73536577	2	-71449935	2	-23108084	3	-24879712	3
13	33593133	2	25907345	2	-86048768	2	15540784	3
14	55196107	2	46054651	2	-13137102	3	35183114	3
15	90760629	2	79639521	2	-21593994	3	78539112	3
16	-77810874	2	-80993372	2	59752684	3	-12109139	4
17	-45841063	2	-52069326	2	62670717	3	-78440876	3
18	34667823	2	21948708	2	60144828	3	19471791	3
19	51639134	2	37192859	2	66274281	3	35443470	3
20	88959131	2	70477411	2	10022839	4	71305605	3
21	-28375026	1	22379001	2	45491972	-1	-31902844	-2
22	-41702909	1	38161978	2	-18557863	0	14836830	0
23	16800858	2	-11653450	3	51539751	0	-29227825	0
24	-91618070	1	74915874	2	21463838	0	-11772891	0
25	-52553610	1	49507387	2	-32669798	0	10917924	0
26	19690055	2	-14073638	3	-12836561	0	71140594	-1
27	-19776923	2	16626511	3	80772840	0	-40536199	0
28	-67897282	1	61395657	2	-29370657	-1	10735146	-1
29	25009834	2	-19586469	3	-53398547	0	31888855	0
30	-25305361	2	20102796	3	78338307	0	-44808757	0
31	-53753267	1	35836242	2	-23190210	0	25701458	0
32	23306368	2	-20127340	3	-71777171	0	34041670	0
33	-20262878	2	13696952	3	80628374	0	-45440549	0
34	31439101	0	-39106161	2	-62181532	0	45784207	0
35	61000682	1	-77157308	2	-47023673	0	-89554055	-1
36	18365827	1	-10333112	2	-46597404	1	-81332024	0

TABLE C21.- Continued

	13		14		15		16	
37	10254360	1	34631236	1	17440558	2	-27609895	1
38	57550007	0	32536873	1	20520911	2	-19852538	1
39	40963107	0	-41665537	1	12566080	2	-12956634	1
40	-82500295	-1	-91263792	0	21768557	1	-32246355	0
41	-46660278	-1	-53667988	0	-33507537	1	26651572	0
42	-13890566	0	16203343	1	-27633754	1	13556187	-1
43	22719600	-1	15621854	0	-27753133	0	-65508451	-2
44	63125827	-1	-12322862	1	19724922	1	22789257	0
45	-40144415	-1	92755356	0	27929406	1	11312061	0
46	-11273760	0	87350022	0	75969068	0	26386857	0
47	-21861356	0	-71497154	0	-48653367	1	59535984	0
48	-85019841	0	59071475	1	-72368268	1	63326625	0
49	-43169051	0	36223464	1	-44351767	1	40436854	0
50	-35035108	0	23462104	1	-41783422	1	56193082	0
51	-86733526	-1	-30680762	0	-17133983	1	48265255	0
52	20383868	0	-22554892	1	22318333	1	10415657	0
53	27770906	0	-83874383	0	37161271	1	-73302743	0
54	-12149873	0	35826747	1	25553540	1	-78406504	0
55	-38787663	0	31443061	1	-23087164	1	-15922019	0
56	-68166178	0	41228291	1	-54782144	1	12521532	1
57	-19310970	0	-54395366	0	-26839556	1	10325695	1
58	33844425	0	-18627627	1	22621923	1	-51469915	0
59	36983331	0	-14875760	1	33943740	1	-74998635	0
60	46905929	-1	-34174700	0	10079481	1	14742016	0
61	28632281	-1	-11489534	1	-20070095	0	-11568591	0
62	36623833	0	-63742002	1	-83792818	0	38858519	0
63	14847229	1	-16848728	2	-18906436	1	45341031	0
64	-15285099	1	12219318	2	-65815583	1	27200538	1
65	23495402	0	-25550309	0	85964982	0	-11526219	0
66	25916845	0	-34889633	0	15363111	1	-50750976	0
67	19399805	0	-41921557	0	13878801	1	-36822153	0
68	78406493	0	-11097021	2	-12393763	1	66580014	0
69	55021328	0	-88834029	1	-16225288	1	11373572	1
70	48948024	1	-65459616	2	-53001919	1	28358343	1
71	31481628	0	-26298032	1	47614718	0	35951610	0
72	24187496	1	-31375681	2	-42170965	1	33077292	1
73	-39342148	0	31373779	1	-43451025	1	17729572	1

TABLE C21.- Concluded

	13		14		15		16	
74	-26632456	-1	-68039843	-1	-15291664	1	-11170045	0
75	14526982	0	-99284307	0	-12253718	0	-72671716	0
76	-55613180	-1	-45136637	0	-98200817	-1	55526657	0
77	-24037748	-1	22461044	0	13648863	0	54302435	0
78	42593566	0	-26507301	1	-53057104	0	24906105	1
79	75495512	-1	19743907	1	12605575	1	-32263133	1
80	-23113653	-3	75460146	0	99431755	0	-24716697	1
81	-27300804	0	-20402478	0	-43722821	0	-11595517	1
82	-58468033	0	39427569	1	-15796963	1	10811814	1
83	-30360238	1	46385285	2	22774241	1	52627727	0
84	-38837122	2	60490910	3	32653176	2	-84807449	1
85	-51097450	0	91791024	0	-16628785	0	-27096972	1
86	-86108457	0	15227508	0	-13442857	1	-11555954	1
87	74642514	0	-14412732	1	17553758	1	-33631392	0
88	21537116	2	-15879255	3	24644604	2	-10566561	2
89	-17493306	1	-24291363	1	-35693181	1	-10984072	1
90	-61833172	0	-54238479	1	-17295264	1	-71927623	0
91	62224190	1	-39271472	2	77264614	1	-20545505	1
92	-55607352	0	-58185262	1	-13240650	1	-72114492	0
93	99999999	0	99999998	0	99999999	0	99999993	0
94	66525929	-1	-14606587	1	10564480	1	38291533	0
95	-45396695	0	-73227445	0	-83075754	1	84263210	0
96	-64321820	0	34919491	1	-67150323	1	55566982	0
97	-59574003	0	41797221	1	-53417488	1	51355015	0

TABLE C22.- SYMMETRIC STRUCTURAL MODES, CASE P5

CP \ Mode	1		2		3		4		5		6	
1	12332267	1	-54466403	-1	35466230	0	-29689342	-2	-13163481	-1	77744060	0
2	10881627	1	-42425566	-1	19983519	0	-23091048	-1	-40654153	-1	10204177	1
3	86065252	0	-21618032	-1	-93019619	-1	-30257583	-1	-63172413	-1	12958463	1
4	82693324	0	-16258005	-1	-14397909	0	-35334692	-1	-73271528	-1	14652714	1
5	72237698	0	-80963759	-2	-30238568	0	-33049008	-1	-63478969	-1	16796013	1
6	12045722	1	-45294856	-1	48894422	0	-13026208	0	-15096861	0	19961595	1
7	10950648	1	-35435137	-1	39550516	0	-14574243	0	-17278061	0	22824690	1
8	87467069	0	-16909361	-1	92456401	-1	-15950154	0	-20839260	0	28050725	1
9	84996934	0	-12779377	-1	50145049	-1	-16032388	0	-21085309	0	28077494	1
10	75360168	0	-37388410	-2	-56747383	-1	-16799103	0	-23094362	0	31677455	1
11	11697560	1	-33699610	-1	74045402	0	-30571925	0	-33947791	0	37388302	1
12	10976582	1	-26271234	-1	71275327	0	-31993245	0	-35735524	0	39795531	1
13	91828507	0	-98180851	-2	39484683	0	-34196406	0	-40308315	0	45202792	1
14	88357659	0	-59439019	-2	32794169	0	-34629123	0	-41306725	0	46565208	1
15	78762381	0	10691808	-2	26504146	0	-35773054	0	-43665398	0	50711640	1
16	11481318	1	-20634783	-1	11408190	1	-54292018	0	-59708189	0	61990350	1
17	10689019	1	-11936250	-1	10702527	1	-54574371	0	-60729898	0	64596149	1
18	94907747	0	-82009906	-3	75858891	0	-54695532	0	-62968963	0	68071060	1
19	92436769	0	28240266	-2	69169425	0	-55776198	0	-64471185	0	68748067	1
20	85850821	0	85003795	-2	62018371	0	-58264557	0	-67832421	0	71586148	1
21	81902379	-1	23571756	-1	67662656	-1	46946471	0	-12939863	0	-44294435	0
22	52158958	-1	55442181	-1	25174123	0	58971859	0	-12388933	0	-38618673	0
23	40569604	-1	10974279	0	78512682	0	20474395	1	-35120554	0	-65022686	0
24	18292615	0	84363522	-1	34833113	0	10601551	1	-27033534	0	-80871005	0
25	87838541	-1	12235776	0	64868078	0	15134503	1	-27941481	0	-69042152	0
26	62028566	-1	18307367	0	11956810	1	28233770	1	-46266641	0	-87167396	0
27	23533517	0	14290313	0	64738887	0	17935285	1	-34662609	0	-85934249	0
28	14126883	0	18976980	0	99831799	0	25946096	1	-43830685	0	-89567249	0
29	10281260	0	25918786	0	17006213	1	40528930	1	-64091955	0	-11363505	1
30	28071536	0	23099824	0	11343696	1	30607341	1	-50056180	0	-99375135	0
31	19792911	0	27760412	0	15090477	1	38413728	1	-59122129	0	-10490785	1
32	13825642	0	35551922	0	22406059	1	52555204	1	-78744806	0	-12904440	1
33	35052904	0	35814881	0	20141499	1	51679117	1	-79471831	0	-13463309	1
34	27006311	0	39576249	0	23857925	1	58061034	1	-87220032	0	-14055963	1
35	18709547	0	51756459	0	30965486	1	73927081	1	-10809456	1	-16925910	1
36	24064968	1	-18641691	0	26910016	1	-12685093	0	50321983	-1	-28434672	1

TABLE C22.- Continued

	1		2		3		4		5		6	
37	15779885	1	-94275496	-1	10109288	1	-32787520	-1	25976090	-1	-71573899	0
38	84765169	0	-27758089	-1	-19749285	0	41795386	-1	13206331	-1	63368210	0
39	17964258	0	26130663	-1	-80849645	0	62600706	-1	65253572	-2	77602857	0
40	-31398560	0	50019381	-1	-77684304	0	40792110	-1	23664355	-2	20830711	0
41	-47704360	0	47836396	-1	-45528292	0	-65924266	-2	-14770718	-1	-10948796	0
42	-50350873	0	23685041	-1	12070384	-1	-19080759	-1	-14329974	-2	-58586881	0
43	-42083322	0	-11007945	-1	31894919	0	-16065925	-1	53452074	-2	-50642170	0
44	-21847685	0	-44272257	-1	41557235	0	14114608	-1	18923574	-1	-15681415	0
45	82282043	-2	-73273160	-1	17314535	0	62139572	-1	33870297	-1	10906803	0
46	22999304	0	-99931608	-1	-22247688	0	12892663	0	56611516	-1	35893980	0
47	44598990	0	-13490069	0	-66522273	0	20743597	0	81958931	-1	73377230	0
48	64776943	0	-17123281	0	-11267380	1	27705181	0	10095408	0	98294374	0
49	-63801056	0	47252261	-1	-17469550	0	-54938215	-1	-30894099	-1	-66808055	0
50	-62826526	0	28284335	-1	14101343	0	-41705783	-1	-11690975	-1	-68248104	0
51	-52080885	0	-50200600	-2	47581461	0	-19506356	-1	91111266	-2	-47736992	0
52	-25680562	0	-39235170	-1	47074746	0	16873495	-1	22745661	-1	-35145120	-1
53	18572477	-1	-66294696	-1	16041614	0	60599330	-1	34200933	-1	19458017	0
54	23590637	0	-83563685	-1	-22765542	0	90147116	-1	36841404	-1	11211871	0
55	47619656	0	-10637880	0	-69115253	0	12292623	0	37204680	-1	-12911855	-1
56	-65855329	0	30786476	-1	22835422	0	-30371486	-1	-18328681	-2	-61438739	0
57	-50367253	0	-13644465	-2	55775660	0	-29098765	-1	-88569905	-3	-59393722	-1
58	-22210901	0	-29305251	-1	56294628	0	-32437194	-2	83491370	-2	46475452	0
59	30433616	-1	-45656481	-1	23821764	0	19997660	-1	10480451	-1	37055713	0
60	26026182	0	-39046664	-1	-16509247	0	21233266	-1	12511557	-2	-60024212	-1
61	51157379	0	-31612125	-1	-62219848	0	58908312	-2	-16603085	-1	-71532011	0
62	71933260	0	16941600	-1	-85064581	0	-72316740	-1	-62126580	-1	-13413173	1
63	85974436	0	13828375	-1	-13145003	1	-10235616	0	-86813141	-1	-24297470	1
64	-53067432	0	40915743	-2	81800124	0	-55303695	-1	-30415308	-1	11719138	1
65	-23303354	0	-12441599	-1	86488222	0	-38905191	-1	-18377851	-1	15989759	1
66	54243691	-1	98867894	-2	44140584	0	-50285699	-1	-28898443	-1	10252359	1
67	36530208	0	46206249	-1	-24933706	-1	-82155531	-1	-49975045	-1	19214295	0
68	65950896	0	79759855	-1	-53867310	0	-13355052	0	-84220596	-1	-94326788	0
69	77382010	0	92113941	-1	-77018801	0	-15814651	0	-10102571	0	-15111930	1
70	98114942	0	96829946	-1	-12303583	1	-21540068	0	-13801393	0	-28386663	1
71	87654715	0	18456573	0	-65865365	0	-25840909	0	-14200841	0	-17860444	1
72	10610367	1	20614807	0	-10621269	1	-31781081	0	-17713991	0	-31528840	1
73	-23344515	0	19349032	-1	12857085	1	-10232171	0	-72231952	-1	35691016	1

TABLE C22.- Continued

	1		2		3		4		5		6	
74	12593305	0	11667713	0	75400232	0	-15259511	0	-82037703	-1	21167122	1
75	44399632	0	17698316	0	22601193	0	-19309354	0	-94903307	-1	61713828	0
76	80229095	0	24760491	0	-27757540	0	-26203629	0	-12549198	0	-10693309	1
77	93106219	0	27009331	0	-48743529	0	-28100267	0	-13288766	0	-16867752	1
78	11522525	1	33040272	0	-86620594	0	-37073105	0	-17630216	0	-33111767	1
79	-13981483	-1	46990367	-1	63114066	0	-53116841	-1	-33490649	-1	25391650	1
80	96577352	-1	98837419	-1	45047121	0	-70775122	-1	-29352155	-1	16235327	1
81	25780474	0	15350659	0	26936899	0	-88952160	-1	-25071122	-1	65693319	0
82	41068487	0	19511142	0	90487615	-1	-93082926	-1	-14018252	-1	-35509875	0
83	48262667	0	22070573	0	-15420749	-1	-80363512	-1	20223150	-2	-77853688	0
84	57491767	0	25353162	0	-21889645	0	-82924038	-1	-96940756	-2	-14128595	1
85	13113008	0	17503821	0	63640066	0	-92378054	-1	-27357692	-1	20898158	1
86	31644141	0	25420999	0	53523094	0	-12185124	0	-20471882	-1	96305803	0
87	56966949	0	36719529	0	26533337	0	31496797	-1	12701277	0	-31225530	0
88	69953124	0	43445670	0	74404321	-1	16289158	0	27271325	0	-69330511	0
89	39191310	0	39254992	0	86396039	0	-19921057	-2	10176815	0	14923754	1
90	56967471	0	50967618	0	77603392	0	16888586	0	26286906	0	77133216	0
91	88599668	0	67846472	0	56183647	0	63117498	0	65923323	0	-10113686	0
92	74281460	0	85668975	0	11121871	1	54304864	0	62808821	0	10874767	1
93	99999959	0	99999998	0	99999999	0	99999999	0	99999999	0	99999999	0
94	-39739018	0	-22453678	-1	53934073	0	-13704923	-1	91576416	-2	-24378330	0
95	64461998	0	-14049764	0	-10659533	1	23022743	0	75581571	-1	10395258	1
96	64969382	0	-13578373	0	-10316654	1	17661047	0	46032197	-1	43646960	0
97	65199085	0	-10057494	0	-96257455	0	91071973	-1	61354141	-2	-18774703	0

TABLE C22.- Continued

	7		8		9		10		11		12	
1	47266148	0	67256451	1	37045471	-1	-73652009	0	-66902812	0	-88669080	1
2	57934673	0	63372566	1	24151426	-1	-45722837	0	-60529058	0	-64420086	1
3	64933553	0	54611056	1	-12931388	-1	10917194	0	88357420	-1	14871120	1
4	73408232	0	55441889	1	-20983296	-1	21135259	0	21578495	0	30531837	1
5	83129371	0	61224024	1	-44633434	-1	43208581	0	46129379	0	60368689	1
6	15592285	1	-38565850	1	10413322	0	-29833170	0	-71914280	0	-82388433	1
7	16473931	1	-41353281	1	81925842	-1	-66846191	-1	-46944479	0	-58275768	1
8	18242329	1	-59227906	1	30478736	-1	47996297	0	22421589	0	21252465	1
9	18499190	1	-62828755	1	21382050	-1	57107219	0	34492172	0	36868675	1
10	20279737	1	-71593023	1	-59099112	-2	78333385	0	56677394	0	63303419	1
11	30651163	1	-18656301	2	18119297	0	29366539	0	-52214973	0	-76882896	1
12	31713616	1	-19565659	2	15993721	0	46908415	0	-33333738	0	-57273375	1
13	34411553	1	-23527698	2	99996023	-1	10442459	1	43156613	0	34450739	1
14	35197888	1	-23800236	2	85544182	-1	11481286	1	56701190	0	51979280	1
15	37320282	1	-25830608	2	57563745	-1	13626214	1	79567541	0	80094510	1
16	52028775	1	-41252580	2	26560603	0	12625677	1	-97298860	-1	-52186906	1
17	52610662	1	-41836218	2	22654399	0	14305506	1	15039277	0	-24366374	1
18	53539411	1	-43459225	2	16722432	0	17766247	1	69045978	0	43188847	1
19	54865972	1	-44718985	2	15927568	0	18865706	1	81341643	0	57906045	1
20	57572749	1	-48632060	2	14218275	0	21634299	1	11083930	1	90807911	1
21	-19900600	-1	32822466	0	-11657342	-1	-29122363	0	30983977	1	94368181	1
22	26660012	-2	35474178	0	16640429	-1	-45115968	0	11545526	2	39661062	1
23	-12702737	0	15141162	1	17304062	-1	-50548138	0	22752467	2	-93428243	2
24	-50778486	-1	54952967	0	-22671190	-1	-82258117	0	11065933	2	27271594	2
25	-36359083	-1	51441527	0	33790791	-1	-76293472	0	18327387	2	20212305	1
26	-13611519	0	13417636	1	25576261	-1	-28129501	0	19299565	2	-10193499	3
27	-36459232	-1	27037232	0	-11302960	-1	-14787334	1	27022193	2	51786012	2
28	-82093973	-1	69662638	0	43755279	-1	-76830324	0	17843454	2	85743486	1
29	-19813491	0	14483946	1	17442371	-1	58653138	0	-49705610	1	-95369878	2
30	-73274468	-1	49155030	-1	-22992614	-1	-10991613	1	15250280	2	88691903	2
31	-11962987	0	46005459	0	21231628	-1	22659515	0	-96189839	1	32646432	2
32	-25916816	0	14861604	1	-97720855	-2	18668280	1	-41713493	2	-49018447	2
33	-20528860	0	26005701	0	-98546992	-1	83618434	0	-36595551	2	12234370	3
34	-24524104	0	43348853	0	-56726047	-1	23033480	1	-68922818	2	74239393	2
35	-36321194	0	13498122	1	-51592062	-1	30698462	1	-74104750	2	45709402	2
36	-43784823	0	-28682673	2	62658126	-1	10944140	1	72421548	0	26793598	1

TABLE C22.- Continued

	7		8		9		10		11		12	
37	-90448888	-1	19866345	1	35963070	-1	-64976693	0	-49538374	0	-16494773	1
38	12039484	-2	11140895	2	-49680675	-1	-22388184	0	-14023272	0	-54121339	0
39	-82212885	-1	66782076	1	-55840818	-1	32565414	0	30184117	0	10706731	1
40	-98401002	-1	-24554615	1	87978966	-2	16881858	0	96895018	-1	23103694	0
41	-11427388	0	-76382119	1	65763035	-1	-29773221	0	-98909647	-1	11759203	-1
42	29558177	-2	-32940507	1	17200306	-1	-42981145	-1	-93078115	-1	-36822839	0
43	86587364	-1	19527000	1	-53735556	-2	68327238	-1	10229277	-1	30156627	-1
44	14359765	0	53008186	1	-28935014	-1	22066658	0	13696098	0	39106666	0
45	12909918	0	48722241	1	-25883371	-3	15144004	0	53167151	-1	-61033893	-1
46	52195351	-1	34364071	0	66705007	-1	24358699	0	10397135	0	-61385965	-2
47	-12456163	0	-10222339	2	11628166	0	33190690	0	22425058	0	32964597	0
48	-21282808	0	-16314359	2	11589727	0	43605157	0	41822004	-1	-11198651	1
49	-25074479	-1	-62570193	1	-18904754	-2	-14374913	0	-23007604	0	-92546182	0
50	43980479	-1	-41273496	1	-17951936	-1	-16936523	-1	-12158956	0	-58773799	0
51	11328538	0	62818033	0	-34082587	-1	95037144	-1	44067288	-1	91571097	-1
52	13302110	0	55267200	1	-23881730	-1	76684537	-1	13793862	0	60169806	0
53	63284260	-1	54146726	1	-81148360	-2	-33550220	-1	68636920	-1	32086213	0
54	49899200	-1	18212758	1	-46678395	-1	-85147645	-1	-11382041	0	-74229844	0
55	90403538	-2	-73722413	1	-98848987	-1	-16268138	0	-13284753	0	-85585318	0
56	90654158	-1	-59786567	1	-52725465	-1	65121775	-1	-14710161	0	-10192176	1
57	66867955	-1	-17694271	1	-47670179	-1	-29806633	-1	23948907	-1	74280602	-1
58	-38521990	-1	40695417	1	-30790673	-2	-13175106	0	74724582	-1	53591978	0
59	-17542304	-1	49792660	1	13882614	-1	-12817053	0	48803077	-1	44944946	0
60	71085148	-1	13857142	1	17810634	-2	-11109208	0	-34110532	-1	32214947	-1
61	10495984	0	-92794007	0	-72456442	-1	-11688992	0	-56963647	-1	32794807	-1
62	16304917	0	-11580601	1	-61276779	-1	-23427023	0	72554632	-2	99090296	0
63	35798559	0	-19819051	1	-20173329	-1	-13888544	1	-84142866	-1	28528338	1
64	-10409527	0	-10374436	2	-61046167	-1	-17572708	0	-45267489	0	-28145137	1
65	-26600441	0	16271331	0	57389034	-1	-46478201	0	-59008961	-1	18025496	0
66	-22802525	0	21438132	1	75830176	-1	-17906203	0	-15136107	-1	21800402	0
67	-13081605	0	23268260	1	68102619	-1	-23889254	-1	-39929526	-1	11864740	0
68	38150253	-1	89760576	0	90857131	-1	-54882557	-1	22308003	0	21993552	1
69	12994602	0	10416843	1	11151970	0	49110394	-1	11921724	0	16600962	1
70	35841798	0	24368299	1	40278234	0	-90722123	0	17069695	1	13663979	2
71	89960731	-1	46064501	1	10136859	0	-19018754	-2	-17542417	0	26676199	0
72	37524040	0	61530519	1	52422248	0	-24271890	0	60775557	0	64659043	1
73	-63149019	0	-10214054	2	13464510	0	-74135408	0	-22801613	0	-62494227	0

TABLE C22.- Continued

	7		8		9		10		11		12	
74	-55223774	0	-33699434	1	57741013	-1	-42493115	-1	31605410	-1	12435818	0
75	-35957948	0	61016823	0	31498585	-1	15986369	0	28430072	-1	21847505	0
76	-11172997	-1	35766749	1	51620435	-1	33250651	0	-85783866	-1	-12282261	0
77	72444631	-1	48678443	1	90006928	-1	34454316	0	-15734323	0	-30341386	0
78	39919505	0	95689429	1	43590534	0	95406755	-1	-32860399	0	26504214	0
79	-79003157	0	-33378930	1	-11706076	0	25055398	0	16980519	0	-11106608	0
80	-54782214	0	-20039596	1	-16748605	0	31066614	0	17705096	0	-21889878	-1
81	-27554608	0	-25535531	1	-24873764	0	47500359	0	20517991	0	-42075738	-1
82	13965977	0	-28338086	1	-15209915	0	-21823260	0	-25864650	0	-12833320	1
83	31720455	0	-14103615	1	-73478180	-1	-11281489	1	-21234345	1	-10642764	2
84	68660279	0	16691696	0	22062302	0	-56221476	1	-23963347	2	-13203745	3
85	-65556388	0	-52750118	1	-43898895	0	83434305	0	39920193	0	-16407028	0
86	-29475891	0	-56011214	1	-59347762	0	86889731	0	37529065	0	-35636436	0
87	41770535	0	-63966303	1	-27538729	0	-28207754	1	-78269279	0	-84275580	0
88	11104237	1	-27763798	1	77955780	0	-23721841	2	-18551160	1	29371580	2
89	-15120498	0	-14417337	2	-12812529	1	14353475	1	85668481	0	-26878954	0
90	31516524	0	-13477674	2	-10019705	1	-32316392	0	43764376	0	11529881	0
91	11056198	1	-28495338	1	58834570	0	-67741481	1	-34571847	0	73687805	1
92	67930710	0	-13934471	2	-86065793	0	46034085	0	99671255	0	58901764	0
93	99999999	0	99999999	0	99999999	0	99999998	0	99999999	0	99999998	0
94	14961234	0	45731701	1	-40790522	-1	80409600	-1	90810329	-1	37889164	0
95	-25370285	0	-17343720	2	89762233	-1	33700918	0	23297579	0	22540829	0
96	-13373513	0	-15026286	2	-73474044	-2	12238835	-1	-71792794	-1	-88305339	0
97	-27451044	-1	-11632744	2	-55769893	-1	-21762566	0	-23945179	0	-11895961	1

TABLE C22.- Continued

	13		14		15		16	
1	-93670624	2	-91762091	2	-58782417	3	41318690	3
2	-69879326	2	-69582588	2	-29606761	3	17034035	3
3	20005775	2	21198537	2	-20023843	3	-36552133	1
4	38622799	2	40407674	2	-34280539	3	-36476285	2
5	75078394	2	78544168	2	-87928443	3	-59627928	3
6	-92039643	2	-93231126	2	-46895522	3	35113226	3
7	-67450859	2	-69782952	2	-29024345	3	18930828	3
8	22931313	2	21496892	2	-29136539	3	11369926	3
9	41964822	2	41355265	2	-40891579	3	13278463	3
10	74611374	2	75658321	2	-80025158	3	52969074	2
11	-94467852	2	-10065956	3	-21802073	3	-17881009	3
12	-72875169	2	-79205947	2	-22596262	3	-25104560	3
13	33259495	2	28732819	2	-84108251	2	15790006	3
14	54663919	2	51068598	2	-12831324	3	35514999	3
15	89901438	2	88312984	2	-21085965	3	79377390	3
16	-77151521	2	-89621147	2	58288629	3	-12222288	4
17	-45476629	2	-57565217	2	61151079	3	-79175715	3
18	34289852	2	24472233	2	58712300	3	19649338	3
19	51101182	2	41379611	2	64702563	3	35768961	3
20	88067011	2	78319449	2	97873251	3	71960021	3
21	-27621440	1	25142815	2	40468963	-1	-16750436	-2
22	-40651765	1	42947553	2	-19318602	0	15064830	0
23	16320925	2	-13074779	3	52218079	0	-29622572	0
24	-89162174	1	84204272	2	19138406	0	-11641442	0
25	-51233102	1	55724445	2	-33242409	0	11063625	0
26	19131539	2	-15794429	3	-11894055	0	71802356	-1
27	-19250197	2	18692741	3	77755751	0	-40860156	0
28	-66144952	1	69067842	2	-28775790	-1	10235806	-1
29	24324487	2	-22004417	3	-51137250	0	32168121	0
30	-24615720	2	22587273	3	77728120	0	-45516441	0
31	-52191545	1	40179921	2	-22282265	0	26886895	0
32	22696129	2	-22635060	3	-69228122	0	34294257	0
33	-19675497	2	15361271	3	79861598	0	-46082997	0
34	35855402	0	-44375303	2	-61201096	0	47262217	0
35	59799619	1	-87035150	2	-47663935	0	-88277958	-1
36	17844485	1	-11471672	2	-49822635	1	-75674428	0

TABLE C22.- Continued

	13		14		15		16	
37	10325520	1	95489439	1	17084150	2	-27987740	1
38	58786760	0	35354975	1	20426514	2	-20578029	1
39	40858202	0	-49021444	1	12724351	2	-13633942	1
40	-85288676	-1	-11944558	1	24080374	1	-35495422	0
41	-49881149	-1	-72214780	0	-31471273	1	25817814	0
42	-13674763	0	17807458	1	-26258832	1	-14162846	-2
43	29650644	-1	16425701	0	-19647640	0	-32168768	-1
44	74433545	-1	-13853904	1	20189207	1	19673780	0
45	-24747543	-1	10406468	1	28162580	1	84226640	-1
46	-10029071	0	95077227	0	81492383	0	24703755	0
47	-21477508	0	-87169086	0	-47349674	1	60416995	0
48	-84137029	0	65834251	1	-70809820	1	62678445	0
49	-43023413	0	40243219	1	-42582601	1	39873525	0
50	-34705687	0	26212035	1	-40324456	1	55388308	0
51	-79931681	-1	-34050259	0	-16191636	1	46320528	0
52	21516100	0	-25423413	1	22740417	1	70408501	-1
53	29070354	0	-96429999	0	37329316	1	-74186887	0
54	-10795512	0	40247043	1	25674638	1	-81127123	0
55	-38556601	0	35337092	1	-22545100	1	-15710687	0
56	-67582390	0	46443093	1	-53233765	1	12541158	1
57	-18335169	0	-60709387	0	-25820668	1	10212234	1
58	35487642	0	-21174136	1	22990114	1	-55353391	0
59	38463978	0	-17040911	1	34105577	1	-78886339	0
60	55178525	-1	-40177389	0	10309439	1	13175529	0
61	24291537	-1	-13063145	1	-17316565	0	-12233519	0
62	34773883	0	-72013156	1	-82032716	0	39342523	0
63	14375976	1	-19011395	2	-19232202	1	47088368	0
64	-14895464	1	13808420	2	-64794499	1	27406621	1
65	26581731	0	-32186482	0	89582751	0	-14796448	0
66	28343079	0	-43972841	0	15708726	1	-54080771	0
67	20772680	0	-51775095	0	14095047	1	-39154783	0
68	76822952	0	-12562733	2	-11914677	1	66456508	0
69	53201518	0	-10057339	2	-15919026	1	11470231	1
70	47809174	1	-73955811	2	-51610371	1	28601677	1
71	30690564	0	-29967680	1	45123640	0	36980306	0
72	23608224	1	-35472711	2	-41856519	1	33433994	1
73	-33895902	0	34823964	1	-42621926	1	17718490	1

TABLE C22.- Concluded

	13		14		15		16	
74	80545303	-2	-14603139	0	-14359484	1	-13769598	0
75	16290154	0	-11804679	1	-60601636	-1	-75421284	0
76	-52770669	-1	-53827547	0	-75713933	-1	55215876	0
77	-25912638	-1	22639481	0	12557567	0	54301565	0
78	41190631	0	-30231841	1	-62111904	0	25210083	1
79	10539706	0	21465368	1	13603487	1	-32821892	1
80	18402602	-1	79989606	0	10810121	1	-25159949	1
81	-26705985	0	-23888235	0	-35584046	0	-11825622	1
82	-58108159	0	44888788	1	-15975224	1	10980978	1
83	-29710682	1	52431356	2	19973745	1	56193130	0
84	-37921089	2	68323029	3	29886248	2	-82748391	1
85	-49264870	0	10046020	1	-56465201	-2	-27596935	1
86	-85697808	0	20794314	0	-12074820	1	-11810320	1
87	73251454	0	-15445155	1	15487098	1	-31622537	0
88	21276730	2	-17923918	3	23314753	2	-10689990	2
89	-17612463	1	-26091990	1	-33176860	1	-11231540	1
90	-64364271	0	-59799480	1	-16479170	1	-72384773	0
91	61477205	1	-44334888	2	72722899	1	-20449619	1
92	-58811340	0	-64496328	1	-11944248	1	-73235910	0
93	99999998	0	99999998	0	99999999	0	99999999	0
94	77070220	-1	-16378736	1	11136351	1	35384955	0
95	-45454863	0	-91101705	0	-81235868	1	86798353	0
96	-64185835	0	38954878	1	-66004331	1	58047918	0
97	-59591684	0	46995668	1	-52787617	1	53703344	0

LOS ANGELES DIVISION
NORTH AMERICAN ROCKWELL CORPORATION

TABLE C23.- SYMMETRIC STRUCTURAL MODES, CASE P6

CP \ Mode	1		2		3		4		5		6	
1	12676216	1	-56516713	-1	38922002	0	-12888121	-2	-13981922	-1	61425684	0
2	11188685	1	-44283822	-1	23425626	0	-22831740	-1	-41896109	-1	80386821	0
3	88517503	0	-23129310	-1	-62827392	-1	-33133322	-1	-65167533	-1	10249701	1
4	85050804	0	-17697430	-1	-11366683	0	-38771016	-1	-75529329	-1	11590444	1
5	74300890	0	-93707150	-2	-27497381	0	-38349480	-1	-86226173	-1	13304786	1
6	12392674	1	-47418484	-1	54184026	0	-12524383	0	-15176473	0	15239063	1
7	11270506	1	-37418360	-1	44969766	0	-14168596	0	-17409160	0	17525328	1
8	90062189	0	-18498581	-1	14304990	0	-15880488	0	-21082374	0	21708615	1
9	87516879	0	-14329343	-1	99822728	-1	-15999266	0	-21326557	0	21705433	1
10	77629822	0	-51619678	-2	-69821522	-2	-16891038	0	-23391272	0	24554734	1
11	12053430	1	-36005164	-1	82133148	0	-29551067	0	-34029100	0	28298385	1
12	11316363	1	-28531519	-1	79629134	0	-30994672	0	-35846365	0	30193684	1
13	94689454	0	-11643038	-1	47318255	0	-33519439	0	-40514221	0	34439074	1
14	91117413	0	-76864169	-2	40541619	0	-34022082	0	-41534349	0	35506364	1
15	81303448	0	-60357305	-3	34453542	0	-35244548	0	-43947676	0	38777916	1
16	11656813	1	-23251412	-1	12606530	1	-52507026	0	-59786997	0	46749401	1
17	11044100	1	-14441510	-1	11904861	1	-52883690	0	-60861844	0	48869612	1
18	98044508	0	-28875728	-2	87060754	0	-53353898	0	-63197035	0	51683194	1
19	95493622	0	81919807	-3	80249976	0	-54473753	0	-64690329	0	52121445	1
20	88742739	0	65752253	-2	73177592	0	-56993237	0	-68058062	0	54225504	1
21	82631275	-1	23599821	-1	49449506	-1	45441582	0	-12939454	0	-39623163	0
22	52855478	-1	55224465	-1	23853093	0	57283310	0	-12399612	0	-34949842	0
23	41057238	-1	10886404	0	73193679	0	19877290	1	-35402774	0	-59827623	0
24	18513144	0	84253974	-1	31786546	0	10282206	1	-27046400	0	-73109958	0
25	89025646	-1	12173559	0	61396006	0	14701971	1	-28062206	0	-63026071	0
26	63016235	-1	18174662	0	11284907	1	27425976	1	-46630314	0	-80414399	0
27	23805722	0	14249045	0	59726772	0	17411491	1	-34807443	0	-78378020	0
28	14263904	0	18882374	0	93168041	0	25195867	1	-44139307	0	-82405754	0
29	10433455	0	25730882	0	16020044	1	39370278	1	-64648508	0	-10512250	1
30	28367381	0	23006933	0	10501235	1	29722732	1	-50433711	0	-91590610	0
31	19988894	0	27611753	0	14098900	1	37311720	1	-59648930	0	-97287239	0
32	14017918	0	35306745	0	21142254	1	51061655	1	-79504986	0	-11993335	1
33	35449501	0	35626042	0	18760668	1	50194991	1	-80207595	0	-12501153	1
34	27339189	0	39331529	0	22387635	1	56404659	1	-88065737	0	-13101200	1
35	18912033	0	51421683	0	29170223	1	71824660	1	-10919681	1	-15778694	1
36	24763366	1	-19135260	0	27740564	1	-94611213	-1	59706275	-1	-23734095	1

TABLE C23.- Continued

	1		2		3		4		5		6	
37	16230058	1	-97195813	-1	10588795	1	-22393144	-1	28455678	-1	-59736956	0
38	87131051	0	-29185382	-1	-17823787	0	36641688	-1	11033339	-1	53532713	0
39	18609257	0	25265557	-1	-79946424	0	50639006	-1	33392565	-2	65607549	0
40	-31793261	0	48742005	-1	-75874653	0	30410792	-1	93749458	-3	16982962	0
41	-48388400	0	46098357	-1	-42272663	0	-12249643	-1	-14733502	-1	-10753866	0
42	-51072039	0	21253422	-1	54064236	-1	-18686437	-1	68734662	-3	-51592404	0
43	-42764138	0	-13640680	-1	36145251	0	-12361025	-1	77962898	-2	-45164212	0
44	-22469003	0	-46572948	-1	44448027	0	18310960	-1	20643718	-1	-15306466	0
45	18722187	-2	-74793497	-1	17456493	0	63047279	-1	34399480	-1	83204912	-1
46	22281428	0	-10046296	0	-25560715	0	12457051	0	55604154	-1	31327324	0
47	43746441	0	-13430069	0	-73672747	0	19683461	0	78847776	-1	65555338	0
48	63800630	0	-16960618	0	-12359044	1	26039189	0	96203218	-1	88492520	0
49	-64616720	0	44833159	-1	-12645564	0	-55999984	-1	-28705149	-1	-59362935	0
50	-63653824	0	25508233	-1	19365407	0	-39515749	-1	-89540007	-2	-60639084	0
51	-52830365	0	-79837621	-2	52823510	0	-14238063	-1	11808754	-1	-43140304	0
52	-26340292	0	-41614675	-1	50385185	0	21358271	-1	24220629	-1	-49888249	-1
53	12133149	-1	-67713375	-1	16222590	0	61275160	-1	34399609	-1	15963696	0
54	22886285	0	-84096191	-1	-25752517	0	87008913	-1	36666286	-1	98078053	-1
55	46842331	0	-10588047	0	-75831256	0	11525199	0	36637316	-1	17998163	-2
56	-66687217	0	27838797	-1	28440266	0	-27545823	-1	94481262	-3	-55141008	0
57	-51079604	0	-42372344	-2	61529128	0	-23402247	-1	89293219	-3	-80671358	-1
58	-22821927	0	-31470068	-1	60322013	0	17479421	-2	85059356	-2	37710460	0
59	24233596	-1	-46966157	-1	24858965	0	22034045	-1	10414991	-1	30435970	0
60	25354067	0	-39496762	-1	-18475493	0	20646699	-1	20177056	-2	-61977192	-1
61	50458986	0	-31140086	-1	-67379623	0	27658422	-2	-14559441	-1	-61594144	0
62	71332448	0	18046187	-1	-91197045	0	-74506522	-1	-58253392	-1	-11594918	1
63	85278714	0	15458103	-1	-14035923	1	-10646071	0	-80371251	-1	-20903185	1
64	-53776515	0	13835917	-2	89300242	0	-48388800	-1	-31400160	-1	95397793	0
65	-23865768	0	-14464254	-1	92637482	0	-32011757	-1	-20825041	-1	13353029	1
66	48332794	-1	88766687	-2	47179982	0	-45634352	-1	-30245877	-1	85272572	0
67	35971609	0	46206314	-1	-25566756	-1	-79246953	-1	-49394268	-1	14354115	0
68	65402604	0	80715007	-1	-57156760	0	-13201765	0	-80831668	-1	-82858671	0
69	76830549	0	93438116	-1	-81697253	0	-15718903	0	-96219831	-1	-13153199	1
70	97570986	0	98758765	-1	-13041808	1	-21541629	0	-13001324	0	-24503503	1
71	87239338	0	18610617	0	-68908338	0	-25328762	0	-13580460	0	-15620845	1
72	10567615	1	20820481	0	-11150887	1	-31293879	0	-16744344	0	-27347764	1
73	-23863843	0	17761784	-1	13785216	1	-92992329	-1	-79208900	-1	29956178	1

TABLE C23.- Continued

	1		2		3		4		5		6	
74	12068234	0	11622659	0	81478384	0	-14385729	0	-85453082	-1	17673777	1
75	43906919	0	17741812	0	25347400	0	-18531480	0	-94584292	-1	49244139	0
76	79860380	0	24886728	0	-28124668	0	-25388363	0	-12051000	0	-95622311	0
77	92758039	0	27170552	0	-50415001	0	-27317837	0	-12636935	0	-14817690	1
78	11492070	1	33252627	0	-90061420	0	-36158088	0	-16529390	0	-28794517	1
79	-16124696	-1	47000192	-1	67809040	0	-49640045	-1	-39618974	-1	21652538	1
80	94579746	-1	98994763	-1	48670707	0	-66506055	-1	-32741457	-1	13780219	1
81	25648239	0	15387101	0	29233731	0	-83610353	-1	-25485515	-1	54541889	0
82	41017278	0	19553658	0	99259864	-1	-86916475	-1	-11245944	-1	-33113128	0
83	48233026	0	22117701	0	-13584437	-1	-74431799	-1	60435578	-2	-69492498	0
84	57467413	0	25393632	0	-22140727	0	-77763060	-1	-34537601	-2	-12627261	1
85	12947140	0	17535088	0	68668659	0	-85808907	-1	-31359140	-1	17691558	1
86	31616142	0	25459892	0	57665390	0	-11259903	0	-20675889	-1	79351807	0
87	56991088	0	36756852	0	27766109	0	39025081	-1	13060283	0	-28678704	0
88	69907409	0	43454625	0	79005521	-1	16756852	0	27738939	0	-60528829	0
89	39241175	0	39271658	0	91367202	0	94000668	-2	10136904	0	12460835	1
90	57094307	0	50974301	0	80789890	0	17881783	0	26459624	0	65088931	0
91	88715800	0	67829340	0	55246813	0	63319528	0	66219057	0	-13864531	-1
92	74285610	0	85658749	0	11460834	1	55209565	0	62976486	0	97507438	0
93	99999999	0	99999999	0	99999999	0	99999999	0	99999998	0	99999999	0
94	-40424371	0	-25220227	-1	58600534	0	-79245988	-2	11395927	-1	-23438931	0
95	63475562	0	-13878527	0	-11663710	1	21519157	0	70998053	-1	92482063	0
96	64063768	0	-13431199	0	-11280959	1	16401668	0	45445933	-1	39952490	0
97	64358073	0	-99280719	-1	-10483560	1	82070335	-1	58067658	-2	-14861890	0

TABLE C23.- Continued

	7		8		9		10		11		12	
1	49047272	0	65895175	1	38756102	-1	-71780551	0	-86990591	0	-89495731	1
2	60310806	0	62232163	1	25514383	-1	-44691050	0	-60775474	0	-65037807	1
3	67917453	0	54016994	1	-12092926	-1	99723653	-1	82935994	-1	14820864	1
4	76772591	0	54867519	1	-20145909	-1	19799958	0	20921291	0	30576922	1
5	86972555	0	60761867	1	-43725593	-1	40941904	0	45150236	0	60559160	1
6	16114922	1	-39328542	1	10524861	0	-28708932	0	-71806671	0	-83082396	1
7	17057128	1	-41991691	1	82724657	-1	-62950823	-1	-46915646	0	-58776177	1
8	18936402	1	-59283206	1	30791437	-1	46387326	0	22007205	0	21302314	1
9	19199283	1	-62761656	1	21697924	-1	55130719	0	33972722	0	37018605	1
10	21060883	1	-71340328	1	-56377043	-2	75499847	0	55889099	0	63587859	1
11	31657998	1	-18654031	2	18142940	0	29532094	0	-51760356	0	-77389596	1
12	32775505	1	-19550574	2	15995616	0	46492711	0	-32967869	0	-57635918	1
13	35600228	1	-23427934	2	99571935	-1	10187418	1	43078597	0	34750074	1
14	36419209	1	-23690427	2	85129071	-1	11184338	1	56517530	0	52397269	1
15	38634872	1	-25692973	2	56970575	-1	13250834	1	79203927	0	80696226	1
16	53715789	1	-41117064	2	26444535	0	12471386	1	-86829230	-1	-52224807	1
17	54347098	1	-41684410	2	22520325	0	14083063	1	15927213	0	-24213354	1
18	55345082	1	-43250885	2	16573353	0	17390584	1	69481595	0	43779922	1
19	56703105	1	-44488082	2	15783493	0	18452063	1	81742054	0	58623694	1
20	59494520	1	-48348070	2	14049708	0	21136749	1	11121165	1	91822130	1
21	-23292248	-1	33483332	0	-11236548	-1	-28399697	0	30989548	1	95154365	1
22	27765466	-3	35234975	0	16902946	-1	-43658991	0	11546433	2	39934492	1
23	-13159458	0	15033067	1	17296205	-1	-48740255	0	22751029	2	-94228407	2
24	-56001590	-1	54906018	0	-21969404	-1	-80001620	0	11087739	2	27495994	2
25	-40604133	-1	51023538	0	34122747	-1	-73817742	0	18328724	2	20278244	1
26	-14164857	0	13312515	1	25296911	-1	-26899252	0	19298049	2	-10280371	3
27	-41878577	-1	27396993	0	-10125511	-1	-14358037	1	27024909	2	52205467	2
28	-87671863	-1	69795934	0	44136764	-1	-74381658	0	17844349	2	86340920	1
29	-20543289	0	14401317	1	16691043	-1	57148071	0	-49727973	1	-96168066	2
30	-79425723	-1	62310233	-1	-21888433	-1	-10690615	1	15252887	2	89427968	2
31	-12596826	0	46963219	0	21180425	-1	21912506	0	-96188628	1	32925308	2
32	-26723055	0	14818651	1	-11185728	-1	18107440	1	-41716299	2	-49404758	2
33	-21359130	0	27900040	0	-98420915	-1	80383834	0	-36594628	2	12339451	3
34	-25365220	0	44605195	0	-57841727	-1	22287690	1	-68923885	2	74905961	2
35	-37346992	0	13642460	1	-53623586	-1	29744721	1	-74108051	2	46134829	2
36	-48370520	0	-28574417	2	60527381	-1	10754316	1	73035664	0	27288419	1

TABLE C23.- Continued

	7		8		9		10		11		12	
37	-10131129	0	13847023	1	369967432	-1	-63056395	0	-49331792	0	-16604377	1
38	11549112	-1	11054215	2	-48617978	-1	-22597761	0	-14572762	0	-56425782	0
39	-68480995	-1	67436619	1	-55983381	-1	30457956	0	29137031	0	10464491	1
40	-90192251	-1	-22379394	1	76683941	-2	15497572	0	87120876	-1	19757992	0
41	-10900512	0	-73821789	1	64023889	-1	-29368564	0	-10571625	0	-20284848	-1
42	30898892	-2	-31335676	1	15809742	-1	-41202790	-1	-94635734	-1	-38141768	0
43	87703639	-1	19914555	1	-64946180	-2	71223258	-1	12415923	-1	34468077	-1
44	14794060	0	52442021	1	-29829720	-1	22134708	0	14092024	0	40588529	0
45	13415553	0	48032047	1	-87963380	-3	15371326	0	56451710	-1	-53344003	-1
46	56412433	-1	32892116	0	65947159	-1	24216306	0	10454942	0	-82891196	-2
47	-12098231	0	-10105466	2	11482897	0	32503492	0	22037189	0	31284450	0
48	-20995189	0	-16109863	2	11439923	0	42239079	0	34472856	-1	-11602834	1
49	-24138897	-1	-60162771	1	-34568653	-2	-14269428	0	-23389553	0	-95155508	0
50	44621815	-1	-39534784	1	-19477975	-1	-15768525	-1	-12240191	0	-59955823	0
51	11572191	0	67982668	0	-35431402	-1	97489590	-1	46810408	-1	98391479	-1
52	13893447	0	54625097	1	-24852704	-1	81805442	-1	14214187	0	61732081	0
53	68785331	-1	53380026	1	-87359950	-2	-26787720	-1	71734535	-1	32948713	0
54	52608512	-1	18055665	1	-46785560	-1	-81071536	-1	-11231693	0	-74603022	0
55	79587667	-2	-72502044	1	-98667179	-1	-16233573	0	-13401144	0	-86752930	0
56	92745801	-1	-57839675	1	-54350213	-1	63483863	-1	-14785788	0	-10333877	1
57	74768944	-1	-17104294	1	-49560200	-1	-24301395	-1	25908878	-1	75201321	-1
58	-27440209	-1	39919014	1	-49350213	-2	-12039312	0	77677860	-1	54065643	0
59	-93179454	-2	48893866	1	12682663	-1	-11795459	0	51492758	-1	45428653	0
60	74058769	-1	13665202	1	13223509	-2	-10461239	0	-32191565	-1	34639956	-1
61	99638399	-1	-87823674	0	-71842934	-1	-11579106	0	-55761200	-1	38904666	-1
62	15224313	0	-10881491	1	-60081579	-1	-23145205	0	88641209	-2	10084084	1
63	33521407	0	-18439998	1	-16689950	-1	-13560444	1	-79298768	-1	28956880	1
64	-80380095	-1	-10272329	2	-65057520	-1	-16638892	0	-45383940	0	-28587397	1
65	-24130076	0	60973424	-1	53580522	-1	-44152360	0	-57929473	-1	16318061	0
66	-21107158	0	20390256	1	72831061	-1	-16538647	0	-14511911	-1	20525839	0
67	-12346364	0	22575108	1	66243366	-1	-17794120	-1	-39528696	-1	11093797	0
68	33182628	-1	89433284	0	90445529	-1	-50623178	-1	22423529	0	22183378	1
69	11893314	0	10610740	1	11173359	0	49826194	-1	12067534	0	16789720	1
70	33180622	0	24677196	1	40492697	0	-87367475	0	17131999	1	13797343	2
71	78537409	-1	45748288	1	10141735	0	26524434	-3	-17344579	0	27469290	0
72	34835371	0	61205946	1	52526686	0	-22263825	0	61335540	0	65349622	1
73	-58249158	0	-10303620	2	12719795	0	-70768953	0	-23164986	0	-68363530	0

TABLE C23.- Continued

	7		8		9		10		11		12	
74	-52027336	0	-34756852	1	52010131	-1	-33306164	-1	28118697	-1	88005157	-1
75	-34454282	0	52519779	0	27868772	-1	15972527	0	26381014	-1	19931585	0
76	-12926818	-1	35212326	1	50262926	-1	32558701	0	-85350059	-1	-12510861	0
77	63633621	-1	48204523	1	89401821	-1	33727290	0	-15616610	0	-30197098	0
78	37368429	0	94973630	1	43674509	0	10416149	0	-32338754	0	28330591	0
79	-76080033	0	-34252863	1	-12207873	0	24321028	0	16297706	0	-15234218	0
80	-52698122	0	-20606406	1	-17105112	0	29919057	0	17205735	0	-48169045	-1
81	-26337633	0	-25563324	1	-25083407	0	45543429	0	20184003	0	-53077527	-1
82	14309190	0	-27947661	1	-15216993	0	-21671597	0	-25784071	0	-12904549	1
83	31682232	0	-13632855	1	-72288983	-1	-11001301	1	-21204892	1	-10728729	2
84	68598993	0	29164192	0	22401296	0	-54652876	1	-23960064	2	-13321425	3
85	-62716360	0	-52955061	1	-44332720	0	80008848	0	39147049	0	-19373030	0
86	-27525802	0	-55639397	1	-59585246	0	82837425	0	37034690	0	-36614294	0
87	42330749	0	-62750642	1	-27259722	0	-27536338	1	-77698615	0	-84004970	0
88	11106720	1	-26742547	1	79825273	0	-23056494	2	-18058476	1	29628308	2
89	-12217918	0	-14224401	2	-12827367	1	13577164	1	84930237	0	-26395648	0
90	33445872	0	-13252128	2	-10005684	1	-34581492	0	43622579	0	13376628	0
91	11022633	1	-27565238	1	59543167	0	-65747195	1	-32908330	0	74426119	1
92	69833310	0	-13661723	2	-85883297	0	41876802	0	99403951	0	61424142	0
93	99999999	0	99999999	0	99999999	0	99999998	0	99999999	0	99999999	0
94	15468604	0	45412154	1	-41881156	-1	84842750	-1	94974623	-1	39302250	0
95	-24867859	0	-17133569	2	87932566	-1	32527237	0	22545456	0	19460850	0
96	-13328584	0	-14823270	2	-80675316	-2	73311898	-2	-76710839	-1	-91121212	0
97	-30949473	-1	-11457356	2	-55732453	-1	-21662335	0	-24182624	0	-12096276	1

TABLE C23.- Continued

	13		14		15		16	
1	-93270198	2	-87656196	2	-57646116	3	41555914	3
2	-69580908	2	-66464232	2	-29041734	3	17132654	3
3	19915952	2	20342556	2	-19650191	3	-36696024	1
4	38451935	2	38719203	2	-33628918	3	-36692949	2
5	74748570	2	75221731	2	-86226818	3	-59980081	3
6	-91644278	2	-89094310	2	-45984177	3	35314806	3
7	-67161778	2	-66683083	2	-28463517	3	19040043	3
8	22829484	2	20609885	2	-28578506	3	11435639	3
9	41780674	2	39605304	2	-40104399	3	13354270	3
10	74285018	2	72435078	2	-78474449	3	53230937	2
11	-94059230	2	-96256694	2	-21367220	3	-17986671	3
12	-72560187	2	-75743617	2	-22146375	3	-25252172	3
13	33116713	2	27467155	2	-82455722	2	15882142	3
14	54428598	2	48828429	2	-12582086	3	35721750	3
15	89513579	2	84451133	2	-20679737	3	79839155	3
16	-76811822	2	-85826757	2	57181014	3	-12293063	4
17	-45274321	2	-55171136	2	59982063	3	-79632116	3
18	34147396	2	23295320	2	57578507	3	19768817	3
19	50887099	2	39453882	2	63450520	3	35982763	3
20	87695240	2	74748607	2	95970549	3	72387400	3
21	-27455701	1	24093266	2	42036891	-1	-39496425	-2
22	-40407107	1	41147238	2	-18334800	0	15128122	0
23	16231603	2	-12531263	3	49803486	0	-29693664	0
24	-88646992	1	80687942	2	19877578	0	-11939427	0
25	-50926846	1	53391668	2	-31944182	0	11186776	0
26	19025938	2	-15137903	3	-12289951	0	72769230	-1
27	-19138736	2	17912558	3	76608879	0	-40988071	0
28	-65755505	1	66188864	2	-32509967	-1	11953238	-1
29	24186558	2	-21087638	3	-50395437	0	32247084	0
30	-24475750	2	21646455	3	75141538	0	-45422824	0
31	-51910878	1	38519556	2	-22090259	0	27110257	0
32	22563014	2	-21690150	3	-67495021	0	34314007	0
33	-19568927	2	14723445	3	78094089	0	-46215479	0
34	34815941	0	-42490195	2	-58428122	0	47258452	0
35	59387317	1	-83381808	2	-45536459	0	-89335907	-1
36	17814862	1	-11095997	2	-46182364	1	-79820433	0

TABLE C23.- Continued

	13		14		15		16	
37	10262134	1	91147505	1	16781974	2	-28160671	1
38	58172301	0	34630598	1	19807150	2	-20401663	1
39	40432598	0	-45320582	1	12135473	2	-13304193	1
40	-85154547	-1	-96492259	0	20800484	1	-32440745	0
41	-51435713	-1	-52870828	0	-32708992	1	28361352	0
42	-13712873	0	17646775	1	-26670286	1	17158278	-1
43	26489173	-1	14720485	0	-22811925	0	-14531894	-1
44	69381010	-1	-13757142	1	19731081	1	21547205	0
45	-29101948	-1	95813950	0	27632359	1	98519213	-1
46	-10304781	0	91974329	0	78480380	0	25776240	0
47	-21573514	0	-74181345	0	-46840773	1	61180215	0
48	-83628742	0	64474292	1	-70035564	1	62939791	0
49	-42792963	0	39538296	1	-43071865	1	42141949	0
50	-34617884	0	25562573	1	-40336069	1	57589483	0
51	-82917258	-1	-34378146	0	-16140137	1	48472180	0
52	20809873	0	-24801801	1	22243433	1	89856464	-1
53	28345837	0	-95254448	0	36530498	1	-73070526	0
54	-10981490	0	38403087	1	25118441	1	-80781399	0
55	-38192749	0	34088955	1	-22189078	1	-15992171	0
56	-67270136	0	44883431	1	-52922976	1	12799992	1
57	-18826397	0	-57567450	0	-25627663	1	10487516	1
58	34295078	0	-20332566	1	22370585	1	-53296868	0
59	37446621	0	-16420088	1	33342655	1	-77562380	0
60	51504438	-1	-39458468	0	10158143	1	13936913	0
61	26343191	-1	-12702230	1	-16248813	0	-12676044	0
62	35051310	0	-69240594	1	-78418861	0	38400539	0
63	14388664	1	-18265179	2	-17974252	1	44253171	0
64	-14934814	1	13307123	2	-63835801	1	27850376	1
65	24583060	0	-24153272	0	85342377	0	-11560860	0
66	26783489	0	-36921869	0	15137819	1	-51890212	0
67	19871707	0	-46407681	0	13651277	1	-38084178	0
68	76280216	0	-12023249	2	-11642767	1	66538390	0
69	53180598	0	-96410865	1	-15390593	1	11426085	1
70	47575414	1	-70848362	2	-50088213	1	28491050	1
71	30735561	0	-28915954	1	47473234	0	36106015	0
72	23529094	1	-34005827	2	-40052750	1	33314668	1
73	-36877061	0	35411475	1	-42327232	1	18307796	1

TABLE C23.- Concluded

	13		14		15		16	
74	-14360324	-1	53697536	-2	-14885625	1	-99334740	-1
75	14923904	0	-10488004	1	-11864074	0	-73575412	0
76	-54540790	-1	-51156849	0	-77615850	-1	55637790	0
77	-24226514	-1	19984947	0	14046448	0	53902474	0
78	41726436	0	-29595580	1	-48944516	0	25043882	1
79	85565024	-1	22130662	1	11875457	1	-32590304	1
80	52597949	-2	86838141	0	94014415	0	-24986942	1
81	-27136358	0	-18501511	0	-43780918	0	-11696581	1
82	-57751878	0	42810414	1	-15460569	1	11025975	1
83	-29496377	1	50159496	2	21077318	1	54532098	0
84	-37666803	2	65410661	3	30555650	2	-84684854	1
85	-50361793	0	10762354	1	-19489555	0	-27323835	1
86	-85765240	0	22846401	0	-13270802	1	-11585248	1
87	72786197	0	-15254537	1	16342878	1	-33274551	0
88	21112032	2	-17166915	3	23728868	2	-10857137	2
89	-17517784	1	-25160833	1	-34905688	1	-10881970	1
90	-63670283	0	-57386907	1	-17154342	1	-71101743	0
91	61080682	1	-42500357	2	74478276	1	-21007177	1
92	-57625695	0	-62418044	1	-13130490	1	-71710012	0
93	99999999	0	99999999	0	99999999	0	99999999	0
94	71472019	-1	-16131208	1	10819523	1	37566811	0
95	-45338933	0	-71802854	0	-80380245	1	87447340	0
96	-63696082	0	38295179	1	-65008265	1	57896467	0
97	-58971104	0	45513139	1	-51694193	1	53069630	0

TABLE C24.- SYMMETRIC STRUCTURAL MODES, CASE P7

CP \ Mode	1		2		3		4		5		6	
1	12076337	1	-47756331	-1	32166086	0	-87944020	-2	-13921610	-1	98637735	0
2	10611697	1	-36982484	-1	15785534	0	-26679431	-1	-41913052	-1	12883727	1
3	83165301	0	-18131112	-1	-14818571	0	-26620381	-1	-64368123	-1	16132614	1
4	79747136	0	-13123884	-1	-20336297	0	-30831967	-1	-74721364	-1	18248102	1
5	69218810	0	-57814962	-2	-36922504	0	-23874176	-1	-84914966	-1	20856731	1
6	11780064	1	-39164340	-1	44298240	0	-15370797	0	-15910105	0	26800604	1
7	10674215	1	-30223285	-1	34297161	0	-16799895	0	-18110804	0	30269812	1
8	84483332	0	-13648791	-1	24303932	-1	-17450861	0	-21689691	0	36613629	1
9	81995342	0	-97664338	-2	-19938317	-1	-17454267	0	-21960128	0	36707550	1
10	72278936	0	-14615101	-2	-13382399	0	-17999321	0	-24016708	0	41225544	1
11	11419489	1	-28150065	-1	67927802	0	-35514276	0	-35767684	0	50890912	1
12	10692199	1	-21252942	-1	64803334	0	-37004689	0	-37602174	0	53916045	1
13	88793484	0	-66426484	-2	31332293	0	-38565474	0	-42286266	0	60761260	1
14	85276505	0	-31317662	-2	24220620	0	-38859775	0	-43313516	0	62492713	1
15	75601376	0	32803096	-2	17418162	0	-39929742	0	-45738169	0	67748647	1
16	11190852	1	-15512274	-1	10623936	1	-62931575	0	-62944778	0	84942467	1
17	10391365	1	-74271085	-2	98742583	0	-63037498	0	-63953399	0	88038079	1
18	91778553	0	22506793	-2	66124581	0	-62290215	0	-66181201	0	92186949	1
19	89276674	0	55582533	-2	59021466	0	-63342015	0	-67787016	0	93308345	1
20	82629960	0	10644052	-1	51323025	0	-65932965	0	-71329414	0	97293596	1
21	82283543	-1	23969866	-1	11993443	0	55648179	0	-12638957	0	-46289295	0
22	52071162	-1	56060620	-1	32028184	0	69072122	0	-11975795	0	-39461062	0
23	41898340	-1	11348838	0	10310001	1	23985448	1	-33103443	0	-65324963	0
24	18324823	0	85291920	-1	46887771	0	12489253	1	-26341160	0	-83308818	0
25	88096180	-1	12451398	0	82717458	0	17706564	1	-26670597	0	-69660361	0
26	63426881	-1	18811841	0	15350788	1	33013159	1	-43546348	0	-86565911	0
27	23660030	0	14550572	0	85241612	0	21019105	1	-33229991	0	-86519972	0
28	14240359	0	19391198	0	13016021	1	30358182	1	-41460920	0	-89059913	0
29	10525142	0	26668556	0	21876441	1	47374879	1	-60116287	0	-11189902	1
30	28312410	0	23620346	0	14877158	1	35796569	1	-47297322	0	-97681090	0
31	20028465	0	28435807	0	19598380	1	44890254	1	-55458569	0	-10206381	1
32	14135226	0	36532305	0	28704292	1	61378053	1	-73523005	0	-12558864	1
33	35496257	0	36774782	0	26215005	1	60398780	1	-74507328	0	-13033907	1
34	27439770	0	40670114	0	30761409	1	67821971	1	-81516589	0	-13516212	1
35	19108640	0	53110443	0	39774104	1	86319067	1	-10072472	1	-16357182	1
36	23954227	1	-16883855	0	27845381	1	-21375328	0	41380899	-1	-31435071	1

TABLE C24.- Continued

	1		2		3		4		5		6	
37	15559151	1	-84518319	-1	10132806	1	-60556965	-1	24226965	-1	-80354419	0
38	81891441	0	-24137163	-1	-24569925	0	56507586	-1	16520793	-1	67812578	0
39	14749903	0	25216372	-1	-87146268	0	94889930	-1	11015666	-1	81161237	0
40	-34532282	0	47281256	-1	-82376267	0	67322481	-1	47389106	-2	18878667	0
41	-50500767	0	45239809	-1	-48195305	0	49229427	-2	-14416243	-1	-14549866	0
42	-52306166	0	23158923	-1	17570682	-1	-23546766	-1	-33963611	-2	-65178236	0
43	-43192353	0	-94306834	-2	34724597	0	-28483543	-1	31570587	-2	-54420100	0
44	-22020979	0	-40662915	-1	45889674	0	22650657	-2	17522332	-1	-13964851	0
45	13412711	-1	-68565424	-1	21756923	0	62133068	-1	33821999	-1	15085448	0
46	24090441	0	-94557275	-1	-18058280	0	14705488	0	58589729	-1	41089255	0
47	46263161	0	-12889069	0	-62292545	0	24703589	0	86969509	-1	80288352	0
48	66995123	0	-16459370	0	-10871664	1	33747685	0	10812403	0	10649178	1
49	-66477367	0	44789379	-1	-18745264	0	-57664899	-1	-33521720	-1	-74217072	0
50	-64887577	0	27497024	-1	15121588	0	-52231775	-1	-14566970	-1	-74256017	0
51	-53256792	0	-34131892	-2	51122265	0	-36700595	-1	67710205	-2	-49990162	0
52	-25902333	0	-35680691	-1	51538086	0	40055021	-2	21841754	-1	-67572646	-2
53	23387069	-1	-61811866	-1	20202227	0	60754800	-1	34652124	-1	23077185	0
54	24614106	0	-78772434	-1	-19236576	0	10261955	0	36882139	-1	13981700	0
55	49210737	0	-10132838	0	-66150553	0	15000129	0	36655035	-1	83846498	-2
56	-67903107	0	30275866	-1	24421705	0	-42395910	-1	-47231872	-2	-65132184	0
57	-51573837	0	19998743	-3	59338716	0	-48704828	-1	-23077060	-2	-26666132	-1
58	-22514100	0	-26103540	-1	60487111	0	-19525995	-1	91325340	-2	52997229	0
59	34011147	-1	-41883695	-1	27424026	0	13412362	-1	10648795	-1	42350192	0
60	26869126	0	-35542568	-1	-14106847	0	21765463	-1	-15972285	-2	-32704080	-1
61	52465089	0	-28632651	-1	-61405958	0	12782100	-1	-23171215	-1	-75310194	0
62	73307953	0	18397847	-1	-86573741	0	-73162034	-1	-73976927	-1	-14278871	1
63	87677484	0	14705884	-1	-13457808	1	-98149683	-1	-10399269	0	-26125733	1
64	-54414781	0	54024917	-2	85803038	0	-81482227	-1	-28653115	-1	13631891	1
65	-23793602	0	-96775544	-2	90787159	0	-64287815	-1	-14278671	-1	17832918	1
66	54845761	-1	12079581	-1	46668695	0	-70558149	-1	-28263037	-1	11424605	1
67	37026995	0	47402801	-1	-22932979	-1	-99985701	-1	-54693098	-1	23062752	0
68	66862475	0	79743871	-1	-56155169	0	-15038738	0	-95914295	-1	-10002859	1
69	78458756	0	91548088	-1	-80400655	0	-17447048	0	-11598172	0	-16166393	1
70	99511355	0	95421191	-1	-12853191	1	-23033988	0	-15935269	0	-30718622	1
71	88439616	0	18187524	0	-71470203	0	-29450915	0	-16132278	0	-19201096	1
72	10714409	1	20233873	0	-11389165	1	-35509162	0	-20338181	0	-34079089	1
73	-24158039	0	21058029	-1	13275535	1	-14138574	0	-62984695	-1	39781968	1

TABLE C24.- Continued

	1		2		3		4		5		6	
74	12180750	0	11623441	0	76037875	0	-19499359	0	-81070343	-1	23488316	1
75	44404211	0	17515345	0	20390340	0	-23574585	0	-10209441	0	69437142	0
76	80643318	0	24425525	0	-33139900	0	-31021720	0	-14322120	0	-11267465	1
77	93679797	0	26618413	0	-55274130	0	-32944352	0	-15392365	0	-18070869	1
78	11596514	1	32467513	0	-96097703	0	-42747713	0	-20665038	0	-35747371	1
79	-18700329	-1	46657393	-1	64047235	0	-71773011	-1	-24910244	-1	27385510	1
80	92978726	-1	97732384	-1	44710163	0	-93722985	-1	-26466616	-1	17567245	1
81	25622267	0	15178198	0	25409950	0	-11718295	0	-28614050	-1	73155417	0
82	41160331	0	19326965	0	65504136	-1	-12461303	0	-24099552	-1	-32549629	0
83	48443011	0	21879199	0	-47192079	-1	-11134492	0	-10545664	-1	-77752836	0
84	57770358	0	25143673	0	-26897177	0	-11278308	0	-27615600	-1	-14140730	1
85	12547903	0	17278821	0	62668282	0	-12683436	0	-25133450	-1	22838767	1
86	31270454	0	25125078	0	51250883	0	-16755187	0	-26526176	-1	11016285	1
87	57023903	0	36508541	0	23335029	0	-62914146	-2	11430241	0	-25426990	0
88	70149270	0	43405885	0	11677879	-1	13480260	0	25885565	0	-70191753	0
89	38827510	0	38986058	0	85097137	0	-55647135	-1	94468873	-1	17420086	1
90	56854738	0	50772868	0	76121985	0	12274957	0	25259500	0	95641972	0
91	89007595	0	67969501	0	55138701	0	62247557	0	65212902	0	-10464886	0
92	73967843	0	85425707	0	10992205	1	50119005	0	61866710	0	12678870	1
93	99999998	0	99999999	0	99999999	0	99999999	0	99999998	0	99999998	0
94	-40418293	0	-19793968	-1	58043423	0	-31807287	-1	71883539	-2	-23229146	0
95	66525415	0	-13482256	0	-10336728	1	28255170	0	81496989	-1	11350100	1
96	67038975	0	-13031286	0	-10026441	1	22015287	0	50221298	-1	49109736	0
97	67132905	0	-96166206	-1	-94405955	0	11997933	0	35691976	-2	-17658356	0

TABLE C24.- Continued

	7		8		9		10		11		12	
1	41736098	0	-59661020	2	37715684	-1	-81898299	0	-88219942	0	-86416605	1
2	50649745	0	-56205550	2	24827130	-1	-51101878	0	-61446634	0	-62746217	1
3	56093790	0	-48297724	2	-12797309	-1	12027774	0	96020151	-1	14741433	1
4	63381963	0	-49049454	2	-21019829	-1	23381586	0	22695566	0	30077780	1
5	71744446	0	-54065365	2	-45031316	-1	48017045	0	48039029	0	59326285	1
6	13708060	1	34318465	2	10217340	0	-34821414	0	-73052946	0	-80354044	1
7	14419566	1	36517893	2	80035860	-1	-92757632	-1	-47587862	0	-56791977	1
8	15865289	1	52253850	2	27691466	-1	51815848	0	23417807	0	20946026	1
9	16096712	1	55594834	2	18208924	-1	62120771	0	35815183	0	36210928	1
10	17620081	1	63267122	2	-97151487	-2	85789233	0	58711811	0	62110178	1
11	26907843	1	16549593	3	17542424	0	28732520	0	-53180122	0	-75100464	1
12	27798646	1	17332007	3	15389213	0	48157795	0	-33870698	0	-55930327	1
13	30075456	1	20858817	3	91937247	-1	11287278	1	44422123	0	33657615	1
14	30754578	1	21107255	3	77044880	-1	12459670	1	58339538	0	50790530	1
15	32570602	1	22890660	3	48069989	-1	14855673	1	81871026	0	78275643	1
16	45653638	1	36581590	3	25334202	0	13346735	1	-10202563	0	-51267470	1
17	46101261	1	37066239	3	21393176	0	15238107	1	15143312	0	-24073519	1
18	46826582	1	38507758	3	15351061	0	19179844	1	70522239	0	41950133	1
19	48015512	1	39664011	3	14457199	0	20426109	1	83091303	0	56282436	1
20	50389351	1	43165284	3	12566663	0	23525437	1	11317787	1	88323198	1
21	-15382856	-1	-24322264	1	-12001037	-1	-31071923	0	31014967	1	92972745	1
22	58031448	-2	-27388381	1	16507770	-1	-49303845	0	11565670	2	39658119	1
23	-11286331	0	-13513598	2	18024552	-1	-56207202	0	22807861	2	-91804262	2
24	-44529558	-1	-44371173	1	-23013166	-1	-88641097	0	11099650	2	26892618	2
25	-28428293	-1	-41071474	1	33637804	-1	-83529119	0	18359493	2	20928732	1
26	-11942587	0	-12012454	2	26566852	-1	-31938788	0	19350004	2	-10019433	3
27	-29827560	-1	-17310681	1	-12959070	-1	-16056930	1	27062445	2	51111196	2
28	-69794017	-1	-56692940	1	43600514	-1	-84180120	0	17874221	2	85411511	1
29	-17497062	0	-13192470	2	19013571	-1	63078791	0	-49659605	1	-93879398	2
30	-62746846	-1	15542511	0	-25151275	-1	-11893841	1	15264512	2	87353796	2
31	-10348927	0	-37988262	1	21215925	-1	24866534	0	-96412829	1	32070244	2
32	-23068379	0	-13938051	2	-75390668	-2	20345030	1	-41782047	2	-48475028	2
33	-18444422	0	-25941738	1	-99653684	-1	93308291	0	-36679291	2	12017850	3
34	-21960152	0	-45354514	1	-55676349	-1	25280586	1	-69059394	2	72657715	2
35	-32550862	0	-13091758	2	-48779683	-1	33546692	1	-74241394	2	44595368	2
36	-34995791	0	25306090	3	59815896	-1	11773598	1	71879155	0	25583371	1

