

Report No. CG-D-8-76

(Handwritten circled 'A')
(Handwritten circled '13')

CALM WATER EQUILIBRIUM, DIRECTIONAL
STABILITY AND STEADY TURNING CONDITIONS
FOR RECREATIONAL PLANING CRAFT

ADAU21499



FINAL REPORT

DDC
RECEIVED
FEB 26 1976
RECEIVED
C

OCTOBER 1975

(Handwritten signature)

Document is available to the public through the
National Technical Information Service,
Springfield, Virginia 22161

Prepared for
DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD
Office of Research and Development
Washington, D.C. 20590

| | | |
|----------|------------------------|-------------------------------------|
| ... | ... | ... |
| ... | Write Station | <input checked="" type="checkbox"/> |
| ... | Ball Station | <input type="checkbox"/> |
| ... | ... | <input type="checkbox"/> |
| ... | ... | ... |
| BY | DISTRIBUTION AVAILABLE | ... |
| ... | ... | ... |
| ... | ... | ... |
| A | ... | ... |

| | | | |
|--|--|---|---|
| 1. Report No. (18) U.SCG-D-8-75 | 2. Government Accession No. (9) Final report | 4. Recipient's Catalog No. | |
| 5. Title and Subtitle (6) Calm Water Equilibrium, Directional Stability and Steady Turning Conditions for Recreational Planing Craft. | | 11. Report Date (11) October 1975 | 6. Performing Organization Code |
| 7. Author(s) (10) Charles J. Henry | | 8. Performing Organization Report No. (14) SIT-DL-75-1851 | 10. Work Unit No. (if any) (16) CG-75231.4, DL-4209/E-12 |
| 9. Performing Organization Name and Address Stevens Institute of Technology Davidson Laboratory Castle Point Station Hoboken, N. J. 07030 | | 11. Contract or Grant No. (15) DOT-CG-43 152-A | 13. Type of Report and Period Covered Final Report |
| 12. Sponsoring Agency Name and Address Department of Transportation United States Coast Guard Washington, D. C. 20590 | | 14. Sponsoring Agency Code G-DST-2 | |
| 15. Supplementary Notes The U. S. Coast Guard Research and Development's technical representative for the work performed herein was W. J. Blanton. | | | |
| 16. Abstract Measurements of steady, symmetric and non-symmetric planing forces and moments on a series of prismatic hulls are tabulated and discussed. An analytical representation of the forces and moments due to an out-board engine is derived. Curve fits of the data together with the out-board engine representation are used to predict: (a) straight course equilibrium conditions; (b) directional stability of these equilibrium conditions with roll fixed; and (c) steady turning equilibrium conditions. A comparison is made between these calculated results and measured turning diameter of a typical full-scale recreational planing craft. | | | |
| 17. Key Words Planing Craft Stability Control Recreational Boats | | 18. Distribution Statement This document is available to the public through the National Technical Information Service, Springfield, Virginia 22161. | |
| 19. Security Classif. (of this report) Unclassified | 20. Security Classif. (of this page) Unclassified | 21. No. of Pages 219 | 22. Price |

9 JAN 1976

The work reported herein was accomplished for the U. S. Coast Guard's Office of Research and Development, Marine Safety Technology Division, as part of its program in Recreational Boating Safety.

The contents of this report reflect the views of Stevens Institute of Technology, Hoboken, New Jersey, who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policy of the Coast Guard. This report does not constitute a standard, specification or regulation.



W. D. MARKLE, JR.
Captain, U. S. Coast Guard
Chief, Marine Safety Technology Division
Office of Research and Development
U. S. Coast Guard Headquarters
Washington, D. C. 20590

C 2

7602232

240

DOT USCG

CALM WATER EQUILIBRIUM, DIRECTIONAL STABILITY AND STEADY
TURNING CONDITIONS FOR RECREATIONAL PLANING CRAFT

OCTOBER 1975

240

76C2232

SPINE COPY

DAVIDSON LABORATORY
Report SIT-DL-75-1851
October 1975

CALM WATER EQUILIBRIUM,
DIRECTIONAL STABILITY AND STEADY TURNING CONDITIONS
FOR RECREATIONAL PLANING CRAFT

by Charles J. Henry

Prepared for
Department of Transportation
United States Coast Guard
Office of Research and Development
Under Contract No. DOT-CG-43152-A
DL Project 4209/390

ABSTRACT

Measurements of steady, symmetric and non-symmetric planing forces and moments on a series of prismatic hulls are tabulated and discussed. An analytical representation of the forces and moments due to an out-board engine is derived. Curve fits of the data together with the out-board engine representation are used to predict (a) straight course equilibrium conditions, (b) directional stability of these equilibrium conditions with roll fixed, and (c) steady turning equilibrium conditions. A comparison is made between these calculated results and measured turning diameter of a typical full-scale recreational planing craft.

KEYWORDS

Planing Craft
Marine Craft Design
Hydrodynamics of Planing Surfaces
Stability and Control

TABLE OF CONTENTS

| | |
|--|----|
| ABSTRACT | ii |
| INTRODUCTION | 1 |
| EXPERIMENTAL PROGRAM | 3 |
| PROPULSION AND CONTROL SYSTEM | 8 |
| ANALYTICAL PROGRAM | 10 |
| DISCUSSION OF RESULTS | 13 |
| CONCLUSIONS AND RECOMMENDATIONS | 18 |
| REFERENCES | 21 |
| TABLE 1: Range of Test Parameters. | 22 |
| NOMENCLATURE | 23 |
| FIGURES | |
| APPENDICES | |
| A Tabulation of Data. | |
| B Empirical Fitting Functions and Transformations. | |
| C Coefficients of Least Squared Fits. | |
| D Propulsion and Control System. | |
| E Applications. | |

INTRODUCTION

At the present time, safety regulations for recreational planing craft include intact buoyancy and maximum loading requirements based on hydrostatic equilibrium and stability, together with maximum safe horsepower limit based on a formula involving several boat dimensions. These regulations do not take account of dynamic response capability of the boat while underway. The relationship between parameters describing the hull, engine and load and boat dynamics underway can be studied by means of a reliable simulator for recreational planing craft. Once developed, this simulator could be used to study the relationship between boat parameters and the risk of accidents while underway, then with the resultant understanding of dynamic effects, a rational powering safety regulation can be developed. At the same time, the information generated while developing and using this recreational planing craft simulator, can be published in a form which would be of great use to designers.

In order to simulate recreational planing craft, an analytical representation is required for the various forces and moments acting on the craft. Presently, available planing force formulations for a wide range of Froude No. include only those for steady symmetric chines-wetted planing as described in References 1, 2 and 3. Attempts to extend these formulations to unsteady symmetric planing have not been successful. As an initial step, therefore, the objective of the present study was to extend the planing force formulation to steady, symmetric and non-symmetric planing conditions typical for recreational planing craft and to utilize the resulting empirical formulation to predict some important operational characteristics.

An experimental program was carried out to acquire the hydrodynamic planing force data for steady, symmetric and non-symmetric planing conditions with prismatic models having deadrises of 10, 15 and 20 degrees. The emphasis of the study was on the so-called "chines dry" planing conditions typical for recreational planing craft operation. This contrasts

with the chines wetted planing conditions typical for more heavily loaded commercial and military planing craft, for which extensive data already exist. (For example, Refs. 1 and 2.) The resulting data are tabulated in Appendix A in dimensionless form. To obtain the desired empirical formulation for the hydrodynamic forces, these data were curve fitted using the procedure described herein giving the results presented in Appendices B and C. An analytical representation of the forces and moments applied by an outboard motor was derived as shown in Appendix D. Finally in Appendix E the resulting empirical model of a recreational planing craft was utilized to predict (a) straight course equilibrium conditions, (b) fixed roll directional stability for these equilibrium conditions, and (c) steady turning equilibrium conditions. The straight course equilibrium conditions are tabulated and can be used by recreational craft designers.

The results obtained are discussed herein and recommendations are made for continued effort to achieve the long-term objective of developing a reliable simulator for recreational planing craft.

This work was sponsored by the U.S. Coast Guard under Contract No. DOT-CG-43152-A, Davidson Laboratory Project 4209/390.

EXPERIMENTAL PROGRAM

Previous experimental studies of hydrodynamic forces acting on planing hulls deal with parameter ranges typical of military and commercial craft which are generally much more heavily loaded than recreational planing craft. Furthermore, these studies have concentrated on steady symmetric planing conditions with chines wetted due to the loading. References 1, 2 and 3 are typical examples of previous studies leading to empirical formulations for steady symmetric planing forces with chines wetted. In References 4 and 5, non-symmetrical planing conditions have been considered but the range of speed coefficient and trim angle is much larger than those for recreational planing craft. Many attempts have been presented for describing the unsteady symmetrical planing forces in terms of combined theoretical and empirical results but these derivations have failed to be verified for a significant range of parameters. The measurements reported in Reference 4 show that the two sides of a prismatic planing surface cannot be treated independently as half of an equivalent symmetrical planing surface, so that empirical formulations based on this assumption, such as in Reference 10, do not agree with measurements.

For the long-term objective of the present work, a representation of the hydrodynamic forces is required for non-symmetric and non-steady chines dry planing typical for recreational planing craft. As a first step in fulfilling this requirement, an experimental program has been carried out to extend the definition of the hydrodynamic forces on planing hulls to non-symmetric, steady planing conditions. More precisely, the objective of this experimental program is to define the steady hydrodynamic drag, side and heave forces, and roll, pitch and yaw moments acting on planing hulls as a function of draft, roll, trim, speed, sideslip and turning rate.

Three prismatic models were constructed with deadrises of 10, 15 and 20 degrees, as shown in Figure 1. Bulkheads at the bow and stern and two intermediate locations maintained shape integrity. The chines and hawser

were made sharp to insure separation of flow. The keel was also not rounded or flattened since in cross flows the sharp corner at model scale Reynolds Numbers should be more representative of typical keel sections at full-scale Reynolds Numbers.

Inside the models, a pitch-roll gimbal was mounted with the roll axis as near the keel as possible and with the pitch axis just above the roll axis. A sketch of the support apparatus, including the pitch-roll gimbal, is shown in Figure 1. Roll angles can be set at intervals of 2.5 degrees up to 30 degrees in either direction. Pitch angles can be set at intervals of 1 degree from 0 to 10 degrees up by the bow.

As shown in Figure 1, a force and moment balance is mounted above the pitch-roll gimbal. Before each test phase, the balance was mounted on a calibration setup and five outputs were calibrated, viz., drag and side forces as well as roll, pitch and yaw moments. The balance was mounted on a free-to-heave apparatus which allowed the model-gimbal-balance system to move vertically. Unloading weights pushed up on the free-to-heave apparatus and the amount of these weights was adjusted to give the desired vertical load. The vertical motion of the free-to-heave apparatus was measured in each test to define the draft of the model. The entire apparatus was supported on a yaw adjustment device where the yaw angle was continuously adjustable and could be set accurately by means of a protractor.

Since the balance moved with the model in yaw, but not in pitch and roll, and since the measured moments are referred to the balance center, a transformation is required to obtain forces and moments in hull coordinates from measured forces and moments. The tabulated measured results and the curve fits of the data are in "balance coordinates" which are defined as follows. The longitudinal force axis (X_S) is horizontal, in the centerline plane of the hull at zero roll, and is positive forward. The side force axis (Y_S) is horizontal, normal to the centerline plane of the hull at zero roll and is positive to starboard. The vertical force axis (Z_S) is vertical and is positive down. The roll (K_S), pitch (M_S) and yaw (N_S) moments are moment components about the X_S , Y_S and Z_S axes, respectively, positive in the right-hand sense. The origin of the balance coordinates is at the center of the balance. These axes are shown in

Figure 1.

Tests were conducted on straight course over a range of speed in Davidson Laboratory Tank No.3 and in circular paths for a range of speed and radius in DL Tank No.2. In this way the desired information was generated as measured values of speed, draft, drag and side force and roll, pitch and yaw moment, for set values of vertical load, radius, and roll, trim and sideslip angles.

In setting up the test program, the boat configurations, dimensions, and speeds tabulated in the full-scale test program in Reference 6 were considered representative of the range of parameters for recreational planing craft. Since the objectives of the present study go beyond equilibrium conditions, the range of trim and vertical loads was increased so that a wide range of drafts would be covered. Because of this extended range of load and since recreational craft are lightly loaded to begin with, the range of parameters covered in this study deals predominantly with chines dry planing conditions where the stagnation line intersects the transom. As a result, a few of the heavier load conditions tested here fall in the range of lightly loaded conditions tested previously for commercial and military craft, while the middle to lightly loaded range tested here is not comparable to previous test results or empirical formulations. The test program covered the range of parameters shown in Table 1. Because of the large number of set parameters and the limited resources of this study, it was not possible to conduct a systematic variation of set parameters with adequate coverage. Alternatively, a random selection of combinations of set parameters was derived. In addition, short series of tests were carried out varying only one parameter at a time and one combination of parameters was repeated several times for each hull, at each radius in the circular course tests.

