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Structural Analysis of Second Generation Heliostats

V. D. Dunder

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STRUCTURAL ANALYSIS OF SECOND GENERATION HELIOSTATS

V. D. Dunder Applied Mechanics Division Sandia National Laboratories, Livermore

ABSTRACT

As part of the overall evaluation of the four second-generation heliostats, a finite element analysis was performed to evaluate structure performance of the mirror modules subjected to gravity, operational wind loads and survival wind loads. All designs evaluated were found to be structurally adequate.

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STRUCTURAL ANALYSIS OF SECOND GENERATION HELIOSTATS

1.0 Summary

A finite element model of each of the four completed 2nd generation heliostats was analyzed using the SAP4 computer code as part of the overall heliostat evaluation. The purpose of the anaysis was four fold:

- 1) Determine facet deflections due to operational wind velocities for the beam quality evaluation.
- 2) Determine individual facet deflections caused by gravity sag for the field performance evaluation to be done by the HELIOS computer code.
- 3) Calculate the natural frequencies and mode shapes to determine susceptibility to vortex shedding excitation.
- 4) Calculate stresses in the structural components due to loading by survival wind velocities and check for structural failure.

The analysis was performed with the aid of a Textronix Mesh Generator in creating the models, and the linear elastic SAP4 Finite Element program for the analysis.

The pedestal in each heliostat was modeled as a linear elastic beam fixed at ground level. Testing of the heliostats at the Central Receiver Test Facility (CRTF) verified that foundations did not substantially add to the structural deflections. Initially the drive mechanisms for all gravity and wind load (static) cases were modeled as rigid beams because the drive stiffnesses were not known. Once the drive stiffnesses were measured by testing at the CRTF their torsional and bending stiffnesses were incorporated into the model and the new frequencies determined. No structural deflections or stresses were determined with the measured drive stiffnesses.

2.0 Conclusions

The four primary analyses:

- 1) Operational Wind Pointing Error
- 2) Gravity Deflections of Individual Mirror Facets
 - 3) Natural Frequencies and Mode Shapes
 - 4) Stresses due to Survival Wind Velocities

performed on each heliostat found no inherent structural problem with any of the designs.

The operational wind pointing errors must be added to the drive mechanism errors before a comparison with the specification can be made. This information may be found in the Second Generation Heliostats - Evaluation Summary Report. The magnitude of the operational wind deflections is about the same or slightly less than the operational wind results of the 10-MWe pilot plant heliostats. The gravity induced mirror module deflections were used as input to the HELIOS optical performance code run at Sandia Albuquerque. The results of this analysis are presented in the Beam Quality and Tracking Evaluation of 2nd Generation Heliostats Report by D. King. These gravity deflections were also within the same order of magnitude as the 10-MWe pilot plant heliostat results. All heliostats produce RMS slope errors and pointing errors of the same order of magnitude.

The dynamic analyses found the heliostats' lowest natural frequencies to be greater than 1.75 Hz. This is well above the vortex shedding frequencies (0.3-0.7 Hz) in a 27 mph wind thus dynamic excitation is not a concern.

The largest stresses in the support structures were produced by the 90 mph, survival, wind loading while the heliostats are in stow position. The pedestals suffered the largest stresses in the case of a 50 mph wind heliostats in vertical position. All structural stresses were found to be below allowable values.

3.0 Introduction

3.1 Second Generation Heliostat Development Program

The Second Generation Heliostat Development Program is the second major heliostat development cycle in the Department of Energy's (DOE) Solar Thermal Central Receiver Program. During the first development cycle 222 heliostats were built for the Central Receiver Test Facility (CRTF); also, a design was developed and is presently being built for the central receiver pilot plant near Barstow, California.

The second heliostat development cycle started in 1978 with the DOE Prototype Heliostat Phase 1 contracts. These paper study contracts developed heliostat conceptual designs and mass-production cost estimates. Rather than continue these contracts into Phase 2, it was decided to initiate the Second Generation Heliostat contracts. Sandia National Laboratories placed these contracts in July 1979.

Technical management and evaluation of the Second Generation Heliostat contracts was performed by Sandia. Heliostat testing was performed at the CRTF in Albuquerque.

The objectives of the Second Generation Heliostat Program were to support the Solar Central Receiver research, development, and demonstration effort by:

- Establishing heliostat designs with associated manufacturing, assembly, installation, and maintenance approaches that, in quantity production, would yield low capital and operating costs over an assumed 30-year lifetime.
- Stimulating broader industry participation in the DOE solar energy program.
- Obtaining design data, manufacturing plans, and projected production costs for release to the solar community.
- Performing side-by-side testing and evaluation of prototype heliostats and evaluating production plans and cost estimates.

The Second Generation Heliostat development contracts are summarized below.

Second Generation Heliostat Contractors	Contra Start	ct Dates Complete	Contract Costs	
ARCO Power Systems (Formerly Northrup Inc.)	July 79	February 81	\$1.0M	
Boeing Engineering and Construction	July 79	February 81	\$1.7M	
Martin Marietta Corp.	July 79	April 81	\$1.4M	
McDonnell Douglas Astronautics	July 79	February 81	\$1.5M	
Westinghouse	July 79	September 80	\$1.7M	

The program objectives have been met for all of the contractors except Westinghouse as they were not able to build prototype heliostats within the funding limits. Therefore, only limited information is available for the Westinghouse design.

Photographs of the ARCO, Boeing, Martin Marietta, and McDonnell Douglas heliostat designs are shown in Figure 3.1 and 3.2.

Each contractor except Westinghouse delivered two prototype heliostats and four spare mirror modules to Sandia for testing. Detailed design reports and final reports containing costs, manufacturing, installation, and maintenance data were also delivered. Westinghouse only delivered a detailed design report.

3.2 Second Generation Heliostat Evaluation

Sandia has evaluated the Second Generation Heliostat designs. The evaluation involved testing, design analysis, analysis of contractor production methods and cost estimates, and cost projections of bus bar energy costs for a power plant. Heliostat testing was performed at the CRTF to verify the ability to survive environmental requirements. Two prototype





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BOEING



NORTHRUP



MARTIN MARIETTA





MC DONNELL DOUGLAS



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MARTIN MARIETTA



heliostats from each contractor were tested. Similar performance and environmental testing of individual mirror modules was also performed in the laboratory at Sandia Livermore.

The objectives of the evaluation and test program were to:

- Compare design features
- Identify design strengths and weaknesses
- Estimate reliability and lifetimes of key components
- Determine performance capabilities
- Identify user concerns
- Estimate central receiver energy costs
- Identify further development requirements
- Disseminate information

Sandia was assisted in the evaluation by a Review Committee-advisors consisting of representatives from other solar programs and potential users as shown below.

User's Panel

- Public Service Company of New Mexico
- Arizona Public Service
- Southern California Edison
- Exxon
- U. S. Gypsum

Review Committee

- Department of Energy
- Electric Power Research Institute
- Solar Energy Research Institute
- Sandia's Solar Energy Projects Department
- Sandia's CRTF Division
- Sandia's Solar Programs Department
- Jet Propulsion Laboratory Solar Program

Information from the evaluation program is being disseminated in the form of published contractor and Sandia reports and a public seminar.

4.0 Purpose of Structural Modeling

The structural modeling of the Second-generation heliostats was done as part of the overall evaluation of these heliostats by SNLL at the culmination of the Second-generation heliostat contracts. The structural analysis provided information, not accessible by testing, on the structural performance and survivability of the heliostats, and identified potential problems with the structures. The analyses that met this need (shown below) are discussed in the following sections.

Required Values:

Gravity deflections of the individual mirror facets

Facet deflections due to operational wind

Natural frequencies and mode shapes

Field performance (by HELIOS)

For Evaluation of:

Compliance with performance specification

Potential excitation by vortex shedding

Stresses in structural components due to survival wind velocities

Survivability

5.0 Procedure and Tools

All heliostats were idealized as a mesh of finite element beam and plate elements from working drawings supplied by the heliostat contractors. The assumptions inherent in the idealization of each structure are described in Section 6.

Model components were created individually on the Textronix 4081 minicomputer using Textronix Finite Element Modeling (FEM) software.³ The software allows nodes and elements to be created by copying and moving already existing nodes and elements, thus greatly simplifying the creation of symmetrical and repetative structures such as heliostats. It also allows rotation of the model on the viewing screen and displays "slices" through the model facilitating visual checking of the completed model or its parts. The majority of node and element properties may also be input at this stage.

The model components were created on separate data files for easier manipulation and verification. Once created and verified, the components were assembled into the complete models. These were input in a series of programs which created input card images for the SAP4 finite element analysis code. The card images were then transfered from the Textronix minicomputer to the CDC 6600 mainframe. After a final editing of the data files, the models were verified again using two interactive threedimensional plotting routines (GRAPE² and DIS3D). The analyses were performed by the SAP4 finite element program on the CRAY computer. SAP4 is a finite element code for the static and dynamic analysis of linear elastic structures. It is based on the April 1974 version of the SAPIV code developed at U.C. Berkeley by J. Bathe, E. L. Wilson, and F. F. Peterson, but contains modifications made by S. Sackett at the Lawrence Livermore National Laboratory (May 1979).¹

Each model was analyzed in seven different elevation angle orientations (15° increments from vertical to horizontal) with only gravity forces applied, three operational wind load conditions where gravity effects were not

included, and two load conditions of survival wind in addition to gravity forces. The five wind load cases (three operational, two survival) are listed in Table 5.1, with Table 5.2 showing the corresponding forces and moments. The moments in Cases 1, 2, and 5A were applied about a line parallel to the elevation axis and passed through the center of the reflective surface. For Cases 3 and 4, they were applied about a line parallel to the cross-elevation axis passing through the center of the reflective surface. For Case 5B the moment was again applied at the center of the reflective surface but about a line that is perpendicular to the elevation axis and is in the plane of the reflective area. The wind forces were applied as normal pressure on the plate elements representing the mirror module surface. The individual mirror module pressures for each case are shown in Appendix A.

TABLE 5.1

WIND LOAD CONDITIONS

	Wind Velocity	Heliostat Orientation	Wind Orientation To Heliostat		
Operational:					
Case 1 Case 2	27 mph 27 mph	Vertical 70° from vertical	Normal 20° Angle of Attack to Eleva- tion Axis		
Case 3	27 mph	Vertical	20° Angle of Attack to Azimuth Axis		
Survival:					
Case 4	50 mph	Vertical	20° Angle of Attack to Azimuth Axis		
Case 5A	90 mph	Horizontal (stow)	10° Angle of Attack to Eleva- tion Axis		
Case 5B	90 mph	Horizontal (stow)	10° Angle of Attack to Cross Elevation Axis		

Case 5B was run only on the McDonnell Douglas model because, due to the aspect ratio of the heliostat, larger forces are created on the heliostat when the wind is parallel to the elevation axis. The reverse is true for the other three heliostats. The heliostats were in stow position for Case 5 (A and B): mirror modules were facing downward for the Martin Marietta heliostat, but face-up for the other models. The choice of stow position was made by the contractor weighing the advantage of lessened mirror soiling when face-down versus the loss of reflective area, and thus produced energy, required for the cut-out to allow the pedestal to pass through the reflective surface.

TABLE 5.2

		ARCO		BOEING		MARTIN MARIETTA			McDONNELL DOUGLAS			
	Moment (ft-lbs)		Moment (ft-1bs)		Moment (ft-lbs)			Moment (ft-lbs)		ent lbs)		
CASE	Force (1bs)	Az.	Elev.	Force (1bs)	Az.	Elev.	Force (1bs)	Az.	Elev.	Force (lbs)	Az.	Elev.
Operational:	==											
1	1044	0	0	767	0	0	1144	0	520	1116	0	0
2	808	0	3108	658	0	2426	849	0	3488	894	0	3095
3	754	2848	0	658	1983	0	815	3620	0	809	3546	0
Survival:						1						
4	2585	9767	0	2160	6800	0	2795	12414	0	2774	12160	0
5A	4072	0	24346	3476	0	19889	4116	0	26802	4506	0	24197
5B										4469	30541	0

NET WIND LOADS

The loads and moments on each heliostat are governed by the reflective area. The larger the mirror surface the more wind it catches. The moments are also affected by the aspect ratio of the heliostat. The 520 ft-lb moment in Case 1 of the Martin Marietta heliostat was created by the load on the extra center mirror.

The postprocessing of the SAP4 output, done on the CDC 6600, included ploting of deflected shapes and frequency mode shapes, and the computation of the individual, average, and RMS value of facet deflections.

The mirror module deflections, measured by a normal vector to the deformed surface, were calculated for each case of gravity loading and operational wind loading. The support points for the mirror modules were used to define the facet plane thus local mirror warping is not included. For the two heliostats with four point mirror module support, an average was taken of the four possible planes that may pass through the permutation of those four points, three at a time.

6.0 Heliostat Models and Assumptions

The four models differed in problem size and complexity. An indication of the difference is given in Table 6.1.

TABLE 6.1

SIZE OF MODELS

			ARCO	BOEING	MARTIN MARIETTA	MCDONNELL DOUGLAS
== #	of	Nodes	1272	789	612	2154
" #	of	Plate Elements	1092	576	300	1686
 #	of	Beam Elements	1617	114	300	513
#	of	Degrees of Freedom	7312	4062	3203	10988

The models are shown in Figures 6.1 through 6.5

For all heliostats, the pedestals were modeled as beams fully fixed at the base. The assumption that the foundation does not significantly add to structural deflections, and can therefore be neglected in modeling, was verified by measurements at the Central Receiver Test Facility (CRTF) in Albuquerque, New Mexico. The drive mechanisms were modeled as rigid beams in all the static load cases analyzed. The frequency analyses were done twice: the first time the drive mechanisms were assumed rigid, as in the static cases, and the second time torsional and flexural springs were substituted. The spring values were determined by testing at the CRTF on the installed drives mechanisms.



(Only top half of support structure is shown and mirror modules are omitted)

Figure 6.5. McDonnell Douglas Model

6.1 Arco Heliostat

The front and back facings of the mirror module box were modeled as thin plates, as were the webs of the C sections which reinforce the box. These components are the major contributors to the large number of plate elements in the model. The connectivity between the mirror module components is high, consequently so was the number of plate elements that were needed. The flanges of the C sections were modeled as beams running at top and bottom of the webs, and accounted for a large number of the beam elements. All the other components were also modeled with beam elements, with the exception of the gusset plates in the torque tube truss intersection.

6.2 Boeing Heliostat

The Z beams in Boeing's heliostat were modeled with plates in the true shape of the beam. The beams are connected to the mirror modules with clips that are specified by rigid beam elements. The beam element end releases allow the appropriate free movement between the mirror module and the clip, thus creating only one attachment per mirror module linked by all six degrees of freedom. The mirror modules are idealized as plates with stiffnesses computed by a sandwich structure theory.



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(Mirrors face down) Figure 6.4. McDonnell Douglas Model

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Sandwich Stiffness Formulation -- The bending stiffness for a sandwich structure (Figure 6.6) with thin facings and negligible bending stiffness of the core is calculated below.

For equal thickness facings:

$$D = \frac{Eth^2}{2(1-\mu^2)}$$
 Eq. 1.1

2

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 $(\mu = Poisson's Ratio)$

Shear stiffness of the sandwich structure:

$$U \simeq hG_c$$
 Eq. 1.2

where G_c = Effective core shear modulus

Axial stiffness K =
$$\sum_{i=1}^{i} \frac{E_i t_i}{1 - \mu_i^2}$$
 Eq. 1.3

To find equivalent E and t:

$$D = \frac{Et^{3}}{12(1-\mu^{2}_{ave})}$$
Eq. 1.4

$$K = \frac{Et}{1-\mu^{2}_{ave}}$$
Eq. 1.5



Figure 6.6. Sandwich Structure

Equivalent Density = $\gamma = \frac{\sum \gamma_i t_i}{+}$

Eq. 1.6

Finding the properties of a homogenious plate equivalent to the sandwich structure requires the computation of the composite bending stiffness (Eq. 1.1 or 1.2) and axial stiffness (Eq. 1.3). Using these two quantities, and solving Eqs. 1.4 and 1.5 simultanously, yields the new thickness and modulus of elasticity. The shear stiffness of the new plate is taken as the shear stiffness of the core section and Eq. 1.6 provides the equivalent density.

6.3 Martin Marietta Heliostat

Martin Marietta's mirror modules were modeled in the same manner as Boeing's: plate elements with properties derived by sandwich structure theory. Since the glass was designed to be "free floating" it contributed only weight, not stiffness, to the module. The impregnated paper honeycomb also did not add to the bending stiffness. The remainder of the structure, with the exception of plates at the torque tube/truss connections, was comprised of beam elements.

6.4 McDonnell Douglas Heliostat

The model of the McDonnell Douglas heliostat had the highest degree of connectivity as a result of the inherent integration present in the structure. The majority of the structure was modeled with plate elements, including the inboard and outboard beams and cross-beams, rather than using equivalent beam models. All gusset plates, stiffners, and angles supporting the mirror modules were also individually modeled.

7.0 Results

7.1 Facet Deflections Due to Gravity

The average of the individual mirror facet pointing errors at each elevation angle affects beam pointing, and can be compensated for by the control software if this average error is known and remains constant in time. This is the precise case with gravity-induced pointing errors. However, since the control software orients the entire heliostat as a unit, only the average of the pointing errors of all facet can be compensated. The remaining error, the scatter of individual facet errors about the average (rootmean-square (RMS) value), affects beam quality and is used by the HELIOS computer code for the optical performance evaluation or field performance. For this reason, the deflections of each facet due to gravity loading were deterined at heliostat elevation angles from 0° to 90° in increments of 15°. The convention for the elevation angle is shown in Figure 7.1.



Figure 7.1. Heliostat Elevation Angle Convention

The pointing error of each facet was determined by calculating the vector normal to the facet plane. The plane of the facets was defined by the attachment points of the mirror module to the structure. The Arco and Martin Marietta heliostats have three attachment points per mirror module. Since three points define a plane, this computation was straight forward. For the two heliostats with four attachment points per module, McDonnell Douglas and Boeing, an average was taken of the four planes that could be passed through a permutation of those four points three at a time. This is the case for all mirror normal computations mentioned in the remainder of this report. It should be noted that this method of calculating pointing errors does not include local facet warping or curvature between these attachment points.

Figure 7.3 shows the pointing error about the elevation axis (mrad rotation), due to gravity, for each individual mirror module plotted versus the elevation angle of the heliostat. This information is also presented numerically in Appendix B. The mirror module numbering is shown in Figure 7.2. The difference in the pointing error among the facets at a given elevation angle is a characteristic of the beam quality degradation. The average of these pointing errors at each elevation angle is shown on Figure 7.4. These results were used as input to the HELIOS optical performance code. Sample deflected shapes resulting from this analysis are shown in Figures 7.5 to 7.14. Note that the displacements were amplified in these plots by the amount shown on each figure.

Table 7.1 lists the computed RMS values of the mirror module errors taken about the average of the individual errors. RMS values are listed for the elevation and cross-elevation axes at various elevation angles, a measure of the individual facet deflections effect the beam quality. All three torque tube/beam assembly heliostats (Arco, Boeing, and Martin Marietta)

TABLE 7.1

GRAVITY DEFLECTIONS - BEAM QUALITY DEGRADATION* (MRAD)

		ARCO		BOEING	6	MARTIN MARIETTA		McDONNEL1 DOUGLAS	-
HELIOST/	AT ELEVATION ANGLE	C-ELEV.** AXIS	ELEV. AXIS	C-ELEV.** AXIS	ELEV. AXIS	C-ELEV.** AXIS	ELEV. AXIS	C-ELEV.** AXIS	ELEV. AXIS
0° (\	/ertical)	0.29	0.07	0.09	0.01	0.05	0.03	0.13	0.21
15°		0.34	0.12	0.16	0.04	0.23	0.08	0.15	0.28
30°		0.47	0.20	0.27	0.07	0.42	0.17	0.18	0.40
45°		0.60	0.28	0.35	0.10	0.58	0.24	0.22	0.53
60°	-	0.71	0.33	0.42	0.12	0.70	0.30	0.25	0.63
75°		0.77	0.37	0.47	0.13	0.78	0.34	0.27	0.69
90° (H	lorizontal)	0.80	0.39	0.49	0.14	0.81	0.36	0.28	0.71

*RMS About the Average of Individual Facet Slope Errors **Cross Elevation Axis

1	7
2	8
3	9
4	10
5	11
6	12

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1	2	3	4	5	6	7
8	9	10	11	12	13	14

BOEING

McDONNELL DOUGLAS

1	11	6		1	7
2		7		2	8
		8		3	9
3				4	10
4		9	9	5	11
5		10		6	12

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7.2. Mirror Module Numbering Convention





Figure 7.3. Gravity Deflections

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Figure 7.4. Gravity Deflections

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Heliostat Vertical



Figure 7.5 Boeing - Gravity Only

Heliostat Horizontal





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Figure 7.7. Martin Marietta - Gravity Only

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Figure 7.8. Martin Marietta - Gravity Only

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Displacement Amplification: 50



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Figure 7.10. Arco - Gravity Only



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(Heliostat Horizontal)



Displacement Amplification: 200



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Displacement Amplification: 200


show a larger beam degradation about the cross-elevation axis than the elevation axis. The opposite is true for the McDonnell Douglas heliostat whose main structural components are parallel to the elevation axis. Note also that the large spread of errors shown in Figure 7.3 for McDonnell Douglas is comparable to the cross-elevation rotations of the other three heliostats. If a similar graph was drawn for the individual cross-elevation axis errors, it would show McDonnell Douglas with the least spread between mirror module errors at any given elevation angle. On this hypothetical graph Arco and Martin Marietta would appear very similar to the McDonnell Douglas' elevation rotation, with Boeing approximately halfway in between.

Referring back to Table 7.2, Boeing shows the smallest RMS values about both axes of the three torque tube/beam assembly heliostats, but has higher RMS facet slope error than McDonnell Douglas about the cross elevation axes.

7.2 Facet Deflections Under Operation Wind Speeds

Facet deflections due to specified maximum operational wind loads were determined for three orientations of the heliostat to the wind (Table 5.1). The highest wind speed for which beam quality is specified under the contract is 27 mph.

The average pointing errors for each heliostat about the cross-elevation and elevation axes resulting from these load cases are listed in Table 7.2. Individual facet deflections are tabularized in Appendix B. Gravity loads were not included in these analyses so that gravity and wind load effects could clearly be separated. The drive mechanisms were assumed rigid in these analyses, so heliostat deflection due to drive flexibility must be added to the values in Table 7.2 before comparison with specifications can be made. Comparing Table 5.2 and Table 7.2 it may be noted that the differences in deflections are not due simply to the differences in loads. These wind load pointing errors are of the same order of magnitude as those produced by gravity although it is clear, from comparing Figure 7.4 with the elevation axis rotations in Table 7.2, that wind loads induce different types of deflections than gravity. Unlike the pointing errors induced by gravity, fluctuating wind load pointing errors cannot be compensated by the control software.

TABLE 7.2

÷		A	RCO	BO	EING	MAR Mari	TIN ETTA	McDONNELL DOUGLAS	
		AZ. AXIS	ELEV. AXIS	AZ. AXIS	ELEV. AXIS	AZ. AXIS	ELEV. AXIS	AZ. Axis	ELEV. AXIS
CASE 1:	27 mph Wind Elevation Angle: 0° Wind _ to Hstat	0.0	0.54	0.0	0.14	0.0	0.19	0.0	0.29
CASE 2:	27 mph Wind Elevation Angle: 70° 20° A.ofA.~Elev. Axis	0.0	0.80	0.0	0.27	0.0	0.38	0.0	0.43
CASE 3:	27 mph Wind Elevation Angle: 0° 20° A.ofA.~Az. Axis	0.46	0.47	0.16	0.12	0.31	0.13	0.65	0.21

OPERATIONAL WIND POINTING ERROR* (MRAD)

*Average of Individual Facet Slope Errors -Note: Gravity Effects Not Included

As with gravity pointing errors, Boeing has the least error of the four heliostats about the elevation axis, followed closely by Martin Marietta. Arco has the largest elevation axis rotation whereas McDonnell Douglas had the largest gravity induced rotation.

A similar analysis was performed at SNLA on the two heliostats developed by Martin Marietta and McDonnell Douglas for the 10-MWe pilot plant at Barstow, California. The pilot plant heliostats and Second-generation heliostats showed gravity deflections on the same order of magnitude. Operational wind load deflections of the Second-generation heliostats were similar to those of the Martin Marietta design for Barstow but slightly less than McDonnell Douglas' Barstow heliostat. Although the two companies involved in the Barstow design were also participating in the Secondgeneration contracts, the Martin Marietta heliostat had undergone a significant redesign and McDonnell Douglas had a completely new design.

