NASA Contractor Report No. 159149

NASA-CR-159149
1980 0001956

Study of the Feasibility Aspects of Flight Testing an Aerolastically Tailored Forward Swept Research Wing on a BQM-34F Drone Vehicle

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Contract NAS1 - 15624
3 September 1979

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National Aeronautics and
Space Administration

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AC 804 827-3966

PREFACE

This study of THE FEASIBILITY ASPECTS OF FLIGHT TESTING AN AEROELASTICALLY TAILORED FORWARD SWEPT RESEARCH WING ON A BQM-34F DRONE VEHICLE, was conducted by Teledyne Ryan Aeronautical at San Diego, California during the period November 1978 through June 1979. This study was conducted under Contract NAS1-15624 for the NASA Langley Research Center, Hampton, Virginia. The NASA Technical Manager was H.N. Murrow.

Acknowledgement is made to the following TRA Engineers for their contributions to this study.

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G.C. Childers	Structural Dynamics
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G.H. Painter	Flutter Analysis
W.C. Parks	Stability and Control
M.M. Rodriguez	Aeroelasticity
H.L. Rozelle	Structural Analysis
L.M. Shaffer	External Loads
R.E. Shankle	Structural Design

SUMMARY

A study has been completed which investigated the feasibility aspects of flight testing an aeroelastically tailored forward swept research wing on a BQM-34F drone vehicle. The study encompassed two broad tasks;

1. Define the geometry of a forward swept wing which can be incorporated into the BQM-34F maintaining satisfactory flight performance, stability and control.

2. Perform a preliminary design of an aeroelastically tailored forward swept wing.

The BQM-34F is a jet powered conventionally configured aircraft. The basic aft swept wing is mounted shoulder high to the circular fuselage at about the mid point of its length. This study shows that a wing designed with leading edge forward sweep of 20-degrees can be mounted using existing wing mounting points. Satisfactory flight stability and control are predicted with the addition of about 300 pounds of ballast external to the forward fuselage. Research mission endurance exceeding 30 minutes is available at the NASA specified design point of Mach number 0.90 at 30,000 feet.

Only minor modifications are required to the basic target to accommodate the forward swept research wing. Forward fuselage ballast must be installed to maintain the proper a.c./c.g. relationship. The ballast must be installed external because of the lack of internal volume. Because of the additional ballast weight, forward fuselage structural reinforcement is required. Four external 1/8-inch stainless steel straps running fore and aft will provide the increased bending modulus required. A preliminary study, assuming rigid fuselage mounting, shows forward-swept wing mounting loads exceeding allowables at one fuselage frame. It is expected that a more detailed analysis which includes fuselage flexibility will show loads do not exceed allowable levels, however, if frame beef-up is required this can be accomplished by adding an inner and outer angle flange extending about 150 degrees around the lower portion of the frame.

SUMMARY (continued)

Installation of the forward ballast produces a center of gravity which would cause the vehicle to hang nose-down while descending beneath the recovery parachutes. A modification is recommended which will allow the large parachute deployment loads to still be taken by the existing structure but then shift the forward parachute attachment point more forward so that the vehicle attitude is level.

The forward swept wing preliminary aeroelastic design was completed making extensive use of the FASTOP structural optimization program. The program can be used to optimize metallic or fiberous composite structure for strength, deflection and flutter. The wing construction consists of graphite/epoxy skins and full depth HFT glass reinforced phenolic honeycomb core. The graphite thickness distributions and ply fiber orientation were chosen to meet strength, deflection and flutter constraints. Skin thickness varied from approximately 0.445 inches (89 plies) at the wing leading edge root to .015 inches (3 plies) near the trailing edge. A weight savings for an outer wing panel on the order of 65 percent is predicted through the use of advanced composite graphite material over conventional aluminum to meet deflection constraints.

The preliminary design effort of this study has shown that a forward swept wing of advanced composite material can be designed to overcome the inherent static divergence tendencies without undo weight penalties. A detail design of this forward swept research wing should encompass studies to insure that deformations normal to the chord are properly controlled, and that ply orientations and layers are chosen, as much as possible, to ease the fabrication process.

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SYMBOLS

A - Aspect ratio

AR - Aspect ratio

A_{WET} - Wetted Area

b - Wing span

BL - Butt line

C - Chord

$\overline{C}$ - Wing MAC

$\overline{C}/2$ - Mid-chord location of MAC

$\overline{C}/4$ - Quarter-chord location of MAC

C_{D_L} - Drag due to lift

C_{D_O} - Drag coefficient at zero lift

C_f - Skin friction coefficient

C_{R_β} - Slope of rolling moment coefficient vs. angle of sideslip

C_L - Lift coefficient

$C_{L_{MAX}}$ - Maximum lift coefficient

C_{L_T} - Trim lift coefficient

$C_{L_{TRIMMED}}$ - Trimmed lift coefficient

C_{L_W} - Lift coefficient of wing

C_{L_α} - Slope of lift coefficient vs. angle of attack

$C_{L_{\delta e}}$ - Slope of lift coefficient vs. elevator deflection

C_M - Moment coefficient

$C_{M_{C_L}}$ - Static margin

C_{M_α} - Slope of pitching moment coefficient vs. angle of attack

$C_{M_{\delta e_{C/4}}}$ - Slope of pitching moment coefficient about $\overline{C}/4$ vs. elevator deflection

C_R - Wing root chord

C_T - Wing tip chord

C.G. - Center of Gravity

DGW - Design gross weight

DIA - Diameter

D.O.F. - Degrees of freedom

e_1 - Strain in primary material direction

e_2 - Strain in secondary material direction

E_x - Youngs Modulus of Elasticity in principal material direction

E_y - Youngs Modulus of Elasticity in secondary material direction

E_1 - Youngs Modulus of Elasticity in primary material direction

E_2 - Youngs Modulus of Elasticity in secondary material direction

f - Drag area

fps(EAS) - Feet per second in equivalent airspeed

f_s - Stress in core

F_{cyd} - Facing stress at which intracellular buckling occurs

F_s - Allowable shear force

F_{xc} - Allowable compressive force in the X-direction

F_{xt} - Allowable tensile force in the X-direction

g - 32.2 ft/sec^2

G - Shear modulus of elasticity

G.W. - Gross weight

H - Pertaining to horizontal tail

K_f - Form factor

KEAS - Knot equivalent air speed

ℓ_{REF} - Characteristic length

L_H - Horizontal tail arm

L.E. - Wing leading edge

L.E.MAC - Leading edge station of mean aerodynamic chord

M - Mach number

$M_{C/2}$ - Root bending

M_{SL} - Equivalent design Mach no. at sea level

M_x - Moment about x or longitudinal axis

M_y - Moment about y or lateral axis

MAC - Mean aerodynamic chord

MAR - Mid-air retrieval

M.S. - Margin of safety

n_{ULT} - Ultimate load factor

n_X - Load factor, X

n_Y - Load factor, Y

n_Z - Load Factor, Z

$n_Z W$ - Product of normal load factor and weight

P_{SHEAR} - Bolt allowable shear load

$P_{TENSION}$ - Bolt allowable tension load

PSI - Pounds per square inch

R_N - Reynolds number

s - Core cell size

S - Planform area

S_W - Wing planform area

S_Z - Shear in Z or vertical direction

SEC $\Lambda_{\frac{1}{4}C}$ - Secant of quarter chord sweep angle

S.L. - Sea level

S.M. - Static margin

t - Thickness, inches

$T_{C/2}$ - Root torsion

t_f - Laminate thickness

t/c - Thickness ratio

T.E. - Wing trailing edge

TR - Thickness of theoretical root chord

V_L - Free flight limit speed

WL - Water line

X - Pertains to longitudinal direction

X_{ac} - Fuselage station location at aerodynamic center

X_{cg} - Fuselage station location of center of gravity

X_F - X coordinate in fuselage coordinate system

XF - Fuselage longitudinal location

$\oint$ - Pertains to lateral direction

Y_F - Y coordinate in fuselage coordinate system

Y_w - Y coordinate in wing coordinate system

YEA - Lateral dimension along elastic axis

Y(LWR) - Y coordinate of airfoil lower surface

Y(UPR) - Y coordinate of airfoil upper surface

Z - Pertains to vertical direction

Z_F - Z coordinate in fuselage coordinate system

Z.F.W. - Zero fuel weight

α - Angle of attack

α_1 - Thermal expansion coefficient in primary material direction

α_2 - Thermal expansion coefficient in secondary material direction

γ_{12} - Shearing strain

δ_e - Elevator deflection, deg.

δ_r - Rudder deflection

ΔX - Distance aft from wing apex at (BL=0)

e_α - Downwash derivative

θ - Pitch angle

θ_X - Rotation about X axis

θ_Y - Rotation about Y axis

λ - Taper ratio

Λ - Wing sweep angle

$\Lambda C/_4$ - Wing sweep angle of quarter cord

$\Lambda C/_2$ - Wing sweep angle of half cord

Λ_{LE} - Wing leading edge sweep

μ - Poisson's ratio

μX - Poisson's ratio in principle laminate direction

μY - Poisson's ratio in secondary laminate direction

ρ - Density

ϕ - Bank angle

' - Feet

- Lb

1.0 INTRODUCTION

A number of years ago the National Aeronautics and Space Administration (NASA) established a program utilizing modified BQM-34F FIREBEE II targets as test vehicles for flight research. The program is known by the acronym DAST for Drones for Aerodynamic and Structural Testing.

The feasibility of using the FIREBEE II target for flight investigation of research wings was substantiated as a result of a TRA study conducted under NASA contract (NASI-11758; Reference 1.1). The study provided aerodynamic performance information for several research wing planforms as well as wing design and integration aspects. Under separate NASA contract (NASI-11758; Reference 1.2), TRA designed an aspect ratio 6.8 supercritical research wing. This wing has been fabricated by NASA and outfitted with active controls for flutter suppression. First flight of the BQM-34F with this wing is scheduled about the time of publication of this report. A second research wing for the BQM-34F is presently being designed by Boeing under NASA contract. This wing, of aspect ratio 10.3, will be equipped with multiple active controls for flight research of gust and maneuver load alleviation, flutter suppression and reduced static stability. Further details of the DAST program are presented in Reference 1.3.

The advent of structures fabricated with isotropic laminates of advanced composite materials provides a means of efficiently tailoring the aeroelastic characteristics of lifting surfaces. The NASA HIMAT vehicle is a significant example of this emerging technology. The flutter characteristics of the aspect ratio 6.8 wing mentioned previously were tailored by means of composite materials. This aeroelastic tailoring capability of composite materials has sparked a renewed interest in forward swept wings which have generally not been used because of inherent static divergent tendencies. Reference 1.4 investigates divergence elimination through use of advanced composites.

This report documents the results of a study conducted by TRA to investigate the feasibility aspects of flight testing an aeroelastically tailored forward swept research wing on a BQM-34F drone vehicle. The study was conducted under NASA contract NASI-15624 during the period November 1978 through June 1979. The program was initated by NASA RFP 1-12-2720-0142 dated 15 August 1978. TRA's response to the RFP was the proposal document of Reference 1.5. The NASA statement of work is included as Appendix A in Volume II of this report.

The study effort addressed the following major tasks:

1. Determine the range of wing geometry which can be adopted to the BQM-34F and meet the specified requirements.
2. Identify any modifications required of the basic airframe.
3. Perform a preliminary structural design of an aeroelastically tailored swept forward wing.
4. Document the study results and present an oral report at Langley.

A three-view of the BQM-34F equipped with the forward swept research wing is shown in Figure 1-1.

Measurement values employed in this technical report are expressed in customary units. As stipulated by the contract a table has been provided for converting the customary units used in this document to the International System of Units (SI). The conversion units are provided in Figure 1-2.

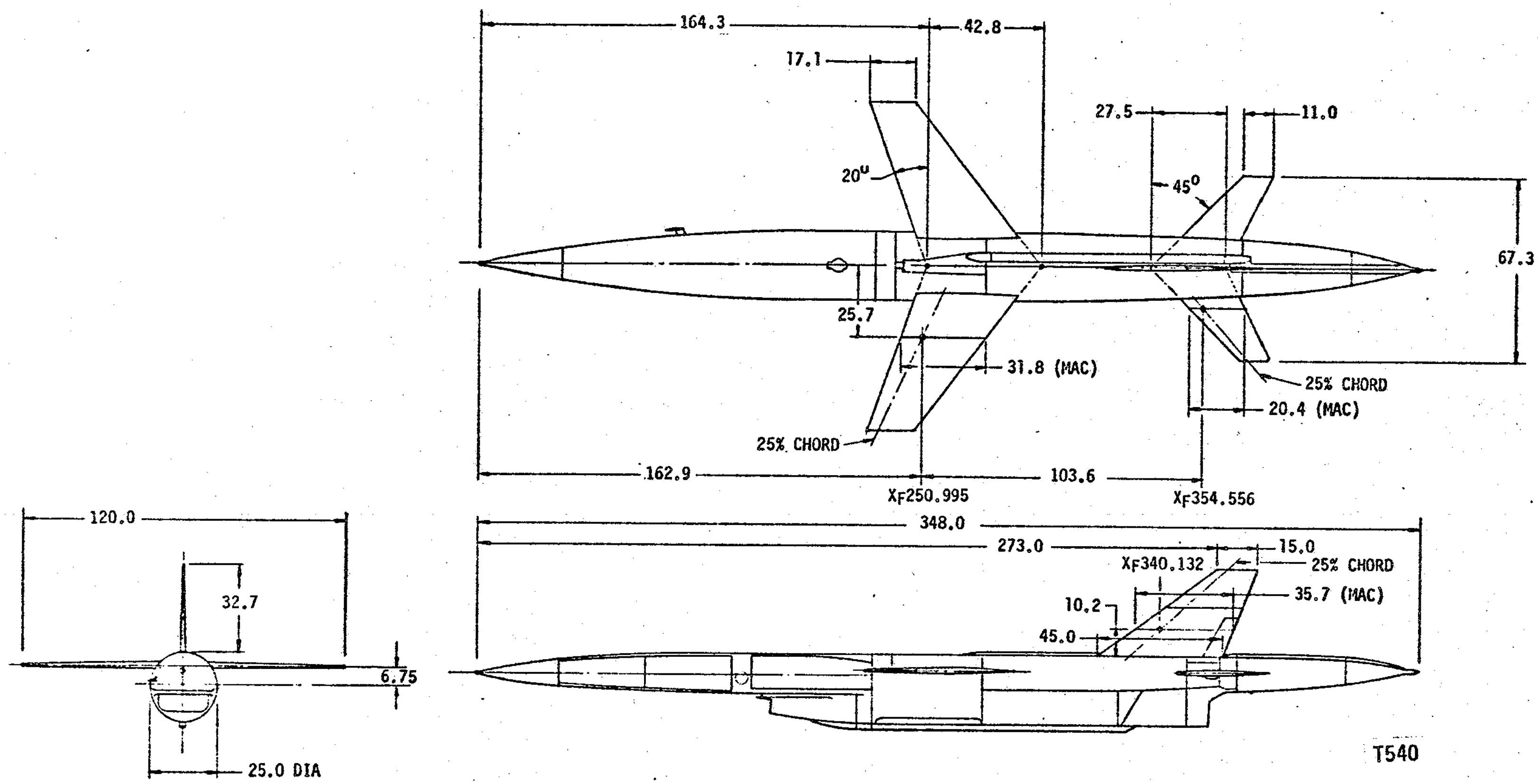

Figure 1-1. General Arrangement BQM-34F Drone with Forward Swept Wing

PHYSICAL QUANTITY	TO CONVERT FROM	TO	MULTIPLY BY
Acceleration	Foot/Second^2	Meter/Second^2	*$3.048.10^{-1}$
Area	Foot^2	Meter^2	*$9.290304.10^{-2}$
Density	ℓbm/Inch^3	Kilogram/Meter^3	$2.767990.10^4$
Density	ℓbm/Foot^3	Kilogram/Meter^3	$1.601846.10^1$
Force	ℓbf	Newton	$4.448221.10^0$
Length	Inch	Meter	*$2.54.10^{-2}$
Length	Foot	Meter	*$3.048.10^{-1}$
Mass	ℓbm	Kilogram	$4.535924.10^{-1}$
Moment	In-ℓbf	Meter-Newton	$1.129848.10^{-1}$
Pressure	ℓbf/Inch^2	Newton/Meter^2	$6.894757.10^3$
Speed	Foot/Second	Meter/Second	*$3.048.10^{-1}$
Speed	Knot	Meter/Second	$5.144444.10^{-1}$
Volume	Hogshead	Meter^3	$2.384809.10^{-1}$

NOTE: An asterisk precedes each number which expresses an exact definition.

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Figure 1-2. Conversion Factors

2.0 STUDY PROCESS

Subsequent sections of this document report on the details and results of the study effort. This section presents a concise description of the study process and chronology. Figure 2-1 provides a calendar of major study events.

A chronology of the events during the study has been captured in the progress reports which were prepared and submitted to NASA on a monthly basis. Copies of these six program reports are presented as Appendix B in Volume II of this report.

This study effort was comprised of two major elements. During the first element the range of wing planform variables provided by the NASA statement of work were evaluated in terms of their impact upon meeting the specified flight research objectives and in terms of their integration with the BQM-34F target. Following selection of a wing planform the second major study element commenced and consisted of a more detailed investigation of integrating the wing with the vehicle and a preliminary design of the wing.

The NASA statement of work asked for consideration of wing planforms with the following geometries:

Reference Wing Area, Sq. Ft.	25 to 36
Airfoil	Supercritical
Root Airfoil Thickness Ratio	Approx. .05
Tip Airfoil Thickness Ratio	Approx. .05
Wing Aspect Ratio	4 to 7
Span, Ft.	11 to 17
Leading Edge Sweep Angle, Deg.	-20 to -35
Twist, Deg.	TBD
Taper Ratio	0.40

In addition, an optional close coupled canard with approximately the following characteristics was to be considered during the study:

Reference Exposed Canard Area, Sq. Ft.	8
Exposed Canard Aspect Ratio	4

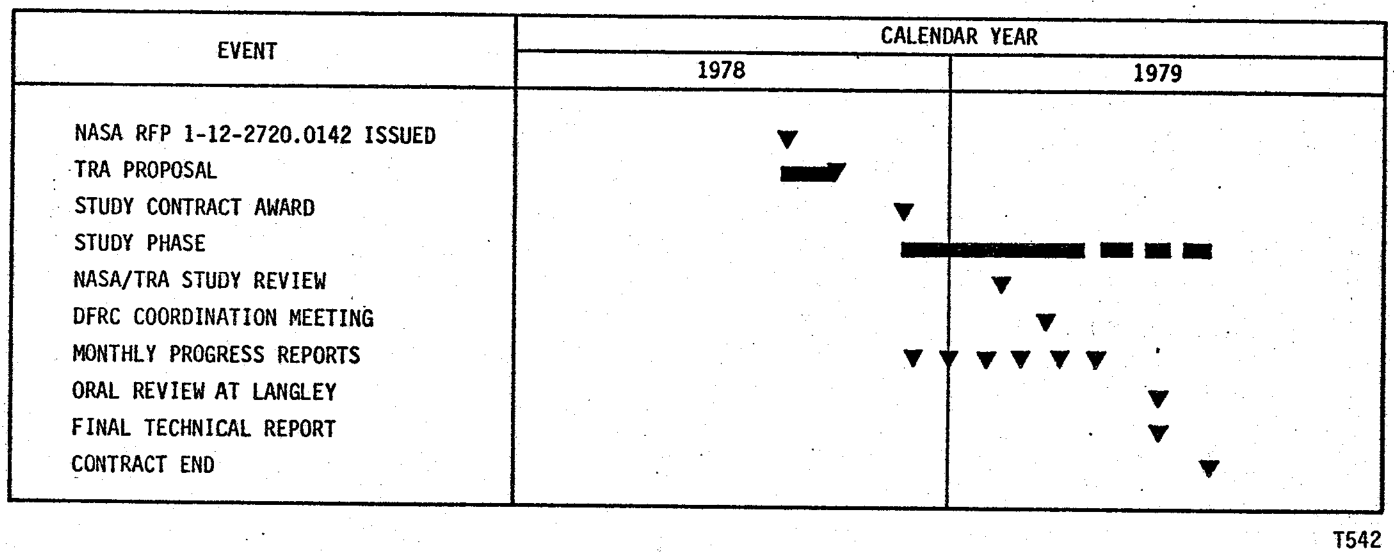

Figure 2-1. Calendar of Major Events

Canard Thickness Ratio	TBD
Leading Edge Sweep Angle, Deg.	-30
Taper Ratio	0.2
Twist, Deg.	0

The matrix of wing geometric characteristics considered in this study is shown in Figure 2-2. Estimates of wing weights for parametric evaluation have been made from the following empirically based formula:

$$\text{Wing Weight} = F\left[.1604(DGW - n_{ULT})^{.297} (S_W)^{.48}(b)^{.7} (SEC\Lambda_{\frac{1}{4}C})^{.37}(1+\lambda)^{.4}(M_{SL})^{.25}\right] / (TR)^{.3}$$

F = Factor = 1.0 for Aluminum = 0.8 for Composites

DGW = Design Gross Weight = 2500 lbs.

n_{ULT} = Ultimate Load Factor = 9

S_W = Gross Wing Area = variable

b = Wing Span = variable

$SEC\,\Lambda_{\frac{1}{4}C}$ = Secant of Quarter Chord Sweep Angle = variable

λ = Taper Ratio = 0.4

M_{SL} = Equivalent Design Mach No. at Sea Level = 0.65

TR = Thickness of Theoretical Root Chord = variable

Wing weights based upon this formula are presented in Figure 2-3.

Placing a forward swept wing on the BQM-34F at the same wing mounting location as the basic target moves the aerodynamic center of the vehicle forward. This requires forward ballast to maintain a constant level of longitudinal static stability. This is illustrated by the curves of Figure 2-4. These curves show the amount of ballast required at the X_F 118.6 bulkhead to maintain a static margin of 10%. Ballast requirements of at least 150 pounds are indicated. The largest influence on quantity of ballast required is the forward sweep angle and fore-aft position of the wing.

The conventional target wing is mounted to the fuselage by means of five bolts per side. For mounting the forward swept research wing a minimum of three mounting bolts is considered required with four desirable. This is illustrated by the sketch of Figure 2-5. The most aft position for the various

NO.	ASPECT RATIO (A)	L.E. SWEEP (Λ_{LE}) DEG.	PLANF. AREA (S) FT^2	ROOT CHORD C_R IN.	TIP CHORD C_T IN.	TAPER RATIO	WING SPAN b IN.	WING MAC $\bar{c}$ IN.	WING SWEEP ANGLE $\Lambda_{c/4}$ DEG.	$\Lambda_{c/2}$ DEG.	WING WETTED AREA SQ. FT.
1 2 3	4	-20 -28 -36	25	42.857	17.142	0.4	120.000	31.837	-25.226 -32.573 -39.817	-30.039 -36.723 -43.254	36.15
4 5 6	4	-20 -28 -36	30	46.948	18.779	0.4	131.453	34.876	-25.226 -32.573 -39.817	-30.039 -36.723 -43.254	44.83
7 8 9	4	-20 -28 -36	36	51.429	20.571	0.4	144.000	38.204	-25.226 -32.573 -39.817	-30.039 -36.723 -43.254	55.20
10 11 12	5	-20 -28 -36	25	38.333	15.333	0.4	134.164	28.476	-24.213 -31.692 -39.085	-28.165 -35.113 -41.923	37.62
13 14 15	5	-20 -28 -36	30	41.991	16.797	0.4	146.969	31.198	-24.213 -31.692 -39.085	-28.165 -35.113 -41.923	46.31
16 17 18	5	-20 -28 -36	36	45.999	18.400	0.4	160.997	34.171	-24.213 -31.692 -39.085	-28.165 -35.113 -41.923	56.98
19 20 21	6	-20 -28 -36	25	34.993	13.997	0.4	146.969	25.995	-23.528 -31.096 -36.589	-26.877 -34.002 -41.004	39.39
22 23 24	6	-20 -28 -36	30	38.333	15.333	0.4	160.997	28.476	-23.528 -31.096 -38.589	-26.877 -34.002 -41.004	48.31
25 26 27	6	-20 -28 -36	36	41.991	16.797	0.4	176.363	31.194	-23.528 -31.096 -38.589	-26.877 -34.002 -41.004	59.23

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Figure 2-2. NASA Forward Swept Wing Geometric Characteristics

WING AREA SQ. FT.	ASPECT RATIO	SWEEP ANGLE, DEGREE		WING WEIGHT (ALUM.) LB.	WING WEIGHT (COMPOSITES) LB.
		L.E.	1/4 CHORD		
25	4	20	25.23	132.27	105.82
		28	32.57	135.79	108.63
		36	39.82	140.53	112.42
	5	20	24.21	147.22	117.78
		28	31.69	150.05	120.04
		36	39.09	156.27	125.02
	6	20	23.53	161.00	128.80
		28	31.10	165.13	132.10
		36	38.58	170.79	136.63
30	4	20	25.23	149.46	119.57
		28	32.57	153.43	122.74
		36	39.82	158.79	127.03
	5	20	24.21	166.75	133.40
		28	31.69	171.09	136.87
		36	39.09	177.01	141.61
	6	20	23.53	182.34	145.79
		28	31.10	186.91	149.53
		36	38.58	193.31	154.65
36	4	20	25.23	169.40	135.52
		28	32.57	173.90	139.12
		36	39.82	179.98	143.98
	5	20	24.21	188.68	150.98
		28	31.69	193.59	154.87
		36	39.09	200.29	160.23
	6	20	23.53	206.38	165.10
		28	31.10	211.67	169.34
		36	38.58	218.92	175.14

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Figure 2-3. Wing Weight Matrix

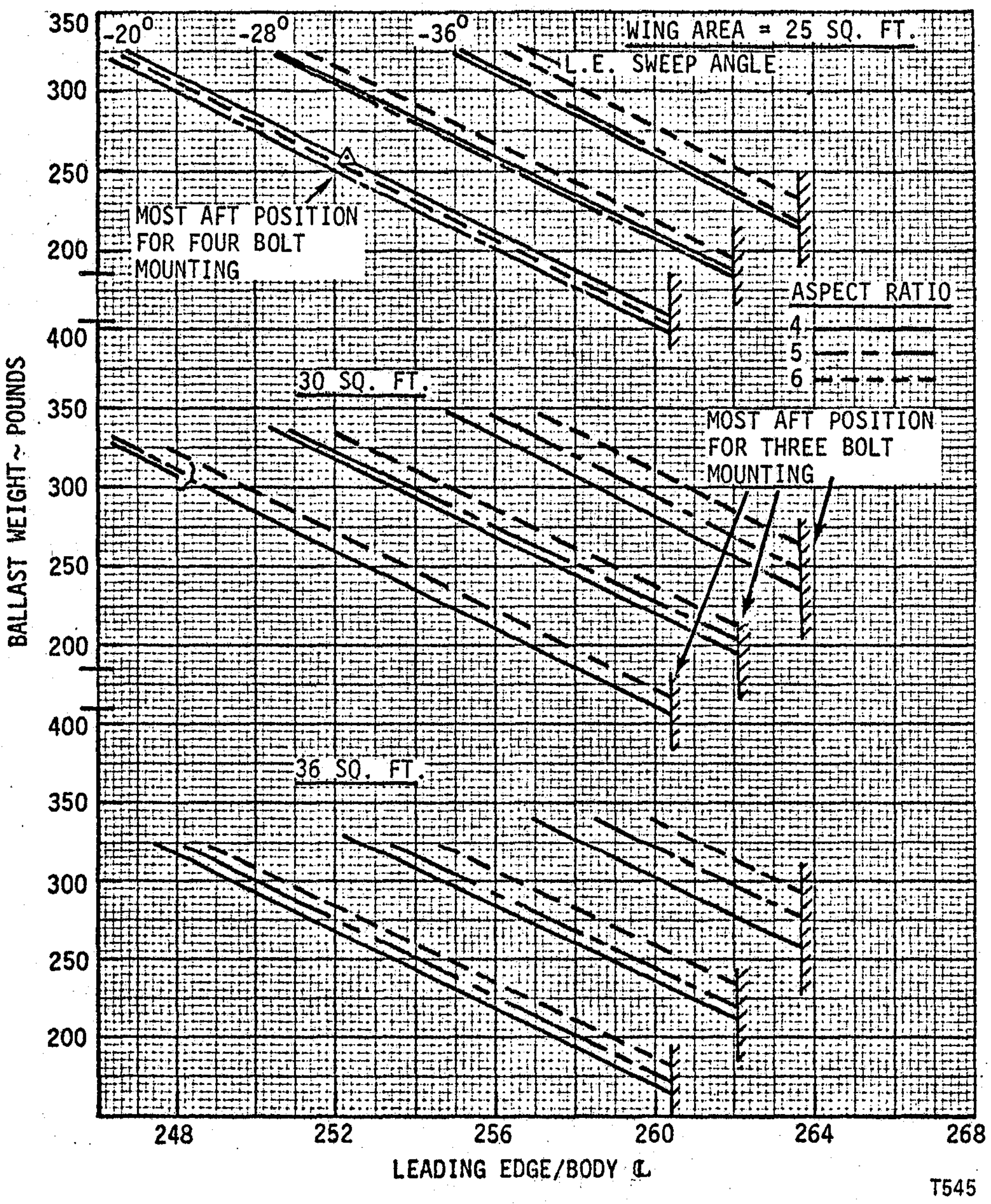
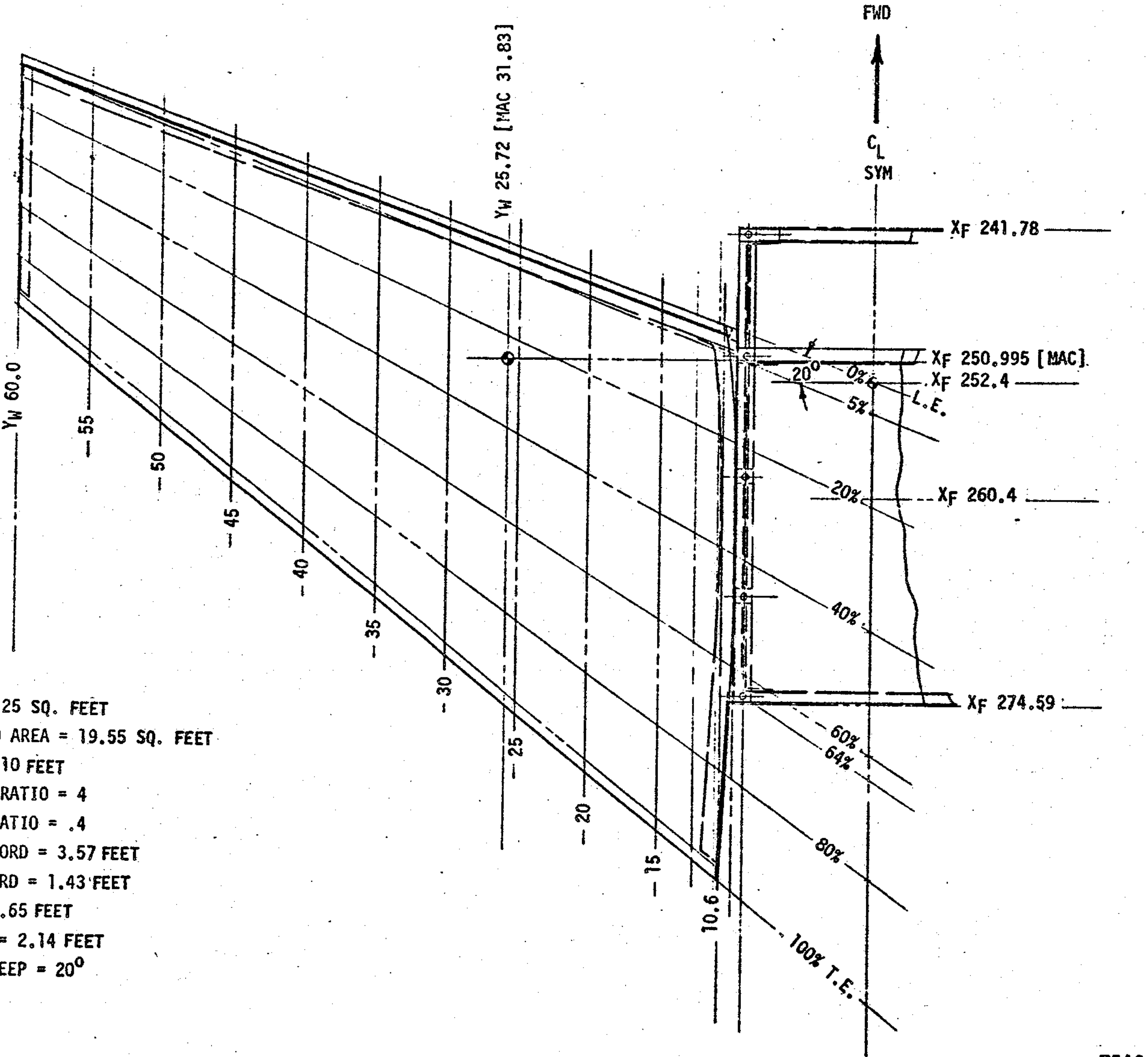


Figure 2-4. NASA Forward Swept Wing - Ballast Weight Requirements



AREA = 25 SQ. FEET
EXPOSED AREA = 19.55 SQ. FEET
SPAN = 10 FEET
ASPECT RATIO = 4
TAPER RATIO = .4
ROOT CHORD = 3.57 FEET
TIP CHORD = 1.43 FEET
MAC = 2.65 FEET
Y_W MAC = 2.14 FEET
L.E. SWEEP = 20°

Figure 2-5. Wing/Fuselage Mounting Study wing geometries to maintain three-bolt per side mounting is shown on Figure 2-4. The most aft positioning for the wing of Figure 2-5 which permits use of four mounting bolts per side is an intersection of the leading edge and the fuselage centerline at station 252.4. This requires about 257 pounds of ballast as shown by the indicated point on Figure 2-4.

It was recognized that large amounts of forward ballast may require fuselage structural modifications to sustain the greater loads. Another problem with forward ballast is its effect upon the vehicle center of gravity when suspended beneath the recovery parachute. Deployment of the recovery parachutes, which are stowed in the aft end of the vehicle, moves the vehicle c.g. forward. For most of the wings, wing mounting locations, and forward ballast requirements, the recovery c.g. falls forward of the forward parachute mounting point. For the wing of Figure 2-5 this would mean a nose-down attitude of about 50 degrees at mid-air helicopter pickup and during towing and docking which is considered unsatisfactory. This problem is illustrated by Figure 2-6. The figure shows that only the 20-degree swept forward wing at the most rearward mounting location would result in a recovery c.g. within the parachute mounting points. This would result in a wing which picks up only three of the existing mounts and a recovery c.g. almost coincident with the forward parachute mount, both undesirable.

Two other alternatives were investigated, dropping ballast at recovery and repositioning the forward parachute attach point. The wing of Figure 2-5 requires more than 90 pounds of droppable ballast as illustrated by the preliminary weight/c.g. curves of Figure 2-7. Although dropping ballast is feasible and has been discussed with safety people at DFRC, repositioning the forward parachute attachment appears more desirable.

During the recovery process, large main parachute loads are transmitted to the fuselage through the forward attachment fitting. Imposing these loads upon a more forward fuselage frame would probably require significant structural modifications to the new frame. A scheme has thus been developed wherein the peak forces of parachute deployment would be taken through the existing fittings and then, once the vehicle is in stabilized descent, a bridle restraint is released allowing the vehicle to swing level prior to Mid Air

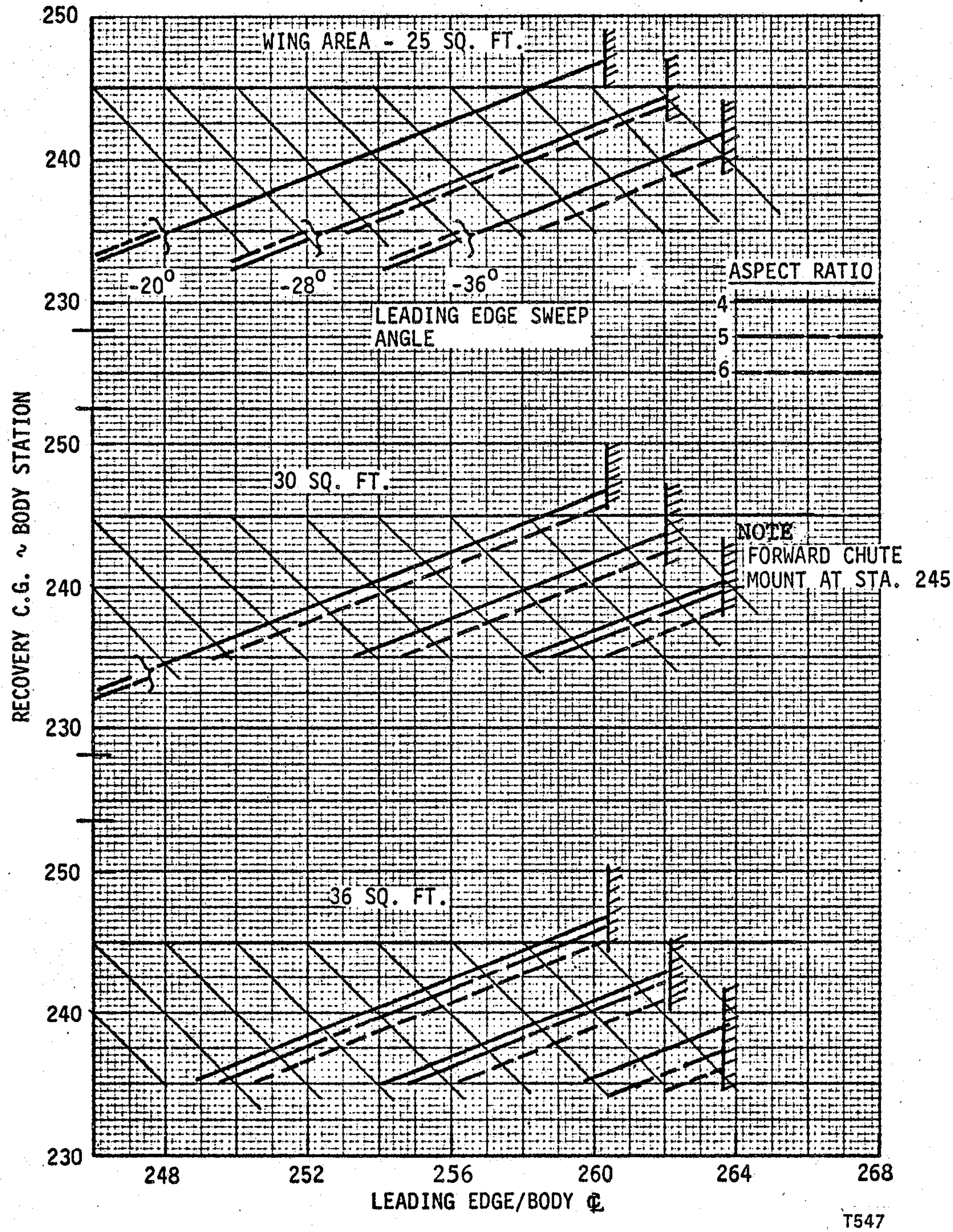


Figure 2-6. NASA Forward Swept Wing - Recovery CG vs. Wing Location

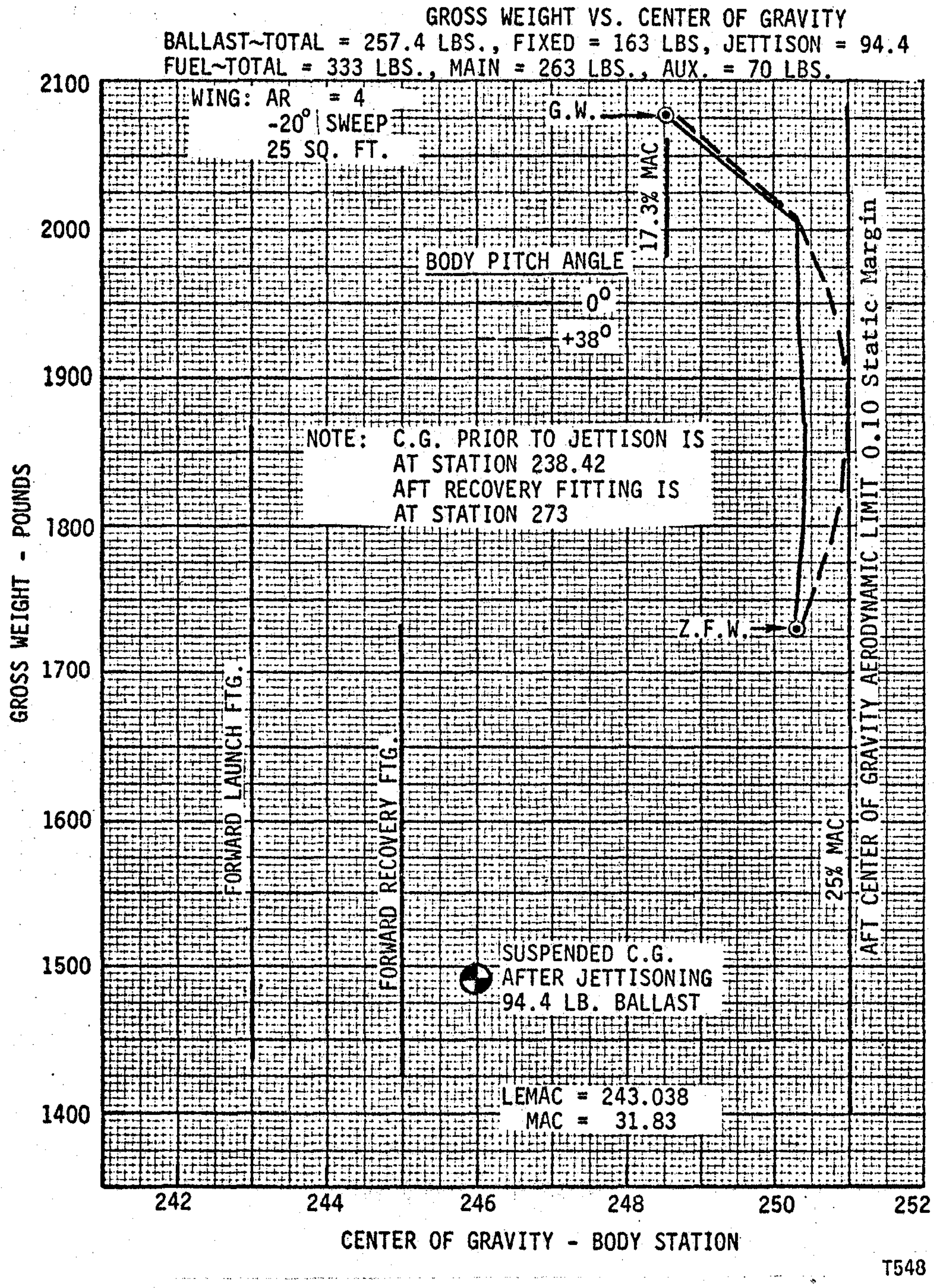


Figure 2-7. NASA Forward Swept Wing

Retrieval (MAR). This concept is presented in more detail in Section 11.1.3.

Adding a canard surface to the BQM-34F will result in a further shift forward of the aerodynamic center of the vehicle. Data from Reference 2.1 have been reviewed in order to estimate this effect. The wing of Reference 2.1 has an aspect ratio of 1.25, taper ratio of 0.25 and leading edge sweep of 32.13 degrees. The close-coupled canard has about the same sweep angle and the exposed canard area is 15.9 percent of the wing reference area. The effect of the canard on aerodynamic center location is shown on Figure 2.8. A forward shift of 24 percent MAC is indicated. For the BQM-34F a canard area of 8.0 square feet is specified which produces an area ratio 0.32 for a 25 square foot wing. A forward shift of the aerodynamic center of considerably more than 24 percent MAC would be expected. A ballast weight increase of about 100 pounds would be needed for a 24 percent forward shift and considerably more than that for the canard/wing area ratios specified for the BQM-34F application. Because of this large increase in required ballast and because of the obvious problems associated with mounting a canard no further consideration was given to the canard configuration.

The choice of wing planform was not influenced by flight performance limits. Preliminary estimates shown in Reference 1.5 and past experience with the BQM-34E/F assure that the required speed and altitude regime can be attained. Flight performance aspects of the BQM-34F with the swept forward wing are presented in Section 4.0.

The choice of a wing planform for further study was influenced primarily by two factors:

1) Wing planform must be consistant with NASA research objectives.
2) Minimize ballast requirements and modifications to basic target airframe.

A 25.0 square foot aspect ratio 4 wing with -20.0 degree forward sweep was chosen. This wing minimizes ballast requirements and airframe structural modifications. NASA concurrence with this choice was obtained by telephone in late January 1979 with Jim Campbell and Hal Murrow of NASA and at a subsequent study review at TRA with Mr. Murrow on 5 March 1979.

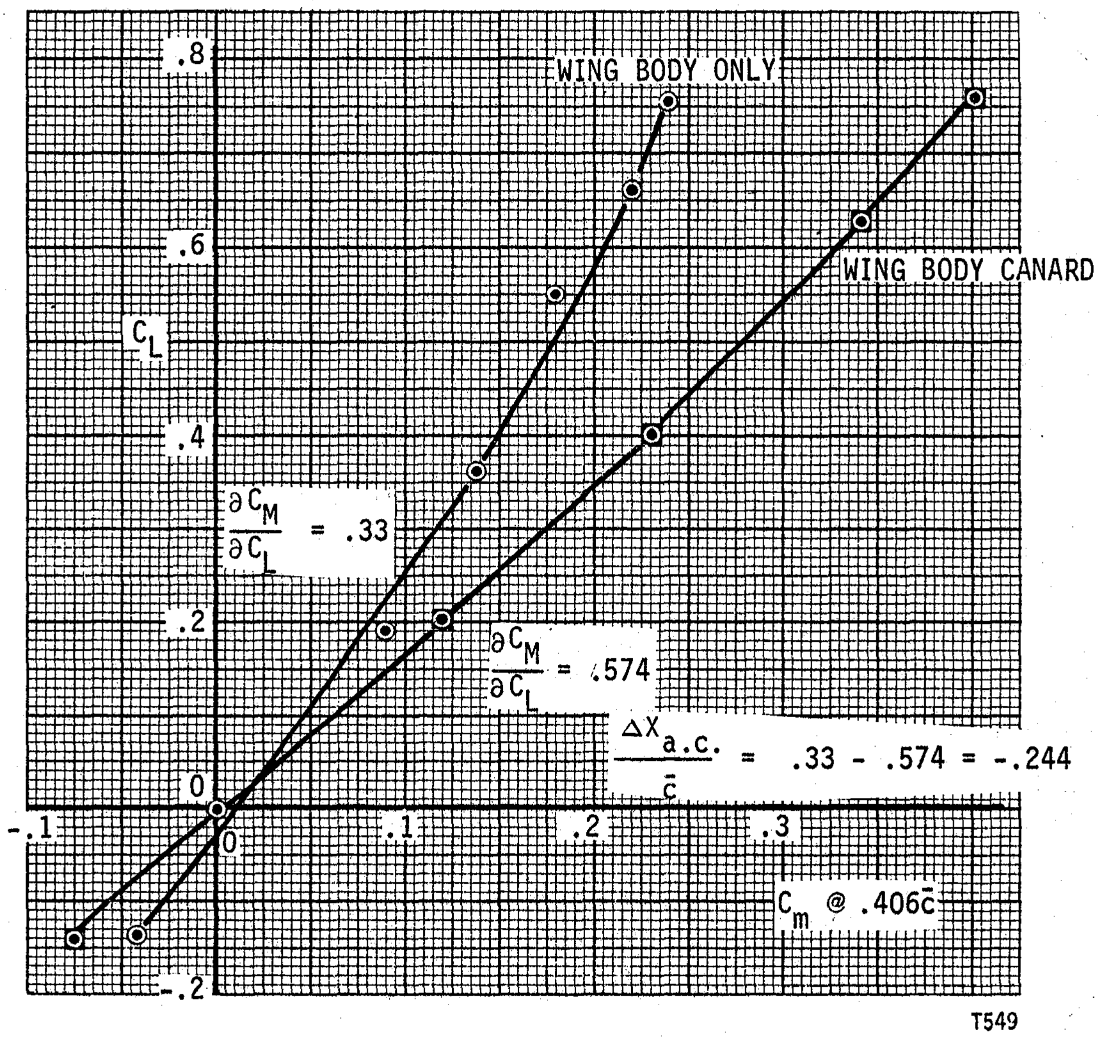


Figure 2-8. Effect of Canard on Aerodynamic Center Location

The NASA SOW stipulates an unspecified supercritical airfoil for the wing. The airfoil which was chosen was the airfoil of Table II of Reference 2.2. The coordinates for the referenced airfoil are for a thickness ratio of 13 percent. These coordinates have been modified to produce the 5 percent thick supercritical airfoil used in this study. The coordinates are shown on Figure 2-9.

Selection of the wing permitted this study to progress into the more detailed stability and control, flight performance, structural, weight and balance and design efforts reported in subsequent sections of this report.

LS(1)-4050 MOD
DATE---------------------4/18/79

	X	Y(UPR.)	Y(LWR.)	MEAN LINE
1	0.000000	0.000000	0.000000	0.000000
2	0.002500	0.004439	-0.002607	0.000276
3	0.005000	0.006115	-0.003615	0.000544
4	0.007500	0.007385	-0.004368	0.000806
5	0.010000	0.008442	-0.004979	0.001061
6	0.012500	0.009370	-0.005498	0.001308
7	0.015000	0.010224	-0.005962	0.001549
8	0.017500	0.011019	-0.006380	0.001782
9	0.020000	0.011766	-0.006758	0.002009
10	0.025000	0.013154	-0.007427	0.002441
11	0.030000	0.014418	-0.008012	0.002845
12	0.035000	0.015551	-0.008530	0.003221
13	0.040000	0.016573	-0.008996	0.003569
14	0.045000	0.017474	-0.009420	0.003889
15	0.050000	0.018308	-0.009808	0.004179
16	0.075000	0.021692	-0.011500	0.005094
17	0.100000	0.024192	-0.012808	0.005674
18	0.125000	0.026154	-0.013846	0.006149
19	0.150000	0.027769	-0.014692	0.006525
20	0.175000	0.029077	-0.015385	0.006830
21	0.200000	0.030115	-0.015962	0.007077
22	0.225000	0.030962	-0.016423	0.007268
23	0.250000	0.031615	-0.016769	0.007421
24	0.275000	0.032115	-0.017038	0.007537
25	0.300000	0.032462	-0.017231	0.007614
26	0.325000	0.032654	-0.017346	0.007651
27	0.350000	0.032692	-0.017385	0.007658
28	0.375000	0.032577	-0.017308	0.007634
29	0.400000	0.032346	-0.017192	0.007580
30	0.425000	0.032000	-0.017000	0.007499
31	0.450000	0.031538	-0.016731	0.007401
32	0.475000	0.030962	-0.016385	0.007286
33	0.500000	0.030269	-0.015962	0.007157
34	0.525000	0.029462	-0.015423	0.007015
35	0.550000	0.028538	-0.014808	0.006862
36	0.575000	0.027500	-0.014077	0.006708
37	0.600000	0.026346	-0.013231	0.006560
38	0.625000	0.025115	-0.012269	0.006417
39	0.650000	0.023769	-0.011192	0.006281
40	0.675000	0.022346	-0.010077	0.006128
41	0.700000	0.020846	-0.008923	0.005954
42	0.725000	0.019269	-0.007769	0.005744
43	0.750000	0.017615	-0.006615	0.005497
44	0.775000	0.015923	-0.005462	0.005222
45	0.800000	0.014154	-0.004308	0.004918
46	0.825000	0.012346	-0.003231	0.004551
47	0.850000	0.010500	-0.002269	0.004112
48	0.875000	0.008615	-0.001500	0.003549
49	0.900000	0.006692	-0.001000	0.002846
50	0.925000	0.004731	-0.000808	0.001952
51	0.950000	0.002692	-0.001077	0.000808
52	0.975000	0.000577	-0.001962	-0.000733
53	1.000000	-0.001654	-0.003615	-0.002635

Figure 2-9. Supercritical Airfoil Coordinates

3.0 PRELIMINARY DESIGN FEASIBILITY

The stated objective of this study was to evaluate the feasibility of incorporating an aeroelastically tailored forward swept wing on to a BQM-34F for flight research testing and to perform a preliminary design of the wing. This section evaluates the feasibility of accomplishing those objectives based upon the details of the study presented in other sections of this report.

The evaluation can be treated in two parts:

(1) The feasibility of designing an aeroelastically tailored forward swept wing and

(2) The feasibility of incorporating such a wing onto the BQM-34F.

The feasibility of number (1) will not be further addressed in this section since it has been shown by others that a swept forward wing can be designed and flown.

A number of issues were uncovered and addressed during the course of the study. The issues and their resolutions are listed below.

ISSUE	RESOLUTION
Wing Position	Wing is positioned at the existing wing mounting location. Wing is located as far aft as possible to reduce ballast requirements.
Wing geometry	The selected wing (see Figure 1-1) was chosen to simultaneously meet NASA planform configuration requirements and to minimize ballast requirements.
Canard surface	Extensive structural modifications would be required to mount a canard and an increase in forward ballast of more than 100 pounds. Canard configuration was discarded.

ISSUE	RESOLUTION
Ballast	Forward ballast is required to maintain proper aircraft balance. The lack of internal volume requires mounting the ballast externally. A recovery cg problem is solved by a redesign of the main parachute attachment system rather that having to jettison ballast.
Airframe Modifications	Modifications will be required to mount the forward fuselage external ballast, provide forward fuselage external structural beef-up, provide a minor beef-up of wing mount frame at station 250.06, provide a more-forward parachute fitting and alter the main parachute attaching hardware.
Flight Performance	Vehicle flight envelopes and mission durations are adequate for the research application.
Stability and Control	Ballast provisions insure adequate static longitudinal and directional stability. Preliminary analysis indicates satisfactory dynamic lateral/directional stability and control. More than adequate longitudinal control is available to achieve 3.0 g's and C_L of 0.7 at the design condition.

The conclusion is that it is entirely feasible to accomplish the stated objectives and that this can be accomplished without extensive modification (other than the wing) to the basic airframe of the BQM-34F.

4.0 FLIGHT PERFORMANCE

4.1 PERFORMANCE BASIS

Performance capabilities for the BQM-34F configured with an aeroelastically tailored forward swept research wing are based on the Reference 4.1 installed characteristics of the CAE J69-T-406 turbojet engine and estimated vehicle aerodynamics data. The physical description of the wing is as follows:

Gross Area	25 Ft^2
Exposed Area	18.9 Ft^2
M.A.C.	2.66 Ft
Span	10.0 Ft
Aspect RAtio	4.0
Taper Ratio	0.4
Sweep, L.E.	-20 Deg.
Sweep, Max. t/c	-27 Deg.
Sweep, T.E.	-38 Deg.
Airfoil, t/c	5 %
Airfoil Type	Supercritical

The vehicle lift and drag bases were derived using computerized estimation methods described in Reference 4.2. For comparison, cross checks were made of the computerized methodology against existing wind tunnel derived BQM-34F characteristics. The estimating procedures were developed for conventional aft-swept wing configurations but it was assumed, for the purpose of this feasibility study that the aerodynamics would be representative of a forward swept wing.

Figure 4-1 presents an example of the basic zero lift drag buildup at 0.9 Mach number, 30,000 feet, obtained from the above referenced method. Figure 4-2 presents zero lift drag throughout the Mach-altitude range of interest.

Drag due to lift and lift curve slope data are shown in Figures 4-3 and 4-4 respectively. These data were also developed from the Reference 4.2 method assuming a fixed elevator and by the method described in Section

ALTITUDE - 30,000 FT
MACH NO. - 0.9
REF. AREA - 25 FT^2

COMPONENTS	A_{WET} FT^2	ℓ_{REF} FT	RN 10^6	C_f	K_f	f FT^2	C_{D_0}
Fuselage	148.5	29.0	74.3	.00208	1.057	.3268	.01307
Wing	37.8	2.66	6.8	.00299	1.179	.1333	.00533
Horizontal Tail	11.0	1.45	3.7	.00332	1.062	.0388	.00155
Vertical Tail	13.6	2.70	6.9	.00298	1.043	.0423	.00169
Interference						.0783	.00313
Base						.0105	.00042
Camber						.0110	.00044
Surface Roughness						.0370	.00148
Drag Rise						.0580	.00232
TOTAL						.7358	.02943

T550

Figure 4-1. Zero Lift Drag Buildup

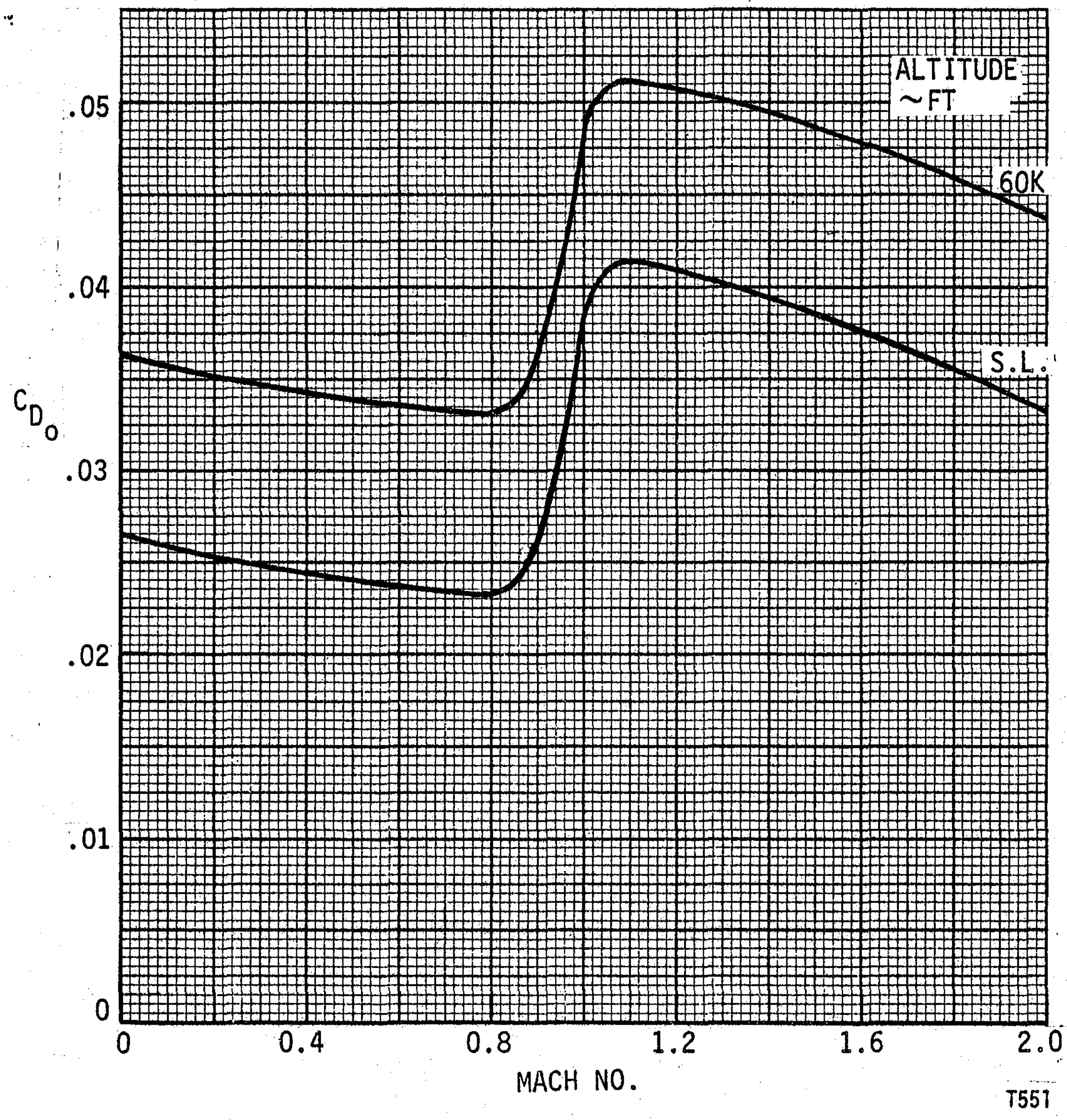


Figure 4-2. Zero Lift Drag Coefficient - BQM-34F
Forward Swept Research Wing

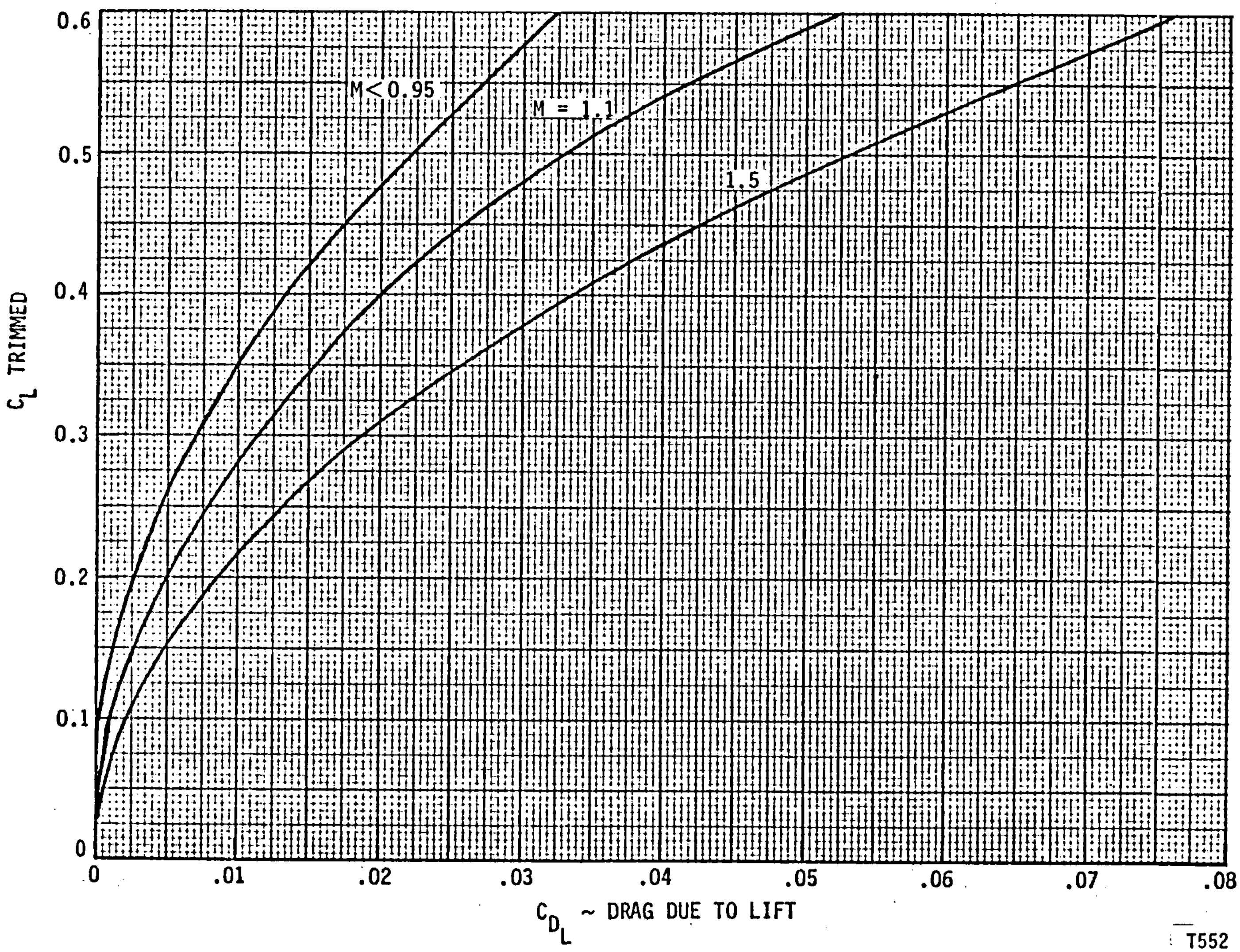


Figure 4-3. Drag Due to Lift BQM-34F Forward Swept Research Wing

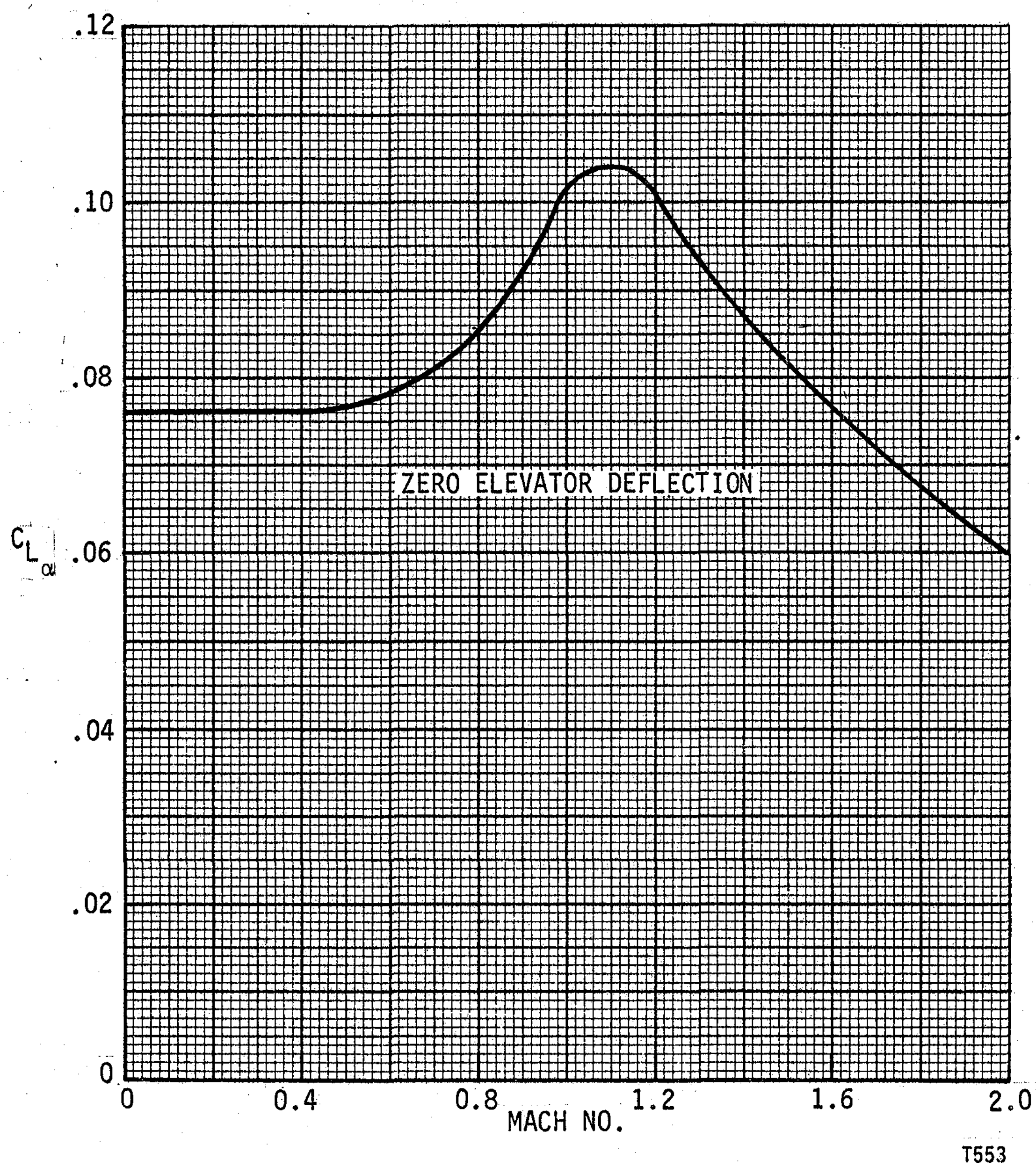


Figure 4-4 Lift Curve Slope BQM-34F Forward Swept Research Wing

5.1.2 This is an acceptable approximation in as much as vehicle stability levels are low and elevator control power is high.

4.2 PERFORMANCE

Theoretical speed altitude envelopes at constant load factors and variable load factors are illustrated in Figures 4-5 and 4-6 respectively. It is recognized that these envelopes, in some instances, exceed chosen wing structural design limits. However, they do serve to point up the performance capabilities available.

Typical mission endurance capabilities for the research vehicle are summarized in Figure 4-7. The missions assume airlaunch from 30,000 feet at 0.7 Mach number. A launch weight of 2071 lbs. and total mission fuel weight of 333 lbs. is assumed. At 30,000 feet, 40 minutes of flight research time is available at 0.9 Mach number. Flight at higher altitude, increases the on-station time.

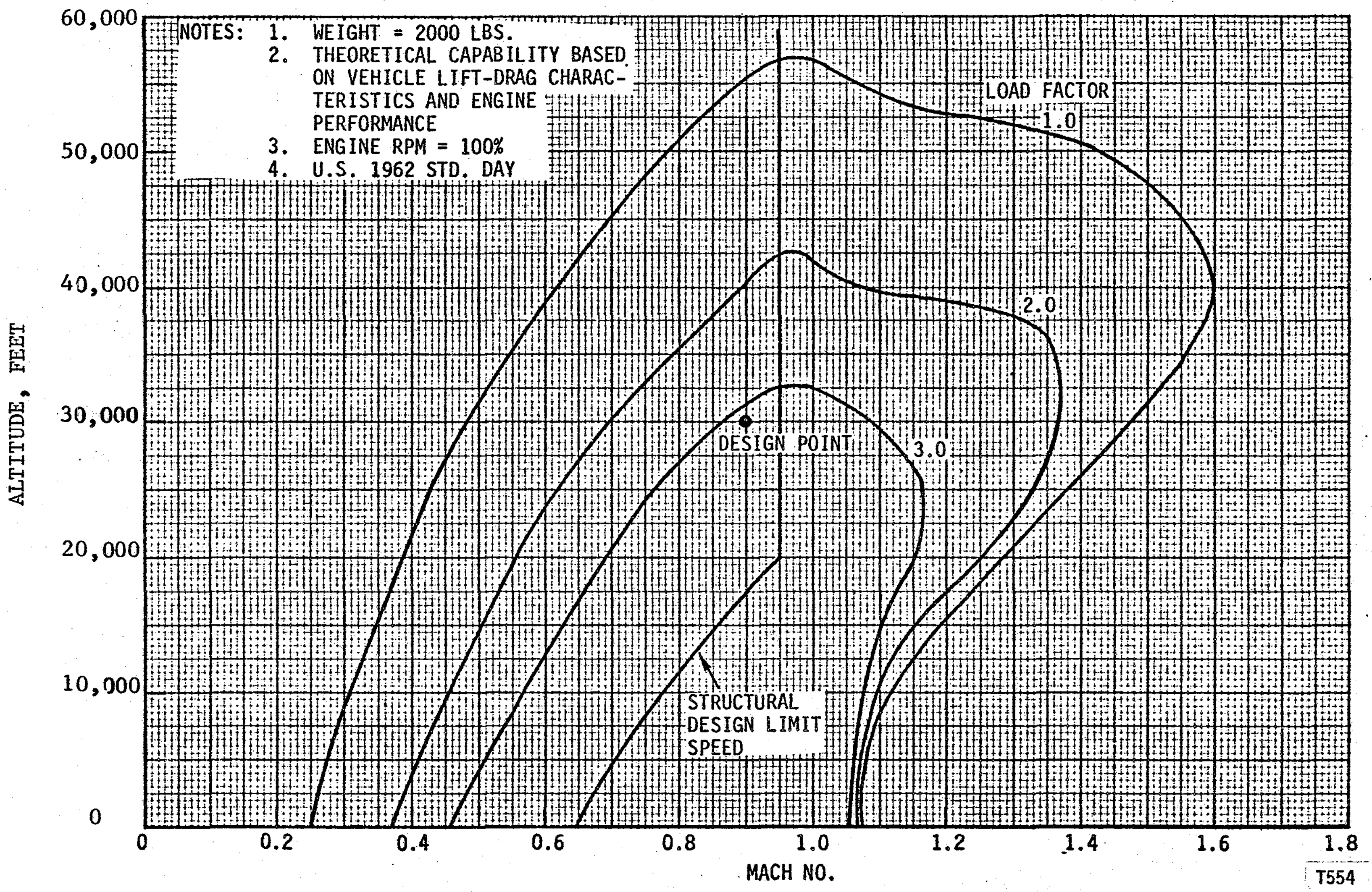


Figure 4-5. Flight Envelope Forward Swept Research Wing

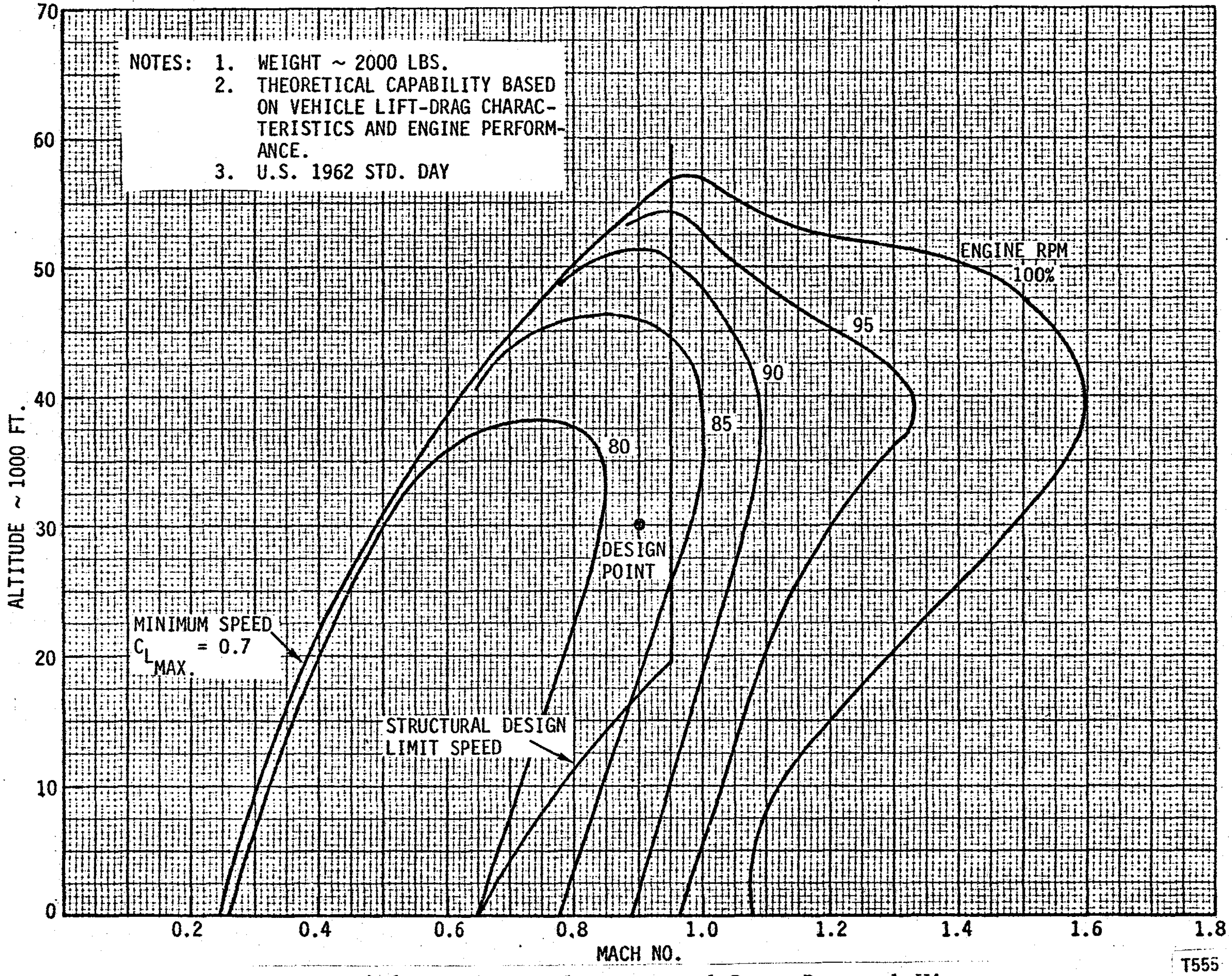


Figure 4-6. Flight Envelope Forward Swept Research Wing

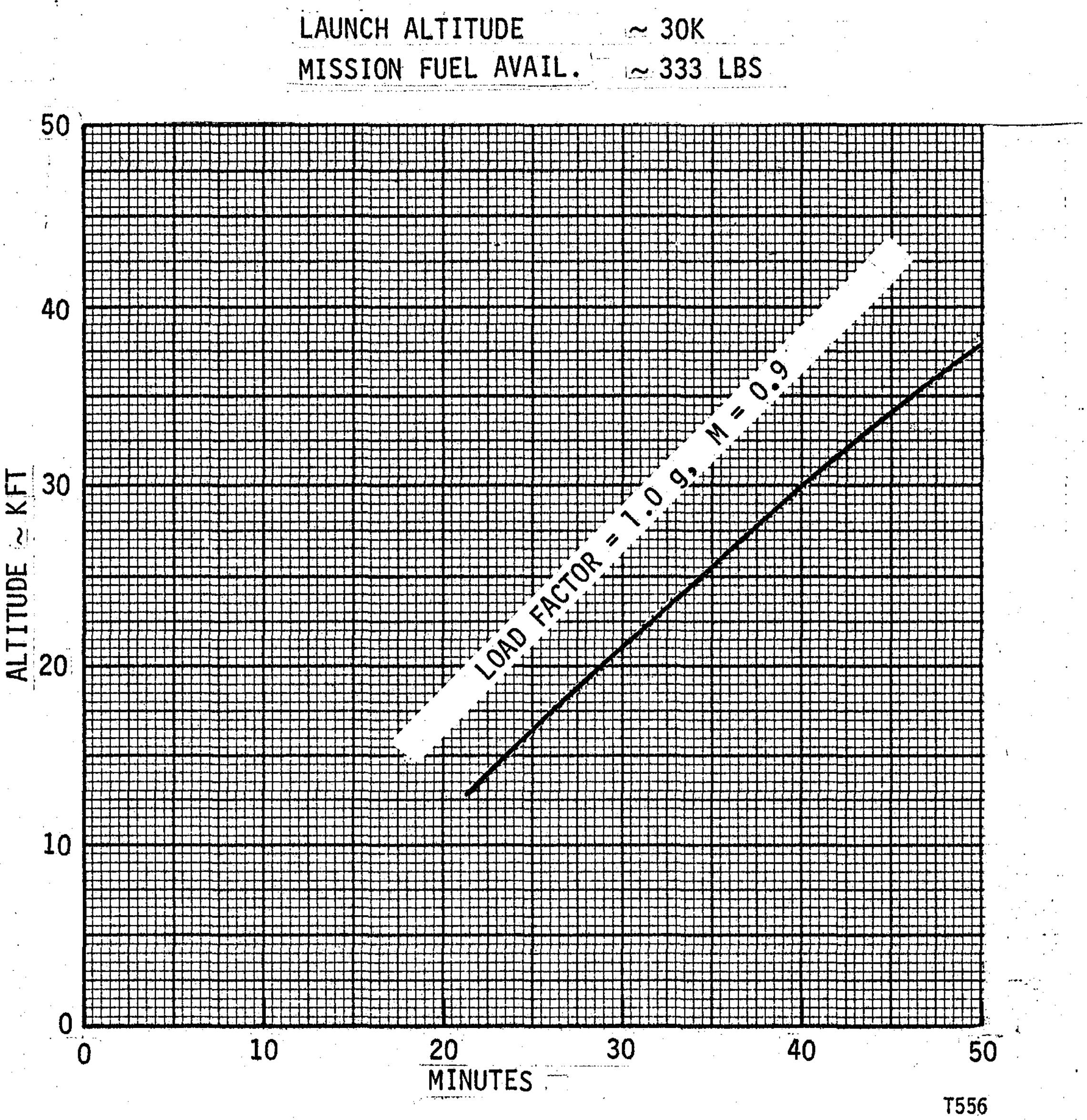


Figure 4-7. Mission Endurance BQM-34F Forward Swept Research Wing

5.0 STABILITY AND CONTROL

The principal objectives of the stability and control analyses conducted for this study were to determine wing placement and center of gravity location requirements for a positive longitudinal static stability margin, to develop preliminary estimates of stability and control characteristics for the BQM-34F/swept forward wing, and to point out potential problem areas which might be unique to this configuration.

5.1 LONGITUDINAL STABILITY AND CONTROL

5.1.1 Parametric Studies

The initial stability analyses were concerned with locating the wing and center of gravity to obtain a desired level of static stability. The specified range of wing planform geometric parameters were utilized in a parametric analyses combining the wing, body, and horizontal tail stability contributions for a range of wing locations. The center of gravity location was then determined for each wing location which resulted in a constant value of static longitudinal stability $C_{m_{C_L}}$.

The initial calculations assumed the wing aerodynamic center acted at the wing quarter-chord. The downwash derivative at the horizontal tail was calculated by an emperical method from Reference 5.1 as a function of the wing planform variables. The selected minimum stability margin was 15%.

A second iteration was performed wherein the wing aerodynamic center location, based on a lifting line theory, was approximately 5% chord farther aft. The estimated downwash derivative ϵ_α was reduced by 0.10 based on comparison of downwash characteristics calculated by the empirical method with trends indicated by test data for a forward swept wing wind tunnel model (Reference 5.2). In addition, in order to provide further relief on ballast requirements, the minimum stability margin was reduced from 15% to 10%. Typical results are shown in Figure 5-1 for a wing area of 25 ft^2. The center of gravity location required for a given wing location is fairly insensitive to both wing area and aspect ratio. The predominant factor is sweep angle, requiring increasingly more aft wing locations as the leading edge sweep is increased.

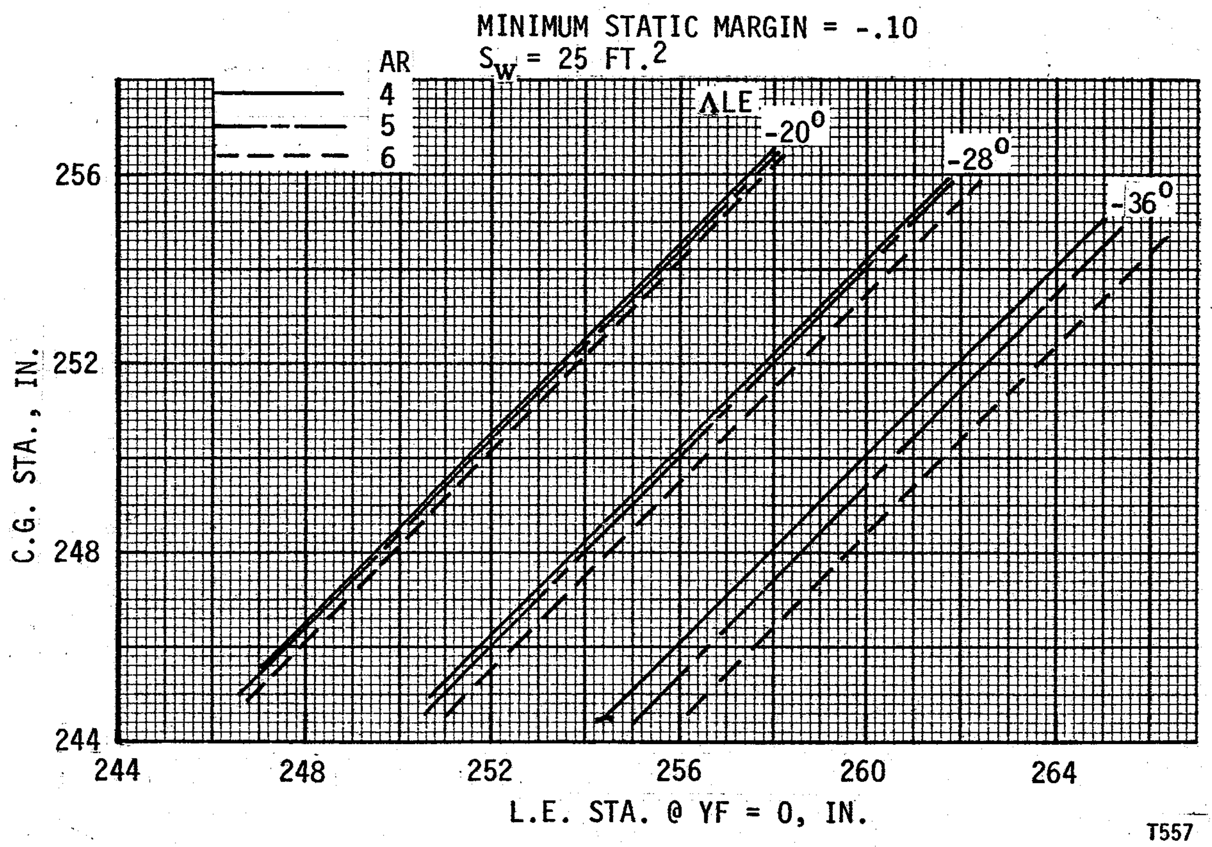


Figure 5-1. Forward Swept Wing Estimated CG Location Required for Various Wing Positions

The effect of wing location on static stability is shown in Figure 5-2 for the selected wing. The plot of $C_{m_{C_L}}$ versus center of gravity location in percent chord can be used in conjunction with the curves of wing and center of gravity location to determine the required combination for any level of static stability.

5.1.2 Estimated Longitudinal Characteristics

The estimated lift and pitching moment curve slopes are shown in Figure 5-3 for the BQM-34F with the forward swept wing. The wing lift curve slope was estimated by methods from Reference 5.1 and the corresponding pitching moment contribution calculated for two values of wing aerodynamic center location, since the exact location is not known.

The effect of elasticizing the horizontal tail contribution is shown by the difference in the pitching moment curve slopes for a rigid airframe and for an altitude of sea level where the elastic losses are greatest. The variation of the expected static stability margin with Mach number is shown in Figure 5-4 along with the longitudinal control effectiveness derivatives.

Longitudinal trim requirements are presented in Figure 5-5 in terms of the elevator deflection required as functions of trimmed lift coefficient and center of gravity location. Two flight conditions are shown, one representative of air launch and the other for the design condition of Mach 0.9 at 30,000 feet. For the air launch condition small positive load factors in excess of one require an angle of attack of approximately 10 degrees. For the design flight condition, a normal load factor of 3 should be attainable with an angle of attack of about 8 degrees, corresponding to a lift coefficient of 0.70.

5.2 LATERAL - DIRECTIONAL STABILITY AND CONTROL

5.2.1 Dihedral Effect

One of the characteristics of swept forward wings is a positive variation of rolling moment with sideslip angle in the linear angle of attack range. This parameter was calculated for the selected wing by the method of Reference 5.1 which in turn is based partly on the methods of Reference 5.3. As

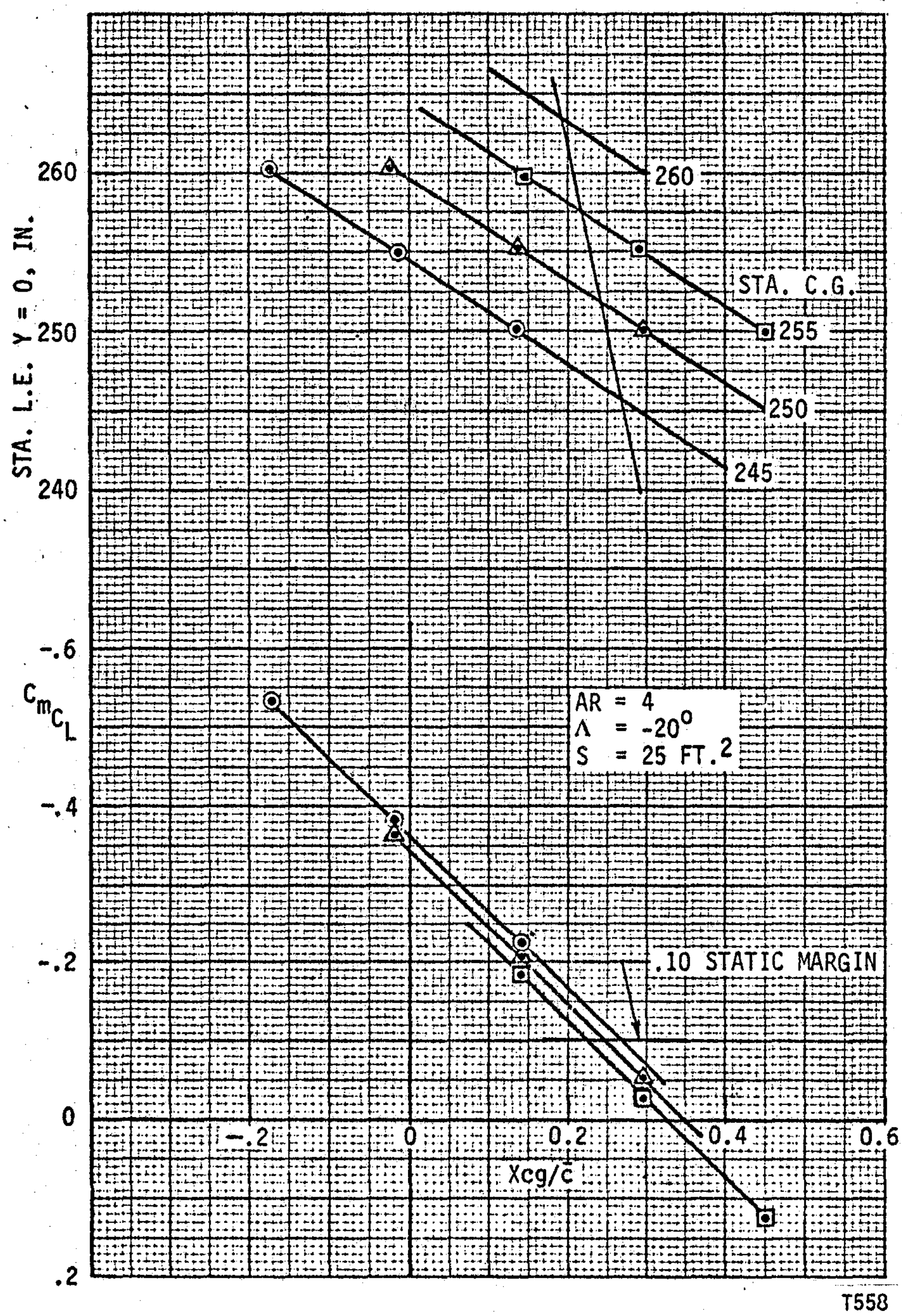


Figure 5-2. Effect of Wing Location on Static Stability

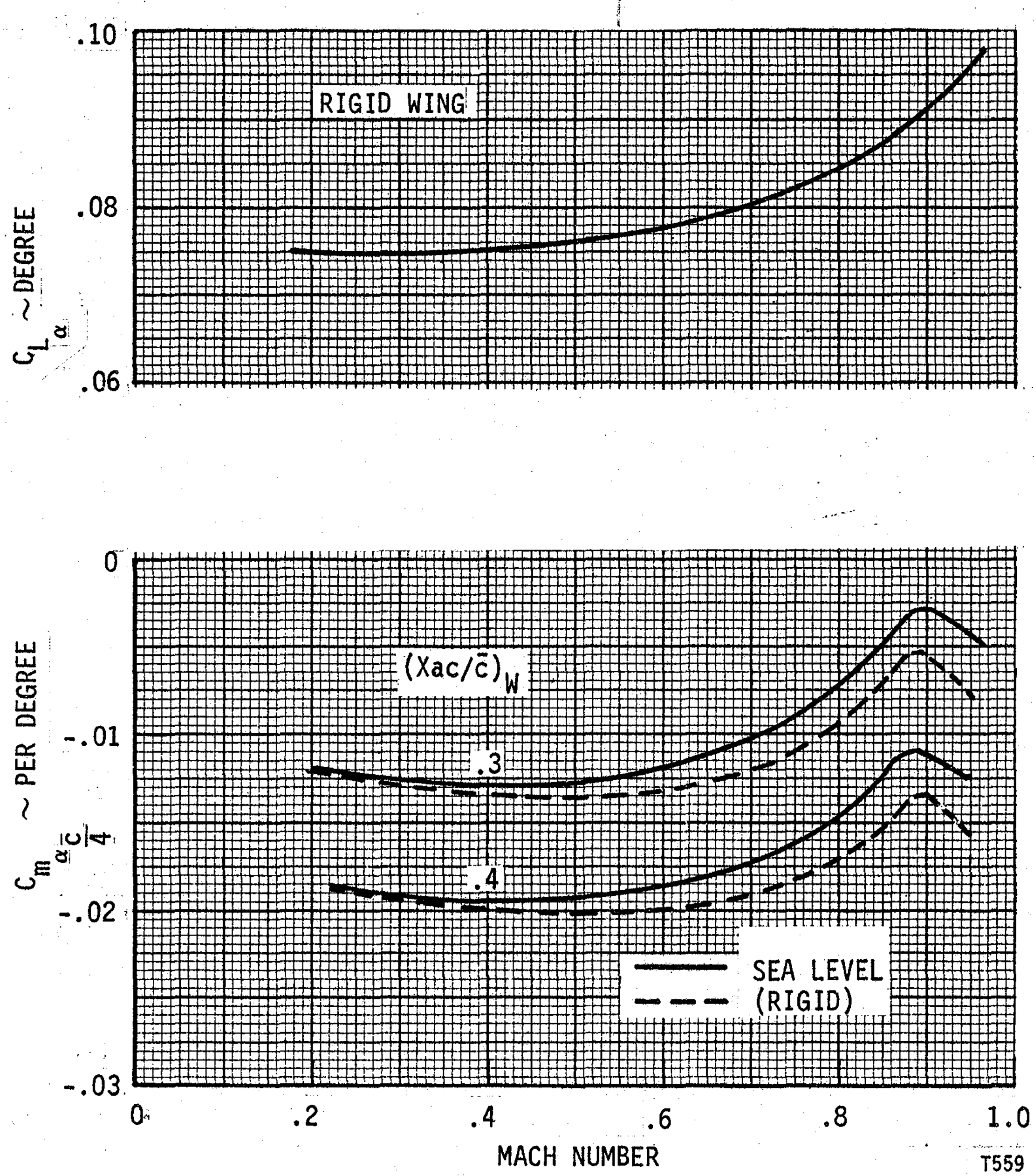


Figure 5-3. Estimated Longitudinal Stability Derivatives

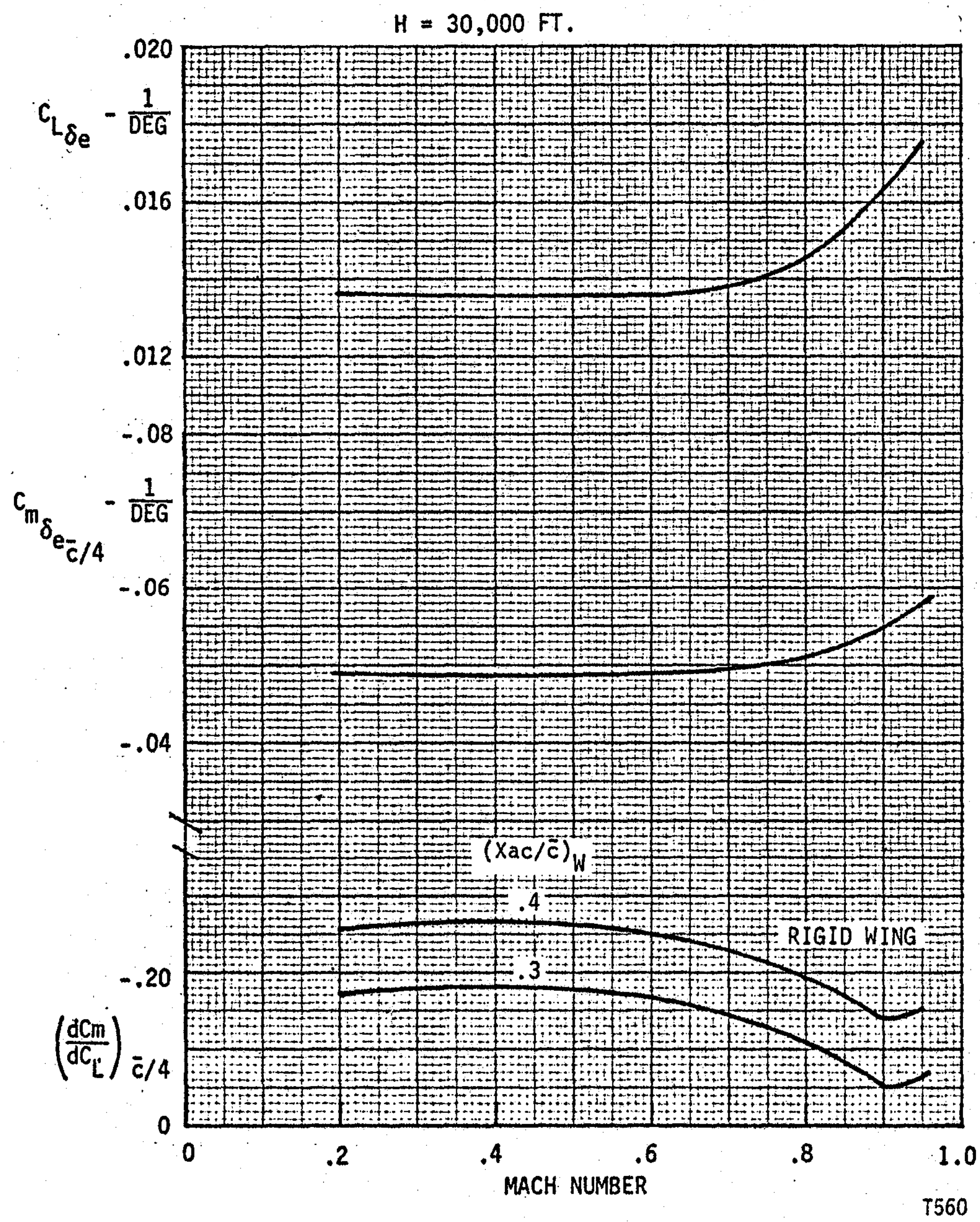


Figure 5-4. Estimated Longitudinal Control Effectiveness and Static Stability Margin

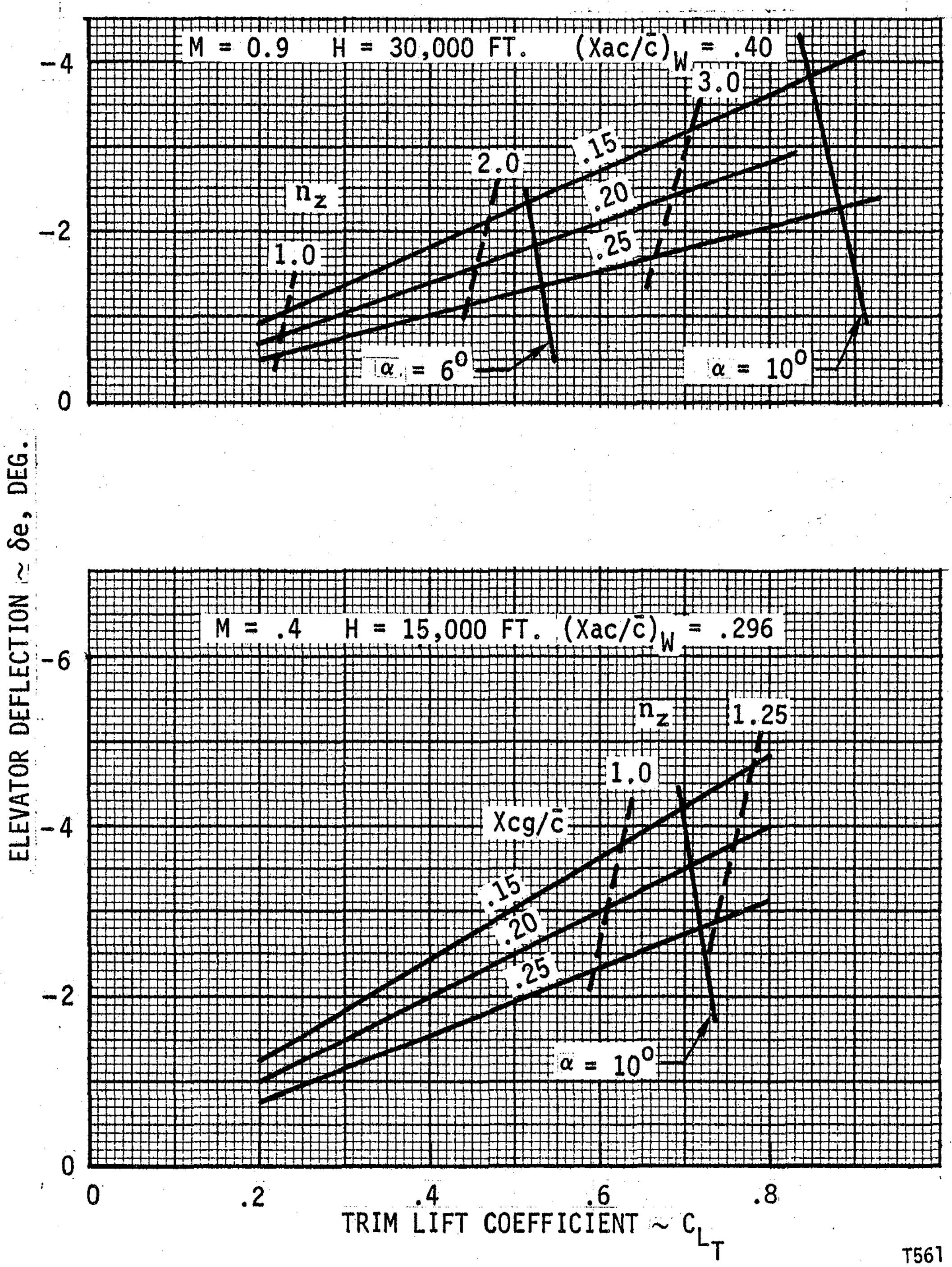


Figure 5-5. Longitudinal Trim Requirements

applied to negative sweep the method is restricted to -20^{o} sweep of the half-chord line, requiring extrapolation for higher sweep angles. The results are shown in Figure 5-6 in comparison with the wing contribution to C_{ℓ_β} for a swept forward wing wind tunnel model and for the basic BQM-34F. The small-scale model data were developed by subtracting the fuselage increment from the wing-body combination of References 5.2 and 2.1.

The model data are seen to be reasonably linear up to 12^{o} angle of attack and in general agreement with the calculated value of C_{ℓ_β}, although there are significant differences in the planforms of the two wings. The effect of wing sweep orientation on C_{ℓ_β} is also discussed in Reference 5.4 which shows large reductions in the rolling moment due to roll displacement parameter for forward sweep compared to a normally aft-swept wing.

The effect of reduced dihedral effect was preliminarily evaluated on the BQM-34F 6 DOF flight simulation program by adding a constant increment in C_{ℓ_β} of +.004 to the basic BQM-34F level. Comparison was made between the basic BQM-34F and the simulated forward swept wing configuration during turn maneuvers at several flight conditions.

The transient dynamics are shown in Figures 5-7(a) through 5-7(c) for the two configurations arranged in tandem along the time scale. At all flight conditions evaluated, the differential aileron excursion required to execute turns and turn reversals is less for the forward swept wing configuration than for the basic BQM-34F. As a result of this study it was concluded that the positive increment in C_{ℓ_β} will not have an adverse effect on vehicle flight control in the research configuration.

5.2.2 Estimated Lateral-Directional Characteristics

The BQM-34F with the swept forward wing is estimated to have a satisfactory level of static directional stability since the wing contribution is small. The increment for the swept forward wing of the wind tunnel model of Reference 5.2 actually indicates a small stabilizing effect. The vertical tail increment for the same model decreased with increasing angle of attack in the presence of the swept forward wing and remained essentially constant in the presence of the swept back wing. This effect may not occur with the

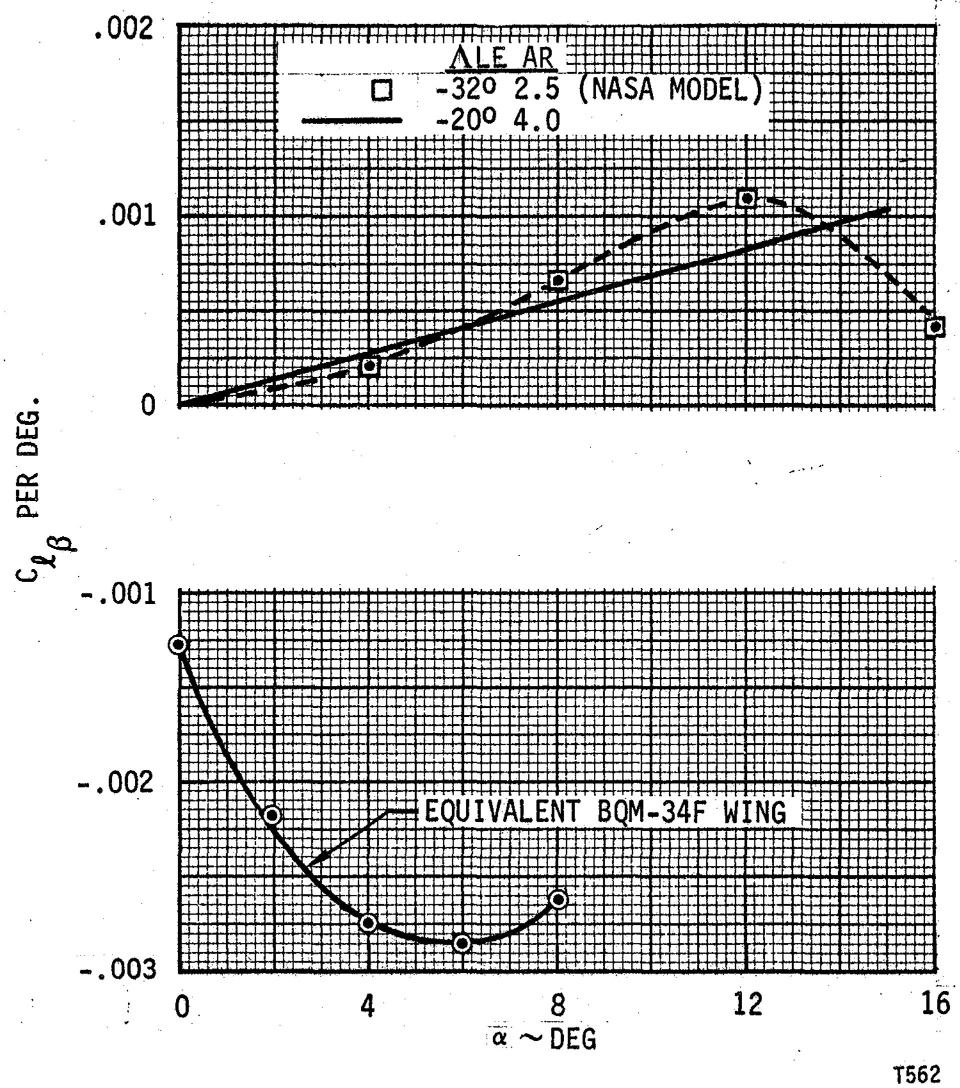
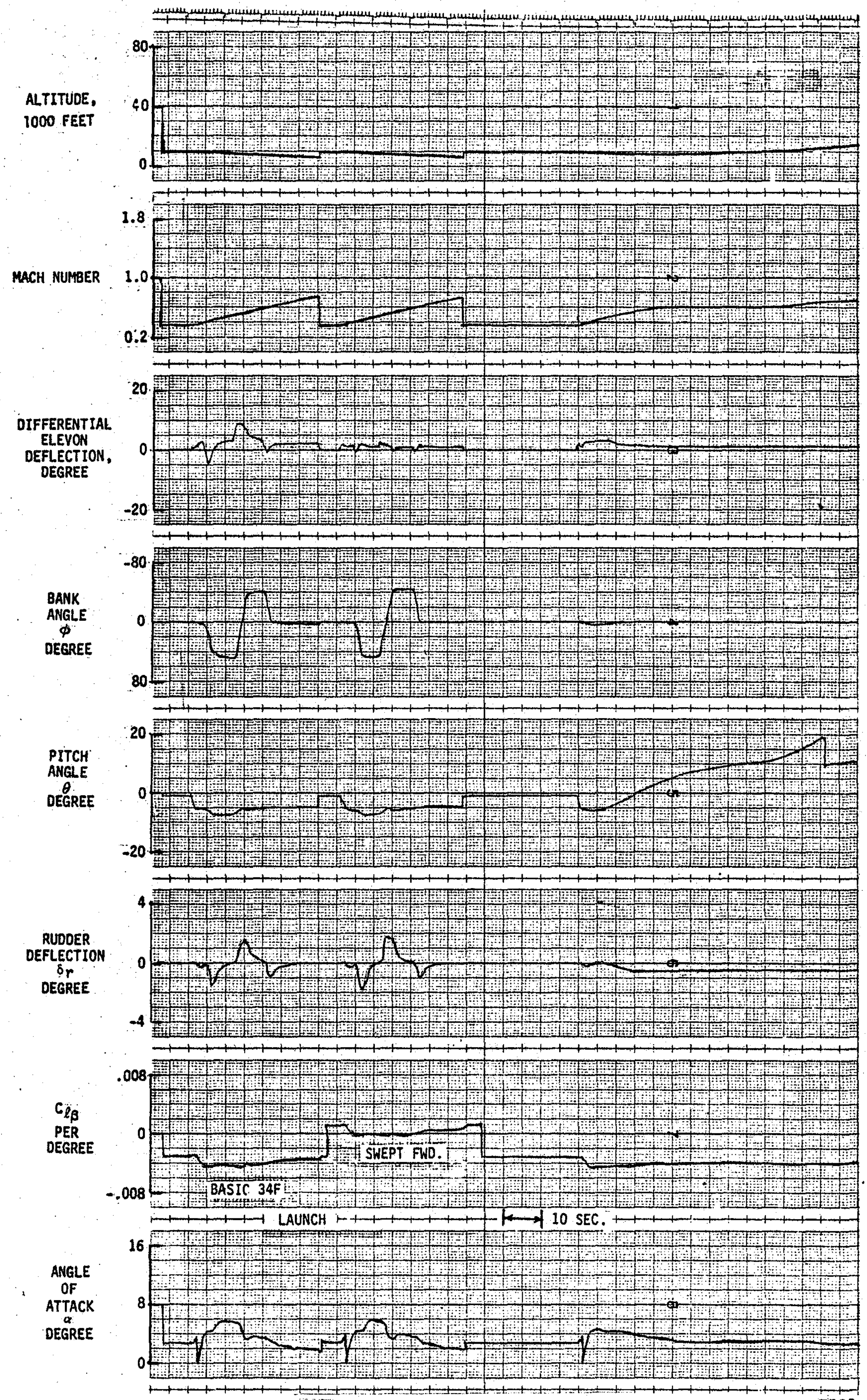
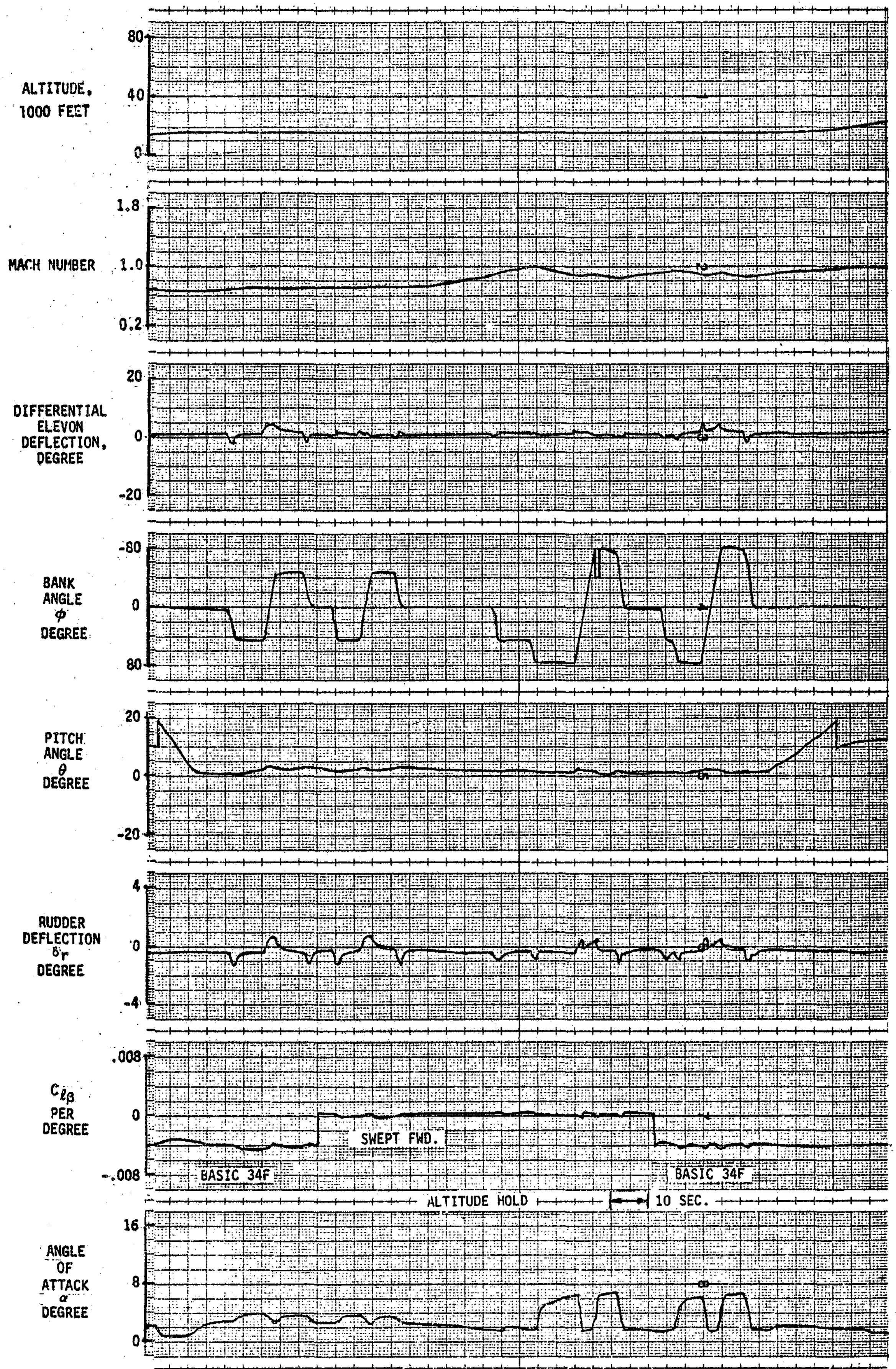


Figure 5-6 Comparison of Wing Contribution to C_{ℓ_β}



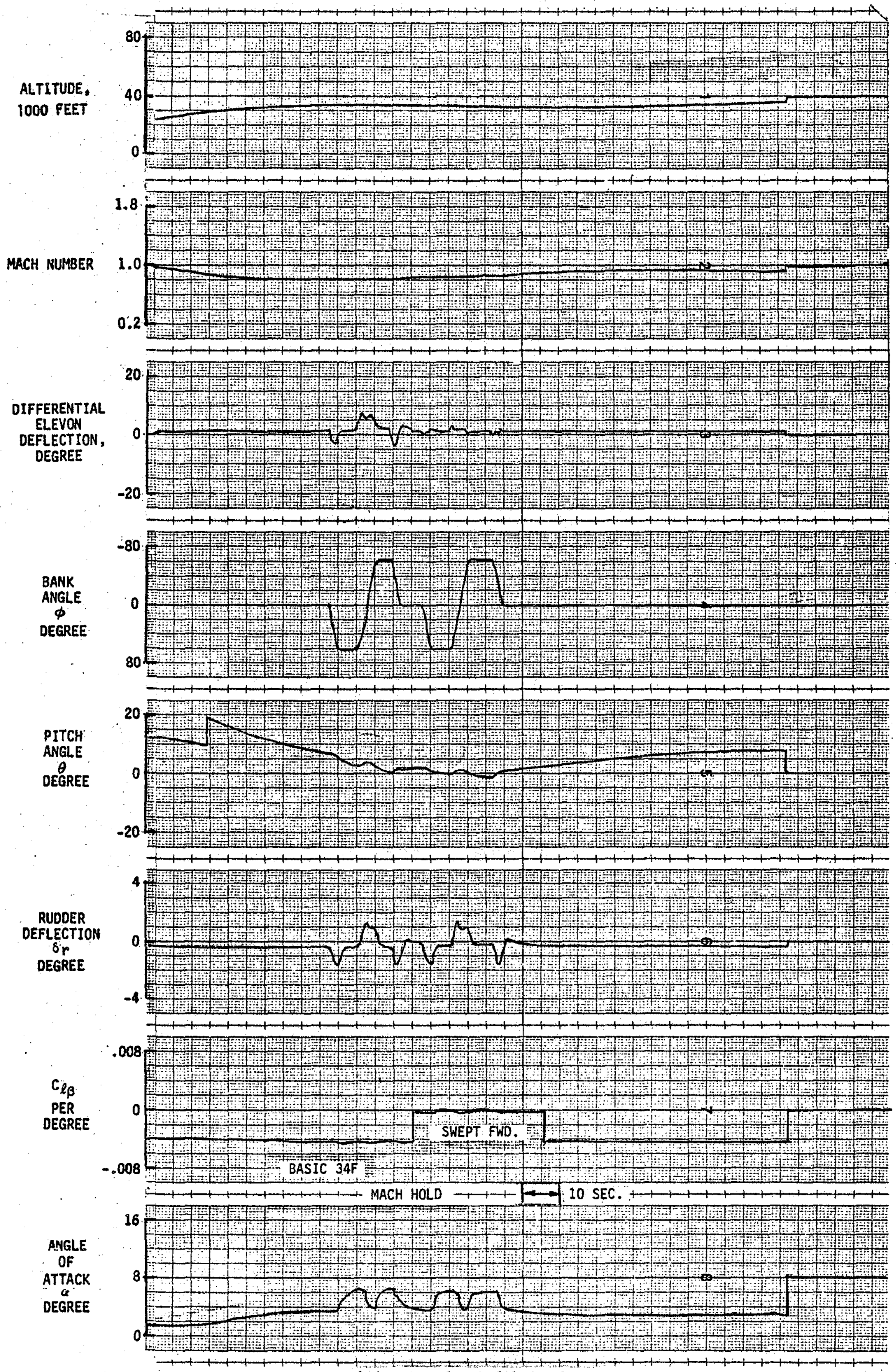
(a) Launch-Release Mode

Figure 5-7. Effect of C_{ℓ_β} on Dynamic Stability in Turns (Sheet 1 of 3)



(b) Altitude Hold Mode

Figure 5-7. Effect of $C_{\ell\beta}$ on Dynamic Stability in Turns (Sheet 2 of 3)



(c) Mach Hold Mode

Figure 5-7. Effect of $C_{\ell\beta}$ on Dynamic Stability in Turns (Sheet 3 of 3)

BQM-34F configuration however, since the research wing has a higher aspect ratio and lower sweep angle.