TABLE C24.- Continued

	7		8		9		10		11		12	
37	-63761558	-1	-17627159	2	35255659	-1	-71074994	0	-50305199	0	-16148879	1
38	-10511315	-1	-98869836	2	-47847658	-1	-24014068	0	-13653340	0	-50665147	0
39	-95536448	-1	-58855062	2	-53520605	-1	36608544	0	31326498	0	10709807	1
40	-10015127	0	23178121	2	86759217	-2	20257808	0	10642953	0	23994555	0
41	-11131817	0	68836457	2	64734121	-1	-30660126	0	-95152723	-1	23537895	-1
42	15023855	-1	30448390	2	15376955	-1	-36198836	-1	-90888931	-1	-35956968	0
43	94922306	-1	-16981052	2	-61256442	-2	72188450	-1	10782785	-1	32517710	-1
44	14130028	0	-47939702	2	-28097574	-1	22671166	0	13750366	0	39287951	0
45	12204388	0	-44571672	2	15371367	-2	14725268	0	53451175	-1	-40356176	-1
46	43983530	-1	-46170067	1	69548347	-1	24407360	0	10576569	0	21495503	-1
47	-13451317	0	88164150	2	11973196	0	34153375	0	22872323	0	35682691	0
48	-22526124	0	14188347	3	11924845	0	46028332	0	49367091	-1	-10557422	1
49	-14687109	-1	57259343	2	-46931027	-2	-13354971	0	-22667342	0	-90739603	0
50	53777302	-1	37848992	2	-20718863	-1	-42910314	-2	-11926959	0	-57980607	0
51	11829935	0	-54946943	1	-35623230	-1	10268657	0	44872368	-1	88435234	-1
52	12885453	0	-50254979	2	-22940068	-1	68684609	-1	13748731	0	60141769	0
53	58223285	-1	-49798494	2	-58951449	-2	-53116637	-1	67962781	-1	33651797	0
54	44243258	-1	-17556459	2	-45608079	-1	-97250632	-1	-11342759	0	-70739622	0
55	14526120	-2	64321998	2	-10015726	0	-16242200	0	-13100532	0	-83076831	0
56	94829872	-1	54117157	2	-56506310	-1	87745712	-1	-14376786	0	-10062368	1
57	59590403	-1	14304612	2	-48227759	-1	-34977982	-1	24656781	-1	80911627	-1
58	-48716041	-1	-39476428	2	79604476	-3	-16552964	0	73505486	-1	55801386	0
59	-26677593	-1	-47029593	2	18205022	-1	-16054839	0	47366826	-1	47464996	0
60	61628368	-1	-13643537	2	42935174	-2	-12759315	0	-35186161	-1	54093399	-1
61	10367335	0	85646612	1	-72289611	-1	-11151962	0	-57398876	-1	35508105	-1
62	16484532	0	12007921	2	-61228477	-1	-22781523	0	48064896	-2	96388845	0
63	37345383	0	23316121	2	-26085046	-1	-14572209	1	-96958396	-1	27511234	1
64	-14544163	0	86155936	2	-57942263	-1	-20295080	0	-45016919	0	-27074047	1
65	-29926923	0	-90734900	1	66600646	-1	-54666885	0	-61614785	-1	25099512	0
66	-25135849	0	-24998993	2	85739216	-1	-23021721	0	-16482684	-1	28309263	0
67	-14483547	0	-24190229	2	76940882	-1	-45612456	-1	-40838649	-1	17079437	0
68	35057114	-1	-80268357	1	97054138	-1	-59222701	-1	22002773	0	21772443	1
69	13303707	0	-75181980	1	11680441	0	61177388	-1	11603666	0	16403966	1
70	38320759	0	-14773338	2	40543535	0	-97961407	0	16890837	1	13339568	2
71	94092807	-1	-39421236	2	10931608	0	78523390	-2	-17952749	0	29001340	0
72	39954466	0	-47651558	2	53271707	0	-27285873	0	59331755	0	63367311	1
73	-71125532	0	75628395	2	15267634	0	-87529432	0	-22997569	0	-46996547	0

TABLE C24.- Continued

	7		8		9		10		11		12	
74	-60288253	0	18623603	2	75363704	-1	-93542258	-1	33593155	-1	23731083	0
75	-38638026	0	-12143934	2	46142673	-1	15073116	0	30098946	-1	29731881	0
76	-22646289	-1	-33011299	2	62558945	-1	36257411	0	-85936363	-1	-72413008	-1
77	70950780	-1	-42482275	2	10013220	0	38153046	0	-15871321	0	-25834449	0
78	41946059	0	-78269187	2	44618871	0	10171921	0	-33912678	0	28804664	0
79	-82330887	0	17916400	2	-10236595	0	23792897	0	17774640	0	-12553939	-1
80	-57466540	0	92562595	1	-15674047	0	32315183	0	18440535	0	44721723	-1
81	-29905331	0	17337895	2	-24264480	0	52604386	0	21293679	0	-10162141	-1
82	11646716	0	24417440	2	-15181204	0	-21233475	0	-25900137	0	-12528196	1
83	29665830	0	14110859	2	-76052528	-1	-11928169	1	-21302996	1	-10395002	2
84	65681767	0	42701279	1	21403633	0	-60408241	1	-23984402	2	-12883206	3
85	-69963373	0	35533804	2	-42800794	0	91130695	0	41461346	0	-97428563	-1
86	-33916406	0	42050350	2	-58912254	0	98343637	0	39038095	0	-33198598	0
87	38078804	0	58103315	2	-28643842	0	-29980757	1	-79985159	0	-85904662	0
88	10853679	1	38561182	2	72567488	0	-25638187	2	-20415435	1	28594717	2
89	-22904935	0	11818043	3	-12871462	1	16663130	1	88539505	0	-30700921	0
90	24783476	0	11599404	3	-10161301	1	-24038734	0	44933772	0	39619466	-1
91	10929463	1	36361318	2	56560904	0	-73373906	1	-40164745	0	71464179	1
92	61257525	0	12370741	3	-87835092	0	60139780	0	10144355	1	48537086	0
93	99999999	0	99999999	0	99999998	0	99999999	0	99999999	0	99999999	0
94	14780205	0	-41273039	2	-40912911	-1	78598151	-1	90620798	-1	37694384	0
95	-27138904	0	15026371	3	93883038	-1	35556716	0	23995095	0	26127239	0
96	-14677930	0	13107763	3	-64150496	-2	20068172	-1	-67575536	-1	-84130261	0
97	-36448637	-1	10222720	3	-56191130	-1	-21835775	0	-23815373	0	-11528670	1

TABLE C24.- Continued

	13		14		15		16	
1	-92014892	2	-98922092	2	-50922423	3	42269304	3
2	-68645424	2	-75050887	2	-25638893	3	17425651	3
3	19671978	2	22758155	2	-17323280	3	-37435665	1
4	37967636	2	43446473	2	-29675018	3	-37292424	2
5	73795095	2	84512288	2	-76166129	3	-60976566	3
6	-90426682	2	-10054405	3	-40634874	3	35922976	3
7	-66269639	2	-75306280	2	-25145712	3	19367961	3
8	22537500	2	23030529	2	-25229835	3	11632444	3
9	41240552	2	44435939	2	-35414352	3	13586261	3
10	73323254	2	81385153	2	-69322941	3	54290441	2
11	-92835180	2	-10860189	3	-18915017	3	-18279274	3
12	-71619399	2	-85497509	2	-19601614	3	-25667690	3
13	32661927	2	30835821	2	-72901337	2	16154079	3
14	53694283	2	54913324	2	-11115260	3	36328885	3
15	88318949	2	95069159	2	-18258971	3	81191624	3
16	-75862313	2	-96711203	2	50449466	3	-12500694	4
17	-44738703	2	-62172022	2	52941128	3	-80980342	3
18	33640132	2	26243793	2	50853983	3	20094690	3
19	50153872	2	44481240	2	56046954	3	36580856	3
20	86464740	2	84327164	2	84796762	3	73591035	3
21	-26791081	1	27295943	2	25050919	-1	36287214	-3
22	-39513796	1	46761677	2	-18240756	0	15577455	0
23	15783783	2	-14154638	3	46688950	0	-30350128	0
24	-86444811	1	91459935	2	15307102	0	-12026128	0
25	-49806392	1	60691996	2	-29675228	0	11284520	0
26	18508665	2	-17109184	3	-10448289	0	75280359	-1
27	-18674260	2	20317864	3	67317502	0	-41934787	0
28	-64239248	1	75163135	2	-11543460	-1	66929648	-2
29	23568172	2	-23884097	3	-44087881	0	33097231	0
30	-23859080	2	24524660	3	69164862	0	-46740286	0
31	-50435148	1	43453806	2	-17956723	0	27291390	0
32	22032198	2	-24616990	3	-59970856	0	35226807	0
33	-19019717	2	16619647	3	69941293	0	-47052574	0
34	42571505	0	-49091795	2	-53191925	0	48418738	0
35	58649768	1	-95222537	2	-43508415	0	-88933342	-1
36	17207117	1	-12308114	2	-47230567	1	-71471989	0

TABLE C24.- Continued

	13		14		15		16	
37	10396811	1	10490910	2	14892363	2	-28834325	1
38	59570194	0	37654036	1	18042191	2	-21607961	1
39	39756001	0	-55175745	1	11379136	2	-14517341	1
40	-96504170	-1	-14001376	1	22754633	1	-39663503	0
41	-53387929	-1	-86309035	0	-26361290	1	23811383	0
42	-14275935	0	19539185	1	-23141567	1	58824944	-2
43	28579915	-1	18226899	0	-21810767	0	-19679771	-1
44	81348620	-1	-15469940	1	17435525	1	20866140	0
45	-68663894	-2	10663481	1	24969811	1	79558370	-1
46	-77898310	-1	91304089	0	83106121	0	22853172	0
47	-19138110	0	-11393814	1	-39138998	1	57204375	0
48	-80765391	0	70026152	1	-59095414	1	58487263	0
49	-43765470	0	44224039	1	-37405621	1	41514616	0
50	-35443151	0	29091660	1	-35873585	1	58551067	0
51	-82932849	-1	-34371494	0	-14883365	1	49478328	0
52	22375274	0	-28244657	1	19818799	1	74405585	-1
53	30762158	0	-11518220	1	33263817	1	-77467620	0
54	-89644554	-1	43271809	1	23070643	1	-84271851	0
55	-37811629	0	38265090	1	-19081475	1	-16652273	0
56	-68238048	0	51570501	1	-47427560	1	13104635	1
57	-17562606	0	-67690282	0	-22798236	1	10494926	1
58	38164849	0	-24592693	1	21014666	1	-59776387	0
59	41183290	0	-20265633	1	30926763	1	-84164376	0
60	74230312	-1	-55889899	0	97047237	0	11559284	0
61	23212425	-1	-14881977	1	-14555771	0	-12281488	0
62	33286837	0	-79425386	1	-74694266	0	41159618	0
63	13869363	1	-20756791	2	-18070598	1	52234034	0
64	-14252701	1	14979746	2	-55577713	1	27603859	1
65	33448864	0	-67459318	0	10530571	1	-24429757	0
66	34276965	0	-81244962	0	16219802	1	-63844325	0
67	25093827	0	-86064506	0	14116507	1	-46545745	0
68	77313473	0	-13980011	2	-94972551	0	64612551	0
69	53137369	0	-11201636	2	-13608372	1	11561908	1
70	46768472	1	-81161310	2	-44483274	1	29219518	1
71	32334160	0	-35288093	1	41242058	0	34973168	0
72	23316903	1	-39124260	2	-36395005	1	34013692	1
73	-20008433	0	31926949	1	-31576824	1	16198661	1

TABLE C24.- Concluded

	13		14		15		16	
74	10634684	0	-72252891	0	-81417236	0	-29545329	0
75	22653744	0	-17465498	1	22948590	0	-87952410	0
76	-18671909	-1	-91065276	0	16596779	-1	51323680	0
77	-73422183	-4	-43617112	-1	13710887	0	51864404	0
78	43097962	0	-35984766	1	-61406120	0	25629923	1
79	17862101	0	18977021	1	16156037	1	-34975154	1
80	65378768	-1	54945073	0	12256784	1	-26694444	1
81	-24930196	0	-43777371	0	-19958211	0	-12535795	1
82	-56997140	0	48866491	1	-14491428	1	11240919	1
83	-28858421	1	57454309	2	15624493	1	58733203	0
84	-36798763	2	74843711	3	24903229	2	-84593864	1
85	-45272531	0	78395052	0	27063177	0	-29170402	1
86	-85308993	0	12006834	0	-10081897	1	-12343207	1
87	71974411	0	-15275617	1	12033598	1	-30110830	0
88	21094857	2	-19590264	3	20635426	2	-11054164	2
89	-18156035	1	-26639095	1	-30514825	1	-11018610	1
90	-71405823	0	-62069928	1	-16933232	1	-66423966	0
91	60808268	1	-48301235	2	63324902	1	-20898090	1
92	-68576608	0	-66301159	1	-13431213	1	-64720634	0
93	99999998	0	99999999	0	99999999	0	99999998	0
94	81179688	-1	-17987830	1	92650875	0	37473591	0
95	-42759809	0	-12332533	1	-67967129	1	82351852	0
96	-62167873	0	41311845	1	-55890243	1	55945218	0
97	-58216727	0	50646977	1	-45293865	1	53525397	0

TABLE C25.- SYMMETRIC STRUCTURAL MODES, CASE P8

CP \ Mode	1		2		3		4		5		6	
1	12385414	1	-53867040	-1	47233190	0	-18831589	-2	-14684807	-1	49490195	0
2	10912528	1	-41993355	-1	26674160	0	-23296279	-1	-43155119	-1	63996438	0
3	85988339	0	-21619610	-1	-12694325	0	-33389407	-1	-67334886	-1	81120131	0
4	82557391	0	-16285204	-1	-19595404	0	-39061247	-1	-78019322	-1	91666330	0
5	71911978	0	-83862594	-2	-41040643	0	-38574970	-1	-89276475	-1	10517553	1
6	12107099	1	-44058694	-1	66774798	0	-12583775	0	-15305218	0	12045768	1
7	10996480	1	-34200164	-1	54451091	0	-14242960	0	-17602956	0	13834530	1
8	87546365	0	-16004613	-1	13761861	0	-15962433	0	-21411502	0	17122419	1
9	85027553	0	-11984296	-1	80033400	-1	-16065407	0	-21655449	0	17111122	1
10	75242219	0	-30258786	-2	-63384304	-1	-16970602	0	-23790029	0	19370767	1
11	11774702	1	-31408603	-1	10278969	1	-29636588	0	-34246030	0	22262421	1
12	11045590	1	-23907937	-1	99317988	0	-31095163	0	-36105140	0	23756439	1
13	92166747	0	-78612405	-2	56540253	0	-33607171	0	-40894428	0	27080358	1
14	88627651	0	-40711902	-2	47487460	0	-34106150	0	-41941494	0	27915181	1
15	78913087	0	29741515	-2	39242359	0	-35356500	0	-44426744	0	30520176	1
16	11585055	1	-16805210	-1	15964288	1	-52647682	0	-60124578	0	36736683	1
17	10781116	1	-80931894	-2	15019278	1	-53050869	0	-61263848	0	38427794	1
18	95534972	0	25847027	-2	10790943	1	-53514367	0	-63708924	0	40637746	1
19	93005324	0	60555787	-2	98873426	0	-54601564	0	-65198249	0	40953451	1
20	86321189	0	11629796	-1	89498593	0	-57101883	0	-68589324	0	42591209	1
21	82152666	-1	23299296	-1	74426793	-1	44932957	0	-12870492	0	-33963861	0
22	53019512	-1	55521613	-1	31553987	0	56618110	0	-12332855	0	-29737723	0
23	42019730	-1	11008109	0	98685535	0	19630413	1	-35422355	0	-50551170	0
24	18454459	0	84334325	-1	42861732	0	10162297	1	-26915713	0	-62949356	0
25	89702561	-1	12269137	0	81517560	0	14525067	1	-27989184	0	-53455062	0
26	64665309	-1	18376739	0	15078298	1	27086858	1	-46638117	0	-67552921	0
27	23778339	0	14305270	0	79542519	0	17204584	1	-34721101	0	-66952410	0
28	14369819	0	19019075	0	12412714	1	24889941	1	-44118916	0	-69701782	0
29	10657109	0	26016016	0	21408484	1	38882750	1	-64696182	0	-87885019	0
30	28411509	0	23140657	0	13963755	1	29363687	1	-50426745	0	-77424344	0
31	20155399	0	27832102	0	18757009	1	36855968	1	-59696146	0	-81460009	0
32	14329162	0	35691365	0	28168492	1	50429007	1	-79613063	0	-99590446	0
33	35593078	0	35911367	0	25006069	1	49579180	1	-80301444	0	-10463763	1
34	27593856	0	39710680	0	29833489	1	55708398	1	-88191813	0	-10896731	1
35	19377250	0	51946828	0	38811535	1	70936188	1	-10938894	1	-13068205	1
36	24360277	1	-18300027	0	36688249	1	-93987770	-1	69613836	-1	-18583073	1

TABLE C25.- Continued

	1		2		3		4		5		6	
37	15903307	1	-92961758	-1	13696522	1	-22196963	-1	31369147	-1	-46864009	0
38	84599512	0	-28128106	-1	-27471860	0	36282690	-1	90204641	-2	42962370	0
39	16792348	0	24500752	-1	-10929144	1	50971767	-1	85406607	-4	52464157	0
40	-33055502	0	47833791	-1	-10300704	1	31955877	-1	-68391098	-3	13651338	0
41	-49400680	0	45998095	-1	-57769141	0	-10521391	-1	-15016291	-1	-86433163	-1
42	-51959042	0	22028755	-1	63286938	-1	-16748403	-1	25152847	-2	-41228622	0
43	-43616243	0	-12324917	-1	48114992	0	-11357493	-1	99261219	-2	-35756357	0
44	-23362775	0	-45494832	-1	60360137	0	17963128	-1	21984056	-1	-11119877	0
45	-80743589	-2	-75050124	-1	26066608	0	61964453	-1	34573423	-1	84602094	-1
46	21179320	0	-10254394	0	-29225826	0	12281432	0	54283616	-1	28000870	0
47	42554739	0	-13830962	0	-90681455	0	19380587	0	75384333	-1	57328894	0
48	62500144	0	-17563596	0	-15469683	1	25669123	0	91123018	-1	76910828	0
49	-65480405	0	45458331	-1	-18333643	0	-53131585	-1	-26839792	-1	-48396434	0
50	-64439389	0	26814878	-1	24672633	0	-37373944	-1	-65684716	-2	-48658803	0
51	-53591433	0	-60266815	-2	69924668	0	-13502830	-1	14116824	-1	-33753935	0
52	-27192306	0	-40235434	-1	67945065	0	20637882	-1	25280915	-1	-26450556	-1
53	22409052	-2	-67945053	-1	24206895	0	59971794	-1	34215434	-1	14537120	0
54	21782257	0	-86274948	-1	-29878692	0	86227371	-1	36144341	-1	96240133	-1
55	45609245	0	-11034356	0	-94158961	0	11505690	0	35722178	-1	22898870	-1
56	-67441147	0	29456921	-1	36551229	0	-25698728	-1	33214226	-2	-43673391	0
57	-51821616	0	-17860505	-2	81247299	0	-23779443	-1	21111311	-2	-52850869	-1
58	-23650446	0	-29459163	-1	80710970	0	-42066930	-3	80496394	-2	31765392	0
59	14657786	-1	-46769898	-1	35034477	0	20436844	-1	98223129	-2	25547710	0
60	24279287	0	-41513074	-1	-21394671	0	20954246	-1	23249417	-2	-47346683	-1
61	49235421	0	-35629823	-1	-85092715	0	56048065	-2	-12874798	-1	-50678612	0
62	70000112	0	12169685	-1	-11729341	1	-68822762	-1	-54736169	-1	-96925444	0
63	83825448	0	70627583	-2	-18128761	1	-96870115	-1	-73969434	-1	-17392520	1
64	-54400111	0	54398709	-2	11769124	1	-52248487	-1	-33465364	-1	78988775	0
65	-24584630	0	-10687850	-1	12260910	1	-37441947	-1	-24324178	-1	10936894	1
66	39757317	-1	10232047	-1	62920062	0	-48667658	-1	-32520670	-1	68960610	0
67	34938589	0	44889560	-1	-27509044	-1	-78846324	-1	-49602771	-1	97821103	-1
68	64189341	0	76425219	-1	-74581292	0	-12718462	0	-78031096	-1	-71063751	0
69	75538060	0	87815267	-1	-10681726	1	-15021130	0	-91884575	-1	-11150326	1
70	96106325	0	90483792	-1	-17044845	1	-20371931	0	-12202468	0	-20579016	1
71	85956355	0	18075325	0	-92558977	0	-24456212	0	-13024991	0	-13384132	1
72	10425579	1	20037151	0	-14858963	1	-29929204	0	-15793230	0	-23113795	1
73	-24400527	0	24172321	-1	18119300	1	-10384508	0	-88054535	-1	24387363	1

TABLE C25.- Continued

	1		2		3		4		5		6	
74	11361712	0	11932644	0	10520355	1	-14915336	0	-90512854	-1	14166585	1
75	43000633	0	17726636	0	30462349	0	-18508184	0	-95591847	-1	36088255	0
76	78718738	0	24538350	0	-41056390	0	-24717044	0	-11652855	0	-84158246	0
77	91533549	0	26692638	0	-70698019	0	-26420338	0	-12070429	0	-12769521	1
78	11354968	1	32520611	0	-12400773	1	-34651206	0	-15470205	0	-24413729	1
79	-17785205	-1	50599025	-1	88121429	0	-57407370	-1	-46989869	-1	17590657	1
80	92256574	-1	10118366	0	61772569	0	-70829120	-1	-37211240	-1	11115859	1
81	25321682	0	15450188	0	35093391	0	-84304606	-1	-26846425	-1	42849365	0
82	40582814	0	19457446	0	86732286	-1	-83753328	-1	-91357290	-2	-28934295	0
83	47752127	0	21944580	0	-70623558	-1	-69555759	-1	95754587	-2	-58737984	0
84	56937170	0	25102755	0	-36276727	0	-69702754	-1	25491491	-2	-10642837	1
85	12799290	0	17835933	0	86052040	0	-91019652	-1	-36879075	-1	14288440	1
86	31369657	0	25617766	0	69734526	0	-11349946	0	-22295858	-1	62792982	0
87	56624962	0	36665614	0	26494620	0	43105664	-1	13345701	0	-23119112	0
88	69542987	0	43263934	0	-53521529	-1	17497175	0	28260434	0	-50069440	0
89	39103269	0	39515364	0	11006549	1	73569543	-2	99011979	-1	10287635	1
90	56872442	0	51080037	0	92115355	0	17951109	0	26485302	0	57177793	0
91	88432559	0	67703270	0	50861070	0	63670556	0	66535609	0	97887340	-1
92	74337302	0	85789884	0	12544089	1	55270702	0	63001218	0	90739626	0
93	99999999	0	99999999	0	99999999	0	99999999	0	99999998	0	99999999	0
94	-41221097	0	-23313072	-1	78099511	0	-79314267	-2	13213826	-1	-17952091	0
95	62221687	0	-14451600	0	-14629281	1	21169612	0	65928178	-1	79298587	0
96	62774739	0	-14020865	0	-14129832	1	16247387	0	42445550	-1	35530962	0
97	63069695	0	-10518393	0	-13169338	1	82877016	-1	50751286	-2	-10829506	0

TABLE C25.- Continued

	7		8		9		10		11		12	
1	50127982	0	56583168	1	37265531	-1	-76895684	0	-86525268	0	-85753357	1
2	61719839	0	53337185	1	24485462	-1	-47937175	0	-60334947	0	-62293409	1
3	69483114	0	45978740	1	-12305273	-1	10971066	0	88638816	-1	14428093	1
4	78571072	0	46737473	1	-20249411	-1	21573855	0	21582849	0	29597495	1
5	88974088	0	51622093	1	-43598003	-1	44511111	0	46133420	0	58514128	1
6	16546489	1	-30653885	1	10487238	0	-32014706	0	-71683329	0	-79766214	1
7	17517920	1	-32891969	1	32738954	-1	-80440901	-1	-46805531	0	-56433311	1
8	19444103	1	-47640516	1	31638237	-1	48797713	0	22259692	0	20507810	1
9	19711790	1	-50660844	1	22655322	-1	58336095	0	34297115	0	35623116	1
10	21620186	1	-57737021	1	-43611083	-2	80344060	0	56447745	0	61221663	1
11	32540284	1	-15259707	2	18264090	0	28589764	0	-52192257	0	-74572979	1
12	33690977	1	-16003185	2	16148886	0	46759376	0	-33380077	0	-55598977	1
13	36587414	1	-19287977	2	10202332	0	10673224	1	42724282	0	33102288	1
14	37426907	1	-19511401	2	87709053	-1	11759037	1	56235304	0	50067353	1
15	39701040	1	-21174134	2	59961938	-1	13984731	1	79018880	0	77257689	1
16	55235073	1	-33893068	2	26821844	0	12811618	1	-10076808	0	-50917470	1
17	55883828	1	-34364945	2	22926429	0	14559937	1	14584043	0	-23996000	1
18	56901765	1	-35710646	2	17026250	0	18180724	1	68321249	0	41353346	1
19	58293943	1	-36762021	2	16253774	0	19336649	1	80579344	0	55585977	1
20	61160293	1	-40008151	2	14577275	0	22223555	1	10991151	1	87369300	1
21	-22165730	-1	22497079	0	-11794471	-1	-29789256	0	30857817	1	93148345	1
22	20182490	-2	25904581	0	16299598	-1	-46777660	0	11508213	2	40168178	1
23	-13293890	0	12301583	1	16886082	-1	-52871386	0	22699637	2	-91795781	2
24	-52884038	-1	37389006	0	-23337637	-1	-84675009	0	11043074	2	26948723	2
25	-38682662	-1	37612819	0	33136409	-1	-79219642	0	18267967	2	21586146	1
26	-14261559	0	10863336	1	25205643	-1	-29690075	0	19259839	2	-10020420	3
27	-38978910	-1	14464110	0	-12178296	-1	-15302260	1	26924019	2	51250363	2
28	-86933261	-1	52300097	0	43135738	-1	-79863586	0	17784067	2	86089111	1
29	-20796258	0	11823918	1	17572080	-1	60510959	0	-49351293	1	-93977329	2
30	-78335449	-1	-26523204	-1	-23455735	-1	-11368478	1	15181585	2	87477355	2
31	-12702199	0	34647048	0	21339692	-1	23538608	0	-95956027	1	32058527	2
32	-27184619	0	12364469	1	-88597487	-2	19361579	1	-41569995	2	-48668749	2
33	-21622033	0	17830643	0	-97700279	-1	87576907	0	-36504317	2	12014711	3
34	-25783541	0	35443630	0	-55313013	-1	23963289	1	-68718884	2	72463746	2
35	-38096683	0	11346531	1	-49803091	-1	31864087	1	-73872227	2	44383338	2
36	-49256526	0	-23875466	2	63767023	-1	11225666	1	71534492	0	25734258	1

TABLE C25.- Continued

	7		8		9		10		11		12	
37	-10384230	0	16397717	1	35700756	-1	-67179689	0	-49586039	0	-16092993	1
38	81451324	-2	92791364	1	-49502633	-1	-23277002	0	-13898730	0	-51919955	0
39	-76366342	-1	55701010	1	-55561491	-1	33350685	0	29996757	0	10389602	1
40	-99110776	-1	-20320048	1	84584702	-2	17300404	0	92307071	-1	20386356	0
41	-11622681	0	-63296914	1	64414798	-1	-30955432	0	-10712086	0	-23387331	-1
42	-76558884	-4	-27308410	1	16530040	-1	-42154177	-1	-94422560	-1	-36879680	0
43	88191809	-1	16513542	1	-57740049	-2	72216878	-1	12647254	-1	38145672	-1
44	15071973	0	44714311	1	-29032107	-1	22750730	0	14191940	0	40344641	0
45	13569942	0	41355206	1	-32745768	-3	15431430	0	58288413	-1	-36250202	-1
46	53864290	-1	39176745	0	66685513	-1	24544628	0	10665111	0	79663817	-2
47	-13055784	0	-83442825	1	11612919	0	33065251	0	22075618	0	31106177	0
48	-22437181	0	-13383723	2	11604774	0	43731572	0	38161496	-1	-11089030	1
49	-28089628	-1	-52144425	1	-27607379	-2	-14393760	0	-23312590	0	-92311514	0
50	43062259	-1	-34236513	1	-18562527	-1	-13516741	-1	-12224140	0	-58206484	0
51	11714737	0	56523200	0	-34468031	-1	99849339	-1	46251314	-1	96803701	-1
52	14175505	0	46726241	1	-24253598	-1	77589118	-1	14161104	0	60603610	0
53	69134147	-1	45923918	1	-85099746	-2	-37200151	-1	71996566	-1	33178039	0
54	51131921	-1	15932104	1	-46670832	-1	-85828965	-1	-10965433	0	-70748060	0
55	34143393	-2	-60560258	1	-98426387	-1	-16103477	0	-13193705	0	-83594562	0
56	92047032	-1	-49462845	1	-53120039	-1	71815290	-1	-14702207	0	-10021246	1
57	76498218	-1	-13837033	1	-48594285	-1	-32836643	-1	23433167	-1	70946326	-1
58	-26514865	-1	35120890	1	-45323365	-2	-14454860	0	74623993	-1	53027274	0
59	-86760171	-2	42452699	1	12764530	-1	-13829288	0	50054641	-1	45038058	0
60	75694946	-1	12065619	1	12554756	-2	-11312042	0	-31966847	-1	40879026	-1
61	10106453	0	-79340769	0	-72179409	-1	-10742687	0	-53543833	-1	39949797	-1
62	15695920	0	-10670106	1	-61033747	-1	-22123739	0	95196602	-2	96806432	0
63	34321999	0	-18746385	1	-20002940	-1	-13981166	1	-87692703	-1	27658274	1
64	-78897153	-1	-83957557	1	-63580218	-1	-19626289	0	-45654801	0	-27640085	1
65	-24132240	0	38446411	0	53858666	-1	-50389132	0	-66126232	-1	16186232	0
66	-21069019	0	19516804	1	73001272	-1	-20201182	0	-18599587	-1	20818831	0
67	-12121670	0	19982371	1	66099796	-1	-30401193	-1	-40122234	-1	11681248	0
68	38899268	-1	67342629	0	89671771	-1	-49021624	-1	22170388	0	21393410	1
69	12643591	0	72652177	0	11082625	0	64757807	-1	12068806	0	16190159	1
70	34419946	0	17145758	1	40156743	0	-91876486	0	16866690	1	13275723	2
71	89337514	-1	36472959	1	10000217	0	15559058	-1	-17078325	0	26695907	0
72	36536244	0	47633042	1	52247672	0	-23397036	0	60260855	0	62912083	1
73	-58385843	0	-80326240	1	12791449	0	-81547546	0	-24687800	0	-66333627	0

TABLE C25.- Continued

	7		8		9		10		11		12	
74	-52031709	0	-25256203	1	52783795	-1	-74879734	-1	21657578	-1	92240506	-1
75	-34139940	0	60504499	0	28046872	-1	15366892	0	25259582	-1	20107887	0
76	-21413588	-2	28715959	1	49709003	-1	35308386	0	-81403059	-1	-11404927	0
77	75931245	-1	38724169	1	88471514	-1	37181663	0	-15070232	0	-28482434	0
78	39418139	0	75843018	1	43419027	0	12187607	0	-32022424	0	27538376	0
79	-77068601	0	-24828822	1	-12059677	0	22831947	0	16101723	0	-13375148	0
80	-53217816	0	-14753106	1	-16989101	0	30450832	0	17239862	0	-36704573	-1
81	-26322637	0	-20343276	1	-24974815	0	48996555	0	20507742	0	-46913815	-1
82	15161260	0	-23735779	1	-15273233	0	-21234517	0	-25664160	0	-12539489	1
83	32868534	0	-12252827	1	-74692408	-1	-11425079	1	-21088165	1	-10354864	2
84	70701980	0	18942149	0	21359451	0	-57301518	1	-23772759	2	-12837337	3
85	-63262970	0	-41419063	1	-44090676	0	84894955	0	39607063	0	-17594605	0
86	-27282429	0	-45288004	1	-59374493	0	90601659	0	37778113	0	-35162536	0
87	43639322	0	-53127295	1	-27743104	0	-26829729	1	-79281806	0	-85948958	0
88	11426179	1	-23717033	1	75738700	0	-24439228	2	-20143909	1	28232021	2
89	-11875282	0	-11767295	2	-12786976	1	15133289	1	86327413	0	-26265508	0
90	34284896	0	-11052927	2	-10000858	1	-29460504	0	43790602	0	99153139	-1
91	11151927	1	-23184162	1	58297290	0	-69806827	1	-38823425	0	70867244	1
92	70524640	0	-11379635	2	-85736829	0	51050061	0	10001347	1	57692114	0
93	99999998	0	99999999	0	99999999	0	99999998	0	99999999	0	99999999	0
94	15813121	0	38619480	1	-41164747	-1	83515559	-1	94526097	-1	38644356	0
95	-26194138	0	-14237663	2	89458050	-1	33479803	0	22573004	0	19216675	0
96	-14274179	0	-12370803	2	-72682171	-2	11166401	-1	-75253413	-1	-87960655	0
97	-35522581	-1	-96198171	1	-55644510	-1	-21681678	0	-24024639	0	-11715554	1

TABLE C25.- Continued

	13		14		15		16	
1	-92024343	2	-10331737	3	-53086156	3	42547821	3
2	-68653765	2	-78388794	2	-26736339	3	17541327	3
3	19671384	2	23919557	2	-18073326	3	-37611264	1
4	37968361	2	45575708	2	-30947065	3	-37545402	2
5	73800373	2	88583420	2	-79399195	3	-61388583	3
6	-90439148	2	-10504376	3	-42358231	3	36159843	3
7	-66281969	2	-78669139	2	-26216433	3	19496450	3
8	22532247	2	24207005	2	-26308966	3	11710047	3
9	41238261	2	46607617	2	-36923602	3	13675698	3
10	73325026	2	85307925	2	-72264735	3	54607951	2
11	-92852703	2	-11353196	3	-19709175	3	-18402411	3
12	-71635819	2	-89365846	2	-20424999	3	-25839947	3
13	32656663	2	32328121	2	-76004423	2	16262449	3
14	53692110	2	57523574	2	-11588979	3	36571460	3
15	88321750	2	99565559	2	-19037988	3	81733049	3
16	-75881423	2	-10121327	3	52605065	3	-12583652	4
17	-44755205	2	-65084670	2	55197128	3	-81515466	3
18	33632648	2	27429744	2	53010146	3	20234366	3
19	50150831	2	46482832	2	58422031	3	36830543	3
20	86468354	2	88121016	2	88384242	3	74090123	3
21	-26302290	1	28997548	2	27765259	-1	-34070324	-2
22	-38788830	1	49735387	2	-18056949	0	15641124	0
23	15512885	2	-15026102	3	47565643	0	-30582543	0
24	-84912086	1	97215084	2	16549857	0	-12006005	0
25	-48894736	1	64568731	2	-30276045	0	11591458	0
26	18187743	2	-18166489	3	-10823430	0	74509570	-1
27	-18336802	2	21597939	3	70542488	0	-41892608	0
28	-63074322	1	79952858	2	-24085758	-1	11844517	-1
29	23150214	2	-25377339	3	-45936145	0	32931371	0
30	-23431531	2	26058788	3	71309372	0	-46746249	0
31	-49583489	1	46123025	2	-19714141	0	27655848	0
32	21630581	2	-26173040	3	-62109657	0	35039402	0
33	-18691083	2	17636614	3	73174156	0	-47506082	0
34	39692922	0	-52492405	2	-54608805	0	48371304	0
35	57407583	1	-10141682	3	-44404390	0	-87798100	-1
36	17211574	1	-13293936	2	-45751377	1	-77011564	0

TABLE C25.- Continued

	13		14		15		16	
37	10386513	1	11141613	2	15562174	2	-29048505	1
38	59535651	0	40803025	1	18572536	2	-21425430	1
39	39711385	0	-57146490	1	11488608	2	-14110121	1
40	-92596947	-1	-12720878	1	20428233	1	-35273810	0
41	-61264468	-1	-64807567	0	-30057765	1	28907651	0
42	-13748251	0	21577077	1	-24923935	1	17372329	-1
43	30639426	-1	16964119	0	-21449663	0	-22013588	-1
44	78023711	-1	-17123757	1	18645698	1	20609764	0
45	-13945437	-1	11186689	1	26164540	1	84444733	-1
46	-90609334	-1	10562565	1	79666558	0	25049674	0
47	-21370176	0	-95391868	0	-42729889	1	62528513	0
48	-82208473	0	78173527	1	-64297401	1	65077074	0
49	-42761627	0	48485047	1	-40311527	1	43682219	0
50	-34427336	0	31486791	1	-37839799	1	59411403	0
51	-79108726	-1	-40533122	0	-15134744	1	49310400	0
52	21494703	0	-30541132	1	21060348	1	76641266	-1
53	29320745	0	-12168291	1	34582359	1	-76704388	0
54	-93799629	-1	46382622	1	23753794	1	-83994041	0
55	-37557339	0	41548312	1	-20576496	1	-16176545	0
56	-66559988	0	55281683	1	-49670104	1	13194366	1
57	-18284190	0	-66302744	0	-23783064	1	10737707	1
58	35186278	0	-25008838	1	21525484	1	-56034438	0
59	38342177	0	-20518038	1	31755432	1	-81178471	0
60	57830831	-1	-51581895	0	97453217	0	13350160	0
61	22108956	-1	-15825740	1	-16713984	0	-13326728	0
62	32812106	0	-84758409	1	-78264079	0	39333016	0
63	13791672	1	-22255560	2	-18093276	1	45893589	0
64	-14504445	1	16355639	2	-59117917	1	28684168	1
65	26499356	0	-27638229	0	92655898	0	-12821252	0
66	28260203	0	-48394641	0	15249271	1	-54371650	0
67	20605793	0	-62318882	0	13354082	1	-39952556	0
68	73438750	0	-14726550	2	-10779596	1	67701939	0
69	50511313	0	-11826316	2	-14721906	1	11691510	1
70	45823912	1	-86511124	2	-46775568	1	29045285	1
71	29500585	0	-36021661	1	38022083	0	36917040	0
72	22647136	1	-41589947	2	-38183648	1	34087214	1
73	-33093292	0	44175768	1	-37066977	1	18794055	1

TABLE C25.- Concluded

	13		14		15		16	
74	52769677	-2	-31612728	-2	-11937555	1	-10582052	0
75	15578110	0	-13360702	1	-28569407	-2	-75850364	0
76	-55933146	-1	-69776625	0	-84967307	-1	56934141	0
77	-28258655	-1	15634623	0	77637131	-1	55262537	0
78	39995106	0	-37201648	1	-61707474	0	25682127	1
79	10412392	0	26586213	1	13318702	1	-33466273	1
80	15662675	-1	10232253	1	10321229	1	-25651914	1
81	-26913487	0	-24228571	0	-33292279	0	-11974196	1
82	-57012190	0	52743796	1	-14906566	1	11403617	1
83	-28418781	1	61315472	2	17482363	1	58595956	0
84	-36197746	2	79875335	3	26728226	2	-84380568	1
85	-49218628	0	12875635	1	92584287	-2	-28009534	1
86	-85452987	0	29686221	0	-11515462	1	-11805333	1
87	70988506	0	-16428195	1	13764372	1	-32117621	0
88	20648725	2	-20833717	3	21732203	2	-11119269	2
89	-17587952	1	-29677757	1	-31689576	1	-10985970	1
90	-66032087	0	-68897413	1	-16265838	1	-70997298	0
91	59845110	1	-51575824	2	67789040	1	-21551564	1
92	-60388398	0	-75202497	1	-12325601	1	-72435133	0
93	99999999	0	99999999	0	99999999	0	99999999	0
94	78258634	-1	-19769755	1	10209772	1	37341203	0
95	-45583910	0	-91066437	0	-73784255	1	90300018	0
96	-63193781	0	46698579	1	-60141869	1	60345279	0
97	-58486576	0	55673311	1	-48266980	1	55514904	0

TABLE C26.- SYMMETRIC STRUCTURAL MODES, CASE P9

CP \ Mode	1		2		3		4		5		6	
1	12488719	1	-54075159	-1	44622346	0	-11803182	-2	-15568273	-1	42098342	0
2	11007709	1	-42087002	-1	25714560	0	-22797534	-1	-44293649	-1	54574154	0
3	86813958	0	-21499811	-1	-10662498	0	-33456203	-1	-68807171	-1	69913922	0
4	83359667	0	-16126916	-1	-16923662	0	-39214162	-1	-79666337	-1	78996071	0
5	72654522	0	-81185445	-2	-36740192	0	-39083181	-1	-91157810	-1	90865598	0
6	12204583	1	-44259499	-1	63842017	0	-12440065	0	-15497571	0	99557939	0
7	11087293	1	-34347191	-1	52687717	0	-14111806	0	-17828240	0	11511314	1
8	88322533	0	-15930471	-1	15310714	0	-15894613	0	-21703791	0	14408787	1
9	85790654	0	-11868303	-1	99394087	-1	-16004474	0	-21945447	0	14393595	1
10	75941834	0	-28391648	-2	-30835531	-1	-16933726	0	-24121566	0	16346521	1
11	11864164	1	-31676230	-1	98885098	0	-29379448	0	-34587220	0	18249123	1
12	11130355	1	-24168148	-1	95923682	0	-30838428	0	-36472462	0	19527420	1
13	92902994	0	-78440920	-2	56561543	0	-33415492	0	-41328797	0	22420849	1
14	89342412	0	-39988777	-2	48244045	0	-33927412	0	-42390049	0	23139353	1
15	79563254	0	30721777	-2	40964534	0	-35194460	0	-44924601	0	25378414	1
16	11664765	1	-17215985	-1	15393817	1	-52230428	0	-60578767	0	30005012	1
17	10855534	1	-84712652	-2	14545139	1	-52650779	0	-61853433	0	31501816	1
18	96203764	0	24756472	-2	10638628	1	-53186975	0	-64351542	0	33496407	1
19	93661691	0	60272317	-2	97963721	0	-54281922	0	-65840321	0	33722191	1
20	86935852	0	11685350	-1	89430745	0	-56790462	0	-69253436	0	35062515	1
21	82483592	-1	23374493	-1	59881543	-1	44286776	0	-12869128	0	-32224093	0
22	52969893	-1	55404287	-1	28667979	0	55869811	0	-12346567	0	-28820944	0
23	41304011	-1	10938981	0	89727694	0	19370865	1	-35516808	0	-51017168	0
24	18498679	0	84315724	-1	38363585	0	10022018	1	-26934025	0	-60472231	0
25	89306483	-1	12226115	0	74343854	0	14334567	1	-28084303	0	-52718990	0
26	63522797	-1	18273897	0	13769601	1	26733454	1	-46898193	0	-68509607	0
27	23793792	0	14275539	0	72116269	0	16975637	1	-34832457	0	-65480439	0
28	14294932	0	18946100	0	11308298	1	24563193	1	-44339625	0	-69729031	0
29	10497128	0	25867323	0	19555133	1	38376517	1	-65091003	0	-89835757	0
30	28368305	0	23064291	0	12719008	1	28978938	1	-50697316	0	-77538436	0
31	20030265	0	27711524	0	17126358	1	36376484	1	-60068440	0	-83049160	0
32	14105531	0	35492709	0	25774088	1	49776689	1	-80150060	0	-10305307	1
33	35468518	0	35751678	0	22826711	1	48933451	1	-80820354	0	-10703620	1
34	27397677	0	39508280	0	27275543	1	54986064	1	-86790594	0	-11271671	1
35	19042004	0	51671650	0	35526188	1	70019906	1	-11316233	1	-13592545	1
36	24535309	1	-18471651	0	33889817	1	-87718579	-1	73152820	-1	-16878245	1

TABLE C26.- Continued

	1		2		3		4		5		6	
37	16030634	1	-93626451	-1	12685257	1	-19744509	-1	32368148	-1	-43033251	0
38	85441277	0	-27999142	-1	-24959549	0	35709895	-1	80291894	-2	39403207	0
39	17262037	0	25048974	-1	-10093442	1	48973577	-1	-13008227	-2	49519484	0
40	-32834105	0	48298025	-1	-95631774	0	30167885	-1	-12643477	-2	14620286	0
41	-49263506	0	46178193	-1	-53737882	0	-11373146	-1	-15069871	-1	-62841864	-1
42	-51797669	0	21725195	-1	51363461	-1	-16323216	-1	36386367	-2	-37621647	0
43	-43403648	0	-12960470	-1	43828224	0	-10303665	-1	11182059	-1	-34106690	0
44	-23065143	0	-46199355	-1	55279981	0	18905636	-1	22717096	-1	-12331355	0
45	-41809570	-2	-75437338	-1	23277514	0	61874738	-1	34587530	-1	64234077	-1
46	21648500	0	-10244287	0	-28286448	0	12113823	0	53335708	-1	26169028	0
47	43081555	0	-13766656	0	-85401622	0	19012889	0	72917699	-1	55669637	0
48	63100991	0	-17445914	0	-14517142	1	25119426	0	87610110	-1	75660905	0
49	-65383799	0	45340912	-1	-17692960	0	-52838356	-1	-25628968	-1	-43772713	0
50	-64332230	0	26344862	-1	22173507	0	-36492305	-1	-51567435	-2	-45058358	0
51	-53431346	0	-68687660	-2	64271984	0	-12105874	-1	15391650	-1	-32791681	0
52	-26922326	0	-41026667	-1	62571422	0	21659133	-1	25825268	-1	-47498698	-1
53	60754420	-2	-68312481	-1	21760961	0	59872167	-1	34045446	-1	12237367	0
54	22263009	0	-86099954	-1	-29052501	0	85007958	-1	35780429	-1	92715770	-1
55	46190412	0	-10950149	0	-89432736	0	11239231	0	34986134	-1	47382700	-1
56	-67354624	0	28874199	-1	33335031	0	-24746830	-1	46324079	-2	-40792549	0
57	-51686429	0	-27058462	-2	75492641	0	-22319556	-1	25964649	-2	-71003799	-1
58	-23409818	0	-30321202	-1	75408761	0	75182753	-3	75880078	-2	26756402	0
59	18281055	-1	-47148902	-1	32380616	0	20785582	-1	93822174	-2	22064546	0
60	24755104	0	-41229275	-1	-20952316	0	20576526	-1	24752167	-2	-43178390	-1
61	49848653	0	-34594640	-1	-81310556	0	46091423	-2	-11739031	-1	-44649794	0
62	70715315	0	13788101	-1	-11181901	1	-69325235	-1	-52340556	-1	-86403788	0
63	84666029	0	94027620	-2	-17315059	1	-97820931	-1	-69711367	-1	-15554003	1
64	-54376478	0	42295192	-2	11142634	1	-50661936	-1	-35391945	-1	69069226	0
65	-24442657	0	-11871850	-1	11643155	1	-35820442	-1	-26914542	-1	96887087	0
66	42642937	-1	97814119	-2	59977029	0	-47480207	-1	-34098643	-1	61347771	0
67	35392957	0	45298211	-1	-22929030	-1	-77929141	-1	-49577086	-1	87347204	-1
68	64819753	0	77788736	-1	-70751059	0	-12646168	0	-76070986	-1	-63701306	0
69	76246877	0	89593709	-1	-10158416	1	-14954582	0	-88872105	-1	-10011244	1
70	96984495	0	93081285	-1	-16285593	1	-20317112	0	-11564656	0	-18521240	1
71	86681810	0	18271001	0	-87801758	0	-24238085	0	-12629942	0	-12094236	1
72	10513408	1	20311335	0	-14194723	1	-29701852	0	-15143993	0	-20912826	1
73	-24428022	0	22582087	-1	17442866	1	-10170858	0	-94430924	-1	21865403	1

TABLE C26.- Continued

	1		2		3		4		5		6	
74	11536223	0	11880508	0	10210481	1	-14663280	0	-93943668	-1	12727629	1
75	43380954	0	17774190	0	30573261	0	-18247095	0	-96110311	-1	32478761	0
76	79332474	0	24692489	0	-38188646	0	-24412332	0	-11363760	0	-76417747	0
77	92231011	0	26887329	0	-66588512	0	-26112004	0	-11563872	0	-11553039	1
78	11441878	1	32801310	0	-11824663	1	-34272391	0	-14735153	0	-22144555	1
79	-18496431	-1	49848675	-1	86509688	0	-56398344	-1	-51731959	-1	16005085	1
80	92394187	-1	10085684	0	60876149	0	-69451667	-1	-40006625	-1	10117677	1
81	25441783	0	15465144	0	34867493	0	-82548568	-1	-27625985	-1	39089935	0
82	40817318	0	19517610	0	88736646	-1	-81784469	-1	-78077811	-2	-26512386	0
83	48033694	0	22026207	0	-62838347	-1	-67620210	-1	11785956	-1	-53442509	0
84	57259978	0	25222827	0	-33850713	0	-68069485	-1	59531677	-2	-96221700	0
85	12753807	0	17795731	0	84818212	0	-88911004	-1	-40318997	-1	12994861	1
86	31442039	0	25623504	0	68406265	0	-11056252	0	-23241674	-1	56700335	0
87	56832102	0	36731416	0	26619879	0	45370329	-1	13503977	0	-20055067	0
88	69767641	0	43366452	0	-28934058	-1	17601133	0	26441918	0	-41866582	0
89	39101782	0	39495895	0	10752001	1	10672971	-1	97460812	-1	93513131	0
90	56937737	0	51088486	0	90195296	0	18230260	0	26482398	0	53404135	0
91	88609682	0	67743224	0	50942558	0	63696029	0	66677220	0	14837021	0
92	74281559	0	85784977	0	12356496	1	55528884	0	63006055	0	87087870	0
93	99999999	0	99999998	0	99999999	0	99999998	0	99999999	0	99999999	0
94	-41006668	0	-24203039	-1	71976641	0	-64612035	-2	14220521	-1	-19036479	0
95	62797035	0	-14330816	0	-13692787	1	20674140	0	62414831	-1	77564048	0
96	63394538	0	-13894830	0	-13305003	1	15825470	0	40272050	-1	36953989	0
97	63718110	0	-10383208	0	-12462973	1	79843606	-1	44222085	-2	-62479441	-1

TABLE C26.- Continued

	7		8		9		10		11		12	
1	51568455	0	14638649	2	38983894	-1	-74934514	0	-86502589	0	-87715542	1
2	63427764	0	13782458	2	25794997	-1	-46713267	0	-60319751	0	-63707153	1
3	71452643	0	11909444	2	-11783781	-1	10554772	0	88680531	-1	14787252	1
4	80741810	0	12076987	2	-19783711	-1	20837051	0	21577702	0	30307696	1
5	91412628	0	13341268	2	-43188105	-1	42994457	0	46067264	0	59880386	1
6	16770577	1	-91724555	1	10523051	0	-30488987	0	-71572963	0	-81541365	1
7	17775858	1	-97424553	1	82745841	-1	-71131044	-1	-46672033	0	-57650180	1
8	19751607	1	-13616628	2	30795809	-1	48182099	0	22420293	0	21088434	1
9	20016653	1	-14429569	2	21722439	-1	57394137	0	34438101	0	36545428	1
10	21961210	1	-16369706	2	-55225049	-2	78754227	0	56560734	0	62734362	1
11	32883432	1	-42428937	2	18108458	0	29582403	0	-51925208	0	-76139661	1
12	34058813	1	-44413960	2	15963489	0	47300769	0	-33094258	0	-56711993	1
13	36991870	1	-53153377	2	99111499	-1	10561737	1	43042752	0	34053854	1
14	37845009	1	-53774161	2	84704575	-1	11611391	1	56534141	0	51405086	1
15	40155861	1	-58253956	2	56554209	-1	13780196	1	79313586	0	79226058	1
16	55737605	1	-93120315	2	26360094	0	12799587	1	-95836820	-1	-51810683	1
17	56414615	1	-94333311	2	22437439	0	14497346	1	15105427	0	-24250550	1
18	57459361	1	-97848485	2	16481471	0	18003431	1	68848038	0	42608450	1
19	58850015	1	-10072443	3	15693821	0	19120480	1	81077451	0	57160211	1
20	61725072	1	-10946356	3	13951360	0	21936492	1	11042148	1	89683480	1
21	-26471712	-1	56867795	0	-11438013	-1	-29145895	0	30996402	1	94732578	1
22	-12549659	-2	64094574	0	16646792	-1	-45229809	0	11554004	2	40080512	1
23	-13568998	0	33428020	1	17175915	-1	-50853799	0	22775764	2	-93703146	2
24	-60096168	-1	97011760	0	-22588659	-1	-82386085	0	11091977	2	27389560	2
25	-43721770	-1	96670670	0	33647004	-1	-76501874	0	18341049	2	20720977	1
26	-14641251	0	29673798	1	25287405	-1	-28344878	0	19320889	2	-10224830	3
27	-46214028	-1	33343727	0	-11044549	-1	-14826429	1	27039189	2	52035714	2
28	-92625979	-1	13927050	1	43621017	-1	-77062121	0	17856252	2	86478201	1
29	-21225860	0	32920309	1	17113794	-1	58743687	0	-49682519	1	-95722152	2
30	-85171727	-1	-67744702	-1	-22593907	-1	-11018839	1	15255999	2	89043844	2
31	-13228806	0	98733200	0	21199187	-1	22767979	0	-96284689	1	32738540	2
32	-27534410	0	35314062	1	-10117990	-1	18723310	1	-41741782	2	-49294725	2
33	-22236798	0	66542377	0	-98036137	-1	83995070	0	-36630833	2	12269176	3
34	-26262881	0	11939406	1	-56716518	-1	23118581	1	-68979694	2	74334128	2
35	-38509956	0	34029696	1	-51930689	-1	30797466	1	-74162445	2	45704691	2
36	-53701519	0	-63336097	2	59324715	-1	11106528	1	72153599	0	26543375	1

TABLE C26.- Continued

	7		8		9		10		11		12	
37	-10818308	0	42543207	1	36551110	-1	-65390281	0	-49456529	0	-16446017	1
38	23422192	-1	24750087	2	-48270416	-1	-23123449	0	-13939935	0	-53156862	0
39	-63159226	-1	15130783	2	-55763210	-1	32325718	0	30014463	0	10657349	1
40	-98524089	-1	-50683236	1	71961895	-2	17172147	0	93212954	-1	20932992	0
41	-12213544	0	-16507217	2	62853038	-1	-29310578	0	-10308798	0	-14460552	-1
42	-76903329	-2	-72019658	1	15889829	-1	-39814895	-1	-94192168	-1	-37888106	0
43	85491192	-1	42912832	1	-55524525	-2	68484390	-1	11868797	-1	37049579	-1
44	15407716	0	11710139	2	-28341043	-1	21839719	0	14052985	0	41109415	0
45	14041547	0	10802323	2	40342030	-3	14824928	0	56567390	-1	-41587753	-1
46	56622280	-1	92566410	0	66617440	-1	24203826	0	10556441	0	33446704	-2
47	-13217756	0	-22031092	2	11426920	0	33462079	0	22274344	0	32078421	0
48	-22890061	0	-35297390	2	11325284	0	44099027	0	38568303	-1	-11415205	1
49	-38509324	-1	-13696593	2	-38636487	-2	-13861134	0	-23260548	0	-94727355	0
50	34477272	-1	-90536098	1	-19263910	-1	-13051986	-1	-12243159	0	-59787659	0
51	11459701	0	14240684	1	-34432270	-1	95837468	-1	45960579	-1	99794253	-1
52	14684124	0	12274271	2	-23493426	-1	73767522	-1	14160742	0	62359381	0
53	75182593	-1	12090822	2	-76623033	-2	-37548390	-1	71929462	-1	34121081	0
54	52162371	-1	41096016	1	-46003234	-1	-87859803	-1	-11171009	0	-73151228	0
55	-49249164	-2	-16152357	2	-98670031	-1	-16145365	0	-13349201	0	-86303760	0
56	83377594	-1	-13098964	2	-54062945	-1	69830535	-1	-14779098	0	-10294212	1
57	77756044	-1	-35926627	1	-49064251	-1	-28709508	-1	25545104	-1	82012857	-1
58	-15966244	-1	94709340	1	-43672416	-2	-13496615	0	78002158	-1	55715812	0
59	-39895402	-3	11301900	2	13300740	-1	-13197821	0	51812305	-1	46847279	0
60	74594484	-1	30542248	1	17715421	-2	-11255247	0	-32651247	-1	38585320	-1
61	88857220	-1	-24070529	1	-71374814	-1	-11631151	0	-57011237	-1	27160045	-1
62	13611464	0	-33022683	1	-59854873	-1	-23215133	0	58301278	-2	97538240	0
63	30615183	0	-59266577	1	-17002495	-1	-13878508	1	-87613262	-1	28264796	1
64	-67212173	-1	-21697485	2	-66070407	-1	-17247288	0	-45171955	0	-28131770	1
65	-21856852	0	16465820	1	52667587	-1	-46813500	0	-56170932	-1	20169771	0
66	-19546562	0	55996962	1	72256174	-1	-18151336	0	-12935930	-1	23224292	0
67	-11794251	0	54388174	1	65886131	-1	-24428676	-1	-39000195	-1	12065694	0
68	25275082	-1	15122045	1	90123247	-1	-52593700	-1	22168634	0	21858988	1
69	10507856	0	14370745	1	11160343	0	52655755	-1	11721042	0	16391201	1
70	30468778	0	34063119	1	40403916	0	-90385284	0	17006064	1	13636024	2
71	67459557	-1	92062658	1	10118419	0	13359173	-2	-17697845	0	24376421	0
72	32495035	0	11425964	2	52456717	0	-23758886	0	60262499	0	64282562	1
73	-54235385	0	-19844419	2	12366954	0	-74231321	0	-22674400	0	-60988463	0

TABLE C26.- Continued

	7		8		9		10		11		12	
74	-49383304	0	-56128988	1	49833945	-1	-41874890	-1	32640149	-1	13167334	0
75	-33275422	0	21673743	1	26606129	-1	16174613	0	28631416	-1	21486342	0
76	-14452901	-1	74635509	1	49865576	-1	33653067	0	-86530230	-1	-14090589	0
77	55905806	-1	98792102	1	89195298	-1	34911130	0	-15860948	0	-32751159	0
78	35470688	0	18914788	2	43650462	0	10068951	0	-33158781	0	22499616	0
79	-73848948	0	-51507129	1	-12386523	0	25018846	0	17092042	0	-98886661	-1
80	-51118632	0	-28908336	1	-17213325	0	31133431	0	17797002	0	-14611387	-1
81	-25528670	0	-48050527	1	-25119125	0	47787621	0	20568200	0	-42076700	-1
82	14490165	0	-64038600	1	-15252496	0	-21574510	0	-25687075	0	-12923742	1
83	31602710	0	-37203250	1	-73016959	-1	-11287951	1	-21225431	1	-10661035	2
84	68108704	0	-90604247	0	22022180	0	-56414663	1	-23944253	2	-13215785	3
85	-60652716	0	-95884851	1	-44419515	0	83766417	0	40054210	0	-15552179	0
86	-26137020	0	-11136549	2	-59578858	0	87414924	0	37562056	0	-35335576	0
87	42521938	0	-14555999	2	-27450586	0	-28245509	1	-76388645	0	-84914211	0
88	11119622	1	-88417125	1	78064685	0	-23785287	2	-18708958	1	29396868	2
89	-10490025	0	-30067108	2	-12813894	1	14443424	1	85939046	0	-25743798	0
90	34401472	0	-29069606	2	-10000163	1	-31918837	0	43912977	0	12325273	0
91	10986162	1	-80869675	1	59075797	0	-67929173	1	-34975450	0	73760308	1
92	70648103	0	-30421391	2	-85746208	0	46562551	0	99865270	0	59968091	0
93	99999999	0	99999999	0	99999999	0	99999999	0	99999999	0	99999998	0
94	16079631	0	10124525	2	-40528809	-1	78628186	-1	94144495	-1	39746870	0
95	-26599285	0	-37463740	2	86445917	-1	34267383	0	22916425	0	20245121	0
96	-15226121	0	-32716079	2	-91072524	-2	16741924	-1	-74803808	-1	-90434724	0
97	-49927307	-1	-25611811	2	-56423613	-1	-21391708	0	-24165843	0	-12099009	1

TABLE C26.- Continued

	13		14		15		16	
1	-92812803	2	-90830491	2	-55425085	3	41867484	3
2	-69240338	2	-68887752	2	-27916177	3	17260602	3
3	19830677	2	20949480	2	-18878980	3	-37010877	1
4	38280837	2	39951757	2	-32320462	3	-36956358	2
5	74410875	2	77679048	2	-82903515	3	-60417088	3
6	-91205436	2	-92280755	2	-44219010	3	35580298	3
7	-66840874	2	-69090517	2	-27367894	3	19183092	3
8	22723673	2	21233578	2	-27471353	3	11521506	3
9	41585745	2	40888029	2	-38554805	3	13455449	3
10	73940335	2	74828100	2	-75452077	3	53685733	2
11	-93625011	2	-99635972	2	-20561864	3	-18115492	3
12	-72227959	2	-78414709	2	-21310057	3	-25434810	3
13	32945045	2	28416160	2	-79325777	2	16000936	3
14	54156795	2	50521931	2	-12099804	3	35987241	3
15	89077372	2	87388099	2	-19881371	3	80430799	3
16	-76487785	2	-88695259	2	54949165	3	-12383965	4
17	-45098560	2	-56982360	2	57649952	3	-80222355	3
18	33948233	2	24212126	2	55353570	3	19911661	3
19	50605886	2	40950839	2	61001107	3	36244868	3
20	87232816	2	77525004	2	92276715	3	72915082	3
21	-27018699	1	25168521	2	26152655	-1	-76976347	-3
22	-39790935	1	42989385	2	-18939004	0	15391218	0
23	15943150	2	-13077172	3	49375503	0	-30064214	0
24	-87193099	1	84266176	2	17168620	0	-11726042	0
25	-50145128	1	55775667	2	-31323857	0	11237470	0
26	18690165	2	-15798277	3	-11379589	0	73254957	-1
27	-18823856	2	18704393	3	73463977	0	-41416434	0
28	-64707672	1	69123908	2	-20673411	-1	92748620	-2
29	23776073	2	-22015918	3	-47910294	0	32542723	0
30	-24061233	2	22597066	3	74441125	0	-46247553	0
31	-50962554	1	40180497	2	-20199715	0	27109659	0
32	22199363	2	-22651397	3	-64725234	0	34685443	0
33	-19213784	2	15360851	3	76003102	0	-46734177	0
34	37841110	0	-44501769	2	-56792478	0	47760880	0
35	58691011	1	-87147612	2	-46157141	0	-86566712	-1
36	17295035	1	-11427593	2	-48587914	1	-73449841	0

TABLE C26.- Continued

	13		14		15		16	
37	10280005	1	95158888	1	16104352	2	-28347694	1
38	59163220	0	34911295	1	19273236	2	-20884115	1
39	40433635	0	-48809583	1	11957534	2	-13776100	1
40	-89139882	-1	-10812481	1	21743602	1	-34775378	0
41	-54876379	-1	-58787774	0	-30536790	1	27260672	0
42	-13865308	0	18516072	1	-25657644	1	14092200	-1
43	30080293	-1	15173497	0	-22856353	0	-21265498	-1
44	78044827	-1	-14626808	1	19124805	1	20429642	0
45	-16876405	-1	96699500	0	26948821	1	83600684	-1
46	-92985752	-1	91887359	0	81950865	0	24340100	0
47	-21122472	0	-82955782	0	-44101745	1	60094982	0
48	-83027260	0	66946259	1	-66343803	1	62239885	0
49	-43165920	0	41530973	1	-41445519	1	42433645	0
50	-34766166	0	26946287	1	-39085735	1	58067846	0
51	-79132700	-1	-35822682	0	-15758997	1	48306425	0
52	21848360	0	-26314538	1	21697450	1	73968132	-1
53	29595503	0	-10495584	1	35769415	1	-75645625	0
54	-99619848	-1	39911172	1	24518925	1	-82551427	0
55	-38223715	0	35800740	1	-21407997	1	-15901957	0
56	-67309621	0	47237930	1	-51380576	1	12931125	1
57	-18005548	0	-62618281	0	-24534907	1	10445050	1
58	36071606	0	-22116119	1	22499568	1	-56677821	0
59	38970437	0	-17884478	1	33002804	1	-80801439	0
60	57295648	-1	-42205499	0	10024065	1	13007450	0
61	18138247	-1	-12715648	1	-20297005	0	-11965918	0
62	32890243	0	-71303283	1	-85253947	0	40674615	0
63	13965714	1	-18907484	2	-19397237	1	48661055	0
64	-14615720	1	13836837	2	-60561209	1	27775730	1
65	28099085	0	-42600027	0	10400333	1	-17178397	0
66	29298496	0	-50929986	0	16342340	1	-56629678	0
67	20932343	0	-52743015	0	14079835	1	-40718947	0
68	74639011	0	-12516003	2	-11326178	1	67212262	0
69	50865827	0	-99667812	1	-15604419	1	11666957	1
70	46751882	1	-73943293	2	-49144706	1	28939001	1
71	28849811	0	-28873913	1	36156311	0	38026810	0
72	22972700	1	-35342869	2	-40295433	1	33889887	1
73	-30703128	0	33967718	1	-36601206	1	17508896	1

TABLE C26.- Concluded

	13		14		15		16	
74	22494896	-1	-19776515	0	-11185336	1	-16764182	0
75	16367880	0	-11757391	1	56269919	-1	-77759172	0
76	-63449488	-1	-45172857	0	-97932917	-1	56320684	0
77	-40707607	-1	34527942	0	49697176	-1	55818181	0
78	38332073	0	-28239211	1	-71458563	0	25645855	1
79	12163300	0	20637126	1	15042839	1	-33518315	1
80	26924878	-1	74692208	0	11503046	1	-25626991	1
81	-26646023	0	-24936892	0	-31326504	0	-11957257	1
82	-58034299	0	45411290	1	-15528726	1	11217112	1
83	-29182604	1	52615293	2	18058788	1	57879955	0
84	-37151150	2	68502822	3	27805738	2	-83559838	1
85	-48271201	0	94222409	0	97261242	-1	-28004519	1
86	-85545999	0	18249147	0	-11660526	1	-11808128	1
87	72312640	0	-15249650	1	14453922	1	-31900310	0
88	21054124	2	-17976945	3	22863645	2	-11011833	2
89	-17622744	1	-26765870	1	-32863780	1	-10926829	1
90	-65371449	0	-60340119	1	-17045909	1	-69650415	0
91	60883099	1	-44469775	2	70731478	1	-21203591	1
92	-59975396	0	-65143241	1	-13215907	1	-69735908	0
93	99999998	0	99999999	0	99999999	0	99999999	0
94	79874219	-1	-17070585	1	10448034	1	36641617	0
95	-45219600	0	-80929144	0	-76079266	1	86604999	0
96	-63754418	0	40022241	1	-62170358	1	58197921	0
97	-59426923	0	48071222	1	-50059103	1	54373314	0

TABLE C27.- SYMMETRIC STRUCTURAL MODES, CASE P10

CP \ Mode	1		2		3		4		5		6	
1	81054715	0	-92376009	-1	13888240	1	72021665	-1	-13240668	-1	99919860	-1
2	73151794	0	-66194008	-1	43867688	0	17047318	-1	-49595416	-1	85443255	-1
3	60402957	0	-36851024	-1	-13925361	1	-50077669	-1	-82265874	-1	66126331	-1
4	58597589	0	-37121668	-1	-15760927	1	-58339901	-1	-98021014	-1	76213282	-1
5	52845909	0	-47256049	-1	-28057841	1	-99578531	-1	-13733352	0	82455470	-1
6	80043106	0	-82773010	-1	90075143	0	63672240	-2	-75329693	-1	40001329	-1
7	73190344	0	-60178422	-1	-44898786	0	-37370611	-1	-10140337	0	39639840	-1
8	60322956	0	-35180769	-1	-17220519	1	-85794451	-1	-14307229	0	47055632	-1
9	58747743	0	-34857118	-1	-19888886	1	-95760387	-1	-15797942	0	55838643	-1
10	52975830	0	-44850264	-1	-30761617	1	-12524122	0	-17148136	0	37434937	-1
11	78761475	0	-70418310	-1	-32908721	-1	-72901148	-1	-14628052	0	-29683621	-1
12	73278053	0	-53031612	-1	-11389766	1	-93251916	-1	-14916822	0	-28283134	-1
13	61223856	0	-33949012	-1	-21703550	1	-12588984	0	-17516022	0	-29579811	-1
14	59093980	0	-34380452	-1	-24239112	1	-12973142	0	-17694346	0	-29772243	-1
15	53234068	0	-43931223	-1	-35131161	1	-15096517	0	-19315692	0	-29206426	-1
16	77474261	0	-59506687	-1	-10877593	1	-14203591	0	-21268032	0	-11805776	0
17	70307007	0	-39618070	-1	-20883435	1	-16529358	0	-22307857	0	-11270694	0
18	60855950	0	-32728119	-1	-28584350	1	-18586562	0	-23879094	0	-11092139	0
19	59352392	0	-32501945	-1	-30742306	1	-19153773	0	-22959298	0	-13085228	0
20	54348554	0	-40770062	-1	-39039498	1	-20935189	0	-21279759	0	-17827593	0
21	50887291	-1	40505628	-1	-60875682	0	75754679	0	-85336031	-1	-99421743	-1
22	29278400	-1	40134313	-1	-83793289	0	93990261	0	-86313358	-1	-89833039	-1
23	-91543063	-2	79050702	-1	-30778118	1	32410115	1	-24493003	0	-11300444	0
24	10531673	0	78764666	-1	-15539469	1	17364903	1	-18025453	0	-17367257	0
25	63044868	-1	99661027	-1	-22873324	1	24068429	1	-18512631	0	-14002419	0
26	17440019	-1	14324697	0	-43887882	1	44269456	1	-35281908	0	-15021343	0
27	13590310	0	13235232	0	-29919907	1	28463458	1	-22225455	0	-18595236	0
28	94003277	-1	16374998	0	-41948531	1	40456690	1	-32860628	0	-19253722	0
29	46536839	-1	21825405	0	-65272830	1	62786518	1	-54903762	0	-19963999	0
30	16151449	0	19279310	0	-54937644	1	47325529	1	-39227650	0	-22322704	0
31	12213764	0	22281291	0	-67495689	1	58863713	1	-52617001	0	-22399896	0
32	78671659	-1	27544836	0	-90646021	1	80485047	1	-75949434	0	-22820293	0
33	18482674	0	26526095	0	-95860425	1	79167507	1	-72217892	0	-28011543	0
34	14716630	0	29485429	0	-10785664	2	88637155	1	-84355083	0	-27493647	0
35	12022472	0	34047412	0	-13096861	2	11223661	2	-11239934	1	-35383151	0
36	15146354	1	-20918684	0	12898524	2	36754096	0	32179596	0	-26761961	0