7.3 Structural Stresses Under Survival Wind Velocities

Structural stresses were computed for two combinations (three for McDonnell Douglas) of gravity and wind loads described as survival conditions in section 5 (Table 5.1). The 50 mph criteria (Load Case 4) was taken from a study of thunderstorm gusts. The heliostat must survive a 50 mph gust at any elevation angle orientation. The 90 mph criteria covering a combination of wind and gusts (Load Case 5) was taken from the Uniform Building Code specification covering most sites in the Southwestern part of the U.S. The heliostats are in the stow position for such high winds: mirrors upward for Arco, Boeing, and McDonnell Douglas, and mirrors downward for Martin Marietta. The stow position was chosen by the heliostat contractor.

The largest stress values found in each heliostat are shown in Table 7.3. These stresses are not high since the designs were driven by deflection criteria rather than loading. Also shown in Table 7.3 are the theoretical wind speeds that would bring about the largest stress (up to the maximum stress allowable) and the theoretical wind speeds that would cause yielding. These wind speeds were calculated from the relationship between wind speed and induced pressure. The pressure or load varies with the square of the wind velocity.

The highest stresses, as a fraction of allowable, in the Arco and Boeing heliostats, occured in the torque tube near the connection to the drive mechanism. Arco also had relatively high stresses in the bolts connecting the mirror modules to the structure. Martin Marieta's highest stress occured in the chord of an exterior truss near the connection of the truss to the torque tube. For McDonnell Douglas, the highest stress was found in the deep cross-beam near the gusset plate reinforced area. The maximum "allowable" and "yield" winds listed in Table 7.3 are the wind velocities required to bring the location of highest stress to the AISC specified allowable and yield stress, respectively.

The heliostat structures experienced the highest stress in the Case 5 (90 mph-stowed) loading. However, the most severe condition for the pedestals was Case 4 (50 mph-heliostat vertical) because of the additional torsion and shear that are present when the heliostat is in a vertical position. All torque tubes showed the highest stresses in Case 5 loading at the connection to the drive mechanisms. The diagonal members in the trusses of the Martin Marietta and Arco heliostats were checked against buckling and were found to be satisfactory.

TABLE 7.3

	Calculated Stress	Allowable Stress	Max "Allowable" Wind	Yield Stress	Max "Yield" Wind
Arco	8,497 psi	21,600 psi	143 mph	36,000	185 mph
Boeing	8,164 psi	21,600 psi	147 mph	36,000	189 mph
Martin Marietta	1 7, 138 psi	21,600 psi	101 mph	36,000	130 mph
McDonnell Douglas	1 4, 251 psi	21,600 psi	111 mph	36,000	143 mph

LARGEST STRESSES IN SURVIVAL CONDITIONS

7.4 Natural Frequencies and Mode Shapes

For each heliostat, the lowest five natural frequencies were determined in order to evaluate the heliostats' susceptibility to excitation by vortex shedding. Excitation by vortex shedding is an oscillation caused by eddies of wind forming behind the heliostat. The frequencies at which this will occur are determined by the heliostat size and shape, and the wind velocity. The vortex shedding frequency is given by:

N_S = SU/D where N_S = frequency of full cycles of vortex shedding D = characteristic dimension of the body projected on a plane normal to the flow velocity U = Velocity of incoming flow S = Strouhal number

The Strouhal number is 0.156 for a flat plate with the direction of flow normal to the plate. In the case of flow parallel to the plate the Strouhal number is 0.145. Table 7.4 shows the vortex shedding frequencies resulting from the above calculation using these two cases with the worst case characteristic dimensions each heliostat (i.e. one side only), shown in Figure 7.15, at a wind velocity of 27 mph.

TABLE 7.4

	Arco	Boeing	Martin Marietta	McDonnell Douglas
for D =	144.23"	120.75"	144.00"	132.25"
With wind perpendicular to heliostat: N _S =	0.51 hz	0.61 hz	0.51 hz	0.56 hz
With wind parallel to heliostat: N _S ≠	0.48 hz	0.57 hz	0.48 hz	0.52 hz

VORTEX SHEDDING FREQUENCIES

It is worth noting that 90 percent of the wind energy is contained in frequencies below 0.5 Hz. Thus, the frequency range of concern is approximately 0.4- 0.6 Hz.

The frequency analysis of the models was first performed with rigid drive mechanisms. These results are presented in Table 7.5. The associated mode shapes are characterized in Figure 7.16 and the computer generated shapes are shown in Figures 7.17 through 7.36. The computer drawn mode shapes were done by a three-dimensional plotting routine, GRAPE, developed at the Lawrence Livermore National Laboratory.







Figure 7.16. Mode Shapes With Rigid Drives







Figure 7.18. Arco Mode 2



Figure 7.19. Arco Mode 3



Figure 7.20. Arco Mode 4



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Figure 7.22. Boeing Mode 1





Figure 7.24. Boeing Mode 3



Figure 7.25. Boeing Mode 4



Figure 7.26. Boeing Mode 5



Figure 7.27. Martin Marietta Mode 1



Figure 7.28. Martin Marietta Mode 2



Figure 7.29. Martin Marietta Mode 3

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Figure 7.30. Martin Marietta Mode 4



Figure 7.31. Martin Marietta Mode 5



Figure 7.32. McDonnell Douglas Mode 1



Figure 7.33. McDonnell Douglas Mode 2



Figure 7.34. McDonnell Douglas Mode 3



Figure 7.35. McDonnell Douglas Mode 4



Figure 7.36. McDonnell Douglas Mode 5

Table 7.6 shows the frequencies of the heliostats where drive mechanisms were characterized by linear flexural and torsional springs (stiffness values were determined from testing data taken at the CRTF). The associated mode shapes are depicted in Figure 7.37 and again in the computer-drawn mode shapes in Figures 7.38 through 7. 57. Table 7.6 also shows the appropriate stiffnesses used in each case. The elevation stiffnesses varied with the elevation angles of the heliostats. The load deflection curves of the drive mechanisms generally did not follow a straight line, but rather diverged at two different slopes. The higher stiffness corresponded to the lower loads with a definite knee where the change in stiffness took place (see report on Structural Testing of Second-Generation Heliostats by W. Rorke for more information). The stiffness chosen was an average value. The effect of the drives was to soften the structure as a whole and to spread out the range of natural frequencies for each heliostat.

The lowest frequencies of the heliostats were still well above the vortex shedding frequencies for operational winds velocities and the entire range of concern.

The natural frequencies of the pilot plant heliostat were comparable with the second-generation results:

	Range of Lowest Five Frequencies							
	W/Rigid Drive	Drive W/Springs						
Martin Marietta (Pilot Plant)	4.1 - 5.8 Hz	2.0 - 5.4 Hz						
McDonnell Douglas (Pilot Plant)	3.1 - 6.2 Hz	1.8 - 5.6 Hz						

TABLE 7.5

HELIOSTAT NATURAL FREQUENCIES-MODELS WITH RIGID DRIVES

Unlighted Flow	Arc	co	Вое	Martin Boeing Marietta			McDon Doug	nell las
Angle	0°	90°	0°	90°	0°	90°	0°	90°
Lowest Five Frequencies	2.29 2.42	2.28 2.42	2.48 2.52	2.47 2.52	4.56 4.69	4.45 4.69	3.59 4.15	3.43 4.15
(Drives Assumed Rigid)	3.33 3.96 4.37	3.26 3.96 4.29	6.90 6.94 7.33	6.57 6.60 7.20	4.85 5.62 6.23	5.01 5.57 5.81	4.91 5.67 8.65	4.89 5.30 8.65



Figure 7.37. Mode Shapes With Flexible Drives



Figure 7.38. Arco With Flexible Drive - Mode 1



Figure 7.39. Arco With Flexible Drive - Mode 2









Figure 7.43. Boeing With Flexible Drive - Mode 1







Figure 7.45. Boeing With Flexible Drive - Mode 3



Figure 7.46. Boeing With Flexible Drive - Mode 4



Figure 7.47. Boeing With Flexible Drive - Mode 5













Figure 7.50. McDonnell Douglas With Flexible Drive - Mode 3



Figure 7.51. McDonnell Douglas With Flexible Drive - Mode 4







Figure 7.53. Martin Marietta With Flexible Drive - Mode 1







Figure 7.54. Martin Marietta With Flexible Drive - Mode 2



Figure 7.56. Martin Marietta With Flexible Drive - Mode 4



Figure 7.57. Martin Marietta With Flexible Drive - Mode 5

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	Arco		Boei	ng	Mar Mari	tin etta	McDonnell Douglas		
	0°	90°	0°	90°	0°	90°	0°	90°	
Elev. Stiff <u>in-lb</u> rad	2.1x10		1.8x10 ⁷	2.2x10 ⁷	5.4x	10 ⁷	4.9x10 ⁷	1.8x	
Azim. Stiff <u>in-1b</u> rad	1.8x10 ⁷		1.5x10 ⁷ 1.5x10 ⁷		2.0x10 ⁷		2.2x10 ⁷	2 . 2x	
(Drives Modeled as Springs-CRTF Test Data)	2.28 2.34 2.41 2.57 3.56	1.59 2.39 2.45 3.24 3.70	2.39 2.52 2.67 3.19 6.94	1.75 2.52 2.81 4.51 6.49	2.15 3.40 4.55 4.69 4.81	1.62 3.44 4.69 4.72 5.67	2.03 3.38 3.58 4.90 8.53	1.65 2.30 4.13 4.89 8.64	

HELIOSTAT NATURAL FREQUENCIES-MODELS WITH FLEXIBLE DRIVES HZ

8.0 Recommendations for Further Analysis

In the event these heliostats will be structurally refined, a review of the deflection results yielded by the current analysis would be very useful. Such a review could identify the percent deflection, individual components are contributing to the total. Consequently, each of the components could be redesigned to more cost effective.

Since it is anticipated that heliostat analyses will continue to be done at Sandia or in the private sector, a single coherent post-processing code to handle the data extraction, vector normal computation and averaging, coordinate convertion, optional gravity, out referencing, and various output options with regard to its further use (i.e. HELIOS, statistical information, reports) would be valuable.

The analysis using measured drive mechanism stiffnesses was limited. Reanalyzing all static load cases with this stiffness is not necessary since deflections due to the drive can be calculated separately and added to structural deflections. However, further work can be done to determine the effects of nonlinear behavior of the drives that may result in lower natural frequencies, possibly enough to slip near the range of concern.

APPENDIX A -- WINDLOAD PRESSURES

Windload pressures applied to mirror modules. The pressures were applied uniformely over the shown area and normal to the reflective surface.



Figure A-1. Arco Heliostat Dimensions

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28.73	45.97	63.20	69.43	69.43	63.20	45.97	28.73
(0.60)	(0.96)	(1.32)	(1.45)	(1.45)	(1.32)	(0.96)	(0.60)
52.67	69.91	87.62	93.37	93.37	87.62	69.91	52.67
(1.10)	(1.46)	(1.83)	(1.95)	(1.95)	(1.83)	{1.46}	{1.10)
64.64	82.32	99.59	105.34	105.34	99.59	82.32	64.64
(1.35)	(1.72)	(2.08)	(2.20)	(2.20)	(2.08)	(1.72)	(1.35)
64.64	82.32	99.59	105.34	105.34	99.59	82.32	64.64
(1.35)	(1.72)	(2.08)	(2.20)	(2.20)	(2.08)	(1.72)	(1.35)
52.67	69.91	87.62	93.37	93.37	87.62	69.91	52.67
(1.10)	(1.46)	(1.83)	(1.95)	(1.95)	(1.83)	(1.46)	(1.10)
28.73	45.97	63.20	69.43	69.43	63.20	45.97	28.7 3
(0.60)	(0.96)	(1.32)	(1.45)	(1.45)	(1.32)	(0.96)	{0.60}

NET FORCE = 464 N, (1044 lbs) NET MOMENT = 0

Figure A-2. Arco Case 1 Wind Pressures, Pascals, (lbs/ft^2)

	123.05 (2.57)			123.05 (2.57)	
	 101.03 (2.11)		-	101.03 (2.11)	
	72.78 (1.52)			72.78 (1.52)	
-	62.72 (1.31)			62.72 (1.31)	-
	 30.64 (0.64)			30.64 (0.64)	
-	12.45 (0.26)	•	-	12.45 (0.26)	

NET FORCE = 3594 N, (808 lbs) NET MOMENT = 4214 N·m, (3108 ft-lbs)



													•		
114. (2.4	91 0)	102 (2.1	.94 15)	82.((1.7	33 '3)	67 {1.	.99 42)	58. (1.2	41 22)	42. (0.8	13 38)	21.! (0.4	55 5)	11.4 (0.2	49 24)
	1				1	,		1				. ,			

NET FORCE = 3354 N, (754 lbs) NET MOMENT = 3861 N·m, (2848 ft-lbs)

Figure A-4. Arco Case 3 Wind Pressures, Pascals, (lbs/ft^2)

													-		
394. (8.2	.53 24)	353 (7.	.84 39)	283 (5.9	.45)2)	232 (4.	2,70 86)	20 (4	1.10 .20)	143 (3.0	.64)0)	73. (1.9	.26 53)	39 (0.	.26 82)
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NET FORCE = 11499 N, (2585 lbs) NET MOMENT = 13242 N·m, (9767 ft-lbs)

Figure A-5. Arco Case 4 Wind Pressures, Pascals, (lbs/ft^2)

-	1030.86 (21.53)		-	1030.86 (21.53)	· · · · · · · · · · · · · · · · · · ·	
	453.43 (9.47)			453.43 (9.47)		
	247.54 (5.17)		-	247.54 (5.17)		
	154.65 (3.23)	-		154.65 (3.23)		
	92.89 (1.94)			92.89 (1.94)		
	51.71 (1.08)			51.71 (1.08)		-

NET FORCE = 18,113 N, (4072) NET MOMENT = 33,008 N·m, (24,346 ft·lbs)

Figure A-6. Arco Case 5 Wind Pressures, Pascals, (lbs/ft^2)





28.73	48.84	62.24	69.43	69.43	62.24	48.84	28.73
(0.60)	(1.02)	(1.30)	(1.45)	(1.45)	(1.30)	(1.02)	(0.60)
52.67	72.28	86.66	93.37	93.37	86.66	72.78	52.67
(1.10)	(1.52)	(1.81)	(1.95)	(1.95)	(1.81)	(1.52)	(1.10)
64.64	85.23	98.63	105.34	105.34	98.63	85.23	64.64
(1.35)	(1.78)	(2.06)	(2.20)	(2.20)	(2.06)	(1.78)	(1.35)
64.64	85.23	98.63	105.34	105.34	98.63	85.23	64.64
(1.35)	(1.78)	(2.06)	(2.20)	(2.20)	(2.06)	(1.78)	(1.35)
52.67	72.78	86.66	93.37	93.37	86.66	72.78	52.67
(1.10)	(1.52)	(1.81)	(1.95)	(1.95)	(1.81)	(1.52)	(1.10)
28.73	48.84	62.24	69.43	69.43	62.24	48.84	28.73
(0.60)	(1.02)	(1.30)	(1.45)	(1.45)	(1.30)	(1.02)	(0.60)

NET FORCE = 3870 N, (870 LBS) NET MOMENT = 0

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Figure A-8. Boeing Case 1 Wind Pressures, Pascals, (lbs/ft^2)

	- 115.39 - (2.41)	 		— 115.39 - (2.41)	
	94.80 (1.98)		-	— 94.80 — (1.98)	
	— 67.99 — (1.42)	 		67.99 (1.42)	
	— 58.89 — (1.23)		-	- 58.89 - (1.23)	
k	— 28.73 — (0.60)			— 28.73 — (0.60)	
-	- 11.49 - (0.24)	 	-=	— 11.49 — (0.24)	

115.39 (2.41)	101.51 (2.12)	85.23 (1.78)	67.99 (1.42)	58.89 (1.23)	39.26 (0.82)	22.98 (0.48)	11.49 (0.24)
	The second se						

NET FORCE = 2807 N, (631 LBS) NET MOMENT = 3289 N • M, (2426 FT-LBS) NET FORCE = 2802 N, (630 LBS) NET MOMENT = 2689 N • M, (1983 FT-LBS)

Figure A-9. Boeing Case 2 Wind Pressures, Pascals,

Figure A-10. Boeing Case 3 Wind Pressures, Pascals,

(lbs/ft²)

(lbs/ft²)

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395.49 (8.26)	348.57 (7.28)	292.07 (6.10)	233.18 (4.87)	201.58 (4.21)	135.50 (2.83)	78.52 (1.64)	39.74 (0.83)
						-	

	1010.75 - (21.11)		- 1010.75 - (21.11)	
	- 444,81 - (9.29)		- 444.81 - (9.29)	
≤	- 242.75 - (5.07)		- 242.75 - (5.07)	
	- 151.78 - (3.17)		- 151.78 - (3.17)	
	- 90.97 - (1.90)	 	- 90.97 - (1.90)	
4	- 50.75 - (1.06)		- 50.75 - (1.06)	

NET FORCE = 9608 N, (2160 LBS) NET MOMENT = 9219 N . M, (6800 FT-LBS) NET FORCE = 14,795 N, (3326 LBS) NET MOMENT = 26,966 N • M, (19889 FT-LBS)

Figure A-11. Boeing Case 4 Wind Pressures, Pascals, Figure A-12. Boeing Case 5 Wind Pressures, Pascals, $(1bs/ft^2)$

(lbs/ft²)




					98.06					
40.22 (0.84)	56.50 (1.18)	65.12 (1.36)	84.27 (1.76)	93.85 (1.96)	(1.86) 94.80 (1.98) 106.8	93.85 (1.96)	84.27 (1.76)	65.12 (1.36)	56.50 (1.18)	40.22 (0.84)
69.91 (1.46)	86.66 {1.81}	95.76 (2.00)	106.29 (2.22)	126.40 (2.64)	(2.23) 124.5 (2.60) 130.7 (2.73)	126.40 (2.64)	106.40 (2.22)	95.76 (2.00)	86.66 (1.81)	69.91 (1.46)
79.96 (1.67)	96.72 (2.02)	105.35 (2.21)	116.35 (2.43)	124.49 (2.60)	k]	124.49 {2.60}	116.35 (2.43)	105.35 (2.21)	96.72 (2.02)	79.96 {1.67}
69.91 (1.46)	86.66 (1.81)	95.76 (2.00)	106. 29 (2.22)	126.40 (2.64)		126.40	106.40 (2.22)	95.76 (2.00)	86.66 (1.81)	69.91 (1.46)
40.22 {0.84}	56.50 (1.18)	65.12 (1.36)	84.27 (1.76)	93.85 (1.96)		93.85 (1.96)	84.27 (1.76)	65.12 (1.36)	56.50 (1.18)	40.22 (0.84)

NET FORCE = 5088 N, (1:44 lbs) NET MOMENT = 705 N m, (520 ft-lbs)

Figure A-14. Martin Marietta Case 1 Wind Pressures, Pascals, (lbs/ft²)

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NET FORCE = 3625, (815 lbs) NET MOMENT = 4908 N·m, (3620 ft-lbs)

Figure A-16. Martin Marietta Case 3 Wind Pressures, Pascals, (lbs/ft²)



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NET FORCE = 18, 309 N, (4116 lbs) NET MOMENT = 36, 338 N·m, (26, 802 ft-lbs)

Figure A-18. Martin Marietta Case 5 Wind Pressures, Pascals, (lbs/ft^2)





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33.52	61.29	75.17	75.17	75.17	61.29	33.52
(0.70)	(1.28)	(1.57)	(1.57)	(1.57)	(1.28)	(0.70)
54.10	82.35	96.72	96.72	96.72	82.35	54.10
(1.13)	(1.72)	(2.02)	(2.02)	(2.02)	(1.72)	(1.13)
73.26	101.98	114.91	114.91	114.91	101.98	73.26
(1.53)	(2.13)	(2.40)	(2.40)	(2.40)	(2.13)	(1.53)
80.44	108.21	122.09	122.09	122.09	108.21	80.44
(1.68)	(2.26)	(2.55)	(2.55)	(2.55)	(2.26)	(1.68)
80.44	108.21	122.09	122.09	122.09	108.21	80.44
(1.68)	(2.26)	(2.55)	(2.55)	(2.55)	(2.26)	(1.68)
73.26	101.98	114.91	114.91	114.91	101.98	73.26
(1,53)	(2.13)	(2.40)	(2.40)	(2.40)	(2.13)	(1.53)
54.10	82.35	96.72	96.72	96.72	82.35	54.10
(1.13)	(1.72)	(2.02)	(2.02)	(2.02)	(1.72)	(1.13)
33.52	61.29	75.17	75.17	75.17	61.29	33.52
(0.70)	(1.28)	(1.57)	(1.57)	(1.57)	(1.28)	(0,70)

NET FORCE = 4964 N, (1164 LBS) NET MOMENT = 0



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		- 127.36 - (2.66)		
		- 113.48 - (2.37)		
		- 92.41 - (1.93)		
	-	- 75.17 - (1.57)		
-		- 65.12 - (1.36)		
		- 65.12 - (1.36) - 45.27 - (0.96)		
		- 65.12 - (1.36) - 45.27 - (0.96) - 23.94 - (0.50)		

NET FORCE = 3977 N, (894 LBS) NET MOMENT = 4196 N • M, (3095 FT-LBS)

Figure A-21. McDonnell Douglas Case 2 Wind Pressures, Pascals, (lbs/ft²)

114.91 (2.40)	98.15 (2.05)	77.09 (1.61)	63.20 (1.32)	48.36 (1.01)	23.33 (0.55)	11.49 (0.24)

NET FORCE = 3599 N, (809 LBS) NET MOMENT = 4808 N • M, (3546 FT-LBS)

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395.01 (8.25)	335.64 (7.01)	264.78 (5.53)	217.38 (4.54)	166.14 (3.47)	90.97 (1.90)	39.74 (0.83)

NET FORCE = 12339 N, (2774 LBS) NET MOMENT = 16487 N • M, (12160 FT-LBS)

Figure A-23. McDonnell Douglas Case 4 Wind Pressures, Pascals, (lbs/ft^2)

-		- 1065.34 - (22.25)		
-		- 711.02 - (14.85)		
•		- 378.73 - (7.91)		
		- 255.68 - (5.34)		
		- 159.92 - (3.34)		
•		- 122.09 - (2.55)		
-		- 81.88 - (1.71)		
-		- 53.15 (1.11)		

NET FORCE = 20,044 N, (4506 LBS) NET MOMENT = 32,806 N • M, (24,197 FT-LBS)

Figure A-24. McDonnell Douglas Case 5A Wind Pressures, Pascals, (lbs/ft²)

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1057.20 (22.08)	560.20 (11.70)	327.50 (6.84)	211.63 (4.42)	137.42 (2.87)	84.75 (1.77)	52.67 (1.10)

NET FORCE = 19,879 N, (4469 LBS) NET MOMENT = 41408 N • M, (30541 FT-LBS)

Figure A-25. McDonnell Douglas Case 5B Wind Pressures, Pascals, (lbs/ft^2)



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In local coordinates, the i component is also the rotation of the module about the y axis, as is the j component the rotation about the x axis, measured in radians. The title for each analysis case shows the elevation angle. Also noted in the title is miscellaneous information pertinent to that analysis. "W/g" and "G ONLY" refer to cases where gravity loading was applied. The McDonnell Douglas and Boeing results had to be averaged over the four possible planes passing through a permutation of the four support points, thre at a time. The average values are those shown and a note of this is made in the caption of those cases. At the end of each case are printed the average rotations and the RMS values for the rotations in local coordinates.