The estimated static stability derivatives are shown in Figure 5-8 for the BQM-34F/forward swept wing configuration. The effect of elasticizing the vertical tail contribution is indicated for the directional stability derivative, but was determined to have a negligible effect on C_{ℓ_β}. It is noted that C_{ℓ_β} is negative at low angles of attack due to the vertical tail contribution and becomes positive at an angle of attack of about 8 degrees.

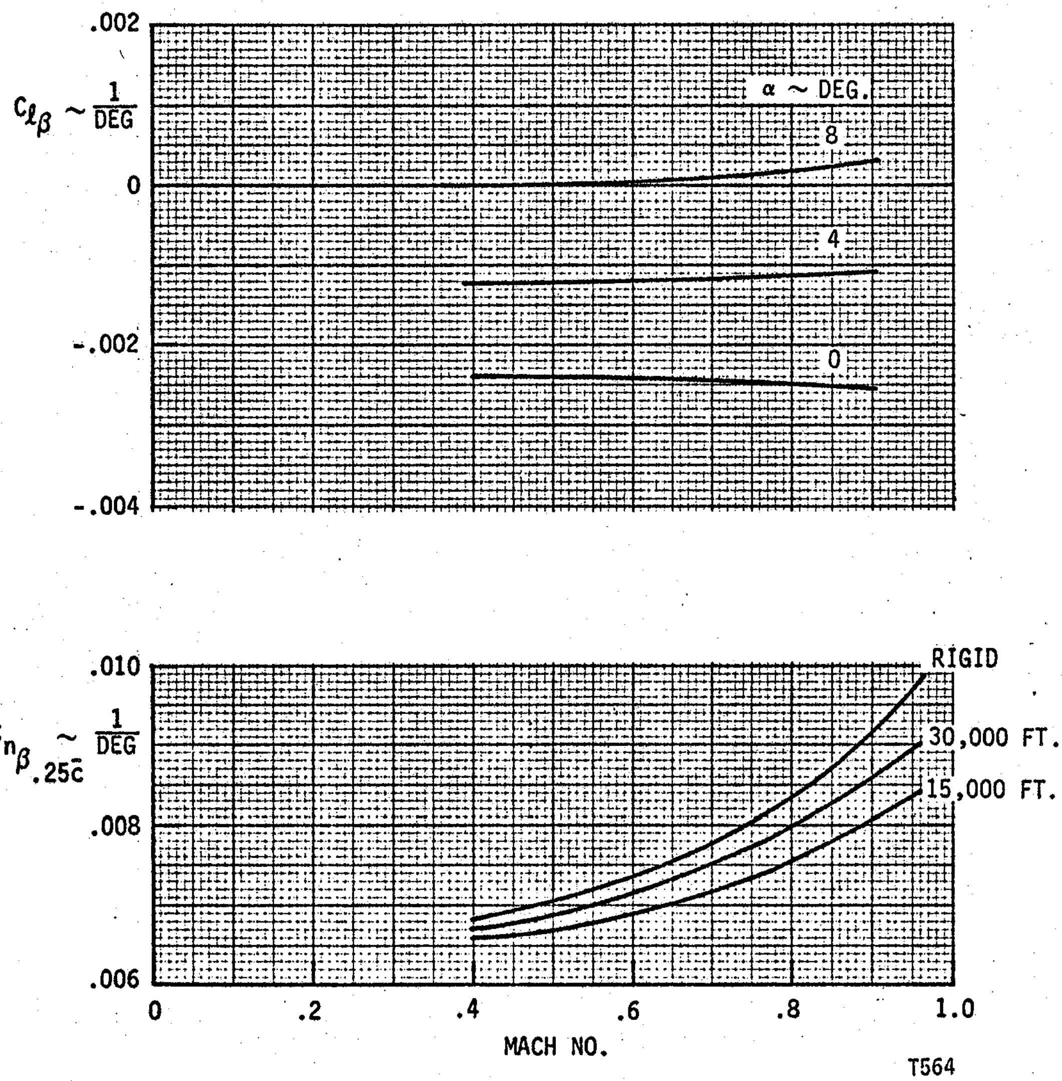


Figure 5-8. Estimated Static Lateral-Directional Stability Derivatives

6.0 STRUCTURAL DESIGN CRITERIA

The structural design criteria for the BQM-34F/Forward Swept Wing consists of a merger of the criteria for the basic BQM-34F with the design requirements of a research oriented forward swept wing. For wing design only, a 1.5 ultimate factor of safety shall apply. Ultimate factors of safety for the existing target shall be retained from the basic BQM-34F criteria.

Free Flight Criteria - Free flight limit speeds are shown on Figure 6-1. These were selected to be consistant with the design cruise point requirement, allow a suitable tolerance for maneuvering and minimize flutter impact on wing design. Basic design symmetrical load factors of -3.0 to +6.0 are applicable. For purposes of wing design, these factors will be conservatively applied to a design free flight gross weight of 2500 pounds. Unsymmetrical maneuvering factors of 1.0 to 4.0 shall be retained from the basic BQM-34F criteria.

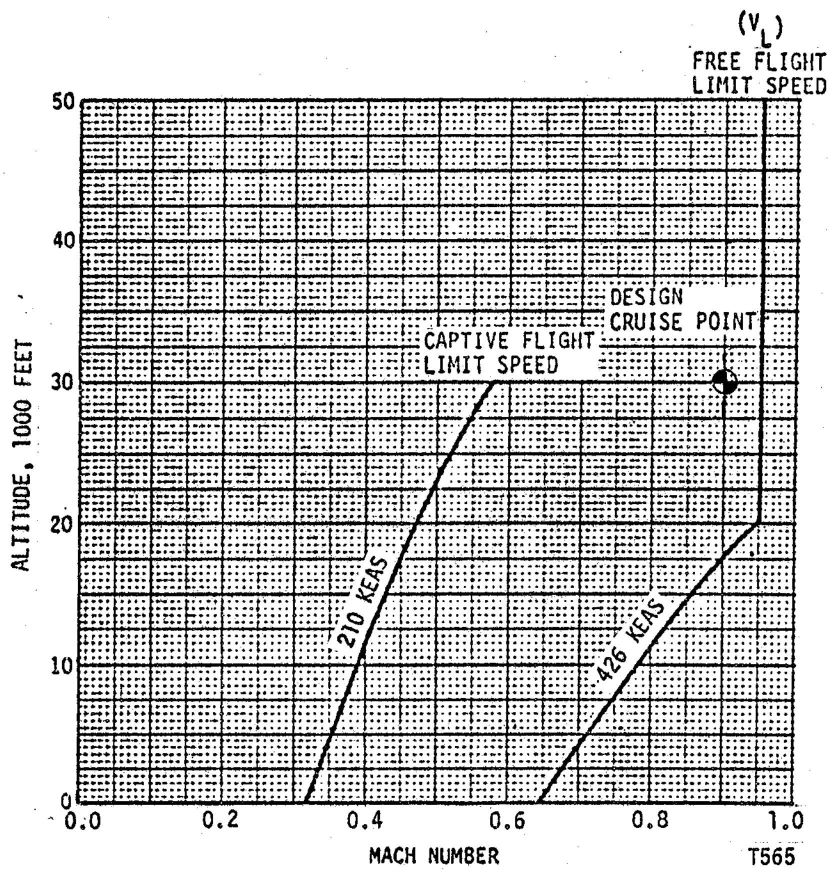


Figure 6-1. BQM-34F/Forward Swept Wing Structural Design Speeds

Captive Flight Criteria - Captive flight limit speeds are also shown on Figure 6-1. These encompass the air launch speeds of the basic BQM-34E/F target from the DP-2E and the DC-130 aircraft. Launch of the BQM-34F/Forward Swept Wing from the B-52 must be verified by launch simulation. Captive flight maneuver limits shall be 0.0 to 2.5g. Design captive flight gust velocity shall be ± 50 fps (EAS) for all flight speeds up to the maximum shown on Figure 6-1.

Recovery Criteria - Recovery conditions for small winged drones such as the basic BQM-34E/F have generally not been critical for wing design. However, for larger winged drones. the rapid pitch-up and associated high angles of attack at main parachute deployment have tended to be critical for wing design. Although this feasibility study will not encompass recovery envelopes studies, should critical design wing loads be encountered later, limitations upon normal recovery procedures can be identified such that critical loads are eliminated.

Additional Criteria - Additional criteria to be retained from the basic target design criteria are summarized along with design gross weights and factors of safety in Table 6-1.

TABLE 6-1. BQM-34F/FORWARD SWEPT RESEARCH WING STRUCTURAL DESIGN CRITERIA SUMMARY

CONDITION	DESIGN GROSS WEIGHT (pounds)	ULTIMATE FACTOR OF SAFETY	MAXIMUM LIMIT LOAD FACTOR			COMMENTS
			n_x	n_y	n_z	
FREE FLIGHT		1.25				
Complete Target	2500					Subsonic (with fuel pod)
	2037					Subsonic (without fuel pod)
Symmetrical Maneuvers					−3.0 to 6.0	ω_{max} = 1.5 rad./sec.^{2}, basic
Asymmetrical Maneuvers					1.0 to 4.0	
Gust						27 fps (EAS) at V_L
CAPTIVE FLIGHT	2544	1.50				
Taxi, Takeoff, Landing			±2.50	±1.50	-3.0 to 6.0	For design of attachments and sway braces. Loads act simultaneously.
Gust						50 fps (EAS) at V_L of DC-130
PARACHUTE RECOVERY		1.25				
Drag Parachute Deployment	1250 to 2028		±12.0*	±3.0*	6.0*	Based upon 15,000-lb. parachute load.
Main/Engagement Parachute	1922					Based on test or analysis
Deployment						(Minimum load of 12,000 lb. per BQM-34E criteria.)
HELICOPTER RETRIEVAL	1571 to 1720	1.50				
Pickup and Towing						Maximum load factor of 2.0 acting within 45° of positive Z axis of target.
Stabilization Parachute						Limit load of 1139 lb. acting aft anywhere within 45° of longitudinal axis.
Docking			0	0	2.0	
			0	±1.0	1.0	
			±1.0	0	1.0	
GROUND LOADS		1.50				
Ground Handling Loads						
Shipping	1900		±4.0	±1.33	±2.0	
Hoisting	2944		±0.4	±0.4	2.67	n_z acts alone and in combination with horizontal load factors.
Jacking	2544		±0.5	±0.5	2.0	
Carting	2544		±2.0	±1.33	2.0	

*Used for equipment installations.

7.0 STRUCTURAL LOADS

7.1 FUSELAGE LOADS

Fuselage loads analyses were primarily devoted to two areas:

1. Evaluation of 27 candidate wing configurations in relation to strength requirements of the wing/fuselage juncture(Figure 2-2.)
2. Evaluation of the effects of installing additional ballast in the forward fuselage compartment.

A 6g (limit) pullup maneuver was the design condition for critical wing/fuselage interface loads. Applicable design gross weight and maximum flight Mach number were 2500 lbs. and 0.90, respectively. To simplify analysis the entire aerodynamic maneuvering load ($N_Z W$ = 15,000 lbs) was applied to the two exposed wing panels. Resultant root shear, per panel, is thus 7500 lbs., while bending/torsional moments vary with the respective centers of pressure associated with planform geometry. The net component loads, summarized in Figure 7-1, were derived from theoretical wing loading distributions. Computational methods employed a modified version of the lifting line theory concept.

Additional ballast in the forward fuselage compartment increases the inertia effects that contribute to forebody shear and bending. Previous loads/structural analyses, Reference 7.1, of the basic airframe show that critical loads are developed during the induced pitch-up dynamics subsequent to deployment of the main parachute.

Wing planform #1 of Figure 2-2, selected for detailed study, requires a total of about 300 pounds of ballast. A comparison of the effects of this revised ballast configuration with the basic BQM-34F is shown in Figures 7-2 and 7-3.

7.2 WING LOADS

Wing airloads for wing strength design and stiffness optimization were generated for a 2500 lb. airplane at 30,000 feet at load factors of 6.0, 2.0 and -3.0. Since the wing twist and camber distributions have not yet

CONF. NO.	ROOT SHEAR (LBS)	ROOT BENDING, $M_{C/2}$ (IN-LBS)	ROOT TORSION $T_{C/2}$ (IN-LBS)	*BODY AXIS MOMENTS M_X (IN-LBS)	*BODY AXIS MOMENTS M_Y (IN-LBS)	*ORIGIN OF BODY AXES X (IN)
	WING (LEFT PANEL) SHEAR, BENDING AND TORSION (LIMIT LOAD)					
1	7500	193,374	34,008	149,509	125,740	15.452
2	↓	210,221	36,052	146,942	154,599	13.718
3		232,685	36,774	144,272	186,228	11.704
4		214,285	37,624	166,669	139,839	17.497
5		234,061	39,895	163.749	171.933	15.763
6		258,949	40,706	160,706	207,087	13.750
7		238,319	41,578	183,495	155,294	19.738
8		260,228	44,100	182,213	190,950	18.004
9		287,767	45,000	178,754	229,962	15.990
10		208,951	31,116	169,522	126,059	13.633
11		226,818	33,415	166,321	157,798	11.899
12		250,290	34,358	163,252	192,791	9.885
13		232,294	34,376	188,562	139,951	15.462
14		252,045	36,925	184,942	175,179	13.728
15		278,006	37,980	181,475	214,004	11.714
16		257,920	37,952	209,467	155,200	17.466
17		279,751	40,772	205,387	194,262	15.732
18		308,404	41,943	201,440	237,262	13.718
19		224,835	28,768	187,547	127,303	12.258
20		242,793	31,162	183,854	161,609	10.524
21		267,330	32,182	180,624	199,685	8.510
22		249,599	31,754	208,280	141,162	13.928
23		269,414	34,405	204,107	179,185	12.194
24		296,466	35,542	200,413	221,337	10,180
35		276,786	35,018	231,054	156,364	15.757
26		298,648	37,948	226,361	198,470	14.023
27	↓	328,505	39,213	222,181	245,128	12.010

NOTE: 1. $M_{C/2}$ (+ = WING TIP UP); $T_{C/2}$ (+ = L.E. UP);
ULT. FACTOR OF SAFETY = 1.5

2. M_X (LEFT HAND RULE, + = AFT) } ORIGIN AT ROOT (BL 10.33582)

3. M_Y (LEFT HAND RULE, + = LEFT) } MID CHORD

4. X = DISTANCE AFT FROM WING APEX (AT BL = 0)

T566

Figure 7-1. Wing Limit Loads

STATION INCHES	LONGITUDINAL SHEAR POUNDS		VERTICAL SHEAR POUNDS		VERTICAL BENDING MOMENT INCH-POUNDS	
	BASIC TARGET	RESEARCH CONFIG.	BASIC TARGET	RESEARCH CONFIG.	BASIC TARGET	RESEARCH CONFIG.
80.00	0	0	0	0	0	0
105.00	- 5	- 5	- 25	- 25	- 253	- 253
118.50	- 73	- 558	- 354	-2706	- 1694	- 1694
135.00	- 165	- 650	- 795	-3147	- 12499	- 53496
150.00	- 296	- 781	-1413	-3765	- 29659	-105937
167.00	- 458	- 943	-2161	-4513	- 61147	-177409
180.00	- 552	-1037	-2575	-4927	- 92805	-239643
189.95	- 630	-1115	-2916	-5268	-120467	-290707
200.00	- 706	-1191	-3240	-5592	-151785	-345663
209.75	- 828	-1313	-3760	-6112	-186624	-403434
220.00	- 961	-1446	-4321	-6673	-228193	-469111
233.50	-1151	-1636	-5117	-7469	-292937	-565607
242.28	-1195	-1680	-5301	-7653	-338864	-632184
242.28	-1297	-1781	-5185	-7537	-339574	-632894
245.20	-1327	-1812	-5309	-7661	-354792	-654980
245.20	1602	+1117	6328	-3976	-318179	-618367

NOTES: 1. PARACHUTE RECOVERY CONDITION AT INSTANT BEFORE AFT LINE IS EFFECTIVE (CONDITION 4PX02 OF REFERENCE 7-1)

2. RESEARCH CONFIGURATION
BALLAST AT STATION 118.6
GROSS WEIGHT = 1572 POUNDS, n_X = 1.863,
n_Z = 7.403, q = 5.061 RAD./SEC.^{2}, X_{CG} = 250.79

T567

Figure 7-2. Forward Fuselage Loading Comparison

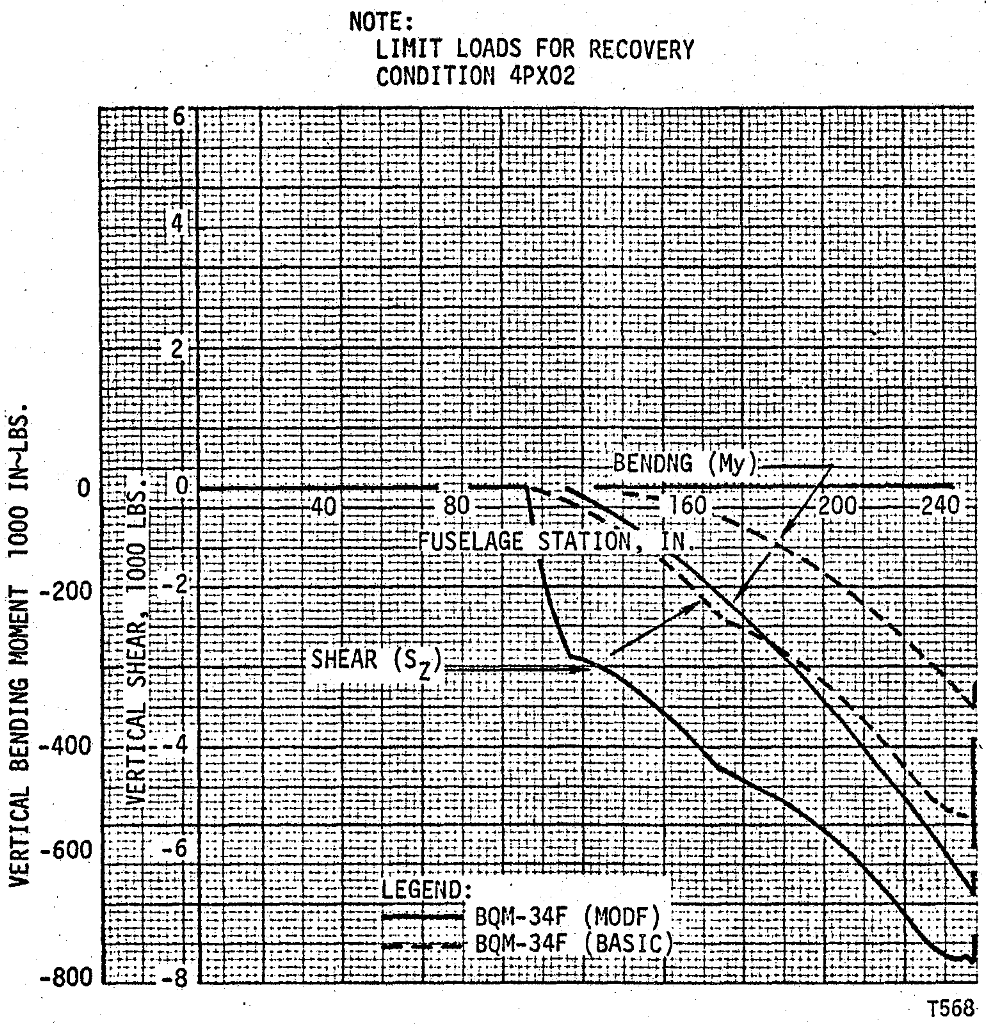


Figure 7-3. Fuselage Shear & Moment Diagrams Forward Swept Wing Proposal Added Ballast Effects

been identified it was necessary to make several assumptions regarding the wing lift distributions:

1) The exposed wing lift is assumed to be 95% of the airplane total lift.

2) Spanwise distributions for all conditions will be elliptical.

3) Chordwise distributions for the 6g case at M=0.90 were obtained from a combination of theory and experiment for a similar supercritical airfoil. The chordwise center-of-pressure is approximately 40-percent chord along the entire span.

4) The chordwise distribution at approximately $C_{L_W} = .2$ is rectangular for the 2g condition.

5) Airloads for the -3g condition were extrapolated linearly utilizing the 6g and 2g conditions.

TRA computer program No. 1584, which transforms pressure loading into an equivalent set of point loads at structural grids was used to distribute wing airloads to the structural grids for ASOP-3 strength and aeroelastic studies. These data are contained in Figures 7-4 thru 7-12. Figures 7-4 thru 7-9 contain pressure loading in the form of loads at the centroids of the aerodynamic panels and at the structural nodes. Figures 7-10 thru 7-12 contain an integration of the aerodynamic loads into shear, moment, and torsion along a load axis.

The wing loads thus determined were used for the wing structural optimization and deflection studies of Section 8.0. These loads were not altered during the course of the wing preliminary design to account for redistribution of airloads due to wing flexibility. Instead, for aeroelastic tailoring and divergence studies, a wing deformation criteria was established for the worst case condition (6.0 g loads). It was assumed that the wing could be tailored to meet this deflection constraint and thus the wing loads provided would be approximately correct. The deflection constraint was established as 0.2 degrees streamwise twist along the length of the span. An exact aerodynamic shape at any particular flight condition could be obtained by

AERODYNAMIC LOADS:

PANEL	LOAD	BODY X	BODY Y	WING X	WING Y
1	77.44	248.713	12.700	248.713	12.700
2	225.19	252.454	12.700	252.454	12.700
3	274.14	259.000	12.700	259.000	12.700
4	107.28	266.482	12.700	266.482	12.700
5	107.28	273.963	12.700	273.963	12.700
6	47.71	281.445	12.700	281.445	12.700
7	70.95	246.914	17.500	246.914	17.500
8	212.86	250.450	17.500	250.450	17.500
9	260.30	256.636	17.500	256.636	17.500
10	153.88	263.706	17.500	263.706	17.500
11	130.16	270.777	17.500	270.777	17.500
12	75.61	277.847	17.500	277.847	17.500
13	71.96	245.041	22.500	245.041	22.500
14	193.87	248.362	22.500	248.362	22.500
15	232.45	254.174	22.500	254.174	22.500
16	166.01	260.815	22.500	260.815	22.500
17	132.89	267.457	22.500	267.457	22.500
18	88.52	274.099	22.500	274.099	22.500
19	76.58	243.168	27.500	243.168	27.500
20	209.13	246.274	27.500	246.274	27.500
21	221.74	251.711	27.500	251.711	27.500
22	147.89	257.924	27.500	257.924	27.500
23	110.87	264.137	27.500	264.137	27.500
24	89.83	270.351	27.500	270.351	27.500
25	76.96	241.294	32.500	241.294	32.500
26	210.76	244.187	32.500	244.187	32.500
27	230.76	249.248	32.500	249.248	32.500
28	123.18	255.033	32.500	255.033	32.500
29	97.42	260.818	32.500	260.818	32.500
30	76.92	266.603	32.500	266.603	32.500
31	59.34	239.421	37.500	239.421	37.500
32	173.60	242.099	37.500	242.099	37.500
33	199.22	246.786	37.500	246.786	37.500
34	127.16	252.142	37.500	252.142	37.500
35	127.16	257.498	37.500	257.498	37.500
36	76.26	262.854	37.500	262.854	37.500
37	53.66	237.547	42.500	237.547	42.500
38	153.80	240.011	42.500	240.011	42.500
39	178.96	244.323	42.500	244.323	42.500
40	128.73	249.251	42.500	249.251	42.500
41	107.40	254.179	42.500	254.179	42.500
42	71.55	259.106	42.500	259.106	42.500
43	49.21	235.674	47.500	235.674	47.500
44	135.67	237.924	47.500	237.924	47.500
45	153.80	241.860	47.500	241.860	47.500
46	113.87	246.360	47.500	246.360	47.500
47	89.17	250.859	47.500	250.859	47.500
48	61.52	255.358	47.500	255.358	47.500
49	36.73	233.801	52.500	233.801	52.500
50	105.23	235.836	52.500	235.836	52.500
51	127.28	239.398	52.500	239.398	52.500
52	90.51	243.469	52.500	243.469	52.500
53	70.98	247.539	52.500	247.539	52.500
54	49.02	251.610	52.500	251.610	52.500
55	19.79	231.927	57.500	231.927	57.500
56	60.83	233.748	57.500	233.748	57.500
57	73.11	236.935	57.500	236.935	57.500
58	57.80	240.578	57.500	240.578	57.500
59	42.61	244.220	57.500	244.220	57.500
60	30.50	247.862	57.500	247.862	57.500

Figure 7-4. Aerodynamic Loads, NZ = 6

AERODYNAMIC LOADS:

PANEL	LOAD	BODY X	BODY Y	WING X	WING Y
1	13.00	248.713	12.700	248.713	12.700
2	39.00	252.454	12.700	252.454	12.700
3	52.00	259.000	12.700	259.000	12.700
4	52.00	266.482	12.700	266.482	12.700
5	52.00	273.963	12.700	273.963	12.700
6	52.01	281.445	12.700	281.445	12.700
7	14.02	246.914	17.500	246.914	17.500
8	42.07	250.450	17.500	250.450	17.500
9	56.10	256.636	17.500	256.636	17.500
10	56.10	263.706	17.500	263.706	17.500
11	56.10	270.777	17.500	270.777	17.500
12	56.10	277.847	17.500	277.847	17.500
13	13.71	245.041	22.500	245.041	22.500
14	41.12	248.362	22.500	248.362	22.500
15	54.83	254.174	22.500	254.174	22.500
16	54.83	260.815	22.500	260.815	22.500
17	54.83	267.457	22.500	267.457	22.500
18	54.83	274.099	22.500	274.099	22.500
19	13.28	243.168	27.500	243.168	27.500
20	39.83	246.274	27.500	246.274	27.500
21	53.10	251.711	27.500	251.711	27.500
22	53.10	257.924	27.500	257.924	27.500
23	53.11	264.137	27.500	264.137	27.500
24	53.11	270.351	27.500	270.351	27.500
25	12.66	241.294	32.500	241.294	32.500
26	37.97	244.187	32.500	244.187	32.500
27	50.62	249.248	32.500	249.248	32.500
28	50.62	255.033	32.500	255.033	32.500
29	50.62	260.818	32.500	260.818	32.500
30	50.63	266.603	32.500	266.603	32.500
31	11.84	239.421	37.500	239.421	37.500
32	35.51	242.099	37.500	242.099	37.500
33	47.34	246.786	37.500	246.786	37.500
34	47.34	252.142	37.500	252.142	37.500
35	47.34	257.498	37.500	257.498	37.500
36	47.34	262.854	37.500	262.854	37.500
37	10.75	237.547	42.500	237.547	42.500
38	32.24	240.011	42.500	240.011	42.500
39	42.98	244.323	42.500	244.323	42.500
40	42.98	249.251	42.500	249.251	42.500
41	42.98	254.179	42.500	254.179	42.500
42	42.98	259.106	42.500	259.106	42.500
43	9.35	235.674	47.500	235.674	47.500
44	28.05	237.924	47.500	237.924	47.500
45	37.41	241.860	47.500	241.860	47.500
46	37.41	246.360	47.500	246.360	47.500
47	37.41	250.859	47.500	250.859	47.500
48	37.40	255.358	47.500	255.358	47.500
49	7.45	233.801	52.500	233.801	52.500
50	22.35	235.836	52.500	235.836	52.500
51	29.81	239.398	52.500	239.398	52.500
52	29.81	243.469	52.500	243.469	52.500
53	29.81	247.539	52.500	247.539	52.500
54	29.81	251.610	52.500	251.610	52.500
55	4.41	231.927	57.500	231.927	57.500
56	13.23	233.748	57.500	233.748	57.500
57	17.64	236.935	57.500	236.935	57.500
58	17.64	240.578	57.500	240.578	57.500
59	17.64	244.220	57.500	244.220	57.500
60	17.64	247.862	57.500	247.862	57.500

Figure 7-5. Aerodynamic Loads to Structural Nodes, NZ = 2

AERODYNAMIC LOADS:

PANEL	LOAD	BODY X	BODY Y	WING X	WING Y
1	-61.14	248.713	12.700	248.713	12.700
2	-175.35	252.454	12.700	252.454	12.700
3	-204.25	259.000	12.700	259.000	12.700
4	-15.47	266.482	12.700	266.482	12.700
5	-15.47	273.963	12.700	273.963	12.700
6	51.93	281.445	12.700	281.445	12.700
7	-51.71	246.914	17.500	246.914	17.500
8	-155.14	250.450	17.500	250.450	17.500
9	-180.26	256.636	17.500	256.636	17.500
10	-59.85	263.706	17.500	263.706	17.500
11	-33.01	270.777	17.500	270.777	17.500
12	28.70	277.847	17.500	277.847	17.500
13	-53.50	245.041	22.500	245.041	22.500
14	-135.59	248.362	22.500	248.362	22.500
15	-151.32	254.174	22.500	254.174	22.500
16	-76.15	260.815	22.500	260.815	22.500
17	-38.69	267.457	22.500	267.457	22.500
18	11.51	274.099	22.500	274.099	22.500
19	-59.60	243.168	27.500	243.168	27.500
20	-155.49	246.274	27.500	246.274	27.500
21	-142.72	251.711	27.500	251.711	27.500
22	-59.17	257.924	27.500	257.924	27.500
23	-17.29	264.137	27.500	264.137	27.500
24	6.52	270.351	27.500	270.351	27.500
25	-61.30	241.294	32.500	241.294	32.500
26	-161.12	244.187	32.500	244.187	32.500
27	-157.98	249.248	32.500	249.248	32.500
28	-36.27	255.033	32.500	255.033	32.500
29	-7.12	260.818	32.500	260.818	32.500
30	16.07	266.603	32.500	266.603	32.500
31	-43.03	239.421	37.500	239.421	37.500
32	-124.10	242.099	37.500	242.099	37.500
33	-128.98	246.786	37.500	246.786	37.500
34	-47.45	252.142	37.500	252.142	37.500
35	-47.45	257.498	37.500	257.498	37.500
36	10.13	262.854	37.500	262.854	37.500
37	-38.83	237.547	42.500	237.547	42.500
38	-108.36	240.011	42.500	240.011	42.500
39	-114.94	244.323	42.500	244.323	42.500
40	-58.11	249.251	42.500	249.251	42.500
41	-33.98	254.179	42.500	254.179	42.500
42	6.58	259.106	42.500	259.106	42.500
43	-36.63	235.674	47.500	235.674	47.500
44	-96.36	237.924	47.500	237.924	47.500
45	-97.83	241.860	47.500	241.860	47.500
46	-52.65	246.360	47.500	246.360	47.500
47	-24.71	250.859	47.500	250.859	47.500
48	6.57	255.358	47.500	255.358	47.500
49	-26.39	233.801	52.500	233.801	52.500
50	-73.53	235.836	52.500	235.836	52.500
51	-83.30	239.398	52.500	239.398	52.500
52	-41.70	243.469	52.500	243.469	52.500
53	-19.61	247.539	52.500	247.539	52.500
54	5.24	251.610	52.500	251.610	52.500
55	-13.41	231.927	57.500	231.927	57.500
56	-41.88	233.748	57.500	233.748	57.500
57	-46.79	236.935	57.500	236.935	57.500
58	-29.47	240.578	57.500	240.578	57.500
59	-12.29	244.220	57.500	244.220	57.500
60	1.41	247.862	57.500	247.862	57.500

Figure 7-6. Aerodynamic Loads to Structural Nodes, NZ = -3

NODE	LOAD	BODY X	BODY Y	WING X	WING Y
1 / 13	0.0	230.562	60.000	230.562	60.000
2 / 27	9.35	232.382	55.000	232.382	55.000
3 / 41	17.44	234.201	50.000	234.201	50.000
4 / 55	23.48	236.021	45.000	236.021	45.000
5 / 69	25.71	237.841	60.000	237.841	40.000
6 / 83	28.52	239.561	35.000	239.661	35.000
7 / 97	37.08	241.481	30.000	241.481	30.000
8 / 111	36.99	243.301	25.000	243.301	25.000
9 / 125	34.82	245.121	20.000	245.121	20.000
10 / 139	41.70	246.940	15.000	246.940	15.000
11 / 159	29.69	249.124	9.000	249.124	9.000
12 / 11	9.89	231.419	60.000	231.419	60.000
13 / 25	47.64	233.346	55.000	233.346	55.000
14 / 39	75.51	235.273	50.000	235.273	50.000
15 / 53	92.70	237.200	45.000	237.200	45.000
16 / 67	104.47	239.127	40.000	239.127	40.000
17 / 81	123.06	241.053	35.000	241.053	35.000
18 / 95	141.27	242.980	30.000	242.980	30.000
19 / 109	138.31	244.907	25.000	244.907	25.000
20 / 123	129.88	246.800	20.000	246.800	20.000
21 / 137	167.95	248.761	15.000	248.761	15.000
22 / 157	86.32	251.074	9.000	251.074	9.000
23 / 9	30.41	233.990	60.000	233.990	60.000
24 / 23	88.82	236.238	55.000	236.238	55.000
25 / 37	130.90	238.486	50.000	238.486	50.000
26 / 51	153.37	240.734	45.000	240.734	45.000
27 / 65	175.74	242.983	40.000	242.983	40.000
28 / 79	204.48	245.231	35.000	245.231	35.000
29 / 93	219.56	247.479	30.000	247.479	30.000
30 / 107	207.57	249.727	25.000	249.727	25.000
31 / 121	222.63	251.975	20.000	251.975	20.000
32 / 135	273.28	254.223	15.000	254.223	15.000
33 / 155	105.09	256.921	9.000	256.921	9.000
34 / 7	36.55	237.418	60.000	237.418	60.000
35 / 21	92.53	240.094	55.000	240.094	55.000
36 / 35	121.49	242.771	50.000	242.771	50.000
37 / 49	147.27	245.447	45.000	245.447	45.000
38 / 63	164.29	248.124	40.000	248.124	40.000
39 / 77	180.74	250.800	35.000	250.800	35.000
40 / 91	174.71	253.477	30.000	253.477	30.000
41 / 105	191.72	256.153	25.000	256.153	25.000
42 / 119	215.68	258.830	20.000	258.830	20.000
43 / 133	233.21	261.506	15.000	261.506	15.000
44 / 151	41.12	264.718	9.000	264.718	9.000
45 / 5	28.90	240.800	60.000	240.800	60.000
46 / 19	66.65	243.800	55.000	243.800	55.000
47 / 33	94.50	247.055	50.000	247.055	50.000
48 / 47	109.02	250.100	45.000	250.100	45.000
49 / 61	118.80	253.300	40.000	253.300	40.000
50 / 75	125.08	256.400	35.000	256.400	35.000
51 / 89	123.00	259.500	30.000	259.500	30.000
52 / 103	139.75	262.700	25.000	262.700	25.000
53 / 117	143.52	265.800	20.000	265.800	20.000
54 / 131	131.44	269.000	15.000	269.000	15.000
55 / 147	41.12	272.600	9.000	272.600	9.000
56 / 3	21.30	244.274	60.000	244.274	60.000
57 / 17	51.83	247.807	55.000	247.807	55.000
58 / 31	69.65	251.340	50.000	251.340	50.000
59 / 45	85.63	254.873	45.000	254.873	45.000
60 / 59	99.76	258.407	40.000	258.407	40.000
61 / 73	87.51	261.940	35.000	261.940	35.000
62 / 87	94.06	265.473	30.000	265.473	30.000
63 / 101	110.68	269.006	25.000	269.006	25.000
64 / 115	108.94	272.539	20.000	272.539	20.000
65 / 129	93.37	276.072	15.000	276.072	15.000
66 / 143	20.90	279.782	9.750	279.782	9.750
67 / 1	15.25	247.702	60.000	247.702	60.000
68 / 15	25.36	251.663	55.000	251.663	55.000
69 / 29	32.00	255.625	50.000	255.625	50.000
70 / 43	37.20	259.586	45.000	259.586	45.000
71 / 57	39.66	263.548	40.000	263.548	40.000
72 / 71	39.97	267.509	35.000	267.509	35.000
73 / 85	46.35	271.471	30.000	271.471	30.000
74 / 99	45.83	275.432	25.000	275.432	25.000
75 / 113	39.27	279.394	20.000	279.394	20.000
76 / 127	25.73	283.355	15.000	283.355	15.000
77 / 141	0.0	286.921	10.500	286.921	10.500

EQUILIBRIUM CHECK (WING COORDINATE SYSTEM)

LOAD INPUT: LOAD= 7125. LBS	NODE DISTRIBUTION: LOAD= 7125. LBS
MX= 224768. IN-LB	MX= 224767. IN-LB
MY=1796050. IN-LB	MY=1796045. IN-LB

Figure 7-7. Aerodynamic Loads to Structural Nodes, NZ = 6, Distribution to Nodes

NODE	LOAD	BODY X	BODY Y	WING X	WING Y
1 / 13	0.0	230.562	60.000	230.562	60.000
2 / 27	2.08	232.382	55.000	232.382	55.000
3 / 41	3.54	234.201	50.000	234.201	50.000
4 / 55	4.46	236.021	45.000	236.021	45.000
5 / 69	5.15	237.841	40.000	237.841	40.000
6 / 83	5.69	239.661	35.000	239.661	35.000
7 / 97	6.10	241.481	30.000	241.481	30.000
8 / 111	6.41	243.301	25.000	243.301	25.000
9 / 125	6.63	245.121	20.000	245.121	20.000
10 / 139	8.00	246.940	15.000	246.940	15.000
11 / 159	4.98	249.124	9.000	249.124	9.000
12 / 11	2.20	231.419	60.000	231.419	60.000
13 / 25	10.09	233.346	55.000	233.346	55.000
14 / 39	15.48	235.273	50.000	235.273	50.000
15 / 53	18.97	237.200	45.000	237.200	45.000
16 / 67	21.59	239.127	40.000	239.127	40.000
17 / 81	23.62	241.053	35.000	241.053	35.000
18 / 95	25.17	242.980	30.000	242.980	30.000
19 / 109	26.32	244.907	25.000	244.907	25.000
20 / 123	27.01	246.800	20.000	246.800	20.000
21 / 137	31.45	248.761	15.000	248.761	15.000
22 / 157	14.95	251.074	9.000	251.074	9.000
23 / 9	6.61	233.990	60.000	233.990	60.000
24 / 23	19.87	236.238	55.000	236.238	55.000
25 / 37	28.74	238.486	50.000	238.486	50.000
26 / 51	34.60	240.734	45.000	240.734	45.000
27 / 65	39.02	242.983	40.000	242.983	40.000
28 / 79	42.42	245.231	35.000	245.231	35.000
29 / 93	44.99	247.479	30.000	247.479	30.000
30 / 107	46.89	249.727	25.000	249.727	25.000
31 / 121	48.36	251.975	20.000	251.975	20.000
32 / 135	53.21	254.223	15.000	254.223	15.000
33 / 155	19.94	256.921	9.000	256.921	9.000
34 / 7	8.82	237.418	60.000	237.418	60.000
35 / 21	23.59	240.094	55.000	240.094	55.000
36 / 35	33.08	242.771	50.000	242.771	50.000
37 / 49	40.18	245.447	45.000	245.447	45.000
38 / 63	44.91	248.124	40.000	248.124	40.000
39 / 77	49.13	250.800	35.000	250.800	35.000
40 / 91	51.99	253.477	30.000	253.477	30.000
41 / 105	54.08	256.153	25.000	256.153	25.000
42 / 119	55.95	258.830	20.000	258.830	20.000
43 / 133	61.31	261.506	15.000	261.506	15.000
44 / 151	19.93	264.718	9.000	264.718	9.000
45 / 5	8.82	240.800	60.000	240.800	60.000
46 / 19	23.54	243.800	55.000	243.800	55.000
47 / 33	34.13	247.055	50.000	247.055	50.000
48 / 47	39.98	250.100	45.000	250.100	45.000
49 / 61	45.54	253.300	40.000	253.300	40.000
50 / 75	48.95	256.400	35.000	256.400	35.000
51 / 89	51.83	259.500	30.000	259.500	30.000
52 / 103	54.33	262.700	25.000	262.700	25.000
53 / 117	55.42	265.800	20.000	265.800	20.000
54 / 131	60.09	269.000	15.000	269.000	15.000
55 / 147	19.93	272.600	9.000	272.600	9.000
56 / 3	8.82	244.274	60.000	244.274	60.000
57 / 17	24.03	247.807	55.000	247.807	55.000
58 / 31	33.60	251.340	50.000	251.340	50.000
59 / 45	40.41	254.873	45.000	254.873	45.000
60 / 59	45.02	258.407	40.000	258.407	40.000
61 / 73	48.86	261.940	35.000	261.940	35.000
62 / 87	51.75	265.473	30.000	265.473	30.000
63 / 101	53.47	269.006	25.000	269.006	25.000
64 / 115	55.00	272.539	20.000	272.539	20.000
65 / 129	56.04	276.072	15.000	276.072	15.000
66 / 143	22.78	279.782	9.750	279.782	9.750
67 / 1	8.82	247.702	60.000	247.702	60.000
68 / 15	15.39	251.663	55.000	251.663	55.000
69 / 29	19.46	255.625	50.000	255.625	50.000
70 / 43	22.36	259.586	45.000	259.586	45.000
71 / 57	24.59	263.548	40.000	263.548	40.000
72 / 71	26.25	267.509	35.000	267.509	35.000
73 / 85	27.50	271.471	30.000	271.471	30.000
74 / 99	28.34	275.432	25.000	275.432	25.000
75 / 113	28.96	279.394	20.000	279.394	20.000
76 / 127	27.64	283.355	15.000	283.355	15.000
77 / 141	0.0	286.921	10.500	286.921	10.500

EQUILIBRIUM CHECK (WING COORDINATE SYSTEM)

LOAD INPUT: LOAD= 2209. LBS
MX= 69697. IN-LB
MY= 564631. IN-LB

NODE DISTRIBUTION: LOAD= 2209. LBS
MX= 69697. IN-LB
MY= 564631. IN-LB

Figure 7-8. Aerodynamic Loads to Structural Nodes, NZ = 2, Distribution to Nodes

NODE	LOAD	BODY X	BODY Y	WING X	WING Y
1 / 13	0.0	230.562	60.000	230.562	60.000
2 / 27	-6.33	232.382	55.000	232.382	55.000
3 / 41	-12.53	234.201	50.000	234.201	50.000
4 / 55	-17.47	236.021	45.000	236.021	45.000
5 / 69	-18.60	237.841	40.000	237.841	40.000
6 / 83	-20.68	239.661	35.000	239.661	35.000
7 / 97	-29.53	241.481	30.000	241.481	30.000
8 / 111	-28.79	243.301	25.000	243.301	25.000
9 / 125	-25.89	245.121	20.000	245.121	20.000
10 / 139	-30.87	246.940	15.000	246.940	15.000
11 / 159	-23.44	249.124	9.000	249.124	9.000
12 / 11	-6.70	231.419	60.000	231.419	60.000
13 / 25	-33.34	233.346	55.000	233.346	55.000
14 / 39	-53.90	235.273	50.000	235.273	50.000
15 / 53	-66.24	237.200	45.000	237.200	45.000
16 / 67	-74.24	239.127	40.000	239.127	40.000
17 / 81	-91.13	241.053	35.000	241.053	35.000
18 / 95	-108.57	242.980	30.000	242.980	30.000
19 / 109	-102.88	244.907	25.000	244.907	25.000
20 / 123	-91.93	246.800	20.000	246.800	20.000
21 / 137	-125.98	248.761	15.000	248.761	15.000
22 / 157	-67.22	251.074	9.000	251.074	9.000
23 / 9	-20.94	233.990	60.000	233.990	60.000
24 / 23	-60.02	236.238	55.000	236.238	55.000
25 / 37	-89.57	238.486	50.000	238.486	50.000
26 / 51	-103.05	240.734	45.000	240.734	45.000
27 / 65	-119.37	242.983	40.000	242.983	40.000
28 / 79	-144.95	245.231	35.000	245.231	35.000
29 / 93	-156.77	247.479	30.000	247.479	30.000
30 / 107	-139.36	249.727	25.000	249.727	25.000
31 / 121	-153.39	251.975	20.000	251.975	20.000
32 / 135	-200.81	254.223	15.000	254.223	15.000
33 / 155	-78.30	256.921	9.000	256.921	9.000
34 / 7	-23.39	237.418	60.000	237.418	60.000
35 / 21	-56.65	240.094	55.000	240.094	55.000
36 / 35	-70.08	242.771	50.000	242.771	50.000
37 / 49	-84.80	245.447	45.000	245.447	45.000
38 / 63	-94.40	248.124	40.000	248.124	40.000
39 / 77	-104.44	250.800	35.000	250.800	35.000
40 / 91	-91.79	253.477	30.000	253.477	30.000
41 / 105	-106.79	256.153	25.000	256.153	25.000
42 / 119	-130.08	258.830	20.000	258.830	20.000
43 / 133	-139.00	261.506	15.000	261.506	15.000
44 / 151	-5.93	264.718	9.000	264.718	9.000
45 / 5	-14.74	240.800	60.000	240.800	60.000
46 / 19	-27.47	243.800	55.000	243.800	55.000
47 / 33	-37.41	247.055	50.000	247.055	50.000
48 / 47	-41.92	250.100	45.000	250.100	45.000
49 / 61	-41.66	253.300	40.000	253.300	40.000
50 / 75	-41.83	256.400	35.000	256.400	35.000
51 / 89	-33.60	259.500	30.000	259.500	30.000
52 / 103	-47.46	262.700	25.000	262.700	25.000
53 / 117	-49.51	265.800	20.000	265.800	20.000
54 / 131	-26.33	269.000	15.000	269.000	15.000
55 / 147	-5.93	272.600	9.000	272.600	9.000
56 / 3	-6.14	244.274	60.000	244.274	60.000
57 / 17	-9.70	247.807	55.000	247.807	55.000
58 / 31	-10.37	251.340	50.000	251.340	50.000
59 / 45	-14.58	254.873	45.000	254.873	45.000
60 / 59	-21.19	258.407	40.000	258.407	40.000
61 / 73	0.49	261.940	35.000	261.940	35.000
62 / 87	-1.02	265.473	30.000	265.473	30.000
63 / 101	-16.34	269.006	25.000	269.006	25.000
64 / 115	-11.25	272.539	20.000	272.539	20.000
65 / 129	8.49	276.072	15.000	276.072	15.000
66 / 143	22.75	279.782	9.750	279.782	9.750
67 / 1	0.71	247.702	60.000	247.702	60.000
68 / 15	2.66	251.663	55.000	251.663	55.000
69 / 29	3.42	255.625	50.000	255.625	50.000
70 / 43	3.44	259.586	45.000	259.586	45.000
71 / 57	5.21	263.548	40.000	263.548	40.000
72 / 71	8.24	267.509	35.000	267.509	35.000
73 / 85	3.56	271.471	30.000	271.471	30.000
74 / 99	5.87	275.432	25.000	275.432	25.000
75 / 113	14.54	279.394	20.000	279.394	20.000
76 / 127	27.17	283.355	15.000	283.355	15.000
77 / 141	0.0	286.921	10.500	286.921	10.500

EQUILIBRIUM CHECK (WING COORDINATE SYSTEM)

LOAD INPUT:		NODE DISTRIBUTION:	
LOAD=	-3562. LBS	LOAD=	-3562. LBS
MX=	-112361. IN-LB	MX=	-112360. IN-LB
MY=	-882162. IN-LB	MY=	-882162. IN-LB

Figure 7-9. Aerodynamic Loads to Structural Nodes, NZ = -3, Distribution to Nodes

YEA	SHEAR	MOMENT	TORQUE
47.100	30.	0.	23.
42.100	334.	1423.	2616.
37.100	826.	5245.	5806.
32.100	1439.	12083.	8238.
27.100	2138.	22392.	9158.
22.100	2901.	36514.	8237.
17.100	3730.	54716.	5656.
12.100	4585.	77198.	522.
7.100	5458.	104109.	-7203.
2.300	6334.	134281.	-16334.
2.300	7125.	134281.	-24689.

Figure 7-10. Aerodynamic Loads Distributed Loading, NZ = 6

YEA	SHEAR	MOMENT	TORQUE
47.100	18.	0.	13.
42.100	118.	441.	620.
37.100	275.	1627.	1224.
32.100	467.	3748.	1447.
27.100	686.	6944.	1087.
22.100	926.	11323.	15.
17.100	1182.	16968.	-1853.
12.100	1449.	23941.	-4568.
7.100	1725.	32284.	-8155.
2.300	2001.	41640.	-12456.
2.300	2209.	41640.	-15394.

Figure 7-11. Aerodynamic Loads Distributed Loading, NZ = 2

YEA	SHEAR	MOMENT	TORQUE
47.100	-142.	-0.	-1683.
42.100	-382.	-712.	-4032.
37.100	-683.	-2621.	-6305.
32.100	-1031.	-6037.	-8003.
27.100	-1412.	-11192.	-8999.
22.100	-1820.	-18251.	-10030.
17.100	-2247.	-27349.	-9600.
12.100	-2691.	-38585.	-7619.
7.100	-3142.	-52040.	-5181.
2.300	-3562.	-67123.	-3417.

Figure 7-12. Aerodynamic Loads Distributed Loading, NZ = -3

designing in a proper jig shape.

7.3 EMPENNAGE LOADS

A preliminary analysis of horizontal tail loads has been conducted in support of this feasibility study. Only symmetrical balanced maneuvers were examined at this time. Fuselage and horizontal tail aerodynamic data for this study were obtained from wind tunnel test data of the BQM-34E/F target. Wing data were based on the wing airload distributions described in Section 7.2 for 0.90 Mach number and adjusted by Glauert compressibility factors for other Mach numbers.

The results of the study are shown in Figure 7-13 and 7-14. A potential strength problem is indicated which must be addressed in more detail during a detail design effort. Several observations can be made, however, at this time. The horizontal tail loads were determined on the basis of a rather crude estimation of wing aerodynamics. A follow-on analysis, made with the knowledge of such wing parameters as required twist and camber distributions may substantially alter the level of the calculated loads. If, at that time, horizontal tail loads are still a potential problem, it may be possible to alter or restrict the flight envelope such that tail loads are reduced but flight research objectives are still obtained.

NOTES: 1. MOST CRITICAL GW/CG COMBINATION
GW = 1975 LBS., CG @ X_F = 251.5"
2. SYMMETRICAL BALANCED MANEUVER
3. LIMIT LOADS
4. LOAD FACTOR = 6.0

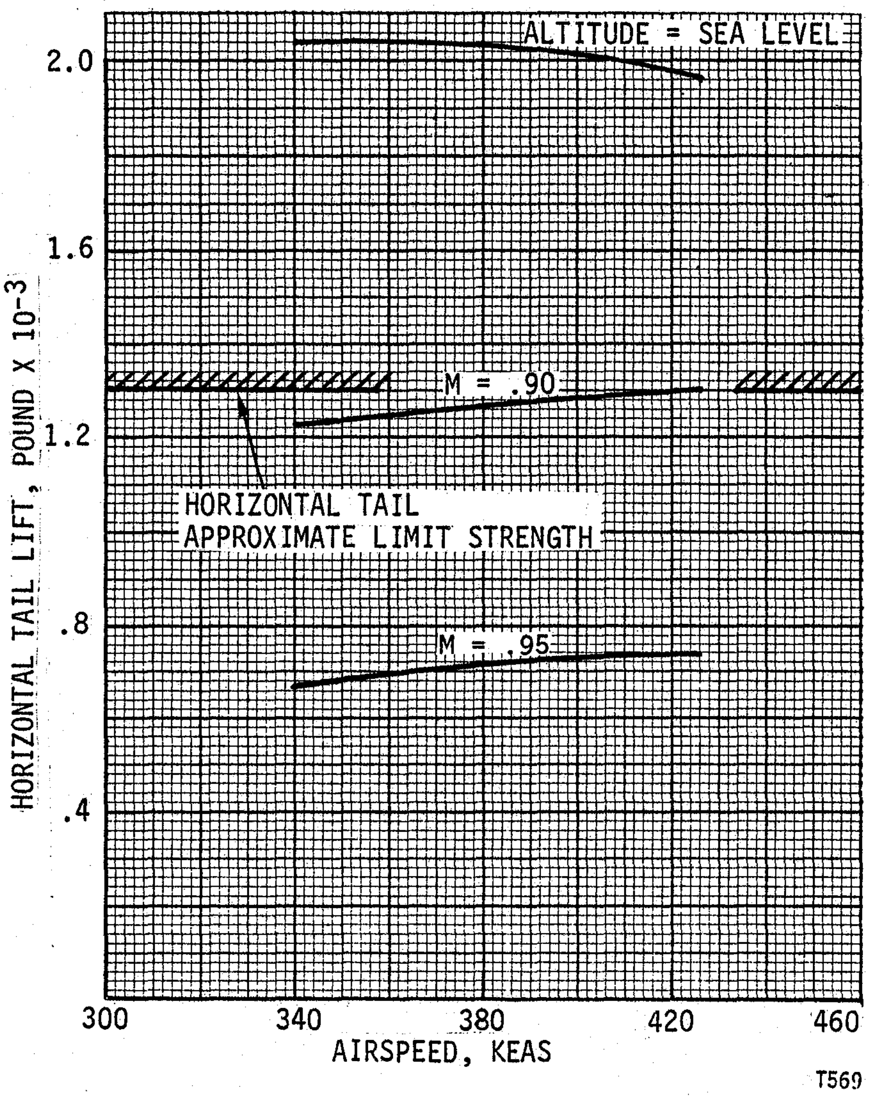


Figure 7-13. Horizontal Tail Load Survey, 426 KEAS

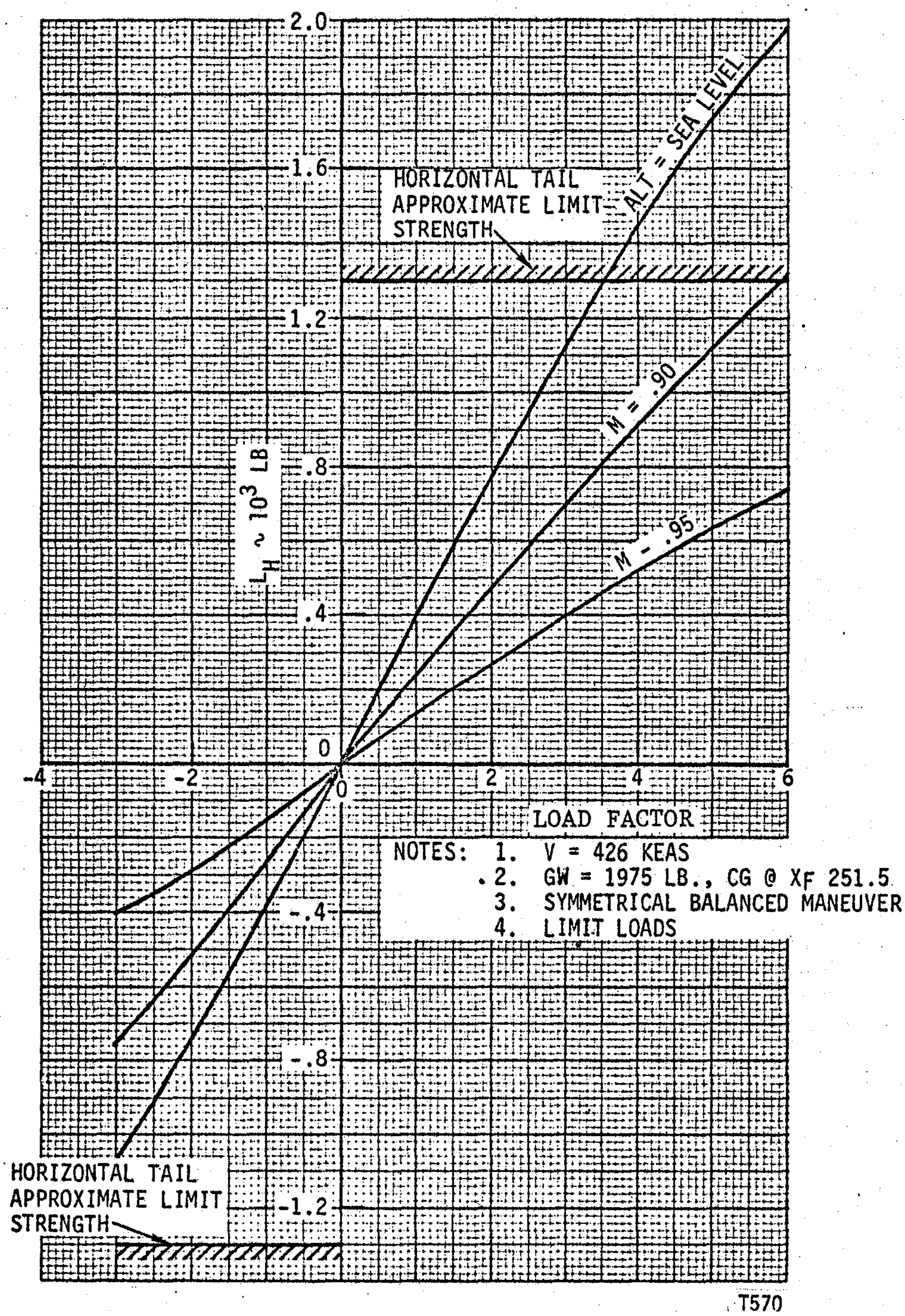


Figure 7-14. Horizontal Tail Loads Survey

8.0 LOAD INDUCED ELASTIC DEFORMATIONS

8.1 METHOD OF APPROACH

General

An automated strength/displacement/flutter redesign process was used to aeroelastically tailor the forward swept research wing. The approach consists of the following elements:

a. Design criteria

b. Materials and structural configuration

c. Analysis techniques

Detail items in the approach are shown in Figure 8-1.

The approach is embodied in two large scale computer program systems named ASOP-3 and FASTOP-3 (Flutter and Strength Optimization Program) used to implement the preliminary design study. The programs perform interactive strength/flutter redesign for minimum weight.

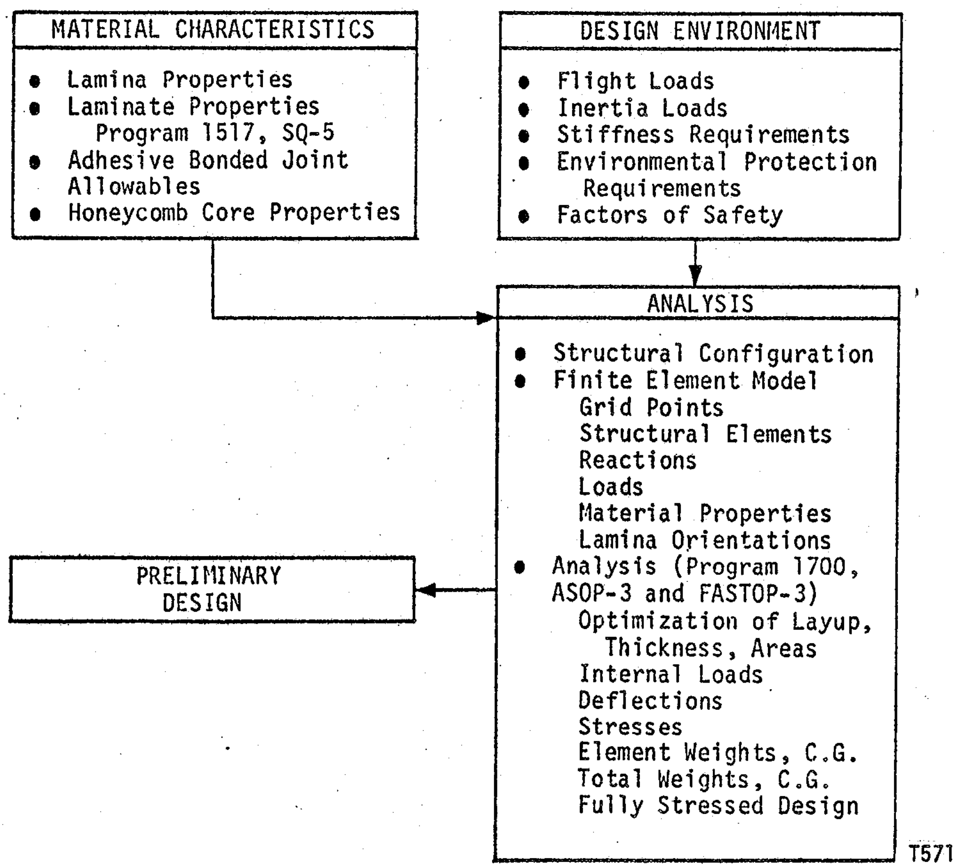
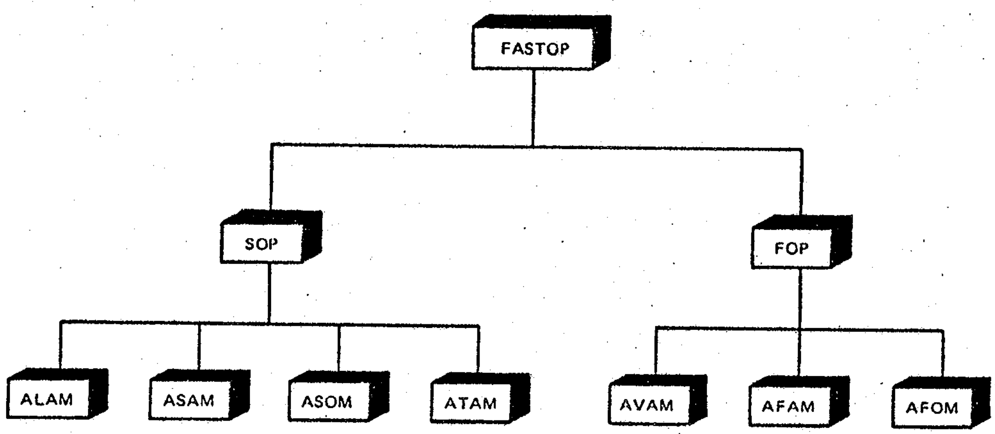


Figure 8-1. Detail Items in the Basic Structural Analysis Approach

The FASTOP system is divided into two major programs, the first which addresses static analysis and redesign functions, and the second which addresses the dynamic analysis and redesign. Each of these two programs, Strength Optimization Program (SOP) and the Flutter Optimization Program (FOP), consist of a number of special purpose modules. Figure 8-2 is a FASTOP-3 modular flow chart. For complete details on these two program systems see Reference 8.1.

ASOP-3 was employed primarily to perform trade-off studies for selecting materials and a structural configuration. The FASTOP-3 system used the CDC version with computing time on the CYBERNET NOS/BATCH System made available by AFFDL. The ASOP-3 program, obtained from AFFDL, was an IBM version run on TRA's IBM computing system.



SOP - Structural Optimization Program

ALAM - Automated Load Analysis Module

ASAM - Automated Structural Analysis Module

ASOM - Automated Structural Optimization Module

ATAM - Automated Transformation Analysis Module

FOP - Flutter Optimization Program

AVAM - Automated Vibration Analysis Module

AFAM - Automated Flutter Analysis Module

AFOM - Automated Flutter Optimization Module

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Figure 8-2. FASTOP-3 Modular Flow Chart

Design Criteria

A detail description of the structural design criteria and structural loads is given in Sections 6.0 and 7.0 respectively. The following items, summarized from these sections, have a significant driving influence on the aeroelastic tailoring design of the forward swept research wing:

1. Flight load conditions:
   a. 6 g limit
   b. 1.5 x 6 g limit loads
   c. 2 g cruise
   d. -3 g limit

2. The wing is aeroelastically tailored for torsional twist = $0^{\circ} \pm .2^{\circ}$ when subjected to the 6 g limit loads.

3. Must be strength adequate for all the load cases.

4. Ultimate factor of safety shall be 1.50.

5. The wing will be designed to provide satisfactory static aeroelastic and flutter characteristics throughout the flight envelope with a margin of 15 percent on speed.

Materials and Structural Configuration

Primary wing construction consists of graphite/epoxy skin bonded to full depth HFT glass reinforced phenolic honeycomb core. A machined aluminum fuel tank cover and graphite/epoxy root ribs and fore/aft closures complete the wing center section. Further discussion of the wing preliminary design is provided in Section 11.2.

The basic layup of the advanced composite skins is balanced and consists of plies oriented at 0° and $\pm 45^{\circ}$. Materials used for the different parts are shown in Figure 8-3.

A weight comparison study was performed by substituting aluminum skins for the graphite epoxy skins. Another candidate used low modulus KEVLAR/epoxy skins aft of the 40 percent chord and graphite/epoxy skins forward.

The mechanical properties of the different materials used in the study are presented in Section 8.2.7.

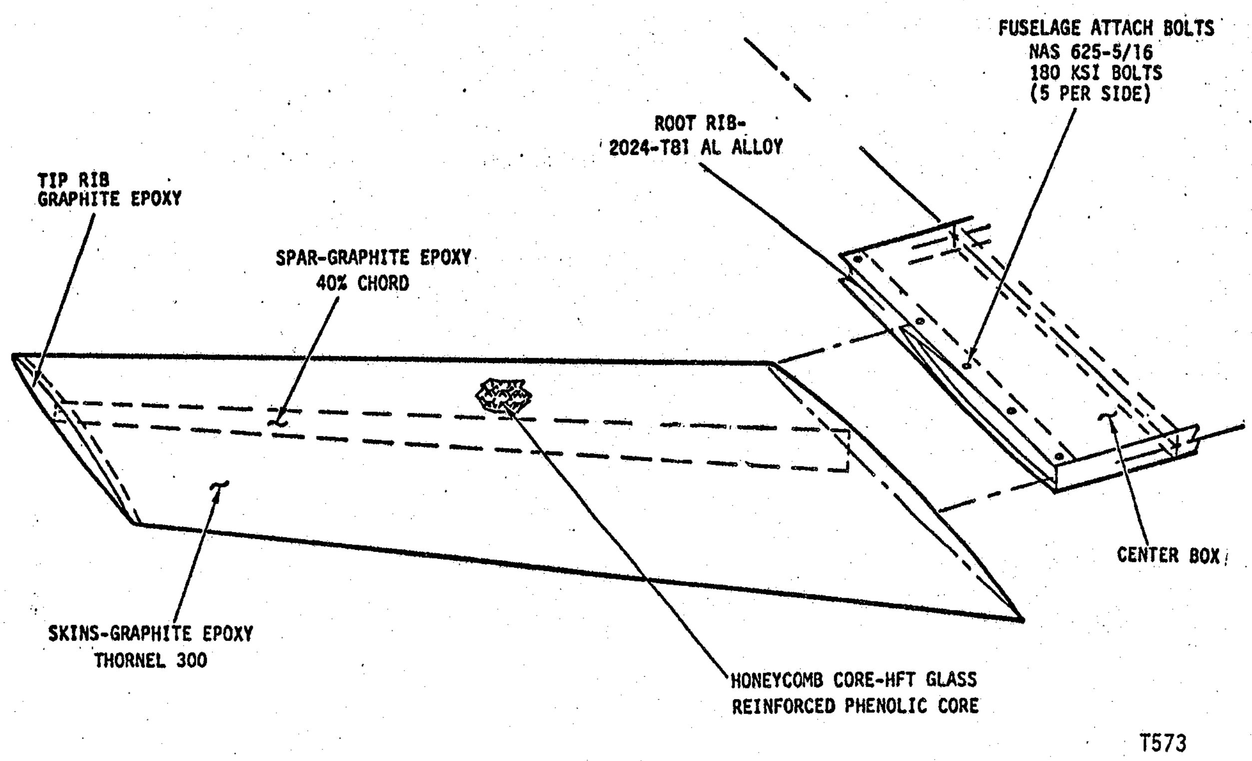

Figure 8-3. Wing Construction and Materials Selection

Analysis Techniques

The use of swept forward wings in the past has not been feasible due to the structural weight penalty associated with divergence prevention. This weight penalty is known to be very severe for conventional metal wings. By the judicious use of advanced composite materials now commercially available the weight penalty can be alleviated. With advanced composites the basic material properties can be tailored to suit a load condition and control the wing displacement behavior.

Full realization of the potential of advanced composite materials requires the availability of powerful and convenient automated analysis tools. The Air Force Flight Dynamics Laboratory has sponsored the development of a series of computer programs directed toward this end. ASOP-3 and FASTOP-3 represent the latest developments in this series of programs.

The ASOP-3 program, which operates on a finite element model of the structure, uses the fully stressed design approach for the satisfaction of strength requirements. Up to 20 load cases can be applied in stress-constraint resizing. Deflection constraint resizing is limited to only one load case. The forward swept research wing was designed with constraints on angle-of-twist at several spanwise stations. This was done by means of successive submissions of the program. In the first submission, only the innermost constraint near the root was applied. A second submission was made, in which only the next outboard constraint was applied, with the sizes of the members inboard of the first constraint submission being fixed at the values yielded by the first submission. This procedure is repeated, moving outboard to the tip. ASOP-3 can accommodate composite laminates with up to six ply directions and the directions can be arbitrary.

FASTOP-3 incorporates all the features of ASOP-3 and in addition can analyze designs with respect to vibration and flutter. The program is capable of obtaining near optimum designs subjected to strength, displacement, and flutter-speed requirements.

ASOP-3 was used extensively to perform configuration trade studies and integrate the composite materials into the design. FASTOP-3 was employed to optimize the wing for strength and twist constraints in addition to performing a vibration and flutter-spread check.

8.2 AEROELASTIC DESIGN/MATERIAL ANALYSIS

The following automated integrated analyses were used in the design process of the swept forward research wing:

- Finite element fully stressed design to satisfy strength requirements and twist displacement requirements.
- Vibration analysis
- Flutter analysis

Each analysis requires a model as shown below:

- Structures model
- Dynamics model
- Flutter model

Transformations between the structures model and the dynamics and flutter models are performed by the automated transformation analysis module (ATAM) in FASTOP-3

8.2.1 Wing Finite Element Structural Analysis

The structure is idealized into an analysis model which describes the wing geometry, support reactions, materials of construction, and the structural elements. The finite elements include rods, shear panels, and membranes. The advanced composite skins are represented as orthotropic membrane elements. These elements and the computer program formulations are described in Reference 8.1.

The idealized structural model consists of the complete outer wing panel, including a root rib. All honeycomb core is idealized into discrete spar and rib shear panels. These panels are bounded by pseudo vertical rods with compressive stiffness equivalent to the core. Five spanwise shear webs are placed at 0.05, 20.0, 40.0, 60.0, and 80.0 percent chord. The core is idealized as streamwise ribs at 5 inch intervals starting at Y_F 15.0. These elements were made non-candidate members for redesign. A spanwise spar web, fabricated from composite materials, was placed at the 40 percent chord as a candidate member for redesign. This member proved to be ineffective and not really required. The laminated skins are represented as orthotropic membrane elements. Basic layup is 0, ±45 degree balanced laminates oriented along the 40.0 percent chord. The rib is represented by rods and shear panels. Reactions are provided at the bolt attachment locations on the root rib.

The structural model consists of 347 elements interconnected at 166 grid points and has 406 degrees of freedom.

8.2.2 Geometry

The structures model is defined with 166 grid points whose coordinates were generated by the loft department. The grids are defined by the intersection of spanwise percent chord lines and Y_F stations at 5.0 inch intervals.

This geometry is shown in Figure 8-4. Upper and lower surface grid numbers are shown in Figures 8-5 and 8-6. Upper surface grids are defined with odd numbers and are incremented by +1 to obtain the lower surface grid number directly below. Root rib geometry and grids are presented in Figure 8-7. Grid coordinate geometry is given in Table 8-1.

8.2.3 Wing Surface Membranes

The laminated wing skins are represented with 120 quadrilateral membrane elements. Basic layup is 0, ±45 degree balanced laminates oriented along the 40.0 percent chord. Figures 8-8 and 8-9 identify the membrane elements and the grid numbers which describe them. (See also Section 8.3.1).

8.2.4 Honeycomb Core Shear Panels

The honeycomb core is "egg-crated" into spanwise and streamwise shear webs representing spars and ribs. Five spanwise shear webs are placed at 0.05, 20.0, 40.0, 60.0, and 80.0 percent chord. The rib webs are spaced at 5 inch intervals starting at $Y_F = 15.0$. Each element is assigned an identification number and defined with grid numbers.

The core ribbon direction is oriented parallel with the 40.0 percent chord line. The "L" direction properties apply to the spanwise elements representing spar webs. The transverse or "W" direction properties are used for the rib webs.

The panels are bounded at each end by pseudo vertical rods with stiffness equivalent to the core.

Figure 8-10 identifies the spanwise shear webs and the grid numbers associated with each element. Figure 8-11 identifies the streamwise rib webs.

Figure 8-12 identifies the pseudo rods which bound the webs at each end. Their location is defined by the intersection of the spanwise and streamwise webs.

8.2.5 Root Rib

The root rib is represented with quadrilateral shear panels, triangular membranes, and bar elements. Five places are provided for a bolt attachment to the fuselage.

Figure 8-13 identifies the finite elements and their grid numbers.

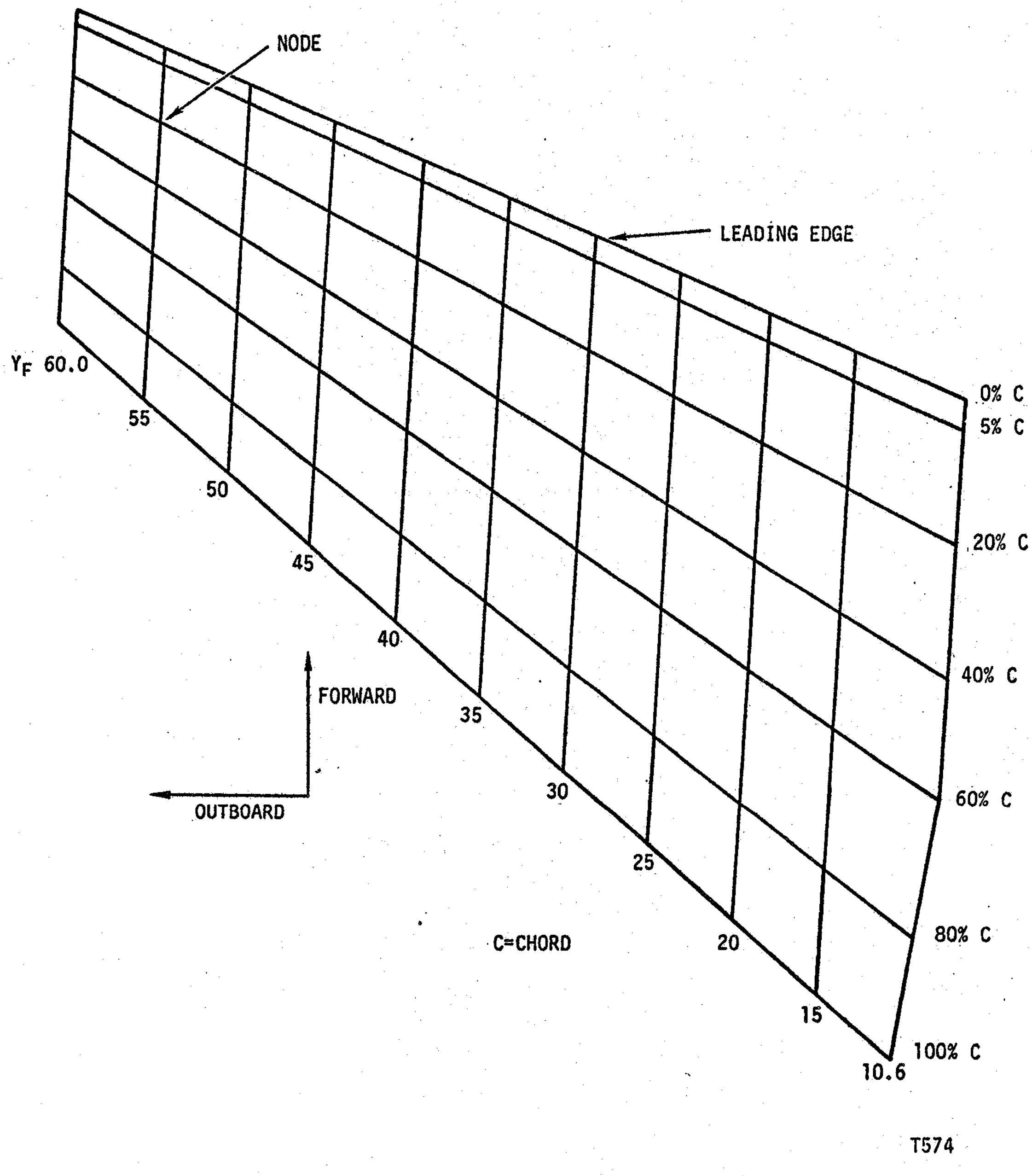

Figure 8-4. Wing Geometry

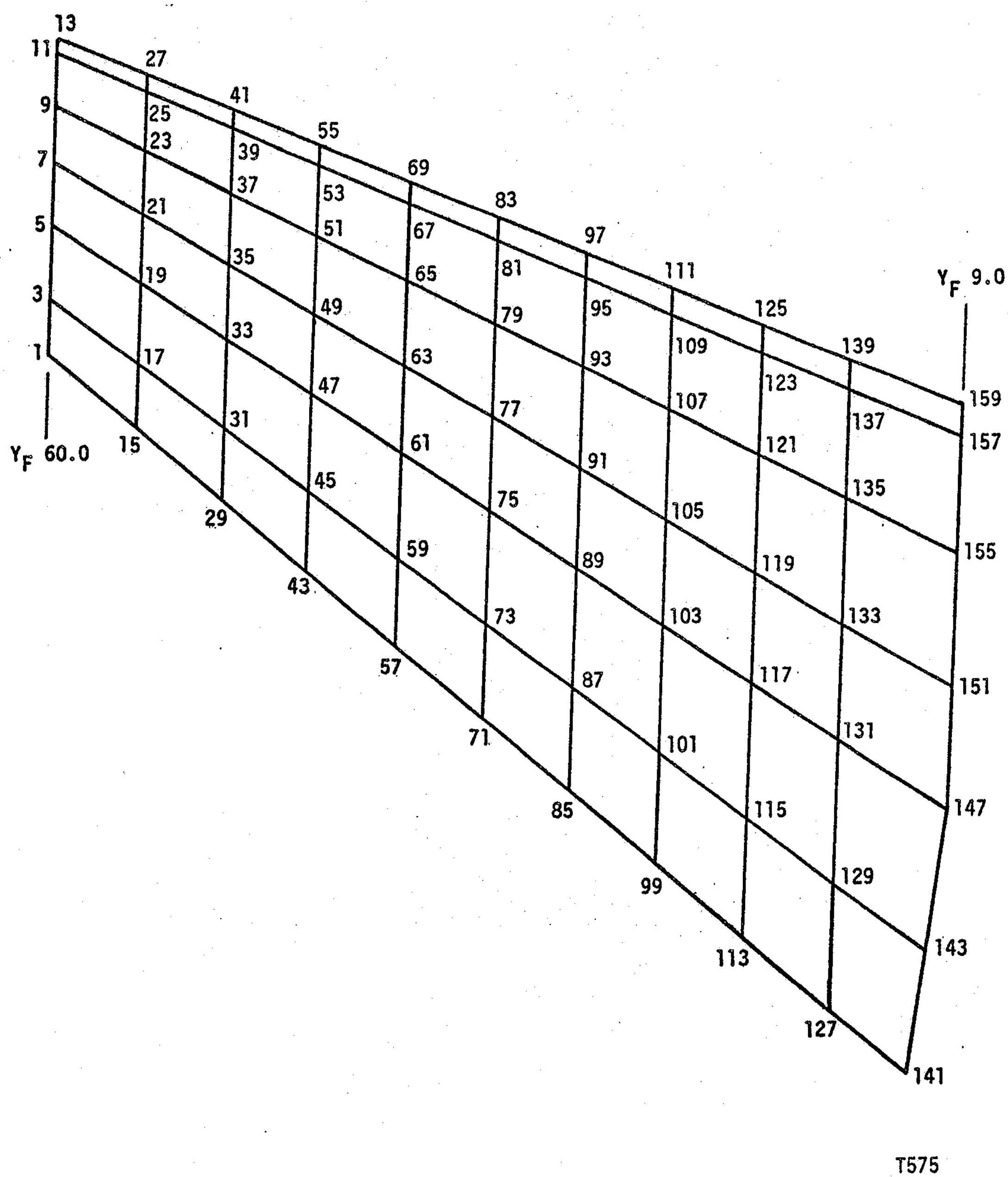

Figure 8-5. Wing Upper Skin Grid Points

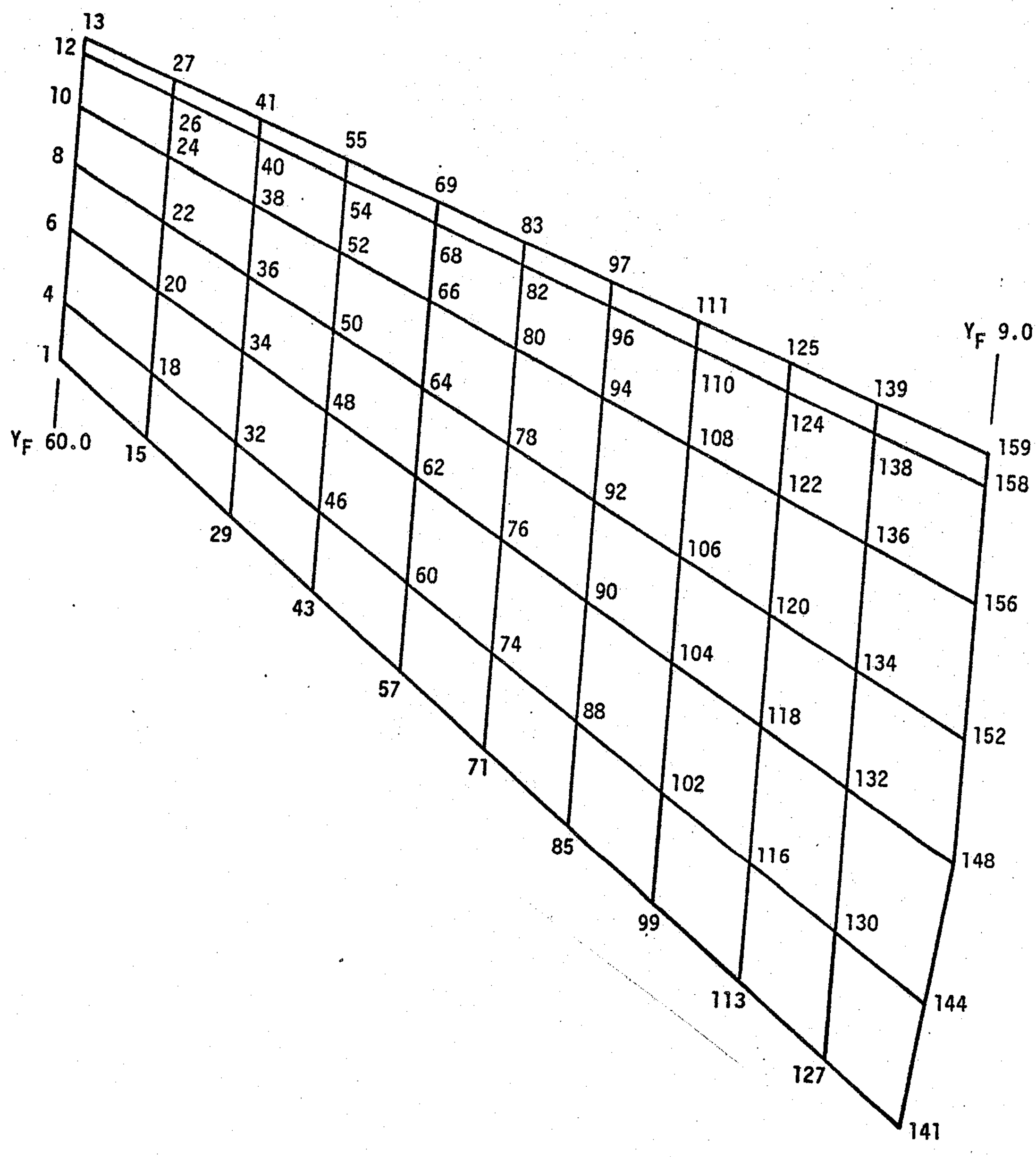

Figure 8-6. Wing Lower Skin Grid Points

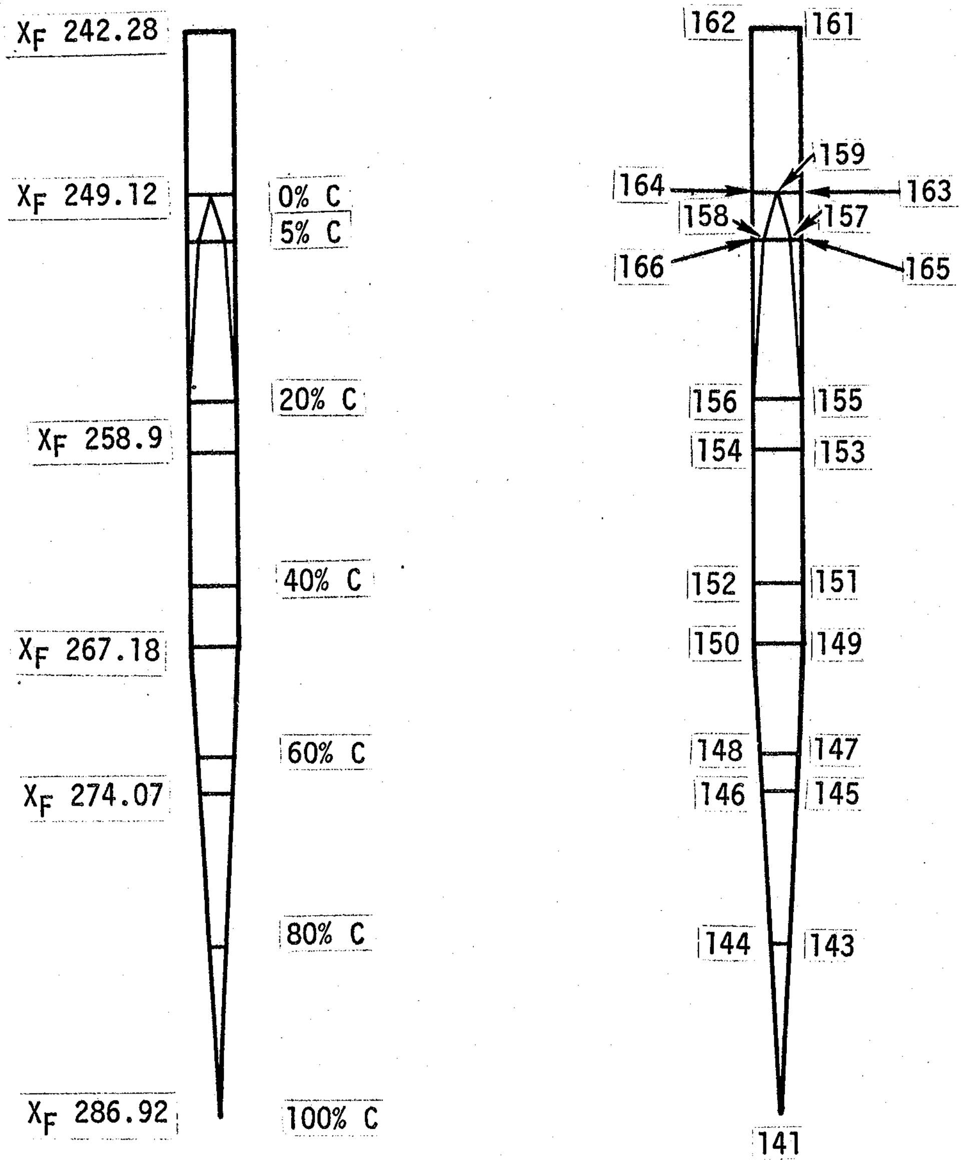

Figure 8-7. Root Rib Geometry and Grid Points

TABLE 8-1

WING/ROOT RIB COORDINATES
(Sheet 1 of 3)

NODE	X	Y	Z
1	247.701786	60.000000	56.721653
2			
3	244.273786	60.000000	56.992597
4	244.273786	60.000000	56.676166
5	240.845786	60.000000	57.201573
6	240.845786	60.000000	56.523225
7	237.417786	60.000000	57.304413
8	237.417786	60.000000	56.455324
9	233.989786	60.000000	57.266178
10	233.989786	60.000000	56.476419
11	231.418786	60.000000	57.063794
12	231.418786	60.000000	56.581896
13	230.561786	60.000000	56.750000
14			
15	251.663304	55.000000	56.718111
16			
17	247.806970	55.000000	57.022910
18	247.806970	55.000000	56.666940
19	243.950637	55.000000	57.257998
20	243.950637	55.000000	56.494889
21	240.094304	55.000000	57.373688
22	240.094304	55.000000	56.418504
23	236.237970	55.000000	57.330675
24	236.237970	55.000000	56.442235
25	233.345720	55.000000	57.103003
26	233.345720	55.000000	56.560891
27	232.381637	55.000000	56.750000
28			
29	255.624822	50.000000	56.714569
30			
31	251.340155	50.000000	57.053223
32	251.340155	50.000000	56.657715
33	247.055488	50.000000	57.314422
34	247.055488	50.000000	56.466553
35	242.770822	50.000000	57.442962
36	242.770822	50.000000	56.381684
37	238.486155	50.000000	57.395172
38	238.486155	50.000000	56.408050
39	235.272655	50.000000	57.142212
40	235.272655	50.000000	56.539886
41	234.201488	50.000000	56.750000
42			
43	259.586339	45.000000	56.711027
44			
45	254.873339	45.000000	57.083535
46	254.873339	45.000000	56.648489
47	250.160339	45.000000	57.370847
48	250.160339	45.000000	56.438217
49	245.447339	45.000000	57.512237
50	245.447339	45.000000	56.344863
51	240.734339	45.000000	57.459669
52	240.734339	45.000000	56.373866
53	237.199589	45.000000	57.181421
54	237.199589	45.000000	56.518881
55	236.021339	45.000000	56.750000

TABLE 8-1

WING/ROOT RIB COORDINATES
(Sheet 2 of 3)

NODE	X	Y	Z
56			
57	263.547857	40.000000	56.707485
58			
59	258.406524	40.000000	57.113848
60	258.406524	40.000000	56.639263
61	253.265191	40.000000	57.427272
62	253.265191	40.000000	56.409881
63	248.123857	40.000000	57.581512
64	248.123857	40.000000	56.308043
65	242.982524	40.000000	57.524166
66	242.982524	40.000000	56.339582
67	239.126524	40.000000	57.220630
68	239.126524	40.000000	56.497877
69	237.841191	40.000000	56.750000
70			
71	267.509375	35.000000	56.703943
72			
73	261.939708	35.000000	57.144161
74	261.939708	35.000000	56.630038
75	256.370042	35.000000	57.483696
76	256.370042	35.000000	56.381545
77	250.800375	35.000000	57.650786
78	250.800375	35.000000	56.271223
79	245.230708	35.000000	57.588663
80	245.230708	35.000000	56.305498
81	241.053458	35.000000	57.259839
82	241.053458	35.000000	56.476872
83	239.661042	35.000000	56.750000
84			
85	271.470893	30.000000	56.700401
86			
87	265.472893	30.000000	57.174474
88	265.472893	30.000000	56.620812
89	259.474893	30.000000	57.540121
90	259.474893	30.000000	56.353209
91	253.476893	30.000000	57.720061
92	253.476893	30.000000	56.234403
93	247.478893	30.000000	57.653160
94	247.478893	30.000000	56.271313
95	242.980393	30.000000	57.299048
96	242.980393	30.000000	56.455867
97	241.480893	30.000000	56.750000
98			
99	275.432411	25.000000	56.696859
100			
101	269.006077	25.000000	57.204787
102	269.006077	25.000000	56.611586
103	262.579744	25.000000	57.596546
104	262.579744	25.000000	56.324874
105	256.153411	25.000000	57.789336
106	256.153411	25.000000	56.197583
107	249.727077	25.000000	57.717558
108	249.727077	25.000000	56.237129
109	244.907327	25.000000	57.338257
110	244.907327	25.000000	56.434862
111	243.300744	25.000000	56.750000

TABLE 8-1

WING/ROOT RIB COORDINATES
(Sheet 3 of 3)

NODE	X	Y	Z
112			
113	279.393929	20.000000	56.693317
114			
115	272.539262	20.000000	57.235100
116	272.539262	20.000000	56.602361
117	265.684595	20.000000	57.652970
118	265.684595	20.000000	56.296538
119	258.829929	20.000000	57.858610
120	258.829929	20.000000	56.160763
121	251.975262	20.000000	57.782155
122	251.975262	20.000000	56.202945
123	246.834262	20.000000	57.377466
124	246.834262	20.000000	56.413857
125	245.120595	20.000000	56.750000
126			
127	283.355446	15.000000	56.689775
128			
129	276.072446	15.000000	57.265412
130	276.072446	15.000000	56.593135
131	268.789446	15.000000	57.709395
132	268.789446	15.000000	56.268202
133	261.506446	15.000000	57.927885
134	261.506446	15.000000	56.123942
135	254.223446	15.000000	57.846652
136	254.223446	15.000000	56.168761
137	248.761196	15.000000	57.416675
138	248.761196	15.000000	56.392852
139	246.940446	15.000000	56.750000
140			
141	286.920813	10.500000	56.686587
142			
143	279.782290	9.750000	57.297241
144	279.782290	9.750000	56.583448
145	274.074668	9.000000	57.698091
146	274.074668	9.000000	56.296533
147	272.515268	9.000000	57.777105
148	272.515268	9.000000	56.234199
149	267.180000	9.000000	57.968294
150	267.180000	9.000000	56.104451
151	264.718268	9.000000	58.011015
152	264.718268	9.000000	56.079758
153	258.900000	9.000000	57.983204
154	258.900000	9.000000	56.095890
155	256.921268	9.000000	57.924048
156	256.921268	9.000000	56.127740
157	251.073518	9.000000	57.463726
158	251.073518	9.000000	56.367647
159	249.124268	9.000000	56.750000
160			
161	242.28	9.0	58.0
162	242.28	9.0	56.0
163	249.124268	9.0	58.0
164	249.124268	9.0	56.0
165	251.073518	9.0	58.0
166	251.073518	9.0	56.0

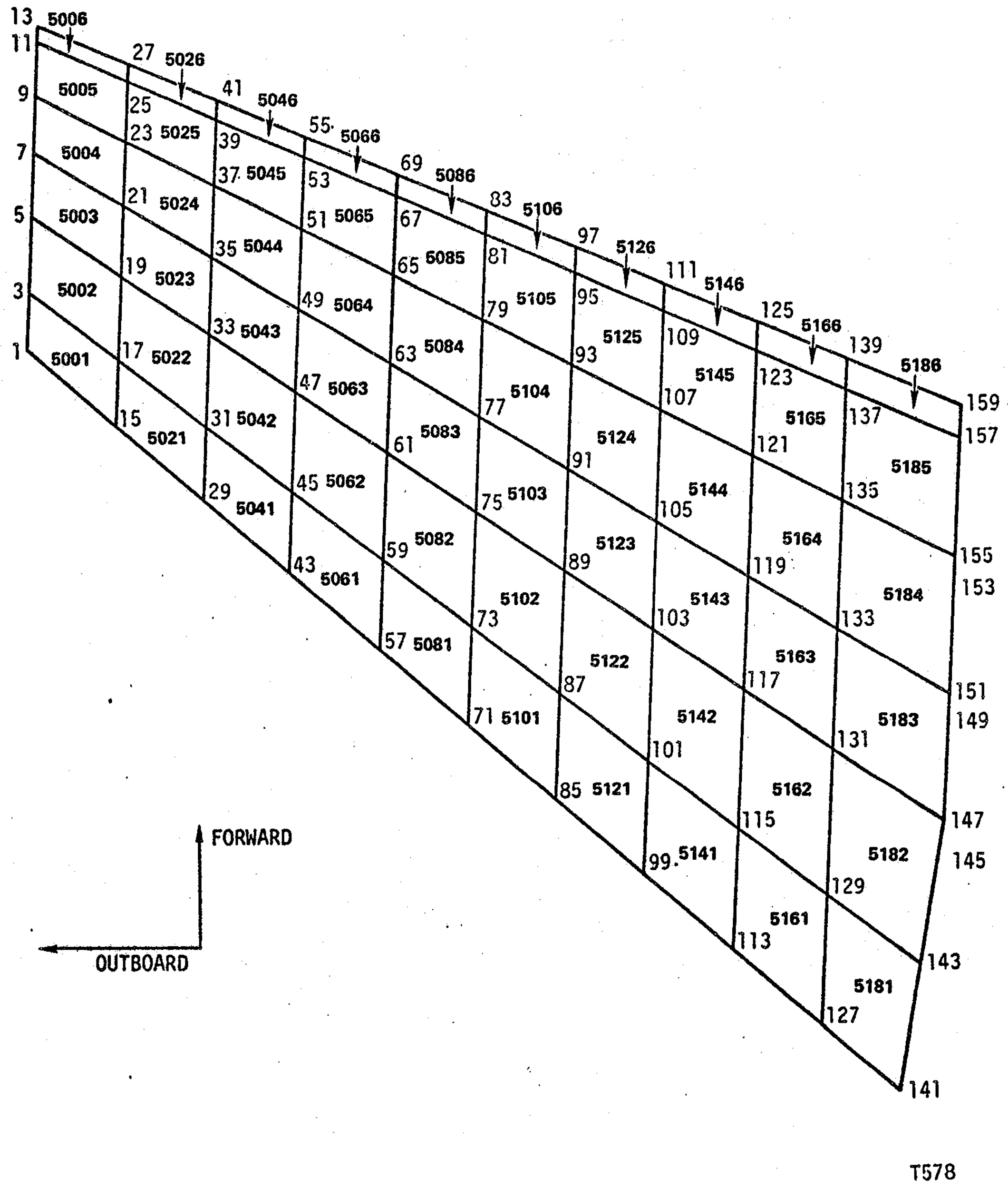

Figure 8-8. Upper Surface-Membrane Elements

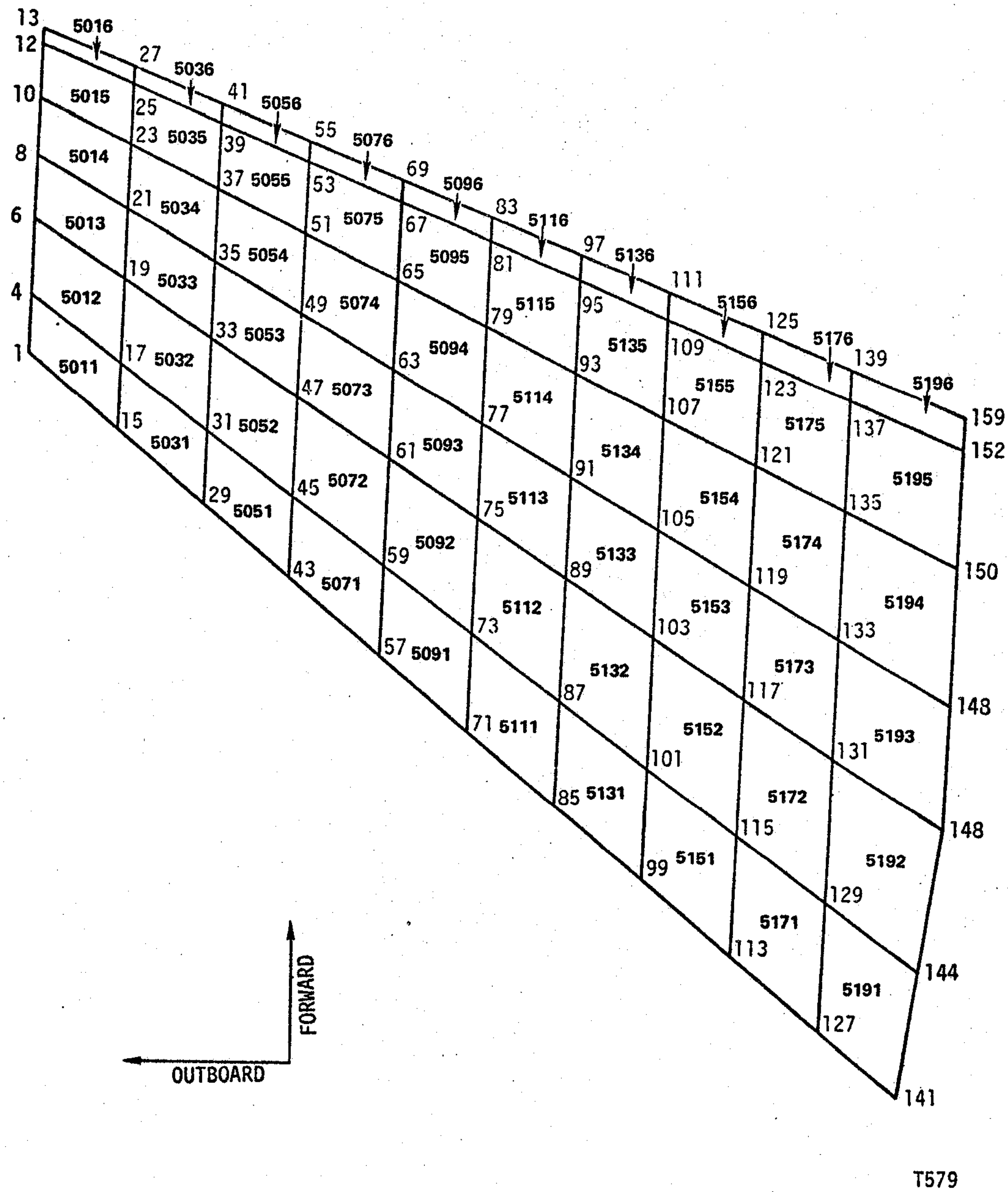

Figure 8-9. Lower Surface-Membrane Elements

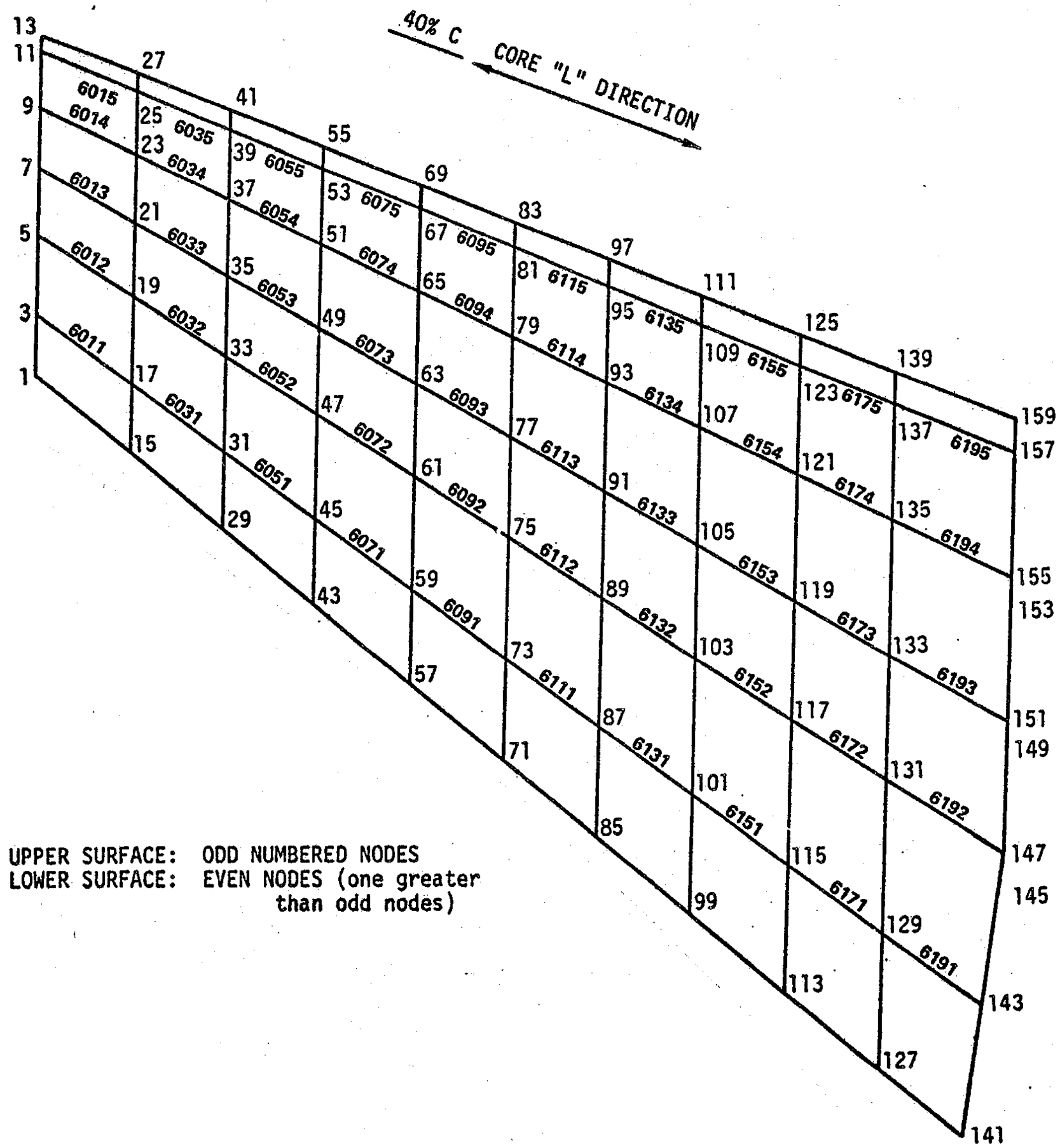

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Figure 8-10. Spanwise Shear Panels

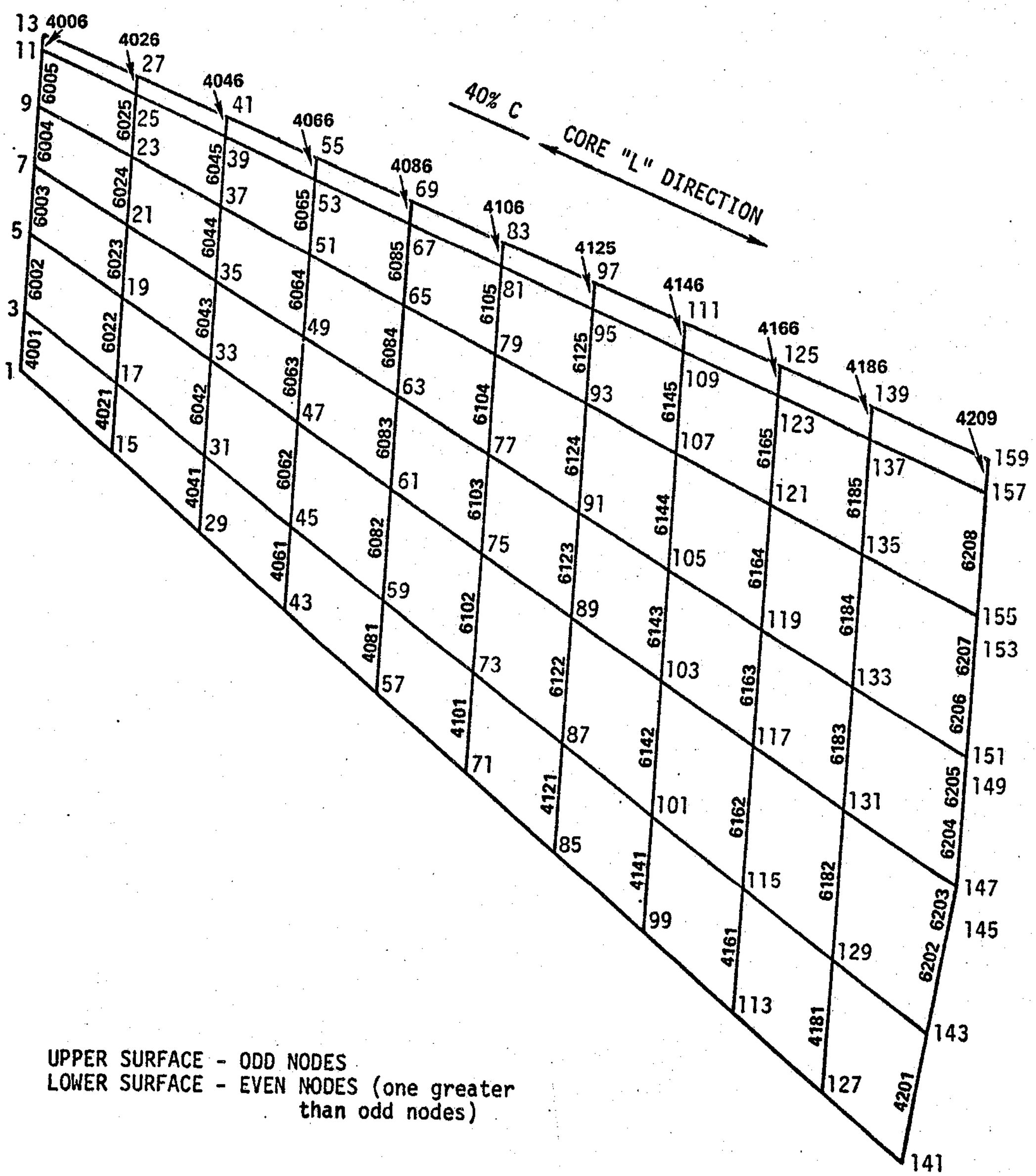

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Figure 8-11. Chordwise Shear Webs

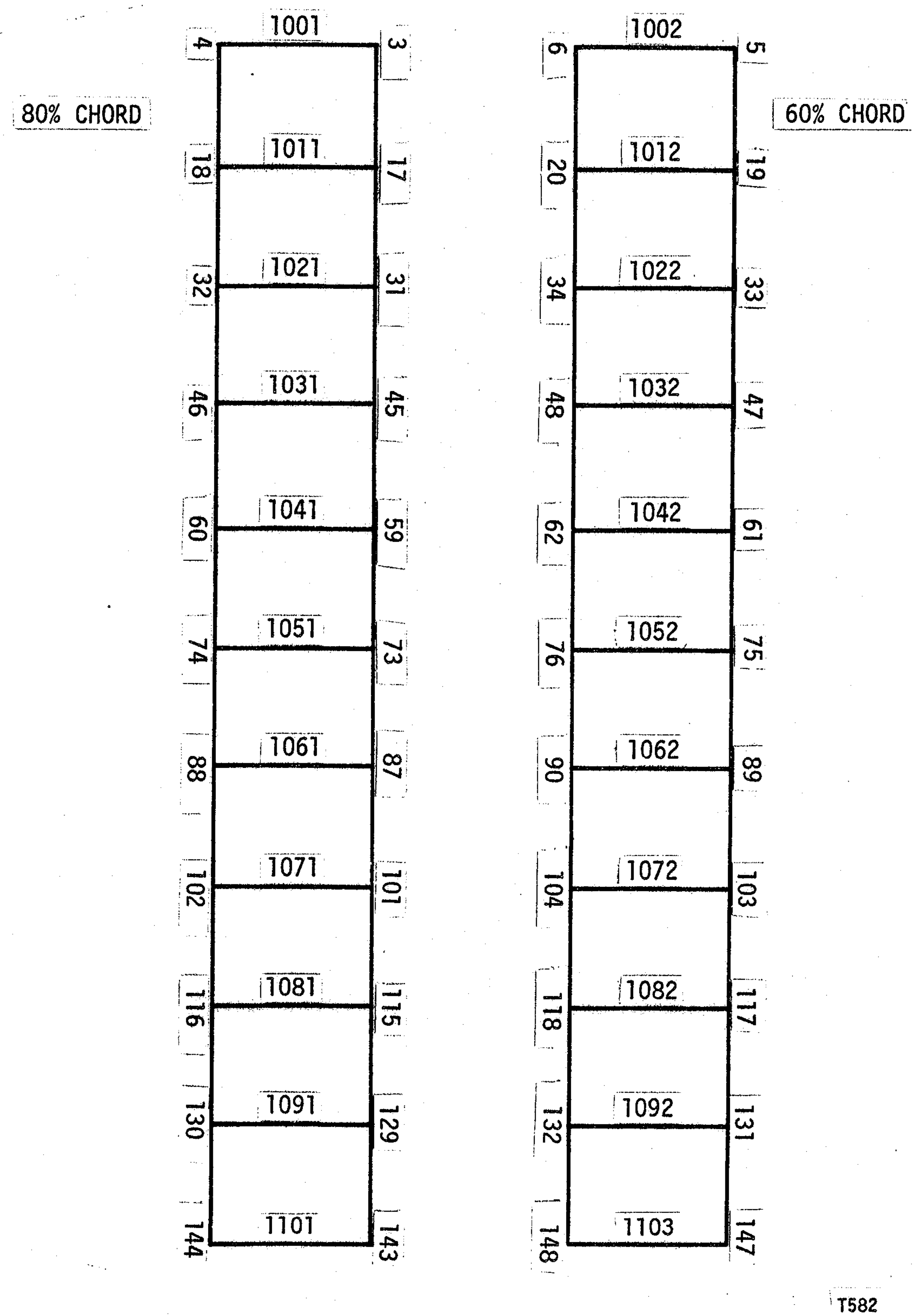


Figure 8-12. Shear Web Vertical Pseudo Rods
(Sheet 1 of 2)

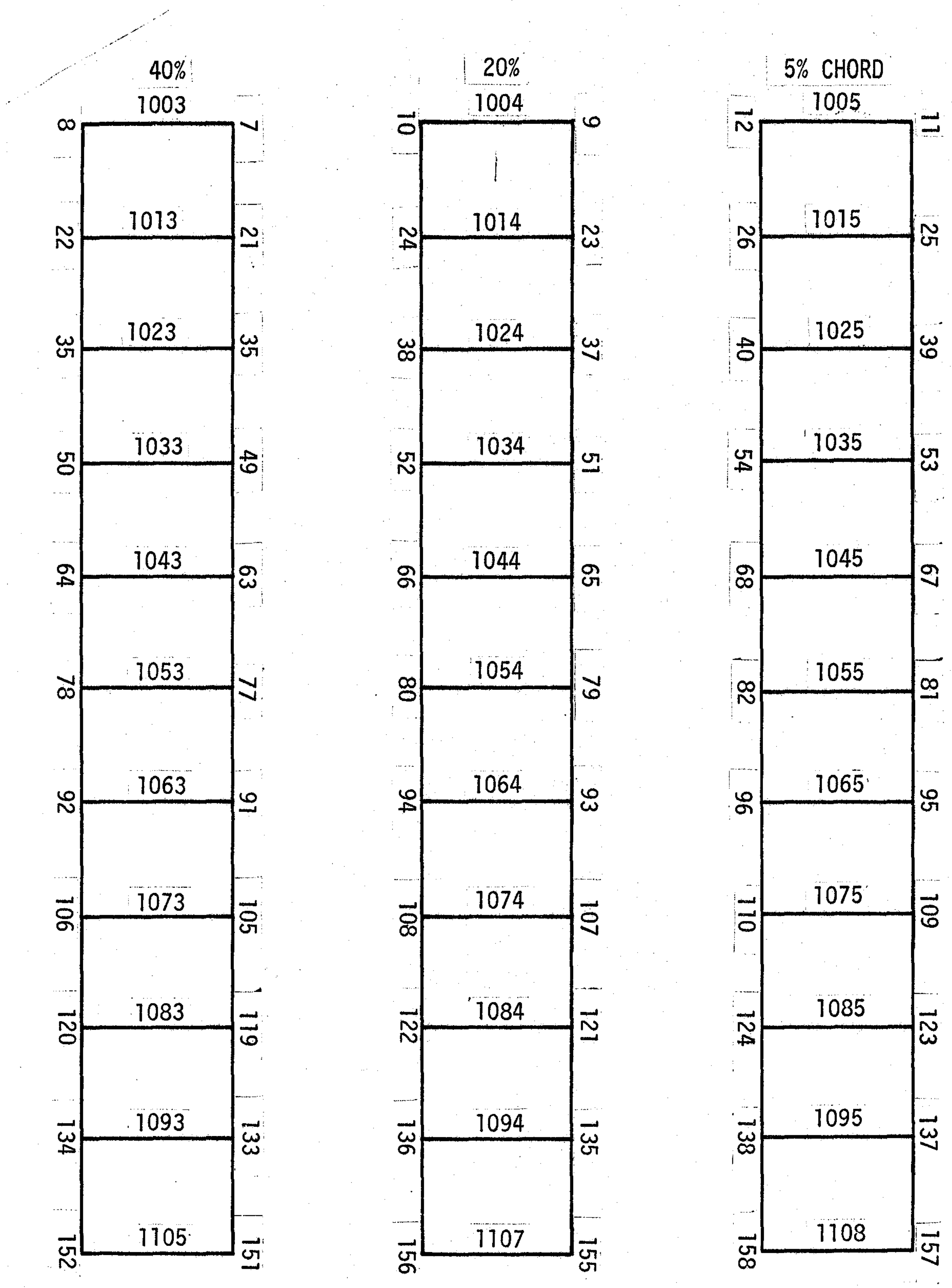


Figure 8-12. Shear Web Vertical Pseudo Rods
(Sheet 2 of 2)

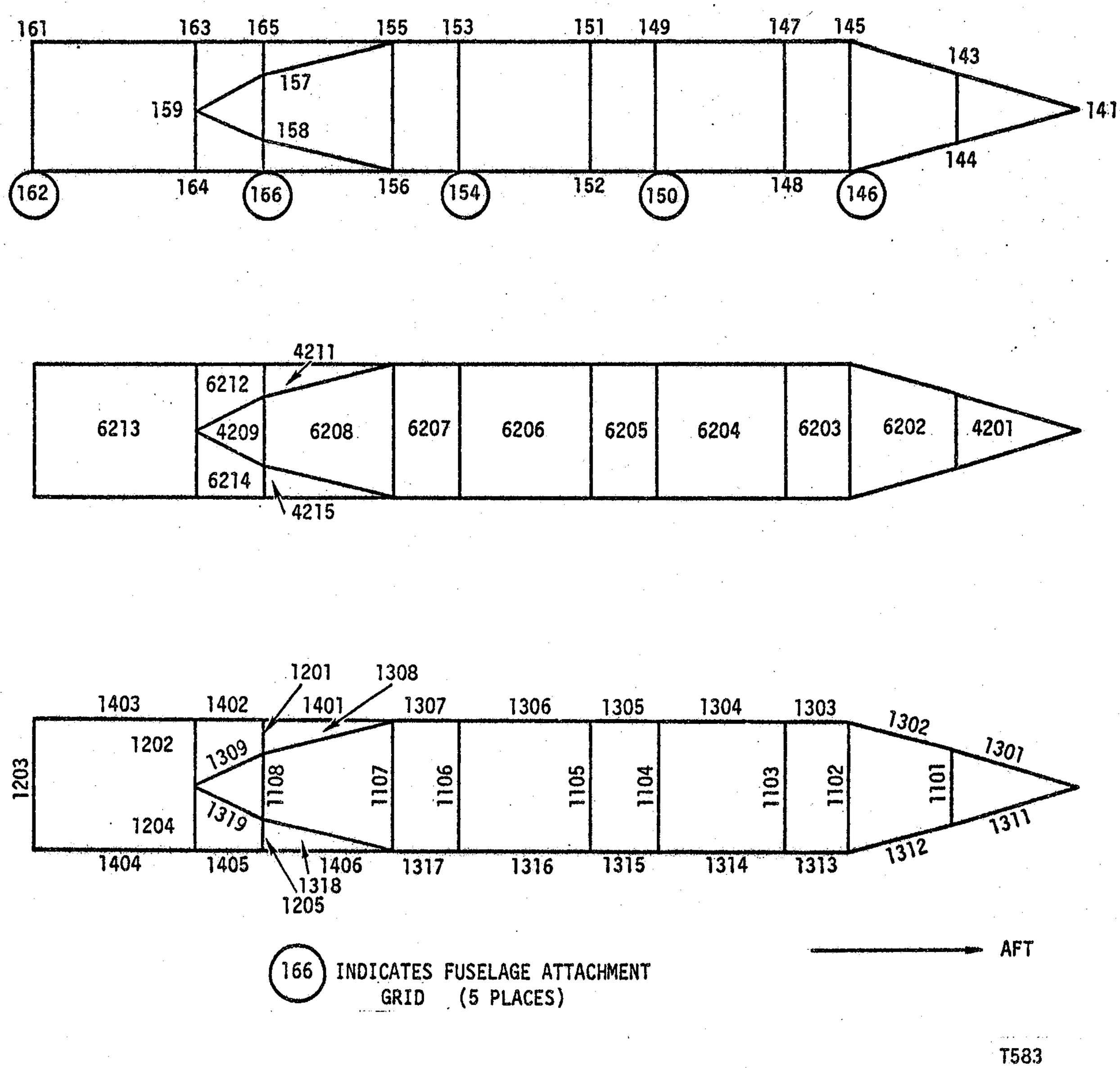


Figure 8-13. Root Rib Structural Model

8.2.6 Reactions

The wing is reacted along the root rib at Y_F 9.0. Vertical reactions are specified at grids corresponding to the five bolts provided for attaching to the fuselage frames. Wing bending is coupled out at 10 upper and lower grids each, representing points where the bending loads are introduced into the center box.