TABLE C27.- Continued

	1		2		3		4		5		6	
37	10624489	1	-11635617	0	54705058	1	96476339	-1	38338228	-1	-40527596	-1
38	57555132	0	-39360366	-1	-68585310	0	-22190616	-1	-69716699	-1	10100126	0
39	11202658	0	27504021	-1	-34753018	1	-87764846	-1	-86148228	-1	86955718	-1
40	-16021065	0	54008490	-1	-32954923	1	-80491640	-1	-39440752	-1	14087646	-1
41	-26324873	0	51020119	-1	-20359067	1	-45153288	-1	37496863	-2	-35018011	-1
42	-29776217	0	23116502	-1	12072324	0	22674357	-1	68342333	-1	-60062531	-1
43	-24923931	0	-11452454	-1	16860472	1	59952897	-1	68201926	-1	-35551047	-1
44	-13211001	0	-49262556	-1	17761699	1	78089015	-1	52731459	-1	53143745	-2
45	-83811453	-2	-79273141	-1	28984275	0	64786399	-1	32181968	-1	34013199	-1
46	13847692	0	-10411493	0	-15223147	1	50010355	-1	10333078	-1	53865346	-1
47	27895663	0	-12739233	0	-40400334	1	46564172	-1	-47151051	-2	85145720	-1
48	42708311	0	-14916013	0	-68301492	1	45207204	-1	-13401472	-1	12096639	0
49	-37989067	0	51934056	-1	-10535984	1	-11751614	-1	76077809	-1	-92554059	-1
50	-37375534	0	28625204	-1	45427247	0	13451164	-1	55726325	-1	-69108711	-1
51	-31450189	0	-88195385	-2	20937381	1	63127379	-1	46252676	-1	-11583971	-1
52	-16084460	0	-48038257	-1	21423426	1	70530119	-1	10658873	-1	40469427	-1
53	31159902	-2	-72918681	-1	54034804	0	53805482	-1	-68671007	-2	66153356	-1
54	15744418	0	-90390956	-1	-14434555	1	27415646	-1	10132871	-2	44133812	-1
55	31067448	0	-11188746	0	-39618365	1	65187031	-2	36370377	-1	-36112888	-2
56	-42011416	0	38712126	-1	11879566	1	49416835	-1	10174970	0	-91575514	-1
57	-31781719	0	24051446	-2	25554350	1	58504038	-1	54667941	-2	26450647	-1
58	-15614103	0	-31159832	-1	24657838	1	72553902	-1	-25847968	-1	93318447	-1
59	82548544	-2	-53819243	-1	73149098	0	53260831	-1	-14717529	-1	78563720	-1
60	17010393	0	-53747965	-1	-10943584	1	31738129	-1	30050864	-1	22531361	-1
61	35621552	0	-44744166	-1	-35035895	1	-45039200	-1	61192167	-1	-78864007	-1
62	49057325	0	24900802	-3	-44932099	1	-11187482	0	84616282	-1	-16826607	0
63	63280950	0	80306284	-2	-63027977	1	-16400058	0	16204716	0	-29182307	0
64	-35115447	0	40322338	-1	33555131	1	73631819	-1	-25228194	-1	90009058	-1
65	-16543149	0	80254341	-2	38674676	1	-10481699	-1	-16937672	0	10620012	0
66	38736933	-1	27767514	-1	22342415	1	-76000072	-1	-15282931	0	30652995	-1
67	23527999	0	42358425	-1	-36335853	-1	-10477521	0	-81422199	-1	-38045248	-1
68	42587468	0	70849874	-1	-24976789	1	-14531363	0	34780590	-1	-17901006	0
69	49736641	0	79827391	-1	-37294365	1	-17436909	0	74054617	-1	-23849240	0
70	64076461	0	10081325	0	-52583995	1	-24895097	0	16138995	0	-39439651	0
71	51103824	0	15978367	0	-27617989	1	-23630334	0	40652792	-1	-28683705	0
72	66817195	0	19502720	0	-42999396	1	-30251696	0	14518188	0	-45935925	0
73	-98914688	-1	62475550	-1	58890133	1	-16677871	0	-38643478	0	94963453	-1

LOS ANGELES DIVISION
NORTH AMERICAN ROCKWELL CORPORATION

TABLE C27.- Continued

	1		2		3		4		5		6	
74	98968028	-1	11148441	0	36093313	1	-21820027	0	-31092558	0	-15720147	-1
75	28869037	0	17334625	0	14194922	1	-22522493	0	-19156534	0	-86120560	-1
76	48456507	0	23442333	0	-89703559	0	-22313686	0	-66637972	-2	-21992508	0
77	55997398	0	25916144	0	-17948325	1	-23576626	0	47733471	-1	-27084038	0
78	70868755	0	30499183	0	-31935470	1	-25487201	0	16801298	0	-42829045	0
79	96766265	-2	12705206	0	60878873	1	-29154564	0	-53607030	0	78240282	-1
80	11743573	0	17884122	0	46668293	1	-26277753	0	-38053603	0	-57205242	-2
81	30556634	0	25261486	0	26424829	1	-20501737	0	-18124087	0	-70466218	-1
82	51649962	0	34482662	0	32384966	0	-14968476	0	44848670	-1	-13166595	0
83	60061502	0	37542034	0	-53517422	0	-10613683	0	13437821	0	-12818731	0
84	74710194	0	43848310	0	-24854419	1	59807264	-2	30733639	0	-14256115	0
85	18294754	0	24356479	0	57193348	1	-28650370	0	-43369118	0	11456142	-1
86	35188350	0	32753015	0	37782243	1	-19669098	0	-18276096	0	-53947486	-1
87	64706814	0	50544932	0	21348254	0	-16125494	-1	20010324	0	-53006094	-2
88	79760291	0	60540769	0	-12788017	1	15361082	0	44425347	0	14234893	0
89	48638966	0	51835246	0	45061996	1	-19159016	0	-16298941	0	21108912	-2
90	66330292	0	63911929	0	27625659	1	52987473	-1	17016978	0	12449182	0
91	88692086	0	83414558	0	35493663	0	56777062	0	79362204	0	48471456	0
92	82133442	0	88310333	0	28568321	1	50141413	0	53835887	0	55480945	0
93	99999999	0	99999999	0	99999999	0	99999999	0	99999998	0	99999999	0
94	-25822002	0	-14392486	-1	27082232	1	71120349	-1	18141014	-1	27409111	-1
95	41217924	0	-15011032	0	-67653877	1	10901343	-1	-23962495	-1	76691407	-1
96	42197380	0	-14354047	0	-67503248	1	-58960339	-2	27260921	-1	58702959	-2
97	43643011	0	-13884752	0	-67507467	1	-40370408	-1	62012610	-1	-57317688	-1

TABLE C27.- Continued

	7		8		9		10		11		12	
1	14868787	0	-34731966	1	76122453	-1	-30804511	0	-51392318	0	-33158685	0
2	27528718	0	-43798511	1	61225943	-1	-24745067	0	-16397367	0	-18396223	0
3	30525358	0	-50505216	1	29213788	-1	-10461756	0	35558235	0	-74374506	-2
4	38667025	0	-58505834	1	20900377	-1	-90679075	-1	47019763	0	-23418736	-1
5	39225203	0	-69974373	1	19273513	-1	-97318993	-1	51543079	0	-80630445	-1
6	21221117	1	-98857254	1	93138717	-1	-33274082	0	-41109717	0	-31166968	0
7	22568193	1	-10612414	2	80539117	-1	-26340302	0	-10178304	0	-18051745	0
8	25250379	1	-12115695	2	43812016	-1	-10800276	0	40681240	0	50748659	-1
9	25959682	1	-12614814	2	32029288	-1	-88517938	-1	47191871	0	97440155	-1
10	27677439	1	-13394647	2	32596336	-1	-59937041	-1	50343277	0	10649973	0
11	47453523	1	-19157492	2	13498039	0	-33313700	0	-26187743	0	-21110240	0
12	48555989	1	-19922568	2	14260073	0	-27057471	0	-26719552	-1	-10792272	0
13	54009849	1	-21685920	2	11841147	0	-82275412	-1	55957095	0	20538985	0
14	54807984	1	-22127201	2	11594387	0	-45841057	-1	65932087	0	25609822	0
15	57531389	1	-23556818	2	10723579	0	36610559	-1	79974006	0	36317626	0
16	86942541	1	-31582908	2	17583689	0	-19996893	0	55225002	-2	57599156	-1
17	87639676	1	-32002426	2	16942521	0	-12235038	0	22103647	0	15814348	0
18	89156591	1	-32490365	2	14491270	0	26389987	-1	72971619	0	42529950	0
19	90522956	1	-33110233	2	16149430	0	54304118	-1	83481469	0	50884766	0
20	94064803	1	-34168817	2	19401086	0	14683425	0	10987225	1	75851291	0
21	-24624138	0	-76258222	0	-18024619	-1	82206814	-1	90846800	0	27930849	0
22	-98590350	-1	-44878273	0	-64407371	-1	28451003	0	22226034	1	-10301997	1
23	-39348653	-1	41659862	0	-13213077	0	30405410	0	23009243	1	-82039405	1
24	-33306417	0	-14946367	1	-90417452	-1	36770615	0	27719780	1	50236218	0
25	-10796654	0	-47311500	0	-11216761	0	46795828	0	35369182	1	-18459170	1
26	-30375011	-1	32985560	0	-30612519	-1	16195446	0	21141372	1	-80774980	1
27	-22617980	0	-10635554	1	-27369340	0	76346845	0	59243314	1	98983420	-1
28	-14011572	0	-23421070	0	-11997401	0	46773630	0	36042039	1	-13834704	1
29	-99406292	-1	38276645	0	18552394	0	-36429356	0	-18557870	1	-48210944	1
30	-24577505	0	-64236943	0	-24257816	0	47045049	0	36433898	1	31992926	1
31	-18279123	0	-14872143	0	60194690	-1	-13090138	0	-11683248	1	30258789	1
32	-20955691	0	32915882	0	40278272	0	-11006535	1	-82269576	1	18357089	1
33	-40817113	0	-27638706	0	15319361	0	-61696862	0	-51806009	1	11065884	2
34	-33973741	0	-63365510	-1	47730663	0	-13583126	1	-11132481	2	12231838	2
35	-46507929	0	47590868	0	52122919	0	-17405155	1	-13939255	2	10463951	2
36	15496756	1	62697552	1	-18294006	-1	39621752	0	-22709690	0	-12177549	0

TABLE C27.- Continued

	7		8		9		10		11		12	
37	-27140296	0	61749551	0	72155915	-1	-18989515	0	-16459347	0	36482537	-1
38	-73057246	0	-12084019	1	-34173134	-1	-72886994	-1	17942580	0	35992970	-1
39	-55511705	0	-50852868	0	-73597430	-1	11328020	0	70135647	-1	30764925	-1
40	69202790	-2	53398184	0	13773881	-1	40582105	-1	-55170994	-1	-51526163	-1
41	42878472	0	13682821	1	59772845	-1	-24533169	-1	-21833133	0	-73219053	-1
42	13914999	0	73380871	0	43288087	-2	-40718936	-1	20471468	0	22430869	-1
43	-13294648	0	-22600664	0	-42536305	-2	-14750350	-1	16785505	0	89070805	-1
44	-29265258	0	-85380336	0	-72041591	-1	-18745663	-1	-66570036	-1	-12562637	-1
45	-24588670	0	-61380903	0	-16168176	-1	-20610776	-2	-39371810	-1	70036185	-2
46	20498551	0	87047930	0	-16084654	-1	78054791	-1	22943800	0	36607383	-1
47	10859012	1	35376416	1	-12338597	-1	20779929	0	-27188850	0	30515109	-1
48	20525558	1	63954751	1	18805012	-1	45183248	0	10225208	0	37363734	0
49	15217706	0	44134777	0	-71126599	-1	52182670	-1	-39369534	0	87914974	-3
50	30814459	0	19265699	0	-87880544	-1	55492695	-1	28921022	0	24739158	0
51	-72291173	-2	-11856632	1	-88651134	-1	24723237	-1	10488625	0	10555418	0
52	-22910090	0	-15539924	1	-87725226	-1	14599743	-1	-13037970	0	-34022222	-1
53	-24245184	0	-87680257	0	-56107463	-1	13078625	-2	-23554336	-1	-11701721	-1
54	-63645687	-1	-95312353	-2	-45785133	-1	-79935639	-1	61136368	-1	-34755662	-1
55	31757191	0	14275565	1	-54329843	-1	-19953769	0	24195601	-1	-73451176	-1
56	27147777	0	27881775	0	-25035408	0	11654310	0	-11026119	1	-15918014	0
57	11993087	0	-13718089	1	12206470	0	-42099029	-1	-35420271	0	-17552443	0
58	-18399476	0	-10632900	1	69383506	-1	95387287	-2	-34894046	0	-17624301	0
59	-21291488	0	-80896974	0	-30636789	-1	37761688	-1	-22933180	0	-11706965	0
60	-38898990	-1	-70410202	0	-18031964	-1	-19027988	-1	-19767143	-1	-90449051	-1
61	-24841913	0	-51795187	0	77709938	-1	-16455424	0	22140587	0	57869909	-1
62	-56140191	0	-16634945	1	53763113	0	12222351	0	-17566121	0	-38715237	-1
63	-11941308	1	-43959101	1	66347494	0	51198249	0	-74478698	0	17145740	-1
64	36405617	0	-89982225	0	41696258	0	-31952099	-1	-65465274	0	-25798573	0
65	26559432	0	11148084	1	45967256	0	-56115418	-1	-49430966	0	-32772239	0
66	32134554	-1	35577264	0	-53443469	-1	76065365	-1	22433613	0	12486997	0
67	-23690887	0	-75933636	0	-50158826	-1	12825126	0	24771732	0	16132385	0
68	-52559358	0	-13790423	1	24171980	0	19710740	0	11924596	0	13130192	0
69	-70768883	0	-21697500	1	47690466	0	32885967	0	93409241	-1	19975812	0
70	-13127964	1	-43859031	1	15436576	1	12656532	1	11910123	1	14418235	1
71	-78213630	0	-23547179	1	50173489	0	37830454	0	-11507127	0	97471546	-1
72	-13870574	1	-52997196	1	17289830	1	17708858	1	-13413365	1	59448149	0
73	60028450	0	34966598	1	10449052	1	-17759181	0	50380304	0	-58237133	-1

TABLE C27.- Continued

	7		8		9		10		11		12	
74	34534048	0	24055110	1	-17745733	0	88697295	-1	40661005	0	27627560	0
75	85806129	-2	38347913	0	-29422775	0	20540201	0	21893106	0	23182242	0
76	-50669403	0	-18282295	1	14424087	0	19498895	0	-51468140	0	-12724414	0
77	-74523653	0	-23327274	1	50075129	0	34709134	0	-77206988	0	-20825719	0
78	-13172100	1	-53383425	1	18918230	1	16479671	1	-37698892	1	-23536896	1
79	10698039	1	53518232	1	24140535	0	-14602155	0	30453349	0	10690012	0
80	65551993	0	31443445	1	-50450826	0	94269583	-1	22228700	0	34611206	0
81	28151508	0	12499566	1	-82607739	0	-30416748	-1	-24088289	0	-28717778	-1
82	-30002855	0	-14110644	1	-72474229	-1	-60259518	-1	-34736782	0	-12976634	0
83	-39053925	0	-18591586	1	46553241	0	-19549651	0	-95152714	0	-48802815	0
84	-75339087	0	-31663413	1	26928217	1	-88913459	0	-96277989	1	-67811775	1
85	97235453	0	41449738	1	-10187389	1	-77217911	-1	-57311460	0	50013761	-2
86	53629208	0	18409826	1	-13372306	1	-23602176	0	-47585215	0	-83110051	-1
87	-11958059	0	-11723020	1	27824690	0	-68615699	0	-41449337	0	-53430934	0
88	-32350853	0	-82644966	0	34305462	1	-22399941	1	26941059	1	-18525987	0
89	72382634	0	18352557	1	-22463771	1	-74002724	0	-40287522	0	-44443313	0
90	62151366	0	15191257	1	-12173019	1	-10188858	1	-16415928	0	-63811104	0
91	11504196	0	17586545	1	23058619	1	-93384885	0	32782040	1	14077297	1
92	11216675	1	13131064	1	-12992374	1	-80808141	0	-56078419	0	-96983224	0
93	99999999	0	99999999	0	99999999	0	99999998	0	99999999	0	99999999	0
94	-76311233	-1	-17501612	1	-10559729	0	15825616	-1	-17342810	0	-32371708	-1
95	17857555	1	61493058	1	15709090	-2	31695579	0	-14527569	0	17028939	0
96	11259149	1	43978501	1	-78517320	-2	-41046801	-1	12315635	-1	12515776	0
97	23288406	0	12796133	1	20500245	-1	-24308472	0	95665122	-1	93895668	-1

TABLE C27.- Continued

	13		14		15		16	
1	-15656297	1	29276563	2	58929456	2	-79028572	2
2	-10958664	1	21774767	2	29209192	2	-32448189	2
3	23016350	0	-60598056	1	21063054	2	43508340	0
4	43158682	0	-11732353	2	36207016	2	65121825	1
5	81080640	0	-22800022	2	92759012	2	11353852	3
6	-15142529	1	28699483	2	46583025	2	-67208678	2
7	-10593294	1	21056165	2	28625043	2	-36241707	2
8	33356861	0	-67631381	1	30586170	2	-22354827	2
9	62282308	0	-12489843	2	43153704	2	-26312779	2
10	10367954	1	-22366397	2	84516160	2	-11196891	2
11	-14055985	1	29246838	2	20578821	2	34566783	2
12	-10263691	1	22662282	2	21906357	2	48316047	2
13	66223084	0	-99762057	1	91904653	1	-30937091	2
14	98550260	0	-16496001	2	14158306	2	-68962972	2
15	15482169	1	-27168149	2	23262271	2	-15346761	3
16	-82372228	0	23233618	2	-61762396	2	23502847	3
17	-32009457	0	13605783	2	-64219757	2	15214463	3
18	96633478	0	-10617159	2	-60376087	2	-38197526	2
19	12782731	1	-15781029	2	-66310723	2	-69182393	2
20	20496534	1	-27246072	2	-10010566	3	-13860979	3
21	-82535612	0	-35808527	0	-22281567	0	-10100569	0
22	-14589499	1	-64646114	0	-52765117	0	-28642866	0
23	38195171	1	22532696	1	-52948789	0	-15230738	0
24	-27741003	1	-12531852	1	-63535540	0	-40376437	0
25	-19303996	1	-78368464	0	-74050546	0	-38911617	0
26	49822561	1	30275461	1	-25253474	0	-11685448	0
27	-62505460	1	-30989091	1	-15746206	1	-69940276	0
28	-23189560	1	-10102213	1	-75097349	0	-33372006	0
29	73100511	1	41779929	1	96420557	0	34898793	0
30	-78564299	1	-44130000	1	-15009171	1	-51289935	0
31	-11752540	1	-73127798	0	31938288	0	11169098	0
32	77619726	1	38918788	1	22715977	1	92474552	0
33	-47736090	1	-32794612	1	71643286	0	51797251	0
34	22995680	1	61160156	0	29156698	1	12017994	1
35	35801195	1	65102009	0	26408608	1	13429858	1
36	-18072996	0	-50552285	0	52408238	0	47034837	0

TABLE C27.— Continued

	13		14		15		16	
37	10014471	0	-40986290	0	-18153312	1	45573853	0
38	55036233	-1	-18478440	0	-20781107	1	34198469	0
39	37708736	-1	-27166561	-1	-12273406	1	32081846	0
40	-58706145	-1	-29419304	-1	-38011538	0	40724603	-1
41	-72860586	-1	-38599654	-1	20240778	0	-11854542	0
42	22843840	-2	28092580	-1	26614906	0	59137897	-1
43	90701074	-1	63827869	-1	15165117	0	12836242	0
44	-74058879	-2	-76564681	-1	-11954791	0	12926432	0
45	12526511	-1	-45792423	-1	-20184487	0	12988437	0
46	37969012	-2	59679243	-1	58066136	-1	68811969	-1
47	23016518	-1	10627721	0	74055000	0	-57300926	-1
48	36764559	0	62957445	0	17117080	1	-15966929	0
49	37026532	-1	38557502	-1	48454573	0	-27515516	-1
50	26135636	0	38334262	0	68052601	0	-17647834	0
51	11070394	0	18316510	0	25008393	0	-19594542	0
52	-32078821	-1	-32703355	-1	-16065369	0	-97312178	-1
53	-13296126	-1	-46625517	-1	-32639514	0	56049638	-1
54	-44946402	-1	-78849972	-1	-33702726	0	49820464	-1
55	-83136696	-1	-12982808	0	-15968039	0	-42654164	-2
56	-95367764	-1	-15835835	0	78804592	0	-10110704	0
57	-18497467	0	-12927822	0	15226600	-1	-41149066	0
58	-18637664	0	-23310960	0	-33104949	0	-34686321	-1
59	-12505814	0	-16041885	0	-33204065	0	41461029	-1
60	-10980372	0	-72075101	-1	-20999856	0	-13159830	0
61	76070331	-1	40062292	-1	-29732944	0	68166843	-2
62	-54516265	-2	26838543	-1	-10473128	0	-48550641	-1
63	11992521	0	22164863	0	16108965	0	-13115053	0
64	-26112982	0	-23044984	0	53785137	-1	-50434925	0
65	-35874669	0	-43888002	0	-21434463	0	-42199906	-1
66	12559480	0	16506408	0	79324866	-1	18634482	-1
67	17756184	0	25574920	0	28018062	-1	-31587938	-1
68	16638966	0	24627744	0	18726580	0	17079939	-1
69	25415152	0	38491482	0	34529836	0	-26332482	-1
70	16313073	1	20660698	1	18592232	1	16725693	0
71	15378885	0	29549069	0	44642641	0	-62978728	-1
72	82701022	0	12057668	1	22777650	1	-50120984	-1
73	-12165414	0	-16292528	0	-15786084	0	54599048	-1

TABLE C27.- Concluded

	13		14		15		16	
74	29471958	0	32821411	0	45443879	0	12807930	0
75	26567551	0	37879195	0	46696919	0	-40715449	-1
76	-75245385	-1	-14189355	-1	25139813	0	-18033337	0
77	-14912428	0	-87073117	-1	33761197	0	-10556630	0
78	-25690269	1	-20347540	1	59022962	0	-55806867	0
79	98520352	-1	48019892	-1	31869115	0	44052135	-1
80	39707467	0	42591368	0	74073605	0	30452709	-1
81	44348696	-2	-56944695	-3	37020743	0	-75317353	-1
82	-84044990	-1	-10725329	0	28799488	-1	-17980088	0
83	-44639994	0	-58298256	0	-33824131	0	-24744610	0
84	-72436040	1	-79997115	1	-43507314	1	-12415549	1
85	69156656	-1	-30880647	-1	61734968	0	-53838056	-1
86	-25926331	-1	-12677366	0	34918321	0	-13798603	0
87	-53405929	0	-77143514	0	-91506493	0	-26794455	0
88	-30547631	0	-84796074	0	-31803182	1	-17982383	0
89	-44597820	0	-60228714	0	-33560234	0	-34518587	0
90	-69183132	0	-99382939	0	-94909564	0	-16314425	0
91	14686320	1	95441479	0	-75218575	0	11036070	1
92	-11136444	1	-13972331	1	-11647773	1	-10006639	0
93	99999999	0	99999999	0	99999999	0	99999998	0
94	-28636602	-1	20916234	-1	33563252	-1	-27412218	0
95	16139944	0	32891732	0	13849276	1	-68008092	-1
96	13560065	0	14852127	0	64906800	0	17664832	-1
97	12895124	0	62772668	-1	-13415494	0	-72326904	-2

TABLE C28.- SYMMETRIC STRUCTURAL MODES, CASE SC1

CP \ Mode	1		2		3		4		5		6	
1	85149513	0	-88587176	-1	52317758	0	74749945	-1	-16115807	-1	10555941	0
2	77105861	0	-63036313	-1	20238140	0	20269875	-1	-52556314	-1	90637181	-1
3	64201570	0	-34145578	-1	-41229280	0	-42811035	-1	-84080475	-1	72715291	-1
4	62395251	0	-34446700	-1	-47361365	0	-50719889	-1	-10056285	0	83238730	-1
5	56714346	0	-44077898	-1	-88956974	0	-88082748	-1	-14008556	0	91995645	-1
6	83977672	0	-78693007	-1	34781436	0	68602221	-2	-78001730	-1	31284346	-1
7	77052931	0	-56181788	-1	-10165340	0	-34021567	-1	-10356775	0	30859407	-1
8	64018255	0	-31770052	-1	-53086235	0	-80619447	-1	-14608570	0	38005262	-1
9	62452639	0	-31375306	-1	-62096838	0	-90142776	-1	-16152367	0	46792113	-1
10	56692518	0	-40838240	-1	-99192833	0	-11565430	0	-17362634	0	28594316	-1
11	82497461	0	-65856489	-1	29536736	-1	-72794967	-1	-14769505	0	-55103976	-1
12	76941134	0	-48467974	-1	-33377448	0	-89589915	-1	-14964039	0	-53196332	-1
13	64707270	0	-29800491	-1	-68351425	0	-12058023	0	-17589309	0	-56885271	-1
14	62560514	0	-30207997	-1	-76822502	0	-12333450	0	-17743588	0	-56862806	-1
15	56721740	0	-39230901	-1	-11351197	1	-14022195	0	-19262683	0	-55838325	-1
16	80939368	0	-53793550	-1	-33244301	0	-14217364	0	-21222029	0	-17028420	0
17	73672600	0	-34178148	-1	-66360015	0	-16288112	0	-22225283	0	-16428595	0
18	64122799	0	-27528455	-1	-92721381	0	-18172028	0	-23303201	0	-16282592	0
19	62572581	0	-27338885	-1	-99845548	0	-18601773	0	-22750013	0	-18280651	0
20	57508653	0	-35277471	-1	-12803139	1	-19962817	0	-20737605	0	-23124339	0
21	49798653	-1	39985165	-1	-13189242	0	82481615	0	-84526184	-1	-95924450	-1
22	28212198	-1	40056308	-1	-19786332	0	10213286	1	-85834892	-1	-87963145	-1
23	-10457530	-1	80981903	-1	-76067398	0	35140788	1	-24966390	0	-10746483	0
24	10384891	0	78524394	-1	-35855371	0	18887354	1	-17933055	0	-16789138	0
25	60976605	-1	10029517	0	-54691502	0	26117807	1	-18578982	0	-13591490	0
26	14978040	-1	14546830	0	-10879045	1	47998945	1	-36014408	0	-14379019	0
27	13392744	0	13324504	0	-72972410	0	30915559	1	-22064671	0	-18032938	0
28	91312392	-1	16535437	0	-10393110	1	43897887	1	-33205917	0	-18659031	0
29	43230406	-1	22124111	0	-16398421	1	68088799	1	-56213958	0	-19022184	0
30	15960382	0	19535073	0	-14011033	1	51387224	1	-39533110	0	-21483682	0
31	11970979	0	22592612	0	-17330323	1	63886513	1	-53554603	0	-21457434	0
32	75793957	-1	27977916	0	-23334495	1	87317162	1	-77930055	0	-21437700	0
33	18376942	0	27061252	0	-25026280	1	85957958	1	-73545373	0	-26405309	0
34	14550661	0	30052993	0	-28291173	1	96224981	1	-86267386	0	-25756290	0
35	11852273	0	34742102	0	-34272774	1	12181702	2	-11525509	1	-33321618	0
36	15565894	1	-20429075	0	43032597	1	33843365	0	33203543	0	-30335151	0

TABLE C28.- Continued

	1		2		3		4		5		6	
37	11040200	1	-11355555	0	18619765	1	84309047	-1	37631590	-1	-42096454	-1
38	61369862	0	-37395786	-1	-18092517	0	-17146903	-1	-73419520	-1	11334435	0
39	14265693	0	27301984	-1	-11382114	1	-78016215	-1	-89697606	-1	98922043	-1
40	-13605878	0	52544288	-1	-11130128	1	-74607515	-1	-42048715	-1	18015128	-1
41	-24240530	0	49323429	-1	-71920806	0	-45068441	-1	12272332	-2	-38302009	-1
42	-27897520	0	21301982	-1	-38178629	-2	19075144	-1	66737703	-1	-58973582	-1
43	-22948991	0	-12166013	-1	51405603	0	52220800	-1	64300765	-1	-30966089	-1
44	-10871374	0	-46908527	-1	54423025	0	71012320	-1	47397014	-1	11520438	-1
45	19779597	-1	-72967281	-1	46854095	-1	62624402	-1	28377549	-1	38516634	-1
46	17189888	0	-93131511	-1	-56971728	0	51901887	-1	82157920	-2	48753878	-1
47	31817314	0	-11065283	0	-14299002	1	53696183	-1	-50113923	-2	63859093	-1
48	47243517	0	-12626250	0	-23800483	1	58476983	-1	-10943793	-1	82026960	-1
49	-36309513	0	48220369	-1	-38489312	0	-10075479	-1	77335038	-1	-88553381	-1
50	-35673949	0	25727556	-1	98034490	-1	77530883	-2	53470985	-1	-69342288	-1
51	-29593059	0	-10462042	-1	64599549	0	53297561	-1	39996675	-1	-69022251	-2
52	-13761342	0	-46210895	-1	66074946	0	60240943	-1	22119262	-2	46275718	-1
53	31652891	-1	-66799934	-1	12845555	0	48567205	-1	-13605387	-1	69706819	-1
54	19042573	0	-80147678	-1	-53174825	0	29078723	-1	-95810572	-3	43292481	-1
55	34820662	0	-96850385	-1	-13728332	1	17833974	-1	41801638	-1	-11463966	-1
56	-40556249	0	34455627	-1	34949820	0	43868158	-1	10081122	0	-89697178	-1
57	-29937884	0	41401598	-3	79523197	0	43479356	-1	-59066255	-2	28813999	-1
58	-13277869	0	-29502574	-1	76662383	0	57445629	-1	-39209189	-1	96521795	-1
59	36160651	-1	-48159721	-1	19638438	0	45916695	-1	-22839422	-1	81161126	-1
60	20092904	0	-44717503	-1	-39655159	0	32545412	-1	29447160	-1	22809856	-1
61	39016682	0	-32624344	-1	-11811322	1	-34721413	-1	70023328	-1	-77015859	-1
62	52422433	0	12275028	-1	-14789313	1	-97633972	-1	96446844	-1	-16010079	0
63	66723093	0	20747385	-1	-20331620	1	-13464596	0	16798237	0	-26742523	0
64	-33433720	0	37316085	-1	10607214	1	50412393	-1	-43391348	-1	87333030	-1
65	-14307094	0	85515124	-2	11836634	1	-45785118	-1	-19439575	0	92919887	-1
66	63632695	-1	30688352	-1	66552822	0	-10355410	0	-16788508	0	19230637	-1
67	26284306	0	48077254	-1	-46854785	-1	-11895491	0	-85862745	-1	-42583065	-1
68	45454162	0	78887647	-1	-82001700	0	-14478544	0	44258237	-1	-17617835	0
69	52663372	0	88730704	-1	-12097706	1	-16674005	0	89122313	-1	-23040454	0
70	66985922	0	10999579	0	-16764374	1	-23020243	0	18753385	0	-37123000	0
71	53633858	0	16574659	0	-87847433	0	-23812553	0	53964139	-1	-28103089	0
72	69224642	0	20048395	0	-13338844	1	-29093933	0	16974075	0	-43428708	0
73	-76909619	-1	61501807	-1	17932897	1	-23084431	0	-42614470	0	61439024	-1

TABLE C28.- Continued

	1		2		3		4		5		6	
74	12166081	0	11216337	0	10844588	1	-26745109	0	-33347424	0	-44767133	-1
75	31136192	0	17534957	0	43081853	0	-25930168	0	-20116514	0	-10455622	0
76	50621821	0	23752949	0	-25261994	0	-23866973	0	-50415845	-3	-22251126	0
77	58141027	0	26265620	0	-52326566	0	-24558132	0	56600285	-1	-26766917	0
78	72817779	0	30767693	0	-92124519	0	-25014224	0	18684938	0	-40380412	0
79	29571114	-1	12562785	0	18308949	1	-36917044	0	-57381521	0	26204995	-1
80	13529131	0	17723309	0	14332314	1	-32351492	0	-40704715	0	-44901216	-1
81	32217047	0	25209297	0	85890809	0	-24673101	0	-19159456	0	-96672811	-1
82	53152357	0	34521529	0	20761898	0	-17183318	0	48668879	-1	-13879097	0
83	61559657	0	37678169	0	-34954035	-1	-12187242	0	14114261	0	-13004805	0
84	76119911	0	44107378	0	-58898035	0	48568922	-2	31012119	0	-12405337	0
85	19913474	0	24071199	0	17834003	1	-35813874	0	-46369903	0	-38418508	-1
86	36557280	0	32532065	0	12535643	1	-24684297	0	-19423475	0	-88019491	-1
87	65797960	0	50516980	0	27609213	0	-38404641	-1	20382924	0	-13328488	-1
88	80839690	0	60835232	0	-10687583	0	13597399	0	44344144	0	14278488	0
89	49445385	0	51301640	0	15693752	1	-25143743	0	-17423525	0	-40202349	-1
90	66915519	0	63580173	0	11406223	1	11927056	-1	16737543	0	94675867	-1
91	88942506	0	83449118	0	61485845	0	55657277	0	79847538	0	48339115	0
92	82108192	0	87931105	0	13950130	1	47237277	0	53617663	0	53048719	0
93	99999999	0	99999999	0	99999999	0	99999999	0	99999999	0	99999999	0
94	-23850808	0	-15148869	-1	85120825	0	57760436	-1	88007168	-2	32181650	-1
95	45690321	0	-12795590	0	-23623364	1	23917476	-1	-20631043	-1	40958993	-1
96	46544705	0	-12858005	0	-23313316	1	12348640	-1	35933554	-1	-17387175	-1
97	47833218	0	-11988650	0	-22925518	1	-16099366	-1	75510608	-1	-62500596	-1

TABLE C28.- Continued

	7		8		9		10		11		12	
1	87254454	-1	-18735228	1	87161625	-1	-31951522	0	-52906663	0	-32760579	0
2	13781544	0	-24420999	1	73678069	-1	-25314444	0	-15321268	0	-17887468	0
3	12408830	0	-28756220	1	43894678	-1	-10222051	0	40199066	0	-62540323	-2
4	16587297	0	-33325189	1	37647661	-1	-87632421	-1	52975003	0	-22817018	-1
5	14874722	0	-39810110	1	39708485	-1	-94297136	-1	58188821	0	-83557949	-1
6	12139436	1	-59126554	1	11198165	0	-34280015	0	-41891368	0	-31026620	0
7	12773486	1	-63781040	1	99848461	-1	-26892308	0	-86616436	-1	-17817021	0
8	14153190	1	-72955687	1	64897973	-1	-10690825	0	45895692	0	49822553	-1
9	14539578	1	-75877246	1	53567201	-1	-86921293	-1	52964173	0	95731128	-1
10	15402601	1	-80831164	1	56258371	-1	-57844186	-1	56030928	0	10111579	0
11	27035058	1	-11689489	2	16837217	0	-34149554	0	-26631148	0	-21519352	0
12	27805004	1	-12166809	2	17800501	0	-27595246	0	-15221583	-1	-11232078	0
13	30641891	1	-13278735	2	15547133	0	-80210310	-1	61174601	0	19710469	0
14	31067569	1	-13543988	2	15433303	0	-42726708	-1	71790654	0	24652673	0
15	32536066	1	-14410160	2	14869822	0	40983303	-1	86377124	0	35061799	0
16	49788597	1	-19517634	2	22470044	0	-20567131	0	72143031	-3	43832662	-1
17	50111871	1	-19783650	2	21857619	0	-12502566	0	23032557	0	14384400	0
18	50943528	1	-20103446	2	19387874	0	29877462	-1	77602766	0	41060412	0
19	51633484	1	-20491155	2	21359822	0	59575775	-1	88621339	0	49219894	0
20	53513494	1	-21195532	2	25052723	0	15668399	0	11571102	1	73845726	0
21	-20263362	0	-42963263	0	-78789126	-2	93952002	-1	99393440	0	28946847	0
22	-98610182	-1	-27759811	0	-54557057	-1	30519813	0	24771186	1	-10053834	1
23	-28873948	-1	24364807	0	-12901866	0	31303887	0	26734723	1	-82062196	1
24	-29230737	0	-85967127	0	-71153120	-1	39772446	0	30524339	1	53712603	0
25	-11301664	0	-29910678	0	-98581849	-1	49897300	0	39468205	1	-18068182	1
26	-30965586	-1	18717081	0	-29502592	-1	17079172	0	24643452	1	-80808827	1
27	-21905371	0	-65291426	0	-24813909	0	81826518	0	55753483	1	17871508	0
28	-13806556	0	-17189905	0	-10854206	0	49953629	0	40190655	1	-13399775	1
29	-75551158	-1	23925598	0	17304689	0	-38606586	0	-19959234	1	-48653900	1
30	-22265334	0	-40426722	0	-22540514	0	50549082	0	40191354	1	32647203	1
31	-15826149	0	-97308296	-1	56027714	-1	-13776965	0	-13360377	1	30277921	1
32	-13960899	0	25408721	0	37161015	0	-11728464	1	-91614838	1	17327001	1
33	-30499051	0	-11595367	0	14239289	0	-65351517	0	-58903161	1	11043962	2
34	-24208899	0	29610998	-1	44371063	0	-14450479	1	-12537034	2	12130767	2
35	-31521715	0	37911671	0	47512612	0	-18567163	1	-15599378	2	10323812	2
36	10566921	1	31603711	1	-40139845	-1	39463530	0	-28218414	0	-12762536	0

TABLE C28.- Continued

	7		8		9		10		11		12	
37	-15347700	0	44287421	0	76017312	-1	-19083091	0	-17325438	0	35583282	-1
38	-45905860	0	-49053909	0	-28313455	-1	-72057318	-1	20879824	0	39863174	-1
39	-36079385	0	-19877095	0	-75691892	-1	11546589	0	72931531	-1	32481974	-1
40	-11783104	-1	23170278	0	60355607	-2	43474834	-1	-60206907	-1	-49868103	-1
41	26078479	0	60817751	0	47988783	-1	-22674181	-1	-23515815	0	-72291364	-1
42	73604103	-1	36104935	0	73845215	-2	-36100029	-1	23004309	0	23779260	-1
43	-91380514	-1	-50888816	-1	67526471	-2	-11795045	-1	13499383	0	87221961	-1
44	-18087323	0	-32724482	0	-57800727	-1	-20306928	-1	-69418556	-1	-18452627	-1
45	-13791201	0	-20512666	0	-60017739	-2	-36924428	-2	-38636014	-1	39173441	-2
46	17342518	0	49011165	0	-21230401	-1	78812851	-1	26321222	0	43501033	-1
47	77924701	0	17432072	1	-46520795	-1	20317072	0	-23898612	0	39985620	-1
48	14414488	1	30737319	1	-45492480	-1	45110485	0	11627799	0	39872732	0
49	54758044	-1	14222299	0	-67258486	-1	52331949	-1	-45042478	0	-10460384	-1
50	16719925	0	12867061	-1	-85233623	-1	61310440	-1	31159144	0	24878415	0
51	-17671258	-1	-59179330	0	-76953334	-1	25748869	-1	11626361	0	10228142	0
52	-13797998	0	-70194654	0	-75496925	-1	11660882	-1	-13700788	0	-39594198	-1
53	-12950896	0	-33557689	0	-48795560	-1	-71437274	-3	-15233710	-1	-12593024	-1
54	-16813826	-1	51941110	-1	-42516228	-1	-80480164	-1	84258523	-1	-31933325	-1
55	22233399	0	68503711	0	-57392593	-1	-19982714	0	51375431	-1	-68152004	-1
56	14131816	0	70543168	-1	-24615756	0	10746314	0	-12350168	1	-18329662	0
57	79512007	-1	-67042077	0	12756085	0	-45221180	-1	-37922828	0	-18126123	0
58	-79628122	-1	-39046207	0	72577225	-1	46673387	-2	-37010424	0	-18006286	0
59	-10543503	0	-29450654	0	-26062968	-1	34109628	-1	-24416349	0	-12059159	0
60	-20574271	-1	-34865272	0	-93671992	-2	-18977712	-1	-18371369	-1	-93110997	-1
61	-19948355	0	-31630190	0	95715259	-1	-15713354	0	23425944	0	55347900	-1
62	-44869391	0	-93118134	0	56634847	0	13445278	0	-26647821	0	-57845858	-1
63	-94137383	0	-24023670	1	72097206	0	52490652	0	-97919472	0	-32081382	-1
64	27101057	0	-38740025	0	41002985	0	-36861169	-1	-70670793	0	-26170684	0
65	24693052	0	75017067	0	43283660	0	-56651772	-1	-51222907	0	-31783523	0
66	37276537	-1	22960498	0	-67358757	-1	84244811	-1	25355631	0	13612490	0
67	-18510772	0	-41785563	0	-46830422	-1	13935538	0	24875557	0	16253495	0
68	-43493298	0	-81140626	0	26482131	0	21385330	0	58011446	-1	11754542	0
69	-58552970	0	-12506870	1	51011083	0	34956116	0	-62559108	-2	17826916	0
70	-10515366	1	-24017693	1	16000753	1	13150666	1	10355164	1	14135546	1
71	-66042237	0	-13782299	1	53441203	0	40200045	0	-25145482	0	71018736	-1
72	-11345052	1	-29092449	1	17823515	1	18027323	1	-18362692	1	51702785	0
73	49172381	0	20081088	1	98540212	0	-15769542	0	60762652	0	-13119695	-1

TABLE C28.- Continued

	7		8		9		10		11		12	
74	23416381	0	12129464	1	-21710170	0	10582353	0	45918287	0	30125018	0
75	-50260021	-1	66430346	-1	-30827611	0	22298430	0	20948665	0	23749524	0
76	-46066900	0	-11232227	1	16501440	0	21172876	0	-65437943	0	-15220612	0
77	-63580503	0	-13674575	1	53057928	0	36611452	0	-97691638	0	-24450992	0
78	-10706206	1	-28661069	1	19426257	1	16522438	1	-44498554	1	-24703594	1
79	78179265	0	27914964	1	15589410	0	-12733188	0	40342841	0	15811089	0
80	43558401	0	15124154	1	-55842283	0	11023375	0	26404156	0	37364610	0
81	12909992	0	44969726	0	-84670224	0	-20955348	-1	-26116759	0	-26077467	-1
82	-29912049	0	-90039625	0	-54833414	-1	-45585602	-1	-43439487	0	-14741216	0
83	-35243734	0	-10792508	1	49163819	0	-18469575	0	-11076831	1	-51720352	0
84	-54099290	0	-14211228	1	27306846	1	-96189601	0	-10617826	2	-69474503	1
85	64225771	0	19561352	1	-10862120	1	-71140231	-1	-58104122	0	26900577	-1
86	29239213	0	68194866	0	-13634816	1	-23140622	0	-49071292	0	-80274860	-1
87	-13614010	0	-70500389	0	30126008	0	-67511814	0	-45073004	0	-54635634	0
88	-15580208	0	-10499219	0	34750534	1	-21881738	1	30734940	1	-12574162	0
89	39645691	0	55316169	0	-22710713	1	-73987169	0	-34137337	0	-43694492	0
90	38768505	0	57069696	0	-12197009	1	-10175354	1	-79521520	-1	-63261734	0
91	26965680	0	13573946	1	23344049	1	-88917987	0	36172413	1	14615578	1
92	86392763	0	64311791	0	-13002380	1	-82720866	0	-50224611	0	-97460645	0
93	99999999	0	99999998	0	99999999	0	99999998	0	99999999	0	99999999	0
94	-51242383	-1	-84992127	0	-93807548	-1	13014747	-1	-18556417	0	-39057045	-1
95	12509372	1	29684195	1	-56433454	-1	31489797	0	-15046370	0	19007654	0
96	77841168	0	21059030	1	-38601702	-1	-40552798	-1	34130695	-1	13987155	0
97	13892436	0	54432724	0	24070590	-1	-24046692	0	11525531	0	97267104	-1

TABLE C28.- Continued

	13		14		15		16	
1	-14964186	1	30917989	2	59745983	2	-77687948	2
2	-10437265	1	22990879	2	29605310	2	-31887373	2
3	21416444	0	-63960502	1	21360651	2	43523106	0
4	40132027	0	-12381439	2	36722468	2	64153013	1
5	75153505	0	-24058346	2	94070642	2	11168939	3
6	-14489407	1	30295755	2	47205181	2	-66047738	2
7	-10114936	1	22221030	2	28993361	2	-35599598	2
8	31373740	0	-71523980	1	31000024	2	-21952109	2
9	58901432	0	-13198220	2	43749938	2	-25842514	2
10	97722166	0	-23622479	2	85698165	2	-10966340	2
11	-13444150	1	30848090	2	20797672	2	34068136	2
12	-98128738	0	23892237	2	22143146	2	47589807	2
13	62815595	0	-10572634	2	92759529	1	-30372282	2
14	93513336	0	-17456315	2	14321874	2	-67772047	2
15	14706206	1	-28726280	2	23568082	2	-15088292	3
16	-78487669	0	24455134	2	-62759605	2	23123356	3
17	-30408018	0	14289506	2	-65238373	2	14971165	3
18	92543845	0	-11285895	2	-61305253	2	-37500589	2
19	12237172	1	-16742392	2	-67319171	2	-67978069	2
20	19658567	1	-28861119	2	-10158242	3	-13627498	3
21	-82482635	0	-34525538	0	-22440654	0	-10242033	0
22	-14536240	1	-61498089	0	-53791969	0	-28654290	0
23	38316645	1	22638255	1	-53569398	0	-15626646	0
24	-27701724	1	-12091454	1	-64417613	0	-40297593	0
25	-19206436	1	-73520342	0	-75806594	0	-38778510	0
26	49993875	1	30342039	1	-25871395	0	-11572217	0
27	-62393909	1	-30085280	1	-16089669	1	-69856365	0
28	-23080465	1	-95941077	0	-77071625	0	-33241255	0
29	73188785	1	41334625	1	98032387	0	35356932	0
30	-78573573	1	-43476534	1	-15324311	1	-51634917	0
31	-11795888	1	-73898071	0	32184248	0	11373311	0
32	77469191	1	37723603	1	23184488	1	92797694	0
33	-48003070	1	-33263974	1	72884491	0	51524913	0
34	22649298	1	47812326	0	29683916	1	12070750	1
35	35333184	1	47414100	0	27064315	1	13354979	1
36	-18341968	0	-52948490	0	52210757	0	46277123	0

TABLE C28.- Continued

	13		14		15		16	
37	98857430	-1	-43297090	0	-18282594	1	43912522	0
38	56061657	-1	-19225153	0	-21000208	1	33042399	0
39	39410911	-1	-27577480	-1	-12544813	1	31618223	0
40	-55818687	-1	-29065695	-1	-41590021	0	47323200	-1
41	-69525312	-1	-40037567	-1	16514345	0	-10500702	0
42	23323765	-2	23226270	-1	23473684	0	70635517	-1
43	87687260	-1	57172018	-1	13506807	0	13647828	0
44	-13806545	-1	-85122998	-1	-12254025	0	13107577	0
45	88295580	-2	-49295926	-1	-19890596	0	12680795	0
46	84920859	-2	69109662	-1	62879583	-1	65639356	-1
47	35002682	-1	12422658	0	74898200	0	-58854362	-1
48	39521844	0	67031647	0	17206938	1	-15343590	0
49	30224876	-1	26933888	-1	45104362	0	-14701458	-1
50	26240031	0	38476174	0	65152079	0	-15414534	0
51	10678901	0	18062174	0	23559692	0	-17792908	0
52	-37711618	-1	-36475644	-1	-15977774	0	-89410676	-1
53	-15228922	-1	-46597022	-1	-32047202	0	55057133	-1
54	-44094618	-1	-76538686	-1	-33281918	0	43090464	-1
55	-79948497	-1	-12760435	0	-16193355	0	-15647769	-1
56	-11037923	0	-17921150	0	76800917	0	-86474798	-1
57	-18881879	0	-13259774	0	32658418	-2	-39276302	0
58	-18907560	0	-23590320	0	-32738034	0	-29324140	-1
59	-12802660	0	-16112704	0	-32307738	0	39456520	-1
60	-11192107	0	-70234672	-1	-20339295	0	-13602226	0
61	72657936	-1	39331099	-1	-29316874	0	-10194501	-1
62	-17515290	-1	25956881	-1	-83397635	-1	-78335775	-1
63	87507317	-1	21250081	0	20468760	0	-17473585	0
64	-26029583	0	-23037880	0	44241379	-1	-48236925	0
65	-34586798	0	-42904693	0	-20566006	0	-35659850	-1
66	13687773	0	18259061	0	97473561	-1	22761992	-1
67	18034512	0	26945309	0	50831729	-1	-37624896	-1
68	15894703	0	25162064	0	21319858	0	-54050335	-2
69	24152665	0	39052713	0	37669273	0	-54761261	-1
70	16203210	1	21001221	1	19226302	1	13231325	0
71	13936267	0	30112163	0	48604821	0	-93520158	-1
72	78962153	0	12197444	1	23792658	1	-10023612	0
73	-78138805	-1	-12234954	0	-14484560	0	64504767	-1

TABLE C28.- Concluded

	13		14		15		16	
74	32054208	0	36064617	0	48299096	0	13439458	0
75	27553629	0	40241861	0	50210553	0	-43338197	-1
76	-88356561	-1	-13096974	-1	28930428	0	-20356009	0
77	-16886320	0	-89950025	-1	38273459	0	-13982622	0
78	-26385677	1	-20550028	1	69533992	0	-63725380	0
79	14978893	0	97989743	-1	34525353	0	60188188	-1
80	42705342	0	46269556	0	77546741	0	44090079	-1
81	10960363	-1	11048181	-1	39984215	0	-74684662	-1
82	-94047590	-1	-11112538	0	54776010	-1	-19661165	0
83	-46385891	0	-60002842	0	-31614582	0	-27538394	0
84	-73528311	1	-81441297	1	-43161905	1	-13669416	1
85	96323127	-1	-35676624	-2	65560208	0	-39235702	-1
86	-20034908	-1	-12206167	0	37550624	0	-13182800	0
87	-54354089	0	-79270771	0	-91729475	0	-28840243	0
88	-27012444	0	-85879739	0	-32678154	1	-21062647	0
89	-44261607	0	-60870667	0	-32437845	0	-33320396	0
90	-69367742	0	-10183703	1	-96547617	0	-16556339	0
91	15018935	1	95061875	0	-81589155	0	10872877	1
92	-11273267	1	-14376264	1	-11940117	1	-96714359	-1
93	99999959	0	99999998	0	99999999	0	99999999	0
94	-34717959	-1	17340014	-1	29173090	-1	-25826159	0
95	18434037	0	36066552	0	13929443	1	-69122190	-1
96	15019787	0	16421258	0	64694622	0	79112144	-2
97	13100985	0	64857533	-1	-13720875	0	-25750674	-1

TABLE C29.- SYMMETRIC STRUCTURAL MODES, CASE SC2

CP \ Mode	1		2		3		4		5		6	
1	70278957	0	-68806656	-1	55371001	0	15075460	0	22756418	-3	16510780	0
2	62785316	0	-47308020	-1	-53464409	0	-12123419	-1	-33637468	-1	15172713	0
3	50792927	0	-24239911	-1	-25231580	1	-25379715	0	-60863646	-1	12318269	0
4	49070614	0	-24969385	-1	-27819976	1	-27944785	0	-72876219	-1	14432579	0
5	43702132	0	-37403167	-1	-41637080	1	-42098983	0	-10134291	0	16365289	0
6	69365002	0	-63383176	-1	-89113485	-1	13991650	-1	-73827649	-1	11416794	0
7	62929564	0	-45151046	-1	-15894013	1	-15584483	0	-92001278	-1	11445144	0
8	50743942	0	-25009688	-1	-30814248	1	-32787903	0	-12340995	0	13387628	0
9	49260889	0	-25377034	-1	-34172322	1	-36128769	0	-13367593	0	15157834	0
10	43892381	0	-37335754	-1	-45425556	1	-47268681	0	-14413579	0	12607712	0
11	68205066	0	-56155784	-1	-12390523	1	-17837685	0	-16039449	0	56120407	-1
12	63064447	0	-41570204	-1	-24341837	1	-29445013	0	-15896319	0	52487878	-1
13	51658084	0	-26310524	-1	-36213865	1	-42111441	0	-17857330	0	55783207	-1
14	49643176	0	-27148187	-1	-38968068	1	-44395654	0	-17934509	0	55549907	-1
15	44148389	0	-38250192	-1	-50746419	1	-54347568	0	-18832462	0	59505296	-1
16	67145851	0	-50637107	-1	-25059771	1	-35520126	0	-24682078	0	-24136522	-1
17	60355064	0	-33810776	-1	-36198273	1	-46889106	0	-25098813	0	-19574683	-1
18	51370104	0	-29246777	-1	-44892743	1	-55333947	0	-25956166	0	-15768007	-1
19	49955823	0	-29437433	-1	-46650009	1	-57829325	0	-25637868	0	-48002531	-1
20	45272434	0	-38987826	-1	-54042639	1	-65671133	0	-24846627	0	-12545730	0
21	48593595	-1	39735764	-1	-21352002	1	16237070	1	-67975141	-1	-11312156	0
22	28602115	-1	40363217	-1	-26714084	1	19993746	1	-54298045	-1	-10117859	0
23	-37417828	-2	87139293	-1	-92854470	1	68342503	1	-85724632	-1	-85129036	-1
24	10171291	0	78657246	-1	-50202663	1	36997325	1	-12451465	0	-18817645	0
25	63574904	-1	10260741	0	-69342318	1	50717399	1	-84983105	-1	-14470874	0
26	23653054	-1	15175816	0	-13029144	2	93131221	1	-13405379	0	-10720650	0
27	13431578	0	13457837	0	-85097864	1	59803318	1	-11031034	0	-20100849	0
28	96298627	-1	16861384	0	-12119933	2	85028866	1	-14427860	0	-17794598	0
29	54562396	-1	22815498	0	-19029906	2	13199631	2	-23010338	0	-11642597	0
30	16332759	0	19795101	0	-14813170	2	99116957	1	-17611642	0	-20525981	0
31	12723557	0	22968711	0	-18527092	2	12343955	2	-23486074	0	-16230875	0
32	89053289	-1	28674679	0	-25354117	2	16895627	2	-33566169	0	-91025783	-1
33	19210712	0	27619597	0	-25463021	2	16584145	2	-32160748	0	-18267539	0
34	15728614	0	30654367	0	-28757182	2	18570160	2	-37898119	0	-13477456	0
35	13464859	0	35602746	0	-35941372	2	23592868	2	-52822837	0	-15385821	0
36	13704965	1	-15942419	0	14251532	2	14821498	1	18690090	0	-42912539	0

TABLE C29.- Continued

	1		2		3		4		5		6	
37	93909645	0	-86535505	-1	52535086	1	47481870	0	-15989087	-2	-40292752	-1
38	47938235	0	-24933408	-1	-17710928	1	-15883407	0	-39101584	-1	16450655	0
39	42026046	-1	30490495	-1	-47470299	1	-46337227	0	-40831077	-1	12910053	0
40	-21044711	0	53352387	-1	-42741386	1	-43294495	0	-13930327	-1	56457361	-2
41	-30175437	0	51190140	-1	-26671501	1	-27451424	0	95660852	-2	-72939669	-1
42	-32474751	0	28734159	-1	-12371936	-1	-36780156	-2	42566102	-1	-11216409	0
43	-26751537	0	-17056547	-2	18121475	1	18680506	0	34943675	-1	-59720119	-1
44	-14098756	0	-37403705	-1	20873852	1	25616135	0	26671523	-1	12006328	-1
45	-97990763	-2	-68489438	-1	67158309	0	16742604	0	25692058	-1	52928002	-1
46	14343854	0	-95753207	-1	-10831813	1	62146514	-1	30597806	-1	76343241	-1
47	29252779	0	-12266257	0	-35623375	1	-61067487	-1	55386245	-1	10630972	0
48	44919835	0	-14841820	0	-63224717	1	-19913953	0	91488571	-1	13768295	0
49	-41325080	0	54465965	-1	-13601204	1	-16489399	0	45709496	-1	-17075385	0
50	-39962026	0	33569616	-1	28122151	0	25794316	-2	27627097	-1	-11582500	0
51	-33198872	0	11648691	-2	21024087	1	21811092	0	17847457	-1	-11197541	-1
52	-16991581	0	-36356021	-1	22823922	1	27009368	0	-39974644	-2	82261051	-1
53	64213909	-3	-62693264	-1	77299996	0	16530943	0	-28861960	-2	11569105	0
54	16064534	0	-82681794	-1	-10290969	1	13686797	-1	11146526	-1	67746035	-1
55	32071662	0	-10701412	0	-32651142	1	-15983407	0	48665285	-1	-31687947	-1
56	-44516034	0	45176881	-1	11776884	1	10243051	0	54244209	-1	-15863989	0
57	-33552116	0	11702604	-1	23861334	1	23896754	0	-98829203	-2	58647174	-1
58	-16537309	0	-20374317	-1	24124891	1	29071476	0	-22176234	-1	16943229	0
59	53641120	-2	-44521670	-1	90488973	0	16782179	0	-89347007	-2	13595565	0
60	17206939	0	-47041296	-1	-61826486	0	16671533	-1	22639935	-1	27416323	-1
61	36137838	0	-43164137	-1	-27074893	1	-27425429	0	30155524	-1	-14689970	0
62	49375692	0	-33201524	-2	-35225164	1	-48249239	0	23480725	-1	-29502863	0
63	63545264	0	20916852	-2	-49125330	1	-71181614	0	51619345	-1	-50662532	0
64	-36814602	0	48265353	-1	29537193	1	30112861	0	-21828573	-1	15945486	0
65	-17564893	0	12651274	-1	34474949	1	25535701	0	-13939775	0	23758730	0
66	31227796	-1	28005398	-1	21238382	1	31840575	-1	-15009063	0	12016256	0
67	23065058	0	39761063	-1	20665030	0	-18300735	0	-10623065	0	-17039728	-1
68	42443005	0	64001870	-1	-17048646	1	-44121568	0	-39047586	-1	-28106073	0
69	49702148	0	70768127	-1	-27463887	1	-58240445	0	-18294550	-1	-38977664	0
70	63915112	0	87298226	-1	-38190666	1	-83870712	0	22834066	-1	-66168176	0
71	50735743	0	14517573	0	-18505470	1	-66415840	0	-74467986	-1	-44542132	0
72	66263364	0	17518372	0	-28753376	1	-91181603	0	-26010465	-1	-74748740	0
73	-11429467	0	57876160	-1	49850292	1	13613134	0	-32936172	0	29823660	0

TABLE C29.- Continued

	1		2		3		4		5		6	
74	86554350	-1	10156819	0	31857112	1	-12719418	0	-30554334	0	11191910	0
75	27859200	0	15983659	0	13932349	1	-33869639	0	-23114231	0	-44280650	-1
76	47704059	0	21807156	0	-28796379	0	-55639598	0	-11528027	0	-32242021	0
77	55337213	0	24073139	0	-98490333	0	-65922092	0	-81545580	-1	-42537683	0
78	70203278	0	28209840	0	-18871842	1	-81705474	0	-20565963	-1	-71468200	0
79	-61283777	-2	11249750	0	49123973	1	-53362667	-1	-46725177	0	33132349	0
80	10272865	0	16370548	0	40073525	1	-15435923	0	-37212035	0	15589339	0
81	29361937	0	23672812	0	25477271	1	-26725584	0	-23331089	0	-19860130	-1
82	50665119	0	32731101	0	75920902	0	-43004394	0	-65622482	-1	-21399383	0
83	59291181	0	35803291	0	69740352	-1	-44849223	0	12000815	-1	-25471953	0
84	74741171	0	42076419	0	-15818609	1	-44679253	0	15003055	0	-37997458	0
85	16523385	0	22476269	0	49072462	1	-14629901	0	-42697116	0	20608941	0
86	33742892	0	30936778	0	36275437	1	-21820658	0	-24668154	0	11153015	-1
87	63891241	0	48662682	0	61450708	0	-33958454	0	82093265	-1	-10699064	0
88	79752793	0	58947410	0	-81935478	0	-28820874	0	34337270	0	-41626513	-1
89	46744817	0	49289647	0	41455387	1	-27845849	0	-25112437	0	85857034	-1
90	65094630	0	61802483	0	28187166	1	-11490274	0	63745523	-1	10766368	0
91	88680597	0	82528533	0	88923826	0	34239830	0	71003838	0	32471990	0
92	81324173	0	86974018	0	27576144	1	43762512	0	46430349	0	57472319	0
93	99999999	0	99999999	0	99999999	0	99999999	0	99999998	0	99999999	0
94	-27127394	0	-36439186	-2	27331516	1	28262218	0	-44937277	-2	62200631	-1
95	43369807	0	-15023183	0	-62069663	1	-25389042	0	66520185	-1	79211060	-1
96	44142155	0	-14825558	0	-59644306	1	-30777701	0	78038280	-1	-37282004	-1
97	45212719	0	-13680834	0	-58208826	1	-40369119	0	70710319	-1	-13441295	0

TABLE C29.- Continued

	7		8		9		10		11		12	
1	63224310	0	64161912	1	38679629	-1	-35800295	0	-93152702	0	-63342522	0
2	95851342	0	74382361	1	30112291	-1	-28114552	0	-35535571	0	-37908261	0
3	11164389	1	82147282	1	-14841548	-2	-94714476	-1	59012482	0	63171032	-1
4	13454345	1	94229744	1	-12421854	-1	-72241773	-1	81707749	0	10356101	0
5	15121892	1	11366242	2	-24543795	-1	-63035114	-1	95156457	0	11689022	0
6	44178494	1	12847998	2	54488502	-1	-38964998	0	-76963149	0	-59698588	0
7	47259408	1	13564824	2	46422186	-1	-30410384	0	-26092584	0	-36738777	0
8	53418342	1	15233970	2	16756550	-1	-10729969	0	64161430	0	12193579	0
9	55149693	1	15875631	2	60076852	-2	-80162729	-1	75709496	0	21200237	0
10	58786322	1	16793825	2	-85645110	-3	-38345301	-1	83713454	0	28130753	0
11	95503381	1	22956346	2	86037803	-1	-39893892	0	-58868724	0	-48915050	0
12	98804528	1	23912602	2	91495589	-1	-32475902	0	-21111370	0	-31159680	0
13	10879590	2	25540702	2	75728974	-1	-94986761	-1	81511399	0	30082003	0
14	11058953	2	26141433	2	71316666	-1	-50168583	-1	99117182	0	40727489	0
15	11658884	2	27999840	2	57427122	-1	49610157	-1	12237384	1	59940727	0
16	17065879	2	35406460	2	12561819	0	-26833874	0	-24347401	0	-15043085	0
17	17232920	2	35826537	2	12119893	0	-17326359	0	12511076	0	45275921	-1
18	17533051	2	36112236	2	10499797	0	74020470	-2	10000767	1	54509416	0
19	17822423	2	37002477	2	11537649	0	39007034	-1	11600783	1	67292781	0
20	18499010	2	38175095	2	14055238	0	14059997	0	15468142	1	10264915	1
21	-23175217	0	21065774	1	-31310158	-1	11004723	0	15942844	1	68690219	0
22	-57638968	-1	11474030	1	-75891022	-1	35664542	0	43216083	1	-51624714	0
23	-77993593	-1	-77892095	0	-14828555	0	38711443	0	57116987	1	-10391089	2
24	-23635123	0	37315753	1	-11062041	0	46048479	0	50160683	1	17378135	1
25	-53300685	-1	12909996	1	-12661759	0	57608177	0	68733859	1	-11672264	1
26	-46850987	-1	-72081792	0	-35820452	-1	20593706	0	51738514	1	-10566571	2
27	-13019844	0	27870440	1	-30276962	0	94857835	0	11061182	2	26098076	1
28	-11796162	0	74290243	0	-12818062	0	57384896	0	69194565	1	-50818031	0
29	-14765810	0	-10524307	1	20677978	0	-45736009	0	-29120283	1	-78790272	1
30	-20917645	0	17094257	1	-27110334	0	59762033	0	65187909	1	63452258	1
31	-18915365	0	19762697	0	71310847	-1	-16980074	0	-26893685	1	37269724	1
32	-29942615	0	-12923313	1	44546833	0	-13700366	1	-15793945	2	-10391088	1
33	-49616821	0	79070518	0	16217364	0	-76966878	0	-11317306	2	13585874	2
34	-43179978	0	-25519657	0	52863306	0	-17133101	1	-22924607	2	12289478	2
35	-66636157	0	-17569137	1	56712934	0	-21356515	1	-27388277	2	94069030	1
36	13755780	1	-13713751	2	25866561	-1	40085752	0	-23629141	0	-79390225	-1

TABLE C29.- Continued

	7		8		9		10		11		12	
37	-52249302	0	20632187	0	59324773	-1	-21666685	0	-29268918	0	-70659569	-2
38	-92775911	0	36759230	1	-47465606	-1	-59781526	-1	26573518	0	49091983	-1
39	-73064421	0	11574129	1	-64356952	-1	15604377	0	78564072	-1	34647834	-1
40	-35625188	-1	-22438568	1	34388842	-1	58499186	-1	-93728367	-1	-74928438	-1
41	46987322	0	-47051208	1	89720509	-1	-29399440	-1	-35303650	0	-12903122	0
42	12553773	0	-19399485	1	85418610	-2	-54422752	-1	31658464	0	37441341	-1
43	-15746562	0	10113062	1	-10814269	-1	-23939118	-1	21944557	0	98501943	-1
44	-32635520	0	28199268	1	-89763931	-1	-18771058	-1	-13290505	0	-26313847	-1
45	-31194277	0	23358510	1	-30431914	-1	37254033	-4	-91806982	-1	-44954806	-2
46	12870706	0	-18543803	1	11642227	-2	87172972	-1	38896345	0	82105236	-1
47	10359652	1	-96743966	1	57559015	-1	22521739	0	-42505318	0	17557144	-2
48	20415464	1	-17996537	2	15869950	0	47981466	0	10784318	0	39950873	0
49	21010653	0	-17305311	1	-76507035	-1	59590951	-1	-72146490	0	-83236311	-1
50	46198176	0	-16089650	1	-70388988	-1	52938680	-1	36306214	0	26930213	0
51	16425813	0	22370493	1	-89482718	-1	24327495	-1	10809819	0	11000517	0
52	-13698792	0	36723987	1	-93543772	-1	23545333	-1	-22203724	0	-51777881	-1
53	-27184813	0	25198219	1	-58039037	-1	99153681	-2	-41193358	-1	-12541289	-1
54	-14281466	0	54745784	0	-52137801	-1	-82263110	-1	11713132	0	-24120006	-1
55	20655629	0	-29712386	1	-67631215	-1	-22251645	0	71598633	-1	-75435740	-1
56	41065859	0	-16722939	1	-25545286	0	13935681	0	-18495946	1	-33099540	0
57	36229616	0	21037829	1	13169170	0	-50581681	-1	-54321116	0	-24279924	0
58	-15151526	0	24174316	1	85049962	-1	16728877	-1	-51603588	0	-22688401	0
59	-23836498	0	22042650	1	-26688193	-1	55433927	-1	-34086764	0	-14148240	0
60	-67079670	-2	19827251	1	-36409104	-1	-98997631	-2	-11413506	-1	-87141068	-1
61	-34241635	0	27078694	1	23118077	-1	-17265238	0	29962136	0	70628076	-1
62	-64433210	0	64437670	1	45203931	0	15863116	0	-39325863	0	-95114106	-1
63	-11811935	1	14357674	2	49915826	0	61886799	0	-14905941	1	-13150381	0
64	63724295	0	40574999	0	45974625	0	-50521079	-1	-10076076	1	-38790594	0
65	20408962	0	-38659573	1	56058231	0	-61519410	-1	-61915206	0	-40020036	0
66	-80973765	-2	-19089096	1	27286197	-1	11373094	0	40431790	0	18627412	0
67	-25418200	0	16897049	1	-25623728	-1	18237207	0	37182842	0	22092522	0
68	-59688301	0	49333718	1	19567424	0	25986658	0	82986235	-1	14873227	0
69	-75795632	0	75555917	1	40115770	0	40637991	0	-38917815	-1	19600390	0
70	-13465829	1	15475668	2	14480900	1	14203297	1	11450702	1	15072326	1
71	-82097184	0	77340984	1	43631501	0	48031647	0	-33778212	0	78075668	-1
72	-12999202	1	17115101	2	16236094	1	20390781	1	-28277340	1	32892185	0
73	36212728	0	-10397181	2	12632349	1	-21206430	0	10704310	1	31519785	-2

TABLE C29.- Continued

	7		8		9		10		11		12	
74	20472983	0	-82147095	1	-70695992	-2	15066487	0	74710731	0	39331203	0
75	-85382710	-2	-25784568	1	-20234975	0	30181604	0	36763435	0	32564571	0
76	-47818162	0	49639339	1	11310476	0	29243387	0	-86363200	0	-17819770	0
77	-76799448	0	73626020	1	43779959	0	46092597	0	-13193903	1	-31358008	0
78	-12062542	1	16864976	2	17220191	1	19811597	1	-56171439	1	-27744701	1
79	84957158	0	-17359375	2	54111900	0	-12921299	0	77299965	0	20044032	0
80	59015409	0	-11569977	2	-28656413	0	17585938	0	45863172	0	45888749	0
81	29394849	0	-57558765	1	-72498287	0	58553766	-1	-25685477	0	31408725	-1
82	-24321460	0	34304819	1	-96074895	-1	47087192	-3	-56135333	0	-16013401	0
83	-35457608	0	56932636	1	39332621	0	-16948376	0	-15017154	1	-65049715	0
84	-84132634	0	12098906	2	23538059	1	-86822199	0	-13687315	2	-81004142	1
85	93366513	0	-15510879	2	-77257588	0	16875522	-1	-68398712	0	43443185	-1
86	60428554	0	-83479961	1	-12207539	1	-15337202	0	-59198134	0	-35107549	-1
87	-81169778	-1	35705809	1	20964724	0	-73434417	0	-54585391	0	-63050562	0
88	-67026836	0	86350653	1	32736447	1	-26901385	1	44032778	1	-14991258	0
89	90138184	0	-10046147	2	-21376046	1	-67436136	0	-24893874	0	-32203586	0
90	67943169	0	-59332843	1	-12093173	1	-10624579	1	85935332	-1	-58792274	0
91	-38900455	0	28584036	1	22309389	1	-12417938	1	46791243	1	15484886	1
92	13321341	1	-52002459	1	-13256971	1	-85977365	0	-52337988	0	-97954598	0
93	99999999	0	99999998	0	99999999	0	99999999	0	99999999	0	99999998	0
94	12836256	0	34436709	1	-10597047	0	23385074	-1	-29711452	0	-59007957	-1
95	16935647	1	-16827519	2	11928982	0	33925939	0	-23131483	0	16398570	0
96	96889106	0	-11037960	2	34400633	-1	-60606596	-1	58022202	-3	11497846	0
97	93971637	-1	-20019153	1	-23185778	-1	-27476678	0	80996369	-1	74187689	-1