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			VECTORS NO	RMAL TO MIRROR SURFAC	Ε	
	IN LO	CAL COORDINAT	ES	IN GL	CBAL COORDIN	IATES
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		· · · · · ·				
NRT . Y	ERT, W/ G	, ELEVATION	ANGLE = 0.	DEGREES FROM VERTICA	L	- 00103066
FACET 2	+00040784	00095633	.99999946	.00040764	69999999	00099821
FACET 3	.00009129	00080213	99999967	.00009129	99999968	00081128
FACET 4	00023995	00080628	.99999967	00008995	99999967	00081128
FACET 5	00026336	00096285	.99999950	00026336	-,99999954	00099821
FACET 6	00040625	00095700	+99999946	00040625	999999954	00103966
FALET 7	00040734	00095633	.999999950	00026495	99999954	00099821
FACET 9	00009129	00060613	99999967	00009129	99999968	0081128
FACETIG	.00008995	00080628	.99999967	.00008995	99999967	00081128
FACET11	.00026336	00096285	.99999950	. 30026336	99999954	00099822
FACETIZ	.00040625	00095700	• 4 4 4 4 4 4 4 4	.00040625	44444454	00103468
AVERAGES 1	.00000000	00090650				
RHS 1	.00028500	-CCC07238				
	N *	12				
····						
NRT AT	150. 6 DNLY	. ELEVATION	ANGLE= 15.	DEGREES FROM VERTICA	L	
FACET 1	.COG18694	00082409	.99999964	.00018694	96613679	.25800272
FACET 2	.00004819	00079779	.99999968	.00004819	96613200	.25804696
FACET 3	00011958	00071645	.99999974	00011958	96611101	.25811736
FACET 4	00029384	00083483	-99999961 00000034	00029384	- 96619818	25770778
FACET 5	00059610	00101663	.99999931	00059610	96618845	.25768052
FACET 7	00018694	00082409	. 9999964	00018694	96613879	.25800272
FACET 8	0004819	00079779	.99999968	00004819	96613200	.25804696
FACET 9	.00011958	00071646	.99999974	.30011958	96611101	.25811736
FACETIO	+C0029384	00083483	.99999961		96614156	25770779
FACET12	.00059610	00101663	.99999931	.00059610	96618845	.25768052
AVERAGES 1	.0000000	00087403				
RMS 1	.00034271	.00012078				
	<u>N</u> =	12				
NRT A	T 2GD, W/ G	. ELEVATION	ANGLE = 20.	DEGREES FROM VERTICA	L	
FACET 1	.00011113	00077147	.99999970	.00011113	93995620	.34128762
FACET 2	00002485	00073458	199999973	00002485	93994361	.34132938
FACET 6	00035916	66093610	.99999959	00010047	93997825	.34116491
FACET 5	00052104	00107469	.99999929	00052104	94005964	.34089760
FACET 6	00065367	00102658	.99999926	00065367	94004324	.34087625
FACET 7	00011112	00077147	.9999997C	00011112	93995620	.34128762
FACET 8	.00002485	→.00073458	.99999973	-00002485	93994361	.34132938
FACETIO	.00016897	00083610	.99999959	- 20035936	93997826	.34116490
FACET11	.00052104	00107469	.95999929	.00052164	94005964	34089759
FACET12	.00065367	00102659	.99999926	. 30065367	94004324	.34087625
ANED ACER -						
4 296434344 • 2009	.00038220	0003377				
	N =	12				
107 IT	100 0 101 9	ES E MATIN	ANCIS- 30	Dicorde communation		
EACET 1	- 60004409	- CCORREAR	ANGLE 30.	UEGREES FRUM VERILLAL	86634517	49944439
FACET 2	00017070	00058304	.9999982	0CC17070	86631678	49947379
FACET 3	0032164	00058150	.9.499978	30032184	86631601	.49942431
FACET 4	0C0478CC	0030998	.99999956	36047360	86643011	.49918527
FACET 5	00062602	00107820	,99999922	00062602	36656400	49891989
FACET 7	00074088	00101109 00063688	.99599970	- 00004498	36634517	.49944437
FACET B	.0017070	00053304	.999999982	.30017070	86631678	49947378
FACET 9	.C0G32184	00058150	.99999978	.00032184	86631601	.49942431
FACETIC	.CC047800	00040999	.99977956	. 30047906	86643011	.49918527
FACET11 FACET12	.00062602	00107820	.999999922	.00062602	86656400	49891988
PALEIIZ	.00074088	~.001011C9	*44444451	.JUU14588	00003001	*#49AT048
AVERAGES 1	.00000000	00073395				
RMS 1	.00046779	.00020040				
	N =	12				