In each run the transducer outputs were integrated over the time required to traverse a preselected test run length and the corresponding time was also measured. Each integrated output was divided by time, the signal level corresponding to zero physical units was subtracted and the results were multiplied by calibration constants to obtain measured results. The test run length divided by measured time gave the speed for

each run. Signal levels corresponding to zero physical units were obtained prior to each run. The resulting data which include air drag have been tabulated in Appendix A in dimensionless form. Measurements of forces and moments acting on the model at various speeds in air were obtained but have not been analyzed or subtracted from corresponding measurements because of their relatively small magnitudes and because prototype craft do indeed experience air drag.

In analyzing the planing data, the six force and moment components: drag, side and vertical force and roll, pitch and yaw moment in balance coordinates, were treated as functions of six parameters: longitudinal and sideslip velocity components in body axes, draft at the transom-keel intersection (measured normal to the water surface), roll, trim and turning rate. This assumed functional relationship was approximated by a Taylor Series expansion up to third order terms. Port and starboard symmetry was assumed and terms not satisfying this requirement were dropped. The resulting expressions for each force and moment component are listed in Appendix B, together with all necessary transformations. The coefficients in the resulting fitting functions were obtained by the least squared error technique for each of the six force and moment components and are listed in Appendix C.

The following procedure was used in applying the least squared error technique to each force or moment component. First, obviously erroneous data points were deleted. Secondly, the least squared error coefficients were calculated. Thirdly, the deviation of every measured point from the resulting fitted expression was calculated as well as the mean deviation and root mean squared deviation of all data points used to obtain the coefficients. Outlying data points were then deleted and steps 2 and 3 were repeated. This procedure was continued until the low order coefficients in the fit and the overall statistics of the fit stabilized. Finally, the resulting expressions were corrected for centrifugal force and moment effects on the experimental apparatus below the balance, as described in Appendix B. The predicted force and moment components using the empirical fit are listed for each data point in Appendix A. Points not included in the final coefficient estimates have been marked with an

R-1851

asterisk. The forces and moments inaccuracies introduced by transformations would not influence the values of coefficients. If desired, the most practical way to obtain the corresponding empirical fit in hull coordinates would be to generate a hull coordinate data set using the balance coordinate expressions, then fit the hull coordinate data.

PROPULSION AND CONTROL SYSTEM

Recreational planing craft of the type considered in this study are propelled by outboard engines, where directional control is affected by turning the propeller thrust vector relative to the hull and speed control is affected by throttle setting. This propulsive and control system can be characterized by (a) defining the geometric relationship between the thrust direction and the hull, (b) defining the relationship between propeller thrust, torque, inflow speed and rpm, (c) defining the relationship between engine rpm and torque, and (d) defining the relationship between rudder geometry, inflow speed and rudder forces. The relationships used in this study are given in Appendix D.

In defining the relationship between thrust direction and hull coordinates, it was assumed that the propeller thrust acts along the propeller axis and that the side and vertical force components acting on the propeller can be ignored. Previous investigations have shown that a propeller operating in an inclined flow does develop a force normal to the propeller axis, with magnitude proportional to the angle of flow inclination. But the angle of inclination between the propeller inflow velocity and the propeller axis is quite small for the case of steady planing conditions. Accordingly, the propeller thrust direction is determined geometrically by the location of the tilt pin axis relative to the hull coordinate system, the tilt angle of the motor, the turning axis location, the engine turning angle and the location of the propeller axis. These geometric relationships are described in detail in Appendix D.

The relationship between propeller inflow speed, rpm thrust and torque is assumed to be given by the propeller charts given in Reference 7. The propeller inflow speed is taken as the component along the propeller axis of the velocity relative to still water, of a point on the propeller axis at the center of the propeller. Possible effects of propeller cavitation or ventilation have been ignored in this initial study as well as any hydrodynamic interactions between the propeller, rudder and hull.

The engine torque-rpm relationship was obtained from a least squared error curve fit of measured data supplied by one outboard engine manufacturer for six different models at full throttle. These data and curve fit are shown in Figure 2 in dimensionless form to preserve the propriety of the data.

With these relationships, the propeller rpm for engine-propeller torque equilibrium can be determined, the thrust magnitude for this rpm can then be calculated. Combining this thrust magnitude with the thrust direction given by geometrical relations yields the forces and moments in hull coordinates given in Appendix D for the outboard propeller.

The side force and drag forces on the rudder, which moves with the lower unit of the outboard motor, were evaluated using finite aspect ratio wing theory. The spar length used to calculate the aspect ratio was the distance from the ventilation plate to the lower tip of the rudder and the area used was the projected side area of the lower unit below the ventilation plate. Thus, no account was taken of the free water surface which normally is a fraction of an inch above the ventilation plate. At this time, the combined effect of the ventilation plate and the free surface on the rudder force cannot be evaluated or estimated from available data. The rudder angle of attack and relative speed through water were evaluated in a plane normal to the engine turn axis, using the velocity components normal to and parallel to the rudder centerline plane, at the rudder area centroid. The rudder lift and drag were assumed to act normal to the engine turn axis as well as normal to and parallel to the component of the relative fluid velocity normal to the engine turn axis. The rudder drag force includes profile drag and induced drag.

ANALYTICAL PROGRAM

The equations of motion together with various kinematical relationships and transformations as derived for example in Reference 8, form the basis of the mathematical model of a recreational planing craft. To this basis must be added the analytical relationships for the forces and moments acting on the craft. In this study we are concerned with hydrodynamic forces acting on a planing hull due to its steady motion through the water and hydrodynamic forces acting on the lower unit of the outboard engine. The data obtained led to empirical expressions for all hydrodynamic force and moment components acting on the hull for symmetric and non-symmetric steady planing conditions as given in Appendices B and C. In addition, an analytical representation of the hydrodynamic forces acting on the propeller-rudder of the outboard motor has been derived in Appendix D.

With the results obtained in this study, the mathematical model of a recreational planing craft with an outboard motor can be utilized to analyze straight course equilibrium conditions, straight course directional stability with roll fixed, and steady turning equilibrium conditions. The detailed analyses which give these results are derived in Appendix E.

Straight Course Equilibrium

Straight course values of trim and draft for heave force and pitch moment equilibrium were evaluated for a range of values of speed, load and longitudinal and vertical center of gravity positions. In this calculation, the pitch moment due to propeller thrust was ignored but this approximation does not significantly affect the predicted results for no engine tilt. The results listed in Tables E-1 through E-24 can be used to find equilibrium trim and draft of a recreational planing craft as follows: First, find the appropriate table for the deadrise and estimated center of gravity location relative to the keel-transom intersection. Then enter the table at the desired speed and load to find the estimated trim and draft at equilibrium. The corresponding effective horsepower required at this

equilibrium condition has also been calculated. Since this is based on model tests which were not corrected for the difference between model and prototype Reynolds Number, this effective horsepower estimate should be higher than actually required. A sample calculation is carried out in Appendix E.

Straight Course Directional Stability

Also shown in Tables E-1 through E-24 are directional stability roots for small perturbations from each equilibrium condition. A root with positive real part indicates an unstable response while a negative real part is stable. Complex roots mean the predicted response is oscillatory while real roots imply an exponential response. The system considered in this analysis includes sideslip and yaw, while surge, heave, roll and trim are held fixed as are the steering and throttle controls. For the calculation of directional stability indices, ignoring surge, heave and pitch is a good approximation since these motions are not strongly coupled with sideslip, roll and yaw in the linearized system of equations. However, roll motions are coupled with sideslip and yaw motions and this degree of freedom is expected to have an effect on directional stability. The degree of dynamic roll stability may, in fact, be very significant in judging safety. Unfortunately at this time there is no way to estimate the hydrodynamic forces and moments due to roll motion perturbations since these are in the non-steady category which has not yet been treated in any available literature. Additional work in this area is deemed imperative.

The contribution of the rudder to controls-fixed directional stability has been included in Tables E-1 through E-24 but any contribution due to propeller side force has been neglected. The latter assumption should be verified. Added inertia terms were also neglected and this assumption would be verified as part of the recommended program described subsequently.

Steady Turning

Steady turning equilibrium conditions can be calculated from the six equations of motion together with the constraints of zero vertical velocity and propeller-engine torque equilibrium. The hydrodynamic forces on the

hull can be evaluated using the results presented in Appendices B and C while the propeller and rudder forces can be evaluated using the results shown in Appendix D. The detailed analysis of turning equilibrium conditions is described in Appendix E. These equations were also used to calculate straight course equilibrium conditions. The results were found to be in agreement with corresponding results obtained from Tables E-1 through E-24 which show that the contribution of propeller forces to straight course equilibrium conditions can be ignored.

DISCUSSION OF RESULTS

The results obtained in this study include:

1. measured forces and moments for symmetric and non-symmetric steady planing of prismatic hulls over a range of parameters of interest for recreational planing craft;
2. an empirical planing force formulation based on least squared error curve fits of the measured data together with a Taylor Series expansion up to third order terms, with the assumption that the centerline plane of the hull is a plane of symmetry;
3. derivation of the equations describing the propulsion and control characteristics of an outboard motor with attached rudder, assuming engine-propeller torque equilibrium;
4. utilization of the empirical planing force formulation to evaluate straight course equilibrium conditions;
5. utilization of the empirical planing force formulation to evaluate directional stability with fixed roll, at the straight course equilibrium conditions, and
6. utilization of the empirical planing force formulation to evaluate steady turning equilibrium conditions.

The dimensionless, measured forces and moments are described and listed in Appendix A, together with the corresponding attitude and velocity parameters. The empirical planing force formulation as obtained from curve fitting these data is shown in Appendices B and C and the corresponding predicted values are listed together with the data in Appendix A. The overall mean error between the measured values and the corresponding predicted values are listed at the bottom of each table in Appendix A as well as the standard deviation of the error. The mean error is seen to be generally two or more orders of magnitude less than the maximum value of each measured force or moment component while the standard deviation is generally one or more orders of magnitude less than the maximum measured

value. The low value of standard deviation indicates that the fit is relatively good. However, the mean error should in principle be zero and in practice should be several orders of magnitude smaller than the listed values. In addition, a cursory glance at the straight course data, $w'=0$ compared with the circular course data, $w' \neq 0$, shows that the fitting error appears to be greater generally for the straight course data. On the other hand, the results obtained using the empirical planing force formulation evaluated here, in the three applications discussed below, yield reasonable results and correctly predict expected trends. In view of (a) the mean fitting error, and (b) the apparent difference in fitting error between straight course and circular course data, together with the conflicting evidence, (c) the small value of standard deviation of the fitting error, and (d) correct prediction of trends and reasonable values obtained in the applications, it is suggested that the curve fits obtained in this study are generally correct in describing the trends of the forces and moments due to planing but that some additional data analysis effort may yield an improved formulation which will give even more consistent results.

In describing the forces and moments due to an outboard motor, several assumptions were made which should be verified by experimental measurements. First of all, it was assumed that the side force and vertical force acting on the propeller due to inflow inclination are negligible. This assumption is appropriate for the purposes of this initial investigation since the angle of flow inclination is small for steady planing conditions. However, for the final objective of a recreational planing craft simulator, lateral forces on the propeller should be studied further. For example, the propeller vertical force may contribute to pitch damping, and the side force to roll damping. Secondly, in treating the side force and drag on the rudder, finite aspect ratio wing theory was used here, assuming that the ventilation plate was a wing tip. In reality the ventilation plate and the free water surface, generally a fraction of an inch above the ventilation plate, will have conflicting effects on rudder side force. Finally, no ventilation or cavitation effects are included in the outboard representation used here. Both of these phenomenon can have

significant steady effects and possibly catastrophic transient effects. Accordingly, it is recommended that further study and development are needed to extend the outboard formulation used here to include additional significant effects.

The evaluation of straight course equilibrium conditions using the empirical planing force formulation presented here is described in Appendix E and an extensive tabulation of results is listed in Tables E-1 through E-24. An illustrative design problem is also stated and solved in Appendix E using the tabulated equilibrium conditions. This example shows the potential usefulness of the results of this effort to the recreational planing craft designer. Once a consistent and validated curve fit of these data is obtained, a graphical presentation of corresponding results can be prepared so that the designers can estimate straight course equilibrium conditions quickly and reliably. In fact, the conditions listed here do fairly well in comparison with full-scale measured results presented in Reference 9, and in comparison with corresponding predictions with validated symmetrical planing formulations for the more heavily loaded conditions of this study. Furthermore, the trends of various equilibrium parameters observed in Tables E-1 through E-24 agree with expectations based on previous experience. Consequently, the present results are adequate for engineering estimations of straight course equilibrium conditions.