Grid points and reaction directions are shown in Figure 8-14. Rigid reactions are used in this study. However, a detail design analysis should use flexible supports to reflect the fuselage elasticity.

8.2.7 Material Properties

Properties published in standard References 8.2, 8.3 and 8.4 were used in the analysis study. Three principal materials are used.

8.2.8 External Loads

The load conditions are defined as panel point loads and applied to the upper surface grids. Loads for N_z = 6, 9, 2, and -3 are presented in Figures 8-15 thru 8-18, respectively.

The wing is designed to be strength adequate for all the conditions and is aeroelastically tailored to meet specified twist constraints when subjected to N_z = 6 loads.

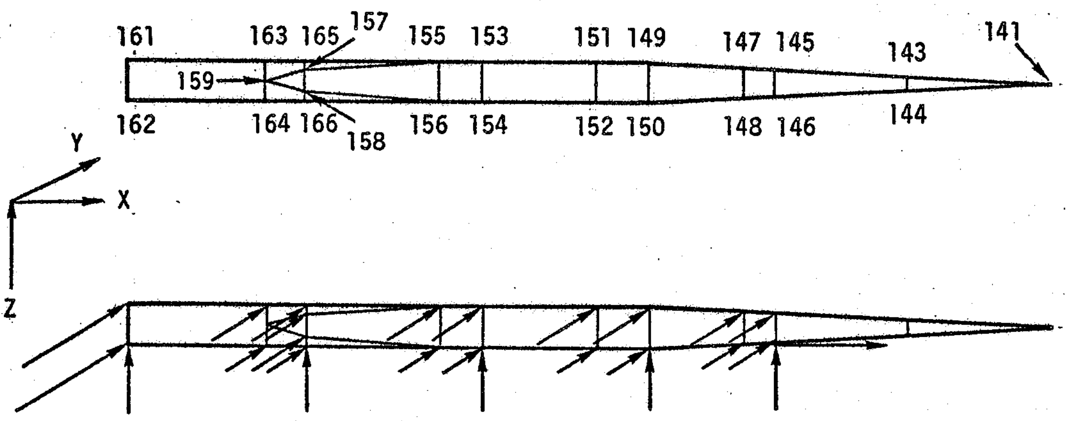
The loads are based on a gross weight of 2500 pounds and it was conservatively assumed the exposed wing carried 95 percent of the total lift of the aircraft.

8.3 RESULTS

8.3.1 Discussion

The study was performed in four phases which culminated in a preliminary wing design tailored to meet specific strength and displacement requirements. By using advanced composite materials effectively, the severe weight penalty associated with divergence prevention of swept forward wings was alleviated.

The study phases consisted of certain tasks which directed the design process in an orderly and logical fashion.



REACTIONS

	DIRECTION		
GRID POINT	X	Y	Z
141			
143			
144			
145		X	
146	X	X	X
147		X	
148		X	
149		X	
150		X	X
151		X	
152		X	
153		X	
154		X	X
155		X	
156		X	
157		X	
158		X	
159			
161		X	
162		X	X
163		X	
164		X	
165		X	
166		X	X

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Figure 8-14. Reactions at Root Rib

NODE NO.	TOTAL LOAD (LB.)
1	15.25
3	21.30
5	28.90
7	36.55
9	30.41
11	9.89
15	25.36
17	51.83
19	66.65
21	92.53
23	88.82
25	47.64
27	9.35
29	32.00
31	69.65
33	94.50
35	121.49
37	130.90
39	75.51
41	17.44
43	37.20
45	85.63
47	109.02
49	147.27
51	153.37
53	92.70
55	23.48
57	39.66
59	99.76
61	118.80
63	164.29
65	175.74
67	104.47
69	25.71
71	39.97
73	87.51
75	125.08
77	180.74

NODE NO.	TOTAL LOAD (LB.)
79	204.48
81	123.06
83	28.52
85	46.35
87	94.06
89	123.00
91	174.71
93	219.56
95	141.27
97	37.08
99	45.83
101	110.68
103	139.75
105	191.72
107	207.57
109	138.31
111	36.99
113	39.27
115	108.94
117	143.52
119	215.68
121	222.63
123	129.88
125	34.82
127	25.73
129	93.37
131	131.44
133	233.21
135	273.28
137	167.95
139	41.70
143	20.90
147	41.12
151	41.12
155	105.09
157	86.32
159	29.69

Figure 8-15. External Loads, NZ = 6

NODE NO.	TOTAL LOAD (LB.)
1	22.875
3	31.95
5	43.35
7	54.825
9	45.615
11	14.835
15	38.04
17	77.745
19	99.975
21	138.795
23	133.23
25	71.46
27	14.025
29	48.00
31	104.475
33	141.75
35	182.235
37	196.35
39	113.265
41	26.16
43	55.80
45	128.445
47	163.53
49	220.905
51	230.055
53	139.05
55	35.22
57	59.49
59	149.64
61	178.2
63	246.436
65	263.61
67	156.705
69	38.565
71	59.955
73	131.265
75	187.62
77	271.11

NODE NO.	TOTAL LOAD (LB.)
79	306.72
81	184.58
83	42.78
85	69.525
87	141.09
89	184.5
91	262.065
93	329.34
95	211.905
97	55.62
99	68.745
101	166.02
103	209.625
105	287.58
107	311.355
109	207.465
111	55.485
113	58.905
115	163.41
117	215.28
119	323.52
121	333.945
123	194.82
125	52.23
127	38.595
129	140.055
131	197.16
133	349.815
135	409.92
137	251.925
139	62.55
143	31.35
147	61.68
151	61.68
155	157.635
157	129.48
159	44.535

Figure 8-16. External Loads, NZ = 9, 69 Loads x 1.5

NODE NO.	TOTAL LOAD (LB.)
1	8.82
3	8.82
5	8.82
7	8.82
9	6.61
11	2.20
15	15.39
17	24.03
19	23.54
21	23.59
23	19.87
25	10.09
27	2.08
29	19.46
31	33.60
33	34.13
35	33.08
37	28.74
39	15.48
41	3.54
43	22.36
45	40.41
47	39.98
49	40.18
51	34.60
53	18.97
55	4.46
57	24.59
59	45.02
61	45.54
63	44.91
65	39.02
67	21.57
69	5.15
71	26.25
73	48.86
75	48.95
77	49.13

NODE NO.	TOTAL LOAD (LB.)
79	42.42
81	23.62
83	5.69
85	27.50
87	51.75
89	51.83
91	51.99
93	44.99
95	25.17
97	6.10
99	28.34
101	53.47
103	54.33
105	54.08
107	46.89
109	26.32
111	6.41
113	28.96
115	55.00
117	55.42
119	55.95
121	48.36
123	27.01
125	6.63
127	27.64
129	56.04
131	60.09
133	61.31
135	53.21
137	31.45
139	8.0
143	22.78
147	19.93
151	19.93
155	19.94
157	14.95
159	4.98

Figure 8-17. External Loads, NZ = 2

NODE NO.	TOTAL LOAD (LB.)
1	0.71
3	-6.14
5	-14.74
7	-23.39
9	-20.94
11	-6.70
15	2.66
17	-9.70
19	-27.47
21	-56.65
23	-60.02
25	-33.34
27	-6.33
29	3.42
31	-10.37
33	-37.41
35	-70.08
37	-89.57
39	-53.90
41	-12.53
43	3.44
45	-14.58
47	-41.92
49	-84.80
51	-103.05
53	-66.24
55	-17.47
57	5.21
59	-21.19
61	-41.66
63	-94.40
65	-119.37
67	-74.24
69	-18.60
71	8.24
73	.49
75	-41.83
77	-104.44

NODE NO.	TOTAL LOAD (LB.)
79	-144.95
81	-91.13
83	-20.68
85	3.56
87	-1.02
89	-33.60
91	-91.79
93	-156.77
95	-108.57
97	-29.53
99	5.87
101	-16.34
103	-47.46
105	-106.79
107	-139.36
109	-102.88
111	-28.79
113	14.54
115	-11.25
117	-49.51
119	-130.08
121	-153.39
123	-91.93
125	-25.89
127	27.17
129	8.49
131	-26.33
133	-139.00
135	-200.81
137	-125.98
139	-30.87
143	22.75
147	-5.93
151	-5.93
155	-78.30
157	-67.22
159	-23.44

Figure 8-18. External Loads, NZ = -3

The phases and tasks performed are shown as follows:

1. Design Sensitivity Considerations

   a. Laminate layup and displacement constraint influence.

   b. Rigid versus flexible supports.

   c. Graphite/epoxy shear web at 40 percent chord.

   d. Leading edge non-participating in twist control.

   e. Camber constraint.

2. Configuration/Material Trade Studies

   a. Aluminum wing.

   b. Graphite/epoxy wing.

   c. Graphite-KEVLAR wing.

3. Computer Optimized Wing

4. Smoothed Wing Design

   a. Strength and displacement analysis.

   b. Vibration/flutter check.

Laminate Layup and Constraint Influence

The laminate is sensitive to the ply orientations and the severity of constraint. A 0^o, $\pm 45^o$ basic layup appears to have a weight advantage over a 0^o, 90^o, $\pm 45^o$ laminate. The optimization procedure doesn't utilize the 90^o ply effectively in either the strength or deflection constraint modes.

Figure 8-19 is a 0^o, 90^o, $\pm 45^o$ laminate optimized for strength only. Figure 8-20 is the twist displacement the laminate experiences when subjected to 6 g loads. All wing twist distributions shown in this report have been determined by the differential deflections of the most forward and most rearward set of grid points. The 90^o basic one ply does not increase in number when subjected to deflection constraints indicating the layup is not sensitive to its presence.

Figure 8-21 is a 0^o $\pm 45^o$ laminate optimized for strength only. Figure 8-22 is optimized for strength plus a tip twist constraint at $Y_W = 60.0$ of 0^o. Figure 8-23 shows the twist behavior under 6 g loads.

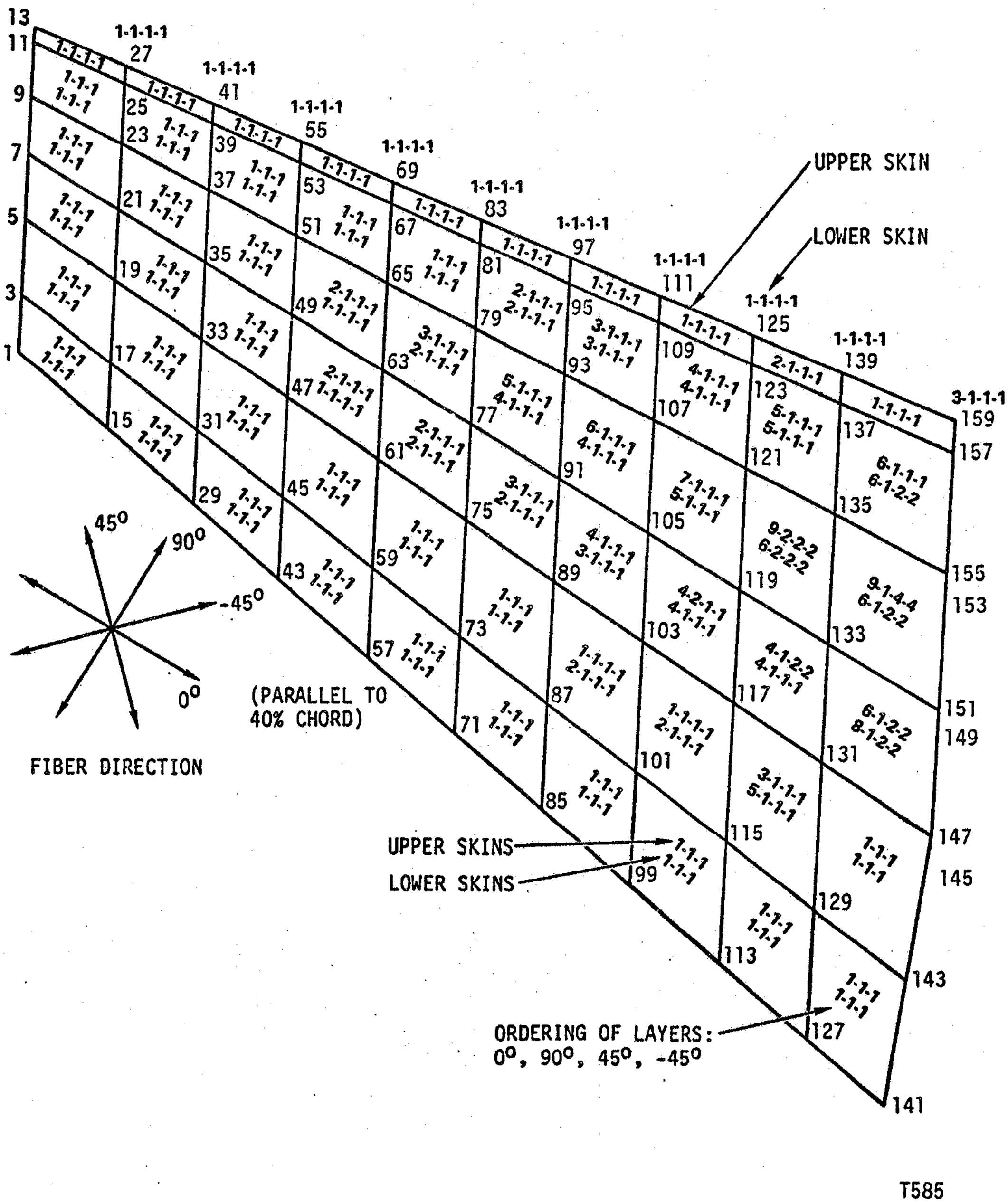

Figure 8-19. All Graphite/Epoxy Wing (0°, 90°, 45°, -45°)
ASOP 3 Load = 6 g, 9 g, 2 g
Strength Optimization Only, Wgt. = 16.74 lb.

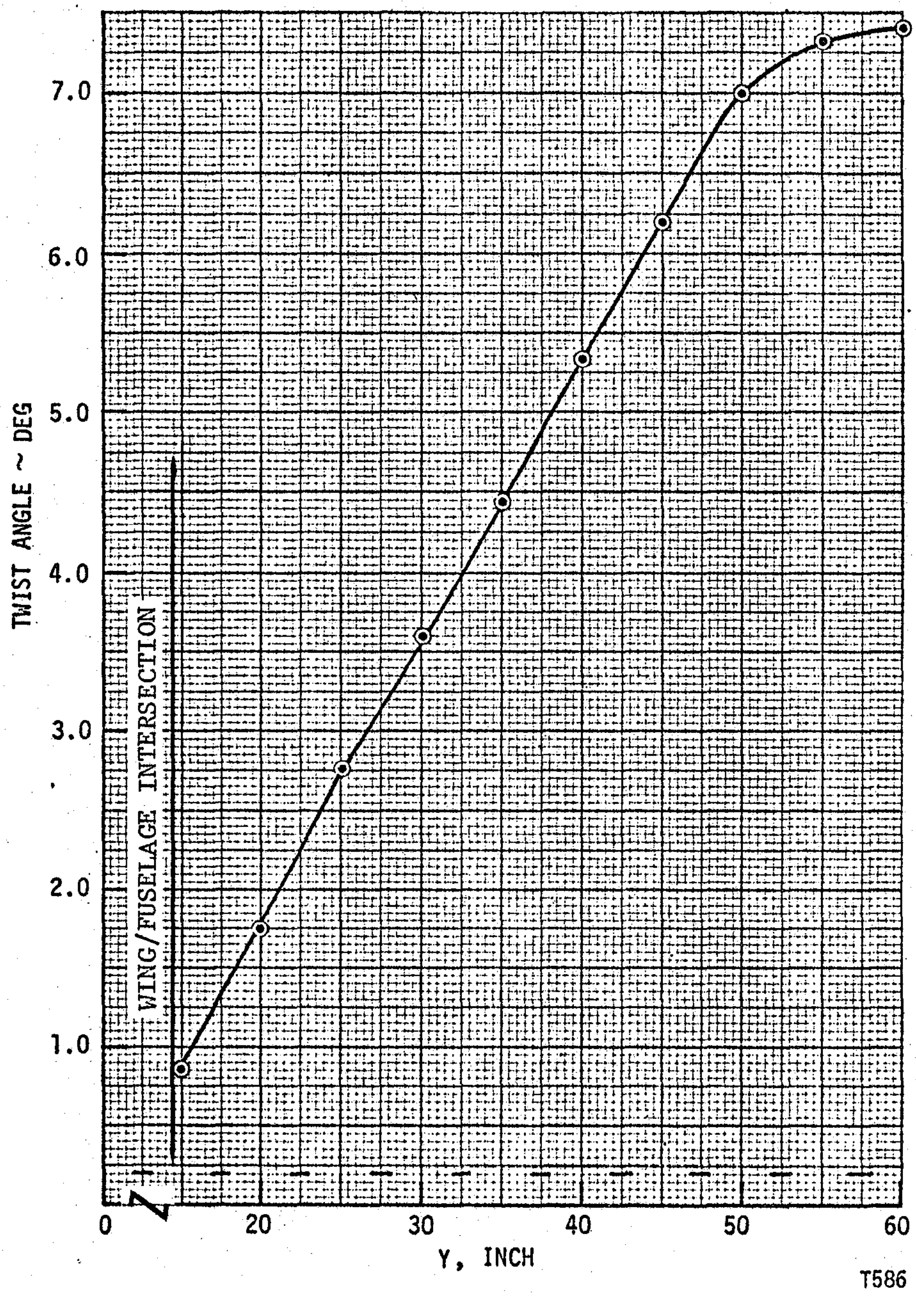

Figure 8-20. All Graphite/Epoxy Wing (0°, 90°, 45°, -45°)
ASOP 3 Load = 6 g
Strength Optimization Only

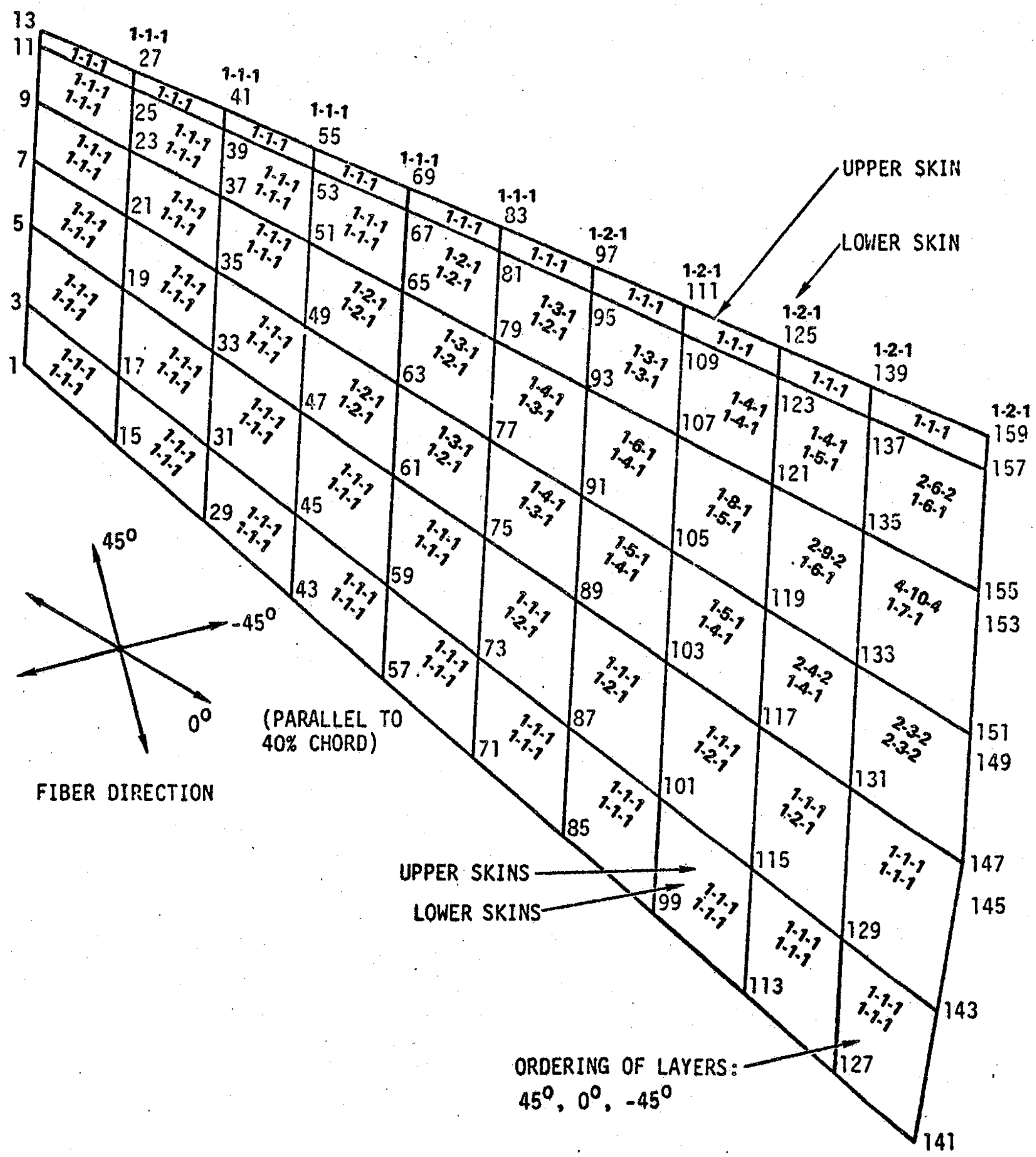

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Figure 8-21. All Graphite/Epoxy Wing (45°, 0°, -45°)
ASOP 3 Load = 6 g, 9 g, 2 g
1 Cut Wing, Stress Constraint
Wgt. = 16.37

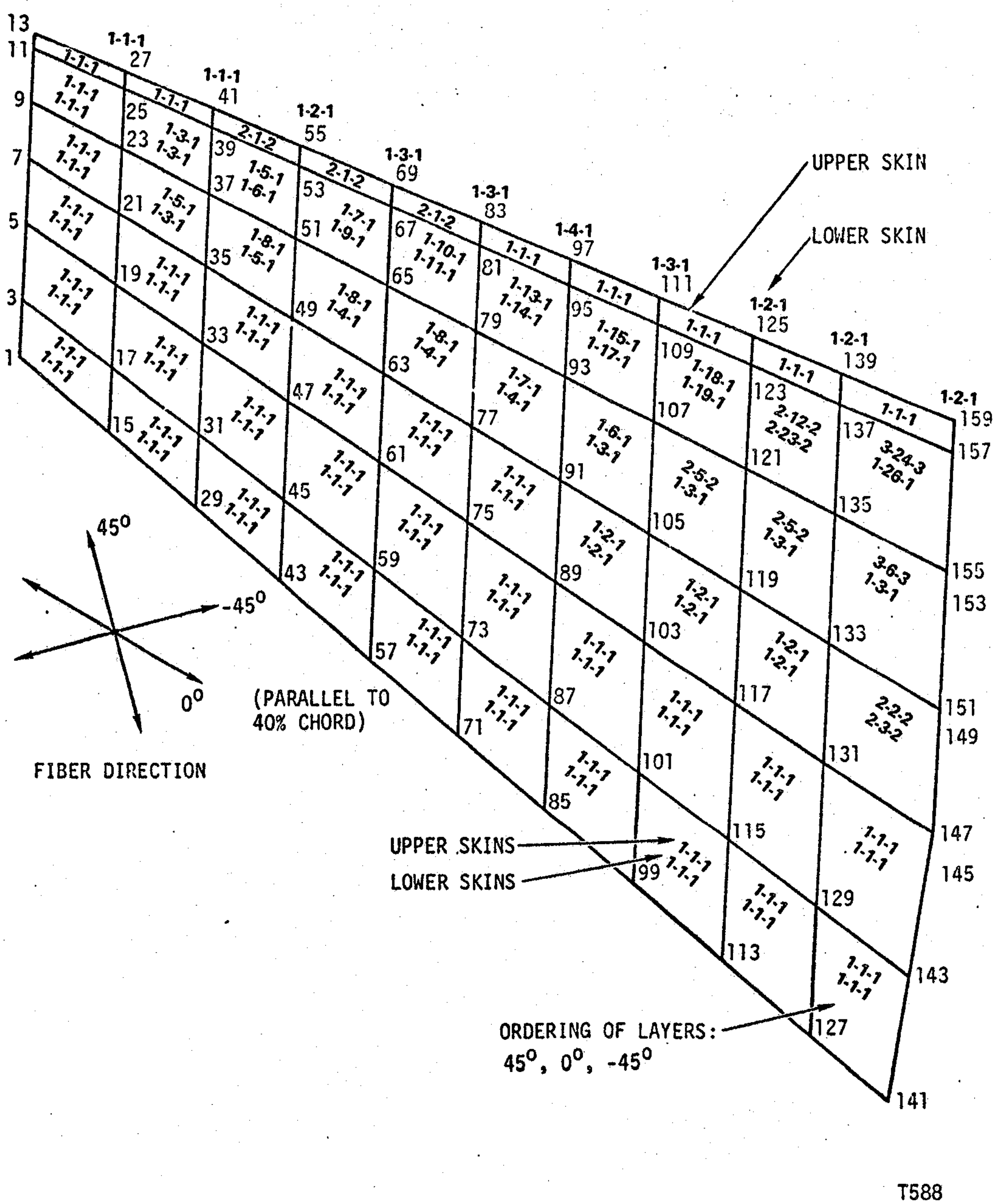

Figure 8-22. All Graphite/Epoxy Wing (45^o, 0^o, -45^o)
ASOP 3 Load = 6 g, 9 g, 2 g
Tip Twist Constrant,
Wgt. = 17.59, Δ Wgt. = 7.46%

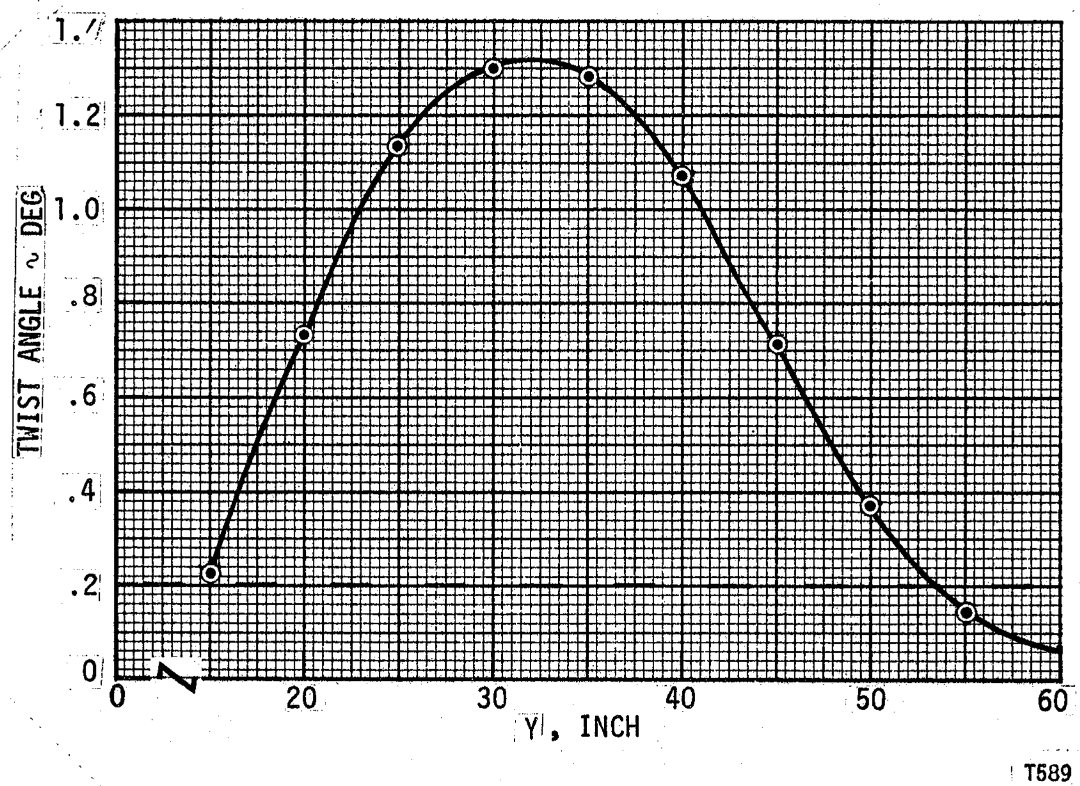

Figure 8-23. All Graphite/Epoxy Wing (45°, 0°, -45°)
ASOP 3   Load = 6 g
1 Cut Wing Displacement Constraint @ Y = 60

Figure 8-24 is a laminate design with the wing constrained to 0° twist at Y_W = 25.0, 40.0, and 60.0. As the constraint severity increases the laminate layers change more abruptly. Figure 8-25 shows the spanwise twist behavior.

The twist angles at the constraint locations of Y = 25, 40, and 60 inches are not precisely zero degrees for several reasons. First of all a tolerance of about .05 degrees (or a maximum number of iterations) was allowed in the solution. In addition the structure outboard of each constraint station (except the tip) effects the deformation at the constraint station by the manner in which the internal loads and stresses are distributed inboard. This structure obviously changes as the constraint station moves outboard thus affecting the deformation. This was observed during the study. A second series of optimization runs starting with the laminate layers of Figure 8-24 would probably show near zero rotation at the constraint stations.

The deflection curve of Figure 8-25 shows a reversal of curvature at station 55. It is believed that this may be due to reaching the minimum number of plies at the outer row or two of panels.

Rigid Versus Flexible Supports

The distribution of wing loads into the supports is sensitive to the fuselage flexibility which also influences the laminate layup. Flexible supports as opposed to rigid support causes an increase in numbers of plies in local areas near the support. The wing twist displacement is also influenced by the support flexibility.

Graphite/Epoxy Shear Web

A graphite shear web was placed along the 40 percent chord in conjunction with the core. This member was permitted to participate in the optimization. This member's effectiveness was similar to the 90° ply in the skin laminate. The thickness never changed from its manufacturing minimum of .01, indicating the design is not sensitive to its presence.

Leading Edge Effectiveness

Analyses were performed with the leading edge participating and non-participating in the optimization process. These results indicate the laminate is greatly influenced by the leading edge structure. The optimization

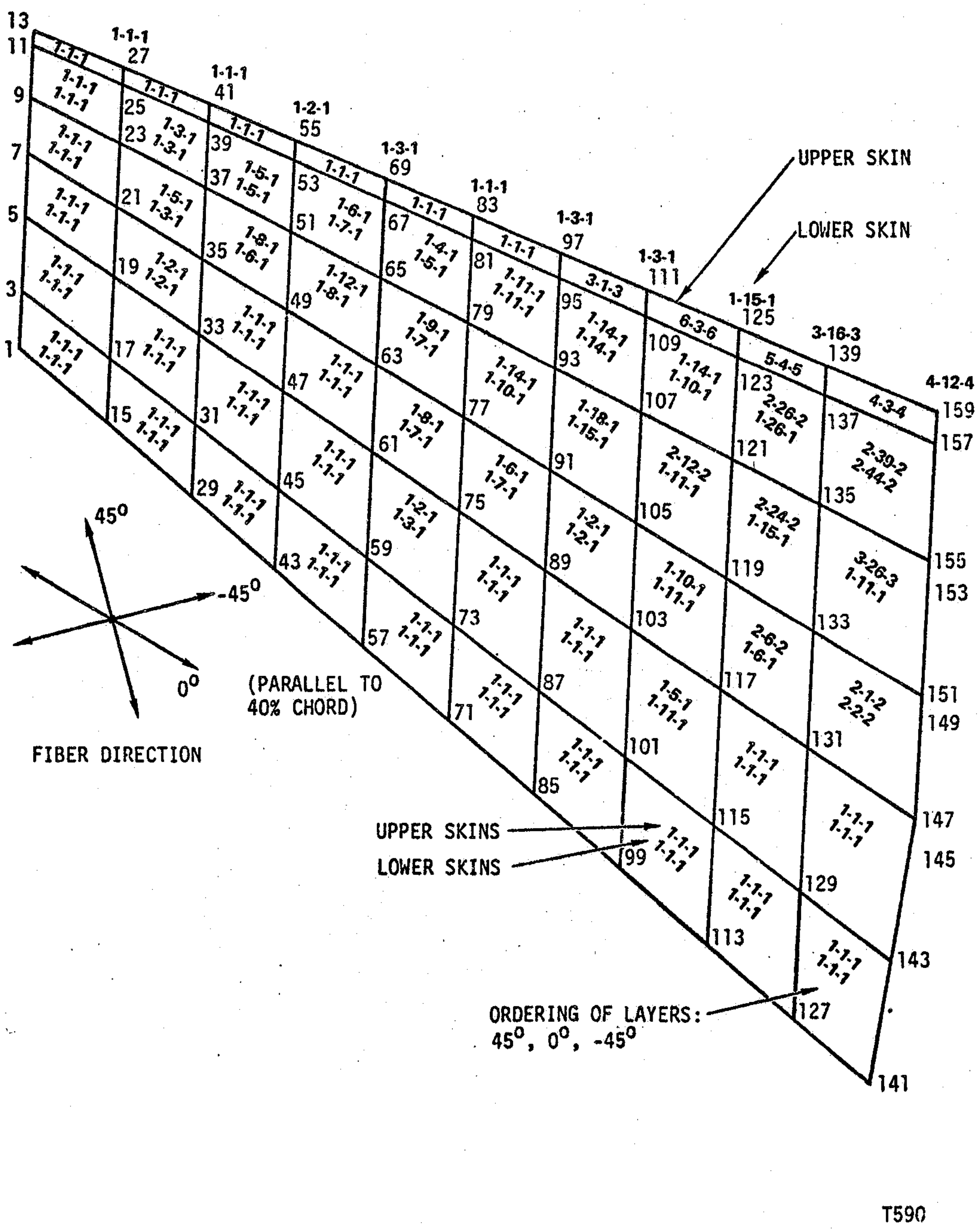

Figure 8-24. All Graphite/Epoxy Wing (45°, 0°, -45°)
ASOP 3, Load = 6 g, 9 g, 2 g, 3 Cut Wing
Displacement Constraint @ Y = 25, Y = 40, Y = 60
Wgt. = 19.74 lb., Δ Wgt. = 20.57%

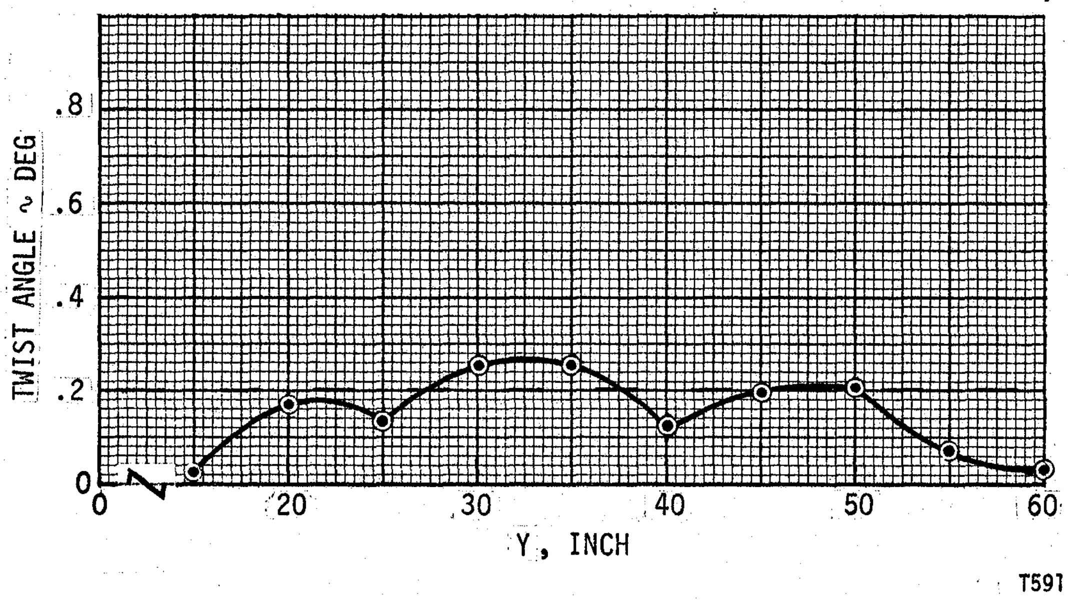

Figure 8-25. All Graphite/Epoxy Wing (45°, 0°, −45°)
ASOP 3 Load 6 g, 3 Cut Wing,
Displacement Constraint @ Y = 25,
Y = 40, Y = 60

program tends to concentrate layers forward of the 40 percent chord and making the leading edge non-effective has a very disturbing effect on the remaining skin laminate.

Deformations Normal To Chordline

Analyses were performed to optimize the wing for twist and simultaneously restrict deflections normal to the chordline in order to retain the built-in camber. All attempts were fruitless since a suitable single constraint equation could not be found. Figure 8-26 shows the layup resulting from a typical attempt at a combined twist/camber constraint at Y = 20. Figure 8-27 shows the displacements along the chord at span station 20.0 for the 6.0 g load case. Neither the twist nor the deflections normal to the chordline were constrained to zero.

Further analyses were performed in an attempt to optimize for retention of the built-in camber and limit the twist by performing two separate optimizations. First, a constraint to retain the built-in camber was imposed at Y = 20. Figure 8-28 shows the resulting layup. Built-in camber was retained at Y = 20 and camber deformations outboard of Y = 20 were essentially eliminated. Figure 8-29 shows the displacements along the chord at Y = 20 and Y = 30 for the 6.0 g load. Further outboard the camber deformations were negligible. Second, the ply layup was initialized as in Figure 8-28 and a twist constraint was imposed at Y = 20. Figure 8-30 shows the layup after optimization and Figure 8-31 shows the deflections for the 6.0 g load. At Y = 20 the twist was held to zero, however, deformations normal to the chordline are evident and the built-in camber was lost.

Configuration/Material Trade Studies

Weight optimization analyses were performed for a graphite wing, a graphite-KEVLAR wing, and an aluminum structure. All three configurations used the same honeycomb core and root rib internal structure. Only the skins differed. The same load and displacement criteria applied to each version. Displacement constraints were placed progressively at span stations 20, 30, 40, 50, and 60.

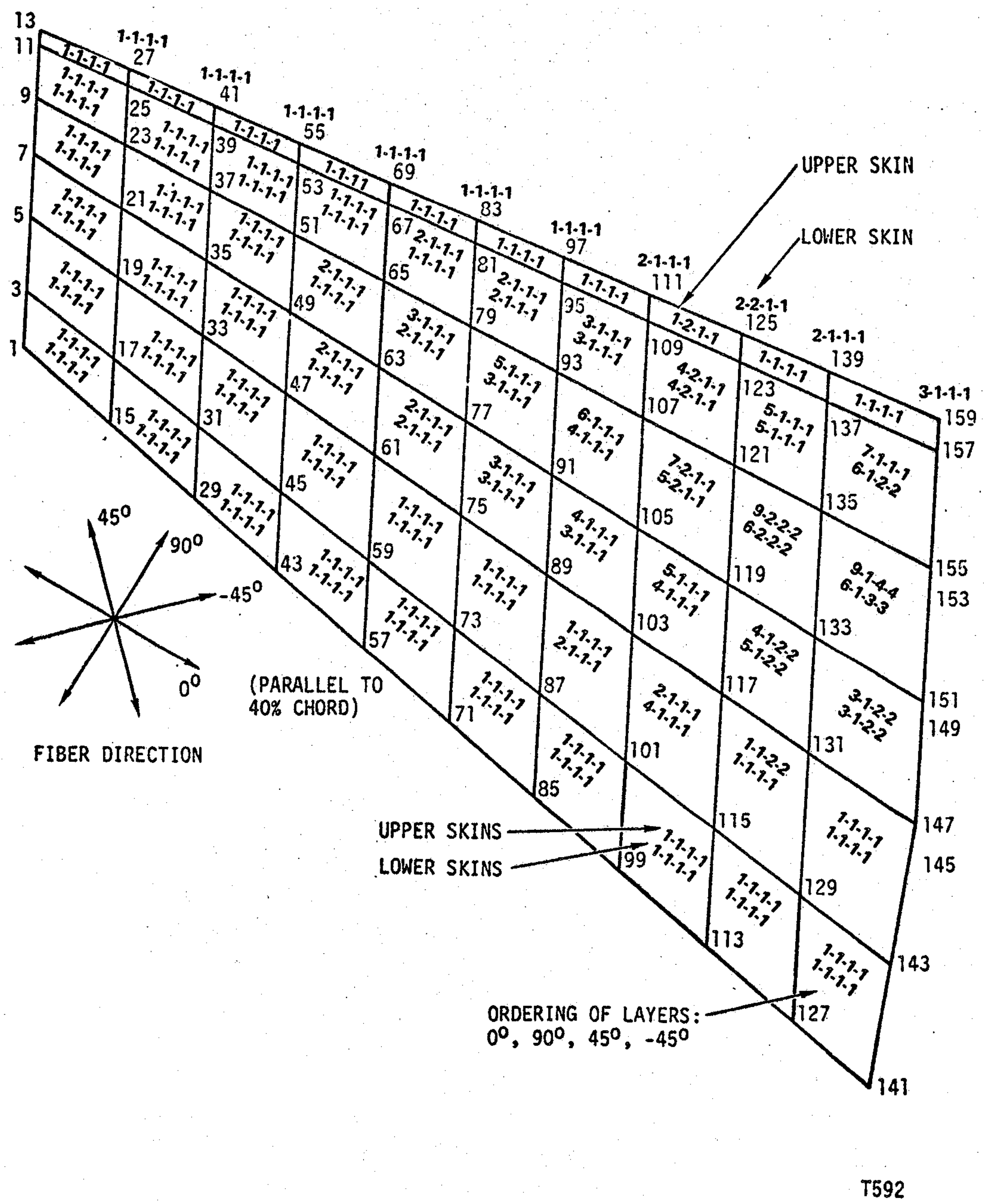

Figure 8-26. All Graphite/Epoxy (0^o, 90^o, 45^o, -45^o)
ASOP 3 Load = 6 g, 9 g, 2 g
Combined Camber/Twist Constraint
Wgt. = 16.77 lb., Δ Wgt. = .76%

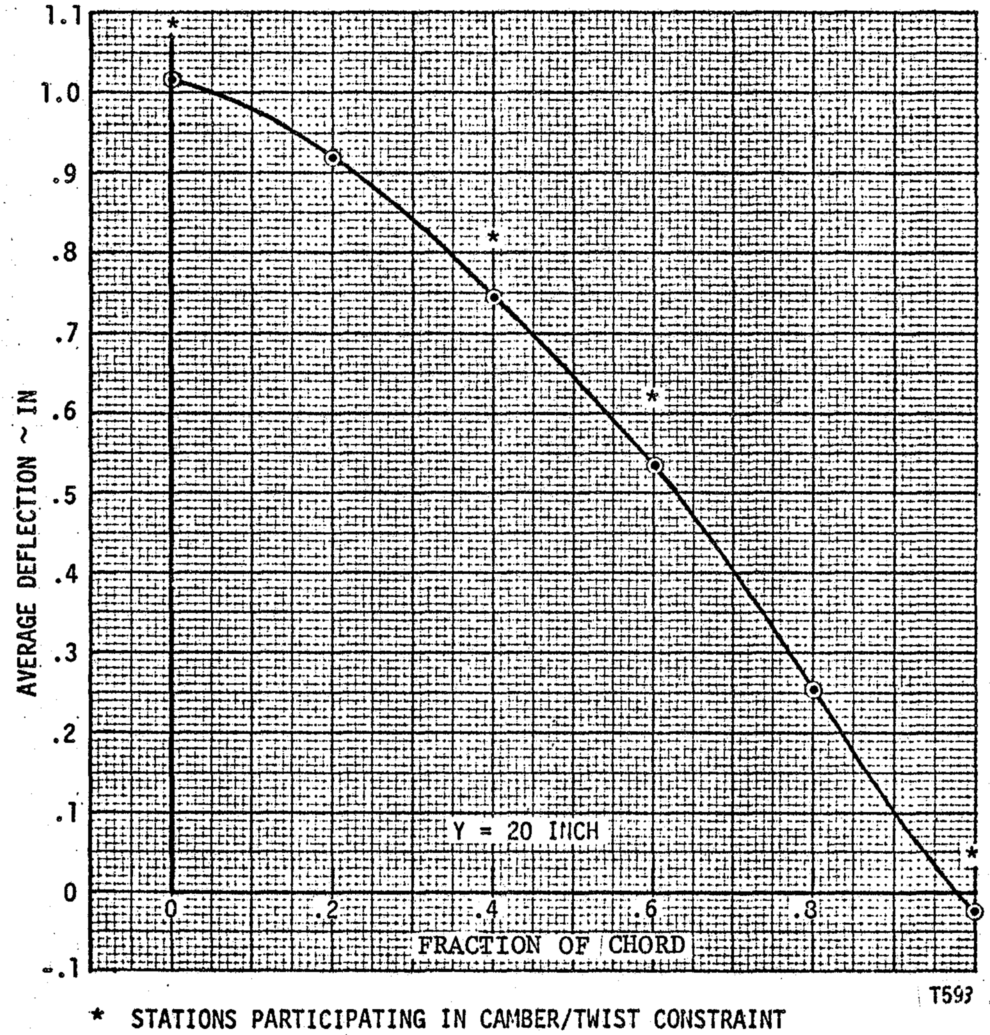

Figure 8-27. All Graphite/Epoxy Wing (0°, 90°, 45°, -45°)
ASOP 3 Load = 6 g
Combined Camber/Twist Constraint

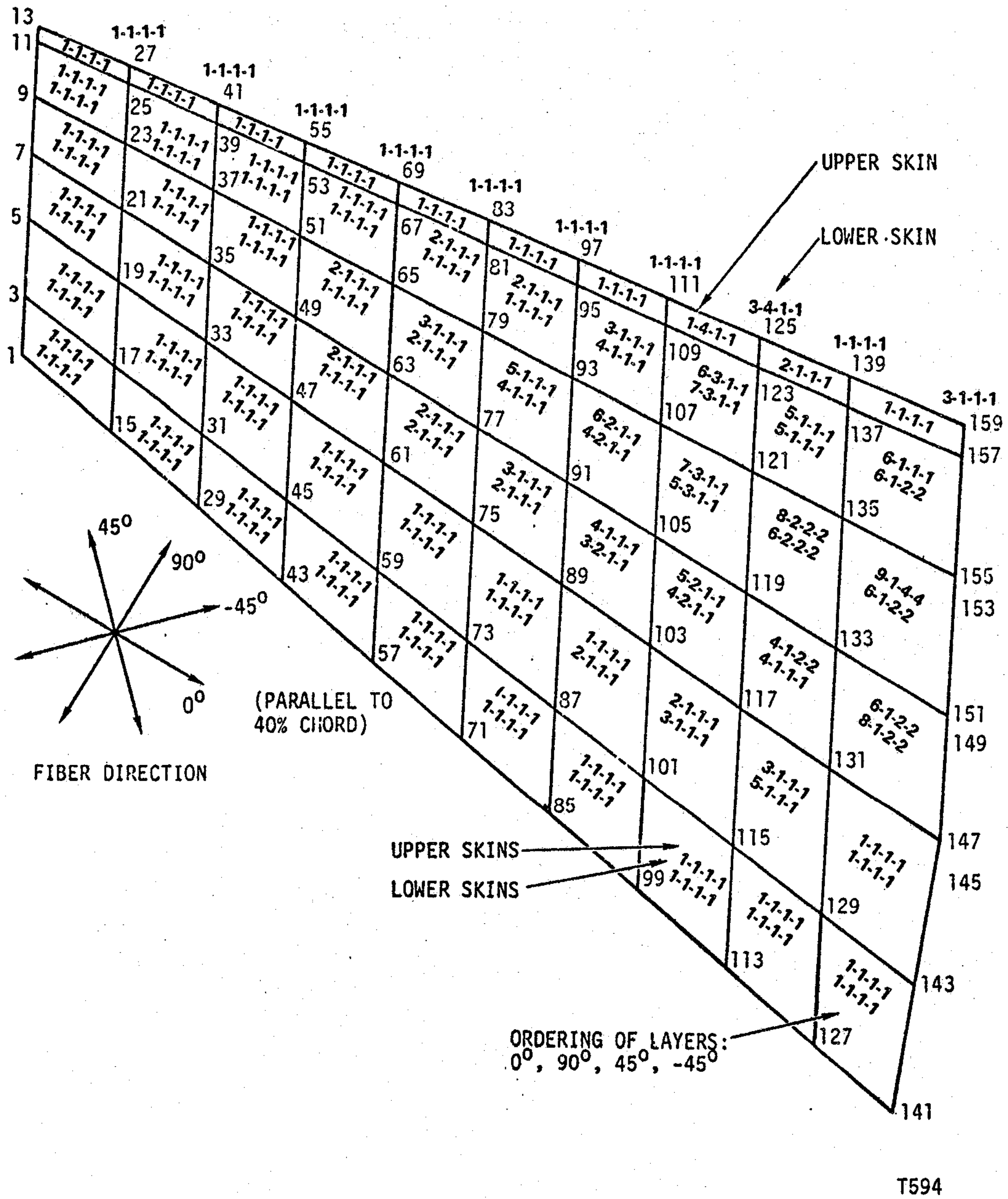

Figure 8-28. All Graphite/Epoxy Wing (0°, 90°, 45°, -45°)
ASOP 3   Load = 6 g, 9 g, 2 g
Camber Restraint @ Y = 20
Wgt. = 17.07 lb., Δ Wgt. = 2.67%

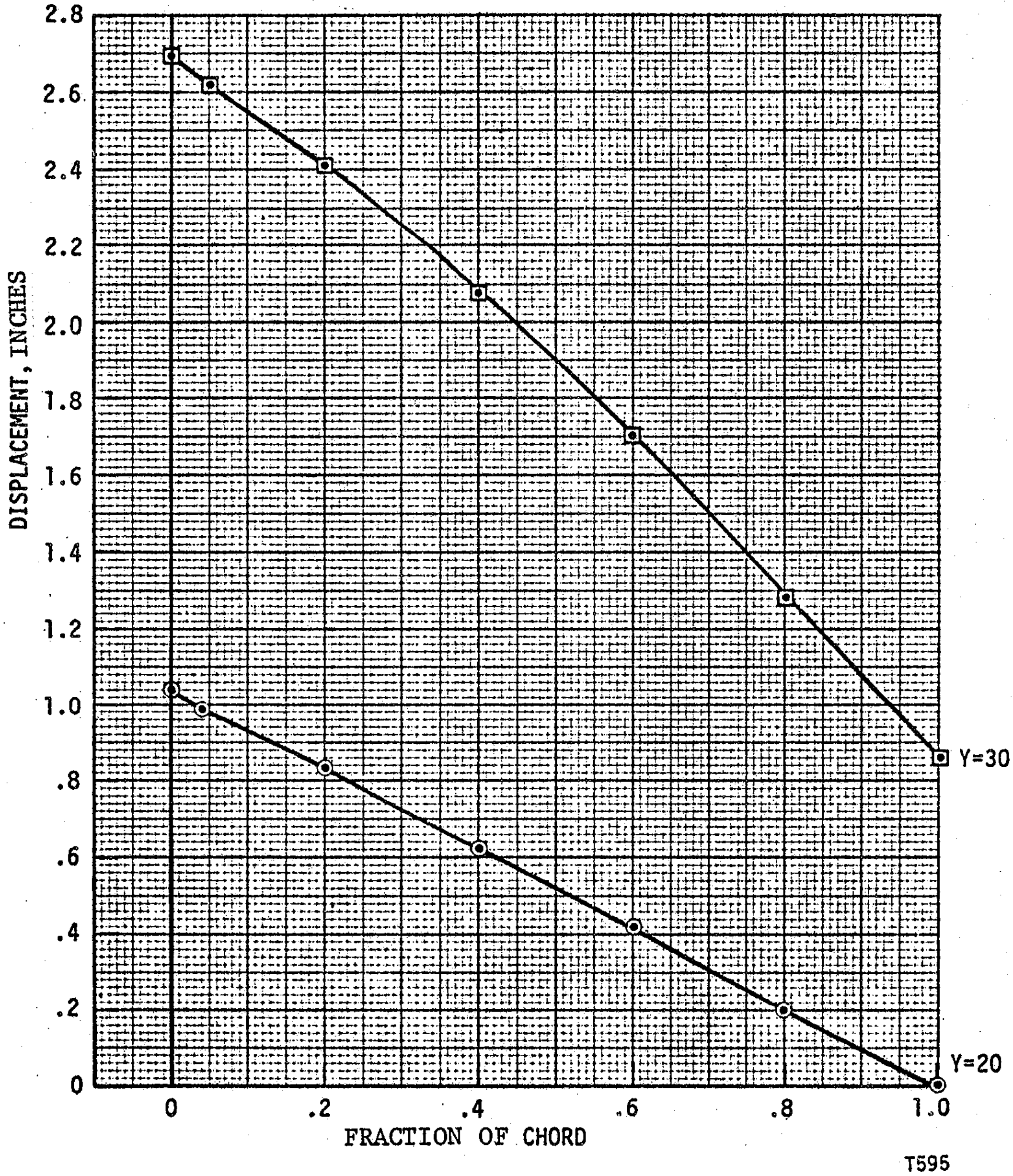

Figure 8-29. All Graphite/Epoxy Wing (0^{o}, 90^{o}, 45^{o}, -45^{o})
ASOP 3 Load = 6 g
Camber Constraint @ Y = 20

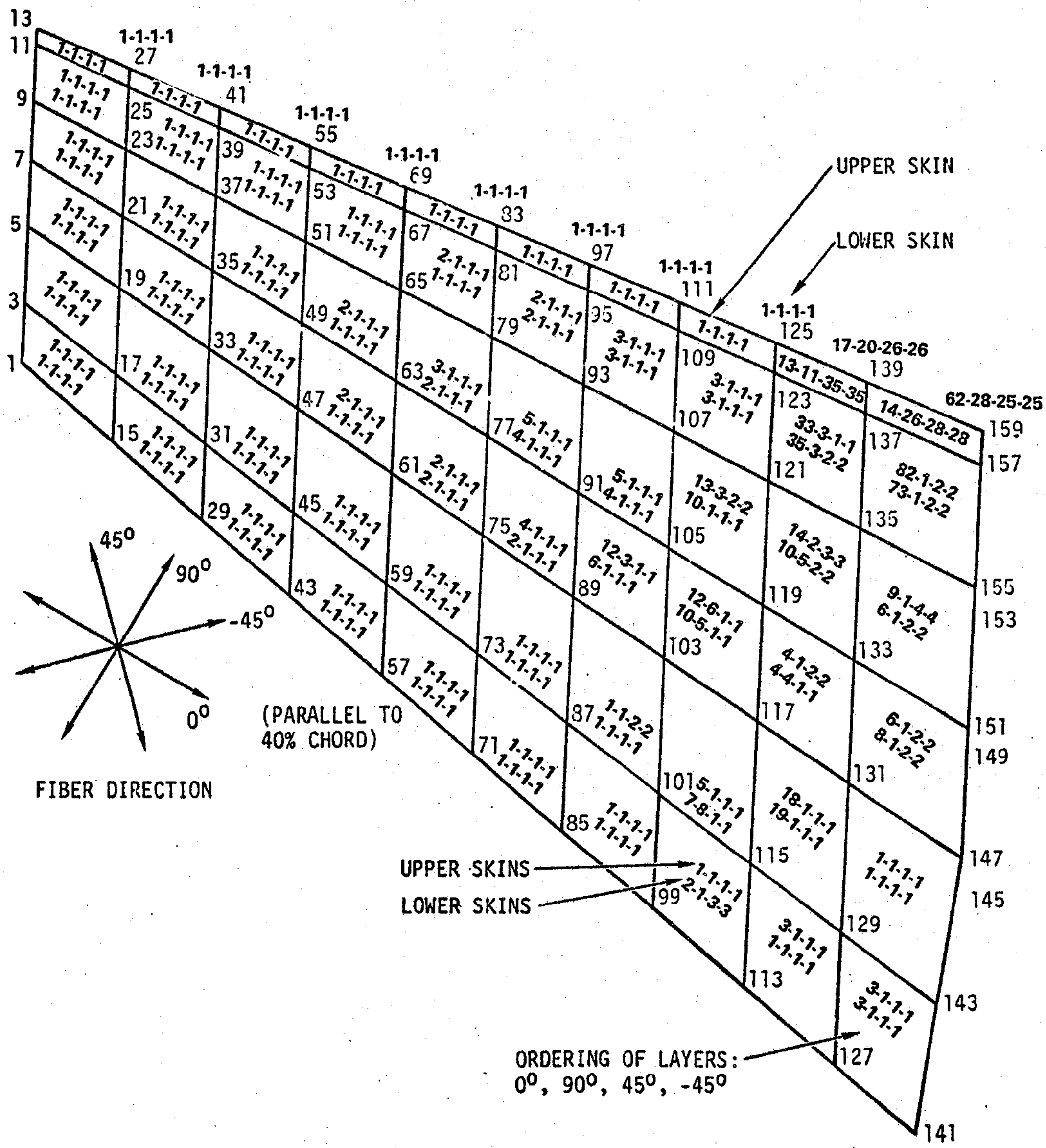

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Figure 8-30. All Graphite/Epoxy Wing (0°, 90°, 45°, -45°)
ASOP 3 Load = 6 g, 9 g, 2 g
Minimum Layers for Cambers
Rum with Twist Constraint @ Y = 20
Wgt. = 21.48 lb., Δ Wgt. = 28.32%

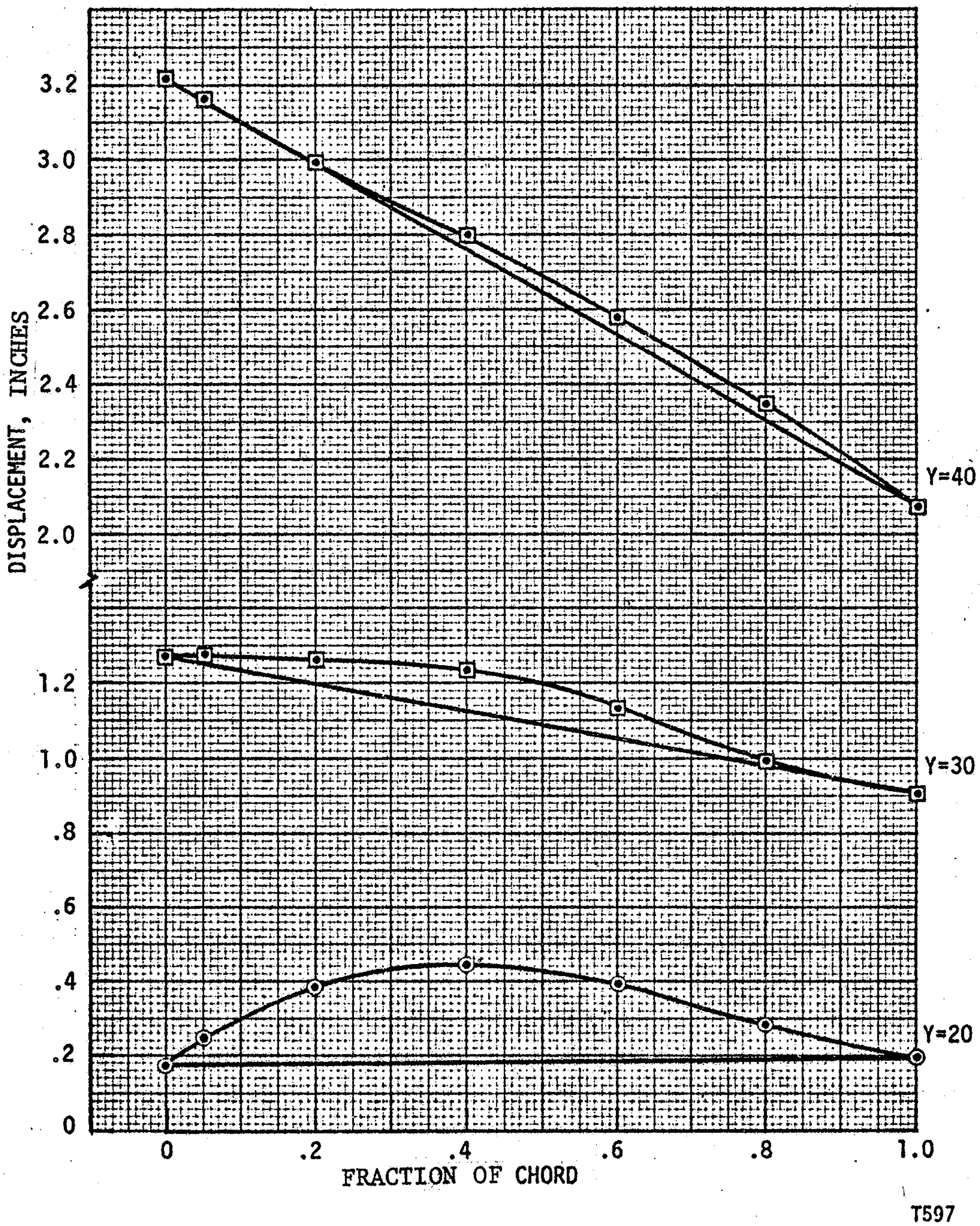

Figure 8-31. All Graphite/Epoxy Wing (0°, 90°, 45°, -45°)
ASOP 3 Load = 6 g
Minimum Layers for Camber, Run with Twist
Constraint @ Y = 20

The weight comparisons are shown below for one wing panel.

Candidate	Weight-Strength Constraint (lb)	Weight-Deflection Constraint (lb)	Δ Weight Percent
Aluminum	23.09	59.07	155.83
Gr/Ep	17.25	20.27	17.51
Gr fwd 40% chord, KEV. aft 40% chord	18.97	23.82	25.57

The graphite/epoxy construction shows a slight weight advantage over the hybrid Gr-KEV construction. The aluminum wing design weight for divergence is 59.07 pounds compared to 20.27 pounds for graphite materials. Those results are in full agreement with past studies regarding the impracticality of using swept-forward metal wing designs.

The thickness of the aluminum wing is shown in Figure 8-32. The laminate plies of the composite wings are shown in Figures 8-33 and 8-34. Deflections for all three wings are shown in Figure 8-35. As mentioned previously, a second sequence of optimization runs starting with the structure of Figures 8-32 through 8-34 would be expected to produce a wing with better deflection characteristics. These analyses were performed with ASOP-3.

Computer Optimized Wing

The wing candidate using graphite/epoxy laminated skins was run on the FASTOP-3 system. Following the strength optimization the wing was designed for a twist displacement of $0^{\circ} \pm .2^{\circ}$. Twist constraints were applied at stations 25.0, 40.0 and 60.0 with the leading and trailing edge grid numbers participating in the constraint.

Figure 8-36 is the ordering of plies over the upper and lower surfaces. The spanwise twist behavior is shown in Figure 8-37. Weight for this configuration is 24.44 pounds.

Note that Figure 8-36 shows two sets of fiber orientations. It was intended that all fiber orientation be parallel to and ±45 degrees to the forty percent chord line. It was discovered late in the study that because of a change in data input format (field) between ASOP-3 and FASTOP-3, the

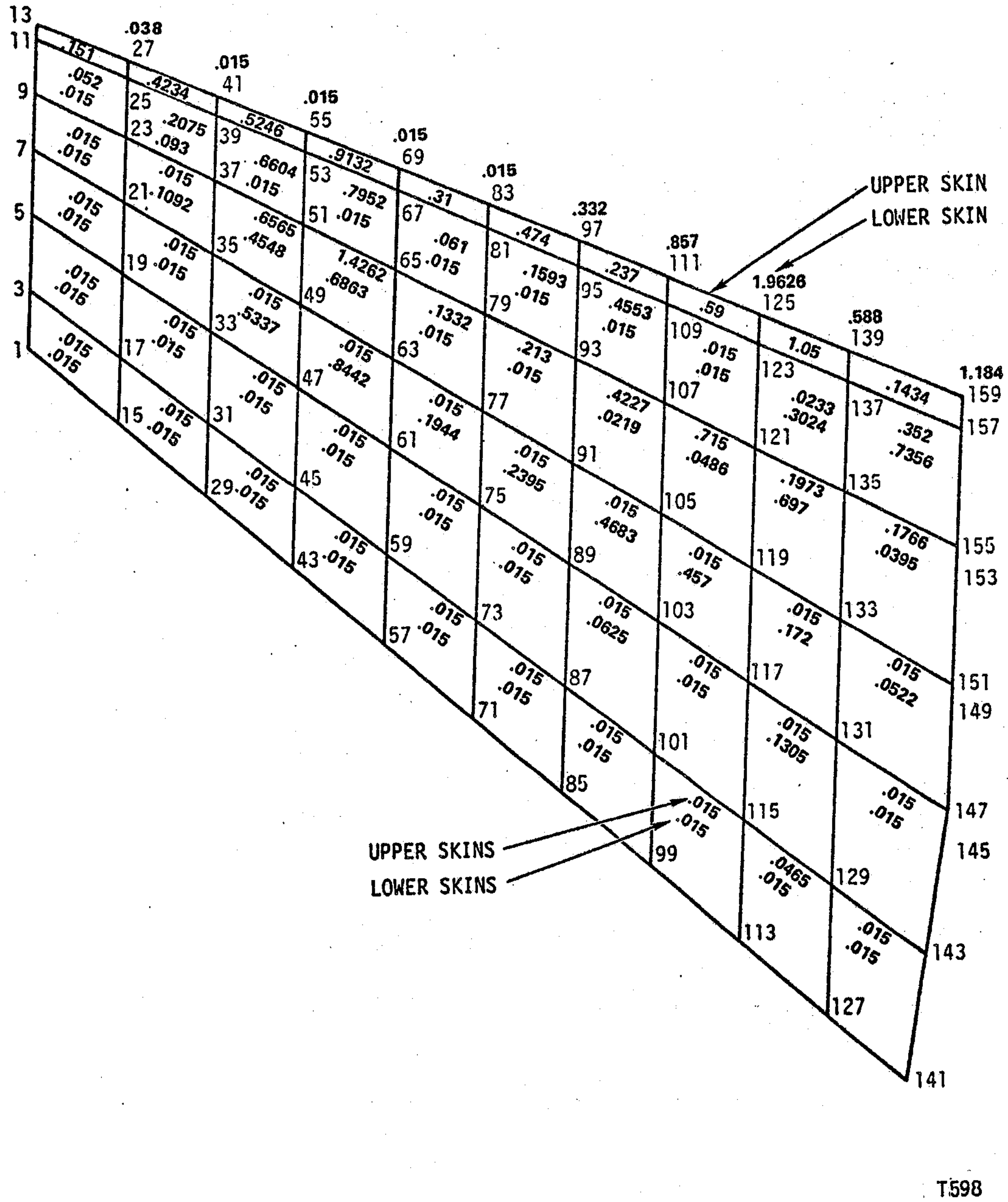

Figure 8-32. Aluminum Wing
ASOP 3 Load = 6 g, 9 g, 2 g
All Aluminum
Wgt. = 59.07 lb., Δ Wgt. = 155.83%

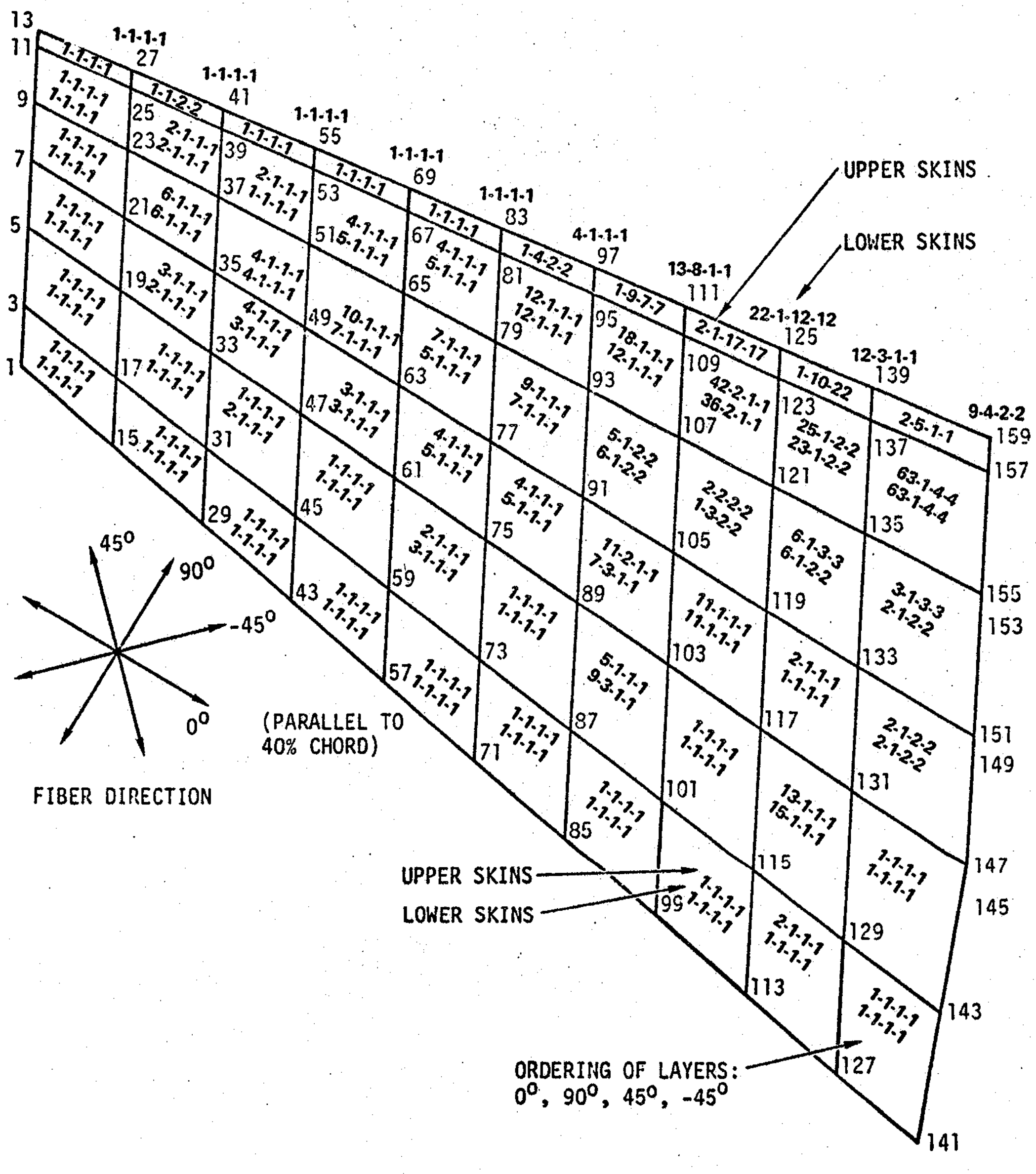

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Figure 8-33. Graphite/Epoxy Wing
ASOP 3 Load = 6 g, 9 g, 2 g
All Graphite Epoxy (0°, 90°, 45°, -45°)
Wgt. = 20.27 lb., Δ Wgt. = 17.51%

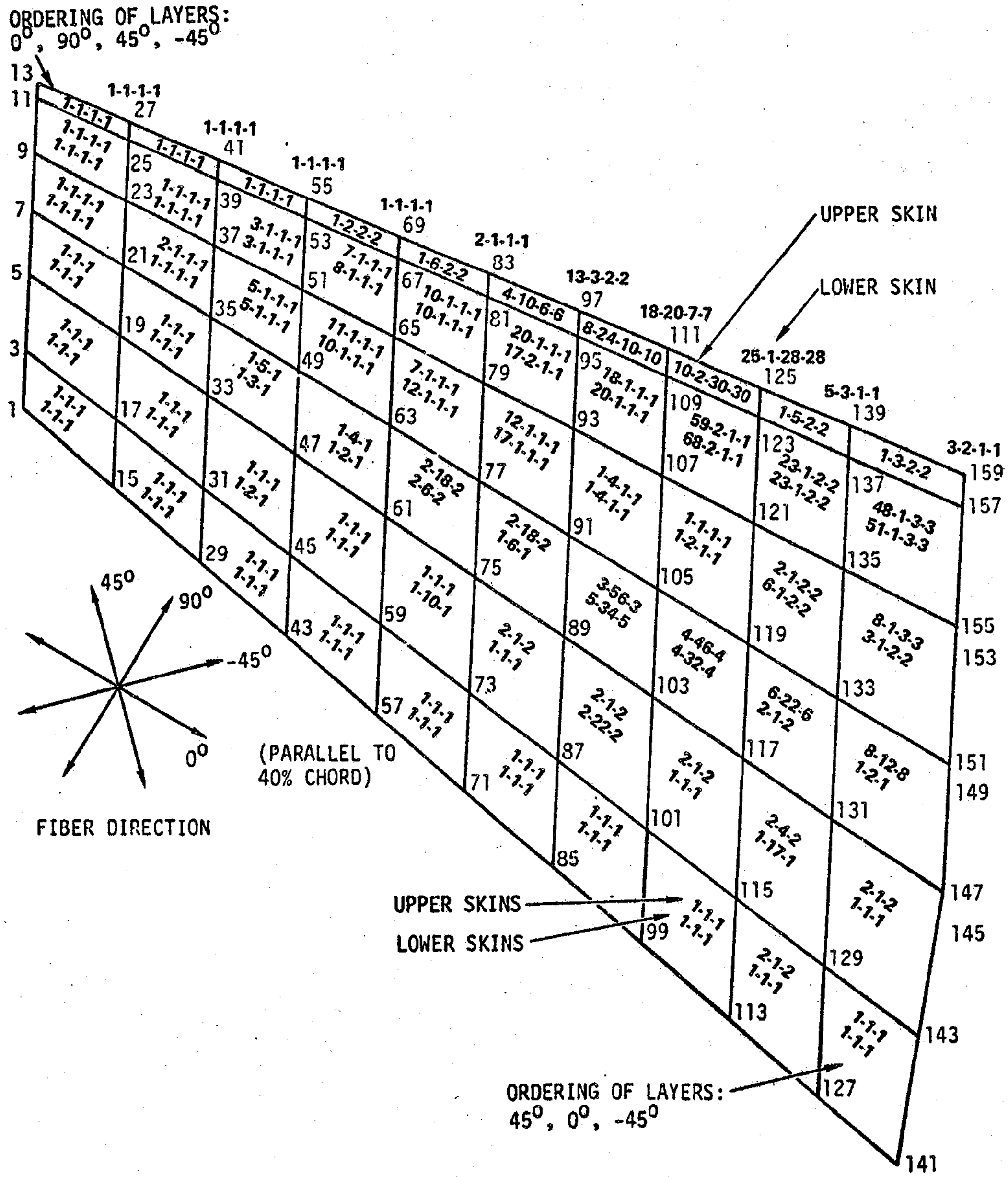


Figure 8-34. Graphite - Kevlar Wing
ASOP 3 Load = 6 g, 9 g, 2 g
Forward of 40% Chord Graphite (0°, 90°, 45°, -45°)
Aft of 40% Chord Kevlar (45, 0, -45)
Wgt. = 23.82 lb., Δ Wgt. = 25.57%

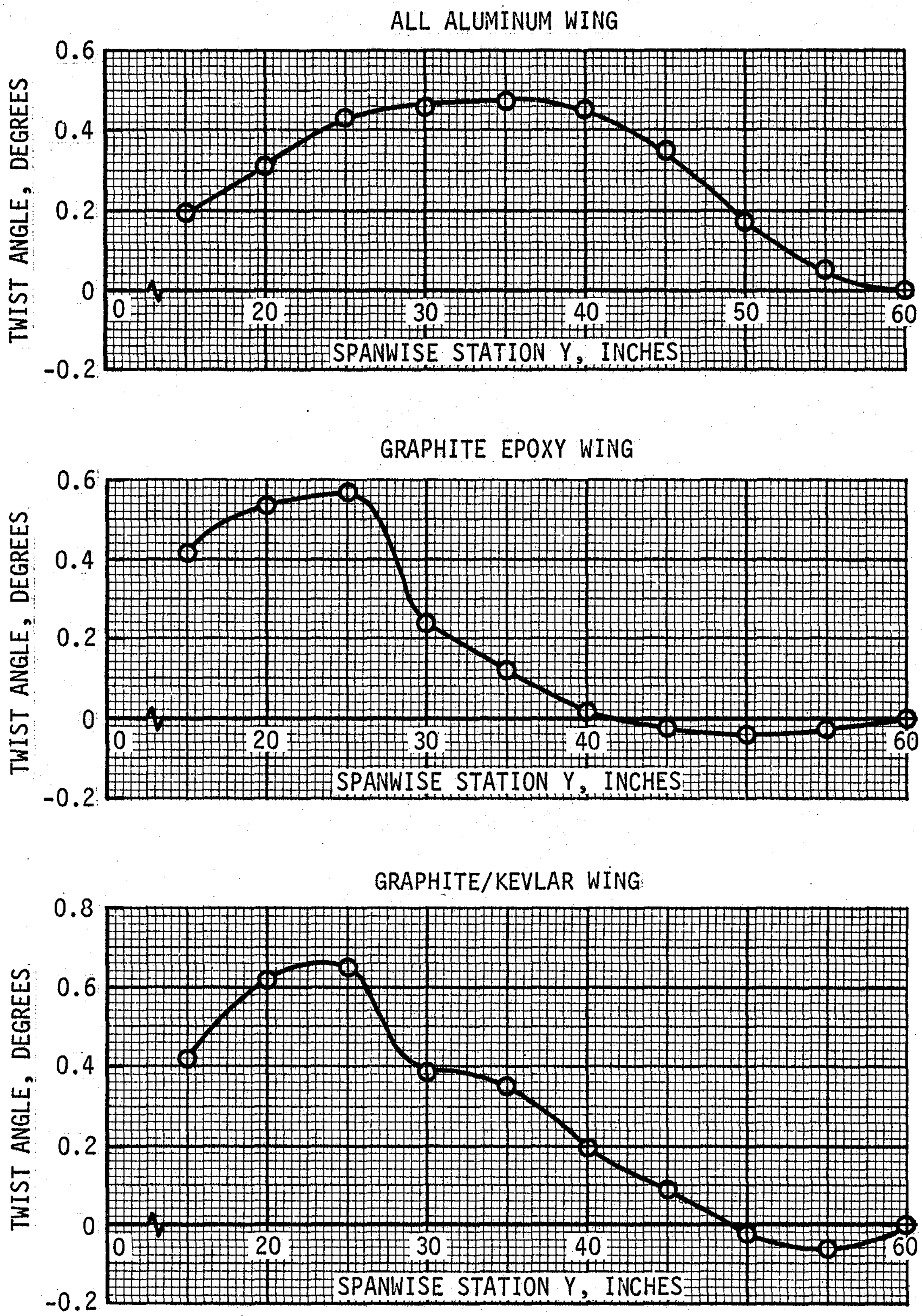


Figure 8-35. Spanwise Twist Deflections, Wing for Configuration/ Material Trade Studies. Progressive Constraints at Y = 20,30,40,50 and 60

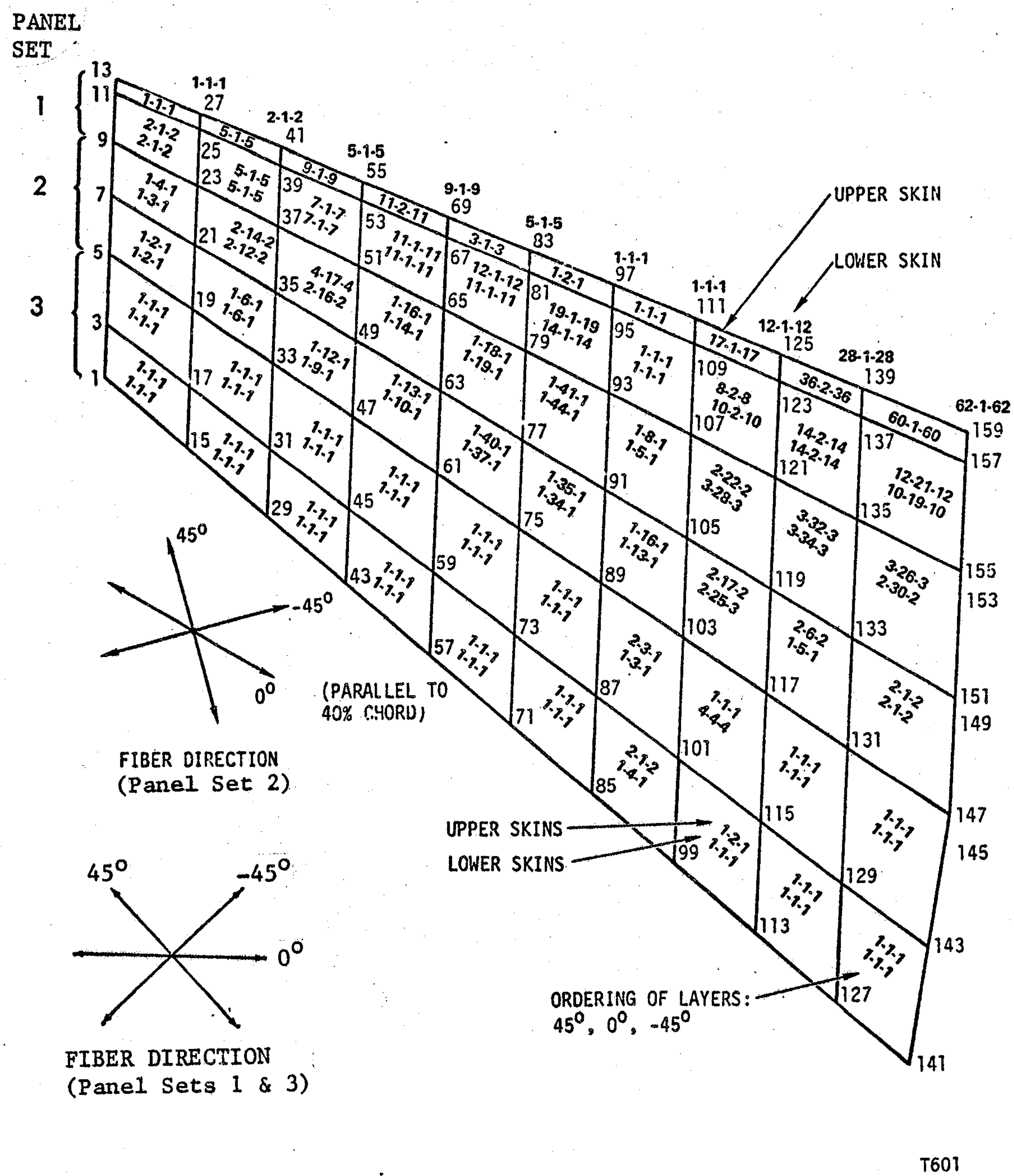


Figure 8-36. All Graphite Wing (45°, 0, -45°)
FASTOP 3 Load 6 g, 9 g, 2 g, -3 g
Computer Optimized Wing
Wgt. = 24.44 lb., Δ Wgt. = 51.90%

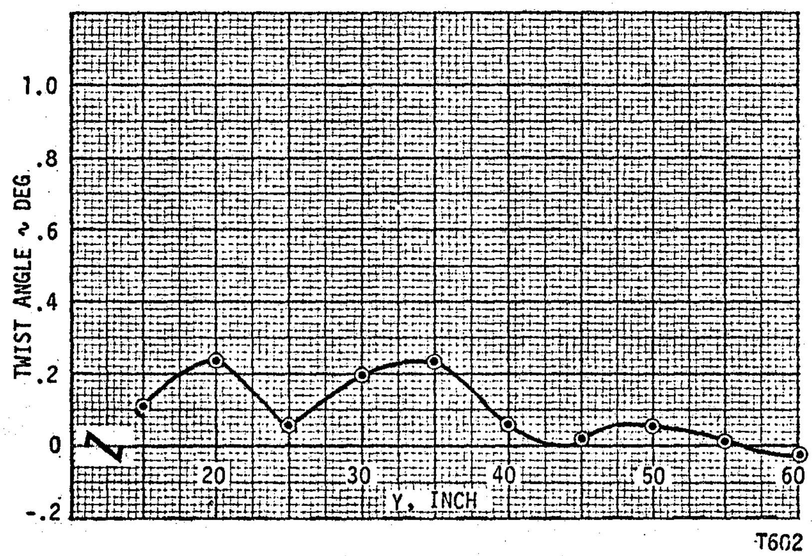


Figure 8-37. All Graphite/Epoxy Wing (45^{o}, 0, -45^{o})
FASTOP 3 Load = 6 g
Computer Optimized Wing

FASTOP-3 program considered the two sets of orientations as shown on Figure 8-36. This is illustrated by the computer output of Appendix C. Line 380 of page 11 of the printout shows the input of the two-point coordinate system for fiber orientation. The single line on page 53 illustrates the manner in which the input data was interpreted by FASTOP-3. The data input format is correct for ASOP-3. A separate option of the program was used in defining the fiber orientation for the middle set of panels.

Smoothed Wing Design

The computer optimized wing was used as the basis for achieving a design with smoother ply distributions. The procedure required the joint effort of stress, design, and manufacturing engineers revising the ordering of plies from FASTOP-3 into a smoother more continuous layup shown in Figure 8-38. This configuration was submitted to FASTOP-3 for deflection calculations and the resulting twist behavior is shown in Figure 8-39. By making changes with successive submissions to FASTOP-3 a smoother design evolved.

Figure 8-40 shows the smoothed laminate layup. The spanwise twist behavior is shown in Figure 8-41. Computer calculated weight is 24.13 pounds for one outboard panel.

This configurations was submitted to the FOP program in the FASTOP-3 system for a vibration and flutter check. The analysis indicated the wing has good flutter speed margins as discussed in Section 9.0.

This FASTOP-3 analysis is shown in Appendix C in its entirety.

The smooth wing of Figure 8-40 and 8-41 also consist of the two sets of ply orientations resulting from the program input problems discussed above. An alteration has been made to the ply laminates of Figure 8-40 and all fiber directions oriented as originally intended. The layup is shown in Figure 8-42 and the deflection characteristics are shown in Figure 8-43. Further efforts could probably improve the deflection characteristics however it is apparent that a successful wing design can be accomplished. The wing of Figure 8-42 was not subjected to a flutter check but it is believed from the previous studies that it will exhibit satisfactory flutter speeds.

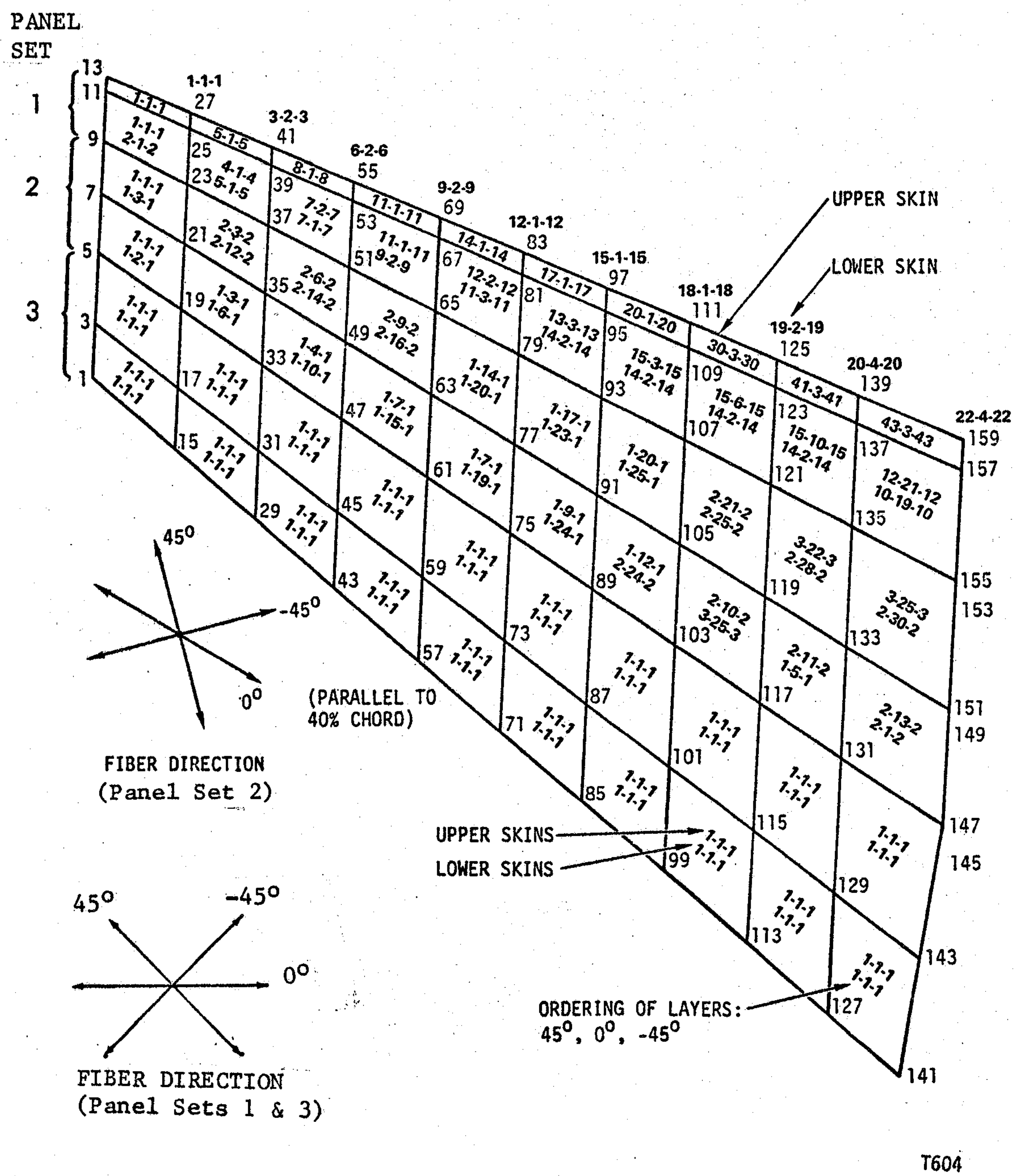


Figure 8-38. All Graphite/Epoxy Wing (45°, 0°, -45°)
FASTOP 3 Load = 6 g, 9 g, 2 g, -3 g
Intermediate Smoothed Wing
Wgt. = 23.86 lb. ΔWgt. = 48.29%

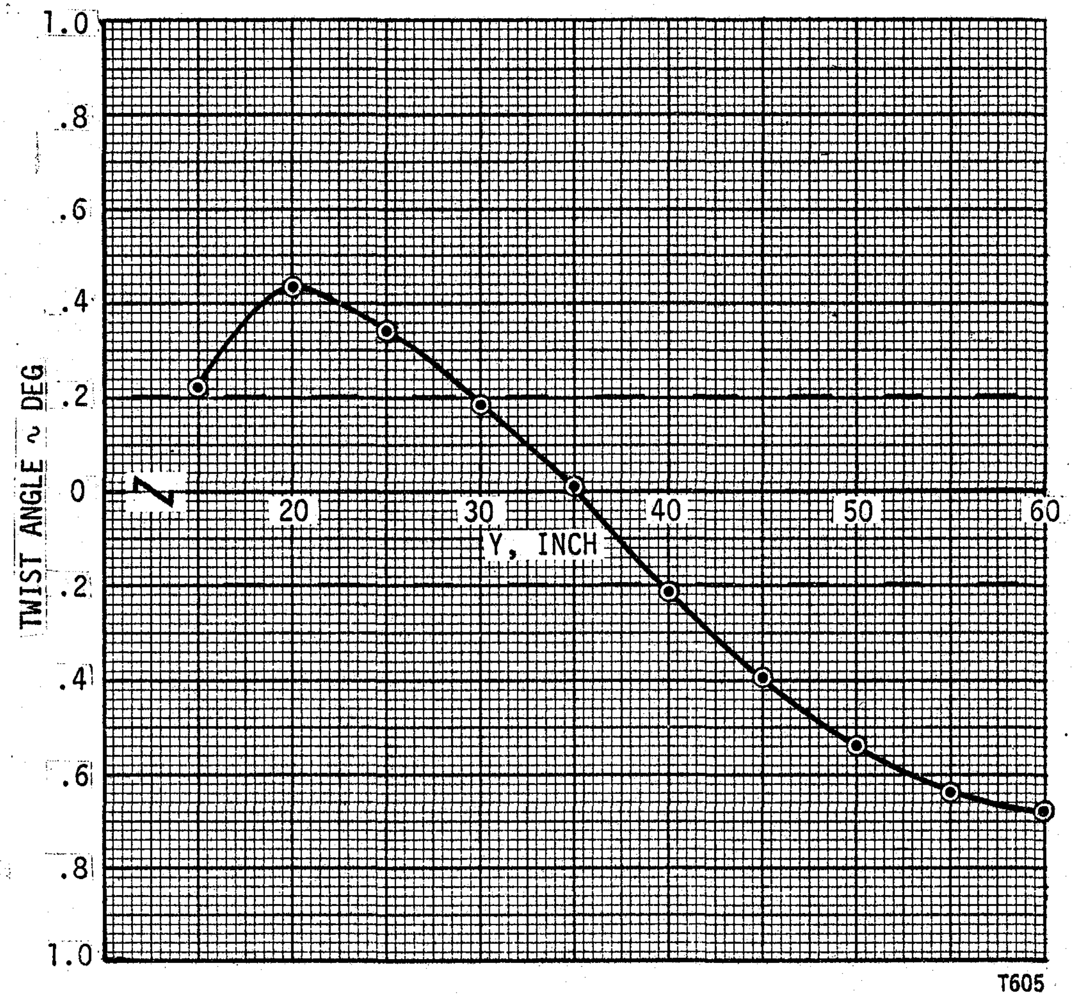


Figure 8-39. All Graphite/Epoxy Wing (45°, 0°, -45°)
FASTOP 3 Load = 6 g
Intermediate Smoothed Wing

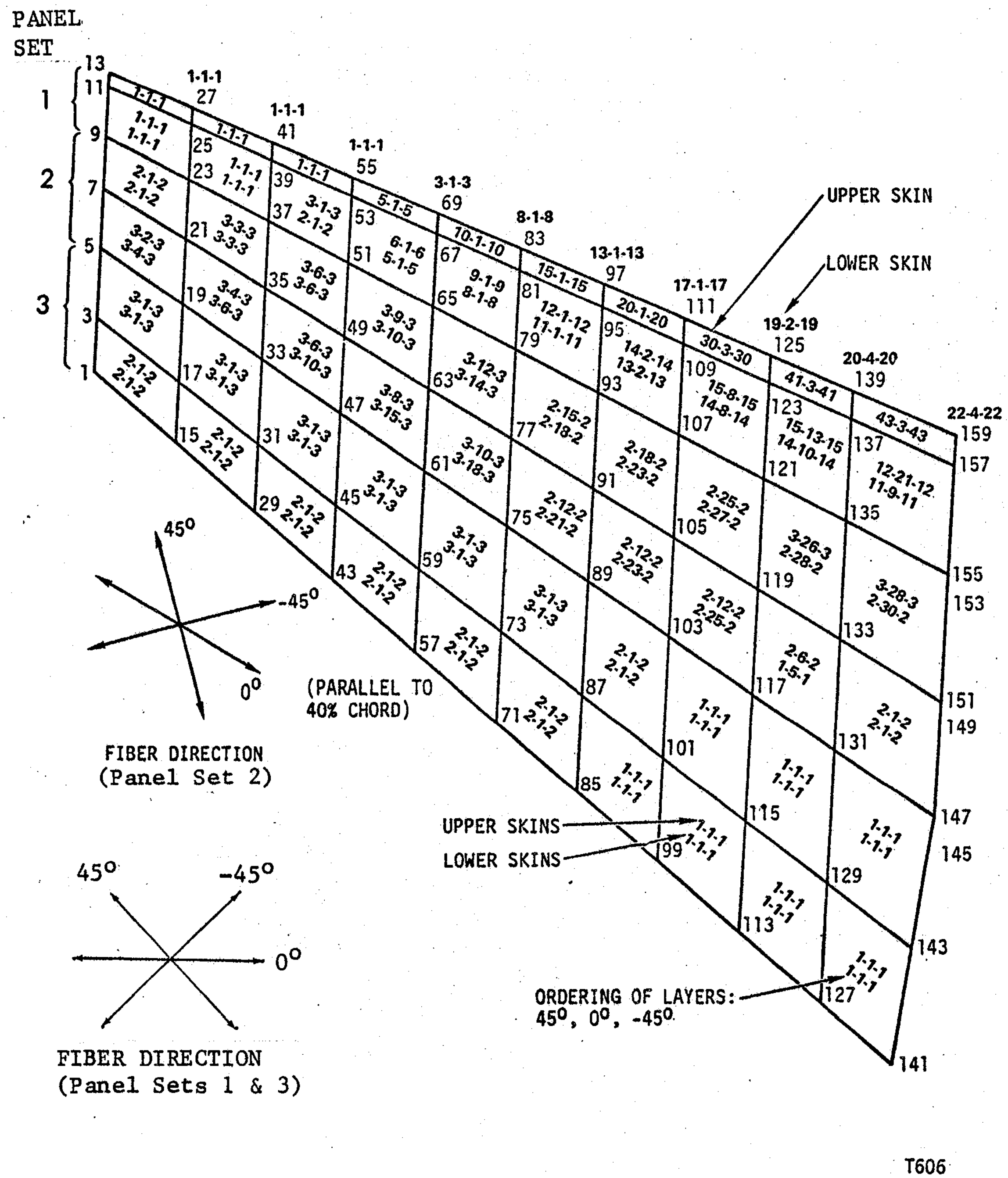


Figure 8-40. All Graphite/Epoxy Wing (45°, 0°, -45°)
FASTOP 3 Load = 6 g, 9 g, 2 g -3 g
Final Smoothed Wing
Wgt. = 24.13 lb., Δ Wgt. = 49.97%

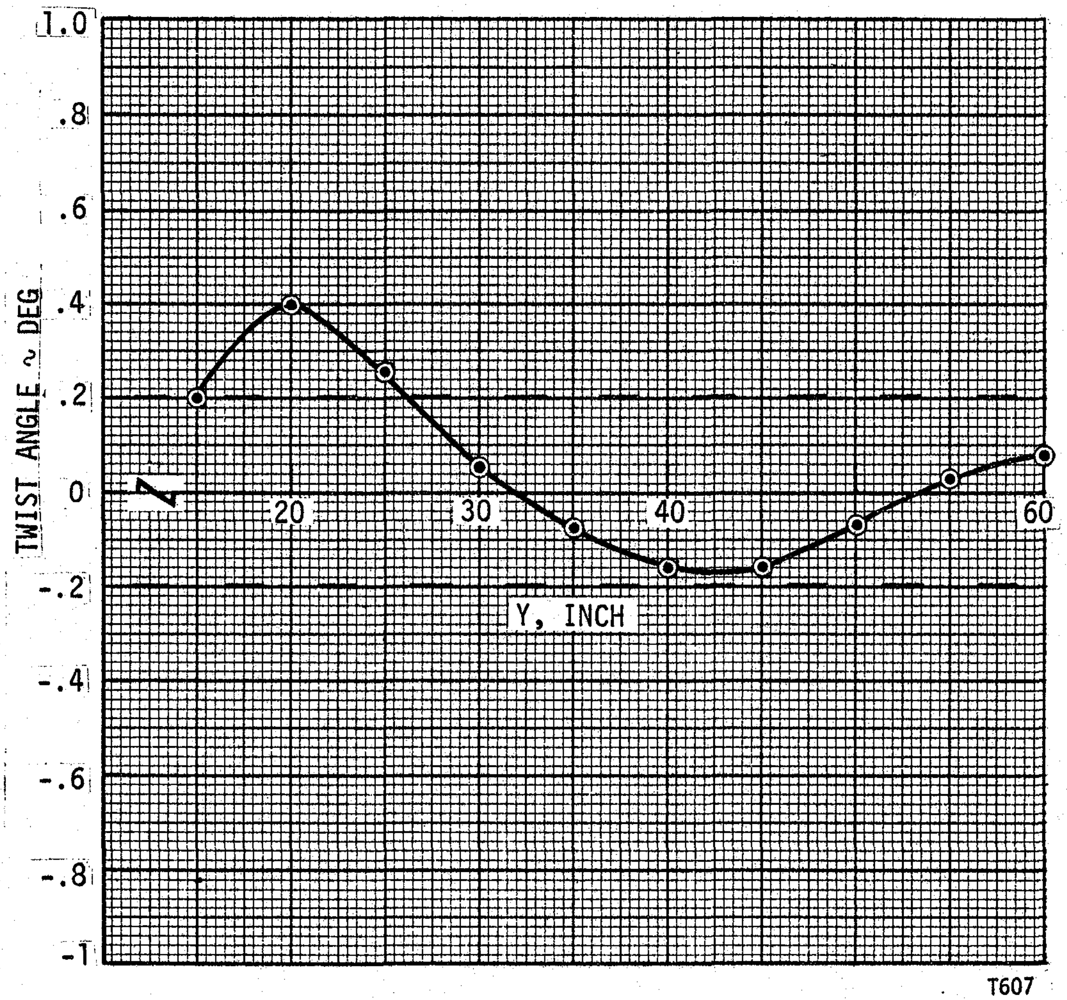


Figure 8-41. All Graphite/Epoxy Wing (45°, 0°, -45°)
FASTOP 3 Load = 6 g
Final Smoothed Wing

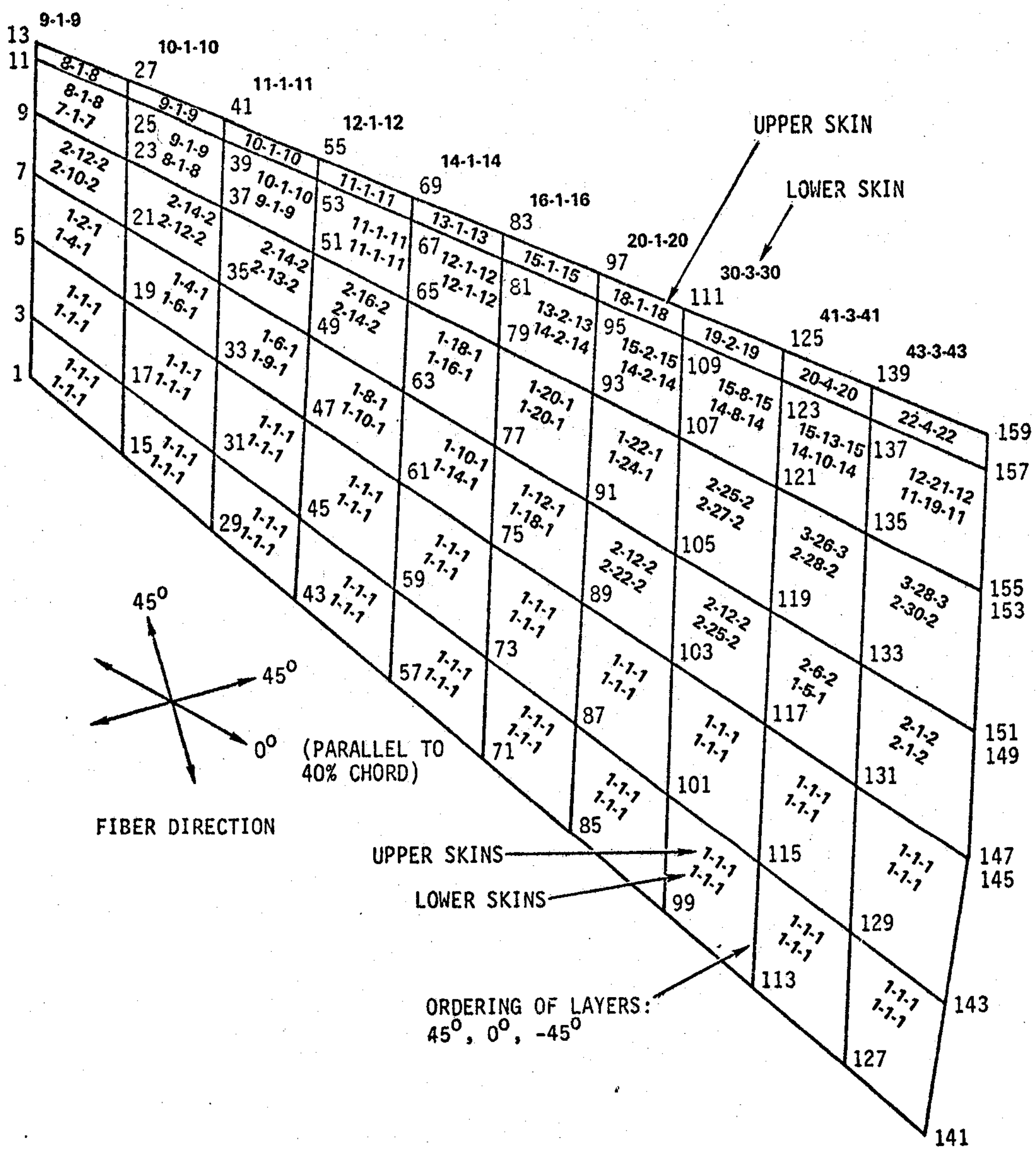


Figure 8-42. All Graphite/Epoxy Wing (45°, 0°, -45°) ASOP 3 Load = 6g, 9g, 2g, -3g Corrected Fiber Orientation Weight = 24.85 Pounds

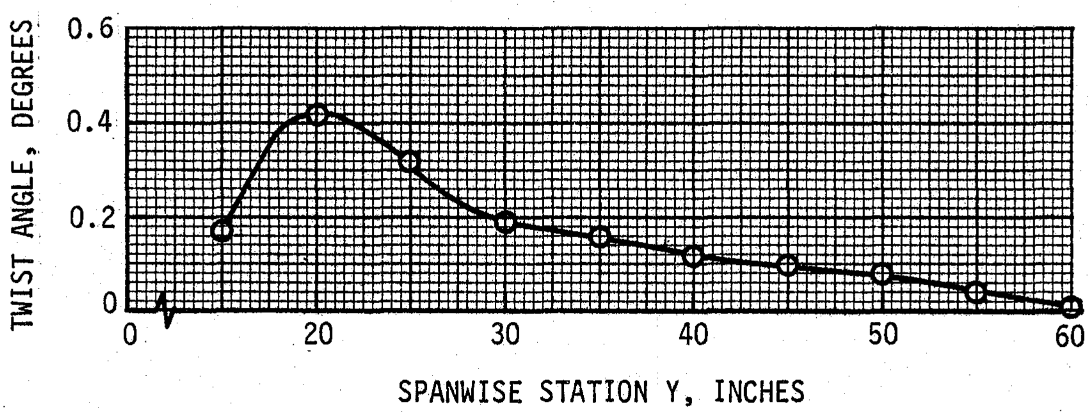


Figure 8-43. Spanwise Twist Distribution All Graphite/Epoxy Wing (45°, 0°, -45°) Corrected Fiber Orientation

8.3.2. Conclusions From Wing Preliminary Design Efforts

A number of conclusions can be reached as a result of the wing preliminary aeroelastic design effort.

1. The ASOP-3/FASTOP-3 computer programs are a valuable aid in optimizing the wing structure for strength and deflections. The addition of an aerodynamic module to provide a closed form static aeroelastic optimization would provide a major additional help.

2. By using advanced composite materials the weight penalty associated with divergence prevention of conventional metallic wings is alleviated.

3. A preliminary evaluation of three candidate wing construction concepts, aluminum, graphite epoxy, and graphite/kevlar confirmed the weight penalties which result from an all-metal construction.

4. A 0^o $\pm 45^o$ basic layup is more efficient than a 0^o, 90^o $\pm 45^o$. A large portion of the wing surface requires only the minimum layers specified by the basic layup, making the 90^o ply superfluous.

5. The tailoring for twist constraints is sensitive to whether the wing support is rigid or flexible. A detail wing design analysis should reflect the fuselage elasticity.

6. The tailoring is sensitive to the severity of twist constraint. As the wing approaches an over-constraint condition the number of plies in the skin layup vary widely from one element to an adjacent element. These abrupt changes are impractical from a manufacturing standpoint. Engineering judgement is required to smooth the layup into more gradual changes in number of plies acceptable for fabrication.

7. The laminate is sensitive to the leading edge participating in the optimization process.

8. Attempts to constrain the chordwise camber displacement behavior in conjunction with twist constraint became unwieldly because when camber was maintained the twist behavior exceeded the tolerance and vice versa.

9. A wing fabricated from graphite/epoxy is attractive from a weight point of view. The weight optimum sizes specified by the optimization program require some hand tailoring to achieve a final practical design.

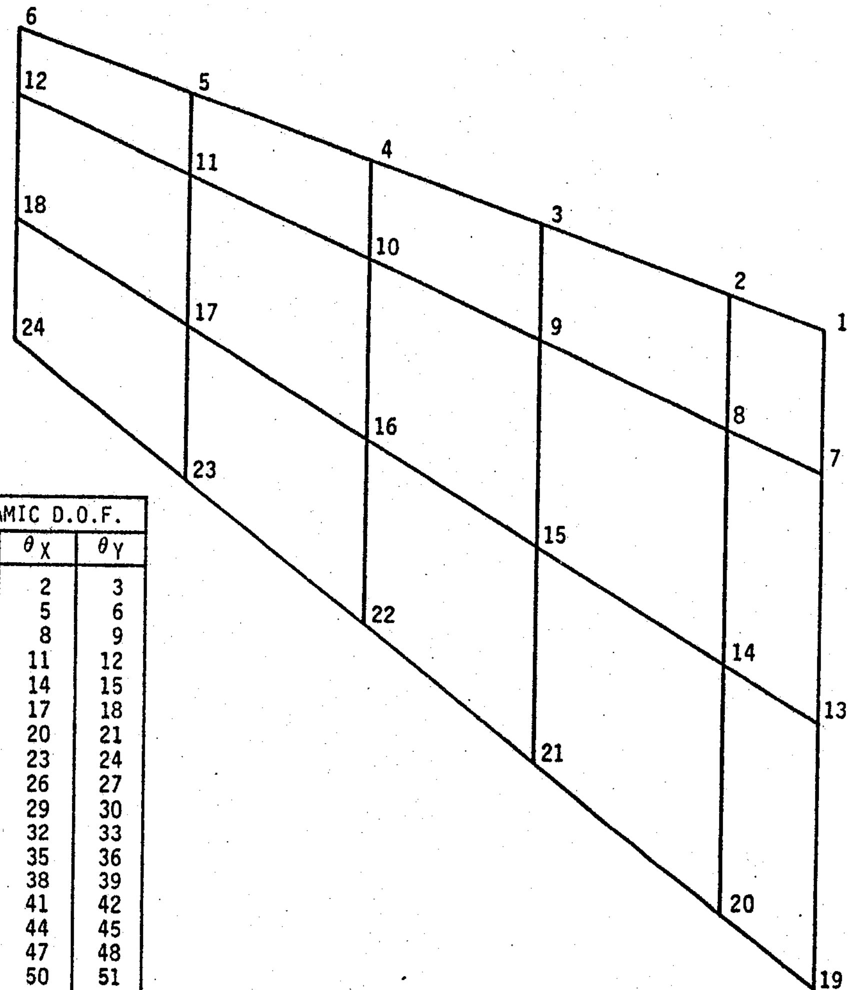
9.0 FLUTTER ANALYSIS

The FASTOP-3 program of reference 8.1 was utilized to conduct a flutter analysis of the forward swept wing. The flutter optimization option of the program was not exercised and the primary objective of this analysis was to determine if the forward swept wing, after strength and restraint optimizations, displayed an adequate flutter margin. The analysis shows the wing to be flutter free to greater than Mach = .90 at sea level. This is a substantial margin over the design V_L at sea level which is 426 knots, Mach = .65.

The vibration analysis was conducted via the AVAM module of FASTOP-3 utilizing the flexibility approach. For the flexibility approach, a separate dynamics model was created. This model, as shown in Figure 9-1, is a reduction of the structural finite element model shown in Figure 9-2. In the dynamics model the structure was assumed to be fixed just inboard of grids 1, 7, 13 and 19 thus providing the boundary conditions for a cantilevered structure. Only out of plane displacements at the grid points were considered yielding a total of 28 degrees of freedom, of which four have zero displacements. Eight modes were calculated and subsequently used in the flutter analysis. Natural frequencies range from 40.4 Hz to 427 Hz. Mode shapes are presented in Appendix D in both tabular and graphical form. Mode shapes in graphical form are shown on pages 38 thru 53 of Appendix D.

The mass matrix used in the vibration analysis was obtained by using the "fully automated" approach, that is, the mass matrix was automatically computed based on the computed weights of all the structural members. There were neither fixed-mass items nor mass-balance weights in the wing.

The flutter analysis was conducted utilizing the AFAM segment of FASTOP-3. The aerodynamics model is identical to the structural model as shown in Figure 9-2. The wing is modeled as one aerodynamic panel which is divided into 10 spanwise elements and six chordwise elements. The subsonic doublet-lattice procedure was used to arrive at oscillatory aerodynamics for a Mach number of 0.90, and nine reduced frequencies ranging from .2 to 2.6. The flutter solution was obtained by using the K-method, zero structural damping, and sea level air density. A printout of the flutter solution is presented in Appendix D along with the conventional velocity versus damping and velocity versus frequency plots. All other pertinent results from the AVAM and AFAM modules are also shown in Appendix D.



NODE	DYNAMIC D.O.F.		
	Z	θ_X	θ_Y
1	1	2	3
2	4	5	6
3	7	8	9
4	10	11	12
5	13	14	15
6	16	17	18
7	19	20	21
8	22	23	24
9	25	26	27
10	28	29	30
11	31	32	33
12	34	35	36
13	37	38	39
14	40	41	42
15	43	44	45
16	46	47	48
17	49	50	51
18	52	53	54
19	55	56	57
20	58	59	60
21	61	62	63
22	64	65	66
23	67	68	69
24	70	71	72

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Figure 9-1. NASA Forward Swept Wing, Dynamics Model

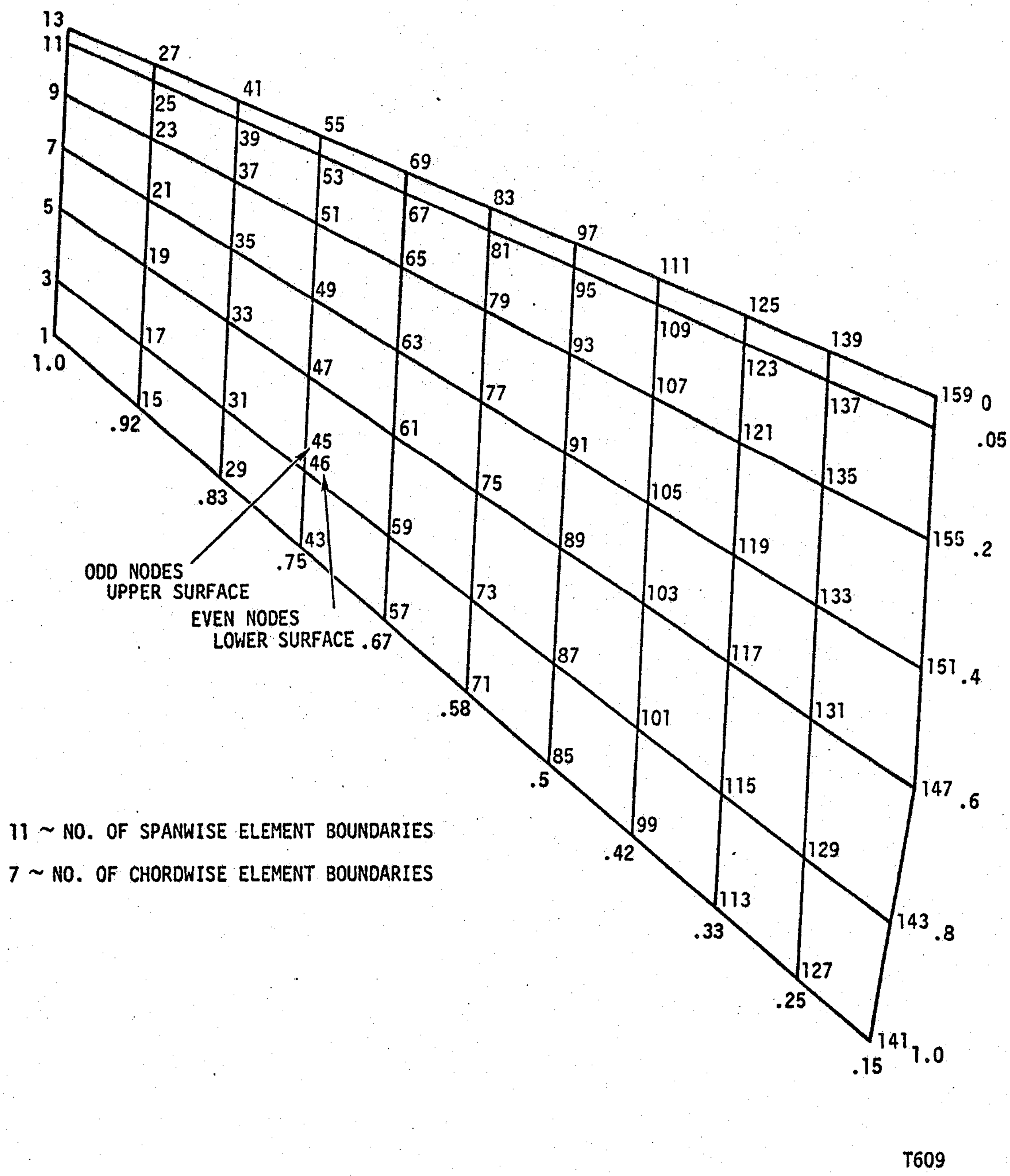


Figure 9-2. Grid Arrangement

10.0 STRESS ANALYSIS

A stress analysis was performed to substantiate the preliminary wing design details. In addition, preliminary stress checks were made to ascertain modifications required for the BQM-34F fuselage/empennage structure.