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NRT A	AT 45D, G ONLY	, ELEVATION	ANGLE= 45.	DEGREES FROM VERTICAL	
FACET 1	00027418	00041345	.99999988	000274187073990	70675590
FACET 2	00037871	00032967	.99999987	000378717073398	.70675165
FACET 3	00050343	00040822	.95999979		10004833
FAGET 6	00053138	00073239	4999993	000031307076244	1 10042270
FALET 2	00015182		199999918		70624324
FALEI O	00084943	- 200093991	0000088		70676500
EACET A	.00027418	- 00032967	00000087		70675146
FACET G	.00057872	00032707	.00000070		.706664932
FACETIO	-00063138	COD73240	.06699951	.0006313870762463	.70642268
FACETII	.00075182	00103213	.99999918	.000751827078362	.70620329
FACET12	.00084943	00093991	.99999920	.000849437077710	70621040
			••••••		
AVERAGES 1	.00000000	00064263			
RMS =	.00059964	.00027494			
	N =	12			
				· · · · · · · · ·	
NRT AT	60D, G DNLY	, ELEVATION	ANGLE= 60.	DEGREES FROM VERTICAL	
FACET 1	00048401	CC015548	.99999987	0004840150013464	.86577111
FACET 2	0055944	06005098	.99999984	000559445000441	.86574439
FACET 3	00064832	00020389	.99999977	0006483250017651	.86568539
FACET 4	00073841	00059948	.99999955	0007384150051908	.86554945
CALES 5	00082217	00090815	.999999925	0068221750078621	.80341224
FALLI O	00088415	00019112	.99999929	0008391550089088	.80242/51
FALEI / Eacet 4	.00045401	00013340	**********	*UUUHAHUI =*JUULIHO: .aanssaik _ saaakii	007//111 .84874470
FACET O	61066832	+ 66626360	00000077	-00064832 - 5001765	8454830
FACETIO	.00073841	- 000020370	.00000055	-00073841 - 50051900	84554945
FACETII	-00082217	00090615	.00000025	.00082217 = 50078628	.86541224
FACET12	.00083915	00079772	.99999929	.00088915 50069069	.86542751
AVERAGES #	.00000000	00645262			
RMS :	.00070467	.00033157			
	N =	12			
	· · · · · · · · · · · · · · · · · · ·				
NRTA	T 7CD, W/ G	, ELEVATION	ANGLE- 70.	EGREES FROM VERTICAL	
NRT A FACET L	T 7CD, W/ G CC060803	, ELEVATION .00002214	ANGLE= 70.	EGREES FROM VERTICAL 0006086334199934	.93990054
NRT A FACET 1 FACET 2	T 7CD, W/ G CC060803 C0066154	<pre>> ELEVATION .00002214 .00013713</pre>	ANGLE= 70. .99999981 .99999977	EGREES FROM VERTICAL 00060863 34199934 00066154 34189126	• 93990054
NRT A FACET L FACET 2 FACET 3	T 7CD, W/ G CC060803 C0066154 CC072359	<pre>> ELEVATION .00002214 .C0013713CC006C69</pre>	ANGLE = 70. .99999981 .99999977 .99999974	DEGREES FROM VERTICAL 0006080334199934 0006615434189126 0007235934207713	• 93990054 • 93992348 • 93944402
NRT A FACET L FACET 2 FACET 3 FACET 4	T 7CD, W/ G CC060803 C0066154 CC072359 CC078546	<pre>, ELEVATION .00002214 .C0013713 CC006C69 CCC49147 CCC49147</pre>	ANGLE = 70. .99999981 .99999977 .99999974 .99999957	DEGREES FROM VERTICAL 0006080334199934 0006615434189126 0007235934207711 0007354634248193	.93990054 .93992348 .93944402 .93937532
NRT A FACET 1 FACET 2 FACET 3 FACET 4 FACET 5 CACET 5	T 7CD, W/ G CC060803 CC072359 CC072359 CC078546 CC078546	<pre>, ELEVATION .00002214 .00013713 -0006669 -0006669 -00079630 -00079630</pre>	ANGLE = 70. .99999981 .99999977 .99999974 .999999357 .99999933	DEGREES FROM VERTICAL 00C6080334199934 00C6615434169126 0C07235934207717 00C7354634248193 0008419734276833 0008419734276833	• 93990054 • 93992348 • 93944402 • 93937532 • 93929563
NRT A FACET 1 FACET 2 FACET 3 FACET 4 FACET 5 FACET 6 FACET 7	T 7CD, W/ G CC060803 CC066154 CC072359 CC078546 CC0864197 CC086627 CC086627	<pre>, ELEVATION .00002214 .00013713 0C00666 0C649147 00079630 0C367723 .0C367723</pre>	ANGLE - 70. .9999981 .9999977 .9999974 .99999757 .99999933 .99999938 .99999938	DEGREES FROM VERTICAL 0006080334199934 0006615434189126 0007355934207711 0007354634248193 0008419734276831 0008862734265661 00088619734265661 00088619734265661 00088619734265661 00088619734265661 00088619734265661 00088619734265661 00088619734265661 0008862734265661 0008865734265665 00088657342656565 0008865734265655 00088555 000885555 000885555 00085555 000855555 00085555 000855555 000855555 000855555 000855555 00085555 000855555 000855555 000855555 000855555 000855555555 00085555555555555555555555555555555555	• 93990054 • 93992348 • 93944402 • 93937532 • 93929563 • 93931055
NRT A FACET 1 FACET 2 FACET 3 FACET 4 FACET 5 FACET 6 FACET 7	T 7CD, W/ G CC060803 CC066154 CC072359 CC078546 CC0864197 LC086627 .CC060603	<pre>, ELEVATION .00002214 .00013713 0000669 00049147 00079630 00367723 .00002214</pre>	ANGLE = 70. .99999981 .99999974 .9999977 .99999757 .99999757 .99999933 .99999938 .99699981	DEGREES FROM VERTICAL 00060334199934 0006015434109126 0007235934207711 0007354634248193 0008419734276331 000886273426564 .000886273426564	.93990054 .93992348 .93944402 .93937532 .9392563 .93931055 .93990054
NRT A FACET 1 FACET 2 FACET 3 FACET 4 FACET 5 FACET 6 FACET 7 FACET 6	T 7CD, W/ G CC060803 C0066154 CC072359 CC078546 CC085427 CC688627 .CC060603 .C0366154	<pre>, ELEVATION .00002214 .C0013713 CC006C69 CCC49147 00079630 0C367723 .CC0C2214 .CC013713</pre>	ANGLE = 70. .9999981 .9969974 .9969974 .99699757 .9999974 .99999933 .96699938 .99699981 .99699977	DEGREES FROM VERTICAL 0006615434199934 0006615434189126 000735934207713 0007354634248103 0008419734276831 000842734276831 0008862734265645 .300660033419934 .3006615434189126	• 93990054 • 93992348 • 93944402 • 93937552 • 9392953 • 93931055 • 93990054 • 93992348
NRT A FACET 1 FACET 2 FACET 3 FACET 3 FACET 5 FACET 6 FACET 6 FACET 7 FACET 7 FACET 9	T 7CD, W/ G CC060803 C0066154 CC072359 CC078546 CC08627 CC68627 .CC060603 .C0060154 .CC72359	, ELEVATION .00002214 .00013713 0004669 00079630 00367723 .0002214 .00013713 00313713	ANGLE - 70. .99999981 .99999977 .99999974 .99999957 .99999938 .99999981 .99999977 .9999974	DEGREES FROM VERTICAL 00C6080334199934 00C6015434189126 0C07235934207711 0CC7354634248193 0008419734276331 0C08462734265645 .0CC608033419934 .3CC66015434189126 .0CC7235934207716	• 93990054 • 93992348 • 93944402 • 93937532 • 9392963 • 93931055 • 93990054 • 93992348 • 93944402
NRT A FACET 1 FACET 2 FACET 3 FACET 4 FACET 5 FACET 6 FACET 7 FACET 7 FACET 9 FACET10 7	T 7CD, W/ G CC060803 C0066154 CC072359 CC078546 CC086197 CC08627 .CC060603 .C060603 .C0066154 .CC72359 .C0073546	<pre>, ELEVATION .0002214 .00013713 -00006669 00079630 00079630 0007723 .0002214 .00013713 00036770 00049143</pre>	ANGLE - 70. .99999981 .99999974 .99999974 .999999757 .99999938 .99699981 .99699981 .59999977 .9999977 .9999977	DEGREES FROM VERTICAL 00C6080334199934 00C6015434189126 00C7354634207717 00C7354634248193 0008419734276831 000842734265645 .0C6608033419934 .0C66615434189126 .0CC735463428199 .0CC7354634248199	. 93990054 . 93992348 . 93944402 . 93937532 . 93929563 . 93931055 . 93990054 . 93990054 . 93992348 . 93944402 . 93937532
NRT A FACET 1 FACET 2 FACET 3 FACET 3 FACET 4 FACET 5 FACET 5 FACET 6 FACET 7 FACET 9 FACET 9 FACET 10 FACET 11 FACET 11	T 7CD, W/ G CC060803 CC072359 CC072359 CC078546 CC0864197 CC086627 .CC060603 .C066603 .C066603 .C073546 .CC72359 .CC073546 .CC084197	<pre>, ELEVATION .00002214 .00013713 -00006669 00040147 00079630 0007723 .0002214 .00013713 00030713 000347143 000349143 000349143</pre>	ANGLE - 70. .99999981 .99999977 .99999974 .99999973 .99999933 .99599981 .99599981 .99599977 .9999977 .9999975 .9999975 .9999953	DEGREES FROM VERTICAL 00C6080334199934 00C6015434189126 0C07235934207711 0C07354634248193 0008419734276831 0C08861973425645 .0CC6080334199934 .0CC60615434189126 .0CC7354634248194 .0C08419734276833	. 93990054 . 93992348 . 93944402 . 93937532 . 93929563 . 93929563 . 93990054 . 93990054 . 93992348 . 93944402 . 93937532 . 93929563
NRT A FACET 1 FACET 2 FACET 3 FACET 5 FACET 6 FACET 6 FACET 7 FACET 7 FACET 9 FACET 10 FACET 11 FACET 12	T 7CD, W/ G CC063B03 CC063B03 CC078546 CC078546 CC08627 .CC086627 .CC060603 .C3366154 .CC72359 .CC073546 .CC08627 .CC086627	<pre>, ELEVATION .00002214 .00013713 -0000666 -00049147 -00079630 -00039630 -0003713 .0002214 .0013713 -00034143 -00034143 -00034143 -00034143 -00034143 -00034143</pre>	ANGLE - 70. .9999981 .9999977 .9999977 .9999977 .9999973 .9999933 .99999938 .99999981 .9999977 .9999974 .9999975 .9999973 .99999938	DEGREES FROM VERTICAL 0006080334199934 0006615434189126 0007235934207711 0007354634248193 0008419734276831 00086273426564 .000660334199934 .0006615434189126 .0007359634204194 .0008419734276833 .300886273426564	• • 93990054 • 93992348 • 93944402 • 93937532 • 93929563 • 93990054 • 93990054 • 93992054 • 93992348 • 93944402 • 93937532 • 93929563 • 93931055
NRT A FACET 1 FACET 2 FACET 3 FACET 4 FACET 5 FACET 5 FACET 7 FACET 7 FACET 9 FACET 10 FACET 11 FACET 12	T 7CD, W/ G CC060803 C0066154 CC072359 CC078546 CC0864197 CC086027 .CC060603 .C3366154 .CC72359 .C0073546 .C2084197 .CC086627	<pre>, ELEVATION .00002214 .00013713 0C006C69 0C049147 00079630 0C067723 .0C002214 .C0013713 0C067723 0C049143 0C049143 0C07723 0C067723</pre>	ANGLE - 70. .99999981 .99999977 .99999974 .999999733 .99999938 .99999981 .99999977 .9999974 .99999973 .99999933 .99999938	DEGREES FROM VERTICAL 0006080334199934 0006015434189126 0007235934207711 0007354634248193 0008419734248193 000886273426564 .000680334199934 .0006615434189126 .0007235934267716 .000735463424819 .0008419734276832 .3008862734265645	• • 93990054 • 93992348 • 93944402 • 93937532 • 93937553 • 93931055 • 93990054 • 93992348 • 93944402 • 939344402 • 9393455
NRT A FACET 1 FACET 2 FACET 3 FACET 3 FACET 4 FACET 5 FACET 5 FACET 6 FACET 7 FACET 7 FACET 9 FACET 10 FACET 11 FACET 12 AVERAGES 1 AVERAGES 1	T 7CD, W/ G CC060803 C0066154 CC072359 CC078546 CC08627 . CC060603 . C0060603 . C0060603 . C006054 . CC073546 . C008627 . CC006CCC	<pre>, ELEVATION .00002214 .0003713 -0C006C69 -0C049147 -00079630 -0C367723 .0C002214 .0C013713 -0C26C70 -0C349143 -0C26C70 -0C649143 -0C667723 -0C667723</pre>	ANGLE - 70. .99999981 .99999977 .99999977 .99999957 .99999988 .99999988 .99999981 .99999977 .99999977 .99999977 .99999978 .99999938	DEGREES FROM VERTICAL 00C6086334199934 00C6015434169126 0C07235934207717 0CC7354634268193 0008419734276831 0CC608033419934 .0CC608033419934 .0CC605434189126 .0CC735463428129 .0CC735463428129 .0CC735463428129 .0CC735463428129 .0C08419734276833 .3008862734265645	• • 93990054 • 93992348 • 93944402 • 93937532 • 9392963 • 93931055 • 93990054 • 93992348 • 93944402 • 93937532 • 93924563 • 93931055
NRT A FACET 1 FACET 2 FACET 3 FACET 3 FACET 4 FACET 6 FACET 6 FACET 7 FACET 9 FACET 10 FACET 11 FACET 12 AVERAGES 1 RMS 1	T 7CD, W/ G CC060803 C0066154 CC072359 0C078546 0C08627 CC086627 . CC060603 . C006603 . C0065546 . C2084197 . CC086627 . CC086627 . CC006CCC . CC75744	<pre>, ELEVATION .00002214 .00013713 00006669 00079630 00079630 0007723 .0002214 .0013713 00249143 00249143 00249143 00249143 00249143 00031107 .00035978</pre>	ANGLE - 70. .99999981 .99999977 .99999977 .99999977 .99999933 .96699938 .99699981 .99699981 .99699981 .99699977 .9999974 .99699957 .99699938	DEGREES FROM VERTICAL 00C6080334199934 00C6015434169126 0C07235934207717 0CC7354634248193 0008419734276831 0C080862734265645 .JCC6080334189126 .JCC6080334189126 .0CC735463428194 .0CC7354634248194 .CC08419734276832 .J008862734265645	• 93990054 • 93992348 • 93944402 • 93937532 • 93929563 • 93990055 • 93990055 • 93990055 • 93992348 • 93944402 • 93937532 • 9392563 • 93931055
NRT A FACET 1 FACET 2 FACET 3 FACET 3 FACET 4 FACET 6 FACET 6 FACET 7 FACET 7 FACET 7 FACET 8 FACET 17 FACET 9 FACET 11 FACET12 AVERAGES 1 AVERAGES 1 RMS 1	T 7CD, W/ G CC060803 C0066154 CC072359 CC078546 CC0864197 CC086627 .CC060603 .C060603 .C0065154 .CC72359 .CC08627 .CC086427 .CC	<pre>, ELEVATION .00002214 .C0013713 -0C006C69 CCC49147 00079630 -0C367723 .CC002214 .C013713 UC36770 0C347143 CC56770 CCC67723 CCC67723 GC0311C7 .0C035978 12</pre>	ANGLE - 70. .9999981 .9999977 .9999977 .9999975 .99999933 .9699981 .99699981 .99699977 .9999977 .9999975 .9999975 .99999933 .96999938	DEGREES FROM VERTICAL 000600334199934 0006615434189126 0007354634248193 0008419734276833 00084273426564 .000600334199934 .0006615434189126 .0007354634248194 .0008419734276833 .0008862734265645	. 93990054 . 93992348 . 93944402 . 93937532 . 93929563 . 93990054 . 93990054 . 93990054 . 939902348 . 93944402 . 93937532 . 93937532 . 93929563
NRT A FACET 1 FACET 2 FACET 3 FACET 5 FACET 6 FACET 6 FACET 7 FACET 7 FACET 9 FACET 10 FACET 11 FACET 12 AVERAGES 1 RMS 1	T 7CD, W/ G CC060803 CC072359 CC078546 CC078546 CC086197 CC086627 .CC060603 .C060603 .C073546 .CC72359 .CC086627 .CC086654 .CC77354 .CC086657 .CC086657 .CC086554 .CC77354 .CC08657 .CC08657 .CC08657 .CC08657 .CC08657 .CC085457 .CC085577 .CC085577 .CC085577 .CC0855777 .CC0855777	<pre>, ELEVATION .00002214 .C0013713 CC006C69 CCC49147 00079630 0C367723 .CC002214 .CC013713 CC36770 CC349143 CC279630 CC667723 CC667723 CC0311C7 .0C035978 12</pre>	ANGLE - 70. .9999981 .9999977 .9999977 .99999757 .99999933 .99699981 .99699981 .99699981 .99699977 .9999977 .9999975 .99699957 .99699938	DEGREES FROM VERTICAL 0006080334199934 0006615434189126 0007359634207711 0007354634248193 0008419734276833 0008862734265645 .000640334199934 .00064197342807716 .0007354634248194 .0008419734276832 .3008862734265645	. 93990054 . 93992348 . 93944402 . 93937532 . 93929563 . 93990054 . 93990054 . 93992348 . 93944402 . 93937532 . 93929563 . 93929563
NRT A FACET 1 FACET 2 FACET 2 FACET 3 FACET 3 FACET 5 FACET 6 FACET 6 FACET 7 FACET 7 FACET 9 FACET10 FACET11 FACET12 AVERAGES 1 RMS 1	T 7CD, W/ G CC060803 C0066154 CC072359 CC078546 CC086027 CC086027 .CC08603 .C3366154 .CC72359 .CC086027 .CC086627 .CC086627 .CC00CCCC .CC75744 N =	<pre>, ELEVATION .00002214 .00013713 0C006C69 0C049147 00079630 0C05723 .CC002214 .CC013713 0C0567723 0C0549143 0C03607723 CC067723 CC067723 CC067723 CC0511C7 .0C035978 12</pre>	ANGLE = 70. .99999981 .99999977 .99999957 .99999953 .99999988 .99999981 .99999977 .9999974 .9999974 .9999974 .9999978 .9999938	DEGREES FROM VERTICAL 0006080334199934 0006615434189126 000735934207711 0007354634248193 0008419734276831 000886273426564 .000600334199934 .000615434189126 .000735934207716 .000735934278832 .0008419734278832 .0008662734265645 DEGREES FROM VERTICAL	• 93990054 • 93992348 • 93944402 • 93937532 • 93937532 • 93931055 • 93990054 • 93992348 • 93944402 • 939344402 • 939344402
NRT A FACET 1 FACET 2 FACET 3 FACET 3 FACET 4 FACET 5 FACET 5 FACET 6 FACET 6 FACET 7 FACET 9 FACET 10 FACET 11 FACET 12 AVERAGES 1 RMS 1 NRT AT FACET 1	T 7CD, W/ G CC060803 C0066154 CC072359 CC078546 CC08627 CC08627 . CC060603 . C0060603 . C0060503 . C0060503 . C0060503 . C0060507 . CC08627 . CC008627 . CC00864147 . CC008647 . CC0086	<pre>, ELEVATION .00002214 .C0013713 0C006C69 0C049147 00079630 0C367723 .CC002214 .C0013713 0C36070 0C364143 0C3607723 CC067723 CC067723 GC0311C7 .0C035978 12 .ELEVATION .CC011118</pre>	ANGLE - 70. .99999981 .99999977 .99999977 .99999935 .99999981 .99999977 .99999977 .99999977 .99999978	DEGREES FROM VERTICAL 00C6080334199934 00C6015434109126 0C07235934207717 0C07354634248193 0008419734276831 0C08862734265645 .0CC608033419934 .0CC608033419934 .0CC7355434189126 .0CC7355434248194 .0C08419734276833 .3008862734265645 DEGREES FRCM VERTICAL 0006611425871165	• • • • • • • • • • • • • • • • • • •
NRT A FACET 1 FACET 2 FACET 3 FACET 3 FACET 4 FACET 5 FACET 6 FACET 6 FACET 7 FACET 7 FACET 9 FACET 10 FACET 12 ACET112 AVERAGES 1 RMS 1 NRT AT FACET 1	T 7CD, W/ G CC060803 C0066154 CC072359 CC078546 CC078546 CC08627 . CC060603 . C0066003 . C00606154 . CC073546 . C2084197 . CC086627 . CC008627 . CC08627 . CC077 . CC08627 . CC08627 . CC08627 . CC0777 . CC07777 . CC07777 . CC07777 . CC07777 . CC07777 . CC07777 . CC07777 . CC07777 . CC07777 . CC077777 . CC077777 . CC077777 . CC077777 . CC07777777 . CC077777777777777777777777777777777777	<pre>, ELEVATION .00002214 .C0013713 CC006C69 CCC49147 00079630 0C367723 .CC002214 .CC013713 CC25C70 CC267723 CC267723 CC267723 CC267723 CC267723 CC267723 CC267723 CC267723 CC267723 CC267723</pre>	ANGLE = 70. .99999981 .9999997 .9999997 .9999997 .9999993 .99999981 .99999981 .99999981 .9999997 .9999997 .99999978 .99999978 .99999978	DEGREES FROM VERTICAL 00C6080334199934 00C6080334199934 00C7354634189126 00C7354634248193 0008419734276831 000842734265645 .JCC608033419934 .JCC608033419934 .JCC6080334189126 .JCC7354634248194 .00C7354634248194 .00C7354634248194 .0008619734276832 .J008862734265645 .J008862734265645 .JCC602027125871164 00C7027125859735	• • • • • • • • • • • • • • • • • • •
NRT A FACET 1 FACET 2 FACET 2 FACET 3 FACET 4 FACET 5 FACET 6 FACET 6 FACET 7 FACET 7 FACET 9 FACET 10 FACET 11 FACET 12 AVERAGES 1 RMS 1 NRT AT FACET 2 FACET 3 FACET 3	T 7CD, W/ G CC060803 C0066154 CC072359 CC078546 CC078546 CC086027 . CC060603 . C060603 . C060603 . C060603 . C0065154 . CC073546 . C2084197 . CC086627 . CC00CCCC . CC75744 N = 75D, G 2NLY CC06114 CC073C72	<pre>, ELEVATION .00002214 .C0013713 CC006C69 CCC49147 00079630 0C367723 .CC002214 .CC012713 CC07723 CC56770 CCC67723</pre>	ANGLE = 70. .99999981 .9999997 .9999974 .99999974 .99999973 .99999981 .99699981 .99699981 .99699977 .99999973 .99999938 ANGLE = 75. .9999978 .9999978 .9999973	DEGREES FROM VERTICAL 000600334199934 000735934207711 0007354634248193 0008419734276831 00084273426564 .00064033419934 .0006615434189126 .000735463428194 .000841973427716 .0008419734276833 .000862734265645 DEGREES FROM VERTICAL 0006611425871164 0005611425871164 0007027125859733 000750222588070	• • • • • • • • • • • • • • • • • • •
NRT A FACET 1 FACET 2 FACET 2 FACET 3 FACET 5 FACET 6 FACET 6 FACET 7 FACET 7 FACET 9 FACET 10 FACET10 FACET12 AVERAGES 1 AVERAGES 1 RMS 1 NRT AT FACET 1 FACET 3 FACET 4	T 7CD, W/ G CC060803 C0066154 CC072359 CC078546 CC086027 .CC086027 .CC086027 .CC060603 .C3066154 .CC72359 .C0073546 .C2084197 .CC08627 .CC08627 N = 75D, G 3NLY CC066114 CC73271 CC07522 C0079682	<pre>, ELEVATION .00002214 .C0013713 CC006C69 CCC49147 00079630 0C367723 .CC002214 .C0013713 CC3670 CC349143 CC349143 CC349143 CC349143 CC349143 CC35978 12 .CC035978 12 .ELEVATION .CC011118 .CC022454 .CC021246 CC242675</pre>	ANGLE - 70. .9999981 .9999977 .9999977 .9999977 .9999933 .99999938 .99699981 .99699977 .9999977 .9999977 .9999975 .9999978 .99999938	DEGREES FROM VERTICAL 0006080334199934 0006015434189126 0007359634207711 0007354634248193 0008419734276833 000862734265645 .000660334199934 .0006615434189126 .0007354634248194 .0008419734276832 .2008862734265645 .0008662734265645 .0008662734265645 .0006611425871166 0007502225880700 0007502225880700	• 93990054 • 93992348 • 93944402 • 93937532 • 93937532 • 93990054 • 93990054 • 93992348 • 93944402 • 9397532 • 93944402 • 93931055 • 93931055 • 93931055 • 93931055 • 93931055 • 93931055
NRT A FACET 1 FACET 2 FACET 2 FACET 3 FACET 5 FACET 6 FACET 6 FACET 7 FACET 7 FACET 6 FACET 7 FACET 1 FACET 12 AVERAGES 1 NRT AT FACET 1 FACET 1 FACET 3 FACET 3 FACET 4 FACET 5 FACET 5	T 7CD, W/ G CC060803 C0066154 CC072359 CC078546 CC086627 .CC086027 .CC086627 .CC086627 .CC086627 .CC086627 .CC086627 .CC086627 .CC086627 .CC086627 .CC075744 N = 75D, G JNLY CC075721 CC075622 CC079685 CC079685 CC079685	<pre>, ELEVATION .00002214 .00013713 0C006C69 0C049147 00079630 0C057723 .CC002214 .CC013713 0C0567723 0C0549143 0C0567723 CC067723 CC067723 CC051117 .0C035978 12 , ELEVATION .CC01118 .0L022954 .CC01246 CC02875 0C072046</pre>	ANGLE = 70. .99999981 .99999981 .99999957 .99999988 .99999988 .99999988 .9999977 .9999974 .9999974 .9999973 .9999973 .9999973 .9999973 .9999973	DEGREES FROM VERTICAL 0006080334199934 0007235934207711 0007354634268193 0008419734276831 0008402734276831 0008402734276831 .0008402734207716 .0007235934207716 .0007235934207716 .0007235934207716 .0008419734276832 .3008862734265645 DEGREES FRCM VERTICAL 0006611425871160 0007027125859733 000750222580700 3007887025923310 0008387025923060	• 93990054 • 93992348 • 93944402 • 93937532 • 93937532 • 93990054 • 93990054 • 93990054 • 93992348 • 93944402 • 93937532 • 9392553 • 93931055 • 940563805 • 940565805 • 940565805 • 940565805 • 940565805 • 940565805 • 940565805 • 940565805 • 940565805 • 940565805 • 94056
NRT A FACET 1 FACET 2 FACET 3 FACET 4 FACET 4 FACET 5 FACET 5 FACET 6 FACET 6 FACET 7 FACET 7 FACET 1 FACET 9 FACET12 AVERAGES 1 RMS 1 AVERAGES 1 FACET 1 FACET 1 FACET 3 FACET 5 FACET 5	T 7CD, W/ G CC060803 C0066154 CC072359 CC078546 CC078546 CC08627 . CC060603 . C0060603 . C0060503 . C0060503 . C0060503 . C0060503 . C0073546 . C008627 . CC086627 . CC0066114 CC075C22 CC0387C25 CC037C25	<pre>, ELEVATION .00002214 .C0013713 -0C006C69 CCC49147 00379630 0C367723 .CC002214 .C0013713 CC36C70 0C36C70 0C36C70 CC667723 CC051116 .CC0311C7 .CC0311C7 .CC035978 12 .CC031266 CCC42875 CCC42875 CCC42875 CCC42875</pre>	ANGLE = 70. .99999981 .99999977 .99999977 .99999938 .99999981 .99999981 .99999981 .9999977 .99999977 .99999978 .9999998 .9999998 .99999978 .99999978 .99999978 .99999978 .99999978 .9999998	DEGREES FROM VERTICAL 00C6080334199934 00C6080334199934 00C735934207717 00C7354634248193 0008419734276831 00C68862734265645 .0CC608033419934 .0CC608033419934 .0CC7354634248199 .0CC7354634248199 .0CC7354634248199 .0CC7354634248199 .0CC7354634248199 .0CC7354634248199 .0C08419734276832 .0008662734265645 .0008662734265645 .0008662734265645 .0008662725871164 0CC7027125871164 0CC796852592314 0CC8387025952064 0CC8307025952064	• 93990054 • 93992348 • 93944402 • 93937532 • 93937532 • 93990055 • 93990055 • 93990055 • 93990055 • 93992348 • 93944402 • 93937532 • 93929563 • 93929563 • 93931055 • 93929563 • 93931055 • 96561689 • 96569123 • 96569123 • 96569283
NRT A FACET 1 FACET 2 FACET 3 FACET 3 FACET 5 FACET 6 FACET 6 FACET 7 FACET 7 FACET 1 FACET 12 ACET12 AVERAGES 1 RMS 1 AVERAGES 1 FACET 1 FACET 2 FACET 3 FACET 5 FACET 5 FACET 5 FACET 5 FACET 6 FACET 7	T 7CD, W/ G CC060803 C0066154 CC072359 CC078546 CC078546 CC08627 CC08627 . CC060603 . C0060603 . C0060527 . CC08627 . CC08627 . CC08627 . CC08627 . CC086214 N = 75D, G 3NLY CC075C22 CC037685 CC037685 . CC037685 . CC0376814	<pre>, ELEVATION .00002214 .00013713 -00006669 -00049147 -00079630 -00067723 .00002214 .0013713 -0002214 .0013713 -000249143 -000249143 -000249143 -00031107 .00035978 12 .00031107 .00035978 12 .00031246 -000325954 .00011117</pre>	ANGLE = 70. .99999981 .99999974 .99999974 .999999757 .99999933 .96699938 .99699981 .49999977 .9999974 .9999974 .99999973 .96999978 .99999978 .99999973 .99999973 .99999973 .99999959 .9999944 .99699978	DEGREES FROM VERTICAL 00066015434199934 0007235934207717 0007354634248193 0008419734276831 000842734276831 000842734276831 000842734265645 .J0068033419934 .J0068015434189122 .J007235934207716 .J007354634248199 .0008419734276832 .J008862734265645 .J008862734265645 .J008862734265645 .J008862734265645 .J008862725871164 0007502225860703 0007502225952064 0008387025952064 0008387025952064 0008387025952064 0008387025952064 0008387025952064 0008387025952064 0008387025952064 0008387025952064 0008387025952064 0008387025952064 0008387025952064 0008387025952064 0008387025952064 0008387025952064 0008387025952064 0008387025952064 0008387025952064 0008387025952064 00086611425871164	. 93990054 . 93992348 . 93944402 . 93937532 . 9392963 . 9392963 . 93990054 . 93990054 . 93990054 . 93992348 . 93944402 . 93937532 . 93929563 . 93931055 . 93931055 . 93931055 . 939611689 . 96611689 . 965618075 . 96563805 . 96565083 . 96565083
NRT A FACET 1 FACET 2 FACET 2 FACET 3 FACET 4 FACET 5 FACET 5 FACET 6 FACET 7 FACET 7 FACET 9 FACET 10 FACET12 AVERAGES 1 AVERAGES 1 FACET 12 AVERAGES 1 FACET 12 AVERAGES 1 FACET 12 FACET 1 FACET 1 FACET 2 FACET 3 FACET 5 FACET 5 FACET 6 FACET 7 FACET 7 FACET 7 FACET 7 FACET 7 FACET 7 FACET 7 FACET 7 FACET 7	T 7CD, W/ G CCO60803 CO066154 CC072359 CC078546 CC078546 CC08627 .CC066003 .C0066003 .C0066154 .CC72359 .CC08627 .CC08627 .CC08627 .CC08627 .CC073546 .CC73271 CC037685 CC037685 CC037685 .CC037685 .CC037685 .CC037685 .CC037685 .CC037685 .CC037685 .CC037685 .CC037685 .CC037687 .CC037687 .CC037687 .CC037687 .CC037687 .CC037687 .CC037687 .CC037687 .CC037687 .CC037687 .CC037687 .CC037687 .CC037687 .CC037687 .CC037687 .CC037687 .CC037687 .CC037687 .CC03767 .CC037687 .CC037687 .CC037687 .CC03767 .CC0377 .CC03767 .CC03767 .CC03767 .CC03767 .CC03767 .CC03777 .CC03767 .CC03767 .CC03777 .CC03777 .CC03777 .CC03777 .CC037777 .CC037777 .CC037777 .CC0377777 .CC0377777 .CC0377777777777777777777777777777777777	<pre>, ELEVATION .00002214 .C0013713 CC006C69 CCC49147 00079630 0C367723 .CC002214 .CC013713 CC367723 CC56770 CC567723 CC567723 CC577630 CC577630 CC577630 CC577630 CC577630 CC577630 CC57764 CC57764 CC57764 CC572646 CC572646 CC572646 CC572646 CC572646 CC572646 CC572646</pre>	ANGLE - 70. .99999981 .9999997 .9999977 .9999973 .9999993 .99999938 .99999981 .99999981 .9999997 .9999973 .9999973 .9999973 .9999973 .9999978 .9999978 .9999978 .9999978 .9999978 .9999978 .9999978 .9999978 .9999978 .9999978	DEGREES FROM VERTICAL 000600334199934 000735934207711 0007354634248193 0008419734276833 00084273426564 .00064615434189126 .0007354634189126 .0007027125871164 000862734267683 .000862734265645 .000862734265645 .000862734265645 .000862734265645 .000862734265645 .000862734265645 .0008862734265645 .0008862734265645 .00088627359733 .00070271259434 .0006611425871164 .0006611425871164 .0006611425871164 .00067085259434	. 93990054 . 93992348 . 93992348 . 93937532 . 9392963 . 9392963 . 93990055 . 93990054 . 93990054 . 93990054 . 93992348 . 93944402 . 93937532 . 93944402 . 93937532 . 93944402 . 93937532 . 93931055 . 93931055 . 96561689 . 96563805 . 96565083 . 96565083 . 9661089
NRT A FACET 1 FACET 2 FACET 2 FACET 3 FACET 5 FACET 6 FACET 6 FACET 7 FACET 7 FACET 10 FACET 11 FACET 12 AVERAGES 1 RMS 1 NRT AT FACET 2 FACET 5 FACET 1 FACET 1 FACET 2 FACET 5 FACET 5 FACET 5 FACET 5 FACET 5 FACET 5 FACET 6 FACET 7 FACET 7 FACET 7 FACET 7 FACET 7	T 7CD, W/ G CC060803 C0066154 CC072359 CC078546 CC086027 .CC086027 .CC086027 .CC086027 .CC086027 .CC086027 .CC086027 .CC086027 .CC086027 .CC086027 .CC086027 .CC086027 .CC086027 .CC086027 .CC086027 .CC086027 .CC086027 .CC086027 .CC080	<pre>, ELEVATION .00002214 .00013713 0C006C69 0C049147 00079630 0C367723 .CC002214 .CC013713 0C36C70 0C349143 0C36C70 0C349143 0C36C7723 0C379630 CCC67723 CCC67723 CCC67723 CCC67723 CCC67723 CCC67723 CCC67723 CCC67723 CCC67723 CCC67723 CCC67254 CCC42875 CCC42875 CCC42875 CCC42875 CCC42875 CCC623 .CO01117 .CC22554 .OO01225</pre>	ANGLE - 70. .99999981 .99999977 .99999977 .99999973 .99999981 .99999977 .9999977 .9999977 .9999978 .99999938 ANGLE - 75. .99999978 .99999978 .99999978 .99999978 .99999978 .99999978 .99999978 .99999978 .99999978 .99999978 .99999978 .99999978 .99999978 .99999978 .99999978 .99999978 .99999978 .99999978 .9999978 .9999978 .9999978 .9999978 .9999978 .999978 .9999978 .999978 .99978 .999978 .99978 .99978 .99978 .99978 .99978 .997888 .99788 .99788 .99788 .997888 .99788 .99788 .9	DEGREES FROM VERTICAL 0006003 34199934 00065154 34189126 00073546 34248193 00084197 34276833 00084197 34265645 .00084197 34265645 .00084197 34276833 00084197 34265645 .00084197 34265645 .00084197 342848194 .00084197 34276833 .00084197 34276833 .0008627 34265645 .0008627 34265645 .0008627 34265645 .0008627 34265645 .0008627 34265645 .0008627 34265645 .0008627 34265645 .0008627 34265645 .00086627 34265645 .00086627 25871164 .00075022 2588070 .00075022 25982064 .0006014 2597334 .0006014 2598733 .00070271 2585973 .00070271 2585973 .0007027	. 93990054 . 93992348 . 93944402 . 93937532 . 93990054 . 93990054 . 93990054 . 93990054 . 939944402 . 939344402 . 939344402 . 939344402 . 9393455 . 93944402 . 9393655 . 93931055 . 946611975 . 96611975 . 96606913 . 96601689 . 96611975 . 96601975 . 96601975 . 96601975 . 96601975 . 96611975 . 96611975 . 96611975 . 96611975 . 96611975 . 96611975
NRT A FACET 1 FACET 2 FACET 3 FACET 4 FACET 6 FACET 5 FACET 7 FACET 10 FACET 11 FACET 11 FACET 1 FACET 12 AVERAGES 1 RMS 1 NRT AT FACET 1 FACET 5 FACET 1 FACET 6 FACET 1 FACET 7 FACET 3 FACET 5 FACET 5 FACET 7 FACET 7 FACET 9 FACET 9 FACET 10 FACET 7	T 7CD, W/ G CC060803 C0066154 CC072359 CC078546 CC08627 CC08627 . C0060603 . C0060603 . C0060603 . C0060603 . C0060603 . C0060603 . C0060607 . CC08627 . CC08627 . CC08627 . CC08614 CC075744 N = 75D, G 9NLY CC0387C CC0387C CC0387C CC0387C CC037C22 . CC079685 . C0075022 . CC079685	<pre>, ELEVATION .00002214 .00013713 -0C006C69 -0C049147 -00079630 -0C367723 .CC002214 .CC013713 -0C367723 -0C367723 -0C367723 -0C367723 -0C367723 -0C35978 12 ; ELEVATION .CC01118 .0L022654 .CC032646 -0CC22654 -0CC72646 -0CC7264 -0CC726 -0CC</pre>	ANGLE = 70. .99999981 .99999981 .99999957 .99999983 .99999988 .99999981 .99999981 .99999977 .99999973 .99999973 .99999973 .99999978 .99999978 .99999978	DEGREES FRCM VERTICAL 00C6086334199934 00C6015434169126 0C07235934207711 0CC7354634268193 0C08419734276831 0CC6080334199934 .0CC6080334199934 .0CC6080334199934 .0CC7354634189126 .0CC7354634248194 .0CC735463426831 .0CC854673426832 .0008419734276833 .000862734265645 .000862734265645 .000862734265645 .000862734265645 .000862734265645 .000862734265645 .0008611425871160 0CC796852592331 0C0838702592306 0CC870852592331 .0CC75022258973 .0CC75022258973 .0CC75022258973 .0CC75022258973 .0CC75022258973	• 93990054 • 93992348 • 93944402 • 93937532 • 93937532 • 93990054 • 93990054 • 93990054 • 93992348 • 93944402 • 93937532 • 93929563 • 93931055 • 93931055 • 93931055 • 93931055 • 93931055 • 93931055 • 93931055 • 94661973 • 96569123 • 9661975 • 96569123 • 96569
NRT A FACET 1 FACET 2 FACET 3 FACET 3 FACET 4 FACET 5 FACET 5 FACET 6 FACET 7 FACET 7 FACET 9 FACET 10 FACET 11 FACET 12 AVERAGES 1 RMS 1 AVERAGES 1 RMS 1 FACET 1 FACET 12 AVERAGES 1 RMS 1 FACET 2 FACET 12 AVERAGES 1 RMS 1 AVERAGES 1 RMS 1 FACET 2 FACET 1 FACET 3 FACET 5 FACET 5 FACET 5 FACET 6 FACET 7 FACET 7 <	T 7CD, W/ G CC060803 C0066154 CC078546 CC078546 CC08627 CC08627 . CC060603 . C0060603 . C0060503 . C0060503 . C008627 . CC08627 . CC08627 . CC08627 . CC08627 . CC08614 CC75744 N = 75D, G 3NLY CC075022 CC03877 . CC03877 . CC075022 . CC075023 . CC075022 . CC075022 . CC075023 . CC075023	<pre>, ELEVATION .00002214 .C0013713 CC006C69 CC049147 00079630 0C367723 .CC002214 .C0013713 CC36C70 0C36C70 0C36C70 CC667723 CC067723 CC051116 .CC0311C7 .CC035978 12 .CC031266 CC42675 CC42675 CC42675 CC672666 CC22554 .C001245 CC072646 CC22554 .C001245 CC072646 CC072646 CC22554 .C001245 CC072647</pre>	ANGLE = 70. .99999981 .9999997 .9999997 .9999997 .99999981 .99999981 .99999981 .9999977 .99999978 .99999978 .99999978 .99999978 .99999978 .99999978 .99999978 .99999978 .99999978 .99999978 .99999978 .999978 .999978 .999978 .999998 .9999988 .99888 .99888 .99888 .99888 .99888 .99888 .998888 .9988888 .99888888 .99888888 .99888888888 .998	DEGREES FROM VERTICAL 00066015434199934 0007235934207717 0007354634248193 0008419734276331 000862734265645 .3006802734265645 .3006802734265645 .3006615434189120 .0007354634189120 .0007354634248199 .0008419734276832 .0008602734265645 .3008862734265645 .3008862734265645 .3008862734265645 .3008862734265645 .3008862734265645 .3008862735952066 0007968525952066 .30073027125859733 .30073027125859733 .30073027125859733 .30073027125859733 .30073027125859733 .300736852592331 .3007368525	• 93990054 • 93992348 • 93992348 • 93937532 • 93937532 • 9393055 • 93990054 • 93990054 • 93990054 • 93992348 • 93944402 • 93937532 • 93929563 • 93929563 • 93931055 • 93929563 • 93931055 • 93929563 • 93931055 • 96611689 • 96569123 • 96563805 • 96569123 • 96563123
$\begin{array}{c c} & NRT & A \\ \hline FACET & 1 \\ \hline FACET & 2 \\ \hline FACET & 3 \\ \hline FACET & 4 \\ \hline FACET & 5 \\ \hline FACET & 6 \\ \hline FACET & 6 \\ \hline FACET & 7 \\ \hline \hline FACET & 7 \\ \hline \hline FACETI0 \\ \hline FACET10 \\ \hline \hline FACET12 \\ \hline \\ \hline AVERAGES & 1 \\ \hline \\ FACET12 \\ \hline \\ $	<pre>T 7CD, W/ G CC060803 C0066154 CC072359 0C078546 0C08627 0C086211 0C075C22 0C076837 0C08114 0C075C22 0C037685 0C087685</pre>	<pre>, ELEVATION .00002214 .00013713 -00006669 -00049147 -00079630 -000607723 .00002214 .0013713 -0002214 .0013713 -000249143 -000249143 -00031107 .00035978 12 .00031107 .00035978 12 .0003107 .00035978 12 .00031246 -0003246 -00001245 -00001245 -00001245 -00001245 -00001245 -00001245 -00001245 -00001245 -00001245 -00001245 -00001245 -00001245</pre>	ANGLE = 70. .99999981 .9999997 .9999997 .9999997 .9999997 .99999981 .99999981 .99999981 .9999997 .9999997 .9999997 .9999997 .9999997 .9999997 .9999997 .9999997 .9999997 .9999997 .9999997 .9999997 .9999997 .9999997 .9999997 .9999997 .9999997 .9999995 .99999944 .9999997 .9999995	DEGREES FROM VERTICAL 000660334199934 0007235934207717 0007354634248193 0008419734276831 000842734265645 .J00608033419934 .J00608033419934 .J006815434189126 .J007235934207716 .J007354634248199 .00084197342778832 .J008862734265645 .J008862734265645 .J008862734265645 .J008862734265645 .J008862734265645 .J008862734265645 .J008862735959733 0007502225860700 0008387025952066 .J0073027125859733 .J00732712585973 .J00732712585973 .J00730272586070 .J00730272586070 .J00730272586070 .J00730272586070 .J00730272586070 .J00730272585973 .J000730272589733 .J000730252592331 .J0008387025952066 .J000870852592331	• 93990054 • 93992348 • 93937532 • 9392963 • 9392963 • 93990055 • 93990055 • 93990055 • 93992348 • 93944402 • 93937532 • 93923563 • 93923563 • 93937552 • 93923563 • 93931055 • 93931055 • 93931055 • 93931055 • 93929563 • 96561689 • 96563805 • 96565083 • 96565083 • 96565083 • 96563805 • 96565083 • 96563805 • 9656565 • 9656565 • 9656565 • 96565656 • 96565656 • 96565656 • 96565656 • 96565656 • 96565656
NRT A FACET 1 FACET 2 FACET 2 FACET 3 FACET 4 FACET 5 FACET 5 FACET 6 FACET 6 FACET 7 FACET 9 FACET 10 FACET12 AVERAGES 1 AVERAGES 1 RMS 1 AVERAGES 1 FACET 12 AVERAGES 1 FACET 2 FACET 2 FACET 3 FACET 5 FACET 4 FACET 5 FACET 5 FACET 6 FACET 7 FACET 7 FACET 6 FACET 7 FACET 7 FACET 7	T 7CD, W/ G CC060803 C0066154 CC072359 CC078546 CC088627 .CCC88627 .CCC88627 .CCC860603 .C3066154 .CC72359 .C0060603 .C3066154 .CC08627 .CC08627 .CC08627 N = 75D, G 3NLY CC086114 CC73271 .CC037622 .CC037625 .CC075C22 .CC03887C .CC03887C .CC075C22	<pre>, ELEVATION .00002214 .C0013713 CC006C69 CCC49147 00079630 0C367723 .CC002214 .CC013713 CC36770 CC367723 CC367723 CC367723 CC367723 CC67723 CC67723 CC67723 CC67723 CC35978 12 .CC35978 12 .CC35978 12 .CC35978 12 .CC35978 12 .CC35978 12 .CC35978 12 .CC35978 12 .CC35978 12 .CC35978 12 .CC35978 12 .CC35978 12 .CC35978 12 .CC35978 .C</pre>	ANGLE - 70. .99999981 .9999997 .9999977 .99999973 .99999938 .99999981 .99999981 .99999981 .9999997 .9999975 .99999938 .99999973 .99999973 .99999973 .99999973 .99999973 .99999973 .99999973 .99999973 .99999973 .99999973 .99999973 .99999973 .99999973 .99999973 .99999973 .99999973 .99999973	DEGREES FROM VERTICAL 000660154 34199934 00072359 34207711 00073546 34248193 00084197 34276833 00084197 34265645 .00084197 34265645 .00084197 34265645 .00084197 34267716 .00084197 34267716 .00073546 342848194 .00084197 34276832 .00084197 34276832 .0008627 34267716 .0008627 34267716 .0008627 34267716 .00088627 34265645 .00088627 34265645 .00088627 34265645 .00088627 34265645 .00088627 34265645 .00088627 34265645 .00088627 34265645 .00088627 34265645 .00070271 2595733 .00070271 259434 .00068370 259434 .00070271 2588973 .00070271 2588973	• 93990054 • 93992348 • 93944402 • 93937532 • 9399653 • 93990054 • 93990054 • 93992348 • 939944402 • 93997532 • 939944402 • 93931055 • 93944402 • 939344602 • 93934553 • 93944602 • 93931055 • 93931055 • 96611689 • 966569123 • 96565083 • 96569123 • 96561689 • 96563123 • 9
NRT A FACET 1 FACET 2 FACET 2 FACET 3 FACET 5 FACET 6 FACET 7 FACET 7 FACET 9 FACET 10 FACET 11 FACET 12 AVERAGES 1 RMS 1 NRT AT FACET 2 FACET 5 FACET 1 FACET 1 FACET 2 FACET 5 FACET 5 FACET 5 FACET 5 FACET 6 FACET 7 FACET 7 FACET 6 FACET 7 FACET 7 FACET 7 FACET 9 FACET 7 FACET 9 FACET 9 FACET 9 FACET 9 FACET 1 FACET 10 FACET 11 FACET 12 AVERAGES 1	T 7CD, W/ G CC060803 C0066154 CC072359 CC078546 CC078546 CC086027 CC086027 .CC086027 .CC086027 .CC086027 .CC086027 .CC086027 .CC086027 .CC086027 .CC086027 .CC086027 .CC086027 N = 75D, G 3NLY CC03271 CC03271 CC03271 .CC03271 .CC032614 N = 75D, G 3NLY CC0387C5 .CC079685 .CC079785 .CC07855 .C	<pre>, ELEVATION .00002214 .00013713 0C006C69 0C049147 00079630 0C367723 .CC002214 .CC013713 0C36C70 0C349143 0C36C70 0C349143 0C36C7723 0C035978 12 .CC067723 0C035978 12 .CC01118 .0C035978 12 .CC024267 0C035978 12 .CC024267 0C035978 12 .CC024267 0C035978 12 .CC024267 0C035978 .CC024267 .CC024267 .CC024267 CC04267 .CC024267 .CC024267 .CC024267 .CC024267 .CC024267 .CC024267 .CC0247 .CC02467 .CC02467 .CC0247 .CC02467 .C</pre>	ANGLE - 70. .99999981 .99999981 .99999981 .99999988 .99999988 .99999988 .99999988 .9999997 .9999998 .9999998 .9999998 .9999998 .9999998 .99999972 .99999972 .99999972 .99999972 .9999998 .99999972 .99999972 .99999972 .9999998 .99999972 .9999998 .99999972 .9999998 .99999972 .9999998 .99999972 .9999998 .99999972 .9999998 .99999972 .9999998 .99999972 .9999998 .9999998 .9999998 .9999998 .9999998 .9999998 .9999998 .9999998 .9999998 .9999998 .9999998 .9999998 .99999998 .999998 .999998 .999998 .9999998 .9999998 .999998 .999998 .99998 .99998 .999998 .999998 .99998 .9998 .99998 .99988 .99888 .99888 .99888 .99888 .99888 .99888 .99888 .99888 .99888 .99888 .99888 .99888 .99888 .99888 .99888 .99888 .99888 .998888 .99888 .99888 .99888 .998888 .99888	DEGREES FROM VERTICAL 00066015434199934 0007235934207711 0007235934207711 000841973427633 000840273427633 .000840273427633 .0008402734265645 .0006405434109934 .0008419734276833 .0008619734276833 .0008602734265645 .0008602734265645 .0008602734265645 .0008602734265645 .0008602734265645 .0008602734265645 .0008602734265645 .0008602734265645 .0008602734265645 .0008602734265645 .0008602735276833 000727125859733 0007308525923314 .000730272585973 .000730272585973 .000730272585973 .000730272585973 .000730252592064 .000730852594034 .00083702595206	• 93990054 • 93992348 • 93944402 • 93937532 • 93990054 • 93990054 • 93990054 • 93990054 • 93992348 • 93944402 • 93937532 • 93944402 • 939344402 • 939344402 • 939344402 • 939344402 • 93934655 • 93944402 • 93934655 • 93944402 • 93934655 • 93944402 • 9393655 • 93931055 • 94563805 • 96563805 • 9