By considering the response to small perturbations from straight course equilibrium with throttle and steering fixed, the dynamic stability of the equilibrium conditions can be analyzed. For this case, the six motion components can be divided into a pair of three component systems and the cross coupling between the systems usually can be ignored. The pair of three component systems are surge, heave and pitch angle on one hand, and sideslip angle, roll angle and yaw rate, on the other hand. In studying the former system, the well-known phenomenon of porpoising can be investigated, while in the latter system, directional stability can be analyzed. In either case, since transient motions are involved, the forces due to non-steady planing must be available. At the present time, there are no applicable formulations for most of the unsteady force and moment

components. The empirical planing force formulation presented here however does include the effects of sideslip angle and yaw rate but not the effects of non-steady roll motions. With this formulation, the directional stability can be analyzed for the simplified case of fixed roll, i.e., perturbations in roll motion are ignored. The resulting predictions of directional stability indices should show general trends correctly but roll motions are expected to have some influence on directional stability measures. Dynamic roll motion stability may in fact have significant influence on safety. For illustration purposes and to investigate trends, the fixed roll directional stability was analyzed for each of the straight course equilibrium conditions listed in Tables E-1 through E-24. The analysis procedure is described in Appendix E, and the resulting directional stability roots are listed next to each equilibrium condition. The predicted trends of directional stability appear reasonable; however, the large number of unstable conditions for 10 and 15 degrees of deadrise does not seem reasonable. It should be noted here that stability conditions are more sensitive to high order terms in the empirical fit than equilibrium conditions, and that these higher order terms would be more sensitive in turn to small inconsistencies in the data set or fitting procedure. Consequently, improvement in stability prediction reliability can be anticipated as the result of the additional data analysis effort suggested previously. Furthermore, additional experimental information is required to extend the empirical planing force formulation to non-steady planing conditions so that the stability of the pair of three component systems listed above can be analyzed. Once a reliable and consistent empirical planing formulation is obtained, the stability margins can be shown in the same graphs or tables as the straight course equilibrium conditions, so that recreational planing craft designers will be able to use the results readily.

The evaluation of steady turning equilibrium conditions is described and illustrated in Appendix E, and the results of a series of calculations are listed in Table E-26. The trends of predicted turning conditions with engine turn angle appear reasonable. It was attempted to compare predicted turning conditions with corresponding full-scale measurements described in Reference 9. However, solutions to the equilibrium equations could not be

obtained for engine turn angles greater than 4 to 5 degrees. Since the numerical procedure used to solve the full set of equations depends on higher order coefficients in the empirical fit, as did stability conditions, small inconsistencies in the data or data fitting procedure could be the source of the problem in obtaining solutions for larger engine turn angles. Consequently, several simplified calculations were carried out to judge whether or not the empirical planing force formulation together with some full-scale measured results gave reasonable turning characteristics. For the 5000 rpm, slow turn described in Reference 9, the sideslip angle required to obtain side force equilibrium was estimated. Using the empirical results for the hull side force and roll moment, together with the measured turning radius and straight course speed, the sideslip angle and roll angle required to obtain side force and roll moment equilibrium were -8 degrees and -7 degrees, respectively. The propeller and rudder forces were estimated using the expressions in Appendix D, together with the measured engine turn angle. Both of these results seem reasonable. (The value of zero degrees roll angle reported in Reference 9 does not seem reasonable for this turn.)

The trend of the predicted turning radius listed in Table E-26, if continued, yields a tighter turn than reported in Ref. 9. Ventilation of the rudder (partial, if not complete) could account for this potential discrepancy. Consequently, the need for a study of outboard ventilation suggested previously, is reinforced. Small waves such as seen in the photograph in Reference 9 could also tend to increase turning radius so that the potential discrepancy, if the trend in predicted turning radius is continued, could be explained by ventilation or waves.

CONCLUSIONS AND RECOMMENDATIONS

Measured forces and moments for symmetric and non-symmetric steady planing conditions for lightly loaded planing surfaces typical of recreational craft were curve fitted to obtain an empirical planing force formulation which was then utilized in three applications. A moderate degree of confidence can be given to this empirical planing force formulation since (a) the standard deviation of the curve fitting error is one or more orders of magnitude less than the maximum force or moment component, (b) all expected trends of predicted values in the applications were obtained, and (c) the values of the predicted straight course equilibrium conditions agree with values predicted by a validated symmetric planing force formulation and with measured full-scale values. On the other hand, the need for additional effort in data analysis to obtain even greater reliability and consistency is indicated by (a) the mean fitting error of two orders of magnitude less than the maximum force or moment component is considered not sufficiently small, and (b) the mean fitting error of the straight course data is different than that of the circular course data.

The empirical planing force formulation for steady planing conditions was utilized to predict straight course equilibrium conditions over a wide range of parameters and the results were tabulated in a useful form for the planing recreational craft designer. These results were found to be in agreement with corresponding full-scale measurements and with corresponding predictions using a validated symmetric planing force formulation.

The empirical planing force formulation for steady planing conditions was used to analyze the directional stability with fixed roll for the straight course equilibrium conditions and the results were tabulated with each condition. The trends of the predicted stability measures are in agreement with expected behavior but, for low deadrise and reasonable longitudinal center of gravity positions, the predicted values of the stability measures seem to be too unstable.

The empirical planing force formulation for steady planing conditions was used to analyze the steady turning equilibrium conditions. The trends of predicted conditions are in agreement with expected behavior. However reasonable solutions to the complicated turning equilibrium equations could be obtained only for engine turn angles up to 4 to 5 degrees. Simplified calculations using elements of the empirical planing force formulation together with results from full-scale measurements gave reasonable results.

Based on these observations and conclusions, it is recommended that continued effort is needed to develop a planing recreational craft simulator which can be used to study safety related problems and which can generate substantial useful design information for these craft. In particular, the following specific programs are recommended:

- 1) Continued analysis of the available steady, symmetric and non-symmetric data, leading to final expressions for the empirical planing formulation for symmetric and non-symmetric steady planing, together with publication of design charts for predicting straight course equilibrium conditions, directional stability at each condition and steady turning equilibrium conditions.
- 2) Initiate non-steady planing tests with one degree of freedom to develop equipment and data analysis procedures and to obtain first estimates of some of the non-steady planing force terms such as heave, pitch, and roll velocity dependent forces and moments. Apply results to prediction of directional stability including roll motions and to the prediction of porpoising stability.
- 3) Continued effort in full-scale verification of predicted results with the development of a reliable instrumentation package which would sense and record essential parameters such as speed, sideslip, angular velocity components, accelerations, rpm and engine turn angle.
- 4) Measurement of thrust and torque for typical outboard propellers

to verify the use of available propeller charts including cavitation inception.

- 5) Measurement of forces normal to an outboard propeller shaft due to inclined inflow to the lower unit, together with observations of ventilation inception with particular attention to the relative position of ventilation plate and keel. Also, estimation of the potential significance of hydrodynamic interactions between propeller and rudder, propeller and hull and between the free surface and lower unit of outboard.

With the results of this program, a reliable simulator for planing recreational craft can be developed which can be utilized to make detailed studies of safety related problems, for a wide class of planing recreational craft. The simulator as well as each phase of the recommended program will also generate substantial advancement of the state-of-the-art for the design of planing recreational craft, in the form of detailed design information easily usable by designers.

REFERENCES

1. Savitsky, D., 'Hydrodynamic Design of Planing Hulls,' Davidson Laboratory Report 1000, December 1963.
2. Brown, P.W., 'An Experimental and Theoretical Study of Planing Surfaces with Trim Flaps,' Davidson Laboratory Report SIT-DL-71-1463, April 1971.
3. Brown, P.W., 'An Analysis of the Forces and Moments on Re-Entrant Vee-Step Planing Surfaces,' Davidson Laboratory Letter Report 1142, May 1966.
4. Savitsky, D., Prowse, R.E. and Lueders, D.H., 'High-Speed Hydrodynamic Characteristics of a Flat Plate and 20° Dead-Rise Surface in Unsymmetrical Planing Conditions,' NACA Technical Note 4187, June 1958.
5. Smiley, R.F., 'A Theoretical and Experimental Investigation of the Effects of Yaw on Pressures, Forces and Moments During Seaplane Landings and Planing,' NACA Technical Note 2817, 1952.
6. White, R.W., Bowman, J.O. and Patrick, S.L., ' - Standards Analysis - Powering/Performance Evaluation Using Test Course Methods,' Volume I - Research Reports,' Preliminary, Wyle Laboratories, March 1974.
7. Gawn, R.W. and Burrill, L.C., 'Effects of Cavitation on the Performance of a Series of 16 inch Model Propellers,' Transactions, The Institution of Naval Architects, 1957.
8. Strumpf, A., 'Equations of Motion of a Submerged Body with Varying Mass,' Davidson Laboratory Report 771, May 1960.
9. Smith, B. and Bowman, J., 'Performance Tests on 17' Outboard Boat During Various Radius Turns at Different Speeds,' Wyle Laboratories, Marine Technology Staff, Technical Brief 75-5, May 1975.
10. Hsu, C.C., 'On the Motions of High Speed Planing Craft,' Hydronautics, Inc., Technical Report 603-1, May 1967.

TABLE 1

RANGE OF TEST PARAMETERS

Model Beam = 9 inches

| | Parameter | Range | |
|-------------------|--------------|---------------|--------------|
| | | Minimum | Maximum |
| speed coefficient | C_V | 2. | 6. |
| trim angle | θ | 2. | 6. |
| load coefficient | C_{Δ} | 0.076 | 1.22 |
| roll angle | φ | $-1.3\beta_H$ | $1.3\beta_H$ |
| drift angle | β_o | -20° | 20° |
| turning rate | ω' | 0 | 0.23 |

NOMENCLATURE

| | |
|--|--|
| A_R | aspect ratio of rudder up to ventilation plate |
| $B_{Xj}, B_{Yj}, B_{Zj}, B_{Kj}, B_{Mj}, B_{Nj}$ | least squared error coefficients listed in Appendix C |
| b_1, b_2, b_3 | coefficients defining engine torque in Appendix D |
| B | beam of hull at chine |
| BAR | blade area ratio |
| C_V | speed coefficient = V/\sqrt{gB} |
| C_Δ | load coefficient = $W/\rho g B^3$ |
| $C_{\Delta a}$ | load coefficient of model and apparatus effecting centrifugal force at force balance |
| C_{LR} | rudder lift coefficient |
| C_{DR} | rudder drag coefficient |
| C_{DoR} | rudder profile drag coefficient |
| D_p | propeller diameter |
| EHP | effective horsepower |
| f_j, g_j | fitting functions listed in Appendix B |
| g | gravitational constant |
| HP_{ER} | rated horsepower of engine |
| J_p | propeller advance coefficient = $V_{PA}/n_p D_p$ |
| K_T | propeller thrust coefficient = $T_p/\rho n_p^2 D_p^4$ |
| K_Q | propeller torque coefficient = $Q_p/\rho n_p^2 D_p^5$ |
| L_R, R_R | rudder lift force and drag force |
| n_E | engine speed in revolutions per second |
| n_{ER} | engine speed at rated power |

| | |
|--------------------------|---|
| n_p | propeller speed in revolutions per second |
| N_{FR}, D_{FR} | rudder normal force and tangential force |
| p, q, r | rotational velocity components in hull coordinates |
| Q_E | engine torque |
| Q_{ER} | engine torque at rated power |
| R | radius to balance in circular course tests |
| R_x, R_y, R_z | radii of gyration of vehicle about hull axes |
| S_R | rudder area |
| T_p, Q_p | propeller thrust and torque |
| u, v, w | rectilinear velocity components in hull coordinates |
| V | steady planing speed |
| V_{PA} | propeller inflow speed |
| V_{RA}, V_{RN} | relative fluid velocity components parallel and normal to rudder |
| W | weight of vehicles |
| x_a, z_a | coordinates of center of gravity of apparatus effecting centrifugal force at force balance in balance coordinates |
| x_G, y_G, z_G | coordinates of center of gravity in hull coordinates |
| x_R, y_R, z_R | coordinates of point of application of rudder forces in hull coordinates |
| x_{RS}, y_{RS}, z_{RS} | coordinates of balance center in hull coordinates |
| z_T | draft at transom-keel intersection |
| X, Y, Z, K, M, N | force and moment components with subscripts denoting the following: G: forces and moments due to gravity in hull coordinates H: forces and moments due to hull planing in hull coordinates P: forces and moments due to propeller in hull coordinates R: forces and moments due to rudder in hull coordinates S: forces and moments due to hull planing in balance coordinates |
| α | hull angle of attack, between x-axis of hull coordinates and projection of hull velocity in centerline plane. |
| α_R | rudder angle of attack defined in Appendix D |

| | |
|------------------------------------|--|
| β | sideslip angle, between hull velocity and hull centerline plane |
| β_0 | drift angle in horizontal plane between projection of hull velocity and projection of x-axis of hull coordinates |
| β_H | deadrise angle shown in Figure 1 |
| γ_E | gear ratio of engine speed to propeller speed |
| ζ_0 | measured displacement of free-to-heave apparatus |
| η_E | transmission efficiency |
| θ | pitch angle |
| θ_P | tilt angle of outboard |
| $\xi_R, \zeta_S, \zeta_P, \zeta_R$ | dimensions used in transformation from balance coordinates to null coordinates used in Appendix B |
| ξ_{RP}, ζ_{RP} | dimensions defining point of application of rudder forces used in Appendix D |
| ξ_{TA}, ζ_{TA} | dimensions defining point of application of propeller thrust used in Appendix D |
| ξ_{TP}, ζ_{TP} | dimensions defining location of outboard tilt pin used in Appendix D |
| ρ | fluid density |
| φ | roll angle |
| ψ_P | engine turn angle |
| ω_E | engine speed in radians per second |
| ω_{ER} | engine speed at rated power |
| ω_P | propeller speed in radians per second |