10.1 WING ANALYSIS

The wing stress analysis involved the following components:

a. Laminated skins

(1) Strength

(2) Intracell buckling

b. Honeycomb core

c. Wing to fuselage attachment bolts

Laminated Skin Analysis

The graphite/epoxy skins are analyzed for the following failure modes:

a. Laminate strength

b. Intracell buckling

Laminate strength is based on the allowable strength of each lamina and its orientation. Intracell buckling is a local stability failure mode which the laminate may experience and is an interaction between the laminate and the honeycomb core. One of the primary functions of the core is to stabilize the laminate until the full compressive strength allowable is developed.

The ASOP-3 and FASTOP-3 systems have the strength failure criterion built into the program and the resizing algorithm is formulated not to violate the strength requirements. Conservative assumptions are made so that interaction between layers may be properly taken into account.

The following material data at room temperature were used:

$E_1 = 20.1 \times 10^6$ psi

$E_2 = 1.6 \times 10^6$ psi

$\mu = .294$

$G = .8 \times 10^6$ psi

$\alpha_1 = .01 \times 10^{-6}$ in/in/f°
$\alpha_2 = 11.5 \times 10^{-6}$ in/in/F°

Allowable strain data at room temperature:

e_1 compression	= -.0092 in/in
e_2 compression	= -.015 in/in
$\gamma_{1,2}$ negative	= -.0106 in/in
e_1 tension	= .0105 in/in
e_2 tension	= .0045 in/in
$\gamma_{1,2}$ positive	= .0106 in/in

Intracellular Buckling

This is a localized mode of instability facing failure and occurs in regions directly above core cells. The facings buckle in plate-like fashion with the cell walls acting as edge supports. The progressive growth of these buckles can eventually precipitate a face-wrinkling failure mode.

The facing stress at which intracellular bucking will occur is given by the following equation:

$$F_{cyd} = \frac{2(E_x\,E_y)^{1/2}}{1 - \mu_x\,\mu_y}\left(\frac{t_f}{s}\right)^2 \qquad \text{(Reference 10.1)}$$

where

E_x, E_y	= Laminate Young's moduli 6,800,000 + 3,900,000 psi
t_f	= Laminate thickness, .025 inches
$\mu_x\ \mu_y$	= Poisson's ratios, .72, .43
s	= Core cell size, 0.125 inches
F_{cyd}	= 6,670 psi

An interaction formula is used for biaxial compressive stresses.

Honeycomb Core Stress Analysis

In addition to having the proper stiffness and geometry required to stabilize the laminated skins, the core must have adequate strength. The spanwise wing shear loads are transferred by the honeycomb core, during which time the core experiences shear stresses.

Core Shear

The HFT glass reinforced phenolic core experiences maximum shear stress in element 6185.

f_s = 142 psi (ult.) Appendix C

F_s = 225 psi (L direction) Reference 8.4

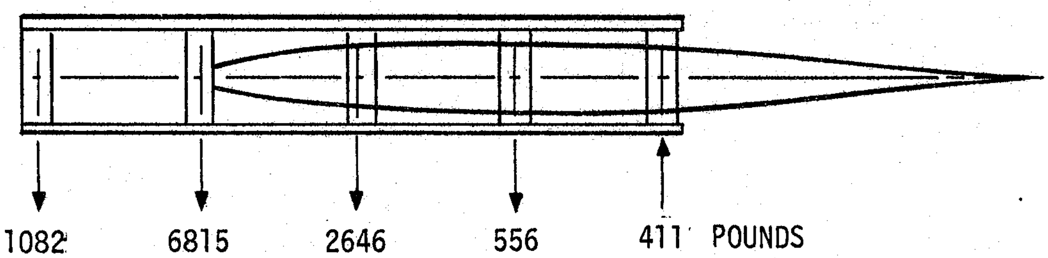
$$MS = \frac{225}{142} - 1 = .58$$

NAS 625 - Fuselage Attachment Bolts

The wing is attached to the fuselage with five 5/16 NAS 625 H.T. 180 KSI bolts, left and right hand side.

Maximum bolt loads occur during the 9 g ultimate load case and are based on rigid support. Studies indicate reactions are sensitive to fuselage flexibility.

Wing/Fuselage Loads - 9 g ultimate



Bolt Allowable Loads

NAS 625, 5/16 dia. H.T. 180 KSI

P tension = 9660 lb

P shear = 8280 lb.

Margin of Safety, M.S.

$$M.S. \frac{9660}{6815} - 1 = .416$$

10.2 FUSELAGE ANALYSIS

The fuselage analysis involves stress checks of the equipment compartment and centerbody sections. Figure 10-1 is an exploded view of the fuselage shell structure. The wing attaches to five frames in the centerbody section.

Equipment Compartment

The addition of about 300 pounds of ballast in the fuselage nose imposes bending loads on the equipment compartment section which exceeds its present structural capability. The added ballast effects on the loads are compared in Figure 7-3 with the original design loads for parachute recovery.

Figure 10-2 shows a structural beef-up which will satisfy the increased loads. It consists of the addition of four steel straps along the upper and lower, left and right hand fuselage sides as shown. The straps extend the full length of the equipment compartment and the forward end of the centerbody section. This ensures adequate strength at the joint where the two sections mate, station 233.50.

Appendix E shows the sizing of external straps at various stations to increase the structural capability of the equipment compartment sections. The sizing is based on determining the increase in structural properties required to meet the new loads. Advantage is taken to reduce high margins of safety where they exist and maintain the neutral axis location and original stress levels.

Centerbody Section

The swept forward wing study is based on rigid support and the reactions on the centerbody frames are shown in Figure 10-3. Analyses performed early in the study indicate the support reactions are sensitive to the fuselage/ frame flexibility, however, the centerbody was not in the finite element analysis model.

Based on the rigid support reactions the frame at X_F 250.06 is loaded by the ultimate loads from the 6.0 g condition in excess of its structural capability. The frame analysis shown in reference 10.2 is used to estimate the frame capability.

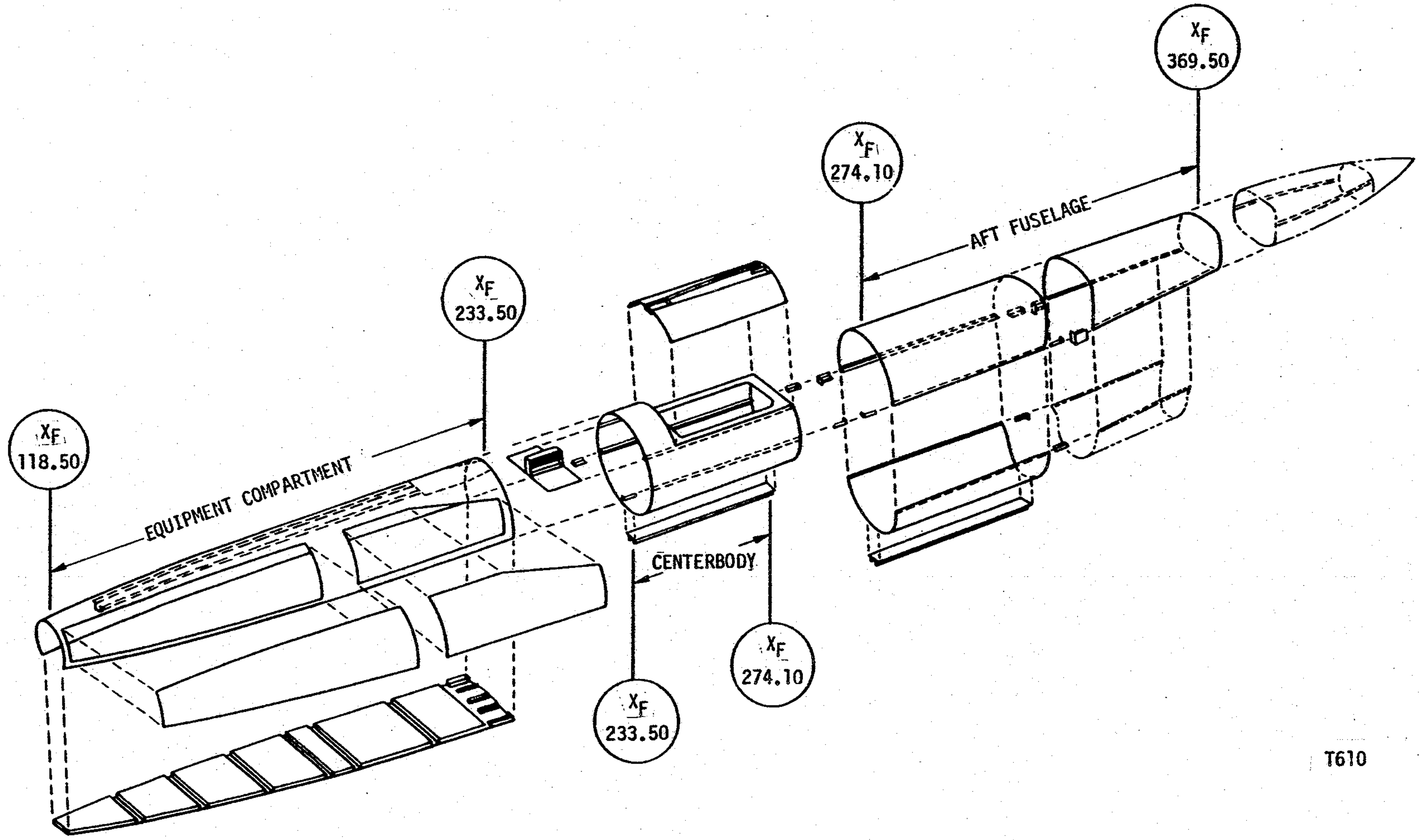


Figure 10-1. Fuselage Shell Structure

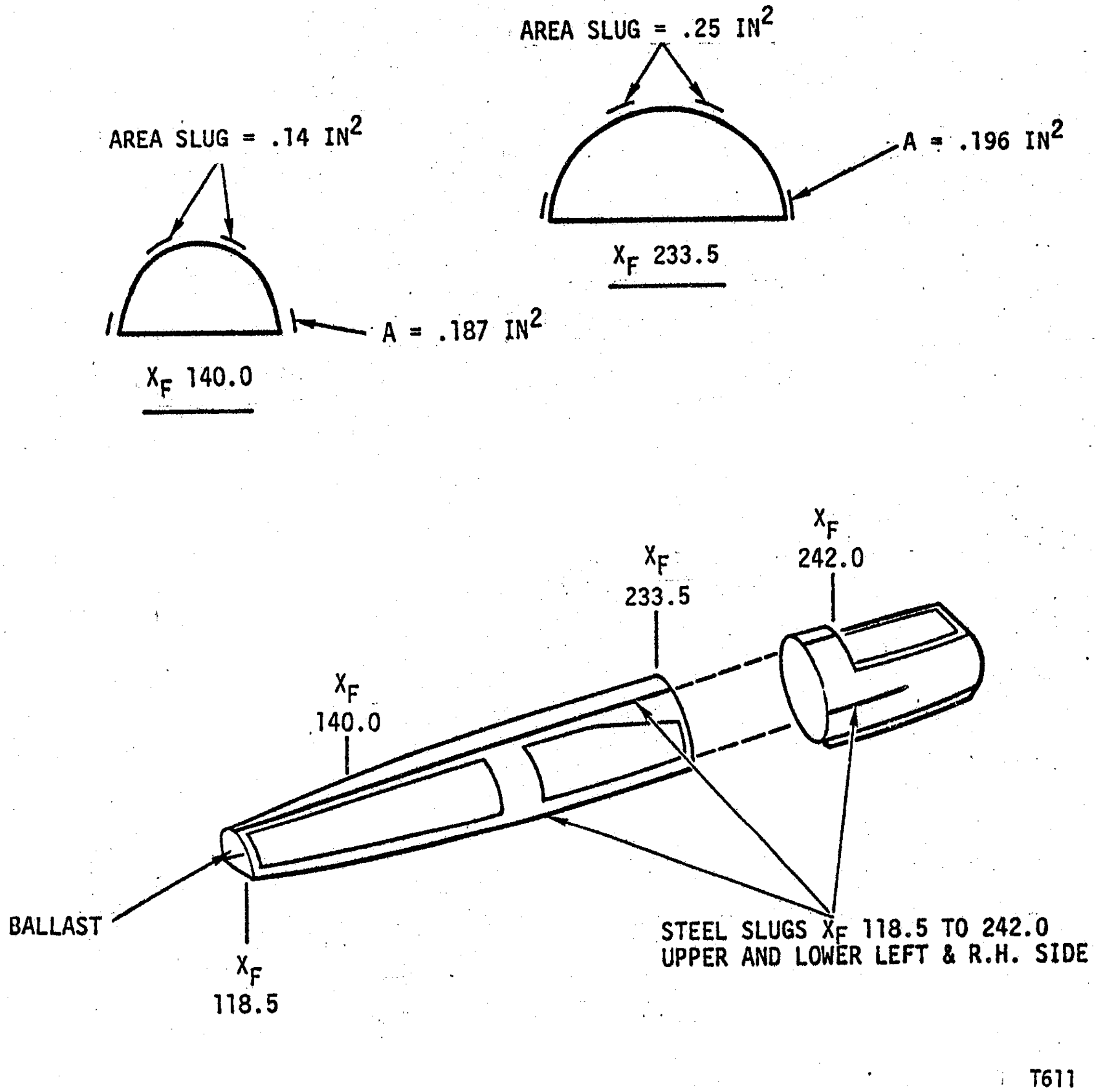
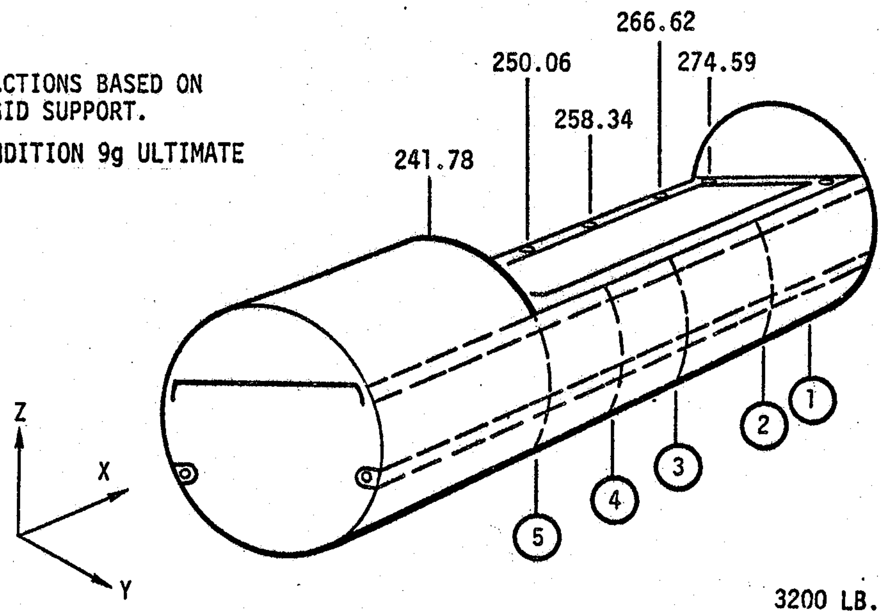


Figure 10-2. Beef-Up Straps Equipment Compartment

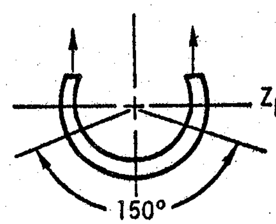
REACTIONS BASED ON RIGID SUPPORT.

CONDITION 9g ULTIMATE



WING REACTIONS, P_Z
9g ULTIMATE

NO.	P_Z (PER SIDE) LB. ULTIMATE
1	-411
2	556
3	2646
4	6815
5	1082



FRAME X_F 250.06

INCREASE IN LOAD REQUIRES ADDING INNER AND OUTER FLANGES EXTENDING 150° AROUND LOWER PORTION.

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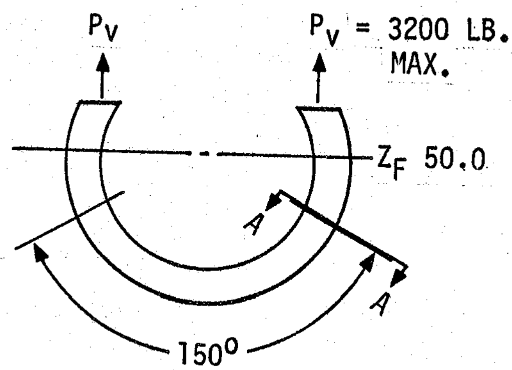
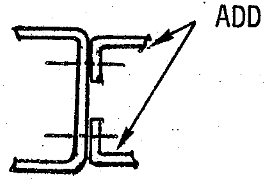
Figure 10-3. Fuselage Wing Attach Frames, 6-g Loads x 1.5

Maximum allowable frame load is 3200 pounds/side. Critical failure mode is flange compression crippling.



For Pv = 6815 lb ultimate the frame at X_F 250.06 requires some beef-up. It is recommended an inner and outer angle flange be added to the channel frame extending approximately 150° around the lower portion.



SECTION A-A

It should be noted that a more detailed analysis with fuselage flexibility considered may show this modification not required.

11.0 DESIGN

11.1 FUSELAGE

Several modifications must be made to the basic fuselage to accommodate a forward swept wing. These modifications are discussed in the following sections.

11.1.1 Structural Modifications

Structural reinforcement of the fuselage as shown in Figure 11-1 is required forward of XF 233.50 in order to support the 300 pounds of ballast. The reinforcement consists of .125 inch thick stainless steel (18-8) straps of sufficient width to increase the forward fuselage bending modulus so that the available strength of the existing aluminum fuselage will not be exceeded (See Section 10.2). Stainless steel was chosen both for high corrosion resistance as well as high modulus thus presenting the least (compared to aluminum) increase to the vehicle cross sectional area. The strap will be installed by picking up existing rivets along with additional rivets where required. A sealant and wet dipped rivets will prevent galvanic coupling between the steel straps and aluminum fuselage.

11.1.2 Ballast Installations

The lead ballast will consist of commercial tin based lead (4% sb) that has a tensile allowable strength of 4000 psi which is twice that of common lead. The lead density is 0.398 lb. per cu. in. The lead sheet will be fastened to the existing structure with flush machine screws installed through relatively large steel washers with countersunk holes. Back up countoured steel washers will be utilized where required to locally reinforce the existing aluminum structure.

11.1.3 Recovery System Modifications

It has been shown that incorporating a forward swept wing on the BQM-34F will require a large amount of forward fuselage ballast to maintain static aerodynamic stability. The resulting forward shift in vehicle center of gravity produces a problem with the recovery system geometry. With the ballast in place, the cg of the vehicle when suspended beneath the main and engagement parachutes is forward of the most forward parachute attachment point. To provide a level vehicle attitude two alternatives were considered

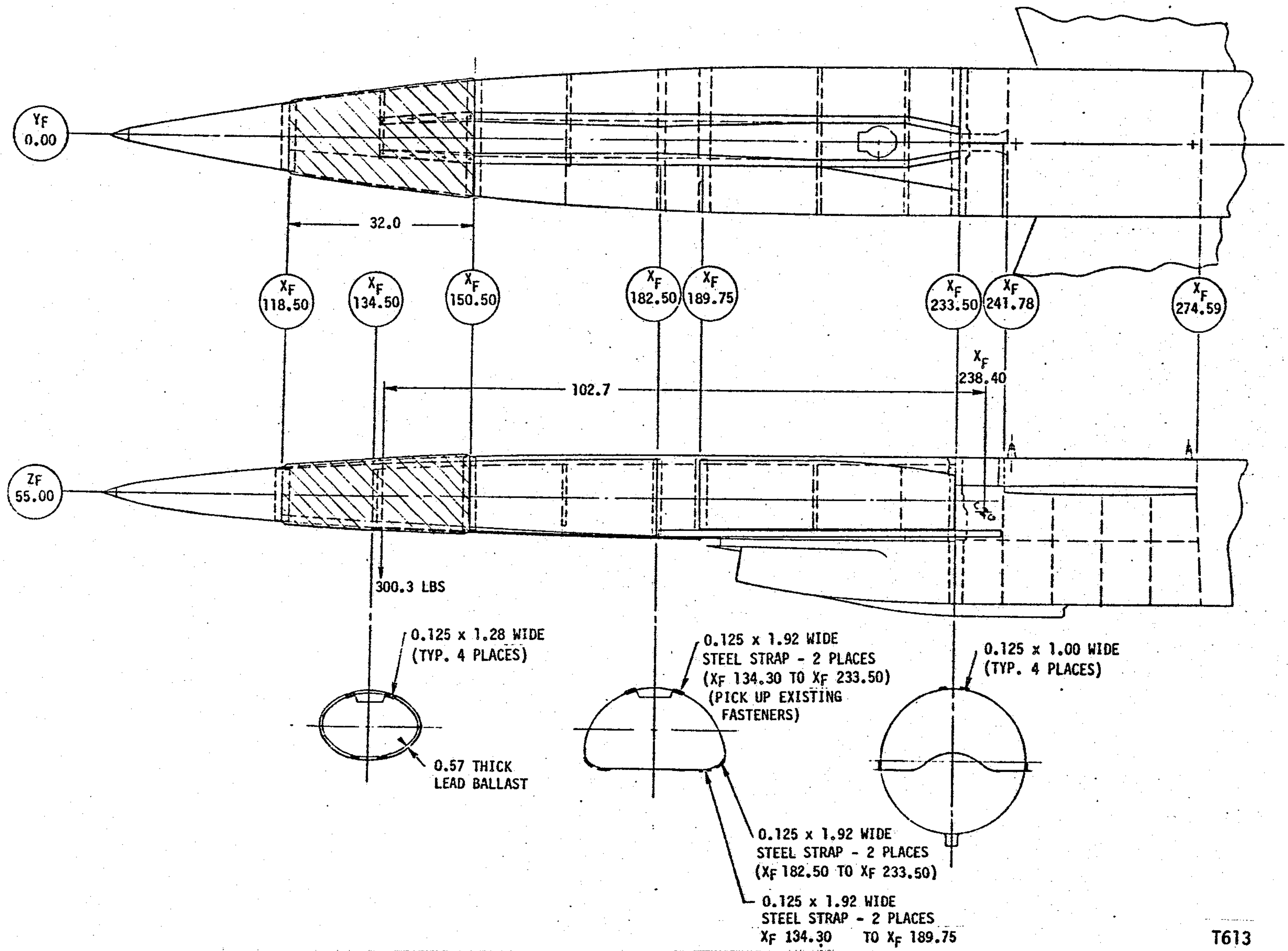


Figure 11-1. Forward Fuselage External Strap Beef-Up and Ballast Installation

as discussed in Section 2.0. Of the two alternatives, dropping ballast or moving the forward fitting forward, the latter seems most attractive if it can be done without requiring major structural modification.

The approach which has been chosen is illustrated by Figure 11-2. The existing parachute fittings are at stations 245 and 273. The main parachute deployment forces for the target are taken primarily by the forward fitting. The concept proposed for the research configuration also uses the fitting at station 245 to take the large deployment loads. After the initial deployment shock, and after the vehicle attains stabilized descent, the explosive bolt is detonated shifting the forward attach point to station 233. This forms a parachute bridle which encompasses the cg producing a level vehicle attitude for mid-air pickup.

Detailed development work will be required to insure the success of this concept however, based upon this initial evaluation, the concept appears to be feasible. There is adequate strength in the fitting and backup structure at station 245 since they are already designed for these conditions. At station 233 a new fitting must be incorporated however, since this is a major bulkhead and the loads will not be large, a major modification is not expected. The new bridle between stations 233 and 273 must be developed including the apex fitting and its explosive bolt attachment and electrical wiring.

11.2 WING

The outer wing panels are of full depth sandwich honeycomb construction. The skins or facings are fabricated from graphite/epoxy advanced composite material. The skins are adhesive bonded to an HFT glass reinforced phenolic honeycomb core with 1/8 inch cell size and four-pound density. At the more heavily loaded local area near the leading edge root a 5.5 pound density core is required. Upper and lower skin are fabricated in one piece from wing tip to wing tip. The upper and lower wing halves are joined at the wing reference plane (WRP) by bonding the two machined faces of the core with METLBOND 1113. Leading and trailing edges are closed with plies of fiberglass or graphite fabric tape.

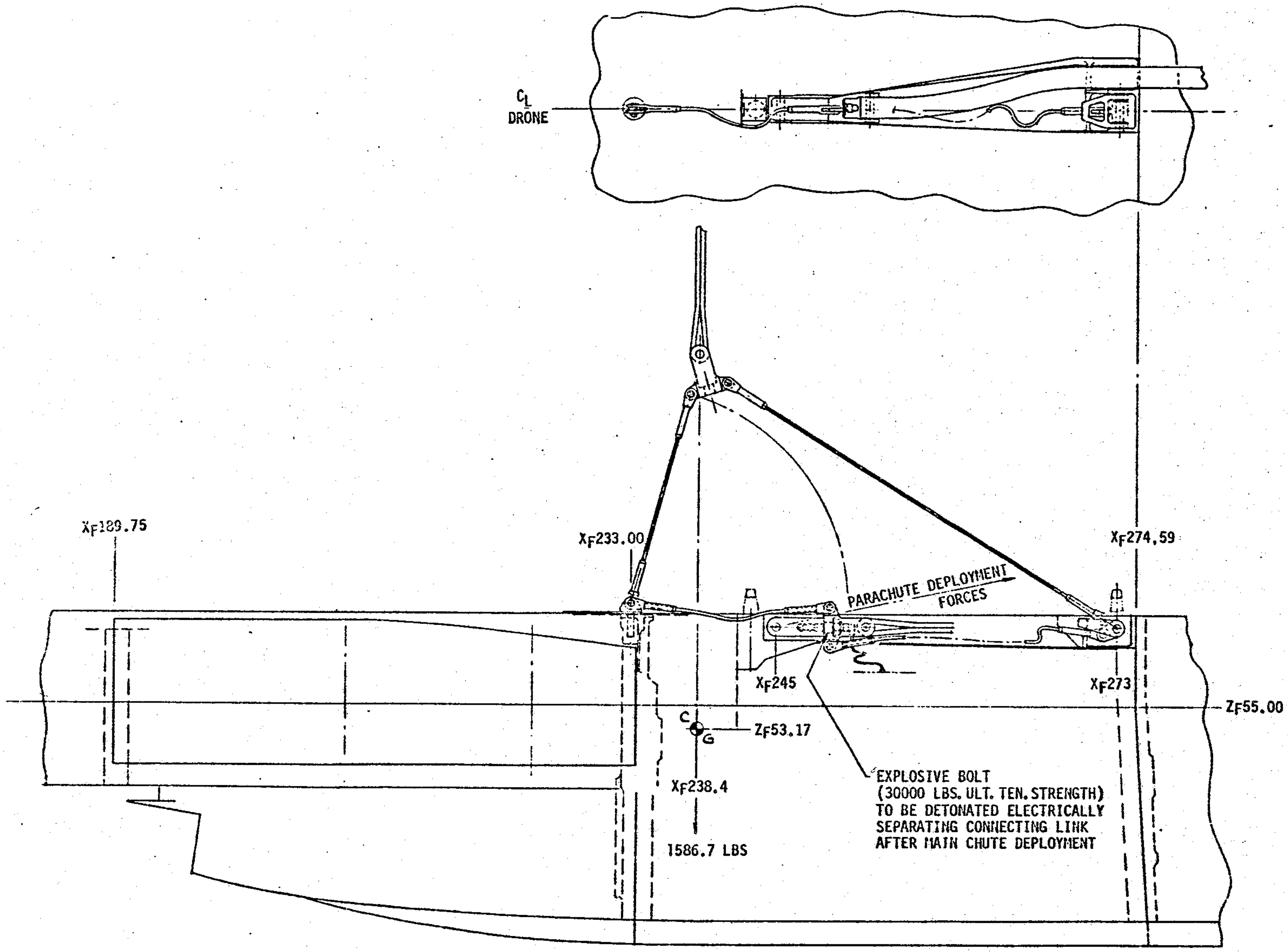


Figure 11-2. Riser Configuration

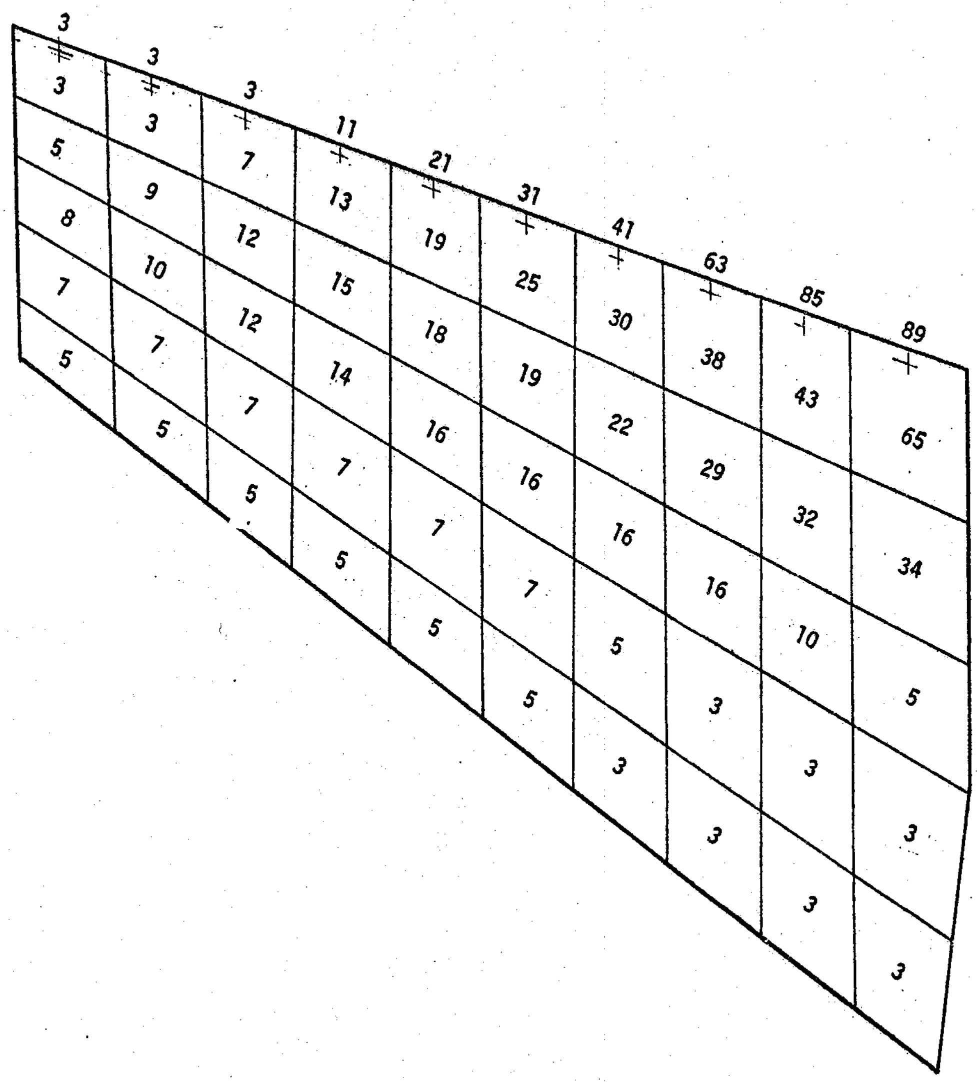


Figure 11-3. Wing Upper Surface Ply Thickness

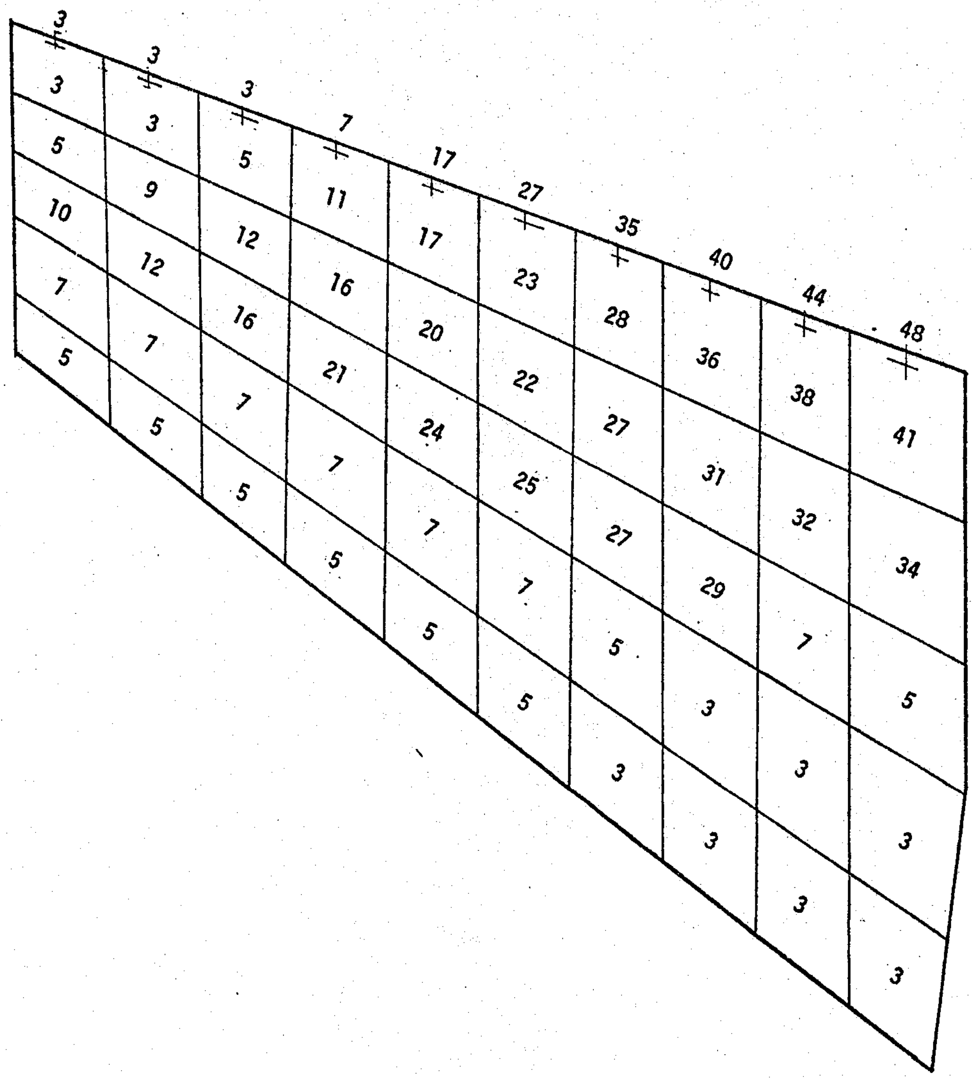


Figure 11-4. Wing Lower Surface Ply Thickness

The skin layup is discussed in the analysis Section 8.3.2 and shown in Figure 8-40 of that section. During a detail wing design effort it may be to advantage to re-orient the plies slightly for ease of manufacture. Figures 11-3 and 11-4 show total ply thickness at the various locations. Ply thickness contour lines are shown in Figures 11-5 and 11-6. Wing preliminary design details are shown on Figure 11-7.

The wing center section consists of the graphite/epoxy center carry-through structure and a machined aluminum fuel tank cover. The machined aluminum piece serves both as a fuel tank cover and as a contoured rest for the composite wing center section. Graphite root ribs and fore and aft closures complete the graphite center wing structure. Five bolts per side are used for attaching the wing to the fuselage. Four of the bolts join the wing and aluminum pieces to the fuselage, the fifth passes only through the aluminum piece.

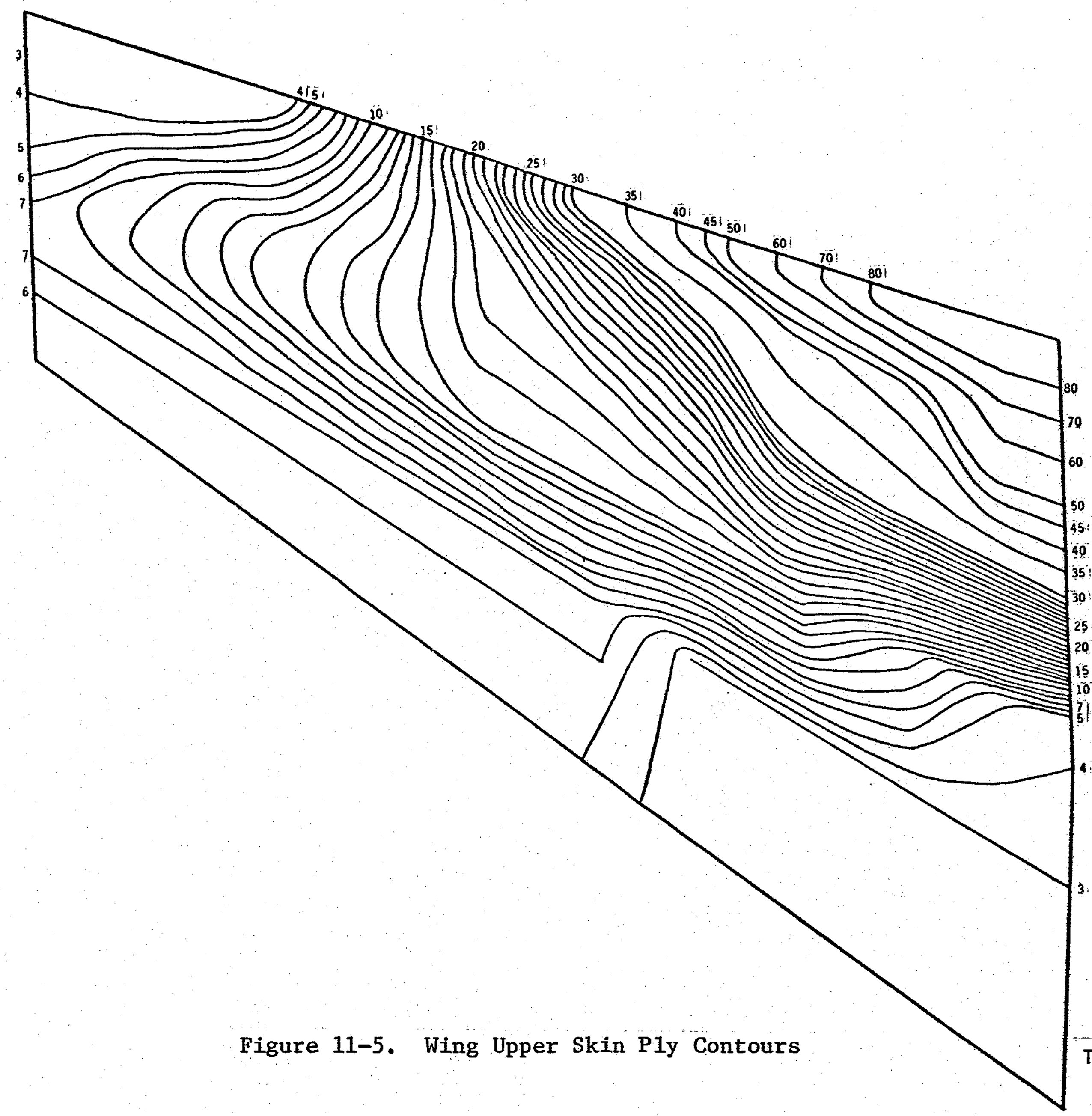


Figure 11-5. Wing Upper Skin Ply Contours

T615

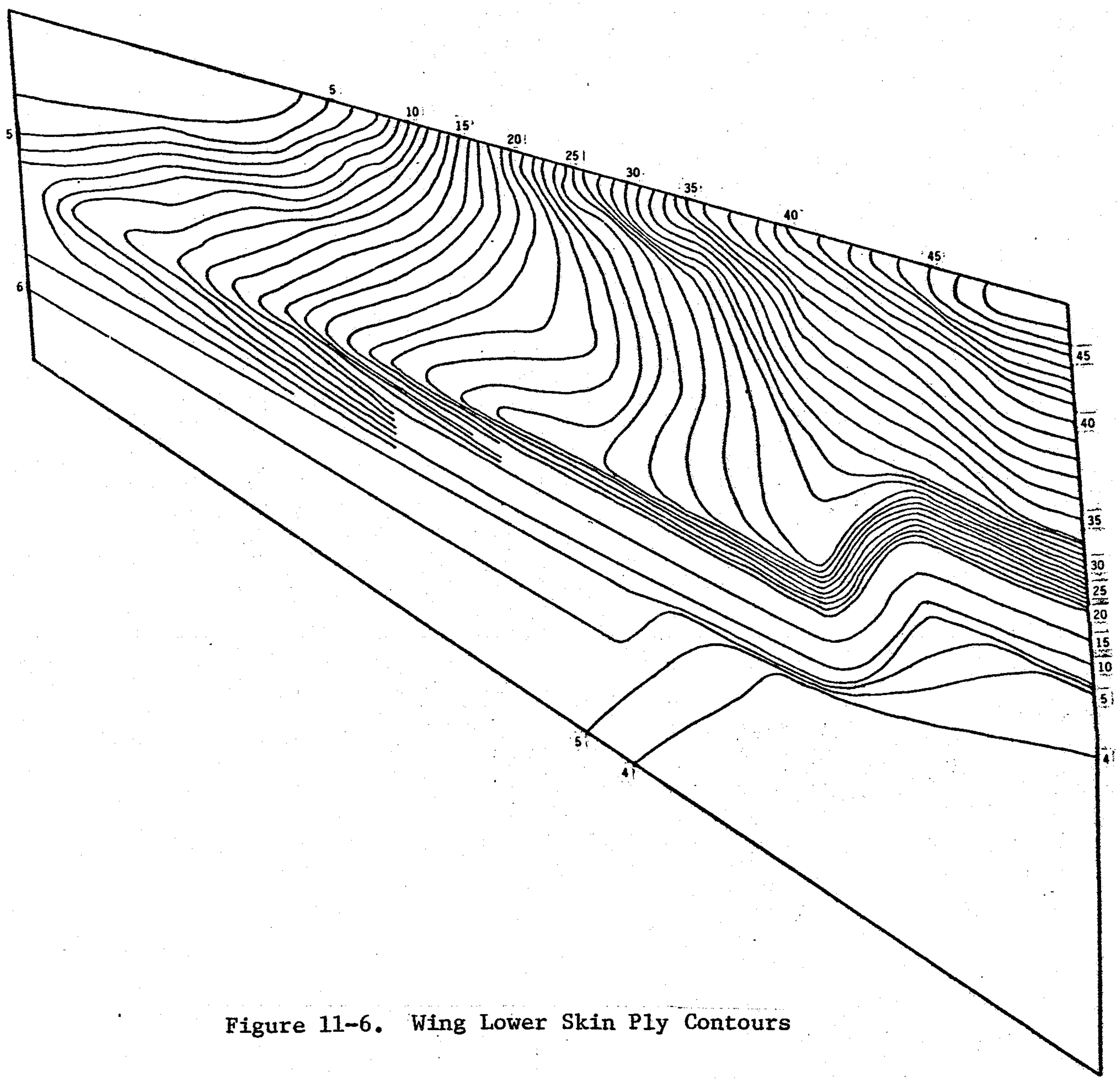


Figure 11-6. Wing Lower Skin Ply Contours

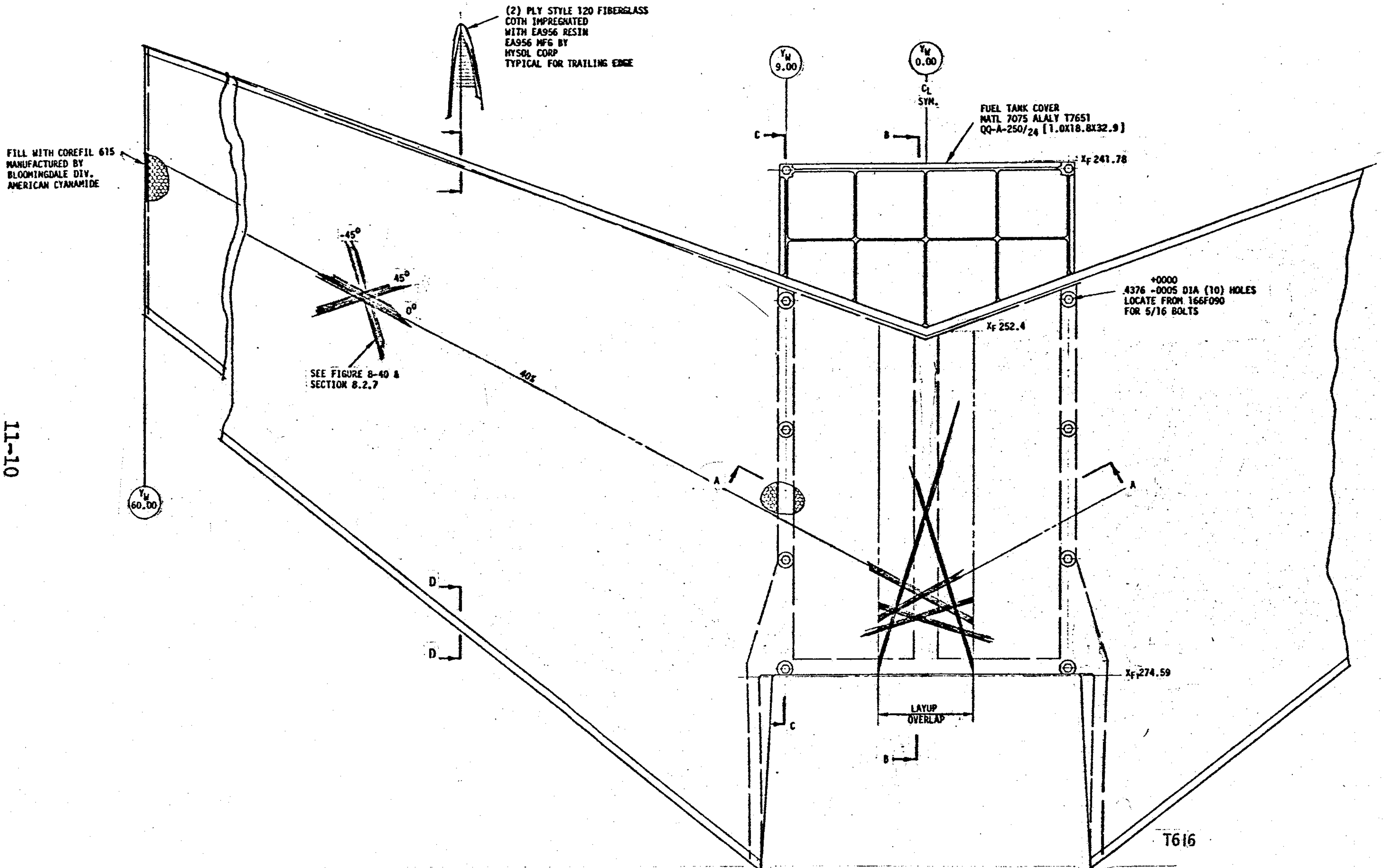


Figure 11-7. Preliminary Design of Forward Swept Research Wing for BQM-34F
(Sheet 1 of 2)

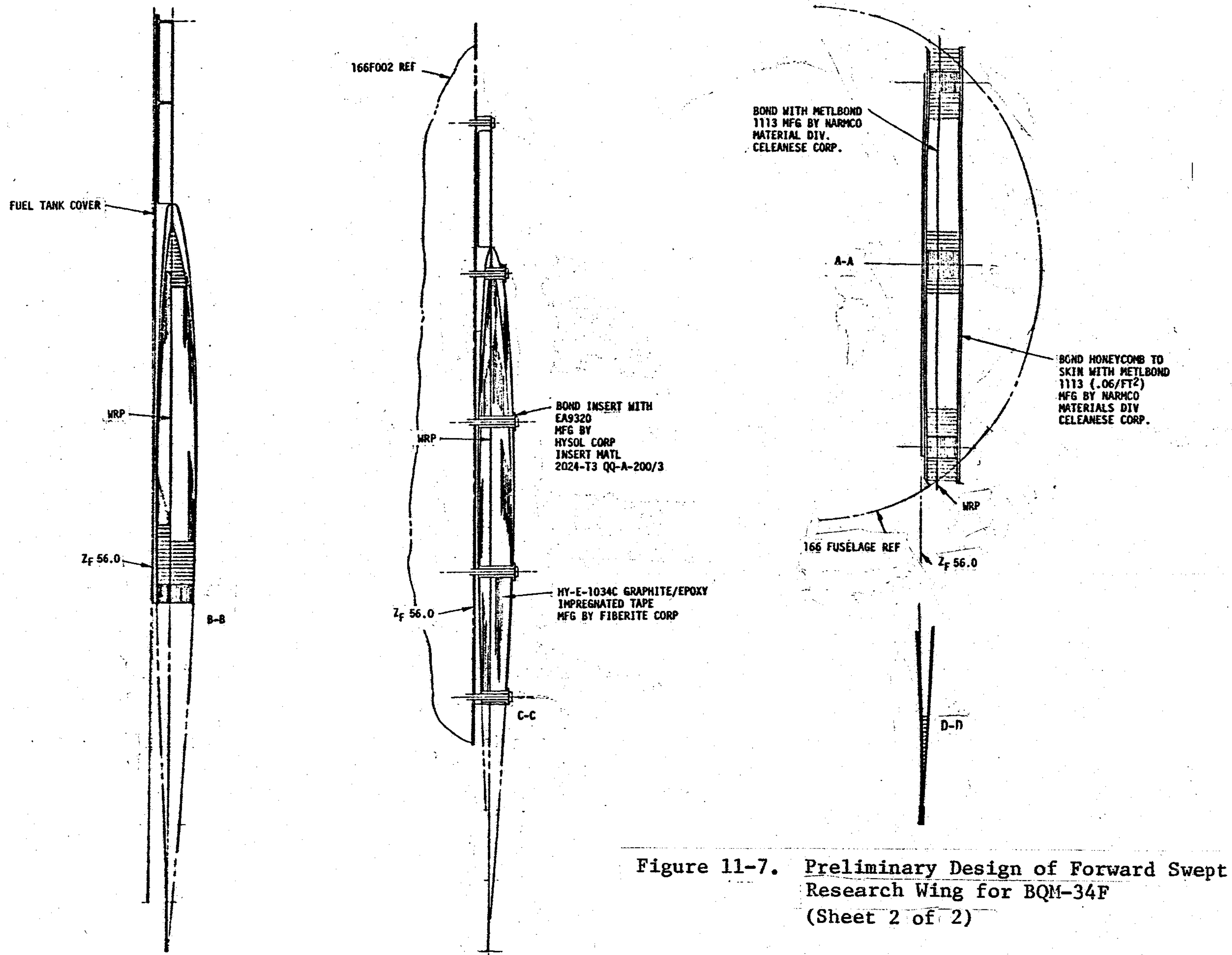


Figure 11-7. Preliminary Design of Forward Swept Research Wing for BQM-34F (Sheet 2 of 2)

12.0 WEIGHT & BALANCE

The total weight of the point design wing is 75.25 pounds. The distribution of the weight is 38.51 pounds for the outboard wing and 36.74 pounds for the center section. A weight breakdown for the wing is presented in Table 12.1 along with the unit weights of each component. These weights were calculated based on design layouts and stress data presented in section 10.2, not on the computer calculated weight.

The fuselage weight penalty of 22.49 pounds is attributed to steel staps on the outside forward fuselage for beef-up due to ballast weight of 297.60 pounds distributed forward and aft of body station 135.7.

The weight penalty assigned to the recovery system redesign of the forward recovery attach points is estimated to be 4.5 pounds.

The summary weight statement for the NASA swept forward wing is presented in Table 12.2.

The center of gravity travel, based upon preliminary data is presented in Figure 2-7. The final data did not alter the curve significantly as to require a new analysis. The major change from the data presented alleviates the requirement for dropable ballast.

TABLE 12-1
WEIGHT BREAKDOWN

OUTBOARD WING		
UPPER SKINS (.057 #(in^3)		12.87
LOWER SKINS (.057 #/in^3)		12.62
ADHESIVE (.07 #/ft^2)		4.31
CORE (4.25 #/ft^2)		6.32
SPAR (.057 #/in^3)		0.09
LEADING & TRAILING EDGES (.065 #/in^3)		0.66
PAINT (.042 #/ft^2)		1.64
	TOTAL	38.51
CENTER SECTION		
UPPER SKIN (.057 #/in^3)		4.94
LOWER SKIN (.057 #/in^3)		3.43
ADHESIVE (.07 #/ft^2)		0.65
CORE (4,5 #/ft^2)		1.73
SPAR (.057 #/in^3)		2.82
RIBS (.057 #/in^3)		7.79
PLATE (.101 #/in^3)		13.62
ATTACHMENT HARDWARE		1.50
PAINT (.042 #/ft^1)		0.26
	TOTAL	36.74
TOTAL WING		75.25 lbs.

TABLE 12-2

NASA SWEPT FWD WING - SUMMARY WEIGHT STATEMENT (1)

		(POUNDS)
AERO SURFACE GROUP		126.95
WING	75.25	
TAIL - VERTICAL	31.73	
TAIL - HORIZONTAL	19.97	
BODY GROUP (2)		260.10
TAKE-OFF & RECOVERY GROUP (3)		175.60
PROPULSION GROUP		479.30
POWER GENERATING GROUP		132.40
ORIENTATION CONTROL GROUP		35.90
GUIDANCE GROUP		43.50
ELECTRONICS GROUP (4)		122.90
ENVIRONMENTAL PROTECTION GROUP		35.90
MISC.		2.10
BALLAST @ F.S. = 135.7		297.60
WEIGHT EMPTY		1712.25
UNUSABLE FUEL (MAIN & AUX)		4.70
LUBRICANT - USABLE		9.30
- UNUSABLE		2.30
REFRIGERANT		8.30
AUX. FUEL TANK		16.10
ZERO FUEL WEIGHT		1752.95
FUEL		333.00
MAIN	263.00	
AUX.	70.00	
GROSS WEIGHT		2085.95

(1) BASELINE REFERENCE: TRA REPORT 16644-33, "ACTUAL WEIGHT REPORT FOR BQM-34F SUPERSONIC AERIAL TARGET SERIAL NO. AF 72-1566, SLIP 99" DATED 16 APRIL 1974.

(2) INCLUDES EXTERNAL STRAPS OF 22.49 POUNDS.

(3) INCLUDES WEIGHT PENALTY OF 4.5 POUNDS FOR FORWARD RECOVERY SUSPENSION SYSTEM.

(4) MAJOR PORTION OF THIS GROUP IS MISSION ORIENTATED AND MAY BE ALLOCATED FOR PAYLOAD WEIGHT & VOLUME.

13.0 REFERENCES

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1.2 Anon., Design Analysis of a Supercritical Wing For Test With a BQM-34F Drone Aircraft, TRA Report 16669-11, 10 April 1975 (Confidential).

1.3 Murrow, H.N. and C.V. Eckstrom, Drones for Aerodynamic and Structural Testing (DAST) - A Status Report, Presented at AIAA Aircraft Systems and Technology Conference, Los Angeles, CA, August 21-23, 1978.

1.4 Krone, Norris J., Divergence Elimination With Advanced Composites, AIAA Paper No. 75-1009, 1975.

1.5 Anon., Technical Proposal for the Study of Feasibility Aspects of Flight Testing an Aeroelastically Tailored Forward Swept Research Wing On a BQM-34F Vehicle, TRA Report 16671-1, 25 September 1978.

2.1 Huffman, J.K. and C.H. Fox Jr., Subsonic Longitudinal and Lateral-Directional Static Aerodynamic Characteristics For a Close-Coupled Wing-Canard Model in Both Swept Back and Swept Forward Configurations, NASA TM 74092, 1978.

2.2 McGhee, Robert J. and William D. Beasley, Low-Speed Wind Tunnel Results For A Modified 13-Percent Thick Airfoil, NASA TM X-74018, May 1977.

4.1 McCunney, S.J., Propulsion System Report for BQM-34F Supersonic Aerial Target, TRA Report 16603-10, 15 February 1974.

4.2 Schemershy, R.T., Development of an Empirically Based Computer Program to Predict The Aerodynamic Characteristics of Aircraft, AFFDL-TR-73-144, October 1973.

5.1 Douglas Aircraft Company, Inc. USAF Stability and Control Handbook, Contract AF33(616)-6480, October 1960.

5.2 Huffman, Jarrett K., and Fox, Charles H., Jr., Subsonic Longitudinal and Lateral-Directional Static Aerodynamic Characteristics for a Model With Swept Back and Swept Forward Wings. NASA TM-74093, 1978.

5.3 Polhamus, Edward C., and Sleeman, William C., Jr., The Rolling Moment Due to Sideslip of Swept Wings at Subsonic and Transonic Speeds. NASA TN D-209, 1960

5.4 Boyden, Richmond P, Subsonic Roll Damping of a Model With Swept-Back and Swept-Forward Wings, NASA TM 78677, 1978

7.1 "Structural Loads Report for BQM-34F Supersonic Aerial Target" TRA Report No. 16642-22, 28 August 73.

8.1 Markowitz, Joel and Gabriel Isakson, FASTOP-3, A Strength, Deflection and Flutter Optimization Program for Metallic and Composite Structures, AFFDL-TR-78-50, May 1978.

8.2 Advanced Composites Design Guide, Volume IV Materials, Third Edition, Los Angeles Division of North American Rockwell International Corp., 1977.

8.3 Metallic Materials and Elements for Aerospace Vehicle Structures, Volumes I and II, MIL-HDBK-5C, 15 September 1976.

8.4 Mechanical Properties of Hexcel Honeycomb Material ISB120, Hexcel 1978 Revision.

10.1 Structural Sandwich Composites, MIL-HD-BK-23A, December 1968.

10.2 TRA Report 16642-19 Fuselage Structural Analysis Report for BQM-34E Supersonic Aerial Target, Volume I, 21 February 1973.

APPENDIX A

NASA STATEMENT OF WORK

STATEMENT OF WORK

STUDY OF THE FEASIBILITY ASPECTS OF FLIGHT TESTING AN AEROELASTICALLY TAILORED FORWARD SWEPT RESEARCH WING ON A BQM-34F DRONE VEHICLE

1-12-2720.0142
EXHIBIT A

JULY 27, 1978

NASA — LANGLEY RESEARCH CENTER

HAMPTON, VA
23665

27 JULY 1978

TECHNICAL STATEMENT OF WORK
FOR
STUDY OF THE FEASIBILITY ASPECTS OF FLIGHT TESTING AN AEROELASTICALLY TAILORED FORWARD SWEPT RESEARCH WING ON A BQM-34F DRONE VEHICLE

1.0 PURPOSE AND SCOPE

1.1 Purpose - The purpose of this Statement of Work is to identify and define the engineering and technical support work required for study of the feasibility aspects and preliminary design of an Aeroelastically Tailored Research Wing for tests on a NASA Model BQM-34F RPRV.

1.2 Scope - This program is limited to the effort required to accomplish analyses for the preliminary design of a wing suitable for flight testing on a NASA BQM-34F Drone Vehicle. Fabrication, testing, target modifications, flight control system, aerospace ground equipment (AGE) and launch interfaces are not included in this effort. Data on documentation submittals will be in contractor format similar to that submitted for the supercritical wing study accomplished for NASA under Contract No. NAS1-13541.

1.3 Background - NASA has an established program utilizing modified BQM-34F vehicles as test beds for flight investigations on research wings. The program is called "DAST" for Drones for Aerodynamic and Structural Testing. An early feasibility study was conducted under Contract (NAS1-11758) which yielded aerodynamic performance information for several candidate wing planforms as well as wing construction and integration aspects. Later a research wing configuration was selected for detailed design which was accomplished under Contract NAS1-13541. This wing with aspect ratio 6.8 was subsequently fabricated in-house by NASA and will be used to study loads and an application of active controls for flutter suppression. A second research wing of aspect ratio 10.3 is presently being designed under Contract NAS1-14665 for flight test on a Firebee II vehicle. The design involves incorporation of multiple active controls for gust and maneuver load alleviation and flutter suppression. Of particular interest in this design effort is the development of an integrated design technique incorporating an iterative loop which allows the structural design to take full advantage of the benefits provided by the active controls. NASA is pursuing studies concerning potential applications of the use of anisotropic laminates of advanced composite materials for tailoring the aeroelastic characteristics of structures. This work includes analytical studies, wind tunnel tests and flight test validation experiments. More recently significant renewed interest has been shown in the unconventional swept-forward wing. Significant performance benefits are indicated, especially if the major structural problem of aeroelastic divergence can be solved without addition of weight such that the potential performance benefit would be eliminated. Research investigations will include study of the use of advanced composites and/or active controls to avoid aeroelastic divergence. It is believed that DAST-type flight tests would provide early research data at relatively low cost and with no human risk involved.

1.4 Objective - The objective of the present work effort is to establish a feasible preliminary design of a swept forward wing of moderate aspect ratio with sufficient performance and stability and control analysis to assure compatibility with the existing NASA BQM-34E/F Drone system. The wing will be used to study aerodynamic and structural interactions (aeroelastic effects), and to measure flight loads, primarily in the transonic speed regime.

2.0 CONDITIONS

2.1 Design Guidelines

2.1.1 The wing shallbe designed for a cruise Mach number of 0.9 at 30,000 ft. altitude and will have approximately the following geometric characteristics.

Reference Wing Area, Sq. Ft.	25 to 36
Airfoil	Supercritical
Root Airfoil Thickness Ratio	Approx. .05
Tip Airfoil Thickness Ratio	Approx. .05
Wing Aspect Ratio	4 to 7
Span, Ft.	11 to 17
Leading Edge Sweep Angle, Deg	-20 to -35
Twist, Deg	TBD
Taper Ratio	0.40

An optional close coupled canard ahving approximately the following characteristics shall be considered in this study:

Reference Exposed Canard Area, Sq. Ft.	8
Exposed Canard Aspect Ratio	4

Canard Thickness Ratio	TBD
Leading Edge Sweep Angle, Deg.	-30
Taper Ratio	0.20
Twist, Deg	0

2.1.2 The wing shall be designed to provide satisfactory static aeroelastic and flutter characteristics throughout the flight envelope with a margin of 15 percent on speed.

2.1.3 The wing shall be designed to be mounted on the BQM-34E/F aircraft using the same carry through area as the standard wing.

2.1.4 Load factors and safety factors shall be applied as follows: Symmetrical maneuver load factor limits shall be approximately +6 and -3 g's. The ultimate factor of safety shall be 1.50.

2.1.5 A vehicle weight of approximately 2200 lbs. (excluding wing) should be used for this study.

2.1.6 Work shall be performed under procedures appropriate for feasibility studies. Drawings shall be checked "in group" and released for record purposed only.

2.1.7 The wing size shall be as large as practical consistent with the constraints of vehicle weight, controllability and flight capabilities at Mach .90 at 30,000 feet.

2.2 Tasks

The Contractor shall:

2.2.1 Prepare preliminary design layouts to establish practical ranges of wing aspect ratio, sweep, thickness, and area that are compatible with the existing NASA BQM-34F vehicle modified for DAST.

2.2.2 Conduct detailed drag build-up and sufficient aerodynamic analysis appropriate for supercritical wing including operational envelopes to provide inputs for general performance and research capabilities.

2.2.3 Prepare structural layouts and conduct loads, weights stress static aeroelastic and flutter analyses in sufficient depth to establish approximate wing structure necessary to comply with Paragraph 2.1.

2.2.4 Provide dimensional drawings defining the structural concept including sizing of the primary structural members. Volumes avavlable for control surfaces, actuators, and research instrumentation, shall be identified.

2.2.5 Estimate stability characteristics including estimates for aeroelastic effects with the research wing in sufficient depth to assure compatibility with the NASA DAST vehicle control system.

2.2.6 Use existing BQM-34F data and data available from NASA to establish design criteria of the modified vehicle.

2.2.7 Establish wing placement and allowable C.G. travel based on existing or estimated data.

2.2.8 Estimate flight performance and maneuvering capabilities of the modified vehicle.

2.2.9 Establish preliminary wing stiffness requirements to provide satisfactory static aeroelastic characteristics.

2.2.10 Develop preliminary structural design loads.

2.2.11 Prepare preliminary layouts for wing and required BQM-34F structural modifications. Layouts shall identify structural concepts and include material type, thickness and ply orientation as applicable.

2.2.12 Conduct preliminary wing stress analysis.

2.2.13 Conduct preliminary wing flutter analysis.

2.2.14 Prepare dimensional layouts of wing, control surface and wing fuselage attachment.

APPENDIX B
MONTHLY PROGRESS REPORTS

TITLE: Study of the Feasibility Aspects of Flight Testing an Aeroelastically Tailored Forward Swept Research Wing on a BQM-34F Drone Vehicle

SUBJECT: Technical Progress Report for 13 November to 13 December 1978

Initial planning, study task assignments and work schedule were accomplished with the principle engineers assigned to this program.

A geometric and dimensional matrix with 27 wings and three forward sweep angles, three aspect ratios and three wing areas was developed. The locus of the 0.25 m.a.c. position for the subject wing matrix was also determined.

Monthly Technical Letter Progress Report - Swept Forward Wing Feasibility Study - NASA Contract NASI-15624

This report describes the progress of the program for December 1978 and is the second monthly report as required by the above contract. (Sales Order 15066, Part III, Item B).

The work in the technical areas described below was performed for the purpose of establishing feasible swept forward wing configurations and their locations on the BQM-34F drone.

AERODYNAMICS: A wing planform geometry parametric analysis was conducted to determine the locus of the quarter-point of the mean aerodynamic chord with wing position on the BQM-34F. Planform parameters selected were aspect ratios 4, 5 and 6 with leading edge sweep angles from -20 to -36 degrees and wing areas from 25 to 36 square feet. The planform areas were then utilized in a longitudinal stability parametric study combining wing, body, and horizontal tail contributions. This study provides a preliminary indication of the required center of gravity location for various wing positions for a fixed minimum stability margin of 15%. The above center of gravity data was passed to the mass properties group in order to determine ballast requirements.

MASS PROPERTIES: The wing weights for 27 wings were estimated by imperical formula. These 27 wings represent the number of possible wing combinations based on the ranges of aspect ratio, sweep and wing area to be considered in this feasibility study. This wing weight matrix is presently being combined with the required C.G. data from aerodynamics (stability and control), for various wing positions, to determine the ballast required matrix. The ballast requirements will be then passed to the stress group and structural dynamics group for loads and structural evaluation as to the adequacy of the existing airframe to support the revised mass distribution.

STRESS ANALYSIS: The approach for stress analysis which will be followed is summarized as follows:

(1) Determine preliminary fuselage reactions for complete range of wing configurations under study.

(2) Evaluate results of (1) for approximate allowable reactions.

(3) Evaluate structural upper limit for ballast in forward fuselage and determine feasibility of fuselage beef-up if required.

(4) Perform Asop-3 and Fastop computerized analysis of a selected wing configuration.

STRUCTURAL DYNAMICS: Initiated structural design criteria and loads evaluation for wing positions and configurations considered in this study. Established contact with AFFDL/FBRB (T. Harris, 53297) to request an allotment of AFFDL computer time (Cybernet Cyber-175) in the use of Fastop-3. This computer program will be utilized and evaluated in the design analysis (Stress, Flutter and Static Aeroelastic) of the swept forward wing program. This request has been granted up to a budget of $2000. See attached TRA letter.

DESIGN: Preliminary structural layout has been prepared to access the feasibility of fuselage attachment of a -20° swept forward wing, 25 square feet, span 10 feet, aspect ratio 4.

Work to be performed in next reporting period (January 1979):

(1) Continue ballast determination for wing configuration matrix.

(2) Determine wing attachment loads. Determine fuselage loads due to ballast requirements.

(3) Evaluate Fastop-3

(4) Evaluate recently received report AFFDL-TR-78-116, "Aeroelastic Stability and Performance Characteristics of Aircraft with Advanced Composite Swept Forward Wing Structures".

(5) Continue design layouts for wing attachment

(6) Determine allowable structural ballast installation

POTENTIAL PROBLEMS: None during the second reporting period.

TELEDYNE
RYAN AERONAUTICAL
2701 HARBOR DRIVE
SAN DIEGO, CALIFORNIA 92138
(714) 291-7311 TWX (910) 335-1180

13 December 1978

Air Force Flight Dynamics Labor-tory
Wright Patterson Air Force Base
Ohio 45433

Attention: AFFDL/FBRB (T. Harris, 53297)

Dear Terry,

Teledyne Ryan is currently under contract to NASA Langley, Contract No. NASI-15624, to study the feasibility of adopting a swept forward composite wing design to the BQM-34F target drone. The wing will be designed for a cruise Mach number of 0.9 at 30,000 feet and have approximately the following characteristics:

Reference Wing Area, Sq. Ft.	25 to 36
Airfoil	Supercritical
t/c	.05
Aspect Ratio	4 to 7
Span Ft.	11 to 17
Leading Edge Sweep, Deg.	-20 to -35
Taper Ratio	0.4

The requirements for aeroelastic tailoring to provide satisfactory static aeroelastic and flutter characteristics make FASTOP-3 an ideal tool for use in this study. The Teledyne Ryan Aeronautical Co., (TRA) is currently using an IBM version of both FASTOP-1 and ASOP-3, however, we have been unable to exercise the FOP portion of FASTOP-1 to a satisfactory conclusion.

From our telephone conversation, it is understood that a limited amount of computer time, if any, could be alloted to TRA for CYBERNET CYBER-175. To make effective use of alloted time we co ld debug our model on our in-house ASOP-3 program. This would also be useful to help you evaluate FASTOP-3.

Request that TRA be allotted approximately 0.5 to 1.0 hours of CYBER-175 CPU time for our swept forward composite wing study program.

Very truly yours,

Grover C. Childers
Group Engineer
Structural Dynamics

Report No. TRA 16663-5B
Dated 7 February 1979

MONTHLY TECHNICAL LETTER PROGRESS REPORT - SWEPT FORWARD WING FEASIBILITY STUDY - NASA CONTRACT NASI-15624

This report describes the progress of the program for January 1979 and is the third monthly report as required by the above contract (Sales Order 15066, Part III, Item B).

AERODYNAMICS: A second iteration was performed in the longitudinal stability parametric study utilizing more refined wing aerodynamic center location data and reduced downwash at the horizontal tail. The wing a.c. location was based on lifting line theory and the downwash derivative ($\varepsilon\alpha$) reduced by 0.10. This was based on comparison of downwash characteristics calculated by an emperical method with trends indicated by test data for a forward swept wing wind tunnel model. In addition, the longitudinal static stability margin was reduced from 0.15 to 0.10. The combined effect of these corrections resulted in an allowable aft shift in center of gravity location of approximately five (5) inches for all the wing planforms being considered.

MASS PROPERTIES: Revised ballast requirements for the ranges in wing sweep, aspect ratio and wing area were calculated versus wing positions on the fuselage. Ballast in amounts of 200 to 300 pounds, located at the nosecone bulkhead were required, with wing position being the most sensitive parameter. These large requirements for nose ballast raised concerns for the c.g. positions at air launch gross weight and at recovery weight. The requirement that the recovery c.g. fall between the existing parachute riser locations was the critical case and could not be met without jettisoning ballast at recovery. The amount of jettisonable ballast (up to 90 pounds) increases as the wing position moves forward and the forward sweep increases. The droppable ballast situation was coordinated with Don Gatlin at NASA DFRC (Edwards AFB, CA.) who in turn contacted LCOL. Kellock in the USAF Safety Office who saw no problem in dropping lead shot.

STRESS ANALYSIS: Fuselage reactions for -20° swept forward 25 sq. ft. wing are being evaluated. Fuselage structural reinforcement feasibility and requirements are being evaluated for up to 300 pounds of ballast.

STRUCTURAL DYNAMICS: Determined wing shear, moment and torque curves for the purpose of evaluating wing root reactions at the wing/fuselage interface. Performed further coordination with TRA computing facility and AFFDL concerning use of AFFDL computer time in performing FASTOP-3 analysis (see attached letter).

DESIGN: Proceeded with evaluation of design layout of -20° swept forward wing, 25 sq. ft., aspect ratio 4 in two positions on the fuselage. The most aft location with the leading edge intersecting the fuselage centerline at X_F260.4 which requires 175 pounds total ballast (0 pounds jettisonable). The most forward wing location with a leading edge intersection with the fuselage centerline at X_F 252.0 which requires 280 pounds total ballast (90 pounds jettisonable). The most feasible location for the wing center box is its existing location, picking up the existing ten fuselage attachments (five per side). The wing semi-spans then will be located in relation to the center box considering ballast requirements (most aft is favorable) and structural requirements (most forward favorable).

The possible wing configurations within practical ballast requirements has been narrowed down to one, -20° sweep, 25 sq. ft. area, aspect ratio 4. Two wing positions on the fuselage are currently under consideration with the most forward one appearing to be the most favorable selection.

Work to be performed in the next reporting period (February 1979):

1) Select wing position on fuselage
2) Determine wing panel point loads
3) Start aeroelastic tailoring analysis
4) Continue fuselage beef-up requirements analysis
5) Detail design layout of wing on fuselage in the selected position

DEPARTMENT OF THE AIR FORCE
AIR FORCE FLIGHT DYNAMICS LABORATORY
WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433

REPLY TO ATTN OF: FBRC (T. M. Harris, 53297) 9 January 1979

SUBJECT: CYBERNET NOS/BATCH Resources Available for FASTOP-3

TO: Teledyne Ryan Aeronautical
Attn: Mr. Jack C. Grams
Engr. Dept 340-4A
2701 Harbor Drive
San Diego, CA 92112

1. In response to your letter of 13 December 1978 requesting an allocation of CDC CYBERNET resources for the application of FASTOP-3 to a forward swept BQM-34F wing, Control Data Corporation is setting up an account for you. At this time, your account limit is $2000 worth of CYBERNET computer time. In return, AFFDL/FBR would like a description of your results, computer run times and any problems encountered. In addition, we would be happy to inspect your input listings for errors. Please contact Mr. Jerry Wesbecher of Control Data Corporation (513-294-1751) for information on setting up your account and logging on the CYBERNET NOS/BATCH system.

2. The following information should be helpful in your effort to use FASTOP-3 on the CYBERNET system:

a. The SOP and FOP absolute binaries are now on magnetic tape. The last four pages of the attachment presents examples of using this tape.

b. FASTOP-3 requires intermediate data storage (SOP-to-FOP, SOP-to-SOP, etc.). Reservation of tapes at CDC for this storage can be arranged through Mr. Wesbecher.

c. You should use the NOS/BATCH priority P2 whenever possible. This priority gives overnight turnaround but is cheaper than other priorities. (9 cents per unit for P2 -vs- 15 cents per unit for P4).

d. The first run through SOP for the NOS/BATCH sample problem, the composite skin intermediate complexity wing, was accomplished while expending 443 units of CYBERNET resources. Under priority P2, this would cost 443 x $.09 = $40. With one hundred finite elements, this sample problem is relatively small. One may initially estimate that each pass of your models through SOP or FOP will cost $200. Thus, your $2000 allotment may give ten FASTOP-3 runs at priority P2. Of course, after the first few runs you will be better able to estimate the extent of the funding available.

e. We are sending you a set of CYBERNET manuals in a separate package. Together with information from your local CYBERNET installation, these manuals should enable you to use NOS/BATCH without major problems.

Dale E. Cooley

DALE E. COOLEY
Technical Manager
Aeroelastic Group
Analysis & Optimization Branch

Atch: Sample FASTOP-3 JCL

MONTHLY TECHNICAL LETTER PROGRESS REPORT - SWEPT FORWARD WING FEASIBILITY STUDY - NASA CONTRACT NAS1-15624

This report describes the progress of the program for February 1979 and is the fourth monthly report as required by the above contract (Sales Order 15066, Part III, Item B).

AERODYNAMICS: Longitudinal control effectiveness for the BQM-34F with the selected forward swept wing (-20^{o} sweep, 25 sq.ft., A.R. 4) was evaluated to insure that the control sensitivity (g's/δe does not exceed levels of approximately 8 to 10 for a reduced static stability margin of 10%. The resulting values were -2.2 and -7.5 g's/δe for altitudes of 30,000 feet and sea level, respectively. Estimated dihedral effect for the selected wing was compared with test results for a NASA wind tunnel model with forward sweep. This comparison confirms that the wing contribution to dihedral effect is negative, or in terms of rolling moment with sideslip c_{ℓ_β} is positive.

MASS PROPERTIES: Recalculated ballast required for selected wing and wing location (leading edge intersection with fuselage centerline at F.S. 252.4). The total ballast required is 257.40 pounds of which 94.4 pounds must be jettisonable to provide a proper recovery configuration if alternate means of solving the problem are not used. A preliminary group weight statement was made on the selected wing/ 34F configuration resulting in a vehicle gross weight of 2071.82 pounds. The subsequent horizontal center of gravity travel resulted in a stable flight vehicle through body attitudes of 0^{o} to $+38^{o}$.

STRESS ANALYSIS: Performed fuselage stress analysis that determined that the existing fuselage wing support frames are structurally adequate to support the wing providing that a relatively stiff wing root rib is utilized to distribute wing loads to the five fuselage support frames. Performed analysis of forward fuselage to determine configuration of exterior beef-up required to support added nose ballast. Prepared finite element model of wing and performed ASOP-3 debugging runs.

STRUCTURAL DYNAMICS: Performed fuselage loads analysis for the critical bending condition of main parachute deployment and added ballast of 257.4 pounds at F.S. 118. Performed box beam analysis of wing leading edge torque box to establish wing trial shear web location which is 40% wing chord to achieve a center of twist at the 31% chord. Established structural arrangement of wing for a first trial optimization process using ASOP-3 computer program. Determined wing loads for the high angle of attack condition at $N_z = 6.0$. Chordwise distribution was taken from theoretical supercritical wing data and spanwise distribution assumed elliptical. Also determined wing loads for the 2.0 g maneuver condition using a rectangular chordwise distribution.

DESIGN: Completed design layout of wing in selected fuselage location. Proposed ballast beef-up layout completed using four steel external straps. Design study underway to provide a parachute riser restraint during recovery to eliminate the need for jettisonable ballast.

Conducted program review with NASA representative Hal Murrow. Work to be performed in the next reporting period (March 1979):

1) Continue structural arrangement of wing using ASOP-3 and FASTOP-3 computer programs.
2) Continue fuselage ballast beef-up stress analysis.
3) Continue design study of riser restraint configuration to remove jettisonable ballast.
4) Coordinate with NASA Edwards on configuration of DAST drone equipment for possible ballast installation.

Dated 9 April 1979

Monthly Technical Letter Progress Report - Swept Forward Wing Feasibility Study - NASA Contract NAS1-15624

This report describes the progress of the program for March 1979 and is the fifth monthly report as required by the above contract (Sales Order 15066, Part III, Item B).

AERODYNAMICS:

In the previous month's (February) progress report, it was reported that the forward swept wing's contribution to C_{ℓ_β} is positive, or opposite to that of normally swept back wings. This effect was qualitatively evaluated utilizing the basic BQM-34F six degree of freedom simulation program. At all flight conditions evaluated, the differential elevon excursion required to execute turns and turn reversals was less for the forward swept wing than for the basic BQM-34F, indicating that the positive increment in C_{ℓ_β} may not have an adverse effect on vehicle operation in the research configuration. Static elasticized stability derivatives were evaluated for BQM-34F empennage contributions for a range of altitudes and Mach number. These derivatives can be added to the wing elastic derivatives, if significant, to obtain estimates of the stability characteristics of the total configuration.

MASS PROPERTIES:

No further work was performed during this period pending selection of wing structural and material configuration.

STRESS ANALYSIS:

Established three candidate wing designs for evaluation using ASOP-3 computer program. These are an all aluminum (baseline), all graphite and graphite forward section/Kevlar trailing section. Material thickness, ply orientation and structural weight are being evaluated at this time. Submitted contractor prepared FASTOP-3 structural optimization input for review by AFFDL in preparation for utilization of AFFDL supplied computer time for performing FASTOP-3 optimization computations. AFFDL approved of this contractors plan with the comment that our plan was the most complete and best they have seen so far in their FASTOP evaluation program. Computer runs (ASOP-3) have been made for wing twist restraint at five wing stations. Separate computer runs have been started which will evaluate wing stiffness for camber.

STRUCTURAL DYNAMICS:

Generated load set for -3g load factor as called for in the statement of work. Evaluated camber change for the all graphite wing optimized for strength and deflection constraints on ASOP-3 computer program. Results were that chordwise deflection increased 100%. Wing studies will continue on the three different material designs. A forth evaluation of incremental weight required to hold camber (chordwise deflection) within ± 10% on the all graphite wing will be conducted. For a specific design, camber changes can be handled by jig shape to obtain a specific camber at the design maneuver/cruise point.

DESIGN:

Visited NASA/Edwards Air Force Base 23 March 1979 to acertain volume available in DAST BQM-34F for ballast installation and also DAST/B-52 launch plane interface. Ballast will have to be installed externally since the internal nose area of the drone is not available for any additional installations. The purpose of viewing the B-52 pylon/drone interface was to ascertain whether the installation of a riser restraint would be possible in order to eliminate the need for jettisonable ballast. We will proceed with a proposed riser restraint design since there appears to be an adequate amount of room at the interface. Photographs along with weight and balance sheets were obtained which will be beneficial in proceeding with the swept forward wing/BQM-34F study.

Work to be performed in the Next Reporting Period (April 1979):

1. Complete ASOP-3 Aeroelastic tailoring analysis for the three candidate wings.
2. Update flight and mission performance estimates.
3. Submit chosen wing/material configuration to AFFDL for FASTOP-3 evaluation.
4. Start preparation of final drawings.
5. Start summary of results for final technical report.

APPENDIX C

FINAL FASTOP-3 STRUCTURAL ANALYSIS

APPENDIX D

FASTOP-3 FLUTTER ANALYSIS

APPENDIX E

FUSELAGE EQUIPMENT COMPARTMENT AREA

ORIGINAL DESIGN M = -219000 IN.LB. (ULT)
NEW DESIGN M = 70976 x 1.25 = -88720 IN. LB. (ULT)
ELEMENT 33 CRITICAL = 1858 PSI
MARGIN OF SAFETY > 2.00

$$I_{REQ.} = \frac{I_{DES} \times M_{NEW}}{M.S. \times M_{ORIG.}}$$

$$I_{REQ} = \frac{55.17 \times 88720}{2 \times 21900} = 111.75 \text{ IN}^4$$

$\Delta I = I_{REQ} - I_{DES}$

$\Delta I = 111.75 - 55.17$

$\Delta I = 56.58 \text{ IN}^4$

$A_U = \frac{4.67}{6.1} \times A_L = .765 A_L \text{ IN}^2$

A_U = Upper Strap
A_L = Lower Strap

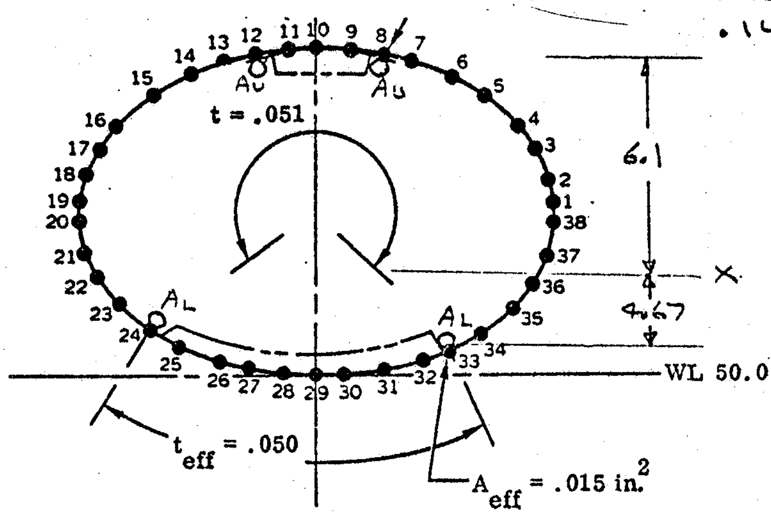
$\Delta I = A_U 6.1^2 + A_L 4.67^2$

$56.58 = 6.1^2 \times \frac{4.67}{6.1} A_L + A_L 4.67^2$

$A_L = 1.12 \text{ IN}^2$ } ALUMINUM ALLOY
$A_U = .86 \text{ IN}^2$ }

<u>STRAPS PER SIDE:</u> LOWER: $.56 \text{ IN}^2$ ALUMINUM
$.187 \text{ IN}^2$ STEEL

UPPER: $.43 \text{ IN}^2$ ALUMINUM
$.14 \text{ IN}^2$ STEEL



STATION 140.0

$I_X = 55.17 \text{ IN}^4$
$\bar{Y} = 5.699 \text{ IN.}$

$M_{ORIG.} = -112\,560$ IN. LB. (ULT)

$M_{NEW} = -239643 \times 1.25 = -299554$ IN. LB. (ULT)

STRESS = −5017 PSI (ULT) ELEMENT 47

M. S. = .45 $I_{ORIG} = 135.783$ IN^4

$$I_{REQ} = \frac{135.783 \times 299554}{1.35 \times 112560}$$

$I_{REQ} = 267.7$ IN^4

$\Delta I = 267.7 - 135.783$

$\Delta I = 131.9$ IN^4

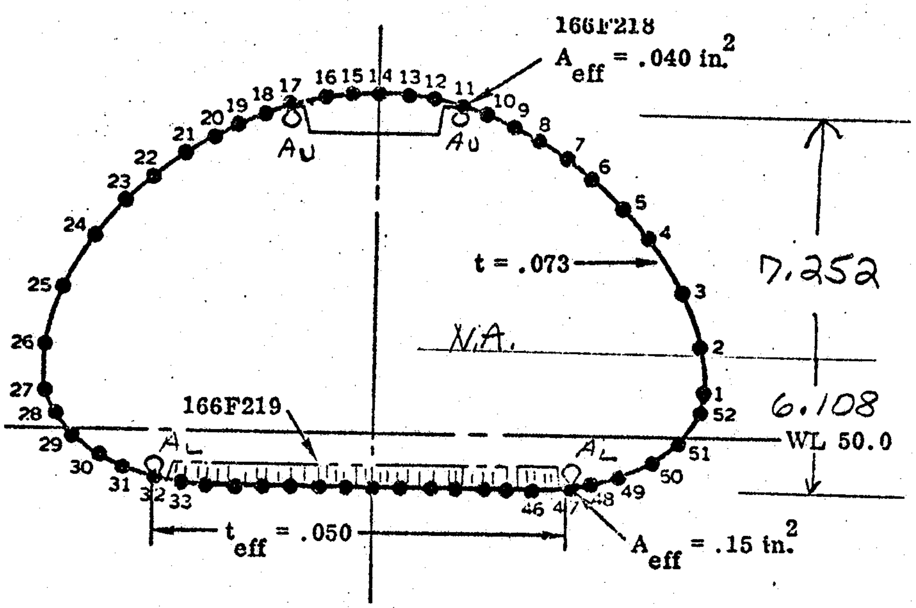
$$A_U = \frac{6.108}{7.252} A_L$$

$$131.9 = 7.252^2 \times \frac{6.108}{7.252} A_L + 6.108^2 A_L$$

$A_L = 1.616$ IN^2 $A_U = 1.36$ IN^2

A_L PER SIDE = .80 IN^2 ALUMINUM
.269 IN^2 STEEL

A_U PER SIDE = .68 IN^2 ALUMINUM
.226 IN^2 STEEL



STATION 180.0

$M_{ORIG} = -185320$ IN. LB. (ULT) $\quad I_{ORIG} = 144.72\ IN^4$

$M_{NEW} = -345663 \times 1.25 = -432079$ IN. LB (ULT)

CRITICAL STRESS = −4964 PSI (ULT) ELEM. 54

M.S. = .49

$$I_{REQ} = \frac{144.722 \times 432079}{1.4 \times 185320} = 241\ IN^4$$

$$\Delta I = 241 - 144.72 = 96.3\ IN^4$$

$$A_U = \frac{3.87}{7.11} A_L$$

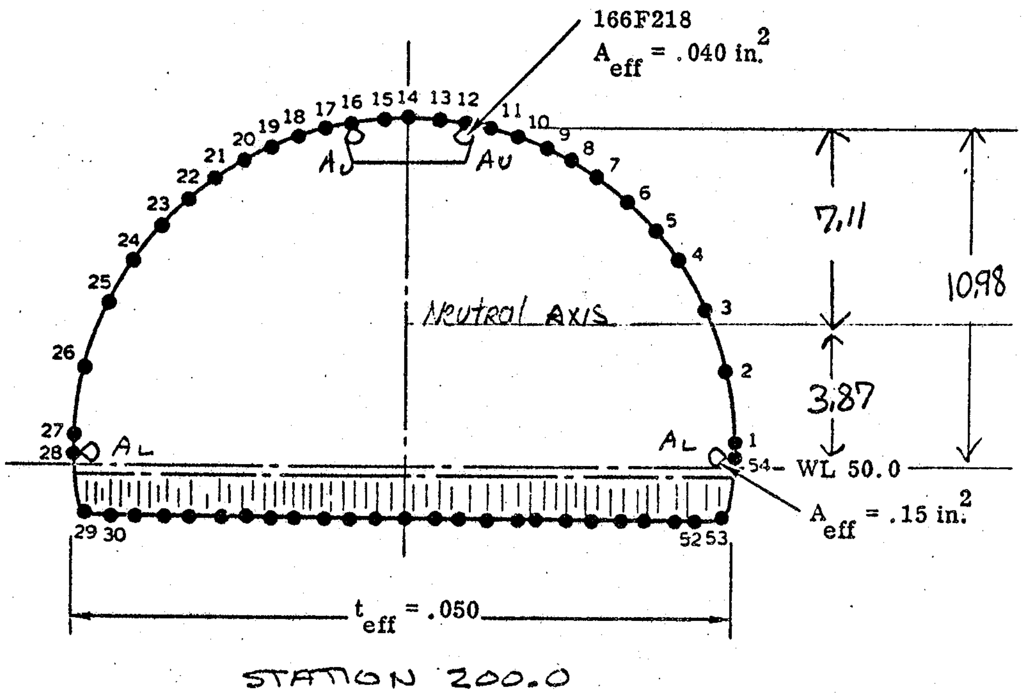
$$96.3 = 7.11^2 \times \frac{3.87}{7.11} A_L + 3.87^2 A_L$$

$A_L = 2.26\ IN^2 \quad A_U = 1.23\ IN^2$

STRAPS PER SIDE:

LOWER: $1.16\ IN^2$ ALUMINUM
$.386\ IN^2$ STEEL

UPPER: $.61\ IN^2$ ALUMINUM
$.20\ IN^2$ STEEL



STATION 200.0

M_{ORIG} = -308770 IN.LB. (ULT)
M_{NEW} = 504850 × 1.25 = 631063 IN.LB (ULT)
STRESS = -15114 PSI (ULT) ELEMENT 52
M.S. = .19 $I_{ORIG.}$ = 124.8 IN^4

$$I_{REQ} = \frac{124.8 \times 631063}{1.1 \times 308770} = 231.8 \ IN^4$$

$$\Delta I = 231.8 - 124.8 = 107.07 \ IN^4$$

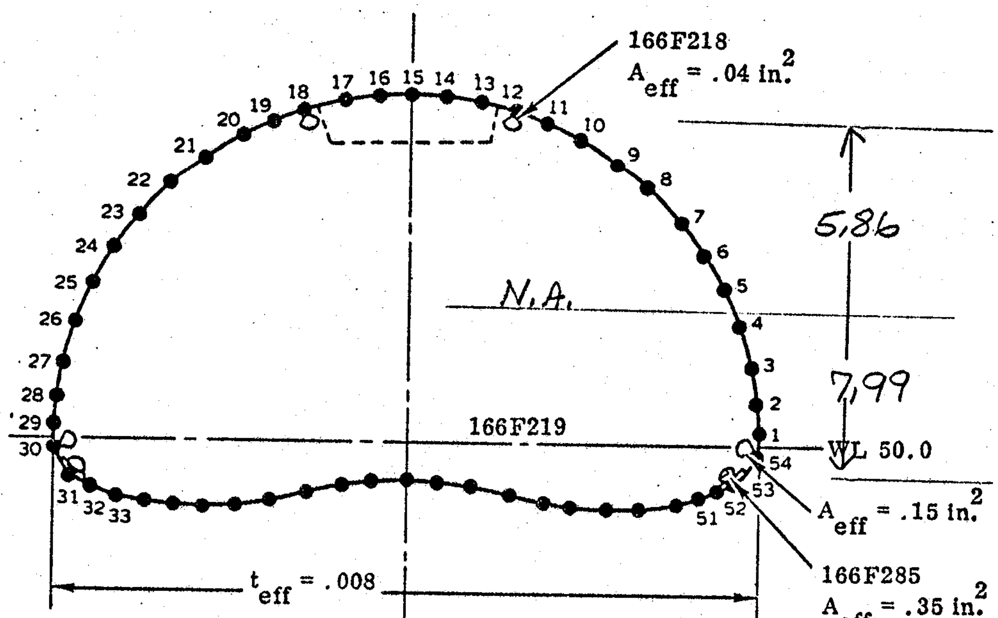
$$A_U = \frac{7.99}{5.86} A_L$$

$$107.07 = 5.86^2 \times \frac{7.99}{5.86} A_L + 7.99^2 A_L$$

A_L = .967 IN^2 A_U = 1.32

A_L PER SIDE = .483 IN^2 ALUMINUM
.16 IN^2 STEEL

A_U PER SIDE = .659 IN^2 ALUMINUM
.219 IN^2 STEEL



STATION 225.0

$M_{ORIG} = -358970$ IN. LB. (ULT)

$M_{NEW} = -565607 \times 1.25 = 707009$ IN. LB. (ULT)

STRESS = −16954 PSI (ULT) ELEMENT 51

M.S. = 0.19 $\qquad I_{ORIG} = 170.5 \text{ IN}^4$

$$I_{REQ} = \frac{170.5}{1.1} \times \frac{707009}{358970} = 305.2 \text{ IN}^4$$

$$\Delta I = 305.2 - 170.5 = 134.7 \text{ IN}^4$$

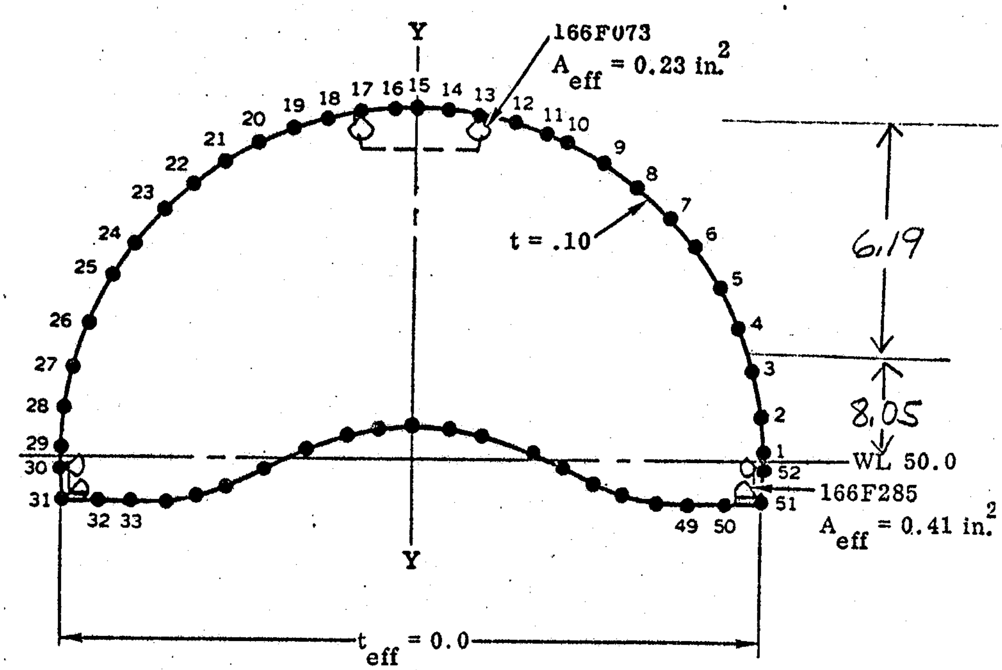
$$A_U = \frac{8.05}{6.19} A_L$$

$$134.7 = \frac{8.05}{6.19} \times 6.19^2 A_L + 8.05^2 A_L$$

$A_L = 1.175 \text{ IN}^2 \qquad A_U = 1.53$

A_L PER SIDE = .587 IN^2 ALUMINUM
.196 IN^2 STEEL

A_U PER SIDE = .76 IN^2 ALUMINUM
.25 IN^2 STEEL



STATION 233.49

**** FASTOP ****
FLUTTER AND STRENGTH
OPTIMIZATION PROGRAM

AIR FORCE
FLIGHT DYNAMICS LABORATORY

MAY 1978

GRUMMAN
AEROSPACE
CORPORATION

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FROM FASTOP, INITIAL TIME
   ELAPSED TIME IS .........     0  MINUTES,      2.56  SECONDS
   INCREMENTAL TIME IS ....      0  MINUTES,      0.00  SECONDS
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**** FASTOP ****
FLUTTER AND STRENGTH
OPTIMIZATION PROGRAM

**** SOP ****
STRENGTH OPTIMIZATION PROGRAM

AIR FORCE
FLIGHT DYNAMICS LABORATORY

MAY 1978

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                              GGGG
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GRUMMAN
AEROSPACE
CORPORATION

PROGRAM LISTING OF CARD DATA

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CARD   .........1.........2.........3.........4.........5.........6.........7.........8
 NO.   12345678901234567890123456789012345678901234567890123456789012345678901234567890

  1    SOP  6    PACAGE, LINES1
  2    NASA FORWARD SWEPT RESEARCH WING ON A BQM-34F VEHICLE, SOP(SA, SO)
  3    EEROELASTICALLY TAILORED WITH ADVANCED COMPOSITES- SMOOTH 7
  4       0 KTITLE
  5       0   2   3   0   5  -6
  6       0   0   0   0   0   0   0   0   0   0
  7       0   0   0   0   0   0   0   0   0   0
  8    SA00   AUTOMATED STRUCTURAL ANALYSIS MODULE
  9    SO   NASA RESEARCH WING. SOP TO FOP PASS
 10       1   0   0   0   0   0   0   8   9   0    KLUES(I), I=01,10
 11       0   0   0  14  15 -16
 12    SOPMEMRS
 13        1    0.0         0.0        4
 14       0     0     0                          ITENS,ICOMP,ISHEAR
 15    SA01 LABEL(1),GEOMETRY,BOUNCOND, GEOMETRY COORD. AND BOUND. COND.
 16       1247.701786   60.000000    56.721653            111              00000010
 17       2                                                                00000020
 18       3244.273786   60.000000    56.992597            111              00000030
 19       4244.273786   60.000000    56.676166            111              00000040
 20       5240.845786   60.000000    57.201573            111              00000050
 21       6240.845786   60.000000    56.523225            111              00000050
 22       7237.417786   60.000000    57.304413            111              00000070
 23       8237.417786   60.000000    56.455324            111              00000080
 24       9233.989786   60.000000    57.266178            111              00000090
 25      10233.989786   60.000000    56.476419            111              00000100
 26      11231.418786   60.000000    57.063794            111              00000110
 27      12231.418786   60.000000    56.581896            111              00000120
 28      13230.561786   60.000000    56.750000            111              00000130
 29      14                                                                00000140
 30      15251.663304   55.000000    56.718111            111              00000150
 31      16                                                                00000160
 32      17247.806970   55.000000    57.022910            111              00000170
 33      18247.806970   55.000000    56.666940            111              00000180
 34      19243.950637   55.000000    57.257998            111              00000190
 35      20243.950637   55.000000    56.494889            111              00000200
 36      21240.094304   55.000000    57.373688            111              00000210
 37      22240.094304   55.000000    56.418504            111              00000220
 38      23236.237970   55.000000    57.330675            111              00000230
 39      24236.237970   55.000000    56.442235            111              00000240
 40      25233.345720   55.000000    57.103003            111              00000250
 41      26233.345720   55.000000    56.560891            111              00000250
 42      27232.381637   55.000000    56.750000            111              00000270
 43      28                                                                00000280
 44      29255.624822   50.000000    56.714569            111              00000290
 45      30                                                                00000300
 46      31251.340155   50.000000    57.053223            111              00000310

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CARD NO.	.........1.........2.........3.........4.........5.........6.........7.........8 12345678901234567890123456789012345678901234567890123456789012345678901234567890				
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49	34247.055488	50.000000	56.466553	111	00000340
50	35242.770822	50.000000	57.442962	111	00000350
51	36242.770822	50.000000	56.381684	111	00000360
52	37238.486155	50.000000	57.395172	111	00000370
53	38238.486155	50.000000	56.408050	111	00000380
54	39235.272655	50.000000	57.142212	111	00000390
55	40235.272655	50.000000	56.539886	111	00000400
56	41234.201488	50.000000	56.750000	111	00000410
57	42				00000420
58	43259.586339	45.000000	56.711027	111	00000430
59	44				00000440
60	45254.873339	45.000000	57.083535	111	00000450
61	46254.873339	45.000000	56.648489	111	00000460
62	47250.160339	45.000000	57.370847	111	00000470
63	48250.160339	45.000000	56.438217	111	
64	49245.447339	45.000000	57.512237	111	00000490
65	50245.447339	45.000000	56.344863	111	00000500
66	51240.734339	45.000000	57.459669	111	00000510
67	52240.734339	45.000000	56.373866	111	00000520
68	53237.199589	45.000000	57.181421	111	00000530
69	54237.199589	45.000000	56.518881	111	00000540
70	55236.021339	45.000000	56.750000	111	00000550
71	56				00000560
72	57263.547857	40.000000	56.707485	111	00000570
73	58				00000580
74	59258.406524	40.000000	57.113848	111	00000590
75	60258.406524	40.000000	56.639263	111	00000600
76	61253.265191	40.000000	57.427272	111	00000610
77	62253.265191	40.000000	56.409881	111	00000620
78	63248.123857	40.000000	57.581512	111	00000630
79	64248.123857	40.000000	56.308043	111	00000640
80	65242.982524	40.000000	57.524166	111	00000650
81	66242.982524	40.000000	56.339682	111	00000660
82	67239.126524	40.000000	57.220630	111	00000670
83	68239.126524	40.000000	56.497877	111	00000680
84	69237.841191	40.000000	56.750000	111	00000690
85	70				00000700
86	71267.509375	35.000000	56.703943	111	00000710
87	72				00000720
88	73261.939708	35.000000	57.144161	111	00000730
89	74261.939708	35.000000	56.630038	111	00000740
90	75256.370042	35.000000	57.483696	111	00000750
91	76256.370042	35.000000	56.381545	111	00000760
92	77250.800375	35.000000	57.650786	111	00000770
93	78250.800375	35.000000	56.271223	111	00000780
94	79245.230708	35.000000	57.588663	111	00000790

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CARD    .........1.........2.........3.........4.........5.........6.........7.........8
NO.     12345678901234567890123456789012345678901234567890123456789012345678901234567890

 95       80245.230708   35.000000    56.305498           111                00000800
 96       81241.053458   35.000000    57.259839           111                00000810
 97       82241.053458   35.000000    56.476872           111                00000820
 98       83239.661042   35.000000    56.750000           111                00000830
 99       84                                                                 00000840
100       85271.470893   30.000000    56.700401           111                00000850
101       86                                                                 00000860
102       87265.472893   30.000000    57.174474           111                00000870
103       88265.472893   30.000000    56.620812           111                00000880
104       89259.474893   30.000000    57.540121           111                00000890
105       90259.474893   30.000000    56.353209           111                00000900
106       91253.476893   30.000000    57.720061           111                00000910
107       92253.476893   30.000000    56.234403           111                00000920
108       93247.478893   30.000000    57.653160           111                00000930
109       94247.478893   30.000000    56.271313           111                00000940
110       95242.980393   30.000000    57.299048           111                00000950
111       96242.980393   30.000000    56.455867           111                00000960
112       97241.480893   30.000000    56.750000           111                00000970
113       98                                                                 00000980
114       99275.432411   25.000000    56.696859           111                00000990
115      100                                                                 00001000
116      101269.006077   25.000000    57.204787           111                00001010
117      102269.006077   25.000000    56.611586           111                00001020
118      103262.579744   25.000000    57.596546           111                00001030
119      104262.579744   25.000000    56.324874           111                00001040
120      105256.153411   25.000000    57.789336           111                00001050
121      106256.153411   25.000000    56.197583           111                00001060
122      107249.727077   25.000000    57.717658           111                00001070
123      108249.727077   25.000000    56.237129           111                00001080
124      109244.907327   25.000000    57.338257           111                00001090
125      110244.907327   25.000000    56.434862           111                00001100
126      111243.300744   25.000000    56.750000           111                00001110
127      112                                                                 00001120
128      113279.393929   20.000000    56.693317           111                00001130
129      114                                                                 00001140
130      115272.539262   20.000000    57.235100           111                00001150
131      116272.539262   20.000000    56.602361           111                00001160
132      117265.684595   20.000000    57.652970           111                00001170
133      118265.684595   20.000000    56.296538           111                00001180
134      119258.829929   20.000000    57.858610           111                00001190
135      120258.829929   20.000000    56.160763           111                00001200
136      121251.975262   20.000000    57.782155           111                00001210
137      122251.975262   20.000000    56.202945           111                00001220
138      123246.834262   20.000000    57.377466           111                00001230
139      124246.834262   20.000000    56.413857           111                00001240
140      125245.120595   20.000000    56.750000           111                00001250
141      126                                                                 00001260
142      127283.355446   15.000000    56.689775           111                00001270

        .........1.........2.........3.........4.........5.........6.........7.........8
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CARD   .........1.........2.........3.........4.........5.........6.........7.........8
NO.    12345678901234567890123456789012345678901234567890123456789012345678901234567890

143     128                                                                   00001280
144     129276.072446    15.000000     57.265412          111                 00001290
145     130276.072446    15.000000     56.593135          111                 00001300
146     131268.789446    15.000000     57.709395          111                 00001310
147     132268.789446    15.000000     56.268202          111                 00001320
148     133261.506446    15.000000     57.927885          111                 00001330
149     134261.506446    15.000000     56.123942          111                 00001340
150     135254.223446    15.000000     57.846652          111                 00001350
151     136254.223446    15.000000     56.168761          111                 00001360
152     137248.761196    15.000000     57.416675          111                 00001370
153     138248.761196    15.000000     56.392852          111                 00001380
154     139246.940446    15.000000     56.750000          111                 00001390
155     140                                                                   00001400
156     141286.920813    10.500000     56.686587          111                 00001410
157     142                                                                   00001420
158     143279.782290     9.750000     57.297241          111                 00001430
159     144279.782290     9.750000     56.583448          111                 00001440
160     145274.074668     9.000000     57.698091          1 1                 00001450
161     146274.074668     9.000000     56.296533          2 2                 00001460
162     147272.515268     9.000000     57.777105          121                 00001470
163     148272.515268     9.000000     56.234199          121                 00001480
164     149267.180000     9.000000     57.968294          1 1                 00001490
165     150267.180000     9.000000     56.104451          1 2                 00001500
166     151264.718268     9.000000     58.011015          121                 00001510
167     152264.718268     9.000000     56.079758          121                 00001520
168     153258.900000     9.000000     57.983204          1 1                 00001530
169     154258.900000     9.000000     56.095890          1 2                 00001540
170     155256.921268     9.000000     57.924048          121                 00001550
171     156256.921268     9.000000     56.127740          121                 00001560
172     157251.073518     9.000000     57.463726          121                 00001570
173     158251.073518     9.000000     56.367647          121                 00001580
174     159249.124268     9.000000     56.750000          111                 00001590
175     160                                                                   00001600
176     161  242.28         9.0          58.0             1 1
177     162  242.28         9.0          56.0             1 2
178     163  249.124268     9.0          58.0             1 1
179     164  249.124268     9.0          56.0             1 1
180     165  251.073518     9.0          58.0             1 1
181     166  251.073518     9.0          56.0             1 2
182
183    SA06 LABEL(6),SA LOADS(4)     LOAD CONDITIONS
184       1 3   1   15.25        1 3   2   22.875       1 3   3    8.82
185       1 Z   4 0.71
186       3 3   1   21.30        3 3   2   31.95        3 3   3    8.82
187       3 Z   4-6.14
188       5 3   1   28.90        5 3   2   43.35        5 3   3    8.82
189       5 Z   4-14.74
190       7 3   1   36.55        7 3   2   54.825       7 3   3    8.82

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CARD NO.

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191	7 Z	4-23.39							
192	9 3	1	30.41	9 3	2	45.615	9 3	3	6.61
193	9 Z	4-20.94							
194	11 3	1	9.89	11 3	2	14.835	11 3	3	2.20
195	11 Z	4-6.70							
196	15 3	1	25.36	15 3	2	38.04	15 3	3	15.39
197	15 Z	4 2.66							
198	17 3	1	51.83	17 3	2	77.745	17 3	3	24.03
199	17 Z	4-9.70							
200	19 3	1	66.65	19 3	2	99.975	19 3	3	23.54
201	19 Z	4-27.47							
202	21 3	1	92.53	21 3	2	138.795	21 3	3	23.59
203	21 Z	4-56.65							
204	23 3	1	88.82	23 3	2	133.23	23 3	3	19.87
205	23 Z	4-60.02							
206	25 3	1	47.64	25 3	2	71.46	25 3	3	10.09
207	25 Z	4-33.34							
208	27 3	1	9.35	27 3	2	14.025	27 3	3	2.08
209	27 Z	4-6.33							
210	29 3	1	32.00	29 3	2	48.00	29 3	3	19.46
211	29 Z	4 3.42							
212	31 3	1	69.65	31 3	2	104.475	31 3	3	33.60
213	31 Z	4-10.37							
214	33 3	1	94.50	33 3	2	141.75	33 3	3	34.13
215	33 Z	4-37.41							
216	35 3	1	121.49	35 3	2	182.235	35 3	3	33.08
217	35 Z	4-70.08							
218	37 3	1	130.90	37 3	2	196.35	37 3	3	28.74
219	37 Z	4-89.57							
220	39 3	1	75.51	39 3	2	113.265	39 3	3	15.48
221	39 Z	4-53.90							
222	41 3	1	17.44	41 3	2	26.16	41 3	3	3.54
223	41 Z	4-12.53							
224	43 3	1	37.20	43 3	2	55.80	43 3	3	22.36
225	43 Z	4 3.44							
226	45 3	1	85.63	45 3	2	128.445	45 3	3	40.41
227	45 Z	4-14.58							
228	47 3	1	109.02	47 3	2	163.53	47 3	3	39.98
229	47 Z	4-41.92							
230	49 3	1	147.27	49 3	2	220.905	49 3	3	40.18
231	49 Z	4-84.80							
232	51 3	1	153.37	51 3	2	230.055	51 3	3	34.60
233	51 Z	4-103.05							
234	53 3	1	92.70	53 3	2	139.05	53 3	3	18.97
235	53 Z	4-66.24							
236	55 3	1	23.48	55 3	2	35.22	55 3	3	4.46
237	55 Z	4-17.47							
238	57 3	1	39.66	57 3	2	59.49	57 3	3	24.59

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CARD NO.	.........1.........2.........3.........4.........5.........6.........7.........8											
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239	57	Z	4 5.21									
240	59	3	1	99.76	59	3	2	149.64	59	3	3	45.02
241	59	Z	4-21.19									
242	61	3	1	118.80	61	3	2	178.2	61	3	3	45.54
243	61	Z	4-41.66									
244	63	3	1	164.29	63	3	2	246.436	63	3	3	44.91
245	63	Z	4-94.40									
246	65	3	1	175.74	65	3	2	263.61	65	3	3	39.02
247	65	Z	4-119.37									
248	67	3	1	104.47	67	3	2	156.705	67	3	3	21.57
249	67	Z	4-74.24									
250	69	3	1	25.71	69	3	2	38.565	69	3	3	5.15
251	69	Z	4-18.60									
252	71	3	1	39.97	71	3	2	59.955	71	3	3	26.25
253	71	Z	4 8.24									
254	73	3	1	87.51	73	3	2	131.265	73	3	3	48.86
255	73	Z	4 .49									
256	75	3	1	125.08	75	3	2	187.62	75	3	3	48.95
257	75	Z	4-41.83									
258	77	3	1	180.74	77	3	2	271.11	77	3	3	49.13
259	77	Z	4-104.44									
260	79	3	1	204.48	79	3	2	306.72	79	3	3	42.42
261	79	Z	4-144.95									
262	81	3	1	123.06	81	3	2	184.58	81	3	3	23.62
263	81	Z	4-91.13									
264	83	3	1	28.52	83	3	2	42.78	83	3	3	5.69
265	83	Z	4-20.68									
266	85	3	1	46.35	85	3	2	69.525	85	3	3	27.50
267	85	Z	4 3.56									
268	87	3	1	94.06	87	3	2	141.09	87	3	3	51.75
269	87	Z	4-1.02									
270	89	3	1	123.00	89	3	2	184.5	89	3	3	51.83
271	89	Z	4-33.60									
272	91	3	1	174.71	91	3	2	262.065	91	3	3	51.99
273	91	Z	4-91.79									
274	93	3	1	219.56	93	3	2	329.34	93	3	3	44.99
275	93	Z	4-156.77									
276	95	3	1	141.27	95	3	2	211.905	95	3	3	25.17
277	95	Z	4-108.57									
278	97	3	1	37.08	97	3	2	55.62	97	3	3	6.10
279	97	Z	4-29.53									
280	99	3	1	45.83	99	3	2	68.745	99	3	3	28.34
281	99	Z	4 5.87									
282	101	3	1	110.68	101	3	2	166.02	101	3	3	53.47
283	101	Z	4-16.34									
284	103	3	1	139.75	103	3	2	209.625	103	3	3	54.33
285	103	Z	4-47.46									
286	105	3	1	191.72	105	3	2	287.58	105	3	3	54.08

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CARD NO.