NRT + H	ORIZ, W/ G	, ELEVATION	ANGLE = 90.	DEGREES FROM VERTICAL	
FACET 1	00079520	.00037269	.99999961	00079520 .00	037209 .99999961
FACET 2	00080010	.00049664	.99999956	00680010 .00	049664 .99999956
FACET 3	00080303	.00022921	.99999965	00080303 .00	022921 .99999965
FACET 4	C0080303	00022920	.99999965	0008030300	022420 .44444465
FACET 5	00080010	00049664	.99999956	0008001000	044004 .44444450
FACET 6	00079520	0037208	.99999961	0007952000	037200 .77777701
FACET 7	.0079520	.00037208	.99999961	.00074520 .00	037200 .77777701
FACET 8	.00000010	.00049864	.9999999926	.00080010 .00	077027 - 0000045
PACET 9	.00080303	- 00022920	00000045	00080303 - 00	022921 .99999965
FACETIO	.00080303		00000056	.0008030300	049664 .99999956
FACEP11	00000010	- 00017269	.00000041	- 00079520 00	017209 .99999961
FAGE112	100017720	-100031207	••••••		
AVEDACES 1	00000000	00000000			
DWC 1	.00079945	.00038194			
	N =	12			
NRT.	CASE1, NO G	> ELEVATION	ANGLE= 0.	DEGREES FROM VERTICAL	
FACET 1	00014072	.CC062353	.99999980	0001407299	999981 .00063921
FACET 2	00015414	.00063188	.99999976	0001541499	999977 .00069908
FACET 3	00017389	.00061741	.99999979	0001738999	999981 .00064143
FACET 4	00017388	.00045988	.99999988	00C1738899	999989 .00049185
FACET 5	00015414	.00039541	.99999991	0001541499	·999992 •00042439
FACET 6	00014071	.00045376	.99999989	0001407199	00047507
FACET 7	.00014072	.00062353	.99999980	.0001407299	
FACET 8	.00015414	85188033	.99999976		0000001 000064343
FACET 9	.00017389		4999999717		00000R9 .00049165
FACEFIO	00017300		00000001	-00015616 99	00042439
FAUE111 5475717	000134071	.00065376		.0001407199	999990 .00047507
FALEILE	100014071		••••••		
AVERAGES 1	000000.00	. 66653864			
R#S :	.00015684	.00010634			
	N =	12			
NRT C	ASE2 NO G	J ELEVATION	ANGLE= 7C.	DEGREES FROM VERTICAL	
FACET 1	00045862	.00095129	-99999944	000458623	+1128C7 .94005329
FAUEL 2	- 00033498	.00093913	.999999999		4104044 64400103
FAULT 3		00002300	C0C00076		41 3A GLA . G3 GG 2 71 A
FACET 5	00063629	.00066121	.00030978	000036293	4139874 93991890
FACET 6	.00007047	. 900696665	.99999975	.000070473	4136542 .93993187
FACET 7	.00045862	.00095129	99999944	.000458623	4112607 .94005329
FACET 8	.CCC35498	.00098913	.99999945	.000354983	4109050 .94005153
FACET 9	.00024909	.00032366	,99599963	.000249093	4124604 .93998658
FACET10	.00014411	.00067114	.99993976	.000144113	4138940 .93992717
FACET11	.00003629	.CC066120	.99999978	.300036293	4139874 .93991890
FACET12	00607047	+00069665	•99999975	306070473	4136543 .93993187
AVERAGES I	.000000000	.00/9865			
KW2 1	.00020028	100013677			
	n •	16			
	·····				
NRT. J C	ASE3, NO G	ELEVATION	NANGLE. 0.	DEGREES FROM VERTICAL	
FACET 1	CC065339	.00066926	.99999956	000653399	9999978 .00093533
FACET 2	00064486	.00073213	.99999952	000644869	9999973 .00097563
FACET 3	00062535	.00058648	.99999963	000625359	9999983 .00085734
FACET 4	00062535	+00034692	. 99999974	000625359	9999994 .00071514
FACET 5	00064486	.CC020127	+9999977	000644869	9999998 .00067554
FACET 6	00065339	.30026414	.99999975	000653399	99999997 .0C07C476
FACET 7	00029096	•CC050120	.99999983	300290969	9999987 .00057954
PACET 8	00027913	.00051130	.99999983	9 <u>GC27913</u> 9	
FALLI V		.00048821	- 44449965	000256159	99999988 -000000252 0000000 -0000000252
FALCIIU ELCETIN	00022013				111110 •00071427 0000001 00050405
		.00042211	48000000	- 00021713 - 9 - 00021713 - 9	9999991 .00052102
			17777700		
AVERAGES 1	- 00046944	00044470			
		+00040670			
RMS 1	.00018300	.00014691			· · · · · · · · · · · · · · · · · · ·
RMS 1	.00018300 N =	.00014691 12			

		CAL CODROINAT	VECTORS NO	RMAL TO MERROR SURFAC	E Obal coordin	ATES
• • • • • • • • • • • • • • • • • • • •						
MARTIN	VERTICAL	, ELEVATION	ANGLE= 0.	DEGREES FROM VERTICA	L	
FACET 1	+0CCC4156	0019968	.99999998	.00004156	99999998	00020396
FACES 2	+00005124	00022752	-99999997	00003124	99999997	
FALEN 3	+.00001921	00019604	. 0000000A	+.00003245	9999999A	00019673
FACET 5	00009005	00021145	99999997	00009005	- 99999998	00022983
FACET 6	00004156	0019968	.99999998	JCCC4156	99999998	00020396
FACET 7	00005124	UC022752	.9999997	00005124	-,99999997	00023322
FACET 8	00001921	0C0158C4	•99999999	00001921	99999999	00015920
FACET 9	.00003245	CC019463	.99999998	.00003245	99999998	00019673
FACETIO	•66009665	00021145	.99999997	.00004005	99999998	00022963
FALEILL	•00000000	00023739	• 44444441	.0000000	44444444	00029134
AVERAGES &	.00000000	00020353				
RMS :	.00005024	. 00002784				
	N =	11				
MARTIN	AT 15 DEGREE	. ELEVATION	ANGLE= 15-	DEGREES FROM VERTICA	IL.	
FACET 1	00008530	00015991	.99999998	00008530	96596720	.25864398
FACET 2	00011574	00020299	.99999997	00011574	96597834	.25859334
FACET 3	00018742	00022983	.9999996	00013742	96598528	.25853258
FACET 4	00027976	00032509	.99999991	00027976	96600991	.25840474
FACET 5	00038714	00035188	.99999986	00038714	96601684	.25831368
FACET 6	+00008530	(0015991	.99999998	.00003530	96596720	.25864398
FACET 7	.00011574	00020299	.9999997	.00011574	9659/834	.25859334
FALEI B	+00018742	- 00022983	44444446	+00010/42 000027976	- 06600991	+23833238
FALCI 7	.00021918	- 00032509	000000RA	- 00038713	96601684	25911348
FACETII	.00030113	00011053	.99599999	00063300.	96595443	.25871228
AVERAGES :	00000000	00024090				
RMS :	.00022721	.00008093				
	<u> </u>	11				
MARTIN	AT 30 DEGREE	. ELEVATION	ANGLE= 30.	DEGREES FROM VERTICA	L	
FACET 1	00020593	00011006	.99999997	00020593	86668043	.49979777
FACET 2	00027451	00016550	.99999995	00027451	86610814	.49972238
FACET 3	<u>00C38117</u>	00028657		00038117	86616865	.49958695
FACEI 4	00050819	00043475	49999978	- 00053619	80024270	+99942070
FALEI 2		- 00040410	0000007	000000032	- 866023404	49929973
FACET 0	.000233451	+.00011000	.00000005	.00027451	86610814	.49972238
FACET 8	.00038117	0C023657		.00038117	86616865	49958695
FACET 9	.00053819	00043475	.99999978	.00050819	86624270	.49942071
FACET10	.00065832	00046916	.99999967	.00065832	86625989	.49929975
FACET11	+00000000	.00004284	.00000000	.0000000	86600398	.50003710
AVERAGES I	00000000	+.00026266	<u> </u>			
*r-3 +	+00041003 N #	11				
					<u></u>	
EANIIN)	AT 45 DEGRE	> ELEVAIIUN	ANGLE 45.	DEGREES FRUM VERILGA	70716517	30/00100
FAGET L	-+00031334		• 4 4 4 4 9 4 9 9 7 7	++00031334	** (0/145 <u>1</u> 3	*10099194
FACEF 2	CCC4158C	00011046	.99999491	00041500	70719054	.7680100
FAUEL 3	0055071		.99999980	00055071	70733747	.70665400
FAUEL 4 Fictor 6	00075436	GCU51796	.999999962	00070436	70747294	.70648828
FACET 6			0000006	30089770	10750109	.70636506
FACET 7	.00041580	000113425		+ 00031334 00041560	70714913	-70686189
FACET 8	• (0055071	COD32630	099999980	.00041380	70711747	.70446400
FACET 9	.00070436	0051796	.99599962	. 30070436	70747294	.76649829
FACET10	.0CC8377C	CC055779	.99999945	. 20088776	70750109	.70636504
FACET11	.00000000	00019250	.999999998	.0000000	70697065	.70724289
						<u></u>
AVERAGES 1	cooococo	0026882		·		
KL3 1	• UCU28130 - M	11				