Coordinate Systems (See Figure 1)

Balance Coordinates:

| | |
|-------|--|
| x_S | horizontal, in centerline plane of hull at zero roll, positive forward |
| y_S | horizontal, normal to centerline plane of hull at zero roll, positive to starboard |

z_S vertical, normal to calm water surface, positive down

Hull Coordinates:

x_H parallel to baseline, in centerline plane of hull, positive forward

y_H normal to centerline plane, positive to starboard

z_H normal to keel, in centerline plane of hull, positive down
origin at transom-keel intersection

Non-Dimensionalizing Factors:

| Quantity: | Dimensions | Divide By: |
|-------------------|------------|-----------------------------------|
| Length | L | B |
| Force | F | $\frac{1}{2}\rho g B^3$ |
| Time | T | $\sqrt{g/B}$ |
| Moment or Torque | FL | $\frac{1}{2}\rho g B^4$ |
| Rectilinear speed | L/T | \sqrt{gB} |
| Rotational speed | 1/T | $\sqrt{B/g}$ |
| Power | FL/T | $\frac{1}{2}\rho g B^3 \sqrt{gB}$ |

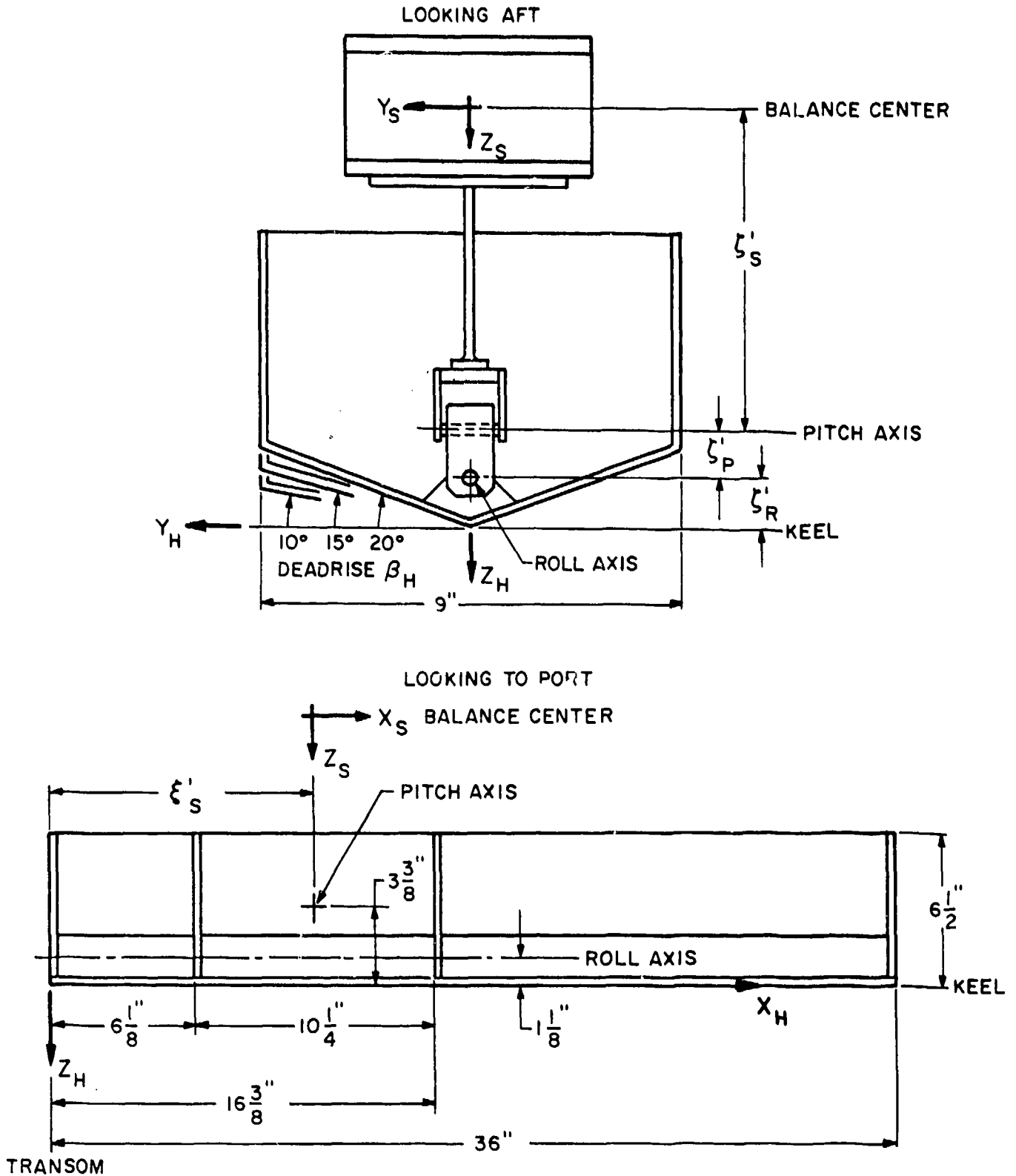


FIG. 1. SCHEMATIC DRAWING OF EXPERIMENTAL SETUP SHOWING BALANCE AXES AND HULL AXES.

| SYMBOL | ENGINE |
|--------|--------|
| ○ | A |
| △ | B |
| □ | C |
| + | D |
| X | E |
| ▽ | F |
| — | FIT |

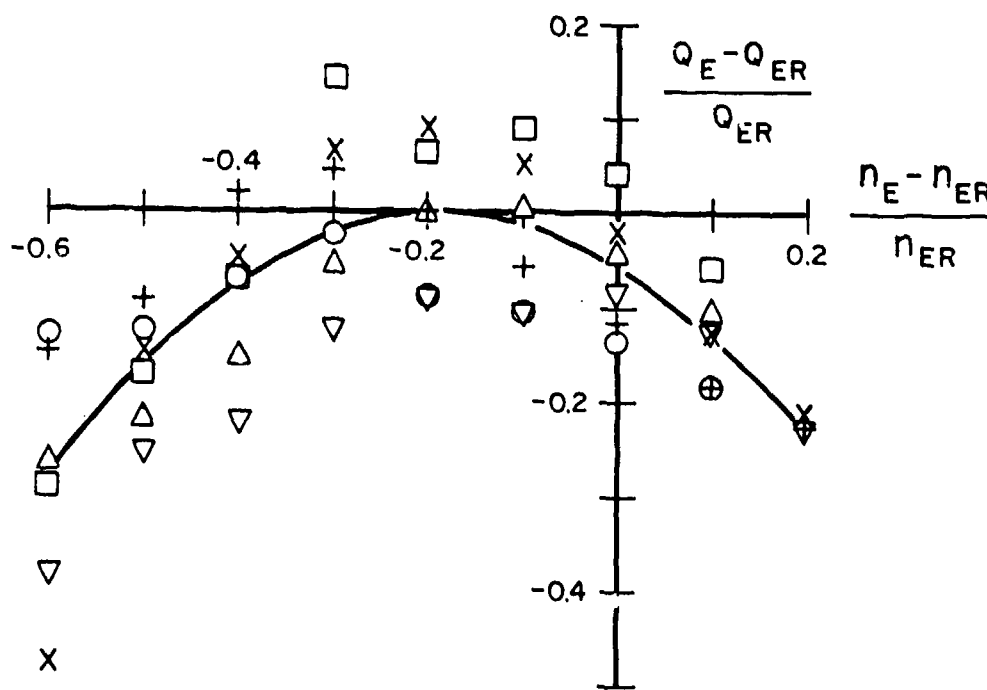


FIG. 2. DIMENSIONLESS TORQUE-RPM RELATION FOR SIX OUTBOARD ENGINES AND FITTED FUNCTION

APPENDIX A
TABULATION OF DATA

The measured forces and moments on three prismatic planing hulls obtained in this study for symmetric and non-symmetric steady planing conditions are tabulated here in dimensionless form. The force and moment components are presented in balance coordinates which can be transformed to hull coordinates using the transformations presented in Appendix B. Each component is tabulated separately for each deadrise and the data for symmetric planing conditions has also been separated from that for the non-symmetric conditions. The drag values are based on model Reynolds number and must be corrected for full-scale Reynolds number when applied to prototype.

Tables A-1 through A-3 give the measured longitudinal force component in balance coordinates in dimensionless form for symmetric, steady planing conditions while Tables A-4 through A-6 list the corresponding vertical force and Tables A-7 through A-9 show the pitch moment. Also shown for each case are the predicted results using the least squared error regression curves described in Appendices B and C. At the bottom of each table the mean error and standard deviation are listed for each predicted column for all data points. It is seen that the standard deviation of the fit is at least two orders of magnitude lower than the maximum value of the force or moment component in each table.

The measured forces and moments for non-symmetric steady planing conditions are listed in Tables A-10 through A-27 for the three deadrise values, together with the corresponding predicted values using the empirical fits described in Appendices B and C. As in the symmetric planing conditions, it is seen that the standard deviation of the error for the all term fit is at least two orders of magnitude lower than the maximum value of the corresponding data points. Again the mean error in the straight course data seems somewhat larger than that for the circular

R-1851

course data. Consequently, in any continued analysis of these data, it would seem fruitful to analyze the circular course data separately and to look for a small consistent error in the straight course data.

NOMENCLATURE

FOR TABLES A-1 THROUGH A-27

| | |
|-------------------|---|
| BETA | deadrise angle of hull as shown in Figure 1 |
| CV | dimensionless speed coefficient = V/\sqrt{gB} where, V = resultant horizontal velocity magnitude g = gravitational constant B = beam |
| PHI | roll angle of hull coordinate system as defined in Reference 8, where the x-axis in this study is taken along the keel line, the y-axis is to starboard and the z-axis downward |
| PSI | yaw angle of hull coordinates as defined in Reference 8 |
| THETA | pitch angle of hull coordinates as defined in Reference 8 |
| W | dimensionless turning rate about vertical = $\omega\sqrt{B/g}$ where, ω = turning rate about vertical |
| ZT | dimensionless draft at transom-keel intersection, $ZT=z_T/B$, where, z_T = draft at transom-keel intersection |
| FORCE COMPONENTS | tabulated in dimensionless form relative to balance coordinates as defined in Appendix B, where the non-dimensionalizing factor is $\frac{1}{2}\rho gB^3$ where, ρ = fluid density |
| MOMENT COMPONENTS | tabulated in dimensionless form relative to balance coordinates as defined in Appendix B, where the non-dimensionalizing factor is $\frac{1}{2}\rho gB^4$ |

TABLE A-1
 MEASURED, PREDICTED AND FITTED LONGITUDINAL FORCE
 BETA=10-DEG

| RUN | CV | THETA | ZT | MEASURED | FITTED |
|---------------------|------|-------|------|----------|----------|
| 2 | 4.00 | 2.60 | .048 | -0.0467 | -0.0606 |
| 14 | 4.00 | 1.60 | .062 | -0.0798 | -0.1032 |
| 15 | 4.00 | 3.70 | .039 | -0.0401 | -0.0488 |
| 16 | 4.00 | 4.70 | .036 | -0.0391 | -0.0534 |
| 17 | 4.00 | 5.70 | .032 | -0.0426 | -0.0552 |
| 18 | 4.00 | 2.60 | .038 | -0.0349 | -0.0480 |
| 19 | 4.00 | 2.60 | .061 | -0.0617 | -0.0790 |
| 21 | 4.00 | 1.60 | .048 | -0.0648* | -0.0817 |
| 23 | 4.00 | 1.60 | .049 | -0.0617 | -0.0833 |
| 25 | 4.00 | 2.70 | .101 | -0.1244 | -0.1354 |
| 26 | 4.00 | 2.70 | .159 | -0.1989 | -0.2252 |
| 27 | 4.00 | 2.70 | .170 | -0.2117 | -0.2430* |
| 29 | 2.00 | 2.60 | .083 | -0.0227 | -0.0403* |
| 30 | 3.00 | 2.60 | .057 | -0.0263 | -0.0490 |
| 31 | 5.00 | 2.60 | .040 | -0.0562 | -0.0719 |
| 32 | 6.00 | 2.60 | .035 | -0.0778 | -0.0848 |
| MEAN ERROR= | | | | | 0.0171 |
| STANDARD DEVIATION= | | | | | 0.0063 |