TABLE C29.- Continued

	13		14		15		16	
1	-22120192	2	21825671	1	66239627	2	-77988511	2
2	-16319419	2	17060686	1	32793637	2	-32019204	2
3	44178255	1	-54917368	0	23541403	2	43010231	0
4	85291533	1	-10737599	1	40561199	2	64117213	1
5	16499231	2	-21405729	1	10417708	3	11190413	3
6	-21647438	2	21668642	1	52430870	2	-66341002	2
7	-15785056	2	16501247	1	32205004	2	-35779609	2
8	50514275	1	-54949085	0	34332008	2	-22071431	2
9	93388946	1	-10085695	1	48455551	2	-25982933	2
10	16577096	2	-18904933	1	94981634	2	-11115810	2
11	-21824497	2	23468968	1	23302901	2	34022801	2
12	-16803089	2	18797138	1	24783605	2	47584311	2
13	77337456	1	-65203304	0	10370317	2	-30542076	2
14	12609092	2	-11744249	1	15931535	2	-68042419	2
15	20642233	2	-20022810	1	26114532	2	-15137889	3
16	-16841548	2	21518142	1	-69169596	2	23175081	3
17	-95910612	1	14148627	1	-71996430	2	15002498	3
18	86824851	1	-42840552	0	-67782539	2	-37666073	2
19	12638513	2	-78940190	0	-74469264	2	-68215366	2
20	21558567	2	-15115222	1	-11251894	3	-13664585	3
21	-87138064	0	-49854755	0	-22759652	0	-95929451	-1
22	-17294126	1	-10751953	1	-62875444	0	-27411756	0
23	31551827	1	19719627	1	-66834163	0	-14529330	0
24	-30006972	1	-17910471	1	-72203232	0	-38369605	0
25	-23594974	1	-14325435	1	-88479271	0	-36751440	0
26	43893619	1	29038807	1	-27127289	0	-10803781	0
27	-67987471	1	-42993889	1	-19081151	1	-65880267	0
28	-27163395	1	-16641129	1	-90094735	0	-31090273	0
29	72923979	1	48551698	1	12443933	1	33671524	0
30	-80689567	1	-53765870	1	-18994344	1	-48956933	0
31	-91020407	0	-58067922	0	37444826	0	10731677	0
32	86477068	1	55677965	1	27764255	1	87510722	0
33	-37248957	1	-26394638	1	78228951	0	49194479	0
34	39995250	1	25699489	1	35293254	1	11436066	1
35	53500384	1	29231215	1	30678741	1	12524859	1
36	61662392	-1	-18299655	0	88288117	0	42226620	0

TABLE C29.- Continued

	13		14		15		16	
37	41771926	0	46314296	-2	-20484889	1	45618071	0
38	22222924	0	29235222	-1	-25244699	1	37164372	0
39	73457547	-1	32634368	-1	-15916348	1	34750539	0
40	-11710101	0	-80651320	-1	-56504004	0	51519969	-1
41	-15922223	0	-12004620	0	16354758	0	-11986451	0
42	-20293502	-1	60928785	-2	31086924	0	61019350	-1
43	11491353	0	91731399	-1	19152333	0	13521875	0
44	38215394	-1	-26781240	-1	-15563001	0	13907588	0
45	51995239	-1	-38725992	-2	-26831190	0	14100826	0
46	-35269083	-2	40179799	-1	41382190	-1	80171989	-1
47	-59064313	-1	16927548	-1	79733225	0	-57340582	-1
48	19821292	0	43760388	0	19623987	1	-15883556	0
49	-29696499	-1	-17827369	-1	51112320	0	-31321130	-1
50	19165189	0	30018266	0	82350951	0	-16691779	0
51	71373469	-1	12555609	0	29274584	0	-18081537	0
52	-32712034	-1	-45149265	-1	-22604684	0	-80620747	-1
53	17475980	-1	-19433760	-1	-42525550	0	72707144	-1
54	-12596512	-1	-46744794	-1	-42404071	0	60692300	-1
55	-59625905	-1	-99423601	-1	-19663494	0	-51348750	-2
56	-16402707	0	-21121256	0	84373557	0	-11151524	0
57	-27443818	0	-24187966	0	-42278380	-1	-40355760	0
58	-18829325	0	-24077878	0	-46809814	0	-21854658	-1
59	-11169259	0	-15077183	0	-45878729	0	54649071	-1
60	-12831736	0	-10530973	0	-27820112	0	-12438016	0
61	11144215	0	83911436	-1	-31426128	0	34062147	-2
62	-66382478	-1	-31000431	-1	-13283436	0	-72618893	-1
63	-25686575	-1	73334864	-1	12606057	0	-16683357	0
64	-38736865	0	-37781885	0	-34284753	-1	-50289528	0
65	-37988888	0	-45378830	0	-32077569	0	-43770828	-1
66	14581703	0	18545721	0	12873960	0	32833658	-1
67	17810228	0	25302928	0	74482066	-1	-23318764	-1
68	13490856	0	21805357	0	27400087	0	13478468	-2
69	17478702	0	30429893	0	45557911	0	-50350849	-1
70	14251902	1	18384093	1	23502021	1	13910969	0
71	54791325	-1	19890739	0	58307586	0	-96375418	-1
72	43537818	0	80371938	0	25981736	1	-12200112	0
73	-10835896	0	-13474807	0	-11069894	0	49714807	-1

TABLE C29.- Concluded

	13		14		15		16	
74	35468064	0	40952960	0	65967780	0	13866099	0
75	27006547	0	39181467	0	65422285	0	-37003437	-1
76	-14137805	0	-67777173	-1	34083369	0	-21116350	0
77	-25832559	0	-18115688	0	40748994	0	-15288814	0
78	-32758824	1	-28278668	1	17473842	0	-69363458	0
79	16360646	0	14992192	0	50999229	0	48091447	-1
80	46744452	0	52667484	0	10254479	1	43746800	-1
81	68331323	-1	91202913	-1	54672357	0	-75494457	-1
82	-81921532	-1	-81987723	-1	11467260	0	-20661059	0
83	-47937585	0	-58321806	0	-39028390	0	-29891786	0
84	-78663353	1	-85958061	1	-62546973	1	-15047129	1
85	17974052	0	13328331	0	85400995	0	-46342482	-1
86	10429749	0	49660716	-1	55886328	0	-13591914	0
87	-46929267	0	-66540350	0	-10076571	1	-31231021	0
88	-81616598	-1	-56715257	0	-34114307	1	-25824868	0
89	-22820773	0	-33431068	0	-20031257	0	-33443654	0
90	-46773893	0	-71362559	0	-96887100	0	-18080049	0
91	18421284	1	14206318	1	-54003277	0	10695033	1
92	-95100137	0	-12070592	1	-14351126	1	-11141970	0
93	99999999	0	99999999	0	99999999	0	99999998	0
94	-70274869	-1	-41215356	-1	68019170	-2	-25796512	0
95	29458052	-1	18868087	0	15685629	1	-74519973	-1
96	10768308	0	13159362	0	75471030	0	95937045	-2
97	15820591	0	10785630	0	-14749513	0	-11968788	-1

TABLE C30.- SYMMETRIC STRUCTURAL MODES, CASE SC3

CP \ Mode	1		2		3		4		5		6	
1	81136285	0	-88356395	-1	-41376436	1	79626526	-1	-12444910	-1	10289158	0
2	73137850	0	-62961360	-1	-11757839	1	19238429	-1	-51332004	-1	89845071	-1
3	60249778	0	-34902859	-1	46273535	1	-57910355	-1	-88745928	-1	72678252	-1
4	58424982	0	-35337392	-1	51586157	1	-66273909	-1	-10475408	0	83424659	-1
5	52612960	0	-46222483	-1	89534251	1	-11230270	0	-14678351	0	91709217	-1
6	80031277	0	-79069894	-1	-26562500	1	10478779	-1	-76245298	-1	44044081	-1
7	73086294	0	-57366703	-1	16161386	1	-40054318	-1	-10566015	0	45455930	-1
8	60080029	0	-33415417	-1	55774256	1	-93961586	-1	-15010703	0	54922984	-1
9	58484209	0	-33289649	-1	63791355	1	-10453361	0	-16545996	0	64332616	-1
10	52654261	0	-43876047	-1	98244692	1	-13948705	0	-18164776	0	46990502	-1
11	78631974	0	-67218701	-1	26768285	0	-74843944	-1	-15029132	0	-23721658	-1
12	73079583	0	-50485779	-1	38365207	1	-10103872	0	-15604029	0	-21031703	-1
13	60897107	0	-32243212	-1	70794089	1	-13824304	0	-18426312	0	-20923065	-1
14	58747964	0	-32829067	-1	78883088	1	-14322668	0	-18663812	0	-20787562	-1
15	52828325	0	-42988748	-1	11320491	2	-16896054	0	-20524424	0	-18822174	-1
16	77190600	0	-56787740	-1	36425796	1	-15043814	0	-21991254	0	-11049431	0
17	69940095	0	-37576559	-1	68385424	1	-17865120	0	-23272143	0	-10389458	0
18	60400672	0	-31289380	-1	92544662	1	-20244711	0	-25001181	0	-10115378	0
19	58886351	0	-31145273	-1	99985117	1	-21032784	0	-24174597	0	-12109793	0
20	53842560	0	-39773070	-1	12746009	2	-23431637	0	-22762205	0	-16842172	0
21	51255185	-1	40555538	-1	24774311	1	80795872	0	-81092015	-1	-99813369	-1
22	29478115	-1	40133413	-1	33260273	1	10017803	1	-80589624	-1	-90504318	-1
23	-94787966	-2	78972518	-1	11863562	2	34548743	1	-22205394	0	-11514555	0
24	10606470	0	78805558	-1	61403785	1	18516374	1	-16999936	0	-17436300	0
25	63312883	-1	99628561	-1	89677778	1	25638349	1	-16984741	0	-14145258	0
26	16868523	-1	14300140	0	16822062	2	47186956	1	-32248789	0	-15233014	0
27	13673888	0	13223639	0	11590057	2	30301647	1	-20562461	0	-18715025	0
28	94067392	-1	16348675	0	16092067	2	43101444	1	-30277756	0	-19426617	0
29	45398593	-1	21770954	0	24716418	2	66942313	1	-50632901	0	-20155564	0
30	16187690	0	19229814	0	20707108	2	50398595	1	-36355484	0	-22445522	0
31	12157444	0	22209479	0	25265544	2	62729667	1	-48851825	0	-22510716	0
32	76836872	-1	27440424	0	33736794	2	85825679	1	-70534931	0	-22918397	0
33	18423528	0	26419558	0	35501053	2	84363535	1	-67210076	0	-28080706	0
34	14560186	0	29351180	0	39762487	2	94484056	1	-78641554	0	-27514183	0
35	11769857	0	33883580	0	48281595	2	11971281	2	-10485145	1	-35471658	0
36	15232413	1	-19709801	0	-39768937	2	41446193	0	34607562	0	-28803814	0

TABLE C30.- Continued

	1		2		3		4		5		6	
37	10661028	1	-10974659	0	-16996357	2	11568407	0	46664770	-1	-44360345	-1
38	57422798	0	-37197744	-1	23173566	1	-25116754	-1	-73678735	-1	10658256	0
39	10643393	0	27080539	-1	11202815	2	-10435300	0	-95720988	-1	94483391	-1
40	-16788873	0	52964303	-1	10769403	2	-98769155	-1	-48329224	-1	18938062	-1
41	-27135882	0	50225802	-1	68258451	1	-58425713	-1	-16914253	-2	-33387836	-1
42	-30475452	0	23020043	-1	88513439	-2	19136369	-1	68247692	-1	-61560724	-1
43	-25488280	0	-11157310	-1	-51726472	1	66843659	-1	73002976	-1	-38234560	-1
44	-13627811	0	-49169472	-1	-56724415	1	89404784	-1	59179928	-1	29600073	-2
45	-11620327	-1	-79937342	-1	-10763104	1	71850978	-1	35984502	-1	33259925	-1
46	13594361	0	-10558803	0	45933021	1	51354633	-1	10945750	-1	54260099	-1
47	27660556	0	-12996693	0	12540581	2	40149806	-1	-81444424	-2	86501531	-1
48	42497319	0	-15292995	0	21392916	2	29559809	-1	-21665373	-1	12355946	0
49	-38806030	0	51487297	-1	39350069	1	-24318946	-1	71950100	-1	-93065408	-1
50	-38132378	0	28507277	-1	-10930348	1	11471471	-1	56634095	-1	-70889179	-1
51	-32064604	0	-85285693	-2	-65732627	1	73825893	-1	52771422	-1	-14040584	-1
52	-16533524	0	-47978334	-1	-70240597	1	86314845	-1	18908914	-1	38756860	-1
53	-18307826	-3	-73611894	-1	-20307777	1	64205298	-1	-17826702	-2	66050550	-1
54	15511039	0	-91850098	-1	43457718	1	27524293	-1	10258233	-2	45074392	-1
55	30919733	0	-11421663	0	12555502	2	-76209278	-2	29702240	-1	-20977561	-2
56	-42786314	0	38955244	-1	-32709661	1	49491392	-1	10434910	0	-95216984	-1
57	-32433617	0	27273375	-2	-82293322	1	74166471	-1	13960036	-1	24430889	-1
58	-16096025	0	-31143130	-1	-82240380	1	93036483	-1	-15772488	-1	92157943	-1
59	48045360	-2	-54509663	-1	-26579589	1	64896975	-1	-90450511	-2	78484310	-1
60	16781018	0	-55035866	-1	34036149	1	30498017	-1	29790465	-1	22915635	-1
61	35522696	0	-46876760	-1	11341788	2	-65363382	-1	52169030	-1	-77253703	-1
62	49038283	0	-22133857	-2	14720126	2	-14463953	0	69963017	-1	-16590421	0
63	63424259	0	51126134	-2	20912679	2	-21552812	0	13894875	0	-28849738	0
64	-35846793	0	40708991	-1	-10928870	2	96413739	-1	-13634356	-1	88069870	-1
65	-17144630	0	80782017	-2	-13233204	2	20429877	-1	-15442716	0	10475648	0
66	34521695	-1	27134978	-1	-78209846	1	-59127604	-1	-14403229	0	30164567	-1
67	23271732	0	41025658	-1	-19476581	0	-10574620	0	-80937381	-1	-37256046	-1
68	42487466	0	68877086	-1	82616918	1	-17000484	0	24738455	-1	-17799302	0
69	49696349	0	77467666	-1	12407426	2	-20995852	0	58980946	-1	-23680758	0
70	64197531	0	98097971	-1	17727953	2	-30491737	0	13700803	0	-39183602	0
71	51024561	0	15755591	0	93331949	1	-27180385	0	26325601	-1	-28573375	0
72	66886860	0	19245387	0	14743363	2	-35903906	0	12149355	0	-45794838	0
73	-10573672	0	62694594	-1	-20447947	2	-12365253	0	-36592700	0	93799652	-1

TABLE C30.- Continued

	1		2		3		4		5		6	
74	94009120	-1	11082546	0	-12641562	2	-19598731	0	-29890262	0	-15665325	-1
75	28529312	0	17202544	0	-50200669	1	-22336949	0	-18867444	0	-86031076	-1
76	48293884	0	23266700	0	32594843	1	-24705133	0	-15215803	-1	-21967737	0
77	55891959	0	25716148	0	63896452	1	-26920024	0	34854699	-1	-27032856	0
78	70863139	0	30271892	0	11374707	2	-30597952	0	14703991	0	-42820358	0
79	29666536	-2	12682159	0	-21477637	2	-24666806	0	-51412459	0	77347358	-1
80	11226183	0	17835324	0	-16168827	2	-23538418	0	-36564558	0	-71185826	-2
81	30220012	0	25178067	0	-87644786	1	-19881092	0	-17553094	0	-71982248	-1
82	51495965	0	34360816	0	-33962718	0	-15928355	0	39008844	-1	-13212946	0
83	59958563	0	37409081	0	27555360	1	-13210237	0	12485344	0	-12834647	0
84	74558307	0	43686719	0	95444607	1	-32102004	-1	29107955	0	-14300416	0
85	17755834	0	24328035	0	-19629520	2	-25342776	0	-41555240	0	91637460	-2
86	34842875	0	32704189	0	-12284971	2	-18630001	0	-17434999	0	-56714097	-1
87	64564680	0	50432114	0	72042049	0	-38270274	-1	19244324	0	-55427833	-2
88	79671827	0	60429930	0	63192836	1	11927801	0	42832434	0	14514473	0
89	48284695	0	51787167	0	-14226280	2	-18228282	0	-15419146	0	-71105110	-3
90	66105682	0	63865165	0	-73848520	1	47683123	-1	17153917	0	12182863	0
91	88671561	0	83397080	0	24415922	1	54492563	0	78406537	0	48417652	0
92	81956655	0	88304129	0	-63145668	1	50293338	0	54197717	0	55230064	0
93	99999999	0	99999999	0	99999999	0	99999998	0	99999999	0	99999999	0
94	-26372977	0	-14038900	-1	-87266744	1	87831128	-1	27224981	-1	25081857	-1
95	41006673	0	-15387511	0	21177158	2	-67591625	-2	-32934631	-1	79181599	-1
96	42060990	0	-15306101	0	21385823	2	-29988706	-1	15578552	-1	83276521	-2
97	43591897	0	-14221401	0	21593150	2	-71250876	-1	47221422	-1	-53918043	-1

LOS ANGELES DIVISION
NORTH AMERICAN ROCKWELL CORPORATION

TABLE C30.- Continued

	7		8		9		10		11		12	
1	13498704	0	-32812295	1	79648944	-1	-30447676	0	-53195161	0	-33625163	0
2	25436314	0	-41512911	1	64715466	-1	-24323235	0	-17321177	0	-18695865	0
3	27937131	0	-47874834	1	33302783	-1	-99738758	-1	35901958	0	-98136400	-2
4	35617426	0	-55515111	1	25202459	-1	-85567658	-1	47620462	0	-26042487	-1
5	35765710	0	-66320677	1	24998645	-1	-91231350	-1	51963065	0	-86085773	-1
6	20387073	1	-95392271	1	97710561	-1	-32965740	0	-42369813	0	-31439017	0
7	21672383	1	-10233680	2	85277057	-1	-25947294	0	-10803048	0	-18265316	0
8	24228678	1	-11677818	2	48211328	-1	-10366251	0	41158751	0	48861016	-1
9	24906807	1	-12153999	2	36394578	-1	-83933804	-1	47693304	0	94837329	-1
10	26546428	1	-12906901	2	37972152	-1	-54816196	-1	50719687	0	10187900	0
11	45660200	1	-18569579	2	14156711	0	-33108285	0	-26830395	0	-21138371	0
12	47091629	1	-19304773	2	14973363	0	-26786658	0	-28697524	-1	-10812152	0
13	51951141	1	-21019698	2	12502150	0	-79600960	-1	57194928	0	20667708	0
14	52710386	1	-21445677	2	12270404	0	-43207295	-1	67384907	0	25733662	0
15	55310845	1	-22823383	2	11451303	0	39160584	-1	81540451	0	36336627	0
16	83764790	1	-30709933	2	18358575	0	-20111652	0	97936026	-2	61872236	-1
17	84422949	1	-31109605	2	17724371	0	-12303242	0	22933400	0	16230362	0
18	85875984	1	-31583709	2	15204342	0	26185299	-1	74946263	0	43034492	0
19	87174636	1	-32189600	2	16926063	0	53965932	-1	85798270	0	51471893	0
20	90567038	1	-33235455	2	20274691	0	14617595	0	11297884	1	76655306	0
21	-24675727	0	-72652763	0	-16962487	-1	82145018	-1	93579026	0	28720071	0
22	-10153864	0	-44109402	0	-64419017	-1	28308069	0	22969338	1	-10168818	1
23	-41292817	-1	37174642	0	-13353089	0	29888816	0	24096758	1	-82191569	1
24	-33690916	0	-14336185	1	-89766845	-1	36637610	0	28547987	1	52475941	0
25	-11279307	0	-47553727	0	-11289056	0	46572064	0	36549049	1	-18263934	1
26	-32667210	-1	29151468	0	-31536807	-1	16007268	0	22145868	1	-80953643	1
27	-23259228	0	-10411564	1	-27460573	0	76045288	0	61090106	1	14550024	0
28	-14376519	0	-24833629	0	-12111379	0	46610850	0	37217988	1	-13617803	1
29	-97756696	-1	36115604	0	18550942	0	-36170221	0	-18962837	1	-48584374	1
30	-24865485	0	-62995251	0	-24254634	0	45809814	0	37486735	1	32447489	1
31	-18187904	0	-14313684	0	60441705	-1	-12896839	0	-12188649	1	30328839	1
32	-20136862	0	34424397	0	40463824	0	-10944858	1	-84944784	1	17773722	1
33	-40092183	0	-23724657	0	15561595	0	-61244854	0	-53867059	1	11074232	2
34	-32951039	0	-13976589	-1	48029191	0	-13484965	1	-11536875	2	12193397	2
35	-44814651	0	51352876	0	52560871	0	-17334342	1	-14412489	2	10404732	2
36	15341335	1	57326548	1	-26126699	-1	38500414	0	-21808234	0	-11515924	0

TABLE C30.- Continued

	7		8		9		10		11		12	
37	-26160200	0	59746728	0	73415719	-1	-18898709	0	-16505447	0	38168898	-1
38	-71797003	0	-10513748	1	-32585139	-1	-68480906	-1	17624927	0	32595462	-1
39	-55006763	0	-40030360	0	-74203195	-1	11773492	0	60930472	-1	24808669	-1
40	-24645576	-2	52385109	0	12603108	-1	45549902	-1	-58484383	-1	-53729395	-1
41	41025553	0	12627086	1	57605525	-1	-20009409	-1	-21899112	0	-72558000	-1
42	12054325	0	64468771	0	19898012	-2	-38424162	-1	22187839	0	23694087	-1
43	-14785830	0	-25838343	0	-69903416	-2	-14984122	-1	18350875	0	95646240	-1
44	-30221985	0	-83651418	0	-74582195	-1	-21246850	-1	-59322722	-1	-84923843	-2
45	-25030633	0	-58953220	0	-17616300	-1	-37324018	-2	-36368154	-1	91728415	-2
46	20251726	0	81581342	0	-18591335	-1	77930214	-1	23371449	0	37478137	-1
47	10820541	1	33241035	1	-17270283	-1	20812666	0	-29070419	0	24453184	-1
48	20461372	1	60094774	1	10290765	-1	45476734	0	79825177	-1	36456317	0
49	12826499	0	35985067	0	-73231539	-1	52699571	-1	-39605123	0	15549952	-2
50	28164155	0	10803737	0	-92480881	-1	56921563	-1	30530872	0	25313948	0
51	-29097367	-1	-11822041	1	-93015724	-1	23317148	-1	11762244	0	11117020	0
52	-24116452	0	-14598214	1	-91552587	-1	11595959	-1	-12687100	0	-31083665	-1
53	-24574256	0	-83015119	0	-58735779	-1	-32218492	-3	-21857056	-1	-10268216	-1
54	-64060587	-1	-31547398	-2	-46282925	-1	-79650959	-1	64037680	-1	-33796513	-1
55	31664884	0	13471829	1	-52309391	-1	-19706709	0	26613660	-1	-73162023	-1
56	24252579	0	17030151	0	-25562881	0	11128493	0	-11214124	1	-16146071	0
57	98338249	-1	-13515417	1	11870396	0	-42978751	-1	-35172843	0	-17116024	0
58	-19093970	0	-10159688	1	65235094	-1	74140498	-2	-35213035	0	-17436800	0
59	-21566502	0	-76412882	0	-33608487	-1	35357976	-1	-23365823	0	-11711330	0
60	-44514121	-1	-67711757	0	-17749849	-1	-20201093	-1	-18034115	-1	-89671386	-1
61	-24886218	0	-48478666	0	83803085	-1	-16258570	0	22981395	0	59997552	-1
62	-56023457	0	-15596507	1	54982107	0	12192672	0	-18343250	0	-40334922	-1
63	-11959209	1	-41470293	1	68203682	0	50487991	0	-77707722	0	79918062	-2
64	34334583	0	-89896357	0	41316891	0	-31318706	-1	-66107079	0	-25415694	0
65	26551296	0	10570509	1	45329446	0	-53694301	-1	-50114005	0	-32455184	0
66	31911787	-1	33427992	0	-61202926	-1	76440175	-1	22801121	0	12657999	0
67	-23711451	0	-71567408	0	-52585644	-1	12739073	0	24931182	0	16108201	0
68	-52605549	0	-13052619	1	24809043	0	19563695	0	11803571	0	13046284	0
69	-70890929	0	-20516371	1	48760207	0	32689995	0	88399360	-1	19796601	0
70	-13144598	1	-41440471	1	15624588	1	12634676	1	11885290	1	14410446	1
71	-78332734	0	-22308517	1	51204992	0	37523307	0	-12517491	0	94617278	-1
72	-13921681	1	-50280755	1	17484008	1	17559656	1	-14180607	1	57557213	0
73	61351344	0	33438303	1	10364405	1	-16483596	0	52198426	0	-46395523	-1

TABLE C30.- Continued

	7		8		9		10		11		12	
74	35111656	0	22755487	1	-19131906	0	91407012	-1	41040872	0	27744203	0
75	93446725	-2	35461360	0	-30257282	0	20414566	0	21549729	0	22917966	0
76	-50953434	0	-17418087	1	14926360	0	19111381	0	-53119104	0	-13174209	0
77	-74598736	0	-22104582	1	51093336	0	34217933	0	-79719159	0	-21425968	0
78	-13206350	1	-50630167	1	19172194	1	16219423	1	-38801720	1	-23807184	1
79	10848870	1	50864887	1	22247175	0	-13550418	0	30724994	0	11098459	0
80	66388032	0	29613422	1	-52393456	0	96012186	-1	21749227	0	34404965	0
81	27950776	0	11530298	1	-93866889	0	-33547147	-1	-24973666	0	-33394471	-1
82	-30366239	0	-13488078	1	-69385331	-1	-62003427	-1	-35339887	0	-13136012	0
83	-39250543	0	-17589171	1	47690539	0	-19573373	0	-96708428	0	-48924983	0
84	-74149002	0	-29304055	1	27428432	1	-90733184	0	-98087313	1	-68109074	1
85	97617878	0	38943855	1	-10434343	1	-78246790	-1	-59629252	0	-26088305	-2
86	53090883	0	16915485	1	-13543965	1	-24023155	0	-48698020	0	-89108407	-1
87	-12146132	0	-11011962	1	28901181	0	-68041177	0	-40381823	0	-52816708	0
88	-30374756	0	-64531339	0	34774341	1	-21925170	1	28311417	1	-13060644	0
89	71480929	0	16758979	1	-22680080	1	-74403146	0	-39970309	0	-44948390	0
90	61537901	0	14071627	1	-12234105	1	-10157136	1	-14060703	0	-63327982	0
91	13143272	0	17651887	1	23309115	1	-90092621	0	33891259	1	14479202	1
92	11099111	1	12190045	1	-13069137	1	-80962432	0	-54937164	0	-96935811	0
93	99999999	0	99999999	0	99999999	0	99999999	0	99999999	0	99999999	0
94	-95503768	-1	-17070280	1	-11034845	0	12786325	-1	-16887104	0	-28707823	-1
95	17825198	1	57863989	1	-49625551	-2	31968863	0	-16917109	0	16136308	0
96	11250129	1	41452210	1	-81131501	-2	-36496863	-1	39702028	-2	12142793	0
97	23381887	0	12192555	1	27042018	-1	-23877387	0	96315075	-1	93017339	-1

TABLE C30.- Continued

	13		14		15		16	
1	-15754657	1	28999338	2	58825953	2	-78679579	2
2	-11031303	1	21569373	2	29149997	2	-32305201	2
3	22745855	0	-60066020	1	21006562	2	43299683	0
4	42918433	0	-11627432	2	36126643	2	64811322	1
5	80678962	0	-22596202	2	92588139	2	11301823	3
6	-15221167	1	28430067	2	46509434	2	-66914985	2
7	-10657032	1	20858798	2	28574117	2	-36084956	2
8	33143951	0	-67019565	1	30526197	2	-22258924	2
9	62078074	0	-12376159	2	43073190	2	-26200261	2
10	10340263	1	-22163441	2	84368046	2	-11157038	2
11	-14110535	1	28976205	2	20563561	2	34399855	2
12	-10310533	1	22453103	2	21886006	2	48087538	2
13	66396697	0	-98805692	1	91841433	1	-30804170	2
14	98812229	0	-16339983	2	14142592	2	-68658523	2
15	15514036	1	-26913851	2	23226083	2	-15278213	3
16	-82284368	0	23026554	2	-61624304	2	23396077	3
17	-31799977	0	13488135	2	-64086468	2	15145242	3
18	97267273	0	-10508992	2	-60256799	2	-38028979	2
19	12862426	1	-15623906	2	-66180982	2	-68872917	2
20	20618121	1	-26979197	2	-99923012	2	-13798207	3
21	-81965388	0	-35485153	0	-21662504	0	-10009344	0
22	-14526643	1	-64195937	0	-53025069	0	-28416245	0
23	37890835	1	22389356	1	-53926078	0	-15097095	0
24	-27585557	1	-12445373	1	-63064276	0	-40066535	0
25	-19222781	1	-77773762	0	-74333500	0	-38570986	0
26	49497567	1	30118325	1	-24883359	0	-11506288	0
27	-62196507	1	-30797732	1	-15850390	1	-69337439	0
28	-23083230	1	-10027682	1	-75529677	0	-33056755	0
29	72721950	1	41566941	1	98421829	0	34586978	0
30	-78170905	1	-43891373	1	-15253904	1	-50850206	0
31	-11657667	1	-72708325	0	31889743	0	11078000	0
32	77274311	1	38688629	1	22916441	1	91653493	0
33	-47392368	1	-32633717	1	71017334	0	51438259	0
34	23041989	1	60672113	0	29388098	1	11922008	1
35	35695153	1	64006647	0	26355370	1	13310273	1
36	-17306120	0	-49558023	0	57547940	0	46369218	0

TABLE C30.- Continued

	13		14		15		16	
37	10222724	0	-40415904	0	-17992575	1	45387970	0
38	51017130	-1	-18617110	0	-21050432	1	34465925	0
39	31541116	-1	-31570458	-1	-12796971	1	32628563	0
40	-60832138	-1	-30697710	-1	-42845752	0	47982911	-1
41	-71658384	-1	-37139482	-1	16563694	0	-11095727	0
42	79482473	-2	32294678	-1	25986235	0	66928548	-1
43	96904369	-1	67961687	-1	16178737	0	13559633	0
44	-31938109	-2	-74112229	-1	-10728705	0	13510740	0
45	14859290	-1	-44793660	-1	-19442089	0	13398373	0
46	42809325	-2	59034606	-1	56779763	-1	70479471	-1
47	18203437	-1	10172486	0	71358944	0	-58888908	-1
48	35954987	0	62124934	0	16712421	1	-16433204	0
49	38734556	-1	39090824	-1	45900138	0	-18279556	-1
50	26653423	0	38534062	0	67988183	0	-16721472	0
51	11613512	0	18544941	0	26006874	0	-18593903	0
52	-28768801	-1	-31498358	-1	-15102692	0	-90523274	-1
53	-11728796	-1	-46330804	-1	-32096800	0	60134743	-1
54	-44213676	-1	-78833243	-1	-33576283	0	51727859	-1
55	-83191850	-1	-12996925	0	-16477402	0	-45870052	-2
56	-94938644	-1	-15922141	0	76693678	0	-91813173	-1
57	-17963662	0	-12549103	0	14867450	-1	-40225359	0
58	-18344665	0	-23071459	0	-33036982	0	-28695044	-1
59	-12443406	0	-16046570	0	-33294539	0	45417038	-1
60	-10808036	0	-72561449	-1	-20854323	0	-12865328	0
61	77368559	-1	40353528	-1	-29070376	0	76231650	-2
62	-65205908	-2	25584536	-1	-11110225	0	-47685401	-1
63	11296115	0	21339459	0	14525740	0	-12891725	0
64	-25519707	0	-22465546	0	45921798	-1	-49519899	0
65	-35370189	0	-43155982	0	-22332430	0	-38694950	-1
66	12720954	0	16586461	0	83804849	-1	20580053	-1
67	17696375	0	25370664	0	31543988	-1	-30045938	-1
68	16592653	0	24403885	0	18868754	0	17954643	-1
69	25249368	0	38166896	0	34456513	0	-25109062	-1
70	16302025	1	20590694	1	18801163	1	16993916	0
71	15159821	0	29227113	0	44168907	0	-61928013	-1
72	81435474	0	11912350	1	22427559	1	-47001273	-1
73	-10964020	0	-14691151	0	-15356594	0	54411996	-1

TABLE C30. - Concluded

	13		14		15		16	
74	29563355	0	32925865	0	45660480	0	12577652	0
75	26288015	0	37494102	0	46490830	0	-41244173	-1
76	-78456076	-1	-17435279	-1	24187027	0	-17971937	0
77	-15297958	0	-90168099	-1	32083955	0	-10500126	0
78	-25861906	1	-20443350	1	46937483	0	-55414324	0
79	10314175	0	56525982	-1	31179981	0	39752570	-1
80	39524478	0	42426854	0	73901116	0	27575144	-1
81	56932925	-4	-51306045	-2	36479908	0	-77197815	-1
82	-85127077	-1	-10811311	0	28382918	-1	-17983679	0
83	-44567679	0	-57960254	0	-34757420	0	-24731559	0
84	-72534508	1	-79790020	1	-45686595	1	-12402821	1
85	63210916	-1	-34957632	-1	60161558	0	-58555304	-1
86	-31526723	-1	-13253538	0	34663622	0	-14091375	0
87	-52796928	0	-76224549	0	-90927992	0	-26835488	0
88	-25812067	0	-79303020	0	-30884930	1	-17977553	0
89	-45232638	0	-60864815	0	-33609550	0	-34914530	0
90	-68891508	0	-98866479	0	-93920893	0	-16637744	0
91	15020224	1	98946311	0	-65485092	0	11015253	1
92	-11142023	1	-13946034	1	-11747755	1	-10179842	0
93	99999998	0	99999999	0	99999999	0	99999999	0
94	-24497170	-1	22423097	-1	42561044	-1	-26566302	0
95	15372357	0	32198108	0	13428609	1	-72835783	-1
96	13207039	0	14546716	0	62672801	0	13912036	-1
97	12754711	0	61034951	-1	-14066576	0	-87444355	-2

TABLE C31.- SYMMETRIC STRUCTURAL MODES, CASE SC4

CP \ Mode	1		2		3		4		5		6	
1	73964811	0	-78106619	-1	86016051	0	11035852	0	-44576948	-2	12336003	0
2	66255803	0	-54705165	-1	-78198704	-1	21681617	-1	-38242757	-1	10821767	0
3	53887925	0	-29116231	-1	-18166852	1	-97460154	-1	-65646490	-1	81811998	-1
4	52111480	0	-29628822	-1	-20259969	1	-10930710	0	-78672735	-1	95937777	-1
5	46519703	0	-41133456	-1	-32237529	1	-17651361	0	-10990281	0	10468683	0
6	72976081	0	-71443303	-1	38911106	0	26685550	-1	-73065026	-1	77246895	-1
7	66307778	0	-51472884	-1	-91125492	0	-52897065	-1	-92982556	-1	76015396	-1
8	53777745	0	-29381821	-1	-21777298	1	-13498387	0	-12675051	0	87435796	-1
9	52234857	0	-29468617	-1	-24586077	1	-15026574	0	-13845878	0	99781406	-1
10	46668850	0	-40782979	-1	-34452491	1	-20108628	0	-14902410	0	77648821	-1
11	71710941	0	-62664198	-1	-49796504	0	-81174836	-1	-15178696	0	23655922	-1
12	66391923	0	-46976943	-1	-15345913	1	-12790399	0	-15081616	0	21758873	-1
13	54677274	0	-30297430	-1	-25321774	1	-18440411	0	-17157850	0	23607114	-1
14	52606940	0	-30990064	-1	-27678443	1	-19274297	0	-17234999	0	23091288	-1
15	46915777	0	-41569141	-1	-37857088	1	-23208949	0	-18276637	0	24315833	-1
16	70508711	0	-55888577	-1	-14413933	1	-17069766	0	-22848749	0	-41439937	-1
17	63523650	0	-37816289	-1	-24013930	1	-21893265	0	-23397710	0	-37679034	-1
18	54315491	0	-32399549	-1	-31400160	1	-25509926	0	-24444457	0	-34930141	-1
19	52873276	0	-32471388	-1	-33004121	1	-26750160	0	-23854828	0	-60351011	-1
20	48063422	0	-41724606	-1	-39669158	1	-30311913	0	-22627653	0	-12001727	0
21	49687095	-1	40157913	-1	-94711302	0	12400740	1	-68743182	-1	-10681160	0
22	29004919	-1	40215945	-1	-12189868	1	15317074	1	-59715522	-1	-93112822	-1
23	-58640155	-2	83609138	-1	-43570837	1	52518170	1	-12478859	0	-90508345	-1
24	10330987	0	78773741	-1	-23081732	1	28339891	1	-13277403	0	-18002955	0
25	63544276	-1	10126109	0	-32467130	1	38997485	1	-10648608	0	-13590121	0
26	21029582	-1	14804842	0	-62003678	1	71706587	1	-18806899	0	-11700668	0
27	13507772	0	13349366	0	-41149293	1	46081877	1	-13244606	0	-18712361	0
28	95321186	-1	16641432	0	-58420404	1	65528539	1	-18686110	0	-17476497	0
29	50776452	-1	22401080	0	-92008712	1	10176647	2	-31012128	0	-14417807	0
30	16230482	0	19567180	0	-73986264	1	76581451	1	-22520796	0	-20478546	0
31	12448764	0	22679136	0	-92227855	1	95368355	1	-30578063	0	-18153134	0
32	83579933	-1	28229261	0	-12573056	2	13050010	2	-44350224	0	-14682884	0
33	18795847	0	27172734	0	-12891932	2	12825341	2	-41987169	0	-21994986	0
34	15155348	0	30192444	0	-14579925	2	14366893	2	-49591386	0	-19279142	0
35	12669047	0	34996451	0	-18009586	2	18223224	2	-67971592	0	-23918334	0
36	14298951	1	-18103867	0	12594783	2	67951986	0	22393597	0	-29662926	0

TABLE C31.- Continued

	1		2		3		4		5		6	
37	98457067	0	-98441977	-1	48646806	1	19914617	0	90817381	-2	-37751935	-1
38	51055052	0	-30306928	-1	-11908510	1	-51525366	-1	-48400181	-1	11593925	0
39	61968808	-1	29397968	-1	-37617901	1	-18172140	0	-53114109	-1	92300605	-1
40	-19734410	0	53011643	-1	-33637526	1	-16926413	0	-19537350	-1	58799871	-2
41	-29209938	0	49905174	-1	-19920766	1	-99887419	-1	96750739	-2	-48070267	-1
42	-31805050	0	24926389	-1	22834923	0	19421311	-1	54032475	-1	-81782671	-1
43	-26360193	0	-73918701	-2	17447880	1	98572647	-1	48417164	-1	-47710476	-1
44	-14083443	0	-44326521	-1	18819880	1	13412603	0	37133317	-1	48277494	-2
45	-13321688	-1	-75511595	-1	55596916	0	10552385	0	28621202	-1	40327293	-1
46	13654300	0	-10266095	0	-10506416	1	75770135	-1	22318039	-1	70729393	-1
47	28114568	0	-12926481	0	-32801775	1	56658129	-1	30346892	-1	11690438	0
48	43319734	0	-15474678	0	-57512268	1	36837563	-1	47646086	-1	16841954	0
49	-40438876	0	52348977	-1	-90495829	0	-54265033	-1	60951410	-1	-12957634	0
50	-39330440	0	30024033	-1	51462007	0	14317621	-1	40152744	-1	-87419772	-1
51	-32849364	0	-45023932	-2	20447733	1	11239463	0	29767048	-1	-13353283	-1
52	-17001629	0	-43073058	-1	21007794	1	13569783	0	19593926	-2	55338773	-1
53	-27924511	-2	-69387127	-1	67659755	0	98618438	-1	-42536194	-2	86091860	-1
54	15448903	0	-89030395	-1	-10152515	1	38297124	-1	74792864	-2	56094180	-1
55	31150556	0	-11312181	0	-31073585	1	-23025628	-1	44286076	-1	-81704423	-2
56	-43833570	0	41234294	-1	12774879	1	64924086	-1	74752614	-1	-12130070	0
57	-33221794	0	64668639	-2	23497013	1	11777800	0	-40686183	-2	40602291	-1
58	-16578827	0	-26618558	-1	22682256	1	14708404	0	-24410245	-1	12573182	0
59	20720236	-2	-50738029	-1	80844328	0	98127912	-1	-11270541	-1	10234802	0
60	16685980	0	-52789947	-1	-66312101	0	34617314	-1	26012363	-1	24348316	-1
61	35477199	0	-47252582	-1	-26697308	1	-11835399	0	43787491	-1	-11265455	0
62	48810150	0	-50030201	-2	-34868756	1	-24595529	0	49513906	-1	-23562692	0
63	63045701	0	17299422	-2	-49065701	1	-37208220	0	10046914	0	-41523198	0
64	-36533566	0	43710721	-1	29382656	1	15075870	0	-25105355	-1	12571166	0
65	-17626170	0	87569850	-2	32976932	1	77475477	-1	-15653375	0	17725336	0
66	29547021	-1	25494089	-1	19491623	1	-49231163	-1	-15450000	0	77552143	-1
67	22790995	0	33224082	-1	84515240	-1	-14455147	0	-97538418	-1	-29708707	-1
68	42105825	0	63990404	-1	-18142585	1	-26907079	0	-93197457	-2	-23305694	0
69	49328768	0	71666579	-1	-28169185	1	-33985905	0	19781654	-1	-31951544	0
70	63632395	0	90197254	-1	-39374905	1	-49456954	0	79994720	-1	-53846220	0
71	50533145	0	14871550	0	-20159051	1	-42546714	0	-28382945	-1	-37211844	0
72	66201228	0	18150689	0	-31218653	1	-57517681	0	43784480	-1	-61864892	0
73	-11374803	0	57554029	-1	47842612	1	-77390976	-1	-36354836	0	21456456	0

TABLE C31.- Continued

	1		2		3		4		5		6	
74	86447244	-1	10309274	0	29489255	1	-21133340	0	-31470783	0	59596516	-1
75	27808294	0	16294939	0	11833361	1	-29692621	0	-21920907	0	-61647937	-1
76	47671639	0	22263649	0	-53059182	0	-38613531	0	-73199672	-1	-27539324	0
77	55296315	0	24627606	0	-12254861	1	-43549465	0	-30721992	-1	-35470584	0
78	70264796	0	29059315	0	-22086566	1	-52059596	0	55421396	-1	-59046729	0
79	-57214977	-2	11601172	0	47252588	1	-22843508	0	-50759999	0	23038536	0
80	10386439	0	16762843	0	37281017	1	-25705126	0	-38390695	0	90645521	-1
81	29491061	0	24114895	0	22295222	1	-26827117	0	-21717059	0	-38094617	-1
82	50820604	0	33289653	0	46380926	0	-30032077	0	-23543651	-1	-17553424	0
83	59397321	0	36372593	0	-19346705	0	-27870562	0	58984100	-1	-19540824	0
84	74650551	0	42841662	0	-17392396	1	-20562684	0	21085002	0	-27858824	0
85	16770115	0	23021791	0	45520161	1	-27678388	0	-43932218	0	12806364	0
86	34023636	0	31477069	0	32015730	1	-25515886	0	-22663765	0	-11209486	-1
87	64053605	0	49310654	0	37105713	0	-18319049	0	12659306	0	-57364782	-1
88	79619497	0	59481370	0	-80693525	0	-45595853	-1	37590615	0	58063358	-1
89	47257552	0	50168878	0	36856629	1	-28685706	0	-22100974	0	52795382	-1
90	65474821	0	62529226	0	24393031	1	-64307611	-1	10213096	0	12438367	0
91	88720312	0	82802308	0	74532439	0	45166866	0	73790034	0	41543901	0
92	81640648	0	87464278	0	24950645	1	44134298	0	49242588	0	56873329	0
93	99999999	0	99999999	0	99999998	0	99999999	0	99999999	0	99999999	0
94	-26954385	0	-96834109	-2	25703975	1	13707211	0	46159675	-2	39957822	-1
95	41811714	0	-15603556	0	-56754233	1	-11230287	-1	28661859	-1	11386427	0
96	42739071	0	-15419811	0	-55414045	1	-55654021	-1	57513052	-1	10319741	-1
97	44011918	0	-14226798	0	-54924398	1	-12902665	0	69448525	-1	-86544987	-1

TABLE C31.- Continued

	7		8		9		10		11		12	
1	65004070	0	11103830	3	57640753	-1	-32328875	0	-74056670	0	-51148959	0
2	10323527	1	13009101	3	45210386	-1	-25841065	0	-28655294	0	-30216535	0
3	12272784	1	14387802	3	14595704	-1	-10081855	0	44112829	0	32178084	-1
4	14787548	1	16553613	3	45892925	-2	-82871478	-1	60306741	0	48261482	-1
5	16544439	1	19948044	3	-16041750	-2	-81567876	-1	69109004	0	34732646	-1
6	50909747	1	22978512	3	74529787	-1	-35250048	0	-60243635	0	-47803560	0
7	54547966	1	24379278	3	64365215	-1	-27888782	0	-20045326	0	-28972007	0
8	61630415	1	27606003	3	30229087	-1	-10818307	0	49741215	0	92897780	-1
9	63560854	1	28844223	3	18468029	-1	-85223690	-1	58649915	0	16486592	0
10	67915813	1	30409810	3	17019896	-1	-51597882	-1	65013704	0	21254215	0
11	11095543	2	41194952	3	11219560	0	-35898548	0	-42279904	0	-36705804	0
12	11485112	2	42827590	3	11972191	0	-29381252	0	-12006146	0	-22011024	0
13	12653144	2	45995329	3	99387671	-1	-91395010	-1	68053570	0	26868097	0
14	12860391	2	47024302	3	96215377	-1	-51961406	-1	81793681	0	35221358	0
15	13554776	2	50292423	3	85631655	-1	37000281	-1	10092849	1	51023328	0
16	19909436	2	63999732	3	15373367	0	-23140426	0	-82601121	-1	-47538707	-1
17	20106555	2	64819214	3	14864256	0	-14804379	0	20718021	0	10882406	0
18	20459034	2	65516549	3	12783582	0	11150786	-1	88630017	0	50973000	0
19	20805049	2	66847546	3	14248772	0	38999022	-1	10228353	1	62056549	0
20	21625036	2	68540880	3	17399151	0	13087453	0	13600832	1	93403701	0
21	-27061669	0	29184404	2	-24421552	-1	89315365	-1	11905975	1	48298157	0
22	-60095602	-1	14571242	2	-68568998	-1	30640548	0	30580574	1	-75880175	0
23	-92769855	-1	-13123924	2	-13578344	0	33563687	0	35869882	1	-91978638	1
24	-28175514	0	52840172	2	-10029267	0	39494863	0	36846100	1	11184954	1
25	-54936781	-1	15262922	2	-11672605	0	49937144	0	48575193	1	-14824354	1
26	-54205393	-1	-11782460	2	-30037923	-1	17568252	0	32449071	1	-92226041	1
27	-14872738	0	36242954	2	-28342658	0	81559631	0	79875373	1	13524669	1
28	-12705678	0	72339006	1	-12170125	0	49744530	0	49174224	1	-92844297	0
29	-17611097	0	-13199625	2	19362617	0	-39440855	0	-23491155	1	-62884862	1
30	-23887371	0	22321786	2	-25149304	0	50716299	0	48362123	1	47268213	1
31	-21734646	0	41390390	1	63772446	-1	-14447716	0	-17492111	1	33404171	1
32	-36736883	0	-10122234	2	41540635	0	-11803118	1	-11254068	2	37680726	0
33	-59051645	0	15370234	2	15404981	0	-66576081	0	-75261234	1	12183320	2
34	-51924727	0	52873935	1	49085030	0	-14697391	1	-15741943	2	12110163	2
35	-80120244	0	-11467707	2	53234129	0	-18487007	1	-19214059	2	98003377	1
36	18894456	1	-24197797	3	47956410	-2	39552777	0	-18135564	0	-91625840	-1

TABLE C31.- Continued

	7		8		9		10		11		12	
37	-60881817	0	-22094537	1	64518731	-1	-19869626	0	-22823313	0	11957592	-1
38	-11715881	1	65432318	2	-42959290	-1	-65988963	-1	19672242	0	39023063	-1
39	-89269453	0	28135794	2	-71064349	-1	13057058	0	79419576	-1	34646115	-1
40	72611864	-2	-28999319	2	25208295	-1	43548577	-1	-58107293	-1	-58018917	-1
41	65074738	0	-70567217	2	76994125	-1	-32457515	-1	-25900629	0	-95874448	-1
42	20428797	0	-33565625	2	85753889	-2	-55236779	-1	25133742	0	31150677	-1
43	-19812329	0	13032526	2	-92969335	-2	-22516864	-1	18191564	0	91000720	-1
44	-44817851	0	43752999	2	-84144478	-1	-17141958	-1	-10473529	0	-25177244	-1
45	-42837329	0	37008866	2	-26141056	-1	22903054	-2	-74848599	-1	-46014798	-2
46	14626482	0	-26314305	2	-99282731	-2	84019671	-1	27824314	0	54001884	-1
47	13184566	1	-14428194	3	20999241	-1	21987089	0	-33278955	0	12641051	-1
48	26148533	1	-27090832	3	86305291	-1	46455782	0	11176858	0	38323242	0
49	32907023	0	-30932412	2	-69377804	-1	47280411	-1	-49455455	0	-35046875	-1
50	59229743	0	-25225253	2	-79802569	-1	44467865	-1	32521171	0	25778408	0
51	14551903	0	37817962	2	-93478857	-1	22290331	-1	98136821	-1	10270845	0
52	-26256960	0	63291645	2	-97687670	-1	23613869	-1	-18289042	0	-50260801	-1
53	-40805303	0	44980537	2	-62994412	-1	10729334	-1	-51228007	-1	-19918117	-1
54	-19917622	0	10795335	2	-49742104	-1	-78452836	-1	63972127	-1	-35581760	-1
55	31080320	0	-50030292	2	-53219604	-1	-21268101	0	29783455	-1	-78027677	-1
56	53715982	0	-27803977	2	-25140846	0	12457954	0	-13607257	1	-24131344	0
57	36113811	0	40267061	2	11987993	0	-39549735	-1	-44216697	0	-21180189	0
58	-29297591	0	47897612	2	66500336	-1	24150050	-1	-43789767	0	-20819354	0
59	-37162367	0	41518808	2	-35943199	-1	54210083	-1	-28933245	0	-13527299	0
60	-38534293	-1	31011485	2	-27405923	-1	-12108618	-1	-23012563	-1	-90844474	-1
61	-36043547	0	30263263	2	58880386	-1	-17227114	0	25682791	0	68204622	-1
62	-68790534	0	76686837	2	50388577	0	14177298	0	-20904226	0	-43290650	-1
63	-13245746	1	18448711	3	59538289	0	56576722	0	-92091286	0	-15893509	-1
64	67585164	0	18748852	2	42604389	0	-25565683	-1	-81466356	0	-32394547	0
65	17206352	0	-41018027	2	48875965	0	-36343195	-1	-57949234	0	-36673554	0
66	-62798971	-1	-14055323	2	-31507921	-1	10204532	0	27933293	0	15069294	0
67	-32521798	0	30798589	2	-48018147	-1	15708753	0	30715901	0	19409697	0
68	-64390069	0	60245699	2	22032105	0	22587038	0	15854738	0	15987827	0
69	-81032028	0	91885278	2	44386389	0	36443771	0	11906935	0	22735200	0
70	-14689174	1	18781455	3	14942683	1	13364200	1	13252984	1	15318994	1
71	-87318088	0	95059149	2	47030813	0	42804088	0	-10736092	0	12377656	0
72	-14062357	1	21264489	3	16688785	1	19181523	1	-16849543	1	54508591	0
73	40756074	0	-13334633	3	11165049	1	-16436216	0	65729961	0	-28123298	-1

TABLE C31.- Continued

	7		8		9		10		11		12	
74	24523878	0	-10179462	3	-12213684	0	12735805	0	52707725	0	33036990	0
75	60812208	-2	-26532993	2	-26800908	0	25422127	0	30479636	0	28433090	0
76	-49600747	0	64999253	2	12559229	0	24498775	0	-57319697	0	-12503499	0
77	-81176619	0	91325757	2	46924307	0	40814288	0	-88017747	0	-22045591	0
78	-12931874	1	21087470	3	18081324	1	18526063	1	-42087516	1	-24505167	1
79	10246194	1	-22411627	3	34551175	0	-11328597	0	42862427	0	14440533	0
80	70928508	0	-14372647	3	-43129575	0	14192903	0	30391889	0	39393184	0
81	37773354	0	-69047155	2	-79307837	0	11533997	-1	-22554228	0	-39723514	-3
82	-23561502	0	46039356	2	-85801968	-1	-31619605	-1	-37841491	0	-12629826	0
83	-34670416	0	70206736	2	43548296	0	-17568297	0	-11083791	1	-53997323	0
84	-84592987	0	14150679	3	25657600	1	-77956670	0	-11046120	2	-73235915	1
85	11261613	1	-19369184	3	-93321626	0	-21642002	-1	-62760226	0	10157229	-1
86	74954656	0	-10179895	3	-12962441	1	-20130637	0	-50860307	0	-69562669	-1
87	-38212706	-1	42567840	2	25463266	0	-70827385	0	-45598526	0	-56628957	0
88	-66844179	0	79842770	2	33857397	1	-24475574	1	32081688	1	-14367202	0
89	10871690	1	-11628471	3	-22035664	1	-72496628	0	-35236567	0	-40702987	0
90	84963490	0	-79087696	2	-12058366	1	-10545709	1	-94296029	-1	-62635444	0
91	-41200624	0	-38030349	1	22895601	1	-10939655	1	37179103	1	14808063	1
92	15018667	1	-64702745	2	-12979652	1	-84611064	0	-58800243	0	-99660028	0
93	99999998	0	99999999	0	99999999	0	99999998	0	99999998	0	99999999	0
94	58209917	-1	60897369	2	-11320296	0	22970611	-1	-23492279	0	-52285011	-1
95	22070240	1	-25532710	3	60493918	-1	32797961	0	-16986906	0	16587610	0
96	13268932	1	-17495849	3	22175118	-1	-54702620	-1	49165733	-2	11788259	0
97	22487321	0	-42902985	2	13577482	-1	-26459461	0	87049023	-1	84192427	-1

TABLE C31.- Continued

	13		14		15		16	
1	-78490315	1	61403265	1	63253561	2	-78469870	2
2	-57436295	1	46323627	1	31344450	2	-32220663	2
3	15067566	1	-13492704	1	22556280	2	42956232	0
4	28998709	1	-26233874	1	38801292	2	64581956	1
5	55864950	1	-51361561	1	99508876	2	11267278	3
6	-76625638	1	60453992	1	50039328	2	-66742970	2
7	-55512376	1	44849266	1	30754800	2	-35997005	2
8	17721270	1	-14486294	1	32815193	2	-22205216	2
9	32780201	1	-26740763	1	46297805	2	-26136998	2
10	57674077	1	-48571630	1	90704903	2	-11149982	2
11	-76312820	1	62812738	1	22180552	2	34277273	2
12	-58327480	1	49210483	1	23605616	2	47924396	2
13	28241869	1	-19994935	1	98940585	1	-30728370	2
14	45345805	1	-33952209	1	15212368	2	-68472994	2
15	73732605	1	-56560854	1	24956099	2	-15235334	3
16	-56912382	1	52388660	1	-66150974	2	23327317	3
17	-31281910	1	32049232	1	-68815099	2	15100574	3
18	33386771	1	-19047009	1	-64741934	2	-37922717	2
19	47625753	1	-29651755	1	-71117808	2	-68675623	2
20	80227514	1	-52546354	1	-10741011	3	-13757557	3
21	-75706186	0	-53559522	0	-22152030	0	-10095133	0
22	-14545156	1	-10721422	1	-57120986	0	-28476375	0
23	31003512	1	23620303	1	-60285136	0	-14884163	0
24	-25999975	1	-18832023	1	-67149490	0	-40062152	0
25	-19551907	1	-14153242	1	-80036742	0	-38650593	0
26	42227047	1	33053849	1	-25237840	0	-11689631	0
27	-59389052	1	-44576644	1	-17274992	1	-69264754	0
28	-22924879	1	-16759506	1	-81045855	0	-33195900	0
29	66544057	1	51867409	1	11142945	1	34273456	0
30	-72788063	1	-56652747	1	-17043461	1	-50545956	0
31	-92550408	0	-71649938	0	34918871	0	10979288	0
32	75034919	1	56861224	1	25098054	1	91530379	0
33	-38357018	1	-31380499	1	72408759	0	51747642	0
34	29757676	1	21837377	1	32039968	1	11906927	1
35	40583050	1	26732495	1	27933698	1	13362654	1
36	-93738455	-1	-23224571	0	72856754	0	44104692	0

TABLE C31.- Continued

	13		14		15		16	
37	18504321	0	-48983356	-1	-19499995	1	45583764	0
38	10387170	0	-63386288	-2	-23053377	1	35195227	0
39	51812611	-1	25126722	-1	-13754882	1	32532015	0
40	-75932745	-1	-57835209	-1	-41097119	0	37264046	-1
41	-10452178	0	-84266362	-1	25168345	0	-12608751	0
42	-26419815	-2	12333854	-1	32845611	0	58495715	-1
43	96254581	-1	82856294	-1	17118007	0	13796991	0
44	-17214754	-2	-39393782	-1	-17486154	0	14712399	0
45	16998124	-1	-15420786	-1	-27461459	0	14675264	0
46	43493127	-2	29131677	-1	33265520	-1	77150665	-1
47	-78443011	-2	32627176	-1	78784169	0	-62984890	-1
48	32254525	0	45511564	0	19144211	1	-18313986	0
49	87286798	-2	11739533	-1	55220621	0	-30750567	-1
50	24410121	0	30471754	0	79821535	0	-17562201	0
51	94823250	-1	12512432	0	26156739	0	-18016524	0
52	-42102359	-1	-50103648	-1	-24165160	0	-73825954	-1
53	-11229209	-1	-32917230	-1	-42337096	0	76260493	-1
54	-39529277	-1	-58807063	-1	-41165341	0	61847337	-1
55	-80966715	-1	-10267963	0	-17951939	0	-53151311	-2
56	-14001485	0	-17319387	0	83465217	0	-96623426	-1
57	-22746428	0	-20922012	0	-36813821	-1	-39241792	0
58	-20242788	0	-23337090	0	-45407710	0	-10314213	-1
59	-13057873	0	-15430424	0	-44682720	0	62181917	-1
60	-11641643	0	-10356904	0	-27650230	0	-11901681	0
61	92563164	-1	77308551	-1	-31244565	0	72812053	-2
62	-97035837	-2	77062242	-2	-12007534	0	-52926308	-1
63	95418273	-1	14341266	0	12978082	0	-13359912	0
64	-32421390	0	-31921757	0	-14355255	-1	-48515701	0
65	-38138919	0	-42424045	0	-30144881	0	-26894842	-1
66	14074482	0	16070439	0	82688080	-1	29974679	-1
67	19461307	0	23388430	0	33852464	-1	-24127524	-1
68	18278571	0	22585162	0	23466058	0	12638155	-1
69	26212045	0	33058948	0	41389690	0	-34520338	-1
70	16489127	1	18742330	1	21747808	1	14561865	0
71	16033282	0	23516577	0	53044616	0	-73623298	-1
72	76061572	0	94853360	0	24695397	1	-67644717	-1
73	-10934744	0	-12160742	0	-12411673	0	55172538	-1

TABLE C31.- Concluded

	13		14		15		16	
74	33511865	0	36132438	0	56681064	0	12739056	0
75	29590201	0	35816090	0	56581669	0	-42169040	-1
76	-72362158	-1	-38315931	-1	29583228	0	-18676403	0
77	-15638031	0	-12166610	0	37661973	0	-11611110	0
78	-27470033	1	-25122871	1	32638717	0	-56254289	0
79	12993428	0	11947080	0	44190283	0	36802786	-1
80	43886454	0	46504000	0	90002480	0	26806289	-1
81	39337687	-1	44501998	-1	45636096	0	-77932683	-1
82	-67401643	-1	-72905400	-1	70730295	-1	-18660339	0
83	-45657740	0	-51964785	0	-37237404	0	-25645834	0
84	-75825081	1	-80041528	1	-55160942	1	-12295263	1
85	10600086	0	69146788	-1	73848866	0	-57360679	-1
86	19492388	-1	-20376687	-1	44721770	0	-14106310	0
87	-52062381	0	-63037559	0	-96573623	0	-27808678	0
88	-23903315	0	-48050181	0	-32207767	1	-21564142	0
89	-37700171	0	-44417381	0	-28704213	0	-34672017	0
90	-63280625	0	-77117598	0	-96912948	0	-17185790	0
91	15951203	1	13766082	1	-55149189	0	10678291	1
92	-10963471	1	-12389852	1	-13511241	1	-95118099	-1
93	99999998	0	99999999	0	99999999	0	99999998	0
94	-51846772	-1	-36355269	-1	-18234969	-1	-25127446	0
95	12289528	0	20983287	0	19443247	1	-90721543	-1
96	12440122	0	13731278	0	75110639	0	-83535836	-3
97	13440122	0	10653613	0	-12411868	0	-15389108	-1

TABLE C32.- SYMMETRIC STRUCTURAL MODES, CASE SC5

CP \ Mode	1		2		3		4		5		6	
1	68749269	0	-72065035	-1	-13774914	1	13516677	0	-80074635	-2	12438589	0
2	61437084	0	-49795473	-1	92869325	0	-50029302	-2	-44219950	-1	10866389	0
3	49720341	0	-25977299	-1	52247042	1	-21124350	0	-74363758	-1	81858055	-1
4	48023582	0	-26640538	-1	57520473	1	-23288836	0	-88389220	-1	95808483	-1
5	42730931	0	-39127678	-1	86749900	1	-35373836	0	-12196282	0	10432638	0
6	67861340	0	-66108630	-1	-21260461	0	18045357	-1	-82132916	-1	78430421	-1
7	61577494	0	-47439493	-1	30134230	1	-12533982	0	-10443095	0	76856711	-1
8	49648105	0	-26568957	-1	61844307	1	-27082517	0	-14135252	0	87730168	-1
9	48187519	0	-26896112	-1	68793914	1	-29888378	0	-15398867	0	99875784	-1
10	42903782	0	-38984309	-1	92954822	1	-39367316	0	-16569016	0	78127628	-1
11	66734740	0	-58343690	-1	20266242	1	-14536447	0	-16819322	0	25500435	-1
12	61715772	0	-43554182	-1	46424963	1	-24188162	0	-16864449	0	23811641	-1
13	50542233	0	-27755514	-1	71687378	1	-34778734	0	-19189907	0	25548002	-1
14	48562811	0	-28594047	-1	77668341	1	-36677122	0	-19301668	0	25175567	-1
15	43147474	0	-39882245	-1	10293448	2	-44999174	0	-20493694	0	26775500	-1
16	65697215	0	-52523949	-1	44697129	1	-29122705	0	-25365015	0	-38169499	-1
17	59059927	0	-35313969	-1	68914812	1	-38621888	0	-26063470	0	-34465806	-1
18	50243457	0	-30471288	-1	87516680	1	-45689720	0	-27225663	0	-31714304	-1
19	48863394	0	-30651568	-1	91615386	1	-47860533	0	-26627397	0	-56649368	-1
20	44265816	0	-40366326	-1	10811157	2	-54572672	0	-25378409	0	-11517266	0
21	48495644	-1	39915510	-1	41751733	1	14746599	1	-65190266	-1	-10575199	0
22	28683772	-1	40158164	-1	52627074	1	18177735	1	-54792902	-1	-91609665	-1
23	-31714200	-2	84705411	-1	18398375	2	62185538	1	-10840895	0	-85182093	-1
24	10117406	0	78404908	-1	98699918	1	33630738	1	-12452600	0	-17754177	0
25	63678038	-1	10145197	0	13769340	2	46156460	1	-94323694	-1	-13200094	0
26	24450564	-1	14901011	0	25826755	2	84788069	1	-16749538	0	-11031369	0
27	13371489	0	13318350	0	16983531	2	54443765	1	-11815183	0	-18275792	0
28	96445984	-1	16653324	0	24086451	2	77423496	1	-16793471	0	-16881063	0
29	55565370	-1	22478419	0	37676222	2	12020877	2	-28378639	0	-13558057	0
30	16269362	0	19523348	0	29564246	2	90287469	1	-20405186	0	-19829897	0
31	12729296	0	22656045	0	36819275	2	11245402	2	-28158431	0	-17376622	0
32	89934245	-1	28255305	0	50221551	2	15391757	2	-41301971	0	-13684231	0
33	19125373	0	27128473	0	50661146	2	15109529	2	-38824951	0	-20962449	0
34	15719813	0	30147807	0	57116764	2	16921181	2	-46275989	0	-18150093	0
35	13506356	0	34988771	0	71110760	2	21490774	2	-63841341	0	-22612282	0
36	13425380	1	-16541109	0	-30724672	2	12526584	1	24659908	0	-29047212	0

TABLE C32.-1 Continued

	1		2		3		4		5		6	
37	91967981	0	-89696364	-1	-11544102	2	39553088	0	12893010	-1	-36846825	-1
38	46909724	0	-26572471	-1	36530278	1	-13151794	0	-54336935	-1	11532062	0
39	40862198	-1	30781630	-1	10157521	2	-38650534	0	-61734148	-1	91895383	-1
40	-20624992	0	54542380	-1	92143118	1	-36016179	0	-26338307	-1	64451479	-2
41	-29563203	0	52401926	-1	57795880	1	-22621446	0	56134965	-2	-46927443	-1
42	-31804134	0	29158811	-1	21456998	0	-95055478	-3	54753101	-1	-79696597	-1
43	-26204191	0	-23136202	-2	-37287953	1	15722280	0	50832395	-1	-46203025	-1
44	-13807692	0	-39771006	-1	-43427456	1	21638618	0	39428383	-1	51917893	-2
45	-96249893	-2	-72671402	-1	-13299404	1	14505841	0	29496112	-1	39849258	-1
46	14042473	0	-10187270	0	23630564	1	63217203	-1	21572912	-1	69191991	-1
47	28631073	0	-13102685	0	75976317	1	-27959778	-1	27545925	-1	11428217	0
48	43955597	0	-15925368	0	13446438	2	-12953443	0	43066042	-1	16502352	0
49	-40453403	0	56046238	-1	32089578	1	-13871327	0	60837288	-1	-12644107	0
50	-39149904	0	34549549	-1	-45039272	0	25770797	-2	40760358	-1	-85255677	-1
51	-32543924	0	98883811	-3	-44084783	1	18367536	0	31350853	-1	-12163516	-1
52	-16667414	0	-38343063	-1	-48815314	1	22795673	0	26651871	-2	54804582	-1
53	57081290	-3	-66610730	-1	-16528021	1	14311728	0	-49812951	-2	84493334	-1
54	15770300	0	-88379432	-1	22726766	1	17951627	-1	58899630	-2	54191823	-1
55	31491912	0	-11483837	0	71954858	1	-12384153	0	42589088	-1	-96973782	-2
56	-43569555	0	46578824	-1	-22372976	1	85875331	-1	77432030	-1	-11835317	0
57	-32899749	0	12071512	-1	-51776856	1	20258883	0	-45733203	-2	40607103	-1
58	-16224964	0	-21924167	-1	-52986698	1	24841961	0	-25571232	-1	12386975	0
59	54944967	-2	-48025624	-1	-19586537	1	14581656	0	-12683949	-1	10026631	0
60	16975218	0	-52059162	-1	14913943	1	19298331	-1	24791473	-1	22873982	-1
61	35655257	0	-49309435	-1	61748174	1	-23198330	0	42171689	-1	-11359843	0
62	48792122	0	-88274707	-2	80695379	1	-41608197	0	47546204	-1	-23558016	0
63	62835452	0	-39677271	-2	11468454	2	-62106401	0	10070449	0	-41222500	0
64	-36083936	0	49638278	-1	-65589569	1	26022241	0	-27663758	-1	12438717	0
65	-17231543	0	13151114	-1	-80839141	1	21464973	0	-16263734	0	17138774	0
66	32129872	-1	27388709	-1	-50047312	1	18502674	-1	-16074096	0	71372575	-1
67	22908030	0	37738011	-1	-53407794	0	-16508519	0	-10310827	0	-34457529	-1
68	42098311	0	60963726	-1	40249156	1	-38800488	0	-12597415	-1	-23499393	0
69	49286224	0	67399789	-1	64369653	1	-51041871	0	17144225	-1	-32003219	0
70	63360751	0	83967777	-1	90552477	1	-73868894	0	81068809	-1	-53429879	0
71	50460232	0	14406842	0	44493698	1	-58814856	0	-32922487	-1	-37410150	0
72	65885124	0	17468982	0	70413476	1	-81078169	0	43371186	-1	-61516541	0
73	-11194623	0	61205755	-1	-12189734	2	10252443	0	-37673467	0	20296030	0

TABLE C32.- Continued

	1		2		3		4		5		6	
74	87718827	-1	10380266	0	-77731798	1	-12823706	0	-32651065	0	48465346	-1
75	27848471	0	16131077	0	-33672184	1	-30806237	0	-22982343	0	-70723413	-1
76	47578501	0	21886592	0	93833629	0	-49496626	0	-80558366	-1	-28034907	0
77	55160154	0	24148614	0	26351036	1	-58362931	0	-37108802	-1	-35819100	0
78	69967371	0	28387879	0	49876539	1	-72615008	0	52366426	-1	-58895996	0
79	-46189197	-2	11742240	0	-12390463	2	-66055133	-1	-52640811	0	21354358	0
80	10453705	0	16787936	0	-97346950	1	-15433841	0	-39867082	0	76747744	-1
81	29460056	0	23976017	0	-58011846	1	-24595914	0	-22863620	0	-48937223	-1
82	50643577	0	32963856	0	-11640079	1	-37766151	0	-31856099	-1	-18173202	0
83	59187871	0	35990856	0	56768913	0	-38660344	0	51454918	-1	-20000392	0
84	74552673	0	42334051	0	45160318	1	-37246393	0	20131665	0	-28065855	0
85	16707877	0	23022412	0	-11800097	2	-14899326	0	-45707504	0	11090668	0
86	33903015	0	31356260	0	-80974273	1	-20366563	0	-23950560	0	-24158475	-1
87	63896468	0	48958240	0	-40458073	0	-27847232	0	11693387	0	-63809932	-1
88	79513213	0	59129213	0	30231776	1	-19896595	0	36594564	0	55569964	-1
89	47031659	0	49945774	0	-89788118	1	-25010487	0	-23849303	0	35823865	-1
90	65277916	0	62283287	0	-51909021	1	-77512755	-1	89383201	-1	11248398	0
91	88661689	0	82665127	0	46222076	0	38519477	0	73606150	0	41543370	0
92	81581464	0	87355274	0	-39406166	1	45259326	0	48239797	0	55890284	0
93	99999999	0	99999998	0	99999999	0	99999999	0	99999999	0	99999999	0
94	-26580236	0	-42346583	-2	-58419361	1	23792707	0	52728660	-2	39812719	-1
95	42454204	0	-16062348	0	13200477	2	-18248192	0	24034910	-1	11040119	0
96	43268867	0	-15850473	0	12915770	2	-23709190	0	54602606	-1	83212339	-2
97	44399922	0	-14648941	0	12855404	2	-33041595	0	67454141	-1	-87092390	-1