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MARTIN	AT 60 DEGREE	<pre>> ELEVATION</pre>	ANGLE 60.	DEGREES FROM VERTICA		
FACET 1	0039787	.0000705	.99999992	00039787	-, 49999389	.86622430
FALLI Z	00052644	- 00000110	+44444460	- 00052844	- 50009298	+ 007 (0UZ 9
FACET A	- 00084910	00034008	.00000048		+- 50048566	.86551656
FACET 5	00105085	000000000	.99999927	00105085	500 52 222	.86541896
FACET 6	.00039787	.00000705	.99999992	.00039767	49999389	.86522430
FACET 7	.00052644	00006116	.99999986	.00052644	50005296	.86576029
FACET 8	.00067943	0034607	.99999971	-00067943	50029448	.86564526
FACET 9	.00084809	00056088	.99999948	.00084809	50048566	.86551656
FACET10	.00105085	00060311	.99999927	• 00105085	50052222	.86541896
FACET11	00000000.	.00032939	,999999995	.0000000	49971472	.86619005
		- 00005004				
AVCKAGES I						
кла н	•00070352	11				
				· · · · · · · · · · · · · · · · · · ·		
MARTIN	AT 75 DEGREE	. ELEVATION	ANGLE .75.	DEGREES FROM VERTICA	L	
FACET 1	00045609	.00006718		00045609	25875416	.96604504
FACET 2	00060242	00000059	.99999982	00060242	25881962	.96576973
FACET 3	00076360	00033237	.99999965	30076360	25914007	.96570995
FACET A	00093640	+.00056794	.99999940	00093090	23930/39	+ Y020410V
FALES 2			.99999999		25875414	+ 9660450415
FACET D	.00042509	00000110	, 7 7 7 7 7 7 0 Y		25381962	496576971
FACET B	.00076359	66033237	99999945	- 00076359	-, 25914007	.96570995
FACET 9	.00093640	00056794	.99999940	.00093640	25936759	.96564180
FACET10	.00114543	00060983	.99999916	.00114543	25940805	.96558915
FACETIL	.00000000	.00044386	.999999990	0000000	25839028	.96604061
AVERAGES 1	00000000	00022211				
RMS *	+00077961	.06034621				
	<u>N =</u>	44				
MARTIN	HOPTZONTAL	. FLEVATION	ANGLES 90.	DEGREES FROM VERTICA		
FACET 1	00048468	.00012311	.99999987	00048468	.00012311	.99999987
FACET 2	00063932	.00306015	.99999979	00063932	.00006015	.99999979
FACET 3	60079823	00030323	.99999964	00079823	00030323	.99999964
FACET 4	00096397	00053829	.99999939	00096397	00053829	.99999939
FACET 5	00116570	00057716	.99999915	00116570	00057716	.99999915
FACET 5 FACET 6	00116570	00057716 .00012311	.99999915	00116570 .00048468	00057716	.99999915 .99999987
FACET 5 FACET 6 FACET 7	00116570 .00048468 .00063932	00057716 .00012311 .00066015	.99999915 .99999987 .99999979	00116570 .00048468 .00063932	00057716 .00012311 .00006015	.99999915 .99999987 .99999979
FACET 5 FACET 6 FACET 7 FACET 8	00116570 .C0048468 .CCC63932 .00079823	00057716 .CC012311 .CC0C6015 00030323	.99999915 .99999987 .99999979 .99999964	00116570 .00043468 .00063932 .00079823	00057716 .00012311 .0006015 00030323	•99999915 •99999987 •99999979 •99999964
FACET 5 FACET 6 FACET 7 FACET 8 FACET 9	00116570 .C0048468 .CCC63932 .00079823 .CC096397	00057716 .CC012311 .CC0C6015 00030323 C0053829	.99999915 .99999987 .99999979 .99999979 .99999964 .99999939	00116570 .00043468 .00063932 .00079823 .00079823	00057716 .00012311 .00C06015 00C30323 00053829	.99999915 .99999987 .99999979 .99999964 .99999939
FACET 5 FACET 6 FACET 7 FACET 8 FACET 9 FACET 10 FACET 11	00116570 .00048468 .00079823 .00079823 .00096397 .00115576 .0000000	00057716 .06012311 .06066015 00030323 00053829 66057716 .06052967	.99999915 .99999967 .99999979 .99999979 .99999999 .99999915 .99999915	00116570 .00043468 .00063932 .00079823 .00096397 .00116570 .00000000	00057716 .00012311 .00006015 00030323 00053829 00057716 .00052967	.99999915 .99999987 .99999987 .99999979 .99999964 .99999964 .99999915 .99999915
FACET 5 FACET 6 FACET 7 FACET 8 FACET 9 FACET10 FACET11	00116570 .C0048468 .CCC63932 .00079823 .00096397 .CC116576 .C0000C0	00057716 .CC012311 .CC06015 00030323 C0053829 CC057716 .CC052967	.99999915 .99999987 .99999979 .99999964 .99999939 .99999915 .9999986	00116570 .0004368 .00063932 .00079623 .00096397 .00116570 .0000000	00057716 .00012311 .00006015 00030323 00053829 00057716 .00052967	.99999915 .99999987 .99999987 .999999964 .999999964 .99999915 .99999986
FACET 5 FACET 6 FACET 7 FACET 8 FACET 9 FACET10 FACET11 AVERAGES :	00116570 .CC048468 .CCC63932 .00079823 .CC079823 .CC16576 .CC16576 .CC0CCC00	00057716 .CC012311 .CC026015 00030323 00053829 0C057716 .CC052967 CCC17647	.99999915 .99999987 .99999979 .9999964 .9999964 .99999964 .99999986	00116570 .00048468 .00063932 .00079823 .00076823 .00076397 .00116570 .0000000	00057716 .00012311 .0006015 00053025 00053829 00057716 .00052967	.99999915 .99999987 .999999964 .99999964 .99999964 .99999915 .99999915
FACET 5 FACET 6 FACET 7 FACET 8 FACET 9 FACET10 FACET11 AVERAGES :	00116570 .CC048468 .CCC63932 .00079823 .CC196397 .CC116576 .CC060CC0	00057716 .CC012311 .CC026015 00030323 C0053829 CC053829 CC053829 CC052967	.99999915 .99999987 .99999979 .9999964 .99999964 .99999999 .99999915 .99999986	00116570 .00048468 .00063332 .00079823 .00096397 .00116570 .0000000	00057716 .00012311 .00006015 00030323 00053829 00057716 .00052967	.99999915 .99999987 .99999979 .99999764 .99999966 .99999915 .99999986
FACET 5 FACET 6 FACET 7 FACET 8 FACET 9 FACET 10 FACET 11 AVERAGES : RMS :	00116570 .C0048468 .CCC63932 .00079823 .C0096397 .CC116570 .C0000C00 6CC00C00 .L003554	00057716 .CC012311 .CC0C6015 00030323 CQ053829 CC053829 CC057716 .CC052967 CCC17647 .CCC35741	.99999915 .99999987 .99999987 .9999964 .9999964 .9999999 .99999915 .99999915	00116570 .00048468 .00063332 .00079623 .00096397 .00116570 .0000000	00057716 .00012311 .0006015 00030323 00053829 00057716 .00057716	.99999915 .99999987 .99999986 .99999966 .99999966 .99999995 .99999915 .99999986
FACET 5 FACET 6 FACET 7 FACET 9 FACET 0 FACET 10 FACET 11 AVERAGES : RFS :	00116570 .CC048468 .CC63932 .00079823 .CC079823 .CC079823 .CC16576 .CC060C00 CC060C00 	00057716 .CC012311 .CC006015 00030323 C0053829 CC057716 .CC052967 CCC17647 .CC035741	.99999915 .99999987 .999999979 .99999964 .99999939 .99999915 .99999986	00116570 .00043468 .00063932 .00079623 .00096397 .00116570 .0000000	00057716 .00012311 .00006015 00030323 00053829 00057716 .00057716	.99999915 .99999987 .99999997 .999999964 .999999964 .999999915 .999999986
FACET 5 FACET 6 FACET 7 FACET 8 FACET 9 FACET10 FACET11 AVERAGES : RFS :	00116570 .CC048468 .CCC63932 .00079823 .C0079823 .CC116576 .CC060C00 00000000 .LC03554 N =	00057716 .CC012311 .CC006015 00030323 C0053829 CC057716 .CC052967 CCC17647 .CC035741	.99999915 .99999987 .99999987 .99999964 .99999939 .99999915 .99999915	00116570 .00043468 .00063932 .00079823 .00096397 .00116570 .0000000	00057716 .00012311 .00006015 00030323 00053829 00057716 .00052967	.99999915 .99999987 .99999997 .999999964 .999999964 .999999915 .99999986
FACET 5 FACET 6 FACET 7 FACET 8 FACET 9 FACET10 FACET11 AVERAGES : RFS : MARTIN	00116570 .CC048468 .CCC63932 .00079823 .CC079823 .CC116576 .CC060C00 6CC060C00 .LCC3554 N =	00057716 .CC012311 .CC026015 00030323 C0053829 CC057716 .CC052967 CCC17647 .CC035741	.99999915 .99999987 .99999979 .99999979 .99999964 .99999939 .99999915 .99999986	00116570 .00043468 .00063932 .00079623 .00096397 .00116570 .0000000	00057716 .00012311 .00006015 00053829 00053829 00057716 .00052967	.9999915 .9999987 .9999997 .999999764 .999999964 .99999935 .99999915 .99999986
FACET 5 FACET 6 FACET 7 FACET 8 FACET 9 FACET10 FACET11 AVERAGES : RPS : MARTIN, FACET 1	00116570 .CC048468 .CCC63932 .00079823 .CC079823 .CC116576 .CC0C0C00 0CC0CC00 .LCC3554 N *	00057716 .CC012311 .CC006015 00030323 C0053829 CC057716 .CC052967 CCC17647 .CC035741 11 .CC035741	.99999915 .99999987 .99999979 .9999964 .9999964 .9999965 .99999986 .9999986		00057716 .00012311 .00006015 00053829 00053829 00057716 .00052967	.99999915 .99999987 .99999997 .999999964 .99999999 .99999915 .99999915
FACET 5 FACET 6 FACET 7 FACET 9 FACET 9 FACET10 FACET11 AVERAGES : RFS : MARTIN, FACET 1 FACET 2	00116570 .CC048468 .CCC63932 .00079823 .C0079823 .CC11657G .CC0C0C00 CC0C0C00 .CC0C0C00 .CC0554 N *	00057716 .CG012311 .CG026015 0003023 CG053829 CG057716 .CG052967 CCC17647 .CC.35741 11 .CC.35741 11 .CC025764 .CC024561	.99999915 .99999987 .99999979 .9999979 .9999964 .9999999 .99999986 .99999986		00057716 .00012311 .00006015 00053829 00053829 00057716 .00052967	.99999915 .99999987 .99999979 .99999964 .999999964 .99999996 .99999986
FACET 5 FACET 6 FACET 7 FACET 8 FACET 9 FACET 10 FACET 11 AVERAGES : RMS : MARTIN, FACET 1 FACET 2 FACET 3	00116570 .CC048468 .CCC63932 .00079823 .C0079823 .CC116576 .CC060000 CC060000 .CC3554 N = .CC06473 CC06473 CC012871 CC012871 CC012871	00057716 .CC012311 .CC026015 0003023 CC053829 CC057716 .CC052967 CCC17647 .CC035741 11 .CC025764 .CC025764 .CC025764 .CC025764	.99999915 .99999987 .99999979 .99999964 .99999964 .9999996 .99999986 .99999986 .9999986 .9999986 .99999986 .99999986 .9999998	00116570 .00048468 .00063932 .00079823 .00079823 .00096397 .00116570 .00000000 .00000000 .00000000 .0000000	00057716 .00012311 .00026015 0003023 00053829 00057716 .00052967 L 999999997 99999997	.99999915 .99999987 .99999986 .99999964 .99999964 .99999986 .99999986 .99999986 .99999986
FACET 5 FACET 6 FACET 7 FACET 9 FACET 10 FACET 11 AVERAGES : RFS : MARTIN; FACET 2 FACET 3 FACET 4	00116570 .CC048468 .CC63932 .OC079823 .OC079823 .CC116576 .CC060CC0 .CC060CC0 .LC03554 .N = .CC06473 CC06473 CC012871 CC017668 CC018376	00057716 .CC012311 .CC006015 00030323 C0053829 CC057716 .CC052967 CCC17647 .CC035741 11 .CC025764 .CC025764 .CC025764 .CC025764 .CC02558 .CC012129	.99999915 .99999987 .99999979 .99999979 .99999939 .99999915 .9999986 .9999986 .9999986 .9999996 .9999996 .39999996 .9999996 .9999999	00116570 .00048468 .00063932 .00079823 .00079823 .00096397 .00116570 .00000000 .00000000 .00000000 .00006473 30012871 00017668 30018370	00057716 .00012311 .00006015 00030323 00053829 00057716 .00052967 90999997 99999999 99999999	.99999915 .99999987 .999999987 .999999964 .999999915 .999999986 .99999986 .99999986 .99999986 .00027729 .C024242 .6022613
FACET 5 FACET 6 FACET 7 FACET 8 FACET 9 FACET10 FACET11 AVERAGES : RFS : MARTIN, FACET 1 FACET 2 FACET 3 FACET 4 FACET 5 EACET 5	00116570 .CC048468 .CCC63932 .00079823 .C0079823 .CC116576 .CC060CC0 0CCCCC0 .CC3554 N = .CC06473 CC06473 CC012871 CC012871 CC012876 00018326	00057716 .CC012311 .CC006015 00030323 C0053829 CC057716 .CC052967 CCC17647 .CC035741 11 .CC025764 .CC025764 .CC025764 .CC025764 .CC025558 .CC012129 .CC011585	.99999915 .99999987 .99999979 .99999939 .99999915 .99999986 .99999986 .99999986 .9999996 .3999996 .3999996 .9999996 .9999997 .9999998	00116570 -0004368 -00063932 -00079823 -00079823 -00096397 -00116570 -00000000 -00000000 -00000000 -0000000	00057716 .00012311 .00026015 00053829 00053829 00057716 .00052967 00052967	.99999915 .99999987 .99999997 .999999964 .999999915 .999999915 .99999986 .99999986 .00027729 .C024242 .G0222013 .C021681
FACET 5 FACET 6 FACET 7 FACET 8 FACET 9 FACET10 FACET11 AVERAGES : RFS : MARTIN; FACET 1 FACET 2 FACET 3 FACET 4 FACET 5 FACET 7	00116570 .CC048468 .CCC63932 .00079823 .CC016576 .CC016576 .CC0C0C00 .CC05554 N = .CC05473 C5012871 C5012871 C5012876 CC018376 00018326 .CC056473	00057716 .CC012311 .CC026015 00030323 CC053829 CC057716 .CC052967 CCC17647 .CC035741 11 .CC025764 .CC025764 .CC01558 .CC011229 .CC011585 .CC025764	.99999915 .99999987 .99999979 .99999979 .99999939 .99999986 .9999986 .9999986 .9999986 .9999986 .9999986 .9999996 .9999998 .9999998 .9999998	00116570 .00048468 .00063932 .00079623 .00096397 .00116570 .00000000 .00000000 .00000000 .0000000	00057716 .00012311 .00026015 00053829 00053829 00057716 .00052967 00052967 99999997 99999999 99999999 99999999	.99999915 .99999987 .99999999 .99999999 .999999964 .99999995 .99999986 .99999986 .99999986 .00027729 .C024242 .C024242 .C022013 .C021681 .C0226565
FACET 5 FACET 6 FACET 7 FACET 8 FACET 9 FACET10 FACET11 AVERAGES : RPS : MARTIN, FACET 1 FACET 2 FACET 2 FACET 4 FACET 5 FACET 6 FACET 8	00116570 .CC048468 .CCC63932 .00079823 .CC079823 .CC116576 .CC050C00 .CC050C00 .CC05554 N = .CC05554 N = .CC056473 C5012871 C5012871 .CC018376 00018326 .C0006473 .CC012871	00057716 .CC012311 .CC026015 00030323 C0053829 CC057716 .CC052967 CCC17647 .CC035741 11 .CC035741 11 .CC025764 .CC025764 .CC024561 .CC01588 .CC01229 .CC011585 .CC025764 .CC024561	.99999915 .99999987 .99999979 .9999964 .9999964 .9999986 .9999986 .9999986 .9999986 .3999996 .39999996 .39999998 .39999998 .39999998 .39999998	00116570 .0004368 .00063932 .00079623 .00096397 .00116570 .0000000 .0000000 .0000000 .0000000 .000000	00057716 .00012311 .00006015 00053829 00053829 00057716 .00052967 00052967 99999997 99999999 99999999 99999999 99999999	.99999915 .99999987 .99999979 .99999979 .99999995 .999999915 .999999915 .99999986 .99999986 .00027729 .CC024242 .GC022013 .CC021681 .CC021681
FACET 5 FACET 6 FACET 7 FACET 8 FACET 9 FACET 10 FACET 11 AVERAGES : RPS : MARTIN, FACET 1 FACET 2 FACET 2 FACET 3 FACET 5 FACET 5 FACET 6 FACET 7 FACET 7 FACET 9	00116570 .CC048468 .CCC63932 .00079823 .C0079823 .CC116576 .CC0C0C00 0CC0CC00 .LCC3554 N * .CC012871 CC012871 CC018376 CC018376 CC018376 .CC017668 .CC017668 .CC017668	00057716 .CC012311 .CC0026015 00030323 C0053829 CC057716 .CC052967 CCC17647 .CC035741 11 .CC025764 .CC024561 .CC024561 .CC024561 .CC021558 .CC021558 .CC021565 .CC024561 .CC024561 .CC024561 .CC024561 .CC024561	.99999915 .99999987 .99999979 .9999964 .9999964 .9999996 .99999986 .99999986 .39999986 .39999996 .9999996 .9999996 .9999998 .9999998 .9999998 .99999998 .99999998 .99999996 .99999996		00057716 .00012311 .00006015 00053829 00053829 00057716 .00052967 00052967 99999997 99999997 99999999 99999999 99999999 99999999	.99999915 .99999987 .99999997 .99999999 .99999995 .999999915 .999999915 .99999986 .99999986 .00027729 .CC024242 .GC022013 .CC021681 .CC026565 .G0027729 .CC24242
FACET 5 FACET 6 FACET 7 FACET 9 FACET 10 FACET 11 AVERAGES : RFS : MARTIN, FACET 1 FACET 2 FACET 3 FACET 4 FACET 5 FACET 6 FACET 7 FACET 8 FACET 9 FACET 9 FACET 10	00116570 .CC048468 .CCC63932 .OOC79823 .OOC79823 .CC060CCO CCCCCCCO .CC060CCCO .CC0554 .CC0554 .CC06473 CC018376 CC018376 CC018376 .CC018376 .CC018370 .CC018370 .CC018370	00057716 .CC022011 .CC026015 00030323 C0053829 CC057716 .CC052967 CCC17647 .CC035741 11 .CC025764 .CC025764 .CC024561 .CC011585 .CC012129 .CC011585 .CC016598 .CC024561 .CC024561 .CC024561 .CC024561 .CC024561	.99999915 .99999987 .99999979 .99999939 .99999915 .99999986 .99999986 .99999986 .99999986 .99999996 .39999996 .39999996 .39999999 .99999998 .99999998 .99999998 .99999998 .99999998 .99999998 .99999998 .99999998 .99999998 .99999998 .99999998 .99999998	00116570 .00048468 .00063932 .00079823 .00079823 .00076397 .00116570 .00000000 .00000000 .00000000 .00000000	00057716 .00012311 .00026015 0003023 00053829 00053829 00057716 .00052967 99999997 99999997 99999999 99999999 99999997 99999997 99999999 99999999 99999999	.99999915 .99999987 .99999997 .999999964 .999999915 .999999986 .999999986 .99999986 .99999986 .00027729 .CC24242 .GC022613 .CO21681 .GO027729 .CC24242 .GC02273
FACET 5 FACET 6 FACET 7 FACET 9 FACET 10 FACET 11 AVERAGES : RFS : MARTIN, FACET 1 FACET 2 FACET 3 FACET 4 FACET 5 FACET 7 FACET 7 FACET 7 FACET 7 FACET 9 FACET 10 FACET 11	00116570 .CC048468 .CC63932 .00079823 .00079823 .CC116576 .CC060C00 .CC060C00 .CC3554 .CC06473 CC012871 CC018376 CC018376 .CC018376 .CC018376 .CC018370 .CC018370 .CC018326 .CC018326 .CC018326	00057716 .CC022311 .CC026015 00030323 C0053829 CC057716 .CC052967 CCC17647 .CC035741 11 .CC025764 .CC024561	.99999915 .99999915 .99999979 .99999939 .99999915 .99999986 .99999986 .99999986 .99999986 .99999998 .99999998 .99999998 .99999998 .99999998 .99999998	00116570 -0004368 -00063932 -00079823 -00079823 -00096397 -00116570 -0000000 -0000000 -0000000 -0000000 -00006473 -30012871 -00017668 -30018370 -00018326 -00018326 -00018326	00057716 .00012311 .00006015 00053829 00053829 00057716 .00052967 00057716 .00052967 99999997 99999997 99999999 99999999 99999999 99999999	.99999915 .99999987 .99999987 .999999964 .9999999915 .999999915 .999999986 .99999986 .99999986 .00027729 .CC024242 .CC024242 .CC022013 .CC021681 .CC021681 .CC021681 .CC021681
FACET 5 FACET 6 FACET 7 FACET 8 FACET 10 FACET11 AVERAGES : RFS : MARTIN; FACET 1 FACET 2 FACET 3 FACET 4 FACET 5 FACET 7 FACET 7 FACET 8 FACET 9 FACET 10 FACET10 FACET11	00116570 .CC048468 .CCC63932 .00079823 .00079823 .CC116576 .CC060CC00 0CCCCCC00 .CC05554 N = .CC06473 CC012871 CC012871 CC012876 CC018376 CC018376 .CC018376 .CC018370 .CC018370 .CC018370 .CC018326 CC018326 CC018326 CC018326	00057716 .CC012311 .CC0026015 00030323 C0053829 CC057716 .CC052967 CCC17647 .CC035741 11 .CC025764 .CC025764 .CC025764 .CC024561 .CC025764 .CC024561 .CC025764 .CC024561 .CC025764 .CC024561 .CC025764 .CC024561 .CC025764 .CC024561 .CC016598 .CC012129 .CC011585 .CC021585 .CC027458	.99999915 .99999987 .99999979 .99999939 .99999915 .99999915 .99999986 .99999986 .9999996 .9999996 .9999999 .9999999 .9999999 .9999999 .999999	00116570 .0004368 .00063932 .00079823 .00079823 .00096397 .00116570 .00000000 .00000000 .00000000 .0000000	00057716 .00012311 .00006015 .000030323 00053829 00053829 00057716 .00057716 .00057716 .00052967 99999997 99999997 99999999 99999999 99999999 99999999	.99999915 .99999987 .99999997 .99999999 .999999915 .999999915 .999999986 .99999986 .99999986 .99999986 .00027729 .C024242 .G022013 .C0221681 .C0221681 .C021681 .C022685
FACET 5 FACET 6 FACET 7 FACET 8 FACET 10 FACET11 AVERAGES : RFS : MARTIN; FACET 1 FACET 2 FACET 3 FACET 4 FACET 5 FACET 7 FACET 8 FACET 9 FACET 10 FACET 2 AVERAGES :	00116570 .CC048468 .CCC63932 .00079823 .00079823 .CC116576 .CC060C00 .CC060C00 .CC0554 .CC0554 .CC0554 .CC058376 .CC018376 .CC018376 .CC018376 .CC018370 .CC018370 .CC018370 .CC018370 .CC018370 .CC018370 .CC018326 .CC018326 .CC018326 .CC018326 .CC018326 .CC018326 .CC018326	00057716 .CC012311 .CC026015 00030323 C0053829 CC057716 .CC052967 CCC17647 .CC035741 11 .CC025764 .CC025765 .CC027458 .CC027458	.99999915 .99999987 .99999979 .99999979 .99999944 .99999986 .9999986 .9999986 .9999986 .9999986 .9999996 .9999996 .9999996 .9999996 .9999996 .9999998 .9999998 .9999998 .9999998 .9999998	00116570 .00048468 .00063932 .00079623 .00079623 .00096397 .00116570 .00000000 .00000000 .00000000 .0000000	00057716 .00012311 .00026015 00053829 00053829 00057716 .00057716 .00052967 99999997 99999997 99999999 99999997 99999997 99999997 99959999 99959999 99959996	.99999915 .99999987 .99999997 .99999999 .99999999 .99999995 .99999986 .99999986 .99999986 .99999986 .99999986 .00027729 .CC024242 .GC0221681 .CC021681 .CC021681 .CC021681 .CC021681
FACET 5 FACET 6 FACET 7 FACET 8 FACET 10 FACET 11 AVERAGES : RPS : MARTIN; FACET 1 FACET 2 FACET 3 FACET 4 FACET 5 FACET 6 FACET 7 FACET 8 FACET 9 FACET 10 FACET 11 AVERAGES : RMS :	00116570 .CC049468 .CCC63932 .00079823 .CC016576 .CC016576 .CC0C0C00 .CC0554 N = .CC0554 N = .CC018376 .CC018576 .CC0	00057716 .CC012311 .CC026015 00030323 C0053829 CC057716 .CC052967 CCC17647 .CC035741 11 .CC025764 .CC025764 .CC024561 .CC01558 .CC024561 .CC024561 .CC024561 .CC024561 .CC024561 .CC024561 .CC024561 .CC024561 .CC024561 .CC024561 .CC024561 .CC024561 .CC024561 .CC024561 .CC024561 .CC024561 .CC024561 .CC024561 .CC027458 .CC027458 .CC027458	.99999915 .99999987 .99999964 .9999964 .9999964 .99999965 .99999966 .99999986 .9999996 .39999996 .39999996 .39999999 .99999996 .399999996 .99999996 .99999996 .99999998 .99999996 .99999996	00116570 .00048468 .00063932 .00079623 .00079623 .00096397 .00116570 .0000000 .0000000 .0000000 .0000000 .000000	00057716 .00012311 .00026015 00053829 00053829 00057716 .00057716 .00052967 99999997 99999999 99999999 99999999 99999999	.99999915 .99999987 .99999979 .99999979 .99999979 .99999998 .99999986 .99999986 .99999986 .99999986 .99999986 .99999986 .99999986 .99999986 .99999986 .99999986 .99999986 .99999986 .99999986 .99999986 .99999986 .99999986 .99999986 .999999986 .999999986 .999999986 .999999986 .9999999986 .9999999986 .99999999986 .9999999986 .9999999986 .9999999986 .99999999986 .9999999986 .999999986 .00027729 .0002686 .00027729 .00021681 .00027458
FACET 5 FACET 6 FACET 9 FACET10 FACET11 AVERAGES : RMS : MARTIN; FACET 1 FACET 2 FACET 2 FACET 3 FACET 5 FACET 6 FACET 7 FACET 9 FACET 10 FACET 11 AVERAGES : RMS :	00116570 .CC048468 .CC63932 .00079823 .00079823 .CC060C00 0CC0CCC0 .CC060CC0 .CC0554 .CC0554 .CC0554 .CC018376 CC018376 CC018376 .CC018376 .CC018376 .CC018376 .CC018376 .CC018376 .CC018376 .CC018376 .CC018376 .CC018326 .CC018326 .CC018376 .CC018326 .CC01827 .CC01828 .CC0188	00057716 .CC012311 .CC006015 00030323 C0053629 CC057716 .CC052967 CCC17647 .CC035741 11 .CC025764 .CC024561 .CC0125764 .CC025764 .CC0257764 .CC0257764 .CC0257764 .CC0257764 .CC0257764 .CC0257764 .CC0257764 .CC0257764 .CC0257764 .CC0257764 .CC0257764 .CC0257764 .CC0257764 .CC0257764 .CC0257764 .CC0257764 .CC0257764	.99999915 .99999987 .99999979 .99999939 .99999939 .99999986 .99999986 .99999986 .99999986 .99999996 .39999996 .39999996 .99999997 .9999998 .99999998 .99999998 .99999998 .99999998 .99999998 .99999998 .99999998 .99999998 .99999998	00116570 .00048468 .00063932 .00079623 .00079623 .00096397 .00116570 .00000000 .00000000 .00000000 .00000000	00057716 .00012311 .00006015 00053829 00053829 00057716 .00052967 00052967 99999997 99999999 99999999 99999999 99999999	.99999915 .99999987 .99999997 .99999999 .99999999 .99999915 .999999915 .999999915 .99999986 .00027729 .CC024242 .GC022013 .CC021681 .CC021681 .CC021681 .CC021681 .CC021681
FACET 5 FACET 6 FACET 7 FACET 9 FACET 10 FACET 11 AVERAGES : RFS : MARTIN, FACET 1 FACET 2 FACET 3 FACET 4 FACET 5 FACET 6 FACET 7 FACET 8 FACET 9 FACET 9 FACET 10 FACET 11 AVERAGES : RMS :	00116570 .CC048468 .CC63932 .OOC79823 .OOC79823 .CC079823 .CC079823 .CC079823 .CC079823 .CC079823 .CC079823 .CC079823 .CC079823 .CC079823 .CC078871 .CC012871 .CC018376 .CC018376 .CC018376 .CC018376 .CC018376 .CC018376 .CC018376 .CC018376 .CC018376 .CC018326 .CC01828 .CC0188 .CC0188 .CC0188 .CC01888 .CC01888 .CC01888 .C	00057716 .CC012311 .CC006015 00030323 C0053829 CC057716 .CC052967 CCC17647 .CC035741 11 .CC025764 .CC025764 .CC024561 .CC015588 .CC012129 .CC011585 .CC0276598 .CC0125764 .CC024561 .CC024561 .CC024561 .CC016598 .CC012598 .CC012598 .CC012976 .CC013976 .CC013976 .CC036330	.99999915 .99999915 .99999979 .99999939 .99999915 .99999915 .99999986 .99999986 .9999996 .9999996 .9999996 .9999996 .99999998 .99999998 .99999996 .99999996 .99999996 .99999996	00116570 -0004368 -00063932 -00079823 -00079823 -00096397 -00116570 -0000000 -0000000 -0000000 -00006473 -30018370 -30018370 -30018370 -00018326 -30008326 -30003326 -30003320	00057716 .00012311 .00006015 00053829 00053829 00057716 .00057716 .00052967 99999997 99999997 99999997 99999999 99999999 99999999 99999999	.99999915 .99999987 .999999987 .99999999 .99999999 .999999915 .999999986 .99999986 .99999986 .00027729 .CC024242 .CC021681 .CC021681 .CC021681 .CC021681 .CC021681 .CC021681
FACET 5 FACET 6 FACET 7 FACET 9 FACET 10 FACET 11 AVERAGES : RFS : HARTIN; FACET 1 FACET 1 FACET 2 FACET 3 FACET 4 FACET 5 FACET 6 FACET 7 FACET 7 FACET 9 FACET 10 FACET 11 AVERAGES : RMS :	00116570 .CC048468 .CC63932 .00079823 .00079823 .CC116576 .CC000C00 0CC00C00 .CC0554 N = .CC012871 CC012871 CC018376 CC018376 CC018376 .CC018376 .CC018370 .CC018326 .CC018370 .CC018326 .CC018326 .CC018370 .CC018326 .CC01828	00057716 .CC012311 .CC006015 00030323 C0053829 CC057716 .CC052967 CCC17647 .CC035741 11 .CC025764 .CC025764 .CC024561 .CC012598 .CC012129 .CC011585 .CC024561 .CC024561 .CC024561 .CC024561 .CC024561 .CC024561 .CC024561 .CC024561 .CC024561 .CC024561 .CC024561 .CC024561 .CC024561 .CC024561 .CC024561 .CC024561 .CC024561 .CC027458 .CC012976 .CC027458	.99999915 .99999915 .99999979 .99999939 .99999915 .99999915 .99999986 .99999986 .9999996 .9999996 .9999996 .9999996 .9999996 .9999996 .9999996 .9999996 .9999996 .9999996 .9999996	00116570 -0004368 -00063932 -00079823 -00079823 -00096397 -00116570 -00000000 -00000000 -00000000 -00000000	00057716 .00012311 .00006015 .000030323 00053829 00053829 00057716 .00057716 .00052967 99999997 99999997 99999999 99999999 99999999 99999999	.99999915 .99999987 .99999997 .99999999 .999999915 .999999915 .999999986 .999999986 .99999986 .00027729 .CC024242 .CC024242 .CC021681 .CC021681 .CC021681 .CC021681
FACET 5 FACET 6 FACET 7 FACET 9 FACET 10 FACET 11 AVERAGES : RFS : MARTIN; FACET 1 FACET 2 FACET 3 FACET 4 FACET 5 FACET 7 FACET 7 FACET 9 FACET 10 FACET 11 AVERAGES : RMS : MARTIN FACET 1	00116570 .CC048468 .CC63932 .00079823 .00079823 .CC115576 .CC060C00 0CC0C00 .CC05554 N * .CC012871 CC018376 CC018376 CC018376 .CC018376 .CC018376 .CC018376 .CC018376 .CC018370 .CC018570 .C002500 .CC018570 .C002500 .CC018570 .C002500 .C00	00057716 .CC012311 .CC026015 00030323 C0053829 CC057716 .CC052967 CCC17647 .CC035741 11 .CC025764 .CC025764 .CC025764 .CC024561 .CC01558 .CC012129 .CC011585 .CC025764 .CC024561 .CC024561 .CC025764 .CC024561 .CC024561 .CC016598 .CC012129 .CC011585 .CC027458 .CC012129 .CC011585 .CC027458 .CC013976 .CC636330	.99999915 .99999987 .99999964 .99999964 .99999964 .99999965 .9999986 .9999986 .9999986 .9999986 .9999996 .9999996 .9999996 .9999998		00057716 .00012311 .00006015 .000030323 00053829 00057716 .00057716 .00057716 .00057716 .00057997 99999997 999999997 999999997 999999997 999999997 999999997 999999997 999999997 99999999	.99999915 .99999987 .99999997 .99999999 .99999999 .999999915 .999999915 .999999986 .999999986 .99999986 .00027729 .C024242 .G0022013 .C0021681 .G0021681 .G0021681 .G0021681
FACET 5 FACET 6 FACET 7 FACET 8 FACET 9 FACET 10 FACET 11 AVERAGES : RFS : MARTIN; FACET 1 FACET 2 FACET 3 FACET 4 FACET 5 FACET 6 FACET 7 FACET 8 FACET 9 FACET 11 AVERAGES : RMS : NARTIN FACET 1 FACET 2	00116570 .CC048468 .CCC63932 .00079823 .00079823 .CC116576 .CC060C00 CC060C00 .CC05554 N = .CC028370 .CC018376 .CC018376 .CC018376 .CC018376 .CC018376 .CC018370 .CC01	00057716 .CC012311 .CC026015 0003023 C0053829 CC057716 .CC052967 CCC17647 .CC035741 11 .CC025764 .CC025764 .CC024561 .CC01558 .CC012129 .CC011565 .CC025764 .CC024561 .CC012129 .CC011565 .CC025764 .CC024561 .CC011565 .CC027458 .CC011565 .CC027458 .CC0113976 .CC024561 .CC044581 .CC044581 .CC044581	.99999915 .99999987 .99999979 .99999964 .99999939 .99999986 .99999986 .99999986 .99999986 .99999986 .99999986 .99999986 .99999986 .99999998 .9999998 .9999998 .9999998 .9999998 .9999998 .9999998 .9999998 .999998 .999998 .999998 .999998 .99998 .99998 .99998 .99998 .99998 .99998 .9998 .9998 .9998 .9998 .9998 .9988 .9998 .99888 .9988 .9988 .998888 .99888 .99888 .99888 .998888 .9988	00116570 .0004868 .00063932 .00079623 .00096397 .00116570 .00000000 .00000000 .00000000 .0000000	00057716 .00012311 .00026015 0003023 00053829 00053829 00057716 .00057716 .00052967 99999997 99999997 99999999 99999997 99999999 99999999 99999999 99999999	.99999915 .99999987 .99999997 .99999999 .99999999 .99999999
FACET 5 FACET 6 FACET 7 FACET 8 FACET 9 FACET 10 FACET 11 AVERAGES : RFS : MARTIN, FACET 1 FACET 2 FACET 5 FACET 5 FACET 6 FACET 7 FACET 6 FACET 7 FACET 7 FACET 7 FACET 7 FACET 8 FACET 9 FACET 9 FACET 1 FACET 1 FACET 1 FACET 1 FACET 2 FACET 3	00116570 .CC048468 .CC63932 .00079823 .00079823 .CC060C00 CC0CCCC0 .CC050C00 .CC0554 .CC0554 .CC0554 .CC018376 CC018376 .CC018576 .CC018576 .CC018576 .CC018576 .CC018576 .CC018576 .CC018576	00057716 .CC012311 .CC026015 00030323 C0053829 CC057716 .CC052967 CCC17647 .CC035741 11 .CC025764 .CC025764 .CC024561 .CC027458	.99999915 .99999987 .99999964 .9999964 .9999964 .9999996 .99999986 .99999986 .99999986 .99999986 .99999996 .99999996 .99999996 .99999996 .99999996 .99999996 .99999996 .99999996 .99999996 .99999998 .99999998 .99999998 .99999998 .99999998 .99999998 .99999998 .99999998 .99999998 .99999998 .99999998 .99999998 .99999998	00116570 .00048468 .00063932 .00079623 .00096397 .00116570 .0000000 .0000000 .0000000 .0000000 .00016570 .00017668 .00018326 .00018526 .0001856 .000	00057716 .00012311 .00006015 00053829 00053829 00053829 00057716 .00052967 99999997 99999999 99999999 99999999 99999999	.99999915 .99999987 .99999979 .99999979 .999999979 .999999975 .999999986 .99999986 .99999986 .99999986 .99999986 .99999986 .99999986 .99999986 .99999986 .00027729 .CC024242 .CC024685 .G0027729 .CC024681 .CC021681 .CC021681 .CC021681 .CC021681 .CC021681
FACET 5 FACET 6 FACET 9 FACET 10 FACET 11 AVERAGES : RFS : MARTIN, FACET 1 FACET 2 FACET 3 FACET 4 FACET 5 FACET 6 FACET 7 FACET 6 FACET 7 FACET 7 FACET 7 FACET 8 FACET 9 FACET 10 FACET 11 AVERAGES 2 RMS 3	00116570 .CC048468 .CC63932 .00079823 .00079823 .CC060C00 CC0CCC00 .CC0554 .CC0554 .CC0554 .CC057687 CC012871 CC018376 CC018376 .CC018376 .CC018376 .CC018376 .CC018376 .CC018376 .CC018376 .CC018376 .CC018376 .CC018376 .CC018376 .CC018376 .CC018376 .CC018376 .CC018326 .CC018376 .CC018376 .CC018376 .CC018376 .CC018376 .CC018376 .CC018326 .CC018376 .CC018376 .CC018326 .CC018376 .CC018326 .CC01837	00057716 .CC012311 .CC006015 00030323 C0053829 CC057716 .CC052967 CCC17647 .CC035741 11 .CC025764 .CC024561 .CC0125764 .CC024561 .CC011585 .CC012129 .CC011585 .CC024561 .CC024561 .CC024561 .CC024561 .CC036545	.99999915 .99999915 .99999999 .99999999 .99999999 .99999999	00116570 -0004368 -00063932 -00079823 -00079823 -00096397 -00116570 -0000000 -0000000 -0000000 -0000473 30018370 30018370 30018370 30018370 30018370 30018370 30018370 30018370 30018370 30018370 30018370 3002372 3002372 3002372 3002372	00057716 .00012311 .00006015 .000030323 00053829 00053829 00057716 .00053829 .00053829 .00057716 .00053829 .00053829 .00053829 .00057716 .00053829 .00057716 .00057716 .00057716 .00052967 .009999997 .099999999 .099999999 .0005 .0005	.99999915 .99999987 .99999987 .999999964 .99999999 .999999915 .999999986 .999999986 .99999986 .99999986 .99999986 .99999986 .00027729 .CC024242 .CC021681 .C
FACET 5 FACET 6 FACET 7 FACET 9 FACET 10 FACET 11 AVERAGES : RFS : MARTIN; FACET 1 FACET 2 FACET 3 FACET 4 FACET 5 FACET 7 FACET 1 AVERAGES : RMS : NARTIN FACET 1 FACET 2 FACET 3 FACET 1 FACET 2 FACET 3 FACET 4 FACET 1 FACET 3 FACET 4 FACET 5	00116570 .CC048468 .CC63932 .00079823 .00079823 .CC116576 .CC060C00 .CC060C00 .CC0554 .CC0554 .CC0554 .CC012871 CC012871 CC012871 .CC012871 .CC012871 .CC012871 .CC012871 .CC012871 .CC012871 .CC012871 .CC012871 .CC01326 .CC01326 .CC01326 .CC01326 .CC01326 .CC014728 .N = 1 .CC014728 .N = 1 .CC025939 CC025939 CC025939 CC02620	00057716 .CC012311 .CC006015 00030323 C0053829 CC057716 .CC052967 CCC17647 .CC035741 11 .CC025764 .CC024561 .CC012129 .CC011585 .CC024561 .CC024561 .CC024561 .CC024561 .CC024561 .CC024561 .CC036330 11 .CC036330 11 .CC036551 .CC036551 .CC030552	.99999915 .99999915 .99999986 .99999939 .99999915 .99999986 .99999986 .99999986 .99999986 .99999986 .99999998 .99999998 .99999998 .99999998 .99999998 .99999998 .99999998 .99999999	00116570 -00048468 -00063932 -00079823 -00079823 -00096397 -00116570 -00000000 -00000000 -00000000 -00000000	00057716 .00012311 .00026015 .00053023 00053829 00053829 00057716 .00057716 .00052967 99999997 99999997 99999999 99999999 99999999 99999999	.99999915 .99999987 .99999997 .999999964 .99999999 .999999915 .999999915 .999999986 .999999986 .99999986 .99999986 .00027729 .CC024242 .CC024242 .CC022013 .CC021681 .CC021681 .CC021681 .CC021681 .CC021681 .CC021681 .CC021681 .CC021681 .CC021681 .CC021681 .CC027458
FACET 5 FACET 6 FACET 7 FACET 8 FACET 9 FACET 10 FACET 11 AVERAGES : RFS : MARTIN; FACET 1 FACET 2 FACET 3 FACET 4 FACET 5 FACET 7 FACET 7 FACET 7 FACET 7 FACET 7 FACET 7 FACET 10 FACET 10 FACET 11 AVERAGES : RMS : MARTIN FACET 1 FACET 2 FACET 3 FACET 5 FACET 5 FACET 5 FACET 5	00116570 .CC048468 .CC63932 .00079823 .00079823 .CC115576 .CC060C00 0CC0CC00 .CC3554 N = .CC06473 CC012871 CC012871 CC012871 CC012871 .CC012871 .CC012871 .CC012871 .CC012871 .CC012871 .CC012871 .CC01326 .CC01326 .CC01326 .CC01326 .CC014728 N = 1 .CC025939 CC025939 .CC025939 .CC025939	00057716 .CC012311 .CC026015 00030323 C0053829 CC057716 .CC052967 CCC17647 .CC035741 11 .CC025764 .CC025764 .CC024561 .CC015598 .CC012129 .CC011585 .CC0125764 .CC024561 .CC024561 .CC024561 .CC024561 .CC024583 .CC013976 .CC0364581 .CC036552 .CC044581	.9999915 .99999987 .99999964 .99999964 .99999964 .99999965 .99999986 .99999986 .99999986 .9999996 .9999996 .9999996 .9999996 .9999996 .9999996 .9999996 .9999996 .9999996 .9999996 .9999996 .9999996 .9999996 .9999995 .9999995 .9999995 .9999995 .9999987	00116570 -00048468 -00063932 -00079623 -00079623 -00096397 -00116570 -00000000 -00000000 -00000000 -00012871 -00017668 -00018326 -00018370 -00018370 -00018326 -00018326 -00018326 -00018326 -00018616 -00013616 -0001379 -0002465 -0002465 -0002465 -0002465	00057716 .00012311 .00026015 .00053023 00053829 00053829 00057716 .00057716 .00057716 .00057716 .00057716 .00057716 .00057716 .00057716 .00057716 .00057716 .00057716 .00057999 99999999 99999999 99999999 99999999	.99999915 .99999987 .99999997 .999999964 .99999999 .999999915 .999999915 .999999986 .999999986 .99999986 .99999986 .99999986 .00027729 .C0024242 .C0024242 .C0021681 .C0021681 .C0021681 .C0021681 .C0021681 .C0021681 .C0021681 .C0021681 .C0027458
FACET 5 FACET 6 FACET 7 FACET 8 FACET 9 FACET 10 FACET11 AVERAGES : RFS : MARTIN FACET 1 FACET 2 FACET 3 FACET 4 FACET 5 FACET 7 FACET 10 FACET 11 AVERAGES 1 RMS 1 MARTIN FACET 1 FACET 5 FACET 5 FACET 5 FACET 5 FACET 6 FACET 7	00116570 .CC048468 .CC63932 .00079823 .00079823 .CC116576 .CC060C00 CC060C00 .CC3554 N = .CC12877 .CC018376 .CC025939 .CC025939 .CC025939 .CC025939 .CC025939 .CC025939	00057716 .CC012311 .CC026015 00030323 C0053829 CC057716 .CC052967 CCC17647 .CC035741 11 .CC025764 .CC025765 .CC027458 .CC018976 .CC036555 .CC03655 .CC03655 .CC03655 .CC0365555 .CC0365555 .CC0365555 .CC0365555 .CC0365555 .CC0365555 .CC0365555 .CC0365555 .CC0365555 .CC0365555 .CC0365555 .CC03655555 .CC03655555 .CC03655555 .CC03655555555555555555555555555555555555	.9999915 .99999917 .99999979 .99999964 .9999999 .99999986 .99999986 .99999986 .99999986 .99999986 .99999989 .999999987 .99999987	00116570 .00048468 .00063932 .00079623 .00096397 .00116570 .00000000 .00000000 .00000000 .00000000	00057716 .00012311 .00026015 .0003323 00053829 00053829 00057716 .00057716 .00057716 .00052967 99999997 99999997 99999999 99999997 99999999 99999999 99999999 99999999	.99999915 .99999987 .99999997 .999999964 .99999999 .99999999 .99999995 .999999986 .999999986 .99999986 .99999986 .00027729 .CC024242 .CC021681 .CC027458
FACET 5 FACET 6 FACET 9 FACET 10 FACET 11 AVERAGES : RFS : MARTIN; FACET 2 FACET 3 FACET 5 FACET 6 FACET 7 FACET 5 FACET 6 FACET 7 FACET 7 FACET 7 FACET 8 FACET 9 FACET 10 FACET 11 AVERAGES 1 RMS 1 MARTIN FACET 5 FACET 6 FACET 7 FACET 8 FACET 1 FACET 2 FACET 3 FACET 4 FACET 5 FACET 5 FACET 6 FACET 7 FACET 7 FACET 6 FACET 7 FACET 6	00116570 .CC048468 .CC63932 .00079823 .00079823 .CC060C00 0CC0CCC0 .CC0554 .CC0554 .CC0554 .CC018576 .CC018376 CC018376 .CC018376 .CC018376 .CC018376 .CC018376 .CC018376 .CC018376 .CC018376 .CC018376 .CC018376 .CC018376 .CC018376 .CC018376 .CC018326 .CC018376 .CC01836 .CC018376	00057716 .CC012311 .CC006015 00030323 00030323 CC052967 CCC17647 .CC035741 11 .CC025764 .CC035741 11 .CC0125764 .CC0125764 .CC0125764 .CC0125764 .CC0125764 .CC0125764 .CC0125764 .CC0125764 .CC0125764 .CC0125764 .CC0125764 .CC0125764 .CC0125764 .CC0125764 .CC0125764 .CC0125764 .CC0125764 .CC024561 .CC013976 .CC013976 .CC036545 .CC036545 .CC036545 .CC041918 .CC041918 .CC041918 .CC041918 .CC041918 .CC041918 .CC041918	.99999915 .99999915 .99999987 .99999999 .99999999 .999999986 .99999986 .99999986 .99999986 .9999999 .99999986 .99999998 .99999998 .9999999 .9999999 .9999999 .9999999 .999999	00116570 .00048468 .00063932 .00079623 .00096397 .00116570 .0000000 .0000000 .0000000 .0000000 .00016570 .00017668 00017668 .00018326 .0001846 .00018326 .0001846 .000186 .000000000000000000000000000000000000	00057716 .00012311 .00006015 00053829 00053829 00053829 00057716 .00052967 00057716 .00052967 9999999 99999999 99999999 99999999	.99999915 .99999987 .99999987 .999999964 .99999999 .999999915 .999999915 .999999986 .99999986 .99999986 .99999986 .00027729 .CC024242 .CC021681 .CC021681 .CC021681 .CC021681 .CC021681 .CC021681 .CC027458 .CC021681 .CC027458 .CC027458 .CC021681 .CC027458 .CC027458 .CC027458 .CC021681 .CC027458 .CC021681 .CC027458 .CC027458 .CC021681 .CC027458 .C
FACET 5 FACET 6 FACET 9 FACET 10 FACET 11 AVERAGES : RFS : MARTIN, FACET 1 FACET 2 FACET 3 FACET 4 FACET 3 FACET 5 FACET 6 FACET 7 FACET 6 FACET 7 FACET 7 FACET 8 FACET 1 AVERAGES 2 RMS 3 MARTIN FACET 5 FACET 6 FACET 7 FACET 10 FACET 11 AVERAGES 2 RMS 3 MARTIN FACET 1 FACET 3 FACET 4 FACET 5 FACET 5 FACET 6 FACET 7 FACET 7 FACET 8 FACET 9	00116570 .CC048468 .CC63932 .00079823 .00079823 .CC07620 .CC060C00 .CC060C00 .CC0554 .CC06473 CC06473 CC012871 CC018376 CC018376 CC018376 .CC018376 .CC018376 .CC018376 .CC018376 .CC018376 .CC018376 .CC018376 .CC018376 .CC018326 CC018326 .CC018326 .CC018326 .CC018326 .CC018326 .CC018326 .CC018326 .CC018326 .CC018326 .CC018326 .CC07879 .CC025939 .CC025939 .CC025939 .CC025939 .CC025939 .CC025939 .CC025939 .CC0265939 .CC025939	00057716 .CC012311 .CC006015 00030323 C0053829 CC057716 .CC052967 CCC17647 .CC035741 11 .CC025764 .CC024561 .CC012129 .CC011585 .CC012129 .CC011585 .CC0125764 .CC024561 .CC024561 .CC024561 .CC037458 .CC013976 .CC03169 .CC03169 .CC032169 .CC032169 .CC032169 .CC032169 .CC032169 .CC032169 .CC032169 .CC032169 .CC032169 .CC032169	.9999915 .99999915 .9999999 .99999939 .99999939 .99999915 .99999986 .99999986 .99999986 .99999986 .99999986 .99999998 .99999998 .99999998 .99999998 .99999998 .99999998 .99999998 .99999998 .99999998 .99999995 .99999998 .99999995 .9999998 .9999998 .9999998 .9999998 .9999998 .9999998 .9999998 .9999998 .9999998 .9999998 .9999998 .9999998 .9999998 .9999998 .9999998	00116570 -00043658 -00063932 -00079623 -00079623 -00096397 -00116570 -0000000 -0000000 -0000000 -0000473 -30018370 -30018370 -30018370 -30018370 -30018370 -30018370 -30018370 -30018370 -30018370 -00018326 -30003326 -30003300 -00018326 -30003379 -00023020 -00013616 -30025939 -0002020 00020320 -00013616 -30002379	00057716 .00012311 .00006015 .00003323 00053829 00053829 00057716 .00057716 .00052967 99999997 99999997 999999997 999999997 999999997 999999997 999999997 99999999 99999999 99999999 99999999	.99999915 .99999987 .99999987 .999999964 .999999964 .999999964 .999999986 .99999986 .99999986 .99999986 .99999986 .99999986 .00027729 .CC024242 .CC021681 .C