TABLE A-2

MEASURED, PREDICTED AND FITTED LONGITUDINAL FORCE
 BETA=15. DEG

| RUN | CV | THETA | ZT | MEASURED | FITTED |
|---------------------|------|-------|------|----------|----------|
| 142 | 4.00 | 2.60 | .063 | -0.0587 | -0.0756 |
| 147 | 4.00 | 3.60 | .058 | -0.0473 | -0.0582 |
| 148 | 4.00 | 3.60 | .061 | -0.0509 | -0.0618 |
| 149 | 4.00 | 3.60 | .076 | -0.0687 | -0.0810 |
| 150 | 4.00 | 3.60 | .113 | -0.1192 | -0.1292 |
| 151 | 4.00 | 3.60 | .163 | -0.1795 | -0.1979 |
| 152 | 4.00 | 3.70 | .216 | -0.2389 | -0.2719* |
| 154 | 3.00 | 3.60 | .077 | -0.0339 | -0.0534 |
| 155 | 5.00 | 3.60 | .051 | -0.0690 | -0.0805 |
| 156 | 6.00 | 3.60 | .043 | -0.0919 | -0.1077 |
| 163 | 4.00 | 4.60 | .058 | -0.0406 | -0.0515 |
| 164 | 4.00 | 5.60 | .056 | -0.0390 | -0.0528 |
| 173 | 4.00 | 6.60 | .055 | -0.0433 | -0.0534 |
| MEAN ERROR= | | | | | 0.0157 |
| STANDARD DEVIATION= | | | | | 0.0060 |

TABLE A-3

MEASURED, PREDICTED AND FITTED LONGITUDINAL FORCE
BETA=20.DEG

| RUN | CV | THETA | ZT | MEASURED | FITTED |
|---------------------|------|-------|------|----------|----------|
| 319 | 4.00 | 3.60 | .095 | -0.0737 | -0.0923 |
| 320 | 2.00 | 3.60 | .152 | -0.0311 | -0.0402 |
| 321 | 2.00 | 3.70 | .151 | -0.0280 | -0.0403* |
| 322 | 3.00 | 3.60 | .113 | -0.0462 | -0.0732* |
| 323 | 5.00 | 3.60 | .076 | -0.0935 | -0.1040 |
| 324 | 6.00 | 3.70 | .067 | -0.1235 | -0.1616 |
| 325 | 4.00 | 3.60 | .075 | -0.0499 | -0.0640 |
| 333 | 4.00 | 3.60 | .153 | -0.1550 | -0.1721 |
| 335 | 5.00 | 3.60 | .183 | -0.3089 | -0.3433 |
| 336 | 4.00 | 3.60 | .200 | -0.2146 | -0.2425 |
| 338 | 4.00 | 4.60 | .076 | -0.0504 | -0.0640 |
| 339 | 4.00 | 2.60 | .105 | -0.0999 | -0.1272* |
| 347 | 6.00 | 5.60 | .059 | -0.0996 | -0.1679 |
| 348 | 4.00 | 5.60 | .074 | -0.0479 | -0.0680* |
| 350 | 4.00 | 6.70 | .068 | -0.0448 | -0.0705 |
| MEAN ERROR= | | | | | 0.0243 |
| STANDARD DEVIATION= | | | | | 0.0145 |

TABLE A-4

MEASURED, PREDICTED AND FITTED VERTICAL FORCE
 BETA=10. DEG

| RUN | CV | THETA | ZT | MEASURED | FITTED |
|-----|------|-------|------|----------|----------|
| 2 | 4.00 | 2.60 | .048 | -0.1521 | -0.1998 |
| 14 | 4.00 | 1.60 | .062 | -0.1521 | -0.2933* |
| 15 | 4.00 | 3.70 | .039 | -0.1521 | -0.1775 |
| 16 | 4.00 | 4.70 | .036 | -0.1521 | -0.2062 |
| 17 | 4.00 | 5.70 | .032 | -0.1521 | -0.2206* |
| 18 | 4.00 | 2.60 | .038 | -0.0761 | -0.1290* |
| 19 | 4.00 | 2.60 | .061 | -0.3042 | -0.2989 |
| 21 | 4.00 | 1.60 | .048 | -0.1521 | -0.1966 |
| 23 | 4.00 | 1.60 | .049 | -0.1521 | -0.2039 |
| 25 | 4.00 | 2.70 | .101 | -0.6085 | -0.5957 |
| 26 | 4.00 | 2.70 | .159 | -0.9127 | -1.0103 |
| 27 | 4.00 | 2.70 | .170 | -0.9127 | -1.0881 |
| 29 | 2.00 | 2.60 | .083 | -0.1521 | -0.1828 |
| 30 | 3.00 | 2.60 | .057 | -0.1521 | -0.1772 |
| 31 | 5.00 | 2.60 | .040 | -0.1521 | -0.1649 |
| 32 | 6.00 | 2.60 | .035 | -0.1521 | -0.0208* |

MEAN ERROR= 0.0424
 STANDARD DEVIATION= 0.0655

TABLE A-5

MEASURED, PREDICTED AND FITTED VERTICAL FORCE
BETA=15. DEG

| RUN | CV | THETA | ZT | MEASURED | FITTED |
|---------------------|------|-------|------|----------|-----------|
| 142 | 4.00 | 2.60 | .063 | -0.1521 | -0.1698 |
| 147 | 4.00 | 3.60 | .058 | -0.1521 | -0.1790 * |
| 148 | 4.00 | 3.60 | .061 | -0.0761 | -0.2024 * |
| 149 | 4.00 | 3.60 | .076 | -0.3042 | -0.3231 |
| 150 | 4.00 | 3.60 | .113 | -0.6085 | -0.6053 |
| 151 | 4.00 | 3.60 | .163 | -0.9127 | -0.9544 |
| 152 | 4.00 | 3.70 | .216 | -1.2169 | -1.2799 |
| 154 | 3.00 | 3.60 | .077 | -0.1521 | -0.1725 |
| 155 | 5.00 | 3.60 | .051 | -0.1521 | -0.2136 |
| 156 | 6.00 | 3.60 | .043 | -0.1521 | -0.1281 * |
| 163 | 4.00 | 4.60 | .058 | -0.1521 | -0.2529 * |
| 164 | 4.00 | 5.60 | .056 | -0.1521 | -0.2887 * |
| 173 | 4.00 | 6.60 | .055 | -0.1521 | -0.2722 * |
| MEAN ERROR= | | | | | 0.0544 |
| STANDARD DEVIATION= | | | | | 0.0501 |

TABLE A-6

MEASURED, PREDICTED AND FITTED VERTICAL FORCE
 BETA=20. DEG

| RUN | CV | THETA | ZT | MEASURED | FITTED * |
|---------------------|------|-------|------|----------|-----------|
| 319 | 4.00 | 3.60 | .095 | -0.1521 | -0.3053 * |
| 320 | 2.00 | 3.60 | .152 | -0.1521 | -0.3040 * |
| 321 | 2.00 | 3.70 | .151 | -0.1521 | -0.2996 * |
| 322 | 3.00 | 3.60 | .113 | -0.1521 | -0.2840 * |
| 323 | 5.00 | 3.60 | .076 | -0.1521 | -0.2273 |
| 324 | 6.00 | 3.70 | .067 | -0.1521 | -0.1538 |
| 325 | 4.00 | 3.60 | .075 | -0.0761 | -0.1771 * |
| 333 | 4.00 | 3.60 | .153 | -0.6085 | -0.6759 |
| 335 | 5.00 | 3.60 | .183 | -1.2169 | -1.1882 |
| 336 | 4.00 | 3.60 | .200 | -0.9127 | -0.9954 |
| 338 | 4.00 | 4.60 | .076 | -0.1521 | -0.2413 * |
| 339 | 4.00 | 2.60 | .105 | -0.1521 | -0.3397 * |
| 347 | 6.00 | 5.60 | .059 | -0.1521 | -0.2080 |
| 348 | 4.00 | 5.60 | .074 | -0.1521 | -0.2721 * |
| 350 | 4.00 | 6.70 | .068 | -0.1521 | -0.2218 |
| MEAN ERROR= | | | | | 0.0937 |
| STANDARD DEVIATION= | | | | | 0.0562 |

TABLE A-7
 MEASURED, PREDICTED AND FITTED PITCH MOMENT
 BETA=10. DEG

| RUN | CV | THETA | ZT | MEASURED | FITTED |
|---------------------|------|-------|------|----------|----------|
| 2 | 4.00 | 2.60 | .048 | -0.2439 | -0.2394 |
| 14 | 4.00 | 1.60 | .062 | -0.2254 | -0.1629 |
| 15 | 4.00 | 3.70 | .039 | -0.2498 | -0.2620 |
| 16 | 4.00 | 4.70 | .036 | -0.2435 | -0.2927 |
| 17 | 4.00 | 5.70 | .032 | -0.2837 | -0.3153 |
| 18 | 4.00 | 2.60 | .038 | -0.1627 | -0.2195 |
| 19 | 4.00 | 2.60 | .061 | -0.3384 | -0.2465 |
| 21 | 4.00 | 1.60 | .048 | -0.2046 | -0.2023 |
| 23 | 4.00 | 1.60 | .049 | -0.1993 | -0.2001* |
| 25 | 4.00 | 2.70 | .101 | -0.2975 | -0.1673* |
| 26 | 4.00 | 2.70 | .159 | 0.2296 | 0.2462 |
| 27 | 4.00 | 2.70 | .170 | 0.4182 | 0.3650 |
| 29 | 2.00 | 2.60 | .083 | -0.1180 | -0.1272 |
| 30 | 3.00 | 2.60 | .057 | -0.1630 | -0.1884 |
| 31 | 5.00 | 2.60 | .040 | -0.2229 | -0.2650 |
| 32 | 6.00 | 2.60 | .035 | -0.2685 | -0.2528 |
| MEAN ERROR= | | | | | -0.0027 |
| STANDARD DEVIATION= | | | | | 0.0511 |

TABLE A-8
 MEASURED, PREDICTED AND FITTED PITCH MOMENT
 BETA=15. DEG

| RUN | CV | THETA | ZT | MEASURED | FITTED |
|---------------------|------|-------|------|----------|----------|
| 142 | 4.00 | 2.60 | .063 | -0.2333 | -0.2144 |
| 147 | 4.00 | 3.60 | .058 | -0.2427 | -0.2394 |
| 148 | 4.00 | 3.60 | .061 | -0.2606 | -0.2532 |
| 149 | 4.00 | 3.60 | .076 | -0.3703 | -0.3103 |
| 150 | 4.00 | 3.60 | .113 | -0.5111 | -0.3460* |
| 151 | 4.00 | 3.60 | .163 | -0.2391 | -0.1712 |
| 152 | 4.00 | 3.70 | .216 | 0.2710 | 0.2327 |
| 154 | 3.00 | 3.60 | .077 | -0.2191 | -0.2413 |
| 155 | 5.00 | 3.60 | .051 | -0.2955 | -0.2666 |
| 156 | 6.00 | 3.60 | .043 | -0.3104 | -0.2827 |
| 163 | 4.00 | 4.60 | .058 | -0.2492 | -0.2914 |
| 164 | 4.00 | 5.60 | .056 | -0.2556 | -0.3328 |
| 173 | 4.00 | 6.60 | .055 | -0.3114 | -0.3786 |
| MEAN ERROR= | | | | | -0.0102 |
| STANDARD DEVIATION= | | | | | 0.0622 |