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CARD NO.						
287	105 Z	4-106.79				
288	107 3	1 207.57	107 3	2 311.355	107 3	3 46.89
289	107 Z	4-139.36				
290	109 3	1 138.31	109 3	2 207.465	109 3	3 26.32
291	109 Z	4-102.88				
292	111 3	1 36.99	111 3	2 55.485	111 3	3 6.41
293	111 Z	4-28.79				
294	113 3	1 39.27	113 3	2 58.905	113 3	3 28.96
295	113 Z	4 14.54				
296	115 3	1 108.94	115 3	2 163.41	115 3	3 55.00
297	115 Z	4-11.25				
298	117 3	1 143.52	117 3	2 215.28	117 3	3 55.42
299	117 Z	4-49.51				
300	119 3	1 215.68	119 3	2 323.52	119 3	3 55.95
301	119 Z	4-130.08				
302	121 3	1 222.63	121 3	2 333.945	121 3	3 48.36
303	121 Z	4-153.39				
304	123 3	1 129.88	123 3	2 194.82	123 3	3 27.01
305	123 Z	4-91.93				
306	125 3	1 34.82	125 3	2 52.23	125 3	3 6.63
307	125 Z	4-25.89				
308	127 3	1 25.73	127 3	2 38.595	127 3	3 27.64
309	127 Z	4 27.17				
310	129 3	1 93.37	129 3	2 140.055	129 3	3 56.04
311	129 Z	4 8.49				
312	131 3	1 131.44	131 3	2 197.16	131 3	3 60.09
313	131 Z	4-26.33				
314	133 3	1 233.21	133 3	2 349.815	133 3	3 61.31
315	133 Z	4-139.00				
316	135 3	1 273.28	135 3	2 409.92	135 3	3 53.21
317	135 Z	4-200.81				
318	137 3	1 167.95	137 3	2 251.925	137 3	3 31.45
319	137 Z	4-125.98				
320	139 3	1 41.70	139 3	2 62.55	139 3	3 8.0
321	139 Z	4-30.87				
322	143 3	1 20.90	143 3	2 31.35	143 3	3 22.78
323	143 Z	4 22.75				
324	147 3	1 41.12	147 3	2 61.68	147 3	3 19.93
325	147 Z	4-5.93				
326	151 3	1 41.12	151 3	2 61.68	151 3	3 19.93
327	151 Z	4-5.93				
328	155 3	1 105.09	155 3	2 157.635	155 3	3 19.94
329	155 Z	4-78.30				
330	157 3	1 86.32	157 3	2 129.48	157 3	3 14.95
331	157 Z	4-67.22				
332	159 3	1 29.69	159 3	2 44.535	159 3	3 4.98
333	159 Z	4-23.44				
334						

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CARD   .........1.........2.........3.........4.........5.........6.........7.........8
 NO.   12345678901234567890123456789012345678901234567890123456789012345678901234567890

 335   SA04 LABEL(4),MATERIAL
 336          4       11CORE-FWD SPANWIS.00116  2.5                87000.  .36
 337          4       12                375.    375.    300.
 338          5       11CORE-FWD STRMWIS .00116 5.0     5.0        33000.  .36
 339          5       12                375.    375.    150.
 340          6       11CORE-AFT SPANWIS .00116 2.5                87000.  .36
 341          6       12                375.    375.    300.
 342          7       11CORE-AFT STRMWIS .00116 5.0     5.0        33000.  .36
 343          7       12                375.    375.    150.
 344          8       11SPAR WEB GR/EP  .057    .01                 2.85+06.778
 345          8       12                 1.77+05 1.77+0550000.
 346          9       11PSEUDO RIB RODS 1.3     .1      .1             1.0+6 .360
 347          9       12                3000.   3000.   185.
 348         11       112024-T81 RIB    .1      .08                 1.05+07.33
 349         11       12                65000.  57000.  39000.
 350         12       115.5 CORE LE-SPAN .00159     2.5          11424.0 .36
 351         12       12                   575.0   575.0   425.0
 352         13       115.5 CORE LE-STRM .00159     5.0      5.0 46.24+3 .36
 353         13       12                   575.0   575.0   225.0
 354         17       61 THORNEL 300           1       1         45.0          1
 355         17       62                0.005   0.057
 356         17       63                  20.1E6   1.6E6   0.8E6   0.294
 357         17       64                 212.0E3 185.0E3
 358         17       65 THORNEL 300           1       1         0.0
 359         17       66                0.005   0.057
 360         17       67                  20.1E6   1.6E6   0.8E6   0.294
 361         17       68                 212.0E3 185.0E3
 362         17       71 THORNEL 300           1       1        -45.0          1
 363         17       72                0.005   0.057
 364         17       73                  20.1E6   1.6E6   0.8E6   0.294
 365         17       74                 212.0E3 185.0E3
 366         18       61 GR/EP AFT SKIN        1       1         45.0          1
 367         18       62                0.005   0.057
 368         18       63                  20.1E6   1.6E6   0.8E6   0.294
 369         18       64                 212.0E3 185.0E3
 370         18       65 GR/EP AFT SKIN        1       1         0.0
 371         18       66                0.005   0.057
 372         18       67                  20.1E6   1.6E6   0.8E6   0.294
 373         18       68                 212.0E3 185.0E3
 374         18       71 GR/EP AFT SKIN        1       1        -45.0          1
 375         18       72                0.005   0.057
 376         18       73                  20.1E6   1.6E6   0.8E6   0.294
 377         18       74                 212.0E3 185.0E3
 378
 379   SA05 LABEL(5),MEMBPROP
 380     1  237.417786   60.0          57.304413    264.718268    9.0         58.011015
 381
 382   4301 4 8       11   4    3    1          .01                          RIB    1

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CARD   .........1.........2.........3.........4.........5.........6.........7.........8
NO.    12345678901234567890123456789012345678901234567890123456789012345678901234567890

383    6302 6 8      11   4   3   6   5     .01                                        2
384    6303 6 8      11   6   5   8   7     .01                                        3
385    6304 6 8      11   8   7  10   9     .01                                        4
386    6305 6 8      11  10   9  12  11     .01                                        5
387    4306 4 8      11  12  11  13         .01                                        6
388    4001 4 7      11   4   3   1         2.5                                 CRIB   1
389    4001          52                     2.5     2.5                         CRIB   2
390    6002 6 7      11   4   3   6   5     2.5                                 CRIB   3
391    6002          52                     2.5     2.5                         CRIB   4
392    6003 6 7      11   6   5   8   7     2.5                                 CRIB   5
393    6003          52                     2.5     2.5                         CRIB   6
394    6004 6 5      11   8   7  10   9     2.5                                 CRIB   7
395    6004          52                     2.5     2.5                         CRIB   8
396    6005 6 5      11  10   9  12  11     2.5                                 CRIB   9
397    6005          52                     2.5     2.5                         CRIB  10
398    4006 4 5      11  12  11  13         2.5                                 CRIB  11
399    4006          52                     2.5     2.5                         CRIB  12
400    1001 1 9      11   3   4              .1                                 ROD    7
401    1002 1 9      11   5   6              .1                                        8
402    1003 1 9      11   7   8              .1                                        9
403    1004 1 9      11   9  10              .1                                       10
404    1005 1 9      11  11  12              .1                                       11
405    6011 6 6      11   4  18   3  17     3.0                                 SP   12
406    6011          52                     3.0     3.0                         SP1012
407    6012 6 6      11   6  20   5  19     3.1                                 SP   13
408    6012          52                     3.1     3.1                         SP1013
409    6013 6 4      11   8  22   7  21     3.2                                 SP   14
410    6013          52                     3.2     3.2                         SP1014
411    6014 6 4      11  10  24   9  23     3.3                                 SP   15
412    6014          52                     3.3     3.3                         SP1015
413    6015 6 4      11  12  26  11  25     1.7                                 SP   16
414    6015          52                     1.7     1.7                         SP1016
415    9013 6 8      11   8  22   7  21     .01                                 SP2016
416    5001 518      11   3  17   1  15    .015    .015                        1UP   17
417    5001          61                       2       2           45.0         1
418    5001          71                       2       2          -45.0         1
419    5002 518      11   5  19   3  17    .015                                1      18
420    5002          61                       3       3           45.0         1
421    5002          71                       3       3          -45.0         1
422    5003 518      11   7  21   5  19    .015                                       19
423    5003          61                       3       3           45.0         1
424    5003          65                       2       2            0.0
425    5003          71                       3       3          -45.0         1
426    5004 517      11   7  21   9  23    .015                                       20
427    5004          61                       2       2           45.0         1
428    5004          71                       2       2          -45.0         1
429    5005 517      11   9  23  11  25    .015                                1      21
430    5006 517      11  11  25  13  27    .015                                1      22

       .........1.........2.........3.........4.........5.........6.........7.........8
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CARD  .........1.........2.........3.........4.........5.........6.........7.........8
 NO.  12345678901234567890123456789012345678901234567890123456789012345678901234567890

431   5011 518      11   4  18   1  15    .015                               1LOW  23
432   5011          61                       2       2            45.0       1
433   5011          71                       2       2           -45.0       1
434   5012 518      11   6  20   4  18    .015                               1     24
435   5012          61                       3       3            45.0       1
436   5012          71                       3       3           -45.0       1
437   5013 518      11   8  22   6  20    .015                                     25
438   5013          61                       3       3            45.0       1
439   5013          65                       4       4             0.0
440   5013          71                       3       3           -45.0       1
441   5014 517      11   8  22  10  24    .015                                     26
442   5014          61                       2       2            45.0       1
443   5014          71                       2       2           -45.0       1
444   5015 517      11  10  24  12  26    .015                               1     27
445   5016 517      11  12  26  13  27    .015                               1     28
446   4021 4 7      11  18  17  15        5.0                                 RIB 29
447   6022 6 7      11  18  17  20  19    5.0                                      30
448   6023 6 7      11  20  19  22  21    5.0                                      31
449   6024 6 5      11  22  21  24  23    5.0                                      32
450   6025 6 5      11  24  23  26  25    5.0                                      33
451   4026 4 5      11  26  25  27        5.0                                      34
452   1011 1 9      11  17  18              .1                                ROD 35
453   1012 1 9      11  19  20              .1                                     36
454   1013 1 9      11  21  22              .1                                     37
455   1014 1 9      11  23  24              .1                                     38
456   1015 1 9      11  25  26              .1                                     39
457   6031 6 6      11  18  32  17  31    3.3                                 SP  40
458   6031          52                    3.3     3.3                         SP1040
459   6032 6 6      11  20  34  19  33    3.4                                 SP  41
460   6032          52                    3.4     3.4                         SP1041
461   6033 6 4      11  22  36  21  35    3.5                                 SP  42
462   6033          52                    3.5     3.5                         SP1042
463   6034 6 4      11  24  38  23  37    3.6                                 SP  43
464   6034          52                    3.6     3.6                         SP1043
465   6035 6 4      11  26  40  25  39    1.9                                 SP  44
466   6035          52                    1.9     1.9                         SP1044
467   9033 6 8      11  22  36  21  35     .01                                SP2044
468   5021 518      11  17  31  15  29    .015                               1UP   45
469   5021          61                       2       2            45.0       1
470   5021          71                       2       2           -45.0       1
471   5022 518      11  19  33  17  31    .015                               1     46
472   5022          61                       3       3            45.0       1
473   5022          71                       3       3           -45.0       1
474   5023 518      11  21  35  19  33    .015                                     47
475   5023          61                       3       3            45.0       1
476   5023          65                       4       4             0.0
477   5023          71                       3       3           -45.0       1
478   5024 517      11  21  35  23  37    .015                                     48

      .........1.........2.........3.........4.........5.........6.........7.........8
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479	5024		61					3	3	45.0	1	
480	5024		65					3	3	0.0		
481	5024		71					3	3	-45.0	1	
482	5025	517	11	23	37	25	39	.015			1	49
483	5026	517	11	25	39	27	41	.015			1	50
484	5031	518	11	18	32	15	29	.015			1LOW	51
485	5031		61					2	2	45.0	1	
486	5031		71					2	2	-45.0	1	
487	5032	518	11	20	34	18	32	.015			1	52
488	5032		61					3	3	45.0	1	
489	5032		71					3	3	-45.0	1	
490	5033	518	11	22	36	20	34	.015				53
491	5033		61					3	3	45.0	1	
492	5033		65					6	6	0.0		
493	5033		71					3	3	-45.0	1	
494	5034	517	11	22	36	24	38	.015				54
495	5034		61					3	3	45.0	1	
496	5034		65					3	3	0.0		
497	5034		71					3	3	-45.0	1	
498	5035	517	11	24	38	26	40	.015			1	55
499	5036	517	11	26	40	27	41	.015			1	56
500	4041	4 7	11	32	31	29		5.0			RIB	57
501	6042	6 7	11	32	31	34	33	5.0				58
502	6043	6 7	11	34	33	36	35	5.0				59
503	6044	6 5	11	36	35	38	37	5.0				60
504	6045	6 5	11	38	37	40	39	5.0				61
505	4046	4 5	11	40	39	41		5.0				62
506	1021	1 9	11	32	31			.1			ROD	63
507	1022	1 9	11	34	33			.1				64
508	1023	1 9	11	36	35			.1				65
509	1024	1 9	11	38	37			.1				66
510	1025	1 9	11	40	39			.1				67
511	6051	6 6	11	32	46	31	45	3.7			SP	68
512	6051		52					3.7	3.7		SP	1068
513	6052	6 6	11	34	48	33	47	3.8			SP	69
514	6052		52					3.8	3.8		SP	1069
515	6053	6 4	11	36	50	35	49	3.95			SP	70
516	6053		52					3.95	3.95		SP	1070
517	6054	6 4	11	38	52	37	51	4.1			SP	71
518	6054		52					4.1	4.1		SP	1071
519	6055	6 4	11	40	54	39	53	2.1			SP	72
520	6055		52					2.1	2.1		SP	1072
521	9053	6 8	11	36	50	35	49	.01			SP	2072
522	5041	518	11	31	45	29	43	.015			1UP	73
523	5041		61					2	2	45.0	1	
524	5041		71					2	2	-45.0	1	
525	5042	518	11	33	47	31	45	.015			1	74
526	5042		61					3	3	45.0	1	

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CARD   .........1.........2.........3.........4.........5.........6.........7.........8
NO.    12345678901234567890123456789012345678901234567890123456789012345678901234567890

527    5042          71                       3       3           -45.0       1
528    5043 518      11  35  49  33  47    .015                                     75
529    5043          61                       3       3            45.0       1
530    5043          65                       6       6              .0
531    5043          71                       3       3           -45.0       1
532    5044 517      11  35  49  37  51    .015                                     75
533    5044          61                       3       3            45.0       1
534    5044          65                       6       6             0.0
535    5044          71                       3       3           -45.0       1
536    5045 517      11  37  51  39  53    .015                               1     77
537    5045          61                       3       3            45.0       1
538    5045          71                       3       3           -45.0       1
539    5046 517      11  39  53  41  55    .015                               1     78
540    5051 518      11  32  46  29  43    .015                               1LOW  79
541    5051          61                       2       2            45.0       1
542    5051          71                       2       2           -45.0       1
543    5052 518      11  34  48  32  46    .015                               1     80
544    5052          61                       3       3            45.0       1
545    5052          71                       3       3           -45.0       1
546    5053 518      11  36  50  34  48     015                                     81
547    5053          61                       3       3            45.0       1
548    5053          65                      10      10        0.0
549    5053          71                       3       3           -45.0       1
550    5054 517      11  36  50  38  52    .015                                     82
551    5054          61                       3       3            45.0       1
552    5054          65                       6       6             0.0
553    5054          71                       3       3           -45.0       1
554    5055 517      11  38  52  40  54    .015                               1     83
555    5055          61                       2       2            45.0       1
556    5055          71                       2       2           -45.0       1
557    5056 517      11  40  54  41  55    .015                               1     84
558    4061 4 7      11  46  45  43         5.0                                RIB  85
559    6062 6 7      11  46  45  48  47     5.0                                     86
560    6063 6 7      11  48  47  50  49     5.0                                     87
561    6064 6 5      11  50  49  52  51     5.0                                     88
562    6065 6 5      11  52  51  54  53     5.0                                     89
563    4066 4 5      11  54  53  55         5.0                                     90
564    1031 1 9      11  46  45              .1                                ROD  91
565    1032 1 9      11  48  47              .1                                     92
566    1033 1 9      11  50  49              .1                                     93
567    1034 1 9      11  52  51              .1                                     94
568    1035 1 9      11  54  53              .1                                     95
569    6071 6 6      11  46  60  45  59    4.0                                 Sp  96
570    6071          52                    4.0     4.0                         SP1096
571    6072 6 6      11  48  62  47  61    4.15                                SP  97
572    6072          52                    4.15    4.15                        SP1097
573    6073 6 4      11  50  64  49  63    4.3                                 SP  98
574    6073          52                    4.3     4.3                         SP1098

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CARD    .........1.........2.........3.........4.........5.........6.........7.........8
NO.     12345678901234567890123456789012345678901234567890123456789012345678901234567890

575     6074 6 4     11  52  66  51  65     4.45                                SP  99
576     6074         52                     4.45    4.45                        SP1099
577     6075 6 4     11  54  68  53  67     2.3                                 SP 100
578     6075         52                     2.3     2.3                         SP1100
579     9073 6 8     11  50  64  49  63      .01                                SP2100
580     5061 518     11  45  59  43  57     .015                               1UP  101
581     5061         61                        2       2            45.0       1
582     5061         71                        2       2           -45.0       1
583     5062 518     11  47  61  45  59     .015                               1    102
584     5062         61                        3       3            45.0       1
585     5062         71                        3       3           -45.0       1
586     5063 518     11  49  63  47  61     .015                                    103
587     5063         61                        3       3            45.0       1
588     5063         65                        8       8              .0
589     5063         71                        3       3           -45.0       1
590     5064 517     11  49  63  51  65     .015                                    104
591     5064         61                        3       3            45.0       1
592     5064         65                        9       9             0.0
593     5064         71                        3       3           -45.0       1
594     5065 517     11  51  65  53  67     .015                               1    105
595     5065         61                        6       6            45.0       1
596     5065         71                        6       6           -45.0       1
597     5066 517     11  53  67  55  69     .015                               1    106
598     5066         61                        5       5            45.0       1
599     5066         71                        5       5           -45.0       1
600     5071 518     11  46  60  43  57 .015                                   1LOW 107
601     5071         61                        2       2            45.0       1
602     5071         71                        2       2           -45.0       1
603     5072 518     11  48  62  46  60 .015                                   1    108
604     5072         61                        3       3            45.0       1
605     5072         71                        3       3           -45.0       1
606.    5073 518     11  50  64  48  62 .015                                        109
607     5073         61                        3       3            45.0       1
608     5073         65                       15      15        0.0
609     5073         71                        3       3           -45.0       1
610     5074 517     11  50  64  52  66 .015                                        110
611     5074         61                        3       3            45.0       1
612     5074         65                       10      10             0.0
613     5074         71                        3       3           -45.0       1
614     5075 517     11  52  66  54  68 .015                                   1    111
615     5075         61                        5       5            45.0       1
616     5075         71                        5       5           -45.0       1
617     5076 517     11  54  68  55  69 .015                                   1    112
618     5076         61                        3       3            45.0       1
619     5076         71                        3       3           -45.0       1
620     4081 4 7     11  60  59  57      5.0                                    RIB 113
621     6082 6 7     11  60  59  62  61  5.0                                        114
622     6083 6 7     11  62  61  64  63  5.0                                        115

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CARD   .........1.........2.........3.........4.........5.........6.........7.........8
 NO.   12345678901234567890123456789012345678901234567890123456789012345678901234567890

623    6084 6 5      11  64  63  66  65 5.0                                        116
624    6085 6 5      11  66  65  68  67 5.0                                        117
625    4086 4 5      11  68  67  69     5.0                                        118
626    1041 1 9      11  60  59         .1                                     ROD 119
627    1042 1 9      11  62  61         .1                                         120
628    1043 1 9      11  64  63         .1                                         121
629    1044 1 9      11  66  65         .1                                         122
630    1045 1 9      11  68  67         .1                                         123
631    6091 6 6      11  60  74  59  73    4.45                                 SP 124
632    6091          52                    4.45    4.45                         SP1124
633    6092 6 6      11  62  76  61  75    4.55                                 SP 125
634    6092          52                    4.55    4.55                         SP1125
635    6093 6 4      11  64  78  63  77    4.7                                  SP 126
636    6093          52                    4.7     4.7                          SP1126
637    6094 6 4      11  66  80  65  79    4.85                                 SP 127
638    6094          52                    4.85    4.85                         SP1127
639    6095 6 4      11  68  82  67  81    2.5                                  SP 128
640    6095          52                    2.5     2.5                          SP1128
641    9093 6 8      11  64  78  63  77     .01                                 SP2128
642    5081 518      11  59  73  57  71 .015                                  1UP  129
643    5081          61                       2       2            45.0       1
644    5081          71                       2       2           -45.0       1
645    5082 518      11  61  75  59  73 .015                                  1    130
646    5082          61                       3       3            45.0       1
647    5082          71                       3       3           -45.0       1
648    5083 518      11  63  77  61  75 .015                                       131
649    5083          61                       3       3            45.0       1
650    5083          65                      10      10              .0
651    5083          71                       3       3           -45.0       1
652    5084 517      11  63  77  65  79 .015                                       132
653    5084          61                       3       3            45.0       1
654    5084          65                      12      12        0.0
655    5084          71                       3       3           -45.0       1
656    5085 517      11  65  79  67  81 .015                                  1    133
657    5085          61                       9       9            45.0       1
658    5085          71                       9       9           -45.0       1
659    5086 517      11  67  81  69  83 .015                                  1    134
660    5086          61                      10      10            45.0       1
661    5086          71                      10      10           -45.0       1
662    5091 518      11  60  74  57  71 .015                                  1LOW 135
663    5091          61                       2       2            45.0       1
664    5091          71                       2       2           -45.0       1
665    5092 518      11  62  76  60  74 .015                                  1    136
666    5092          61                       3       3            45.0       1
667    5092          71                       3       3           -45.0       1
668    5093 518      11  64  78  62  76 .015                                       137
669    5093          61                       3       3            45.0       1
670    5093          65                      18      18              .0

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CARD NO.

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CARD NO.												
671	5093	71						3	3	-45.0	1
672	5094 517	11	64	78	66	80	.015				138
673	5094	61						3	3	45.0	1
674	5094	65						14	14	0.0	
675	5094	71						3	3	-45.0	1
676	5095 517	11	66	80	68	82	.015				1 139
677	5095	61						8	8	45.0	1
678	5095	71						8	8	-45.0	1
679	5096 517	11	68	82	69	83	.015				1 140
680	5096	61						8	8	45.0	1
681	5096	71						8	8	-45.0	1
682	4101 4 7	11	74	73	71		5.0				RIB 141
683	6102 6 7	11	74	73	76	75	5.0				142
684	6103 6 7	11	76	75	78	77	5.0				143
685	6104 6 5	11	78	77	80	79	5.0				144
686	6105 6 5	11	80	79	82	81	5.0				145
687	4106 4 5	11	82	81	83		5.0				146
688	1051 1 9	11	74	73			.1				ROD 147
689	1052 1 9	11	76	75			.1				148
690	1053 1 9	11	78	77			.1				149
691	1054 1 9	11	80	79			.1				150
692	1055 1 9	11	82	81			.1				151
693	6111 6 6	11	74	88	73	87		4.8			SP 152
694	6111	52						4.8	4.8		SP1152
695	6112 6 6	11	76	90	75	89		4.9			SP 153
696	6112	52						4.9	4.9		SP1153
697	6113 6 4	11	78	92	77	91		5.05			SP 154
698	6113	52						5.05	5.05		SP1154
699	6114 6 4	11	80	94	79	93		5.25			SP 155
700	6114	52						5.25	5.25		SP1155
701	6115 6 4	11	82	96	81	95		2.7			SP 156
702	6115	52						2.7	2.7		SP1156
703	9113 6 8	11	78	92	77	91		.01			SP2156
704	5101 518	11	73	87	71	85	.015				1UP 157
705	5101	61						2	2	45.0	1
706	5101	71						2	2	-45.0	1
707	5102 518	11	75	89	73	87	.015				1 158
708	5102	61						3	3	45.0	1
709	5102	71						3	3	-45.0	1
710	5103 518	11	77	91	75	89	.015				159
711	5103	61						2	2	45.0	1
712	5103	65						12	12	0.0	
713	5103	71						2	2	-45.0	1
714	5104 517	11	77	91	79	93	.015				160
715	5104	61						2	2	45.0	1
716	5104	65						15	15	0.0	
717	5104	71						2	2	-45.0	1
718	5105 517	11	79	93	81	95	.015				1 161

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CARD    .........1.........2.........3.........4.........5.........6.........7.........8
NO.     12345678901234567890123456789012345678901234567890123456789012345678901234567890

719     5105          61                      12      12            45.0       1
720     5105          71                      12      12           -45.0       1
721     5106 517      11  81  95  83  97 .015                                  1     162
722     5106          61                      15      15            45.0       1
723     5106          71                      15      15           -45.0       1
724     5111 518      11  74  88  71  85 .015                                  1LOW  163
725     5111          61                       2       2            45.0       1
726     5111          71                       2       2           -45.0       1
727     5112 518      11  76  90  74  88 .015                                  1     164
728     5112          61                       3       3            45.0       1
729     5112          71                       3       3           -45.0       1
730     5113 518      11  78  92  76  90 .015                                        165
731     5113          61                       2       2            45.0       1
732     5113          65                      21      21             0.0
733     5113          71                       2       2           -45.0       1
734     5114 517      11  78  92  80  94 .015                                        166
735     5114          61                       2       2         45.0          1
736     5114          65                      18      18             0.0
737     5114          71                       2       2       -45.0           1
738     5115 517      11  80  94  82  96 .015                                  1     167
739     5115          61                      11      11            45.0       1
740     5115          71                      11      11           -45.0       1
741     5116 517      11  82  96  83  97 .015                                  1     168
742     5116          61                      13      13            45.0       1
743     5116          71                      13      13           -45.0       1
744     4121 4 7      11  88  87  85      5.0                                     RIB 169
745     6122 6 7      11  88  87  90  89 5.0                                          170
746     6123 6 7      11  90  89  92  91 5.0                                          171
747     6124 6 5      11  92  91  94  93 5.0                                          172
748     6125 6 5      11  94  93  96  95 5.0                                          173
749     4126 4 5      11  96  95  97      5.0                                         174
750     1061 1 9      11  88  87         .1                                       ROD 175
751     1062 1 9      11  90  89         .1                                           176
752     1063 1 9      11  92  91         .1                                           177
753     1064 1 9      11  94  93         .1                                           178
754     1065 1 9      11  96  95         .1                                           179
755     6131 6 6      11  88 102  87 101    5.2                                   SP 180
756     6131          52                    5.2     5.2                           SP1180
757     6132 6 6      11  90 104  89 103    5.3                                   SP 181
758     6132          52                    5.3     5.3                           SP1181
759     6133 6 4      11  92 106  91 105    5.45                                  SP 182
760     6133          52                    5.45    5.45                          SP1182
761     6134 6 4      11  94 108  93 107    5.65                                  SP 183
762     6134          52                    5.65    5.65                          SP1183
763     6135 6 4      11  96 110  95 109    2.9                                   SP 184
764     6135          52                    2.9     2.9                           SP1184
765     9133 6 8      11  92 106  91 105     .01                                  SP2184
766     5121 518      11  87 101  85  99 .015                                  1UP  185

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CARD  .........1.........2.........3.........4.........5.........6.........7.........8
NO.   12345678901234567890123456789012345678901234567890123456789012345678901234567890

767   5122 518     11  89 103  87 101 .015                                  1   186
768   5122         61                         2       2           45.0      1
769   5122         71                         2       2          -45.0      1
770   5123 518     11  91 105  89 103 .015                                      187
771   5123         61                         2       2           45.0      1
772   5123         65                        12      12            0.0
773   5123         71                         2       2          -45.0      1
774   5124 517     11  91 105  93 107 .015                                      188
775   5124         61                         2       2        45.0         1
776   5124         65                        18      18        0.0
777   5124         71                         2       2       -45.0         1
778   5125 517     11  93 107  95 109 .015                                  1   189
779   5125         61                        14      14           45.0      1
780   5125         65                         2       2            0.0
781   5125         71                        14      14          -45.0      1
782   5126 517     11  95 109  97 111 .015                                  1   190
783   5126         61                        20      20           45.0      1
784   5126         71                        20      20          -45.0      1
785   5131 518     11  88 102  85  99 .015                                  1LOW 191
786   5132 518     11  90 104  88 102 .015                                  1   192
787   5132         61                         2       2           45.0      1
788   5132         71                         2       2          -45.0      1
789   5133 518     11  92 106  90 104 .015                                      193
790   5133         61                         2       2        45.0         1
791   5133         65                        23      23            0.0
792   5133         71                         2       2       -45.0         1
793   5134 517     11  92 106  94 108 .015                                      194
794   5134         61                         2       2        45.0         1
795   5134         65                        23      23        0.0
796   5134         71                         2       2       -45.0         1
797   5135 517     11  94 108  96 110 .015                                  1   195
798   5135         65                         2       2            0.0
799   5135         61                        13      13           45.0      1
800   5135         71                        13      13          -45.0      1
801   5136 517     11  96 110  97 111 .015                                  1   195
802   5136         61                        17      17           45.0      1
803   5136         71                        17      17          -45.0      1
804   4141 4 7     11 102 101  99      5.0                                   RIB 197
805   6142 6 7     11 102 101 104 103 5.0                                       198
806   6143 6 7     11 104 103 106 105 5.0                                       199
807   6144 613     11 106 105 108 107 5.0                                       200
808   6145 613     11 108 107 110 109 5.0                                       201
809   4146 413     11 110 109 111     5.0                                       202
810   1071 1 9     11 102 101          .1                                       203
811   1072 1 9     11 104 103          .1                                       204
812   1073 1 9     11 106 105          .1                                       205
813   1074 1 9     11 108 107          .1                                       206
814   1075 1 9     11 110 109          .1                                       207

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CARD  .........1.........2.........3.........4.........5.........6.........7.........8
NO.   12345678901234567890123456789012345678901234567890123456789012345678901234567890

815   6151 6 6      11 102 116 101 115    5.5                                  SP 208
816   6151          52                    5.5     5.5                          SP1208
817   6152 6 6      11 104 118 103 117    5.6                                  SP 209
818   6152          52                    5.6     5.6                          SP1209
819   6153 612      11 106 120 105 119    5.8                                  SP 210
820   6153          52                    5.8     5.8                          SP1210
821   6154 612      11 108 122 107 121    6.0                                  SP 211
822   6154          52                    6.0     6.0                          SP1211
823   6155 612      11 110 124 109 123    3.1                                  SP 212
824   6155          52                    3.1     3.1                          SP1212
825   9153 6 8      11 106 120 105 119     .01                                 SP2212
826   5141 518      11 101 115  99 113 .015                                   1UP  213
827   5142 518      11 103 117 101 115 .015                                   1    214
828   5143 518      11 105 119 103 117 .015                                        215
829   5143          61                       2       2            45.0        1
830   5143          65                      12      12             0.0
831   5143          71                       2       2           -45.0        1
832   5144 517      11 105 119 107 121 .015                                        216
833   5144          61                       2       2            45.0        1
834   5144          65                      25      25             0.0
835   5144          71                       2       2           -45.0        1
836   5145 517      11 107 121 109 123 .015                                   1    217
837   5145          61                      15      15            45.0        1
838   5145          65                       8       8             0.0
839   5145          71                      15      15           -45.0        1
840   5146 517      11 109 123 111 125 .015                                   1    218
841   5146          61                      30      30            45.0        1
842   5146          65                       3       3             0.0
843   5146          71                      30      30           -45.0        1
844   5151 518      11 102 116  99 113 .015                                   1LOW 219
845   5152 518      11 104 118 102 116 .015                                   1    220
846   5153 518      11 106 120 104 118 .015                                        221
847   5153          61                       2       2            45.0        1
848   5153          65                      25      25             0.0
849   5153          71                       2       2           -45.0        1
850   5154 517      11 106 120 108 122 .015                                        222
851   5154          61                       2       2         45.0           1
852   5154          65                      27      27             0.0
853   5154          71                       2       2        -45.0           1
854   5155 517      11 108 122 110 124 .015                                   1    223
855   5155          61                      14      14            45.0        1
856   5155          65                       8       8             0.0
857   5155          71                      14      14           -45.0        1
858   5156 517      11 110 124 111 125 .015                                   1    224
859   5156          61                      19      19            45.0        1
860   5156          65                       2       2             0.0
861   5156          71                      19      19           -45.0        1
862   4161 4 7      11 116 115 113     5.0                                     RIB 225

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CARD  .........1.........2.........3.........4.........5.........6.........7.........8
NO.   12345678901234567890123456789012345678901234567890123456789012345678901234567890

863   6162 6 7      11 116 115 118 117 5.0                                        225
864   6163 6 7      11 118 117 120 119 5.0                                        227
865   6164 613      11 120 119 122 121 5.0                                        228
866   6165 613      11 122 121 124 123 5.0                                        229
867   4166 413      11 124 123 125     5.0                                        230
868   1081 1 9      11 116 115         .1                                     ROD 231
869   1082 1 9      11 118 117         .1                                         232
870   1083 1 9      11 120 119         .1                                         233
871   1084 1 9      11 122 121         .1                                         234
872   1085 1 9      11 124 123         .1                                         235
873   6171 6 6      11 116 130 115 129    5.8                                 SP 236
874   6171          52                    5.8     5.8                         SP1236
875   6172 6 6      11 118 132 117 131    6.0                                 SP 237
876   6172          52                    6.0     6.0                         SP1237
877   6173 612      11 120 134 119 133    6.2                                 SP 238
878   6173          52                    6.2     6.2                         SP1238
879   6174 612      11 122 136 121 135    6.45                                SP 239
880   6174          52                    6.45    6.45                        SP1239
881   6175 612      11 124 138 123 137    3.3                                 SP 240
882   6175          52                    3.3     3.3                         SP1240
883   9173 6 8      11 120 134 119 133     .01                                SP2240
884   5161 518      11 115 129 113 127 .015                                  1UP  241
885   5162 518      11 117 131 115 129 .015                                  1    242
886   5163 518      11 119 133 117 131 .015                                       243
887   5163          61                       2       2            45.0       1
888   5163          65                       6       6             0.0
889   5163          71                       2       2           -45.0       1
890   5164 517      11 119 133 121 135 .015                                       243
891   5164          61                       3       3            45.0       1
892   5164          65                      26      26             0.0
893   5164          71                       3       3           -45.0       1
894   5165 517      11 121 135 123 137 .015                                  1    244
895   5165          61                      15      15            45.0       1
896   5165          65                      13      13             0.0
897   5165          71                      15      15           -45.0       1
898   5166 517      11 123 137 125 139 .015                                  1    245
899   5166          61                      41      41            45.0       1
900   5166          65                       3       3             0.0
901   5166          71                      41      41           -45.0       1
902   5171 518      11 116 130 113 127 .015                                  1LOW 246
903   5172 518      11 118 132 116 130 .015                                  1    247
904   5173 518      11 120 134 118 132 .015                                       248
905   5173          65                       5       5             0.0
906   5174 517      11 120 134 122 136 .015                                       249
907   5174          61                       2       2         45.0          1
908   5174          65                      28      28         0.0
909   5174          71                       2       2        -45.0          1
910   5175 517      11 122 136 124 138 .015                                  1    250

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CARD   .........1.........2.........3.........4.........5.........6.........7.........8
 NO.   12345678901234567890123456789012345678901234567890123456789012345678901234567890

911    5175          61                      14      14           45.0       1
912    5175          65                      10      10            0.0
913    5175          71                      14      14          -45.0       1
914    5176 517      11 124 138 125 139 .015                                 1    251
915    5176          61                      20      20           45.0       1
916    5176          65                       4       4            0.0
917    5176          71                      20      20          -45.0       1
918    4181 4 7      11 130 129 127     5.0                                   RIB 252
919    6182 6 7      11 130 129 132 131 5.0                                       253
920    6183 6 7      11 132 131 134 133 5.0                                       254
921    6184 613      11 134 133 136 135 5.0                                       255
922    6185 613      11 136 135 138 137 5.0                                       256
923    4186 413      11 138 137 139     5.0                                       257
924    1091 1 9      11 130 129         .1                                    ROD 258
925    1092 1 9      11 132 131         .1                                        259
926    1093 1 9      11 134 133         .1                                        260
927    1094 1 9      11 136 135         .1                                        261
928    1095 1 9      11 138 137         .1                                        262
929    6191 6 6      11 130 144 129 143    6.2                                SP 263
930    6191          52                    6.2    6.2                         SP1263
931    6192 6 6      11 132 148 131 147    6.45                               SP 264
932    6192          52                    6.45   6.45                        SP1264
933    6193 612      11 134 152 133 151    6.6                                SP 265
934    6193          52                    6.6    6.6                         SP1265
935    6194 612      11 136 156 135 155    6.9                                SP 266
936    6194          52                    6.9    6.9                         SP1266
937    6195 612      11 138 158 137 157    3.5                                SP 267
938    6195          52                    3.5    3.5                         SP1267
939    9193 6 8      11 134 152 133 151    .01                                SP2267
940    5181 518      11 129 143 127 141 .015                                 1UP  268
941    5182 518      11 131 147 129 143 .015                                 1    269
942    5183 518      11 133 151 131 147 .015                                      270
943    5183          61                       2       2           45.0       1
944    5183          71                       2       2          -45.0       1
945    5184 517      11 133 151 135 155 .015                                      271
946    5184          61                       3       3           45.0       1
947    5184          65                      28      28            0.0
948    5184          71                       3       3          -45.0       1
949    5185 517      11 135 155 137 157 .015                                 1    272
950    5185          61                      12      12           45.0       1
951    5185          65                      21      21            0.0
952    5185          71                      12      12          -45.0       1
953    5186 517      11 137 157 139 159 .015                                 1    273
954    5186          61                      43      43           45.0       1
955    5186          65                       3       3            0.0
956    5186          71                      43      43          -45.0       1
957    5191 518      11 130 144 127 141 .015                                 1LOW 274
958    5192 518      11 132 148 130 144 .015                                 1    275

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CARD   .........1.........2.........3.........4.........5.........6.........7.........8
 NO.   12345678901234567890123456789012345678901234567890123456789012345678901234567890

 959   5193 518      11 134 152 132 148 .015                                        275
 960   5193          61                       2       2             45.0      1
 961   5193          71                       2       2            -45.0      1
 962   5194 517      11 134 152 136 156 .015                                        277
 963   5194          61                       2       2             45.0      1
 964   5194          65                      30      30              0.0
 965   5194          71                       2       2            -45.0      1
 966   5195 517      11 136 156 138 158 .015                                  1     278
 967   5195          61                      11      11             45.0      1
 968   5195          65                      19      19              0.0
 969   5195          71                      11      11            -45.0      1
 970   5196 517      11 138 158 139 159 .015                                  1     279
 971   5196          61                      22      22             45.0      1
 972   5196          65                       4       4              0.0
 973   5196          71                      22      22            -45.0      1
 974   4201 411      11 144 143 141         .1                                 RR   280
 975   6202 611      11 144 143 146 145     .1                                      281
 976   6203 611      11 146 145 148 147     .1                                      282
 977   6204 611      11 148 147 150 149     .1                                      283
 978   6205 611      11 150 149 152 151     .1                                      284
 979   6206 611      11 152 151 154 153     .1                                      285
 980   6207 611      11 154 153 156 155     .1                                      286
 981   6208 611      11 156 155 158 157     .1                                      287
 982   4209 411      11 158 157 159         .1                                      288
 983   4211 411      11 157 165 155         .1                                 RR   289
 984   6212 611      11 157 165 159 163     .1                                      290
 985   6213 611      11 164 163 162 161     .1                                      291
 986   6214 611      11 158 166 159 164     .1                                      292
 987   4215 411      11 158 166 156         .1                                      293
 988   1101 1 9      11 144 143             .1                                 RR   294
 989   1102 111      11 146 145             .1                                      295
 990   1103 1 9      11 148 147             .1                                      296
 991   1104 111      11 150 149             .1                                      297
 992   1105 1 9      11 152 151             .1                                      298
 993   1106 111      11 154 153             .1                                      299
 994   1107 1 9      11 156 155             .1                                      300
 995   1108 111      11 158 157             .1                                      301
 996   1201 111      11 157 165             .1                                 RR   302
 997   1202 111      11 159 163             .1                                      303
 998   1203 111      11 162 161             .1                                      304
 999   1204 111      11 159 164             .1                                      305
1000   1205 111      11 158 166             .1                                      306
1001   1301 111      11 141 143             .1                                 RR   307
1002   1302 111      11 143 145             .1                                 RR   308
1003   1303 111      11 145 147              .1                                     309
1004   1304 111      11 147 149              .1                                     310
1005   1305 111      11 149 151              .1                                     311
1006   1306 111      11 151 153              .1                                     312

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CARD     .........1.........2.........3.........4.........5.........6.........7.........8
 NO.     12345678901234567890123456789012345678901234567890123456789012345678901234567890

1007     1307 111      11 153 155             .1                                      313
1008     1308 111      11 155 157             .1                                      314
1009     1309 111      11 157 159             .1                                      315
1010     1311 111      11 141 144             .1                                  RR  316
1011     1312 111      11 144 146             .1                                      317
1012     1313 111      11 146 148             .1                                      318
1013     1314 111      11 148 150             .1                                      319
1014     1315 111      11 150 152             .1                                      320
1015     1316 111      11 152 154             .1                                      321
1016     1317 111      11 154 156             .1                                      322
1017     1318 111      11 156 158             .1                                      323
1018     1319 111      11 158 159             .1                                      324
1019     1401 111      11 155 165             .1                                  RR  325
1020     1402 111      11 165 163             .1                                      326
1021     1403 111      11 163 161             .1                                      327
1022     1404 111      11 164 162             .1                                      328
1023     1405 111      11 166 164             .1                                      329
1024     1406 111      11 156 166             .1                                      330
1025
1026     DEND
1027     TA00  AUTOMATED TRANSFORMATION MODULE
1028     TA  - GENERATE DYNAMICS TRANSFORMATIONS
1029        0   0   0  -4                               KLUET(I) I=1,4
1030     TA01  STRUCTURES GEOMETRY GRID
1031      166
1032        1247.701786   60.000000    56.721653
1033        2
1034        3244.273786   60.000000    56.992597
1035        4244.273786   60.000000    56.676166
1036        5240.845786   60.000000    57.201573
1037        6240.845786   60.000000    56.523225
1038        7237.417786   60.000000    57.304413
1039        8237.417786   60.000000    56.455324
1040        9233.989786   60.000000    57.266178
1041       10233.989786   60.000000    56.476419
1042       11231.418786   60.000000    57.063794
1043       12231.418786   60.000000    56.581896
1044       13230.561786   60.000000    56.750000
1045       14
1046       15251.663304   55.000000    56.718111
1047       16
1048       17247.806970   55.000000    57.022910
1049       18247.806970   55.000000    56.666940
1050       19243.950637   55.000000    57.257998
1051       20243.950637   55.000000    56.494889
1052       21240.094304   55.000000    57.373688
1053       22240.094304   55.000000    56.418504
1054       23236.237970   55.000000    57.330675

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CARD NO.	●●●●●●●●●1●●●●●●●●●2●●●●●●●●●3●●●●●●●●●4●●●●●●●●●5●●●●●●●●●6●●●●●●●●●7●●●●●●●●●8 12345678901234567890123456789012345678901234567890123456789012345678901234567890		
1055	24236.237970	55.000000	56.442235
1056	25233.345720	55.000000	57.103003
1057	26233.345720	55.000000	56.560891
1058	27232.381637	55.000000	56.750000
1059	28		
1060	29255.624822	50.000000	56.714569
1061	30		
1062	31251.340155	50.000000	57.053223
1063	32251.340155	50.000000	56.657715
1064	33247.055488	50.000000	57.314422
1065	34247.055488	50.000000	56.466553
1066	35242.770822	50.000000	57.442962
1067	36242.770822	50.000000	56.381684
1068	37238.486155	50.000000	57.395172
1069	38238.486155	50.000000	56.408050
1070	39235.272655	50.000000	57.142212
1071	40235.272655	50.000000	56.539886
1072	41234.201488	50.000000	56.750000
1073	42		
1074	43259.586339	45.000000	56.711027
1075	44		
1076	45254.873339	45.000000	57.083535
1077	46254.873339	45.000000	56.648489
1078	47250.160339	45.000000	57.370847
1079	48250.160339	45.000000	56.438217
1080	49245.447339	45.000000	57.512237
1081	50245.447339	45.000000	56.344863
1082	51240.734339	45.000000	57.459669
1083	52240.734339	45.000000	56.373866
1084	53237.199589	45.000000	57.181421
1085	54237.199589	45.000000	56.518881
1086	55236.021339	45.000000	56.750000
1087	56		
1088	57263.547857	40.000000	56.707485
1089	58		
1090	59258.406524	40.000000	57.113848
1091	60258.406524	40.000000	56.639263
1092	61253.265191	40.000000	57.427272
1093	62253.265191	40.000000	56.409881
1094	63248.123857	40.000000	57.581512
1095	64248.123857	40.000000	56.308043
1096	65242.982524	40.000000	57.524166
1097	66242.982524	40.000000	56.339682
1098	67239.126524	40.000000	57.220630
1099	68239.126524	40.000000	56.497877
1100	69237.841191	40.000000	56.750000
1101	70		
1102	71267.509375	35.000000	56.703943

●●●●●●●●●1●●●●●●●●●2●●●●●●●●●3●●●●●●●●●4●●●●●●●●●5●●●●●●●●●6●●●●●●●●●7●●●●●●●●●8
12345678901234567890123456789012345678901234567890123456789012345678901234567890

CARD NO.	........1.........2.........3.........4.........5.........6.........7.........8 12345678901234567890123456789012345678901234567890123456789012345678901234567890		
1103	72		
1104	73261.939708	35.000000	57.144161
1105	74261.939708	35.000000	56.630038
1106	75256.370042	35.000000	57.483696
1107	76256.370042	35.000000	56.381545
1108	77250.800375	35.000000	57.650786
1109	78250.800375	35.000000	56.271223
1110	79245.230708	35.000000	57.588663
1111	80245.230708	35.000000	56.305498
1112	81241.053458	35.000000	57.259839
1113	82241.053458	35.000000	56.476872
1114	83239.661042	35.000000	56.750000
1115	84		
1116	85271.470893	30.000000	56.700401
1117	86		
1118	87265.472893	30.000000	57.174474
1119	88265.472893	30.000000	56.620812
1120	89259.474893	30.000000	57.540121
1121	90259.474893	30.000000	56.353209
1122	91253.476893	30.000000	57.720061
1123	92253.476893	30.000000	56.234403
1124	93247.478893	30.000000	57.653160
1125	94247.478893	30.000000	56.271313
1126	95242.980393	30.000000	57.299048
1127	96242.980393	30.000000	56.455867
1128	97241.480893	30.000000	56.750000
1129	98		
1130	99275.432411	25.000000	56.696859
1131	100		
1132	101269.006077	25.000000	57.204787
1133	102269.006077	25.000000	56.611586
1134	103262.579744	25.000000	57.596546
1135	104262.579744	25.000000	56.324874
1136	105256.153411	25.000000	57.789336
1137	106256.153411	25.000000	56.197583
1138	107249.727077	25.000000	57.717658
1139	108249.727077	25.000000	56.237129
1140	109244.907327	25.000000	57.338257
1141	110244.907327	25.000000	56.434862
1142	111243.300744	25.000000	56.750000
1143	112		
1144	113279.393929	20.000000	56.693317
1145	114		
1146	115272.539262	20.000000	57.235100
1147	116272.539262	20.000000	56.602361
1148	117265.684595	20.000000	57.652970
1149	118265.684595	20.000000	56.296538
1150	119258.829929	20.000000	57.858610

........1.........2.........3.........4.........5.........6.........7.........8
12345678901234567890123456789012345678901234567890123456789012345678901234567890

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CARD   .........1.........2.........3.........4.........5.........6.........7.........8
 NO.   12345678901234567890123456789012345678901234567890123456789012345678901234567890

1151     120258.829929   20.000000   56.160763
1152     121251.975262   20.000000   57.782155
1153     122251.975262   20.000000   56.202945
1154     123246.834262   20.000000   57.377466
1155     124246.834262   20.000000   56.413857
1156     125245.120595   20.000000   56.750000
1157     126
1158     127283.355446   15.000000   56.689775
1159     128
1160     129276.072446   15.000000   57.265412
1161     130276.072446   15.000000   56.593135
1162     131268.789446   15.000000   57.709395
1163     132268.789446   15.000000   56.268202
1164     133261.506446   15.000000   57.927885
1165     134261.506446   15.000000   56.123942
1166     135254.223446   15.000000   57.846652
1167     136254.223446   15.000000   56.168761
1168     137248.761196   15.000000   57.416675
1169     138248.761196   15.000000   56.392852
1170     139246.940446   15.000000   56.750000
1171     140
1172     141286.920813   10.500000   56.686587
1173     142
1174     143279.782290    9.750000   57.297241
1175     144279.782290    9.750000   56.583448
1176     145274.074668    9.000000   57.698091
1177     146274.074668    9.000000   56.296533
1178     147272.515268    9.000000   57.777105
1179     148272.515268    9.000000   56.234199
1180     149267.180000    9.000000   57.968294
1181     150267.180000    9.000000   56.104451
1182     151264.718268    9.000000   58.011015
1183     152264.718268    9.000000   56.079758
1184     153258.900000    9.000000   57.983204
1185     154258.900000    9.000000   56.095890
1186     155256.921268    9.000000   57.924048
1187     156256.921268    9.000000   56.127740
1188     157251.073518    9.000000   57.463726
1189     158251.073518    9.000000   56.367647
1190     159249.124268    9.000000   56.750000
1191     160
1192     161  242.28        9.0          58.0
1193     162  242.28        9.0          56.0
1194     163  249.124268    9.0          58.0
1195     164  249.124268    9.0          56.0
1196     165  251.073518    9.0          58.0
1197     166  251.073518    9.0          56.0
1198   TADG      DYNAMICS GRID FOR VIBRATION ANALYSIS

       .........1.........2.........3.........4.........5.........6.........7.........8
       12345678901234567890123456789012345678901234567890123456789012345678901234567890
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CARD   .........1.........2.........3.........4.........5.........6.........7.........8
 NO.   12345678901234567890123456789012345678901234567890123456789012345678901234567890

1199      24
1200        246.9404   15.0         0.0                    (1)
1201        245.1206   20.0         0.0                    (2)
1202        241.4809   30.0         0.0                    (3)
1203        237.8412   40.0         0.0                    (4)
1204        234.2015   50.0         0.0                    (5)
1205        230.5618   60.0         0.0                    (6)
1206        254.2234   15.0         0.0                    (7)
1207        251.9753   20.0         0.0                    (8)
1208        247.4789   30.0         0.0                    (9)
1209        242.9825   40.0         0.0                    (10)
1210        238.4862   50.0         0.0                    (11)
1211        233.9898   60.0         0.0                    (12)
1212        268.7894   15.0         0.0                    (13)
1213        265.6846   20.0         0.0                    (14)
1214        259.4749   30.0         0.0                    (15)
1215        253.2652   40.0         0.0                    (16)
1216        247.0555   50.0         0.0                    (17)
1217        240.8458   60.0         0.0                    (18)
1218        283.3554   15.0         0.0                    (19)
1219        279.3939   20.0         0.0                    (20)
1220        271.4709   30.0         0.0                    (21)
1221        263.5479   40.0         0.0                    (22)
1222        255.6248   50.0         0.0                    (23)
1223        247.7018   60.0         0.0                    (24)
1224   TAC3
1225      24  24  12   0   0
1226                   0.          0.        56.75
1227     139 125  97  69  41  13 127 113  85  57
1228      29   1
1229       1 139               H 0 0 1 0 0 0
1230       2 125               H 0 0 1 0 0 0
1231       3  97               H 0 0 1 0 0 0
1232       4  69               H 0 0 1 0 0 0
1233       5  41               H 0 0 1 0 0 0
1234       6  13               H 0 0 1 0 0 0
1235       7 157 137 155 135 B 0 0 1 0 0 0
1236       8 121 107 119 105 B 0 0 1 0 0 0
1237       9 109  95 105  91 B 0 0 1 0 0 0
1238      10  81  67  77  63 B 0 0 1 0 0 0
1239      11  53  39  49  35 B 0 0 1 0 0 0
1240      12  25  11  21   7 B 0 0 1 0 0 0
1241      13 151 133 147 131 B 0 0 1 0 0 0
1242      14 131 117 129 115 B 0 0 1 0 0 0
1243      15 103  89 101  87 B 0 0 1 0 0 0
1244      16  75  61  73  59 B 0 0 1 0 0 0
1245      17  47  33  45  31 B 0 0 1 0 0 0
1246      18  19   5  17   3 B 0 0 1 0 0 0

       .........1.........2.........3.........4.........5.........6.........7.........8
       12345678901234567890123456789012345678901234567890123456789012345678901234567890
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CARD    .........1.........2.........3.........4.........5.........6.........7.........8
 NO.    12345678901234567890123456789012345678901234567890123456789012345678901234567890

1247       19 127            U 0 0 1 0 0 0
1248       20 113            U 0 0 1 0 0 0
1249       21  85            U 0 0 1 0 0 0
1250       22  57            U 0 0 1 0 0 0
1251       23  29            U 0 0 1 0 0 0
1252       24   1            U 0 0 1 0 0 0
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.........1.........2.........3.........4.........5.........6.........7.........8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
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NASA FORWARD SWEPT RESEARCH WING ON A BQM-34F VEHICLE, SOP(SA, SO)
EEROELASTICALLY TAILORED WITH ADVANCED COMPOSITES- SMOOTH 7

FROM SOP, AFTER LDB - LIST INPUT DATA

ELAPSED TIME IS	0	MINUTES,	10.58	SECONDS
INCREMENTAL TIME IS	0	MINUTES,	8.01	SECONDS

**** FASTOP ****
FLUTTER AND STRENGTH
OPTIMIZATION PROGRAM

**** SOP ****
STRENGTH OPTIMIZATION PROGRAM

**** ATAM ****
AUTOMATED
TRANSFORMATION ANALYSIS MODULE

AIR FORCE
FLIGHT DYNAMICS LABORATORY

MAY 1978

GRUMMAN
AEROSPACE
CORPORATION

INPUT STRUCTURES GEOMETRY, ROW = SEQUENTIAL NODE NO.,
NODE = STRUCTURAL NODE NO. DESIGNATED BY USER.

NOTE - SUBSEQUENT LOAD ANALYSIS OUTPUT OF AERO., INERTIAL, AND COMBINED LOADS IN THE STRUCTURES GRID IS IDENTIFIED BY ROW NO. (SEQUENTIAL).

ROW	NODE	XSGEO(I)	YSGEO(I)	ZSGEO(I)
1	1	2.477018E+02	6.000000E+01	5.672165E+01
2	2	0.	0.	0.
3	3	2.442738E+02	6.000000E+01	5.699260E+01
4	4	2.442738E+02	6.000000E+01	5.667617E+01
5	5	2.408458E+02	6.000000E+01	5.720157E+01
6	6	2.408458E+02	6.000000E+01	5.652323E+01
7	7	2.374178E+02	6.000000E+01	5.730441E+01
8	8	2.374178E+02	6.000000E+01	5.645532E+01
9	9	2.339898E+02	6.000000E+01	5.726618E+01
10	10	2.339898E+02	6.000000E+01	5.647642E+01
11	11	2.314188E+02	6.000000E+01	5.706379E+01
12	12	2.314188E+02	6.000000E+01	5.658190E+01
13	13	2.305618E+02	6.000000E+01	5.675000E+01
14	14	0.	0.	0.
15	15	2.516633E+02	5.500000E+01	5.671811E+01
16	16	0.	0.	0.
17	17	2.478070E+02	5.500000E+01	5.702291E+01
18	18	2.478070E+02	5.500000E+01	5.666694E+01
19	19	2.439506E+02	5.500000E+01	5.725800E+01
20	20	2.439506E+02	5.500000E+01	5.649489E+01
21	21	2.400943E+02	5.500000E+01	5.737369E+01
22	22	2.400943E+02	5.500000E+01	5.641850E+01
23	23	2.362380E+02	5.500000E+01	5.733068E+01
24	24	2.362380E+02	5.500000E+01	5.644224E+01
25	25	2.333457E+02	5.500000E+01	5.710300E+01
26	26	2.333457E+02	5.500000E+01	5.656089E+01
27	27	2.323816E+02	5.500000E+01	5.675000E+01
28	28	0.	0.	0.
29	29	2.556248E+02	5.000000E+01	5.671457E+01
30	30	0.	0.	0.
31	31	2.513402E+02	5.000000E+01	5.705322E+01
32	32	2.513402E+02	5.000000E+01	5.665772E+01
33	33	2.470555E+02	5.000000E+01	5.731442E+01
34	34	2.470555E+02	5.000000E+01	5.646655E+01
35	35	2.427708E+02	5.000000E+01	5.744296E+01
36	36	2.427708E+02	5.000000E+01	5.638168E+01
37	37	2.384862E+02	5.000000E+01	5.739517E+01
38	38	2.384862E+02	5.000000E+01	5.640805E+01
39	39	2.352727E+02	5.000000E+01	5.714221E+01
40	40	2.352727E+02	5.000000E+01	5.653989E+01
41	41	2.342015E+02	5.000000E+01	5.675000E+01
42	42	0.	0.	0.
43	43	2.595863E+02	4.500000E+01	5.671103E+01
44	44	0.	0.	0.
45	45	2.548733E+02	4.500000E+01	5.708354E+01
46	46	2.548733E+02	4.500000E+01	5.664849E+01
47	47	2.501603E+02	4.500000E+01	5.737085E+01

INPUT STRUCTURES GEOMETRY, ROW = SEQUENTIAL NODE NO.,
NODE = STRUCTURAL NODE NO. DESIGNATED BY USER.

NOTE - SUBSEQUENT LOAD ANALYSIS OUTPUT OF AERO., INERTIAL, AND COMBINED
LOADS IN THE STRUCTURES GRID IS IDENTIFIED BY ROW NO. (SEQUENTIAL).

ROW	NODE	XSGEO(I)	YSGEO(I)	ZSGEO(I)
48	48	2.501603E+02	4.500000E+01	5.643822E+01
49	49	2.454473E+02	4.500000E+01	5.751224E+01
50	50	2.454473E+02	4.500000E+01	5.634486E+01
51	51	2.407343E+02	4.500000E+01	5.745967E+01
52	52	2.407343E+02	4.500000E+01	5.637387E+01
53	53	2.371996E+02	4.500000E+01	5.718142E+01
54	54	2.371996E+02	4.500000E+01	5.651888E+01
55	55	2.360213E+02	4.500000E+01	5.675000E+01
56	56	0.	0.	0.
57	57	2.635479E+02	4.000000E+01	5.670749E+01
58	58	0.	0.	0.
59	59	2.584065E+02	4.000000E+01	5.711385E+01
60	60	2.584065E+02	4.000000E+01	5.663926E+01
61	61	2.532652E+02	4.000000E+01	5.742727E+01
62	62	2.532652E+02	4.000000E+01	5.640988E+01
63	63	2.481239E+02	4.000000E+01	5.758151E+01
64	64	2.481239E+02	4.000000E+01	5.630804E+01
65	65	2.429825E+02	4.000000E+01	5.752417E+01
66	66	2.429825E+02	4.000000E+01	5.633968E+01
67	67	2.391265E+02	4.000000E+01	5.722063E+01
68	68	2.391265E+02	4.000000E+01	5.649788E+01
69	69	2.378412E+02	4.000000E+01	5.675000E+01
70	70	0.	0.	0.
71	71	2.675094E+02	3.500000E+01	5.670394E+01
72	72	0.	0.	0.
73	73	2.619397E+02	3.500000E+01	5.714416E+01
74	74	2.619397E+02	3.500000E+01	5.663004E+01
75	75	2.563700E+02	3.500000E+01	5.748370E+01
76	76	2.563700E+02	3.500000E+01	5.638155E+01
77	77	2.508004E+02	3.500000E+01	5.765079E+01
78	78	2.508004E+02	3.500000E+01	5.627122E+01
79	79	2.452307E+02	3.500000E+01	5.758866E+01
80	80	2.452307E+02	3.500000E+01	5.630550E+01
81	81	2.410535E+02	3.500000E+01	5.725984E+01
82	82	2.410535E+02	3.500000E+01	5.647687E+01
83	83	2.396610E+02	3.500000E+01	5.675000E+01
84	84	0.	0.	0.
85	85	2.714709E+02	3.000000E+01	5.670040E+01
86	86	0.	0.	0.
87	87	2.654729E+02	3.000000E+01	5.717447E+01
88	88	2.654729E+02	3.000000E+01	5.662081E+01
89	89	2.594749E+02	3.000000E+01	5.754012E+01
90	90	2.594749E+02	3.000000E+01	5.635321E+01
91	91	2.534769E+02	3.000000E+01	5.772006E+01
92	92	2.534769E+02	3.000000E+01	5.623440E+01
93	93	2.474789E+02	3.000000E+01	5.765316E+01
94	94	2.474789E+02	3.000000E+01	5.627131E+01

INPUT STRUCTURES GEOMETRY, ROW = SEQUENTIAL NODE NO.,
NODE = STRUCTURAL NODE NO. DESIGNATED BY USER.

NOTE - SUBSEQUENT LOAD ANALYSIS OUTPUT OF AERO., INERTIAL, AND COMBINED
LOADS IN THE STRUCTURES GRID IS IDENTIFIED BY ROW NO. (SEQUENTIAL).

ROW	NODE	XSGEO(I)	YSGEO(I)	ZSGEO(I)
95	95	2.429804E+02	3.000000E+01	5.729905E+01
96	96	2.429804E+02	3.000000E+01	5.645587E+01
97	97	2.414809E+02	3.000000E+01	5.675000E+01
98	98	0.	0.	0.
99	99	2.754324E+02	2.500000E+01	5.669686E+01
100	100	0.	0.	0.
101	101	2.690061E+02	2.500000E+01	5.720479E+01
102	102	2.690061E+02	2.500000E+01	5.661159E+01
103	103	2.625797E+02	2.500000E+01	5.759655E+01
104	104	2.625797E+02	2.500000E+01	5.632487E+01
105	105	2.561534E+02	2.500000E+01	5.778934E+01
106	106	2.561534E+02	2.500000E+01	5.619758E+01
107	107	2.497271E+02	2.500000E+01	5.771766E+01
108	108	2.497271E+02	2.500000E+01	5.623713E+01
109	109	2.449073E+02	2.500000E+01	5.733826E+01
110	110	2.449073E+02	2.500000E+01	5.643486E+01
111	111	2.433007E+02	2.500000E+01	5.675000E+01
112	112	0.	0.	0.
113	113	2.793939E+02	2.000000E+01	5.669332E+01
114	114	0.	0.	0.
115	115	2.725393E+02	2.000000E+01	5.723510E+01
116	116	2.725393E+02	2.000000E+01	5.660236E+01
117	117	2.656846E+02	2.000000E+01	5.765297E+01
118	118	2.656846E+02	2.000000E+01	5.629654E+01
119	119	2.588299E+02	2.000000E+01	5.785861E+01
120	120	2.588299E+02	2.000000E+01	5.616076E+01
121	121	2.519753E+02	2.000000E+01	5.778216E+01
122	122	2.519753E+02	2.000000E+01	5.620295E+01
123	123	2.468343E+02	2.000000E+01	5.737747E+01
124	124	2.468343E+02	2.000000E+01	5.641386E+01
125	125	2.451206E+02	2.000000E+01	5.675000E+01
126	126	0.	0.	0.
127	127	2.833554E+02	1.500000E+01	5.668978E+01
128	128	0.	0.	0.
129	129	2.760724E+02	1.500000E+01	5.726541E+01
130	130	2.760724E+02	1.500000E+01	5.659314E+01
131	131	2.687894E+02	1.500000E+01	5.770940E+01
132	132	2.687894E+02	1.500000E+01	5.626820E+01
133	133	2.615064E+02	1.500000E+01	5.792789E+01
134	134	2.615064E+02	1.500000E+01	5.612394E+01
135	135	2.542234E+02	1.500000E+01	5.784665E+01
136	136	2.542234E+02	1.500000E+01	5.616876E+01
137	137	2.487612E+02	1.500000E+01	5.741668E+01
138	138	2.487612E+02	1.500000E+01	5.639285E+01
139	139	2.469404E+02	1.500000E+01	5.675000E+01
140	140	0.	0.	0.
141	141	2.869208E+02	1.050000E+01	5.668659E+01

INPUT STRUCTURES GEOMETRY, ROW = SEQUENTIAL NODE NO.,
NODE = STRUCTURAL NODE NO. DESIGNATED BY USER.

NOTE - SUBSEQUENT LOAD ANALYSIS OUTPUT OF AERO., INERTIAL, AND COMBINED
LOADS IN THE STRUCTURES GRID IS IDENTIFIED BY ROW NO. (SEQUENTIAL).

ROW	NODE	XSGEO(I)	YSGEO(I)	ZSGEO(I)
142	142	0.	0.	0.
143	143	2.797823E+02	9.750000E+00	5.729724E+01
144	144	2.797823E+02	9.750000E+00	5.658345E+01
145	145	2.740747E+02	9.000000E+00	5.769809E+01
146	146	2.740747E+02	9.000000E+00	5.629653E+01
147	147	2.725153E+02	9.000000E+00	5.777711E+01
148	148	2.725153E+02	9.000000E+00	5.623420E+01
149	149	2.671800E+02	9.000000E+00	5.796829E+01
150	150	2.671800E+02	9.000000E+00	5.610445E+01
151	151	2.647183E+02	9.000000E+00	5.801102E+01
152	152	2.647183E+02	9.000000E+00	5.607976E+01
153	153	2.589000E+02	9.000000E+00	5.798320E+01
154	154	2.589000E+02	9.000000E+00	5.609589E+01
155	155	2.569213E+02	9.000000E+00	5.792405E+01
156	156	2.569213E+02	9.000000E+00	5.612774E+01
157	157	2.510735E+02	9.000000E+00	5.746373E+01
158	158	2.510735E+02	9.000000E+00	5.636765E+01
159	159	2.491243E+02	9.000000E+00	5.675000E+01
160	160	0.	0.	0.
161	161	2.422800E+02	9.000000E+00	5.800000E+01
162	162	2.422800E+02	9.000000E+00	5.600000E+01
163	163	2.491243E+02	9.000000E+00	5.800000E+01
164	164	2.491243E+02	9.000000E+00	5.600000E+01
165	165	2.510735E+02	9.000000E+00	5.800000E+01
166	166	2.510735E+02	9.000000E+00	5.600000E+01

TA - TRANSFORMATION MATRIX FROM THE DYNAMICS TO THE STRUCTURES GRID
JDTRAN = 2, 79/05/31., SIZE= 24X 534

******INPUT ROW****		NODE	*****OUTPUT COL****		NODE****	OUTPUT FOR UNIT INPUT	*****OUTPUT COL****		NODE****	OUTPUT FOR UNIT INPUT	*****OUTPUT COL****		NODE****	OUTPUT FOR UNIT INPUT	*****OUTPUT COL****		NODE****	OUTPUT FOR UNIT INPUT
1	FZ	1	450	FZ	139	-1.00000F+00												
2	FZ	2	402	FZ	125	-1.00000F+00												
3	FZ	3	312	FZ	97	-1.00000F+00												
4	FZ	4	222	FZ	69	-1.00000F+00												
5	FZ	5	132	FZ	41	-1.00000F+00												
6	FZ	6	42	FZ	13	-1.00000E+00												
7	FZ	7	438	FZ	135	-3.46408F-01	441	FZ	136	-6.53586E-01	444	FZ	137	-1.99726E-06	447	FZ	138	-3.72821E-06
7	FZ	7	501	FZ	155	8.72344F-07	504	FZ	156	1.64589E-06	507	FZ	157	-8.78455E-07	510	FZ	158	-1.63978E-06
8	FZ	8	339	FZ	105	-9.86501F-07	342	FZ	106	-1.85604E-06	345	FZ	107	9.84685E-07	348	FZ	108	1.85785E-06
8	FZ	8	384	FZ	119	-9.99071F-07	387	FZ	120	-1.87968E-06	390	FZ	121	-3.46410E-01	393	FZ	122	-6.53588E-01
9	FZ	9	294	FZ	91	-2.11527F-01	297	FZ	92	-3.97975E-01	306	FZ	95	-1.36220E-01	309	FZ	96	-2.54278E-01
9	FZ	9	339	FZ	105	5.86064E-02	342	FZ	106	1.10264E-01	351	FZ	109	-5.89083E-02	354	FZ	110	-1.09962E-01
10	FZ	10	204	FZ	63	-2.03156F-01	207	FZ	64	-3.82224E-01	215	FZ	67	-1.44635E-01	219	FZ	68	-2.69986E-01
10	FZ	10	249	FZ	77	5.02358F-02	252	FZ	78	9.45153E-02	261	FZ	81	-5.04946E-02	264	FZ	82	-9.42566E-02
11	FZ	11	114	FZ	35	-1.94788F-01	117	FZ	36	-3.66481E-01	125	FZ	39	-1.53046E-01	129	FZ	40	-2.85685E-01
11	FZ	11	159	FZ	49	4.18656F-02	162	FZ	50	7.87672E-02	171	FZ	53	-4.20813E-02	174	FZ	54	-7.85515E-02
12	FZ	12	24	FZ	7	-1.86417F-01	27	FZ	8	-3.50730E-01	36	FZ	11	-1.61460E-01	39	FZ	12	-3.01393E-01
12	FZ	12	69	FZ	21	3.34950F-02	72	FZ	22	6.30186E-02	81	FZ	25	-3.36675E-02	84	FZ	26	-6.28460E-02
13	FZ	13	426	FZ	131	-3.34304F-01	429	FZ	132	-6.65693E-01	432	FZ	133	-1.04760E-06	435	FZ	134	-1.97098E-06
13	FZ	13	477	FZ	147	1.02970F-06	480	FZ	148	2.05042E-06	489	FZ	151	-1.06895E-06	492	FZ	152	-2.01116E-06
14	FZ	14	372	FZ	115	-2.81305F-07	375	FZ	116	-9.24288E-07	378	FZ	117	-3.34305E-01	381	FZ	118	-6.65694E-01
14	FZ	14	420	FZ	129	1.04570F-07	423	FZ	130	3.43588E-07	426	FZ	131	-1.49822E-07	429	FZ	132	-2.98337E-07
15	FZ	15	282	FZ	87	-4.29167F-07	285	FZ	88	-1.41012E-06	288	FZ	89	-3.34305E-01	291	FZ	90	-6.65693E-01
15	FZ	15	327	FZ	101	1.46399F-07	330	FZ	102	4.81022E-07	333	FZ	103	-2.09750E-07	336	FZ	104	-4.17671E-07
16	FZ	16	192	FZ	59	-6.12365F-07	195	FZ	60	-2.01204E-06	198	FZ	61	-3.34304E-01	201	FZ	62	-6.65693E-01
16	FZ	16	237	FZ	73	1.88226F-07	240	FZ	74	6.18458E-07	243	FZ	75	-2.69679E-07	246	FZ	76	-5.37005E-07
17	FZ	17	102	FZ	31	-9.29548F-07	105	FZ	32	-3.05424E-06	108	FZ	33	-3.34304E-01	111	FZ	34	-6.65692E-01
17	FZ	17	147	FZ	45	2.50969F-07	150	FZ	46	8.24609E-07	153	FZ	47	-3.59571E-07	156	FZ	48	-7.16006E-07
18	FZ	18	12	FZ	3	-1.28232F-06	15	FZ	4	-4.21333E-06	18	FZ	5	-3.34303E-01	21	FZ	6	-6.65692E-01
18	FZ	18	57	FZ	17	2.92797F-07	60	FZ	18	9.62042E-07	63	FZ	19	-4.19499E-07	66	FZ	20	-8.35340E-07
19	FZ	19	411	FZ	127	-1.00000F+00												
20	FZ	20	363	FZ	113	-1.00000E+00												
21	FZ	21	273	FZ	85	-1.00000F+00												
22	FZ	22	183	FZ	57	-1.00000F+00												
23	FZ	23	93	FZ	29	-1.00000F+00												
24	FZ	24	3	FZ	1	-1.00000E+00												

**** FASTOP ****
FLUTTER AND STRENGTH
OPTIMIZATION PROGRAM

**** SOP ****
STRENGTH OPTIMIZATION PROGRAM

**** ASAM ****
AUTOMATED
STRENGTH ANALYSIS MODULE

AIR FORCE
FLIGHT DYNAMICS LABORATORY

MAY 1978

GRUMMAN
AEROSPACE
CORPORATION

*** ALLOWABLE STRESS MODIFICATION FACTORS ***

LOAD COND.	TENS. FACTOR	COMP. FACTOR	SHEAR FACTOR
1	1.0000	1.0000	1.0000
2	1.0000	1.0000	1.0000
3	1.0000	1.0000	1.0000
4	1.0000	1.0000	1.0000

INPUT STRUCTURES GEOMETRY, KARD = CARD NO., NODE = STRUCTURES NODE NO.

KARD	NODE X(KARD)	Y(KARD)	Z(KARD)	IBC(KARD,K), K=1,6	
1	1247.701786	60.000000	56.721653	111	00000010
2	2				00000020
3	3244.273786	60.000000	56.992597	111	00000030
4	4244.273786	60.000000	56.676166	111	00000040
5	5240.845786	60.000000	57.201573	111	00000050
6	6240.845786	60.000000	56.523225	111	00000060
7	7237.417786	60.000000	57.304413	111	00000070
8	8237.417786	60.000000	56.455324	111	00000080
9	9233.989786	60.000000	57.266178	111	00000090
10	10233.989786	60.000000	56.476419	111	00000100
11	11231.418786	60.000000	57.063794	111	00000110
12	12231.418786	60.000000	56.581896	111	00000120
13	13230.561786	60.000000	56.750000	111	00000130
14	14				00000140
15	15251.663304	55.000000	56.718111	111	00000150
16	16				00000160
17	17247.806970	55.000000	57.022910	111	00000170
18	18247.806970	55.000000	56.666940	111	00000180
19	19243.950637	55.000000	57.257998	111	00000190
20	20243.950637	55.000000	56.494889	111	00000200
21	21240.094304	55.000000	57.373688	111	00000210
22	22240.094304	55.000000	56.418504	111	00000220
23	23236.237970	55.000000	57.330675	111	00000230
24	24236.237970	55.000000	56.442235	111	00000240
25	25233.345720	55.000000	57.103003	111	00000250
26	26233.345720	55.000000	56.560891	111	00000260
27	27232.381637	55.000000	56.750000	111	00000270
28	28				00000280
29	29255.624822	50.000000	56.714569	111	00000290
30	30				00000300
31	31251.340155	50.000000	57.053223	111	00000310
32	32251.340155	50.000000	56.657715	111	00000320
33	33247.055488	50.000000	57.314422	111	00000330
34	34247.055488	50.000000	56.466553	111	00000340
35	35242.770822	50.000000	57.442962	111	00000350
36	36242.770822	50.000000	56.381684	111	00000360
37	37238.486155	50.000000	57.395172	111	00000370
38	38238.486155	50.000000	56.408050	111	00000380
39	39235.272655	50.000000	57.142212	111	00000390
40	40235.272655	50.000000	56.539886	111	00000400
41	41234.201488	50.000000	56.750000	111	00000410
42	42				00000420
43	43259.586339	45.000000	56.711027	111	00000430
44	44				00000440
45	45254.873339	45.000000	57.083535	111	00000450
46	46254.873339	45.000000	56.648489	111	00000460
47	47250.160339	45.000000	57.370847	111	00000470
48	48250.160339	45.000000	56.438217	111	
49	49245.447339	45.000000	57.512237	111	00000490
50	50245.447339	45.000000	56.344863	111	00000500
51	51240.734339	45.000000	57.459669	111	00000510

INPUT STRUCTURES GEOMETRY, KARD = CARD NO., NODE = STRUCTURES NODE NO.

KARD	NODE X(KARD)	Y(KARD)	Z(KARD)	IBC(KARD,K), K=1,6	
52	52240.734339	45.000000	56.373866	111	00000520
53	53237.199589	45.000000	57.181421	111	00000530
54	54237.199589	45.000000	56.518881	111	00000540
55	55236.021339	45.000000	56.750000	111	00000550
56	56				00000560
57	57263.547857	40.000000	56.707485	111	00000570
58	58				00000580
59	59258.406524	40.000000	57.113848	111	00000590
60	60258.406524	40.000000	56.639263	111	00000600
61	61253.265191	40.000000	57.427272	111	00000610
62	62253.265191	40.000000	56.409881	111	00000620
63	63248.123857	40.000000	57.581512	111	00000630
64	64248.123857	40.000000	56.308043	111	00000640
65	65242.982524	40.000000	57.524166	111	00000650
66	66242.982524	40.000000	56.339682	111	00000660
67	67239.126524	40.000000	57.220630	111	00000670
68	68239.126524	40.000000	56.497877	111	00000680
69	69237.841191	40.000000	56.750000	111	00000690
70	70				00000700
71	71267.509375	35.000000	56.703943	111	00000710
72	72				00000720
73	73261.939708	35.000000	57.144161	111	00000730
74	74261.939708	35.000000	56.630038	111	00000740
75	75256.370042	35.000000	57.483696	111	00000750
76	76256.370042	35.000000	56.381545	111	00000760
77	77250.800375	35.000000	57.650786	111	00000770
78	78250.800375	35.000000	56.271223	111	00000780
79	79245.230708	35.000000	57.588663	111	00000790
80	80245.230708	35.000000	56.305498	111	00000800
81	81241.053458	35.000000	57.259839	111	00000810
82	82241.053458	35.000000	56.476872	111	00000820
83	83239.661042	35.000000	56.750000	111	00000830
84	84				00000840
85	85271.470893	30.000000	56.700401	111	00000850
86	86				00000860
87	87265.472893	30.000000	57.174474	111	00000870
88	88265.472893	30.000000	56.620812	111	00000880
89	89259.474893	30.000000	57.540121	111	00000890
90	90259.474893	30.000000	56.353209	111	00000900
91	91253.476893	30.000000	57.720061	111	00000910
92	92253.476893	30.000000	56.234403	111	00000920
93	93247.478893	30.000000	57.653160	111	00000930
94	94247.478893	30.000000	56.271313	111	00000940
95	95242.980393	30.000000	57.299048	111	00000950
96	96242.980393	30.000000	56.455867	111	00000960
97	97241.480893	30.000000	56.750000	111	00000970
98	98				00000980
99	99275.432411	25.000000	56.696859	111	00000990
100	100				00001000
101	101269.006077	25.000000	57.204787	111	00001010
102	102269.006077	25.000000	56.611586	111	00001020

INPUT STRUCTURES GEOMETRY, KARD = CARD NO., NODE = STRUCTURES NODE NO.

KARD	NODE X(KARD)	Y(KARD)	Z(KARD)	IBC(KARD,K), K=1,6	
103	103262.579744	25.000000	57.596546	111	00001030
104	104262.579744	25.000000	56.324874	111	00001040
105	105256.153411	25.000000	57.789336	111	00001050
106	106256.153411	25.000000	56.197583	111	00001060
107	107249.727077	25.000000	57.717658	111	00001070
108	108249.727077	25.000000	56.237129	111	00001080
109	109244.907327	25.000000	57.338257	111	00001090
110	110244.907327	25.000000	56.434862	111	00001100
111	111243.300744	25.000000	56.750000	111	00001110
112	112				00001120
113	113279.393929	20.000000	56.693317	111	00001130
114	114				00001140
115	115272.539262	20.000000	57.235100	111	00001150
116	116272.539262	20.000000	56.602361	111	00001160
117	117265.684595	20.000000	57.652970	111	00001170
118	118265.684595	20.000000	56.296538	111	00001180
119	119258.829929	20.000000	57.858610	111	00001190
120	120258.829929	20.000000	56.160763	111	00001200
121	121251.975262	20.000000	57.782155	111	00001210
122	122251.975262	20.000000	56.202945	111	00001220
123	123246.834262	20.000000	57.377466	111	00001230
124	124246.834262	20.000000	56.413857	111	00001240
125	125245.120595	20.000000	56.750000	111	00001250
126	126				00001260
127	127283.355446	15.000000	56.689775	111	00001270
128	128				00001280
129	129276.072446	15.000000	57.265412	111	00001290
130	130276.072446	15.000000	56.593135	111	00001300
131	131268.789446	15.000000	57.709395	111	00001310
132	132268.789446	15.000000	56.268202	111	00001320
133	133261.506446	15.000000	57.927885	111	00001330
134	134261.506446	15.000000	56.123942	111	00001340
135	135254.223446	15.000000	57.846652	111	00001350
136	136254.223446	15.000000	56.168761	111	00001360
137	137248.761196	15.000000	57.416675	111	00001370
138	138248.761196	15.000000	56.392852	111	00001380
139	139246.940446	15.000000	56.750000	111	00001390
140	140				00001400
141	141286.920813	10.500000	56.686587	111	00001410
142	142				00001420
143	143279.782290	9.750000	57.297241	111	00001430
144	144279.782290	9.750000	56.583448	111	00001440
145	145274.074668	9.000000	57.698091	1 1	00001450
146	146274.074668	9.000000	56.296533	2 2	00001460
147	147272.515268	9.000000	57.777105	121	00001470
148	148272.515268	9.000000	56.234199	121	00001480
149	149267.180000	9.000000	57.968294	1 1	00001490
150	150267.180000	9.000000	56.104451	1 2	00001500
151	151264.718268	9.000000	58.011015	121	00001510
152	152264.718268	9.000000	56.079758	121	00001520
153	153258.900000	9.000000	57.983204	1 1	00001530

INPUT STRUCTURES GEOMETRY, KARD = CARD NO., NODE = STRUCTURES NODE NO.

KARD	NODE	X(KARD)	Y(KARD)	Z(KARD)	IBC(KARD,K), K=1,6	
154	154	258.900000	9.000000	56.095890	1 2	00001540
155	155	256.921268	9.000000	57.924048	121	00001550
156	156	256.921268	9.000000	56.127740	121	00001560
157	157	251.073518	9.000000	57.463726	121	00001570
158	158	251.073518	9.000000	56.367647	121	00001580
159	159	249.124268	9.000000	56.750000	111	00001590
160	160					00001600
161	161	242.28	9.0	58.0	1 1	
162	162	242.28	9.0	56.0	1 2	
163	163	249.124268	9.0	58.0	1 1	
164	164	249.124268	9.0	56.0	1 1	
165	165	251.073518	9.0	58.0	1 1	
166	166	251.073518	9.0	56.0	1 2	
167						

A P P L I E D L O A D S

NODE	DIRECTION	CONDITION	LOAD	NODE	DIRECTION	CONDITION	LOAD	NODE	DIRECTION	CONDITION	LOAD
1	3	1	.1525000E+02	1	3	2	.2287500E+02	1	3	3	.8820000E+01
1	Z	4	.7100000E+00	0		0	0.	0		0	0.
3	3	1	.2130000E+02	3	3	2	.3195000E+02	3	3	3	.8820000E+01
3	Z	4	-.6140000E+01	0		0	0.	0		0	0.
5	3	1	.2890000E+02	5	3	2	.4335000E+02	5	3	3	.8820000E+01
5	Z	4	-.1474000E+02	0		0	0.	0		0	0.
7	3	1	.3655000E+02	7	3	2	.5482500E+02	7	3	3	.8820000E+01
7	Z	4	-.2339000E+02	0		0	0.	0		0	0.
9	3	1	.3041000E+02	9	3	2	.4561500E+02	9	3	3	.6610000E+01
9	Z	4	-.2094000E+02	0		0	0.	0		0	0.
11	3	1	.9890000E+01	11	3	2	.1483500E+02	11	3	3	.2200000E+01
11	Z	4	-.6700000E+01	0		0	0.	0		0	0.
15	3	1	.2536000E+02	15	3	2	.3804000E+02	15	3	3	.1539000E+02
15	Z	4	.2660000E+01	0		0	0.	0		0	0.
17	3	1	.5183000E+02	17	3	2	.7774500E+02	17	3	3	.2403000E+02
17	Z	4	-.9700000E+01	0		0	0.	0		0	0.
19	3	1	.6665000E+02	19	3	2	.9997500E+02	19	3	3	.2354000E+02
19	Z	4	-.2747000E+02	0		0	0.	0		0	0.
21	3	1	.9253000E+02	21	3	2	.1387950E+03	21	3	3	.2359000E+02
21	Z	4	-.5665000E+02	0		0	0.	0		0	0.
23	3	1	.8882000E+02	23	3	2	.1332300E+03	23	3	3	.1987000E+02
23	Z	4	-.6002000E+02	0		0	0.	0		0	0.
25	3	1	.4764000E+02	25	3	2	.7146000E+02	25	3	3	.1009000E+02
25	Z	4	-.3334000E+02	0		0	0.	0		0	0.
27	3	1	.9350000E+01	27	3	2	.1402500E+02	27	3	3	.2080000E+01
27	Z	4	-.6330000E+01	0		0	0.	0		0	0.
29	3	1	.3200000E+02	29	3	2	.4800000E+02	29	3	3	.1946000E+02
29	Z	4	.3420000E+01	0		0	0.	0		0	0.
31	3	1	.6965000E+02	31	3	2	.1044750E+03	31	3	3	.3360000E+02
31	Z	4	-.1037000E+02	0		0	0.	0		0	0.
33	3	1	.9450000E+02	33	3	2	.1417500E+03	33	3	3	.3413000E+02
33	Z	4	-.3741000E+02	0		0	0.	0		0	0.
35	3	1	.1214900E+03	35	3	2	.1822350E+03	35	3	3	.3308000E+02
35	Z	4	-.7008000E+02	0		0	0.	0		0	0.
37	3	1	.1309000E+03	37	3	2	.1963500E+03	37	3	3	.2874000E+02
37	Z	4	-.8957000E+02	0		0	0.	0		0	0.
39	3	1	.7551000E+02	39	3	2	.1132650E+03	39	3	3	.1548000E+02
39	Z	4	-.5390000E+02	0		0	0.	0		0	0.
41	3	1	.1744000E+02	41	3	2	.2616000E+02	41	3	3	.3540000E+01
41	Z	4	-.1253000E+02	0		0	0.	0		0	0.
43	3	1	.3720000E+02	43	3	2	.5580000E+02	43	3	3	.2236000E+02
43	Z	4	.3440000E+01	0		0	0.	0		0	0.

A P P L I E D   L O A D S

NODE	DIRECTION	CONDITION	LOAD	NODE	DIRECTION	CONDITION	LOAD	NODE	DIRECTION	CONDITION	LOAD
45	3	1	.8563000E+02	45	3	2	.1284450E+03	45	3	3	.4041000E+02
45	Z	4	-.1458000E+02	0		0	0.	0		0	0.
47	3	1	.1090200E+03	47	3	2	.1635300E+03	47	3	3	.3998000E+02
47	Z	4	-.4192000E+02	0		0	0.	0		0	0.
49	3	1	.1472700E+03	49	3	2	.2209050E+03	49	3	3	.4018000E+02
49	Z	4	-.8480000E+02	0		0	0.	0		0	0.
51	3	1	.1533700E+03	51	3	2	.2300550E+03	51	3	3	.3460000E+02
51	Z	4	-.1030500E+03	0		0	0.	0		0	0.
53	3	1	.9270000E+02	53	3	2	.1390500E+03	53	3	3	.1897000E+02
53	Z	4	-.6624000E+02	0		0	0.	0		0	0.
55	3	1	.2348000E+02	55	3	2	.3522000E+02	55	3	3	.4460000E+01
55	Z	4	-.1747000E+02	0		0	0.	0		0	0.
57	3	1	.3966000E+02	57	3	2	.5949000E+02	57	3	3	.2459000E+02
57	Z	4	.5210000E+01	0		0	0.	0		0	0.
59	3	1	.9976000E+02	59	3	2	.1496400E+03	59	3	3	.4502000E+02
59	Z	4	-.2119000E+02	0		0	0.	0		0	0.
61	3	1	.1188000E+03	61	3	2	.1782000E+03	61	3	3	.4554000E+02
61	Z	4	-.4166000E+02	0		0	0.	0		0	0.
63	3	1	.1642900E+03	63	3	2	.2464360E+03	63	3	3	.4491000E+02
63	Z	4	-.9440000E+02	0		0	0.	0		0	0.
65	3	1	.1757400E+03	65	3	2	.2636100E+03	65	3	3	.3902000E+02
65	Z	4	-.1193700E+03	0		0	0.	0		0	0.
67	3	1	.1044700E+03	67	3	2	.1567050E+03	67	3	3	.2157000E+02
67	Z	4	-.7424000E+02	0		0	0.	0		0	0.
69	3	1	.2571000E+02	69	3	2	.3856500E+02	69	3	3	.5150000E+01
69	Z	4	-.1860000E+02	0		0	0.	0		0	0.
71	3	1	.3997000E+02	71	3	2	.5995500E+02	71	3	3	.2625000E+02
71	Z	4	.8240000E+01	0		0	0.	0		0	0.
73	3	1	.8751000E+02	73	3	2	.1312650E+03	73	3	3	.4886000E+02
73	Z	4	.4900000E+00	0		0	0.	0		0	0.
75	3	1	.1250800E+03	75	3	2	.1876200E+03	75	3	3	.4895000E+02
75	Z	4	-.4183000E+02	0		0	0.	0		0	0.
77	3	1	.1807400E+03	77	3	2	.2711100E+03	77	3	3	.4913000E+02
77	Z	4	-.1044400E+03	0		0	0.	0		0	0.
79	3	1	.2044800E+03	79	3	2	.3067200E+03	79	3	3	.4242000E+02
79	Z	4	-.1449500E+03	0		0	0.	0		0	0.
81	3	1	.1230600E+03	81	3	2	.1845800E+03	81	3	3	.2362000E+02
81	Z	4	-.9113000E+02	0		0	0.	0		0	0.
83	3	1	.2852000E+02	83	3	2	.4278000E+02	83	3	3	.5690000E+01
83	Z	4	-.2068000E+02	0		0	0.	0		0	0.
85	3	1	.4635000E+02	85	3	2	.6952500E+02	85	3	3	.2750000E+02
85	Z	4	.3560000E+01	0		0	0.	0		0	0.

A P P L I E D   L O A D S

NODE	DIRECTION	CONDITION	LOAD	NODE	DIRECTION	CONDITION	LOAD	NODE	DIRECTION	CONDITION	LOAD
87	3	1	.9406000E+02	87	3	2	.1410900E+03	87	3	3	.5175000E+02
87	Z	4	-.1020000E+01	0		0	0.	0		0	0.
89	3	1	.1230000E+03	89	3	2	.1845000E+03	89	3	3	.5183000E+02
89	Z	4	-.3360000E+02	0		0	0.	0		0	0.
91	3	1	.1747100E+03	91	3	2	.2620650E+03	91	3	3	.5199000E+02
91	7	4	-.9179000E+02	0		0	0.	0		0	0.
93	3	1	.2195600E+03	93	3	2	.3293400E+03	93	3	3	.4499000E+02
93	Z	4	-.1567700E+03	0		0	0.	0		0	0.
95	3	1	.1412700E+03	95	3	2	.2119050E+03	95	3	3	.2517000E+02
95	7	4	-.1085700E+03	0		0	0.	0		0	0.
97	3	1	.3708000E+02	97	3	2	.5562000E+02	97	3	3	.6100000E+01
97	Z	4	-.2953000E+02	0		0	0.	0		0	0.
99	3	1	.4583000E+02	99	3	2	.6874500E+02	99	3	3	.2834000E+02
99	Z	4	.5870000E+01	0		0	0.	0		0	0.
101	3	1	.1106800E+03	101	3	2	.1660200E+03	101	3	3	.5347000E+02
101	Z	4	-.1634000E+02	0		0	0.	0		0	0.
103	3	1	.1397500E+03	103	3	2	.2096250E+03	103	3	3	.5433000E+02
103	Z	4	-.4746000E+02	0		0	0.	0		0	0.
105	3	1	.1917200E+03	105	3	2	.2875800E+03	105	3	3	.5408000E+02
105	Z	4	-.1067900E+03	0		0	0.	0		0	0.
107	3	1	.2075700E+03	107	3	2	.3113550E+03	107	3	3	.4689000E+02
107	7	4	-.1393600E+03	0		0	0.	0		0	0.
109	3	1	.1383100E+03	109	3	2	.2074650E+03	109	3	3	.2632000E+02
109	7	4	-.1028800E+03	0		0	0.	0		0	0.
111	3	1	.3699000E+02	111	3	2	.5548500E+02	111	3	3	.6410000E+01
111	Z	4	-.2879000E+02	0		0	0.	0		0	0.
113	3	1	.3927000E+02	113	3	2	.5890500E+02	113	3	3	.2896000E+02
113	7	4	.1454000E+02	0		0	0.	0		0	0.
115	3	1	.1089400E+03	115	3	2	.1634100E+03	115	3	3	.5500000E+02
115	7	4	-.1125000E+02	0		0	0.	0		0	0.
117	3	1	.1435200E+03	117	3	2	.2152800E+03	117	3	3	.5542000E+02
117	Z	4	-.4951000E+02	0		0	0.	0		0	0.
119	3	1	.2156800E+03	119	3	2	.3235200E+03	119	3	3	.5595000E+02
119	7	4	-.1300800E+03	0		0	0.	0		0	0.
121	3	1	.2226300E+03	121	3	2	.3339450E+03	121	3	3	.4836000E+02
121	7	4	-.1533900E+03	0		0	0.	0		0	0.
123	3	1	.1298800E+03	123	3	2	.1948200E+03	123	3	3	.2701000E+02
123	7	4	-.9193000E+02	0		0	0.	0		0	0.
125	3	1	.3482000E+02	125	3	2	.5223000E+02	125	3	3	.6630000E+01
125	Z	4	-.2589000E+02	0		0	0.	0		0	0.
127	3	1	.2573000E+02	127	3	2	.3859500E+02	127	3	3	.2764000E+02
127	Z	4	.2717000E+02	0		0	0.	0		0	0.

A P P L I E D   L O A D S

NODE	DIRECTION	CONDITION	LOAD	NODE	DIRECTION	CONDITION	LOAD	NODE	DIRECTION	CONDITION	LOAD
129	3	1	.9337000E+02	129	3	2	.1400550E+03	129	3	3	.5604000E+02
129	2	4	.8490000E+01	0		0	0.	0		0	0.
131	3	1	.1314400E+03	131	3	2	.1971600E+03	131	3	3	.6009000E+02
131	2	4	-.2633000E+02	0		0	0.	0		0	0.
133	3	1	.2332100E+03	133	3	2	.3498150E+03	133	3	3	.6131000E+02
133	2	4	-.1390000E+03	0		0	0.	0		0	0.
135	3	1	.2732800E+03	135	3	2	.4099200E+03	135	3	3	.5321000E+02
135	2	4	-.2008100E+03	0		0	0.	0		0	0.
137	3	1	.1679500E+03	137	3	2	.2519250E+03	137	3	3	.3145000E+02
137	2	4	-.1259800E+03	0		0	0.	0		0	0.
139	3	1	.4170000E+02	139	3	2	.6255000E+02	139	3	3	.8000000E+01
139	2	4	-.3087000E+02	0		0	0.	0		0	0.
143	3	1	.2090000E+02	143	3	2	.3135000E+02	143	3	3	.2278000E+02
143	2	4	.2275000E+02	0		0	0.	0		0	0.
147	3	1	.4112000E+02	147	3	2	.6168000E+02	147	3	3	.1993000E+02
147	2	4	-.5930000E+01	0		0	0.	0		0	0.
151	3	1	.4112000E+02	151	3	2	.6168000E+02	151	3	3	.1993000E+02
151	2	4	-.5930000E+01	0		0	0.	0		0	0.
155	3	1	.1050900E+03	155	3	2	.1576350E+03	155	3	3	.1994000E+02
155	2	4	-.7830000E+02	0		0	0.	0		0	0.
157	3	1	.8632000E+02	157	3	2	.1294800E+03	157	3	3	.1495000E+02
157	2	4	-.6722000E+02	0		0	0.	0		0	0.
159	3	1	.2969000E+02	159	3	2	.4453500E+02	159	3	3	.4980000E+01
159	2	4	-.2344000E+02	0		0	0.	0		0	0.
0		0	0.	0		0	0.	0		0	0.

RESULTANTS OF APPLIED LOADS

LOAD CONDITION	FX	FY	FZ	MX	MY	MZ
1	0.	0.	7.124970E+03	2.247683E+05	-1.796011E+05	0.
2	0.	0.	1.068745E+04	3.371522E+05	-2.694014E+05	0.
3	0.	0.	2.209140E+03	6.969502E+04	-5.645956E+05	0.
4	0.	0.	-3.562040E+03	-1.123602E+05	8.821496E+05	0.

MATERIAL PROPERTIES

ISOTROPIC MATERIALS

MAT. NO.	DENSITY	MIN. GAGE	MAX. GAGE	E	NU	FT	FC	FS	MATERIAL
1	1.0000E-01	1.0000E-02	0.	1.0500E+07	.300	6.7000E+04	5.7000E+04	3.9000E+04	ALUMINUM
2	2.8500E-01	1.0000E-02	0.	2.9500E+07	.300	2.2000E+05	2.1300E+05	1.2900E+05	STEEL
3	1.6000E-01	1.0000E-02	0.	1.6000E+07	.300	1.3000E+05	1.2600E+05	7.6000E+04	TITANIUM 6-4
4	1.1600E-03	2.5000E+00	0.	8.7000E+04	.360	3.7500E+02	3.7500E+02	3.0000E+02	CORE-FWD SPANWIS
5	1.1600E-03	5.0000E+00	5.0000E+00	3.3000E+04	.360	3.7500E+02	3.7500E+02	1.5000E+02	CORE-FWD STRMWIS
6	1.1600E-03	2.5000E+00	0.	8.7000E+04	.360	3.7500E+02	3.7500E+02	3.0000E+02	CORE-AFT SPANWIS
7	1.1600E-03	5.0000E+00	5.0000E+00	3.3000E+04	.360	3.7500E+02	3.7500E+02	1.5000E+02	CORE-AFT STRMWIS
8	5.7000E-02	1.0000E-02	0.	2.8500E+06	.778	1.7700E+05	1.7700E+05	5.0000E+04	SPAR WEB GR/EP
9	1.3000E+00	1.0000E-01	1.0000E-01	1.0000E+06	.360	3.0000E+03	3.0000E+03	1.8500E+02	PSEUDO RIB RODS
11	1.0000E-01	8.0000E-02	0.	1.0500E+07	.330	6.5000E+04	5.7000E+04	3.9000E+04	2024-T81 RIB
12	1.5900E-03	2.5000E+00	0.	1.1424E+04	.360	5.7500E+02	5.7500E+02	4.2500E+02	5.5 CORE LE-SPAN
13	1.5900E-03	5.0000E+00	5.0000E+00	4.6240E+04	.360	5.7500E+02	5.7500E+02	2.2500E+02	5.5 CORE LE-STRM

M A T E R I A L P R O P E R T I E S

COMPOSITE MATERIAL NO. 17 (NO. OF LAYERS = 3)

LAYER NUMBER	1	2	3	4	5	6
MATERIAL	THORNEL 300	THORNEL 300	THORNEL 300			
FIBER ANGLE	45.000	0.000	-45.000	0.000	0.000	0.000
BAL. LAYER CLUE	1	0	1	0	0	0
INI. NO. OF LAM.	1	1	1	0	0	0
MIN. NO. OF LAM.	1	1	1	0	0	0
MAX. NO. OF LAM.	0	0	0	0	0	0
LAMINA THICKNESS	5.00000E-03	5.00000E-03	5.00000E-03	0.	0.	0.
DENSITY	5.70000E-02	5.70000E-02	5.70000E-02	0.	0.	0.
E11	2.01000E+07	2.01000E+07	2.01000E+07	0.	0.	0.
E22	1.60000E+06	1.60000E+06	1.60000E+06	0.	0.	0.
G12	8.00000E+05	8.00000E+05	8.00000E+05	0.	0.	0.
NU12	.29400E+00	.29400E+00	.29400E+00	0.	0.	0.
FXT	2.12000E+05	2.12000E+05	2.12000E+05	0.	0.	0.
FXC	1.85000E+05	1.85000E+05	1.85000E+05	0.	0.	0.
GZ	1.00000E+19	1.00000E+19	1.00000E+19	0.	0.	0.

COMPOSITE MATERIAL NO. 18 (NO. OF LAYERS = 3)

LAYER NUMBER	1	2	3	4	5	6
MATERIAL	GR/EP AFT SKIN	GR/EP AFT SKIN	GR/EP AFT SKIN			
FIBER ANGLE	45.000	0.000	-45.000	0.000	0.000	0.000
BAL. LAYER CLUE	1	0	1	0	0	0
INI. NO. OF LAM.	1	1	1	0	0	0
MIN. NO. OF LAM.	1	1	1	0	0	0
MAX. NO. OF LAM.	0	0	0	0	0	0
LAMINA THICKNESS	5.00000E-03	5.00000E-03	5.00000E-03	0.	0.	0.
DENSITY	5.70000E-02	5.70000E-02	5.70000E-02	0.	0.	0.
E11	2.01000E+07	2.01000E+07	2.01000E+07	0.	0.	0.
E22	1.60000E+06	1.60000E+06	1.60000E+06	0.	0.	0.
G12	8.00000E+05	8.00000E+05	8.00000E+05	0.	0.	0.
NU12	.29400E+00	.29400E+00	.29400E+00	0.	0.	0.
FXT	2.12000E+05	2.12000E+05	2.12000E+05	0.	0.	0.
FXC	1.85000E+05	1.85000E+05	1.85000E+05	0.	0.	0.
GZ	1.00000E+19	1.00000E+19	1.00000E+19	0.	0.	0.

COORDINATES OF POINTS DEFINING REFERENCE DIRECTIONS FOR PROPERTY AXES

	POINT A			POINT B		
ZONE	X	Y	Z	X	Y	Z
1	237.418	8600060.000	.001	.304	264.718	800009.000

MEMBER CARDS TO GENERATE MEMBER PSEUDO MATRIX

4301	4	8	11	4	3	1		.01				RIB	1
6302	6	8	11	4	3	6	5	.01					2
6303	6	8	11	6	5	8	7	.01					3
6304	6	8	11	8	7	10	9	.01					4
6305	6	8	11	10	9	12	11	.01					5
4306	4	8	11	12	11	13		.01					6
4001	4	7	11	4	3	1		2.5				CRIB	1
4001			52					2.5	2.5			CRIB	2
6002	6	7	11	4	3	6	5	2.5				CRIB	3
6002			52					2.5	2.5			CRIB	4
6003	6	7	11	6	5	8	7	2.5				CRIB	5
6003			52					2.5	2.5			CRIB	6
6004	6	5	11	8	7	10	9	2.5				CRIB	7
6004			52					2.5	2.5			CRIB	8
6005	6	5	11	10	9	12	11	2.5				CRIB	9
6005			52					2.5	2.5			CRIB	10
4006	4	5	11	12	11	13		2.5				CRIB	11
4006			52					2.5	2.5			CRIB	12
1001	1	9	11	3	4			.1				ROD	7
1002	1	9	11	5	6			.1					8
1003	1	9	11	7	8			.1					9
1004	1	9	11	9	10			.1					10
1005	1	9	11	11	12			.1					11
6011	6	6	11	4	18	3	17	3.0				SP	12
6011			52					3.0	3.0			SP1012	
6012	6	6	11	6	20	5	19	3.1				SP	13
6012			52					3.1	3.1			SP1013	
6013	6	4	11	8	22	7	21	3.2				SP	14
6013			52					3.2	3.2			SP1014	
6014	6	4	11	10	24	9	23	3.3				SP	15
6014			52					3.3	3.3			SP1015	
6015	6	4	11	12	26	11	25	1.7				SP	16
6015			52					1.7	1.7			SP1016	
9013	6	8	11	8	22	7	21	.01				SP2016	
5001	518		11	3	17	1	15	.015	.015		1	UP	17
5001			61					2	2	45.0	1		
5001			71					2	2	-45.0	1		
5002	518		11	5	19	3	17	.015			1		18
5002			61					3	3	45.0	1		
5002			71					3	3	-45.0	1		
5003	518		11	7	21	5	19	.015					19
5003			61					3	3	45.0	1		
5003			65					2	2	0.0			
5003			71					3	3	-45.0	1		
5004	517		11	7	21	9	23	.015					20
5004			61					2	2	45.0	1		
5004			71					2	2	-45.0	1		
5005	517		11	9	23	11	25	.015			1		21
5006	517		11	11	25	13	27	.015			1		22
5011	518		11	4	18	1	15	.015			1	LOW	23
5011			61					2	2	45.0	1		
5011			71					2	2	-45.0	1		

MEMBER CARDS TO GENERATE MEMBER PSEUDO MATRIX

5012	518	11	6	20	4	18	.015			1	24
5012		61					3	3	45.0	1	
5012		71					3	3	-45.0	1	
5013	518	11	8	22	6	20	.015				25
5013		61					3	3	45.0	1	
5013		65					4	4	0.0		
5013		71					3	3	-45.0	1	
5014	517	11	8	22	10	24	.015				26
5014		61					2	2	45.0	1	
5014		71					2	2	-45.0	1	
5015	517	11	10	24	12	26	.015			1	27
5016	517	11	12	26	13	27	.015			1	28
4021	4 7	11	18	17	15		5.0			RIB	29
6022	6 7	11	18	17	20	19	5.0				30
6023	6 7	11	20	19	22	21	5.0				31
6024	6 5	11	22	21	24	23	5.0				32
6025	6 5	11	24	23	26	25	5.0				33
4026	4 5	11	26	25	27		5.0				34
1011	1 9	11	17	18			.1			ROD	35
1012	1 9	11	19	20			.1				36
1013	1 9	11	21	22			.1				37
1014	1 9	11	23	24			.1				38
1015	1 9	11	25	26			.1				39
6031	6 6	11	18	32	17	31	3.3			SP	40
6031		52					3.3	3.3		SP1040	
6032	6 6	11	20	34	19	33	3.4			SP	41
6032		52					3.4	3.4		SP1041	
6033	6 4	11	22	36	21	35	3.5			SP	42
6033		52					3.5	3.5		SP1042	
6034	6 4	11	24	38	23	37	3.6			SP	43
6034		52					3.6	3.6		SP1043	
6035	6 4	11	26	40	25	39	1.9			SP	44
6035		52					1.9	1.9		SP1044	
9033	6 8	11	22	36	21	35	.01			SP2044	
5021	518	11	17	31	15	29	.015			1UP	45
5021		61					2	2	45.0	1	
5021		71					2	2	-45.0	1	
5022	518	11	19	33	17	31	.015			1	46
5022		61					3	3	45.0	1	
5022		71					3	3	-45.0	1	
5023	518	11	21	35	19	33	.015				47
5023		61					3	3	45.0	1	
5023		65					4	4	0.0		
5023		71					3	3	-45.0	1	
5024	517	11	21	35	23	37	.015				48
5024		61					3	3	45.0	1	
5024		65					3	3	0.0		
5024		71					3	3	-45.0	1	
5025	517	11	23	37	25	39	.015			1	49
5026	517	11	25	39	27	41	.015			1	50
5031	518	11	18	32	15	29	.015			1LOW	51
5031		61					2	2	45.0	1	

MEMBER CARDS TO GENERATE MEMBER PSEUDO MATRIX

5031		71					2	2	-45.0	1	
5032	518	11	20	34	18	32	.015			1	52
5032		61					3	3	45.0	1	
5032		71					3	3	-45.0	1	
5033	518	11	22	36	20	34	.015				53
5033		61					3	3	45.0	1	
5033		65					6	6	0.0		
5033		71					3	3	-45.0	1	
5034	517	11	22	36	24	38	.015				54
5034		61					3	3	45.0	1	
5034		65					3	3	0.0		
5034		71					3	3	-45.0	1	
5035	517	11	24	38	26	40	.015			1	55
5036	517	11	26	40	27	41	.015			1	56
4041	4 7	11	32	31	29		5.0				RIB 57
6042	6 7	11	32	31	34	33	5.0				58
6043	6 7	11	34	33	36	35	5.0				59
6044	6 5	11	36	35	38	37	5.0				60
6045	6 5	11	38	37	40	39	5.0				61
4046	4 5	11	40	39	41		5.0				62
1021	1 9	11	32	31			.1				ROD 63
1022	1 9	11	34	33			.1				64
1023	1 9	11	36	35			.1				65
1024	1 9	11	38	37			.1				66
1025	1 9	11	40	39			.1				67
6051	6 6	11	32	46	31	45	3.7				SP 68
6051		52					3.7	3.7			SP1068
6052	6 6	11	34	48	33	47	3.8				SP 69
6052		52					3.8	3.8			SP1069
6053	6 4	11	36	50	35	49	3.95				SP 70
6053		52					3.95	3.95			SP1070
6054	6 4	11	38	52	37	51	4.1				SP 71
6054		52					4.1	4.1			SP1071
6055	6 4	11	40	54	39	53	2.1				SP 72
6055		52					2.1	2.1			SP1072
9053	6 8	11	36	50	35	49	.01				SP2072
5041	518	11	31	45	29	43	.015			1	UP 73
5041		61					2	2	45.0	1	
5041		71					2	2	-45.0	1	
5042	518	11	33	47	31	45	.015			1	74
5042		61					3	3	45.0	1	
5042		71					3	3	-45.0	1	
5043	518	11	35	49	33	47	.015				75
5043		61					3	3	45.0	1	
5043		65					6	6	.0		
5043		71					3	3	-45.0	1	
5044	517	11	35	49	37	51	.015				76
5044		61					3	3	45.0	1	
5044		65					6	6	0.0		
5044		71					3	3	-45.0	1	
5045	517	11	37	51	39	53	.015			1	77
5045		61					3	3	45.0	1	

MEMBER CARDS TO GENERATE MEMBER PSEUDO MATRIX

5045		71					3	3	-45.0	1	
5046	517	11	39	53	41	55	.015			1	78
5051	518	11	32	46	29	43	.015			1LOW	79
5051		61					2	2	45.0	1	
5051		71					2	2	-45.0	1	
5052	518	11	34	48	32	46	.015			1	80
5052		61					3	3	45.0	1	
5052		71					3	3	-45.0	1	
5053	518	11	36	50	34	48	.015				81
5053		61					3	3	45.0	1	
5053		65					10	10	0.0		
5053		71					3	3	-45.0	1	
5054	517	11	36	50	38	52	.015				82
5054		61					3	3	45.0	1	
5054		65					6	6	0.0		
5054		71					3	3	-45.0	1	
5055	517	11	38	52	40	54	.015			1	83
5055		61					2	2	45.0	1	
5055		71					2	2	-45.0	1	
5056	517	11	40	54	41	55	.015			1	84
4061	4 7	11	46	45	43		5.0				RIB 85
6062	6 7	11	46	45	48	47	5.0				86
6063	6 7	11	48	47	50	49	5.0				87
6064	6 5	11	50	49	52	51	5.0				88
6065	6 5	11	52	51	54	53	5.0				89
4066	4 5	11	54	53	55		5.0				90
1031	1 9	11	46	45			.1				ROD 91
1032	1 9	11	48	47			.1				92
1033	1 9	11	50	49			.1				93
1034	1 9	11	52	51			.1				94
1035	1 9	11	54	53			.1				95
6071	6 6	11	46	60	45	59	4.0				SP 96
6071		52					4.0	4.0			SP1096
6072	6 6	11	48	62	47	61	4.15				SP 97
6072		52					4.15	4.15			SP1097
6073	6 4	11	50	64	49	63	4.3				SP 98
6073		52					4.3	4.3			SP1098
6074	6 4	11	52	66	51	65	4.45				SP 99
6074		52					4.45	4.45			SP1099
6075	6 4	11	54	68	53	67	2.3				SP 100
6075		52					2.3	2.3			SP1100
9073	6 8	11	50	64	49	63	.01				SP2100
5061	518	11	45	59	43	57	.015			1UP	101
5061		61					2	2	45.0	1	
5061		71					2	2	-45.0	1	
5062	518	11	47	61	45	59	.015			1	102
5062		61					3	3	45.0	1	
5062		71					3	3	-45.0	1	
5063	518	11	49	63	47	61	.015				103
5063		61					3	3	45.0	1	
5063		65					8	8	.0		
5063		71					3	3	-45.0	1	

MEMBER CARDS TO GENERATE MEMBER PSEUDO MATRIX

5064	517	11	49	63	51	65	.015					104
5064		61						3	3	45.0	1	
5064		65						9	9	0.0		
5064		71						3	3	-45.0	1	
5065	517	11	51	65	53	67	.015				1	105
5065		61						6	6	45.0	1	
5065		71						6	6	-45.0	1	
5066	517	11	53	67	55	69	.015				1	106
5066		61						5	5	45.0	1	
5066		71						5	5	-45.0	1	
5071	518	11	46	60	43	57	.015				1LOW	107
5071		61						2	2	45.0	1	
5071		71						2	2	-45.0	1	
5072	518	11	48	62	46	60	.015				1	108
5072		61						3	3	45.0	1	
5072		71						3	3	-45.0	1	
5073	518	11	50	64	48	62	.015					109
5073		61						3	3	45.0	1	
5073		65						15	15	0.0		
5073		71						3	3	-45.0	1	
5074	517	11	50	64	52	66	.015					110
5074		61						3	3	45.0	1	
5074		65						10	10	0.0		
5074		71						3	3	-45.0	1	
5075	517	11	52	66	54	68	.015				1	111
5075		61						5	5	45.0	1	
5075		71						5	5	-45.0	1	
5076	517	11	54	68	55	69	.015				1	112
5076		61						3	3	45.0	1	
5076		71						3	3	-45.0	1	
4081	4 7	11	60	59	57		5.0					RIB 113
6082	6 7	11	60	59	62	61	5.0					114
6083	6 7	11	62	61	64	63	5.0					115
6084	6 5	11	64	63	66	65	5.0					116
6085	6 5	11	66	65	68	67	5.0					117
4086	4 5	11	68	67	69		5.0					118
1041	1 9	11	60	59			.1					ROD 119
1042	1 9	11	62	61			.1					120
1043	1 9	11	64	63			.1					121
1044	1 9	11	66	65			.1					122
1045	1 9	11	68	67			.1					123
6091	6 6	11	60	74	59	73	4.45					SP 124
6091		52					4.45		4.45			SP1124
6092	6 6	11	62	76	61	75	4.55					SP 125
6092		52					4.55		4.55			SP1125
6093	6 4	11	64	78	63	77	4.7					SP 126
6093		52					4.7		4.7			SP1126
6094	6 4	11	66	80	65	79	4.85					SP 127
6094		52					4.85		4.85			SP1127
6095	6 4	11	68	82	67	81	2.5					SP 128
6095		52					2.5		2.5			SP1128
9093	6 8	11	64	78	63	77	.01					SP2128

MEMBER CARDS TO GENERATE MEMBER PSEUDO MATRIX

5081	518	11	59	73	57	71	.015				1UP	129
5081		61						2	2	45.0	1	
5081		71						2	2	-45.0	1	
5082	518	11	61	75	59	73	.015				1	130
5082		61						3	3	45.0	1	
5082		71						3	3	-45.0	1	
5083	518	11	63	77	61	75	.015					131
5083		61						3	3	45.0	1	
5083		65						10	10	.0		
5083		71						3	3	-45.0	1	
5084	517	11	63	77	65	79	.015					132
5084		61						3	3	45.0	1	
5084		65						12	12	0.0		
5084		71						3	3	-45.0	1	
5085	517	11	65	79	67	81	.015				1	133
5085		61						9	9	45.0	1	
5085		71						9	9	-45.0	1	
5086	517	11	67	81	69	83	.015				1	134
5086		61						10	10	45.0	1	
5086		71						10	10	-45.0	1	
5091	518	11	60	74	57	71	.015				1LOW	135
5091		61						2	2	45.0	1	
5091		71						2	2	-45.0	1	
5092	518	11	62	76	60	74	.015				1	136
5092		61						3	3	45.0	1	
5092		71						3	3	-45.0	1	
5093	518	11	64	78	62	76	.015					137
5093		61						3	3	45.0	1	
5093		65						18	18	.0		
5093		71						3	3	-45.0	1	
5094	517	11	64	78	66	80	.015					138
5094		61						3	3	45.0	1	
5094		65						14	14	0.0		
5094		71						3	3	-45.0	1	
5095	517	11	66	80	68	82	.015				1	139
5095		61						8	8	45.0	1	
5095		71						8	8	-45.0	1	
5096	517	11	68	82	69	83	.015				1	140
5096		61						8	8	45.0	1	
5096		71						8	8	-45.0	1	
4101	4 7	11	74	73	71		5.0				RIB	141
6102	6 7	11	74	73	76	75	5.0					142
6103	6 7	11	76	75	78	77	5.0					143
6104	6 5	11	78	77	80	79	5.0					144
6105	6 5	11	80	79	82	81	5.0					145
4106	4 5	11	82	81	83		5.0					146
1051	1 9	11	74	73			.1				ROD	147
1052	1 9	11	76	75			.1					148
1053	1 9	11	78	77			.1					149
1054	1 9	11	80	79			.1					150
1055	1 9	11	82	81			.1					151
6111	6 6	11	74	88	73	87	4.8				SP	152

MEMBER CARDS TO GENERATE MEMBER PSEUDO MATRIX

6111		52						4.8	4.8			SP1152
6112	6 6	11	76	90	75	89		4.9				SP 153
6112		52						4.9	4.9			SP1153
6113	6 4	11	78	92	77	91		5.05				SP 154
6113		52						5.05	5.05			SP1154
6114	6 4	11	80	94	79	93		5.25				SP 155
6114		52						5.25	5.25			SP1155
6115	6 4	11	82	96	81	95		2.7				SP 156
6115		52						2.7	2.7			SP1156
9113	6 8	11	78	92	77	91		.01				SP2156
5101	518	11	73	87	71	85	.015				1	UP 157
5101		61						2	2	45.0	1	
5101		71						2	2	-45.0	1	
5102	518	11	75	89	73	87	.015				1	158
5102		61						3	3	45.0	1	
5102		71						3	3	-45.0	1	
5103	518	11	77	91	75	89	.015					159
5103		61						2	2	45.0	1	
5103		65						12	12	0.0		
5103		71						2	2	-45.0	1	
5104	517	11	77	91	79	93	.015					160
5104		61						2	2	45.0	1	
5104		65						15	15	0.0		
5104		71						2	2	-45.0	1	
5105	517	11	79	93	81	95	.015				1	161
5105		61						12	12	45.0	1	
5105		71						12	12	-45.0	1	
5106	517	11	81	95	83	97	.015				1	162
5106		61						15	15	45.0	1	
5106		71						15	15	-45.0	1	
5111	518	11	74	88	71	85	.015				1	LOW 163
5111		61						2	2	45.0	1	
5111		71						2	2	-45.0	1	
5112	518	11	76	90	74	88	.015				1	164
5112		61						3	3	45.0	1	
5112		71						3	3	-45.0	1	
5113	518	11	78	92	76	90	.015					165
5113		61						2	2	45.0	1	
5113		65						21	21	0.0		
5113		71						2	2	-45.0	1	
5114	517	11	78	92	80	94	.015					166
5114		61						2	2	45.0	1	
5114		65						18	18	0.0		
5114		71						2	2	-45.0	1	
5115	517	11	80	94	82	96	.015				1	167
5115		61						11	11	45.0	1	
5115		71						11	11	-45.0	1	
5116	517	11	82	96	83	97	.015				1	168
5116		61						13	13	45.0	1	
5116		71						13	13	-45.0	1	
4121	4 7	11	88	87	85		5.0					RIB 169
6122	6 7	11	88	87	90	89	5.0					170

MEMBER CARDS TO GENERATE MEMBER PSEUDO MATRIX

6123	6 7	11	90	89	92	91	5.0					171
6124	6 5	11	92	91	94	93	5.0					172
6125	6 5	11	94	93	96	95	5.0					173
4126	4 5	11	96	95	97		5.0					174
1061	1 9	11	88	87			.1				ROD	175
1062	1 9	11	90	89			.1					176
1063	1 9	11	92	91			.1					177
1064	1 9	11	94	93			.1					178
1065	1 9	11	96	95			.1					179
6131	6 6	11	88	102	87	101		5.2			SP	180
6131		52						5.2	5.2		SP1180	
6132	6 6	11	90	104	89	103		5.3			SP	181
6132		52						5.3	5.3		SP1181	
6133	6 4	11	92	106	91	105		5.45			SP	182
6133		52						5.45	5.45		SP1182	
6134	6 4	11	94	108	93	107		5.65			SP	183
6134		52						5.65	5.65		SP1183	
6135	6 4	11	96	110	95	109		2.9			SP	184
6135		52						2.9	2.9		SP1184	
9133	6 8	11	92	106	91	105		.01			SP2184	
5121	518	11	87	101	85	99	.015				1UP	185
5122	518	11	89	103	87	101	.015				1	186
5122		61						2	2	45.0	1	
5122		71						2	2	-45.0	1	
5123	518	11	91	105	89	103	.015					187
5123		61						2	2	45.0	1	
5123		65						12	12	0.0		
5123		71						2	2	-45.0	1	
5124	517	11	91	105	93	107	.015					188
5124		61						2	2	45.0	1	
5124		65						18	18	0.0		
5124		71						2	2	-45.0	1	
5125	517	11	93	107	95	109	.015				1	189
5125		61						14	14	45.0	1	
5125		65						2	2	0.0		
5125		71						14	14	-45.0	1	
5126	517	11	95	109	97	111	.015				1	190
5126		61						20	20	45.0	1	
5126		71						20	20	-45.0	1	
5131	518	11	88	102	85	99	.015				1LOW	191
5132	518	11	90	104	88	102	.015				1	192
5132		61						2	2	45.0	1	
5132		71						2	2	-45.0	1	
5133	518	11	92	106	90	104	.015					193
5133		61						2	2	45.0	1	
5133		65						23	23	0.0		
5133		71						2	2	-45.0	1	
5134	517	11	92	106	94	108	.015					194
5134		61						2	2	45.0	1	
5134		65						23	23	0.0		
5134		71						2	2	-45.0	1	
5135	517	11	94	108	96	110	.015				1	195

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5135        65                      2       2        0.0
5135        61                     13      13       45.0      1
5135        71                     13      13      -45.0      1
5136 517    11  96 110  97 111 .015                           1    196
5136        61                     17      17       45.0      1
5136        71                     17      17      -45.0      1
4141 4 7    11 102 101  99     5.0                             RIB 197
6142 6 7    11 102 101 104 103 5.0                                 198
6143 6 7    11 104 103 106 105 5.0                                 199
6144 613    11 106 105 108 107 5.0                                 200
6145 613    11 108 107 110 109 5.0                                 201
4146 413    11 110 109 111     5.0                                 202
1071 1 9    11 102 101          .1                                 203
1072 1 9    11 104 103          .1                                 204
1073 1 9    11 106 105          .1                                 205
1074 1 9    11 108 107          .1                                 206
1075 1 9    11 110 109          .1                                 207
6151 6 6    11 102 116 101 115    5.5                          SP  208
6151        52                    5.5     5.5                  SP1208
6152 6 6    11 104 118 103 117    5.6                          SP  209
6152        52                    5.6     5.6                  SP1209
6153 612    11 106 120 105 119    5.8                          SP  210
6153        52                    5.8     5.8                  SP1210
6154 612    11 108 122 107 121    6.0                          SP  211
6154        52                    6.0     6.0                  SP1211
6155 612    11 110 124 109 123    3.1                          SP  212
6155        52                    3.1     3.1                  SP1212
9153 6 8    11 106 120 105 119    .01                          SP2212
5141 518    11 101 115  99 113 .015                           1UP  213
5142 518    11 103 117 101 115 .015                           1    214
5143 518    11 105 119 103 117 .015                                215
5143        61                      2       2       45.0      1
5143        65                     12      12        0.0
5143        71                      2       2      -45.0      1
5144 517    11 105 119 107 121 .015                                216
5144        61                      2       2       45.0      1
5144        65                     25      25        0.0
5144        71                      2       2      -45.0      1
5145 517    11 107 121 109 123 .015                           1    217
5145        61                     15      15       45.0      1
5145        65                      8       8        0.0
5145        71                     15      15      -45.0      1
5146 517    11 109 123 111 125 .015                           1    218
5146        61                     30      30       45.0      1
5146        65                      3       3        0.0
5146        71                     30      30      -45.0      1
5151 518    11 102 116  99 113 .015                           1LOW 219
5152 518    11 104 118 102 116 .015                           1    220
5153 518    11 106 120 104 118 .015                                221
5153        61                      2       2       45.0      1
5153        65                     25      25        0.0
5153        71                      2       2      -45.0      1
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MEMBER CARDS TO GENERATE MEMBER PSEUDO MATRIX