				00000446	- 24172202	02070743
FACETIO	.00002465	.00030552	.99999995	.00002465	- 34147690	4939/9/91
FACET11	00000000	.0057816	.99999983	00000000	3414/000	
AVERAGES 1	00000000	.00037941				
R MS #	.00015534					
	N #	11				•
		CI CHATTER	ANGLES O	DECREES ERGH VERTICA		
MANIIN	PUASES) ELEVAILUN	00000001	- 00036411	- 0000000g	.00041508
FACET 1		.00019929	0000061	- 00039445	- 00000000	.00043262
FALEI Z	00034045	.00017510	100000000	- 00066969	-1.00000000	.00045045
FACEI 3	00044909	.00002012	00000085	00054398	-1.00000000	0054821
FALEI 4	00054398	- 00003803	.00000078	+.00066120	-1.00000000	00066679
FALEL 2	- 000120		00000004	00018038	- 99999998	.00026642
FAGEL G	- 00014695	00019000		30014695	- 99999998	.00024094
CALCE A	- 00014075	00017094	00000008	00012972	- 99999999	.00021514
FACEI G	00014605	.00015875		00014505	- 99999999	.00021503
FACET 7	00016893	.00015632	99999997	00016893	99999999	.00023016
FACET11	- 00011746	. 00022573		00018746	- 99999996	.00033342
FACEILL						
AVERAGES 1	00030672	-00012671				
DAS .	.00030010					
	N B	11				
	···· ···· ··· ··· ··· ··· ··· ··· ···		VECTORS NO	RMAL TO MIRBOR SURFA	: 6	
	IN LO	ICAL COORDINAT	ES	IN G	LOBAL COORDIN	ATES
				· · · · · · · · · · · · · · · · · · ·		
MDAC-	VERTOW/ G	, ELEVATION	ANGLE. O.	DEGREES FROM VERTIC	AL/4 PLANE AVE	RAGE
FACET 1	00016062	00065218	.999999971	00016062	99999979	00076025
FACET 2	CCC16630	00093410	.99999949	00016630	-,99999956	00100599
FACET 3	0008113	00113045	.99999934	00008113	99999936	00114936
FACET 4	.00000000	00119732	.99999928	.0000000	99999928	00119732
FACET 5	.0008113	00113645	.99999934	.00008113	-,99999936	00114936
FACET 6	.0016630	00093410	.99999949	.00016630	99999956	00100599
FACET 7	.00016062	00065218	.99999971	.00015062	99999979	00076025
FACET 8	.00016066	CCC66565	.99999970	.00015086	-, 99999978	00077192
FACET 9	.00016661	00094749	.99999948	.00016561	99999955	00101849
FACETIG	.00008139	C0114379	.99999933	.00008139	-,99999935	00116250
FACET11	.00000000	00121058	.99999927	.0000000	-,99999927	0C121058
FACET12	00068139	0C114379	. 99999933	00008139	99999935	00116250
FACET13	00016662	00096484	.99999946	00015562	99999953	00103563
FACET14	00016086	00066565	.99999970	00016086	99999978	00077192
		<u>,</u>				
AVERAGES :	00000000	00095519				
RMS :	.00013109	.00020853				
	N =	14				
HDAC	<u>→ AT 150+₩/ G</u>	ELEVATION	ANGLE= 15.	DEGREES FROM VERTIC	AU4 PLANE AVE	RAGE
FACET 1	0026046	00054796	•99999977	00025046	96606750	.25816981
FACET 2	00023964	00077768	.99999963	00023964	96612665	.25799661
FACET 3	00010492	00059325	.99999959	00013492	96615663	.25794496
FACET 4	.00000000	00091854	.99999958	.0000000	96616315	.25793170
FACET 5	.00010492	00019325	.99999959	.00010492	-,96615663	.25794496
FACET 6	.00023964	00077708	+99999963	.00023964	-,96612666	.25799661
FACET 7	CC026046	00054796	.99999977	.00025046	96605750	.25816981
FACET 8	.00004914	00077494	.99999962	.00004914	96612610	.25798089
FACET 9	.00008098	00108658	.99999933	.00008098	96620700	.25769945
FACETIO	.0005166	00135043	.99999905	.00005166	96627446	.25748777
FACET11	.00000000	00145381	.99999894	•0000000	96630108	+25741450
FACET12	00005166	00135044	.99999905	00005166	96627446	.25748777
FACET13	0008099	00111447	,99999929	00008099	-,96621366	.25767517
FACET14	00004914	CG077494	+99999962	00004914	96612610	.25798089
AVERAGES #	00000000	00094734				
8#2 t	.00014537	.0027678				
	<u>N *</u>	14				
MDAC	JAT 30DJ₩/ 6	ELEVATION	ANGLE= 30.	DEGREES FROM VERTIC	AUA PLANE AVE	RAGE
PACET 1	00034302	00042900		00034302	80023982	. 49949447
FAUEL Z	00029716	00059080	.44449977	00029716	80032055	.49941225
PACET 3	00012181	00061932	.99999980	00012181	800 33490	.+9945328
FACET 4	00000000	00060152	.9999982	00000000	86632601	. 49947898
FACET 5	.00012181	00061932	.99999980	+00012181	86633490	.49945328
FACET 6	.00029716	00059060	•99999977	.00029716	86632055	.49941225
HACET 7	.0034302	00042900	.99999982	.00034302	36623982	.49949447
FACET 8	00006538	00085398	.99999956	00006538	86645207	.49918659
HACET 9	00000960	00117893	,99999921	0000960	86661426	.49891693
FACETIC	.00001869	00143907	.99999883	.00001869	86676898	.49867854
FACET11	.0000000.	00162217	.99999868	.0000000	86683535	.49859450
FACET12	00001869	00143907	.99999883	00001369	86676898	.49857854
FACET13	.00003959	00121163	.99999917	.00000959	86663057	.49888988