TABLE C32.- Continued

	7		8		9		10		11		12	
1	65379968	0	-34764224	2	52946185	-1	-33443860	0	-77319665	0	-55446946	0
2	10203708	1	-40074414	2	41871705	-1	-26609316	0	-30425676	0	-33121152	0
3	12093091	1	-43588848	2	13972301	-1	-96586606	-1	45592029	0	39358404	-1
4	14551755	1	-50201435	2	37212974	-2	-76583092	-1	62849167	0	63932612	-1
5	16332684	1	-60549459	2	-25919369	-2	-69639615	-1	72594360	0	60584839	-1
6	48699265	1	-68514401	2	70317730	-1	-36768518	0	-63268851	0	-51826505	0
7	52167400	1	-72128450	2	61834482	-1	-29005659	0	-21824009	0	-31779245	0
8	58962220	1	-81170089	2	29613846	-1	-10865067	0	51008225	0	99992249	-1
9	60823734	1	-84831835	2	17920614	-1	-83566538	-1	60331622	0	17774719	0
10	64969431	1	-89147644	2	17496193	-1	-45071444	-1	67093601	0	23315425	0
11	10584221	2	-12103182	3	10859074	0	-37981747	0	-45231751	0	-40523863	0
12	10958192	2	-12549415	3	11755494	0	-31152494	0	-14061913	0	-24926446	0
13	12070147	2	-13400822	3	99641674	-1	-98862552	-1	69268382	0	27998138	0
14	12270152	2	-13701634	3	96868275	-1	-57207960	-1	83642636	0	37118527	0
15	12937588	2	-14650287	3	87309516	-1	36608620	-1	10357872	1	54060476	0
16	18956930	2	-18558402	3	15250346	0	-25832905	0	-10883414	0	-74650805	-1
17	19145936	2	-18759746	3	14877777	0	-16999043	0	19154461	0	93848661	-1
18	19481050	2	-18907968	3	13000621	0	-26796440	-2	89682558	0	52516626	0
19	19813747	2	-19299161	3	14530335	0	25947206	-1	10369693	1	64194975	0
20	20594567	2	-19747518	3	17903608	0	11971836	0	13800804	1	96840317	0
21	-23727828	0	-97558016	1	-23755636	-1	92862563	-1	12501813	1	54581987	0
22	-43766682	-1	-47847906	1	-66238583	-1	31692858	0	32436572	1	-67618237	0
23	-83165305	-1	39798888	1	-13432285	0	34982594	0	39065150	1	-95115084	1
24	-23109664	0	-17394040	2	-97556672	-1	40789824	0	38814422	1	13091121	1
25	-32403929	-1	-49964386	1	-11265257	0	51413546	0	51505338	1	-13733570	1
26	-47666568	-1	36790735	1	-29054333	-1	18078282	0	35203907	1	-95876659	1
27	-10485256	0	-11734387	2	-27606306	0	84008049	0	84342145	1	17386923	1
28	-10368846	0	-24197681	1	-11729506	0	51139556	0	52048337	1	-79159174	0
29	-17249938	0	40100754	1	19010103	0	-40993291	0	-24450407	1	-67519956	1
30	-20211954	0	-73475541	1	-24667092	0	52474331	0	50862822	1	52052206	1
31	-20209820	0	-14969293	1	62875921	-1	-15054405	0	-18905504	1	34386268	1
32	-36667050	0	28017057	1	40471963	0	-12182842	1	-11921898	2	-72757085	-1
33	-55434483	0	-55723928	1	14899720	0	-68818096	0	-80774596	1	12544239	2
34	-50599837	0	-22418791	1	47929076	0	-15213452	1	-16797770	2	12084722	2
35	-79138584	0	25698387	1	51448814	0	-18990172	1	-20388487	2	96176847	1
36	16622772	1	75266971	2	79815511	-2	39271243	0	-16936924	0	-78756080	-1

TABLE C32.- Continued

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37	-57917450	0	-10533709	1	60763713	-1	-20579130	0	-23862023	0	69641790	-2
38	-10760946	1	-20777922	2	-43789838	-1	-60249044	-1	20040292	0	37619779	-1
39	-83133459	0	-72757009	1	-67197369	-1	14767716	0	72869293	-1	28772743	-1
40	-13304564	-1	11853741	2	31216117	-1	55754645	-1	-78699143	-1	-70527501	-1
41	57170208	0	25265662	2	83346609	-1	-26132089	-1	-29202854	0	-11368043	0
42	18337422	0	11940477	2	13373697	-1	-56266456	-1	24459498	0	26731729	-1
43	-16732981	0	-42640454	1	-80270228	-2	-24814053	-1	18270650	0	91482399	-1
44	-38905263	0	-14925151	2	-85570239	-1	-18190172	-1	-10048826	0	-22667226	-1
45	-38036291	0	-12752778	2	-27911976	-1	22583621	-2	-69392366	-1	-16697159	-2
46	11697919	0	83163175	1	-93396572	-2	85825194	-1	29340348	0	61483567	-1
47	11430529	1	47683502	2	25159507	-1	22797326	0	-35059776	0	49670417	-2
48	22838056	1	90151073	2	96241855	-1	47641511	0	87915107	-1	37363504	0
49	30361484	0	11835363	2	-62304465	-1	55369247	-1	-53201838	0	-53439334	-1
50	55354682	0	97428301	1	-73789417	-1	45173560	-1	31452860	0	25277198	0
51	16817336	0	-11823695	2	-92624131	-1	21469332	-1	98812577	-1	10338792	0
52	-20754452	0	-20965766	2	-10044599	0	24788276	-1	-17683312	0	-46717597	-1
53	-36075911	0	-15236756	2	-65727693	-1	11913014	-1	-41255560	-1	-14832980	-1
54	-18930868	0	-39924087	1	-50751039	-1	-79673239	-1	72769287	-1	-31804824	-1
55	25119153	0	16159786	2	-50867815	-1	-21807743	0	26205130	-1	-81207628	-1
56	50499675	0	10172908	2	-24610859	0	13614230	0	-14140687	1	-26534398	0
57	36483784	0	-12505950	2	11714599	0	-39060094	-1	-45280552	0	-21716507	0
58	-24954683	0	-16029462	2	61356983	-1	27228849	-1	-43688167	0	-20737160	0
59	-32990118	0	-14098316	2	-39374825	-1	58977840	-1	-28243594	0	-13134307	0
60	-25316191	-1	-10448375	2	-28507312	-1	-99904085	-2	-11790891	-1	-85146008	-1
61	-33204485	0	-10473590	2	59803657	-1	-17404057	0	26413792	0	71949191	-1
62	-61534167	0	-25932142	2	50283863	0	15781426	0	-20558430	0	-38189425	-1
63	-11467394	1	-61430443	2	59472189	0	60377946	0	-92665279	0	-10956145	-1
64	64345475	0	-53081070	1	42020009	0	-24088706	-1	-84046720	0	-33651138	0
65	12033403	0	12918499	2	47986140	0	-31688401	-1	-58677144	0	-36913250	0
66	-84568073	-1	41434793	1	-34710568	-1	11110423	0	29886295	0	16354216	0
67	-30481987	0	-10566634	2	-49418295	-1	17061984	0	33030237	0	20937005	0
68	-58351902	0	-20553479	2	22063123	0	24529782	0	17603974	0	17372716	0
69	-72058009	0	-30922316	2	44431737	0	39014320	0	13506031	0	24178595	0
70	-12719544	1	-62635560	2	14952285	1	13870393	1	13584276	1	15636763	1
71	-78218644	0	-32098898	2	46981093	0	46166266	0	-91162850	-1	14027343	0
72	-12038454	1	-71036406	2	16653880	1	20116634	1	-17080499	1	55606811	0
73	26591342	0	42726777	2	11031210	1	-16564935	0	67515490	0	-17241257	-1

TABLE C32.- Continued

	7		8		9		10		11		12	
74	13915225	0	32761396	2	-12460831	0	14265525	0	54914565	0	34742908	0
75	-37856395	-1	83276395	1	-26802091	0	27842127	0	32934162	0	30376920	0
76	-45072120	0	-22028393	2	12436762	0	27581277	0	-56776392	0	-11439721	0
77	-73001982	0	-30968333	2	46687210	0	44760279	0	-87989833	0	-21092417	0
78	-11097511	1	-71086110	2	17954405	1	19757398	1	-41906477	1	-24248898	1
79	77903947	0	72901062	2	33716570	0	-10519998	0	43609655	0	15334859	0
80	54449433	0	46832935	2	-43240165	0	16088890	0	31586528	0	40773502	0
81	28607321	0	22350335	2	-79116016	0	31124164	-1	-21538904	0	11209116	-1
82	-21482436	0	-15573918	2	-86647521	-1	-13760936	-1	-37523489	0	-11893467	0
83	-30507810	0	-23738359	2	43076061	0	-16044870	0	-11283192	1	-54537342	0
84	-76307597	0	-49483544	2	25278783	1	-71030843	0	-11198504	2	-74041365	1
85	89888962	0	63274012	2	-93356783	0	-29963344	-4	-63794418	0	13470356	-1
86	61416806	0	33241603	2	-12923079	1	-18689899	0	-51055343	0	-64025375	-1
87	-31267255	-1	-14298446	2	25015318	0	-71713543	0	-46899055	0	-57309815	0
88	-60682788	0	-27378691	2	33634369	1	-25526514	1	32220562	1	-15454106	0
89	91637286	0	38606002	2	-21962573	1	-72287296	0	-34036202	0	-39805050	0
90	73254054	0	26127483	2	-12024901	1	-10754450	1	-91418469	-1	-62760216	0
91	-36114166	0	45128142	0	22823009	1	-11739076	1	37224016	1	14739489	1
92	13809551	1	22454654	2	-12943775	1	-87032454	0	-58896721	0	-10041517	1
93	99999999	0	99999999	0	99999998	0	99999999	0	99999999	0	99999999	0
94	94554125	-1	-19692643	2	-11518031	0	24150029	-1	-23406773	0	-51173152	-1
95	19078812	1	84641813	2	69348162	-1	33924198	0	-19717604	0	15411989	0
96	11297257	1	57711118	2	29433083	-1	-56479780	-1	-19031526	-1	10563923	0
97	17171178	0	13986514	2	17947434	-1	-27116362	0	72822824	-1	75737378	-1

TABLE C32.- Continued

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2	-92823665	1	28573140	1	32259280	2	-31946970	2
3	24765058	1	-86521220	0	23178218	2	42730098	0
4	47787279	1	-16840068	1	39913226	2	63985650	1
5	92312784	1	-33151180	1	10245962	3	11167089	3
6	-12338652	2	36990290	1	51555242	2	-66183263	2
7	-89743001	1	27678902	1	31674014	2	-35695097	2
8	28655786	1	-90319345	0	33777149	2	-22019823	2
9	53006353	1	-16640418	1	47664813	2	-25921394	2
10	93763283	1	-30552020	1	93411289	2	-11079496	2
11	-12373169	2	39041063	1	22902061	2	33962509	2
12	-94983779	1	30833915	1	24361450	2	47492217	2
13	44659030	1	-11787103	1	10208578	2	-30469066	2
14	72340083	1	-20449898	1	15680575	2	-67887019	2
15	11808180	2	-34373658	1	25700368	2	-15104054	3
16	-94101654	1	33781394	1	-68033102	2	23125177	3
17	-52813470	1	21287008	1	-70802970	2	14970227	3
18	51295658	1	-10055079	1	-66642309	2	-37583156	2
19	73999855	1	-16419740	1	-73212942	2	-68066861	2
20	12551547	2	-29835285	1	-11061292	3	-13635541	3
21	-78280963	0	-52396046	0	-22696978	0	-99349707	-1
22	-15301239	1	-10812226	1	-61578192	0	-27864053	0
23	30609915	1	22096237	1	-65192726	0	-14397305	0
24	-26973223	1	-18591851	1	-71320528	0	-39275132	0
25	-20707822	1	-14365818	1	-86634723	0	-37713908	0
26	42062817	1	31451613	1	-26611349	0	-11392879	0
27	-61550484	1	-44233332	1	-18658893	1	-67496105	0
28	-24107855	1	-16876975	1	-88125057	0	-32249517	0
29	67746997	1	50656385	1	12116327	1	33385018	0
30	-74500837	1	-55691923	1	-18478976	1	-49174659	0
31	-90307269	0	-66307827	0	36752020	0	10759834	0
32	78001148	1	56725358	1	27120825	1	89164359	0
33	-37277314	1	-29293916	1	77363373	0	50673277	0
34	33113371	1	23674656	1	34493701	1	11612983	1
35	44675915	1	28319060	1	30103421	1	13021126	1
36	-34516237	-1	-19657460	0	86016536	0	42037214	0

TABLE C32.- Continued

	13		14		15		16	
37	26305777	0	-12855271	-1	-19933211	1	45211677	0
38	13835585	0	98368523	-2	-24497970	1	36185329	0
39	51163048	-1	23641173	-1	-15336025	1	33833713	0
40	-98737406	-1	-73681428	-1	-52699549	0	47399965	-1
41	-13197252	0	-10500300	0	18300887	0	-12010897	0
42	-14663344	-1	40258446	-2	31207215	0	58609493	-1
43	10117021	0	85471589	-1	18231138	0	13538731	0
44	14639631	-1	-30142757	-1	-16406400	0	14402198	0
45	31900804	-1	-65255924	-2	-27280943	0	14460065	0
46	16974157	-2	31217798	-1	32688090	-1	76574135	-1
47	-30253217	-1	19972071	-1	78137798	0	-61890942	-1
48	26559608	0	42600246	0	19250001	1	-17949680	0
49	-10908532	-1	-42088096	-2	51452869	0	-27969433	-1
50	21776764	0	29039782	0	80603612	0	-17365224	0
51	85649939	-1	12111133	0	27686964	0	-17958196	0
52	-34757548	-1	-44671091	-1	-23587410	0	-74033160	-1
53	18297009	-2	-24031681	-1	-42907337	0	75816630	-1
54	-29340473	-1	-52339179	-1	-42233523	0	61058431	-1
55	-77154277	-1	-10290948	0	-19027804	0	-71541381	-2
56	-14986634	0	-18566033	0	82852722	0	-97036770	-1
57	-23889577	0	-21746692	0	-43568145	-1	-39025027	0
58	-19070346	0	-22715867	0	-46814759	0	-10133204	-1
59	-11832287	0	-14596964	0	-46077459	0	62169549	-1
60	-11550363	0	-10031074	0	-28029572	0	-11907519	0
61	10228286	0	84632112	-1	-31031447	0	46731471	-2
62	-97980159	-2	14459442	-1	-12553748	0	-55046169	-1
63	87970005	-1	15175157	0	12649226	0	-13440729	0
64	-33791653	0	-33155668	0	-29810646	-1	-48227379	0
65	-37057492	0	-41960403	0	-31947511	0	-27700362	-1
66	14634283	0	17169871	0	99725218	-1	29792283	-1
67	19658909	0	24540318	0	49092483	-1	-23954679	-1
68	18246370	0	23747180	0	25544491	0	10120907	-1
69	25423609	0	34046936	0	43766081	0	-36825280	-1
70	16091628	1	18855244	1	22846835	1	14280996	0
71	15210283	0	24745264	0	55809096	0	-76335628	-1
72	71528368	0	95519682	0	25341941	1	-68665255	-1
73	-98980759	-1	-11150475	0	-11767274	0	52533336	-1

TABLE C32.- Concluded

	13		14		15		16	
74	34244537	0	37740284	0	60520393	0	12611300	0
75	29410644	0	37259928	0	60070036	0	-41955783	-1
76	-72040528	-1	-25393044	-1	31455163	0	-18879288	0
77	-15746393	0	-10818319	0	38857619	0	-11920001	0
78	-28152311	1	-25176012	1	20553226	0	-55951940	0
79	13990801	0	13163608	0	46553852	0	35845910	-1
80	44453877	0	48033916	0	95177471	0	26545548	-1
81	49969669	-1	60399756	-1	49016900	0	-79060866	-1
82	-56542252	-1	-58796161	-1	92628685	-1	-18939907	0
83	-43853942	0	-50861941	0	-37864389	0	-26083761	0
84	-75381066	1	-80222525	1	-59586150	1	-12341849	1
85	12400450	0	86148571	-1	77703300	0	-57709236	-1
86	41333600	-1	-21231922	-2	49200999	0	-14311467	0
87	-48948467	0	-61873577	0	-97867927	0	-28341300	0
88	-17299562	0	-47105884	0	-32417908	1	-23259439	0
89	-34460720	0	-42306864	0	-26163673	0	-34734044	0
90	-58828922	0	-75403495	0	-97053051	0	-17723671	0
91	16654631	1	13985498	1	-47818341	0	10491499	1
92	-10596852	1	-12327716	1	-14081083	1	-96292197	-1
93	99999999	0	99999999	0	99999999	0	99999999	0
94	-54875596	-1	-37042170	-1	-72596911	-2	-25034581	0
95	79335485	-1	18597448	0	15419632	1	-88748998	-1
96	10729753	0	12427815	0	74778694	0	-20587698	-2
97	13685868	0	10421474	0	-13623066	0	-17112087	-1

TABLE C33.- SYMMETRIC STRUCTURAL MODES, CASE SC6

CP \ Mode	1		2		3		4		5		6	
1	12939592	1	-55418161	-1	59804963	0	10366632	-2	-26839522	-1	96724789	-1
2	11437902	1	-43411842	-1	39680070	0	-22798592	-1	-62220352	-1	11740084	0
3	90786860	0	-22683142	-1	-33882242	-2	-38042184	-1	-96483640	-1	15762710	0
4	87289560	0	-17316948	-1	-65641244	-1	-44772985	-1	-11128539	0	17757715	0
5	76449860	0	-92443124	-2	-28322627	0	-47324076	-1	-12899077	0	20990862	0
6	12646685	1	-45813171	-1	87156567	0	-11963347	0	-18183278	0	12256561	0
7	11513462	1	-35950272	-1	76261966	0	-13804243	0	-21256359	0	15567131	0
8	92279377	0	-17406380	-1	36545222	0	-16122206	0	-26648011	0	22525115	0
9	89707331	0	-13293250	-1	30240611	0	-16280310	0	-26904793	0	22327431	0
10	79725299	0	-42701564	-2	17066357	0	-17422847	0	-29920306	0	26673330	0
11	12294677	1	-33646183	-1	13499237	1	-28473829	0	-39496532	0	16803111	0
12	11549487	1	-26215089	-1	13295859	1	-29993707	0	-41897054	0	19154215	0
13	96843688	0	-96188333	-2	90738549	0	-33109487	0	-48214317	0	24938420	0
14	93243381	0	-57422983	-2	81906799	0	-33734647	0	-49610195	0	26410916	0
15	83330418	0	12543985	-2	75542530	0	-35159579	0	-53033867	0	31061450	0
16	12082833	1	-19783728	-1	20846182	1	-50677091	0	-68663246	0	23721191	0
17	11261831	1	-11073068	-1	20032889	1	-51263643	0	-70535758	0	27727806	0
18	10011778	1	19164333	-3	15778806	1	-52353487	0	-74232894	0	33198516	0
19	97545550	0	38361374	-2	14808766	1	-53510610	0	-75789849	0	32457625	0
20	90720345	0	95626123	-2	13920966	1	-56107026	0	-79666575	0	33222285	0
21	83156360	-1	23552298	-1	12447964	-1	42953593	0	-12206554	0	-18869496	0
22	52588580	-1	55186194	-1	26484384	0	54452118	0	-11686828	0	-17889764	0
23	40363711	-1	10829837	0	83939308	0	18847464	1	-35477326	0	-40067838	0
24	18561421	0	84337597	-1	32721946	0	97456052	0	-25695454	0	-37788413	0
25	88251425	-1	12152916	0	70336091	0	13963952	1	-27250747	0	-36245413	0
26	61557280	-1	18106499	0	13155670	1	26032441	1	-46533704	0	-53722776	0
27	23842768	0	14236353	0	65233420	0	16515538	1	-33913368	0	-44561537	0
28	14174908	0	18829197	0	10540644	1	23905410	1	-43847935	0	-52147762	0
29	10248615	0	25630303	0	18668628	1	37366967	1	-64876222	0	-72752968	0
30	28364104	0	22953980	0	11748250	1	28195641	1	-50304485	0	-58765837	0
31	19867251	0	27523433	0	16109106	1	35406283	1	-59981099	0	-66889185	0
32	13761954	0	35175454	0	24749189	1	48473214	1	-80266861	0	-87105246	0
33	35390301	0	35516736	0	21462741	1	47621244	1	-80949570	0	-88350766	0
34	27162594	0	39198017	0	25978963	1	53530874	1	-89044736	0	-95900478	0
35	18530571	0	51231200	0	34036255	1	68178289	1	-11069562	1	-11753951	1
36	25104823	1	-18625227	0	37346199	1	-40790386	-1	17594480	0	-60249898	0

TABLE C33.- Continued

	1		2		3		4		5		6	
37	16520002	1	-95118359	-1	14604429	1	-39155792	-2	61764086	-1	-15041832	0
38	89424975	0	-29055943	-1	-19355330	0	29051667	-1	-12450176	-1	15070031	0
39	20174701	0	24353090	-1	-10666962	1	33231535	-1	-33616178	-1	20223789	0
40	-30867400	0	47529248	-1	-10670919	1	18111256	-1	-17057650	-1	81766877	-1
41	-47763543	0	45199224	-1	-61859395	0	-16463517	-1	-17864489	-1	-13191367	-1
42	-50507487	0	20380012	-1	-12032165	-1	-11313656	-1	22862077	-1	-12864122	0
43	-42130551	0	-14377266	-1	41135667	0	-61297011	-3	33933064	-1	-12855252	0
44	-21657317	0	-47082594	-1	54236377	0	28044569	-1	37940054	-1	-56047237	-1
45	12132110	-1	-75176374	-1	17972747	0	64688016	-1	38379138	-1	24385461	-1
46	23506964	0	-10072313	0	-40564140	0	11452339	0	42739789	-1	12145478	0
47	45128749	0	-13424828	0	-10443688	1	17189547	0	41940259	-1	25512044	0
48	65382500	0	-16948345	0	-17255547	1	22239220	0	41258306	-1	35206376	0
49	-64166187	0	43821972	-1	-25682209	0	-49619487	-1	-69105640	-2	-16143818	0
50	-63225020	0	24593038	-1	17396415	0	-28304745	-1	19462247	-1	-16782296	0
51	-52316591	0	-87132542	-2	64276657	0	18433298	-3	40031229	-1	-12982057	0
52	-25578384	0	-42114004	-1	63548383	0	31136852	-1	38269092	-1	-30362644	-1
53	22332561	-1	-68038282	-1	17511121	0	61989064	-1	34354382	-1	46928686	-1
54	24103035	0	-84341020	-1	-42427043	0	80345393	-1	32588739	-1	52875280	-1
55	48248741	0	-10589832	0	-11374595	1	99423078	-1	27699104	-1	53913931	-1
56	-66300466	0	26946320	-1	29844895	0	-15556605	-1	29240714	-1	-15339108	0
57	-50600027	0	-46530081	-2	80802085	0	-10650867	-1	15953017	-1	-57387366	-1
58	-22104824	0	-31515257	-1	83801420	0	92021885	-2	47401228	-2	62971602	-1
59	33820353	-1	-46964285	-1	32666463	0	23883420	-1	48701523	-2	61010024	-1
60	26492802	0	-39425550	-1	-32613715	0	19100263	-1	57157728	-2	-20255556	-1
61	51812507	0	-31037378	-1	-10693255	1	-10830269	-2	42696390	-2	-14814276	0
62	72790972	0	18437124	-1	-14468556	1	-74299629	-1	-20575279	-1	-30908718	0
63	86889316	0	15549682	-1	-22350549	1	-10455029	0	-11340764	-1	-53762581	0
64	-53478219	0	18640912	-2	13269125	1	-40708190	-1	-55592461	-1	15734999	0
65	-23314232	0	-13649424	-1	14183491	1	-27834374	-1	-60819891	-1	26404141	0
66	56203131	-1	97125431	-2	72682165	0	-43365604	-1	-56836208	-1	15747529	0
67	37002502	0	47095444	-1	-47251648	-1	-76737676	-1	-53661511	-1	-12831829	-1
68	66662249	0	81606369	-1	-91504526	0	-12718160	0	-52590407	-1	-25771353	0
69	78191569	0	94260965	-1	-13107861	1	-15076144	0	-51175902	-1	-38153664	0
70	99130530	0	99365198	-1	-21053084	1	-20463487	0	-45587014	-1	-66890572	0
71	88538308	0	18740709	0	-11394839	1	-23839296	0	-78778756	-1	-47986867	0
72	10712258	1	20931399	0	-18570648	1	-29198018	0	-67888163	-1	-78000231	0
73	-23597246	0	20125499	-1	22715496	1	-96142195	-1	-18323184	0	60849105	0

TABLE C33.- Continued

	1		2		3		4		5		6	
74	12596732	0	11842235	0	13425564	1	-14123915	0	-14664356	0	32756973	0
75	44709661	0	17934885	0	40972433	0	-17727518	0	-11044464	0	28395105	-1
76	80954880	0	25062098	0	-50693668	0	-23704631	0	-81793784	-1	-33655883	0
77	93958501	0	27337952	0	-87753780	0	-25405950	0	-69031679	-1	-46168744	0
78	11627109	1	33402050	0	-15792893	1	-33201934	0	-54818199	-1	-82672239	0
79	-15470545	-1	48703122	-1	12190846	1	-58148497	-1	-12353685	0	48802513	0
80	96031524	-1	10045217	0	84664126	0	-68672728	-1	-84498233	-1	29998642	0
81	25902806	0	15518527	0	46215485	0	-79052803	-1	-42940974	-1	99293610	-1
82	41387969	0	19660663	0	67993406	-1	-75510346	-1	85436472	-2	-11103823	0
83	48652567	0	22209070	0	-14471744	0	-60959323	-1	40768563	-1	-18610202	0
84	57840333	0	25496652	0	-50724375	0	-62061261	-1	53209751	-1	-33288928	0
85	12972277	0	17732525	0	11648330	1	-86572617	-1	-95475602	-1	38681069	0
86	31744655	0	25646682	0	87489787	0	-10290495	0	-41979827	-1	14519544	0
87	57252277	0	36876810	0	24527378	0	53215327	-1	15652690	0	-13367611	-2
88	69956334	0	43546787	0	-99417843	-1	17929409	0	31502299	0	52706244	-1
89	39253828	0	39481980	0	13145560	1	20544105	-1	72575149	-1	32648469	0
90	57130782	0	51129504	0	10134015	1	19218462	0	26424862	0	30880916	0
91	88944408	0	67845114	0	41769733	0	63971309	0	69173061	0	48583855	0
92	74127867	0	85773960	0	13389884	1	56502243	0	63070411	0	66519375	0
93	99999999	0	99999999	0	99999999	0	99999998	0	99999999	0	99999998	0
94	-39792409	0	-25825214	-1	73807874	0	58239118	-2	33899304	-1	-89389858	-1
95	64974535	0	-13838413	0	-16122089	1	17953619	0	15173849	-1	33799196	0
96	65586283	0	-13401234	0	-16108710	1	13573605	0	12677245	-1	18132191	0
97	65846054	0	-98951211	-1	-15473704	1	63400178	-1	-23362475	-2	56938922	-2

TABLE C33.- Continued

	7		8		9		10		11		12	
1	56181380	0	-86012647	1	44162166	-1	-63637432	0	-88022249	0	-94151133	1
2	69354057	0	-81057243	1	29742704	-1	-39672404	0	-61639363	0	-68463660	1
3	78608958	0	-70641807	1	-97920426	-2	82685493	-1	78523060	-1	15421953	1
4	88809046	0	-71288805	1	-17914534	-1	16807324	0	20467876	0	31937889	1
5	10055344	1	-79094392	1	-41366158	-1	35001266	0	44566432	0	63345724	1
6	18007271	1	72350487	1	10850275	0	-24338472	0	-72461732	0	-87258791	1
7	19161484	1	75946925	1	84734101	-1	-45356317	-1	-47441895	0	-61754057	1
8	21387308	1	10021526	2	30777354	-1	41564015	0	21899729	0	22359920	1
9	21656102	1	10518566	2	21730473	-1	49047057	0	33901756	0	38868589	1
10	23790651	1	11854414	2	-59864814	-2	66701505	0	55781788	0	66745639	1
11	35225185	1	29370065	2	18140951	0	28791014	0	-51889174	0	-81052430	1
12	36534023	1	30675346	2	15903996	0	43698542	0	-33014148	0	-60313626	1
13	39735386	1	36219323	2	96841194	-1	91873824	0	43655119	0	36835971	1
14	40661397	1	36631951	2	82397453	-1	10040343	1	57135814	0	55379211	1
15	43193887	1	39604128	2	53375025	-1	11844456	1	79966189	0	85166242	1
16	59636183	1	62975628	2	25911336	0	11498782	1	-77984412	-1	-54129907	1
17	60438457	1	63762698	2	21898778	0	12892061	1	16924445	0	-24726466	1
18	61627447	1	65938793	2	15867244	0	15730185	1	70835505	0	46723831	1
19	63070594	1	67779480	2	15109313	0	16632109	1	83180564	0	62351059	1
20	66118670	1	73404917	2	13292056	0	18978147	1	11302216	1	97357453	1
21	-40887741	-1	-56512019	0	-89290542	-2	-25898915	0	30849092	1	96224353	1
22	-11815647	-1	-55650984	0	18796618	-1	-38556244	0	11488450	2	39514969	1
23	-14990108	0	-23075115	1	17916222	-1	-42127190	0	22622086	2	-95641220	2
24	-83642942	-1	-98758278	0	-17714444	-1	-71864704	0	11036730	2	27777045	2
25	-61022469	-1	-84888037	0	36663239	-1	-64868695	0	18237265	2	19109096	1
26	-16393171	0	-20915502	1	24877503	-1	-22567683	0	19185421	2	-10430119	3
27	-69900574	-1	-54371411	0	-40215385	-2	-12776413	1	26896372	2	52671611	2
28	-11406382	0	-11520082	1	46572605	-1	-65198117	0	17756527	2	86056790	1
29	-23367237	0	-23031509	1	13551869	-1	51491658	0	-49609751	1	-97375388	2
30	-10932325	0	-25367753	0	-17068050	-1	-95523826	0	15189422	2	90480753	2
31	-15395051	0	-83580070	0	20652009	-1	19442536	0	-95646357	1	33433357	2
32	-29657878	0	-24127066	1	-18276382	-1	16044009	1	-41512392	2	-49712722	2
33	-24875113	0	-69345196	0	-99558336	-1	68815141	0	-36392972	2	12529252	3
34	-28635980	0	-93650188	0	-64674223	-1	19568623	1	-68564327	2	76436164	2
35	-41163856	0	-23772281	1	-64452880	-1	26255205	1	-73730771	2	47277151	2
36	-65440562	0	40466668	2	50206515	-1	97590748	0	73931165	0	28618817	1

TABLE C33.- Continued

	7		8		9		10		11		12	
37	-13349004	0	-24865005	1	40685447	-1	-56097566	0	-49176297	0	-17098444	1
38	51264571	-1	-15647359	2	-45455921	-1	-20985934	0	-15120897	0	-60415345	0
39	-35922631	-1	-98617198	1	-57007158	-1	26851945	0	28949079	0	10713765	1
40	-96947131	-1	27484798	1	50815507	-2	14768276	0	96187056	-1	23716572	0
41	-13142927	0	10018335	2	60751787	-1	-23793231	0	-87963830	-1	29942425	-1
42	-25462868	-1	41809623	1	14634774	-1	-29040694	-1	-86647333	-1	-36714077	0
43	79078815	-1	-28814371	1	-68199505	-2	65670077	-1	12380319	-1	28613559	-1
44	16492469	0	-72760792	1	-30313171	-1	19650808	0	13422723	0	38524127	0
45	15585491	0	-64930491	1	-12183119	-2	13994797	0	49720740	-1	-88592697	-1
46	69830712	-1	-54210412	-1	63769094	-1	23058023	0	10145449	0	-29557440	-1
47	-12160732	0	14718567	2	10807968	0	32264803	0	22640623	0	33299726	0
48	-22129098	0	23280779	2	10600813	0	41176217	0	44027486	-1	-11575323	1
49	-61500138	-1	80797625	1	-47975411	-2	-12082545	0	-22100960	0	-93125930	0
50	16729459	-1	53108812	1	-20718296	-1	-10833348	-1	-11449532	0	-58806726	0
51	11209499	0	-10373883	1	-36521893	-1	88096885	-1	47223994	-1	96955236	-1
52	16306685	0	-75962143	1	-25559682	-1	76118499	-1	13683239	0	60124369	0
53	92800181	-1	-73228760	1	-90766098	-2	-18897453	-1	66387965	-1	30349494	0
54	58320653	-1	-22459129	1	-45679586	-1	-78447801	-1	-11689059	0	-78668463	0
55	-16182656	-1	10616784	2	-97267784	-1	-16086121	0	-13344321	0	-88007518	0
56	69700551	-1	79411075	1	-56173013	-1	56389329	-1	-14010594	0	-10287962	1
57	92187165	-1	22845893	1	-53217270	-1	-10742633	-1	30182824	-1	79954724	-1
58	18425572	-1	-56989266	1	-95205423	-2	-84008317	-1	78217161	-1	52848255	0
59	25067033	-1	-68200638	1	10269566	-1	-88536675	-1	49409526	-1	43471838	0
60	76682069	-1	-16911474	1	20035565	-2	-92468506	-1	-34442886	-1	18203809	-1
61	58420035	-1	15211381	1	-66646144	-1	-13077276	0	-60441089	-1	33964287	-1
62	79980045	-1	18006078	1	-51342528	-1	-24602336	0	41725216	-2	10346289	1
63	20099768	0	31288325	1	35416600	-2	-12714570	1	-78880716	-1	29810491	1
64	-37864356	-2	14189996	2	-78229526	-1	-10215825	0	-43697247	0	-29006184	1
65	-13884242	0	-38264031	0	40564803	-1	-32620887	0	-45480542	-1	15344387	0
66	-14355102	0	-30931693	1	63268951	-1	-96492386	-1	-78737197	-2	19177171	0
67	-10405996	0	-32982075	1	61959476	-1	96418313	-2	-37538018	-1	99184070	-1
68	-11136134	-1	-12049238	1	93277404	-1	-46352114	-1	22377656	0	22696371	1
69	44542560	-1	-13494107	1	11781086	0	30592311	-1	11790744	0	17196061	1
70	18457218	0	-29883181	1	42122125	0	-78368540	0	17166950	1	14140341	2
71	11901834	-2	-65236673	1	10829020	0	-17188191	-1	-17737700	0	27583764	0
72	19874169	0	-82574492	1	53903085	0	-18995121	0	61415665	0	66929241	1
73	-38522882	0	13854514	2	98153944	-1	-49089550	0	-19844778	0	-68235144	0

TABLE C33.- Continued

	7		8		9		10		11		12	
74	-39696298	0	41708763	1	30955614	-1	58884498	-1	45076014	-1	92842625	-1
75	-29864198	0	-13225656	1	16882116	-1	18482388	0	32847902	-1	20122833	0
76	-47564148	-1	-52376807	1	50718634	-1	28678486	0	-88566562	-1	-13350754	0
77	-36856607	-2	-69760563	1	93775814	-1	28587187	0	-16173420	0	-31534158	0
78	22893751	0	-13168375	2	45075663	0	84901642	-1	-32832064	0	28024867	0
79	-63459857	0	38633847	1	-14430471	0	28480448	0	17488906	0	-15248483	0
80	-44178453	0	21288299	1	-18620798	0	30014224	0	17742677	0	-46977248	-1
81	-22248548	0	30523276	1	-25904118	0	39933607	0	20017467	0	-48374549	-1
82	13792464	0	39161054	1	-14978780	0	-21904043	0	-25812881	0	-13109104	1
83	29056282	0	22059158	1	-62509689	-1	-10115314	1	-21155929	1	-10978689	2
84	62365693	0	10486510	1	25808309	0	-48952166	1	-23910900	2	-13642918	3
85	-51423878	0	63668686	1	-46294339	0	72252218	0	39216219	0	-18784797	0
86	-20867702	0	70108696	1	-60617127	0	69206131	0	36207098	0	-36180576	0
87	41486027	0	92625074	1	-25674115	0	-25063094	1	-76301215	0	-83012527	0
88	10437061	1	63054819	1	89801385	0	-20471494	2	-16393439	1	30456717	2
89	-24838452	-1	19135705	2	-12926619	1	10710319	1	82681019	0	-23998475	0
90	38526955	0	18648560	2	-99616103	0	-44118298	0	42381805	0	16997659	0
91	10629869	1	62227013	1	63147076	0	-58206915	1	-28405388	0	76464715	1
92	74832957	0	19940956	2	-85400839	0	24539960	0	97451999	0	65591319	0
93	99999999	0	99999999	0	99999999	0	99999999	0	99999999	0	99999999	0
94	17100401	0	-63865769	1	-42383709	-1	75577285	-1	90969812	-1	37908227	0
95	-25428131	0	24590523	2	78518770	-1	32694468	0	23716959	0	23635904	0
96	-15878274	0	21352820	2	-11725333	-1	15154375	-1	-68532781	-1	-90152408	0
97	-74080963	-1	16561666	2	-54634818	-1	-20467586	0	-23681245	0	-12138021	1

TABLE C33.- Continued

	13		14		15		16	
1	-95556526	2	-81945735	2	-57945335	3	40407586	3
2	-71283313	2	-62099932	2	-29196726	3	16658597	3
3	20376750	2	19048579	2	-19770589	3	-35718700	1
4	39355545	2	36232295	2	-33824320	3	-35700138	2
5	76514708	2	70363885	2	-86690653	3	-58340611	3
6	-93862936	2	-83273579	2	-46210572	3	34336227	3
7	-68782397	2	-62290811	2	-28604263	3	18510834	3
8	23382705	2	19313644	2	-28733661	3	11117205	3
9	42788087	2	37062212	2	-40321109	3	12982280	3
10	76067112	2	67740254	2	-78890408	3	51674630	2
11	-96292305	2	-89938104	2	-21444897	3	-17503667	3
12	-74272610	2	-70752271	2	-22230775	3	-24569509	3
13	33960727	2	25689038	2	-82786053	2	15439655	3
14	55784079	2	45644728	2	-12643595	3	34734832	3
15	91711693	2	78894209	2	-20792018	3	77640903	3
16	-78554984	2	-80209918	2	57535649	3	-11956355	4
17	-46257464	2	-51548506	2	60339744	3	-77452243	3
18	35076149	2	21770092	2	57900324	3	19222243	3
19	52223881	2	36872620	2	63798915	3	34992167	3
20	89934404	2	69836775	2	96478146	3	70401792	3
21	-29291844	1	21786826	2	51959456	-1	-29718807	-2
22	-42993546	1	37097934	2	-17557900	0	14633020	0
23	17371954	2	-11359979	3	48876642	0	-28887621	0
24	-94588381	1	72909549	2	21409921	0	-11648596	0
25	-54174011	1	48116430	2	-31053335	0	10744702	0
26	20356317	2	-13715405	3	-12725371	0	69744129	-1
27	-20415486	2	16176932	3	77338211	0	-40133755	0
28	-70033597	1	59691128	2	-21731710	-1	95187806	-2
29	25834440	2	-19069407	3	-51760838	0	31583611	0
30	-26136702	2	19569780	3	74128396	0	-44288353	0
31	-55601707	1	34946682	2	-21850506	0	26341308	0
32	24049249	2	-19577283	3	-69445302	0	33833221	0
33	-20960620	2	13357529	3	75795260	0	-44761550	0
34	27748293	0	-37714266	2	-60081862	0	46437477	0
35	62594871	1	-74836615	2	-43653623	0	-69378086	-1
36	18963137	1	-10096408	2	-42976456	1	-82496558	0

TABLE C33.- Continued

	13		14		15		16	
37	10220347	1	82569662	1	16733809	2	-27187015	1
38	56720772	0	32130683	1	19680933	2	-19525889	1
39	41819625	0	-40600290	1	12189818	2	-12873427	1
40	-70788599	-1	-98986151	0	23815893	1	-34175802	0
41	-31060504	-1	-66120753	0	-28707697	1	23491578	0
42	-13441035	0	15056464	1	-24608192	1	46618472	-2
43	20183840	-1	15978034	0	-23987829	0	26417402	-2
44	54120495	-1	-11322730	1	17842093	1	24611150	0
45	-54577871	-1	96634285	0	25516970	1	13278552	0
46	-12381819	0	87846629	0	65964352	0	27203322	0
47	-21833635	0	-74711403	0	-45990056	1	57800651	0
48	-85803586	0	56242675	1	-67904678	1	57124799	0
49	-42559071	0	33972391	1	-39572321	1	37869002	0
50	-34773198	0	22038752	1	-38149781	1	54551472	0
51	-88981357	-1	-29652035	0	-16149153	1	48447770	0
52	19646468	0	-21245338	1	20299750	1	12413357	0
53	26789103	0	-74445669	0	34373177	1	-67315882	0
54	-13562235	0	35196099	1	23670289	1	-76007881	0
55	-39212009	0	30293160	1	-21859302	1	-15990238	0
56	-68315690	0	39161602	1	-50552626	1	12246061	1
57	-19569748	0	-55070524	0	-25265031	1	10211370	1
58	33092094	0	-17680196	1	20850091	1	-49390344	0
59	36144402	0	-13872139	1	31446984	1	-72300049	0
60	41055076	-1	-29819591	0	90529411	0	15783219	0
61	31158242	-1	-10879640	1	-21778534	0	-10465740	0
62	38350849	0	-61578816	1	-80010274	0	39304573	0
63	15332644	1	-16312522	2	-17610437	1	45861917	0
64	-15574358	1	11729785	2	-61651507	1	26629969	1
65	22208042	0	-26568257	0	78759445	0	-11488650	0
66	24840544	0	-33282236	0	14204779	1	-49649819	0
67	18844910	0	-39209533	0	12964920	1	-35720590	0
68	80672560	0	-10744810	2	-11847796	1	66562527	0
69	57126115	0	-85959497	1	-15337178	1	11325368	1
70	50342398	1	-63420162	2	-50603571	1	28267922	1
71	32438128	0	-25193428	1	46962408	0	37670938	0
72	24892909	1	-30381197	2	-39908292	1	32889802	1
73	-41594489	0	28973334	1	-40786463	1	17181207	1

TABLE C33.- Concluded

	13		14		15		16	
74	-38525808	-1	-13823690	0	-14385132	1	-12770519	0
75	14165311	0	-98709290	0	-10761544	0	-72324339	0
76	-54770080	-1	-42405137	0	-78912543	-1	55482214	0
77	-21426335	-1	24390018	0	14348276	0	54558286	0
78	43947723	0	-25196427	1	-46143003	0	24815177	1
79	63305572	-1	18516777	1	12194847	1	-32079124	1
80	-73338306	-2	69370151	0	95143666	0	-24556316	1
81	-27497891	0	-22057074	0	-42399364	0	-11554433	1
82	-58998087	0	38047093	1	-14914480	1	10631779	1
83	-31183998	1	44942306	2	22750189	1	51336934	0
84	-39973002	2	58613784	3	32226945	2	-84711462	1
85	-51991278	0	83378291	0	-16887647	0	-27000723	1
86	-86525350	0	11649996	0	-13203892	1	-11585782	1
87	76524178	0	-14267269	1	17539029	1	-33728789	0
88	21944506	2	-15399576	3	23958358	2	-10490061	2
89	-17486025	1	-23967059	1	-35036454	1	-11131895	1
90	-60168508	0	-52848212	1	-16986063	1	-72773099	0
91	63316931	1	-38061596	2	75131338	1	-20074191	1
92	-53798775	0	-56508582	1	-13100043	1	-72657482	0
93	99999999	0	99999998	0	99999999	0	99999999	0
94	59923302	-1	-13703453	1	94252701	0	39620333	0
95	-44813880	0	-82529361	0	-78046662	1	80467843	0
96	-64405039	0	32981065	1	-63091360	1	52863580	0
97	-59723822	0	39937384	1	-50242777	1	49518183	0

TABLE C34.- SYMMETRIC STRUCTURAL MODES, CASE SC7

CP \ Mode	1		2		3		4		5		6	
1	12586408	1	-55713604	-1	47570400	0	-94132705	-3	-15732114	-1	37402286	0
2	11102587	1	-43627621	-1	28833889	0	-23144085	-1	-44780584	-1	48563458	0
3	87717072	0	-22821527	-1	-73625763	-1	-34845211	-1	-69774137	-1	62465677	0
4	84258464	0	-17425637	-1	-13515089	0	-40827865	-1	-80822563	-1	70659475	0
5	73536313	0	-93074651	-2	-33194239	0	-41261341	-1	-92590805	-1	81396216	0
6	12302382	1	-46164901	-1	67750792	0	-12429694	0	-15620902	0	88155540	0
7	11182899	1	-36189065	-1	56714308	0	-14140170	0	-17988754	0	10224196	1
8	89239732	0	-17561572	-1	19627778	0	-16037651	0	-21939294	0	12852578	1
9	86702439	0	-13472048	-1	14303648	0	-16163269	0	-22182819	0	12832929	1
10	76838890	0	-43792139	-2	14728970	-1	-17138419	0	-24400920	0	14599850	1
11	11962217	1	-33989059	-1	10406129	1	-29366010	0	-34864814	0	16157939	1
12	11226938	1	-26466603	-1	10119968	1	-30842247	0	-36778117	0	17312604	1
13	93836441	0	-99341828	-2	62228926	0	-33543866	0	-41711813	0	19920657	1
14	90272029	0	-60545222	-2	54019418	0	-34082396	0	-42789559	0	20566285	1
15	80478920	0	10494500	-2	46917730	0	-35381833	0	-45370859	0	22594170	1
16	11763356	1	-20108052	-1	16079217	1	-52194920	0	-61173112	0	26579149	1
17	10952555	1	-11304135	-1	15237515	1	-52645528	0	-62382134	0	27948623	1
18	97155558	0	-14136168	-3	11357988	1	-53295960	0	-64937900	0	29763702	1
19	94610781	0	34326874	-2	10531365	1	-54418301	0	-66433631	0	29943875	1
20	87873532	0	91131898	-2	97026184	0	-56963276	0	-69881647	0	31127439	1
21	82554704	-1	23404124	-1	51263436	-1	44557942	0	-12806951	0	-30853278	0
22	52982521	-1	55337772	-1	27513283	0	56244291	0	-12278527	0	-27649519	0
23	41404682	-1	10938264	0	85153219	0	19497431	1	-35463318	0	-49619221	0
24	18507496	0	84256872	-1	36374642	0	10087700	1	-26809908	0	-58090902	0
25	89347005	-1	12215140	0	71186503	0	14429715	1	-27944976	0	-50849408	0
26	63614363	-1	18264202	0	13143124	1	26909905	1	-46683526	0	-66579184	0
27	23810617	0	14271426	0	68520990	0	17084061	1	-34671879	0	-63198443	0
28	14308835	0	18941140	0	10757727	1	24721063	1	-44138367	0	-67642479	0
29	10513045	0	25857168	0	18651033	1	38628369	1	-64795737	0	-87473801	0
30	28394850	0	23064035	0	12076667	1	29162025	1	-50470658	0	-75308696	0
31	20053164	0	27707972	0	16295901	1	36609022	1	-59797723	0	-80922530	0
32	14125562	0	35479671	0	24599972	1	50101933	1	-79786123	0	-10060131	1
33	35507337	0	35751813	0	21701906	1	49245813	1	-80467523	0	-10445913	1
34	27430508	0	39500915	0	25991893	1	55341445	1	-88396687	0	-11015785	1
35	19070420	0	51658194	0	33882272	1	70473475	1	-10966912	1	-13291396	1
36	24644796	1	-18784678	0	33988511	1	-79261819	-1	77420466	-1	-15520370	1

TABLE C34.- Continued

	1		2		3		4		5		6	
37	16131895	1	-95688510	-1	12906279	1	-17042160	-1	33974526	-1	-40204137	0
38	86339211	0	-29141253	-1	-22222605	0	34311873	-1	76023700	-2	35645930	0
39	18013726	0	24469130	-1	-98147170	0	45538403	-1	-23700421	-2	45170923	0
40	-32229647	0	47860706	-1	-93208576	0	26941637	-1	-18468049	-2	13126830	0
41	-48762894	0	45686183	-1	-51779374	0	-13487566	-1	-15299689	-1	-61616052	-1
42	-51416990	0	21193504	-1	61345732	-1	-16508390	-1	43942456	-2	-35167383	0
43	-43121530	0	-13388483	-1	43957254	0	-91868395	-2	12123820	-1	-31942198	0
44	-22872410	0	-46316394	-1	54625013	0	20524783	-1	23343425	-1	-11677546	0
45	-27390595	-2	-75089915	-1	22232914	0	62779592	-1	34722320	-1	59389303	-1
46	21761349	0	-10154218	0	-29599085	0	12078180	0	52820493	-1	24701563	0
47	43163002	0	-13612900	0	-87044003	0	18831007	0	71397092	-1	52791462	0
48	63156990	0	-17232479	0	-14706263	1	24792287	0	85378710	-1	71792556	0
49	-64935862	0	44654216	-1	-15965348	0	-53858869	-1	-24940027	-1	-41139982	0
50	-63964453	0	25683651	-1	23160315	0	-36239179	-1	-42099705	-2	-42184384	0
51	-53160217	0	-74123715	-2	64301307	0	-10466826	-1	16375797	-1	-30689720	0
52	-26733711	0	-41178660	-1	61878176	0	23435750	-1	26326172	-1	-46111049	-1
53	75064139	-2	-67950519	-1	20739435	0	60672132	-1	34022897	-1	11388464	0
54	22372863	0	-85258305	-1	-30149613	0	84529639	-1	35549646	-1	88013505	-1
55	46270420	0	-10810526	0	-90564472	0	11033958	0	34433089	-1	49022273	-1
56	-66989722	0	28168623	-1	34234329	0	-24205524	-1	55461302	-2	-38156668	0
57	-51418467	0	-32738658	-2	75507142	0	-20566996	-1	29992963	-2	-68830335	-1
58	-23227729	0	-30498440	-1	74706228	0	26059792	-2	73269587	-2	24671503	0
59	19628938	-1	-46866687	-1	31509691	0	21620457	-1	90591151	-2	20353754	0
60	24854639	0	-40532347	-1	-21634892	0	19986991	-1	24001418	-2	-41882838	-1
61	49917002	0	-33477027	-1	-81718530	0	24235853	-2	-11335535	-1	-41706573	0
62	70769575	0	14987882	-1	-11157318	1	-72624944	-1	-51380527	-1	-80938257	0
63	84702099	0	10906338	-1	-17244102	1	-10260767	0	-67594687	-1	-14540801	1
64	-54125099	0	35826936	-2	11132492	1	-48465517	-1	-36734108	-1	63788732	0
65	-24278350	0	-12185771	-1	11562998	1	-33385094	-1	-28734023	-1	89739239	0
66	43785793	-1	99034046	-2	59375081	0	-46544012	-1	-35452048	-1	56633838	0
67	35474559	0	45797472	-1	-24077980	-1	-78737099	-1	-50281534	-1	75469194	-1
68	64870898	0	78648179	-1	-70230999	0	-12915185	0	-75568441	-1	-60074364	0
69	76286710	0	90597120	-1	-10076989	1	-15304396	0	-87769291	-1	-94086289	0
70	97007877	0	94333529	-1	-16144510	1	-20814927	0	-11403591	0	-17353826	1
71	86708708	0	18347448	0	-86314820	0	-24608530	0	-12491797	0	-11391020	1
72	10513962	1	20405819	0	-13980574	1	-30205373	0	-14844229	0	-19628270	1
73	-24292714	0	22105482	-1	17357209	1	-98671989	-1	-99067590	-1	20267439	1

TABLE C34.- Continued

	1		2		3		4		5		6	
74	11619722	0	11869817	0	10197825	1	-14567060	0	-97019282	-1	11759428	1
75	43433414	0	17795693	0	31137612	0	-18340795	0	-97508808	-1	29281131	0
76	79359024	0	24738960	0	-36697360	0	-24696855	0	-11306700	0	-72442919	0
77	92246198	0	26946286	0	-64800173	0	-26472158	0	-11537994	0	-10888960	1
78	11441061	1	32868628	0	-11551871	1	-34775227	0	-14411411	0	-20793813	1
79	-18166168	-1	49728975	-1	85960181	0	-55249827	-1	-55314539	-1	14884566	1
80	92632169	-1	10077859	0	60791346	0	-69022680	-1	-42413994	-1	93965213	0
81	25453388	0	15463766	0	35255019	0	-82880716	-1	-28822812	-1	36111252	0
82	40822421	0	19521285	0	97544165	-1	-82794349	-1	-76327308	-2	-25076126	0
83	48038051	0	22033741	0	-51285981	-1	-69060045	-1	12530913	-1	-50126539	0
84	57255720	0	25233693	0	-31650361	0	-70679422	-1	72950875	-2	-90298900	0
85	12764003	0	17775217	0	84914636	0	-88392792	-1	-43418868	-1	12072441	1
86	31439041	0	25600086	0	69097980	0	-11064927	0	-24854135	-1	52410333	0
87	56829911	0	36726704	0	27863315	0	44162819	-1	13529504	0	-18172811	0
88	69776717	0	43370757	0	-52439139	-2	17341123	0	28529395	0	-37683338	0
89	39090513	0	39462112	0	10809433	1	11049518	-1	95299537	-1	87482845	0
90	56928352	0	51064610	0	90965676	0	18219657	0	26386839	0	51213111	0
91	88625957	0	67751952	0	51579234	0	63620984	0	66768383	0	18152528	0
92	74261230	0	85752686	0	12431188	1	55530404	0	62921927	0	85134489	0
93	99999999	0	99999999	0	99999999	0	99999998	0	99999999	0	99999998	0
94	-40783119	0	-24600429	-1	71617966	0	-45272369	-2	15017976	-1	-18023586	0
95	62843265	0	-14126583	0	-13857988	1	20341311	0	60030993	-1	73349630	0
96	63440008	0	-13703356	0	-13446484	1	15505563	0	38735829	-1	35258189	0
97	63755820	0	-10212482	0	-12559571	1	76708876	-1	37428712	-2	-54085593	-1

TABLE C34.- Continued

	7		8		9		10		11		12	
1	51913581	0	28930256	2	40050886	-1	-75441510	0	-87895592	0	-89733999	1
2	63939472	0	27283646	2	26663875	-1	-47315574	0	-61448379	0	-65212421	1
3	72191969	0	23658090	2	-11251115	-1	96003673	-1	82429364	-1	14852488	1
4	81578201	0	24003908	2	-19286029	-1	19754812	0	20971064	0	30651318	1
5	92410681	0	26550785	2	-42708283	-1	41509997	0	45357359	0	60700695	1
6	16844752	1	-18747006	2	10565739	0	-30613492	0	-72525166	0	-83311619	1
7	17866206	1	-19817279	2	82996971	-1	-73327007	-1	-47402311	0	-58926820	1
8	19874247	1	-27435249	2	30681433	-1	47607122	0	22165707	0	21372247	1
9	20140964	1	-29057618	2	21572866	-1	56719140	0	34224656	0	37118755	1
10	22104494	1	-32910046	2	-57711467	-2	77792209	0	56321346	0	63757141	1
11	33012426	1	-85322178	2	18058344	0	30055515	0	-52208883	0	-77601264	1
12	34199038	1	-89249577	2	15898948	0	47689854	0	-33240016	0	-57786008	1
13	37163040	1	-10660950	3	98002765	-1	10575539	1	43556447	0	34836307	1
14	38024469	1	-10783896	3	83540665	-1	11614812	1	57116996	0	52524640	1
15	40353692	1	-11676019	3	55194169	-1	13771083	1	80051028	0	80905652	1
16	55939874	1	-18676943	3	26157752	0	12946223	1	-85437663	-1	-52371368	1
17	56630206	1	-18913340	3	22221453	0	14630814	1	16305860	0	-24270604	1
18	57698766	1	-19606682	3	16243449	0	18104916	1	70377702	0	43897158	1
19	59093900	1	-20183099	3	15446822	0	19218962	1	82734258	0	58755282	1
20	61980176	1	-21928708	3	13671817	0	22042567	1	11251277	1	92022374	1
21	-27211263	-1	11206050	1	-11269566	-1	-28886145	0	31071098	1	95650169	1
22	-20445264	-2	12619548	1	16797592	-1	-44628354	0	11579140	2	40250707	1
23	-13625370	0	67122704	1	17316864	-1	-50202822	0	22818108	2	-94707623	2
24	-61569121	-1	19363573	1	-22237526	-1	-81495229	0	11118440	2	27650110	2
25	-44938540	-1	19216586	1	33869783	-1	-75477405	0	18381084	2	20573094	1
26	-14744985	0	59671481	1	25347445	-1	-27895704	0	19355415	2	-10333229	3
27	-47576529	-1	64709902	0	-10593514	-1	-14652645	1	27101222	2	52512033	2
28	-93634044	-1	27897612	1	43842766	-1	-76058374	0	17895425	2	86999000	1
29	-21345093	0	66464596	1	16955787	-1	58080325	0	-49850933	1	-96686789	2
30	-86252219	-1	-12783692	0	-22300291	-1	-10893622	1	15295063	2	89922470	2
31	-13316409	0	20066678	1	21147434	-1	22482768	0	-96468566	1	33092837	2
32	-27644661	0	71708604	1	-10606721	-1	18492112	1	-41834674	2	-49710433	2
33	-22342276	0	14249650	1	-98238023	-1	82697828	0	-36701588	2	12401780	3
34	-26373031	0	25060481	1	-57296433	-1	22817446	1	-69122564	2	75236785	2
35	-38616185	0	69848471	1	-52743974	-1	30411775	1	-74320742	2	46311634	2
36	-56068152	0	-12697668	3	58183179	-1	11191404	1	73214392	0	27189163	1

TABLE C34.- Continued

	7		8		9		10		11		12	
37	-11361515	0	81678479	1	37288474	-1	-65099631	0	-49662294	0	-16669825	1
38	28682169	-1	49392436	2	-47387907	-1	-24145226	0	-14781722	0	-56506266	0
39	-55663461	-1	30342186	2	-55263419	-1	30842420	0	29180659	0	10485972	1
40	-94326128	-1	-10065614	2	74243434	-2	16369234	0	88326837	-1	19653269	0
41	-12082686	0	-32961024	2	63002390	-1	-29175802	0	-10377206	0	-13937201	-1
42	-93251252	-2	-14499669	2	16007912	-1	-40540463	-1	-94993978	-1	-38337500	0
43	83517380	-1	84234853	1	-54169171	-2	66673137	-1	11180343	-1	36197579	-1
44	15297396	0	23253760	2	-28249450	-1	21497888	0	13967653	0	41242716	0
45	14030923	0	21436893	2	51828437	-3	14543528	0	55445539	-1	-45939457	-1
46	57310625	-1	17281584	1	66578417	-1	23992262	0	10497777	0	97983439	-3
47	-13099582	0	-44036619	2	11383074	0	33539032	0	22420159	0	32907424	0
48	-22695507	0	-70502497	2	11262164	0	44128967	0	39305587	-1	-11505201	1
49	-39770458	-1	-27434226	2	-37270819	-2	-13897147	0	-23401569	0	-95801315	0
50	32199922	-1	-18202654	2	-19211969	-1	-13627655	-1	-12290768	0	-60348328	0
51	11222930	0	27067116	1	-34408527	-1	94588536	-1	45991332	-1	10175363	0
52	14611320	0	24399786	2	-23374971	-1	71922237	-1	14133655	0	62907974	0
53	75510279	-1	24049709	2	-74732459	-2	-38991779	-1	71211786	-1	34241530	0
54	52265350	-1	80732111	1	-45814667	-1	-89697783	-1	-11322539	0	-74352070	0
55	-57811285	-2	-32420655	2	-98668720	-1	-16156304	0	-13385501	0	-87185864	0
56	80875916	-1	-26285460	2	-54137637	-1	68939913	-1	-14816455	0	-10394712	1
57	76473996	-1	-72097457	1	-49156241	-1	-27343206	-1	26802727	-1	88107729	-1
58	-15202285	-1	18969601	2	-43124254	-2	-13300293	0	79126842	-1	56730939	0
59	50683308	-3	22566898	2	13479465	-1	-13120948	0	52022166	-1	47481052	0
60	74189078	-1	59743577	1	19975424	-2	-11247777	0	-32916903	-1	39678859	-1
61	86630922	-1	-50477008	1	-71014564	-1	-11844271	0	-58269402	-1	25662094	-1
62	13229690	0	-69237480	1	-59264752	-1	-23367157	0	49653512	-2	98648175	0
63	29915152	0	-12505006	2	-15733265	-1	-13805293	1	-86092526	-1	28674855	1
64	-65529453	-1	-43051372	2	-66621478	-1	-16463931	0	-44854628	0	-28293576	1
65	-21468034	0	36544131	1	52484174	-1	-45812237	0	-51832871	-1	21995544	0
66	-19262269	0	11441900	2	72247507	-1	-17616186	0	-10680337	-1	24434813	0
67	-11711968	0	10953235	2	66107973	-1	-22796438	-1	-38582387	-1	12649589	0
68	22901347	-1	28626890	1	90620378	-1	-51844116	-1	22256763	0	22158213	1
69	10118222	0	25828171	1	11223737	0	51502543	-1	11687422	0	16600828	1
70	29703709	0	61328086	1	40528987	0	-89270978	0	17100978	1	13814334	2
71	63235205	-1	18143382	2	10207294	0	-43319133	-3	-17881625	0	24697366	0
72	31680374	0	22158753	2	52590851	0	-23208557	0	60619217	0	65142521	1
73	-53318893	0	-38710682	2	12285795	0	-72041427	0	-21702386	0	-58034113	0

TABLE C34.- Continued

	7		8		9		10		11		12	
74	-48777673	0	-10493367	2	49399438	-1	-32742796	-1	37445907	-1	15266807	0
75	-33048793	0	47258852	1	26647033	-1	16404727	0	30106912	-1	22637418	0
76	-16758757	-1	14887978	2	50420824	-1	33334227	0	-88171683	-1	-14179344	0
77	51964212	-1	19565084	2	89968237	-1	34467873	0	-16126843	0	-33299313	0
78	34642648	0	37144889	2	43798558	0	99948936	-1	-33416246	0	22843359	0
79	-73073915	0	-93901340	1	-12459674	0	25306989	0	17351708	0	-90669891	-1
80	-50612314	0	-51221462	1	-17261472	0	31072486	0	17901477	0	-10529871	-1
81	-25339821	0	-92018262	1	-25151632	0	47309686	0	20525024	0	-43119899	-1
82	14333687	0	-12829553	2	-15230582	0	-21498096	0	-25913309	0	-13041248	1
83	31322141	0	-77442410	1	-72130855	-1	-11223696	1	-21279569	1	-10783263	2
84	67610242	0	-32217150	1	22490853	0	-56170181	1	-24023513	2	-13374581	3
85	-60025935	0	-18244039	2	-44509599	0	83055822	0	40051894	0	-15758577	0
86	-25897226	0	-21644244	2	-59645138	0	86280200	0	37495291	0	-36288458	0
87	42271132	0	-29415394	2	-27336875	0	-28030267	1	-77885894	0	-83753777	0
88	11071164	1	-19813825	2	78980226	0	-23565417	2	-18007469	1	29957970	2
89	-10243230	0	-59298015	2	-12827448	1	14205700	1	85571225	0	-27721330	0
90	34358177	0	-57919333	2	-10004173	1	-32670083	0	43885156	0	11957088	0
91	10948932	1	-17541033	2	59359579	0	-67285111	1	-33028375	0	75183153	1
92	70606090	0	-60912930	2	-85811299	0	45086331	0	99652051	0	58926151	0
93	99999999	0	99999999	0	99999998	0	99999999	0	99999998	0	99999998	0
94	15936003	0	20095169	2	-40419295	-1	76746808	-1	93854641	-1	40091515	0
95	-26387308	0	-74753297	2	85789619	-1	34471972	0	23148937	0	21303085	0
96	-15205736	0	-65404844	2	-94521177	-2	18843932	-1	-73637343	-1	-90818250	0
97	-51448036	-1	-51319266	2	-56446244	-1	-21174525	0	-24138431	0	-12180664	1

TABLE C34.- Continued

	13		14		15		16	
1	-93291496	2	-85648400	2	-58541522	3	41307865	3
2	-69597398	2	-64941282	2	-29490429	3	17030034	3
3	19932142	2	19889644	2	-19944970	3	-36529315	1
4	38476749	2	37848719	2	-34140438	3	-36469299	2
5	74790763	2	73528574	2	-87561189	3	-59614186	3
6	-91672500	2	-87060960	2	-46704204	3	35104305	3
7	-67182111	2	-65167020	2	-28908203	3	18926247	3
8	22843506	2	20133609	2	-29016722	3	11366891	3
9	41802402	2	38701857	2	-40721347	3	13274697	3
10	74321983	2	70785362	2	-79688988	3	52944284	2
11	-94099154	2	-94077267	2	-21714896	3	-17876229	3
12	-72591745	2	-74035715	2	-22504689	3	-25098092	3
13	33123384	2	26823821	2	-83747046	2	15786053	3
14	54443751	2	47700614	2	-12775799	3	35505994	3
15	89543111	2	82505451	2	-20993953	3	79357119	3
16	-76864960	2	-83916467	2	58043372	3	-12219106	4
17	-45314239	2	-53964581	2	60894886	3	-79154721	3
18	34138745	2	22717696	2	58468289	3	19645443	3
19	50882257	2	38517407	2	64432874	3	35761298	3
20	87699026	2	73009856	2	97464570	3	71943874	3
21	-27511830	1	23482061	2	26688549	-1	13654739	-2
22	-40505856	1	40095727	2	-19234625	0	15119015	0
23	16235508	2	-12202377	3	50810958	0	-29603395	0
24	-88777520	1	78607668	2	19693384	0	-11562142	0
25	-51045232	1	52018858	2	-31997523	0	10904942	0
26	19033411	2	-14741408	3	-12830584	0	72108891	-1
27	-19166234	2	17448748	3	79532618	0	-41185607	0
28	-65878769	1	64476848	2	-20132718	-1	80054854	-2
29	24210492	2	-20539306	3	-52063499	0	32275958	0
30	-24500806	2	21082658	3	78823602	0	-45832743	0
31	-51900114	1	37497231	2	-21720737	0	26759372	0
32	22602060	2	-21130198	3	-69724942	0	34466991	0
33	-19568330	2	14335193	3	80481489	0	-46175364	0
34	38088379	0	-41466162	2	-59817837	0	47253833	0
35	59716025	1	-81270496	2	-47775406	0	-86372883	-1
36	17765725	1	-10743795	2	-47390001	1	-78709263	0

TABLE C34.- Continued

	13		14		15		16	
37	10409753	1	89143551	1	17192502	2	-28262162	1
38	59179171	0	33872285	1	20260808	2	-20510651	1
39	40362323	0	-44133734	1	12386314	2	-13286142	1
40	-91789815	-1	-94241179	0	21038022	1	-31819582	0
41	-51957652	-1	-54857529	0	-33190605	1	27956220	0
42	-13943316	0	17226126	1	-27480188	1	17942536	-1
43	30041934	-1	14374789	0	-24915900	0	-22026751	-1
44	77836920	-1	-13526841	1	20184600	1	19825927	0
45	-19267181	-1	91206485	0	28454897	1	79205768	-1
46	-95206747	-1	86085791	0	84182225	0	24007178	0
47	-21008976	0	-79712810	0	-47036840	1	59383288	0
48	-83740683	0	62065194	1	-70698741	1	61722152	0
49	-43509190	0	38619852	1	-44351391	1	42621044	0
50	-35004368	0	24979379	1	-41543800	1	57502259	0
51	-78938403	-1	-34225174	0	-16615567	1	47279976	0
52	22060084	0	-24459572	1	22974357	1	67659968	-1
53	29740025	0	-96564172	0	37766734	1	-75017654	0
54	-10391784	0	37286697	1	25822935	1	-81515697	0
55	-38604147	0	33229547	1	-22786038	1	-15435139	0
56	-67854718	0	43809313	1	-54449965	1	12758307	1
57	-17821479	0	-61090489	0	-25748295	1	10217209	1
58	36627073	0	-20738546	1	24010374	1	-57104116	0
59	39379365	0	-16679881	1	34960370	1	-80396585	0
60	57979598	-1	-39975940	0	10585231	1	12829168	0
61	17722567	-1	-11823785	1	-23986774	0	-10811459	0
62	33423229	0	-66445590	1	-93422739	0	41869253	0
63	14189792	1	-17633115	2	-20452790	1	50209326	0
64	-14707939	1	12799270	2	-63133885	1	27128105	1
65	29083770	0	-46053215	0	11724301	1	-19695508	0
66	29949824	0	-51348333	0	17594069	1	-57349238	0
67	21263754	0	-51321830	0	14997547	1	-40330303	0
68	75929915	0	-11677863	2	-12294179	1	67740598	0
69	51704426	0	-92969164	1	-16869979	1	11716628	1
70	47537608	1	-68916967	2	-52938434	1	28962653	1
71	29067109	0	-26994192	1	36447691	0	39582630	0
72	23341583	1	-32956816	2	-42934728	1	33800580	1
73	-29346009	0	30077058	1	-37275647	1	16760674	1

TABLE C34.- Concluded

	13		14		15		16	
74	31659556	-1	-27074381	0	-11428997	1	-18899308	0
75	16894992	0	-11395093	1	54234031	-1	-77064471	0
76	-64630377	-1	-43815468	0	-12756919	0	57107615	0
77	-43596657	-1	31391688	0	24827323	-1	57249621	0
78	38472339	0	-26456434	1	-74648233	0	25629975	1
79	12658263	0	18849533	1	15707852	1	-33266905	1
80	29244554	-1	67586243	0	11821094	1	-25378976	1
81	-26811929	0	-23943460	0	-37837163	0	-11787529	1
82	-58542731	0	42045521	1	-16127336	1	11072800	1
83	-29660264	1	48972837	2	21033972	1	55395409	0
84	-37797806	2	63795307	3	31303630	2	-84810829	1
85	-48559894	0	86629424	0	17787084	-1	-27695529	1
86	-86306282	0	17167369	0	-13189458	1	-11616966	1
87	73939092	0	-14907011	1	16927582	1	-33212746	0
88	21398220	2	-16799119	3	25307800	2	-11010687	2
89	-17783196	1	-24598118	1	-36476853	1	-10684255	1
90	-65526322	0	-56108611	1	-18591232	1	-68509084	0
91	61805757	1	-41543512	2	78236964	1	-21306309	1
92	-60648818	0	-60058050	1	-15331229	1	-67385557	0
93	99999958	0	99999999	0	99999999	0	99999999	0
94	80850072	-1	-15893197	1	11116414	1	35538417	0
95	-45099543	0	-79651527	0	-81058427	1	85806599	0
96	-64095643	0	36902769	1	-66000162	1	57684262	0
97	-59848274	0	44428616	1	-52960742	1	54039826	0

APPENDIX D

A TECHNIQUE FOR OBTAINING AERODYNAMIC FLEXIBLE-TO-RIGID RATIOS FROM MODAL DATA UNDER QUASI-STEADY CONDITIONS

The equations of motion of the flexible airplane presented in Appendix B describe two degrees of freedom of rigid-body motion (plunge and pitch) and four degrees of freedom of symmetric structural motion. This description of the flexible XB-70 was determined to be adequate to permit important integrated investigations of all static and dynamic flying qualities including control system augmentation dynamic interactions. While these equations are capable of permitting the study of a broad spectrum of static and dynamic problems on a unified basis, the rapidity which one can study certain limited but important design synthesis areas is compromised. These problem areas referred to lie in the static and quasi-static flight domain. In addition, the manner in which the flexibility corrections are made to the rigid data within the equations make it awkward to inspect any given flexible aerodynamic parameter when one is attempting to analyze a particular airplane response resulting from these equations. It is quickly added, however, that the modal description of the flexibility influences which cause this particular analysis problem is a tremendous simplification in setting up a complicated flexible, dynamic analytical model of an airplane such as the XB-70. It is the intent of this discussion to show some of the advantages of the modal format and how flexible-to-rigid aerodynamic data can be obtained to overcome the cited two weaknesses.

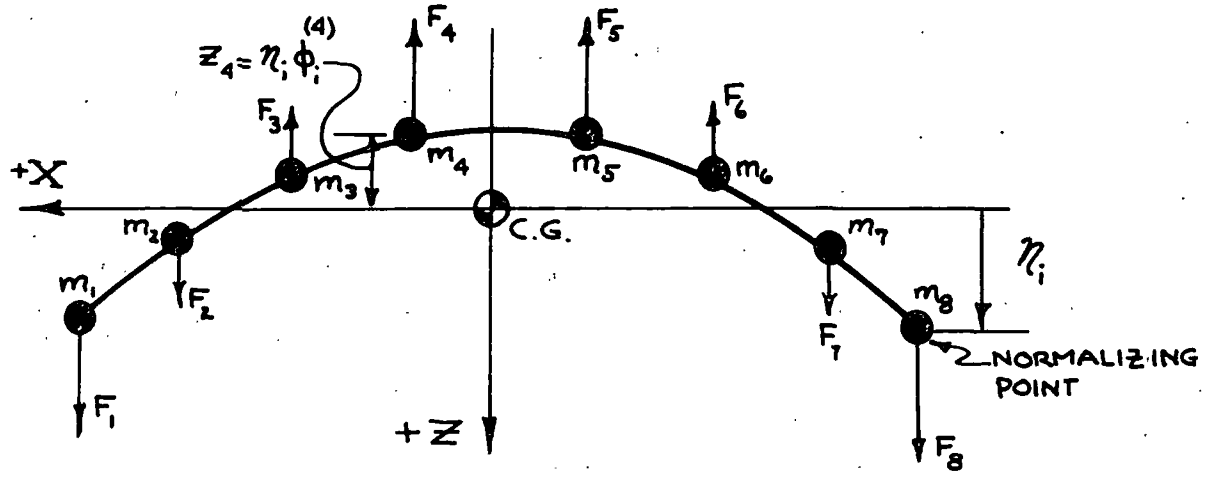
Useful Features of the Modal Approach

Before beginning a detailed discussion of techniques of getting flexible-to-rigid ratios for aerodynamic data, the following discussion is given to aid in understanding the approaches taken.