5154	517	11	106	120	108	122	.015					222
5154		61						2	2	45.0	1	
5154		65						27	27	0.0		
5154		71						2	2	-45.0	1	
5155	517	11	108	122	110	124	.015				1	223
5155		61						14	14	45.0	1	
5155		65						8	8	0.0		
5155		71						14	14	-45.0	1	
5156	517	11	110	124	111	125	.015				1	224
5156		61						19	19	45.0	1	
5156		65						2	2	0.0		
5156		71						19	19	-45.0	1	
4161	4 7	11	116	115	113		5.0					RIB 225
6162	6 7	11	116	115	118	117	5.0					226
6163	6 7	11	118	117	120	119	5.0					227
6164	613	11	120	119	122	121	5.0					228
6165	613	11	122	121	124	123	5.0					229
4166	413	11	124	123	125		5.0					230
1081	1 9	11	116	115			.1					ROD 231
1082	1 9	11	118	117			.1					232
1083	1 9	11	120	119			.1					233
1084	1 9	11	122	121			.1					234
1085	1 9	11	124	123			.1					235
6171	6 6	11	116	130	115	129		5.8				SP 236
6171		52						5.8	5.8			SP1236
6172	6 6	11	118	132	117	131		6.0				SP 237
6172		52						6.0	6.0			SP1237
6173	612	11	120	134	119	133		6.2				SP 238
6173		52						6.2	6.2			SP1238
6174	612	11	122	136	121	135		6.45				SP 239
6174		52						6.45	6.45			SP1239
6175	612	11	124	138	123	137		3.3				SP 240
6175		52						3.3	3.3			SP1240
9173	6 8	11	120	134	119	133		.01				SP2240
5161	518	11	115	129	113	127	.015				1	UP 241
5162	518	11	117	131	115	129	.015				1	242
5163	518	11	119	133	117	131	.015					243
5163		61						2	2	45.0	1	
5163		65						6	6	0.0		
5163		71						2	2	-45.0	1	
5164	517	11	119	133	121	135	.015					243
5164		61						3	3	45.0	1	
5164		65						26	26	0.0		
5164		71						3	3	-45.0	1	
5165	517	11	121	135	123	137	.015				1	244
5165		61						15	15	45.0	1	
5165		65						13	13	0.0		
5165		71						15	15	-45.0	1	
5166	517	11	123	137	125	139	.015				1	245
5166		61						41	41	45.0	1	
5166		65						3	3	0.0		
5166		71						41	41	-45.0	1	

MEMBER CARDS TO GENERATE MEMBER PSEUDO MATRIX

5171	518	11	116	130	113	127	.015				1	LOW 246
5172	518	11	118	132	116	130	.015				1	247
5173	518	11	120	134	118	132	.015					248
5173		65						5	5	0.0		
5174	517	11	120	134	122	136	.015					249
5174		61						2	2	45.0	1	
5174		65						28	28	0.0		
5174		71						2	2	-45.0	1	
5175	517	11	122	136	124	138	.015				1	250
5175		61						14	14	45.0	1	
5175		65						10	10	0.0		
5175		71						14	14	-45.0	1	
5176	517	11	124	138	125	139	.015				1	251
5176		61						20	20	45.0	1	
5176		65						4	4	0.0		
5176		71						20	20	-45.0	1	
4181	4 7	11	130	129	127		5.0					RIB 252
6182	6 7	11	130	129	132	131	5.0					253
6183	6 7	11	132	131	134	133	5.0					254
6184	613	11	134	133	136	135	5.0					255
6185	613	11	136	135	138	137	5.0					256
4186	413	11	138	137	139		5.0					257
1091	1 9	11	130	129			.1					ROD 258
1092	1 9	11	132	131			.1					259
1093	1 9	11	134	133			.1					260
1094	1 9	11	136	135			.1					261
1095	1 9	11	138	137			.1					262
6191	6 6	11	130	144	129	143		6.2				SP 263
6191		52						6.2	6.2			SP1263
6192	6 6	11	132	148	131	147		6.45				SP 264
6192		52						6.45	6.45			SP1264
6193	612	11	134	152	133	151		6.6				SP 265
6193		52						6.6	6.6			SP1265
6194	612	11	136	156	135	155		6.9				SP 266
6194		52						6.9	6.9			SP1266
6195	612	11	138	158	137	157		3.5				SP 267
6195		52						3.5	3.5			SP1267
9193	6 8	11	134	152	133	151		.01				SP2267
5181	518	11	129	143	127	141	.015				1	UP 268
5182	518	11	131	147	129	143	.015				1	269
5183	518	11	133	151	131	147	.015					270
5183		61						2	2	45.0	1	
5183		71						2	2	-45.0	1	
5184	517	11	133	151	135	155	.015					271
5184		61						3	3	45.0	1	
5184		65						28	28	0.0		
5184		71						3	3	-45.0	1	
5185	517	11	135	155	137	157	.015				1	272
5185		61						12	12	45.0	1	
5185		65						21	21	0.0		
5185		71						12	12	-45.0	1	
5186	517	11	137	157	139	159	.015				1	273

MEMBER CARDS TO GENERATE MEMBER PSEUDO MATRIX

5186		61						43	43	45.0	1	
5186		65						3	3	0.0		
5186		71						43	43	-45.0	1	
5191	518	11	130	144	127	141	.015				1LOW	274
5192	518	11	132	148	130	144	.015				1	275
5193	518	11	134	152	132	148	.015					276
5193		61						2	2	45.0	1	
5193		71						2	2	-45.0	1	
5194	517	11	134	152	136	156	.015					277
5194		61						2	2	45.0	1	
5194		65						30	30	0.0		
5194		71						2	2	-45.0	1	
5195	517	11	136	156	138	158	.015				1	278
5195		61						11	11	45.0	1	
5195		65						19	19	0.0		
5195		71						11	11	-45.0	1	
5196	517	11	138	158	139	159	.015				1	279
5196		61						22	22	45.0	1	
5196		65						4	4	0.0		
5196		71						22	22	-45.0	1	
4201	411	11	144	143	141		.1				RR	280
6202	611	11	144	143	146	145	.1					281
6203	611	11	146	145	148	147	.1					282
6204	611	11	148	147	150	149	.1					283
6205	611	11	150	149	152	151	.1					284
6206	611	11	152	151	154	153	.1					285
6207	611	11	154	153	156	155	.1					286
6208	611	11	156	155	158	157	.1					287
4209	411	11	158	157	159		.1					288
4211	411	11	157	165	155		.1				RR	289
6212	611	11	157	165	159	163	.1					290
6213	611	11	164	163	162	161	.1					291
6214	611	11	158	166	159	164	.1					292
4215	411	11	158	166	156		.1					293
1101	1 9	11	144	143			.1				RR	294
1102	111	11	146	145			.1					295
1103	1 9	11	148	147			.1					296
1104	111	11	150	149			.1					297
1105	1 9	11	152	151			.1					298
1106	111	11	154	153			.1					299
1107	1 9	11	156	155			.1					300
1108	111	11	158	157			.1					301
1201	111	11	157	165			.1				RR	302
1202	111	11	159	163			.1					303
1203	111	11	162	161			.1					304
1204	111	11	159	164			.1					305
1205	111	11	158	166			.1					306
1301	111	11	141	143			.1				RR	307
1302	111	11	143	145			.1				RR	308
1303	111	11	145	147			.1					309
1304	111	11	147	149			.1					310
1305	111	11	149	151			.1					311

MEMBER CARDS TO GENERATE MEMBER PSEUDO MATRIX

1306	111	11	151	153	.1		312
1307	111	11	153	155	.1		313
1308	111	11	155	157	.1		314
1309	111	11	157	159	.1		315
1311	111	11	141	144	.1	RR	316
1312	111	11	144	146	.1		317
1313	111	11	146	148	.1		318
1314	111	11	148	150	.1		319
1315	111	11	150	152	.1		320
1316	111	11	152	154	.1		321
1317	111	11	154	156	.1		322
1318	111	11	156	158	.1		323
1319	111	11	158	159	.1		324
1401	111	11	155	165	.1	RR	325
1402	111	11	165	163	.1		326
1403	111	11	163	161	.1		327
1404	111	11	164	162	.1		328
1405	111	11	166	164	.1		329
1406	111	11	156	166	.1		330

THE NUMBER OF CORNER FORCES IN THE TOTAL STRUCTURE = 5931
ALL INPUT IN SUBROUTINE CARDIN HAS BEEN COMPLETED

KARD	NODE	GEOMETRY X	GEOMETRY Y	GEOMETRY Z	BOUNDARY CONDITIONS X	Y	Z	MX	MY	MZ
1	1	2.477018E+02	6.000000E+01	5.672165E+01	1	2	3	0	0	0
2	2	0.	0.	0.	0	0	0	0	0	0
3	3	2.442738E+02	6.000000E+01	5.699260E+01	4	5	6	0	0	0
4	4	2.442738E+02	6.000000E+01	5.667617E+01	7	8	9	0	0	0
5	5	2.408458E+02	6.000000E+01	5.720157E+01	10	11	12	0	0	0
6	6	2.408458E+02	6.000000E+01	5.652323E+01	13	14	15	0	0	0
7	7	2.374178E+02	6.000000E+01	5.730441E+01	16	17	18	0	0	0
8	8	2.374178E+02	6.000000E+01	5.645532E+01	19	20	21	0	0	0
9	9	2.339898E+02	6.000000E+01	5.726618E+01	22	23	24	0	0	0
10	10	2.339898E+02	6.000000E+01	5.647642E+01	25	26	27	0	0	0
11	11	2.314188E+02	6.000000E+01	5.706379E+01	28	29	30	0	0	0
12	12	2.314188E+02	6.000000E+01	5.658190E+01	31	32	33	0	0	0
13	13	2.305618E+02	6.000000E+01	5.675000E+01	34	35	36	0	0	0
14	14	0.	0.	0.	0	0	0	0	0	0
15	15	2.516633E+02	5.500000E+01	5.671811E+01	37	38	39	0	0	0
16	16	0.	0.	0.	0	0	0	0	0	0
17	17	2.478070E+02	5.500000E+01	5.702291E+01	40	41	42	0	0	0
18	18	2.478070E+02	5.500000E+01	5.666694E+01	43	44	45	0	0	0
19	19	2.439506E+02	5.500000E+01	5.725800E+01	46	47	48	0	0	0
20	20	2.439506E+02	5.500000E+01	5.649489E+01	49	50	51	0	0	0
21	21	2.400943E+02	5.500000E+01	5.737369E+01	52	53	54	0	0	0
22	22	2.400943E+02	5.500000E+01	5.641850E+01	55	56	57	0	0	0
23	23	2.362380E+02	5.500000E+01	5.733068E+01	58	59	60	0	0	0
24	24	2.362380E+02	5.500000E+01	5.644224E+01	61	62	63	0	0	0
25	25	2.333457E+02	5.500000E+01	5.710300E+01	64	65	66	0	0	0
26	26	2.333457E+02	5.500000E+01	5.656089E+01	67	68	69	0	0	0
27	27	2.323816E+02	5.500000E+01	5.675000E+01	70	71	72	0	0	0
28	28	0.	0.	0.	0	0	0	0	0	0
29	29	2.556248E+02	5.000000E+01	5.671457E+01	73	74	75	0	0	0
30	30	0.	0.	0.	0	0	0	0	0	0
31	31	2.513402E+02	5.000000E+01	5.705322E+01	76	77	78	0	0	0
32	32	2.513402E+02	5.000000E+01	5.665772E+01	79	80	81	0	0	0
33	33	2.470555E+02	5.000000E+01	5.731442E+01	82	83	84	0	0	0
34	34	2.470555E+02	5.000000E+01	5.646655E+01	85	86	87	0	0	0
35	35	2.427708E+02	5.000000E+01	5.744296E+01	88	89	90	0	0	0
36	36	2.427708E+02	5.000000E+01	5.638168E+01	91	92	93	0	0	0
37	37	2.384862E+02	5.000000E+01	5.739517E+01	94	95	96	0	0	0
38	38	2.384862E+02	5.000000E+01	5.640805E+01	97	98	99	0	0	0
39	39	2.352727E+02	5.000000E+01	5.714221E+01	100	101	102	0	0	0
40	40	2.352727E+02	5.000000E+01	5.653989E+01	103	104	105	0	0	0
41	41	2.342015E+02	5.000000E+01	5.675000E+01	106	107	108	0	0	0
42	42	0.	0.	0.	0	0	0	0	0	0
43	43	2.595863E+02	4.500000E+01	5.671103E+01	109	110	111	0	0	0
44	44	0.	0.	0.	0	0	0	0	0	0
45	45	2.548733E+02	4.500000E+01	5.708354E+01	112	113	114	0	0	0
46	46	2.548733E+02	4.500000E+01	5.664849E+01	115	116	117	0	0	0
47	47	2.501603E+02	4.500000E+01	5.737085E+01	118	119	120	0	0	0
48	48	2.501603E+02	4.500000E+01	5.643822E+01	121	122	123	0	0	0
49	49	2.454473E+02	4.500000E+01	5.751224E+01	124	125	126	0	0	0
50	50	2.454473E+02	4.500000E+01	5.634486E+01	127	128	129	0	0	0

		GEOMETRY			BOUNDARY CONDITIONS					
KARD	NODE	X	Y	Z	X	Y	Z	MX	MY	MZ
51	51	2.407343E+02	4.500000E+01	5.745967E+01	130	131	132	0	0	0
52	52	2.407343E+02	4.500000E+01	5.637387E+01	133	134	135	0	0	0
53	53	2.371996E+02	4.500000E+01	5.718142E+01	136	137	138	0	0	0
54	54	2.371996E+02	4.500000E+01	5.651888E+01	139	140	141	0	0	0
55	55	2.360213E+02	4.500000E+01	5.675000E+01	142	143	144	0	0	0
56	56	0.	0.	0.	0	0	0	0	0	0
57	57	2.635479E+02	4.000000E+01	5.670749E+01	145	146	147	0	0	0
58	58	0.	0.	0.	0	0	0	0	0	0
59	59	2.584065E+02	4.000000E+01	5.711385E+01	148	149	150	0	0	0
60	60	2.584065E+02	4.000000E+01	5.663926E+01	151	152	153	0	0	0
61	61	2.532652E+02	4.000000E+01	5.742727E+01	154	155	156	0	0	0
62	62	2.532652E+02	4.000000E+01	5.640988E+01	157	158	159	0	0	0
63	63	2.481239E+02	4.000000E+01	5.758151E+01	160	161	162	0	0	0
64	64	2.481239E+02	4.000000E+01	5.630804E+01	163	164	165	0	0	0
65	65	2.429825E+02	4.000000E+01	5.752417E+01	166	167	168	0	0	0
66	66	2.429825E+02	4.000000E+01	5.633968E+01	169	170	171	0	0	0
67	67	2.391265E+02	4.000000E+01	5.722063E+01	172	173	174	0	0	0
68	68	2.391265E+02	4.000000E+01	5.649788E+01	175	176	177	0	0	0
69	69	2.378412E+02	4.000000E+01	5.675000E+01	178	179	180	0	0	0
70	70	0.	0.	0.	0	0	0	0	0	0
71	71	2.675094E+02	3.500000E+01	5.670394E+01	181	182	183	0	0	0
72	72	0.	0.	0.	0	0	0	0	0	0
73	73	2.619397E+02	3.500000E+01	5.714416E+01	184	185	186	0	0	0
74	74	2.619397E+02	3.500000E+01	5.663004E+01	187	188	189	0	0	0
75	75	2.563700E+02	3.500000E+01	5.748370E+01	190	191	192	0	0	0
76	76	2.563700E+02	3.500000E+01	5.638155E+01	193	194	195	0	0	0
77	77	2.508004E+02	3.500000E+01	5.765079E+01	196	197	198	0	0	0
78	78	2.508004E+02	3.500000E+01	5.627122E+01	199	200	201	0	0	0
79	79	2.452307E+02	3.500000E+01	5.758866E+01	202	203	204	0	0	0
80	80	2.452307E+02	3.500000E+01	5.630550E+01	205	206	207	0	0	0
81	81	2.410535E+02	3.500000E+01	5.725984E+01	208	209	210	0	0	0
82	82	2.410535E+02	3.500000E+01	5.647687E+01	211	212	213	0	0	0
83	83	2.396610E+02	3.500000E+01	5.675000E+01	214	215	216	0	0	0
84	84	0.	0.	0.	0	0	0	0	0	0
85	85	2.714709E+02	3.000000E+01	5.670040E+01	217	218	219	0	0	0
86	86	0.	0.	0.	0	0	0	0	0	0
87	87	2.654729E+02	3.000000E+01	5.717447E+01	220	221	222	0	0	0
88	88	2.654729E+02	3.000000E+01	5.662081E+01	223	224	225	0	0	0
89	89	2.594749E+02	3.000000E+01	5.754012E+01	226	227	228	0	0	0
90	90	2.594749E+02	3.000000E+01	5.635321E+01	229	230	231	0	0	0
91	91	2.534769E+02	3.000000E+01	5.772006E+01	232	233	234	0	0	0
92	92	2.534769E+02	3.000000E+01	5.623440E+01	235	236	237	0	0	0
93	93	2.474789E+02	3.000000E+01	5.765316E+01	238	239	240	0	0	0
94	94	2.474789E+02	3.000000E+01	5.627131E+01	241	242	243	0	0	0
95	95	2.429804E+02	3.000000E+01	5.729905E+01	244	245	246	0	0	0
96	96	2.429804E+02	3.000000E+01	5.645587E+01	247	248	249	0	0	0
97	97	2.414809E+02	3.000000E+01	5.675000E+01	250	251	252	0	0	0
98	98	0.	0.	0.	0	0	0	0	0	0
99	99	2.754324E+02	2.500000E+01	5.669686E+01	253	254	255	0	0	0
100	100	0.	0.	0.	0	0	0	0	0	0

KARD	NODE	G E O M E T R Y X	Y	Z	BOUNDARY CONDITIONS X	Y	Z	MX	MY	MZ
101	101	2.690061E+02	2.500000E+01	5.720479E+01	256	257	258	0	0	0
102	102	2.690061E+02	2.500000E+01	5.661159E+01	259	260	261	0	0	0
103	103	2.625797E+02	2.500000E+01	5.759655E+01	262	263	264	0	0	0
104	104	2.625797E+02	2.500000E+01	5.632487E+01	265	266	267	0	0	0
105	105	2.561534E+02	2.500000E+01	5.778934E+01	268	269	270	0	0	0
106	106	2.561534E+02	2.500000E+01	5.619758E+01	271	272	273	0	0	0
107	107	2.497271E+02	2.500000E+01	5.771766E+01	274	275	276	0	0	0
108	108	2.497271E+02	2.500000E+01	5.623713E+01	277	278	279	0	0	0
109	109	2.449073E+02	2.500000E+01	5.733826E+01	280	281	282	0	0	0
110	110	2.449073E+02	2.500000E+01	5.643486E+01	283	284	285	0	0	0
111	111	2.433007E+02	2.500000E+01	5.675000E+01	286	287	288	0	0	0
112	112	0.	0.	0.	0	0	0	0	0	0
113	113	2.793939E+02	2.000000E+01	5.669332E+01	289	290	291	0	0	0
114	114	0.	0.	0.	0	0	0	0	0	0
115	115	2.725393E+02	2.000000E+01	5.723510E+01	292	293	294	0	0	0
116	116	2.725393E+02	2.000000E+01	5.660236E+01	295	296	297	0	0	0
117	117	2.656846E+02	2.000000E+01	5.765297E+01	298	299	300	0	0	0
118	118	2.656846E+02	2.000000E+01	5.629654E+01	301	302	303	0	0	0
119	119	2.588299E+02	2.000000E+01	5.785861E+01	304	305	306	0	0	0
120	120	2.588299E+02	2.000000E+01	5.616076E+01	307	308	309	0	0	0
121	121	2.519753E+02	2.000000E+01	5.778216E+01	310	311	312	0	0	0
122	122	2.519753E+02	2.000000E+01	5.620295E+01	313	314	315	0	0	0
123	123	2.468343E+02	2.000000E+01	5.737747E+01	316	317	318	0	0	0
124	124	2.468343E+02	2.000000E+01	5.641386E+01	319	320	321	0	0	0
125	125	2.451206E+02	2.000000E+01	5.675000E+01	322	323	324	0	0	0
126	126	0.	0.	0.	0	0	0	0	0	0
127	127	2.833554E+02	1.500000E+01	5.668978E+01	325	326	327	0	0	0
128	128	0.	0.	0.	0	0	0	0	0	0
129	129	2.760724E+02	1.500000E+01	5.726541E+01	328	329	330	0	0	0
130	130	2.760724E+02	1.500000E+01	5.659314E+01	331	332	333	0	0	0
131	131	2.687894E+02	1.500000E+01	5.770940E+01	334	335	336	0	0	0
132	132	2.687894E+02	1.500000E+01	5.626820E+01	337	338	339	0	0	0
133	133	2.615064E+02	1.500000E+01	5.792789E+01	340	341	342	0	0	0
134	134	2.615064E+02	1.500000E+01	5.612394E+01	343	344	345	0	0	0
135	135	2.542234E+02	1.500000E+01	5.784665E+01	346	347	348	0	0	0
136	136	2.542234E+02	1.500000E+01	5.616876E+01	349	350	351	0	0	0
137	137	2.487612E+02	1.500000E+01	5.741668E+01	352	353	354	0	0	0
138	138	2.487612E+02	1.500000E+01	5.639285E+01	355	356	357	0	0	0
139	139	2.469404E+02	1.500000E+01	5.675000E+01	358	359	360	0	0	0
140	140	0.	0.	0.	0	0	0	0	0	0
141	141	2.869208E+02	1.050000E+01	5.668659E+01	361	362	363	0	0	0
142	142	0.	0.	0.	0	0	0	0	0	0
143	143	2.797823E+02	9.750000E+00	5.729724E+01	364	365	366	0	0	0
144	144	2.797823E+02	9.750000E+00	5.658345E+01	367	368	369	0	0	0
145	145	2.740747E+02	9.000000E+00	5.769809E+01	370	0	371	0	0	0
146	146	2.740747E+02	9.000000E+00	5.629653E+01	-1	0	-2	0	0	0
147	147	2.725153E+02	9.000000E+00	5.777711E+01	372	-3	373	0	0	0
148	148	2.725153E+02	9.000000E+00	5.623420E+01	374	-4	375	0	0	0
149	149	2.671800E+02	9.000000E+00	5.796829E+01	376	0	377	0	0	0
150	150	2.671800E+02	9.000000E+00	5.610445E+01	378	0	-5	0	0	0

G E O M E T R Y

BOUNDARY CONDITIONS

KARD	NODE	X	Y	Z	X	Y	Z	MX	MY	MZ
151	151	2.647183E+02	9.000000E+00	5.801102E+01	379	-6	380	0	0	0
152	152	2.647183E+02	9.000000E+00	5.607976E+01	381	-7	382	0	0	0
153	153	2.589000E+02	9.000000E+00	5.798320E+01	383	0	384	0	0	0
154	154	2.589000E+02	9.000000E+00	5.609589E+01	385	0	-8	0	0	0
155	155	2.569213E+02	9.000000E+00	5.792405E+01	386	-9	387	0	0	0
156	156	2.569213E+02	9.000000E+00	5.612774E+01	388	-10	389	0	0	0
157	157	2.510735E+02	9.000000E+00	5.746373E+01	390	-11	391	0	0	0
158	158	2.510735E+02	9.000000E+00	5.636765E+01	392	-12	393	0	0	0
159	159	2.491243E+02	9.000000E+00	5.675000E+01	394	395	396	0	0	0
160	160	0.	0.	0.	0	0	0	0	0	0
161	161	2.422800E+02	9.000000E+00	5.800000E+01	397	0	398	0	0	0
162	162	2.422800E+02	9.000000E+00	5.600000E+01	399	0	-13	0	0	0
163	163	2.491243E+02	9.000000E+00	5.800000E+01	400	0	401	0	0	0
164	164	2.491243E+02	9.000000E+00	5.600000E+01	402	0	403	0	0	0
165	165	2.510735E+02	9.000000E+00	5.800000E+01	404	0	405	0	0	0
166	166	2.510735E+02	9.000000E+00	5.600000E+01	406	0	-14	0	0	0

MEMBER/TYPE	TYPE NO.	NODE	NODE	NODE	NODE	GEOMETRIC PROPERTIES			ELASTIC	PROPERTIES		
						(26)	(27)	(28)	(36)	(37)	(38)	(39)
						(29)	(30)		(40)	(41)		
							ALLOWABLE STRESSES				MIN/MAX GAGES	
						FXT	FXC	FYT	FYC	FS	MIN	MAX
						(81)	(82)	(83)	(84)	(85)	(86)	(87)
BAR	1	I	J			AREA			E			
BEAM	2	I	J	K		AREA	BETA	I-YY	E			
						I-ZZ	J					
									A23	A13		
TRIANGLE (NODE FORCE)	4	I	J	K		T		BETA	A11	A22	A33	A12
									A23	A13		
QUADRILATERAL	5	I	J	K	L	T	BETA		A11	A22	A33	A12
									A23	A13		
SHEAR PANEL	6	I	J	K	L	T			E	G		
KINKED QUAD. (4 NODES)	8	I	J	K	L	T	BETA		A11	A22	A33	A12
									A23	A13		
KINKED QUAD. (8 NODES)	8	I	J	K	L	T	BETA		A11	A22	A33	A12
		M	N	O	P				A23	A13		
HINGED BEAM	11	SAME AS TYPE 2										
PLATE BENDING TRIANGLE	15	SAME AS TYPE 4										
PLATE BENDING QUAD	16	SAME AS TYPE 5										
PLATE-MEMBRANE TRIANGLE	17	SAME AS TYPE 15										
PLATE-MEMBRANE QUAD	18	SAME AS TYPE 16										

MEMB NO	MEMB TYPE	NODE (I) (M)	NODE (J) (N)	NODE (K) (O)	NODE (L) (P)	F (26) (29) (81)	A (27) (30) (82)	C (28) (83)	T (36) (40) (84)	O (37) (41) (85)	R (38) (86)	S (39) (87)
4301	4	4	3	1		1.00000E-02		0.	7.22038E+06	7.22038E+06	8.01462E+05	5.61746E+06
						1.77000E+05	1.77000E+05	1.77000E+05	1.77000E+05	5.00000E+04	1.00000E-02	0.
6302	6	4	3	6	5	1.00000E-02			2.85000E+06	8.01462E+05		
						1.77000E+05	1.77000E+05	1.77000E+05	1.77000E+05	5.00000E+04	1.00000E-02	0.
						****MEMBER NUMBER 6302 HAS 0. WARP						
6303	6	6	5	8	7	1.00000E-02			2.85000E+06	8.01462E+05		
						1.77000E+05	1.77000E+05	1.77000E+05	1.77000E+05	5.00000E+04	1.00000E-02	0.
						****MEMBER NUMBER 6303 HAS 0. WARP						
6304	6	8	7	10	9	1.00000E-02			2.85000E+06	8.01462E+05		
						1.77000E+05	1.77000E+05	1.77000E+05	1.77000E+05	5.00000E+04	1.00000E-02	0.
						****MEMBER NUMBER 6304 HAS 0. WARP						
6305	6	10	9	12	11	1.00000E-02			2.85000E+06	8.01462E+05		
						1.77000E+05	1.77000E+05	1.77000E+05	1.77000E+05	5.00000E+04	1.00000E-02	0.
						****MEMBER NUMBER 6305 HAS 0. WARP						
4306	4	12	11	13		1.00000E-02		0.	7.22038E+06	7.22038E+06	8.01462E+05	5.61746E+06
						1.77000E+05	1.77000E+05	1.77000E+05	1.77000E+05	5.00000E+04	1.00000E-02	0.
4001	4	4	3	1		2.50000E+00		0.	3.79136E+04	3.79136E+04	1.21324E+04	1.36489E+04
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	2.50000E+00	2.50000E+00
6002	6	4	3	6	5	2.50000E+00			3.30000E+04	1.21324E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	2.50000E+00	2.50000E+00
						****MEMBER NUMBER 6002 HAS 0. WARP						
6003	6	6	5	8	7	2.50000E+00			3.30000E+04	1.21324E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	2.50000E+00	2.50000E+00
						****MEMBER NUMBER 6003 HAS 0. WARP						
6004	6	8	7	10	9	2.50000E+00			3.30000E+04	1.21324E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	2.50000E+00	2.50000E+00
						****MEMBER NUMBER 6004 HAS 0. WARP						
6005	6	10	9	12	11	2.50000E+00			3.30000E+04	1.21324E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	2.50000E+00	2.50000E+00
						****MEMBER NUMBER 6005 HAS 0. WARP						
4006	4	12	11	13		2.50000E+00		0.	3.79136E+04	3.79136E+04	1.21324E+04	1.36489E+04
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	2.50000E+00	2.50000E+00
1001	1	3	4			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01

MEMB NO	MEMB TYPE	NODE (I) (M)	NODE (J) (N)	NODE (K) (O)	NODE (L) (P)	F (26) (29) (81)	A (27) (30) (82)	C (28) (83)	T (36) (40) (84)	O (37) (41) (85)	R (38) (86)	S (39) (87)
1002	1	5	6			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
1003	1	7	8			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
1004	1	9	10			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
1005	1	11	12			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
6011	6	4	18	3	17	3.00000E+00			8.70000E+04	3.19853E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	3.00000E+02	3.00000E+00	3.00000E+00
				****MEMBER		NUMBER 6011 HAS	0.	WARP				
6012	6	6	20	5	19	3.10000E+00			8.70000E+04	3.19853E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	3.00000E+02	3.10000E+00	3.10000E+00
				****MEMBER		NUMBER 6012 HAS	1.421085D-14 WARP					
6013	6	8	22	7	21	3.20000E+00			8.70000E+04	3.19853E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	3.00000E+02	3.20000E+00	3.20000E+00
				****MEMBER		NUMBER 6013 HAS	1.421085D-14 WARP					
6014	6	10	24	9	23	3.30000E+00			8.70000E+04	3.19853E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	3.00000E+02	3.30000E+00	3.30000E+00
				****MEMBER		NUMBER 6014 HAS	1.421085D-14 WARP					
6015	6	12	26	11	25	1.70000E+00			8.70000E+04	3.19853E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	3.00000E+02	1.70000E+00	1.70000E+00
				****MEMBER		NUMBER 6015 HAS	1.421085D-14 WARP					
9013	6	8	22	7	21	1.00000E-02			2.85000E+06	8.01462E+05		
						1.77000E+05	1.77000E+05	1.77000E+05	1.77000E+05	5.00000E+04	1.00000E-02	0.
				****MEMBER		NUMBER 9013 HAS	1.421085D-14 WARP					
5001	5	3	17	1	15	COMP MAT 18	3.55128E+01					
5002	5	5	19	3	17	COMP MAT 18	3.20570E+01					
5003	5	7	21	5	19	COMP MAT 18	0.					
5004	5	7	21	9	23	COMP MAT 17	0.					
5005	5	9	23	11	25	COMP MAT 17	-2.37696E+01					

MEMB NO	MEMB TYPE	NODE (I) (M)	NODE (J) (N)	NODE (K) (O)	NODE (L) (P)	F (26) (29) (81)	A (27) (30) (82)	C (28) (83)	T (36) (40) (84)	O (37) (41) (85)	R (38) (86)	S (39) (87)
5006	5	11	25	13	27	COMP MAT 17	-1.80232E+01					
5011	5	4	18	1	15	COMP MAT 18	3.51722E+01					
5012	5	6	20	4	18	COMP MAT 18	3.15520E+01					
5013	5	8	22	6	20	COMP MAT 18	0.					
5014	5	8	22	10	24	COMP MAT 17	0.					
5015	5	10	24	12	26	COMP MAT 17	-2.44242E+01					
5016	5	12	26	13	27	COMP MAT 17	-2.17331E+01					
4021	4	18	17	15		5.00000E+00		0.	3.79136E+04	3.79136E+04	1.21324E+04	1.36489E+04
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000E+00	5.00000E+00
6022	6	18	17	20	19	5.00000E+00			3.30000E+04	1.21324E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000E+00	5.00000E+00
				****MEMBER		NUMBER 6022 HAS	0.	WARP				
6023	6	20	19	22	21	5.00000E+00			3.30000E+04	1.21324E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000E+00	5.00000E+00
				****MEMBER		NUMBER 6023 HAS	0.	WARP				
6024	6	22	21	24	23	5.00000E+00			3.30000E+04	1.21324E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000E+00	5.00000E+00
				****MEMBER		NUMBER 6024 HAS	0.	WARP				
6025	6	24	23	26	25	5.00000E+00			3.30000E+04	1.21324E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000E+00	5.00000E+00
				****MEMBER		NUMBER 6025 HAS	0.	WARP				
4026	4	26	25	27		5.00000E+00		0.	3.79136E+04	3.79136E+04	1.21324E+04	1.36489E+04
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000E+00	5.00000E+00
1011	1	17	18			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
1012	1	19	20			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
1013	1	21	22			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
1014	1	23	24			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01

MEMB NO	MEMB TYPE	NODE	NODE	NODE	NODE	F	A	C	T	O	R	S
		(I)	(J)	(K)	(L)	(26)	(27)	(28)	(36)	(37)	(38)	(39)
		(M)	(N)	(O)	(P)	(29)	(30)		(40)	(41)		
						(81)	(82)	(83)	(84)	(85)	(86)	(87)
1015	1	25	26			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
6031	6	18	32	17	31	3.30000E+00			8.70000E+04	3.19853E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	3.00000E+02	3.30000E+00	3.30000E+00
				****MEMBER NUMBER 6031 HAS 1.421085D-14 WARP								
6032	6	20	34	19	33	3.40000E+00			8.70000E+04	3.19853E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	3.00000E+02	3.40000E+00	3.40000E+00
				****MEMBER NUMBER 6032 HAS 1.421085D-14 WARP								
6033	6	22	36	21	35	3.50000E+00			8.70000E+04	3.19853E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	3.00000E+02	3.50000E+00	3.50000E+00
				****MEMBER NUMBER 6033 HAS 0. WARP								
6034	6	24	38	23	37	3.60000E+00			8.70000E+04	3.19853E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	3.00000E+02	3.60000E+00	3.60000E+00
				****MEMBER NUMBER 6034 HAS 0. WARP								
6035	6	26	40	25	39	1.90000E+00			8.70000E+04	3.19853E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	3.00000E+02	1.90000E+00	1.90000E+00
				****MEMBER NUMBER 6035 HAS 7.105427D-15 WARP								
9033	6	22	36	21	35	1.00000E-02			2.85000E+06	8.01462E+05		
						1.77000E+05	1.77000E+05	1.77000E+05	1.77000E+05	5.00000E+04	1.00000E-02	0.
				****MEMBER NUMBER 9033 HAS 0. WARP								
5021	5	17	31	15	29	COMP MAT 18	3.55128E+01					
5022	5	19	33	17	31	COMP MAT 18	3.20570E+01					
5023	5	21	35	19	33	COMP MAT 18	0.					
5024	5	21	35	23	37	COMP MAT 17	0.					
5025	5	23	37	25	39	COMP MAT 17	-2.37696E+01					
5026	5	25	39	27	41	COMP MAT 17	-1.80232E+01					
5031	5	18	32	15	29	COMP MAT 18	3.51722E+01					
5032	5	20	34	18	32	COMP MAT 18	3.15520E+01					
5033	5	22	36	20	34	COMP MAT 18	0.					
5034	5	22	36	24	38	COMP MAT 17	0.					

MEMB NO	MEMB TYPE	NODE (I) (M)	NODE (J) (N)	NODE (K) (O)	NODE (L) (P)	F (26) (29) (81)	A (27) (30) (82)	C (28) (83)	T (36) (40) (84)	O (37) (41) (85)	R (38) (86)	S (39) (87)
5035	5	24	38	26	40	COMP MAT 17	-2.44242E+01					
5036	5	26	40	27	41	COMP MAT 17	-2.17331E+01					
4041	4	32	31	29		5.00000E+00		0.	3.79136E+04	3.79136E+04	1.21324E+04	1.36489E+04
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000E+00	5.00000E+00
6042	6	32	31	34	33	5.00000E+00			3.30000E+04	1.21324E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000E+00	5.00000E+00
					****MEMBER	NUMBER 6042 HAS	0.	WARP				
6043	6	34	33	36	35	5.00000E+00			3.30000E+04	1.21324E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000E+00	5.00000E+00
					****MEMBER	NUMBER 6043 HAS	0.	WARP				
6044	6	36	35	38	37	5.00000E+00			3.30000E+04	1.21324E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000E+00	5.00000E+00
					****MEMBER	NUMBER 6044 HAS	0.	WARP				
6045	6	38	37	40	39	5.00000E+00			3.30000E+04	1.21324E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000E+00	5.00000E+00
					****MEMBER	NUMBER 6045 HAS	0.	WARP				
4046	4	40	39	41		5.00000E+00		0.	3.79136E+04	3.79136E+04	1.21324E+04	1.36489E+04
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000E+00	5.00000E+00
1021	1	32	31			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
1022	1	34	33			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
1023	1	36	35			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
1024	1	38	37			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
1025	1	40	39			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
6051	6	32	46	31	45	3.70000E+00			8.70000E+04	3.19853E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	3.00000E+02	3.70000E+00	3.70000E+00
					****MEMBER	NUMBER 6051 HAS	1.421085D-14	WARP				

MEMB NO	MEMB TYPE	NODE (I) (M)	NODE (J) (N)	NODE (K) (O)	NODE (L) (P)	F (26) (29) (81)	A (27) (30) (82)	C (28) (83)	T (36) (40) (84)	O (37) (41) (85)	R (38) (86)	S (39) (87)
6052	6	34	48	33	47	3.80000E+00			8.70000E+04	3.19853E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	3.00000E+02	3.80000E+00	3.80000E+00
					****MEMBER	NUMBER 6052 HAS	0.	WARP				
6053	6	36	50	35	49	3.95000E+00			8.70000E+04	3.19853E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	3.00000E+02	3.95000E+00	3.95000E+00
					****MEMBER	NUMBER 6053 HAS	0.	WARP				
6054	6	38	52	37	51	4.10000E+00			8.70000E+04	3.19853E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	3.00000E+02	4.10000E+00	4.10000E+00
					****MEMBER	NUMBER 6054 HAS	1.4210850-14	WARP				
6055	6	40	54	39	53	2.10000E+00			8.70000E+04	3.19853E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	3.00000E+02	2.10000E+00	2.10000E+00
					****MEMBER	NUMBER 6055 HAS	7.1054270-15	WARP				
9053	6	36	50	35	49	1.00000E-02			2.85000E+06	8.01462E+05		
						1.77000E+05	1.77000E+05	1.77000E+05	1.77000E+05	5.00000E+04	1.00000E-02	0.
					****MEMBER	NUMBER 9053 HAS	0.	WARP				
5041	5	31	45	29	43	COMP MAT 18	3.55128E+01					
5042	5	33	47	31	45	COMP MAT 18	3.20570E+01					
5043	5	35	49	33	47	COMP MAT 18	0.					
5044	5	35	49	37	51	COMP MAT 17	0.					
5045	5	37	51	39	53	COMP MAT 17	-2.37696E+01					
5046	5	39	53	41	55	COMP MAT 17	-1.80232E+01					
5051	5	32	46	29	43	COMP MAT 18	3.51722E+01					
5052	5	34	48	32	46	COMP MAT 18	3.15520E+01					
5053	5	36	50	34	48	COMP MAT 18	0.					
5054	5	36	50	38	52	COMP MAT 17	0.					
5055	5	38	52	40	54	COMP MAT 17	-2.44242E+01					
5056	5	40	54	41	55	COMP MAT 17	-2.17331E+01					
4061	4	46	45	43		5.00000E+00		0.	3.79136E+04	3.79136E+04	1.21324E+04	1.36489E+04
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000E+00	5.00000E+00

MEMB NO	MEMB TYPE	NODE (I) (M)	NODE (J) (N)	NODE (K) (O)	NODE (L) (P)	F (26) (29) (81)	A (27) (30) (82)	C (28) (83)	T (36) (40) (84)	O (37) (41) (85)	R (38) (86)	S (39) (87)
6062	6	46	45	48	47	5.00000E+00			3.30000E+04	1.21324E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000E+00	5.00000E+00
				****MEMBER		NUMBER 6062 HAS	0.	WARP				
6063	6	48	47	50	49	5.00000E+00			3.30000E+04	1.21324E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000E+00	5.00000E+00
				****MEMBER		NUMBER 6063 HAS	0.	WARP				
6064	6	50	49	52	51	5.00000E+00			3.30000E+04	1.21324E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000E+00	5.00000E+00
				****MEMBER		NUMBER 6064 HAS	0.	WARP				
6065	6	52	51	54	53	5.00000E+00			3.30000E+04	1.21324E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000E+00	5.00000E+00
				****MEMBER		NUMBER 6065 HAS	0.	WARP				
4066	4	54	53	55		5.00000E+00		0.	3.79136E+04	3.79136E+04	1.21324E+04	1.36489E+04
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000E+00	5.00000E+00
1031	1	46	45			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
1032	1	48	47			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
1033	1	50	49			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
1034	1	52	51			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
1035	1	54	53			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
6071	6	46	60	45	59	4.00000E+00			8.70000E+04	3.19853E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	3.00000E+02	4.00000E+00	4.00000E+00
				****MEMBER		NUMBER 6071 HAS	0.	WARP				
6072	6	48	62	47	61	4.15000E+00			8.70000E+04	3.19853E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	3.00000E+02	4.15000E+00	4.15000E+00
				****MEMBER		NUMBER 6072 HAS	1.421085D-14	WARP				
6073	6	50	64	49	63	4.30000E+00			8.70000E+04	3.19853E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	3.00000E+02	4.30000E+00	4.30000E+00
				****MEMBER		NUMBER 6073 HAS	1.421085D-14	WARP				

MEMB NO	MEMB TYPE	NODE (I) (M)	NODE (J) (N)	NODE (K) (O)	NODE (L) (P)	F (26) (29) (81)	A (27) (30) (82)	C (28) (83)	T (36) (40) (84)	O (37) (41) (85)	R (38) (86)	S (39) (87)
6074	6	52	66	51	65	4.45000E+00			8.70000E+04	3.19853E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	3.00000E+02	4.45000E+00	4.45000E+00
				****MEMBER		NUMBER 6074 HAS	0.	WARP				
6075	6	54	68	53	67	2.30000E+00			8.70000E+04	3.19853E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	3.00000E+02	2.30000E+00	2.30000E+00
				****MEMBER		NUMBER 6075 HAS	1.421085D-14	WARP				
9073	6	50	64	49	63	1.00000E-02			2.85000E+06	8.01462E+05		
						1.77000E+05	1.77000E+05	1.77000E+05	1.77000E+05	5.00000E+04	1.00000E-02	0.
				****MEMBER		NUMBER 9073 HAS	1.421085D-14	WARP				
5061	5	45	59	43	57	COMP MAT 18	3.55128E+01					
5062	5	47	61	45	59	COMP MAT 18	3.20570E+01					
5063	5	49	63	47	61	COMP MAT 18	0.					
5064	5	49	63	51	65	COMP MAT 17	0.					
5065	5	51	65	53	67	COMP MAT 17	-2.37696E+01					
5066	5	53	67	55	69	COMP MAT 17	-1.80232E+01					
5071	5	46	60	43	57	COMP MAT 18	3.51722E+01					
5072	5	48	62	46	60	COMP MAT 18	3.15520E+01					
5073	5	50	64	48	62	COMP MAT 18	0.					
5074	5	50	64	52	66	COMP MAT 17	0.					
5075	5	52	66	54	68	COMP MAT 17	-2.44242E+01					
5076	5	54	68	55	69	COMP MAT 17	-2.17331E+01					
4081	4	60	59	57		5.00000E+00		0.	3.79136E+04	3.79136E+04	1.21324E+04	1.36489E+04
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000E+00	5.00000E+00
6082	6	60	59	62	61	5.00000E+00			3.30000E+04	1.21324E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000E+00	5.00000E+00
				****MEMBER		NUMBER 6082 HAS	0.	WARP				
6083	6	62	61	64	63	5.00000E+00			3.30000E+04	1.21324E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000E+00	5.00000E+00
				****MEMBER		NUMBER 6083 HAS	0.	WARP				

MEMB NO	MEMB TYPE	NODE (I) (M)	NODE (J) (N)	NODE (K) (O)	NODE (L) (P)	F (26) (29) (81)	A (27) (30) (82)	C (28) (83)	T (36) (40) (84)	O (37) (41) (85)	R (38) (86)	S (39) (87)
6084	6	64	63	66	65	5.00000E+00			3.30000E+04	1.21324E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000E+00	5.00000E+00
				****MEMBER		NUMBER 6084 HAS	0.	WARP				
6085	6	66	65	68	67	5.00000E+00			3.30000E+04	1.21324E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000E+00	5.00000E+00
				****MEMBER		NUMBER 6085 HAS	0.	WARP				
4086	4	68	67	69		5.00000E+00		0.	3.79136E+04	3.79136E+04	1.21324E+04	1.36489E+04
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000E+00	5.00000E+00
1041	1	60	59			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
1042	1	62	61			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
1043	1	64	63			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
1044	1	66	65			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
1045	1	68	67			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
6091	6	60	74	59	73	4.45000E+00			8.70000E+04	3.19853E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	3.00000E+02	4.45000E+00	4.45000E+00
				****MEMBER		NUMBER 6091 HAS	2.842171D-14	WARP				
6092	6	62	76	61	75	4.55000E+00			8.70000E+04	3.19853E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	3.00000E+02	4.55000E+00	4.55000E+00
				****MEMBER		NUMBER 6092 HAS	2.842171D-14	WARP				
6093	6	64	78	63	77	4.70000E+00			8.70000E+04	3.19853E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	3.00000E+02	4.70000E+00	4.70000E+00
				****MEMBER		NUMBER 6093 HAS	0.	WARP				
6094	6	66	80	65	79	4.85000E+00			8.70000E+04	3.19853E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	3.00000E+02	4.85000E+00	4.85000E+00
				****MEMBER		NUMBER 6094 HAS	0.	WARP				
6095	6	68	82	67	81	2.50000E+00			8.70000E+04	3.19853E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	3.00000E+02	2.50000E+00	2.50000E+00
				****MEMBER		NUMBER 6095 HAS	0.	WARP				

MEMB NO	MEMB TYPE	NODE (I) (M)	NODE (J) (N)	NODE (K) (O)	NODE (L) (P)	F (26) (29) (81)	A (27) (30) (82)	C (28) (83)	T (36) (40) (84)	O (37) (41) (85)	R (38) (86)	S (39) (87)
9093	6	64	78	63	77	1.00000E-02			2.85000E+06	8.01462E+05		
						1.77000E+05	1.77000E+05	1.77000E+05	1.77000E+05	5.00000E+04	1.00000E-02	0.
				****MEMBER		NUMBER 9093 HAS	0.	WARP				
5081	5	59	73	57	71	COMP MAT 18	3.55128E+01					
5082	5	61	75	59	73	COMP MAT 18	3.20570E+01					
5083	5	63	77	61	75	COMP MAT 18	0.					
5084	5	63	77	65	79	COMP MAT 17	0.					
5085	5	65	79	67	81	COMP MAT 17	-2.37696E+01					
5086	5	67	81	69	83	COMP MAT 17	-1.80232E+01					
5091	5	60	74	57	71	COMP MAT 18	3.51722E+01					
5092	5	62	76	60	74	COMP MAT 18	3.15520E+01					
5093	5	64	78	62	76	COMP MAT 18	0.					
5094	5	64	78	66	80	COMP MAT 17	0.					
5095	5	66	80	68	82	COMP MAT 17	-2.44242E+01					
5096	5	68	82	69	83	COMP MAT 17	-2.17331E+01					
4101	4	74	73	71		5.00000E+00		0.	3.79136E+04	3.79136E+04	1.21324E+04	1.36489E+04
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000E+00	5.00000E+00
6102	6	74	73	76	75	5.00000E+00			3.30000E+04	1.21324E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000E+00	5.00000E+00
				****MEMBER		NUMBER 6102 HAS	0.	WARP				
6103	6	76	75	78	77	5.00000E+00			3.30000E+04	1.21324E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000E+00	5.00000E+00
				****MEMBER		NUMBER 6103 HAS	0.	WARP				
6104	6	78	77	80	79	5.00000E+00			3.30000E+04	1.21324E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000E+00	5.00000E+00
				****MEMBER		NUMBER 6104 HAS	0.	WARP				
6105	6	80	79	82	81	5.00000E+00			3.30000E+04	1.21324E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000E+00	5.00000E+00
				****MEMBER		NUMBER 6105 HAS	0.	WARP				

MEMB NO	MEMB TYPE	NODE (I) (M)	NODE (J) (N)	NODE (K) (O)	NODE (L) (P)	F (26) (29) (81)	A (27) (30) (82)	C (28) (83)	T (36) (40) (84)	O (37) (41) (85)	R (38) (86)	S (39) (87)
4106	4	82	81	83		5.00000E+00		0.	3.79136E+04	3.79136E+04	1.21324E+04	1.36489E+04
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000E+00	5.00000E+00
1051	1	74	73			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
1052	1	76	75			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
1053	1	78	77			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
1054	1	80	79			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
1055	1	82	81			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
6111	6	74	88	73	87	4.80000E+00			8.70000E+04	3.19853E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	3.00000E+02	4.80000E+00	4.80000E+00
				****MEMBER NUMBER 6111 HAS 1.421085D-14 WARP								
6112	6	76	90	75	89	4.90000E+00			8.70000E+04	3.19853E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	3.00000E+02	4.90000E+00	4.90000E+00
				****MEMBER NUMBER 6112 HAS 0. WARP								
6113	6	78	92	77	91	5.05000E+00			8.70000E+04	3.19853E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	3.00000E+02	5.05000E+00	5.05000E+00
				****MEMBER NUMBER 6113 HAS 1.421085D-14 WARP								
6114	6	80	94	79	93	5.25000E+00			8.70000E+04	3.19853E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	3.00000E+02	5.25000E+00	5.25000E+00
				****MEMBER NUMBER 6114 HAS 0. WARP								
6115	6	82	96	81	95	2.70000E+00			8.70000E+04	3.19853E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	3.00000E+02	2.70000E+00	2.70000E+00
				****MEMBER NUMBER 6115 HAS 0. WARP								
9113	6	78	92	77	91	1.00000E-02			2.85000E+06	8.01462E+05		
						1.77000E+05	1.77000E+05	1.77000E+05	1.77000E+05	5.00000E+04	1.00000E-02	0.
				****MEMBER NUMBER 9113 HAS 1.421085D-14 WARP								
5101	5	73	87	71	85	COMP MAT 18	3.55128E+01					
5102	5	75	89	73	87	COMP MAT 18	3.20570E+01					

MEMB NO	MEMB TYPE	NODE (I) (M)	NODE (J) (N)	NODF (K) (O)	NODE (L) (P)	F (26) (29) (81)	A (27) (30) (82)	C (28) (83)	T (36) (40) (84)	O (37) (41) (85)	R (38) (86)	S (39) (87)
5103	5	77	91	75	89	COMP MAT 18	0.					
5104	5	77	91	79	93	COMP MAT 17	0.					
5105	5	79	93	81	95	COMP MAT 17	-2.37696E+01					
5106	5	81	95	83	97	COMP MAT 17	-1.80232E+01					
5111	5	74	88	71	85	COMP MAT 18	3.51722E+01					
5112	5	76	90	74	88	COMP MAT 18	3.15520E+01					
5113	5	78	92	76	90	COMP MAT 18	0.					
5114	5	78	92	80	94	COMP MAT 17	0.					
5115	5	80	94	82	96	COMP MAT 17	-2.44242E+01					
5116	5	82	96	83	97	COMP MAT 17	-2.17331E+01					
4121	4	88	87	85		5.00000E+00		0.	3.79136E+04	3.79136E+04	1.21324F+04	1.36489E+04
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000E+00	5.00000E+00
6122	6	88	87	90	89	5.00000E+00			3.30000E+04	1.21324E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000E+00	5.00000E+00
				****MEMBER		NUMBER 6122 HAS	0.	WARP				
6123	6	90	89	92	91	5.00000E+00			3.30000E+04	1.21324E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000F+00	5.00000E+00
				****MEMBER		NUMBER 6123 HAS	0.	WARP				
6124	6	92	91	94	93	5.00000E+00			3.30000E+04	1.21324E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000E+00	5.00000E+00
				****MEMBER		NUMBER 6124 HAS	0.	WARP				
6125	6	94	93	96	95	5.00000E+00			3.30000E+04	1.21324E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000F+00	5.00000E+00
				****MEMBER		NUMBER 6125 HAS	0.	WARP				
4126	4	96	95	97		5.00000E+00		0.	3.79136E+04	3.79136E+04	1.21324F+04	1.36489E+04
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000E+00	5.00000E+00
1061	1	88	87			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000F-01	1.00000E-01
1062	1	90	89			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000F-01	1.00000E-01

MEMB NO	MEMB TYPE	NODE (I) (M)	NODE (J) (N)	NODE (K) (O)	NODE (L) (P)	F (26) (29) (81)	A (27) (30) (82)	C (28) (83)	T (36) (40) (84)	O (37) (41) (85)	R (38) (86)	S (39) (87)
1063	1	92	91			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
1064	1	94	93			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
1065	1	96	95			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
6131	6	88	102	87	101	5.20000E+00			8.70000E+04	3.19853E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	3.00000E+02	5.20000E+00	5.20000E+00
				****MEMBER		NUMBER 6131 HAS	1.421085D-14	WARP				
6132	6	90	104	89	103	5.30000E+00			8.70000E+04	3.19853E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	3.00000E+02	5.30000E+00	5.30000E+00
				****MEMBER		NUMBER 6132 HAS	1.421085D-14	WARP				
6133	6	92	106	91	105	5.45000E+00			8.70000E+04	3.19853E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	3.00000E+02	5.45000E+00	5.45000E+00
				****MEMBER		NUMBER 6133 HAS	1.421085D-14	WARP				
6134	6	94	108	93	107	5.65000E+00			8.70000E+04	3.19853E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	3.00000E+02	5.65000E+00	5.65000E+00
				****MEMBER		NUMBER 6134 HAS	0.	WARP				
6135	6	96	110	95	109	2.90000E+00			8.70000E+04	3.19853E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	3.00000E+02	2.90000E+00	2.90000E+00
				****MEMBER		NUMBER 6135 HAS	1.421085D-14	WARP				
9133	6	92	106	91	105	1.00000E-02			2.85000E+06	8.01462E+05		
						1.77000E+05	1.77000E+05	1.77000E+05	1.77000E+05	5.00000E+04	1.00000E-02	0.
				****MEMBER		NUMBER 9133 HAS	1.421085D-14	WARP				
5121	5	87	101	85	99	COMP MAT 18	3.55128E+01					
5122	5	89	103	87	101	COMP MAT 18	3.20570E+01					
5123	5	91	105	89	103	COMP MAT 18	0.					
5124	5	91	105	93	107	COMP MAT 17	0.					
5125	5	93	107	95	109	COMP MAT 17	-2.37696E+01					
5126	5	95	109	97	111	COMP MAT 17	-1.80232E+01					
5131	5	88	102	85	99	COMP MAT 18	3.51722E+01					

MEMB NO	MEMB TYPE	NODE (I) (M)	NODE (J) (N)	NODE (K) (O)	NODE (L) (P)	F (26) (29) (81)	A (27) (30) (82)	C (28) (83)	T (36) (40) (84)	O (37) (41) (85)	R (38) (86)	S (39) (87)
5132	5	90	104	88	102	COMP MAT 18	3.15520E+01					
5133	5	92	106	90	104	COMP MAT 18	0.					
5134	5	92	106	94	108	COMP MAT 17	0.					
5135	5	94	108	96	110	COMP MAT 17	-2.44242E+01					
5136	5	96	110	97	111	COMP MAT 17	-2.17331E+01					
4141	4	102	101	99		5.00000E+00		0.	3.79136E+04	3.79136E+04	1.21324E+04	1.36489E+04
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000E+00	5.00000E+00
6142	6	102	101	104	103	5.00000E+00			3.30000E+04	1.21324E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000E+00	5.00000E+00
				****MEMBER		NUMBER 6142 HAS	0.	WARP				
6143	6	104	103	106	105	5.00000E+00			3.30000E+04	1.21324E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000E+00	5.00000E+00
				****MEMBER		NUMBER 6143 HAS	0.	WARP				
6144	6	106	105	108	107	5.00000E+00			4.62400E+04	1.70000E+04		
						5.75000E+02	5.75000E+02	5.75000E+02	5.75000E+02	2.25000E+02	5.00000E+00	5.00000E+00
				****MEMBER		NUMBER 6144 HAS	0.	WARP				
6145	6	108	107	110	109	5.00000E+00			4.62400E+04	1.70000E+04		
						5.75000E+02	5.75000E+02	5.75000E+02	5.75000E+02	2.25000E+02	5.00000E+00	5.00000E+00
				****MEMBER		NUMBER 6145 HAS	0.	WARP				
4146	4	110	109	111		5.00000E+00		0.	5.31250E+04	5.31250E+04	1.70000E+04	1.91250E+04
						5.75000E+02	5.75000E+02	5.75000E+02	5.75000E+02	2.25000E+02	5.00000E+00	5.00000E+00
1071	1	102	101			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
1072	1	104	103			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
1073	1	106	105			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
1074	1	108	107			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
1075	1	110	109			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01

MEMB NO	MEMB TYPE	NODE (I) (M)	NODE (J) (N)	NODE (K) (O)	NODE (L) (P)	F (26) (29) (81)	A (27) (30) (82)	C (28) (83)	T (36) (40) (84)	O (37) (41) (85)	R (38) (86)	S (39) (87)
6151	6	102	116	101	115	5.50000E+00			8.70000E+04	3.19853E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	3.00000E+02	5.50000E+00	5.50000E+00
				****MEMBER		NUMBER 6151 HAS	1.421085D-14	WARP				
6152	6	104	118	103	117	5.60000E+00			8.70000E+04	3.19853E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	3.00000E+02	5.60000E+00	5.60000E+00
				****MEMBER		NUMBER 6152 HAS	0.	WARP				
6153	6	106	120	105	119	5.80000E+00			1.14240E+04	4.20000E+03		
						5.75000E+02	5.75000E+02	5.75000E+02	5.75000E+02	4.25000E+02	5.80000E+00	5.80000E+00
				****MEMBER		NUMBER 6153 HAS	0.	WARP				
6154	6	108	122	107	121	6.00000E+00			1.14240E+04	4.20000E+03		
						5.75000E+02	5.75000E+02	5.75000E+02	5.75000E+02	4.25000E+02	6.00000E+00	6.00000E+00
				****MEMBER		NUMBER 6154 HAS	0.	WARP				
6155	6	110	124	109	123	3.10000E+00			1.14240E+04	4.20000E+03		
						5.75000E+02	5.75000E+02	5.75000E+02	5.75000E+02	4.25000E+02	3.10000E+00	3.10000E+00
				****MEMBER		NUMBER 6155 HAS	7.105427D-15	WARP				
9153	6	106	120	105	119	1.00000E-02			2.85000E+06	8.01462E+05		
						1.77000E+05	1.77000E+05	1.77000E+05	1.77000E+05	5.00000E+04	1.00000E-02	0.
				****MEMBER		NUMBER 9153 HAS	0.	WARP				
5141	5	101	115	99	113	COMP MAT 18	3.55128E+01					
5142	5	103	117	101	115	COMP MAT 18	3.20570E+01					
5143	5	105	119	103	117	COMP MAT 18	0.					
5144	5	105	119	107	121	COMP MAT 17	0.					
5145	5	107	121	109	123	COMP MAT 17	-2.37696E+01					
5146	5	109	123	111	125	COMP MAT 17	-1.80232E+01					
5151	5	102	116	99	113	COMP MAT 18	3.51722E+01					
5152	5	104	118	102	116	COMP MAT 18	3.15520E+01					
5153	5	106	120	104	118	COMP MAT 18	0.					
5154	5	106	120	108	122	COMP MAT 17	0.					
5155	5	108	122	110	124	COMP MAT 17	-2.44242E+01					

MEMB NO	MEMB TYPE	NODE (I) (M)	NODE (J) (N)	NODE (K) (O)	NODE (L) (P)	F (26) (29) (81)	A (27) (30) (82)	C (28) (83)	T (36) (40) (84)	O (37) (41) (85)	R (38) (86)	S (39) (87)
5156	5	110	124	111	125	COMP MAT 17	-2.17331E+01					
4161	4	116	115	113		5.00000E+00		0.	3.79136E+04	3.79136E+04	1.21324E+04	1.36489E+04
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000E+00	5.00000E+00
6162	6	116	115	118	117	5.00000E+00			3.30000E+04	1.21324E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000E+00	5.00000E+00
				****MEMBER NUMBER 6162 HAS 0. WARP								
6163	6	118	117	120	119	5.00000E+00			3.30000E+04	1.21324E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000E+00	5.00000E+00
				****MEMBER NUMBER 6163 HAS 0. WARP								
6164	6	120	119	122	121	5.00000E+00			4.62400E+04	1.70000E+04		
						5.75000E+02	5.75000E+02	5.75000E+02	5.75000E+02	2.25000E+02	5.00000E+00	5.00000E+00
				****MEMBER NUMBER 6164 HAS 0. WARP								
6165	6	122	121	124	123	5.00000E+00			4.62400E+04	1.70000E+04		
						5.75000E+02	5.75000E+02	5.75000E+02	5.75000E+02	2.25000E+02	5.00000E+00	5.00000E+00
				****MEMBER NUMBER 6165 HAS 0. WARP								
4166	4	124	123	125		5.00000E+00		0.	5.31250E+04	5.31250E+04	1.70000E+04	1.91250E+04
						5.75000E+02	5.75000E+02	5.75000E+02	5.75000E+02	2.25000E+02	5.00000E+00	5.00000E+00
1081	1	116	115			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
1082	1	118	117			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
1083	1	120	119			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
1084	1	122	121			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
1085	1	124	123			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
6171	6	116	130	115	129	5.80000E+00			8.70000E+04	3.19853E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	3.00000E+02	5.80000E+00	5.80000E+00
				****MEMBER NUMBER 6171 HAS 0. WARP								
6172	6	118	132	117	131	6.00000E+00			8.70000E+04	3.19853E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	3.00000E+02	6.00000E+00	6.00000E+00
				****MEMBER NUMBER 6172 HAS 1.421085D-14 WARP								

MEMB NO	MEMB TYPE	NODE (I) (M)	NODE (J) (N)	NODE (K) (O)	NODE (L) (P)	F (26) (29) (81)	A (27) (30) (82)	C (28) (83)	T (36) (40) (84)	O (37) (41) (85)	R (38) (86)	S (39) (87)
6173	6	120	134	119	133	6.20000E+00			1.14240E+04	4.20000E+03		
						5.75000E+02	5.75000E+02	5.75000E+02	5.75000E+02	4.25000E+02	6.20000E+00	6.20000E+00
				****MEMBER		NUMBER 6173 HAS	0.	WARP				
6174	6	122	136	121	135	6.45000E+00			1.14240E+04	4.20000E+03		
						5.75000E+02	5.75000E+02	5.75000E+02	5.75000E+02	4.25000E+02	6.45000E+00	6.45000E+00
				****MEMBER		NUMBER 6174 HAS	1.421085D-14	WARP				
6175	6	124	138	123	137	3.30000E+00			1.14240E+04	4.20000E+03		
						5.75000E+02	5.75000E+02	5.75000E+02	5.75000E+02	4.25000E+02	3.30000E+00	3.30000E+00
				****MEMBER		NUMBER 6175 HAS	0.	WARP				
9173	6	120	134	119	133	1.00000E-02			2.85000E+06	8.01462E+05		
						1.77000E+05	1.77000E+05	1.77000E+05	1.77000E+05	5.00000E+04	1.00000E-02	0.
				****MEMBER		NUMBER 9173 HAS	0.	WARP				
5161	5	115	129	113	127	COMP MAT 18	3.55128E+01					
5162	5	117	131	115	129	COMP MAT 18	3.20570E+01					
5163	5	119	133	117	131	COMP MAT 18	0.					
5164	5	119	133	121	135	COMP MAT 17	0.					
5165	5	121	135	123	137	COMP MAT 17	-2.37696E+01					
5166	5	123	137	125	139	COMP MAT 17	-1.80232E+01					
5171	5	116	130	113	127	COMP MAT 18	3.51722E+01					
5172	5	118	132	116	130	COMP MAT 18	3.15520E+01					
5173	5	120	134	118	132	COMP MAT 18	0.					
5174	5	120	134	122	136	COMP MAT 17	0.					
5175	5	122	136	124	138	COMP MAT 17	-2.44242E+01					
5176	5	124	138	125	139	COMP MAT 17	-2.17331E+01					
4181	4	130	129	127		5.00000E+00		0.	3.79136E+04	3.79136E+04	1.21324E+04	1.36489E+04
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000E+00	5.00000E+00
6182	6	130	129	132	131	5.00000E+00			3.30000E+04	1.21324E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000E+00	5.00000E+00
				****MEMBER		NUMBER 6182 HAS	0.	WARP				

MEMB NO	MEMB TYPE	NODE (I) (M)	NODE (J) (N)	NODE (K) (O)	NODE (L) (P)	F (26) (29) (81)	A (27) (30) (82)	C (28) (83)	T (36) (40) (84)	O (37) (41) (85)	R (38) (86)	S (39) (87)
6183	6	132	131	134	133	5.00000E+00			3.30000E+04	1.21324E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	1.50000E+02	5.00000E+00	5.00000E+00
						****MEMBER NUMBER 6183 HAS 0. WARP						
6184	6	134	133	136	135	5.00000E+00			4.62400E+04	1.70000E+04		
						5.75000E+02	5.75000E+02	5.75000E+02	5.75000E+02	2.25000E+02	5.00000E+00	5.00000E+00
						****MEMBER NUMBER 6184 HAS 0. WARP						
6185	6	136	135	138	137	5.00000E+00			4.62400E+04	1.70000E+04		
						5.75000E+02	5.75000E+02	5.75000E+02	5.75000E+02	2.25000E+02	5.00000E+00	5.00000E+00
						****MEMBER NUMBER 6185 HAS 0. WARP						
4186	4	138	137	139		5.00000E+00		0.	5.31250E+04	5.31250E+04	1.70000E+04	1.91250E+04
						5.75000E+02	5.75000E+02	5.75000E+02	5.75000E+02	2.25000E+02	5.00000E+00	5.00000E+00
1091	1	130	129			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
1092	1	132	131			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
1093	1	134	133			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
1094	1	136	135			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
1095	1	138	137			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
6191	6	130	144	129	143	6.20000E+00			8.70000E+04	3.19853E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	3.00000E+02	6.20000E+00	6.20000E+00
						****MEMBER NUMBER 6191 HAS 0. WARP						
6192	6	132	148	131	147	6.45000E+00			8.70000E+04	3.19853E+04		
						3.75000E+02	3.75000E+02	3.75000E+02	3.75000E+02	3.00000E+02	6.45000E+00	6.45000E+00
						****MEMBER NUMBER 6192 HAS 2.842171D-14 WARP						
6193	6	134	152	133	151	6.60000E+00			1.14240E+04	4.20000E+03		
						5.75000E+02	5.75000E+02	5.75000E+02	5.75000E+02	4.25000E+02	6.60000E+00	6.60000E+00
						****MEMBER NUMBER 6193 HAS 1.421085D-14 WARP						
6194	6	136	156	135	155	6.90000E+00			1.14240E+04	4.20000E+03		
						5.75000E+02	5.75000E+02	5.75000E+02	5.75000E+02	4.25000E+02	6.90000E+00	6.90000E+00
						****MEMBER NUMBER 6194 HAS 0. WARP						

MEMB NO	MEMB TYPE	NODE (I) (M)	NODE (J) (N)	NODE (K) (O)	NODE (L) (P)	F (26) (29) (81)	A (27) (30) (82)	C (28) (83)	T (36) (40) (84)	O (37) (41) (85)	R (38) (86)	S (39) (87)
6195	6	138	158	137	157	3.50000E+00			1.14240E+04	4.20000E+03		
						5.75000E+02	5.75000E+02	5.75000E+02	5.75000E+02	4.25000E+02	3.50000E+00	3.50000E+00
				****MEMBER		NUMBER 6195 HAS	0.	WARP				
9193	6	134	152	133	151	1.00000E-02			2.85000E+06	8.01462E+05		
						1.77000E+05	1.77000E+05	1.77000E+05	1.77000E+05	5.00000E+04	1.00000E-02	0.
				****MEMBER		NUMBER 9193 HAS	1.4210850-14	WARP				
5181	5	129	143	127	141	COMP MAT 18	3.55128E+01					
5182	5	131	147	129	143	COMP MAT 18	3.20570E+01					
5183	5	133	151	131	147	COMP MAT 18	0.					
5184	5	133	151	135	155	COMP MAT 17	0.					
5185	5	135	155	137	157	COMP MAT 17	-2.37696E+01					
5186	5	137	157	139	159	COMP MAT 17	-1.80232E+01					
5191	5	130	144	127	141	COMP MAT 18	3.51722E+01					
5192	5	132	148	130	144	COMP MAT 18	3.15520E+01					
5193	5	134	152	132	148	COMP MAT 18	0.					
5194	5	134	152	136	156	COMP MAT 17	0.					
5195	5	136	156	138	158	COMP MAT 17	-2.44242E+01					
5196	5	138	158	139	159	COMP MAT 17	-2.17331E+01					
4201	4	144	143	141		1.00000E-01		0.	1.17832E+07	1.17832E+07	3.94737E+06	3.88845E+06
						6.50000E+04	5.70000E+04	6.50000E+04	5.70000E+04	3.90000E+04	8.00000E-02	0.
6202	6	144	143	146	145	1.00000E-01			1.05000E+07	3.94737E+06		
						6.50000E+04	5.70000E+04	6.50000E+04	5.70000E+04	3.90000E+04	8.00000E-02	0.
				****MEMBER		NUMBER 6202 HAS	0.	WARP				
6203	6	146	145	148	147	1.00000E-01			1.05000E+07	3.94737E+06		
						6.50000E+04	5.70000E+04	6.50000E+04	5.70000E+04	3.90000E+04	8.00000E-02	0.
				****MEMBER		NUMBER 6203 HAS	0.	WARP				
6204	6	148	147	150	149	1.00000E-01			1.05000E+07	3.94737E+06		
						6.50000E+04	5.70000E+04	6.50000E+04	5.70000E+04	3.90000E+04	8.00000E-02	0.
				****MEMBER		NUMBER 6204 HAS	0.	WARP				

MEMB NO	MEMB TYPE	NODE (I) (M)	NODE (J) (N)	NODE (K) (O)	NODE (L) (P)	F (26) (29) (81)	A (27) (30) (82)	C (28) (83)	T (36) (40) (84)	O (37) (41) (85)	R (38) (86)	S (39) (87)
6205	6	150	149	152	151	1.00000E-01			1.05000E+07	3.94737E+06		
						6.50000E+04	5.70000E+04	6.50000E+04	5.70000E+04	3.90000E+04	8.00000E-02	0.
				****MEMBER		NUMBER 6205 HAS	0.	WARP				
6206	6	152	151	154	153	1.00000E-01			1.05000E+07	3.94737E+06		
						6.50000E+04	5.70000E+04	6.50000E+04	5.70000E+04	3.90000E+04	8.00000E-02	0.
				****MEMBER		NUMBER 6206 HAS	0.	WARP				
6207	6	154	153	156	155	1.00000E-01			1.05000E+07	3.94737E+06		
						6.50000E+04	5.70000E+04	6.50000E+04	5.70000E+04	3.90000E+04	8.00000E-02	0.
				****MEMBER		NUMBER 6207 HAS	0.	WARP				
6208	6	156	155	158	157	1.00000E-01			1.05000E+07	3.94737E+06		
						6.50000E+04	5.70000E+04	6.50000E+04	5.70000E+04	3.90000E+04	8.00000E-02	0.
				****MEMBER		NUMBER 6208 HAS	0.	WARP				
4209	4	158	157	159		1.00000E-01		0.	1.17832E+07	1.17832E+07	3.94737E+06	3.88845E+06
						6.50000E+04	5.70000E+04	6.50000E+04	5.70000E+04	3.90000E+04	8.00000E-02	0.
4211	4	157	165	155		1.00000E-01		0.	1.17832E+07	1.17832E+07	3.94737E+06	3.88845E+06
						6.50000E+04	5.70000E+04	6.50000E+04	5.70000E+04	3.90000E+04	8.00000E-02	0.
6212	6	157	165	159	163	1.00000E-01			1.05000E+07	3.94737E+06		
						6.50000E+04	5.70000E+04	6.50000E+04	5.70000E+04	3.90000E+04	8.00000E-02	0.
				****MEMBER		NUMBER 6212 HAS	0.	WARP				
6213	6	164	163	162	161	1.00000E-01			1.05000E+07	3.94737E+06		
						6.50000E+04	5.70000E+04	6.50000E+04	5.70000E+04	3.90000E+04	8.00000E-02	0.
				****MEMBER		NUMBER 6213 HAS	0.	WARP				
6214	6	158	166	159	164	1.00000E-01			1.05000E+07	3.94737E+06		
						6.50000E+04	5.70000E+04	6.50000E+04	5.70000E+04	3.90000E+04	8.00000E-02	0.
				****MEMBER		NUMBER 6214 HAS	0.	WARP				
4215	4	158	166	156		1.00000E-01		0.	1.17832E+07	1.17832E+07	3.94737E+06	3.88845E+06
						6.50000E+04	5.70000E+04	6.50000E+04	5.70000E+04	3.90000E+04	8.00000E-02	0.
1101	1	144	143			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
1102	1	146	145			1.00000E-01			1.05000E+07			
						6.50000E+04	5.70000E+04	6.50000E+04	5.70000E+04	3.90000E+04	8.00000E-02	0.
1103	1	148	147			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01

MEMB NO	MEMB TYPE	NODE (I) (M)	NODE (J) (N)	NODF (K) (O)	NODE (L) (P)	F (26) (29) (81)	A (27) (30) (82)	C (28) (83)	T (36) (40) (84)	O (37) (41) (85)	R (38) (86)	S (39) (87)
1104	1	150	149			1.00000E-01			1.05000E+07			
						6.50000E+04	5.70000E+04	6.50000E+04	5.70000E+04	3.90000E+04	8.00000E-02	0.
1105	1	152	151			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
1106	1	154	153			1.00000E-01			1.05000E+07			
						6.50000E+04	5.70000E+04	6.50000E+04	5.70000E+04	3.90000E+04	8.00000E-02	0.
1107	1	156	155			1.00000E-01			1.00000E+06			
						3.00000E+03	3.00000E+03	3.00000E+03	3.00000E+03	1.85000E+02	1.00000E-01	1.00000E-01
1108	1	158	157			1.00000E-01			1.05000E+07			
						6.50000E+04	5.70000E+04	6.50000E+04	5.70000E+04	3.90000E+04	8.00000E-02	0.
1201	1	157	165			1.00000E-01			1.05000E+07			
						6.50000E+04	5.70000E+04	6.50000E+04	5.70000E+04	3.90000E+04	8.00000E-02	0.
1202	1	159	163			1.00000E-01			1.05000E+07			
						6.50000E+04	5.70000E+04	6.50000E+04	5.70000E+04	3.90000E+04	8.00000E-02	0.
1203	1	162	161			1.00000E-01			1.05000E+07			
						6.50000E+04	5.70000E+04	6.50000E+04	5.70000E+04	3.90000F+04	8.00000E-02	0.
1204	1	159	164			1.00000E-01			1.05000E+07			
						6.50000E+04	5.70000E+04	6.50000E+04	5.70000E+04	3.90000E+04	8.00000E-02	0.
1205	1	158	166			1.00000E-01			1.05000E+07			
						6.50000E+04	5.70000E+04	6.50000E+04	5.70000E+04	3.90000E+04	8.00000E-02	0.
1301	1	141	143			1.00000E-01			1.05000E+07			
						6.50000E+04	5.70000E+04	6.50000E+04	5.70000E+04	3.90000E+04	8.00000E-02	0.
1302	1	143	145			1.00000E-01			1.05000E+07			
						6.50000E+04	5.70000E+04	6.50000E+04	5.70000E+04	3.90000E+04	8.00000E-02	0.
1303	1	145	147			1.00000E-01			1.05000E+07			
						6.50000E+04	5.70000E+04	6.50000E+04	5.70000E+04	3.90000E+04	8.00000E-02	0.
1304	1	147	149			1.00000E-01			1.05000E+07			
						6.50000E+04	5.70000E+04	6.50000E+04	5.70000E+04	3.90000E+04	8.00000E-02	0.
1305	1	149	151			1.00000E-01			1.05000E+07			
						6.50000E+04	5.70000E+04	6.50000E+04	5.70000E+04	3.90000E+04	8.00000E-02	0.
1306	1	151	153			1.00000E-01			1.05000E+07			
						6.50000E+04	5.70000E+04	6.50000E+04	5.70000E+04	3.90000E+04	8.00000E-02	0.

MEMB NO	MEMB TYPE	NODE (I) (M)	NODE (J) (N)	NODE (K) (O)	NODE (L) (P)	F (26) (29) (81)	A (27) (30) (82)	C (28) (83)	T (36) (40) (84)	O (37) (41) (85)	R (38) (86)	S (39) (87)
1307	1	153	155			1.00000E-01 6.50000E+04	5.70000E+04	6.50000E+04	1.05000E+07 5.70000E+04	3.90000E+04	8.00000E-02	0.
1308	1	155	157			1.00000E-01 6.50000E+04	5.70000E+04	6.50000E+04	1.05000E+07 5.70000E+04	3.90000E+04	8.00000E-02	0.
1309	1	157	159			1.00000E-01 6.50000E+04	5.70000E+04	6.50000E+04	1.05000E+07 5.70000E+04	3.90000E+04	8.00000E-02	0.
1311	1	141	144			1.00000E-01 6.50000E+04	5.70000E+04	6.50000E+04	1.05000E+07 5.70000E+04	3.90000E+04	8.00000E-02	0.
1312	1	144	146			1.00000E-01 6.50000E+04	5.70000E+04	6.50000E+04	1.05000E+07 5.70000E+04	3.90000E+04	8.00000E-02	0.
1313	1	146	148			1.00000E-01 6.50000E+04	5.70000E+04	6.50000E+04	1.05000E+07 5.70000E+04	3.90000E+04	8.00000E-02	0.
1314	1	148	150			1.00000E-01 6.50000E+04	5.70000E+04	6.50000E+04	1.05000E+07 5.70000E+04	3.90000E+04	8.00000E-02	0.
1315	1	150	152			1.00000E-01 6.50000E+04	5.70000E+04	6.50000E+04	1.05000E+07 5.70000E+04	3.90000E+04	8.00000E-02	0.
1316	1	152	154			1.00000E-01 6.50000E+04	5.70000E+04	6.50000E+04	1.05000E+07 5.70000E+04	3.90000E+04	8.00000E-02	0.
1317	1	154	156			1.00000E-01 6.50000E+04	5.70000E+04	6.50000E+04	1.05000E+07 5.70000E+04	3.90000E+04	8.00000E-02	0.
1318	1	156	158			1.00000E-01 6.50000E+04	5.70000E+04	6.50000E+04	1.05000E+07 5.70000E+04	3.90000E+04	8.00000E-02	0.
1319	1	158	159			1.00000E-01 6.50000E+04	5.70000E+04	6.50000E+04	1.05000E+07 5.70000E+04	3.90000E+04	8.00000E-02	0.
1401	1	155	165			1.00000E-01 6.50000E+04	5.70000E+04	6.50000E+04	1.05000E+07 5.70000E+04	3.90000E+04	8.00000E-02	0.
1402	1	165	163			1.00000E-01 6.50000E+04	5.70000E+04	6.50000E+04	1.05000E+07 5.70000E+04	3.90000E+04	8.00000E-02	0.
1403	1	163	161			1.00000E-01 6.50000E+04	5.70000E+04	6.50000E+04	1.05000E+07 5.70000E+04	3.90000E+04	8.00000E-02	0.
1404	1	164	162			1.00000E-01 6.50000E+04	5.70000E+04	6.50000E+04	1.05000E+07 5.70000E+04	3.90000E+04	8.00000E-02	0.

MEMB NO	MEMB TYPE	NODE (I) (M)	NODE (J) (N)	NODE (K) (O)	NODE (L) (P)	F (26) (29) (81)	A (27) (30) (82)	C (28) (83)	T (36) (40) (84)	O (37) (41) (85)	R (38) (86)	S (39) (87)
1405	1	166	164			1.00000E-01			1.05000E+07			
						6.50000E+04	5.70000E+04	6.50000E+04	5.70000E+04	3.90000E+04	8.00000E-02	0.
1406	1	156	166			1.00000E-01			1.05000E+07			
						6.50000E+04	5.70000E+04	6.50000E+04	5.70000E+04	3.90000E+04	8.00000E-02	0.

TOTAL NUMBER OF MEMBERS = 347
NUMBER OF MEMBERS ADJACENT TO CONSTRAINED NODES = 57
BAND WIDTH OF STRUCTURE STIFFNESS MATRIX = 48

**** FASTOP ****
FLUTTER AND STRENGTH
OPTIMIZATION PROGRAM

**** SOP ****
STRENGTH OPTIMIZATION PROGRAM

**** ASOM ****
AUTOMATED
STRENGTH OPTIMIZATION MODULE

AIR FORCE
FLIGHT DYNAMICS LABORATORY

MAY 1978

GRUMMAN
AEROSPACE
CORPORATION

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******************** STEP 1 FROM PROGRAM SBMAIN ********************

STACK THE ELEMENT STIFFNESSES TO OBTAIN THE STIFFNESS MATRIX (KS)

THE TOTAL STIFFNESS MATRIX WAS STACKED IN   2 BLOCKS


******************** STEP 2 FROM PROGRAM SBMAIN ********************

SOLVE THE EQUATION  KS = L * LT.  SPLIT THE STIFFNESS MATRIX TO OBTAIN
THE STIFFNESS MATRIX LOWER TRIANGLE (L) AND THE TRANSPOSE OF THE
STIFFNESS MATRIX LOWER TRIANGLE (LT) BY THE CHOLESKY FACTORIZATION METHOD

LOWER TRIANGLE EXCEEDS STORAGE IN CORE


******************** STEP 3 FROM PROGRAM SBMAIN ********************

SOLVE THE EQUATION  L * ZF = F.  USING THE LOAD MATRIX INPUT (F) SOLVE
FOR THE INTERMEDIATE SOLUTION (ZF) BY THE FORWARD SOLUTION METHOD


******************** STEP 4 FROM PROGRAM SBMAIN ********************

REVERSE THE ORDER OF THE STIFFNESS MATRIX LOWER TRIANGEL (LT) TO OBTAIN
THE REVERSE STIFFNESS MATRIX LOWER TRIANGLE (LTR) FOR USE IN THE
SOLUTION OF  LTR * XR = XFR  FOR XR.


******************** STEP 5 FROM PROGRAM SBMAIN ********************

REVERSE THE ORDER OF THE INTERMEDIATE SOLUTION (ZF) TO OBTAIN THE
REVERSE INTERMEDIATE SOLUTION (ZFR) FOR USE IN THE SOLUTION OF
LTR * XR = ZFR  FOR XR.


******************** STEP 6 FROM PROGRAM SBMAIN ********************

SOLVE LTR * XR = ZFR.  USING THE REVERSED SOLUTIONS LTR AND ZFR OBTAINED
PREVIOUSLY SOLVE FOR THE REVERSED DEFLECTIONS (XR) DUE TO THE FORCE
MATRIX INPUT.  USE THE BACKWARD SOLUTION METHOD
TOTAL MATRIX EXCEEDS STORAGE IN CORE


******************** STEP 7 FROM PROGRAM SBMAIN ********************

REVERSE THE ORDER OF THE REVERSE DEFLECTIONS (XR) TO OBTAIN THE
DEFLECTIONS (X)
```

******************** STEP 8 FROM PROGRAM SBMAIN ********************

SOLVE C = U * X. USING THE STRESS PER UNIT DEFLECTION (U) AND THE DEFLECTIONS (X) SOLVE FOR THE CORNER FORCES (C)

REDESIGN CYCLE NO. 0 IN STRESS CONSTRAINT MODE

MEMBER GAGES IN CURRENT CYCLE

MEMBER	GAGE	MEMBER	GAGE	MEMBER	GAGE	MEMBER	GAGE
4301	1.000000E-02	6302	1.000000E-02	6303	1.000000E-02	6304	1.000000E-02
6305	1.000000E-02	4306	1.000000E-02	4001	2.500000E+00	6002	2.500000E+00
6003	2.500000E+00	6004	2.500000E+00	6005	2.500000E+00	4006	2.500000E+00
1001	1.000000E-01	1002	1.000000E-01	1003	1.000000E-01	1004	1.000000E-01
1005	1.000000E-01	6011	3.000000E+00	6012	3.100000E+00	6013	3.200000E+00
6014	3.300000E+00	6015	1.700000E+00	9013	1.000000E-02	5001	2 1 2 0 0 0
5002	3 1 3 0 0 0	5003	3 2 3 0 0 0	5004	2 1 2 0 0 0	5005	1 1 1 0 0 0
5006	1 1 1 0 0 0	5011	2 1 2 0 0 0	5012	3 1 3 0 0 0	5013	3 4 3 0 0 0
5014	2 1 2 0 0 0	5015	1 1 1 0 0 0	5016	1 1 1 0 0 0	4021	5.000000E+00
6022	5.000000E+00	6023	5.000000E+00	6024	5.000000E+00	6025	5.000000E+00
4026	5.000000E+00	1011	1.000000E-01	1012	1.000000E-01	1013	1.000000E-01
1014	1.000000E-01	1015	1.000000E-01	6031	3.300000E+00	6032	3.400000E+00
6033	3.500000E+00	6034	3.600000E+00	6035	1.900000E+00	9033	1.000000E-02
5021	2 1 2 0 0 0	5022	3 1 3 0 0 0	5023	3 4 3 0 0 0	5024	3 3 3 0 0 0
5025	1 1 1 0 0 0	5026	1 1 1 0 0 0	5031	2 1 2 0 0 0	5032	3 1 3 0 0 0
5033	3 6 3 0 0 0	5034	3 3 3 0 0 0	5035	1 1 1 0 0 0	5036	1 1 1 0 0 0
4041	5.000000E+00	6042	5.000000E+00	6043	5.000000E+00	6044	5.000000E+00
6045	5.000000E+00	4046	5.000000E+00	1021	1.000000E-01	1022	1.000000E-01
1023	1.000000E-01	1024	1.000000E-01	1025	1.000000E-01	6051	3.700000E+00
6052	3.800000E+00	6053	3.950000E+00	6054	4.100000E+00	6055	2.100000E+00
9053	1.000000E-02	5041	2 1 2 0 0 0	5042	3 1 3 0 0 0	5043	3 6 3 0 0 0
5044	3 6 3 0 0 0	5045	3 1 3 0 0 0	5046	1 1 1 0 0 0	5051	2 1 2 0 0 0
5052	3 1 3 0 0 0	5053	3 10 3 0 0 0	5054	3 6 3 0 0 0	5055	2 1 2 0 0 0
5056	1 1 1 0 0 0	4061	5.000000E+00	6062	5.000000E+00	6063	5.000000E+00
6064	5.000000E+00	6065	5.000000E+00	4066	5.000000E+00	1031	1.000000E-01
1032	1.000000E-01	1033	1.000000E-01	1034	1.000000E-01	1035	1.000000E-01
6071	4.000000E+00	6072	4.150000E+00	6073	4.300000E+00	6074	4.450000E+00
6075	2.300000E+00	9073	1.000000E-02	5061	2 1 2 0 0 0	5062	3 1 3 0 0 0
5063	3 8 3 0 0 0	5064	3 9 3 0 0 0	5065	6 1 6 0 0 0	5066	5 1 5 0 0 0
5071	2 1 2 0 0 0	5072	3 1 3 0 0 0	5073	3 15 3 0 0 0	5074	3 10 3 0 0 0
5075	5 1 5 0 0 0	5076	3 1 3 0 0 0	4081	5.000000E+00	6082	5.000000E+00
6083	5.000000E+00	6084	5.000000E+00	6085	5.000000E+00	4086	5.000000E+00
1041	1.000000E-01	1042	1.000000E-01	1043	1.000000E-01	1044	1.000000E-01
1045	1.000000E-01	6091	4.450000E+00	6092	4.550000E+00	6093	4.700000E+00
6094	4.850000E+00	6095	2.500000E+00	9093	1.000000E-02	5081	2 1 2 0 0 0
5082	3 1 3 0 0 0	5083	3 10 3 0 0 0	5084	3 12 3 0 0 0	5085	9 1 9 0 0 0
5086	10 1 10 0 0 0	5091	2 1 2 0 0 0	5092	3 1 3 0 0 0	5093	3 18 3 0 0 0
5094	3 14 3 0 0 0	5095	8 1 8 0 0 0	5096	8 1 8 0 0 0	4101	5.000000E+00
6102	5.000000E+00	6103	5.000000E+00	6104	5.000000E+00	6105	5.000000E+00
4106	5.000000E+00	1051	1.000000E-01	1052	1.000000E-01	1053	1.000000E-01
1054	1.000000E-01	1055	1.000000E-01	6111	4.800000E+00	6112	4.900000E+00
6113	5.050000E+00	6114	5.250000E+00	6115	2.700000E+00	9113	1.000000E-02
5101	2 1 2 0 0 0	5102	3 1 3 0 0 0	5103	2 12 2 0 0 0	5104	2 15 2 0 0 0
5105	12 1 12 0 0 0	5106	15 1 15 0 0 0	5111	2 1 2 0 0 0	5112	3 1 3 0 0 0
5113	2 21 2 0 0 0	5114	2 18 2 0 0 0	5115	11 1 11 0 0 0	5116	13 1 13 0 0 0
4121	5.000000E+00	6122	5.000000E+00	6123	5.000000E+00	6124	5.000000E+00
6125	5.000000E+00	4126	5.000000E+00	1061	1.000000E-01	1062	1.000000E-01
1063	1.000000E-01	1064	1.000000E-01	1065	1.000000E-01	6131	5.200000E+00

REDESIGN CYCLE NO. 0 IN STRESS CONSTRAINT MODE

MEMBER GAGES IN CURRENT CYCLE

MEMBER	GAGE	MEMBER	GAGE	MEMBER	GAGE	MEMBER	GAGE
6132	5.300000E+00	6133	5.450000E+00	6134	5.650000E+00	6135	2.900000E+00
9133	1.000000E-02	5121	1 1 1 0 0 0	5122	2 1 2 0 0 0	5123	2 12 2 0 0 0
5124	2 18 2 0 0 0	5125	14 2 14 0 0 0	5126	20 1 20 0 0 0	5131	1 1 1 0 0 0
5132	2 1 2 0 0 0	5133	2 23 2 0 0 0	5134	2 23 2 0 0 0	5135	13 2 13 0 0 0
5136	17 1 17 0 0 0	4141	5.000000E+00	6142	5.000000E+00	6143	5.000000E+00
6144	5.000000E+00	6145	5.000000E+00	4146	5.000000E+00	1071	1.000000E-01
1072	1.000000E-01	1073	1.000000E-01	1074	1.000000E-01	1075	1.000000E-01
6151	5.500000E+00	6152	5.600000E+00	6153	5.800000E+00	6154	6.000000E+00
6155	3.100000E+00	9153	1.000000E-02	5141	1 1 1 0 0 0	5142	1 1 1 0 0 0
5143	2 12 2 0 0 0	5144	2 25 2 0 0 0	5145	15 8 15 0 0 0	5146	30 3 30 0 0 0
5151	1 1 1 0 0 0	5152	1 1 1 0 0 0	5153	2 25 2 0 0 0	5154	2 27 2 0 0 0
5155	14 8 14 0 0 0	5156	19 2 19 0 0 0	4161	5.000000E+00	6162	5.000000E+00
6163	5.000000E+00	6164	5.000000E+00	6165	5.000000E+00	4166	5.000000E+00
1081	1.000000E-01	1082	1.000000E-01	1083	1.000000E-01	1084	1.000000E-01
1085	1.000000E-01	6171	5.800000E+00	6172	6.000000E+00	6173	6.200000E+00
6174	6.450000E+00	6175	3.300000E+00	9173	1.000000E-02	5161	1 1 1 0 0 0
5162	1 1 1 0 0 0	5163	2 6 2 0 0 0	5164	3 26 3 0 0 0	5165	15 13 15 0 0 0
5166	41 3 41 0 0 0	5171	1 1 1 0 0 0	5172	1 1 1 0 0 0	5173	1 5 1 0 0 0
5174	2 28 2 0 0 0	5175	14 10 14 0 0 0	5176	20 4 20 0 0 0	4181	5.000000E+00
6182	5.000000E+00	6183	5.000000E+00	6184	5.000000E+00	6185	5.000000E+00
4186	5.000000E+00	1091	1.000000E-01	1092	1.000000E-01	1093	1.000000E-01
1094	1.000000E-01	1095	1.000000E-01	6191	6.200000E+00	6192	6.450000E+00
6193	6.600000E+00	6194	6.900000E+00	6195	3.500000E+00	9193	1.000000E-02
5181	1 1 1 0 0 0	5182	1 1 1 0 0 0	5183	2 1 2 0 0 0	5184	3 28 3 0 0 0
5185	12 21 12 0 0 0	5186	43 3 43 0 0 0	5191	1 1 1 0 0 0	5192	1 1 1 0 0 0
5193	2 1 2 0 0 0	5194	2 30 2 0 0 0	5195	11 19 11 0 0 0	5196	22 4 22 0 0 0
4201	1.000000E-01	6202	1.000000E-01	6203	1.000000E-01	6204	1.000000E-01
6205	1.000000E-01	6206	1.000000E-01	6207	1.000000E-01	6208	1.000000E-01
4209	1.000000E-01	4211	1.000000E-01	6212	1.000000E-01	6213	1.000000E-01
6214	1.000000E-01	4215	1.000000E-01	1101	1.000000E-01	1102	1.000000E-01
1103	1.000000E-01	1104	1.000000E-01	1105	1.000000E-01	1106	1.000000E-01
1107	1.000000E-01	1108	1.000000E-01	1201	1.000000E-01	1202	1.000000E-01
1203	1.000000E-01	1204	1.000000E-01	1205	1.000000E-01	1301	1.000000E-01
1302	1.000000E-01	1303	1.000000E-01	1304	1.000000E-01	1305	1.000000E-01
1306	1.000000E-01	1307	1.000000E-01	1308	1.000000E-01	1309	1.000000E-01
1311	1.000000E-01	1312	1.000000E-01	1313	1.000000E-01	1314	1.000000E-01
1315	1.000000E-01	1316	1.000000E-01	1317	1.000000E-01	1318	1.000000E-01
1319	1.000000E-01	1401	1.000000E-01	1402	1.000000E-01	1403	1.000000E-01
1404	1.000000E-01	1405	1.000000E-01	1406	1.000000E-01		

STRESS CONSTRAINT RATIO IN CURRENT CYCLE = .975518 OCCURRING IN MEMBER NUMBER 1307

TOTAL WEIGHT OF INITIAL DESIGN = 2.4494730E+01

THE ABOVE RESULTS ARE FOR THE INITIAL DESIGN

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******************** STEP 1 FROM PROGRAM SBMAIN ********************

STACK THE ELEMENT STIFFNESSES TO OBTAIN THE STIFFNESS MATRIX (KS)

THE TOTAL STIFFNESS MATRIX WAS STACKED IN   2 BLOCKS


******************** STEP 2 FROM PROGRAM SBMAIN ********************

SOLVE THE EQUATION  KS = L * LT.  SPLIT THE STIFFNESS MATRIX TO OBTAIN
THE STIFFNESS MATRIX LOWER TRIANGLE (L) AND THE TRANSPOSE OF THE
STIFFNESS MATRIX LOWER TRIANGLE (LT) BY THE CHOLESKY FACTORIZATION METHOD

LOWER TRIANGLE EXCEEDS STORAGE IN CORE


******************** STEP 3 FROM PROGRAM SBMAIN ********************

SOLVE THE EQUATION  L * ZF = F.  USING THE LOAD MATRIX INPUT (F) SOLVE
FOR THE INTERMEDIATE SOLUTION (ZF) BY THE FORWARD SOLUTION METHOD


******************** STEP 4 FROM PROGRAM SBMAIN ********************

REVERSE THE ORDER OF THE STIFFNESS MATRIX LOWER TRIANGEL (LT) TO OBTAIN
THE REVERSE STIFFNESS MATRIX LOWER TRIANGLE (LTR) FOR USE IN THE
SOLUTION OF  LTR * XR = XFR  FOR XR.


******************** STEP 5 FROM PROGRAM SBMAIN ********************

REVERSE THE ORDER OF THE INTERMEDIATE SOLUTION (ZF) TO OBTAIN THE
REVERSE INTERMEDIATE SOLUTION (ZFR) FOR USE IN THE SOLUTION OF
LTR * XR = ZFR  FOR XR.


******************** STEP 6 FROM PROGRAM SBMAIN ********************

SOLVE LTR * XR = ZFR.  USING THE REVERSED SOLUTIONS LTR AND ZFR OBTAINED
PREVIOUSLY SOLVE FOR THE REVERSED DEFLECTIONS (XR) DUE TO THE FORCE
MATRIX INPUT.  USE THE BACKWARD SOLUTION METHOD
TOTAL MATRIX EXCEEDS STORAGE IN CORE


******************** STEP 7 FROM PROGRAM SBMAIN ********************

REVERSE THE ORDER OF THE REVERSE DEFLECTIONS (XR) TO OBTAIN THE
DEFLECTIONS (X)
```

```
******************** STEP 8 FROM PROGRAM SBMAIN ********************

SOLVE  C = U * X.  USING THE STRESS PER UNIT DEFLECTION (U) AND THE
DEFLECTIONS (X) SOLVE FOR THE CORNER FORCES (C)
```

REDESIGN CYCLE NO. 1 IN STRESS CONSTRAINT MODE

MEMBER GAGES IN CURRENT CYCLE

MEMBER	GAGE	MEMBER	GAGE	MEMBER	GAGE	MEMBER	GAGE
4301	1.000000E-02	6302	1.000000E-02	6303	1.000000E-02	6304	1.000000E-02
6305	1.000000E-02	4306	1.000000E-02	4001	2.500000E+00	6002	2.500000E+00
6003	2.500000E+00	6004	2.500000E+00	6005	2.500000E+00	4006	2.500000E+00
1001	1.000000E-01	1002	1.000000E-01	1003	1.000000E-01	1004	1.000000E-01
1005	1.000000E-01	6011	3.000000E+00	6012	3.100000E+00	6013	3.200000E+00
6014	3.300000E+00	6015	1.700000E+00	9013	1.000000E-02	5001	2 1 2 0 0 0
5002	3 1 3 0 0 0	5003	3 2 3 0 0 0	5004	2 1 2 0 0 0	5005	1 1 1 0 0 0
5006	1 1 1 0 0 0	5011	2 1 2 0 0 0	5012	3 1 3 0 0 0	5013	3 4 3 0 0 0
5014	2 1 2 0 0 0	5015	1 1 1 0 0 0	5016	1 1 1 0 0 0	4021	5.000000E+00
6022	5.000000E+00	6023	5.000000E+00	6024	5.000000E+00	6025	5.000000E+00
4026	5.000000E+00	1011	1.000000E-01	1012	1.000000E-01	1013	1.000000E-01
1014	1.000000E-01	1015	1.000000E-01	6031	3.300000E+00	6032	3.400000E+00
6033	3.500000E+00	6034	3.600000E+00	6035	1.900000E+00	9033	1.000000E-02
5021	2 1 2 0 0 0	5022	3 1 3 0 0 0	5023	3 4 3 0 0 0	5024	3 3 3 0 0 0
5025	1 1 1 0 0 0	5026	1 1 1 0 0 0	5031	2 1 2 0 0 0	5032	3 1 3 0 0 0
5033	3 6 3 0 0 0	5034	3 3 3 0 0 0	5035	1 1 1 0 0 0	5036	1 1 1 0 0 0
4041	5.000000E+00	6042	5.000000E+00	6043	5.000000E+00	6044	5.000000E+00
6045	5.000000E+00	4046	5.000000E+00	1021	1.000000E-01	1022	1.000000E-01
1023	1.000000E-01	1024	1.000000E-01	1025	1.000000E-01	6051	3.700000E+00
6052	3.800000E+00	6053	3.950000E+00	6054	4.100000E+00	6055	2.100000E+00
9053	1.000000E-02	5041	2 1 2 0 0 0	5042	3 1 3 0 0 0	5043	3 6 3 0 0 0
5044	3 6 3 0 0 0	5045	3 1 3 0 0 0	5046	1 1 1 0 0 0	5051	2 1 2 0 0 0
5052	3 1 3 0 0 0	5053	3 10 3 0 0 0	5054	3 6 3 0 0 0	5055	2 1 2 0 0 0
5056	1 1 1 0 0 0	4061	5.000000E+00	6062	5.000000E+00	6063	5.000000E+00
6064	5.000000E+00	6065	5.000000E+00	4066	5.000000E+00	1031	1.000000E-01
1032	1.000000E-01	1033	1.000000E-01	1034	1.000000E-01	1035	1.000000E-01
6071	4.000000E+00	6072	4.150000E+00	6073	4.300000E+00	6074	4.450000E+00
6075	2.300000E+00	9073	1.000000E-02	5061	2 1 2 0 0 0	5062	3 1 3 0 0 0
5063	3 8 3 0 0 0	5064	3 9 3 0 0 0	5065	6 1 6 0 0 0	5066	5 1 5 0 0 0
5071	2 1 2 0 0 0	5072	3 1 3 0 0 0	5073	3 15 3 0 0 0	5074	3 10 3 0 0 0
5075	5 1 5 0 0 0	5076	3 1 3 0 0 0	4081	5.000000E+00	6082	5.000000E+00
6083	5.000000E+00	6084	5.000000E+00	6085	5.000000E+00	4086	5.000000E+00
1041	1.000000E-01	1042	1.000000E-01	1043	1.000000E-01	1044	1.000000E-01
1045	1.000000E-01	6091	4.450000E+00	6092	4.550000E+00	6093	4.700000E+00
6094	4.850000E+00	6095	2.500000E+00	9093	1.000000E-02	5081	2 1 2 0 0 0
5082	3 1 3 0 0 0	5083	3 10 3 0 0 0	5084	3 12 3 0 0 0	5085	9 1 9 0 0 0
5086	10 1 10 0 0 0	5091	2 1 2 0 0 0	5092	3 1 3 0 0 0	5093	3 18 3 0 0 0
5094	3 14 3 0 0 0	5095	8 1 8 0 0 0	5096	8 1 8 0 0 0	4101	5.000000E+00
6102	5.000000E+00	6103	5.000000E+00	6104	5.000000E+00	6105	5.000000E+00
4106	5.000000E+00	1051	1.000000E-01	1052	1.000000E-01	1053	1.000000E-01
1054	1.000000E-01	1055	1.000000E-01	6111	4.800000E+00	6112	4.900000E+00
6113	5.050000E+00	6114	5.250000E+00	6115	2.700000E+00	9113	1.000000E-02
5101	2 1 2 0 0 0	5102	3 1 3 0 0 0	5103	2 12 2 0 0 0	5104	2 15 2 0 0 0
5105	12 1 12 0 0 0	5106	15 1 15 0 0 0	5111	2 1 2 0 0 0	5112	3 1 3 0 0 0
5113	2 21 2 0 0 0	5114	2 18 2 0 0 0	5115	11 1 11 0 0 0	5116	13 1 13 0 0 0
4121	5.000000E+00	6122	5.000000E+00	6123	5.000000E+00	6124	5.000000E+00
6125	5.000000E+00	4126	5.000000E+00	1061	1.000000E-01	1062	1.000000E-01
1063	1.000000E-01	1064	1.000000E-01	1065	1.000000E-01	6131	5.200000E+00

REDESIGN CYCLE NO. 1 IN STRESS CONSTRAINT MODE

MEMBER GAGES IN CURRENT CYCLE

MEMBER	GAGE	MEMBER	GAGE	MEMBER	GAGE	MEMBER	GAGE
6132	5.300000E+00	6133	5.450000E+00	6134	5.650000E+00	6135	2.900000E+00
9133	1.000000E-02	5121	1 1 1 0 0 0	5122	2 1 2 0 0 0	5123	2 12 2 0 0 0
5124	2 18 2 0 0 0	5125	14 2 14 0 0 0	5126	20 1 20 0 0 0	5131	1 1 1 0 0 0
5132	2 1 2 0 0 0	5133	2 23 2 0 0 0	5134	2 23 2 0 0 0	5135	13 2 13 0 0 0
5136	17 1 17 0 0 0	4141	5.000000E+00	6142	5.000000E+00	6143	5.000000E+00
6144	5.000000E+00	6145	5.000000E+00	4146	5.000000E+00	1071	1.000000E-01
1072	1.000000E-01	1073	1.000000E-01	1074	1.000000E-01	1075	1.000000E-01
6151	5.500000E+00	6152	5.600000E+00	6153	5.900000E+00	6154	6.000000E+00
6155	3.100000E+00	9153	1.000000E-02	5141	1 1 1 0 0 0	5142	1 1 1 0 0 0
5143	2 12 2 0 0 0	5144	2 25 2 0 0 0	5145	15 8 15 0 0 0	5146	30 3 30 0 0 0
5151	1 1 1 0 0 0	5152	1 1 1 0 0 0	5153	2 25 2 0 0 0	5154	2 27 2 0 0 0
5155	14 8 14 0 0 0	5156	19 2 19 0 0 0	4161	5.000000E+00	6162	5.000000E+00
6163	5.000000E+00	6164	5.000000E+00	6165	5.000000E+00	4166	5.000000E+00
1081	1.000000E-01	1082	1.000000E-01	1083	1.000000E-01	1084	1.000000E-01
1085	1.000000E-01	6171	5.800000E+00	6172	6.000000E+00	6173	6.200000E+00
6174	6.450000E+00	6175	3.300000E+00	9173	1.000000E-02	5161	1 1 1 0 0 0
5162	1 1 1 0 0 0	5163	2 6 2 0 0 0	5164	3 26 3 0 0 0	5165	15 13 15 0 0 0
5166	41 3 41 0 0 0	5171	1 1 1 0 0 0	5172	1 1 1 0 0 0	5173	1 5 1 0 0 0
5174	2 28 2 0 0 0	5175	14 10 14 0 0 0	5176	20 4 20 0 0 0	4181	5.000000E+00
6182	5.000000E+00	6183	5.000000E+00	6184	5.000000E+00	6185	5.000000E+00
4186	5.000000E+00	1091	1.000000E-01	1092	1.000000E-01	1093	1.000000E-01
1094	1.000000E-01	1095	1.000000E-01	6191	6.200000E+00	6192	6.450000E+00
6193	6.600000E+00	6194	6.900000E+00	6195	3.500000E+00	9193	1.000000E-02
5181	1 1 1 0 0 0	5182	1 1 1 0 0 0	5183	2 1 2 0 0 0	5184	3 28 3 0 0 0
5185	12 21 12 0 0 0	5186	43 3 43 0 0 0	5191	1 1 1 0 0 0	5192	1 1 1 0 0 0
5193	2 1 2 0 0 0	5194	2 30 2 0 0 0	5195	11 19 11 0 0 0	5196	22 4 22 0 0 0
4201	8.000000E-02	6202	8.000000E-02	6203	8.000000E-02	6204	8.000000E-02
6205	8.000000E-02	6206	8.000000E-02	6207	8.000000E-02	6208	8.000000E-02
4209	8.000000E-02	4211	8.000000E-02	6212	8.000000E-02	6213	8.000000E-02
6214	9.655305E-02	4215	8.000000E-02	1101	1.000000E-01	1102	8.000000E-02
1103	1.000000E-01	1104	8.000000E-02	1105	1.000000E-01	1106	8.000000E-02
1107	1.000000E-01	1108	8.000000E-02	1201	8.000000E-02	1202	8.000000E-02
1203	8.000000E-02	1204	8.000000E-02	1205	8.000000E-02	1301	8.000000E-02
1302	8.000000E-02	1303	8.000000E-02	1304	8.000000E-02	1305	8.000000E-02
1306	8.000000E-02	1307	9.755183E-02	1308	8.000000E-02	1309	8.000000E-02
1311	8.000000E-02	1312	8.000000E-02	1313	8.000000E-02	1314	8.000000E-02
1315	8.000000E-02	1316	8.000000E-02	1317	8.000000E-02	1318	8.000000E-02
1319	8.000000E-02	1401	8.000000E-02	1402	8.000000E-02	1403	8.000000E-02
1404	8.000000E-02	1405	8.000000E-02	1406	8.000000E-02		

STRESS CONSTRAINT RATIO IN PRECEDING CYCLE = .975518
STRESS CONSTRAINT RATIO IN CURRENT CYCLE = 1.049690 OCCURRING IN MEMBER NUMBER 6214

TOTAL WEIGHT OF DESIGN ANALYZED IN PRECEDING CYCLE = 2.4494730E+01
TOTAL WEIGHT OF DESIGN ANALYZED IN CURRENT CYCLE = 2.4130814E+01

THE ABOVE RESULTS ARE FOR REDESIGN CYCLE NO. 1 IN THE STRESS CONSTRAINT MODE

ITERATIONS IN STRESS CONSTRAINT MODE NOW COMPLETE

**** FASTOP ****
FLUTTER AND STRENGTH
OPTIMIZATION PROGRAM

**** SOP ****
STRENGTH OPTIMIZATION PROGRAM

**** ASAM ****
AUTOMATED
STRENGTH ANALYSIS MODULE

AIR FORCE
FLIGHT DYNAMICS LABORATORY

MAY 1978

GRUMMAN
AEROSPACE
CORPORATION

GAGES DETERMINED IN FINAL STRESS CONSTRAINT RESIZING

(NOTE THAT THIS REPRESENTS A DESIGN FOR WHICH AN ANALYSIS HAS NOT BEEN DONE. IT IS USEFUL PRIMARILY TO CHECK CONVERGENCE)

MEMBER	GAGE	MEMBER	GAGE	MEMBER	GAGE	MEMBER	GAGE
4301	1.000000E-02	6302	1.000000E-02	6303	1.000000E-02	6304	1.000000E-02
6305	1.000000E-02	4306	1.000000E-02	4001	2.500000E+00	6002	2.500000E+00
6003	2.500000E+00	6004	2.500000E+00	6005	2.500000E+00	4006	2.500000E+00
1001	1.000000E-01	1002	1.000000E-01	1003	1.000000E-01	1004	1.000000E-01
1005	1.000000E-01	6011	3.000000E+00	6012	3.100000E+00	6013	3.200000E+00
6014	3.300000E+00	6015	1.700000E+00	9013	1.000000E-02	5001	2 1 2 0 0 0
5002	3 1 3 0 0 0	5003	3 2 3 0 0 0	5004	2 1 2 0 0 0	5005	1 1 1 0 0 0
5006	1 1 1 0 0 0	5011	2 1 2 0 0 0	5012	3 1 3 0 0 0	5013	3 4 3 0 0 0
5014	2 1 2 0 0 0	5015	1 1 1 0 0 0	5016	1 1 1 0 0 0	4021	5.000000E+00
6022	5.000000E+00	6023	5.000000E+00	6024	5.000000E+00	6025	5.000000E+00
4026	5.000000E+00	1011	1.000000E-01	1012	1.000000E-01	1013	1.000000E-01
1014	1.000000E-01	1015	1.000000E-01	6031	3.300000E+00	6032	3.400000E+00
6033	3.500000E+00	6034	3.600000E+00	6035	1.900000E+00	9033	1.000000E-02
5021	2 1 2 0 0 0	5022	3 1 3 0 0 0	5023	3 4 3 0 0 0	5024	3 3 3 0 0 0
5025	1 1 1 0 0 0	5026	1 1 1 0 0 0	5031	2 1 2 0 0 0	5032	3 1 3 0 0 0
5033	3 6 3 0 0 0	5034	3 3 3 0 0 0	5035	1 1 1 0 0 0	5036	1 1 1 0 0 0
4041	5.000000E+00	6042	5.000000E+00	6043	5.000000E+00	6044	5.000000E+00
6045	5.000000E+00	4046	5.000000E+00	1021	1.000000E-01	1022	1.000000E-01
1023	1.000000E-01	1024	1.000000E-01	1025	1.000000E-01	6051	3.700000E+00
6052	3.800000E+00	6053	3.950000E+00	6054	4.100000E+00	6055	2.100000E+00
9053	1.000000E-02	5041	2 1 2 0 0 0	5042	3 1 3 0 0 0	5043	3 6 3 0 0 0
5044	3 6 3 0 0 0	5045	3 1 3 0 0 0	5046	1 1 1 0 0 0	5051	2 1 2 0 0 0
5052	3 1 3 0 0 0	5053	3 10 3 0 0 0	5054	3 6 3 0 0 0	5055	2 1 2 0 0 0
5056	1 1 1 0 0 0	4061	5.000000E+00	6062	5.000000E+00	6063	5.000000E+00
6064	5.000000E+00	6065	5.000000E+00	4066	5.000000E+00	1031	1.000000E-01
1032	1.000000E-01	1033	1.000000E-01	1034	1.000000E-01	1035	1.000000E-01
6071	4.000000E+00	6072	4.150000E+00	6073	4.300000E+00	6074	4.450000E+00
6075	2.300000E+00	9073	1.000000E-02	5061	2 1 2 0 0 0	5062	3 1 3 0 0 0
5063	3 8 3 0 0 0	5064	3 9 3 0 0 0	5065	6 1 6 0 0 0	5066	5 1 5 0 0 0
5071	2 1 2 0 0 0	5072	3 1 3 0 0 0	5073	3 15 3 0 0 0	5074	3 10 3 0 0 0
5075	5 1 5 0 0 0	5076	3 1 3 0 0 0	4081	5.000000E+00	6082	5.000000E+00
6083	5.000000E+00	6084	5.000000E+00	6085	5.000000E+00	4086	5.000000E+00
1041	1.000000E-01	1042	1.000000E-01	1043	1.000000E-01	1044	1.000000E-01
1045	1.000000E-01	6091	4.450000E+00	6092	4.550000E+00	6093	4.700000E+00
6094	4.850000E+00	6095	2.500000E+00	9093	1.000000E-02	5081	2 1 2 0 0 0
5082	3 1 3 0 0 0	5083	3 10 3 0 0 0	5084	3 12 3 0 0 0	5085	9 1 9 0 0 0
5086	10 1 10 0 0 0	5091	2 1 2 0 0 0	5092	3 1 3 0 0 0	5093	3 18 3 0 0 0
5094	3 14 3 0 0 0	5095	8 1 8 0 0 0	5096	8 1 8 0 0 0	4101	5.000000E+00
6102	5.000000E+00	6103	5.000000E+00	6104	5.000000E+00	6105	5.000000E+00
4106	5.000000E+00	1051	1.000000E-01	1052	1.000000E-01	1053	1.000000E-01
1054	1.000000E-01	1055	1.000000E-01	6111	4.800000E+00	6112	4.900000E+00
6113	5.050000E+00	6114	5.250000E+00	6115	2.700000E+00	9113	1.000000E-02
5101	2 1 2 0 0 0	5102	3 1 3 0 0 0	5103	2 12 2 0 0 0	5104	2 15 2 0 0 0
5105	12 1 12 0 0 0	5106	15 1 15 0 0 0	5111	2 1 2 0 0 0	5112	3 1 3 0 0 0
5113	2 21 2 0 0 0	5114	2 18 2 0 0 0	5115	11 1 11 0 0 0	5116	13 1 13 0 0 0
4121	5.000000E+00	6122	5.000000E+00	6123	5.000000E+00	6124	5.000000E+00
6125	5.000000E+00	4126	5.000000E+00	1061	1.000000E-01	1062	1.000000E-01

GAGES DETERMINED IN FINAL STRESS CONSTRAINT RESIZING

(NOTE THAT THIS REPRESENTS A DESIGN FOR WHICH AN ANALYSIS HAS NOT BEEN DONE. IT IS USEFUL PRIMARILY TO CHECK CONVERGENCE)