R-1851

TABLE A-9
MEASURED, PREDICTED AND FITTED PITCH MOMENT
BETA=20. DEG

| RUN | CV | THETA | ZT | MEASURED | FITTED |
|-----|------|-------|------|---------------------|----------|
| 319 | 4.00 | 3.60 | .095 | -0.2806 | |
| 320 | 2.00 | 3.60 | .152 | -0.1396 | -0.2976 |
| 321 | 2.00 | 3.70 | .151 | -0.1373 | -0.1538 |
| 322 | 3.00 | 3.60 | .113 | -0.2152 | -0.1586 |
| 323 | 5.00 | 3.60 | .076 | -0.3135 | -0.2416 |
| 324 | 6.00 | 3.70 | .067 | -0.3472 | -0.3191 |
| 325 | 4.00 | 3.60 | .075 | -0.2036 | -0.3906 |
| 333 | 4.00 | 3.60 | .153 | -0.4382 | -0.2346 |
| 335 | 5.00 | 3.60 | .183 | -0.4429 | -0.2913* |
| 336 | 4.00 | 3.60 | .200 | -0.1856 | -0.2281* |
| 338 | 4.00 | 4.60 | .076 | -0.2521 | -0.1087 |
| 339 | 4.00 | 2.60 | .105 | -0.2620 | -0.3055 |
| 347 | 6.00 | 5.60 | .059 | -0.3525 | -0.2471 |
| 348 | 4.00 | 5.60 | .074 | -0.2633 | -0.5026* |
| 350 | 4.00 | 6.70 | .068 | -0.2803 | -0.3475 |
| | | | | | -0.3120 |
| | | | | MEAN ERROR= | 0.0017 |
| | | | | STANDARD DEVIATION= | 0.0803 |

TABLE A-10

MEASURED AND FITTED LONGITUDINAL FORCE
BETA=10.DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|------|-------|------|-------|----------|----------|
| 3 | 4.00 | .000 | 2.1 | 2.60 | 0.0 | .043 | -0.0468 | -0.0557 |
| 5 | 4.00 | .000 | 4.6 | 2.50 | 0.0 | .035 | -0.0451 | -0.0493 |
| 6 | 4.00 | .000 | 7.2 | 2.60 | 0.0 | .139 | -0.1943 | -0.2092 |
| 7 | 4.00 | .000 | 9.7 | 2.50 | 0.0 | .020 | -0.0503 | -0.0440 |
| 8 | 4.00 | .000 | 12.2 | 2.40 | 0.0 | .011 | -0.0503 | -0.0444 |
| 1 | 4.00 | .000 | 4.7 | 2.50 | 5.0 | .028 | -0.0433 | -0.0411 |
| 9 | 4.00 | .000 | 0.0 | 2.60 | -5.0 | .046 | -0.0478 | -0.0590 |
| 10 | 4.00 | .000 | 0.0 | 2.60 | 5.0 | .046 | -0.0465 | -0.0593 |
| 11 | 4.00 | .000 | 0.0 | 2.60 | 10.0 | .048 | -0.0461 | -0.0638 |
| 12 | 4.00 | .000 | 0.1 | 2.60 | 15.0 | .047 | -0.0461 | -0.0680 |
| 13 | 4.00 | .000 | 0.1 | 2.60 | 20.0 | .046 | -0.0435 | -0.0726* |
| 24 | 4.00 | .000 | 5.1 | 2.80 | 0.0 | .039 | -0.0364 | -0.0533 |
| 34 | 5.00 | .000 | 2.4 | 2.40 | -5.0 | .076 | -0.1521 | -0.1595 |
| 36 | 2.00 | .000 | 7.4 | 5.50 | -5.0 | .287 | -0.1350 | -0.1451 |
| 37 | 3.00 | .000 | 5.0 | 4.50 | 20.0 | .058 | -0.0387 | -0.0749* |
| 40 | 4.00 | .000 | 12.4 | 4.50 | 20.0 | .007 | -0.0447 | -0.0864* |
| 41 | 3.00 | .000 | 5.0 | 4.50 | 20.0 | .031 | -0.0109 | -0.0668* |
| 42 | 2.00 | .000 | 10.0 | 4.50 | 20.0 | .079 | -0.0274 | -0.0492* |
| 43 | 2.00 | .000 | 10.0 | 4.50 | 20.0 | .056 | -0.0176 | -0.0487* |
| 44 | 5.00 | .000 | 7.4 | 4.50 | 20.0 | .019 | -0.0408 | -0.0901* |
| 45 | 2.00 | .000 | 12.4 | 4.50 | 20.0 | .124 | -0.0633 | -0.0598 |
| 46 | 3.00 | .000 | 10.0 | 3.50 | 20.0 | .110 | -0.1100 | -0.0997 |
| 47 | 4.00 | .000 | 10.0 | 2.50 | 20.0 | .042 | -0.0652 | -0.0784 |
| 48 | 4.00 | .000 | 0.1 | 6.50 | 20.0 | .111 | -0.1873 | -0.1810 |
| 49 | 6.00 | .000 | 9.9 | 2.40 | 20.0 | .034 | -0.1282 | -0.1254 |
| 50 | 4.00 | .000 | 4.9 | 5.60 | 20.0 | .243 | -0.2839 | -0.3011 |
| 51 | 3.00 | .000 | 0.0 | 5.50 | 20.0 | .059 | -0.0413 | -0.0756* |
| 52 | 4.00 | .000 | 7.5 | 2.50 | 20.0 | .056 | -0.0834 | -0.0892 |
| 53 | 4.00 | .000 | 2.4 | 3.50 | 20.0 | .112 | -0.1437 | -0.1501 |
| 54 | 3.00 | .000 | 2.5 | 5.50 | 20.0 | .033 | -0.0133 | -0.0708* |
| 55 | 5.00 | .000 | 0.1 | 6.50 | 10.0 | .045 | -0.1107 | -0.1118 |
| 56 | 2.00 | .000 | 10.0 | 4.60 | 10.0 | .030 | -0.0087 | -0.0436* |
| 57 | 4.00 | .000 | 5.0 | 2.50 | 10.0 | .036 | -0.0369 | -0.0533 |
| 58 | 3.00 | .000 | 12.5 | 6.50 | 10.0 | -.005 | -0.0112 | -0.0429* |
| 59 | 4.00 | .000 | 2.5 | 3.60 | 5.0 | .040 | -0.0377 | -0.0517 |
| 60 | 4.00 | .000 | 2.5 | 3.60 | 5.0 | .029 | -0.0276 | -0.0401 |
| 61 | 4.00 | .000 | 5.1 | 3.50 | 5.0 | .043 | -0.0496 | -0.0591 |
| 62 | 3.00 | .000 | 0.0 | 2.50 | 5.0 | .054 | -0.0314 | -0.0487* |
| 63 | 5.00 | .000 | 2.5 | 2.50 | 5.0 | .035 | -0.0534 | -0.0631 |
| 64 | 3.00 | .000 | 9.9 | 2.60 | 5.0 | .013 | -0.0148 | -0.0341* |
| 65 | 4.00 | .000 | 5.0 | 2.60 | 5.0 | .039 | -0.0383 | -0.0545 |
| 66 | 5.00 | .000 | 5.0 | 6.60 | 5.0 | .022 | -0.0538 | -0.0616 |
| 67 | 3.00 | .000 | 9.9 | 6.60 | 5.0 | .020 | -0.0287 | -0.0417 |
| 68 | 6.00 | .000 | 12.4 | 5.70 | 5.0 | -.006 | -0.0517 | -0.0551 |
| 69 | 3.00 | .000 | -5.1 | 6.60 | 5.0 | .240 | -0.2094 | -0.2063 |
| 70 | 6.00 | .000 | -5.1 | 5.70 | 5.0 | .016 | -0.0547 | -0.0577 |
| 71 | 6.00 | .000 | 7.4 | 5.60 | 5.0 | .012 | -0.0609 | -0.0619 |
| 72 | 4.00 | .000 | 12.4 | 5.60 | 5.0 | .102 | -0.1933 | -0.1927* |
| 73 | 2.00 | .000 | 0.0 | 5.60 | 5.0 | .060 | -0.0111 | -0.0513 |
| 74 | 4.00 | .000 | 2.4 | 3.60 | 5.0 | .041 | -0.0389 | -0.0527 |

TABLE A-10 (cont'd)

MEASURED AND FITTED LONGITUDINAL FORCE
 BETA=10. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|------|-------|------|------|----------|----------|
| 76 | 5.00 | .000 | 2.4 | 5.60 | 0.0 | .026 | -0.0493 | -0.0599 |
| 77 | 2.00 | .000 | 4.9 | 5.70 | 0.0 | .329 | -0.1625 | -0.1474 |
| 78 | 6.00 | .000 | 7.5 | 5.70 | 0.0 | .015 | -0.0683 | -0.0680 |
| 79 | 3.00 | .000 | 12.4 | 5.60 | 0.0 | .112 | -0.1045 | -0.1133 |
| 80 | 3.00 | .000 | 12.4 | 5.60 | 0.0 | .247 | -0.2218 | -0.2174 |
| 81 | 4.00 | .000 | 12.4 | 4.60 | 0.0 | .117 | -0.1813 | -0.1934 |
| 82 | 4.00 | .000 | 4.9 | 6.60 | 0.0 | .099 | -0.1751 | -0.1590 |
| 83 | 3.00 | .000 | -5.1 | 6.60 | 0.0 | .049 | -0.0489 | -0.0544* |
| 84 | 3.00 | .000 | 2.4 | 2.60 | 0.0 | .044 | -0.0211 | -0.0422 |
| 85 | 4.00 | .000 | 7.4 | 2.60 | -5.0 | .026 | -0.0417 | -0.0457 |
| 87 | 2.00 | .000 | 4.9 | 2.60 | -5.0 | .135 | -0.0525 | -0.0625 |
| 88 | 4.00 | .000 | 4.9 | 2.60 | -5.0 | .061 | -0.0729 | -0.0843 |
| 89 | 2.00 | .000 | 7.4 | 5.70 | -5.0 | .285 | -0.1344 | -0.1463 |
| 90 | 6.00 | .000 | 7.5 | 6.70 | -5.0 | .014 | -0.0789 | -0.0649* |
| 91 | 2.00 | .000 | 0.0 | 4.60 | -5.0 | .119 | -0.0305 | -0.0581 |
| 92 | 5.00 | .000 | 0.0 | 3.60 | -5.0 | .037 | -0.0569 | -0.0641 |
| 93 | 6.00 | .000 | 9.9 | 3.50 | -5.0 | .110 | -0.3830 | -0.3781 |
| 94 | 6.00 | .000 | 9.9 | 4.60 | -5.0 | .078 | -0.2927 | -0.2839 |
| 95 | 6.00 | .000 | 10.0 | 5.60 | -5.0 | .002 | -0.0703 | -0.0490 |
| 97 | 4.00 | .000 | 9.9 | 5.60 | -5.0 | .037 | -0.0563 | -0.0751 |
| 98 | 5.00 | .000 | 9.9 | 5.50 | -5.0 | .097 | -0.2577 | -0.2456 |
| 99 | 3.00 | .000 | 0.1 | 6.60 | -5.0 | .142 | -0.1275 | -0.1408 |
| 100 | 4.00 | .000 | 4.9 | 6.60 | -5.0 | .034 | -0.0621 | -0.0564 |
| 101 | 4.00 | .000 | 2.4 | 3.50 | 5.0 | .039 | -0.0396 | -0.0505 |
| 102 | 6.00 | .000 | 9.9 | 2.50 | 0.0 | .105 | -0.3777 | -0.3763 |
| 103 | 3.00 | .000 | -5.1 | 2.50 | 10.0 | .122 | -0.0942 | -0.1054 |
| 105 | 5.00 | .000 | 10.0 | 3.50 | 10.0 | .013 | -0.0595 | -0.0523 |
| 106 | 4.00 | .000 | 5.0 | 3.50 | 10.0 | .045 | -0.0460 | -0.0644 |
| 107 | 3.00 | .000 | 7.4 | 6.50 | 10.0 | .158 | -0.1643 | -0.1717 |
| 108 | 4.00 | .000 | 12.5 | 6.60 | 10.0 | **** | -0.0256 | -0.0508* |
| 109 | 2.00 | .000 | -5.1 | 6.60 | 10.0 | .057 | -0.0141 | -0.0347* |
| 110 | 3.00 | .000 | 2.4 | 6.50 | 10.0 | .077 | -0.0740 | -0.0855 |
| 111 | 3.00 | .000 | -5.1 | 5.60 | 10.0 | .135 | -0.1039 | -0.1194* |
| 112 | 3.00 | .000 | 12.5 | 5.60 | 10.0 | .006 | -0.0211 | -0.0565* |
| 113 | 4.00 | .000 | 2.4 | 3.60 | 5.0 | .038 | -0.0306 | -0.0496* |
| 114 | 4.00 | .000 | 0.0 | 3.50 | 15.0 | .042 | -0.0297 | -0.0612* |
| 115 | 4.00 | .000 | 12.5 | 3.60 | 15.0 | .001 | -0.0352 | -0.0517 |
| 116 | 3.00 | .000 | 7.4 | 2.60 | 15.0 | .139 | -0.1301 | -0.1253* |
| 117 | 4.00 | .000 | 7.4 | 2.50 | 15.0 | .030 | -0.0348 | -0.0550* |
| 118 | 3.00 | .000 | 5.0 | 2.50 | 15.0 | .067 | -0.0427 | -0.0609* |
| 119 | 3.00 | .000 | 2.4 | 2.50 | 15.0 | .057 | -0.0269 | -0.0549* |
| 120 | 6.00 | .000 | 2.4 | 2.50 | 15.0 | .069 | -0.1990 | -0.2007 |
| 121 | 3.00 | .000 | 0.0 | 2.60 | 15.0 | .172 | -0.1502 | -0.1569 |
| 126 | 6.00 | .000 | 4.9 | 2.50 | 20.0 | .065 | -0.1804 | -0.1948 |
| 127 | 4.00 | .000 | 5.0 | 2.60 | 20.0 | .137 | -0.2151 | -0.1938 |
| 128 | 6.00 | .000 | 12.5 | 5.50 | 20.0 | .022 | -0.1997 | -0.1939 |
| 129 | 2.00 | .000 | 12.5 | 6.60 | 0.0 | .057 | -0.0214 | -0.0198 |
| 130 | 5.00 | .000 | 6.6 | **** | 7.5 | **** | -0.0497 | -0.0436 |
| 131 | 6.00 | .000 | -5.0 | 6.70 | 0.0 | .022 | -0.0732 | -0.0791 |
| 132 | 3.00 | .000 | 9.9 | 3.60 | 0.0 | .148 | -0.1208 | -0.1244 |