It is well known that a structural deformation pattern under any set of loading or restraint conditions can be solved for using a number of natural vibration modes of the structure. Theoretically, an infinite number would be required, but practically a finite number will suffice. No attempt will be made to prove this statement herein, for it is well treated in most engineering math and structures books; it will, however, be used as the basis of proof that certain derived observations are valid.

The requirements for the existence of free-free natural modes of structure are: (1) the net force acting is zero; (2) the net moment acting is zero, and (3) the motion of all points on the structure are either in phase or 180° out of phase with every other point. This information will be of primary importance in the discussion to follow.

Another piece of information of importance is concerned with the acceleration and the inertia reaction force acting at a given point as the structure is vibrating in a free-free natural mode. Consider the structure to be composed of concentrated masses (m_j) connected by weightless flexible rods as illustrated in the simple sketch below. The F_j shown are equal and opposite to the free vibration inertia forces and freeze the beam in the shape associated with the free vibration frequency ω_i.

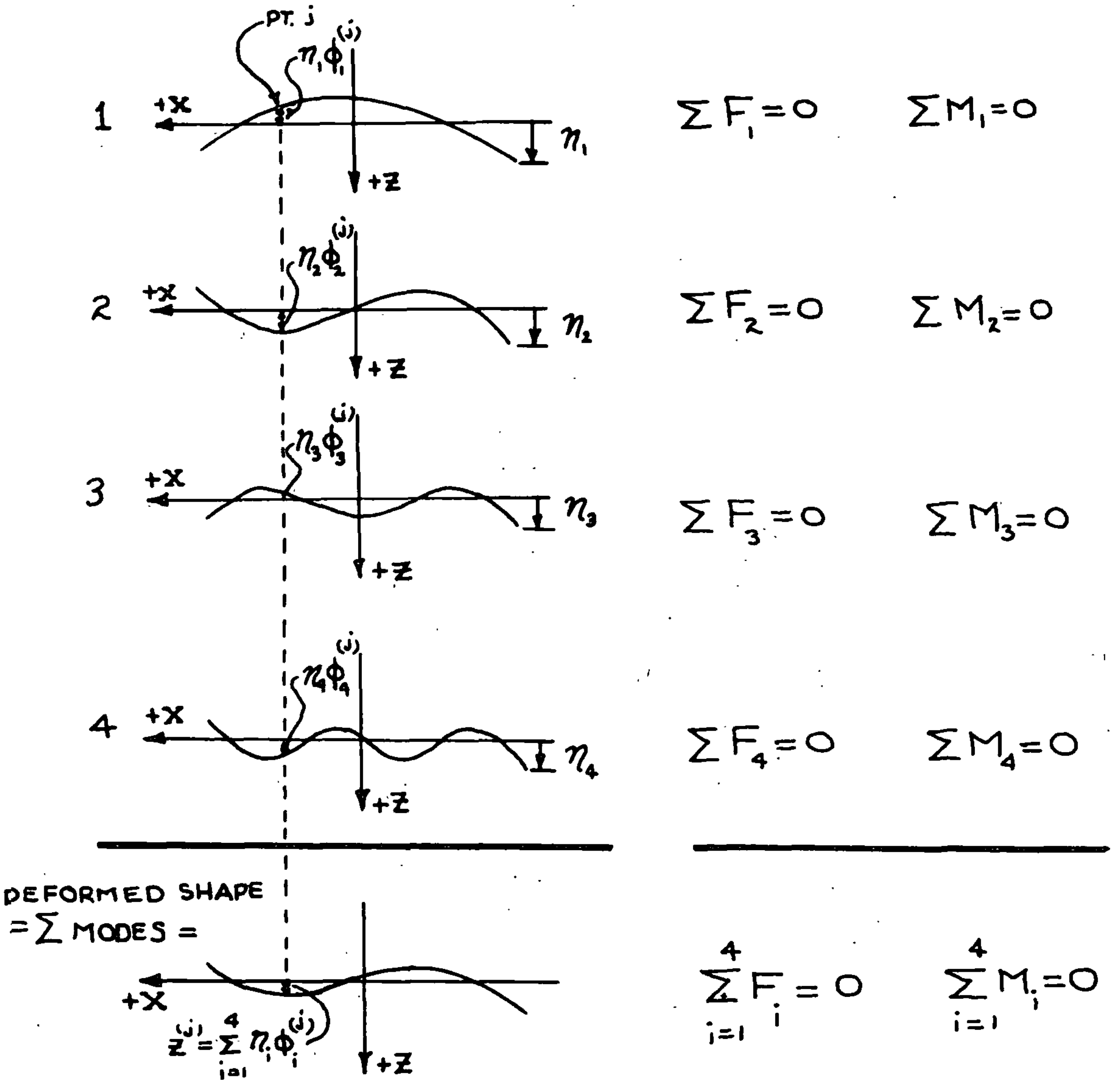


where: ϕ_i is shape parameter and is unity at normalized point
η_i is the generalized coordinate but may be viewed as a scaling factor on ϕ_i

The deflection of point j moving in simple harmonic motion at frequency ω_i is: $Z_i^{(j)} = \eta_i \phi_i^{(j)} e^{i\omega_i t}$. The acceleration at point j is: $\ddot{Z}_i = -\eta_i \phi_i^{(j)} \omega_i^2 e^{i\omega_i t}$ The maximum force at point j then is: $F_i^{(j)} = m_j \eta_i \phi_i^{(j)} \omega_i^2$ and, as already observed, the sum of forces acting is zero ($\sum_{j=1}^{8} F_i^{(j)} = 0$) and the moments about the C.G. are zero ($\sum_{j=1}^{8} F_i^{(j)} X^{(j)} = 0$).

With these facts in mind, consider the situation of a flexible airplane performing static or dynamic maneuvers. Using simple representative shapes for the airplane, let us look at two possible longitudinal-symmetric flight conditions: (1) 1.0g trimmed level flight and (2) acceleration in pitch as well as translation.

In case (1), the structure has acting on it forces due to gravity (uniform acceleration) and forces due to the aerodynamics. Since the airplane is trimmed, the net force acting on the structure is zero ($\Sigma F = 0$) and the net moment is zero ($\Sigma M = 0$). However, the amount of structural deformation is the result of the net distributed load due to the combined weight-aerodynamic forces. As was stated initially, the final deformed pattern may be determined from the superposition of normal (natural) free-free modes as is simply illustrated in the following sketch:



The structure is deformed in a static condition; therefore, each contributing mode is deformed statically. The static incremental load acting on the normal mode to hold it in this shape is identical to the dynamic inertia loading which determined the mode shape in the first place. The total load acting at point j on the airplane is:

$$F^{(j)} = \sum_{i=1}^{4} \Delta F_i^{j} = m^{(j)} \sum_{i=1}^{4} \eta_i \phi_i^{(j)} \omega_i^2$$

The total distributed load is still zero and, it will be recalled, is the sum of the aerodynamic and weight loads. Theoretically, then the local load composed of the sum of the local aerodynamic load and local weight load is equal to the load determined from the modes as described above:

$$F_{AERO}^{(j)} + F_{WT.}^{(j)} = m^{(j)} \sum_{i=1}^{4} \eta_i \phi_i^{(j)} \omega_i^2$$

The corresponding moments about the C.G. are:

$$M_{AERO}^{(j)} + M_{WT}^{(j)} = -m^{(j)} x^{(j)} \sum_{i=1}^{4} \eta_i \phi_i^{(j)} \omega_i^2$$

Where x is distance from mass to C.G.

The total loads and moments are:

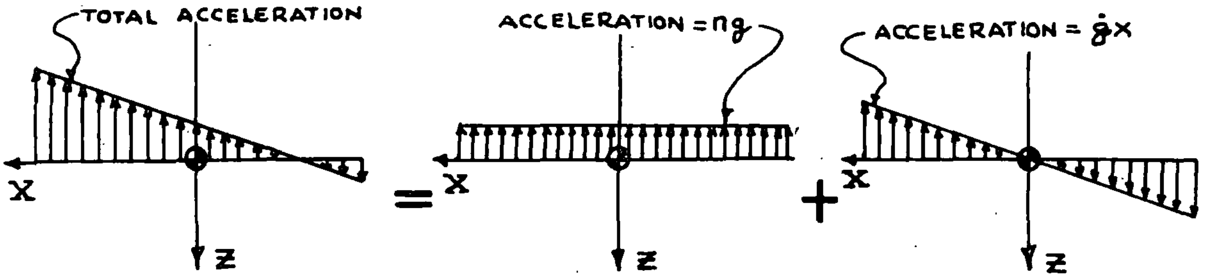
$$\sum_{j=1}^{8} F_{AERO}^{(j)} + \sum_{j=1}^{8} F_{WT}^{(j)} = \sum_{j=1}^{8} m^{(j)} \sum_{i=1}^{4} \eta_i \phi_i^{(j)} \omega_i^2 = 0$$

$$\sum_{j=1}^{8} M_{AERO}^{(j)} + \sum_{j=1}^{8} M_{WT}^{(j)} = \sum_{j=1}^{8} m^{(j)} x^{(j)} \sum_{i=1}^{4} \eta_i \phi_i^{(j)} \omega_i^2 = 0$$

It should be realized that in practice the accuracy of the equivalency is dependent on the number of structural modes used (theoretically, an infinite number).

As a momentary digression, it is of value to note that this equivalency could be highly useful in determining airload distributions without having to refer back to aerodynamic coefficients. Given the mass distribution for a given set of modes one can subtract out the acceleration loads (under 1.0g flight, the weight) and have the acting distributed airloads as a residue. This has been tried using four symmetric modes during a short study of the technique's potential and the answers obtained looked reasonable. No more formal check than this was made. It is estimated that approximately ten free-free complete vehicle modes would probably be needed for practical usable load numbers; however, for getting answers indicating the basic cause of the airplane's deformed shape, even four modes appear sufficient.

Consider now the second case proposed; that is the airplane accelerating in pitch as well as translation. The total acceleration field acting on the vehicle mass may be viewed as being composed of two separate fields as illustrated in the following sketch for an accelerated pull up:



By knowing the mass distribution of the vehicle, one can calculate the force loading due to acceleration:

$$F^{(j)} = -m^{(j)}\left(ng + \dot{g}\, x^{(j)}\right) \quad ; + F \text{ along } + Z \text{ axis}$$

Where: j is point designation as before
n is load factor
$\dot{g}$ is pitch acceleration
x is distance from C.G. to point mass,

As in the previous case, the structural deformation may be determined using the modal description for flexibility. Again, the final deformed shape is determined from summing the contributing static mode shapes. Also, the loadings to hold the modes in this shape are determined as previously explained.

The significant feature to note in the two examples cited is that the modal description of the flexibility was able to encompass any combination of static and accelerated flight conditions. The proper structural response to any set of flight conditions is automatically assured by the use of normal modes. To say it another way, the aerodynamic modal coefficients for the rigid airplane aerodynamic data ($C_{\eta_i(\alpha)}$, $C_{\eta_i(\delta_e)}$, etc.) have associated with them the ability to call forth the matching inertia loadings that would result from applying the individual aerodynamic loads to an unrestrained airplane. For example, applying an elevon loading to the free-free airplane would cause a translational acceleration proportional to the elevon load and a pitch acceleration corresponding to the unbalanced pitching moment about the C.G. caused by this elevon load. This elevon force would activate the structural response via the appropriate modal coefficients, so that both the air load and the corresponding inertia load would be always coordinated. Correspondingly, if the rigid body forces were trimmed out, so, too, would be the matching component inertia loadings of the structural modes.

Technique of Calculating Quasi-Steady Flexible-to-Rigid Ratios

The aerodynamic data input to the normal force equation of Appendix B appear as follows:

$$\dot{\alpha} = + q + \left(\frac{g}{V_0}\right)\cos\Theta - \left(\frac{q_0 S_w}{m V_0}\right)\left[C_{N_{RIGID}} + \Delta C_{N_{FLEXIBILITY}} \right]$$

As shown, the rigid data components and the flexible corrections to those components appear as separate contributions. Expanding this part of the equation, but restricting it for simplicity of explanation to consideration of only two rigid airplane components (wing-body and canard), the aerodynamic coefficients appear as follows:

$$\underbrace{(C_{N_\alpha})\alpha_{WING\text{-}BODY} + (C_{N_{\alpha_c}})\alpha_{c\,CANARD}}_{\text{RIGID AERO}} + \underbrace{(C_{N_{\eta_1}})\eta_{1\,TOTAL} + (C_{N_{\eta_2}})\eta_{2\,TOTAL} + (C_{N_{\eta_3}})\eta_{3\,TOTAL} + (C_{N_{\eta_4}})\eta_{4\,TOTAL}}_{\text{FLEXIBLE CORRECTION}}$$

As is seen from the form of these data, the flexibility corrections are lumped and individual component flexibilities are not readily broken out and associated with the appropriate rigid loads. In order to form the desired flexible-to-rigid ratios for correcting the rigid data, these data must be broken out. With the assumption of linearity of the rigid aerodynamic data and its companion property of allowing superposition of component answers to form the total, this can be done as described below.

The modal equations for the symmetric modes associated with the longitudinal equations of motion take the following form under the assumption of quasi-steady conditions. (See Appendix B and List of Symbols for detailed definitions of symbols in this and all other equations used herein).

$$\eta_i = + \left(\frac{q_0 S_w}{\omega_i^2 M_i}\right)\left[\underbrace{(C_{\eta_{i\alpha}})\alpha_{WING\text{-}BODY} + (C_{\eta_{i\alpha_c}})\alpha_{c\,CANARD}}_{\text{RIGID AERO COUPLING}} + \underbrace{(C_{\eta_{i\eta_1}})\eta_{1\,TOTAL} + (C_{\eta_{i\eta_2}})\eta_{2\,TOTAL} + (C_{\eta_{i\eta_3}})\eta_{3\,TOTAL} + (C_{\eta_{i\eta_4}})\eta_{4\,TOTAL}}_{\text{STRUCTURAL AERO COUPLING}}\right]$$

$i = 1 \text{ TO } 4$

If one were to remove all but one of the rigid aero inputs to the modal equations, one would obtain the modal response in all four modes for that particular loading. These modal responses, in turn, may be used to determine the amount of flexibility caused by that component in the force and moment equations.

Consider the wing-body component as an example. The above modal equations made specific to this case are:

$$\left[C_{\eta_1\eta_1} - \left(\frac{\omega_1^2 M_1}{g_o S_w}\right)\right]\eta_1 + C_{\eta_1\eta_2}\eta_2 + C_{\eta_1\eta_3}\eta_3 + C_{\eta_1\eta_4}\eta_4 = -(C_{\eta_{1\alpha}})\alpha_{\substack{WING\\BODY}}$$

$$C_{\eta_2\eta_1}\eta_1 + \left[C_{\eta_2\eta_2} - \left(\frac{\omega_2^2 M_2}{g_o S_w}\right)\right]\eta_2 + C_{\eta_2\eta_3}\eta_3 + C_{\eta_2\eta_4}\eta_4 = -(C_{\eta_{2\alpha}})\alpha_{\substack{WING\\BODY}}$$

$$C_{\eta_3\eta_1}\eta_1 + C_{\eta_3\eta_2}\eta_2 + \left[C_{\eta_3\eta_3} - \left(\frac{\omega_3^2 M_3}{g_o S_w}\right)\right]\eta_3 + C_{\eta_3\eta_4}\eta_4 = -(C_{\eta_{3\alpha}})\alpha_{\substack{WING\\BODY}}$$

$$C_{\eta_4\eta_1}\eta_1 + C_{\eta_4\eta_2}\eta_2 + C_{\eta_4\eta_3}\eta_3 + \left[C_{\eta_4\eta_4} - \left(\frac{\omega_4^2 M_4}{g_o S_w}\right)\right]\eta_4 = -(C_{\eta_{4\alpha}})\alpha_{\substack{WING\\BODY}}$$

Solving this set of simultaneous equations, η_1, η_2, η_3, and η_4 are obtained due to the inputs $(C_{\eta_{1\alpha}})\alpha_{WING-BODY}$, $(C_{\eta_{2\alpha}})\alpha_{WING-BODY}$, $(C_{\eta_{3\alpha}})\alpha_{WING-BODY}$ and $(C_{\eta_{4\alpha}})\alpha_{WING-BODY}$ which are associated with the rigid airload $(C_{N_\alpha})\alpha_{WING-BODY}$. The flexible airload and moment are now obtained using these responses:

$$C_{N_{FLEXIBLE}} = C_{N_{RIGID}} + C_{N_{\eta_1}}\eta_1 + C_{N_{\eta_2}}\eta_2 + C_{N_{\eta_3}}\eta_3 + C_{N_{\eta_4}}\eta_4$$

$$C_{m_{FLEXIBLE}} = C_{m_{RIGID}} + C_{m_{\eta_1}}\eta_1 + C_{m_{\eta_2}}\eta_2 + C_{m_{\eta_3}}\eta_3 + C_{m_{\eta_4}}\eta_4$$

It is easy now to form a flexible-to-rigid ratio for these wing-body force and moment components:

$$\frac{[C_{N_\alpha}]_{FLEX}}{[C_{N_\alpha}]_{RIGID}} = \frac{C_{N_{FLEX}}}{C_{N_{RIGID}}} = 1 + \left(\frac{C_{N_{\eta_1}}\eta_1 + C_{N_{\eta_2}}\eta_2 + C_{N_{\eta_3}}\eta_3 + C_{N_{\eta_4}}\eta_4}{C_{N_{RIGID}}}\right)$$

$$\frac{[C_{m_\alpha}]_{FLEX}}{[C_{m_\alpha}]_{RIGID}} = \frac{C_{m_{FLEX}}}{C_{m_{RIGID}}} = 1 + \left(\frac{C_{m_{\eta_1}}\eta_1 + C_{m_{\eta_2}}\eta_2 + C_{m_{\eta_3}}\eta_3 + C_{m_{\eta_4}}\eta_4}{C_{m_{RIGID}}}\right)$$

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APPENDIX E

AERODYNAMIC, GEOMETRIC, AND MASS CHARACTERISTICS

Summaries of pertinent aerodynamic, geometric and mass characteristics for each of the performance cases are presented in tables E1 through E10 and for each of the stability and control cases in tables E11 through E17. The nomenclature is defined in the List of Symbols. Sign conventions are given in the List of Symbols and in Appendix B. The data are compatible with the equations of motion presented in Appendix B.

Detailed discussions of the data are presented in the appropriate sections of the main part of the report; however, the following clarifications bear repeating here. The rigid-body aerodynamic data are based on wind tunnel test and correlations done to support the XB-70 research and development. The original definitions have been revised to reflect Ames tests of Force Model 5 and the Deformed Model as necessary. Elevon deflection data are given for nominal deflections of all segments; no attempt was made to account for the variation in position between segments which is apparent in flight. Similarly, off-design positions of the folding wing tips have been omitted. Although most of the aerodynamic data due to rigid-body motions are nonlinear, linearized values are shown in tables E1 through E18. A discussion of the philosophy, linearization process, and applications of the nonlinear data is presented in the main part of the report under the discussions of aerodynamics. The data shown for zero angle of attack include the effects of thrust, bypass doors, bleed, and nose ramp position. Aerodynamic forces due to the structural modes were estimated from the appropriate lifting surface theory and from slender body theory.

TABLE E1. AERODYNAMIC, GEOMETRIC, AND MASS CHARACTERISTICS FOR CASE P1

Aerodynamic coefficients are for wing-body unless subscripts denote otherwise
Units: Ft., Slugs, Rad., Sec.

Mass and Geometric Data

Weight	Iy	C.G.		Sw	$\bar{c}_w$	δtip
318,394 Lbs	16,447,585	FS 1613.0	.241 $\bar{c}_w$	6297.8	78.532	0 Deg

Aerodynamic Coefficients Due to Rigid-Body Modes, M = 0.76

$C_{N_{\alpha=0}}$	-.03118	$C_{m_{\alpha=0}}$	+.01524	$C_{\eta_1 \alpha=0}$	+.00826	$C_{\eta_2 \alpha=0}$	+.00917	$C_{\eta_3 \alpha=0}$	-.03286	$C_{\eta_4 \alpha=0}$	-.00417
C_{N_α}	+2.52160	C_{m_α}	-.37306	$C_{\eta_1 \alpha}$	+.00435	$C_{\eta_2 \alpha}$	-.27883	$C_{\eta_3 \alpha}$	+.63254	$C_{\eta_4 \alpha}$	+.08856
$C_{N_{\alpha_c}}$	+.23457	$C_{m_{\alpha_c}}$	+.24790	$C_{\eta_1 \alpha_c}$	-.08196	$C_{\eta_2 \alpha_c}$	+.00422	$C_{\eta_3 \alpha_c}$	-.05854	$C_{\eta_4 \alpha_c}$	+.01054
$(C_{N_{\alpha_c}})_I$	-.22744	$(C_{m_{\alpha_c}})_I$	-.05049	$(C_{\eta_1 \alpha_c})_I$	-.06369	$(C_{\eta_2 \alpha_c})_I$	+.00475	$(C_{\eta_3 \alpha_c})_I$	+.00474	$(C_{\eta_4 \alpha_c})_I$	+.00797
$C_{N_{\delta_c}}$	+.17432	$C_{m_{\delta_c}}$	+.19292	$C_{\eta_1 \delta_c}$	-.06125	$C_{\eta_2 \delta_c}$	+.00315	$C_{\eta_3 \delta_c}$	-.04375	$C_{\eta_4 \delta_c}$	+.00787
$(C_{N_{\delta_c}})_I$	-.15466	$(C_{m_{\delta_c}})_I$	-.03876	$(C_{\eta_1 \delta_c})_I$	-.04810	$(C_{\eta_2 \delta_c})_I$	+.00538	$(C_{\eta_3 \delta_c})_I$	+.02235	$(C_{\eta_4 \delta_c})_I$	+.00565
$C_{N_{\delta_e}}$	+.51263	$C_{m_{\delta_e}}$	-.25113	$C_{\eta_1 \delta_e}$	-.15200	$C_{\eta_2 \delta_e}$	-.06700	$C_{\eta_3 \delta_e}$	+.01530	$C_{\eta_4 \delta_e}$	+.00403
C_{N_q}	+2.0362	C_{m_q}	-1.4538	$C_{\eta_1 q}$	-.72714	$C_{\eta_2 q}$	-.28465	$C_{\eta_3 q}$	-.10363	$C_{\eta_4 q}$	-.01053

Aerodynamic Coefficients Due to Structural Modes, M = 0.76

$C_{N_{\eta_1}}$	+.04438	$C_{m_{\eta_1}}$	-.01387	$C_{\eta_1 \eta_1}$	-.00317	$C_{\eta_2 \eta_1}$	-.00650	$C_{\eta_3 \eta_1}$	+.01103	$C_{\eta_4 \eta_1}$	+.00147
$C_{N_{\eta_2}}$	+.00834	$C_{m_{\eta_2}}$	-.00452	$C_{\eta_1 \eta_2}$	-.00316	$C_{\eta_2 \eta_2}$	-.00251	$C_{\eta_3 \eta_2}$	+.00259	$C_{\eta_4 \eta_2}$	+.00014
$C_{N_{\eta_3}}$	+.09226	$C_{m_{\eta_3}}$	-.03476	$C_{\eta_1 \eta_3}$	-.01750	$C_{\eta_2 \eta_3}$	-.01471	$C_{\eta_3 \eta_3}$	+.02457	$C_{\eta_4 \eta_3}$	+.00098
$C_{N_{\eta_4}}$	+.03191	$C_{m_{\eta_4}}$	-.01581	$C_{\eta_1 \eta_4}$	-.00943	$C_{\eta_2 \eta_4}$	-.00825	$C_{\eta_3 \eta_4}$	+.00557	$C_{\eta_4 \eta_4}$	-.00044
$C_{N_{\dot\eta_1}}$	+1.1837	$C_{m_{\dot\eta_1}}$	-.62157	$C_{\eta_1 \dot\eta_1}$	-.36698	$C_{\eta_2 \dot\eta_1}$	-.16607	$C_{\eta_3 \dot\eta_1}$	+.13195	$C_{\eta_4 \dot\eta_1}$	-.00904
$C_{N_{\dot\eta_2}}$	+.35089	$C_{m_{\dot\eta_2}}$	-.14354	$C_{\eta_1 \dot\eta_2}$	-.13557	$C_{\eta_2 \dot\eta_2}$	-.12443	$C_{\eta_3 \dot\eta_2}$	+.05057	$C_{\eta_4 \dot\eta_2}$	-.02044
$C_{N_{\dot\eta_3}}$	+.93532	$C_{m_{\dot\eta_3}}$	-.71709	$C_{\eta_1 \dot\eta_3}$	-.40575	$C_{\eta_2 \dot\eta_3}$	-.11963	$C_{\eta_3 \dot\eta_3}$	-.33999	$C_{\eta_4 \dot\eta_3}$	-.08089
$C_{N_{\dot\eta_4}}$	+.29332	$C_{m_{\dot\eta_4}}$	-.18947	$C_{\eta_1 \dot\eta_4}$	-.16834	$C_{\eta_2 \dot\eta_4}$	-.10194	$C_{\eta_3 \dot\eta_4}$	-.06959	$C_{\eta_4 \dot\eta_4}$	-.05754

Normalized Mode Shape Data
At Canard Station; FS 572

ϕ_1	+.35	ϕ_1'	+.0216
ϕ_2	-.018	ϕ_2'	-.0027
ϕ_3	+.25	ϕ_3'	-.0355
ϕ_4	-.045	ϕ_4'	+.0024

K_c	1.019
l_{c1}	87.78
l_{c2}	113.0

Structural Frequencies, Damping and Generalized Forces

ω_1	15.8	M_1	724	ζ_{s_1}	.02
ω_2	23.8	M_2	72.5	ζ_{s_2}	.02
ω_3	36.8	M_3	2040.	ζ_{s_3}	.02
ω_4	46.8	M_4	50.6	ζ_{s_4}	.02

TABLE E2- AERODYNAMIC, GEOMETRIC, AND MASS CHARACTERISTICS FOR CASE P2

Aerodynamic coefficients are for wing-body unless subscripts denote otherwise
Units: Ft., Slugs, Rad., Sec.

Mass and Geometric Data

Weight	Iy	C.G.		Sw	$\bar{c}_W$	δ_{tip}
480,310 Lbs	22,227,936	FS 1592.7	.219 $\bar{c}_W$	6297.8	78.532	25 Deg

Aerodynamic Coefficients Due to Rigid Body Modes, M = 0.93

$C_{N_{\alpha=0}}$	-.04996	$C_{m_{\alpha=0}}$	+.02062	$C_{\eta_1,\alpha=0}$	+.01837	$C_{\eta_2,\alpha=0}$	+.01279	$C_{\eta_3,\alpha=0}$	+.10965	$C_{\eta_4,\alpha=0}$	+.00147
C_{N_α}	+2.75716	C_{m_α}	-.49339	$C_{\eta_1,\alpha}$	-.10080	$C_{\eta_2,\alpha}$	-.33520	$C_{\eta_3,\alpha}$	-2.6650	$C_{\eta_4,\alpha}$	+.04120
$C_{N_{\alpha_c}}$	+.26459	$C_{m_{\alpha_c}}$	+.28120	C_{η_1,α_c}	-.13530	C_{η_2,α_c}	+.00990	C_{η_3,α_c}	+.05210	C_{η_4,α_c}	+.01302
$(C_{N_{\alpha_c}})_I$	-.26282	$(C_{m_{\alpha_c}})_I$	-.04732	$(C_{\eta_1,\alpha_c})_I$	-.06330	$(C_{\eta_2,\alpha_c})_I$	+.00233	$(C_{\eta_3,\alpha_c})_I$	+.06140	$(C_{\eta_4,\alpha_c})_I$	+.01040
$C_{N_{\delta_c}}$	+.18788	$C_{m_{\delta_c}}$	+.20234	C_{η_1,δ_c}	-.09658	C_{η_2,δ_c}	+.00706	C_{η_3,δ_c}	+.03714	C_{η_4,δ_c}	+.00929
$(C_{N_{\delta_c}})_I$	-.16738	$(C_{m_{\delta_c}})_I$	+.00017	$(C_{\eta_1,\delta_c})_I$	-.04560	$(C_{\eta_2,\delta_c})_I$	+.00422	$(C_{\eta_3,\delta_c})_I$	-.00950	$(C_{\eta_4,\delta_c})_I$	+.00750
$C_{N_{\delta_e}}$	+.36724	$C_{m_{\delta_e}}$	-.21028	C_{η_1,δ_e}	-.12200	C_{η_2,δ_e}	-.04650	C_{η_3,δ_e}	+.15520	C_{η_4,δ_e}	-.01578
C_{N_q}	+2.2448	C_{m_q}	-1.6843	$C_{\eta_1,q}$	-.86156	$C_{\eta_2,q}$	-.37644	$C_{\eta_3,q}$	+.94962	$C_{\eta_4,q}$	-.10634

Aerodynamic Coefficients Due to Structural Modes, M = 0.93

$C_{N_{\eta_1}}$	+.04541	$C_{m_{\eta_1}}$	-.01682	C_{η_1,η_1}	-.00513	C_{η_2,η_1}	-.00685	C_{η_3,η_1}	-.04059	C_{η_4,η_1}	+.00043
$C_{N_{\eta_2}}$	+.01074	$C_{m_{\eta_2}}$	-.00583	C_{η_1,η_2}	-.00403	C_{η_2,η_2}	-.00287	C_{η_3,η_2}	-.01037	C_{η_4,η_2}	-.00034
$C_{N_{\eta_3}}$	-.32369	$C_{m_{\eta_3}}$	+.12528	C_{η_1,η_3}	+.05295	C_{η_2,η_3}	+.03480	C_{η_3,η_3}	+.29673	C_{η_4,η_3}	-.00551
$C_{N_{\eta_4}}$	+.03582	$C_{m_{\eta_4}}$	-.01903	C_{η_1,η_4}	-.01133	C_{η_2,η_4}	-.00874	C_{η_3,η_4}	-.02261	C_{η_4,η_4}	-.00141
$C_{N_{\dot\eta_1}}$	+1.3833	$C_{m_{\dot\eta_1}}$	-.76928	$C_{\eta_1,\dot\eta_1}$	-.48384	$C_{\eta_2,\dot\eta_1}$	-.20226	$C_{\eta_3,\dot\eta_1}$	-.15774	$C_{\eta_4,\dot\eta_1}$	-.06405
$C_{N_{\dot\eta_2}}$	+.44506	$C_{m_{\dot\eta_2}}$	-.26397	$C_{\eta_1,\dot\eta_2}$	-.18626	$C_{\eta_2,\dot\eta_2}$	-.14583	$C_{\eta_3,\dot\eta_2}$	-.19771	$C_{\eta_4,\dot\eta_2}$	-.04866
$C_{N_{\dot\eta_3}}$	-4.4784	$C_{m_{\dot\eta_3}}$	+3.3898	$C_{\eta_1,\dot\eta_3}$	-1.7023	$C_{\eta_2,\dot\eta_3}$	-.29329	$C_{\eta_3,\dot\eta_3}$	-6.6642	$C_{\eta_4,\dot\eta_3}$	+.25727
$C_{N_{\dot\eta_4}}$	+.47386	$C_{m_{\dot\eta_4}}$	-.30982	$C_{\eta_1,\dot\eta_4}$	-.25290	$C_{\eta_2,\dot\eta_4}$	-.14196	$C_{\eta_3,\dot\eta_4}$	+.27321	$C_{\eta_4,\dot\eta_4}$	-.09384

Normalized Mode Shape Data At Canard Station; FS 572

ϕ_1	+.52	ϕ_1'	+.025
ϕ_2	-.038	ϕ_2'	-.0038
ϕ_3	-.20	ϕ_3'	+.101
ϕ_4	-.05	ϕ_4'	+.0028

K_c	1.021
ℓ_{c_1}	85.99
ℓ_{c_2}	113.0

Structural Frequencies, Damping and Generalized Forces

ω_1	14.33	M_1	1029.	g_{s_1}	.02
ω_2	22.3	M_2	96.5	g_{s_2}	.02
ω_3	31.8	M_3	19300.	g_{s_3}	.02
ω_4	41.6	M_4	75.9	g_{s_4}	.02

TABLE E3.- AERODYNAMIC, GEOMETRIC, AND MASS CHARACTERISTICS FOR CASE P3

Aerodynamic coefficients are for wing-body unless subscripts denote otherwise
Units: Ft., Slugs, Rad., Sec.

Mass and Geometric Data

Weight	Iy	C.G.		Sw	$\bar{c}_W$	δtip
334,450 Lbs	18,121,904	FS 1596.4	.223 $\bar{c}_W$	6297.8	78.532	25 Deg

Aerodynamic Coefficients Due to Rigid-Body Modes, M = 1.18

$C_{N_{\alpha=0}}$	-.04655	$C_{m_{\alpha=0}}$	+.02885	$C_{\eta_1,\alpha=0}$	+.02035	$C_{\eta_{2\alpha=0}}$	+.00964	$C_{\eta_{3\alpha=0}}$	-.03083	$C_{\eta_{4\alpha=0}}$	+.00194
C_{N_α}	+2.43415	C_{m_α}	-.56511	$C_{\eta_1,\alpha}$	-.11562	$C_{\eta_{2\alpha}}$	-.27068	$C_{\eta_{3\alpha}}$	+1.1806	$C_{\eta_{4\alpha}}$	+.02792
$C_{N_{\alpha_c}}$	+.23633	$C_{m_{\alpha_c}}$	+.25317	C_{η_1,α_c}	-.09616	$C_{\eta_{2\alpha_c}}$	+.00520	$C_{\eta_{3\alpha_c}}$	-.00948	$C_{\eta_{4\alpha_c}}$	+.00948
$(C_{N_{\alpha_c}})_I$	-.22624	$(C_{m_{\alpha_c}})_I$	-.05558	$(C_{\eta_1,\alpha_c})_I$	-.06661	$(C_{\eta_{2\alpha_c}})_I$	+.00530	$(C_{\eta_{3\alpha_c}})_I$	-.00013	$(C_{\eta_{4\alpha_c}})_I$	+.00849
$C_{N_{\delta_c}}$	+.17209	$C_{m_{\delta_c}}$	+.18447	C_{η_1,δ_c}	-.06950	$C_{\eta_{2\delta_c}}$	+.00378	$C_{\eta_{3\delta_c}}$	-.00687	$C_{\eta_{4\delta_c}}$	+.00687
$(C_{N_{\delta_c}})_I$	-.15719	$(C_{m_{\delta_c}})_I$	-.04119	$(C_{\eta_1,\delta_c})_I$	-.0468	$(C_{\eta_{2\delta_c}})_I$	+.00431	$(C_{\eta_{3\delta_c}})_I$	+.01203	$(C_{\eta_{4\delta_c}})_I$	+.00594
$C_{N_{\delta_e}}$	.13756	$C_{m_{\delta_e}}$	-.09420	C_{η_1,δ_e}	-.06370	$C_{\eta_{2\delta_e}}$	-.01570	$C_{\eta_{3\delta_e}}$	-.12360	$C_{\eta_{4\delta_e}}$	-.07940
C_{N_q}	+2.2559	C_{m_q}	-1.5992	$C_{\eta_1,q}$	-.9648	$C_{\eta_{2q}}$	-.3210	$C_{\eta_{3q}}$	-.1326	$C_{\eta_{4q}}$	-.06249

Aerodynamic Coefficients Due to Structural Modes, M = 1.18

$C_{N_{\eta_1}}$	+.03708	$C_{m_{\eta_1}}$	-.01686	C_{η_1,η_1}	-.00913	$C_{\eta_2\eta_1}$	-.00643	$C_{\eta_3\eta_1}$	+.00470	$C_{\eta_4\eta_1}$	-.00077
$C_{N_{\eta_2}}$	+.00401	$C_{m_{\eta_2}}$	-.00370	C_{η_1,η_2}	-.00432	$C_{\eta_2\eta_2}$	-.00270	$C_{\eta_3\eta_2}$	-.00081	$C_{\eta_4\eta_2}$	-.00097
$C_{N_{\eta_3}}$	+.17080	$C_{m_{\eta_3}}$	-.09193	C_{η_1,η_3}	-.06513	$C_{\eta_2\eta_3}$	-.02463	$C_{\eta_3\eta_3}$	-.00705	$C_{\eta_4\eta_3}$	-.00689
$C_{N_{\eta_4}}$	+.01554	$C_{m_{\eta_4}}$	-.01065	C_{η_1,η_4}	-.01097	$C_{\eta_2\eta_4}$	-.00734	$C_{\eta_3\eta_4}$	-.00515	$C_{\eta_4\eta_4}$	-.00299
$C_{N_{\dot\eta_1}}$	+.58465	$C_{m_{\dot\eta_1}}$	-.41700	$C_{\eta_1,\dot\eta_1}$	-.37781	$C_{\eta_2\dot\eta_1}$	-.10156	$C_{\eta_3\dot\eta_1}$	-.46410	$C_{\eta_4\dot\eta_1}$	-.08417
$C_{N_{\dot\eta_2}}$	+.07723	$C_{m_{\dot\eta_2}}$	-.06068	$C_{\eta_1,\dot\eta_2}$	-.09736	$C_{\eta_2\dot\eta_2}$	-.08204	$C_{\eta_3\dot\eta_2}$	-.03815	$C_{\eta_4\dot\eta_2}$	-.03829
$C_{N_{\dot\eta_3}}$	+.77304	$C_{m_{\dot\eta_3}}$	-1.0866	$C_{\eta_1,\dot\eta_3}$	-.74570	$C_{\eta_2\dot\eta_3}$	-.04176	$C_{\eta_3\dot\eta_3}$	-2.9218	$C_{\eta_4\dot\eta_3}$	-.19509
$C_{N_{\dot\eta_4}}$	+.02435	$C_{m_{\dot\eta_4}}$	-.04111	$C_{\eta_1,\dot\eta_4}$	-.08724	$C_{\eta_2\dot\eta_4}$	-.05520	$C_{\eta_3\dot\eta_4}$	-.15953	$C_{\eta_4\dot\eta_4}$	-.06240

Normalized Mode Shape Data
At Canard Station; FS 572

ϕ_1	+.405	ϕ_1'	+.0228
ϕ_2	-.022	ϕ_2'	-.0030
ϕ_3	+.040	ϕ_3'	-.0821
ϕ_4	-.040	ϕ_4'	+.0019

K_c	1.026
ℓ_{c_1}	85.40
ℓ_{c_2}	113.0

Structural Frequencies, Damping
and Generalized Forces

ω_1	15.40	M_1	809.3	g_{s_1}	.02
ω_2	23.31	M_2	80.6	g_{s_2}	.02
ω_3	35.02	M_3	7602.8	g_{s_3}	.02
ω_4	45.15	M_4	51.5	g_{s_4}	.02

TABLE E4.- AERODYNAMIC, GEOMETRIC, AND MASS CHARACTERISTICS FOR CASE P4

Aerodynamic coefficients are for wing-body unless subscripts denote otherwise
Units: Ft., Slugs, Rad., Sec.

Mass and Geometric Data

Weight	Iy	C.G.		Sw	$\bar{c}_w$	δ tip
400,104 Lbs	21,025,152	FS 1590.2	.217 $\bar{c}_w$	6297.8	78.532	65 Deg

Aerodynamic Coefficients Due to Rigid-Body Modes, M = 1.60

$C_{N_{\alpha=0}}$	-.01855	$C_{m_{\alpha=0}}$	+.01635	$C_{\eta_1\alpha=0}$	+.01687	$C_{\eta_2\alpha=0}$	+.00384	$C_{\eta_3\alpha=0}$	+.03796	$C_{\eta_4\alpha=0}$	+.00165
C_{N_α}	+1.77462	C_{m_α}	-.35524	$C_{\eta_1\alpha}$	-.02222	$C_{\eta_2\alpha}$	-.14002	$C_{\eta_3\alpha}$	-.73735	$C_{\eta_4\alpha}$	-.05830
$C_{N_{\alpha_c}}$	+.19566	$C_{m_{\alpha_c}}$	+.21303	$C_{\eta_1\alpha_c}$	-.13900	$C_{\eta_2\alpha_c}$	+.00431	$C_{\eta_3\alpha_c}$	+.01960	$C_{\eta_4\alpha_c}$	-.00078
$(C_{N_{\alpha_c}})_I$	-.13600	$(C_{m_{\alpha_c}})_I$	-.05616	$(C_{\eta_1\alpha_c})_I$	-.08645	$(C_{\eta_2\alpha_c})_I$	+.00611	$(C_{\eta_3\alpha_c})_I$	+.01001	$(C_{\eta_4\alpha_c})_I$	-.00098
$C_{N_{\delta_c}}$	+.14227	$C_{m_{\delta_c}}$	+.15072	$C_{\eta_1\delta_c}$	-.10106	$C_{\eta_2\delta_c}$	+.00313	$C_{\eta_3\delta_c}$	+.01423	$C_{\eta_4\delta_c}$	-.00057
$(C_{N_{\delta_c}})_I$	-.10250	$(C_{m_{\delta_c}})_I$	-.03570	$(C_{\eta_1\delta_c})_I$	-.04780	$(C_{\eta_2\delta_c})_I$	+.00219	$(C_{\eta_3\delta_c})_I$	+.00063	$(C_{\eta_4\delta_c})_I$	-.000061
$C_{N_{\delta_e}}$	+.08783	$C_{m_{\delta_e}}$	-.06215	$C_{\eta_1\delta_e}$	-.06545	$C_{\eta_2\delta_e}$	-.00898	$C_{\eta_3\delta_e}$	+.08265	$C_{\eta_4\delta_e}$	+.00518
C_{N_q}	+1.1194	C_{m_q}	-.90812	$C_{\eta_1 q}$	-.42165	$C_{\eta_2 q}$	-.03970	$C_{\eta_3 q}$	+.43949	$C_{\eta_4 q}$	+.00824

Aerodynamic Coefficients Due to Structural Modes, M = 1.60

$C_{N_{\eta_1}}$	+.03422	$C_{m_{\eta_1}}$	-.01732	$C_{\eta_1\eta_1}$	-.00684	$C_{\eta_2\eta_1}$	-.00483	$C_{\eta_3\eta_1}$	-.00551	$C_{\eta_4\eta_1}$	-.00272
$C_{N_{\eta_2}}$	+.00172	$C_{m_{\eta_2}}$	-.00137	$C_{\eta_1\eta_2}$	-.00255	$C_{\eta_2\eta_2}$	-.00143	$C_{\eta_3\eta_2}$	-.00175	$C_{\eta_4\eta_2}$	-.00091
$C_{N_{\eta_3}}$	-.06184	$C_{m_{\eta_3}}$	+.03449	$C_{\eta_1\eta_3}$	+.03230	$C_{\eta_2\eta_3}$	+.00396	$C_{\eta_3\eta_3}$	-.00693	$C_{\eta_4\eta_3}$	+.00298
$C_{N_{\eta_4}}$	+.00227	$C_{m_{\eta_4}}$	-.00143	$C_{\eta_1\eta_4}$	-.00293	$C_{\eta_2\eta_4}$	-.00293	$C_{\eta_3\eta_4}$	-.00361	$C_{\eta_4\eta_4}$	-.00216
$C_{N_{\dot\eta_1}}$	+.29453	$C_{m_{\dot\eta_1}}$	-.26429	$C_{\eta_1\dot\eta_1}$	-.44549	$C_{\eta_2\dot\eta_1}$	-.03430	$C_{\eta_3\dot\eta_1}$	+.24797	$C_{\eta_4\dot\eta_1}$	-.03375
$C_{N_{\dot\eta_2}}$	+.02631	$C_{m_{\dot\eta_2}}$	-.02720	$C_{\eta_1\dot\eta_2}$	-.04840	$C_{\eta_2\dot\eta_2}$	-.04448	$C_{\eta_3\dot\eta_2}$	-.03349	$C_{\eta_4\dot\eta_2}$	-.02679
$C_{N_{\dot\eta_3}}$	+.05179	$C_{m_{\dot\eta_3}}$	+.29313	$C_{\eta_1\dot\eta_3}$	+.20946	$C_{\eta_2\dot\eta_3}$	-.05839	$C_{\eta_3\dot\eta_3}$	-.84991	$C_{\eta_4\dot\eta_3}$	-.04203
$C_{N_{\dot\eta_4}}$	+.01341	$C_{m_{\dot\eta_4}}$	-.00887	$C_{\eta_1\dot\eta_4}$	-.03070	$C_{\eta_2\dot\eta_4}$	-.02477	$C_{\eta_3\dot\eta_4}$	-.02873	$C_{\eta_4\dot\eta_4}$	-.02302

Normalized Mode Shape Data
At Canard Station; FS 572

ϕ_1	+.710	ϕ_1'	-.0345
ϕ_2	-.022	ϕ_2'	+.0028
ϕ_3	-.100	ϕ_3'	-.0410
ϕ_4	+.004	ϕ_4'	-.0015

K_c	1.013
ℓ_{c1}	84.10
ℓ_{c2}	113.0

Structural Frequencies, Damping
and Generalized Forces

ω_1	14.73	M_1	2193.0	g_{s_1}	.02
ω_2	23.65	M_2	64.9	g_{s_2}	.02
ω_3	32.2	M_3	2970.0	g_{s_3}	.02
ω_4	43.8	M_4	30.4	g_{s_4}	.02

TABLE E5.- AERODYNAMIC, GEOMETRIC, AND MASS CHARACTERISTICS FOR CASE P5

Aerodynamic coefficients are for wing-body unless subscripts denote otherwise
Units: Ft., Slugs, Rad., Sec.

Mass and Geometric Data

Weight	Iy	C.G.		Sw	$\bar{c}_w$	δ tip
387,309 Lbs	20,162,096	FS 1592.9	.220 $\bar{c}_w$	6297.8	78.532	65 Deg

Aerodynamic Coefficients Due to Rigid-Body Modes, M = 1.67

$C_{N_{\alpha=0}}$	-.01898	$C_{m_{\alpha=0}}$	+.01543	$C_{\eta_{1\alpha=0}}$	+.01672	$C_{\eta_{2\alpha=0}}$	+.00379	$C_{\eta_{3\alpha=0}}$	+.03218	$C_{\eta_{4\alpha=0}}$	+.00155
C_{N_α}	+1.74053	C_{m_α}	-.34224	$C_{\eta_{1\alpha}}$	-.02802	$C_{\eta_{2\alpha}}$	-.13837	$C_{\eta_{3\alpha}}$	-.59526	$C_{\eta_{4\alpha}}$	-.06057
$C_{N_{\alpha_c}}$	+.18881	$C_{m_{\alpha_c}}$	+.20635	$C_{\eta_{1\alpha_c}}$	-.13013	$C_{\eta_{2\alpha_c}}$	+.00377	$C_{\eta_{3\alpha_c}}$	+.02451	$C_{\eta_{4\alpha_c}}$	-.00246
$(C_{N_{\alpha_c}})_I$	-.12259	$(C_{m_{\alpha_c}})_I$	-.05471	$(C_{\eta_{1\alpha_c}})_I$	-.07677	$(C_{\eta_{2\alpha_c}})_I$	+.00573	$(C_{\eta_{3\alpha_c}})_I$	+.00434	$(C_{\eta_{4\alpha_c}})_I$	-.00186
$C_{N_{\delta_c}}$	+.13784	$C_{m_{\delta_c}}$	+.14670	$C_{\eta_{1\delta_c}}$	-.09520	$C_{\eta_{2\delta_c}}$	+.00276	$C_{\eta_{3\delta_c}}$	+.01795	$C_{\eta_{4\delta_c}}$	-.00180
$(C_{N_{\delta_c}})_I$	-.09309	$(C_{m_{\delta_c}})_I$	-.03391	$(C_{\eta_{1\delta_c}})_I$	-.04325	$(C_{\eta_{2\delta_c}})_I$	+.00216	$(C_{\eta_{3\delta_c}})_I$	-.00084	$(C_{\eta_{4\delta_c}})_I$	-.00063
$C_{N_{\delta_e}}$	+.08248	$C_{m_{\delta_e}}$	-.05870	$C_{\eta_{1\delta_e}}$	-.06148	$C_{\eta_{2\delta_e}}$	-.00835	$C_{\eta_{3\delta_e}}$	+.06015	$C_{\eta_{4\delta_e}}$	+.00650
C_{N_q}	+1.0517	C_{m_q}	-.86494	$C_{\eta_{1q}}$	-.4274	$C_{\eta_{2q}}$	-.0389	$C_{\eta_{3q}}$	+.3340	$C_{\eta_{4q}}$	+.00835

Aerodynamic Coefficients Due to Structural Modes, M = 1.67

$C_{N_{\eta_1}}$	+.03260	$C_{m_{\eta_1}}$	-.01295	$C_{\eta_1\eta_1}$	-.00675	$C_{\eta_2\eta_1}$	-.00459	$C_{\eta_3\eta_1}$	-.00479	$C_{\eta_4\eta_1}$	-.00264
$C_{N_{\eta_2}}$	+.00153	$C_{m_{\eta_2}}$	-.00158	$C_{\eta_1\eta_2}$	-.00245	$C_{\eta_2\eta_2}$	-.00140	$C_{\eta_3\eta_2}$	-.00161	$C_{\eta_4\eta_2}$	-.00089
$C_{N_{\eta_3}}$	-.04453	$C_{m_{\eta_3}}$	+.03082	$C_{\eta_1\eta_3}$	+.02384	$C_{\eta_2\eta_3}$	+.00213	$C_{\eta_3\eta_3}$	-.00441	$C_{\eta_4\eta_3}$	+.00170
$C_{N_{\eta_4}}$	+.00165	$C_{m_{\eta_4}}$	-.00089	$C_{\eta_1\eta_4}$	-.00250	$C_{\eta_2\eta_4}$	-.00271	$C_{\eta_3\eta_4}$	-.00339	$C_{\eta_4\eta_4}$	-.00205
$C_{N_{\dot\eta_1}}$	+.25914	$C_{m_{\dot\eta_1}}$	-.23633	$C_{\eta_1\dot\eta_1}$	-.42095	$C_{\eta_2\dot\eta_1}$	-.03034	$C_{\eta_3\dot\eta_1}$	+.16843	$C_{\eta_4\dot\eta_1}$	-.02708
$C_{N_{\dot\eta_2}}$	+.02626	$C_{m_{\dot\eta_2}}$	-.02495	$C_{\eta_1\dot\eta_2}$	-.04579	$C_{\eta_2\dot\eta_2}$	-.04366	$C_{\eta_3\dot\eta_2}$	-.03554	$C_{\eta_4\dot\eta_2}$	-.02581
$C_{N_{\dot\eta_3}}$	+.08543	$C_{m_{\dot\eta_3}}$	+.19874	$C_{\eta_1\dot\eta_3}$	+.12843	$C_{\eta_2\dot\eta_3}$	-.05554	$C_{\eta_3\dot\eta_3}$	-.52784	$C_{\eta_4\dot\eta_3}$	-.04311
$C_{N_{\dot\eta_4}}$	+.01086	$C_{m_{\dot\eta_4}}$	-.00804	$C_{\eta_1\dot\eta_4}$	-.02598	$C_{\eta_2\dot\eta_4}$	-.02376	$C_{\eta_3\dot\eta_4}$	-.02806	$C_{\eta_4\dot\eta_4}$	-.02152

Normalized Mode Shape Data At Canard Station; FS 572

ϕ_1	+.690	ϕ_1'	+.0349
ϕ_2	-.020	ϕ_2'	-.0027
ϕ_3	-.130	ϕ_3'	+.0371
ϕ_4	+.013	ϕ_4'	+.0004

K_c	1.009
ℓ_{c_1}	84.30
ℓ_{c_2}	113.0

Structural Frequencies, Damping and Generalized Forces

ω_1	14.78	M_1	2138.0	g_{s_1}	.02
ω_2	23.80	M_2	63.7	g_{s_2}	.02
ω_3	33.15	M_3	1957.0	g_{s_3}	.02
ω_4	43.95	M_4	28.8	g_{s_4}	.02

TABLE E6.- AERODYNAMIC, GEOMETRIC, AND MASS CHARACTERISTICS FOR CASE P6

Aerodynamic coefficients are for wing-body unless subscripts denote otherwise
Units: Ft., Slugs, Rad., Sec.

Mass and Geometric Data

Weight	Iy	C.G.		S_W	$\bar{c}_W$	δ_{tip}
392,409 Lbs	20,859,440	FS 1584.8	.211 $\bar{c}_W$	6297.8	78.532	65 Deg

Aerodynamic Coefficients Due to Rigid-Body Modes, M = 2.10

$C_{N_{\alpha=0}}$	-.01498	$C_{m_{\alpha=0}}$	+.01255	$C_{\eta_{1_{\alpha=0}}}$	+02309	$C_{\eta_{2_{\alpha=0}}}$	+00318	$C_{\eta_{3_{\alpha=0}}}$	+.01422	$C_{\eta_{4_{\alpha=0}}}$	+.00265
C_{N_α}	+1.54088	C_{m_α}	-.31079	$C_{\eta_{1_\alpha}}$	-.01482	$C_{\eta_{2_\alpha}}$	-.10570	$C_{\eta_{3_\alpha}}$	-.50849	$C_{\eta_{4_\alpha}}$	-.04245
$C_{N_{\alpha_c}}$	+.15142	$C_{m_{\alpha_c}}$	+.16090	$C_{\eta_{1_{\alpha_c}}}$	-.10753	$C_{\eta_{2_{\alpha_c}}}$	+.00333	$C_{\eta_{3_{\alpha_c}}}$	+.01817	$C_{\eta_{4_{\alpha_c}}}$	-.00121
$(C_{N_{\alpha_c}})_I$	-.06250	$(C_{m_{\alpha_c}})_I$	-.03829	$(C_{\eta_{1_{\alpha_c}}})_I$	-.04089	$(C_{\eta_{2_{\alpha_c}}})_I$	+.00288	$(C_{\eta_{3_{\alpha_c}}})_I$	+.00555	$(C_{\eta_{4_{\alpha_c}}})_I$	-.00086
$C_{N_{\delta_c}}$	+.10992	$C_{m_{\delta_c}}$	+.11534	$C_{\eta_{1_{\delta_c}}}$	-.07810	$C_{\eta_{2_{\delta_c}}}$	+.00242	$C_{\eta_{3_{\delta_c}}}$	+.01320	$C_{\eta_{4_{\delta_c}}}$	-.00088
$(C_{N_{\delta_c}})_I$	-.04613	$(C_{m_{\delta_c}})_I$	-.01753	$(C_{\eta_{1_{\delta_c}}})_I$	-.02065	$(C_{\eta_{2_{\delta_c}}})_I$	+.00116	$(C_{\eta_{3_{\delta_c}}})_I$	-.00238	$(C_{\eta_{4_{\delta_c}}})_I$	-.00033
$C_{N_{\delta_e}}$	+.05841	$C_{m_{\delta_e}}$	-.04401	$C_{\eta_{1_{\delta_e}}}$	-.04445	$C_{\eta_{2_{\delta_e}}}$	-.00656	$C_{\eta_{3_{\delta_e}}}$	+.04565	$C_{\eta_{4_{\delta_e}}}$	+.00414
C_{N_q}	+.75481	C_{m_q}	-.69708	$C_{\eta_{1_q}}$	-.2649	$C_{\eta_{2_q}}$	-.0377	$C_{\eta_{3_q}}$	+.2854	$C_{\eta_{4_q}}$	+.000176

Aerodynamic Coefficients Due to Structural Modes, M = 2.10

$C_{N_{\eta_1}}$	+.02401	$C_{m_{\eta_1}}$	-.02111	$C_{\eta_{1_{\eta_1}}}$	-.00462	$C_{\eta_{2_{\eta_1}}}$	-.00341	$C_{\eta_{3_{\eta_1}}}$	-.00275	$C_{\eta_{4_{\eta_1}}}$	+.00191
$C_{N_{\eta_2}}$	+.00115	$C_{m_{\eta_2}}$	-.00091	$C_{\eta_{1_{\eta_2}}}$	-.00202	$C_{\eta_{2_{\eta_2}}}$	-.00120	$C_{\eta_{3_{\eta_2}}}$	-.00153	$C_{\eta_{4_{\eta_2}}}$	-.00074
$C_{N_{\eta_3}}$	-.03301	$C_{m_{\eta_3}}$	+.01859	$C_{\eta_{1_{\eta_3}}}$	+02011	$C_{\eta_{2_{\eta_3}}}$	+.00133	$C_{\eta_{3_{\eta_3}}}$	-.00406	$C_{\eta_{4_{\eta_3}}}$	+.00121
$C_{N_{\eta_4}}$	+.00138	$C_{m_{\eta_4}}$	-.00084	$C_{\eta_{1_{\eta_4}}}$	-.00203	$C_{\eta_{2_{\eta_4}}}$	-.00222	$C_{\eta_{3_{\eta_4}}}$	-.00290	$C_{\eta_{4_{\eta_4}}}$	-.00172
$C_{N_{\dot\eta_1}}$	+.10611	$C_{m_{\dot\eta_1}}$	-.12947	$C_{\eta_{1_{\dot\eta_1}}}$	-.33238	$C_{\eta_{2_{\dot\eta_1}}}$	-.01535	$C_{\eta_{3_{\dot\eta_1}}}$	+.13977	$C_{\eta_{4_{\dot\eta_1}}}$	-.01788
$C_{N_{\dot\eta_2}}$	+02217	$C_{m_{\dot\eta_2}}$	-.02080	$C_{\eta_{1_{\dot\eta_2}}}$	-.03598	$C_{\eta_{2_{\dot\eta_2}}}$	-.03763	$C_{\eta_{3_{\dot\eta_2}}}$	-.03432	$C_{\eta_{4_{\dot\eta_2}}}$	-.02245
$C_{N_{\dot\eta_3}}$	+.14711	$C_{m_{\dot\eta_3}}$	-.01435	$C_{\eta_{1_{\dot\eta_3}}}$	+.05127	$C_{\eta_{2_{\dot\eta_3}}}$	-.05467	$C_{\eta_{3_{\dot\eta_3}}}$	-.48137	$C_{\eta_{4_{\dot\eta_3}}}$	-.04319
$C_{N_{\dot\eta_4}}$	+00742	$C_{m_{\dot\eta_4}}$	-.00569	$C_{\eta_{1_{\dot\eta_4}}}$	-.02076	$C_{\eta_{2_{\dot\eta_4}}}$	-.01832	$C_{\eta_{3_{\dot\eta_4}}}$	-.02157	$C_{\eta_{4_{\dot\eta_4}}}$	-.01703

Normalized Mode Shape Data At Canard Station; FS 572

ϕ_1	+.71	ϕ_1'	-.0348
ϕ_2	-.022	ϕ_2'	+.0028
ϕ_3	-.12	ϕ_3'	-.0386
ϕ_4	+.008	ϕ_4'	-.0006

K_c	1.000
l_{c_1}	83.37
l_{c_2}	113.0

Structural Frequencies, Damping and Generalized Forces

ω_1	14.76	M_1	2195.0	g_{s_1}	.02
ω_2	23.75	M_2	643	g_{s_2}	.02
ω_3	32.65	M_3	2219.0	g_{s_3}	.02
ω_4	43.90	M_4	29.0	g_{s_4}	.02

TABLE E7.- AERODYNAMIC, GEOMETRIC, AND MASS CHARACTERISTICS FOR CASE P7

Aerodynamic coefficients are for wing-body unless subscripts denote otherwise
Units: Ft., Slugs, Rad., Sec.

Mass and Geometric Data

Weight	Iy	C.G.		Sw	$\bar{c}_W$	δ tip
353,535 Lbs	18,999,584	FS 1584.6	.211 $\bar{c}_W$	6297.8	78.532	65 Deg

Aerodynamic Coefficients Due to Rigid-Body Modes, M = 2.15

$C_{N_{\alpha=0}}$	-.01417	$C_{m_{\alpha=0}}$	+.01203	$C_{\eta_1 \alpha=0}$	+.02203	$C_{\eta_2 \alpha=0}$	+.00310	$C_{\eta_3 \alpha=0}$	+.01349	$C_{\eta_4 \alpha=0}$	+.00241
C_{N_α}	+1.52970	C_{m_α}	-.31866	$C_{\eta_1 \alpha}$	-.01517	$C_{\eta_2 \alpha}$	-.10770	$C_{\eta_3 \alpha}$	-.47569	$C_{\eta_4 \alpha}$	-.03922
$C_{N_{\alpha_c}}$	+.14642	$C_{m_{\alpha_c}}$	+.15695	$C_{\eta_1 \alpha_c}$	-.09785	$C_{\eta_2 \alpha_c}$	+.00292	$C_{\eta_3 \alpha_c}$	+.02191	$C_{\eta_4 \alpha_c}$	-.00146
$(C_{N_{\alpha_c}})_I$	-.05730	$(C_{m_{\alpha_c}})_I$	-.03627	$(C_{\eta_1 \alpha_c})_I$	-.03751	$(C_{\eta_2 \alpha_c})_I$	+.00257	$(C_{\eta_3 \alpha_c})_I$	+.00161	$(C_{\eta_4 \alpha_c})_I$	-.00097
$C_{N_{\delta_c}}$	.10894	$C_{m_{\delta_c}}$	+.11341	$C_{\eta_1 \delta_c}$	-.07305	$C_{\eta_2 \delta_c}$	+.00218	$C_{\eta_3 \delta_c}$	+.01636	$C_{\eta_4 \delta_c}$	-.00109
$(C_{N_{\delta_c}})_I$	-.04200	$(C_{m_{\delta_c}})_I$	-.01663	$(C_{\eta_1 \delta_c})_I$	-.02715	$(C_{\eta_2 \delta_c})_I$	+.00151	$(C_{\eta_3 \delta_c})_I$	-.00507	$(C_{\eta_4 \delta_c})_I$	-.00057
$C_{N_{\delta_e}}$	+.05485	$C_{m_{\delta_e}}$	-.04136	$C_{\eta_1 \delta_e}$	-.04230	$C_{\eta_2 \delta_e}$	-.00602	$C_{\eta_3 \delta_e}$	+.04175	$C_{\eta_4 \delta_e}$	+.00485
C_{N_q}	+.7306	C_{m_q}	-.67847	$C_{\eta_1 q}$	-.2618	$C_{\eta_2 q}$	-.0362	$C_{\eta_3 q}$	+.2471	$C_{\eta_4 q}$	+.00326

Aerodynamic Coefficients Due to Structural Modes, M = 2.15

$C_{N_{\eta_1}}$	+.02393	$C_{m_{\eta_1}}$	-.01329	$C_{\eta_1 \eta_1}$	-.00477	$C_{\eta_2 \eta_1}$	-.00339	$C_{\eta_3 \eta_1}$	-.00282	$C_{\eta_4 \eta_1}$	-.00180
$C_{N_{\eta_2}}$	+.00107	$C_{m_{\eta_2}}$	-.00085	$C_{\eta_1 \eta_2}$	-.00193	$C_{\eta_2 \eta_2}$	-.00119	$C_{\eta_3 \eta_2}$	-.00145	$C_{\eta_4 \eta_2}$	-.00072
$C_{N_{\eta_3}}$	-.02928	$C_{m_{\eta_3}}$	+.01681	$C_{\eta_1 \eta_3}$	+.01927	$C_{\eta_2 \eta_3}$	+.00098	$C_{\eta_3 \eta_3}$	-.00305	$C_{\eta_4 \eta_3}$	+.00073
$C_{N_{\eta_4}}$	+.00108	$C_{m_{\eta_4}}$	-.00064	$C_{\eta_1 \eta_4}$	-.00185	$C_{\eta_2 \eta_4}$	-.00214	$C_{\eta_3 \eta_4}$	-.00270	$C_{\eta_4 \eta_4}$	-.00167
$C_{N_{\dot\eta_1}}$	+.09961	$C_{m_{\dot\eta_1}}$	-.12885	$C_{\eta_1 \dot\eta_1}$	-.33001	$C_{\eta_2 \dot\eta_1}$	-.01428	$C_{\eta_3 \dot\eta_1}$	+.12500	$C_{\eta_4 \dot\eta_1}$	-.01433
$C_{N_{\dot\eta_2}}$	+.02491	$C_{m_{\dot\eta_2}}$	-.02030	$C_{\eta_1 \dot\eta_2}$	-.03518	$C_{\eta_2 \dot\eta_2}$	-.03669	$C_{\eta_3 \dot\eta_2}$	-.03193	$C_{\eta_4 \dot\eta_2}$	-.02143
$C_{N_{\dot\eta_3}}$	+.14984	$C_{m_{\dot\eta_3}}$	+.11126	$C_{\eta_1 \dot\eta_3}$	+.04100	$C_{\eta_2 \dot\eta_3}$	-.04893	$C_{\eta_3 \dot\eta_3}$	-.41540	$C_{\eta_4 \dot\eta_3}$	-.04142
$C_{N_{\dot\eta_4}}$	+.00384	$C_{m_{\dot\eta_4}}$	-.00409	$C_{\eta_1 \dot\eta_4}$	-.01769	$C_{\eta_2 \dot\eta_4}$	-.01685	$C_{\eta_3 \dot\eta_4}$	-.02107	$C_{\eta_4 \dot\eta_4}$	-.01622

Normalized Mode Shape Data
At Canard Station; FS 572

ϕ_1	+.67	ϕ_1'	+.036
ϕ_2	-.02	ϕ_2'	-.0026
ϕ_3	-.15	ϕ_3'	+.0409
ϕ_4	+.01	ϕ_4'	+.0005

K_c	.997
ℓ_{c1}	83.35
ℓ_{c2}	113.0

Structural Frequencies, Damping
and Generalized Forces

ω_1	15.10	M_1	2085.0	g_{s_1}	.02
ω_2	24.18	M_2	59.5	g_{s_2}	.02
ω_3	34.20	M_3	1943.0	g_{s_3}	.02
ω_4	44.40	M_4	28.6	g_{s_4}	.02

TABLE E8.- AERODYNAMIC, GEOMETRIC, AND MASS CHARACTERISTICS FOR CASE P8

Aerodynamic coefficients are for wing-body unless subscripts denote otherwise
Units: Ft., Slugs, Rad., Sec.

Mass and Geometric Data

Weight	Iy	C.G.		Sw	$\bar{c}_w$	δ tip
376,516 Lbs	20,268,373	FS 1591.0	.218 $\bar{c}_w$	6297.8	78.532	65 Deg

Aerodynamic Coefficients Due to Rigid-Body Modes, M = 2.53

$C_{N_{\alpha=0}}$	-.00492	$C_{m_{\alpha=0}}$	+.00940	$C_{\eta_1 \alpha=0}$	+.01504	$C_{\eta_2 \alpha=0}$	+.00244	$C_{\eta_3 \alpha=0}$	+.01308	$C_{\eta_4 \alpha=0}$	+.00189
C_{N_α}	+1.32343	C_{m_α}	-.25576	$C_{\eta_1 \alpha}$	-.01226	$C_{\eta_2 \alpha}$	-.09132	$C_{\eta_3 \alpha}$	-.55424	$C_{\eta_4 \alpha}$	-.03827
$C_{N_{\alpha_c}}$	+.12175	$C_{m_{\alpha_c}}$	+.13071	$C_{\eta_1 \alpha_c}$	-.08781	$C_{\eta_2 \alpha_c}$	+.00305	$C_{\eta_3 \alpha_c}$	+.01708	$C_{\eta_4 \alpha_c}$	-.00093
$(C_{N_{\alpha_c}})_I$	-.02865	$(C_{m_{\alpha_c}})_I$	-.02168	$(C_{\eta_1 \alpha_c})_I$	-.01736	$(C_{\eta_2 \alpha_c})_I$	+.00192	$(C_{\eta_3 \alpha_c})_I$	-.01780	$(C_{\eta_4 \alpha_c})_I$	-.00068
$C_{N_{\delta_c}}$	+.09021	$C_{m_{\delta_c}}$	+.09327	$C_{\eta_1 \delta_c}$	-.06502	$C_{\eta_2 \delta_c}$	+.00226	$C_{\eta_3 \delta_c}$	+.01265	$C_{\eta_4 \delta_c}$	-.00063
$(C_{N_{\delta_c}})_I$	-.02000	$(C_{m_{\delta_c}})_I$	-.00234	$(C_{\eta_1 \delta_c})_I$	-.00971	$(C_{\eta_2 \delta_c})_I$	+.00049	$(C_{\eta_3 \delta_c})_I$	-.00043	$(C_{\eta_4 \delta_c})_I$	-.00011
$C_{N_{\delta_e}}$	+.04418	$C_{m_{\delta_e}}$	-.03214	$C_{\eta_1 \delta_e}$	-.03325	$C_{\eta_2 \delta_e}$	-.00455	$C_{\eta_3 \delta_e}$	+.04850	$C_{\eta_4 \delta_e}$	+.00329
C_{N_q}	+.6000	C_{m_q}	-.5398	$C_{\eta_1 q}$	-.2691	$C_{\eta_2 q}$	-.0396	$C_{\eta_3 q}$	+.2860	$C_{\eta_4 q}$	+.00705

Aerodynamic Coefficients Due to Structural Modes, M = 2.53

$C_{N_{\eta_1}}$	+.01913	$C_{m_{\eta_1}}$	-.01127	$C_{\eta_1 \eta_1}$	-.00321	$C_{\eta_2 \eta_1}$	-.00279	$C_{\eta_3 \eta_1}$	-.00162	$C_{\eta_4 \eta_1}$	-.00154
$C_{N_{\eta_2}}$	+.00084	$C_{m_{\eta_2}}$	-.00060	$C_{\eta_1 \eta_2}$	-.00126	$C_{\eta_2 \eta_2}$	-.00105	$C_{\eta_3 \eta_2}$	-.00160	$C_{\eta_4 \eta_2}$	-.00065
$C_{N_{\eta_3}}$	-.03406	$C_{m_{\eta_3}}$	+.01802	$C_{\eta_1 \eta_3}$	+.02322	$C_{\eta_2 \eta_3}$	+.00157	$C_{\eta_3 \eta_3}$	-.00395	$C_{\eta_4 \eta_3}$	+.00148
$C_{N_{\eta_4}}$	+.00123	$C_{m_{\eta_4}}$	-.00077	$C_{\eta_1 \eta_4}$	-.00173	$C_{\eta_2 \eta_4}$	-.00192	$C_{\eta_3 \eta_4}$	-.00265	$C_{\eta_4 \eta_4}$	-.00148
$C_{N_{\dot\eta_1}}$	+.03886	$C_{m_{\dot\eta_1}}$	-.11071	$C_{\eta_1 \dot\eta_1}$	-.35002	$C_{\eta_2 \dot\eta_1}$	-.01225	$C_{\eta_3 \dot\eta_1}$	+.17507	$C_{\eta_4 \dot\eta_1}$	-.01789
$C_{N_{\dot\eta_2}}$	+.02610	$C_{m_{\dot\eta_2}}$	-.02019	$C_{\eta_1 \dot\eta_2}$	-.03620	$C_{\eta_2 \dot\eta_2}$	-.04182	$C_{\eta_3 \dot\eta_2}$	-.04795	$C_{\eta_4 \dot\eta_2}$	-.02477
$C_{N_{\dot\eta_3}}$	+.24166	$C_{m_{\dot\eta_3}}$	+.13508	$C_{\eta_1 \dot\eta_3}$	+.05207	$C_{\eta_2 \dot\eta_3}$	-.07345	$C_{\eta_3 \dot\eta_3}$	-.80168	$C_{\eta_4 \dot\eta_3}$	-.05607
$C_{N_{\dot\eta_4}}$	+.00739	$C_{m_{\dot\eta_4}}$	-.00582	$C_{\eta_1 \dot\eta_4}$	-.02339	$C_{\eta_2 \dot\eta_4}$	-.01977	$C_{\eta_3 \dot\eta_4}$	-.02307	$C_{\eta_4 \dot\eta_4}$	-.01802

Normalized Mode Shape Data
At Canard Station; FS 572

ϕ_1	+.72	ϕ_1'	+.0377
ϕ_2	-.025	ϕ_2'	-.0027
ϕ_3	-.14	ϕ_3'	+.0750
ϕ_4	+.007	ϕ_4'	+.0006

K_c	.992
ℓ_{c_1}	83.66
ℓ_{c_2}	113.0

Structural Frequencies, Damping
and Generalized Forces

ω_1	14.65	M_1	2110.	g_{s_1}	.02
ω_2	24.75	M_2	64.2	g_{s_2}	.02
ω_3	33.8	M_3	3755.	g_{s_3}	.02
ω_4	43.8	M_4	29.3	g_{s_4}	.02

TABLE E9.- AERODYNAMIC, GEOMETRIC, AND MASS CHARACTERISTICS FOR CASE P9

Aerodynamic coefficients are for wing-body unless subscripts denote otherwise
Units: Ft., Slugs, Rad., Sec.