MEMBER	GAGE	MEMBER	GAGE	MEMBER	GAGE	MEMBER	GAGE
1063	1.000000E-01	1064	1.000000E-01	1065	1.000000E-01	6131	5.200000E+00
6132	5.300000E+00	6133	5.450000E+00	6134	5.650000E+00	6135	2.900000E+00
9133	1.000000E-02	5121	1 1 1 0 0 0	5122	2 1 2 0 0 0	5123	2 12 2 0 0 0
5124	2 18 2 0 0 0	5125	14 2 14 0 0 0	5126	20 1 20 0 0 0	5131	1 1 1 0 0 0
5132	2 1 2 0 0 0	5133	2 23 2 0 0 0	5134	2 23 2 0 0 0	5135	13 2 13 0 0 0
5136	17 1 17 0 0 0	4141	5.000000E+00	6142	5.000000E+00	6143	5.000000E+00
6144	5.000000E+00	6145	5.000000E+00	4146	5.000000E+00	1071	1.000000E-01
1072	1.000000E-01	1073	1.000000E-01	1074	1.000000E-01	1075	1.000000E-01
6151	5.500000E+00	6152	5.600000E+00	6153	5.800000E+00	6154	6.000000E+00
6155	3.100000E+00	9153	1.000000E-02	5141	1 1 1 0 0 0	5142	1 1 1 0 0 0
5143	2 12 2 0 0 0	5144	2 25 2 0 0 0	5145	15 8 15 0 0 0	5146	30 3 30 0 0 0
5151	1 1 1 0 0 0	5152	1 1 1 0 0 0	5153	2 25 2 0 0 0	5154	2 27 2 0 0 0
5155	14 8 14 0 0 0	5156	19 2 19 0 0 0	4161	5.000000E+00	6162	5.000000E+00
6163	5.000000E+00	6164	5.000000E+00	6165	5.000000E+00	4166	5.000000E+00
1081	1.000000E-01	1082	1.000000E-01	1083	1.000000E-01	1084	1.000000E-01
1085	1.000000E-01	6171	5.800000E+00	6172	6.000000E+00	6173	6.200000E+00
6174	6.450000E+00	6175	3.300000E+00	9173	1.000000E-02	5161	1 1 1 0 0 0
5162	1 1 1 0 0 0	5163	2 6 2 0 0 0	5164	3 26 3 0 0 0	5165	15 13 15 0 0 0
5166	41 3 41 0 0 0	5171	1 1 1 0 0 0	5172	1 1 1 0 0 0	5173	1 5 1 0 0 0
5174	2 28 2 0 0 0	5175	14 10 14 0 0 0	5176	20 4 20 0 0 0	4181	5.000000E+00
6182	5.000000E+00	6183	5.000000E+00	6184	5.000000E+00	6185	5.000000E+00
4186	5.000000E+00	1091	1.000000E-01	1092	1.000000E-01	1093	1.000000E-01
1094	1.000000E-01	1095	1.000000E-01	6191	6.200000E+00	6192	6.450000E+00
6193	6.600000E+00	6194	6.900000E+00	6195	3.500000E+00	9193	1.000000E-02
5181	1 1 1 0 0 0	5182	1 1 1 0 0 0	5183	2 1 2 0 0 0	5184	3 28 3 0 0 0
5185	12 21 12 0 0 0	5186	43 3 43 0 0 0	5191	1 1 1 0 0 0	5192	1 1 1 0 0 0
5193	2 1 2 0 0 0	5194	2 30 2 0 0 0	5195	11 19 11 0 0 0	5196	22 4 22 0 0 0
4201	8.000000E-02	6202	8.000000E-02	6203	8.000000E-02	6204	8.000000E-02
6205	8.000000E-02	6206	8.000000E-02	6207	8.000000E-02	6208	8.000000E-02
4209	8.000000E-02	4211	8.000000E-02	6212	8.000000E-02	6213	8.000000E-02
6214	1.013508E-01	4215	8.000000E-02	1101	1.000000E-01	1102	8.000000E-02
1103	1.000000E-01	1104	8.000000E-02	1105	1.000000E-01	1106	8.000000E-02
1107	1.000000E-01	1108	8.000000E-02	1201	8.000000E-02	1202	8.000000E-02
1203	8.000000E-02	1204	8.000000E-02	1205	8.000000E-02	1301	8.000000E-02
1302	8.000000E-02	1303	8.000000E-02	1304	8.000000E-02	1305	8.000000E-02
1306	8.000000E-02	1307	9.962442E-02	1308	8.000000E-02	1309	8.000000E-02
1311	8.000000E-02	1312	8.000000E-02	1313	8.000000E-02	1314	8.000000E-02
1315	8.000000E-02	1316	8.000000E-02	1317	8.000000E-02	1318	8.000000E-02
1319	8.000000E-02	1401	8.000000E-02	1402	8.000000E-02	1403	8.000000E-02
1404	8.000000E-02	1405	8.000000E-02	1406	8.000000E-02		

R E A C T I O N S   A T   R I G I D   S U P P O R T S

NODE	COMPONENT	1 / 9 / 17	2 / 10 / 18	3 / 11 / 19	4 / 12 / 20	5 / 13	6 / 14	7 / 15	8 / 16
146	FX	-3.750638E-07	-5.640422E-07	-1.015687E-07	2.182420E-07				
146	FZ	2.742692E+02	4.114023E+02	-9.760123E+01	-5.090289E+02				
147	FY	5.560676E+03	8.341014E+03	2.402802E+03	-1.397998E+03				
148	FY	-6.134948E+03	-9.202422E+03	-2.588252E+03	1.670038E+03				
150	FZ	-3.705673E+02	-5.558535E+02	-2.491262E+02	-8.805860E+01				
151	FY	2.779700E+04	4.169546E+04	9.024253E+03	-1.307056E+04				
152	FY	-2.855759E+04	-4.283635E+04	-9.246816E+03	1.347781E+04				
154	FZ	-1.763686E+03	-2.645529E+03	-6.526122E+02	6.663564E+02				
155	FY	3.565621E+04	5.348426E+04	1.061073E+04	-1.873108E+04				
156	FY	-3.175474E+04	-4.763206E+04	-9.406065E+03	1.677042E+04				
157	FY	3.197322E+04	4.795977E+04	8.957010E+03	-1.793206E+04				
158	FY	-3.453446E+04	-5.180163E+04	-9.752295E+03	1.921015E+04				
162	FZ	-7.214425E+02	-1.082162E+03	-1.621782E+02	4.859235E+02				
166	FZ	-4.543544E+03	-6.815304E+03	-1.047622E+03	3.006848E+03				

R E S U L T A N T S O F R E A C T I O N S

LOAD CONDITION	FX	FY	FZ	MX	MY	MZ
1	-3.750638E-07	5.361286E+00	-7.124970E+03	-2.251440E+05	1.796011E+06	1.469389E+03
2	-5.640422E-07	8.041922E+00	-1.068745E+04	-3.377157E+05	2.694014E+06	2.204082E+03
3	-1.015687E-07	1.363727E+00	-2.209140E+03	-6.977212E+04	5.645956E+05	3.737620E+02
4	2.182420E-07	-3.288172E+00	3.562040E+03	1.126282E+05	-8.821496E+05	-9.012026E+02

(BC=1) USING DEFL. MATRIX DEFLECT AND B.C. MATRIX BOUNCOND

DEFLECTIONS FOR NODE 1 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-3.705088E-03	-5.557608E-03	-6.846694E-04	2.797370E-03
DY	2.102409E-02	3.153613E-02	7.006035E-03	-9.517976E-03
DZ	3.954382E+00	5.931570E+00	1.256444E+00	-1.915064E+00

DEFLECTIONS FOR NODE 3 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-3.443036E-03	-5.164561E-03	-2.743521E-03	-1.691364E-03
DY	-9.992700E-03	-1.498905E-02	-3.147661E-03	4.895057E-03
DZ	3.956997E+00	5.935492E+00	1.229545E+00	-1.972795E+00

DEFLECTIONS FOR NODE 4 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-3.830020E-03	-5.745002E-03	-3.750135E-04	3.569197E-03
DY	2.594892E-02	3.892337E-02	8.360507E-03	-1.233129E-02
DZ	3.956991E+00	5.935483E+00	1.229543E+00	-1.972792E+00

DEFLECTIONS FOR NODE 5 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-2.972755E-03	-4.459162E-03	-4.198668E-03	-5.186031E-03
DY	-3.454763E-02	-5.182143E-02	-1.111927E-02	1.644122E-02
DZ	3.960678E+00	5.941013E+00	1.203855E+00	-2.029266E+00

DEFLECTIONS FOR NODE 6 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-3.933289E-03	-5.899887E-03	7.349616E-04	5.945887E-03
DY	4.334050E-02	6.501072E-02	1.374193E-02	-2.104797E-02
DZ	3.960578E+00	5.940862E+00	1.203824E+00	-2.029216E+00

DEFLECTIONS FOR NODE 7 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-2.813252E-03	-4.219920E-03	-4.920962E-03	-6.836987E-03
DY	-4.724472E-02	-7.086707E-02	-1.525538E-02	2.238286E-02
DZ	3.966657E+00	5.949981E+00	1.179046E+00	-2.086542E+00

DEFLECTIONS FOR NODE 8 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-3.954731E-03	-5.932042E-03	1.226771E-03	6.971388E-03
DY	5.161901E-02	7.742849E-02	1.613852E-02	-2.553305E-02
DZ	3.966499E+00	5.949744E+00	1.179008E+00	-2.086442E+00

(BC=1) USING DEFL. MATRIX DEFLECT AND B.C. MATRIX BOUNCOND

DEFLECTIONS FOR NODE 9 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-2.793325E-03	-4.190026E-03	-4.618814E-03	-6.244061E-03
DY	-4.315449E-02	-6.473173E-02	-1.408692E-02	2.013496E-02
DZ	3.973135E+00	5.959698E+00	1.154655E+00	-2.143530E+00

DEFLECTIONS FOR NODE 10 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-4.018135E-03	-6.027151E-03	1.044133E-03	6.670950E-03
DY	4.957735E-02	7.436600E-02	1.524360E-02	-2.504558E-02
DZ	3.973014E+00	5.959517E+00	1.154629E+00	-2.143447E+00

DEFLECTIONS FOR NODE 11 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-3.169716E-03	-4.754589E-03	-3.188660E-03	-2.906441E-03
DY	-1.934882E-02	-2.902322E-02	-6.701423E-03	8.243061E-03
DZ	3.977607E+00	5.966406E+00	1.136292E+00	-2.185975E+00

DEFLECTIONS FOR NODE 12 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-3.822418E-03	-5.733588E-03	2.995101E-04	4.933363E-03
DY	3.703808E-02	5.555710E-02	1.115400E-02	-1.918772E-02
DZ	3.977596E+00	5.966388E+00	1.136289E+00	-2.185968E+00

DEFLECTIONS FOR NODE 13 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-3.600609E-03	-5.400893E-03	-9.179919E-04	2.203771E-03
DY	1.736774E-02	2.605160E-02	4.878222E-03	-9.714261E-03
DZ	3.978918E+00	5.968372E+00	1.130112E+00	-2.200039E+00

DEFLECTIONS FOR NODE 15 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-3.557891E-03	-5.336811E-03	-4.094589E-04	3.191355E-03
DY	2.141767E-02	3.212649E-02	7.334884E-03	-9.293505E-03
DZ	3.380676E+00	5.071012E+00	1.100480E+00	-1.583625E+00

DEFLECTIONS FOR NODE 17 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-2.896508E-03	-4.344770E-03	-2.502273E-03	-1.818492E-03
DY	-1.252638E-02	-1.878956E-02	-3.903045E-03	6.223141E-03
DZ	3.389013E+00	5.083516E+00	1.073444E+00	-1.648109E+00

(BC=1) USING DEFL. MATRIX DEFLECT AND B.C. MATRIX BOUNCOND

DEFLECTIONS FOR NODE 18 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-3.706517E-03	-5.559743E-03	-8.813579E-05	4.013751E-03
DY	2.678632E-02	4.017946E-02	8.868684E-03	-1.224379E-02
DZ	3.388991E+00	5.083483E+00	1.073435E+00	-1.648104E+00

DEFLECTIONS FOR NODE 19 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-3.069496E-03	-4.604280E-03	-4.325076E-03	-5.334187E-03
DY	-3.943297E-02	-5.914944E-02	-1.269180E-02	1.876575E-02
DZ	3.389230E+00	5.083841E+00	1.044242E+00	-1.707816E+00

DEFLECTIONS FOR NODE 20 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-3.336721E-03	-5.005030E-03	1.305309E-03	6.432530E-03
DY	4.570574E-02	6.855858E-02	1.475830E-02	-2.165409E-02
DZ	3.388970E+00	5.083452E+00	1.044149E+00	-1.707712E+00

DEFLECTIONS FOR NODE 21 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-3.462697E-03	-5.194093E-03	-5.244887E-03	-6.762059E-03
DY	-5.374337E-02	-8.061503E-02	-1.728722E-02	2.559730E-02
DZ	3.388399E+00	5.082595E+00	1.015087E+00	-1.766242E+00

DEFLECTIONS FOR NODE 22 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-3.075662E-03	-4.613433E-03	1.902618E-03	7.353233E-03
DY	5.487647E-02	8.231467E-02	1.737910E-02	-2.669204E-02
DZ	3.387959E+00	5.081935E+00	1.014972E+00	-1.765977E+00

DEFLECTIONS FOR NODE 23 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-3.679958E-03	-5.519981E-03	-4.994835E-03	-6.007007E-03
DY	-5.018680E-02	-7.528018E-02	-1.620773E-02	2.377185E-02
DZ	3.387062E+00	5.080588E+00	9.861613E-01	-1.823623E+00

DEFLECTIONS FOR NODE 24 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-2.985359E-03	-4.477980E-03	1.757595E-03	6.955642E-03
DY	5.319784E-02	7.979674E-02	1.651878E-02	-2.654471E-02
DZ	3.386670E+00	5.080001E+00	9.860743E-01	-1.823357E+00

DEFLECTIONS FOR NODE 25 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-3.110665E-03	-4.666015E-03	-3.201839E-03	-3.000099E-03
DY	-2.413001E-02	-3.619501E-02	-8.071763E-03	1.086136E-02
DZ	3.388064E+00	5.082091E+00	9.647451E-01	-1.868360E+00

DEFLECTIONS FOR NODE 26 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-3.614070E-03	-5.421060E-03	7.686191E-04	5.652925E-03
DY	3.975514E-02	5.963269E-02	1.207246E-02	-2.039110E-02
DZ	3.388001E+00	5.081997E+00	9.647316E-01	-1.868316E+00

DEFLECTIONS FOR NODE 27 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-3.448822E-03	-5.173211E-03	-6.165628E-04	2.645858E-03
DY	1.743152E-02	2.614726E-02	4.985498E-03	-9.567970E-03
DZ	3.389010E+00	5.083510E+00	9.576789E-01	-1.883816E+00

DEFLECTIONS FOR NODE 29 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-3.378085E-03	-5.067100E-03	-2.461550E-04	3.320252E-03
DY	2.160122E-02	3.240182E-02	7.540412E-03	-9.082828E-03
DZ	2.825233E+00	4.237848E+00	9.429484E-01	-1.276048E+00

DEFLECTIONS FOR NODE 31 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-2.076824E-03	-3.115243E-03	-2.107382E-03	-1.941518E-03
DY	-1.372599E-02	-2.058898E-02	-4.331660E-03	6.707445E-03
DZ	2.842725E+00	4.264085E+00	9.190857E-01	-1.344423E+00

DEFLECTIONS FOR NODE 32 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-3.639772E-03	-5.459625E-03	3.078747E-05	4.180211E-03
DY	2.703098E-02	4.054646E-02	9.150754E-03	-1.194620E-02
DZ	2.842693E+00	4.264038E+00	9.190713E-01	-1.344416E+00

DEFLECTIONS FOR NODE 33 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-2.975800E-03	-4.463737E-03	-4.251632E-03	-5.290740E-03
DY	-4.232454E-02	-6.348679E-02	-1.371450E-02	1.995443E-02
DZ	2.841724E+00	4.262584E+00	8.888171E-01	-1.404924E+00

(BC=1) USING DEFL. MATRIX DEFLECT AND B.C. MATRIX BOUNCOND

DEFLECTIONS FOR NODE 34 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-2.504830E-03	-3.757190E-03	1.752975E-03	6.403076E-03
DY	4.652899E-02	6.979347E-02	1.530195E-02	-2.147841E-02
DZ	2.841313E+00	4.261967E+00	8.886669E-01	-1.404765E+00

DEFLECTIONS FOR NODE 35 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-4.579425E-03	-6.869192E-03	-5.564549E-03	-6.149836E-03
DY	-5.809640E-02	-8.714458E-02	-1.869646E-02	2.765221E-02
DZ	2.832945E+00	4.249414E+00	8.562345E-01	-1.461336E+00

DEFLECTIONS FOR NODE 36 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-1.421165E-03	-2.131682E-03	2.624858E-03	6.952354E-03
DY	5.647345E-02	8.471015E-02	1.811295E-02	-2.700440E-02
DZ	2.832308E+00	4.248459E+00	8.560559E-01	-1.460979E+00

DEFLECTIONS FOR NODE 37 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-5.855632E-03	-8.783498E-03	-5.612836E-03	-4.804382E-03
DY	-5.548419E-02	-8.322627E-02	-1.779509E-02	2.653245E-02
DZ	2.817538E+00	4.226303E+00	8.220544E-01	-1.513503E+00

DEFLECTIONS FOR NODE 38 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-6.780186E-04	-1.016964E-03	2.679505E-03	6.222864E-03
DY	5.546455E-02	8.319680E-02	1.736385E-02	-2.738830E-02
DZ	2.816953E+00	4.225426E+00	8.219268E-01	-1.513101E+00

DEFLECTIONS FOR NODE 39 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-4.498216E-03	-6.747345E-03	-3.561982E-03	-2.164114E-03
DY	-2.826457E-02	-4.239685E-02	-9.244041E-03	1.315168E-02
DZ	2.802709E+00	4.204059E+00	7.950533E-01	-1.551705E+00

DEFLECTIONS FOR NODE 40 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-2.106469E-03	-3.159655E-03	1.509744E-03	5.456949E-03
DY	4.199650E-02	6.299473E-02	1.280058E-02	-2.144408E-02
DZ	2.802607E+00	4.203907E+00	7.950326E-01	-1.551633E+00

(BC=1) USING DEFL. MATRIX DEFLECT AND B.C. MATRIX BOUNCOND

DEFLECTIONS FOR NODE 41 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-2.886495E-03	-4.329718E-03	-2.416718E-04	2.773236E-03
DY	1.740345E-02	2.610516E-02	5.045702E-03	-9.413611E-03
DZ	2.798921E+00	4.198378E+00	7.860916E-01	-1.565668E+00

DEFLECTIONS FOR NODE 43 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-3.174250E-03	-4.761349E-03	-1.563168E-04	3.272550E-03
DY	2.160657E-02	3.240985E-02	7.641818E-03	-8.882460E-03
DZ	2.299521E+00	3.449280E+00	7.881480E-01	-9.965380E-01

DEFLECTIONS FOR NODE 45 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-8.336488E-04	-1.250480E-03	-1.566163E-03	-2.245821E-03
DY	-1.384058E-02	-2.076086E-02	-4.444662E-03	6.607068E-03
DZ	2.331360E+00	3.497038E+00	7.702099E-01	-1.069079E+00

DEFLECTIONS FOR NODE 46 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-3.564051E-03	-5.346045E-03	5.947934E-05	4.152908E-03
DY	2.688885E-02	4.033327E-02	9.252737E-03	-1.157788E-02
DZ	2.331317E+00	3.496973E+00	7.701911E-01	-1.069068E+00

DEFLECTIONS FOR NODE 47 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-2.486665E-03	-3.730036E-03	-3.936341E-03	-5.202059E-03
DY	-4.295047E-02	-6.442568E-02	-1.404802E-02	1.998350E-02
DZ	2.331739E+00	3.497606E+00	7.412207E-01	-1.128535E+00

DEFLECTIONS FOR NODE 48 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-1.711678E-03	-2.567461E-03	2.016636E-03	6.042638E-03
DY	4.615754E-02	6.923629E-02	1.539576E-02	-2.086728E-02
DZ	2.331216E+00	3.496822E+00	7.410262E-01	-1.128339E+00

DEFLECTIONS FOR NODE 49 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-5.541987E-03	-8.313038E-03	-5.696659E-03	-5.330043E-03
DY	-5.972887E-02	-8.959328E-02	-1.927193E-02	2.832723E-02
DZ	2.315629E+00	3.473441E+00	7.066827E-01	-1.180637E+00

(BC=1) USING DEFL. MATRIX DEFLECT AND B.C. MATRIX BOUNCOND

DEFLECTIONS FOR NODE 50 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	3.418652E-04	5.128674E-04	3.209766E-03	6.148977E-03
DY	5.630390E-02	8.445582E-02	1.825694E-02	-2.651945E-02
DZ	2.314775E+00	3.472159E+00	7.064405E-01	-1.180163E+00

DEFLECTIONS FOR NODE 51 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-7.991296E-03	-1.198700E-02	-6.097699E-03	-3.375785E-03
DY	-5.834154E-02	-8.751229E-02	-1.860594E-02	2.811386E-02
DZ	2.284235E+00	3.426350E+00	6.678974E-01	-1.224096E+00

DEFLECTIONS FOR NODE 52 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	2.274107E-03	3.411232E-03	3.610190E-03	4.778388E-03
DY	5.588936E-02	8.383402E-02	1.757850E-02	-2.743188E-02
DZ	2.283495E+00	3.425239E+00	6.677275E-01	-1.223604E+00

DEFLECTIONS FOR NODE 53 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-6.159159E-03	-9.238763E-03	-3.956516E-03	-1.088566E-03
DY	-3.010803E-02	-4.516203E-02	-9.741398E-03	1.422451E-02
DZ	2.247841E+00	3.371757E+00	6.347122E-01	-1.250495E+00

DEFLECTIONS FOR NODE 54 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	1.336251E-03	2.004431E-03	2.620356E-03	3.823824E-03
DY	4.162237E-02	6.243354E-02	1.277310E-02	-2.107702E-02
DZ	2.247757E+00	3.371632E+00	6.346939E-01	-1.250438E+00

DEFLECTIONS FOR NODE 55 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-1.261638E-03	-1.892430E-03	3.557882E-04	2.151648E-03
DY	1.642884E-02	2.464324E-02	4.802339E-03	-8.806689E-03
DZ	2.234257E+00	3.351382E+00	6.227640E-01	-1.259457E+00

DEFLECTIONS FOR NODE 57 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-3.101638E-03	-4.652434E-03	-1.533932E-04	3.196541E-03
DY	2.134666E-02	3.201998E-02	7.642065E-03	-8.587827E-03
DZ	1.798439E+00	2.697657E+00	6.358364E-01	-7.398139E-01

DEFLECTIONS FOR NODE 59 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	1.087090E-03	1.630629E-03	-8.150198E-04	-2.889409E-03
DY	-1.323446E-02	-1.985168E-02	-4.346518E-03	6.121252E-03
DZ	1.857418E+00	2.786125E+00	6.283488E-01	-8.217844E-01

DEFLECTIONS FOR NODE 60 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-3.824215E-03	-5.736294E-03	-6.777069E-05	4.188295E-03
DY	2.644617E-02	3.966924E-02	9.219362E-03	-1.114506E-02
DZ	1.857363E+00	2.786044E+00	6.283263E-01	-8.217687E-01

DEFLECTIONS FOR NODE 61 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-1.512936E-03	-2.269441E-03	-3.375863E-03	-5.162373E-03
DY	-4.157101E-02	-6.235649E-02	-1.376640E-02	1.899648E-02
DZ	1.866888E+00	2.800331E+00	6.040490E-01	-8.819776E-01

DEFLECTIONS FOR NODE 62 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-1.404487E-03	-2.106678E-03	2.019401E-03	5.700745E-03
DY	4.494519E-02	6.741776E-02	1.517536E-02	-1.994463E-02
DZ	1.866273E+00	2.799408E+00	6.038089E-01	-8.817706E-01

DEFLECTIONS FOR NODE 63 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-6.020600E-03	-9.030956E-03	-5.543878E-03	-4.477573E-03
DY	-5.864529E-02	-8.796789E-02	-1.898769E-02	2.768027E-02
DZ	1.846115E+00	2.769171E+00	5.694588E-01	-9.289108E-01

DEFLECTIONS FOR NODE 64 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	1.669649E-03	2.504541E-03	3.524383E-03	5.287561E-03
DY	5.473303E-02	8.209952E-02	1.789388E-02	-2.548170E-02
DZ	1.845074E+00	2.767609E+00	5.691594E-01	-9.283426E-01

DEFLECTIONS FOR NODE 65 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-9.617022E-03	-1.442559E-02	-6.319277E-03	-1.987923E-03
DY	-5.843286E-02	-8.764925E-02	-1.853472E-02	2.836224E-02
DZ	1.800835E+00	2.701250E+00	5.277434E-01	-9.626282E-01

DEFLECTIONS FOR NODE 66 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	4.646938E-03	6.970482E-03	4.271455E-03	3.440631E-03
DY	5.446712E-02	8.170064E-02	1.716584E-02	-2.666326E-02
DZ	1.799892E+00	2.699835E+00	5.275233E-01	-9.620089E-01

DEFLECTIONS FOR NODE 67 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-7.157607E-03	-1.073644E-02	-4.129291E-03	-3.109582E-04
DY	-3.077773E-02	-4.616659E-02	-9.850434E-03	1.476005E-02
DZ	1.749080E+00	2.623617E+00	4.908482E-01	-9.792049E-01

DEFLECTIONS FOR NODE 68 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	3.982469E-03	5.973763E-03	3.452743E-03	2.525255E-03
DY	4.008962E-02	6.013441E-02	1.234482E-02	-2.021512E-02
DZ	1.748928E+00	2.623388E+00	4.908094E-01	-9.791114E-01

DEFLECTIONS FOR NODE 69 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	2.455395E-04	3.683399E-04	8.814814E-04	1.517098E-03
DY	1.543130E-02	2.314694E-02	4.553721E-03	-8.184466E-03
DZ	1.729054E+00	2.593577E+00	4.770699E-01	-9.846055E-01

DEFLECTIONS FOR NODE 71 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-2.907661E-03	-4.361473E-03	-1.069046E-04	3.071817E-03
DY	2.078087E-02	3.117129E-02	7.565586E-03	-8.103453E-03
DZ	1.320391E+00	1.980587E+00	4.862668E-01	-5.035676E-01

DEFLECTIONS FOR NODE 73 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	3.933724E-03	5.900579E-03	2.644108E-04	-3.911865E-03
DY	-1.172924E-02	-1.759385E-02	-3.962338E-03	5.200701E-03
DZ	1.417814E+00	2.126720E+00	4.931728E-01	-5.997213E-01

DEFLECTIONS FOR NODE 74 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-4.538033E-03	-6.807025E-03	-3.809406E-04	4.358238E-03
DY	2.559432E-02	3.839147E-02	9.033842E-03	-1.055913E-02
DZ	1.417773E+00	2.126658E+00	4.931526E-01	-5.997156E-01

(BC=1) USING DEFL. MATRIX DEFLECT AND B.C. MATRIX BOUNCOND

DEFLECTIONS FOR NODE 75 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	6.238820E-04	9.357891E-04	-2.403992E-03	-5.600902E-03
DY	-3.858060E-02	-5.787087E-02	-1.300744E-02	1.715894E-02
DZ	1.450019E+00	2.175027E+00	4.783864E-01	-6.662635E-01

DEFLECTIONS FOR NODE 76 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-1.875804E-03	-2.813660E-03	1.684772E-03	5.552668E-03
DY	4.284492E-02	6.426735E-02	1.466507E-02	-1.860772E-02
DZ	1.449331E+00	2.173995E+00	4.781119E-01	-6.660445E-01

DEFLECTIONS FOR NODE 77 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-6.052078E-03	-9.078168E-03	-5.194666E-03	-3.730946E-03
DY	-5.509349E-02	-8.264019E-02	-1.795125E-02	2.577272E-02
DZ	1.431221E+00	2.146829E+00	4.468125E-01	-7.092898E-01

DEFLECTIONS FOR NODE 78 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	2.810278E-03	4.215479E-03	3.688170E-03	4.330742E-03
DY	5.162408E-02	7.743608E-02	1.701741E-02	-2.374940E-02
DZ	1.429988E+00	2.144980E+00	4.464576E-01	-7.086176E-01

DEFLECTIONS FOR NODE 79 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-1.073545E-02	-1.610322E-02	-6.292118E-03	-6.674261E-04
DY	-5.579023E-02	-8.368529E-02	-1.756301E-02	2.735144E-02
DZ	1.375366E+00	2.063047E+00	4.042432E-01	-7.327835E-01

DEFLECTIONS FOR NODE 80 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	6.856223E-03	1.028440E-02	4.779834E-03	1.976540E-03
DY	5.121775E-02	7.682658E-02	1.611440E-02	-2.512841E-02
DZ	1.374124E+00	2.061184E+00	4.039586E-01	-7.319579E-01

DEFLECTIONS FOR NODE 81 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-8.210624E-03	-1.231595E-02	-4.267547E-03	5.987794E-04
DY	-2.999685E-02	-4.499525E-02	-9.480293E-03	1.463044E-02
DZ	1.312303E+00	1.968452E+00	3.655399E-01	-7.402508E-01

(BC=1) USING DEFL. MATRIX DEFLECT AND B.C. MATRIX BOUNCOND

DEFLECTIONS FOR NODE 82 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	6.299056E-03	9.448640E-03	4.124588E-03	1.272628E-03
DY	3.761900E-02	5.642846E-02	1.156318E-02	-1.901185E-02
DZ	1.312106E+00	1.968156E+00	3.654885E-01	-7.401328E-01

DEFLECTIONS FOR NODE 83 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	1.399904E-03	2.099887E-03	1.277567E-03	1.017740E-03
DY	1.401280E-02	2.101918E-02	4.159113E-03	-7.383299E-03
DZ	1.286301E+00	1.929448E+00	3.502779E-01	-7.419121E-01

DEFLECTIONS FOR NODE 85 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-1.814401E-03	-2.721585E-03	3.544958E-04	2.774480E-03
DY	2.000792E-02	3.001187E-02	7.494586E-03	-7.373675E-03
DZ	8.853664E-01	1.328049E+00	3.476974E-01	-2.935969E-01

DEFLECTIONS FOR NODE 87 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	6.945446E-03	1.041816E-02	1.368291E-03	-5.071122E-03
DY	-9.803796E-03	-1.470569E-02	-3.477676E-03	4.009359E-03
DZ	1.010818E+00	1.516227E+00	3.641933E-01	-4.019295E-01

DEFLECTIONS FOR NODE 88 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-4.918099E-03	-7.377127E-03	-5.097797E-04	4.525776E-03
DY	2.486563E-02	3.729843E-02	8.956001E-03	-9.893253E-03
DZ	1.010811E+00	1.516216E+00	3.641874E-01	-4.019329E-01

DEFLECTIONS FOR NODE 89 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	5.111359E-03	7.667007E-03	-5.782029E-04	-6.959870E-03
DY	-3.413522E-02	-5.120280E-02	-1.174437E-02	1.470191E-02
DZ	1.077218E+00	1.615827E+00	3.630408E-01	-4.793950E-01

DEFLECTIONS FOR NODE 90 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-4.023199E-03	-6.034759E-03	7.008722E-04	5.978613E-03
DY	4.005564E-02	6.008344E-02	1.390137E-02	-1.700737E-02
DZ	1.076483E+00	1.614724E+00	3.627254E-01	-4.792056E-01

(BC=1) USING DEFL. MATRIX DEFLECT AND B.C. MATRIX BOUNCOND

DEFLECTIONS FOR NODE 91 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-3.752169E-03	-5.628296E-03	-3.901823E-03	-3.700314E-03
DY	-4.796044E-02	-7.194061E-02	-1.568019E-02	2.232775E-02
DZ	1.076145E+00	1.614217E+00	3.406412E-01	-5.237929E-01

DEFLECTIONS FOR NODE 92 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	2.419422E-03	3.629183E-03	3.161235E-03	3.699996E-03
DY	4.621798E-02	6.932694E-02	1.529440E-02	-2.114211E-02
DZ	1.074872E+00	1.612308E+00	3.402411E-01	-5.231677E-01

DEFLECTIONS FOR NODE 93 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-1.181227E-02	-1.771844E-02	-6.136065E-03	8.685172E-04
DY	-5.003468E-02	-7.505196E-02	-1.557100E-02	2.489664E-02
DZ	1.015512E+00	1.523267E+00	3.001909E-01	-5.375668E-01

DEFLECTIONS FOR NODE 94 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	9.159812E-03	1.373977E-02	5.180124E-03	1.856170E-04
DY	4.574781E-02	6.862167E-02	1.428978E-02	-2.265588E-02
DZ	1.014176E+00	1.521263E+00	2.998969E-01	-5.366538E-01

DEFLECTIONS FOR NODE 95 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-8.816959E-03	-1.322546E-02	-4.231101E-03	1.358883E-03
DY	-2.772839E-02	-4.159255E-02	-8.618570E-03	1.381895E-02
DZ	9.423174E-01	1.413474E+00	2.606503E-01	-5.352770E-01

DEFLECTIONS FOR NODE 96 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	8.455721E-03	1.268364E-02	4.649812E-03	-9.764786E-05
DY	3.416178E-02	5.124262E-02	1.042882E-02	-1.741072E-02
DZ	9.420105E-01	1.413014E+00	2.605689E-01	-5.350955E-01

DEFLECTIONS FOR NODE 97 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	2.671352E-03	4.007056E-03	1.655569E-03	3.490903E-04
DY	1.249802E-02	1.874701E-02	3.717221E-03	-6.569505E-03
DZ	9.113083E-01	1.366960E+00	2.444449E-01	-5.331951E-01

(BC=1) USING DEFL. MATRIX DEFLECT AND B.C. MATRIX BOUNCOND

DEFLECTIONS FOR NODE 99 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-3.974963E-03	-5.962431E-03	-3.470920E-04	3.790207E-03
DY	1.467341E-02	2.201011E-02	5.824602E-03	-4.739256E-03
DZ	4.607727E-01	6.911591E-01	2.071984E-01	-9.934936E-02

DEFLECTIONS FOR NODE 101 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	9.577104E-03	1.436565E-02	2.367799E-03	-6.013143E-03
DY	-9.260540E-03	-1.389081E-02	-3.545592E-03	3.256469E-03
DZ	6.242379E-01	9.363566E-01	2.371795E-01	-2.232307E-01

DEFLECTIONS FOR NODE 102 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-5.700769E-03	-8.551136E-03	-6.999330E-04	5.024105E-03
DY	2.497131E-02	3.745695E-02	9.294883E-03	-9.322740E-03
DZ	6.241754E-01	9.362629E-01	2.371557E-01	-2.232085E-01

DEFLECTIONS FOR NODE 103 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	1.144163E-02	1.716242E-02	2.005971E-03	-8.859172E-03
DY	-2.894896E-02	-4.342343E-02	-1.021994E-02	1.193895E-02
DZ	7.396893E-01	1.109533E+00	2.552376E-01	-3.170695E-01

DEFLECTIONS FOR NODE 104 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-7.947489E-03	-1.192120E-02	-9.410758E-04	7.074660E-03
DY	3.739471E-02	5.609204E-02	1.317039E-02	-1.548561E-02
DZ	7.387685E-01	1.108152E+00	2.548747E-01	-3.167669E-01

DEFLECTIONS FOR NODE 105 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	3.432663E-04	5.148663E-04	-1.954879E-03	-4.369004E-03
DY	-3.769109E-02	-5.653660E-02	-1.237025E-02	1.745013E-02
DZ	7.854011E-01	1.178101E+00	2.525868E-01	-3.741815E-01

DEFLECTIONS FOR NODE 106 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	4.748315E-04	7.122869E-04	2.109945E-03	3.759226E-03
DY	3.900653E-02	5.850976E-02	1.295715E-02	-1.774320E-02
DZ	7.839093E-01	1.175863E+00	2.521468E-01	-3.733898E-01

(BC=1) USING DEFL. MATRIX DEFLECT AND B.C. MATRIX BOUNCOND

DEFLECTIONS FOR NODE 107 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-1.227412E-02	-1.841121E-02	-5.746698E-03	2.183855E-03
DY	-4.036648E-02	-6.054966E-02	-1.241991E-02	2.037572E-02
DZ	7.315008E-01	1.097250E+00	2.187873E-01	-3.820293E-01

DEFLECTIONS FOR NODE 108 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	1.145512E-02	1.718271E-02	5.484740E-03	-1.790754E-03
DY	3.790639E-02	5.685953E-02	1.172693E-02	-1.900372E-02
DZ	7.303588E-01	1.095537E+00	2.185290E-01	-3.812632E-01

DEFLECTIONS FOR NODE 109 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-8.731484E-03	-1.309724E-02	-3.926794E-03	1.881836E-03
DY	-2.463709E-02	-3.695559E-02	-7.494194E-03	1.261140E-02
DZ	6.376547E-01	9.564807E-01	1.756026E-01	-3.637971E-01

DEFLECTIONS FOR NODE 110 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	1.045604E-02	1.568409E-02	4.993727E-03	-1.660283E-03
DY	3.009883E-02	4.514819E-02	9.099601E-03	-1.552111E-02
DZ	6.378105E-01	9.567143E-01	1.756512E-01	-3.638744E-01

DEFLECTIONS FOR NODE 111 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	3.617370E-03	5.426075E-03	1.879381E-03	-2.653907E-04
DY	1.121637E-02	1.682454E-02	3.333306E-03	-5.901393E-03
DZ	6.041438E-01	9.062143E-01	1.595955E-01	-3.584812E-01

DEFLECTIONS FOR NODE 113 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-7.806173E-03	-1.170925E-02	-1.809364E-03	5.146577E-03
DY	1.019813E-02	1.529719E-02	4.270492E-03	-2.841209E-03
DZ	1.132695E-01	1.699043E-01	8.281723E-02	4.049540E-02

DEFLECTIONS FOR NODE 115 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	7.133233E-03	1.069985E-02	1.730967E-03	-4.545006E-03
DY	-9.001268E-03	-1.350190E-02	-3.820918E-03	2.402554E-03
DZ	2.765592E-01	4.148388E-01	1.172405E-01	-7.413481E-02

(BC=1) USING DEFL. MATRIX DEFLECT AND B.C. MATRIX BOUNCOND

DEFLECTIONS FOR NODE 116 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-9.447757E-03	-1.417162E-02	-2.242109E-03	6.122531E-03
DY	1.819197E-02	2.728794E-02	7.199153E-03	-5.920880E-03
DZ	2.765022E-01	4.147532E-01	1.172189E-01	-7.411413E-02

DEFLECTIONS FOR NODE 117 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	1.560312E-02	2.340466E-02	3.955965E-03	-9.596358E-03
DY	-2.554435E-02	-3.831652E-02	-9.291658E-03	9.977631E-03
DZ	4.216734E-01	6.325098E-01	1.500583E-01	-1.714754E-01

DEFLECTIONS FOR NODE 118 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-9.526540E-03	-1.428978E-02	-1.621728E-03	7.475072E-03
DY	3.766609E-02	5.649912E-02	1.350386E-02	-1.511360E-02
DZ	4.205626E-01	6.308437E-01	1.496264E-01	-1.710985E-01

DEFLECTIONS FOR NODE 119 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	5.189192E-03	7.783763E-03	1.926307E-04	-5.478239E-03
DY	-2.792110E-02	-4.188163E-02	-9.174487E-03	1.290497E-02
DZ	4.769812E-01	7.154714E-01	1.553087E-01	-2.233543E-01

DEFLECTIONS FOR NODE 120 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-7.323377E-04	-1.098475E-03	1.341722E-03	3.560560E-03
DY	3.179055E-02	4.768580E-02	1.060759E-02	-1.436424E-02
DZ	4.751844E-01	7.127762E-01	1.548368E-01	-2.222825E-01

DEFLECTIONS FOR NODE 121 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-6.500473E-03	-9.750730E-03	-3.339136E-03	5.545914E-04
DY	-2.868493E-02	-4.302735E-02	-8.712992E-03	1.470887E-02
DZ	4.428177E-01	6.642259E-01	1.331792E-01	-2.297666E-01

DEFLECTIONS FOR NODE 122 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	1.088543E-02	1.632817E-02	4.704480E-03	-2.735084E-03
DY	2.768638E-02	4.152953E-02	8.459081E-03	-1.409624E-02
DZ	4.413187E-01	6.619774E-01	1.328539E-01	-2.287332E-01

(BC=1) USING DEFL. MATRIX DEFLECT AND B.C. MATRIX BOUNCOND

DEFLECTIONS FOR NODE 123 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-3.513448E-03	-5.270187E-03	-2.023041E-03	-1.447655E-04
DY	-1.973069E-02	-2.959600E-02	-5.872505E-03	1.036307E-02
DZ	3.725017E-01	5.587518E-01	1.019588E-01	-2.137916E-01

DEFLECTIONS FOR NODE 124 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	9.396798E-03	1.409522E-02	4.278274E-03	-1.918814E-03
DY	2.571234E-02	3.856848E-02	7.688775E-03	-1.343161E-02
DZ	3.725457E-01	5.588178E-01	1.019609E-01	-2.138371E-01

DEFLECTIONS FOR NODE 125 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	4.729454E-03	7.094194E-03	2.093474E-03	-1.087528E-03
DY	1.014401E-02	1.521599E-02	3.000431E-03	-5.366093E-03
DZ	3.504641E-01	5.256953E-01	9.066474E-02	-2.118585E-01

DEFLECTIONS FOR NODE 127 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-3.798020E-03	-5.697023E-03	-4.922291E-04	3.294198E-03
DY	1.296119E-02	1.944178E-02	5.226310E-03	-4.020767E-03
DZ	3.599777E-02	5.399670E-02	5.007273E-02	6.123432E-02

DEFLECTIONS FOR NODE 129 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-2.098127E-04	-3.147129E-04	-6.720766E-04	-1.131114E-03
DY	-1.051410E-03	-1.577120E-03	-1.119212E-03	-1.089520E-03
DZ	6.989161E-02	1.048375E-01	4.149531E-02	5.427635E-03

DEFLECTIONS FOR NODE 130 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-3.791550E-03	-5.687318E-03	-4.636873E-04	3.345002E-03
DY	8.926029E-03	1.338904E-02	3.888071E-03	-2.180811E-03
DZ	6.984057E-02	1.047609E-01	4.147596E-02	5.445976E-03

DEFLECTIONS FOR NODE 131 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	1.477321E-02	2.215980E-02	4.074229E-03	-8.416639E-03
DY	-2.067267E-02	-3.100901E-02	-8.052181E-03	6.990338E-03
DZ	1.523762E-01	2.285643E-01	5.655305E-02	-5.722453E-02

(BC=1) USING DEFL. MATRIX DEFLECT AND B.C. MATRIX BOUNCOND

DEFLECTIONS FOR NODE 132 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-1.546764E-02	-2.320144E-02	-4.520342E-03	8.293779E-03
DY	2.429612E-02	3.644417E-02	9.301217E-03	-8.546121E-03
DZ	1.513608E-01	2.270412E-01	5.609046E-02	-5.701782E-02

DEFLECTIONS FOR NODE 133 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	7.649921E-03	1.147486E-02	1.489696E-03	-5.620881E-03
DY	-1.670683E-02	-2.506023E-02	-5.530365E-03	7.638864E-03
DZ	2.236500E-01	3.354749E-01	7.375824E-02	-1.028222E-01

DEFLECTIONS FOR NODE 134 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-2.950403E-03	-4.425584E-03	-1.883795E-04	2.954125E-03
DY	1.868689E-02	2.803031E-02	6.163185E-03	-8.590288E-03
DZ	2.209664E-01	3.314494E-01	7.298918E-02	-1.013521E-01

DEFLECTIONS FOR NODE 135 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	3.557207E-04	5.335654E-04	-7.090730E-04	-1.846280E-03
DY	-1.504318E-02	-2.256474E-02	-4.550600E-03	7.751901E-03
DZ	2.215066E-01	3.322596E-01	6.707308E-02	-1.140097E-01

DEFLECTIONS FOR NODE 136 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	3.741322E-03	5.612002E-03	1.989503E-03	-1.814340E-04
DY	1.288154E-02	1.932229E-02	3.936388E-03	-6.557159E-03
DZ	2.187828E-01	3.281740E-01	6.645457E-02	-1.121878E-01

DEFLECTIONS FOR NODE 137 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	1.084178E-03	1.626252E-03	-3.720446E-04	-1.984119E-03
DY	-1.328490E-02	-1.992734E-02	-3.861473E-03	7.166076E-03
DZ	1.693500E-01	2.540247E-01	4.627818E-02	-9.734935E-02

DEFLECTIONS FOR NODE 138 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	8.006631E-03	1.200996E-02	3.369578E-03	-2.196500E-03
DY	1.881019E-02	2.821525E-02	5.485010E-03	-1.011078E-02
DZ	1.687147E-01	2.530717E-01	4.609714E-02	-9.699921E-02

(BC=1) USING DEFL. MATRIX DEFLECT AND B.C. MATRIX BOUNCOND

DEFLECTIONS FOR NODE 139 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	5.708180E-03	8.562277E-03	2.163937E-03	-2.051281E-03
DY	8.699131E-03	1.304868E-02	2.537447E-03	-4.674301E-03
DZ	1.548631E-01	2.322943E-01	3.866858E-02	-9.645558E-02

DEFLECTIONS FOR NODE 141 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-1.158509E-03	-1.737762E-03	-2.348536E-04	8.323615E-04
DY	1.494651E-02	2.241976E-02	5.413595E-03	-5.885281E-03
DZ	-6.028109E-02	-9.042163E-02	-7.504698E-03	5.291448E-02

DEFLECTIONS FOR NODE 143 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	3.474000E-03	5.211001E-03	7.929417E-04	-2.315517E-03
DY	1.758170E-03	2.637243E-03	-1.220699E-03	-4.474550E-03
DZ	-2.187821E-02	-3.281731E-02	-3.534686E-03	1.755341E-02

DEFLECTIONS FOR NODE 144 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	-1.401707E-03	-2.102558E-03	-3.077633E-04	9.590410E-04
DY	1.158452E-02	1.737678E-02	5.434812E-03	-2.038801E-03
DZ	-2.187948E-02	-3.281921E-02	-3.536913E-03	1.755031E-02

DEFLECTIONS FOR NODE 145 (DEGREES OF FREEDOM = 2)

	1	2	3	4
DX	3.955942E-03	5.933914E-03	1.043016E-03	-2.351530E-03
DZ	-2.322637E-04	-3.483944E-04	8.132171E-05	4.283578E-04

DEFLECTIONS FOR NODE 147 (DEGREES OF FREEDOM = 2)

	1	2	3	4
DX	3.587980E-03	5.381971E-03	1.020779E-03	-1.980511E-03
DZ	3.403953E-03	5.105935E-03	1.634246E-03	-5.231036E-04

DEFLECTIONS FOR NODE 148 (DEGREES OF FREEDOM = 2)

	1	2	3	4
DX	3.703975E-04	5.555965E-04	3.104523E-05	-3.558389E-04
DZ	2.628876E-03	3.943320E-03	1.261318E-03	-4.056924E-04

DEFLECTIONS FOR NODE 149 (DEGREES OF FREEDOM = 2)

	1	2	3	4
DX	3.417377E-03	5.126062E-03	9.265679E-04	-1.979331E-03
DZ	4.206024E-04	6.309065E-04	2.795496E-04	9.340340E-05

(BC=1) USING DEFL. MATRIX DEFLECT AND B.C. MATRIX BOUNCOND

DEFLECTIONS FOR NODE 150 (DEGREES OF FREEDOM = 1)

	1	2	3	4
DX	8.127847E-04	1.219181E-03	2.258668E-04	-4.596208E-04

DEFLECTIONS FOR NODE 151 (DEGREES OF FREEDOM = 2)

	1	2	3	4
DX	1.053309E-02	1.579962E-02	3.036834E-03	-5.732175E-03
DZ	1.078764E-02	1.618145E-02	3.650487E-03	-4.770536E-03

DEFLECTIONS FOR NODE 152 (DEGREES OF FREEDOM = 2)

	1	2	3	4
DX	-6.058482E-03	-9.087709E-03	-1.798167E-03	3.192279E-03
DZ	8.245627E-03	1.236843E-02	2.744952E-03	-3.738756E-03

DEFLECTIONS FOR NODE 153 (DEGREES OF FREEDOM = 2)

	1	2	3	4
DX	1.534245E-03	2.301369E-03	4.047257E-04	-9.116023E-04
DZ	2.028955E-03	3.043433E-03	7.475814E-04	-7.730714E-04

DEFLECTIONS FOR NODE 154 (DEGREES OF FREEDOM = 1)

	1	2	3	4
DX	6.073078E-03	9.109614E-03	1.840717E-03	-3.122247E-03

DEFLECTIONS FOR NODE 155 (DEGREES OF FREEDOM = 2)

	1	2	3	4
DX	8.908622E-03	1.336292E-02	2.476798E-03	-5.034836E-03
DZ	2.039254E-04	3.058960E-04	2.860917E-04	3.517255E-04

DEFLECTIONS FOR NODE 156 (DEGREES OF FREEDOM = 2)

	1	2	3	4
DX	-1.790674E-03	-2.685999E-03	-3.232765E-04	1.367432E-03
DZ	-3.655412E-04	-5.483051E-04	1.903839E-04	8.012145E-04

DEFLECTIONS FOR NODE 157 (DEGREES OF FREEDOM = 2)

	1	2	3	4
DX	7.053452E-03	1.058017E-02	1.860823E-03	-4.190425E-03
DZ	1.373222E-03	2.059829E-03	2.995176E-04	-9.436267E-04

DEFLECTIONS FOR NODE 158 (DEGREES OF FREEDOM = 2)

	1	2	3	4
DX	5.528379E-04	8.292684E-04	5.078087E-04	4.085681E-04
DZ	3.781960E-04	5.672931E-04	9.129742E-05	-2.419450E-04

DEFLECTIONS FOR NODE 159 (DEGREES OF FREEDOM = 3)

	1	2	3	4
DX	1.381799E-03	2.072706E-03	5.903374E-04	-3.611824E-04
DY	7.030468E-03	1.054569E-02	1.945042E-03	-3.992869E-03
DZ	1.978636E-02	2.967949E-02	4.519485E-03	-1.318128E-02

DEFLECTIONS FOR NODE 161 (DEGREES OF FREEDOM = 2)

	1	2	3	4
DX	-3.861720E-03	-5.792557E-03	-5.684935E-04	3.211083E-03
DZ	8.588601E-04	1.288288E-03	1.930693E-04	-5.784804E-04

DEFLECTIONS FOR NODE 162 (DEGREES OF FREEDOM = 1)

	1	2	3	4
DX	9.275817E-03	1.391371E-02	2.404727E-03	-5.597031E-03

DEFLECTIONS FOR NODE 163 (DEGREES OF FREEDOM = 2)

	1	2	3	4
DX	6.196392E-03	9.294582E-03	1.692542E-03	-3.563501E-03
DZ	1.853671E-02	2.780501E-02	4.235303E-03	-1.234622E-02

DEFLECTIONS FOR NODE 164 (DEGREES OF FREEDOM = 2)

	1	2	3	4
DX	-7.822945E-04	-1.173428E-03	1.436919E-04	1.177553E-03
DZ	1.903476E-02	2.855208E-02	4.347127E-03	-1.268196E-02

DEFLECTIONS FOR NODE 165 (DEGREES OF FREEDOM = 2)

	1	2	3	4
DX	7.884894E-03	1.182733E-02	2.053619E-03	-4.738434E-03
DZ	1.527359E-03	2.291035E-03	3.309661E-04	-1.053964E-03

DEFLECTIONS FOR NODE 166 (DEGREES OF FREEDOM = 1)

	1	2	3	4
DX	-5.925183E-04	-8.887628E-04	2.331885E-04	1.145099E-03

CONDENSED TABLE OF MEMBER OUTPUT DATA

MEM. NO.	TYPE	MAT'L	NODES				AREA OR LENGTH	GAGE	CRIT. LOAD COND.	MAX. STRESS			MAX. STRESS RATIO	DES. CONST.	MICROBUCKLING CRIT. LOAD COND.	MICROBUCKLING MAX. STRESS RATIO
4301	4	8	4	3	1	0	.5424	.0100	2	3.730E+02	3.766E+02	5.550E+02	.011	M/M		
6302	6	8	4	3	6	5	1.7051	.0100	2	-5.766E+00	-2.541E-08	-3.527E+02	.007	M/M		
6303	6	8	6	5	8	7	2.6180	.0100	2	4.416E+00	-6.668E-09	4.333E+02	.009	M/M		
6304	6	8	8	7	10	9	2.8090	.0100	2	-3.024E+00	2.679E-08	6.047E+02	.012	M/M		
6305	6	8	10	9	12	11	1.6347	.0100	2	-1.277E+01	3.261E-08	3.388E+02	.007	M/M		
4306	4	8	12	11	13	0	.2065	.0100	2	3.214E+02	2.794E+02	2.211E+02	.005	M/M		
4001	4	7	4	3	1	0	.5424	2.5000	2	1.478E+00	1.533E+00	8.402E+00	.056	M/M		
6002	6	7	4	3	6	5	1.7051	2.5000	2	-8.725E-02	9.550E-12	-5.337E+00	.036	M/M		
6003	6	7	6	5	8	7	2.6180	2.5000	2	6.684E-02	2.337E-10	6.558E+00	.044	M/M		
6004	6	5	8	7	10	9	2.8090	2.5000	2	-4.577E-02	4.187E-10	9.154E+00	.061	M/M		
6005	6	5	10	9	12	11	1.6347	2.5000	2	-1.932E-01	-2.967E-10	5.125E+00	.034	M/M		
4006	4	5	12	11	13	0	.2065	2.5000	2	1.525E+00	8.884E-01	3.347E+00	.023	M/M		
1001	1	9	3	4	0	0	.3164	.1000	2	2.807E+01	0.	0.	.009	M/M		
1002	1	9	5	6	0	0	.6783	.1000	2	2.216E+02	0.	0.	.074	M/M		
1003	1	9	7	8	0	0	.8491	.1000	2	2.789E+02	0.	0.	.093	M/M		
1004	1	9	9	10	0	0	.7898	.1000	2	2.299E+02	0.	0.	.077	M/M		
1005	1	9	11	12	0	0	.4819	.1000	2	3.651E+01	0.	0.	.012	M/M		
6011	6	6	4	18	3	17	2.0583	3.0000	2	5.290E-02	-1.134E-01	-1.755E+01	.059	M/M		
6012	6	6	6	20	5	19	4.2419	3.1000	2	2.824E-01	-4.223E-01	-2.932E+01	.098	M/M		
6013	6	4	8	22	7	21	5.1163	3.2000	2	2.522E-01	-3.633E-01	-1.942E+01	.065	M/M		
6014	6	4	10	24	9	23	4.6001	3.3000	2	1.296E-01	-1.871E-01	-1.039E+01	.035	M/M		
6015	6	4	12	26	11	25	2.7436	1.7000	2	9.909E-03	-1.420E-02	-1.264E+00	.004	M/M		
9013	6	8	8	22	7	21	5.1163	.0100	2	6.318E+00	-9.103E+00	-4.866E+02	.010	M/M		

CONDENSED TABLE OF MEMBER OUTPUT DATA

MEM. NO.	TYPE	MATL.	NODES				AREA OR LENGTH	GAGE		CRIT. LOAD COND.	MAX. STRESS	MAX. STRESS RATIO	DES. CONST.	MICROBUCKLING CRIT. LOAD COND.	MICROBUCKLING MAX. STRESS RATIO
5001	5	18	3	17	1	15	18.3024	1	2	2	-3.035E+03	.016	M/M	2	.000
								2	1	2	-3.915E+03	.021	M/M		
								3	2	2	-2.757E+02	.001	M/M		
5002	5	18	5	19	3	17	18.2666	1	3	2	-8.571E+02	.005	M/M	2	.000
								2	1	2	-6.420E+03	.035	M/M		
								3	3	2	-3.988E+03	.022	M/M		
5003	5	18	7	21	5	19	18.2272	1	3	4	-1.187E+03	.006	M/M	2	.000
								2	2	2	-1.112E+04	.060	M/M		
								3	3	2	-1.236E+03	.007	M/M		
5004	5	17	7	21	9	23	18.2125	1	2	2	-2.383E+03	.013	M/M	2	.000
								2	1	2	-1.093E+04	.059	M/M		
								3	2	2	2.475E+03	.012	M/M		
5005	5	17	9	23	11	25	13.7038	1	1	2	-4.731E+03	.026	M/M	2	.000
								2	1	2	8.626E+02	.004	M/M		
								3	1	4	1.414E+02	.001	M/M		
5006	5	17	11	25	13	27	4.8861	1	1	2	-4.263E+02	.002	M/M	4	.000
								2	1	2	9.276E+02	.004	M/M		
								3	1	4	1.932E+02	.001	M/M		
5011	5	18	4	18	1	15	18.2136	1	2	2	2.826E+03	.013	M/M	4	.000
								2	1	2	3.183E+03	.015	M/M		
								3	2	4	-5.866E+02	.003	M/M		
5012	5	18	6	20	4	18	18.2391	1	3	2	8.163E+02	.004	M/M	4	.000
								2	1	2	8.120E+03	.038	M/M		
								3	3	2	1.682E+03	.008	M/M		
5013	5	18	8	22	6	20	18.2173	1	3	4	1.202E+03	.006	M/M	4	.000
								2	4	2	7.496E+03	.035	M/M		
								3	3	2	7.203E+02	.003	M/M		
5014	5	17	8	22	10	24	18.2113	1	2	2	2.802E+03	.013	M/M	4	.000
								2	1	2	9.389E+03	.044	M/M		
								3	2	2	-3.444E+03	.019	M/M		
5015	5	17	10	24	12	26	13.6705	1	1	2	4.684E+03	.022	M/M	4	.000
								2	1	2	-1.066E+03	.006	M/M		
								3	1	2	4.113E+02	.002	M/M		

CONDENSED TABLE OF MEMBER OUTPUT DATA

MEM. NO.	TYPE	MATL.	NODES				AREA OR LENGTH	GAGE		CRIT. LOAD COND.	MAX. STRESS			MAX. STRESS RATIO	DES. CONST.	MICROBUCKLING CRIT. LOAD COND.	MICROBUCKLING MAX. STRESS RATIO
5016	5	17	12	26	13	27	4.6508	1	1	2		5.277E+02		.002	M/M	2	.000
								2	1	2		-1.069E+03		.006	M/M		
								3	1	4		-2.610E+02		.001	M/M		
4021	4	7	18	17	15	0	.6864		5.0000	4	-5.264E-01	-5.265E-02	4.080E+00	.027	M/M		
6022	6	7	18	17	20	19	2.1578		5.0000	2	-2.778E-01	-2.153E-10	-1.699E+01	.113	M/M		
6023	6	7	20	19	22	21	3.3132		5.0000	2	-3.095E-02	-9.896E-11	-3.037E+00	.020	M/M		
6024	6	5	22	21	24	23	3.5548		5.0000	2	-2.486E-02	-8.509E-11	4.972E+00	.033	M/M		
6025	6	5	24	23	26	25	2.0698		5.0000	2	-3.634E-01	1.523E-11	9.642E+00	.064	M/M		
4026	4	5	26	25	27	0	.2613		5.0000	2	6.798E+00	2.979E+00	1.726E+00	.019	M/M		
1011	1	9	17	18	0	0	.3560		.1000	2	9.204E+01	0.	0.	.031	M/M		
1012	1	9	19	20	0	0	.7631		.1000	2	5.108E+02	0.	0.	.170	M/M		
1013	1	9	21	22	0	0	.9552		.1000	2	6.913E+02	0.	0.	.230	M/M		
1014	1	9	23	24	0	0	.8884		.1000	2	6.611E+02	0.	0.	.220	M/M		
1015	1	9	25	26	0	0	.5421		.1000	2	1.735E+02	0.	0.	.058	M/M		
6031	6	6	18	32	17	31	2.3004		3.3000	2	5.950E-02	-1.275E-01	-1.974E+01	.066	M/M		
6032	6	6	20	34	19	33	4.7408		3.4000	2	6.583E-01	-9.847E-01	-6.837E+01	.228	M/M		
6033	6	4	22	36	21	35	5.7180		3.5000	2	7.503E-01	-1.081E+00	-5.778E+01	.193	M/M		
6034	6	4	24	38	23	37	5.1411		3.6000	2	5.748E-01	-8.296E-01	-4.608E+01	.154	M/M		
6035	6	4	26	40	25	39	3.0662		1.9000	2	1.833E-01	-2.627E-01	-2.337E+01	.078	M/M		
9033	6	8	22	36	21	35	5.7180		.0100	2	1.880E+01	-2.709E+01	-1.448E+03	.029	M/M		
5021	5	18	17	31	15	29	20.4548	1	2	2		-4.124E+03		.022	M/M	2	.000
								2	1	2		-7.918E+03		.042	M/M		
								3	2	2		-1.252E+03		.007	M/M		
5022	5	18	19	33	17	31	20.4148	1	3	2		-1.758E+03		.010	M/M	2	.000
								2	1	2		-2.140E+04		.116	M/M		
								3	3	2		-6.415E+03		.035	M/M		

C O N D E N S E D T A B L E O F M E M B E R O U T P U T D A T A

MEM. NO.	TYPE	MATL.	NODES				AREA OR LENGTH	GAGE		CRIT. LOAD COND.		MAX. STRESS		MAX. STRESS RATIO	DES. CONST.	MICROBUCKLING CRIT. LOAD COND.	MICROBUCKLING MAX. STRESS RATIO
5023	5	18	21	35	19	33	20.3708	1	3	2		-5.875E+03		.032	M/M	2	.000
								2	4	2		-1.984E+04		.107	M/M		
								3	3	2		2.212E+03		.010	M/M		
5024	5	17	21	35	23	37	20.3544	1	3	4		7.306E+02		.003	M/M	2	.000
								2	3	2		-2.261E+04		.122	M/M		
								3	3	4		-3.128E+03		.017	M/M		
5025	5	17	23	37	25	39	15.3154	1	1	2		-1.628E+04		.088	M/M	2	.000
								2	1	2		-2.052E+03		.011	M/M		
								3	1	2		7.662E+03		.036	M/M		
5026	5	17	25	39	27	41	5.4607	1	1	2		-7.673E+03		.041	M/M	2	.000
								2	1	2		2.766E+03		.013	M/M		
								3	1	2		5.514E+03		.026	M/M		
5031	5	18	18	32	15	29	20.3556	1	2	2		4.087E+03		.019	M/M	4	.000
								2	1	2		6.596E+03		.032	M/M		
								3	2	2		1.446E+03		.007	M/M		
5032	5	18	20	34	18	32	20.3841	1	3	2		2.027E+03		.010	M/M	4	.000
								2	1	2		2.108E+04		.099	M/M		
								3	3	2		3.216E+03		.015	M/M		
5033	5	18	22	36	20	34	20.3598	1	3	2		5.657E+03		.027	M/M	4	.000
								2	6	2		1.602E+04		.076	M/M		
								3	3	2		-9.337E+02		.005	M/M		
5034	5	17	22	36	24	38	20.3531	1	3	2		2.114E+03		.010	M/M	4	.000
								2	3	2		1.944E+04		.092	M/M		
								3	3	2		-3.080E+03		.017	M/M		
5035	5	17	24	38	26	40	15.2782	1	1	2		1.571E+04		.079	M/M	4	.000
								2	1	4		1.561E+03		.007	M/M		
								3	1	2		-4.500E+03		.024	M/M		
5036	5	17	26	40	27	41	5.1978	1	1	2		5.621E+03		.027	M/M	2	.000
								2	1	2		-8.166E+02		.004	M/M		
								3	1	2		-3.797E+03		.021	M/M		
4041	4	7	32	31	29	0	.8473	5.0000		4	-5.927E-01	-5.905E-02	5.806E+00	.039	M/M		
6042	6	7	32	31	34	33	2.6637	5.0000		2	-3.425E-01	4.256E-10	-2.096E+01	.140	M/M		
6043	6	7	34	33	36	35	4.0900	5.0000		2	-3.183E-02	6.494E-11	-3.123E+00	.021	M/M		

CONDENSED TABLE OF MEMBER OUTPUT DATA

MEM. NO.	TYPE	MATL.	NODES				AREA OR LENGTH		GAGE	CRIT. LOAD COND.	MAX. STRESS			MAX. STRESS RATIO	DES. CONST.	MICROBUCKLING CRIT. LOAD COND.	MICROBUCKLING MAX. STRESS RATIO
6044	6	5	36	35	38	37	4.3884		5.0000	2	-4.854E-02	9.572E-11	9.708E+00	.065	M/M		
6045	6	5	38	37	40	39	2.5538		5.0000	2	-1.469E-01	-2.303E-10	3.898E+00	.026	M/M		
4046	4	5	40	39	41	0	.3226		5.0000	2	8.536E+00	5.535E-01	9.040E+00	.064	M/M		
1021	1	9	32	31	0	0	.3955		.1000	2	1.213E+02	0.	0.	.040	M/M		
1022	1	9	34	33	0	0	.8479		.1000	2	7.270E+02	0.	0.	.242	M/M		
1023	1	9	36	35	0	0	1.0613		.1000	2	8.998E+02	0.	0.	.300	M/M		
1024	1	9	38	37	0	0	.9871		.1000	2	8.880E+02	0.	0.	.296	M/M		
1025	1	9	40	39	0	0	.6023		.1000	2	2.525E+02	0.	0.	.084	M/M		
6051	6	6	32	46	31	45	2.5425		3.7000	2	6.327E-02	-1.356E-01	-2.099E+01	.070	M/M		
6052	6	6	34	48	33	47	5.2396		3.8000	2	1.026E+00	-1.535E+00	-1.066E+02	.355	M/M		
6053	6	4	36	50	35	49	6.3197		3.9500	2	1.199E+00	-1.727E+00	-9.231E+01	.308	M/M		
6054	6	4	38	52	37	51	5.6821		4.1000	2	7.612E-01	-1.099E+00	-6.103E+01	.203	M/M		
6055	6	4	40	54	39	53	3.3889		2.1000	2	6.360E-01	-9.116E-01	-8.112E+01	.270	M/M		
9053	6	8	36	50	35	49	6.3197		.0100	2	3.004E+01	-4.328E+01	-2.313E+03	.046	M/M		
5041	5	18	31	45	29	43	22.6073	1	2	2		-5.015E+03		.027	M/M	2	.000
								2	1	2		-1.055E+04		.057	M/M		
								3	2	2		-1.559E+03		.008	M/M		
5042	5	18	33	47	31	45	22.5630	1	3	4		-1.529E+03		.009	M/M	2	.000
								2	1	2		-3.467E+04		.187	M/M		
								3	3	2		-8.011E+03		.043	M/M		
5043	5	18	35	49	33	47	22.5143	1	3	2		-1.311E+04		.071	M/M	2	.000
								2	6	2		-2.888E+04		.156	M/M		
								3	3	2		8.852E+03		.042	M/M		
5044	5	17	35	49	37	51	22.4963	1	3	2		7.755E+03		.037	M/M	2	.000
								2	6	2		-3.141E+04		.170	M/M		
								3	3	4		-3.814E+03		.021	M/M		

CONDENSED TABLE OF MEMBER OUTPUT DATA

MEM. NO.	TYPE	MATL.	NODES				AREA OR LENGTH	GAGE		CRIT. LOAD COND.	MAX. STRESS			MAX. STRESS RATIO	DES. CONST.	MICROBUCKLING CRIT. LOAD COND.	MICROBUCKLING MAX. STRESS RATIO
5045	5	17	37	51	39	53	16.9271	1	3	2		-1.920E+04		.104	M/M	2	.000
								2	1	2		-2.163E+04		.117	M/M		
								3	3	2		1.087E+04		.051	M/M		
5046	5	17	39	53	41	55	6.0354	1	1	2		-1.454E+04		.079	M/M	2	.000
								2	1	2		5.960E+03		.028	M/M		
								3	1	2		1.695E+04		.080	M/M		
5051	5	18	32	46	29	43	22.4976	1	2	2		5.153E+03		.024	M/M	4	.000
								2	1	2		9.384E+03		.044	M/M		
								3	2	2		2.036E+03		.010	M/M		
5052	5	18	34	48	32	46	22.5291	1	3	2		1.769E+03		.008	M/M	4	.000
								2	1	2		3.174E+04		.150	M/M		
								3	3	4		-2.866E+03		.015	M/M		
5053	5	18	36	50	34	48	22.5022	1	3	2		1.146E+04		.054	M/M	4	.000
								2	10	2		2.184E+04		.103	M/M		
								3	3	2		-6.338E+03		.034	M/M		
5054	5	17	36	50	38	52	22.4948	1	3	2		-3.573E+03		.019	M/M	4	.000
								2	6	2		2.701E+04		.127	M/M		
								3	3	4		4.353E+03		.021	M/M		
5055	5	17	38	52	40	54	16.8860	1	2	2		2.454E+04		.116	M/M	4	.000
								2	1	2		1.526E+04		.072	M/M		
								3	2	2		-1.000E+04		.054	M/M		
5056	5	17	40	54	41	55	5.7448	1	1	2		1.856E+04		.088	M/M	4	.000
								2	1	2		7.367E+03		.035	M/M		
								3	1	2		-1.019E+04		.055	M/M		
4061	4	7	46	45	43	0	1.0252		5.0000	2	5.639E+00	2.002E+00	-8.582E+00	.059	M/M		
6062	6	7	46	45	48	47	3.2229		5.0000	2	-4.149E-01	3.829E-10	-2.538E+01	.169	M/M		
6063	6	7	48	47	50	49	4.9487		5.0000	2	-5.176E-02	7.651E-11	-5.078E+00	.034	M/M		
6064	6	5	50	49	52	51	5.3096		5.0000	2	-5.243E-02	-4.457E-11	1.049E+01	.070	M/M		
6065	6	5	52	51	54	53	3.0900		5.0000	2	3.663E-02	-5.265E-12	-9.718E-01	.006	M/M		
4066	4	5	54	53	55	0	.3903		5.0000	2	6.881E+00	1.772E+00	-3.079E+00	.026	M/M		
1031	1	9	46	45	0	0	.4350		.1000	2	1.491E+02	0.	0.	.050	M/M		

CONDENSED TABLE OF MEMBER OUTPUT DATA

MEM. NO.	TYPE	MATL.	NODES				AREA OR LENGTH	GAGE		CRIT. LOAD COND.	MAX. STRESS			MAX. STRESS RATIO	DES. CONST.	MICROBUCKLING CRIT. LOAD COND.	MICROBUCKLING MAX. STRESS RATIO
1032	1	9	48	47	0	0	.9326		.1000	2	8.410E+02	0.	0.	.280	M/M		
1033	1	9	50	49	0	0	1.1674		.1000	2	1.098E+03	0.	0.	.366	M/M		
1034	1	9	52	51	0	0	1.0858		.1000	2	1.023E+03	0.	0.	.341	M/M		
1035	1	9	54	53	0	0	.6625		.1000	2	1.892E+02	0.	0.	.063	M/M		
6071	6	6	46	60	45	59	2.7845		4.0000	2	5.609E-02	-1.202E-01	-1.861E+01	.062	M/M		
6072	6	6	48	62	47	61	5.7385		4.1500	2	1.311E+00	-1.961E+00	-1.362E+02	.454	M/M		
6073	6	4	50	64	49	63	6.9214		4.3000	2	1.597E+00	-2.300E+00	-1.230E+02	.410	M/M		
6074	6	4	52	66	51	65	6.2231		4.4500	2	8.246E-01	-1.190E+00	-6.612E+01	.220	M/M		
6075	6	4	54	68	53	67	3.7115		2.3000	2	7.360E-01	-1.055E+00	-9.388E+01	.313	M/M		
9073	6	8	50	64	49	63	6.9214		.0100	2	4.001E+01	-5.764E+01	-3.081E+03	.062	M/M		
5061	5	18	45	59	43	57	24.7597	1	2	2		-6.170E+03		.033	M/M	2	.000
								2	1	2		-1.317E+04		.071	M/M		
								3	2	2		-6.347E+02		.003	M/M		
5062	5	18	47	61	45	59	24.7112	1	3	4		-2.321E+03		.013	M/M	2	.000
								2	1	2		-4.764E+04		.258	M/M		
								3	3	2		-7.029E+03		.038	M/M		
5063	5	18	49	63	47	61	24.6579	1	3	2		-2.085E+04		.113	M/M	2	.000
								2	8	2		-3.608E+04		.195	M/M		
								3	3	2		1.680E+04		.079	M/M		
5064	5	17	49	63	51	65	24.6381	1	3	2		1.635E+04		.077	M/M	2	.000
								2	9	2		-3.956E+04		.214	M/M		
								3	3	2		-7.167E+03		.039	M/M		
5065	5	17	51	65	53	67	18.5387	1	6	2		-1.732E+04		.094	M/M	2	.000
								2	1	2		-5.552E+04		.300	M/M		
								3	6	2		8.887E+03		.042	M/M		
5066	5	17	53	67	55	69	6.6100	1	5	2		-1.176E+04		.064	M/M	2	.000
								2	1	4		-4.040E+03		.022	M/M		
								3	5	2		1.383E+04		.065	M/M		

CONDENSED TABLE OF MEMBER OUTPUT DATA

MEM. NO.	TYPE	MATL.	NODES				AREA OR LENGTH	GAGE		CRIT. LOAD COND.	MAX. STRESS			MAX. STRESS RATIO	DES. CONST.	MICROBUCKLING CRIT. LOAD COND.	MICROBUCKLING MAX. STRESS RATIO
5071	5	18	46	60	43	57	24.6396	1	2	2		6.710E+03		.032	M/M	4	.000
								2	1	2		1.176E+04		.055	M/M		
								3	2	2		1.861E+03		.009	M/M		
5072	5	18	48	62	46	60	24.6740	1	3	4		1.735E+03		.008	M/M	4	.000
								2	1	2		3.984E+04		.188	M/M		
								3	3	4		-2.403E+03		.013	M/M		
5073	5	18	50	64	48	62	24.6446	1	3	2		1.842E+04		.087	M/M	4	.000
								2	15	2		2.437E+04		.115	M/M		
								3	3	2		-1.448E+04		.078	M/M		
5074	5	17	50	64	52	66	24.6365	1	3	2		-1.302E+04		.070	M/M	4	.000
								2	10	2		3.086E+04		.146	M/M		
								3	3	4		4.557E+03		.021	M/M		
5075	5	17	52	66	54	68	18.4937	1	5	2		1.988E+04		.094	M/M	4	.000
								2	1	2		4.471E+04		.211	M/M		
								3	5	2		-9.025E+03		.049	M/M		
5076	5	17	54	68	55	69	6.2917	1	3	2		1.710E+04		.081	M/M	4	.000
								2	1	2		1.338E+04		.063	M/M		
								3	3	2		-1.030E+04		.056	M/M		
4081	4	7	60	59	57	0	1.2200		5.0000	2	6.575E+00	2.527E+00	-2.027E+01	.136	M/M		
6082	6	7	60	59	62	61	3.8354		5.0000	2	-4.242E-01	1.637E-11	-2.595E+01	.173	M/M		
6083	6	7	62	61	64	63	5.8890		5.0000	2	-1.249E-01	4.843E-11	-1.226E+01	.082	M/M		
6084	6	5	64	63	66	65	6.3186		5.0000	4	2.507E-02	-2.603E-11	-5.014E+00	.033	M/M		
6085	6	5	66	65	68	67	3.6772		5.0000	4	1.218E-02	1.616E-11	-3.233E-01	.002	M/M		
4086	4	5	68	67	69	0	.4645		5.0000	2	9.618E+00	-2.281E+00	-1.636E+00	.031	M/M		
1041	1	9	60	59	0	0	.4746		.1000	2	1.717E+02	0.	0.	.057	M/M		
1042	1	9	62	61	0	0	1.0174		.1000	2	9.069E+02	0.	0.	.302	M/M		
1043	1	9	64	63	0	0	1.2735		.1000	2	1.226E+03	0.	0.	.409	M/M		
1044	1	9	66	65	0	0	1.1845		.1000	2	1.195E+03	0.	0.	.398	M/M		
1045	1	9	68	67	0	0	.7228		.1000	2	3.163E+02	0.	0.	.105	M/M		

CONDENSED TABLE OF MEMBER OUTPUT DATA

MEM. NO.	TYPE	MATL.	NODES				AREA OR LENGTH		GAGE	CRIT. LOAD COND.	MAX. STRESS			MAX. STRESS RATIO	DES. CONST.	MICROBUCKLING CRIT. LOAD COND.	MICROBUCKLING MAX. STRESS RATIO
6091	6	6	60	74	59	73	3.0266		4.4500	2	5.788E-02	-1.240E-01	-1.921E+01	.064	M/M		
6092	6	6	62	76	61	75	6.2374		4.5500	2	1.408E+00	-2.105E+00	-1.462E+02	.487	M/M		
6093	6	4	64	78	63	77	7.5231		4.7000	2	1.853E+00	-2.670E+00	-1.427E+02	.476	M/M		
6094	6	4	66	80	65	79	6.7641		4.8500	2	9.871E-01	-1.425E+00	-7.915E+01	.264	M/M		
6095	6	4	68	82	67	81	4.0342		2.5000	2	7.140E-01	-1.023E+00	-9.106E+01	.304	M/M		
9093	6	8	64	78	63	77	7.5231		.0100	2	4.644E+01	-6.691E+01	-3.577E+03	.072	M/M		
5081	5	18	59	73	57	71	26.9121	1	2	2		-8.115E+03		.044	M/M	2	.000
								2	1	2		-1.715E+04		.093	M/M		
								3	2	2		1.142E+03		.005	M/M		
5082	5	18	61	75	59	73	26.8595	1	3	4		-3.216E+03		.017	M/M	2	.000
								2	1	2		-6.120E+04		.331	M/M		
								3	3	2		-3.386E+03		.018	M/M		
5083	5	18	63	77	61	75	26.8015	1	3	2		-2.826E+04		.153	M/M	2	.000
								2	10	2		-4.079E+04		.221	M/M		
								3	3	2		2.861E+04		.135	M/M		
5084	5	17	63	77	65	79	26.7800	1	3	2		2.479E+04		.117	M/M	2	.000
								2	12	2		-4.661E+04		.252	M/M		
								3	3	2		-1.631E+04		.088	M/M		
5085	5	17	65	79	67	81	20.1503	1	9	2		-1.905E+04		.103	M/M	2	.000
								2	1	2		-9.911E+04		.536	M/M		
								3	9	2		7.887E+03		.037	M/M		
5086	5	17	67	81	69	83	7.1846	1	10	2		-1.262E+04		.068	M/M	2	.000
								2	1	4		-6.049E+03		.033	M/M		
								3	10	2		9.548E+03		.045	M/M		
5091	5	18	60	74	57	71	26.7815	1	2	2		9.131E+03		.043	M/M	4	.000
								2	1	2		1.366E+04		.064	M/M		
								3	2	2		2.510E+03		.012	M/M		
5092	5	18	62	76	60	74	26.8190	1	3	4		2.236E+03		.011	M/M	4	.000
								2	1	2		4.777E+04		.225	M/M		
								3	3	4		-1.800E+03		.010	M/M		

CONDENSED TABLE OF MEMBER OUTPUT DATA

MEM. NO.	TYPE	MATL.	NODES				AREA OR LENGTH	GAGE		CRIT. LOAD COND.	MAX. STRESS			MAX. STRESS RATIO	DES. CONST.	MICROBUCKLING CRIT. LOAD COND.	MICROBUCKLING MAX. STRESS RATIO
5093	5	18	64	78	62	76	26.7871	1	3	2		2.599E+04		.127	M/M	4	.000
								2	18	2		2.755E+04		.130	M/M		
								3	3	2		-2.546E+04		.138	M/M		
5094	5	17	64	78	66	80	26.7782	1	3	2		-2.207E+04		.119	M/M	4	.000
								2	14	2		3.586E+04		.169	M/M		
								3	3	2		1.343E+04		.063	M/M		
5095	5	17	66	80	68	82	20.1014	1	8	2		1.935E+04		.091	M/M	4	.000
								2	1	2		8.154E+04		.385	M/M		
								3	8	2		-7.771E+03		.042	M/M		
5096	5	17	68	82	69	83	6.8387	1	8	2		1.721E+04		.081	M/M	4	.000
								2	1	2		2.941E+04		.139	M/M		
								3	8	2		-8.983E+03		.048	M/M		
4101	4	7	74	73	71	0	1.4317	5.0000		2	6.093E+00	5.860E+00	-1.833E+01	.123	M/M		
6102	6	7	74	73	76	75	4.5011	5.0000		2	-3.149E-01	-1.583E-11	-1.927E+01	.128	M/M		
6103	6	7	76	75	78	77	6.9112	5.0000		2	-1.588E-01	-4.161E-11	-1.558E+01	.104	M/M		
6104	6	5	78	77	80	79	7.4153	5.0000		4	1.234E-02	-3.268E-11	-2.469E+00	.016	M/M		
6105	6	5	80	79	82	81	4.3154	5.0000		2	-3.779E-01	8.185E-12	1.003E+01	.067	M/M		
4106	4	5	82	81	83	0	.5451	5.0000		2	1.191E+01	-1.483E+00	-9.173E-01	.034	M/M		
1051	1	9	74	73	0	0	.5141	.1000		2	1.207E+02	0.	0.	.040	M/M		
1052	1	9	76	75	0	0	1.1022	.1000		2	9.357E+02	0.	0.	.312	M/M		
1053	1	9	78	77	0	0	1.3796	.1000		2	1.341E+03	0.	0.	.447	M/M		
1054	1	9	80	79	0	0	1.2832	.1000		2	1.452E+03	0.	0.	.484	M/M		
1055	1	9	82	81	0	0	.7830	.1000		2	3.772E+02	0.	0.	.126	M/M		
6111	6	6	74	88	73	87	3.2687	4.8000		2	6.321E-02	-1.354E-01	-2.097E+01	.070	M/M		
6112	6	6	76	90	75	89	6.7362	4.9000		2	1.395E+00	-2.087E+00	-1.449E+02	.483	M/M		
6113	6	4	78	92	77	91	8.1248	5.0500		2	2.037E+00	-2.935E+00	-1.569E+02	.523	M/M		
6114	6	4	80	94	79	93	7.3050	5.2500		2	1.304E+00	-1.882E+00	-1.046E+02	.349	M/M		

CONDENSED TABLE OF MEMBER OUTPUT DATA

MEM. NO.	TYPE	MATL.	NODES				AREA OR LENGTH	GAGE		CRIT. LOAD COND.	MAX. STRESS			MAX. STRESS RATIO	DES. CONST.	MICROBUCKLING CRIT. LOAD COND.	MICROBUCKLING MAX. STRESS RATIO
6115	6	4	82	96	81	95	4.3568		2.7000	2	6.924E-01	-9.925E-01	-8.832E+01	.294	M/M		
9113	6	8	78	92	77	91	8.1248		.0100	2	5.105E+01	-7.355E+01	-3.931E+03	.079	M/M		
5101	5	18	73	87	71	85	29.0646	1	2	2		-7.927E+03		.043	M/M	2	.000
								2	1	2		-1.744E+04		.094	M/M		
								3	2	2		3.192E+03		.015	M/M		
5102	5	18	75	89	73	87	29.0077	1	3	4		-3.594E+03		.019	M/M	2	.000
								2	1	2		-7.047E+04		.381	M/M		
								3	3	4		2.440E+03		.012	M/M		
5103	5	18	77	91	75	89	28.9451	1	2	2		-5.219E+04		.282	M/M	2	.000
								2	12	2		-4.281E+04		.231	M/M		
								3	2	2		5.447E+04		.257	M/M		
5104	5	17	77	91	79	93	28.9219	1	2	2		5.038E+04		.238	M/M	2	.000
								2	15	2		-5.429E+04		.293	M/M		
								3	2	2		-3.289E+04		.178	M/M		
5105	5	17	79	93	81	95	21.7619	1	12	2		-2.260E+04		.122	M/M	2	.000
								2	1	2		-1.521E+05		.822	M/M		
								3	12	2		6.907E+03		.033	M/M		
5106	5	17	81	95	83	97	7.7593	1	15	2		-1.288E+04		.070	M/M	2	.000
								2	1	4		-7.445E+03		.040	M/M		
								3	15	2		6.532E+03		.031	M/M		
5111	5	18	74	88	71	85	28.9235	1	2	2		9.536E+03		.045	M/M	4	.000
								2	1	2		1.036E+04		.049	M/M		
								3	2	2		5.976E+03		.028	M/M		
5112	5	18	76	90	74	88	28.9640	1	3	2		3.014E+03		.014	M/M	4	.000
								2	1	2		5.078E+04		.240	M/M		
								3	3	2		-3.622E+03		.020	M/M		
5113	5	18	78	92	76	90	28.9295	1	2	2		5.264E+04		.248	M/M	4	.000
								2	21	2		2.883E+04		.136	M/M		
								3	2	2		-5.197E+04		.281	M/M		
5114	5	17	78	92	80	94	28.9200	1	2	2		-4.662E+04		.252	M/M	4	.000
								2	18	2		4.158E+04		.196	M/M		
								3	2	2		3.042E+04		.143	M/M		

CONDENSED TABLE OF MEMBER OUTPUT DATA

MEM. NO.	TYPE	MATL.	NODES				AREA OR LENGTH	GAGE		CRIT. LOAD COND.	MAX. STRESS			MAX. STRESS RATIO	DES. CONST.	MICROBUCKLING CRIT. LOAD COND.	MICROBUCKLING MAX. STRESS RATIO
5115	5	17	80	94	82	96	21.7091	1	11	2		2.255E+04		.106	M/M	4	.000
								2	1	2		1.235E+05		.583	M/M		
								3	11	2		-6.838E+03		.037	M/M		
5116	5	17	82	96	83	97	7.3856	1	13	2		1.718E+04		.081	M/M	4	.000
								2	1	2		5.184E+04		.245	M/M		
								3	13	2		-6.223E+03		.034	M/M		
4121	4	7	88	87	85	0	1.6604		5.0000	2	5.563E+00	1.354E+01	9.333E+00	.070	M/M		
6122	6	7	88	87	90	89	5.2200		5.0000	2	-3.121E-01	-6.366E-12	-1.909E+01	.127	M/M		
6123	6	7	90	89	92	91	8.0150		5.0000	2	-2.464E-01	4.184E-11	-2.417E+01	.161	M/M		
6124	6	5	92	91	94	93	8.5996		5.0000	2	6.602E-02	-1.592E-11	-1.320E+01	.088	M/M		
6125	6	5	94	93	96	95	5.0046		5.0000	2	-6.967E-01	-5.048E-11	1.848E+01	.123	M/M		
4126	4	5	96	95	97	0	.6322		5.0000	2	1.741E+01	-1.688E+00	-1.114E+00	.049	M/M		
1061	1	9	88	87	0	0	.5537		.1000	2	2.083E+01	0.	0.	.007	M/M		
1062	1	9	90	89	0	0	1.1869		.1000	2	9.290E+02	0.	0.	.310	M/M		
1063	1	9	92	91	0	0	1.4857		.1000	2	1.285E+03	0.	0.	.428	M/M		
1064	1	9	94	93	0	0	1.3818		.1000	2	1.451E+03	0.	0.	.484	M/M		
1065	1	9	96	95	0	0	.8432		.1000	2	5.460E+02	0.	0.	.182	M/M		
6131	6	6	88	102	87	101	3.5108		5.2000	2	6.364E-02	-1.364E-01	-2.111E+01	.070	M/M		
6132	6	6	90	104	89	103	7.2351		5.3000	2	1.283E+00	-1.919E+00	-1.333E+02	.444	M/M		
6133	6	4	92	106	91	105	8.7265		5.4500	2	2.053E+00	-2.958E+00	-1.581E+02	.527	M/M		
6134	6	4	94	108	93	107	7.8460		5.6500	2	1.634E+00	-2.358E+00	-1.310E+02	.437	M/M		
6135	6	4	96	110	95	109	4.6795		2.9000	2	7.840E-01	-1.124E+00	-1.000E+02	.333	M/M		
9133	6	8	92	106	91	105	8.7265		.0100	2	5.144E+01	-7.412E+01	-3.962E+03	.079	M/M		
5121	5	18	87	101	85	99	31.2170	1	1	2		-1.333E+04		.072	M/M	2	.000
								2	1	2		-7.964E+03		.043	M/M		
								3	1	2		8.486E+03		.040	M/M		

C O N D E N S E D   T A B L E   O F   M E M B E R   O U T P U T   D A T A

MEM. NO.	TYPE	MATL.	NODES	AREA OR LENGTH	GAGE		CRIT. LOAD COND.	MAX. STRESS	MAX. STRESS RATIO	DES. CONST.	MICROBUCKLING CRIT. LOAD COND.	MICROBUCKLING MAX. STRESS RATIO
5122	5	18	89 103 87 101	31.1559	1	2	2	-8.209E+03	.044	M/M	2	.000
					2	1	2	-6.104E+04	.330	M/M		
					3	2	2	5.855E+03	.028	M/M		
5123	5	18	91 105 89 103	31.0887	1	2	2	-7.509E+04	.406	M/M	2	.000
					2	12	2	-4.511E+04	.244	M/M		
					3	2	2	7.675E+04	.362	M/M		
5124	5	17	91 105 93 107	31.0637	1	2	2	8.600E+04	.406	M/M	2	.000
					2	18	2	-6.354E+04	.343	M/M		
					3	2	2	-4.948E+04	.267	M/M		
5125	5	17	93 107 95 109	23.3736	1	14	2	-2.773E+04	.150	M/M	2	.000
					2	2	2	-1.199E+05	.648	M/M		
					3	14	2	1.170E+04	.055	M/M		
5126	5	17	95 109 97 111	8.3339	1	20	2	-1.191E+04	.064	M/M	2	.000
					2	1	2	-1.439E+04	.078	M/M		
					3	20	2	3.488E+03	.016	M/M		
5131	5	18	88 102 85 99	31.0655	1	1	2	6.030E+03	.028	M/M	4	.000
					2	1	2	1.062E+04	.050	M/M		
					3	1	2	7.458E+03	.035	M/M		
5132	5	18	90 104 88 102	31.1090	1	2	2	1.259E+04	.059	M/M	4	.000
					2	1	2	4.027E+04	.190	M/M		
					3	2	2	-8.512E+03	.046	M/M		
5133	5	18	92 106 90 104	31.0719	1	2	2	7.853E+04	.370	M/M	4	.000
					2	23	2	2.756E+04	.130	M/M		
					3	2	2	-7.872E+04	.425	M/M		
5134	5	17	92 106 94 108	31.0617	1	2	2	-8.478E+04	.458	M/M	4	.000
					2	23	2	4.701E+04	.222	M/M		
					3	2	2	4.472E+04	.211	M/M		
5135	5	17	94 108 96 110	23.3168	1	13	2	2.744E+04	.129	M/M	4	.000
					2	2	2	9.593E+04	.452	M/M		
					3	13	2	-1.066E+04	.058	M/M		
5136	5	17	96 110 97 111	7.9326	1	17	2	1.890E+04	.089	M/M	4	.000
					2	1	2	5.167E+04	.244	M/M		
					3	17	2	-3.306E+03	.018	M/M		
4141	4	7	102 101 99 0	1.9061	5.0000		4	-6.675E-01 1.571E+00 8.104E+00	.054	M/M		

CONDENSED TABLE OF MEMBER OUTPUT DATA

MEM. NO.	TYPE	MATL.	NODES				AREA OR LENGTH	GAGE	CRIT. LOAD COND.	MAX. STRESS			MAX. STRESS RATIO	DES. CONST.	MICROBUCKLING CRIT. LOAD COND.	MICROBUCKLING MAX. STRESS RATIO
6142	6	7	102	101	104	103	5.9921	5.0000	2	-2.039E-01	-1.364E-12	-1.248E+01	.083	M/M		
6143	6	7	104	103	106	105	9.2007	5.0000	2	6.447E-02	5.286E-12	6.326E+00	.042	M/M		
6144	6	13	106	105	108	107	9.8718	5.0000	2	8.474E-02	-5.116E-11	-1.695E+01	.075	M/M		
6145	6	13	108	107	110	109	5.7450	5.0000	2	1.287E+00	-6.048E-11	-3.414E+01	.152	M/M		
4146	4	13	110	109	111	0	.7257	5.0000	4	2.652E+00	-3.629E+00	-9.873E+00	.045	M/M		
1071	1	9	102	101	0	0	.5932	.1000	2	1.580E+02	0.	0.	.053	M/M		
1072	1	9	104	103	0	0	1.2717	.1000	2	1.086E+03	0.	0.	.362	M/M		
1073	1	9	106	105	0	0	1.5918	.1000	2	1.406E+03	0.	0.	.469	M/M		
1074	1	9	108	107	0	0	1.4805	.1000	2	1.157E+03	0.	0.	.386	M/M		
1075	1	9	110	109	0	0	.9034	.1000	2	-2.586E+02	0.	0.	.086	M/M		
6151	6	6	102	116	101	115	3.7528	5.5000	2	1.302E-01	-2.790E-01	-4.320E+01	.144	M/M		
6152	6	6	104	118	103	117	7.7340	5.6000	2	1.543E+00	-2.308E+00	-1.602E+02	.534	M/M		
6153	6	12	106	120	105	119	9.3282	5.8000	2	1.392E+00	-2.005E+00	-1.072E+02	.252	M/M		
6154	6	12	108	122	107	121	8.3870	6.0000	2	1.419E+00	-2.048E+00	-1.138E+02	.268	M/M		
6155	6	12	110	124	109	123	5.0021	3.1000	2	2.862E-01	-4.102E-01	-3.650E+01	.086	M/M		
9153	6	8	106	120	105	119	9.3282	.0100	2	2.656E+02	-3.827E+02	-2.045E+04	.409	M/M		
5141	5	18	101	115	99	113	33.3694	1 1	2		-1.303E+04		.070	M/M	2	.000
								2 1	2		-9.202E+03		.050	M/M		
								3 1	2		-5.192E+03		.028	M/M		
5142	5	18	103	117	101	115	33.3041	1 1	2		-1.306E+04		.071	M/M	2	.000
								2 1	2		-4.363E+04		.236	M/M		
								3 1	2		-4.932E+03		.027	M/M		
5143	5	18	105	119	103	117	33.2323	1 2	2		-9.628E+04		.520	M/M	2	.000
								2 12	2		-4.188E+04		.226	M/M		
								3 2	2		8.692E+04		.410	M/M		

CONDENSED TABLE OF MEMBER OUTPUT DATA

MEM. NO.	TYPE	MATL.	NODES	AREA OR LENGTH	GAGE		CRIT. LOAD COND.	MAX. STRESS	MAX. STRESS RATIO	DES. CONST.	MICROBUCKLING CRIT. LOAD COND.	MICROBUCKLING MAX. STRESS RATIO
5144	5	17	105 119 107 121	33.2056	1	2	2	1.179E+05	.556	M/M	2	.000
					2	25	2	-5.790E+04	.313	M/M		
					3	2	2	-8.193E+04	.443	M/M		
5145	5	17	107 121 109 123	24.9852	1	15	2	-2.863E+04	.155	M/M	2	.000
					2	8	2	-5.747E+04	.311	M/M		
					3	15	2	1.534E+04	.077	M/M		
5146	5	17	109 123 111 125	8.9085	1	30	2	-1.384E+04	.075	M/M	2	.000
					2	3	4	-3.688E+03	.020	M/M		
					3	30	2	8.493E+03	.040	M/M		
5151	5	18	102 116 99 113	33.2075	1	1	2	8.207E+03	.039	M/M	4	.000
					2	1	2	2.339E+04	.110	M/M		
					3	1	2	9.230E+03	.044	M/M		
5152	5	18	104 118 102 116	33.2540	1	1	4	7.435E+03	.035	M/M	4	.000
					2	1	2	3.366E+04	.159	M/M		
					3	1	2	-2.400E+03	.013	M/M		
5153	5	18	106 120 104 118	33.2144	1	2	2	1.016E+05	.479	M/M	4	.000
					2	25	2	2.533E+04	.119	M/M		
					3	2	2	-9.656E+04	.522	M/M		
5154	5	17	106 120 108 122	33.2034	1	2	2	-1.131E+05	.611	M/M	4	.000
					2	27	2	4.975E+04	.235	M/M		
					3	2	2	7.202E+04	.340	M/M		
5155	5	17	108 122 110 124	24.9245	1	14	2	3.313E+04	.156	M/M	4	.000
					2	8	2	4.773E+04	.225	M/M		
					3	14	2	-1.576E+04	.085	M/M		
5156	5	17	110 124 111 125	8.4795	1	19	2	2.240E+04	.106	M/M	4	.000
					2	2	2	1.056E+04	.050	M/M		
					3	19	2	-6.788E+03	.037	M/M		
4161	4	7	116 115 113 0	2.1686		5.0000	2	2.910E+00 -4.310E+00 4.350E+01	.291	M/M		
6162	6	7	116 115 118 117	6.8176		5.0000	4	-4.580E-02 2.558E-12 -2.802E+00	.019	M/M		
6163	6	7	118 117 120 119	10.4680		5.0000	2	-3.974E-01 9.550E-12 -3.899E+01	.260	M/M		
6164	6	13	120 119 122 121	11.2316		5.0000	2	2.085E-01 -5.912E-12 -4.171E+01	.185	M/M		
6165	6	13	122 121 124 123	6.5363		5.0000	2	1.557E+00 1.182E-11 -4.131E+01	.184	M/M		

CONDENSED TABLE OF MEMBER OUTPUT DATA

MEM. NO.	TYPE	MATL.	NODES				AREA OR LENGTH		GAGE	CRIT. LOAD COND.	MAX. STRESS			MAX. STRESS RATIO	DES. CONST.	MICROBUCKLING CRIT. LOAD COND.	MICROBUCKLING MAX. STRESS RATIO
4166	4	13	124	123	125	0	.8257		5.0000	2	-8.981E-01	6.305E+00	1.329E+01	.060	M/M		
1081	1	9	116	115	0	0	.6327		.1000	2	1.352E+02	0.	0.	.045	M/M		
1082	1	9	118	117	0	0	1.3564		.1000	2	1.228E+03	0.	0.	.409	M/M		
1083	1	9	120	119	0	0	1.6978		.1000	2	1.587E+03	0.	0.	.529	M/M		
1084	1	9	122	121	0	0	1.5792		.1000	2	1.424E+03	0.	0.	.475	M/M		
1085	1	9	124	123	0	0	.9636		.1000	2	-6.851E+01	0.	0.	.023	M/M		
6171	6	6	116	130	115	129	3.9949		5.8000	2	2.353E-01	-5.042E-01	-7.807E+01	.260	M/M		
6172	6	6	118	132	117	131	8.2328		6.0000	2	1.169E+00	-1.749E+00	-1.214E+02	.405	M/M		
6173	6	12	120	134	119	133	9.9299		6.2000	2	1.519E+00	-2.189E+00	-1.170E+02	.275	M/M		
6174	6	12	122	136	121	135	8.9280		6.4500	2	1.531E+00	-2.210E+00	-1.228E+02	.289	M/M		
6175	6	12	124	138	123	137	5.3248		3.3000	2	2.628E-01	-3.766E-01	-3.352E+01	.079	M/M		
9173	6	8	120	134	119	133	9.9299		.0100	2	2.899E+02	-4.177E+02	-2.232E+04	.446	M/M		
5161	5	18	115	129	113	127	35.5219	1	1	2		8.306E+03		.039	M/M	2	.000
								2	1	2		-1.269E+04		.069	M/M		
								3	1	2		-3.114E+04		.168	M/M		
5162	5	18	117	131	115	129	35.4524	1	1	2		-2.220E+04		.120	M/M	2	.000
								2	1	2		-4.381E+04		.237	M/M		
								3	1	2		-4.997E+04		.270	M/M		
5163	5	18	119	133	117	131	35.3759	1	2	2		-1.052E+05		.568	M/M	2	.000
								2	6	2		-5.601E+04		.303	M/M		
								3	2	2		5.650E+04		.266	M/M		
5164	5	17	119	133	121	135	35.3475	1	3	2		6.834E+04		.322	M/M	2	.000
								2	26	2		-6.239E+04		.337	M/M		
								3	3	2		-1.120E+05		.606	M/M		
5165	5	17	121	135	123	137	26.5968	1	15	2		-3.619E+04		.196	M/M	2	.000
								2	13	2		-5.275E+04		.285	M/M		
								3	15	2		1.842E+04		.087	M/M		

CONDENSED TABLE OF MEMBER OUTPUT DATA

MEM. NO.	TYPE	MATL.	NODES	AREA OR LENGTH	GAGE		CRIT. LOAD COND.	MAX. STRESS			MAX. STRESS RATIO	DES. CONST.	MICROBUCKLING CRIT. LOAD COND.	MICROBUCKLING MAX. STRESS RATIO
5166	5	17	123 137 125 139	9.4831	1	41	2		-1.164E+04		.063	M/M	2	.000
					2	3	2		-2.641E+04		.143	M/M		
					3	41	2		1.032E+04		.049	M/M		
5171	5	18	116 130 113 127	35.3495	1	1	2		-9.943E+03		.054	M/M	4	.000
					2	1	2		2.240E+04		.106	M/M		
					3	1	2		2.710E+04		.128	M/M		
5172	5	18	118 132 116 130	35.3990	1	1	2		1.821E+04		.086	M/M	4	.000
					2	1	2		6.376E+04		.301	M/M		
					3	1	2		4.376E+04		.206	M/M		
5173	5	18	120 134 118 132	35.3568	1	1	2		1.648E+05		.777	M/M	4	.000
					2	5	2		6.277E+04		.296	M/M		
					3	1	2		-7.548E+04		.408	M/M		
5174	5	17	120 134 122 136	35.3451	1	2	2		-8.890E+04		.481	M/M	4	.000
					2	28	2		6.010E+04		.283	M/M		
					3	2	2		1.890E+05		.891	M/M		
5175	5	17	122 136 124 138	26.5322	1	14	2		3.532E+04		.167	M/M	4	.000
					2	10	2		5.901E+04		.278	M/M		
					3	14	2		-2.110E+04		.114	M/M		
5176	5	17	124 138 125 139	9.0265	1	20	2		2.632E+04		.124	M/M	4	.000
					2	4	2		2.147E+04		.101	M/M		
					3	20	2		-1.313E+04		.071	M/M		
4181	4	7	130 129 127 0	2.4481	5.0000		2	2.852E+00	-2.517E+00	1.237E+01	.083	M/M		
6182	6	7	130 129 132 131	7.6962	5.0000		2	-1.408E+00	-3.638E-12	-8.613E+01	.574	M/M		
6183	6	7	132 131 134 133	11.8172	5.0000		2	-5.392E-01	9.095E-13	-5.290E+01	.353	M/M		
6184	6	13	134 133 136 135	12.6791	5.0000		2	3.375E-01	-4.547E-12	-6.750E+01	.300	M/M		
6185	6	13	136 135 138 137	7.3787	5.0000		2	5.337E+00	1.819E-12	-1.416E+02	.629	M/M		
4186	4	13	138 137 139 0	.9321	5.0000		2	4.762E+01	1.271E+01	-2.468E+01	.132	M/M		
1091	1	9	130 129 0 0	.6723	.1000		2	1.139E+02	0.	0.	.038	M/M		
1092	1	9	132 131 0 0	1.4412	.1000		2	1.057E+03	0.	0.	.352	M/M		
1093	1	9	134 133 0 0	1.8039	.1000		2	2.231E+03	0.	0.	.744	M/M		

CONDENSED TABLE OF MEMBER OUTPUT DATA

MEM. NO.	TYPE	MATL.	NODES				AREA OR LENGTH		GAGE	CRIT. LOAD COND.	MAX. STRESS			MAX. STRESS RATIO	DES. CONST.	MICROBUCKLING CRIT. LOAD COND.	MICROBUCKLING MAX. STRESS RATIO
1094	1	9	136	135	0	0	1.6779		.1000	2	2.435E+03	0.	0.	.812	M/M		
1095	1	9	138	137	0	0	1.0238		.1000	2	9.309E+02	0.	0.	.310	M/M		
6191	6	6	130	144	129	143	4.4552		6.2000	2	-1.369E-01	2.933E-01	4.541E+01	.151	M/M		
6192	6	6	132	148	131	147	10.5379		6.4500	2	1.127E+00	-1.685E+00	-1.171E+02	.390	M/M		
6193	6	12	134	152	133	151	12.7101		6.6000	2	1.593E+00	-2.295E+00	-1.227E+02	.289	M/M		
6194	6	12	136	156	135	155	11.4277		6.9000	2	1.986E+00	-2.866E+00	-1.592E+02	.375	M/M		
6195	6	12	138	158	137	157	6.8156		3.5000	2	6.184E-01	-8.863E-01	-7.887E+01	.186	M/M		
9193	6	8	134	152	133	151	12.7101		.0100	2	3.040E+02	-4.379E+02	-2.341E+04	.468	M/M		
5181	5	18	129	143	127	141	36.7002	1	1	4		-2.647E+03		.014	M/M	2	.000
								2	1	2		-1.138E+03		.006	M/M		
								3	1	4		3.701E+03		.017	M/M		
5182	5	18	131	147	129	143	42.4456	1	1	2		-2.477E+04		.134	M/M	2	.000
								2	1	2		-5.879E+04		.318	M/M		
								3	1	2		-5.600E+04		.303	M/M		
5183	5	18	133	151	131	147	45.2806	1	2	2		-1.231E+05		.666	M/M	2	.000
								2	1	2		-1.096E+05		.593	M/M		
								3	2	2		-3.740E+03		.020	M/M		
5184	5	17	133	151	135	155	45.2442	1	3	2		2.866E+04		.135	M/M	2	.000
								2	28	2		-6.052E+04		.327	M/M		
								3	3	2		-1.447E+05		.782	M/M		
5185	5	17	135	155	137	157	34.0435	1	12	2		-4.115E+04		.222	M/M	2	.000
								2	21	2		-5.605E+04		.303	M/M		
								3	12	2		1.007E+04		.048	M/M		
5186	5	17	137	157	139	159	12.1383	1	43	2		-2.792E+04		.151	M/M	2	.000
								2	3	2		-5.227E+04		.283	M/M		
								3	43	2		6.885E+03		.032	M/M		
5191	5	18	130	144	127	141	36.5221	1	1	2		3.222E+03		.015	M/M	4	.000
								2	1	2		2.975E+03		.014	M/M		
								3	1	2		-2.346E+03		.013	M/M		

CONDENSED TABLE OF MEMBER OUTPUT DATA

MEM. NO.	TYPE	MATL.	NODES	AREA OR LENGTH	GAGE		CRIT. LOAD COND.	MAX. STRESS			MAX. STRESS RATIO	DES. CONST.	MICROBUCKLING CRIT. LOAD COND.	MICROBUCKLING MAX. STRESS RATIO
5192	5	18	132 148 130 144	42.3818	1	1	2		2.582E+04		.122	M/M	4	.000
					2	1	2		7.220E+04		.341	M/M		
					3	1	2		5.923E+04		.279	M/M		
5193	5	18	134 152 132 148	45.2562	1	2	2		1.196E+05		.564	M/M	4	.000
					2	1	2		1.300E+05		.613	M/M		
					3	2	2		-2.249E+03		.012	M/M		
5194	5	17	134 152 136 156	45.2412	1	2	2		-4.924E+04		.266	M/M	4	.000
					2	30	2		5.692E+04		.269	M/M		
					3	2	2		1.816E+05		.857	M/M		
5195	5	17	136 156 138 158	33.9608	1	11	2		3.487E+04		.164	M/M	4	.000
					2	19	2		6.902E+04		.326	M/M		
					3	11	2		-6.542E+03		.035	M/M		
5196	5	17	138 158 139 159	11.5538	1	22	2		6.106E+04		.288	M/M	2	.000
					2	4	2		-8.713E+03		.047	M/M		
					3	22	2		-2.529E+04		.137	M/M		
4201	4	11	144 143 141 0	2.5617		.0800	2	6.455E+01	1.110E+02	2.848E+01	.002	M/M		
6202	6	11	144 143 146 145	6.0887		.0800	2	2.867E+01	-2.619E-10	1.448E+03	.037	M/M		
6203	6	11	146 145 148 147	2.2958		.0800	4	3.863E+01	1.455E-11	3.611E+03	.093	M/M		
6204	6	11	148 147 150 149	9.0880		.0800	2	-1.522E+02	-2.328E-10	-1.321E+04	.339	M/M		
6205	6	11	150 149 152 151	4.6713		.0800	2	-5.527E+01	5.821E-11	-7.548E+03	.194	M/M		
6206	6	11	152 151 154 153	11.1087		.0800	2	5.683E+01	4.657E-10	-2.831E+04	.726	M/M		
6207	6	11	154 153 156 155	3.6445		.0800	2	1.822E+02	-2.910E-11	-1.320E+04	.339	M/M		
6208	6	11	156 155 158 157	8.4570		.0800	2	1.290E+03	0.	-3.422E+04	.878	M/M		
4209	4	11	158 157 159 0	1.0683		.0800	2	2.035E+04	1.834E+04	2.278E+04	.656	M/M		
4211	4	11	157 165 155 0	1.5680		.0800	2	6.219E+03	5.127E+03	7.862E+03	.220	M/M		
6212	6	11	157 165 159 163	1.7409		.0800	2	-1.227E+04	9.313E-10	3.350E+04	.885	M/M		
6213	6	11	164 163 162 161	13.6885		.0800	2	0.	0.	-6.764E+03	.173	M/M		
6214	6	11	158 166 159 164	1.0893		.0966	2	7.975E+03	-9.313E-10	-4.066E+04	1.050	STR		

C O N D E N S E D   T A B L E   O F   M E M B E R   O U T P U T   D A T A

MEM. NO.	TYPE	MATL.	NODES				AREA OR LENGTH	GAGE	CRIT. LOAD COND.	MAX. STRESS			MAX. STRESS RATIO	DES. CONST.	MICROBUCKLING CRIT. LOAD COND.	MICROBUCKLING MAX. STRESS RATIO
4215	4	11	158	166	156	0	1.0750	.0800	2	1.659E+04	1.176E+03	-1.794E+04	.522	M/M		
1101	1	9	144	143	0	0	.7138	.1000	4	4.347E+00	0.	0.	.001	M/M		
1102	1	11	146	145	0	0	1.4016	.0800	4	3.209E+03	0.	0.	.049	M/M		
1103	1	9	148	147	0	0	1.5429	.1000	2	7.535E+02	0.	0.	.251	M/M		
1104	1	11	150	149	0	0	1.8638	.0800	2	3.554E+03	0.	0.	.055	M/M		
1105	1	9	152	151	0	0	1.9313	.1000	2	1.974E+03	0.	0.	.658	M/M		
1106	1	11	154	153	0	0	1.8873	.0800	2	1.693E+04	0.	0.	.260	M/M		
1107	1	9	156	155	0	0	1.7963	.1000	2	4.755E+02	0.	0.	.159	M/M		
1108	1	11	158	157	0	0	1.0961	.0800	2	1.430E+04	0.	0.	.220	M/M		
1201	1	11	157	165	0	0	.5363	.0800	2	4.527E+03	0.	0.	.070	M/M		
1202	1	11	159	163	0	0	1.2500	.0800	2	-1.575E+04	0.	0.	.276	M/M		
1203	1	11	162	161	0	0	2.0000	.0800	2	6.764E+03	0.	0.	.104	M/M		
1204	1	11	159	164	0	0	.7500	.0800	2	1.578E+04	0.	0.	.243	M/M		
1205	1	11	158	166	0	0	.3676	.0800	2	1.620E+04	0.	0.	.249	M/M		
1301	1	11	141	143	0	0	7.2037	.0800	2	8.281E+01	0.	0.	.001	M/M		
1302	1	11	143	145	0	0	5.7706	.0800	4	-3.158E+03	0.	0.	.055	M/M		
1303	1	11	145	147	0	0	1.5614	.0800	2	5.563E+03	0.	0.	.086	M/M		
1304	1	11	147	149	0	0	5.3387	.0800	2	1.878E+02	0.	0.	.003	M/M		
1305	1	11	149	151	0	0	2.4621	.0800	2	-4.436E+04	0.	0.	.778	M/M		
1306	1	11	151	153	0	0	5.8183	.0800	2	2.447E+04	0.	0.	.377	M/M		
1307	1	11	153	155	0	0	1.9796	.0976	2	-5.821E+04	0.	0.	1.021	STR		
1308	1	11	155	157	0	0	5.8658	.0800	2	4.719E+03	0.	0.	.073	M/M		
1309	1	11	157	159	0	0	2.0758	.0800	2	-7.626E+03	0.	0.	.134	M/M		

CONDENSED TABLE OF MEMBER OUTPUT DATA

MICROBUCKLING

MEM. NO.	TYPE	MATL.	NODES				AREA OR LENGTH	GAGE	CRIT. LOAD COND.	MAX. STRESS			MAX. STRESS RATIO	DES. CONST.	CRIT. LOAD COND.	MAX. STRESS RATIO
1311	1	11	141	144	0	0	7.1786	.0800	2	9.073E+01	0.	0.	.001	M/M		
1312	1	11	144	146	0	0	5.7638	.0800	2	-2.650E+03	0.	0.	.046	M/M		
1313	1	11	146	148	0	0	1.5606	.0800	2	-4.795E+03	0.	0.	.084	M/M		
1314	1	11	148	150	0	0	5.3368	.0800	2	-1.117E+03	0.	0.	.020	M/M		
1315	1	11	150	152	0	0	2.4619	.0800	2	4.343E+04	0.	0.	.568	M/M		
1316	1	11	152	154	0	0	5.8183	.0800	2	-3.290E+04	0.	0.	.577	M/M		
1317	1	11	154	156	0	0	1.9790	.0800	2	6.253E+04	0.	0.	.962	M/M		
1318	1	11	156	158	0	0	5.8527	.0800	2	-6.219E+03	0.	0.	.109	M/M		
1319	1	11	158	159	0	0	1.9864	.0800	2	2.317E+04	0.	0.	.356	M/M		
1401	1	11	155	165	0	0	5.8482	.0800	2	2.803E+03	0.	0.	.043	M/M		
1402	1	11	165	163	0	0	1.9493	.0800	2	1.364E+04	0.	0.	.210	M/M		
1403	1	11	163	161	0	0	6.8443	.0800	2	2.315E+04	0.	0.	.356	M/M		
1404	1	11	164	162	0	0	6.8443	.0800	2	-2.315E+04	0.	0.	.406	M/M		
1405	1	11	166	164	0	0	1.9493	.0800	2	1.533E+03	0.	0.	.024	M/M		
1406	1	11	156	166	0	0	5.8491	.0800	2	-3.247E+03	0.	0.	.057	M/M		

NORMAL END OF PROBLEM

LIST OF OVERSTRESSED MEMBERS

6214 1307

S U M M A R Y   O F   F I N A L   M E M B E R   G A G E S   A N D   W E I G H T S

MEMBER	GAGE	WEIGHT	MEMBER	GAGE	WEIGHT
4301	1.000000E-02	3.091468E-04	6302	1.000000E-02	9.718792E-04
6303	1.000000E-02	1.492275E-03	6304	1.000000E-02	1.601122E-03
6305	1.000000E-02	9.317876E-04	4306	1.000000E-02	1.177012E-04
4001	2.500000E+00	1.572852E-03	6002	2.500000E+00	4.944648E-03
6003	2.500000E+00	7.592278E-03	6004	2.500000E+00	8.146058E-03
6005	2.500000E+00	4.740674E-03	4006	2.500000E+00	5.988305E-04
1001	1.000000E-01	4.113603E-02	1002	1.000000E-01	8.818524E-02
1003	1.000000E-01	1.103816E-01	1004	1.000000E-01	1.026687E-01
1005	1.000000E-01	6.264674E-02	6011	3.000000E+00	7.163034E-03
6012	3.100000E+00	1.525390E-02	6013	3.200000E+00	1.899169E-02
6014	3.300000E+00	1.760917E-02	6015	1.700000E+00	5.410295E-03
9013	1.000000E-02	2.916288E-03	5001	2 1 2 0 0 0	2.608091E-02
5002	3 1 3 0 0 0	3.644181E-02	5003	3 2 3 0 0 0	4.155794E-02
5004	2 1 2 0 0 0	2.595286E-02	5005	1 1 1 0 0 0	1.171677E-02
5006	1 1 1 0 0 0	4.177630E-03	5011	2 1 2 0 0 0	2.595436E-02
5012	3 1 3 0 0 0	3.638696E-02	5013	3 4 3 0 0 0	5.191943E-02
5014	2 1 2 0 0 0	2.595115E-02	5015	1 1 1 0 0 0	1.168831E-02
5016	1 1 1 0 0 0	3.976467E-03	4021	5.000000E+00	3.980944E-03
6022	5.000000E+00	1.251507E-02	6023	5.000000E+00	1.921630E-02
6024	5.000000E+00	2.061793E-02	6025	5.000000E+00	1.199879E-02
4026	5.000000E+00	1.515659E-03	1011	1.000000E-01	4.627610E-02
1012	1.000000E-01	9.920417E-02	1013	1.000000E-01	1.241739E-01
1014	1.000000E-01	1.154972E-01	1015	1.000000E-01	7.047455E-02

SUMMARY OF FINAL MEMBER GAGES AND WEIGHTS

MEMBER	GAGE						WEIGHT	MEMBER	GAGE						WEIGHT
6031	3.300000E+00						8.805980E-03	6032	3.400000E+00						1.869761E-02
6033	3.500000E+00						2.321504E-02	6034	3.600000E+00						2.146918E-02
6035	1.900000E+00						6.757931E-03	9033	1.000000E-02						3.259254E-03
5021	2	1	2	0	0	0	2.914813E-02	5022	3	1	3	0	0	0	4.072752E-02
5023	3	4	3	0	0	0	5.805665E-02	5024	3	3	3	0	0	0	5.220904E-02
5025	1	1	1	0	0	0	1.309471E-02	5026	1	1	1	0	0	0	4.668937E-03
5031	2	1	2	0	0	0	2.900670E-02	5032	3	1	3	0	0	0	4.066521E-02
5033	3	6	3	0	0	0	6.963043E-02	5034	3	3	3	0	0	0	5.220559E-02
5035	1	1	1	0	0	0	1.306290E-02	5036	1	1	1	0	0	0	4.444117E-03
4041	5.000000E+00						4.914398E-03	6042	5.000000E+00						1.544962E-02
6043	5.000000E+00						2.372217E-02	6044	5.000000E+00						2.545246E-02
6045	5.000000E+00						1.481230E-02	4046	5.000000E+00						1.871056E-03
1021	1.000000E-01						5.141604E-02	1022	1.000000E-01						1.102230E-01
1023	1.000000E-01						1.379661E-01	1024	1.000000E-01						1.283259E-01
1025	1.000000E-01						7.830238E-02	6051	3.700000E+00						1.091232E-02
6052	3.800000E+00						2.309633E-02	6053	3.950000E+00						2.895681E-02
6054	4.100000E+00						2.702396E-02	6055	2.100000E+00						8.255277E-03
9053	1.000000E-02						3.602221E-03	5041	2	1	2	0	0	0	3.221534E-02
5042	3	1	3	0	0	0	4.501322E-02	5043	3	6	3	0	0	0	7.699905E-02
5044	3	6	3	0	0	0	7.693723E-02	5045	3	1	3	0	0	0	3.376950E-02
5046	1	1	1	0	0	0	5.160243E-03	5051	2	1	2	0	0	0	3.205903E-02
5052	3	1	3	0	0	0	4.494546E-02	5053	3	10	3	0	0	0	1.026101E-01
5054	3	6	3	0	0	0	7.693215E-02	5055	2	1	2	0	0	0	2.406248E-02

SUMMARY OF FINAL MEMBER GAGES AND WEIGHTS

MEMBER	GAGE	WEIGHT	MEMBER	GAGE	WEIGHT
5056	1 1 1 0 0 0	4.911766E-03	4061	5.000000E+00	5.946078E-03
6062	5.000000E+00	1.869299E-02	6063	5.000000E+00	2.870222E-02
6064	5.000000E+00	3.079575E-02	6065	5.000000E+00	1.792187E-02
4066	5.000000E+00	2.263849E-03	1031	1.000000E-01	5.655598E-02
1032	1.000000E-01	1.212419E-01	1033	1.000000E-01	1.517585E-01
1034	1.000000E-01	1.411544E-01	1035	1.000000E-01	8.613020E-02
6071	4.000000E+00	1.292030E-02	6072	4.150000E+00	2.762517E-02
6073	4.300000E+00	3.452388E-02	6074	4.450000E+00	3.212346E-02
6075	2.300000E+00	9.902329E-03	9073	1.000000E-02	3.945191E-03
5061	2 1 2 0 0 0	3.528256E-02	5062	3 1 3 0 0 0	4.929892E-02
5063	3 8 3 0 0 0	9.838516E-02	5064	3 9 3 0 0 0	1.053280E-01
5065	6 1 6 0 0 0	6.868586E-02	5066	5 1 5 0 0 0	2.072234E-02
5071	2 1 2 0 0 0	3.511136E-02	5072	3 1 3 0 0 0	4.922471E-02
5073	3 15 3 0 0 0	1.474982E-01	5074	3 10 3 0 0 0	1.123425E-01
5075	5 1 5 0 0 0	5.797763E-02	5076	3 1 3 0 0 0	1.255195E-02
4081	5.000000E+00	7.075909E-03	6082	5.000000E+00	2.224515E-02
6083	5.000000E+00	3.415642E-02	6084	5.000000E+00	3.664775E-02
6085	5.000000E+00	2.132749E-02	4086	5.000000E+00	2.694037E-03
1041	1.000000E-01	6.169605E-02	1042	1.000000E-01	1.322608E-01
1043	1.000000E-01	1.655510E-01	1044	1.000000E-01	1.539829E-01
1045	1.000000E-01	9.395789E-02	6091	4.450000E+00	1.562340E-02
6092	4.550000E+00	3.292085E-02	6093	4.700000E+00	4.101585E-02
6094	4.850000E+00	3.805456E-02	6095	2.500000E+00	1.169909E-02