R-1851

TABLE A-10 (cont'd)

MEASURED AND FITTED LONGITUDINAL FORCE
BETA=10-DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|----------|
| 133 | 4.00 | .000 | 7.4 | 3.60 | 5.0 | .145 | -0.1923 | -0.2048 |
| 134 | 3.00 | .000 | 9.9 | 3.70 | 5.0 | .224 | -0.1872 | -0.1992* |
| 135 | 4.00 | .000 | 2.4 | 3.60 | 5.0 | .040 | -0.0339 | -0.0515 |
| 138 | 4.00 | .000 | -5.0 | 5.60 | 20.0 | .221 | -0.2709 | -0.2631 |
| 139 | 4.00 | .000 | -5.1 | 3.60 | 5.0 | .044 | -0.0500 | -0.0590 |
| 1 | 1.97 | .049 | 0.0 | 3.00 | 0.0 | .057 | -0.0352 | -0.0340 |
| 2 | 1.98 | .050 | 0.0 | 3.00 | 0.0 | .058 | -0.0341 | -0.0340 |
| 3 | 3.15 | .079 | 0.0 | 3.00 | 0.0 | .029 | -0.0466 | -0.0335* |
| 4 | 4.01 | .100 | 0.0 | 3.00 | 0.0 | .022 | -0.0719 | -0.0317* |
| 6 | 5.30 | .133 | 0.0 | 3.00 | 0.0 | .033 | -0.0816 | -0.0817 |
| 8 | 6.00 | .150 | 0.0 | 3.00 | 0.0 | .032 | -0.1475 | -0.1119 |
| 10 | 3.01 | .075 | -2.5 | 3.00 | 0.0 | .042 | -0.0487 | -0.0402 |
| 9 | 3.12 | .078 | 5.0 | 3.00 | 0.0 | .038 | -0.0501 | -0.0324 |
| 11 | 3.02 | .076 | -5.0 | 3.00 | 0.0 | .037 | -0.0508 | -0.0409 |
| 12 | 2.95 | .074 | -7.5 | 3.00 | 0.0 | .033 | -0.0408 | -0.0404 |
| 13 | 2.98 | .075 | -10.0 | 3.00 | 0.0 | .032 | -0.0526 | -0.0427 |
| 14 | 2.96 | .074 | -12.5 | 3.00 | 0.0 | .026 | -0.0531 | -0.0411 |
| 15 | 2.95 | .074 | 0.0 | 2.00 | 0.0 | .064 | -0.0703 | -0.0599 |
| 16 | 2.99 | .075 | 0.0 | 4.00 | 0.0 | .047 | -0.0444 | -0.0430 |
| 19 | 2.72 | .068 | 0.0 | 5.00 | 0.0 | .041 | -0.0469 | -0.0463 |
| 20 | 2.68 | .067 | 0.0 | 5.00 | 0.0 | .041 | -0.0472 | -0.0463 |
| 21 | 3.14 | .079 | 0.0 | 6.00 | 0.0 | .033 | -0.0582 | -0.0460 |
| 22 | 2.01 | .050 | -7.5 | 6.00 | 0.0 | .089 | -0.0552 | -0.0484 |
| 23 | 2.98 | .074 | 0.0 | 3.00 | 0.0 | .025 | -0.0359 | -0.0327 |
| 24 | 2.97 | .074 | 0.0 | 3.00 | 0.0 | .072 | -0.0722 | -0.0525 |
| 25 | 2.46 | .062 | 0.0 | 3.00 | 0.0 | .151 | -0.1103 | -0.0921 |
| 26 | 3.46 | .087 | 0.0 | 3.00 | 0.0 | .103 | -0.1418 | -0.1026 |
| 27 | 2.96 | .074 | 0.0 | 3.00 | 0.0 | .127 | -0.1197 | -0.0982 |
| 28 | 2.93 | .073 | 0.0 | 3.00 | 0.0 | .181 | -0.1726 | -0.1516* |
| 30 | 4.49 | .112 | 0.0 | 3.00 | 0.0 | .193 | -0.1951 | -0.3340* |
| 31 | 5.03 | .126 | 0.0 | 3.00 | 0.0 | .115 | -0.2893 | -0.2562 |
| 32 | 3.15 | .079 | 0.0 | 3.00 | -5.0 | .055 | -0.1050 | -0.1048 |
| 34 | 3.07 | .077 | -2.5 | 3.00 | -5.0 | .054 | -0.0995 | -0.1028 |
| 35 | 5.82 | .146 | 0.0 | 3.00 | -5.0 | .049 | -0.3385 | -0.3480 |
| 36 | 5.77 | .144 | -12.5 | 6.00 | -5.0 | .008 | -0.3244 | -0.3281 |
| 37 | 4.91 | .123 | 5.0 | 2.00 | -5.0 | .040 | -0.2172 | -0.2331 |
| 38 | 2.87 | .072 | -10.0 | 4.00 | -5.0 | .157 | -0.1950 | -0.1855 |
| 39 | 5.96 | .149 | -12.5 | 5.00 | -5.0 | .045 | -0.4551 | -0.4782 |
| 40 | 3.00 | .075 | 0.0 | 3.00 | -10.0 | .135 | -0.1438 | -0.2154 |
| 41 | 6.02 | .150 | -7.5 | 5.00 | -10.0 | .025 | -0.5512 | -0.5541 |
| 42 | 2.95 | .074 | -2.5 | 2.00 | -10.0 | .057 | -0.1472 | -0.1622* |
| 43 | 5.21 | .130 | -5.0 | 2.00 | -10.0 | .022 | -0.4213 | -0.3948 |
| 46 | 3.09 | .077 | -5.0 | 2.00 | -10.0 | .092 | -0.2154 | -0.2117 |
| 47 | 3.14 | .079 | -2.5 | 3.00 | -5.0 | .036 | -0.1025 | -0.0967 |
| 48 | 3.09 | .077 | 0.0 | 3.00 | -15.0 | .041 | -0.2166 | -0.2078 |
| 56 | 5.23 | .131 | -5.0 | 3.00 | -15.0 | .060 | -0.6685 | -0.6343 |
| 57 | 5.19 | .130 | -5.0 | 2.00 | -15.0 | .027 | -0.5691 | -0.5584 |
| 58 | 5.12 | .128 | -12.5 | 5.00 | -15.0 | .027 | -0.6474 | -0.6037 |
| 59 | 3.05 | .076 | 0.0 | 3.00 | -20.0 | .048 | -0.2627 | -0.2625 |
| 60 | 4.17 | .104 | -12.5 | 6.00 | -20.0 | -.007 | -0.4713 | -0.4707 |

R-1851

TABLE A-10 (cont'd)

MEASURED AND FITTED LONGITUDINAL FORCE
BETA=10. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|----------|
| 62 | 5.18 | .129 | 5.0 | 3.00 | -20.0 | .022 | -0.6827 | -0.6725 |
| 65 | 4.10 | .102 | -2.5 | 6.00 | -20.0 | .033 | -0.4541 | -0.4583* |
| 66 | 6.15 | .154 | -10.0 | 5.00 | -20.0 | .004 | -1.0546 | -0.9641 |
| 67 | 2.11 | .053 | -7.5 | 2.00 | -20.0 | .046 | -0.1367 | -0.1495 |
| 69 | 4.05 | .101 | -5.0 | 5.00 | -20.0 | .047 | -0.4818 | -0.4737 |
| 70 | 3.01 | .075 | -7.5 | 2.00 | -20.0 | .076 | -0.3202 | -0.2959 |
| 71 | 3.00 | .075 | 0.0 | 3.00 | 5.0 | .038 | 0.0126 | 0.0152 |
| 72 | 6.08 | .152 | -5.0 | 3.00 | 5.0 | .057 | -0.0546 | -0.0292 |
| 74 | 5.05 | .126 | -10.0 | 3.00 | 5.0 | .108 | -0.1740 | -0.1672* |
| 75 | 6.03 | .151 | -2.5 | 5.00 | 5.0 | .047 | -0.0193 | 0.0149* |
| 76 | 5.05 | .126 | -2.5 | 2.00 | 5.0 | .038 | 0.0313 | 0.0377 |
| 77 | 5.05 | .126 | -10.0 | 5.00 | 5.0 | .031 | 0.0077 | 0.0112 |
| 78 | 4.02 | .101 | -7.5 | 5.00 | 5.0 | .008 | 0.0469 | 0.0511 |
| 79 | 2.04 | .051 | -10.0 | 3.00 | 5.0 | .016 | -0.0095 | -0.0085 |
| 80 | 5.33 | .133 | -2.5 | 3.00 | 0.0 | .061 | -0.1948 | -0.1633 |
| 82 | 3.87 | .097 | -2.5 | 2.00 | 0.0 | .099 | -0.1909 | -0.1521 |
| 83 | 3.02 | .075 | -2.5 | 3.00 | -5.0 | .038 | -0.0967 | -0.0923 |
| 418 | 1.85 | .069 | 0.0 | 3.00 | 0.0 | .060 | -0.0292 | -0.0302 |
| 419 | 2.96 | .111 | 0.0 | 3.00 | 0.0 | .044 | -0.0479 | -0.0352 |
| 420 | 3.95 | .148 | 0.0 | 3.00 | 0.0 | .033 | -0.0649 | -0.0464 |
| 421 | 5.02 | .188 | 0.0 | 3.00 | 0.0 | .025 | -0.0864 | -0.0753 |
| 422 | 6.09 | .228 | 0.0 | 3.00 | 0.0 | .022 | -0.0905 | -0.1349 |
| 423 | 3.86 | .145 | 0.0 | 3.00 | 0.0 | .028 | -0.0552 | -0.0391 |
| 424 | 3.91 | .146 | 0.0 | 3.00 | 0.0 | .045 | -0.0795 | -0.0593 |
| 425 | 3.96 | .148 | 0.0 | 3.00 | 0.0 | .067 | -0.1101 | -0.0892 |
| 426 | 4.03 | .151 | 0.0 | 3.00 | 0.0 | .117 | -0.1951 | -0.1688 |
| 427 | 4.01 | .150 | 0.0 | 3.00 | 0.0 | .158 | -0.2431 | -0.2292 |
| 428 | 3.99 | .150 | 5.0 | 3.00 | 0.0 | .027 | -0.0572 | -0.0343 |
| 429 | 4.02 | .151 | -2.5 | 3.00 | 0.0 | .031 | -0.0659 | -0.0534 |
| 430 | 3.99 | .150 | -5.0 | 3.00 | 0.0 | .027 | -0.0653 | -0.0564 |
| 431 | 4.01 | .150 | -7.5 | 3.00 | 0.0 | .017 | -0.0604 | -0.0558 |
| 432 | 4.00 | .150 | -10.0 | 3.00 | 0.0 | .011 | -0.0634 | -0.0615 |
| 433 | 4.01 | .150 | -12.5 | 3.00 | 0.0 | .006 | -0.0656 | -0.0712 |
| 434 | 3.99 | .150 | -12.5 | 3.00 | 5.0 | .007 | 0.0607 | 0.0630 |
| 435 | 4.00 | .150 | -12.5 | 3.00 | -5.0 | -.002 | -0.1926 | -0.1972 |
| 436 | 4.02 | .151 | -12.5 | 3.00 | -10.0 | -.004 | -0.3331 | -0.3348 |
| 438 | 3.97 | .149 | 0.0 | 3.00 | 5.0 | .032 | 0.0716 | 0.0885 |
| 440 | 4.01 | .150 | 0.0 | 3.00 | -5.0 | .035 | -0.2025 | -0.1891 |
| 441 | 4.00 | .150 | 0.0 | 3.00 | -10.0 | .036 | -0.3408 | -0.3287 |
| 443 | 3.98 | .149 | 0.0 | 3.00 | -15.0 | .040 | -0.4717 | -0.4670 |
| 444 | 3.98 | .149 | 0.0 | 3.00 | -20.0 | .035 | -0.5886 | -0.5989 |
| 445 | 3.98 | .149 | 0.0 | 2.00 | 0.0 | .036 | -0.0757 | -0.0630 |
| 446 | 3.98 | .149 | 0.0 | 4.00 | 0.0 | .032 | -0.0642 | -0.0489 |
| 448 | 4.02 | .151 | 0.0 | 5.00 | 0.0 | .025 | -0.0516 | -0.0488 |
| 449 | 4.03 | .151 | 0.0 | 6.00 | 0.0 | .024 | -0.0606 | -0.0495 |
| 451 | 1.81 | .068 | -10.0 | 4.00 | 5.0 | .132 | -0.0369 | -0.0062* |
| 452 | 4.01 | .150 | -2.5 | 3.00 | -5.0 | .043 | -0.2161 | -0.2068 |
| 455 | 4.91 | .184 | 5.0 | 4.00 | -20.0 | .131 | -1.0887 | -1.0982 |
| 456 | 4.90 | .184 | -7.5 | 4.00 | 5.0 | .099 | -0.0572 | -0.0638 |
| 457 | 2.92 | .109 | -2.5 | 3.00 | -5.0 | .043 | -0.1183 | -0.1128 |