Mass and Geometric Data

Weight	Iy	C.G.		Sw	$\bar{c}_W$	δ tip
381,591 Lbs	20,449,920	FS 1596.2	.216 $\bar{c}_W$	6297.8	78.532	65 Deg

Aerodynamic Coefficients Due to Rigid-Body Modes, M = 2.50

$C_{N_{\alpha=0}}$	-.00466	$C_{m_{\alpha=0}}$	+.00947	$C_{\eta_{1,\alpha=0}}$	+.01485	$C_{\eta_{2,\alpha=0}}$	+.00243	$C_{\eta_{3,\alpha=0}}$	+.01277	$C_{\eta_{4,\alpha=0}}$	+.00190
C_{N_α}	+1.33022	C_{m_α}	-.25388	$C_{\eta_{1,\alpha}}$	-.01523	$C_{\eta_{2,\alpha}}$	-.09139	$C_{\eta_{3,\alpha}}$	-.52260	$C_{\eta_{4,\alpha}}$	-.03780
$C_{N_{\alpha_c}}$	+.12175	$C_{m_{\alpha_c}}$	+.12831	$C_{\eta_{1,\alpha_c}}$	-.08537	$C_{\eta_{2,\alpha_c}}$	+.00243	$C_{\eta_{3,\alpha_c}}$	+.00976	$C_{\eta_{4,\alpha_c}}$	-.00061
$(C_{N_{\alpha_c}})_I$	-.02865	$(C_{m_{\alpha_c}})_I$	-.02188	$(C_{\eta_{1,\alpha_c}})_I$	-.01834	$(C_{\eta_{2,\alpha_c}})_I$	+.00130	$(C_{\eta_{3,\alpha_c}})_I$	+.00238	$(C_{\eta_{4,\alpha_c}})_I$	-.00030
$C_{N_{\delta_c}}$	+.09004	$C_{m_{\delta_c}}$	+.09307	$C_{\eta_{1,\delta_c}}$	-.06310	$C_{\eta_{2,\delta_c}}$	+.00180	$C_{\eta_{3,\delta_c}}$	+.00721	$C_{\eta_{4,\delta_c}}$	-.00045
$(C_{N_{\delta_c}})_I$	-.02000	$(C_{m_{\delta_c}})_I$	-.00232	$(C_{\eta_{1,\delta_c}})_I$	-.00971	$(C_{\eta_{2,\delta_c}})_I$	+.00049	$(C_{\eta_{3,\delta_c}})_I$	-.00050	$(C_{\eta_{4,\delta_c}})_I$	-.00009
$C_{N_{\delta_e}}$	+.04430	$C_{m_{\delta_e}}$	-.03227	$C_{\eta_{1,\delta_e}}$	-.03380	$C_{\eta_{2,\delta_e}}$	-.00465	$C_{\eta_{3,\delta_e}}$	+.04600	$C_{\eta_{4,\delta_e}}$	+.00316
C_{N_q}	+.6000	C_{m_q}	-.5404	$C_{\eta_{1,q}}$	-.15120	$C_{\eta_{2,q}}$	-.03025	$C_{\eta_{3,q}}$	+.30205	$C_{\eta_{4,q}}$	+.00111

Aerodynamic Coefficients Due to Structural Modes, M = 2.50

$C_{N_{\eta_1}}$	+.01915	$C_{m_{\eta_1}}$	-.01148	$C_{\eta_{1,\eta_1}}$	-.00324	$C_{\eta_{2,\eta_1}}$	-.00281	$C_{\eta_{3,\eta_1}}$	-.00174	$C_{\eta_{4,\eta_1}}$	-.00154
$C_{N_{\eta_2}}$	+.00085	$C_{m_{\eta_2}}$	-.00064	$C_{\eta_{1,\eta_2}}$	-.00171	$C_{\eta_{2,\eta_2}}$	-.00105	$C_{\eta_{3,\eta_2}}$	-.00156	$C_{\eta_{4,\eta_2}}$	-.00065
$C_{N_{\eta_3}}$	-.03209	$C_{m_{\eta_3}}$	+.01721	$C_{\eta_{1,\eta_3}}$	+.02187	$C_{\eta_{2,\eta_3}}$	+.00153	$C_{\eta_{3,\eta_3}}$	-.00372	$C_{\eta_{4,\eta_3}}$	+.00136
$C_{N_{\eta_4}}$	+.00128	$C_{m_{\eta_4}}$	-.00079	$C_{\eta_{1,\eta_4}}$	-.00176	$C_{\eta_{2,\eta_4}}$	-.00193	$C_{\eta_{3,\eta_4}}$	-.00259	$C_{\eta_{4,\eta_4}}$	-.00148
$C_{N_{\dot\eta_1}}$	+.04118	$C_{m_{\dot\eta_1}}$	-.12629	$C_{\eta_{1,\dot\eta_1}}$	-.33102	$C_{\eta_{2,\dot\eta_1}}$	-.01270	$C_{\eta_{3,\dot\eta_1}}$	+.15707	$C_{\eta_{4,\dot\eta_1}}$	-.01822
$C_{N_{\dot\eta_2}}$	+.02828	$C_{m_{\dot\eta_2}}$	-.02169	$C_{\eta_{1,\dot\eta_2}}$	-.03630	$C_{\eta_{2,\dot\eta_2}}$	-.04167	$C_{\eta_{3,\dot\eta_2}}$	-.04635	$C_{\eta_{4,\dot\eta_2}}$	-.02467
$C_{N_{\dot\eta_3}}$	+.24148	$C_{m_{\dot\eta_3}}$	+.13430	$C_{\eta_{1,\dot\eta_3}}$	+.04007	$C_{\eta_{2,\dot\eta_3}}$	-.07003	$C_{\eta_{3,\dot\eta_3}}$	-.82818	$C_{\eta_{4,\dot\eta_3}}$	-.05342
$C_{N_{\dot\eta_4}}$	+.00784	$C_{m_{\dot\eta_4}}$	-.00642	$C_{\eta_{1,\dot\eta_4}}$	-.02339	$C_{\eta_{2,\dot\eta_4}}$	-.01975	$C_{\eta_{3,\dot\eta_4}}$	-.02112	$C_{\eta_{4,\dot\eta_4}}$	-.01795

Normalized Mode Shape Data
At Canard Station; FS 572

ϕ_1	+.700	ϕ_1'	+.0344
ϕ_2	-.020	ϕ_2'	-.0027
ϕ_3	-.080	ϕ_3'	+.0454
ϕ_4	+.005	ϕ_4'	+.0009

K_c	.992
ℓ_{c_1}	83.58
ℓ_{c_2}	113.0

Structural Frequencies, Damping
and Generalized Forces

ω_1	14.82	M_1	2163.	g_{s_1}	.02
ω_2	23.65	M_2	64.5	g_{s_2}	.02
ω_3	33.05	M_3	3300.	g_{s_3}	.02
ω_4	43.75	M_4	29.5	g_{s_4}	.02

TABLE E10.- AERODYNAMIC, GEOMETRIC, AND MASS CHARACTERISTICS FOR CASE P10

Aerodynamic coefficients are for wing-body unless subscripts denote otherwise
Units: Ft., Slugs, Rad., Sec.

Mass and Geometric Data

Weight	Iy	C.G.		Sw	$\bar{c}_w$	δtip
436,975 Lbs	21,508,768	FS 1596.2	.223 $\bar{c}_w$	6297.8	78.532	25 Deg

Aerodynamic Coefficients Due to Rigid-Body Modes, M = 1.06

$C_{N_{\alpha=0}}$	-.04969	$C_{m_{\alpha=0}}$	+.02481	$C_{\eta_1,\alpha=0}$	+.02088	$C_{\eta_2,\alpha=0}$	+.00987	$C_{\eta_3,\alpha=0}$	+.17160	$C_{\eta_4,\alpha=0}$	+.00281
C_{N_α}	+2.59922	C_{m_α}	-.52094	$C_{\eta_1,\alpha}$	-.10241	$C_{\eta_2,\alpha}$	-.31451	$C_{\eta_3,\alpha}$	-8.8373	$C_{\eta_4,\alpha}$	+.01718
$C_{N_{\alpha_c}}$	+.24048	$C_{m_{\alpha_c}}$	+.25888	C_{η_1,α_c}	-.11727	C_{η_2,α_c}	+.00832	C_{η_3,α_c}	+.19146	C_{η_4,α_c}	+.01034
$(C_{N_{\alpha_c}})_I$	-.23920	$(C_{m_{\alpha_c}})_I$	-.04940	$(C_{\eta_1,\alpha_c})_I$	-.06664	$(C_{\eta_2,\alpha_c})_I$	+.00483	$(C_{\eta_3,\alpha_c})_I$	+.11971	$(C_{\eta_4,\alpha_c})_I$	+.00996
$C_{N_{\delta_c}}$	+.17841	$C_{m_{\delta_c}}$	+.19470	C_{η_1,δ_c}	-.08695	C_{η_2,δ_c}	+.00621	C_{η_3,δ_c}	+.14195	C_{η_4,δ_c}	+.00799
$(C_{N_{\delta_c}})_I$	-.16718	$(C_{m_{\delta_c}})_I$	-.02666	$(C_{\eta_1,\delta_c})_I$	-.04710	$(C_{\eta_2,\delta_c})_I$	+.00407	$(C_{\eta_3,\delta_c})_I$	+.01108	$(C_{\eta_4,\delta_c})_I$	+.00726
$C_{N_{\delta_e}}$	+.20467	$C_{m_{\delta_e}}$	-.12890	C_{η_1,δ_e}	-.08010	C_{η_2,δ_e}	-.02795	C_{η_3,δ_e}	+.67500	C_{η_4,δ_e}	-.01050
C_{N_q}	+2.3958	C_{m_q}	-1.79898	$C_{\eta_1,q}$	-.91669	$C_{\eta_2,q}$	-.39501	$C_{\eta_3,q}$	+3.7507	$C_{\eta_4,q}$	-.10764

Aerodynamic Coefficients Due to Structural Modes, M = 1.06

$C_{N_{\eta_1}}$	+.04852	$C_{m_{\eta_1}}$	-.02268	$C_{\eta_1\eta_1}$	-.00971	$C_{\eta_2\eta_1}$	-.00724	$C_{\eta_3\eta_1}$	-.05176	$C_{\eta_4\eta_1}$	-.00118
$C_{N_{\eta_2}}$	+.01002	$C_{m_{\eta_2}}$	-.00569	$C_{\eta_1\eta_2}$	-.00532	$C_{\eta_2\eta_2}$	-.00311	$C_{\eta_3\eta_2}$	+.00083	$C_{\eta_4\eta_2}$	-.00123
$C_{N_{\eta_3}}$	-1.39919	$C_{m_{\eta_3}}$	+.70702	$C_{\eta_1\eta_3}$	+.38189	$C_{\eta_2\eta_3}$	+.16720	$C_{\eta_3\eta_3}$	+.83394	$C_{\eta_4\eta_3}$	+.03798
$C_{N_{\eta_4}}$	+.03148	$C_{m_{\eta_4}}$	-.02017	$C_{\eta_1\eta_4}$	-.01423	$C_{\eta_2\eta_4}$	-.00889	$C_{\eta_3\eta_4}$	+.02761	$C_{\eta_4\eta_4}$	-.00388
$C_{N_{\dot\eta_1}}$	+1.00174	$C_{m_{\dot\eta_1}}$	-.64876	$C_{\eta_1\dot\eta_1}$	-.47549	$C_{\eta_2\dot\eta_1}$	-.14379	$C_{\eta_3\dot\eta_1}$	+3.39111	$C_{\eta_4\dot\eta_1}$	-.10792
$C_{N_{\dot\eta_2}}$	+.22919	$C_{m_{\dot\eta_2}}$	-.16639	$C_{\eta_1\dot\eta_2}$	-.13889	$C_{\eta_2\dot\eta_2}$	-.09552	$C_{\eta_3\dot\eta_2}$	+.48523	$C_{\eta_4\dot\eta_2}$	-.05297
$C_{N_{\dot\eta_3}}$	-12.9155	$C_{m_{\dot\eta_3}}$	+11.7134	$C_{\eta_1\dot\eta_3}$	+7.05111	$C_{\eta_2\dot\eta_3}$	+.95973	$C_{\eta_3\dot\eta_3}$	-130.9524	$C_{\eta_4\dot\eta_3}$	+1.70621
$C_{N_{\dot\eta_4}}$	+.19828	$C_{m_{\dot\eta_4}}$	-.16048	$C_{\eta_1\dot\eta_4}$	-.16422	$C_{\eta_2\dot\eta_4}$	-.08207	$C_{\eta_3\dot\eta_4}$	+1.63621	$C_{\eta_4\dot\eta_4}$	-.07827

Normalized Mode Shape Data
At Canard Station; FS 572

ϕ_1	+.490	ϕ_1'	+.0248
ϕ_2	-.035	ϕ_2'	-.0038
ϕ_3	-.800	ϕ_3'	+.4500
ϕ_4	-.045	ϕ_4'	+.0024

K_c	1.048
l_{c1}	86.04
l_{c2}	113.0

Structural Frequencies, Damping
and Generalized Forces

ω_1	14.75	M_1	960.0	g_{s_1}	.02
ω_2	22.52	M_2	94.0	g_{s_2}	.02
ω_3	32.4	M_3	262500.	g_{s_3}	.02
ω_4	42.4	M_4	65.5	g_{s_4}	.02

TABLE E11.- AERODYNAMIC, GEOMETRIC, AND MASS CHARACTERISTICS FOR CASE SC1

Aerodynamic coefficients are for wing-body unless subscripts denote otherwise
Units: Ft., Slugs, Rad., Sec.

Mass and Geometric Data

Weight	Iy	C.G.		Sw	$\bar{c}_W$	δ tip
480,425 Lbs	21,810,032	FS 1593.9	.221 $\bar{c}_W$	6297.8	78.532	0 Deg

Aerodynamic Coefficients Due to Rigid-Body Modes, M = 0.76

C_{N_α}	+2.5302	C_{m_α}	-.42680	$C_{\eta_1\alpha}$	-.05642	$C_{\eta_2\alpha}$	-.27630	$C_{\eta_3\alpha}$	-1.5940	$C_{\eta_4\alpha}$	+.06958
$C_{N_{\alpha_c}}$	+.23457	$C_{m_{\alpha_c}}$	+.24321	$C_{\eta_1\alpha_c}$	-.12204	$C_{\eta_2\alpha_c}$	-.00774	$C_{\eta_3\alpha_c}$	+.02346	$C_{\eta_4\alpha_c}$	+.01173
$(C_{N_{\alpha_c}})_I$	-.22744	$(C_{m_{\alpha_c}})_I$	-.04594	$(C_{\eta_1\alpha_c})_I$	-.05709	$(C_{\eta_2\alpha_c})_I$	+.00274	$(C_{\eta_3\alpha_c})_I$	+.02284	$(C_{\eta_4\alpha_c})_I$	+.00938
$C_{N_{\delta_c}}$	+.17537	$C_{m_{\delta_c}}$	+.19078	$C_{\eta_1\delta_c}$	-.09119	$C_{\eta_2\delta_c}$	-.00579	$C_{\eta_3\delta_c}$	+.01754	$C_{\eta_4\delta_c}$	+.00877
$(C_{N_{\delta_c}})_I$	-.15466	$(C_{m_{\delta_c}})_I$	-.03526	$(C_{\eta_1\delta_c})_I$	-.04260	$(C_{\eta_2\delta_c})_I$	+.00431	$(C_{\eta_3\delta_c})_I$	-.02010	$(C_{\eta_4\delta_c})_I$	+.00691
$C_{N_{\delta_e}}$	+.43960	$C_{m_{\delta_e}}$	-.22406	$C_{\eta_1\delta_e}$	-.13900	$C_{\eta_2\delta_e}$	-.06286	$C_{\eta_3\delta_e}$	+.02607	$C_{\eta_4\delta_e}$	-.00958
$C_{N_{\dot\alpha}}$	+1.1100	$C_{m_{\dot\alpha}}$	-.46800	$C_{\eta_1\dot\alpha}$	-.10800	$C_{\eta_2\dot\alpha}$	+.06700	$C_{\eta_3\dot\alpha}$	+.45500	$C_{\eta_4\dot\alpha}$	-.01010
C_{N_q}	+3.3475	C_{m_q}	-1.3476	$C_{\eta_1 q}$	-.44330	$C_{\eta_2 q}$	-.43719	$C_{\eta_3 q}$	-1.38626	$C_{\eta_4 q}$	+.05498

Aerodynamic Coefficients Due to Structural Modes, M = 0.76

$C_{N_{\eta_1}}$	+.04419	$C_{m_{\eta_1}}$	-.01486	$C_{\eta_1\eta_1}$	-.00378	$C_{\eta_2\eta_1}$	-.00647	$C_{\eta_3\eta_1}$	-.02753	$C_{\eta_4\eta_1}$	+.00096
$C_{N_{\eta_2}}$	+.01031	$C_{m_{\eta_2}}$	-.00518	$C_{\eta_1\eta_2}$	-.00342	$C_{\eta_2\eta_2}$	-.00265	$C_{\eta_3\eta_2}$	-.00785	$C_{\eta_4\eta_2}$	-.00003
$C_{N_{\eta_3}}$	-.18375	$C_{m_{\eta_3}}$	+.06410	$C_{\eta_1\eta_3}$	+.02525	$C_{\eta_2\eta_3}$	+.01764	$C_{\eta_3\eta_3}$	+.11241	$C_{\eta_4\eta_3}$	-.00538
$C_{N_{\eta_4}}$	+.03389	$C_{m_{\eta_4}}$	-.01682	$C_{\eta_1\eta_4}$	-.00958	$C_{\eta_2\eta_4}$	-.00821	$C_{\eta_3\eta_4}$	-.01914	$C_{\eta_4\eta_4}$	-.00070
$C_{N_{\dot\eta_1}}$	+1.24019	$C_{m_{\dot\eta_1}}$	-.63532	$C_{\eta_1\dot\eta_1}$	-.39862	$C_{\eta_2\dot\eta_1}$	-.18056	$C_{\eta_3\dot\eta_1}$	-.31692	$C_{\eta_4\dot\eta_1}$	-.03393
$C_{N_{\dot\eta_2}}$	+.39788	$C_{m_{\dot\eta_2}}$	-.21942	$C_{\eta_1\dot\eta_2}$	-.15576	$C_{\eta_2\dot\eta_2}$	-.13452	$C_{\eta_3\dot\eta_2}$	-.21737	$C_{\eta_4\dot\eta_2}$	-.03386
$C_{N_{\dot\eta_3}}$	-2.15056	$C_{m_{\dot\eta_3}}$	+1.58207	$C_{\eta_1\dot\eta_3}$	+.72608	$C_{\eta_2\dot\eta_3}$	+.07543	$C_{\eta_3\dot\eta_3}$	-1.89617	$C_{\eta_4\dot\eta_3}$	+.07216
$C_{N_{\dot\eta_4}}$	+.37776	$C_{m_{\dot\eta_4}}$	-.23552	$C_{\eta_1\dot\eta_4}$	-.19873	$C_{\eta_2\dot\eta_4}$	-.12119	$C_{\eta_3\dot\eta_4}$	+.03191	$C_{\eta_4\dot\eta_4}$	-.07239

Normalized Mode Shape Data
At Canard Station; FS 572

ϕ_1	+.52	ϕ_1'	+.0248
ϕ_2	+.033	ϕ_2'	-.0036
ϕ_3	-.10	ϕ_3'	+.0815
ϕ_4	-.05	ϕ_4'	+.0026

K_c	1.031
ℓ_{c1}	86.21
ℓ_{c2}	113.0

Structural Frequencies, Damping
and Generalized Forces

ω_1	14.4	M_1	1037.	g_{s_1}	.02
ω_2	22.65	M_2	88.	g_{s_2}	.02
ω_3	31.79	M_3	7645.	g_{s_3}	.02
ω_4	42.3	M_4	72.	g_{s_4}	.02

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TABLE E12.- AERODYNAMIC, GEOMETRIC, AND MASS CHARACTERISTICS FOR CASE SC2

Aerodynamic coefficients are for wing-body unless subscripts denote otherwise
Units: Ft., Slugs, Rad., Sec.

Mass and Geometric Data

Weight	Iy	C.G.		Sw	$\bar{c}_W$	δ tip
339,625 Lbs	17,829,776.	FS 1606.9	.234 $\bar{c}_W$	6297.8	78.532	0 Deg

Aerodynamic Coefficients Due to Rigid-Body Modes, M = 0.75

C_{N_α}	+2.5273	C_{m_α}	-.39157	$C_{\eta_1\alpha}$	+.01767	$C_{\eta_2\alpha}$	-.27295	$C_{\eta_3\alpha}$	-75.189	$C_{\eta_4\alpha}$	+.06116
$C_{N_{\alpha_c}}$	+.23354	$C_{m_{\alpha_c}}$	+.24596	$C_{\eta_1\alpha_c}$	-.09568	$C_{\eta_2\alpha_c}$	+.00467	$C_{\eta_3\alpha_c}$	+11.201	$C_{\eta_4\alpha_c}$	+.00582
$(C_{N_{\alpha_c}})_I$	-.22643	$(C_{m_{\alpha_c}})_I$	-.04890	$(C_{\eta_1\alpha_c})_I$	-.06472	$(C_{\eta_2\alpha_c})_I$	+.00425	$(C_{\eta_3\alpha_c})_I$	+1.2288	$(C_{\eta_4\alpha_c})_I$	+.00482
$C_{N_{\delta_c}}$	+.17588	$C_{m_{\delta_c}}$	+.19380	$C_{\eta_1\delta_c}$	-.07211	$C_{\eta_2\delta_c}$	+.00352	$C_{\eta_3\delta_c}$	+8.4422	$C_{\eta_4\delta_c}$	+.00440
$(C_{N_{\delta_c}})_I$	-.15401	$(C_{m_{\delta_c}})_I$	-.03767	$(C_{\eta_1\delta_c})_I$	-.04825	$(C_{\eta_2\delta_c})_I$	+.00514	$(C_{\eta_3\delta_c})_I$	-1.2940	$(C_{\eta_4\delta_c})_I$	+.00366
$C_{N_{\delta_e}}$	+.44044	$C_{m_{\delta_e}}$	-.21788	$C_{\eta_1\delta_e}$	-.12861	$C_{\eta_2\delta_e}$	-.05823	$C_{\eta_3\delta_e}$	-.45806	$C_{\eta_4\delta_e}$	+.00564
$C_{N_{\dot{\alpha}}}$	+1.1200	$C_{m_{\dot{\alpha}}}$	-.44700	$C_{\eta_1\dot{\alpha}}$	-.07370	$C_{\eta_2\dot{\alpha}}$	+.06700	$C_{\eta_3\dot{\alpha}}$	+10.900	$C_{\eta_4\dot{\alpha}}$	-.01035
C_{N_q}	+3.1859	C_{m_q}	-1.2964	$C_{\eta_1 q}$	-.36257	$C_{\eta_2 q}$	-.40586	$C_{\eta_3 q}$	-69.728	$C_{\eta_4 q}$	+.06585

Aerodynamic Coefficients Due to Structural Modes, M = 0.75

$C_{N_{\eta_1}}$	+.04493	$C_{m_{\eta_1}}$	-.01507	$C_{\eta_1\eta_1}$	-.00290	$C_{\eta_2\eta_1}$	-.00647	$C_{\eta_3\eta_1}$	+1.30469	$C_{\eta_4\eta_1}$	+.00096
$C_{N_{\eta_2}}$	+.00916	$C_{m_{\eta_2}}$	-.00493	$C_{\eta_1\eta_2}$	-.00322	$C_{\eta_2\eta_2}$	-.00258	$C_{\eta_3\eta_2}$	-.32891	$C_{\eta_4\eta_2}$	+.00008
$C_{N_{\eta_3}}$	-3.49133	$C_{m_{\eta_3}}$	+1.00100	$C_{\eta_1\eta_3}$	+.51582	$C_{\eta_2\eta_3}$	+.35937	$C_{\eta_3\eta_3}$	+147.929	$C_{\eta_4\eta_3}$	-.09284
$C_{N_{\eta_4}}$	+.02743	$C_{m_{\eta_4}}$	-.01406	$C_{\eta_1\eta_4}$	-.00853	$C_{\eta_2\eta_4}$	-.00774	$C_{\eta_3\eta_4}$	-.71084	$C_{\eta_4\eta_4}$	-.00098
$C_{N_{\dot{\eta}_1}}$	+1.17809	$C_{m_{\dot{\eta}_1}}$	-.63850	$C_{\eta_1\dot{\eta}_1}$	-.37004	$C_{\eta_2\dot{\eta}_1}$	-.16578	$C_{\eta_3\dot{\eta}_1}$	-16.3517	$C_{\eta_4\dot{\eta}_1}$	-.01335
$C_{N_{\dot{\eta}_2}}$	+.36273	$C_{m_{\dot{\eta}_2}}$	-.19780	$C_{\eta_1\dot{\eta}_2}$	-.13898	$C_{\eta_2\dot{\eta}_2}$	-.12571	$C_{\eta_3\dot{\eta}_2}$	-8.5303	$C_{\eta_4\dot{\eta}_2}$	-.02195
$C_{N_{\dot{\eta}_3}}$	-92.8770	$C_{m_{\dot{\eta}_3}}$	+75.5858	$C_{\eta_1\dot{\eta}_3}$	+35.1683	$C_{\eta_2\dot{\eta}_3}$	+4.6747	$C_{\eta_3\dot{\eta}_3}$	-3869.93	$C_{\eta_4\dot{\eta}_3}$	+3.1097
$C_{N_{\dot{\eta}_4}}$	+.25199	$C_{m_{\dot{\eta}_4}}$	-.17074	$C_{\eta_1\dot{\eta}_4}$	-.14661	$C_{\eta_2\dot{\eta}_4}$	-.09432	$C_{\eta_3\dot{\eta}_4}$	+2.2277	$C_{\eta_4\dot{\eta}_4}$	-.04860

Normalized Mode Shape Data
At Canard Station; FS 572

ϕ_1	+.41	ϕ_1'	+.02255
ϕ_2	-.02	ϕ_2'	-.00309
ϕ_3	-48.	ϕ_3'	+4.14
ϕ_4	-.025	ϕ_4'	+.0009

K_c	1.019
ℓ_{c_1}	87.22
ℓ_{c_2}	113.0

Structural Frequencies, Damping and Generalized Forces

ω_1	15.48	M_1	819.5	g_{s_1}	.02
ω_2	23.6	M_2	74.5	g_{s_2}	.02
ω_3	35.95	M_3	19,160,000.	g_{s_3}	.02
ω_4	48.65	M_4	32.22	g_{s_4}	.02

TABLE E13.- AERODYNAMIC, GEOMETRIC, AND MASS CHARACTERISTICS FOR CASE SC3

Aerodynamic coefficients are for wing-body unless subscripts denote otherwise
Units: Ft., Slugs, Rad., Sec.

Mass and Geometric Data

Weight	I_y	C.G.		S_W	$\bar{c}_W$	δ_{tip}
423,474 Lbs	20,999,872	FS 1600.8	.228 $\bar{c}_W$	6297.8	78.532	25 Deg

Aerodynamic Coefficients Due to Rigid-Body Modes, M = 1.21

C_{N_α}	+2.3862	C_{m_α}	-.55843	$C_{\eta_{1\alpha}}$	-.11657	$C_{\eta_{2\alpha}}$	-.31713	$C_{\eta_{3\alpha}}$	+3.7177	$C_{\eta_{4\alpha}}$	-.00212
$C_{N_{\alpha_c}}$	+.23435	$C_{m_{\alpha_c}}$	+.25284	$C_{\eta_{1\alpha_c}}$	-.11708	$C_{\eta_{2\alpha_c}}$	+.00703	$C_{\eta_{3\alpha_c}}$	-.11708	$C_{\eta_{4\alpha_c}}$	+.01172
$(C_{N_{\alpha_c}})_I$	-.22114	$(C_{m_{\alpha_c}})_I$	-.05808	$(C_{\eta_{1\alpha_c}})_I$	-.06288	$(C_{\eta_{2\alpha_c}})_I$	+.00437	$(C_{\eta_{3\alpha_c}})_I$	-.02987	$(C_{\eta_{4\alpha_c}})_I$	+.00920
$C_{N_{\delta_c}}$	+.17095	$C_{m_{\delta_c}}$	+.18337	$C_{\eta_{1\delta_c}}$	-.08548	$C_{\eta_{2\delta_c}}$	+.00515	$C_{\eta_{3\delta_c}}$	-.08548	$C_{\eta_{4\delta_c}}$	+.00855
$(C_{N_{\delta_c}})_I$	-.15388	$(C_{m_{\delta_c}})_I$	-.04390	$(C_{\eta_{1\delta_c}})_I$	-.04450	$(C_{\eta_{2\delta_c}})_I$	+.00374	$(C_{\eta_{3\delta_c}})_I$	+.01244	$(C_{\eta_{4\delta_c}})_I$	+.00665
$C_{N_{\delta_e}}$	+.09911	$C_{m_{\delta_e}}$	-.06819	$C_{\eta_{1\delta_e}}$	-.04628	$C_{\eta_{2\delta_e}}$	-.01237	$C_{\eta_{3\delta_e}}$	-.32805	$C_{\eta_{4\delta_e}}$	-.00773
$C_{N_{\dot{\alpha}}}$	+.0042	$C_{m_{\dot{\alpha}}}$	+.2360	$C_{\eta_{1\dot{\alpha}}}$	+.4310	$C_{\eta_{2\dot{\alpha}}}$	+.2130	$C_{\eta_{3\dot{\alpha}}}$	+.5760	$C_{\eta_{4\dot{\alpha}}}$	-.0265
C_{N_q}	+2.3049	C_{m_q}	-1.2907	$C_{\eta_{1q}}$	-.90777	$C_{\eta_{2q}}$	-.20887	$C_{\eta_{3q}}$	-6.9596	$C_{\eta_{4q}}$	-.12149

Aerodynamic Coefficients Due to Structural Modes, M = 1.21

$C_{N_{\eta_1}}$	+.04165	$C_{m_{\eta_1}}$	-.02031	$C_{\eta_{1\eta_1}}$	-.00882	$C_{\eta_{2\eta_1}}$	-.00635	$C_{\eta_{3\eta_1}}$	+.01209	$C_{\eta_{4\eta_1}}$	-.00137
$C_{N_{\eta_2}}$	+.00669	$C_{m_{\eta_2}}$	-.00489	$C_{\eta_{1\eta_2}}$	-.00438	$C_{\eta_{2\eta_2}}$	-.00271	$C_{\eta_{3\eta_2}}$	-.00206	$C_{\eta_{4\eta_2}}$	-.00112
$C_{N_{\eta_3}}$	+.62104	$C_{m_{\eta_3}}$	-.34225	$C_{\eta_{1\eta_3}}$	-.20370	$C_{\eta_{2\eta_3}}$	-.07638	$C_{\eta_{3\eta_3}}$	-.24196	$C_{\eta_{4\eta_3}}$	-.02720
$C_{N_{\eta_4}}$	+.02040	$C_{m_{\eta_4}}$	-.01382	$C_{\eta_{1\eta_4}}$	-.01061	$C_{\eta_{2\eta_4}}$	-.00733	$C_{\eta_{3\eta_4}}$	-.01353	$C_{\eta_{4\eta_4}}$	-.00337
$C_{N_{\dot{\eta}_1}}$	+.63445	$C_{m_{\dot{\eta}_1}}$	-.44706	$C_{\eta_{1\dot{\eta}_1}}$	-.36619	$C_{\eta_{2\dot{\eta}_1}}$	-.10127	$C_{\eta_{3\dot{\eta}_1}}$	-1.57097	$C_{\eta_{4\dot{\eta}_1}}$	-.08236
$C_{N_{\dot{\eta}_2}}$	+.14040	$C_{m_{\dot{\eta}_2}}$	-.10543	$C_{\eta_{1\dot{\eta}_2}}$	-.10042	$C_{\eta_{2\dot{\eta}_2}}$	-.08515	$C_{\eta_{3\dot{\eta}_2}}$	-.10302	$C_{\eta_{4\dot{\eta}_2}}$	-.04422
$C_{N_{\dot{\eta}_3}}$	+2.56359	$C_{m_{\dot{\eta}_3}}$	-3.49609	$C_{\eta_{1\dot{\eta}_3}}$	-2.25843	$C_{\eta_{2\dot{\eta}_3}}$	-.11973	$C_{\eta_{3\dot{\eta}_3}}$	-30.35812	$C_{\eta_{4\dot{\eta}_3}}$	-.57668
$C_{N_{\dot{\eta}_4}}$	+.07301	$C_{m_{\dot{\eta}_4}}$	-.06154	$C_{\eta_{1\dot{\eta}_4}}$	-.09019	$C_{\eta_{2\dot{\eta}_4}}$	-.06199	$C_{\eta_{3\dot{\eta}_4}}$	-.41787	$C_{\eta_{4\dot{\eta}_4}}$	-.05636

Normalized Mode Shape Data
At Canard Station; FS 572

ϕ_1	+.50	ϕ_1'	+.0254
ϕ_2	-.03	ϕ_2'	-.0036
ϕ_3	+.50	ϕ_3'	-.2318
ϕ_4	-.05	ϕ_4'	+.0029

K_c	1.027
ℓ_{c_1}	85.64
ℓ_{c_2}	113.0

Structural Frequencies, Damping
and Generalized Forces

ω_1	14.8	M_1	9645	g_{s_1}	.02
ω_2	22.6	M_2	92.9	g_{s_2}	.02
ω_3	32.8	M_3	69750.0	g_{s_3}	.02
ω_4	42.6	M_4	62.5	g_{s_4}	.02

LOS ANGELES DIVISION
NORTH AMERICAN ROCKWELL CORPORATION

TABLE E14 - AERODYNAMIC, GEOMETRIC, AND MASS CHARACTERISTICS FOR CASE SC 4

Aerodynamic coefficients are for wing-body unless subscripts denote otherwise
Units: Ft., Slugs, Rad., Sec.

Mass and Geometric Data

Weight	Iy	C.G.		Sw	$\bar{c}_W$	δtip
357,505 Lbs	19,133,264	FS 1582.7	.209 $\bar{c}_W$	6297.8	78.532	25 Deg

Aerodynamic Coefficients Due to Rigid Body Modes, M = 1.22

C_{N_α}	+2.4310	C_{m_α}	-.60661	$C_{\eta_1\alpha}$	-.11300	$C_{\eta_2\alpha}$	-.26720	$C_{\eta_3\alpha}$	-10.800	$C_{\eta_4\alpha}$	+.02805
$C_{N_{\alpha_c}}$	+.24616	$C_{m_{\alpha_c}}$	+.24950	$C_{\eta_1\alpha_c}$	-.10690	$C_{\eta_2\alpha_c}$	+.00622	$C_{\eta_3\alpha_c}$	+.64550	$C_{\eta_4\alpha_c}$	+.00746
$(C_{N_{\alpha_c}})_I$	-.22754	$(C_{m_{\alpha_c}})_I$	-.05219	$(C_{\eta_1\alpha_c})_I$	-.06740	$(C_{\eta_2\alpha_c})_I$	+.00487	$(C_{\eta_3\alpha_c})_I$	+.21450	$(C_{\eta_4\alpha_c})_I$	+.00708
$C_{N_{\delta_c}}$	+.17309	$C_{m_{\delta_c}}$	+.18194	$C_{\eta_1\delta_c}$	-.07407	$C_{\eta_2\delta_c}$	+.00431	$C_{\eta_3\delta_c}$	+.44788	$C_{\eta_4\delta_c}$	+.00517
$(C_{N_{\delta_c}})_I$	-.15272	$(C_{m_{\delta_c}})_I$	-.04158	$(C_{\eta_1\delta_c})_I$	-.04570	$(C_{\eta_2\delta_c})_I$	+.00389	$(C_{\eta_3\delta_c})_I$	+.04930	$(C_{\eta_4\delta_c})_I$	+.00481
$C_{N_{\delta_e}}$	+.09727	$C_{m_{\delta_e}}$	-.06897	$C_{\eta_1\delta_e}$	-.04519	$C_{\eta_2\delta_e}$	-.01150	$C_{\eta_3\delta_e}$	+.69416	$C_{\eta_4\delta_e}$	-.00439
$C_{N_{\dot\alpha}}$	+.0042	$C_{m_{\dot\alpha}}$	+.2360	$C_{\eta_1\dot\alpha}$	+.4280	$C_{\eta_2\dot\alpha}$	+.2030	$C_{\eta_3\dot\alpha}$	-1.330	$C_{\eta_4\dot\alpha}$	-.0597
C_{N_q}	2.3690	C_{m_q}	-1.3823	$C_{\eta_1 q}$	-.90395	$C_{\eta_2 q}$	-.20427	$C_{\eta_3 q}$	+15.915	$C_{\eta_4 q}$	-.10536

Aerodynamic Coefficients Due to Structural Modes, M = 1.22

$C_{N_{\eta_1}}$	+.04167	$C_{m_{\eta_1}}$	-.02085	$C_{\eta_1\eta_1}$	-.00878	$C_{\eta_2\eta_1}$	-.00623	$C_{\eta_3\eta_1}$	-.05527	$C_{\eta_4\eta_1}$	-.00083
$C_{N_{\eta_2}}$	+.00632	$C_{m_{\eta_2}}$	-.00525	$C_{\eta_1\eta_2}$	-.00428	$C_{\eta_2\eta_2}$	-.00269	$C_{\eta_3\eta_2}$	-.00557	$C_{\eta_4\eta_2}$	-.00093
$C_{N_{\eta_3}}$	-1.44686	$C_{m_{\eta_3}}$	+.80081	$C_{\eta_1\eta_3}$	+.45999	$C_{\eta_2\eta_3}$	+.15082	$C_{\eta_3\eta_3}$	-.12551	$C_{\eta_4\eta_3}$	+.03943
$C_{N_{\eta_4}}$	+.01919	$C_{m_{\eta_4}}$	-.01319	$C_{\eta_1\eta_4}$	-.01019	$C_{\eta_2\eta_4}$	-.00714	$C_{\eta_3\eta_4}$	+.00134	$C_{\eta_4\eta_4}$	-.00302
$C_{N_{\dot\eta_1}}$	+.61314	$C_{m_{\dot\eta_1}}$	-.45257	$C_{\eta_1\dot\eta_1}$	-.35885	$C_{\eta_2\dot\eta_1}$	-.09596	$C_{\eta_3\dot\eta_1}$	+3.1897	$C_{\eta_4\dot\eta_1}$	-.06797
$C_{N_{\dot\eta_2}}$	+.13254	$C_{m_{\dot\eta_2}}$	-.10019	$C_{\eta_1\dot\eta_2}$	-.09520	$C_{\eta_2\dot\eta_2}$	-.08144	$C_{\eta_3\dot\eta_2}$	-.10336	$C_{\eta_4\dot\eta_2}$	-.03798
$C_{N_{\dot\eta_3}}$	-4.5879	$C_{m_{\dot\eta_3}}$	+8.12298	$C_{\eta_1\dot\eta_3}$	+4.9494	$C_{\eta_2\dot\eta_3}$	-.27587	$C_{\eta_3\dot\eta_3}$	-186.83	$C_{\eta_4\dot\eta_3}$	+1.06772
$C_{N_{\dot\eta_4}}$	+.04397	$C_{m_{\dot\eta_4}}$	-.05265	$C_{\eta_1\dot\eta_4}$	-.07459	$C_{\eta_2\dot\eta_4}$	-.05079	$C_{\eta_3\dot\eta_4}$	+.69992	$C_{\eta_4\dot\eta_4}$	-.04674

Normalized Mode Shape Data
At Canard Station; FS 572

ϕ_1	+.430	ϕ_1'	+.0236
ϕ_2	-.025	ϕ_2'	-.0034
ϕ_3	-2.60	ϕ_3'	+.6840
ϕ_4	-.030	ϕ_4'	+.0014

K_c	1.016
ℓ_{c_1}	84.10
ℓ_{c_2}	113.0

Structural Frequencies, Damping
and Generalized Forces

ω_1	15.22	M_1	866.0	g_{s_1}	.02
ω_2	23.15	M_2	82.3	g_{s_2}	.02
ω_3	34.2	M_3	516500.	g_{s_3}	.02
ω_4	46.1	M_4	41.4	g_{s_4}	.02

LOS ANGELES DIVISION
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TABLE E15.- AERODYNAMIC, GEOMETRIC, AND MASS CHARACTERISTICS FOR CASE SC5

Aerodynamic coefficients are for wing-body unless subscripts denote otherwise
Units: Ft., Slugs, Rad., Sec.

Mass and Geometric Data

Weight	Iy	C.G.		Sw	$\bar{c}_W$	δtip
338,505 Lbs	17,822,736	FS 1599.1	.226 $\bar{c}_W$	6297.8	78.532	25 Deg

Aerodynamic Coefficients Due to Rigid-Body Modes, M = 1.22

C_{N_α}	+2.3738	C_{m_α}	-.56412	$C_{\eta_{1\alpha}}$	-.11200	$C_{\eta_{2\alpha}}$	-.26338	$C_{\eta_{3\alpha}}$	+1.9825	$C_{\eta_{4\alpha}}$	+.03127
$C_{N_{\alpha_c}}$	+.23361	$C_{m_{\alpha_c}}$	+.25166	$C_{\eta_{1\alpha_c}}$	-.09343	$C_{\eta_{2\alpha_c}}$	+.00585	$C_{\eta_{3\alpha_c}}$	-.17519	$C_{\eta_{4\alpha_c}}$	+.00820
$(C_{N_{\alpha_c}})_I$	-.21931	$(C_{m_{\alpha_c}})_I$	-.05798	$(C_{\eta_{1\alpha_c}})_I$	-.06457	$(C_{\eta_{2\alpha_c}})_I$	+.00549	$(C_{\eta_{3\alpha_c}})_I$	-.00144	$(C_{\eta_{4\alpha_c}})_I$	+.00684
$C_{N_{\delta_c}}$	+.17089	$C_{m_{\delta_c}}$	+.18274	$C_{\eta_{1\delta_c}}$	-.06836	$C_{\eta_{2\delta_c}}$	+.00428	$C_{\eta_{3\delta_c}}$	-.12817	$C_{\eta_{4\delta_c}}$	+.00598
$(C_{N_{\delta_c}})_I$	-.15272	$(C_{m_{\delta_c}})_I$	-.04410	$(C_{\eta_{1\delta_c}})_I$	-.04565	$(C_{\eta_{2\delta_c}})_I$	+.00441	$(C_{\eta_{3\delta_c}})_I$	+.01930	$(C_{\eta_{4\delta_c}})_I$	+.00483
$C_{N_{\delta_e}}$	+.09735	$C_{m_{\delta_e}}$	-.06743	$C_{\eta_{1\delta_e}}$	-.04507	$C_{\eta_{2\delta_e}}$	-.01115	$C_{\eta_{3\delta_e}}$	-.13561	$C_{\eta_{4\delta_e}}$	-.00417
$C_{N_{\dot\alpha}}$	+.0042	$C_{m_{\dot\alpha}}$	+.2360	$C_{\eta_{1\dot\alpha}}$	+.4210	$C_{\eta_{2\dot\alpha}}$	+.1960	$C_{\eta_{3\dot\alpha}}$	+.1550	$C_{\eta_{4\dot\alpha}}$	-.0575
C_{N_q}	2.2918	C_{m_q}	-1.2867	$C_{\eta_{1q}}$	-.90160	$C_{\eta_{2q}}$	-.18697	$C_{\eta_{3q}}$	-.63509	$C_{\eta_{4q}}$	-.09283

Aerodynamic Coefficients Due to Structural Modes, M = 1.22

$C_{N_{\eta_1}}$	+.04157	$C_{m_{\eta_1}}$	-.01999	$C_{\eta_1\eta_1}$	-.00886	$C_{\eta_2\eta_1}$	-.00622	$C_{\eta_3\eta_1}$	+.00949	$C_{\eta_4\eta_1}$	-.00068
$C_{N_{\eta_2}}$	+.00583	$C_{m_{\eta_2}}$	-.00444	$C_{\eta_1\eta_2}$	-.00415	$C_{\eta_2\eta_2}$	-.00264	$C_{\eta_3\eta_2}$	+.00011	$C_{\eta_4\eta_2}$	-.00090
$C_{N_{\eta_3}}$	+.29786	$C_{m_{\eta_3}}$	-.16306	$C_{\eta_1\eta_3}$	-.10050	$C_{\eta_2\eta_3}$	-.03529	$C_{\eta_3\eta_3}$	-.00835	$C_{\eta_4\eta_3}$	-.00971
$C_{N_{\eta_4}}$	+.01931	$C_{m_{\eta_4}}$	-.01296	$C_{\eta_1\eta_4}$	-.01028	$C_{\eta_2\eta_4}$	-.00716	$C_{\eta_3\eta_4}$	-.00394	$C_{\eta_4\eta_4}$	-.00294
$C_{N_{\dot\eta_1}}$	+.61397	$C_{m_{\dot\eta_1}}$	-.44461	$C_{\eta_1\dot\eta_1}$	-.35514	$C_{\eta_2\dot\eta_1}$	-.09428	$C_{\eta_3\dot\eta_1}$	-.65581	$C_{\eta_4\dot\eta_1}$	-.06602
$C_{N_{\dot\eta_2}}$	+.13053	$C_{m_{\dot\eta_2}}$	-.09359	$C_{\eta_1\dot\eta_2}$	-.09234	$C_{\eta_2\dot\eta_2}$	-.08074	$C_{\eta_3\dot\eta_2}$	-.01013	$C_{\eta_4\dot\eta_2}$	-.03566
$C_{N_{\dot\eta_3}}$	+.87761	$C_{m_{\dot\eta_3}}$	-1.5749	$C_{\eta_1\dot\eta_3}$	-.01549	$C_{\eta_2\dot\eta_3}$	+.01278	$C_{\eta_3\dot\eta_3}$	-.38110	$C_{\eta_4\dot\eta_3}$	-.25306
$C_{N_{\dot\eta_4}}$	+.03867	$C_{m_{\dot\eta_4}}$	-.04697	$C_{\eta_1\dot\eta_4}$	-.07453	$C_{\eta_2\dot\eta_4}$	-.04963	$C_{\eta_3\dot\eta_4}$	-.19674	$C_{\eta_4\dot\eta_4}$	-.04647

Normalized Mode Shape Data
At Canard Station; FS 572

ϕ_1	+.400	ϕ_1'	+.0221
ϕ_2	-.025	ϕ_2'	-.0030
ϕ_3	+.750	ϕ_3'	-.1360
ϕ_4	-.035	ϕ_4'	+.0010

K_c	1.017
ℓ_{c1}	85.43
ℓ_{c2}	113.0

Structural Frequencies, Damping
and Generalized Forces

ω_1	15.40	M_1	800.0	g_{s_1}	.02
ω_2	23.35	M_2	79.6	g_{s_2}	.02
ω_3	35.55	M_3	21700.	g_{s_3}	.02
ω_4	46.6	M_4	42.4	g_{s_4}	.02

TABLE E16.- AERODYNAMIC, GEOMETRIC, AND MASS CHARACTERISTICS FOR CASE SC6

Aerodynamic coefficients are for wing-body unless subscripts denote otherwise
Units: Ft., Slugs, Rad., Sec.

Mass and Geometric Data

Weight	Iy	C.G.		Sw	$\bar{c}_w$	δtip
412,504 Lbs	21,155,952	FS 1593.2	.220 $\bar{c}_w$	6297.8	78.532	65 Deg

Aerodynamic Coefficients Due to Rigid-Body Modes, M = 1.61

C_{N_α}	+1.7696	C_{m_α}	-.34879	$C_{\eta_1\alpha}$	-.03008	$C_{\eta_2\alpha}$	-.13909	$C_{\eta_3\alpha}$	-.87066	$C_{\eta_4\alpha}$	-.05150
$C_{N_{\alpha_c}}$	+.19468	$C_{m_{\alpha_c}}$	+.21258	$C_{\eta_1\alpha_c}$	-.14203	$C_{\eta_2\alpha_c}$	+.00428	$C_{\eta_3\alpha_c}$	+.02335	$C_{\eta_4\alpha_c}$	+.00156
$(C_{N_{\alpha_c}})_I$	-.13404	$(C_{m_{\alpha_c}})_I$	-.05631	$(C_{\eta_1\alpha_c})_I$	-.08460	$(C_{\eta_2\alpha_c})_I$	+.00585	$(C_{\eta_3\alpha_c})_I$	+.00645	$(C_{\eta_4\alpha_c})_I$	+.00092
$C_{N_{\delta_c}}$	+.14194	$C_{m_{\delta_c}}$	+.15080	$C_{\eta_1\delta_c}$	-.10355	$C_{\eta_2\delta_c}$	+.00312	$C_{\eta_3\delta_c}$	+.01703	$C_{\eta_4\delta_c}$	+.00114
$(C_{N_{\delta_c}})_I$	-.10116	$(C_{m_{\delta_c}})_I$	-.03588	$(C_{\eta_1\delta_c})_I$	-.04670	$(C_{\eta_2\delta_c})_I$	+.00206	$(C_{\eta_3\delta_c})_I$	-.00291	$(C_{\eta_4\delta_c})_I$	+.00101
$C_{N_{\delta_e}}$	+.07371	$C_{m_{\delta_e}}$	-.05200	$C_{\eta_1\delta_e}$	-.05550	$C_{\eta_2\delta_e}$	-.00761	$C_{\eta_3\delta_e}$	+.09133	$C_{\eta_4\delta_e}$	+.00195
$C_{N_{\dot\alpha}}$	-.0760	$C_{m_{\dot\alpha}}$	+.1500	$C_{\eta_1\dot\alpha}$	+.4100	$C_{\eta_2\dot\alpha}$	+.2070	$C_{\eta_3\dot\alpha}$	+.0247	$C_{\eta_4\dot\alpha}$	+.0505
C_{N_q}	1.1310	C_{m_q}	-.7813	$C_{\eta_1 q}$	-.51832	$C_{\eta_2 q}$	-.05228	$C_{\eta_3 q}$	+.71731	$C_{\eta_4 q}$	-.01586

Aerodynamic Coefficients Due to Structural Modes, M = 1.61

$C_{N_{\eta_1}}$	+.03440	$C_{m_{\eta_1}}$	-.01726	$C_{\eta_1\eta_1}$	-.00701	$C_{\eta_2\eta_1}$	-.00486	$C_{\eta_3\eta_1}$	-.00569	$C_{\eta_4\eta_1}$	-.00263
$C_{N_{\eta_2}}$	+.00173	$C_{m_{\eta_2}}$	-.00138	$C_{\eta_1\eta_2}$	-.00256	$C_{\eta_2\eta_2}$	-.00143	$C_{\eta_3\eta_2}$	-.00187	$C_{\eta_4\eta_2}$	-.00089
$C_{N_{\eta_3}}$	-.07786	$C_{m_{\eta_3}}$	+.04372	$C_{\eta_1\eta_3}$	+.04174	$C_{\eta_2\eta_3}$	+.00598	$C_{\eta_3\eta_3}$	-.01287	$C_{\eta_4\eta_3}$	+.00421
$C_{N_{\eta_4}}$	+.00315	$C_{m_{\eta_4}}$	-.00214	$C_{\eta_1\eta_4}$	-.00345	$C_{\eta_2\eta_4}$	-.00318	$C_{\eta_3\eta_4}$	-.00349	$C_{\eta_4\eta_4}$	-.00223
$C_{N_{\dot\eta_1}}$	+.29994	$C_{m_{\dot\eta_1}}$	-.25872	$C_{\eta_1\dot\eta_1}$	-.45319	$C_{\eta_2\dot\eta_1}$	-.03463	$C_{\eta_3\dot\eta_1}$	+.33158	$C_{\eta_4\dot\eta_1}$	-.04087
$C_{N_{\dot\eta_2}}$	+.02676	$C_{m_{\dot\eta_2}}$	-.02702	$C_{\eta_1\dot\eta_2}$	-.04873	$C_{\eta_2\dot\eta_2}$	-.04461	$C_{\eta_3\dot\eta_2}$	-.03362	$C_{\eta_4\dot\eta_2}$	-.02770
$C_{N_{\dot\eta_3}}$	-.00680	$C_{m_{\dot\eta_3}}$	+.18822	$C_{\eta_1\dot\eta_3}$	+.27808	$C_{\eta_2\dot\eta_3}$	-.05754	$C_{\eta_3\dot\eta_3}$	-1.26980	$C_{\eta_4\dot\eta_3}$	-.03478
$C_{N_{\dot\eta_4}}$	+.01763	$C_{m_{\dot\eta_4}}$	-.00785	$C_{\eta_1\dot\eta_4}$	-.03652	$C_{\eta_2\dot\eta_4}$	-.02855	$C_{\eta_3\dot\eta_4}$	-.02438	$C_{\eta_4\dot\eta_4}$	-.02500

Normalized Mode Shape Data
At Canard Station; FS 572

ϕ_1	+.73	ϕ_1'	+.036
ϕ_2	-.022	ϕ_2'	-.0025
ϕ_3	-.12	ϕ_3'	+.0558
ϕ_4	-.008	ϕ_4'	+.0020

K_c	1.014
ℓ_{c_1}	84.33
ℓ_{c_2}	113.0

Structural Frequencies, Damping
and Generalized Forces

ω_1	14.65	M_1	2275	g_{s_1}	.02
ω_2	23.65	M_2	65.1	g_{s_2}	.02
ω_3	31.8	M_3	4450.	g_{s_3}	.02
ω_4	43.5	M_4	36.5	g_{s_4}	.02

TABLE E17.- AERODYNAMIC, GEOMETRIC, AND MASS CHARACTERISTICS FOR CASE SC7

Aerodynamic coefficients are for wing-body unless subscripts denote otherwise
Units: Ft., Slugs, Rad., Sec.

Mass and Geometric Data

Weight	Iy	C.G.		Sw	$\bar{c}_w$	δ_{tip}
385,155 Lbs	20,633,984	FS 1585.6	.212 $\bar{c}_w$	6297.8	78.532	65 Deg

Aerodynamic Coefficients Due to Rigid-Body Modes, M = 2.39

C_{N_α}	+1.3995	C_{m_α}	-.26654	$C_{\eta_{1\alpha}}$	-.01649	$C_{\eta_{2\alpha}}$	-.09671	$C_{\eta_{3\alpha}}$	-.55840	$C_{\eta_{4\alpha}}$	-.03954
$C_{N_{\alpha_c}}$	+.12613	$C_{m_{\alpha_c}}$	+.13605	$C_{\eta_{1\alpha_c}}$	-.08831	$C_{\eta_{2\alpha_c}}$	+.00253	$C_{\eta_{3\alpha_c}}$	+.01892	$C_{\eta_{4\alpha_c}}$	-.00063
$(C_{N_{\alpha_c}})_I$	-.03675	$(C_{m_{\alpha_c}})_I$	-.02654	$(C_{\eta_{1\alpha_c}})_I$	-.02336	$(C_{\eta_{2\alpha_c}})_I$	+.00165	$(C_{\eta_{3\alpha_c}})_I$	+.00360	$(C_{\eta_{4\alpha_c}})_I$	-.00036
$C_{N_{\delta_c}}$	+.09488	$C_{m_{\delta_c}}$	+.09834	$C_{\eta_{1\delta_c}}$	-.06642	$C_{\eta_{2\delta_c}}$	+.00190	$C_{\eta_{3\delta_c}}$	+.01423	$C_{\eta_{4\delta_c}}$	-.00048
$(C_{N_{\delta_c}})_I$	-.02609	$(C_{m_{\delta_c}})_I$	-.00652	$(C_{\eta_{1\delta_c}})_I$	-.01190	$(C_{\eta_{2\delta_c}})_I$	+.00057	$(C_{\eta_{3\delta_c}})_I$	-.00021	$(C_{\eta_{4\delta_c}})_I$	-.00009
$C_{N_{\delta_e}}$	+.04392	$C_{m_{\delta_e}}$	-.03243	$C_{\eta_{1\delta_e}}$	-.03348	$C_{\eta_{2\delta_e}}$	-.00464	$C_{\eta_{3\delta_e}}$	+.04560	$C_{\eta_{4\delta_e}}$	+.00306
$C_{N_{\dot\alpha}}$	—	$C_{m_{\dot\alpha}}$	—	$C_{\eta_{1\dot\alpha}}$	—	$C_{\eta_{2\dot\alpha}}$	—	$C_{\eta_{3\dot\alpha}}$	—	$C_{\eta_{4\dot\alpha}}$	—
C_{N_q}	+.5359	C_{m_q}	-.4524	$C_{\eta_{1q}}$	-.16252	$C_{\eta_{2q}}$	-.03669	$C_{\eta_{3q}}$	+.26256	$C_{\eta_{4q}}$	-.12326

Aerodynamic Coefficients Due to Structural Modes, M = 2.39

$C_{N_{\eta_1}}$	+.01990	$C_{m_{\eta_1}}$	-.01180	$C_{\eta_{1\eta_1}}$	-.00343	$C_{\eta_{2\eta_1}}$	-.00292	$C_{\eta_{3\eta_1}}$	-.00194	$C_{\eta_{4\eta_1}}$	-.00157
$C_{N_{\eta_2}}$	+.00092	$C_{m_{\eta_2}}$	-.00106	$C_{\eta_{1\eta_2}}$	-.00177	$C_{\eta_{2\eta_2}}$	-.00109	$C_{\eta_{3\eta_2}}$	-.00162	$C_{\eta_{4\eta_2}}$	-.00067
$C_{N_{\eta_3}}$	-.03375	$C_{m_{\eta_3}}$	+.01826	$C_{\eta_{1\eta_3}}$	+.02256	$C_{\eta_{2\eta_3}}$	+.00161	$C_{\eta_{3\eta_3}}$	-.00426	$C_{\eta_{4\eta_3}}$	+.00147
$C_{N_{\eta_4}}$	+.00136	$C_{m_{\eta_4}}$	-.00086	$C_{\eta_{1\eta_4}}$	-.00185	$C_{\eta_{2\eta_4}}$	-.00203	$C_{\eta_{3\eta_4}}$	-.00274	$C_{\eta_{4\eta_4}}$	-.00154
$C_{N_{\dot\eta_1}}$	+.05780	$C_{m_{\dot\eta_1}}$	-.08121	$C_{\eta_{1\dot\eta_1}}$	-.29644	$C_{\eta_{2\dot\eta_1}}$	-.00909	$C_{\eta_{3\dot\eta_1}}$	+.14078	$C_{\eta_{4\dot\eta_1}}$	-.01579
$C_{N_{\dot\eta_2}}$	+.02039	$C_{m_{\dot\eta_2}}$	-.01871	$C_{\eta_{1\dot\eta_2}}$	-.03037	$C_{\eta_{2\dot\eta_2}}$	-.03418	$C_{\eta_{3\dot\eta_2}}$	-.03404	$C_{\eta_{4\dot\eta_2}}$	-.02046
$C_{N_{\dot\eta_3}}$	+.19368	$C_{m_{\dot\eta_3}}$	+.13523	$C_{\eta_{1\dot\eta_3}}$	+.02338	$C_{\eta_{2\dot\eta_3}}$	-.05824	$C_{\eta_{3\dot\eta_3}}$	-.64242	$C_{\eta_{4\dot\eta_3}}$	-.04032
$C_{N_{\dot\eta_4}}$	+.00580	$C_{m_{\dot\eta_4}}$	-.00409	$C_{\eta_{1\dot\eta_4}}$	-.01891	$C_{\eta_{2\dot\eta_4}}$	-.01568	$C_{\eta_{3\dot\eta_4}}$	-.01814	$C_{\eta_{4\dot\eta_4}}$	-.01485

Normalized Mode Shape Data
At Canard Station; FS 572

ϕ_1	+.70	ϕ_1'	+.0348
ϕ_2	-.02	ϕ_2'	-.0028
ϕ_3	-.15	ϕ_3'	+.0515
ϕ_4	+.005	ϕ_4'	+.0008

K_c	.994
l_{c_1}	83.32
l_{c_2}	113.0

Structural Frequencies, Damping and Generalized Forces

ω_1	14.85	M_1	2160	g_{s_1}	.02
ω_2	23.78	M_2	64.3	g_{s_2}	.02
ω_3	32.85	M_3	3360.	g_{s_3}	.02
ω_4	43.8	M_4	29.6	g_{s_4}	.02

TABLE E18.- NORMAL FORCE AND PITCHING MOMENT COEFFICIENT DUE TO VERTICAL ACCELERATION AND DUE TO PITCHING, RIGID AIRPLANE

Case ID	Coefficient			
	$C_{N_{\dot{\alpha}}A/P}$	$C_{m_{\dot{\alpha}}A/P}$	$C_{N_{q}A/P}$	$C_{m_{q}A/P}$
SC1	1.1502	-.4599	3.3350	-1.7800
SC2	1.1622	-.4379	3.1750	-1.7320
SC3	.0306	.2431	2.2770	-1.7160
SC4	.0316	.2423	2.3300	-1.8020
SC5	.0306	.2430	2.2600	-1.7090
SC6	-.0638	.1551	1.0000	-1.1175
SC7	.0014	.0008	.3465	- .6850

Moments and pitching motion referenced to flight C.G. of each case

APPENDIX F

VEHICLE DEFLECTIONS AT 1G TRIM

This appendix contains tabulations of the structural deformations of the vehicle at 1g trim for each of the performance cases that were studied. Deflections are measured in the z-direction from the undeformed positions of the points, except on the folded wing tip where deflections are measured perpendicular to the undeformed wing tip plane. Positive deflections are down.

The grid network of points at which wing-body deflections are specified is defined in figure C2, Appendix C. Wing-body deformations are presented in tables F1 through F11. For performance case P8, data are shown for a canard-to-elevon gearing which matches the flight test control values based on the final aerodynamic description. Data are also shown for the design gearing and the early Phase 1 aerodynamic representation, which was the basis for definition of the Deformed Model shape. Isometric plots of the deformation patterns are shown along with the discussions of trimmed airplane characteristics in the main body of the report.

The grid network of points at which canard deflections are specified is defined in table F12. Canard deformations are listed in table F13.