SUMMARY OF FINAL MEMBER GAGES AND WEIGHTS

MEMBER	GAGE	WEIGHT	MEMBER	GAGE	WEIGHT
9093	1.000000E-02	4.288157E-03	5081	2 1 2 0 0 0	3.834978E-02
5082	3 1 3 0 0 0	5.358462E-02	5083	3 10 3 0 0 0	1.222149E-01
5084	3 12 3 0 0 0	1.373814E-01	5085	9 1 9 0 0 0	1.091140E-01
5086	10 1 10 0 0 0	4.299997E-02	5091	2 1 2 0 0 0	3.816370E-02
5092	3 1 3 0 0 0	5.350396E-02	5093	3 18 3 0 0 0	1.832236E-01
5094	3 14 3 0 0 0	1.526359E-01	5095	8 1 8 0 0 0	9.739114E-02
5096	8 1 8 0 0 0	3.313334E-02	4101	5.000000E+00	8.304132E-03
6102	5.000000E+00	2.610611E-02	6103	5.000000E+00	4.008473E-02
6104	5.000000E+00	4.300847E-02	6105	5.000000E+00	2.502917E-02
4106	5.000000E+00	3.161626E-03	1051	1.000000E-01	6.683599E-02
1052	1.000000E-01	1.432796E-01	1053	1.000000E-01	1.793432E-01
1054	1.000000E-01	1.668115E-01	1055	1.000000E-01	1.017857E-01
6111	4.800000E+00	1.820005E-02	6112	4.900000E+00	3.828877E-02
6113	5.050000E+00	4.759494E-02	6114	5.250000E+00	4.448771E-02
6115	2.700000E+00	1.364557E-02	9113	1.000000E-02	4.631123E-03
5101	2 1 2 0 0 0	4.141700E-02	5102	3 1 3 0 0 0	5.787033E-02
5103	2 12 2 0 0 0	1.319897E-01	5104	2 15 2 0 0 0	1.566119E-01
5105	12 1 12 0 0 0	1.550538E-01	5106	15 1 15 0 0 0	6.855298E-02
5111	2 1 2 0 0 0	4.121604E-02	5112	3 1 3 0 0 0	5.778321E-02
5113	2 21 2 0 0 0	2.061227E-01	5114	2 18 2 0 0 0	1.813281E-01
5115	11 1 11 0 0 0	1.423030E-01	5116	13 1 13 0 0 0	5.683239E-02
4121	5.000000E+00	9.630508E-03	6122	5.000000E+00	3.027589E-02
6123	5.000000E+00	4.648722E-02	6124	5.000000E+00	4.987796E-02

S U M M A R Y   O F   F I N A L   M E M B E R   G A G E S   A N D   W E I G H T S

MEMBER	GAGE	WEIGHT	MEMBER	GAGE	WEIGHT
6125	5.000000E+00	2.902694E-02	4126	5.000000E+00	3.666615E-03
1061	1.000000E-01	7.197606E-02	1062	1.000000E-01	1.542986E-01
1063	1.000000E-01	1.931355E-01	1064	1.000000E-01	1.796401E-01
1065	1.000000E-01	1.096135E-01	6131	5.200000E+00	2.117690E-02
6132	5.300000E+00	4.448140E-02	6133	5.450000E+00	5.516877E-02
6134	5.650000E+00	5.142291E-02	6135	2.900000E+00	1.574176E-02
9133	1.000000E-02	4.974091E-03	5121	1 1 1 0 0 0	2.669053E-02
5122	2 1 2 0 0 0	4.439716E-02	5123	2 12 2 0 0 0	1.417644E-01
5124	2 18 2 0 0 0	1.947696E-01	5125	14 2 14 0 0 0	1.998440E-01
5126	20 1 20 0 0 0	9.738137E-02	5131	1 1 1 0 0 0	2.656102E-02
5132	2 1 2 0 0 0	4.433033E-02	5133	2 23 2 0 0 0	2.390985E-01
5134	2 23 2 0 0 0	2.390196E-01	5135	13 2 13 0 0 0	1.860680E-01
5136	17 1 17 0 0 0	7.912751E-02	4141	5.000000E+00	1.105511E-02
6142	5.000000E+00	3.475446E-02	6143	5.000000E+00	5.336384E-02
6144	5.000000E+00	7.848045E-02	6145	5.000000E+00	4.567242E-02
4146	5.000000E+00	5.769232E-03	1071	1.000000E-01	7.711613E-02
1072	1.000000E-01	1.653174E-01	1073	1.000000E-01	2.069279E-01
1074	1.000000E-01	1.924698E-01	1075	1.000000E-01	1.174414E-01
6151	5.500000E+00	2.394304E-02	6152	5.600000E+00	5.023983E-02
6153	5.800000E+00	8.602438E-02	6154	6.000000E+00	8.001222E-02
6155	3.100000E+00	2.465551E-02	9153	1.000000E-02	5.317057E-03
5141	1 1 1 0 0 0	2.853086E-02	5142	1 1 1 0 0 0	2.847503E-02
5143	2 12 2 0 0 0	1.515392E-01	5144	2 25 2 0 0 0	2.744443E-01

SUMMARY OF FINAL MEMBER GAGES AND WEIGHTS

MEMBER	GAGE	WEIGHT	MEMBER	GAGE	WEIGHT
5145	15 8 15 0 0 0	2.705896E-01	5146	30 3 30 0 0 0	1.599522E-01
5151	1 1 1 0 0 0	2.839243E-02	5152	1 1 1 0 0 0	2.843216E-02
5153	2 25 2 0 0 0	2.745168E-01	5154	2 27 2 0 0 0	2.933521E-01
5155	14 8 14 0 0 0	2.557254E-01	5156	19 2 19 0 0 0	9.666677E-02
4161	5.000000E+00	1.257792E-02	6162	5.000000E+00	3.954180E-02
6163	5.000000E+00	6.071458E-02	6164	5.000000E+00	8.929096E-02
6165	5.000000E+00	5.196371E-02	4166	5.000000E+00	6.563937E-03
1081	1.000000E-01	8.225607E-02	1082	1.000000E-01	1.763362E-01
1083	1.000000E-01	2.207201E-01	1084	1.000000E-01	2.052973E-01
1085	1.000000E-01	1.252692E-01	6171	5.800000E+00	2.687765E-02
6172	6.000000E+00	5.730049E-02	6173	6.200000E+00	9.788862E-02
6174	6.450000E+00	9.156123E-02	6175	3.300000E+00	2.793915E-02
9173	1.000000E-02	5.660024E-03	5161	1 1 1 0 0 0	3.037119E-02
5162	1 1 1 0 0 0	3.031176E-02	5163	2 6 2 0 0 0	1.008212E-01
5164	3 26 3 0 0 0	3.223689E-01	5165	15 13 15 0 0 0	3.259439E-01
5166	41 3 41 0 0 0	2.297289E-01	5171	1 1 1 0 0 0	3.022383E-02
5172	1 1 1 0 0 0	3.026613E-02	5173	1 5 1 0 0 0	7.053682E-02
5174	2 28 2 0 0 0	3.223476E-01	5175	14 10 14 0 0 0	2.873438E-01
5176	20 4 20 0 0 0	1.131923E-01	4181	5.000000E+00	1.419895E-02
6182	5.000000E+00	4.463797E-02	6183	5.000000E+00	6.853954E-02
6184	5.000000E+00	1.007998E-01	6185	5.000000E+00	5.866081E-02
4186	5.000000E+00	7.409900E-03	1091	1.000000E-01	8.739601E-02
1092	1.000000E-01	1.873551E-01	1093	1.000000E-01	2.345126E-01

SUMMARY OF FINAL MEMBER GAGES AND WEIGHTS

MEMBER	GAGE	WEIGHT	MEMBER	GAGE	WEIGHT
1094	1.000000E-01	2.181258E-01	1095	1.000000E-01	1.330970E-01
6191	6.200000E+00	3.204156E-02	6192	6.450000E+00	7.884457E-02
6193	6.600000E+00	1.333796E-01	6194	6.900000E+00	1.253735E-01
6195	3.500000E+00	3.792906E-02	9193	1.000000E-02	7.244748E-03
5181	1 1 1 0 0 0	3.137863E-02	5182	1 1 1 0 0 0	3.629103E-02
5183	2 1 2 0 0 0	6.452483E-02	5184	3 28 3 0 0 0	4.384165E-01
5185	12 21 12 0 0 0	4.366081E-01	5186	43 3 43 0 0 0	3.078872E-01
5191	1 1 1 0 0 0	3.122638E-02	5192	1 1 1 0 0 0	3.623640E-02
5193	2 1 2 0 0 0	6.449005E-02	5194	2 30 2 0 0 0	4.383875E-01
5195	11 19 11 0 0 0	3.968323E-01	5196	22 4 22 0 0 0	1.580557E-01
4201	8.000000E-02	2.049389E-02	6202	8.000000E-02	4.870965E-02
6203	8.000000E-02	1.836639E-02	6204	8.000000E-02	7.270368E-02
6205	8.000000E-02	3.737008E-02	6206	8.000000E-02	8.886988E-02
6207	8.000000E-02	2.915560E-02	6208	8.000000E-02	6.765582E-02
4209	8.000000E-02	8.546128E-03	4211	8.000000E-02	1.254399E-02
6212	8.000000E-02	1.392758E-02	6213	8.000000E-02	1.095083E-01
6214	9.655305E-02	1.051740E-02	4215	8.000000E-02	8.599631E-03
1101	1.000000E-01	9.279309E-02	1102	8.000000E-02	1.121246E-02
1103	1.000000E-01	2.005778E-01	1104	8.000000E-02	1.491074E-02
1105	1.000000E-01	2.510634E-01	1106	8.000000E-02	1.509851E-02
1107	1.000000E-01	2.335200E-01	1108	8.000000E-02	8.768632E-03
1201	8.000000E-02	4.290192E-03	1202	8.000000E-02	1.000000E-02
1203	8.000000E-02	1.600000E-02	1204	8.000000E-02	6.000000E-03

S U M M A R Y   O F   F I N A L   M E M B E R   G A G E S   A N D   W E I G H T S

MEMBER	GAGE	WEIGHT	MEMBER	GAGE	WEIGHT
1205	8.000000E-02	2.941176E-03	1301	8.000000E-02	5.762994E-02
1302	8.000000E-02	4.616501E-02	1303	8.000000E-02	1.249120E-02
1304	8.000000E-02	4.270954E-02	1305	8.000000E-02	1.969682E-02
1306	8.000000E-02	4.654668E-02	1307	9.755183E-02	1.931152E-02
1308	8.000000E-02	4.692672E-02	1309	8.000000E-02	1.660547E-02
1311	8.000000E-02	5.742844E-02	1312	8.000000E-02	4.611066E-02
1313	8.000000E-02	1.248516E-02	1314	8.000000E-02	4.269476E-02
1315	8.000000E-02	1.969485E-02	1316	8.000000E-02	4.654632E-02
1317	8.000000E-02	1.583191E-02	1318	8.000000E-02	4.682135E-02
1319	8.000000E-02	1.589117E-02	1401	8.000000E-02	4.678595E-02
1402	8.000000E-02	1.559400E-02	1403	8.000000E-02	5.475414E-02
1404	8.000000E-02	5.475414E-02	1405	8.000000E-02	1.559400E-02
1406	8.000000E-02	4.679316E-02			

TOTAL WEIGHT OF STRUCTURE AT END OF STRESS CONSTRAINT MODE (AFTER 1 CYCLES) = .241308E+02

******************** STEP 1 FROM PROGRAM SBMAIN ********************

STACK THE ELEMENT STIFFNESSES TO OBTAIN THE STIFFNESS MATRIX (KS)

THE TOTAL STIFFNESS MATRIX WAS STACKED IN 2 BLOCKS

******************** STEP 2 FROM PROGRAM SBMAIN ********************

SOLVE THE EQUATION KS = L * LT. SPLIT THE STIFFNESS MATRIX TO OBTAIN
THE STIFFNESS MATRIX LOWER TRIANGLE (L) AND THE TRANSPOSE OF THE
STIFFNESS MATRIX LOWER TRIANGLE (LT) BY THE CHOLESKY FACTORIZATION METHOD

LOWER TRIANGLE EXCEEDS STORAGE IN CORE

```
******************** STEP  3  FROM PROGRAM SBMAIN  ********************

SOLVE THE EQUATION L * ZT = T.  USING THE DYNAMIC TRANSFORMATION MATRIX
INPUT (T) SOLVE FOR THE INTERMEDIATE SOLUTION (ZT) BY THE FORWARD
SOLUTION METHOD

******************** STEP  4  FROM PROGRAM SBMAIN  ********************

REVERSE THE ORDER OF THE STIFFNESS MATRIX LOWER TRIANGLE (LT) TO OBTAIN
THE REVERSE STIFFNESS MATRIX LOWER TRIANGLE (LTR) FOR USE IN THE
SOLUTION OF  LTR * YR = ZTR  FOR YR.

******************** STEP  5  FROM PROGRAM SBMAIN  ********************

REVERSE THE ORDER OF THE INTERMEDIATE SOLUTION (ZT) TO OBTAIN THE
REVERSE INTERMEDIATE SOLUTION (ZTR) FOR USE IN THE SOLUTION OF
LTR * YR = ZTR  FOR YR.

******************** STEP  6  FROM PROGRAM SBMAIN  ********************

SOLVE LTR * YR = ZTR.  USING THE REVERSED SOLUTIONS LTR AND ZTR OBTAINED
PREVIOUSLY SOLVE FOR THE REVERSED DEFLECTIONS (YR) DUE TO THE
TRANSFORMATION MATRIX INPUT.  USE THE BACKWARD SOLUTION METHOD
TOTAL MATRIX EXCEEDS STORAGE IN CORE
TOTAL MATRIX EXCEEDS STORAGE IN CORE

******************** STEP  7  FROM PROGRAM SBMAIN  ********************

REVERSE THE ORDER OF THE REVERSE DEFLECTIONS (YR) TO OBTAIN THE
DEFLECTIONS (Y)

******************** STEP  8  FROM PROGRAM SBMAIN  ********************

SOLVE KF = TT * Y.  USING THE TRANSPOSE OF THE DYNAMIC TRANSFORMATION
MATRIX (TT) AND THE DEFLECTIONS (Y) SOLVE FOR THE FLEXIBILITY MATRIX (KF)
```

**** FASTOP ****
FLUTTER AND STRENGTH
OPTIMIZATION PROGRAM

AIR FORCE
FLIGHT DYNAMICS LABORATORY

MAY 1978

FASTOP

GRUMMAN
AEROSPACE
CORPORATION

**** FASTOP ****
FLUTTER AND STRENGTH
OPTIMIZATION PROGRAM

**** FOP ****
FLUTTER OPTIMIZATION PROGRAM

AIR FORCE
FLIGHT DYNAMICS LABORATORY

MAY 1978

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GRUMMAN
AEROSPACE
CORPORATION

PROGRAM LISTING OF CARD DATA

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CARD    .........1.........2.........3.........4.........5.........6.........7.........8
 NO.    12345678901234567890123456789012345678901234567890123456789012345678901234567890

  1     FOP    6  PACAGE  LINESI
  2     FLUTTER ANALYSIS, NASA FORWARD SWEPT RESEARCH WING ON A BQM-34F(VA,FA)
  3     FIRST PASS, FLEXIBILITY APPROACH, PLOTS, RODDEN, K METHOD,SMOOTHED
  4        0      KTITLE
  5        0    0    3    4    0    0    0    0    0    0
  6        0    0    0    0    0    0   27   28    0    0          KLUE(I)
  7        0    0  -33
  8     VA00   AUTOMATED VIBRATION ANALYSIS MODULE
  9     VA   REDUCED GRID (FLEXIBILITY APPROACH)
 10        0    0    0    4   -5                                 KLUEV(I),I= 1,6
 11        8   24    4      ROOTS, NDOFF, NZERO
 12        1    2    2    3    3    4    4    5    5    6        IDFV(I)
 13        6    7    7    9    8   10    9   11   10   12        IDFV(I)
 14       11   13   12   14   13   16   14   17   15   18        IDFV(I)
 15       16   19   17   20   18   21   19   23   20   24        IDFV(I)
 16       21   25   22   26   23   27   24   28                  IDFV(I)
 17     FA00   AUTOMATED FLUTTER ANALYSIS MODULE
 18     FA   RODDEN AERODYNAMIC THEORY, K FLUTTER METHOD WITH PLOTS
 19        0    0    0    0    0    0    0    0    0    0   KLUEF(I)
 20         1     8     1     9     1     0     0     1     0     0     LC(I),I=01,10
 21         1     1     0     0     1     0     0     0     0     0     LC(I),I=11,20
 22         1     0     1     1     0     0     0     0     0     0     LC(I),I=21,30
 23         0     0     0     0     0     0     0                       LC(I),I=31,37
 24         3                IN
 25         1     2     3     4     5     6     7     8
 26       19.50     0.90                BR,FMACH
 27      0.2        0.5       0.8       1.1        1.4       1.7       2.0
 28     2.3         2.6
 29       0.2        -.50      1500.0    300.0         GMAX,GMIN,VMAX,FMAX
 30       1.0                                                                   RHO
 31       30.6      1800.                   FL,ACAP
 32         1    1     0  480     0     0     1       NDELT,NP,NB,NCORE,N3,N4,N7
 33       0.0           0.0          0.0          0.0      X0,Y0,Z0,GMAS
 34     249.12427  288.1093  230.5617  247.7017  9.00       60.00      X1,X2,X3,X4,Y1,Y2
 35       0.0        0.0         11   7     0.0                        Z1,Z2,NS,NC,COEFF
 36       0.0        0.05        0.20      0.40       0.60      0.80    TH(I),I=1,6
 37     1.0
 38       0.15       0.25        0.3333    0.4166     0.500     0.5833  TAU(I),I=1,6
 39       0.6666     0.75        0.83333   0.9166     1.0               TAU(I),I=7,11
 40       10    0     0     0     0     0
 41        1  6   0     7 12   0   13 18   0   19 24   0   25 30   0   31 36   0
 42       37 42   0    43 48   0   49 54   0   55 60   0
 43        F   60     0                            KSURF,NBOXS,NCS
 44        4    0     0     0                   NLINES,NELAXS,NICH,NISP
 45        7 249.12427  9.0        230.56178  60.0       NGP,XTERM1,YTERM1,XTERM2,YTER2
 46       9.0        15.0       20.0      30.0       40.0      50.0      60.0

        .........1.........2.........3.........4.........5.........6.........7.........8
        12345678901234567890123456789012345678901234567890123456789012345678901234567890
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CARD   .........1.........2.........3.........4.........5.........6.........7.........8
 NO.   12345678901234567890123456789012345678901234567890123456789012345678901234567890

 47      7 256.92     9.0       233.99     60.0        NGP,XTER1,YTER1,XTER2,YTER2
 48     9.0     15.0      20.0      30.0      40.0      50.0      60.0
 49      7 272.52     9.0       240.85     60.0       NGP(3)
 50     9.0     15.0      20.0      30.0      40.0      50.0      60.0
 51      7 288.109    9.0       247.7      60.0        NGP(4)
 52     9.0     15.0      20.0      30.0      40.0      50.0      60.0
 53      1 KLUGLB

       .........1.........2.........3.........4.........5.........6.........7.........8
       12345678901234567890123456789012345678901234567890123456789012345678901234567890
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**** FASTOP ****
FLUTTER AND STRENGTH
OPTIMIZATION PROGRAM

**** FOP ****
FLUTTER OPTIMIZATION PROGRAM

**** AVAM ****
AUTOMATED
VIBRATION ANALYSIS MODULE

AIR FORCE
FLIGHT DYNAMICS LABORATORY

MAY 1978

GRUMMAN
AEROSPACE
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PAGES 9 THROUGH 12 MISSING FROM ORIGINAL DOCUMENT.

MATRIX NAME= MD (24 X 24) PRINT LOWER TRIANGLE
(MASS MATRIX TO BE USED IN VIBRATION ANALYSIS)

ROW	COL	VALUE	VALUE	VALUE	VALUE	VALUE	VALUE	VALUE
1	1	7.097075E-01						
2	1	-5.117239E-03	7.305376E-01					
3	1	-2.691503E-02	1.418397E-01	6.453762E-01				
4	1	9.168717E-04	-5.007828E-03	1.029798E-01	2.877876E-01			
5	1	1.310402E-04	-3.234059E-04	7.132978E-03	2.198108E-02	9.814944E-02		
6	1	-5.934884E-05	4.029981E-05	-5.692986E-04	1.806230E-03	8.717788E-03	4.853547E-02	
7	1	5.497758E-02	-2.583274E-02	-2.119514E-02	-8.793840E-04	2.044096E-04	8.345982E-08	1.383799E+00
8	1	-3.578576E-02	5.298062E-02	-8.866029E-02	-1.041485E-02	7.491613E-04	-2.029650E-05	1.260039E-01
8	8	1.248141E+00						
9	1	3.887654E-03	9.858083E-03	-5.739099E-01	-1.461274E-01	-4.249395E-03	2.887313E-04	4.805721E-02
9	8	3.351385E-01	3.064693E+00					
10	1	1.360160E-02	-6.377665E-02	-1.544733E-01	-2.706331E-01	-6.916699E-02	1.559476E-03	-3.089994E-04
10	8	2.634243E-02	6.140720E-01	1.776457E+00				
11	1	-1.663763E-03	3.198906E-03	-4.119486E-02	-4.419338E-02	-1.365789E-01	-2.200822E-02	-1.394560E-03
11	8	-6.995464E-03	-1.497826E-03	3.290094E-01	1.214228E+00			
12	1	1.298499E-04	-1.612036E-04	3.981186E-03	-1.538303E-02	-4.789916E-03	-1.000479E-01	3.947322E-05
12	8	1.429232E-04	-2.052415E-03	-9.706860E-03	1.344597E-01	6.073635E-01		
13	1	-3.822057E-03	-7.057242E-03	5.061197E-03	-1.878545E-04	-6.053578E-04	-1.378924E-04	9.360817E-02
13	8	-2.192224E-03	-3.414137E-02	-3.807713E-03	9.710287E-04	1.178514E-04	7.361516E-01	
14	1	-3.014923E-02	-1.906774E-02	-4.704764E-02	1.423716E-04	1.131821E-03	9.257126E-06	8.429095E-02
14	8	1.683465E-01	1.619056E-01	-1.373805E-02	-6.281875E-03	1.861576E-04	2.817313E-02	9.486461E-01

MATRIX NAME= MD (24 X 24) PRINT LOWER TRIANGLE
(MASS MATRIX TO BE USED IN VIBRATION ANALYSIS)

ROW	COL	VALUE	VALUE	VALUE	VALUE	VALUE	VALUE	VALUE
15	1	-1.012738E-02	-5.488598E-02	-1.318932E-01	-3.997841E-03	3.597816E-03	-1.034246E-04	3.000069E-02
15	8	9.181264E-02	3.202699E-01	-3.942937E-03	-1.923800E-02	7.113369E-04	-4.260951E-02	3.030149E-01
15	15	1.092556E+00						
16	1	2.875630E-03	-3.356109E-02	-1.085177E-01	-7.445568E-02	2.140170E-03	6.318151E-04	1.786513E-03
16	8	3.477210E-03	1.411357E-01	1.350264E-01	-2.678324E-02	-4.541804E-03	-2.953989E-04	-3.328209E-02
16	15	1.796364E-01	8.723521E-01					
17	1	-4.782280E-05	1.443688E-03	-2.373793E-02	-8.803305E-02	-5.953837E-02	5.823234E-03	-1.277175E-03
17	8	-4.324104E-03	-7.831219E-03	1.271940E-01	1.001007E-01	-2.819438E-02	2.363083E-03	-4.886216E-03
17	15	-2.899001E-02	1.288380E-01	7.001912E-01				
18	1	2.627340E-04	4.419790E-04	3.841091E-03	-1.333418E-02	-3.433891E-02	-1.368359E-02	-6.398067E-05
18	8	-3.072109E-04	-6.463231E-03	-1.539372E-02	8.666203E-02	-8.906652E-03	7.879616E-04	-7.399038E-05
18	15	9.511629E-04	-1.868733E-02	8.832566E-02	2.745846E-01			
19	1	-5.643278E-04	6.117739E-04	1.597852E-04	1.231105E-04	5.867561E-05	1.124438E-05	-7.206905E-04
19	8	-1.629069E-04	4.045192E-04	-1.349595E-04	-8.049922E-05	-9.346517E-06	-3.694411E-02	8.459563E-03
19	15	-2.128153E-05	-1.411739E-04	-1.826808E-04	-5.965889E-05	6.039393E-02		
20	1	3.441111E-03	1.438638E-03	2.529092E-03	8.336508E-05	-4.073898E-05	-3.039327E-06	-1.561702E-02
20	8	-1.289707E-02	-6.904491E-03	1.217257E-04	1.813651E-04	-1.422889E-06	3.468559E-02	2.949278E-02
20	15	8.802576E-04	-8.796656E-04	2.148252E-04	1.960955E-05	1.232328E-03	4.835377E-02	
21	1	-1.295927E-03	9.558363E-04	9.501759E-03	1.297674E-03	-1.301162E-05	3.352604E-06	-4.968994E-03
21	8	-1.365458E-02	-3.483508E-02	-4.253342E-03	3.348274E-04	5.872524E-06	3.788060E-03	4.971819E-02
21	15	5.324234E-02	8.278772E-04	-5.362135E-04	5.779110E-05	-1.143061E-04	5.962900E-03	5.625303E-02
22	1	-1.334097E-03	-2.578828E-03	4.500392E-03	3.676718E-03	7.962147E-04	-2.908558E-05	2.315325E-04
22	8	-4.865972E-03	-2.920615E-02	-1.758832E-02	-4.088823E-03	1.053350E-04	-1.698605E-03	6.307559E-04
22	15	5.417257E-02	5.634372E-02	6.018006E-04	-3.438373E-04	-2.300622E-05	-6.087422E-05	5.589714E-03
22	22	5.737263E-02						
23	1	-7.308902E-05	-5.369388E-04	-1.140184E-03	-2.722053E-03	1.866503E-03	5.724114E-04	-3.047597E-04
23	8	-1.629300E-03	-9.664377E-03	-4.827303E-03	-1.351662E-02	-2.927056E-03	3.552123E-04	-1.870608E-03
23	15	-2.249350E-03	4.525950E-02	4.789194E-02	-3.721166E-04	-2.089779E-05	3.801852E-05	-2.894136E-05
23	22	3.480180E-03	4.649231E-02					
24	1	2.347236E-05	2.831757E-04	7.505314E-04	-2.285356E-03	-3.884552E-03	2.860111E-03	-3.181965E-05

MATRIX NAME= MD (24 X 24) PRINT LOWER TRIANGLE
(MASS MATRIX TO BE USED IN VIBRATION ANALYSIS)

ROW	COL	VALUE	VALUE	VALUE	VALUE	VALUE	VALUE	VALUE
24	8	-1.992366E-04	-3.056138E-03	-6.209417E-03	2.851016E-03	-1.081020E-02	1.907996E-04	-3.777065E-05
24	15	-2.702510E-05	-4.404120E-03	3.915634E-02	2.522883E-02	-1.365436E-05	5.672249E-06	2.644008E-05
24	22	-1.075331E-04	1.939552E-03	2.364737E-02				

M	FREQUENCIES, CPS
1	40.4275
2	105.3595
3	144.3544
4	213.1469
5	294.0645
6	337.0482
7	363.3346
8	426.6627

NORMALIZED EIGEN VECTORS FOR ALL REQUESTED DEGREES OF FREEDOM (ABSOLUTE MOTION)

IOLD	M = 1	2	3	4	5	6	7	8
1	2.712177E-02	-7.549283E-03	-1.300646E-01	-2.274855E-03	2.046879E-01	-3.371469E-03	2.355145E-02	-8.429530E-02
2	6.427574E-02	-1.522877E-02	-2.582002E-01	-1.348464E-02	3.206127E-01	-1.036013E-03	4.695725E-02	-1.702611E-04
3	1.805161E-01	-9.272162E-04	-5.228213E-01	-7.362341E-02	2.426666E-01	2.773503E-02	4.545729E-02	3.381151E-01
4	3.698704E-01	1.052380E-01	-6.633175E-01	-1.375901E-01	-2.659212E-01	8.159306E-02	-8.257065E-02	1.633800E-01
5	6.486854E-01	4.174887E-01	-5.269089E-01	8.010193E-02	-7.160659E-01	4.669618E-02	-1.680900E-01	-5.518826E-01
6	1.000000E+00	1.000000E+00	-6.022672E-02	1.000000E+00	-3.694496E-01	-4.323481E-01	3.786862E-01	-4.154219E-01
7	3.648139E-02	-5.799126E-02	-6.139452E-02	6.382236E-02	1.918112E-01	-1.428603E-03	-3.853037E-02	-4.242016E-01
8	7.806202E-02	-9.954115E-02	-1.407583E-01	7.850961E-02	2.962487E-01	-8.156083E-03	-5.515728E-03	-3.359171E-01
9	1.937587E-01	-1.311553E-01	-2.966107E-01	3.174624E-03	1.741568E-01	-1.450962E-02	5.226235E-02	1.980854E-01
10	3.780507E-01	-5.065964E-02	-3.706833E-01	-1.347529E-01	-1.474805E-01	2.225071E-02	-1.585735E-02	1.067831E-01
11	6.441561E-01	2.271735E-01	-2.346060E-01	-6.859068E-02	-3.613903E-01	6.889061E-02	-1.276248E-01	-2.898020E-01
12	9.844647E-01	7.806281E-01	1.723988E-01	6.473307E-01	3.826144E-02	-2.068738E-01	2.044391E-01	3.177534E-02
13	2.015409E-02	-8.032710E-02	1.053976E-02	1.229751E-01	3.498350E-02	6.430229E-02	-8.026405E-02	-9.537429E-02
14	6.456550E-02	-1.889976E-01	1.543173E-02	2.386230E-01	4.218642E-02	1.004535E-01	-1.094996E-01	-9.235208E-02
15	1.950365E-01	-3.473575E-01	2.408959E-02	2.305884E-01	-7.054913E-02	-1.647893E-02	-7.729185E-03	1.417774E-01
16	3.781681E-01	-3.584240E-01	9.042432E-02	-5.489599E-02	-1.830934E-01	-1.151406E-01	9.473145E-02	-4.708042E-02
17	6.321018E-01	-1.436021E-01	2.785707E-01	-3.006493E-01	3.323739E-02	4.045010E-02	-3.023060E-02	-1.928737E-01
18	9.556126E-01	3.636105E-01	6.155767E-01	4.229993E-02	6.831954E-01	1.197116E-01	-3.607177E-02	5.747300E-01
19	-6.984619E-03	8.537559E-03	1.704490E-02	2.745906E-02	-3.168291E-01	1.000000E+00	1.000000E+00	-8.991270E-01
20	-2.821269E-03	-5.181049E-02	5.859522E-02	1.901830E-01	-3.628725E-01	9.530627E-01	4.252942E-01	-6.154173E-02
21	1.299271E-01	-4.272244E-01	2.016628E-01	6.249316E-01	-4.943724E-01	4.832764E-01	-3.282517E-01	1.000000E+00
22	3.325821E-01	-6.276519E-01	3.508628E-01	2.816718E-01	-5.853454E-01	-2.291875E-01	1.370792E-01	3.104887E-01
23	5.943547E-01	-5.363246E-01	6.211110E-01	-4.122552E-01	-1.634774E-01	-1.765669E-01	1.767570E-01	-6.953387E-01
24	9.240933E-01	-4.052969E-02	1.000000E+00	-4.525607E-01	1.000000E+00	2.753719E-01	-1.438645E-01	5.159794E-01

GENERALIZED MASS, LBS
(NORMALIZATION/LARGEST VALUE IN EACH MODE IS UNITY)

MN =	1	2	3	4	5	6	7	8
1	2.592592E+00	-5.273559E-16	6.328271E-14	-1.565414E-14	-2.420286E-14	6.217249E-15	-5.551115E-15	2.042810E-14
2	-5.273559E-16	1.096850E+00	1.930400E-14	-1.239980E-14	3.157197E-14	2.844947E-15	5.013351E-16	5.884182E-15
3	6.328271E-14	1.930400E-14	1.229013E+00	-2.220446E-14	3.752554E-14	1.071365E-14	-3.330569E-16	3.308465E-14
4	-1.565414E-14	-1.239980E-14	-2.220446E-14	6.016879E-01	-3.885781E-15	6.133982E-15	1.984524E-15	4.363176E-14
5	-2.420286E-14	3.157197E-14	3.752554E-14	-3.885781E-15	9.458282E-01	3.885781E-15	-1.210143E-14	7.327472E-15
6	6.217249E-15	2.844947E-15	1.071365E-14	6.133982E-15	3.885781E-15	2.100029E-01	8.132384E-15	7.410739E-15
7	-5.551115E-15	5.013351E-16	-3.330669E-16	1.984524E-15	-1.210143E-14	8.132384E-15	1.558602E-01	-1.097733E-14
8	2.042810E-14	5.884182E-15	3.308465E-14	4.363176E-14	7.327472E-15	7.410739E-15	-1.097733E-14	9.615235E-01

NORMALIZED EIGEN VECTORS FOR REDUCED DEGREES OF FREEDOM (ABSOLUTE MOTION)

INEW	IOLD	M = 1	2	3	4	5	6	7	8
1	NONE	0.	0.	0.	0.	0.	0.	0.	0.
2	1	2.712177E-02	-7.549283E-03	-1.300646E-01	-2.274855E-03	2.046879E-01	-3.371469E-03	2.355145E-02	-8.429530E-02
3	2	6.427574E-02	-1.522877E-02	-2.582002E-01	-1.348464E-02	3.205127E-01	-1.036013E-03	4.695725E-02	-1.702611E-04
4	3	1.805161E-01	-9.272162E-04	-5.228213E-01	-7.362341E-02	2.426666E-01	2.773503E-02	4.545729E-02	3.381151E-01
5	4	3.698704E-01	1.052380E-01	-6.633175E-01	-1.375901E-01	-2.659212E-01	8.159306E-02	-8.257065E-02	1.633800E-01
6	5	6.486854E-01	4.174887E-01	-5.269089E-01	8.010193E-02	-7.160659E-01	4.669618E-02	-1.680900E-01	-5.518826E-01
7	6	1.000000E+00	1.000000E+00	-6.022672E-02	1.000000E+00	-3.694496E-01	-4.323481E-01	3.786862E-01	-4.154219E-01
8	NONE	0.	0.	0.	0.	0.	0.	0.	0.
9	7	3.648139E-02	-5.799126E-02	-6.139452E-02	6.382236E-02	1.918112E-01	-1.428603E-03	-3.853037E-02	-4.242016E-01
10	8	7.806202E-02	-9.954115E-02	-1.407583E-01	7.850961E-02	2.962487E-01	-8.156083E-03	-5.515728E-03	-3.359171E-01
11	9	1.937587E-01	-1.311553E-01	-2.966107E-01	3.174624E-03	1.741568E-01	-1.450962E-02	5.226235E-02	1.980854E-01
12	10	3.780507E-01	-5.065964E-02	-3.706833E-01	-1.347529E-01	-1.474805E-01	2.225071E-02	-1.585735E-02	1.067831E-01
13	11	6.441561E-01	2.271735E-01	-2.346060E-01	-6.859068E-02	-3.613903E-01	6.889061E-02	-1.276248E-01	-2.898020E-01
14	12	9.844647E-01	7.806281E-01	1.723988E-01	6.473307E-01	3.826144E-02	-2.068738E-01	2.044391E-01	3.177534E-02
15	NONE	0.	0.	0.	0.	0.	0.	0.	0.
16	13	2.015409E-02	-8.032710E-02	1.053976E-02	1.229751E-01	3.498350E-02	6.430229E-02	-8.026405E-02	-9.537429E-02
17	14	6.456550E-02	-1.889976E-01	1.543173E-02	2.386230E-01	4.218642E-02	1.004535E-01	-1.094996E-01	-9.235208E-02
18	15	1.950365E-01	-3.473575E-01	2.408959E-02	2.305884E-01	-7.054913E-02	-1.647893E-02	-7.729185E-03	1.417774E-01
19	16	3.781681E-01	-3.584240E-01	9.042432E-02	-5.489599E-02	-1.830934E-01	-1.151406E-01	9.473145E-02	-4.708042E-02
20	17	6.321018E-01	-1.436021E-01	2.785707E-01	-3.006493E-01	3.323739E-02	4.045010E-02	-3.023060E-02	-1.928737E-01
21	18	9.556126E-01	3.636105E-01	6.155767E-01	4.229993E-02	6.831954E-01	1.197116E-01	-3.607177E-02	5.747300E-01
22	NONE	0.	0.	0.	0.	0.	0.	0.	0.
23	19	-6.984619E-03	8.537559E-03	1.704490E-02	2.745906E-02	-3.168291E-01	1.000000E+00	1.000000E+00	-8.991270E-01
24	20	-2.821269E-03	-5.181049E-02	5.859522E-02	1.901830E-01	-3.628725E-01	9.530627E-01	4.252942E-01	-6.154173E-02
25	21	1.299271E-01	-4.272244E-01	2.016628E-01	6.249316E-01	-4.943724E-01	4.832764E-01	-3.282517E-01	1.000000E+00
26	22	3.325821E-01	-6.276519E-01	3.508628E-01	2.816718E-01	-5.853454E-01	-2.291875E-01	1.370792E-01	3.104887E-01
27	23	5.943547E-01	-5.363246E-01	6.211110E-01	-4.122552E-01	-1.634774E-01	-1.765669E-01	1.767570E-01	-6.953387E-01
28	24	9.240933E-01	-4.052969E-02	1.000000E+00	-4.525607E-01	1.000000E+00	2.753719E-01	-1.438645E-01	5.159794E-01

**** FASTOP ****
FLUTTER AND STRENGTH
OPTIMIZATION PROGRAM

**** FOP ****
FLUTTER OPTIMIZATION PROGRAM

**** AFAM ****
AUTOMATED
FLUTTER ANALYSIS MODULE

AIR FORCE
FLIGHT DYNAMICS LABORATORY

MAY 1978

GRUMMAN
AEROSPACE
CORPORATION

ENTER VIBRATION DATA FOR FLUTTER ANALYSIS

VIBRATION DATA HAS BEEN ENTERED FROM ONE FILE ON TAPE

GENERALIZED MASS, FREQUENCY, AND GENERALIZED MODAL STIFFNESS

GENERALIZED MASS, LB

MODE	MODE= 1	2	3	4	5	6	7	8
1	2.592592E+00	-5.273559E-16	6.328271E-14	-1.565414E-14	-2.420286E-14	6.217249E-15	-5.551115E-15	2.042810E-14
2	-5.273559E-16	1.096850E+00	1.930400E-14	-1.239980E-14	3.157197E-14	2.844947E-15	5.013351E-16	5.884182E-15
3	6.328271E-14	1.930400E-14	1.229013E+00	-2.220446E-14	3.752554E-14	1.071365E-14	-3.330669E-16	3.308465E-14
4	-1.565414E-14	-1.239980E-14	-2.220446E-14	6.016879E-01	-3.885781E-15	6.133982E-15	1.984524E-15	4.363176E-14
5	-2.420286E-14	3.157197E-14	3.752554E-14	-3.885781E-15	9.458282E-01	3.885781E-15	-1.210143E-14	7.327472E-15
6	6.217249E-15	2.844947E-15	1.071365E-14	6.133982E-15	3.885781E-15	2.100029E-01	8.132384E-15	7.410739E-15
7	-5.551115E-15	5.013351E-16	-3.330669E-16	1.984524E-15	-1.210143E-14	8.132384E-15	1.558602E-01	-1.097733E-14
8	2.042810E-14	5.884182E-15	3.308465E-14	4.363176E-14	7.327472E-15	7.410739E-15	-1.097733E-14	9.615235E-01

MODE	FREQUENCY CYC/SEC	FREQUENCY RAD/SEC	DAMPING NO UNITS
1	4.042748E+01	2.540133E+02	0.
2	1.053595E+02	6.619930E+02	0.
3	1.443544E+02	9.070051E+02	0.
4	2.131469E+02	1.339241E+03	0.
5	2.940645E+02	1.847661E+03	0.
6	3.370482E+02	2.117736E+03	0.
7	3.633346E+02	2.282898E+03	0.
8	4.266627E+02	2.680800E+03	0.

COMPLEX GENERALIZED MODAL STIFFNESS, (REAL, IMAG), LB/IN

MODE	MODE= 1	2	3	4
1	(2.5926E+00, 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
2	(0. , 0.)	(7.4497E+00, 0.)	(0. , 0.)	(0. , 0.)
3	(0. , 0.)	(0. , 0.)	(1.5670E+01, 0.)	(0. , 0.)
4	(0. , 0.)	(0. , 0.)	(0. , 0.)	(1.6725E+01, 0.)
5	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
6	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
7	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
8	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)

MODE	MODE= 5	6	7	8
1	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
2	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
3	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
4	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)

COMPLEX GENERALIZED MODAL STIFFNESS, (REAL, IMAG), LB/IN

MODE	MODE= 5	6	7	8
5	(5.0043E+01, 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)

COMPLEX GENERALIZED MODAL STIFFNESS, (REAL, IMAG), LB/IN

MODE	MODE= 5	6	7	8
6	(0. , 0.)	(1.4597E+01, 0.)	(0. , 0.)	(0. , 0.)
7	(0. , 0.)	(0. , 0.)	(1.2589E+01, 0.)	(0. , 0.)
8	(0. , 0.)	(0. , 0.)	(0. , 0.)	(1.0710E+02, 0.)

SUBSONIC UNSTEADY AERODYNAMICS USING DOUBLET LATTICE PROCEDURE

SURFACE AND BODY GEOMETRY AND ASSOCIATED PARAMETERS

```
REFERENCE CHORD     =  30.60000  IN
REFERENCE SEMI-SPAN =  12.00000  IN
REFERENCE AREA      =1800.00000  IN**2
MACH NUMBER         =     .90000
BETA                =     .43589
```

INPUT VALUES FOR PANEL 1

```
XCAP(1) = 249.12427,  YCAP(1) =   9.00000,  NC    =  7
XCAP(2) = 288.10930,  YCAP(2) =  60.00000,  NS    = 11
XCAP(3) = 230.56170,  ZCAP(1) =   0.00000,  NDELT =  1
XCAP(4) = 247.70170,  ZCAP(2) =   0.00000,  NOPAN =  1
```

PANEL 1 HAS 7 CHORDWISE DIVISIONS - TH(I)

1	0.	5.000000E-02	2.000000E-01	4.000000E-01	6.000000E-01	8.000000E-01	1.000000E+00

PANEL 1 HAS 11 SPANWISE DIVISIONS - TAU(I)

1	1.500000E-01	2.500000E-01	3.333000E-01	4.166000E-01	5.000000E-01	5.833000E-01	6.666000E-01	7.500000E-01
9	8.333300E-01	9.166000E-01	1.000000E+00					

PANEL 1 HAS 60 ELEMENTS WITH 77 VERTICES.
THE X COORDINATES OF THESE VERTICES ARE

1	2.463399E+02	2.481253E+02	2.534815E+02	2.606232E+02	2.677648E+02	2.749065E+02	2.820482E+02	2.444836E+02
9	2.461598E+02	2.511884E+02	2.578931E+02	2.645979E+02	2.713026E+02	2.780074E+02	2.429374E+02	2.445226E+02
17	2.492782E+02	2.556190E+02	2.619598E+02	2.683006E+02	2.746414E+02	2.413911E+02	2.428853E+02	2.473680E+02
25	2.533449E+02	2.593217E+02	2.652986E+02	2.712755E+02	2.398430E+02	2.412461E+02	2.454555E+02	2.510680E+02
33	2.566805E+02	2.622930E+02	2.679055E+02	2.382967E+02	2.396089E+02	2.435453E+02	2.487939E+02	2.540424E+02
41	2.592910E+02	2.645395E+02	2.367505E+02	2.379716E+02	2.416351E+02	2.465197E+02	2.514043E+02	2.562890E+02
49	2.611736E+02	2.352023E+02	2.363324E+02	2.397226E+02	2.442428E+02	2.487631E+02	2.532833E+02	2.578036E+02
57	2.336555E+02	2.346946E+02	2.378117E+02	2.419679E+02	2.461241E+02	2.502803E+02	2.544364E+02	2.321098E+02
65	2.330579E+02	2.359022E+02	2.396946E+02	2.434869E+02	2.472793E+02	2.510717E+02	2.305517E+02	2.314187E+02
73	2.339897E+02	2.374177E+02	2.408457E+02	2.442737E+02	2.477017E+02			

PANEL 1 HAS 60 ELEMENTS WITH 77 VERTICES.
THE Y COORDINATES OF THESE VERTICES ARE

1	1.665000E+01	1.665000E+01	1.665000E+01	1.665000E+01	1.665000E+01	1.665000E+01	1.665000E+01	2.175000E+01
9	2.175000E+01	2.175000E+01	2.175000E+01	2.175000E+01	2.175000E+01	2.175000E+01	2.599830E+01	2.599830E+01
17	2.599830E+01	2.599830E+01	2.599830E+01	2.599830E+01	2.599830E+01	3.024660E+01	3.024660E+01	3.024660E+01
25	3.024660E+01	3.024660E+01	3.024660E+01	3.024660E+01	3.450000E+01	3.450000E+01	3.450000E+01	3.450000E+01
33	3.450000E+01	3.450000E+01	3.450000E+01	3.874830E+01	3.874830E+01	3.874830E+01	3.874830E+01	3.874830E+01
41	3.874830E+01	3.874830E+01	4.299660E+01	4.299660E+01	4.299660E+01	4.299660E+01	4.299660E+01	4.299660E+01
49	4.299660E+01	4.725000E+01	4.725000E+01	4.725000E+01	4.725000E+01	4.725000E+01	4.725000E+01	4.725000E+01
57	5.149983E+01	5.149983E+01	5.149983E+01	5.149983E+01	5.149983E+01	5.149983E+01	5.149983E+01	5.574660E+01

PANEL 1 HAS 60 ELEMENTS WITH 77 VERTICES.
THE Y COORDINATES OF THESE VERTICES ARE

65	5.574660E+01	5.574660E+01	5.574660E+01	5.574660E+01	5.574660E+01	5.574660E+01	6.000000E+01	6.000000E+01
73	6.000000E+01	6.000000E+01	6.000000E+01	6.000000E+01	6.000000E+01			

PANEL 1 HAS 60 ELEMENTS WITH 77 VERTICES.
THE Z COORDINATES OF THESE VERTICES ARE

1	0.	0.	0.	0.	0.	0.	0.	0.
9	0.	0.	0.	0.	0.	0.	0.	0.
17	0.	0.	0.	0.	0.	0.	0.	0.
25	0.	0.	0.	0.	0.	0.	0.	0.
33	0.	0.	0.	0.	0.	0.	0.	0.
41	0.	0.	0.	0.	0.	0.	0.	0.
49	0.	0.	0.	0.	0.	0.	0.	0.
57	0.	0.	0.	0.	0.	0.	0.	0.
65	0.	0.	0.	0.	0.	0.	0.	0.
73	0.	0.	0.	0.	0.			

PANEL 1 HAS 10 XI-J ELEMENTS - XIJ(I)

1	2.454118E+02	2.437105E+02	2.421642E+02	2.406170E+02	2.390699E+02	2.375236E+02	2.359764E+02	2.344289E+02
9	2.328827E+02	2.313358E+02						

PANEL 1 HAS 10 C.WIGGLES - CWIG(I)

1	3.461602E+01	3.261393E+01	3.079424E+01	2.897345E+01	2.715267E+01	2.533298E+01	2.351220E+01	2.169108E+01
9	1.987139E+01	1.805094E+01						

INTERPOLATED MODES FOR PRIMARY AND CONTROL SURFACES

INTERPOLATED MODES, PRIMARY SURFACES, SURF = 1, MODE = 1

POINT	X INCHES	Y INCHES	H NO UNITS	ALPHA RAD/FT
1	2.4671E+02	1.9200E+01	6.1121E-02	3.0933E-02
2	2.5104E+02	1.9200E+01	6.9450E-02	1.5359E-02
3	2.5753E+02	1.9200E+01	7.1669E-02	-6.9417E-03
4	2.6445E+02	1.9200E+01	6.1137E-02	-2.9326E-02
5	2.7137E+02	1.9200E+01	3.8110E-02	-5.0261E-02
6	2.7830E+02	1.9200E+01	3.4214E-03	-6.9748E-02
7	2.4493E+02	2.3874E+01	1.0547E-01	3.2965E-02
8	2.4901E+02	2.3874E+01	1.1472E-01	2.1149E-02
9	2.5513E+02	2.3874E+01	1.2025E-01	-1.5489E-04
10	2.6165E+02	2.3874E+01	1.1292E-01	-2.7615E-02
11	2.6817E+02	2.3874E+01	8.9343E-02	-5.9965E-02
12	2.7469E+02	2.3874E+01	4.6849E-02	-9.7204E-02
13	2.4332E+02	2.8122E+01	1.5678E-01	3.0834E-02
14	2.4717E+02	2.8122E+01	1.6559E-01	2.3521E-02
15	2.5294E+02	2.8122E+01	1.7304E-01	6.1385E-03
16	2.5910E+02	2.8122E+01	1.6963E-01	-2.0884E-02
17	2.6526E+02	2.8122E+01	1.5010E-01	-5.6661E-02
18	2.7142E+02	2.8122E+01	1.0997E-01	-1.0119E-01
19	2.4170E+02	3.2373E+01	2.2081E-01	2.8237E-02
20	2.4533E+02	3.2373E+01	2.2875E-01	2.3670E-02
21	2.5076E+02	3.2373E+01	2.3656E-01	9.3687E-03
22	2.5655E+02	3.2373E+01	2.3543E-01	-1.5743E-02
23	2.6235E+02	3.2373E+01	2.1972E-01	-5.1028E-02
24	2.6814E+02	3.2373E+01	1.8451E-01	-9.6487E-02
25	2.4009E+02	3.6624E+01	2.9892E-01	2.5266E-02
26	2.4348E+02	3.6624E+01	3.0561E-01	2.1396E-02
27	2.4857E+02	3.6624E+01	3.1227E-01	8.6129E-03
28	2.5400E+02	3.6624E+01	3.1136E-01	-1.4251E-02
29	2.5943E+02	3.6624E+01	2.9794E-01	-4.6643E-02
30	2.6486E+02	3.6624E+01	2.6770E-01	-8.8561E-02
31	2.3847E+02	4.0872E+01	3.9236E-01	1.8597E-02
32	2.4164E+02	4.0872E+01	3.9695E-01	1.5583E-02
33	2.4639E+02	4.0872E+01	4.0123E-01	4.8416E-03
34	2.5146E+02	4.0872E+01	3.9942E-01	-1.4845E-02
35	2.5652E+02	4.0872E+01	3.8750E-01	-4.3027E-02
36	2.6159E+02	4.0872E+01	3.6189E-01	-7.9703E-02
37	2.3686E+02	4.5123E+01	5.0297E-01	5.2497E-03
38	2.3980E+02	4.5123E+01	5.0430E-01	5.0100E-03
39	2.4421E+02	4.5123E+01	5.0511E-01	-1.8960E-03
40	2.4891E+02	4.5123E+01	5.0152E-01	-1.7921E-02
41	2.5361E+02	4.5123E+01	4.8990E-01	-4.2883E-02
42	2.5831E+02	4.5123E+01	4.6675E-01	-7.6784E-02

POINT	X INCHES	Y INCHES	H NO UNITS	ALPHA RAD/FT
43	2.3524E+02	4.9375E+01	6.2812E-01	-1.1585E-02
44	2.3795E+02	4.9375E+01	6.2587E-01	-8.9482E-03
45	2.4202E+02	4.9375E+01	6.2260E-01	-1.1704E-02
46	2.4636E+02	4.9375E+01	6.1651E-01	-2.3520E-02
47	2.5070E+02	4.9375E+01	6.0449E-01	-4.4498E-02
48	2.5504E+02	4.9375E+01	5.8323E-01	-7.4639E-02
49	2.3363E+02	5.3623E+01	7.6655E-01	-3.0193E-02
50	2.3611E+02	5.3623E+01	7.6084E-01	-2.5511E-02
51	2.3984E+02	5.3623E+01	7.5325E-01	-2.4647E-02
52	2.4381E+02	5.3623E+01	7.4412E-01	-3.1873E-02
53	2.4779E+02	5.3623E+01	7.3121E-01	-4.7507E-02
54	2.5176E+02	5.3623E+01	7.1172E-01	-7.1551E-02
55	2.3201E+02	5.7873E+01	9.1729E-01	-4.8217E-02
56	2.3427E+02	5.7873E+01	9.0869E-01	-4.3625E-02
57	2.3765E+02	5.7873E+01	8.9690E-01	-4.0847E-02
58	2.4126E+02	5.7873E+01	8.8438E-01	-4.3320E-02
59	2.4487E+02	5.7873E+01	8.7027E-01	-5.1405E-02
60	2.4848E+02	5.7873E+01	8.5288E-01	-6.5102E-02

INTERPOLATED MODES, PRIMARY SURFACES, SURF = 1, MODE = 2

POINT	X INCHES	Y INCHES	H NO UNITS	ALPHA RAD/FT
1	2.4671E+02	1.9200E+01	-3.0025E-02	-1.4445E-01
2	2.5104E+02	1.9200E+01	-7.9951E-02	-1.3058E-01
3	2.5753E+02	1.9200E+01	-1.4036E-01	-8.8543E-02
4	2.6445E+02	1.9200E+01	-1.7180E-01	-1.5629E-02
5	2.7137E+02	1.9200E+01	-1.5282E-01	8.6268E-02
6	2.7830E+02	1.9200E+01	-6.6686E-02	2.1715E-01
7	2.4493E+02	2.3874E+01	-3.6663E-02	-1.9713E-01
8	2.4901E+02	2.3874E+01	-1.0272E-01	-1.8940E-01
9	2.5513E+02	2.3874E+01	-1.9086E-01	-1.5116E-01
10	2.6165E+02	2.3874E+01	-2.5400E-01	-7.5106E-02
11	2.6817E+02	2.3874E+01	-2.6591E-01	3.7346E-02
12	2.7469E+02	2.3874E+01	-2.0680E-01	1.8619E-01
13	2.4332E+02	2.8122E+01	-3.2162E-02	-2.4362E-01
14	2.4717E+02	2.8122E+01	-1.0957E-01	-2.3717E-01
15	2.5294E+02	2.8122E+01	-2.1730E-01	-2.0639E-01
16	2.5910E+02	2.8122E+01	-3.0887E-01	-1.4566E-01
17	2.6526E+02	2.8122E+01	-3.6189E-01	-5.6142E-02
18	2.7142E+02	2.8122E+01	-3.6158E-01	6.2175E-02
19	2.4170E+02	3.2373E+01	-1.4136E-02	-2.8548E-01
20	2.4533E+02	3.2373E+01	-9.9974E-02	-2.8198E-01
21	2.5076E+02	3.2373E+01	-2.2367E-01	-2.6140E-01
22	2.5655E+02	3.2373E+01	-3.4054E-01	-2.1915E-01
23	2.6235E+02	3.2373E+01	-4.3195E-01	-1.5595E-01
24	2.6814E+02	3.2373E+01	-4.8778E-01	-7.1800E-02
25	2.4009E+02	3.6624E+01	2.4497E-02	-3.2553E-01
26	2.4348E+02	3.6624E+01	-6.7940E-02	-3.2704E-01

POINT	X INCHES	Y INCHES	H NO UNITS	ALPHA RAD/FT
27	2.4857E+02	3.6624E+01	-2.0514E-01	-3.1736E-01
28	2.5400E+02	3.6624E+01	-3.4347E-01	-2.9126E-01
29	2.5943E+02	3.6624E+01	-4.6630E-01	-2.4886E-01
30	2.6486E+02	3.6624E+01	-5.6626E-01	-1.9017E-01
31	2.3847E+02	4.0872E+01	9.3773E-02	-3.7441E-01
32	2.4164E+02	4.0872E+01	-5.5181E-03	-3.7752E-01
33	2.4639E+02	4.0872E+01	-1.5480E-01	-3.7542E-01
34	2.5146E+02	4.0872E+01	-3.1128E-01	-3.6422E-01
35	2.5652E+02	4.0872E+01	-4.6107E-01	-3.4377E-01
36	2.6159E+02	4.0872E+01	-6.0027E-01	-3.1408E-01
37	2.3686E+02	4.5123E+01	2.0276E-01	-4.4404E-01
38	2.3980E+02	4.5123E+01	9.4441E-02	-4.4065E-01
39	2.4421E+02	4.5123E+01	-6.6776E-02	-4.3737E-01
40	2.4891E+02	4.5123E+01	-2.3787E-01	-4.3625E-01
41	2.5361E+02	4.5123E+01	-4.0900E-01	-4.3759E-01
42	2.5831E+02	4.5123E+01	-5.8115E-01	-4.4139E-01
43	2.3524E+02	4.9375E+01	3.5485E-01	-5.2680E-01
44	2.3795E+02	4.9375E+01	2.3732E-01	-5.1444E-01
45	2.4202E+02	4.9375E+01	6.4748E-02	-5.0591E-01
46	2.4636E+02	4.9375E+01	-1.1848E-01	-5.1005E-01
47	2.5070E+02	4.9375E+01	-3.0568E-01	-5.2785E-01
48	2.5504E+02	4.9375E+01	-5.0179E-01	-5.5931E-01
49	2.3363E+02	5.3623E+01	5.5517E-01	-6.2093E-01
50	2.3611E+02	5.3623E+01	4.2890E-01	-6.0042E-01
51	2.3984E+02	5.3623E+01	2.4540E-01	-5.8455E-01
52	2.4381E+02	5.3623E+01	5.1901E-02	-5.8733E-01
53	2.4779E+02	5.3623E+01	-1.4588E-01	-6.1045E-01
54	2.5176E+02	5.3623E+01	-3.5470E-01	-6.5391E-01
55	2.3201E+02	5.7873E+01	8.0921E-01	-7.2419E-01
56	2.3427E+02	5.7873E+01	6.7533E-01	-7.0093E-01
57	2.3765E+02	5.7873E+01	4.8117E-01	-6.7839E-01
58	2.4126E+02	5.7873E+01	2.7865E-01	-6.7070E-01
59	2.4487E+02	5.7873E+01	7.5915E-02	-6.7988E-01
60	2.4848E+02	5.7873E+01	-1.3212E-01	-7.0592E-01

INTERPOLATED MODES, PRIMARY SURFACES, SURF = 1, MODE = 3

POINT	X INCHES	Y INCHES	H NO UNITS	ALPHA RAD/FT
1	2.4671E+02	1.9200E+01	-2.1426E-01	2.0201E-01
2	2.5104E+02	1.9200E+01	-1.4613E-01	1.7577E-01
3	2.5753E+02	1.9200E+01	-6.1996E-02	1.3505E-01
4	2.6445E+02	1.9200E+01	2.9558E-03	8.9806E-02
5	2.7137E+02	1.9200E+01	4.1270E-02	4.2704E-02
6	2.7830E+02	1.9200E+01	5.1872E-02	-6.2593E-03
7	2.4493E+02	2.3874E+01	-3.3251E-01	3.1396E-01
8	2.4901E+02	2.3874E+01	-2.3237E-01	2.7562E-01
9	2.5513E+02	2.3874E+01	-1.0647E-01	2.1856E-01
10	2.6165E+02	2.3874E+01	-4.0762E-03	1.5829E-01

POINT	X INCHES	Y INCHES	H NO UNITS	ALPHA RAD/FT
11	2.6817E+02	2.3874E+01	6.5724E-02	9.8633E-02
12	2.7469E+02	2.3874E+01	1.0326E-01	3.9588E-02
13	2.4332E+02	2.8122E+01	-4.3551E-01	4.3016E-01
14	2.4717E+02	2.8122E+01	-3.0622E-01	3.7644E-01
15	2.5294E+02	2.8122E+01	-1.4345E-01	3.0116E-01
16	2.5910E+02	2.8122E+01	-8.0001E-03	2.2787E-01
17	2.6526E+02	2.8122E+01	9.1689E-02	1.6181E-01
18	2.7142E+02	2.8122E+01	1.5933E-01	1.0298E-01
19	2.4170E+02	3.2373E+01	-5.2318E-01	5.4189E-01
20	2.4533E+02	3.2373E+01	-3.6902E-01	4.8014E-01
21	2.5076E+02	3.2373E+01	-1.7173E-01	3.9244E-01
22	2.5655E+02	3.2373E+01	-3.5048E-03	3.0541E-01
23	2.6235E+02	3.2373E+01	1.2432E-01	2.2512E-01
24	2.6814E+02	3.2373E+01	2.1499E-01	1.5155E-01
25	2.4009E+02	3.6624E+01	-5.8411E-01	6.4079E-01
26	2.4348E+02	3.6624E+01	-4.1129E-01	5.8107E-01
27	2.4857E+02	3.6624E+01	-1.8410E-01	4.8954E-01
28	2.5400E+02	3.6624E+01	1.4863E-02	3.8933E-01
29	2.5943E+02	3.6624E+01	1.6788E-01	2.8647E-01
30	2.6486E+02	3.6624E+01	2.7375E-01	1.8095E-01
31	2.3847E+02	4.0872E+01	-6.0523E-01	7.2514E-01
32	2.4164E+02	4.0872E+01	-4.2065E-01	6.7288E-01
33	2.4639E+02	4.0872E+01	-1.7146E-01	5.8410E-01
34	2.5146E+02	4.0872E+01	5.2764E-02	4.7567E-01
35	2.5652E+02	4.0872E+01	2.2822E-01	3.5306E-01
36	2.6159E+02	4.0872E+01	3.4890E-01	2.1627E-01
37	2.3686E+02	4.5123E+01	-5.7320E-01	7.8666E-01
38	2.3980E+02	4.5123E+01	-3.8533E-01	7.4591E-01
39	2.4421E+02	4.5123E+01	-1.2509E-01	6.6735E-01
40	2.4891E+02	4.5123E+01	1.1627E-01	5.6052E-01
41	2.5361E+02	4.5123E+01	3.1110E-01	4.2989E-01
42	2.5831E+02	4.5123E+01	4.5008E-01	2.7546E-01
43	2.3524E+02	4.9375E+01	-4.8829E-01	8.2714E-01
44	2.3795E+02	4.9375E+01	-3.0427E-01	7.9970E-01
45	2.4202E+02	4.9375E+01	-4.3260E-02	7.3605E-01
46	2.4636E+02	4.9375E+01	2.0611E-01	6.3841E-01
47	2.5070E+02	4.9375E+01	4.1464E-01	5.1008E-01
48	2.5504E+02	4.9375E+01	5.7122E-01	3.5103E-01
49	2.3363E+02	5.3623E+01	-3.4628E-01	8.4421E-01
50	2.3611E+02	5.3623E+01	-1.7290E-01	8.2896E-01
51	2.3984E+02	5.3623E+01	7.8013E-02	7.8256E-01
52	2.4381E+02	5.3623E+01	3.2472E-01	7.0194E-01
53	2.4779E+02	5.3623E+01	5.3942E-01	5.8919E-01
54	2.5176E+02	5.3623E+01	7.1145E-01	4.4432E-01
55	2.3201E+02	5.7873E+01	-1.4269E-01	8.3462E-01
56	2.3427E+02	5.7873E+01	1.3615E-02	8.2636E-01
57	2.3765E+02	5.7873E+01	2.4294E-01	7.9629E-01
58	2.4126E+02	5.7873E+01	4.7477E-01	7.4082E-01
59	2.4487E+02	5.7873E+01	6.8627E-01	6.6121E-01
60	2.4848E+02	5.7873E+01	8.7020E-01	5.5746E-01

INTERPOLATED MODES, PRIMARY SURFACES, SURF = 1, MODE = 4

POINT	X INCHES	Y INCHES	H NO UNITS	ALPHA RAD/FT
1	2.4671E+02	1.9200E+01	5.2480E-03	1.4903E-01
2	2.5104E+02	1.9200E+01	6.1654E-02	1.6088E-01
3	2.5753E+02	1.9200E+01	1.4630E-01	1.4549E-01
4	2.6445E+02	1.9200E+01	2.1503E-01	8.5218E-02
5	2.7137E+02	1.9200E+01	2.3592E-01	-2.0330E-02
6	2.7830E+02	1.9200E+01	1.8287E-01	-1.7115E-01
7	2.4493E+02	2.3874E+01	-1.6668E-02	1.6294E-01
8	2.4901E+02	2.3874E+01	4.3273E-02	1.8771E-01
9	2.5513E+02	2.3874E+01	1.4328E-01	1.9975E-01
10	2.6165E+02	2.3874E+01	2.4787E-01	1.7937E-01
11	2.6817E+02	2.3874E+01	3.3206E-01	1.2470E-01
12	2.7469E+02	2.3874E+01	3.7722E-01	3.5739E-02
13	2.4332E+02	2.8122E+01	-4.5816E-02	1.5452E-01
14	2.4717E+02	2.8122E+01	7.4512E-03	1.7771E-01
15	2.5294E+02	2.8122E+01	1.0156E-01	2.1371E-01
16	2.5910E+02	2.8122E+01	2.2145E-01	2.5374E-01
17	2.6526E+02	2.8122E+01	3.6231E-01	2.9545E-01
18	2.7142E+02	2.8122E+01	5.2500E-01	3.3883E-01
19	2.4170E+02	3.2373E+01	-8.7749E-02	1.2691E-01
20	2.4533E+02	3.2373E+01	-4.7207E-02	1.4390E-01
21	2.5076E+02	3.2373E+01	2.8091E-02	1.9360E-01
22	2.5655E+02	3.2373E+01	1.4078E-01	2.7863E-01
23	2.6235E+02	3.2373E+01	3.0251E-01	3.9673E-01
24	2.6814E+02	3.2373E+01	5.2926E-01	5.4789E-01
25	2.4009E+02	3.6624E+01	-1.2701E-01	7.3497E-02
26	2.4348E+02	3.6624E+01	-1.0515E-01	8.4298E-02
27	2.4857E+02	3.6624E+01	-5.9807E-02	1.3669E-01
28	2.5400E+02	3.6624E+01	2.3667E-02	2.4045E-01
29	2.5943E+02	3.6624E+01	1.6528E-01	3.9363E-01
30	2.6486E+02	3.6624E+01	3.8739E-01	5.9623E-01
31	2.3847E+02	4.0872E+01	-1.3754E-01	-2.1714E-02
32	2.4164E+02	4.0872E+01	-1.4269E-01	-1.3786E-02
33	2.4639E+02	4.0872E+01	-1.3955E-01	3.7573E-02
34	2.5146E+02	4.0872E+01	-1.0299E-01	1.4456E-01
35	2.5652E+02	4.0872E+01	-9.8932E-03	3.0542E-01
36	2.6159E+02	4.0872E+01	1.6250E-01	5.2018E-01
37	2.3686E+02	4.5123E+01	-1.0084E-01	-1.7756E-01
38	2.3980E+02	4.5123E+01	-1.4277E-01	-1.6225E-01
39	2.4421E+02	4.5123E+01	-1.9391E-01	-1.1038E-01
40	2.4891E+02	4.5123E+01	-2.2012E-01	-1.6829E-02
41	2.5361E+02	4.5123E+01	-2.0195E-01	1.1617E-01
42	2.5831E+02	4.5123E+01	-1.2392E-01	2.8862E-01
43	2.3524E+02	4.9375E+01	2.3310E-02	-3.9429E-01
44	2.3795E+02	4.9375E+01	-6.2681E-02	-3.6573E-01
45	2.4202E+02	4.9375E+01	-1.7766E-01	-3.1019E-01
46	2.4636E+02	4.9375E+01	-2.7657E-01	-2.3415E-01
47	2.5070E+02	4.9375E+01	-3.4486E-01	-1.4076E-01

POINT	X INCHES	Y INCHES	H NO UNITS	ALPHA RAD/FT
48	2.5504E+02	4.9375E+01	-3.7626E-01	-3.0030E-02
49	2.3363E+02	5.3623E+01	2.6748E-01	-6.8118E-01
50	2.3611E+02	5.3623E+01	1.3134E-01	-6.3448E-01
51	2.3984E+02	5.3623E+01	-5.5213E-02	-5.6790E-01
52	2.4381E+02	5.3623E+01	-2.3216E-01	-5.0146E-01
53	2.4779E+02	5.3623E+01	-3.8789E-01	-4.3975E-01
54	2.5176E+02	5.3623E+01	-5.2397E-01	-3.8278E-01
55	2.3201E+02	5.7873E+01	6.6466E-01	-1.0519E+00
56	2.3427E+02	5.7873E+01	4.7340E-01	-9.8348E-01
57	2.3765E+02	5.7873E+01	2.0917E-01	-8.9254E-01
58	2.4126E+02	5.7873E+01	-4.6695E-02	-8.1105E-01
59	2.4487E+02	5.7873E+01	-2.8045E-01	-7.4558E-01
60	2.4848E+02	5.7873E+01	-4.9692E-01	-6.9613E-01

INTERPOLATED MODES, PRIMARY SURFACES, SURF = 1, MODE = 5

POINT	X INCHES	Y INCHES	H NO UNITS	ALPHA RAD/FT
1	2.4671E+02	1.9200E+01	3.1148E-01	9.7053E-03
2	2.5104E+02	1.9200E+01	2.9860E-01	-7.9225E-02
3	2.5753E+02	1.9200E+01	2.2441E-01	-1.9070E-01
4	2.6445E+02	1.9200E+01	8.7011E-02	-2.8063E-01
5	2.7137E+02	1.9200E+01	-9.3638E-02	-3.4063E-01
6	2.7830E+02	1.9200E+01	-3.0027E-01	-3.7070E-01
7	2.4493E+02	2.3874E+01	3.3663E-01	-4.8219E-02
8	2.4901E+02	2.3874E+01	3.0574E-01	-1.3187E-01
9	2.5513E+02	2.3874E+01	2.1062E-01	-2.3749E-01
10	2.6165E+02	2.3874E+01	5.6820E-02	-3.2388E-01
11	2.6817E+02	2.3874E+01	-1.3657E-01	-3.8316E-01
12	2.7469E+02	2.3874E+01	-3.5481E-01	-4.1532E-01
13	2.4332E+02	2.8122E+01	2.7998E-01	-1.0697E-01
14	2.4717E+02	2.8122E+01	2.3717E-01	-1.5977E-01
15	2.5294E+02	2.8122E+01	1.4156E-01	-2.3735E-01
16	2.5910E+02	2.8122E+01	-1.0475E-03	-3.1798E-01
17	2.6526E+02	2.8122E+01	-1.8447E-01	-3.9642E-01
18	2.7142E+02	2.8122E+01	-4.0759E-01	-4.7266E-01
19	2.4170E+02	3.2373E+01	1.3866E-01	-5.2227E-02
20	2.4533E+02	3.2373E+01	1.1481E-01	-1.0644E-01
21	2.5076E+02	3.2373E+01	4.6943E-02	-1.9480E-01
22	2.5655E+02	3.2373E+01	-7.1751E-02	-2.9840E-01
23	2.6235E+02	3.2373E+01	-2.4280E-01	-4.1163E-01
24	2.6814E+02	3.2373E+01	-4.7084E-01	-5.3449E-01
25	2.4009E+02	3.6624E+01	-6.3502E-02	1.3765E-01
26	2.4348E+02	3.6624E+01	-3.8002E-02	4.2413E-02
27	2.4857E+02	3.6624E+01	-5.0793E-02	-1.0328E-01
28	2.5400E+02	3.6624E+01	-1.3340E-01	-2.6244E-01
29	2.5943E+02	3.6624E+01	-2.8891E-01	-4.2547E-01
30	2.6486E+02	3.6624E+01	-5.1907E-01	-5.9238E-01
31	2.3847E+02	4.0872E+01	-2.8486E-01	4.0062E-01

POINT	X INCHES	Y INCHES	H NO UNITS	ALPHA RAD/FT
32	2.4164E+02	4.0872E+01	-1.9704E-01	2.6460E-01
33	2.4639E+02	4.0872E+01	-1.3337E-01	5.6232E-02
34	2.5146E+02	4.0872E+01	-1.5756E-01	-1.7177E-01
35	2.5652E+02	4.0872E+01	-2.7926E-01	-4.0570E-01
36	2.6159E+02	4.0872E+01	-5.0098E-01	-6.4556E-01
37	2.3686E+02	4.5123E+01	-4.9688E-01	7.0664E-01
38	2.3980E+02	4.5123E+01	-3.4168E-01	5.5840E-01
39	2.4421E+02	4.5123E+01	-1.8119E-01	3.1015E-01
40	2.4891E+02	4.5123E+01	-1.1709E-01	1.1101E-02
41	2.5361E+02	4.5123E+01	-1.7711E-01	-3.2330E-01
42	2.5831E+02	4.5123E+01	-3.7509E-01	-6.9305E-01
43	2.3524E+02	4.9375E+01	-6.3303E-01	1.0216E+00
44	2.3795E+02	4.9375E+01	-4.1835E-01	8.7428E-01
45	2.4202E+02	4.9375E+01	-1.6622E-01	6.0361E-01
46	2.4636E+02	4.9375E+01	-1.0027E-02	2.4917E-01
47	2.5070E+02	4.9375E+01	5.7656E-03	-1.7311E-01
48	2.5504E+02	4.9375E+01	-1.4337E-01	-6.6324E-01
49	2.3363E+02	5.3623E+01	-6.3971E-01	1.2963E+00
50	2.3611E+02	5.3623E+01	-3.8471E-01	1.1618E+00
51	2.3984E+02	5.3623E+01	-6.3412E-02	8.9483E-01
52	2.4381E+02	5.3623E+01	1.7398E-01	5.2395E-01
53	2.4779E+02	5.3623E+01	2.7383E-01	6.4151E-02
54	2.5176E+02	5.3623E+01	2.0666E-01	-4.8458E-01
55	2.3201E+02	5.7873E+01	-4.6342E-01	1.4624E+00
56	2.3427E+02	5.7873E+01	-1.9845E-01	1.3508E+00
57	2.3765E+02	5.7873E+01	1.5244E-01	1.1259E+00
58	2.4126E+02	5.7873E+01	4.4564E-01	8.1018E-01
59	2.4487E+02	5.7873E+01	6.3207E-01	4.1609E-01
60	2.4848E+02	5.7873E+01	6.8815E-01	-5.6348E-02

INTERPOLATED MODES, PRIMARY SURFACES, SURF = 1, MODE = 6

POINT	X INCHES	Y INCHES	H NO UNITS	ALPHA RAD/FT
1	2.4671E+02	1.9200E+01	5.5851E-04	1.2203E-02
2	2.5104E+02	1.9200E+01	-4.0052E-03	-2.7268E-02
3	2.5753E+02	1.9200E+01	-9.8217E-03	2.8819E-02
4	2.6445E+02	1.9200E+01	6.0485E-02	2.4114E-01
5	2.7137E+02	1.9200E+01	2.9870E-01	6.1088E-01
6	2.7830E+02	1.9200E+01	7.9563E-01	1.1380E+00
7	2.4493E+02	2.3874E+01	4.9443E-03	-2.4280E-02
8	2.4901E+02	2.3874E+01	-8.5717E-03	-4.6467E-02
9	2.5513E+02	2.3874E+01	-2.0500E-02	1.9501E-02
10	2.6165E+02	2.3874E+01	3.8764E-02	2.2114E-01
11	2.6817E+02	2.3874E+01	2.4446E-01	5.5829E-01
12	2.7469E+02	2.3874E+01	6.7025E-01	1.0309E+00
13	2.4332E+02	2.8122E+01	1.5479E-02	-5.6577E-02
14	2.4717E+02	2.8122E+01	-7.7484E-03	-8.0205E-02
15	2.5294E+02	2.8122E+01	-3.7452E-02	-2.5165E-02

POINT	X INCHES	Y INCHES	H NO UNITS	ALPHA RAD/FT
16	2.5910E+02	2.8122E+01	-9.8739E-03	1.5322E-01
17	2.6526E+02	2.8122E+01	1.4096E-01	4.5514E-01
18	2.7142E+02	2.8122E+01	4.7845E-01	8.8060E-01
19	2.4170E+02	3.2373E+01	3.4752E-02	-9.2593E-02
20	2.4533E+02	3.2373E+01	2.1693E-03	-1.1704E-01
21	2.5076E+02	3.2373E+01	-4.6303E-02	-8.2954E-02
22	2.5655E+02	3.2373E+01	-5.8875E-02	4.6983E-02
23	2.6235E+02	3.2373E+01	1.4621E-02	2.7352E-01
24	2.6814E+02	3.2373E+01	2.2083E-01	5.9665E-01
25	2.4009E+02	3.6624E+01	5.7610E-02	-1.2335E-01
26	2.4348E+02	3.6624E+01	1.9364E-02	-1.4365E-01
27	2.4857E+02	3.6624E+01	-4.1480E-02	-1.3544E-01
28	2.5400E+02	3.6624E+01	-9.1213E-02	-7.5552E-02
29	2.5943E+02	3.6624E+01	-1.0190E-01	3.7125E-02
30	2.6486E+02	3.6624E+01	-4.9649E-02	2.0259E-01
31	2.3847E+02	4.0872E+01	7.7537E-02	-1.2513E-01
32	2.4164E+02	4.0872E+01	4.2163E-02	-1.4233E-01
33	2.4639E+02	4.0872E+01	-1.8155E-02	-1.6101E-01
34	2.5146E+02	4.0872E+01	-8.8690E-02	-1.7149E-01
35	2.5652E+02	4.0872E+01	-1.6160E-01	-1.7223E-01
36	2.6159E+02	4.0872E+01	-2.3276E-01	-1.6324E-01
37	2.3686E+02	4.5123E+01	9.2020E-02	-7.2022E-02
38	2.3980E+02	4.5123E+01	7.2548E-02	-8.8243E-02
39	2.4421E+02	4.5123E+01	3.3581E-02	-1.2672E-01
40	2.4891E+02	4.5123E+01	-2.7156E-02	-1.8648E-01
41	2.5361E+02	4.5123E+01	-1.1510E-01	-2.6557E-01
42	2.5831E+02	4.5123E+01	-2.3781E-01	-3.6397E-01
43	2.3524E+02	4.9375E+01	6.1603E-02	4.8317E-02
44	2.3795E+02	4.9375E+01	7.0423E-02	2.7335E-02
45	2.4202E+02	4.9375E+01	7.0671E-02	-3.1299E-02
46	2.4636E+02	4.9375E+01	4.2674E-02	-1.2977E-01
47	2.5070E+02	4.9375E+01	-2.7625E-02	-2.6532E-01
48	2.5504E+02	4.9375E+01	-1.5363E-01	-4.3796E-01
49	2.3363E+02	5.3623E+01	-4.0480E-02	2.6080E-01
50	2.3611E+02	5.3623E+01	1.0085E-02	2.2518E-01
51	2.3984E+02	5.3623E+01	6.8101E-02	1.4271E-01
52	2.4381E+02	5.3623E+01	9.5532E-02	1.6326E-02
53	2.4779E+02	5.3623E+01	7.4537E-02	-1.4972E-01
54	2.5176E+02	5.3623E+01	-8.0179E-03	-3.5542E-01
55	2.3201E+02	5.7873E+01	-2.4115E-01	6.0085E-01
56	2.3427E+02	5.7873E+01	-1.3424E-01	5.3491E-01
57	2.3765E+02	5.7873E+01	8.9092E-04	4.2018E-01
58	2.4126E+02	5.7873E+01	1.0629E-01	2.7689E-01
59	2.4487E+02	5.7873E+01	1.6533E-01	1.1202E-01
60	2.4848E+02	5.7873E+01	1.7152E-01	-7.4445E-02

INTERPOLATED MODES, PRIMARY SURFACES, SURF = 1, MODE = 7

POINT	X INCHES	Y INCHES	H NO UNITS	ALPHA RAD/FT
1	2.4671E+02	1.9200E+01	4.0729E-02	-4.8928E-02
2	2.5104E+02	1.9200E+01	4.4845E-03	-1.4016E-01
3	2.5753E+02	1.9200E+01	-7.9249E-02	-1.4258E-01
4	2.6445E+02	1.9200E+01	-1.1979E-01	3.2625E-02
5	2.7137E+02	1.9200E+01	-6.3099E-03	3.9136E-01
6	2.7830E+02	1.9200E+01	3.6708E-01	9.3363E-01
7	2.4493E+02	2.3874E+01	5.4548E-02	-3.2093E-02
8	2.4901E+02	2.3874E+01	3.2831E-02	-9.0483E-02
9	2.5513E+02	2.3874E+01	-2.3493E-02	-1.1869E-01
10	2.6165E+02	2.3874E+01	-7.8517E-02	-7.0252E-02
11	2.6817E+02	2.3874E+01	-8.5177E-02	5.9256E-02
12	2.7469E+02	2.3874E+01	5.9071E-04	2.6983E-01
13	2.4332E+02	2.8122E+01	5.3202E-02	-1.9525E-03
14	2.4717E+02	2.8122E+01	4.9385E-02	-2.2742E-02
15	2.5294E+02	2.8122E+01	2.9005E-02	-6.3981E-02
16	2.5910E+02	2.8122E+01	-1.7946E-02	-1.2127E-01
17	2.6526E+02	2.8122E+01	-9.7820E-02	-1.9228E-01
18	2.7142E+02	2.8122E+01	-2.1766E-01	-2.7702E-01
19	2.4170E+02	3.2373E+01	2.4521E-02	4.9602E-02
20	2.4533E+02	3.2373E+01	4.0085E-02	4.9850E-02
21	2.5076E+02	3.2373E+01	5.5230E-02	8.7687E-03
22	2.5655E+02	3.2373E+01	3.7924E-02	-8.9878E-02
23	2.6235E+02	3.2373E+01	-4.0683E-02	-2.4512E-01
24	2.6814E+02	3.2373E+01	-2.0792E-01	-4.5696E-01
25	2.4009E+02	3.6624E+01	-2.6158E-02	1.1377E-01
26	2.4348E+02	3.6624E+01	6.5168E-03	1.1456E-01
27	2.4857E+02	3.6624E+01	5.0184E-02	8.5170E-02
28	2.5400E+02	3.6624E+01	7.4052E-02	1.3352E-02
29	2.5943E+02	3.6624E+01	5.5969E-02	-1.0023E-01
30	2.6486E+02	3.6624E+01	-2.2969E-02	-2.5559E-01
31	2.3847E+02	4.0872E+01	-8.6981E-02	1.6690E-01
32	2.4164E+02	4.0872E+01	-4.3591E-02	1.6141E-01
33	2.4639E+02	4.0872E+01	1.7703E-02	1.4707E-01
34	2.5146E+02	4.0872E+01	7.5156E-02	1.2369E-01
35	2.5652E+02	4.0872E+01	1.2098E-01	9.1986E-02
36	2.6159E+02	4.0872E+01	1.5166E-01	5.1943E-02
37	2.3686E+02	4.5123E+01	-1.5505E-01	1.8545E-01
38	2.3980E+02	4.5123E+01	-1.1110E-01	1.7446E-01
39	2.4421E+02	4.5123E+01	-4.8353E-02	1.6943E-01
40	2.4891E+02	4.5123E+01	1.9443E-02	1.7919E-01
41	2.5361E+02	4.5123E+01	9.4126E-02	2.0458E-01
42	2.5831E+02	4.5123E+01	1.8182E-01	2.4559E-01
43	2.3524E+02	4.9375E+01	-1.6585E-01	1.3441E-01
44	2.3795E+02	4.9375E+01	-1.3694E-01	1.2371E-01
45	2.4202E+02	4.9375E+01	-9.4259E-02	1.3330E-01
46	2.4636E+02	4.9375E+01	-3.9148E-02	1.7742E-01
47	2.5070E+02	4.9375E+01	3.8236E-02	2.5652E-01
48	2.5504E+02	4.9375E+01	1.5054E-01	3.7062E-01
49	2.3363E+02	5.3623E+01	-7.5936E-02	-3.2544E-02
50	2.3611E+02	5.3623E+01	-8.2519E-02	-2.8415E-02
51	2.3984E+02	5.3623E+01	-8.6683E-02	7.5418E-03

POINT	X INCHES	Y INCHES	H NO UNITS	ALPHA RAD/FT
52	2.4381E+02	5.3623E+01	-7.2437E-02	8.5262E-02
53	2.4779E+02	5.3623E+01	-2.5722E-02	2.0362E-01
54	2.5176E+02	5.3623E+01	6.6921E-02	3.6261E-01
55	2.3201E+02	5.7873E+01	1.5823E-01	-3.8073E-01
56	2.3427E+02	5.7873E+01	9.0820E-02	-3.3495E-01
57	2.3765E+02	5.7873E+01	7.6685E-03	-2.5178E-01
58	2.4126E+02	5.7873E+01	-5.2347E-02	-1.4389E-01
59	2.4487E+02	5.7873E+01	-7.6927E-02	-1.6213E-02
60	2.4848E+02	5.7873E+01	-6.0117E-02	1.3126E-01

INTERPOLATED MODES, PRIMARY SURFACES, SURF = 1, MODE = 8

POINT	X INCHES	Y INCHES	H NO UNITS	ALPHA RAD/FT
1	2.4671E+02	1.9200E+01	-1.2855E-01	-8.7860E-01
2	2.5104E+02	1.9200E+01	-3.3924E-01	-3.1734E-01
3	2.5753E+02	1.9200E+01	-3.4968E-01	2.1730E-01
4	2.6445E+02	1.9200E+01	-1.5688E-01	3.8116E-01
5	2.7137E+02	1.9200E+01	9.4450E-03	1.2550E-01
6	2.7830E+02	1.9200E+01	-9.2750E-02	-5.4969E-01
7	2.4493E+02	2.3874E+01	6.0576E-02	-6.7545E-01
8	2.4901E+02	2.3874E+01	-1.0958E-01	-3.3611E-01
9	2.5513E+02	2.3874E+01	-1.7367E-01	6.2538E-02
10	2.6165E+02	2.3874E+01	-5.6952E-02	3.4179E-01
11	2.6817E+02	2.3874E+01	1.7060E-01	4.7035E-01
12	2.7469E+02	2.3874E+01	4.2708E-01	4.4823E-01
13	2.4332E+02	2.8122E+01	2.4716E-01	-4.0170E-01
14	2.4717E+02	2.8122E+01	1.3306E-01	-3.0366E-01
15	2.5294E+02	2.8122E+01	3.5431E-02	-8.8550E-02
16	2.5910E+02	2.8122E+01	6.7988E-02	2.3090E-01
17	2.6526E+02	2.8122E+01	2.8834E-01	6.4325E-01
18	2.7142E+02	2.8122E+01	7.4417E-01	1.1485E+00
19	2.4170E+02	3.2373E+01	3.2529E-01	-2.2441E-01
20	2.4533E+02	3.2373E+01	2.4663E-01	-2.8196E-01
21	2.5076E+02	3.2373E+01	1.2979E-01	-2.0071E-01
22	2.5655E+02	3.2373E+01	9.8102E-02	1.0759E-01
23	2.6235E+02	3.2373E+01	2.7053E-01	6.4468E-01
24	2.6814E+02	3.2373E+01	7.5755E-01	1.4106E+00
25	2.4009E+02	3.6624E+01	2.7070E-01	-1.5121E-01
26	2.4348E+02	3.6624E+01	2.1039E-01	-2.5969E-01
27	2.4857E+02	3.6624E+01	9.5413E-02	-2.4728E-01
28	2.5400E+02	3.6624E+01	2.9896E-02	-2.4203E-03
29	2.5943E+02	3.6624E+01	1.2929E-01	4.8153E-01
30	2.6486E+02	3.6624E+01	5.0180E-01	1.2046E+00
31	2.3847E+02	4.0872E+01	1.0380E-01	-9.0830E-03
32	2.4164E+02	4.0872E+01	8.2039E-02	-1.4384E-01
33	2.4639E+02	4.0872E+01	6.5386E-03	-2.1055E-01
34	2.5146E+02	4.0872E+01	-6.6075E-02	-1.0259E-01
35	2.5652E+02	4.0872E+01	-5.4073E-02	1.9026E-01

POINT	X INCHES	Y INCHES	H NO UNITS	ALPHA RAD/FT
36	2.6159E+02	4.0872E+01	1.2061E-01	6.6802E-01
37	2.3686E+02	4.5123E+01	-1.9495E-01	3.5261E-01
38	2.3980E+02	4.5123E+01	-1.3276E-01	1.6182E-01
39	2.4421E+02	4.5123E+01	-1.1504E-01	-5.0602E-02
40	2.4891E+02	4.5123E+01	-1.6344E-01	-1.7961E-01
41	2.5361E+02	4.5123E+01	-2.4265E-01	-2.0788E-01
42	2.5831E+02	4.5123E+01	-3.1321E-01	-1.3544E-01
43	2.3524E+02	4.9375E+01	-4.6180E-01	7.8874E-01
44	2.3795E+02	4.9375E+01	-3.1041E-01	5.5147E-01
45	2.4202E+02	4.9375E+01	-1.8367E-01	1.9660E-01
46	2.4636E+02	4.9375E+01	-1.8082E-01	-1.8058E-01
47	2.5070E+02	4.9375E+01	-3.1407E-01	-5.5636E-01
48	2.5504E+02	4.9375E+01	-5.8292E-01	-9.3074E-01
49	2.3363E+02	5.3623E+01	-5.9527E-01	1.2293E+00
50	2.3611E+02	5.3623E+01	-3.6739E-01	9.6722E-01
51	2.3984E+02	5.3623E+01	-1.3549E-01	5.1471E-01
52	2.4381E+02	5.3623E+01	-5.5713E-02	-4.6464E-02
53	2.4779E+02	5.3623E+01	-1.7521E-01	-6.8866E-01
54	2.5176E+02	5.3623E+01	-5.2081E-01	-1.4119E+00
55	2.3201E+02	5.7873E+01	-4.9432E-01	1.5774E+00
56	2.3427E+02	5.7873E+01	-2.2047E-01	1.3289E+00
57	2.3765E+02	5.7873E+01	9.3357E-02	8.8156E-01
58	2.4126E+02	5.7873E+01	2.7452E-01	3.0582E-01
59	2.4487E+02	5.7873E+01	2.6716E-01	-3.7171E-01
60	2.4848E+02	5.7873E+01	4.0652E-02	-1.1510E+00

GRAPHICAL REPRESENTATION OF INTERPOLATED MODES

MODAL DEFLECTIONS TIMES 1.0E 2, SURFACE = 1, MODE = 1

19.20	6	6	7	6	3	0
23.87	10	11	12	11	8	4
28.12	15	16	17	16	15	10
32.37	22	22	23	23	21	18
36.62	29	30	31	31	29	26
40.87	39	39	40	39	38	36
45.12	50	50	50	50	48	46
49.37	62	62	62	61	60	58
53.62	76	76	75	74	73	71
57.87	91	90	89	88	87	85

FREQUENCY = 40.4 Hz

1ST BENDING

MODAL SLOPES (RAD/FT) TIMES 1.0E 2, SURFACE = 1, MODE = 1

19.20	3	1	0	-2	-5	-6
23.87	3	2	0	-2	-5	-9
28.12	3	2	0	-2	-5	-10
32.37	2	2	0	-1	-5	-9
36.62	2	2	0	-1	-4	-8
40.87	1	1	0	-1	-4	-7
45.12	0	0	0	-1	-4	-7
49.37	-1	0	-1	-2	-4	-7
53.62	-3	-2	-2	-3	-4	-7
57.87	-4	-4	-4	-4	-5	-6

MODAL DEFLECTIONS TIMES 1.0E 2, SURFACE = 1, MODE = 2

19.20	-3	-7	-14	-17	-15	-6
23.87	-3	-10	-19	-25	-26	-20
28.12	-3	-10	-21	-30	-36	-36
32.37	-1	-9	-22	-34	-43	-48
36.62	2	-6	-20	-34	-46	-56
40.87	9	0	-15	-31	-46	-60
45.12	20	9	-6	-23	-40	-58
49.37	35	23	6	-11	-30	-50
53.62	55	42	24	5	-14	-35
57.87	80 67	48	27	7	-13	

NODE LINE

FREQUENCY = 105.4 Hz

2ND BENDING

MODAL SLOPES (RAD/FT) TIMES 1.0E 2, SURFACE = 1, MODE = 2

19.20	-14	-13	-8	-1	8	21
23.87	-19	-18	-15	-7	3	18
28.12	-24	-23	-20	-14	-5	6
32.37	-28	-28	-26	-21	-15	-7
36.62	-32	-32	-31	-29	-24	-19
40.87	-37	-37	-37	-36	-34	-31
45.12	-44	-44	-43	-43	-43	-44
49.37	-52	-51	-50	-51	-52	-55
53.62	-62	-60	-58	-58	-61	-65
57.87	-72	-70	-67	-67	-67	-70

MODAL DEFLECTIONS TIMES 1.0E 2, SURFACE = 1, MODE = 3

19.20	-21	-14	-6	0	4	5
23.87	-33	-23	-10	0	6	10
28.12	-43	-30	-14	0	9	15
32.37	-52	-36	-17	0	12	21
36.62	-58	-41	-18	1	16	27
40.87	-60	-42	-17	5	22	34
45.12	-57	-38	-12	11	31	45
49.37	-48	-30	-4	20	41	57
53.62	-34	-17	7	32	53	71
57.87	-14	1	24	47	68	87

NODE LINE

FREQUENCY = 144.4 Hz

TORSION

MODAL SLOPES (RAD/FT) TIMES 1.0E 2, SURFACE = 1, MODE = 3

19.20	20	17	13	8	4	0
23.87	31	27	21	15	9	3
28.12	43	37	30	22	16	10
32.37	54	48	39	30	22	15
36.62	64	58	48	38	28	18
40.87	72	67	58	47	35	21
45.12	78	74	66	56	42	27
49.37	82	79	73	63	51	35
53.62	84	82	78	70	58	44
57.87	83	82	79	74	66	55

MODAL DEFLECTIONS TIMES 1.0E 2. SURFACE = 1. MODE = 4

19.20 0 6 14 21 23 18

23.87 -1 4 14 24 33 37

28.12 -4 0 10 22 36 52

32.37 -8 -4 2 14 30 52

36.62 -12 -10 -5 2 16 38

40.87 -13 -14 -13 -10 0 16

45.12 -10 -14 -19 -22 -20 -12

49.37 2 -6 -17 -27 -34 -37

53.62 26 13 -5 -23 -38 -52

57.87 66 47 20 -4 -28 -49

NODE LINE

NODE LINE

FREQUENCY = 213.1 Hz

3RD BENDING

MODAL SLOPES (RAD/FT) TIMES 1.0E 1, SURFACE = 1, MODE = 4

19.20	1	1	1	0	0	-1
23.87	1	1	1	1	1	0
28.12	1	1	2	2	2	3
32.37	1	1	1	2	3	5
36.62	0	0	1	2	3	5
40.87	0	0	0	1	3	5
45.12	-1	-1	-1	0	1	2
49.37	-3	-3	-3	-2	-1	0
53.62	-6	-6	-5	-5	-4	-3
57.87	-10	-9	-8	-8	-7	-6

MODAL DEFLECTIONS TIMES 1.0E 2, SURFACE = 1, MODE = 5

19.20	31	29	22	8	-9	-30
23.87	33	30	21	5	-13	-35
28.12	27	23	14	0	-18	-40
32.37	13	11	4	-7	-24	-47
36.62	-6	-3	-5	-13	-28	-51
40.87	-28	-19	-13	-15	-27	-50
45.12	-49	-34	-18	-11	-17	-37
49.37	-63	-41	-16	-1	0	-14
53.62	-63	-38	-6	17	27	20
57.87	-46	-19	15	44	63	68

NODE LINE

NODE LINE

FREQUENCY = 294.1 Hz

2ND TORSION

MODAL SLOPES (RAD/FT) TIMES 1.0E 1, SURFACE = 1, MODE = 5

19.20	0	0	-1	-2	-3	-3
23.87	0	-1	-2	-3	-3	-4
28.12	-1	-1	-2	-3	-3	-4
32.37	0	-1	-1	-2	-4	-5
36.62	1	0	-1	-2	-4	-5
40.87	4	2	0	-1	-4	-6
45.12	7	5	3	0	-3	-6
49.37	10	8	6	2	-1	-6
53.62	12	11	8	5	0	-4
57.87	14	13	11	8	4	0

MODAL DEFLECTIONS TIMES 1.0E 2. SURFACE = 1. MODE = 6

19.20	0	0	0	6	29	79
23.87	0	0	-2	3	24	67
28.12	1	0	-3	0	14	47
32.37	3	0	-4	-5	1	22
36.62	5	1	-4	-9	-10	-4
40.87	7	4	-1	-8	-16	-23
45.12	9	7	3	-2	-11	-23
49.37	6	7	7	4	-2	-15
53.62	-4	1	6	9	7	0
57.87	-24	-13	0	10	16	17

FREQUENCY = 337.0 Hz
4TH BENDING

NODE LINE

MODAL SLOPES (RAD/FT) TIMES 1.0E 1, SURFACE = 1, MODE = 6

19.20	0	0	0	2	6	11
23.87	0	0	0	2	5	10
28.12	0	0	0	1	4	8
32.37	0	-1	0	0	2	5
36.62	-1	-1	-1	0	0	2
40.87	-1	-1	-1	-1	-1	-1
45.12	0	0	-1	-1	-2	-3
49.37	0	0	0	-1	-2	-4
53.62	2	2	1	0	-1	-3
57.87	6	5	4	2	1	0

MODAL DEFLECTIONS TIMES 1.0E 2, SURFACE = 1, MODE = 7

19.20	4	0	-7	-11	0	36
23.87	5	3	-2	-7	-8	0
28.12	5	4	2	-1	-9	-21
32.37	2	4	5	3	-4	-20
36.62	-2	0	5	7	5	-2
40.87	-8	-4	1	7	12	15
45.12	-15	-11	-4	1	9	18
49.37	-16	-13	-9	-3	3	15
53.62	-7	-8	-8	-7	-2	6
57.87	15	9	0	-5	-7	-6

NODE LINE

FREQUENCY = 363.3 Hz

5TH BENDING

MODAL SLOPES (RAD/FT) TIMES 1.0E 2, SURFACE = 1, MODE = 7

19.20	-4	-14	-14	3	39	93
23.87	-3	-9	-11	-7	5	26
28.12	0	-2	-6	-12	-19	-27
32.37	4	4	0	-8	-24	-45
36.62	11	11	8	1	-10	-25
40.87	16	16	14	12	9	5
45.12	18	17	16	17	20	24
49.37	13	12	13	17	25	37
53.62	-3	-2	0	8	20	36
57.87	-38	-33	-25	-14	-1	13

MODAL DEFLECTIONS TIMES 1.0E 2. SURFACE = 1, MODE = 8

19.20	-12	-33	-34	-15	0	-9	
23.87	6	-10	-17	-5	17	42	
28.12	24	13	3	6	28	74	
32.37	32	24	12	9	27	75.	
36.62	27	21	9	2	12	50	
40.87	10	8	0	-6	-5	12	
45.12	-19	-13	-11	-16	-24	-31	
49.37	-46	-31	-18	-18	-31	-58	
53.62	-59	-36	-13	-5	-17	-52	
57.87	-49	-22	9	27	26	4	

FREQUENCY = 426.7 Hz

MODAL SLOPES (RAD/FT) TIMES 1.0E 1, SURFACE = 1, MODE = 8

19.20	-8	-3	2	3	1	-5
23.87	-6	-3	0	3	4	4
28.12	-4	-3	0	2	6	11
32.37	-2	-2	-2	1	5	14
36.62	-1	-2	-2	0	4	12
40.87	0	-1	-2	-1	1	6
45.12	3	1	0	-1	-2	-1
49.37	7	5	1	-1	-5	-9
53.62	12	9	5	0	-6	-14
57.87	15	13	8	3	-3	-11

PASS= 1, MACH = .90, DEN RATIO = 1.00, FREQ RATIO = 1.00

FLUTTER ANALYSIS USING THE K METHOD

DENSITY VARIATIONS

DENSITY = 7.647400E-02, LB/FT**3

FREQUENCY VARIATIONS

VARIATION IN FREQUENCY FOR MODE NO. 0

GENERALIZED MASS, FREQUENCY, AND MODAL STIFFNESS

GENERALIZED MASS, LB

MODE	MODE= 1	2	3	4	5	6	7	8
1	2.592592E+00	-5.273559E-16	6.328271E-14	-1.565414E-14	-2.420286E-14	6.217249E-15	-5.551115E-15	2.042810E-14
2	-5.273559E-16	1.096850E+00	1.930400E-14	-1.239980E-14	3.157197E-14	2.844947E-15	5.013351E-16	5.884182E-15
3	6.328271E-14	1.930400E-14	1.229013E+00	-2.220446E-14	3.752554E-14	1.071365E-14	-3.330669E-16	3.308465E-14
4	-1.565414E-14	-1.239980E-14	-2.220446E-14	6.016879E-01	-3.885781E-15	6.133982E-15	1.984524E-15	4.363176E-14
5	-2.420286E-14	3.157197E-14	3.752554E-14	-3.885781E-15	9.458282E-01	3.885781E-15	-1.210143E-14	7.327472E-15
6	6.217249E-15	2.844947E-15	1.071365E-14	6.133982E-15	3.885781E-15	2.100029E-01	8.132384E-15	7.410739E-15
7	-5.551115E-15	5.013351E-16	-3.330669E-16	1.984524E-15	-1.210143E-14	8.132384E-15	1.558602E-01	-1.097733E-14
8	2.042810E-14	5.884182E-15	3.308465E-14	4.363176E-14	7.327472E-15	7.410739E-15	-1.097733E-14	9.615235E-01

MODE	FREQUENCY CYC/SEC	FREQUENCY RAD/SEC
1	4.042748E+01	2.540133E+02
2	1.053595E+02	6.619930E+02
3	1.443544E+02	9.070051E+02
4	2.131469E+02	1.339241E+03
5	2.940645E+02	1.847661E+03
6	3.370482E+02	2.117736E+03
7	3.633346E+02	2.282898E+03
8	4.266627E+02	2.680800E+03

COMPLEX GENERALIZED MODAL STIFFNESS, (REAL, IMAG), LB/IN

MODE	MODE= 1	2	3	4
1	(2.5926E+00, 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
2	(0. , 0.)	(7.4497E+00, 0.)	(0. , 0.)	(0. , 0.)
3	(0. , 0.)	(0. , 0.)	(1.5670E+01, 0.)	(0. , 0.)

PASS= 1, MACH = .90, DEN RATIO = 1.00, FREQ RATIO = 1.00

COMPLEX GENERALIZED MODAL STIFFNESS, (REAL, IMAG), LB/IN

MODE	MODE= 1	2	3	4
4	(0. , 0.)	(0. , 0.)	(0. , 0.)	(1.6725E+01, 0.)
5	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
6	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
7	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
8	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)

MODE	MODE= 5	6	7	8
1	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
2	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
3	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
4	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
5	(5.0043E+01, 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
6	(0. , 0.)	(1.4597E+01, 0.)	(0. , 0.)	(0. , 0.)
7	(0. , 0.)	(0. , 0.)	(1.2589E+01, 0.)	(0. , 0.)
8	(0. , 0.)	(0. , 0.)	(0. , 0.)	(1.0710E+02, 0.)

MODAL ELIMINATION VARIATIONS

NUMBER OF MODES ELIMINATED ARE ZERO

FLUTTER SOLUTIONS

MACH NO = .900 RHO/RHO(SL) = 1.0000 VBO = .2000

C.P.S.	V.EQUIV.	DAMPING	RAD/SEC	VTRUE
40.1918	48.6274	-.023510	252.5333	48.6274
104.7879	126.7811	-.023280	658.4036	126.7811
143.6824	173.8388	-.021514	902.7852	173.8388
211.9943	256.4882	-.027854	1332.0023	256.4882
292.0356	353.3289	-.023049	1834.9184	353.3289
335.3584	405.7443	-.041768	2107.1237	405.7443
362.1656	438.1779	-.012655	2275.5589	438.1779
424.1347	513.1533	-.018530	2664.9233	513.1533

ALL ROOTS CHECK AND ARE UNIQUE

FLUTTER SOLUTIONS

MACH NO = .900 RHO/RHO(SL) = 1.0000 VBO = .5000

C.P.S.	V.EQUIV.	DAMPING	RAD/SEC	VTRUE
39.9501	120.8373	-.051432	251.0144	120.8373
104.9348	317.3968	-.080176	659.3260	317.3968
140.6090	425.3011	-.087307	883.4747	425.3011
210.5656	636.8991	-.098917	1323.0256	636.8991
285.7277	864.2424	-.048577	1795.2840	864.2424
342.9578	1037.3466	-.180691	2154.8722	1037.3466
361.0312	1092.0135	-.034542	2268.4313	1092.0135
422.2831	1277.2825	-.053438	2653.2892	1277.2825

ALL ROOTS CHECK AND ARE UNIQUE

FLUTTER SOLUTIONS

MACH NO = .900 RHO/RHO(SL) = 1.0000 VRO = .8000

C.P.S.	V.EQUIV.	DAMPING	RAD/SEC	VTRUE
39.7956	192.5921	-.076496	250.0438	192.5921
104.1556	504.0640	-.180614	654.4302	504.0640
132.4189	640.8451	-.104512	832.0142	640.8451
207.4787	1004.0995	-.165462	1303.6301	1004.0995
279.6749	1353.4954	-.071592	1757.2535	1353.4954
350.8003	1697.7090	-.345529	2204.1486	1697.7090
360.3843	1744.0910	-.048291	2264.3667	1744.0910
418.7761	2026.6800	-.077837	2631.2542	2026.6800

ALL ROOTS CHECK AND ARE UNIQUE

FLUTTER SOLUTIONS

MACH NO = .900 RHO/RHO(SL) = 1.0000 VRO = 1.1000

C.P.S.	V.EQUIV.	DAMPING	RAD/SEC	VTRUE
39.6588	263.9037	-.103685	249.1841	263.9037
99.3546	661.1405	-.288851	624.2646	661.1405
126.7533	843.4616	-.064304	796.4165	843.4616
200.4199	1333.6651	-.243993	1259.2783	1333.6651
272.9724	1816.4551	-.089792	1715.1401	1816.4551
352.6491	2346.6524	-.493225	2215.7650	2346.6524
357.8453	2381.2294	-.077972	2248.4134	2381.2294
421.4684	2804.6001	-.051721	2648.1701	2804.6001

ALL ROOTS CHECK AND ARE UNIQUE

5526

FLUTTER SOLUTIONS

MACH NO = .900 RHO/RHO(SL) = 1.0000 VBO = 1.4000

C.P.S.	V.EQUIV.	DAMPING	RAD/SEC	VTRUE
39.4549	334.1505	-.134115	247.9029	334.1505
91.1730	772.1606	-.324328	572.8583	772.1606
123.9800	1050.0085	-.047515	778.9909	1050.0085
187.5292	1588.2186	-.280186	1178.2837	1588.2186
268.6925	2275.6044	-.102330	1688.2484	2275.6044
350.3179	2966.9048	-.108211	2201.1173	2966.9048
357.4566	3027.3636	-.590724	2245.9711	3027.3636
437.0562	3701.5068	.014842	2746.1113	3701.5068

ALL ROOTS CHECK AND ARE UNIQUE

FLUTTER SOLUTIONS

MACH NO = .900 RHO/RHO(SL) = 1.0000 VBO = 1.7000

C.P.S.	V.EQUIV.	DAMPING	RAD/SEC	VTRUE
39.2178	403.3158	-.164912	246.4132	403.3158
83.1518	855.1330	-.296800	522.4591	855.1330
122.4380	1259.1528	-.057478	769.3025	1259.1528
174.2641	1792.1326	-.278490	1094.9362	1792.1326
268.1023	2757.1649	-.125877	1684.5404	2757.1649
342.0552	3517.6971	-.124745	2149.2015	3517.6971
364.8664	3752.2874	-.703563	2292.5287	3752.2874
461.9182	4750.3682	.133021	2902.3245	4750.3682

ALL ROOTS CHECK AND ARE UNIQUE

55p

FLUTTER SOLUTIONS

MACH NO = .900 RHO/RHO(SL) = 1.0000 VBO = 2.0000

C.P.S.	V.EQUIV.	DAMPING	RAD/SEC	VTRUE
38.9809	471.6231	-.199082	244.9248	471.6231
76.0027	919.5433	-.250426	477.5401	919.5433
122.0592	1476.7726	-.090107	766.9221	1476.7726
160.8541	1946.1459	-.260587	1010.6785	1946.1459
269.6496	3262.4432	-.167056	1694.2621	3262.4432
335.4713	4058.8091	-.138617	2107.8332	4058.8091
368.3399	4456.4812	-.777523	2314.3535	4456.4812
488.0889	5905.3030	.336371	3066.7601	5905.3030

ALL ROOTS CHECK AND ARE UNIQUE

FLUTTER SOLUTIONS

MACH NO = .900 RHO/RHO(SL) = 1.0000 VHO = 2.3000

C.P.S.	V.EQUIV.	DAMPING	RAD/SEC	VTRUE
38.7234	538.7840	-.238648	243.3069	538.7840
69.5732	968.0168	-.195027	437.1421	968.0168
123.3120	1715.7196	-.156962	774.7937	1715.7196
147.1428	2047.2940	-.211940	924.5279	2047.2940
271.8798	3782.8413	-.229614	1708.2754	3782.8413
332.7838	4630.2370	-.173443	2090.9469	4630.2370
368.1707	5122.5988	-.760997	2313.2902	5122.5988
497.3416	6919.8374	.631294	3124.8967	6919.8374

ALL ROOTS CHECK AND ARE UNIQUE

FLUTTER SOLUTIONS

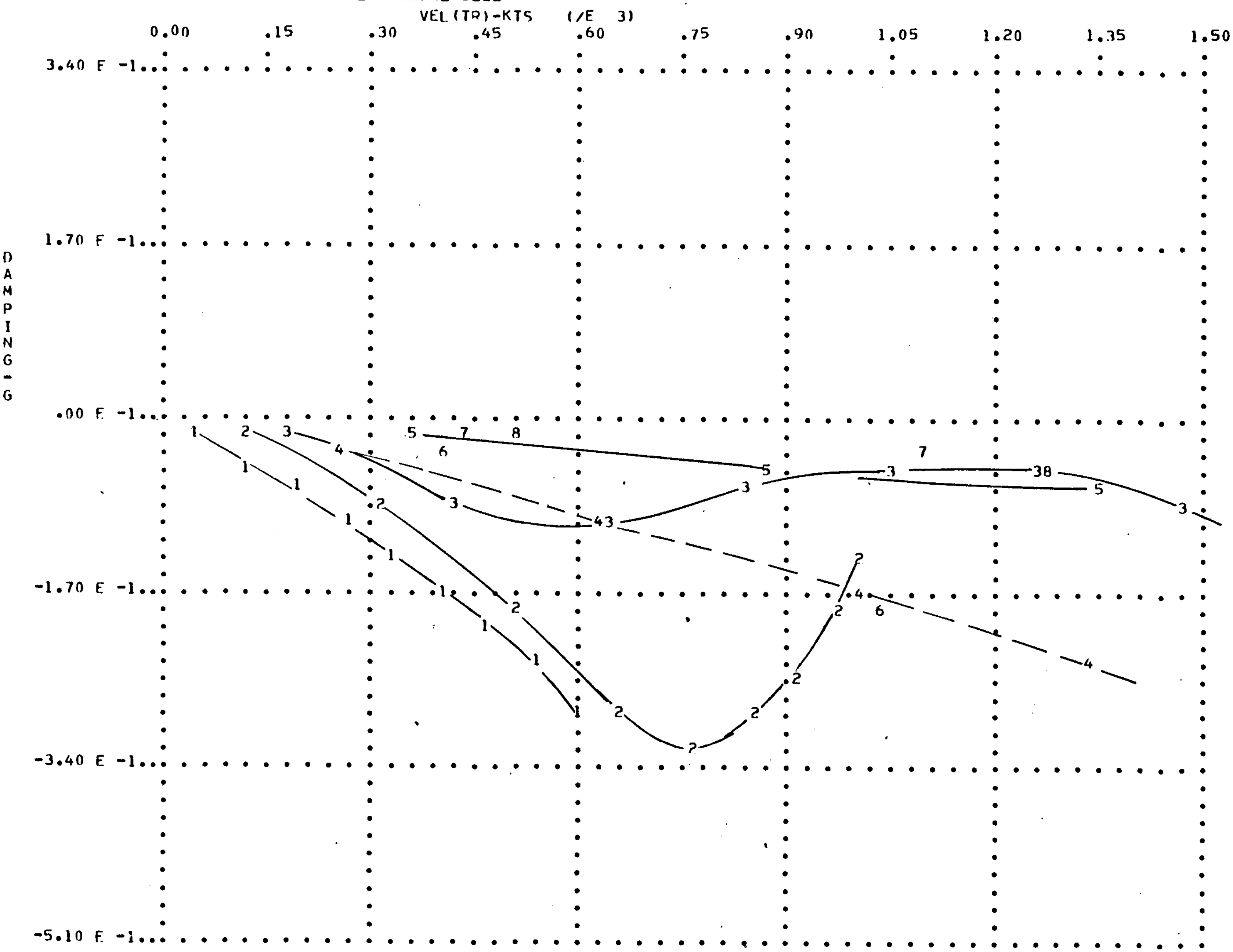
MACH NO = .900 RHO/RHO(SL) = 1.0000 VBO = 2.6000

C.P.S.	V.EQUIV.	DAMPING	RAD/SEC	VTRUE
38.4135	604.1851	-.284429	241.3594	604.1851
63.9421	1005.7118	-.132992	401.7610	1005.7118
123.6967	1945.5597	-.302730	777.2108	1945.5597
137.7285	2166.2597	-.095951	865.3759	2166.2597
272.7935	4290.6261	-.314928	1714.0163	4290.6261
321.4146	5055.3611	-.317802	2019.5121	5055.3611
388.3264	6107.7820	-.601567	2439.9324	6107.7820
470.2277	7395.9648	.960563	2954.5348	7395.9648

ALL ROOTS CHECK AND ARE UNIQUE

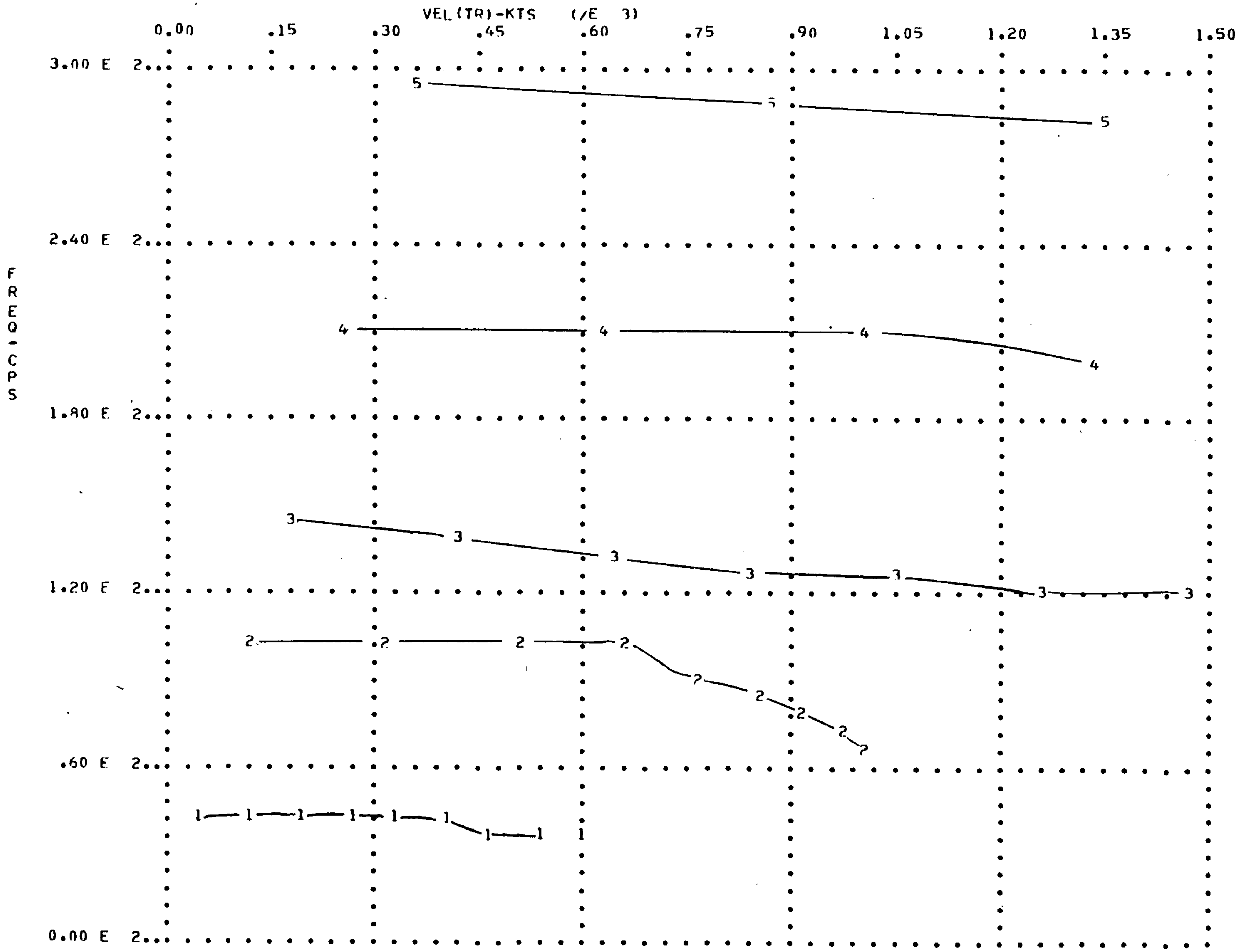
PASS= 1, MACH = .90, DEN RATIO = 1.00, FREQ RATIO = 1.00

PRINT-PLOT OF DAMPING VS VELOCITY (TRUE)



PASS= 1, MACH = .90, DEN RATIO = 1.00, FREQ RATIO = 1.00

PRINT-PLOT OF FREQUENCY VS VELOCITY (TRUE)



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