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FACET14	.0006537	00035398	99999956	. 30006537	46645207	.49918659
AVERAGES :	00006000	CC089844				
RMS 1	CG017949	.00040324	<u> </u>		······································	
	·····					
MDAC	-,AT 450,47 G	. ELEVATION	ANGLE= 45.	DEGREES FROM VERTICAL	4 PLANE AVE	RAGE
FACET 1	00040351	00023342	.99999967	00040351	70730716	.70675135
FACET 2	0013080	000366// 00030586	.99999999	00033549	-,70732302	.70686294
FACET 4	00000000	CC024599	.99999997	00000000	70728070	.70693282
FACET 5	.00013080	00030586	.999999994	.00013080	70732302	.70686294
FACET 7	.60040351	00028342	.99999987	.00040351	70730716	.70675135
FACET 8	00017601	00087955	.99999953	00017601	70772844	.70642485
FALET 9 FACET10	00009985	66119464	.99999919	00001989	70818995	.70599097
FACET11	.0000000	00168727	.99999858	.30000006	70829885	.70591269
FACET12	.00001560	00153301	.99999875	.30601560	70818995	.70599097
FACET14	.00017601	00123204	99999953	.00017601	70772844	.70642485
RHS 1	000000000	00079265				
	<u>N =</u>	14	. <u></u>			<u> </u>
HDAC	AT CODANY G	. ELEVATION	ANGLE. 60.	DEGREES FROM VERTICAL	4 PLANE AVE	RAGE
FACET 1	00043402	CC014318	.9999990	00043402	50012399	.86579652
FACET 3	00013007	.0000388	.99999998	00013007	49999664	.86602617
FACET 4	00000600	.00010135	.99999999	00000000	49991222	.86607608
FACET 5	.00034891	-00000368	.99999998	.00036891	49999664	-86602617
FACET 7	.00043402	00014318	.99999990	.06043402	50012400	.86579652
FACET 8	00027358	00086581	.99999954	+.00027358	50074962	.86554796
FACETIG	00018272	06148922	.99999881	00013272	50128915	.86525555
FACET11	.00000000	00165318	.99999863	.0000000	50143101	.86519763
FACET12 FACET13	.00004877	00118705	.99999881	.00004877	+.50128915	+86525555
FACET14	.00027357	00086581	.99999954	.00027357	50074963	+86554795
				····		
RMS 1	00000000	00062640				
	N =	14				
MDAC	+AT 750+W/ G	. ELEVATION	ANGLE - 75.	DEGREES FROM VERTICAL	4 PLANE AVE	RAGE
FACET 1	00043624	.0005279	.99999990	00043624	25876806	.96603952
FACET 3	00012086	+00013797	.99999989	00012086	25847201	.96604485
FACET 4	-,0000000	.00048791	.99999988	0000000	25834773	.96605199
FACET 5	.00012087	.00035926	.999999989	.06012087	25847201	.96604485
FACET 7	.00043624	•CC005278	.9999990	.00033400	-125876806	.96603952
FACET 0	00035308	00074922	.99999963	300 35368	25954267	.96570415
FALET 9	00025345	00130216	.999999943	00025345	25976525	496363064
FACET11	.00000000	00146515	.99999893	.0000000	25023399	. 96554558
FACET12	.00007867	06130216	.99999908	.00007867	26007662	.96557424
FACET14	.00035307	00074923	.99999963	.00025345	25954267	.96570415
				·····		
AAFKVGF2 1	00000000	00342701	-	•	2 2	
K (1) 1	100027133 N =	14				
					·····	
MDAC	HORIZANA G	. FLEVATION	ANGLE 90	BEGREES FROM VERTICAL	A PLANE ANE	PAGE
FACET 1	CCC41065	.36313240	.999999990	00041005	.00013240	. 9999990
FACET 2	0030811	.00029641	.99999988	00030811	.00029641	.99999988
FACET 4	CC0CCC0G	+00057890	<u>.99999977</u>	00010373	.00057890	.999999977
FACET 5	.00010373	LCC57690	.99999977	.00010373	.00057890	99999977
FACET 6	.60030811	.0029641	.99999988	. 30030811	.00029641	.99999988
FACET 8	00640986	00069731	.999999966	.00041005	00013239	000000000
FACET 9	00030791	00086116	.99999955	30030791	00086116	. 99999955
FACETLO	60610353	00114348	.99999928	00010353	00114348	.99999928

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FACET11 -	coccocco	06129489	. 99999916	00000000	00129489	. 99999916
FACET12	.0C010352	00114348	.99999928	.00010352	00114348	.99999928
FACET13	.0030790	00089671	.99999951	.00030790	00059671	.99999951
FACET14	.00040985	CGJ69731	.99999966	.00040985	00069731	.99999966
AVERAGES :	0000000	CC028489				
RMS I	+CC027963	.00071155			·····	
	N =	14				
			<u> </u>			
	CACC1 04 C	F1 - 0 + 7 7 0 4			the of the the	BACC
CACET 1	JLASELS#7 6	P ELEVALLUN	ANGLE V.	DEGREES FRUM VERILLA	- 00000001	- 00040010
FAUEL 1	- 00023399	- 00053847	.999999967	- 30021399	- 00000085	00049010
CACET 2	- 000021704	- 00053887	00000091	- 200021789	- 999999999	- 00062302
FACET 4	.00000733	00061992	.00000091	-300000135	00000081	06061992
FACET 5	.00009733	00061126	-99999981	-00009733	99999981	00062302
FACET 6	.00021789	00053867	.99999981	.00021789	99999985	00061332
FACET 7	.00023399	00037143	.99999987	.00023399	99999993	00049009
FACET 8	.00008754	00035929	.99999981	.00003754	99999993	00060850
FACET 9	.00011512	0C075576	.99999955	.00011512	-,99999971	00089594
FACET10	.C0006531	00107579	.99999937	.00006531	-,99999942	00112181
FACET11	00000000	00120075	.99999928	00000000	99999928	00120075
FACET12	0006531	00107579	.99999937	00006531	99999942	00112181
FACET13	00011512	00078806	•99999956	30011512	99999968	00092621
FACET14	00008755	00035929	.49499981	00008755	99999993	00060850
INEDACES -		- 60964947				
ATERAGES I						
KU2 1	+444T2404	14				
		• •				
HDAC	.CASE1.W/OG	. ELEVATION	ANGLE = 0.	DEGREES FROM VERTICAL	G EFFECTS T	AKEN OUT
FACET 1	OCC07337	.00028075	.0000016	00007337	00000014	.00027015
FACET 2	0005159	.00039543	.0000032	00005159	00000029	.00039267
FACET 3	00001620	.00051919	+00CC0047	0001620	00000045	.CC052634
FACET 4	•00000000	.00057740	+0000053	.0000000	00000053	.00057740
FACET 5	.00001621	.00051919	.0000047	.00001621	00000045	.00052634
FACET 6	.00005160	.0039543	.0000032	.30005160	00000029	.0039267
FACEL 7	.00007337	.00028075	.0000016	.00007337	00000014	.00027016
FALE1 0		.00030837	.0000011	00007332	00000015	.00016342
FALEL 7	- 00003130	000019173	00000004	00005150		-00012235
FACETIC	00000000	48060000	100000004	- 00001808	- 000000001	00000004
FACET12	00001608	.0000404	-00000004	- 00001608	00000001	2000004049
FACET13	.00005149	.00017678	.000000010	.00005149	00000015	.60010942
FACET14	.66007331	.00030637	GC000011	. 30007331	00000015	.0016342
AVERAGES 1	0000000	.00329252				
RMS :	.00004869	.06017114				
•	N =	14				
MGAC	.CASE2/ G	ELÉVATION	ANGLE = 70.	DEGREES FROM VERTICAL	A PLANE AVE	RAGE
FACET 1	00059687	.00147444	.99999971	00059087	34157427	.93995156
FACET 2	00045334	.00055467	.99999973	00045334	34149943	93994184
FACET 3	63015058	.00083598	.99999957	00015058	34123446	.94000695
FACET 4	00000000	.00100543	.99999949	30000300	34167518	.94003602
FACET 5	.00015058	.00033597	.99999957	.00015058	34123446	.94000695
FACET 6	•CC045334	.00055407	,99999973	• 30045334	-, 34149944	.93994184
FACET 7	.00059087	• CC 64 7444	,99999971	.00659087	34157428	.93995156
FALLI B		00048956	499999975	J0C39268	34248008	. 43946082
FA461 7	00020313		10000000	- 0000710	-+ 39617961	. 93937807
FACETII	0000000	00115118	- GOOJJOAA	-000009719	- 34321001	93927988
FACET12	.00009719	00116652	69699922	.00009719	3431160A	93926696
FACET13	.CC028312	0033190	99999952	.00023312	34280175	93936531
FACET14	.00039268	00048951	.99999975	.00039268	34248009	.93946082
			· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	
AVEPAGES 1	00000000	0C011CE8				
RMS 1	.00034250	.00083000				
<u> </u>	<u>N</u> =	14	_ ·			
	C10000	E1 5			k	
RUAC EARST 1	JUASE28,W/D G	> ELEVATION	ANGLE 70.	DEGREES FROM VERTICAL	74 PLANE AVE	(AGE
FALCI L			•77777760	00015056	34133531	. 43987632
FACET 2		-00033782	• 4 4 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	- 00003633 - 00003633	-4341214/1	473756104
FACET 4	0000000	+COOH7124	477777700	00002733		. 9399003
FACET 5	.00002533	.00062143	.GGGGGGGGAA	- 10000000	- 34142612	. 43776202
FACET 6	.00013688	.00053782	.99999985	.00010688	34151471	.93988104
FACET 7	.00015058	.30051590	.99999986	.00015058	34153531	93987632
FACET 8	00006255	.CC033624	.99999994	00006255	34170416	.93981070
FACET 9	00005078	.00028943	.99999996	00005078	34174815	.93979446
FACETIO	C0002776	.06024261	.99999997	00002776	34179272	.93977710
FACET11	00000000	.0022026	.99999998	00000000	34181316	.93976793
FACET12	.00002776	.00024261	.99999997	.00002776	34179272	.93977710
FACET13	.00005078	.00028354	.99999996	.00005078	34175369	.93979258
FACET14	•COOC6255	.00033624	•99999994	. 30005255	34170416	.93981070

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AVERAGES 1	00000000	.00042653				
<u></u>	.00007746 N =	<u>+00015649</u> 14				
<u> </u>		·····				
MDAC .	CASE3.W/ G	. FLEVATI	N ANGLE . O.	DEGREES FROM VERTICA		PACE
FACET 1	00092984	00022742	.99999946	20092984	99999997	00096922
FACET 2	00089009	00070177	.99999940	00089009	99999985	00105636
FACET 4	00056381	00077596	.99999954	00056381	999999970	00096047
FACET 5	00050293	06078114	.99999956	00050293	99999970	00093324
FACET 7	00041427	00067360	.999999976	00041427	99999978	00081886
FACET 8	00064295	00066423	.99999952	00064295	99999978	00095652
FACET 9 Facetio	00059178	-+00092092	.99999934	00059178	999999958	00113346
FACET11	00060550	00120852	.99999909	00060550	99999927	00135252
FACET12	00070032	60107231	.99999914	00070032	99999942	00130280
FACET14	00077112	00341899	.99999951	00078194	99999996	00118212
RHS 1	00065660	60074422	······			
·	<u>N</u> •	14	· · · · · · · · · · · · · · · · · · ·			
MDAC: ,	CASE3, #/D G	. ELEVATIO	N ANGLE - O.	DEGREES FROM VERTICA	G EFFECTS T	AKEN OUT
FACET 1	66076921	.00042477	+.00C00C25	00076921	00000018	0020897
FACET 2	00072380	· 0CU39944	0000069	30072360	00000029	0005038
FACET 3	00063228	+ 66042673	.00000015	00063228	00000040	.60014349
FACET 5	00058406	.06034931	.0000028	00058406	00000034	.00021612
FACET 6	0058096	.00326050	.0000017	0CC58056	00000022	.00018712
FACET 7	00057555	• 0CJ17378	00000005	00657555	00000000	00018460
FACET 9	66675839	.00302657	0000014	00075839	00000003	00011497
FACETIO	00066696	00000274	00000019	→.000666696	.00000001	00014343
FACET12	00061893	.CC007148	00000019	30661893	00000007	CC014030
FACET13 .	0061532	.0C015C12	00000020	00061532	00000013	00014649
FAUE114		.[[]24000	00000014	00001020	03003013	00014274
AVERAGES :	0065060	.00321096				
<u> </u>		+06015638 14				
			VECTORS NO	MAL TO MIRROR SURFAC	E	
·····	IN LO	CAL COORDINA	TES	IN GL	OBAL COORDIN	ATES
8CEING	VERTANA G	. FLEVATIO	IN ANGLES O.	DEGREES FROM VERTICA	A PLANE AVE	RAGE
FACET 1	.00013300	CC027154	.99999996	.00013300	799999996	0030348
FACET 2	.CC008166	0025618	.99999996	.30003166	999999997	0027965
FACET 4	00002762	00025521	.99999997	-,00002762	999999997	00025814
FACET 5	00008143	00026630	.99999996	00008143	99999997	00027969
FACET 6 FACET 7	00013276	60027154	.999999995 .99999996	30013276	999999996	00030533
FACET 8	CC009166	00026618	.99999996	00008166	99999997	00027965
FACET 9	00002784	00025516	.99999997	00002784	-,99999997	00025812
FACET11	.00008143	CC026630	.99999996	.00002762	99999997	00027969
FACET12	.00013276	00027372	.999999995	•00013276	999999996	00030533
AVERAGES 1	.00000000	00026469		<u></u>		
RMS 1	.00009142	-00000723				
	N =	12				
•				· · · · · · · · · · · · · · · · · · ·		
BOEING	AT 15.	> ELEVATI	DN ANGLE - 15.	DEGREES FROM VERTICA	1/4 PLANE AVE	- 25860066
FACET 2	0005808	00021658	.99999997	00005808	96598237	.25857809
FACET 3	00011091	00022969	.9999996	00011091	96598530	.25855746
FACET 5	00021760	00030470	.99999992	00016515	96600464	.25842469
FACET 6	00026757	00031797	.99999999	00025757	96600807	.25838704
FACET 7 FACET A	.00000761	CC021776	.99999997 .99999'007	.00000761	96598216 96598237	.25860066
FACET 9	.06011091	-+06022989	.99999996	.00011091	96598530	.25855746
FACET10	.00016515	0027167	.99999994	.00016515	96599610	.25849068
FACET12	.00021760	00031797	.99999992	.00021760	96500807	.25838704
AVERAGES 1 RNC 1	.00000000	00026010				
nna *	N #	12		•		

0.057.96		CI SUATION	ANCIE - 30	DECOLES EDON VEDTICA	14 PLANE AVE	RAGE
BUEING	AI SU.	J ELEVALION	ANGLES 300	- 00019240	- 86610516	. 49081741
FACET 1	0013249	00015453	14444448	00013244		40078204
FACET 2	00017944	00016560	.99999997			40073640
FACET 3	00022851	00019640	.99999995	00022851	50012327	
FACET 4	00027871	00027310	•99999992	30627871	90010144	
FACET 5	00032710	00032386	.9999988	00032710	55618729	.44420101
FACET 6	00037313	0034163	.99999986	00637313	86619617	.49954710
FACET 7	.00013249	00015953	.99999998	.00013249	86610516	.49981741
FACET 8	.00017944	CC016560	.9999997	.30017944	86610829	•49978396
FACET 9	00022851	00019640	.99999995	.00022851	86612359	.49973540
FACETIC	. CC027871	00027310	.999999992	.00027871	86616192	+49965115
FACETII	00032710	00012386	.0000088	.00632710	+.86618729	.49958161
EACETIZ	00037313	- 00034163	COCOOCRA	-00037313	86619617	49954716
TACELLE		-100034103		*****		••••••
	60000000	- 00034330				
AVEFAGES I	.00000000					
RHS I	.00020042	.00007334	······	·····		· · · · · · · · · · · · · · · · · · ·
•	N =	12				
BCEING	., AT 450, W/	> ELEVATION	I ANGLE = 45.	DEGREES FROM VERTICA	LA PLANE AVER	AGE
FACET 1	(0024164	00309683	.99999997	30024164	70717525	.70692189
FACET 2	0028242	COG10784	. 99999996	00023242	70718304	.76689226
FACET 3	00032495	0001 5466	. 30000004	00032495	70721615	.76635159
FACET 4	00036830	(0025949	.00000000	30036830	70729024	.70678766
CARETE	- (0040001	- 100023945	00000066		- 70733571	76673696
FACET D			47777700	- 000040941		306 70696
CACCE D					- 7071740	70403140
PAGET 7	.00024164	00009663		.30024164	70717925	.70042184
FACET 8	.0028242	00010784	. 39999996	. 00028242	70718304	.76689226
FACET 9	.00032495	00015468	.99999994	.00032495	70721615	.7C685159
FACETLO	.0036830	00025948	+99699990	.06636930	70729024	.70678766
FACET11	.00040991	00032380	.99999986	.30643991	70733571	.70673696
FACET12	.00044943	00034470	.9999984	.00044943	70735048	.70670586
AVERAGES :	.00000000	00021456				
RMS 1	.02035341	.00039977		• • • • • • • • • • • • • • • • • • • •		
	N #	12				
				······································		
POSTAC	AT 60	. LIEVATION	ANCIE- 40	DECRECS FROM VERTICA	IK BLANE AVVI	-66
EACET 1	- 00033607	- 00022049	60000006	- 00033603 - 00033603	4 FLANE ATTA	94694001
						100300401
FALEL 2	00036761	00004472		=.0003870L	50003872	* 90282239
FACEI 3	0040024	000104/5	.99999992	00040024	50009071	.86582955
FACET 4	00043391	0023081	.9999989	00043391	50619988	.86578609
FACET 5	00046664	OLC30451	.99999985	00046604	50026369	.86574838
FACET 6	00049648	00032718	.99999983	30049648	50028332	.86573371
FACET 7	.00033507	00002968	.99999995	.00033507	50002570	.86586901
FACET 8	.CC036701	00004472	.99999994	.00036701	50003872	.86585539
FACET 9	CC040024	00010475	.99999992	.00040024	50009071	.86582955
FACETIO	.0043391	60023081	.99999999	.00043391	50019988	.86578609
FACETII	.00046604	00030451		-00046604	50026369	.86574838
FACET12	-00049648	00032718	.00000091	-00049648	+ 50029332	.86573371
AMEDACES .	0000000	- 00017261				
0 45 -	0000000					
KH3 4		******		· · · · · · · · · · · · · · · · · · ·		
	N =	14				
		······				
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BCEING	AT 75.	, ELEVATION	ANGLE= 75.	DEGREES FROM VERTICA	V4 PLANE AVVI	-6E
FACET 1	00041276	.00004193	.99999992	00041276	25877854	.96602856
FACET 2	00043321	.00002359	.99999992	00043321	25879626	.96603211
FACET 3	00045438	00004659	.99999990	00045438	25886404	.96581193
FACET 4	00047555	00018711	.99999988	30047555	25899978	.96579658
FACET 5	00049549	00026599	.99999984	00049549	25907596	.96578080
FACET 6	00051426	0028908	99999983	30051426	- 25909826	.96577624
FACET 7	.00041274	.00004193	.99999999	.000.41274	25877854	.96502854
FACET B	.06643321	.00002350	.00000000	- 444422.21	25870424	.96602211
EACET O	.00045454	00002334	COCO0000			04591107
CAUCI V	000073755 000075655		+7777777VV	• 40047438	- 35200404	e 70301173
EACETIV	60640570		47777700 00000001		-+ 62044419	
FALEI11 CACCTIC	400049349 66651/94		********	• 00044344	2340/340	+Y03/0000
FALEI12	+00021426		• 44444483	.00051426	23909826	. 902/7624
AVERAGES 1	.00000000	00012054				
RMS 1	.00046559	.06613331				
	<u>N</u> =	12	· · · · · · · · · · · · · · · · · · ·			
SCEING	,HORIZ,H/ G	ELEVATION	ANGLE: 90.	DEGREES FROM VERTICA	VA PLANE AVER	AGE
FACET 1	-,00047473	.00011800	.99999988	00047473	.00011800	.99999988
FACET 2	CC043103	.00009706	.99579988	00048103	.30009704	.99999988
FACET 3	00048734	00001980		00043734	.00001980	GCGGGGGAR
FACET 4	00049122	0(01 2424			00012934	. 99996987
54061 4 51067 4	- 00040915		• • • • • • • • • • • • • • • • • • •		- 00012030	+77777770/ 000000##
EACET 2			* 4444482	00049925	0020824	
TAUEL D	00000279	00023038		30053279	00023038	

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				- A state of the state of th		
FACET N	.0048103	.00009706	.9999988	.30048103	.00009766	.9999988
FACET 9	.00046736	.30001980	9999988	.30048736	.00001980	.9999988
FACETIC	.0049322	CC012836	.99999987	. 30049322	00012836	.99999987
FACETII	.00049825	06023824	.00000085	.00049825	00020824	.99999985
GACET12	.06050279	00023038	.00000085	- 00050279	00023038	. 99999985
	100030271		•••••••••			••••••
AVERAGES 1	.00000000	00005535				
BHC :		-00014040				
	N =	12				
	,. –	**				
				• • • • • • • • • • • • • • • • • • • •		
BOETNG	-CASE1-W/D G	ELEVATION	N ANGLES 0.	DEGREES FROM VERTICA	1/4 PLANE AVER	AGE
FACET 1	00007062	-00017770	.00000008	30007062	00000000	.00019138
FACET 2	00008572	.00017341		00008572	999999999	00019357
FACET 2	00009647	.00015622	8999999	00009647	99999999	.00018365
FACET A	00009673	.00012055	.00000000	30009673	999999999	.00015461
CACCT 6	- 00003650	06010224	6000000	- 0000650	-1.00000000	.00013497
FAGET A	- 000008830	00010334	00000000	- 30607189	-1.000000000	. 00012240
FALLI D		00007700	0000000		- 00000000	00012207
FAUCE F	.0000/002	300017770	17777770 00000008	.30007082	- 00000000	00010257
TALEI B			47777779900 0000000	100000772	- 00000000	00019346
FALET 9	.00009047	•UUU13022	4 77777777	.00009547		+ 6 6 6 1 6 4 6 1
FACETIO	.00004673	.00012055		.00004673	-1 000:0000	00012401
PACETII	.00068650	.00010334	********	.00008550	-1-000000000	-00013497
FACEFIZ	*0000\184	• 00004468		•00001184	-1.0000000	.00012209
AVERAGES	.0000000	.00013838				
KH2 1	.00006529	.00033210				
	N #	12				
0.05190	P1053 44 P	CI CHATTO	N ANCIE- 70	0508555 5000 VESTIC	1/2 BIANG ANG	1.65
BUEING	JLASE2987 0	J ELEVALU	N ANGLE* 7V*	- 0000000 FRUM VERTICA	- 14179442	02094314
FALET 1		.00031448	.99999991			473704210
FAGES 2	00022829	.00030514	.99999993	- 00014744	- 26176201	• 7 3 7 0 2 3 2 9
FACEL 3	00014744	.00027266	.99999993	00014744	341/0391	. 434/943/
FALES A	00005602	+00023707		00008662	141/9000	*737//GL1
PACEL 5	.00001308	.00023318	. 4444444	.00001308	34100102	. 9 39 1 / 3 3 3
FACET D	.00006858	.00023222	.99999997	.0000858	34180192	. 9 3 9 7 7 8 3 7
FACET 7	.0030140	.00031446	.99999991	.00030140	34172403	+93984210
FACET 8	•C0022625	.00030519	.99999993	.00022625	34173334	. 93982324
FACET 9	.CC014744	.00027266	.99999995	.00014744	34176391	.93979957
FACET10	.00006662	.00023767	.99999997	.00006602	34179680	.93977811
FACET11	00001306	.60623318	.99999997	00001306	34180102	.93977353
FACET12	00008858	.00023222	•99 99997	0000858	34180192	.93977857
					<u>.</u>	··· <u>·</u> · · · · · · · · · · · · · · · · ·
AVERAGES :	00000000	.00026590				
RMS #	.0017134	.00003403		<u> </u>		
	N =	12				
				ACCARCE EAAM UCATIO	the number of the	
BOEING	JLASE3,W/Q G	J ELEVATION	N ANGLE = 0.	UEGREES FRUM VERTICA	LA PLANE AVER	AUC
FACET 1	00028654	.00018659	.99999994	00023654	4444444	.00033886
HACET Z	C0026954	+00017313	.9999995	00026954	44444444	.00032048
HACET 3	00025761	.00014600	.99999996	00025761	99999999	.00029614
FACET 4	00025784	.00309444	.99999996	00025784	-1-00000000	.00027464
FACET 5	00027021	.00006728	.99999996	00027021	-1.00000000	.00027864
FACET 6	CC028763	.00005986	.9999996	00028763	-1.00000000	.00029401
FACET 7	00007206	.00014180	.99999999	30007206	-,999999999	.00015934
FACET 8	0005461	.00013913	.99999999	30005461	99993999	.00014969
FACET 9	00004221	.00012943	.99999999	00004221	999999999	.CO013620
FACET10	00004197	.00011100	.99999999	00004197	99999999	.GOO11873
FACET11	00005393	.00010128	.99999999	00005393	-1.0000000	.00011504
FACET12	00007095	.60009863	.99999999	00007095	-1.00000000	.00012188
AVERAGES 3	0016376	.00012621				
RHS 1	.00013848	.0003656				
	N =	12				

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