Table F1.- WING-BODY DEFLECTIONS AT 1G TRIM

Performance Case P1

Mach No. 0.76 Altitude 25,750 ft

Sta	Deflect.-In.	Sta	Deflect.-In.	Sta	Deflect.-In.
1	-0.80312347E 00	42	-0.62445047E-01	83	-0.12586048E 01
2	-0.75722956E 00	43	-0.30113970E-00	84	-0.16520165E 01
3	-0.70632539E 00	44	-0.51402451E 00	85	-0.19785419E 01
4	-0.66564470E 00	45	-0.60558787E 00	86	-0.23244991E 01
5	-0.58766807E 00	46	-0.54737790E 00	87	-0.26025996E 01
6	-0.55065789E 00	47	-0.61002849E 00	88	-0.27867481E 01
7	-0.48684724E-00	48	-0.63850603E 00	89	-0.28704520E 01
8	-0.44473223E-00	49	-0.69925808E 00	90	-0.30490201E 01
9	-0.35004967E-00	50	0.13566751E-00	91	-0.14569096E 01
10	-0.20034889E-00	51	0.76009323E-01	92	-0.17825161E 01
11	-0.13523711E-00	52	-0.32511052E-01	93	-0.22467340E 01
12	-0.76536359E-01	53	-0.31649344E-00	94	-0.27117226E 01
13	0.14590714E-00	54	-0.61720937E 00	95	-0.31091947E 01
14	0.26696426E-00	55	-0.86050212E 00	96	-0.33262264E 01
15	0.30751602E-00	56	-0.96514416E 00	97	-0.35882128E 01
16	0.34173762E-00	57	-0.95860159E 00	98	-0.37072975E 01
17	0.35134654E-00	58	-0.10444028E 01	99	-0.39613448E 01
18	0.35377928E-00	59	-0.10834034E 01	100	-0.24532156E 01
19	0.31153826E-00	60	-0.11666046E 01	101	-0.28673702E 01
20	0.29057434E-00	61	-0.13141023E-00	102	-0.33674883E 01
21	0.26431827E-00	62	-0.24148560E-00	103	-0.38480236E 01
22	0.23239004E-00	63	-0.56745350E 00	104	-0.42012560E 01
23	0.31231169E-00	64	-0.97431404E 00	105	-0.46406426E 01
24	0.34673803E-00	65	-0.12763873E 01	106	-0.36449885E 01
25	0.36743796E-00	66	-0.14063112E 01	107	-0.41560149E 01
26	0.35181735E-00	67	-0.13995764E 01	108	-0.47297575E 01
27	0.30522896E-00	68	-0.15190265E 01	109	-0.50732162E 01
28	0.23690555E-00	69	-0.15733219E 01	110	-0.55423305E 01
29	0.21457198E-00	70	-0.16891522E 01	111	-0.48140904E 01
30	0.19218998E-00	71	-0.27681936E-00	112	-0.51027935E 01
31	0.33856402E-00	72	-0.46653514E-00	113	-0.53978645E 01
32	0.29616883E-00	73	-0.83771817E 00	114	-0.57339175E 01
33	0.30497796E-00	74	-0.13588882E 01	115	-0.62175062E 01
34	0.26433734E-00	75	-0.17242636E 01	116	-0.61183310E 01
35	0.20710237E-00	76	-0.18814142E 01	117	-0.64463980E 01
36	0.48404409E-01	77	-0.19662312E 01	118	-0.69505010E 01
37	-0.10238581E-00	78	-0.21066006E 01		
38	-0.24344761E-00	79	-0.21704049E 01		
39	0.23402707E-00	80	-0.23065208E 01		
40	0.18529741E-00	81	-0.70433228E 00		
41	0.10801238E-00	82	-0.96361051E 00		

Table F2.- WING-BODY DEFLECTIONS AT 1G TRIM

Performance Case P2

Mach No. 0.93 Altitude 32,700 ft

Sta	Deflect.-In.	Sta	Deflect.-In.	Sta	Deflect.-In.
1	-0.21905082E 01	42	-0.18228467E-00	83	-0.24492610E 01
2	-0.19565887E 01	43	-0.44267316E-00	84	-0.29483017E 01
3	-0.16971321E 01	44	-0.68355837E 00	85	-0.33672263E 01
4	-0.15435132E 01	45	-0.78716490E 00	86	-0.38149936E 01
5	-0.13294685E 01	46	-0.64461373E 00	87	-0.42444287E 01
6	-0.12278761E 01	47	-0.70111091E 00	88	-0.44636349E 01
7	-0.10527168E 01	48	-0.72679148E 00	89	-0.45632742E 01
8	-0.93711173E 00	49	-0.78157663E 00	90	-0.47758378E 01
9	-0.72247625E 00	50	0.89299161E-01	91	-0.30221782E 01
10	-0.38312018E-00	51	-0.48836505E-01	92	-0.34098039E 01
11	-0.25259290E-00	52	-0.29000484E-00	93	-0.39890588E 01
12	-0.13822489E-00	53	-0.69372441E 00	94	-0.46079142E 01
13	0.25267892E-00	54	-0.10393547E 01	95	-0.51300654E 01
14	0.44481721E-00	55	-0.13114871E 01	96	-0.54389259E 01
15	0.49696516E-00	56	-0.14285333E 01	97	-0.57815979E 01
16	0.54702787E 00	57	-0.13960487E 01	98	-0.59373579E 01
17	0.58045677E 00	58	-0.15077681E 01	99	-0.62696457E 01
18	0.64499491E 00	59	-0.15585497E 01	100	-0.45785600E 01
19	0.65586732E 00	60	-0.16668838E 01	101	-0.50822330E 01
20	0.70371321E 00	61	-0.50507739E 00	102	-0.57308665E 01
21	0.74813956E 00	62	-0.74789715E 00	103	-0.63223802E 01
22	0.42214011E-00	63	-0.11962061E 01	104	-0.67657576E 01
23	0.50913772E 00	64	-0.17048053E 01	105	-0.73172757E 01
24	0.54750998E 00	65	-0.20597284E 01	106	-0.63709746E 01
25	0.57095051E 00	66	-0.22123835E 01	107	-0.70203768E 01
26	0.55540325E 00	67	-0.22089452E 01	108	-0.77347855E 01
27	0.53967675E 00	68	-0.23764417E 01	109	-0.81421585E 01
28	0.52936763E 00	69	-0.24525764E 01	110	-0.86985698E 01
29	0.59538680E 00	70	-0.26149973E 01	111	-0.81457839E 01
30	0.65707207E 00	71	-0.98733303E 00	112	-0.84712537E 01
31	0.54666077E 00	72	-0.12410119E 01	113	-0.88049926E 01
32	0.42720664E-00	73	-0.17373402E 01	114	-0.91850842E 01
33	0.43092257E-00	74	-0.24214444E 01	115	-0.97320452E 01
34	0.37504932E-00	75	-0.28655268E 01	116	-0.99590720E 01
35	0.35618646E-00	76	-0.30565298E 01	117	-0.10309744E 02
36	0.20926641E-00	77	-0.32012790E 01	118	-0.10848582E 02
37	0.55763012E-01	78	-0.33974586E 01		
38	-0.87836930E-01	79	-0.34866313E 01		
39	0.30799738E-00	80	-0.36768660E 01		
40	0.18065007E-00	81	-0.17921835E 01		
41	0.27594595E-01	82	-0.20917308E 01		

Table F3.- WING-BODY DEFLECTIONS AT 1G TRIM

Performance Case P3

Mach No. 1.18 Altitude 33,750 ft

Sta	Deflect.-In.	Sta	Deflect.-In.	Sta	Deflect.-In.
1	-0.16906544E 01	42	0.18039109E-00	83	-0.41817036E-02
2	-0.12020033E 01	43	-0.63632895E-01	84	-0.54828094E 00
3	-0.66000598E 00	44	-0.28858879E-00	85	-0.10134732E 01
4	-0.43262042E-00	45	-0.38534401E-00	86	-0.15022825E 01
5	-0.30470943E-00	46	-0.38575358E-00	87	-0.17826889E 01
6	-0.24399880E-00	47	-0.48280757E-00	88	-0.20460906E 01
7	-0.13932531E-00	48	-0.52692302E 00	89	-0.21658185E 01
8	-0.70240809E-01	49	-0.62103597E 00	90	-0.24212383E 01
9	-0.38111661E-02	50	0.68951836E-01	91	0.33104121E-00
10	0.10121948E-00	51	0.17820867E-00	92	-0.21525253E-00
11	0.10900617E-00	52	0.36025335E-00	93	-0.94617239E 00
12	0.10868572E-00	53	0.19686855E-00	94	-0.15854612E 01
13	0.62645511E-01	54	-0.12606934E-00	95	-0.21390428E 01
14	-0.72944769E-03	55	-0.45651671E-00	96	-0.24120633E 01
15	0.12481120E-01	56	-0.59864461E 00	97	-0.28098990E 01
16	0.47044265E-01	57	-0.60781220E 00	98	-0.29907335E 01
17	0.90274816E-01	58	-0.73257002E 00	99	-0.33765136E 01
18	0.15938029E-00	59	-0.78927810E 00	100	-0.56866878E 00
19	0.22487896E-00	60	-0.91025538E 00	101	-0.12455301E 01
20	0.26758481E-00	61	0.28532935E-00	102	-0.20383111E 01
21	0.29217631E-00	62	0.46441050E-00	103	-0.29820409E 01
22	-0.20167953E-01	63	0.22101045E-00	104	-0.36494860E 01
23	0.32376063E-01	64	-0.22963014E-00	105	-0.44797226E 01
24	0.59566271E-01	65	-0.65844564E 00	106	-0.18988903E 01
25	0.10531656E-00	66	-0.84288240E 00	107	-0.27835803E 01
26	0.16000540E-00	67	-0.79659373E 00	108	-0.38728225E 01
27	0.19821817E-00	68	-0.95949409E 00	109	-0.46460019E 01
28	0.19314452E-00	69	-0.10335396E 01	110	-0.57020520E 01
29	0.16724479E-00	70	-0.11915036E 01	111	-0.30582628E 01
30	0.13957345E-00	71	0.74502677E 00	112	-0.37985492E 01
31	-0.58781042E-01	72	0.57657973E 00	113	-0.45477851E 01
32	0.10692034E-00	73	0.24700941E-00	114	-0.54010816E 01
33	0.14794154E-00	74	-0.34115713E-00	115	-0.66289963E 01
34	0.18658614E-00	75	-0.87590756E 00	116	-0.52756447E 01
35	0.17414531E-00	76	-0.11059077E 01	117	-0.62153371E 01
36	0.34599295E-01	77	-0.11598415E 01	118	-0.76592547E 01
37	-0.71389386E-01	78	-0.13510116E 01		
38	-0.17054009E-00	79	-0.14379071E 01		
39	0.16343297E-01	80	-0.16232841E 01		
40	0.16386440E-00	81	0.89348131E 00		
41	0.27263238E-00	82	0.45077632E-00		

Table F4.- WING-BODY DEFLECTIONS AT 1G TRIM

Performance Case P4

Mach No. 1.60 Altitude 38,600 ft

Sta	Deflect.-In.	Sta	Deflect.-In.	Sta	Deflect.-In.
1	0.30019914E-01	42	0.16767329E-00	83	-0.30389476E-00
2	-0.15591229E-00	43	-0.32527100E-00	84	-0.58560627E 00
3	-0.36214278E-00	44	-0.70489611E 00	85	-0.77564503E 00
4	-0.44450048E-00	45	-0.86817572E 00	86	-0.97153646E 00
5	-0.47896166E-00	46	-0.90088190E 00	87	-0.12072459E 01
6	-0.49531804E-00	47	-0.10113599E 01	88	-0.13214001E 01
7	-0.52351870E 00	48	-0.10615773E 01	89	-0.13732884E 01
8	-0.54213114E 00	49	-0.11687075E 01	90	-0.14839833E 01
9	-0.51235110E 00	50	0.64653237E 00	91	-0.29259673E-00
10	-0.46526648E-00	51	0.59454058E 00	92	-0.62556893E 00
11	-0.38880531E-00	52	0.48704032E-00	93	-0.99878559E 00
12	-0.30902896E-00	53	0.88052357E-01	94	-0.12383244E 01
13	0.56611203E-01	54	-0.51756218E 00	95	-0.14526323E 01
14	0.26898361E-00	55	-0.96513655E 00	96	-0.17241742E 01
15	0.36931698E-00	56	-0.11576416E 01	97	-0.18939224E 01
16	0.45185786E-00	57	-0.12072393E 01	98	-0.19710806E 01
17	0.45363898E-00	58	-0.13524450E 01	99	-0.21356849E 01
18	0.33345119E-00	59	-0.14184476E 01	100	-0.88144707E 00
19	0.12042198E-00	60	-0.15592532E 01	101	-0.12470035E 01
20	-0.22807037E-01	61	0.60483915E 00	102	-0.16047828E 01
21	-0.15499438E-00	62	0.49165644E-00	103	-0.18338867E 01
22	0.15685443E-00	63	-0.60757421E-01	104	-0.20965610E 01
23	0.35649077E-00	64	-0.73915081E 00	105	-0.24233021E 01
24	0.45118890E-00	65	-0.12594319E 01	106	-0.17868607E 01
25	0.51199535E 00	66	-0.14832087E 01	107	-0.22241296E 01
26	0.47338457E-00	67	-0.15948429E 01	108	-0.27268752E 01
27	0.30796078E-00	68	-0.17525890E 01	109	-0.30693386E 01
28	0.59261622E-01	69	-0.18242916E 01	110	-0.35370936E 01
29	-0.13422096E-00	70	-0.19772578E 01	111	-0.27032901E 01
30	-0.31481709E-00	71	0.86342233E 00	112	-0.30497254E 01
31	0.42890976E-00	72	0.49662765E-00	113	-0.34035100E 01
32	0.47596025E-00	73	-0.22101411E-00	114	-0.38064313E 01
33	0.52276620E 00	74	-0.97778470E 00	115	-0.43862449E 01
34	0.45439703E-00	75	-0.15763654E 01	116	-0.41331728E 01
35	0.25387358E-00	76	-0.18338194E 01	117	-0.46012901E 01
36	-0.10174578E-00	77	-0.19182903E 01	118	-0.53205922E 01
37	-0.39334001E-00	78	-0.21492558E 01		
38	-0.66612171E 00	79	-0.22542401E 01		
39	0.53854411E 00	80	-0.24782067E 01		
40	0.55796309E 00	81	0.29972652E-00		
41	0.46756147E-00	82	-0.15372497E-01		

Table F5.- WING-BODY DEFLECTIONS AT 1G TRIM

Performance Case P5

Mach No. 1.67 Altitude 42,000 ft

Sta	Deflect.-In.	Sta	Deflect.-In.	Sta	Deflect.-In.
1	0.44317218E-02	42	0.14102186E-00	83	-0.32214285E-00
2	-0.15637919E-00	43	-0.28345865E-00	84	-0.57813782E 00
3	-0.33474586E-00	44	-0.60687176E 00	85	-0.74712327E 00
4	-0.40560543E-00	45	-0.74597416E 00	86	-0.92517579E 00
5	-0.43414492E-00	46	-0.75959709E 00	87	-0.11723579E 01
6	-0.44769068E-00	47	-0.84602324E 00	88	-0.12763860E 01
7	-0.47104544E-00	48	-0.88530784E 00	89	-0.13236715E 01
8	-0.48645958E-00	49	-0.96911500E 00	90	-0.14245472E 01
9	-0.46090301E-00	50	0.54191315E 00	91	-0.35184881E-00
10	-0.42049601E-00	51	0.49624318E-00	92	-0.66402894E 00
11	-0.35435537E-00	52	0.40268005E-00	93	-0.10223906E 01
12	-0.28531989E-00	53	0.55535730E-01	94	-0.12573979E 01
13	0.34075040E-01	54	-0.47395208E-00	95	-0.14600138E 01
14	0.22173540E-00	55	-0.86019392E 00	96	-0.17435439E 01
15	0.31454770E-00	56	-0.10263194E 01	97	-0.19221754E 01
16	0.39469128E-00	57	-0.10616709E 01	98	-0.20033714E 01
17	0.40433504E-00	58	-0.11793329E 01	99	-0.21765897E 01
18	0.31433088E-00	59	-0.12328155E 01	100	-0.95323983E 00
19	0.14948711E-00	60	-0.13469119E 01	101	-0.12986194E 01
20	0.43676710E-01	61	0.49336007E-00	102	-0.16625864E 01
21	-0.50371368E-01	62	0.39431367E-00	103	-0.18958547E 01
22	0.12249948E-00	63	-0.10087886E-00	104	-0.21686377E 01
23	0.29701665E-00	64	-0.70033340E 00	105	-0.25079530E 01
24	0.38274955E-00	65	-0.11574191E 01	106	-0.18959830E 01
25	0.44243135E-00	66	-0.13540152E 01	107	-0.23454101E 01
26	0.41771295E-00	67	-0.14454155E 01	108	-0.28697953E 01
27	0.28876439E-00	68	-0.15785126E 01	109	-0.32369853E 01
28	0.93374764E-01	69	-0.16390113E 01	110	-0.37385131E 01
29	-0.55370206E-01	70	-0.17680752E 01	111	-0.28447923E 01
30	-0.19341241E-00	71	0.71989191E 00	112	-0.32225481E 01
31	0.35518507E-00	72	0.38530372E-00	113	-0.36077691E 01
32	0.40028518E-00	73	-0.26932535E-00	114	-0.40464932E 01
33	0.44635329E-00	74	-0.94412868E 00	115	-0.46778279E 01
34	0.39372503E-00	75	-0.14775079E 01	116	-0.44035780E 01
35	0.23321642E-00	76	-0.17069183E 01	117	-0.49194424E 01
36	-0.62898254E-01	77	-0.17826335E 01	118	-0.57121119E 01
37	-0.30431456E-00	78	-0.19880116E 01		
38	-0.53015561E 00	79	-0.20813654E 01		
39	0.44928554E-00	80	-0.22805199E 01		
40	0.47038641E-00	81	0.23452093E-00		
41	0.39482148E-00	82	-0.56361020E-01		

Table F6.- WING-BODY DEFLECTIONS AT 1G TRIM

Performance Case P6

Mach No. 2.1 Altitude 48,600 ft

Sta	Deflect.-In.	Sta	Deflect.-In.	Sta	Deflect.-In.
1	0.29684117E 01	42	0.24859627E-01	83	-0.21640714E-00
2	0.24146130E 01	43	0.28398417E-00	84	-0.19731298E-00
3	0.18003558E 01	44	0.47797858E-00	85	-0.17292956E-00
4	0.15182146E 01	45	0.56141703E 00	86	-0.15052471E-00
5	0.12898251E 01	46	0.67569952E 00	87	-0.26363760E-00
6	0.11814243E 01	47	0.75639207E 00	88	-0.26368152E-00
7	0.99452633E 00	48	0.79307051E 00	89	-0.26370148E-00
8	0.87117366E 00	49	0.87131782E 00	90	-0.26374407E-00
9	0.61699616E 00	50	-0.61832746E 00	91	-0.47529239E-00
10	0.21512098E-00	51	-0.50469071E 00	92	-0.51474252E 00
11	0.44920306E-01	52	-0.28392616E-00	93	-0.55241448E 00
12	-0.10763234E-00	53	-0.79037163E-01	94	-0.53722950E 00
13	-0.51502423E 00	54	0.16427069E-00	95	-0.51824696E 00
14	-0.51390009E 00	55	0.33839506E-00	96	-0.61974549E 00
15	-0.43884505E-00	56	0.41328726E-00	97	-0.62069732E 00
16	-0.28465479E-00	57	0.46441036E-00	98	-0.62112996E 00
17	-0.84982079E-01	58	0.55776941E 00	99	-0.62205292E 00
18	0.21011631E-00	59	0.60020535E 00	100	-0.74999367E 00
19	0.60831516E 00	60	0.69073534E 00	101	-0.79288483E 00
20	0.92339172E 00	61	-0.58900475E 00	102	-0.83980682E 00
21	0.12218425E 01	62	-0.37064335E-00	103	-0.63836753E 00
22	-0.66289877E 00	63	-0.23064012E-00	104	-0.64554600E 00
23	-0.62792016E 00	64	-0.19838949E-01	105	-0.65447528E 00
24	-0.54232594E 00	65	0.13154268E-00	106	-0.12263371E 01
25	-0.36397389E-00	66	0.19665306E-00	107	-0.13167372E 01
26	-0.12619938E-00	67	0.22048289E-00	108	-0.13820391E 01
27	0.19937426E-00	68	0.27858045E-00	109	-0.13950439E 01
28	0.56391493E 00	69	0.30498843E-00	110	-0.14128065E 01
29	0.86258836E 00	70	0.36132548E-00	111	-0.19184408E 01
30	0.11428222E 01	71	-0.49987341E-00	112	-0.19302385E 01
31	-0.69692978E 00	72	-0.46403111E-00	113	-0.19455337E 01
32	-0.58208167E 00	73	-0.39390484E-00	114	-0.19629532E 01
33	-0.39878254E-00	74	-0.21811087E-00	115	-0.19880203E 01
34	-0.15601823E-00	75	-0.91221417E-01	116	-0.25531893E 01
35	0.13868203E-00	76	-0.36645305E-01	117	-0.25753696E 01
36	0.42934971E-00	77	-0.30525097E-01	118	-0.26094513E 01
37	0.65946698E 00	78	-0.15014562E-01		
38	0.87473795E 00	79	-0.79642965E-02		
39	-0.64391391E 00	80	0.70762464E-02		
40	-0.45176198E-00	81	-0.17106861E-00		
41	-0.22086030E-00	82	-0.20345441E-00		

Table F7.- WING-BODY DEFLECTIONS AT 1G TRIM

Performance Case P7

Mach No. 2.15 Altitude 57,600 ft

Sta	Deflect.-In.	Sta	Deflect.-In.	Sta	Deflect.-In.
1	0.12314451E 01	42	-0.15899015E-01	83	-0.28928311E-00
2	0.10383610E 01	43	0.15462150E-00	84	-0.31410579E-00
3	0.82419780E 00	44	0.29093854E-00	85	-0.31831250E-00
4	0.72405192E 00	45	0.34956952E-00	86	-0.33239174E-00
5	0.63836020E 00	46	0.45779634E-00	87	-0.50566218E 00
6	0.59768821E 00	47	0.53446058E 00	88	-0.51580272E 00
7	0.52756406E 00	48	0.56930796E 00	89	-0.52041206E 00
8	0.48128213E-00	49	0.64364903E 00	90	-0.53024530E 00
9	0.35967760E-00	50	-0.43475518E-00	91	-0.55029476E 00
10	0.16741098E-00	51	-0.37279921E-00	92	-0.64153411E 00
11	0.72833665E-01	52	-0.24962372E-00	93	-0.76348694E 00
12	-0.14552736E-01	53	-0.12335908E-00	94	-0.82429343E 00
13	-0.27484518E-00	54	0.17250518E-01	95	-0.85943051E 00
14	-0.30368605E-00	55	0.12943364E-00	96	-0.10298111E 01
15	-0.26361797E-00	56	0.17768446E-00	97	-0.10898519E 01
16	-0.17142300E-00	57	0.22944652E-00	98	-0.11171433E 01
17	-0.44694202E-01	58	0.30827954E-00	99	-0.11753647E 01
18	0.17416570E-00	59	0.34411272E-00	100	-0.96301114E 00
19	0.48667158E-00	60	0.42055685E-00	101	-0.10764541E 01
20	0.74398317E 00	61	-0.45706598E-00	102	-0.12385892E 01
21	0.99585177E 00	62	-0.33677971E-00	103	-0.11915231E 01
22	-0.36810004E-00	63	-0.28852448E-00	104	-0.13009501E 01
23	-0.37836032E-00	64	-0.18647307E-00	105	-0.14370666E 01
24	-0.33756045E-00	65	-0.11195435E-00	106	-0.16675319E 01
25	-0.23356564E-00	66	-0.79903296E-01	107	-0.18963312E 01
26	-0.78510436E-01	67	-0.52639352E-01	108	-0.21466564E 01
27	0.16134822E-00	68	-0.80225950E-02	109	-0.23139459E 01
28	0.44851258E-00	69	0.12257753E-01	110	-0.25424388E 01
29	0.69116767E 00	70	0.55522485E-01	111	-0.25046874E 01
30	0.92066845E 00	71	-0.41236529E-00	112	-0.26849946E 01
31	-0.43895431E-00	72	-0.43064001E-00	113	-0.28703797E 01
32	-0.37509694E-00	73	-0.46639490E-00	114	-0.30815127E 01
33	-0.27100539E-00	74	-0.40586771E-00	115	-0.33853382E 01
34	-0.11624966E-00	75	-0.37191068E-00	116	-0.36508211E 01
35	0.10069360E-00	76	-0.35730550E-00	117	-0.39092337E 01
36	0.31678119E-00	77	-0.35797403E-00	118	-0.43063066E 01
37	0.49250865E-00	78	-0.36388783E-00		
38	0.65689885E 00	79	-0.36657592E-00		
39	-0.43010698E-00	80	-0.37231051E-00		
40	-0.32289951E-00	81	-0.17512590E-00		
41	-0.18516655E-00	82	-0.23980077E-00		

Table F8.- WING-BODY DEFLECTIONS AT 1G TRIM

Performance Case P8 (Flight Test Gearing)

Mach No. 2.53 Altitude 62,980 ft

Sta	Deflect.-In.	Sta	Deflect.-In.	Sta	Deflect.-In.
1	0.15434595E-00	42	-0.32339501E-01	83	-0.31398857E-00
2	0.18168265E-00	43	0.70318176E-01	84	-0.35868277E-00
3	0.21200370E-00	44	0.15881596E-00	85	-0.37815078E-00
4	0.22352022E-00	45	0.19687952E-00	86	-0.40815921E-00
5	0.22656569E-00	46	0.29257465E-00	87	-0.58736794E 00
6	0.22801118E-00	47	0.35945266E-00	88	-0.60063276E 00
7	0.23050338E-00	48	0.38985176E-00	89	-0.60666222E 00
8	0.23214824E-00	49	0.45470316E-00	90	-0.61952507E 00
9	0.19740544E-00	50	-0.28493494E-00	91	-0.55818401E 00
10	0.14247426E-00	51	-0.26003950E-00	92	-0.66479208E 00
11	0.10012906E-00	52	-0.20697432E-00	93	-0.81150618E 00
12	0.58378889E-01	53	-0.13871173E-00	94	-0.89267642E 00
13	-0.97010904E-01	54	-0.72302949E-01	95	-0.94564106E 00
14	-0.13776083E-00	55	-0.86991072E-02	96	-0.11278766E 01
15	-0.12132506E-00	56	0.18657388E-01	97	-0.12026159E 01
16	-0.73002467E-01	57	0.65326428E-01	98	-0.12365883E 01
17	0.78034994E-03	58	0.12665117E-00	99	-0.13090626E 01
18	0.15713076E-00	59	0.15452605E-00	100	-0.98902663E 00
19	0.39552230E-00	60	0.21399248E-00	101	-0.11257415E 01
20	0.59886494E 00	61	-0.34594312E-00	102	-0.13127460E 01
21	0.80339861E 00	62	-0.29573853E-00	103	-0.13251384E 01
22	-0.15256157E-00	63	-0.30471208E-00	104	-0.14581138E 01
23	-0.18405586E-00	64	-0.27456297E-00	105	-0.16235222E 01
24	-0.17148124E-00	65	-0.25224020E-00	106	-0.17179916E 01
25	-0.11881096E-00	66	-0.24263901E-00	107	-0.19743589E 01
26	-0.25455187E-01	67	-0.22202129E-00	108	-0.22654641E 01
27	0.14360172E-00	68	-0.19076436E-00	109	-0.24702761E 01
28	0.36145563E-00	69	-0.17655668E-00	110	-0.27500192E 01
29	0.55080295E 00	70	-0.14624693E-00	111	-0.25279759E 01
30	0.73114170E 00	71	-0.34423137E-00	112	-0.27503385E 01
31	-0.23169858E-00	72	-0.39133075E-00	113	-0.29779672E 01
32	-0.20710603E-00	73	-0.48348170E-00	114	-0.32372112E 01
33	-0.15763533E-00	74	-0.49238147E-00	115	-0.36102695E 01
34	-0.69346564E-01	75	-0.51451523E 00	116	-0.37463094E 01
35	0.83020184E-01	76	-0.52403511E 00	117	-0.40642510E 01
36	0.23646082E-00	77	-0.52919964E 00	118	-0.45527957E 01
37	0.36372253E-00	78	-0.54870349E 00		
38	0.48277380E-00	79	-0.55756889E 00		
39	-0.25619014E-00	80	-0.57648172E 00		
40	-0.21059651E-00	81	-0.18109220E-00		
41	-0.14146907E-00	82	-0.25296796E-00		

TABLE F9.- WING-BODY DEFLECTIONS AT 1G TRIM

Deformed Model Design Shape

Performance Case P8 (Design Gearing)

Mach No. 2.53 Altitude 62,980 ft

Sta	Deflect.-In.	Sta	Deflect.-In.	Sta	Deflect.-In.
1	0.39914415E-00	42	-0.41875319E-01	83	-0.32979851E-00
2	0.39679033E-00	43	0.12187552E-00	84	-0.35911721E-00
3	0.39417955E-00	44	0.25879885E-00	85	-0.36487507E-00
4	0.38945740E-00	45	0.31769059E-00	86	-0.38400912E-00
5	0.37646139E-00	46	0.43214256E-00	87	-0.57985426E 00
6	0.37029307E-00	47	0.51844219E 00	88	-0.58660021E 00
7	0.35965803E-00	48	0.55766931E 00	89	-0.58966654E 00
8	0.35263892E-00	49	0.64135380E 00	90	-0.59620806E 00
9	0.29242248E-00	50	-0.39126800E-00	91	-0.61157493E 00
10	0.19721544E-00	51	-0.35220363E-00	92	-0.71091957E 00
11	0.13280258E-00	52	-0.27103740E-00	93	-0.85507187E 00
12	0.70276270E-01	53	-0.15558188E-00	94	-0.93752114E 00
13	-0.15059511E-00	54	-0.24234712E-01	95	-0.98518809E 00
14	-0.20946246E-00	55	0.89382569E-01	96	-0.11822694E 01
15	-0.19233304E-00	56	0.13825022E-00	97	-0.12633029E 01
16	-0.13369127E-00	57	0.19656804E-00	98	-0.13001364E 01
17	-0.39354824E-01	58	0.28095853E-00	99	-0.13787144E 01
18	0.15814141E-00	59	0.31931784E-00	100	-0.10743049E 01
19	0.45557363E-00	60	0.40115105E-00	101	-0.12042062E 01
20	0.70508543E 00	61	-0.44632716E-00	102	-0.14050075E 01
21	0.95465133E 00	62	-0.36810087E-00	103	-0.14128745E 01
22	-0.22612114E-00	63	-0.33202375E-00	104	-0.15582312E 01
23	-0.27264566E-00	64	-0.23900092E-00	105	-0.17390406E 01
24	-0.25939822E-00	65	-0.16764537E-00	106	-0.18682210E 01
25	-0.19354070E-00	66	-0.13695482E-00	107	-0.21457996E 01
26	-0.72481264E-01	67	-0.10128358E-00	108	-0.24644018E 01
27	0.14436319E-00	68	-0.51477318E-01	109	-0.26928564E 01
28	0.42183466E-00	69	-0.28838112E-01	110	-0.30048919E 01
29	0.66044571E 00	70	0.19458878E-01	111	-0.27550603E 01
30	0.88728271E 00	71	-0.44737814E-00	112	-0.30052841E 01
31	-0.33523561E-00	72	-0.47263076E-00	113	-0.32611647E 01
32	-0.30047677E-00	73	-0.52203808E 00	114	-0.35525842E 01
33	-0.23676261E-00	74	-0.47028761E-00	115	-0.39719440E 01
34	-0.11829318E-00	75	-0.44444470E-00	116	-0.41203699E 01
35	0.81136659E-01	76	-0.43332946E-00	117	-0.44796889E 01
36	0.29219585E-00	77	-0.43287881E-00	118	-0.50318133E 01
37	0.46691991E-00	78	-0.43606628E-00		
38	0.63037144E 00	79	-0.43751515E-00		
39	-0.36003777E-00	80	-0.44060605E-00		
40	-0.29615408E-00	81	-0.21659193E-00		
41	-0.19784260E-00	82	-0.27913850E-00		

LOS ANGELES DIVISION
NORTH AMERICAN ROCKWELL CORPORATION

Table F10.- WING-BODY DEFLECTIONS AT 1G TRIM

Performance Case P9

Mach No. 2.50 Altitude 61,625 ft

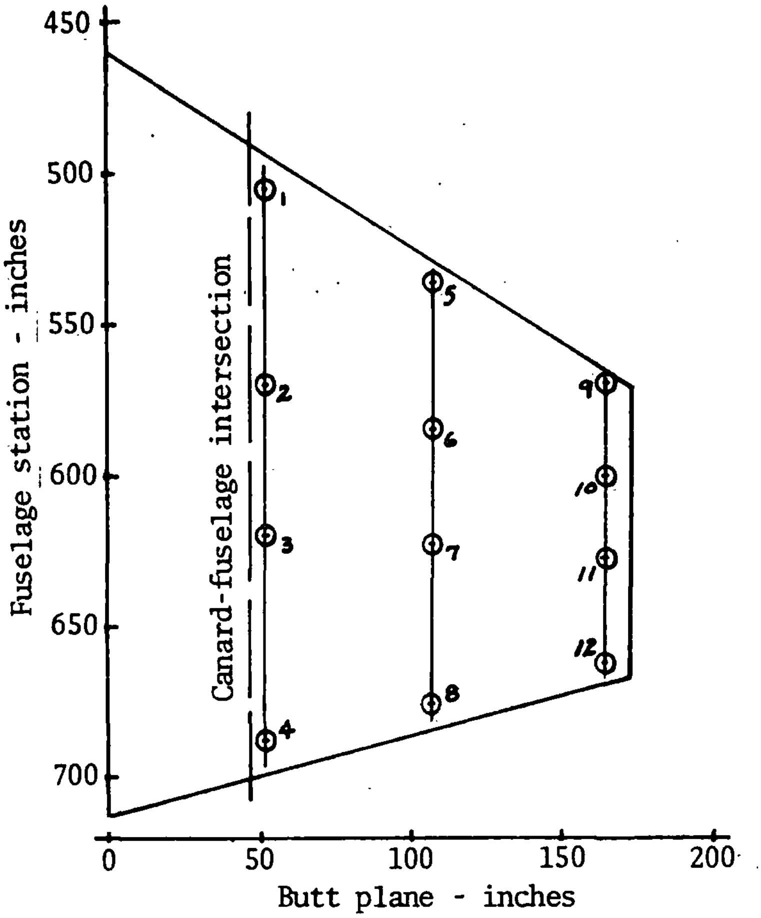
Sta	Deflect.-In.	Sta	Deflect.-In.	Sta	Deflect.-In.
1	0.38404749E-00	42	-0.21755357E-01	83	-0.34242920E-00
2	0.35645287E-00	43	0.73604129E-01	84	-0.39691979E-00
3	0.32584573E-00	44	0.15586425E-00	85	-0.42249832E-00
4	0.31018250E-00	45	0.19124495E-00	86	-0.45816456E-00
5	0.29332474E-00	46	0.29212081E-00	87	-0.65084773E 00
6	0.28532352E-00	47	0.35843884E-00	88	-0.66937894E 00
7	0.27152829E-00	48	0.38858341E-00	89	-0.67780221E 00
8	0.26242345E-00	49	0.45289180E-00	90	-0.69577186E 00
9	0.21092313E-00	50	-0.29442170E-00	91	-0.60334178E 00
10	0.12949695E-00	51	-0.26454172E-00	92	-0.72431490E 00
11	0.79762150E-01	52	-0.20203780E-00	93	-0.88489392E 00
12	0.32150778E-01	53	-0.13955283E-00	94	-0.97011535E 00
13	-0.13019836E-00	54	-0.86141816E-01	95	-0.10279716E 01
14	-0.15670992E-00	55	-0.32831156E-01	96	-0.12245295E 01
15	-0.12936024E-00	56	-0.99018362E-02	97	-0.13030236E 01
16	-0.65997401E-01	57	0.37382235E-01	98	-0.13387028E 01
17	0.21196726E-01	58	0.97444659E-01	99	-0.14148183E 01
18	0.18968732E-00	59	0.12474576E-00	100	-0.10683499E 01
19	0.44126695E-00	60	0.18298812E-00	101	-0.12203836E 01
20	0.65555643E 00	61	-0.35807357E-00	102	-0.14174206E 01
21	0.87057750E 00	62	-0.29879089E-00	103	-0.14170935E 01
22	-0.19003960E-00	63	-0.32327922E-00	104	-0.15541556E 01
23	-0.20597553E-00	64	-0.31010714E-00	105	-0.17246474E 01
24	-0.18176546E-00	65	-0.30165743E-00	106	-0.18507762E 01
25	-0.11341536E-00	66	-0.29802314E-00	107	-0.21216657E 01
26	-0.65495455E-02	67	-0.28229534E-00	108	-0.24249688E 01
27	0.17413162E-00	68	-0.25467922E-00	109	-0.26339378E 01
28	0.40133869E-00	69	-0.24212645E-00	110	-0.29193587E 01
29	0.59836912E 00	70	-0.21534719E-00	111	-0.27317055E 01
30	0.78595061E 00	71	-0.34259776E-00	112	-0.29573300E 01
31	-0.25339907E-00	72	-0.40298650E-00	113	-0.31886557E 01
32	-0.21954600E-00	73	-0.52113840E 00	114	-0.34521098E 01
33	-0.15481918E-00	74	-0.55130057E 00	115	-0.38312268E 01
34	-0.54471035E-01	75	-0.59116264E 00	116	-0.40121926E 01
35	0.10618444E-00	76	-0.60830761E 00	117	-0.43344022E 01
36	0.26003977E-00	77	-0.61681134E 00	118	-0.48295045E 01
37	0.38692338E-00	78	-0.64545147E 00		
38	0.50562094E 00	79	-0.65846971E 00		
39	-0.27073074E-00	80	-0.68624197E 00		
40	-0.21156407E-00	81	-0.18413511E-00		
41	-0.13188842E-00	82	-0.26980437E-00		

Table F11.- WING-BODY DEFLECTIONS AT 1G TRIM

Performance Case P10

Mach No. 1.06 Altitude 27,160 ft

Sta	Deflect.-In.	Sta	Deflect.-In.	Sta	Deflect.-In.
1	-0.84840933E 00	42	-0.14468571E-00	83	-0.20773107E 01
2	-0.81487983E 00	43	-0.20748329E-00	84	-0.23664249E 01
3	-0.77768987E 00	44	-0.28753719E-00	85	-0.26102756E 01
4	-0.73381716E 00	45	-0.32196897E-00	86	-0.28775155E 01
5	-0.62854229E 00	46	-0.15734417E-00	87	-0.32004194E 01
6	-0.57857548E 00	47	-0.15705820E-00	88	-0.33207253E 01
7	-0.49242583E-00	48	-0.15692820E-00	89	-0.33754098E 01
8	-0.43556706E-00	49	-0.15665089E-00	90	-0.34920700E 01
9	-0.34362463E-00	50	-0.13425723E-00	91	-0.26562478E 01
10	-0.19825619E-00	51	-0.22347243E-00	92	-0.28801807E 01
11	-0.13908590E-00	52	-0.37228393E-00	93	-0.32319129E 01
12	-0.86527502E-01	53	-0.59669206E 00	94	-0.36297414E 01
13	0.11410096E-00	54	-0.71716688E 00	95	-0.39542685E 01
14	0.25250744E-00	55	-0.81553250E 00	96	-0.41796587E 01
15	0.30189382E-00	56	-0.85784027E 00	97	-0.43944600E 01
16	0.37121058E-00	57	-0.81109834E 00	98	-0.44920970E 01
17	0.44827960E-00	58	-0.85677669E 00	99	-0.47003890E 01
18	0.58180775E 00	59	-0.87753960E 00	100	-0.38513540E 01
19	0.71410290E 00	60	-0.92183373E 00	101	-0.41479314E 01
20	0.85232681E 00	61	-0.62399244E 00	102	-0.45580314E 01
21	0.99250500E 00	62	-0.77406756E 00	103	-0.48988867E 01
22	0.21162331E-00	63	-0.10325946E 01	104	-0.51820637E 01
23	0.26703248E-00	64	-0.12899320E 01	105	-0.55343082E 01
24	0.30707062E-00	65	-0.14532460E 01	106	-0.51995063E 01
25	0.35989156E-00	66	-0.15234885E 01	107	-0.56025722E 01
26	0.40569744E-00	67	-0.15169638E 01	108	-0.60356633E 01
27	0.48847945E-00	68	-0.16053849E 01	109	-0.62612870E 01
28	0.61170996E 00	69	-0.16455762E 01	110	-0.65694560E 01
29	0.77323911E 00	70	-0.17313176E 01	111	-0.65820932E 01
30	0.92678382E 00	71	-0.10558415E 01	112	-0.67372034E 01
31	0.26121553E-00	72	-0.12067576E 01	113	-0.68970213E 01
32	0.18354131E-00	73	-0.15020281E 01	114	-0.70790357E 01
33	0.22319965E-00	74	-0.19067560E 01	115	-0.73409591E 01
34	0.24194625E-00	75	-0.21400143E 01	116	-0.78258838E 01
35	0.33050758E-00	76	-0.22403405E 01	117	-0.79608714E 01
36	0.34723060E-00	77	-0.23455957E 01	118	-0.81682915E 01
37	0.33142512E-00	78	-0.24589110E 01		
38	0.31663934E-00	79	-0.25104181E 01		
39	0.57252275E-01	80	-0.26202995E 01		
40	-0.99984303E-02	81	-0.17010041E 01		
41	-0.78397137E-01	82	-0.18711101E 01		



Point No.	Butt Plane Inches	$\frac{y}{b/2}$	Fuselage Sta. Inches	$\frac{x}{c}$
1	51.5	.298	504.13	.050
2	|	|	568.92	.368
3	|	|	619.32	.615
4	51.5	.298	687.72	.950
5	108.2	.626	536.62	.050
6	|	|	585.42	.367
7	|	|	623.52	.615
8	108.2	.626	675.12	.950
9	164.0	.947	568.52	.050
10	|	|	601.72	.367
11	|	|	627.62	.615
12	164.0	.947	662.82	.950

Table F12.- XB-70 CANARD DEFLECTION POINT GRID GEOMETRY

Table F13.- CANARD DEFLECTIONS AT 1G TRIM, PERFORMANCE CASES

Point No.	Performance case									
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10
1	- 0.804	- 1.206	- 0.790	- 0.687	- 0.669	- 0.689	- 0.607	- 0.599	- 0.605	- 1.102
2	- 0.166	- 0.255	- 0.206	- 0.224	- 0.219	- 0.228	- 0.204	- 0.195	- 0.197	- 0.262
3	- 0.088	- 0.135	- 0.126	- 0.155	- 0.152	- 0.168	- 0.156	- 0.152	- 0.154	- 0.145
4	- 0.123	- 0.200	- 0.378	- 0.551	- 0.548	- 0.755	- 0.710	- 0.722	- 0.727	- 0.287
5	- 2.49	- 3.82	- 2.91	- 3.04	- 2.96	- 3.06	- 2.72	- 2.61	- 2.64	- 3.80
6	- 1.90	- 2.92	- 2.38	- 2.60	- 2.53	- 2.64	- 2.36	- 2.25	- 2.28	- 3.01
7	- 1.65	- 2.54	- 2.14	- 2.43	- 2.37	- 2.50	- 2.24	- 2.15	- 2.17	- 2.66
8	- 1.60	- 2.49	- 2.35	- 2.85	- 2.80	- 3.22	- 2.88	- 2.79	- 2.82	- 2.71
9	- 4.47	- 6.88	- 5.56	- 5.96	- 5.83	- 6.00	- 5.35	- 5.19	- 5.15	- 7.13
10	- 4.39	- 6.17	- 5.11	- 5.60	- 5.48	- 5.68	- 5.08	- 4.83	- 4.88	- 6.44
11	- 3.70	- 5.74	- 4.82	- 5.41	- 5.29	- 5.54	- 4.96	- 4.72	- 4.78	- 6.04
12	- 3.47	- 5.35	- 4.72	- 5.49	- 5.37	- 5.75	- 5.17	- 4.93	- 4.98	- 5.73

Values for case P8 are for control gearing through flight test point

APPENDIX G

DERIVATION OF CONTROL GEARING CHANGE RELATIONSHIPS

It is often desirable to compute the trim conditions for a particular control system gearing from the known trim at some other gearing without reverting to the computerized nonlinear trim analysis. This calculation is readily accomplished by the relationships derived below based on the assumption that the changes in the trim variables, α, δ_C and δ_e, are sufficiently small that the aerodynamic derivatives defined at the original trim point will not be altered. In normal use, no serious restriction is imposed by this assumption.

For any given set of flight conditions, there exists an infinite number of combinations of canard and elevon deflection which will satisfy the requirements for 1g trim. Within the range of linear aerodynamic data, the locus of these points describe a straight line, as illustrated in the sketch of figure G1. The solution for trim with any particular gearing between the two control surfaces represents one specific point on that line, for instance, point A of the sketch. The transfer from one gearing curve to another (moving from point A to point B) requires knowledge of the slope and intercept of the constant trim curve and the definition of the new gearing curve. The new gearing curve is known. The given trim point (point A) will serve in lieu of the intercept of the constant trim curve. It remains to find the slope of the constant trim curve.

By definition of the trim conditions, the summation of effects due to the change in gearing must produce no change in normal force or pitching moment. Angle of attack must be allowed to vary in order to retain a normal force balance. The normal force and pitching moment relationships are written in terms of incremental variations from the original trim point as follows.

$$C_{N\alpha_{A/P}} \Delta\alpha + C_{N\delta_e} \Delta\delta e + C_{N\delta_C} \Delta\delta c = 0$$

$$C_{m\alpha\,A/P} \Delta\alpha + C_{m\delta_e} \Delta\delta e + C_{m\delta_C} \Delta\delta_C = 0$$

where the coefficients are flexible airplane values linearized at the original trim point. The canard derivatives include the effects of canard interference acting on the wing. Dividing both equations by $\Delta\delta_C$

$$C_{N_{\alpha_{A/P}}} \frac{\Delta\alpha}{\Delta\delta_c} + C_{N_{\delta_e}} \frac{\Delta\delta_e}{\Delta\delta_c} + C_{N_{\delta_c}} = 0$$

$$C_{m_{\alpha_{A/P}}} \frac{\Delta\alpha}{\Delta\delta_c} + C_{m_{\delta_e}} \frac{\Delta\delta_e}{\Delta\delta_c} + C_{m_{\delta_c}} = 0$$

Simultaneous solution of these equations yields the desired definition of the slope of the constant trim curve.

$$\frac{\Delta\delta_e}{\Delta\delta_c} = \frac{-C_{m_{\alpha_{A/P}}} C_{N_{\delta_c}} + C_{N_{\alpha_{A/P}}} C_{m_{\delta_c}}}{C_{m_{\alpha_{A/P}}} C_{N_{\delta_e}} - C_{N_{\alpha_{A/P}}} C_{m_{\delta_e}}}$$

The solution also defines the variation of angle of attack which is necessary to retain the normal force balance.

$$\frac{\Delta\alpha}{\Delta\delta_c} = \frac{-C_{m_{\delta_c}} C_{N_{\delta_e}} + C_{N_{\delta_c}} C_{m_{\delta_e}}}{C_{m_{\alpha_{A/P}}} C_{N_{\delta_e}} - C_{N_{\alpha_{A/P}}} C_{m_{\delta_e}}}$$

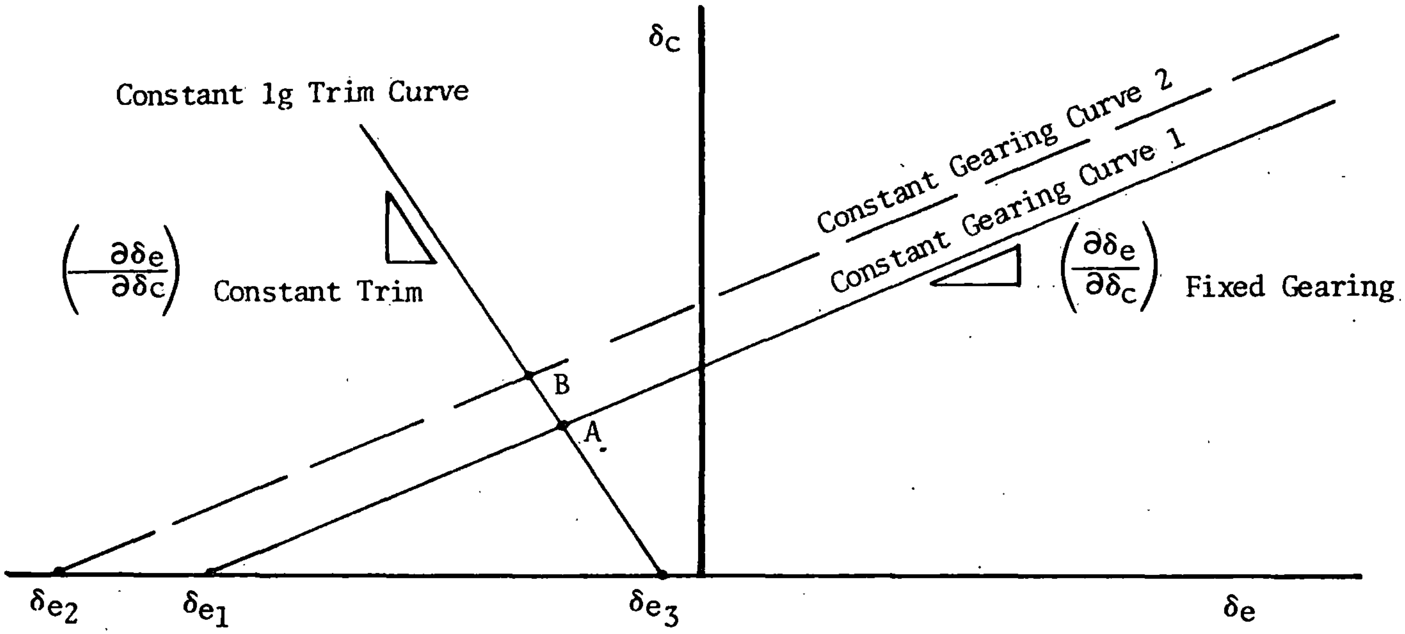


Figure G1.- Illustration of gearing change relationship

APPENDIX H

WING-BODY DEFLECTIONS DURING ROLLER COASTER MANEUVERS

This appendix contains tabulations of the structural deformations of the wing-body at selected points from roller coaster maneuvers performed shortly after the 1g trim point for performance cases P3 and P8. Deflections are measured in the z-direction from the undeformed positions of the points, except on the folded wing tip where deflections are measured perpendicular to the undeformed wing plane. Positive deflections are down.

The grid network of points at which wing-body deflections are specified is defined in figure C2, Appendix C. Deformations are presented for case P3 in tables H1 and H2 and for case P8 in tables H3 and H4. Isometric plots of the deformation patterns are shown in the main body of the report along with general discussions of the roller coaster characteristics.

TABLE H1.- WING-BODY DEFLECTIONS AT n_z = 0.63g, ROLLER COASTER MANEUVER FOLLOWING PERFORMANCE CASE P3

Mach No. 1.18 Altitude 33,750 ft

Sta	Deflect.-In.	Sta	Deflect.-In.	Sta	Deflect.-In.
1	-0.14252418E 01	42	0.36132769E-00	83	0.12903772E 01
2	-0.87542295E 00	43	0.76209048E-01	84	0.72966269E 00
3	-0.26558010E-00	44	-0.17502909E-00	85	0.24843779E-00
4	-0.31463845E-01	45	-0.28308851E-00	86	-0.25187089E-00
5	0.38276060E-01	46	-0.38230325E-00	87	-0.43286914E-00
6	0.71376833E-01	47	-0.51181196E 00	88	-0.70796252E 00
7	0.12844713E-00	48	-0.57067955E 00	89	-0.83300494E 00
8	0.16611353E-00	49	-0.69626375E 00	90	-0.10997621E 01
9	0.17251593E-00	50	0.15986068E-00	91	0.21059082E 01
10	0.18263865E-00	51	0.37609635E-00	92	0.14980169E 01
11	0.15037843E-00	52	0.73824285E 00	93	0.71705836E 00
12	0.11419297E-00	53	0.66102524E 00	94	0.86199095E-01
13	-0.56710277E-01	54	0.30236284E-00	95	-0.46978078E-00
14	-0.19658821E-00	55	-0.80649775E-01	96	-0.70520221E 00
15	-0.18865306E-00	56	-0.24538638E-00	97	-0.11124513E 01
16	-0.15900277E-00	57	-0.28839554E-00	98	-0.12975645E 01
17	-0.12865004E-00	58	-0.42800787E-00	99	-0.16924726E 01
18	-0.10968281E-00	59	-0.49146801E-00	100	0.16041902E 01
19	-0.98634795E-01	60	-0.62684965E 00	101	0.86490022E 00
20	-0.12983246E-00	61	0.77264104E 00	102	0.31386604E-01
21	-0.19041787E-00	62	0.11313610E 01	103	-0.10448156E 01
22	-0.23234030E-00	63	0.96162772E 00	104	-0.17815752E 01
23	-0.16498543E-00	64	0.50959336E 00	105	-0.26980321E 01
24	-0.13202937E-00	65	0.32657392E-01	106	0.60078688E 00
25	-0.76185373E-01	66	-0.17247636E-00	107	-0.36231117E-00
26	-0.98597109E-02	67	-0.11428448E-00	108	-0.15904210E 01
27	-0.42027491E-03	68	-0.27971376E-00	109	-0.25191941E 01
28	-0.76637900E-01	69	-0.35490890E-00	110	-0.37877622E 01
29	-0.20922965E-00	70	-0.51532517E 00	111	-0.12682144E-00
30	-0.34030513E-00	71	0.16923946E 01	112	-0.10605793E 01
31	-0.28157043E-00	72	0.15547189E 01	113	-0.20038369E 01
32	0.74061421E-02	73	0.12853535E 01	114	-0.30781023E 01
33	0.64229092E-01	74	0.73276471E 00	115	-0.46239968E 01
34	0.12366981E-00	75	0.15468049E-00	116	-0.24496522E 01
35	0.61796613E-01	76	-0.93957880E-01	117	-0.36808123E 01
36	-0.12908617E-00	77	-0.10317526E-00	118	-0.55725953E 01
37	-0.25875062E-00	78	-0.28982864E-00		
38	-0.38004962E-00	79	-0.37467109E-00		
39	-0.39484472E-01	80	-0.55566829E 00		
40	0.22707474E-00	81	0.22876243E 01		
41	0.43755955E-00	82	0.17850168E 01		

TABLE H2.- WING-BODY DEFLECTIONS AT n_Z = 1.48g, ROLLER COASTER MANEUVER FOLLOWING PERFORMANCE CASE P3

Mach No. 1.18 Altitude 33,750 ft

Sta	Deflect.-In.	Sta	Deflect.-In.	Sta	Deflect.-In.
1	-0.20847005E 01	42	-0.47526803E-01	83	-0.16555031E 01
2	-0.16615202E 01	43	-0.24714873E-00	84	-0.21896517E 01
3	-0.11921413E 01	44	-0.44527229E-00	85	-0.26438241E 01
4	-0.96714367E 00	45	-0.53048673E 00	86	-0.31277219E 01
5	-0.76052913E 00	46	-0.40610920E-00	87	-0.35397768E 01
6	-0.66246332E 00	47	-0.46453026E-00	88	-0.37935138E 01
7	-0.49338432E-00	48	-0.49108526E-00	89	-0.39088488E 01
8	-0.38179219E-00	49	-0.54773598E 00	90	-0.41548967E 01
9	-0.23484067E-00	50	-0.38226374E-01	91	-0.19259954E 01
10	-0.24984006E-02	51	-0.65063263E-01	92	-0.24041534E 01
11	0.58125179E-01	52	-0.11245150E-00	93	-0.30850413E 01
12	0.10494781E-00	53	-0.39171676E-00	94	-0.37471708E 01
13	0.22134079E-00	54	-0.67859118E 00	95	-0.43084385E 01
14	0.25496165E-00	55	-0.95030636E 00	96	-0.46338688E 01
15	0.27458569E-00	56	-0.10671730E 01	97	-0.50269017E 01
16	0.31465352E-00	57	-0.10338137E 01	98	-0.52055530E 01
17	0.37312308E-00	58	-0.11427447E 01	99	-0.55866758E 01
18	0.50468073E 00	59	-0.11922587E 01	100	-0.33492983E 01
19	0.63686259E 00	60	-0.12978888E 01	101	-0.39593957E 01
20	0.77166307E 00	61	-0.32547416E-00	102	-0.47146331E 01
21	0.90238933E 00	62	-0.37527823E-00	103	-0.55061595E 01
22	0.25725404E-00	63	-0.71977188E 00	104	-0.60964505E 01
23	0.29164772E-00	64	-0.11798640E 01	105	-0.68307149E 01
24	0.31127456E-00	65	-0.15570725E 01	106	-0.51192284E 01
25	0.34333791E-00	66	-0.17193127E 01	107	-0.59197077E 01
26	0.38181780E-00	67	-0.16876917E 01	108	-0.68508995E 01
27	0.45427594E-00	68	-0.18511344E 01	109	-0.74389808E 01
28	0.53595455E 00	69	-0.19254265E 01	110	-0.82422137E 01
29	0.64276391E 00	70	-0.20839164E 01	111	-0.68484838E 01
30	0.74371843E 00	71	-0.44634441E-00	112	-0.73549412E 01
31	0.23275983E-00	72	-0.65832241E 00	113	-0.78698353E 01
32	0.24242965E-00	73	-0.10730620E 01	114	-0.84562422E 01
33	0.26231526E-00	74	-0.17196964E 01	115	-0.93000963E 01
34	0.27264851E-00	75	-0.22105130E 01	116	-0.89686251E 01
35	0.31986028E-00	76	-0.24216168E 01	117	-0.95532265E 01
36	0.23968431E-00	77	-0.25338085E 01	118	-0.10451517E 02
37	0.15908065E-00	78	-0.27348445E 01		
38	0.83677227E-01	79	-0.28262246E 01		
39	0.95667513E-01	80	-0.30211686E 01		
40	0.91649836E-01	81	-0.86730406E 00		
41	0.69894165E-01	82	-0.12421302E 01		

TABLE H3.- WING-BODY DEFLECTIONS AT n_z = 0.81g, ROLLER COASTER MANEUVER FOLLOWING PERFORMANCE CASE P8

Mach No. 2.53 Altitude 62,980 ft

Sta	Deflect.-In.	Sta	Deflect.-In.	Sta	Deflect.-In.
1	0.60454028E 00	42	-0.76002239E-02	83	-0.21807421E-00
2	0.51173241E 00	43	0.70036481E-01	84	-0.24892957E-00
3	0.40879270E-00	44	0.13319201E-00	85	-0.26293314E-00
4	0.36090481E-00	45	0.16035569E-00	86	-0.28176150E-00
5	0.32056358E-00	46	0.22866299E-00	87	-0.39943388E-00
6	0.30141635E-00	47	0.27259661E-00	88	-0.41103197E-00
7	0.26840390E-00	48	0.29256644E-00	89	-0.41630383E-00
8	0.24661568E-00	49	0.33516873E-00	90	-0.42755046E-00
9	0.18543516E-00	50	-0.23442252E-00	91	-0.39170182E-00
10	0.88703807E-01	51	-0.20360471E-00	92	-0.46593355E-00
11	0.40461292E-01	52	-0.14144550E-00	93	-0.55985186E 00
12	-0.42262216E-02	53	-0.86737138E-01	94	-0.60253210E 00
13	-0.14092383E-00	54	-0.35709023E-01	95	-0.63202958E 00
14	-0.15100103E-00	55	0.78943646E-02	96	-0.75002258E 00
15	-0.12451193E-00	56	0.26648513E-01	97	-0.78949142E 00
16	-0.68156512E-01	57	0.57410354E-01	98	-0.80743182E 00
17	0.60570538E-02	58	0.98820934E-01	99	-0.84570462E 00
18	0.13500143E-00	59	0.11764392E-00	100	-0.67960501E 00
19	0.32178637E-00	60	0.15779965E-00	101	-0.77133640E 00
20	0.47819293E-00	61	-0.26607350E-00	102	-0.88087383E 00
21	0.63239125E 00	62	-0.20603665E-00	103	-0.84703886E 00
22	-0.19252108E-00	63	-0.20863197E-00	104	-0.91770747E 00
23	-0.19192737E-00	64	-0.18426117E-00	105	-0.10056122E 01
24	-0.16534290E-00	65	-0.16861367E-00	106	-0.11627599E 01
25	-0.10302937E-00	66	-0.16188356E-00	107	-0.13171729E 01
26	-0.13786435E-01	67	-0.15400328E-00	108	-0.14824854E 01
27	0.12494518E-00	68	-0.13475174E-00	109	-0.15892471E 01
28	0.29244065E-00	69	-0.12600105E-00	110	-0.17350679E 01
29	0.43554609E-00	70	-0.10733289E-00	111	-0.17320201E 01
30	0.57118569E 00	71	-0.24272835E-00	112	-0.18462205E 01
31	-0.22489719E-00	72	-0.27559636E-00	113	-0.19639757E 01
32	-0.19096355E-00	73	-0.33990333E-00	114	-0.20980859E 01
33	-0.13007922E-00	74	-0.34424039E-00	115	-0.22910737E 01
34	-0.44234234E-01	75	-0.35869925E-00	116	-0.24832005E 01
35	0.78636805E-01	76	-0.36491811E-00	117	-0.26468024E 01
36	0.19440576E-00	77	-0.37006456E-00	118	-0.28981906E 01
37	0.28820819E-00	78	-0.38783580E-00		
38	0.37595885E-00	79	-0.39591364E-00		
39	-0.22601631E-00	80	-0.41314636E-00		
40	-0.16790101E-00	81	-0.11942177E-00		
41	-0.95005276E-01	82	-0.17371485E-00		

TABLE H4.- WING-BODY DEFLECTIONS AT n_z = 1.52g, ROLLER COASTER MANEUVER FOLLOWING PERFORMANCE CASE P8

Mach No. 2.53 Altitude 62,980 ft

Sta	Deflect.-In.	Sta	Deflect.-In.	Sta	Deflect.-In.
1	-0.11097606E 01	42	-0.10199735E-00	83	-0.57454675E 00
2	-0.74472908E 00	43	0.73052727E-01	84	-0.65533972E 00
3	-0.33984691E-00	44	0.23435406E-00	85	-0.68821700E 00
4	-0.16142182E-00	45	0.30373097E-00	86	-0.74781402E 00
5	-0.36638082E-01	46	0.47497135E-00	87	-0.10964005E 01
6	0.22588243E-01	47	0.60606524E 00	88	-0.11132478E 01
7	0.12470260E-00	48	0.66565337E 00	89	-0.11209057E 01
8	0.19209807E-00	49	0.79277471E 00	90	-0.11372425E 01
9	0.23164025E-00	50	-0.42574359E-00	91	-0.10123678E 01
10	0.29415967E-00	51	-0.41746365E-00	92	-0.12060042E 01
11	0.26835483E-00	52	-0.38997712E-00	93	-0.14967602E 01
12	0.23482519E-00	53	-0.28178156E-00	94	-0.16846509E 01
13	0.27067854E-01	54	-0.16847655E-00	95	-0.18019204E 01
14	-0.10086057E-00	55	-0.46023214E-01	96	-0.21610141E 01
15	-0.11363463E-00	56	0.66448906E-02	97	-0.23340666E 01
16	-0.89265462E-01	57	0.97672297E-01	98	-0.24127268E 01
17	-0.18002140E-01	58	0.21520554E-00	99	-0.25805352E 01
18	0.21328601E-00	59	0.26862974E-00	100	-0.18350754E 01
19	0.59344207E 00	60	0.38260138E-00	101	-0.20934279E 01
20	0.92563266E 00	61	-0.56683268E 00	102	-0.24950080E 01
21	0.12685684E 01	62	-0.54419379E 00	103	-0.26392167E 01
22	-0.39048339E-01	63	-0.56688478E 00	104	-0.29458144E 01
23	-0.16192038E-00	64	-0.51586404E 00	105	-0.33271917E 01
24	-0.18969254E-00	65	-0.47095621E-00	106	-0.32395513E 01
25	-0.16552080E-00	66	-0.45164102E-00	107	-0.37780570E 01
26	-0.61947025E-01	67	-0.39408442E-00	108	-0.44186959E 01
27	0.19042890E-00	68	-0.32825527E-00	109	-0.48972890E 01
28	0.54755463E 00	69	-0.29833295E-00	110	-0.55509768E 01
29	0.86476921E 00	70	-0.23449864E-00	111	-0.47076787E 01
30	0.11687303E 01	71	-0.62663215E 00	112	-0.52323834E 01
31	-0.25067855E-00	72	-0.71027329E 00	113	-0.57670423E 01
32	-0.25264957E-00	73	-0.87391900E 00	114	-0.63759595E 01
33	-0.23648145E-00	74	-0.88997363E 00	115	-0.72522063E 01
34	-0.14225625E-00	75	-0.92857636E 00	116	-0.72210587E 01
35	0.91752270E-01	76	-0.94517968E 00	117	-0.79705136E 01
36	0.35103850E-00	77	-0.94966335E 00	118	-0.91221152E 01
37	0.57239581E 00	78	-0.97169618E 00		
38	0.77947198E 00	79	-0.98171110E 00		
39	-0.34039430E-00	80	-0.10030762E 01		
40	-0.33063092E-00	81	-0.35142624E-00		
41	-0.27251185E-00	82	-0.46955077E-00		

APPENDIX I

INCREMENTAL STRUCTURAL DEFORMATIONS DUE TO PARAMETRIC VARIATIONS

Tables I1 and I2 present incremental structural deflections due to parametric variations for performance case P1 (subsonic) and P9 (supersonic), respectively. The magnitude of each variation is given along with detailed discussion of the sensitivity studies in main part of report. The tabulated deflections are incremental variations from the 1g deformed shape of the base case. Thus, total deflection is the sum of the base case 1g deflection plus the increment variation. The limited number of points at which the data are given were selected to provide visibility of the centerline shape, wing twist at two spanwise stations, and spanwise bending.

These data were developed during Phase 1 of the program. Revisions to the aerodynamic representation during Phase 2 have but a minor impact on these results.

TABLE I1.1- | INCREMENTAL STRUCTURAL DEFLECTIONS DUE TO PARAMETRIC VARIATIONS

Performance Case P1

Point No.	Incremental deflections due to			
	No. of modes	Thrust	Bypass doors	$C_{N_{\delta e}}$, $C_{m_{\delta e}}$
1	1.852876E-01	2.652186E-02		-1.836419E-02
8	-3.459424E-02	8.909404E-03		-5.047202E-03
16	1.596004E-02	-4.851580E-03		2.613604E-03
20	-1.517144E-01	6.536365E-03		-3.824174E-03
61	-1.715276E-01	-7.283151E-03		3.275812E-03
65	2.666686E-01	1.062965E-02		-5.293846E-03
112	2.054338E-01	2.332020E-02		-8.000374E-03
115	-5.915098E-01	4.008007E-02		-1.199341E-02

Point No.	Incremental deflections due to			
	Wing-body C_{N_α}	Wing-body C_{m_α}	$C_{N_{\alpha c}}$, $C_{m_{\alpha c}}$	$C_{N_{\delta c}}$, $C_{m_{\delta c}}$
1	9.770793E-02	1.815315E-01	-2.111031E-01	-9.372014E-02
8	3.278655E-02	5.555212E-02	-6.504357E-02	-2.902555E-02
16	-1.670098E-02	-3.002018E-02	3.314626E-02	1.481044E-02
20	2.819216E-02	3.969085E-02	-5.862904E-02	-2.611852E-02
61	-1.724291E-02	-4.426742E-02	5.452496E-02	2.433020E-02
65	2.610207E-02	6.742382E-02	-5.982971E-02	-2.677250E-02
112	1.585960E-03	1.499949E-01	-6.682587E-02	-3.028297E-02
115	-1.368904E-02	2.536678E-01	-1.413555E-01	-6.375217E-02

Point No.	Incremental deflections due to			
	Dynamic pressure	Gross weight	Control gearing	
1	1.550488E-01		-7.852691E-02	
8	5.819577E-02		-2.372664E-02	
16	-2.199614E-02		1.238507E-02	
20	1.130689E-01		-1.870233E-02	
61	-1.015748E-01		1.652408E-02	
65	-1.737881E-02		-2.432632E-02	
112	-3.040857E-01		-3.586578E-02	
115	-2.424030E-01		-5.728817E-02	

TABLE I2.-1 INCREMENTAL STRUCTURAL DEFLECTIONS DUE TO PARAMETRIC VARIATIONS

Performance Case P9

Point No.	Incremental deflections due to			
	No. of modes	Thrust	Bypass doors	$C_{N\delta e}$, $C_{m\delta e}$
1	4.215937E-01	8.085608E-03	5.645841E-02	-5.677164E-03
8	-8.093524E-02	1.271033E-02	2.953655E-02	-1.637816E-03
16	9.047127E-02	-8.979380E-03	-2.078611E-02	7.405281E-04
20	-1.062905E-01	5.076528E-03	-5.671024E-03	-7.165074E-04
61	-3.822198E-01	-1.219803E-02	-1.957864E-02	7.679462E-04
65	1.534504E-01	2.032191E-02	6.039083E-02	-1.537025E-03
112	-1.281427E 00	1.511002E-02	1.680012E-01	-4.520416E-04
115	-1.286688E-01	1.631069E-02	2.334805E-01	-2.708435E-04

Point No.	Incremental deflections due to			
	Wing-body $C_{N\alpha}$	Wing-body $C_{m\alpha}$	$C_{N\alpha c}$, $C_{m\alpha c}$	$C_{N\delta c}$, $C_{m\delta c}$
1	1.371281E-01	3.180361E-02	-1.308696E-01	-8.077610E-02
8	2.035409E-02	5.371183E-02	-6.161523E-02	-3.820705E-02
16	-1.272559E-03	-3.792775E-02	3.325993E-02	2.064306E-02
20	2.060002E-02	2.268720E-02	-3.705770E-02	-2.305633E-02
61	-2.762437E-03	-5.237257E-02	4.745960E-02	2.953297E-02
65	-9.689391E-03	8.487713E-02	-6.336915E-02	-3.928137E-02
112	-4.785824E-02	5.856037E-02	1.170158E-03	8.115768E-04
115	-4.410934E-02	6.298637E-02	1.309395E-03	7.524490E-04

Point No.	Incremental deflections due to			
	Dynamic pressure	Gross weight	Control gearing	Wing Tip Position
1	-2.257627E-01	-1.070799E-01	4.602015E-02	-6.972116E-02
8	-3.290510E-02	-1.312613E-03	2.072674E-02	-1.295817E-02
16	8.721173E-03	-1.467407E-03	-1.105165E-02	9.786963E-03
20	4.946828E-03	3.703648E-02	1.226580E-02	2.732128E-02
61	-2.068281E-03	-2.344847E-02	-1.569515E-02	3.966093E-04
65	-3.019226E-02	-2.495950E-02	2.112603E-02	-4.702604E-02
112	-2.132339E-01	-2.587700E-01	2.481461E-03	-3.090286E-01
115	-3.428240E-01	-3.720379E-01	4.649162E-03	-4.676476E-01

APPENDIX J

SUGGESTED PROCEDURE FOR ESTIMATING XB-70 DRAG

The following procedure is suggested for estimating the drag characteristics of the flexible XB-70 airplane at the performance case flight conditions of table 1 of this report using Deformed Model wind tunnel test data. Several assumptions have been made to circumvent test data limitations and theoretical program restrictions. These will be itemized later. Miscellaneous drag and scale effects may be treated by conventional methods and will not be considered here.

The procedure supposes availability of the following:

1. Definition of Deformed Model shape, available from Langley measurements of the model

2. Definition of structural deformation increment of Deformed Model, available from NR analyses

3. Definition of structural deformation increment at particular flight point of interest, available from NR analyses

4. Airplane trim conditions at particular flight point, available from NR analyses

5. Wind tunnel force data at particular flight point, including canard and elevon control effectiveness. These data are available from Ames tests of the Deformed Model, although interpolation on Mach number will be required for several points

6. Theoretical methodology for estimating airplane force data; i.e., lift, drag and pitching moment.

Let the subscript 1 denote the Deformed Model shape and the subscript 2 denote the shape at trim for some particular flight point. In the following discussion, all test data and analyses are M_2, the Mach number corresponding to shape 2. Any necessary interpolation of wind tunnel data is assumed to have been completed. The following procedure may be used to define a complete drag polar for shape 2; however, only one point (1g trim) on the polar is a valid representation of the airplane since only at that point does shape 2 actually exist. Definition of a correct polar would involve repeating the procedure for several shapes which are valid for a series of normal force coefficients. Data provided in this report for roller coaster maneuvers may be used for this purpose.

Step 1: Find α, δ_c and δ_e at 1g trim for case 2 (NR data)

Step 2: Find equivalent canard deflection which defines the correct orientation of the canard to the freestream for case 2.

$$\delta'_{c2} = \delta_{c2} + \Delta\phi'_{c2}$$

where: δ_{c2} is canard deflection at trim, case 2 (NR data)

$\Delta\phi'_{c2} = -(\phi'_{c2} - \phi'_{c1})$ (Remembering that $-\phi' = +\alpha$)

ϕ'_c = slope of forebody at canard attachment point due to structural deformation. Subscripts indicate deflection case from which slope is taken (NR data)

Step 3: Find set of wind tunnel force data for Deformed Model shape at M_2 with control settings of δ'_{c2} and δ_{e2} by interpolating on control effectiveness curves. Figure J1 illustrates such a set of data. The points A,B,C,D define the path through the curves for the various configurations at a constant angle of attack for 1g trim of case 2. Note that the curve labeled WBC, $\delta_c = \delta'_{c2}$, $\delta_e = \delta_{e2}$ represents the canard at the correct orientation to the freestream and the elevon at the correct deflection for case 2. Point D on that curve is not in trim, however, since it reflects the angle of attack and control deflection for case 2 but still retains the deformed shape for case 1. The sketch of figure J1 is illustrative only, and is not meant to imply magnitude or directive of specific component inputs. (Ames wind tunnel data)

Step 4: Using an appropriate theory, compute the force characteristics of the Deformed Model shape wing-afterbody at M_2. (It is assumed that the influence of changes in shape of the forebody on wing-body pressures will be ignored. If desired, forebody shape effects could be included with no change in basic approach.)

Step 5: Find total deformed shape of wing-afterbody at case 2.

$Z_2 = Z_1 - \emptyset_1 + \emptyset_2$ at any location X,Y

where Z_1 = total z-ordinate of the Deformed Model obtained from Langley measurements of the Model, positive down. Z may be inferred to be mean camber ordinates or upper and lower surface ordinates, depending on desired representation.

$\emptyset_1$ = structural deformation increment of the mean camber surface of the Deformed Model, positive down, from NR analyses

$\emptyset_2$ = structural deformation increment of the mean camber surface for case 2, positive down, from NR analyses

$Z_1 - \emptyset$ = airplane jig shape

If Z is used as upper and lower surface values, the mean camber structural deflections, $\emptyset$, should be added to both sets.

Step 6: Using the same procedure as in Step 4, find the theoretical force characteristics of the wing-afterbody of shape 2 at M_2.

Step 7: Find the incremental change in force characteristics due to change in shape of wing afterbody.

$$\left.\begin{aligned} C_{N_{2-1}} &= C_{N_2} - C_{N_1} \\ C_{m_{2-1}} &= C_{m_2} - C_{m_1} \\ C_{D_{2-1}} &= C_{D_2} - C_{D_1} \end{aligned}\right\} \text{ at } \alpha = \text{constant}, M_2$$

Step 8: Find estimated force data for case 2 at M_2 by adding the theoretical increments found in Step 7 to the wind tunnel force data of Step 3 for $\delta_c = \delta_{c2}$ and $\delta_e = \delta_{e2}$. This addition is performed at constant angle of attack. Point E on this curve (figure J1) should not be in trim at the C_N for 1g for the gross weight and center of gravity of case 2. This trim check is a necessary condition for validity of the procedure.

The following assumptions are inherent in the procedure outlined above.

1. It is assumed that canard drag is not influenced by change in canard shape due to structural deformation, but rather is related only to its orientation to the freestream. A small error in airplane balance is also introduced since the procedure does not account for the change in canard lift and moment due to the shape change. This assumption is not essential. If desired, the influence of changes in canard shape could be estimated by the same theoretical approach that was applied to the wing-afterbody.

2. It is assumed that the drag arising from the canard interference loading on the wing is unchanged by structural deformation. Two elements are involved here. First is the assumption that the drag due to a given loading acting on wing (due to the presence of the canard) does not change with variations of wing twist and camber shape. Second is the assumption that the interference loading on the wing is unchanged by canard shape and vertical position. It is possible to avoid the first of these assumptions by use of canard interference load distributions developed from Force Model 5 test data during the airplane design process. Drag due to the interference loading could be computed for the Deformed Model wing shape and for a particular new wing shape. The incremental difference between these drags could then be added to the estimated drag for the new wing shape.

3. It is assumed that the effect of changes in forebody shape arising from changes in forebody pressures is negligible. This assumption is readily eliminated if desired.

4. It is assumed that the drag of the elevons is a function of α and δ_e and is not influenced by twist and camber changes of the wing.

5. It is assumed that wing twist and camber changes will not influence drag associated with the leading edge vortices.

6. It is assumed that drag characteristics related to wedge-on-wing effects are not altered by changes in wing twist and camber. This assumption could be eliminated by an analysis to estimate the pressure loading acting on the wing due to presence of the afterbody. The wedge-on-wing drag could then be calculated for the Deformed Model shape and a desired new shape. The incremental difference between these drags defines the correction for wedge-on-wing effects to be added to the airplane drag estimate.

——— Ames Wind Tunnel Test Data, M_2, Deformed Model Shape

— — Complete Airplane Data for Shape 2 at M_2 with $\delta_c = \delta'_{c2}$ and $\delta_e = \delta_{e2}$ obtained by Adding Theoretical Correction for Change in Shape to Wind Tunnel Data

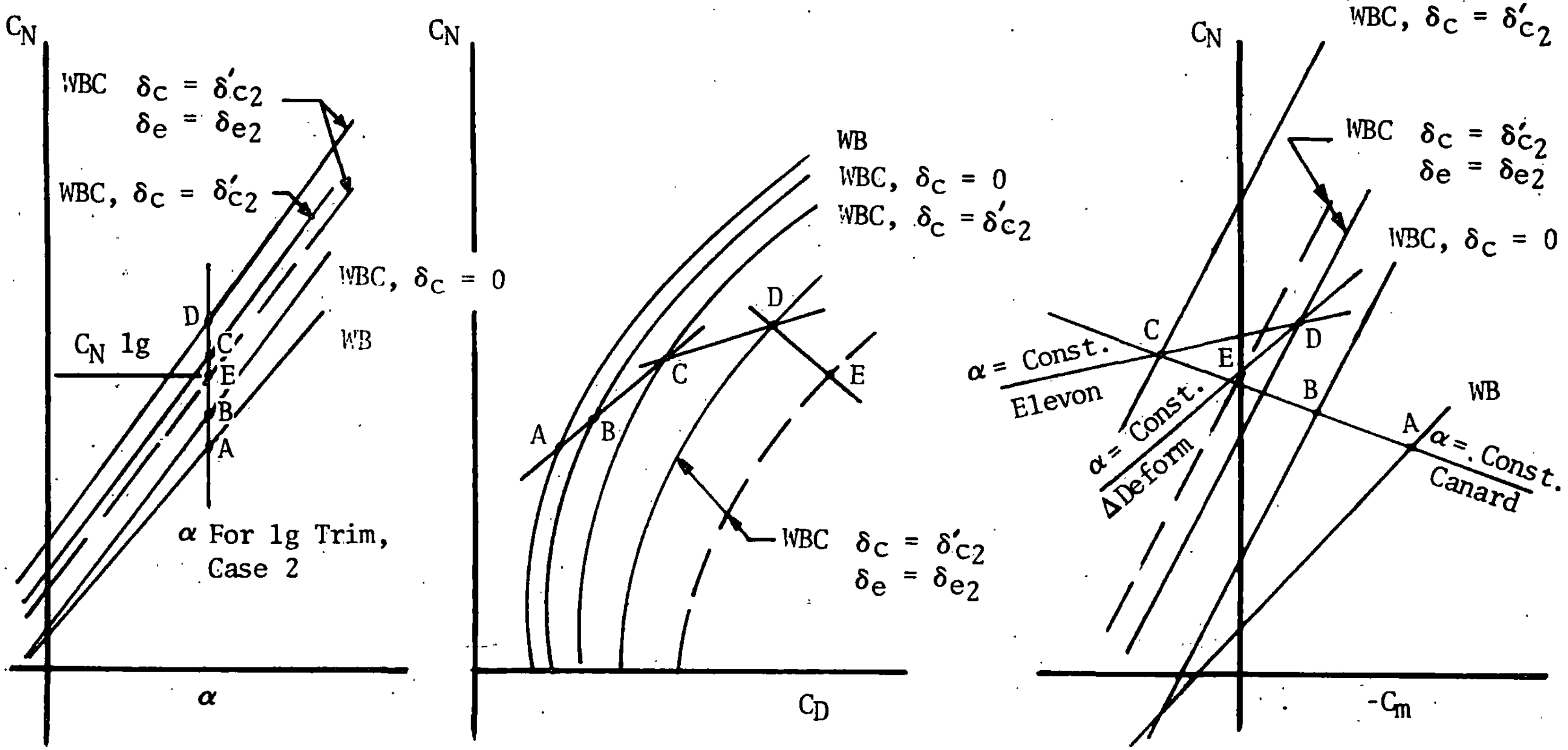


Figure J1.- Illustration of arbitrary shape force data estimation from deformed model wind tunnel results

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