R-1851

TABLE A-10 (cont'd)

MEASURED AND FITTED LONGITUDINAL FORCE
BETA=10. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|----------|
| 458 | 4.00 | .150 | -7.5 | 6.00 | 0.0 | .010 | -0.0553 | -0.0418* |
| 459 | 5.96 | .224 | 0.0 | 2.00 | -5.0 | .025 | -0.3905 | -0.4547* |
| 460 | 5.01 | .188 | -10.0 | 5.00 | 0.0 | .045 | -0.1646 | -0.1891 |
| 463 | 4.02 | .151 | -12.5 | 3.00 | 5.0 | .110 | -0.0972 | -0.0879 |
| 465 | 5.97 | .224 | 0.0 | 2.00 | 5.0 | .090 | -0.0718 | -0.0660 |
| 466 | 5.97 | .224 | -12.5 | 5.00 | -20.0 | .011 | -1.3841 | -1.3932 |
| 467 | 4.00 | .150 | -7.5 | 6.00 | 0.0 | .011 | -0.0387 | -0.0432 |
| 469 | 5.05 | .189 | 5.0 | 4.00 | -10.0 | .083 | -0.6263 | -0.6342 |
| 470 | 3.01 | .113 | -2.5 | 3.00 | 0.0 | .131 | -0.1132 | -0.1086 |
| 471 | 2.99 | .112 | -2.5 | 3.00 | -5.0 | .047 | -0.1218 | -0.1195 |
| 473 | 4.96 | .186 | -5.0 | 6.00 | -20.0 | .024 | -0.9145 | -0.9326 |
| 475 | 4.97 | .186 | -2.5 | 2.00 | -20.0 | .086 | -1.1013 | -1.0858 |
| 476 | 4.97 | .186 | 5.0 | 3.00 | 0.0 | .031 | -0.0872 | -0.0751 |
| 483 | 1.98 | .074 | -10.0 | 6.00 | -5.0 | .168 | -0.1311 | -0.1315 |
| 484 | 2.91 | .109 | -2.5 | 2.00 | 0.0 | .089 | -0.0965 | -0.0816 |
| 485 | 3.01 | .113 | 0.0 | 6.00 | -20.0 | .133 | -0.4568 | -0.4368 |
| 487 | 3.93 | .148 | -10.0 | 2.00 | -5.0 | .097 | -0.3622 | -0.3420 |
| 488 | 3.00 | .113 | -2.5 | 3.00 | -5.0 | .043 | -0.1233 | -0.1185* |
| 489 | 4.13 | .155 | -5.0 | 2.00 | 5.0 | .112 | -0.1210 | -0.0704* |
| 490 | 6.08 | .227 | -5.0 | 2.00 | 5.0 | .081 | -0.0751 | -0.0973 |
| 491 | 4.10 | .154 | -7.5 | 3.00 | -5.0 | .075 | -0.2988 | -0.2891 |
| 492 | 4.04 | .152 | 0.0 | 3.00 | 0.0 | .028 | -0.0507 | -0.0429* |
| 494 | 3.18 | .119 | -2.5 | 4.00 | -5.0 | .140 | -0.3454 | -0.2163* |
| 496 | 6.07 | .228 | 5.0 | 5.00 | -15.0 | .074 | -1.2208 | -1.2348 |
| 499 | 6.05 | .227 | -10.0 | 5.00 | -15.0 | .001 | -1.0668 | -1.0590 |
| 500 | 4.08 | .153 | -5.0 | 6.00 | -5.0 | .015 | -0.1965 | -0.1875 |
| 502 | 3.09 | .116 | -12.5 | 4.00 | 0.0 | .105 | -0.1339 | -0.1119 |
| 503 | 3.10 | .116 | -2.5 | 4.00 | -15.0 | .053 | -0.3043 | -0.3031 |
| 505 | 3.03 | .114 | -2.5 | 5.00 | 5.0 | .161 | -0.0682 | -0.0560 |
| 506 | 3.02 | .113 | -2.5 | 3.00 | -5.0 | .041 | -0.1216 | -0.1184* |
| 507 | 3.01 | .113 | -5.0 | 2.00 | 5.0 | .092 | -0.0448 | -0.0151* |
| 508 | 2.99 | .112 | -5.0 | 5.00 | -10.0 | .104 | -0.2709 | -0.2543 |
| 512 | 2.01 | .075 | -7.5 | 6.00 | -10.0 | .220 | -0.2012 | -0.2123 |
| 513 | 5.15 | .193 | -10.0 | 5.00 | -10.0 | .042 | -0.6486 | -0.6448 |
| 514 | 5.10 | .191 | -12.5 | 2.00 | -10.0 | -.016 | -0.5050 | -0.5260* |
| 795 | 3.00 | .225 | 0.0 | 3.00 | 0.0 | .055 | -0.0168 | -0.0278* |
| 796 | 2.99 | .224 | 5.0 | 3.00 | 0.0 | .047 | -0.0140 | -0.0084* |
| 797 | 3.01 | .226 | -2.5 | 3.00 | 0.0 | .056 | -0.0201 | -0.0361* |
| 798 | 3.00 | .225 | -5.0 | 3.00 | 0.0 | .051 | -0.0187 | -0.0404* |
| 799 | 3.01 | .226 | -7.5 | 3.00 | 0.0 | .046 | -0.0203 | -0.0452* |
| 800 | 3.00 | .225 | -10.0 | 3.00 | 0.0 | .039 | -0.0235 | -0.0477* |
| 801 | 3.00 | .225 | -12.5 | 3.00 | 0.0 | .033 | -0.0269 | -0.0506* |
| 802 | 2.99 | .224 | 0.0 | 3.00 | 5.0 | .054 | 0.1337 | 0.1295 |
| 803 | 2.99 | .224 | 0.0 | 3.00 | -5.0 | .068 | -0.1849 | -0.1928 |
| 804 | 2.98 | .223 | 0.0 | 3.00 | -10.0 | .072 | -0.3355 | -0.3487 |
| 805 | 2.99 | .224 | 0.0 | 3.00 | -15.0 | .075 | -0.4964 | -0.5086 |
| 806 | 3.00 | .225 | 0.0 | 3.00 | -20.0 | .069 | -0.6411 | -0.6580 |
| 807 | 3.00 | .225 | 0.0 | 2.00 | 0.0 | .067 | -0.0388 | -0.0504* |
| 808 | 2.97 | .223 | 0.0 | 4.00 | 0.0 | .058 | -0.0181 | -0.0289* |
| 809 | 3.00 | .225 | 0.0 | 5.00 | 0.0 | .053 | -0.0206 | -0.0327* |

TABLE A-10 (cont'd)

MEASURED AND FITTED LONGITUDINAL FORCE
 BETA=10. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|------|----------|----------|
| 810 | 2.99 | .224 | 0.0 | 6.00 | 0.0 | .056 | -0.0301 | -0.0357* |
| 811 | 3.00 | .225 | 0.0 | 3.00 | 0.0 | .051 | -0.0138 | -0.0255* |
| 812 | 3.00 | .225 | 0.0 | 3.00 | 0.0 | .082 | -0.0395 | -0.0469 |
| 813 | 3.00 | .225 | 0.0 | 3.00 | 0.0 | .130 | -0.0853 | -0.0929 |
| 815 | 2.01 | .151 | 0.0 | 3.00 | 0.0 | .104 | -0.0306 | -0.0220 |
| 816 | 2.51 | .188 | -2.5 | 3.00 | 0.0 | .069 | -0.0216 | -0.0247 |
| 817 | 3.01 | .226 | 0.0 | 6.00 | -20.0 | .036 | -0.6627 | -0.6565 |
| 818 | 3.02 | .226 | 5.0 | 6.00 | -5.0 | .175 | -0.2889 | -0.2954 |
| 819 | 3.02 | .226 | -2.5 | 6.00 | 5.0 | .211 | -0.0104 | -0.0137 |
| 820 | 2.03 | .152 | 0.0 | 4.00 | -10.0 | .205 | -0.2204 | -0.2392 |
| 821 | 3.01 | .226 | -12.5 | 3.00 | -10.0 | .017 | -0.3291 | -0.3574 |
| 822 | 3.01 | .226 | -2.5 | 3.00 | -5.0 | .065 | -0.1865 | -0.2022 |
| 823 | 2.02 | .152 | -12.5 | 3.00 | -10.0 | .093 | -0.1800 | -0.1700 |
| 824 | 2.52 | .189 | -10.0 | 3.00 | 5.0 | .111 | 0.0438 | 0.0474 |
| 825 | 2.01 | .150 | -5.0 | 3.00 | -15.0 | .112 | -0.2461 | -0.2511 |
| 826 | 2.48 | .186 | -12.5 | 6.00 | -10.0 | .190 | -0.3599 | -0.3715 |
| 827 | 2.48 | .186 | -12.5 | 5.00 | 5.0 | .281 | -0.0975 | -0.0788 |
| 828 | 2.99 | .224 | 0.0 | 3.00 | -5.0 | .084 | -0.1954 | -0.2053 |
| 829 | 1.99 | .149 | 5.0 | 6.00 | -10.0 | .287 | -0.2719 | -0.2666 |
| 830 | 2.00 | .150 | -5.0 | 3.00 | -10.0 | .076 | -0.1598 | -0.1622 |
| 831 | 2.50 | .187 | -2.5 | 5.00 | -20.0 | .248 | -0.5949 | -0.6048 |
| 832 | 2.99 | .224 | -2.5 | 3.00 | -5.0 | .065 | -0.1859 | -0.1995 |
| 833 | 1.96 | .147 | -5.0 | 6.00 | -5.0 | .263 | -0.1925 | -0.2106 |
| 834 | 2.95 | .221 | 5.0 | 5.00 | 0.0 | .063 | -0.0319 | -0.0308 |
| 835 | 2.96 | .222 | -5.0 | 6.00 | 0.0 | .034 | -0.0144 | -0.0202 |
| 836 | 1.98 | .148 | -12.5 | 3.00 | -20.0 | .019 | -0.2856 | -0.2890 |
| 839 | 2.06 | .155 | 5.0 | 4.00 | 0.0 | .192 | -0.0841 | -0.0648 |
| 840 | 2.03 | .153 | -7.5 | 3.00 | 5.0 | .088 | 0.0411 | 0.0529 |
| 841 | 2.98 | .223 | 0.0 | 5.00 | -20.0 | .219 | -0.8062 | -0.7950 |
| 842 | 2.99 | .224 | -7.5 | 6.00 | -15.0 | .031 | -0.4930 | -0.4822 |
| 845 | 2.98 | .223 | 5.0 | 6.00 | -10.0 | .174 | -0.4549 | -0.4390 |
| 846 | 3.01 | .226 | -2.5 | 3.00 | -5.0 | .053 | -0.1883 | -0.1931 |
| 847 | 2.54 | .190 | -7.5 | 5.00 | 0.0 | .242 | -0.1729 | -0.1658 |
| 848 | 3.01 | .226 | -10.0 | 5.00 | 0.0 | .204 | -0.1843 | -0.2041 |
| 849 | 2.55 | .191 | 0.0 | 5.00 | -5.0 | .046 | -0.1328 | -0.1320 |
| 850 | 2.54 | .191 | -2.5 | 4.00 | -15.0 | .180 | -0.4584 | -0.4558 |
| 851 | 2.08 | .156 | 0.0 | 5.00 | 5.0 | .038 | 0.0642 | 0.0512 |
| 852 | 2.53 | .190 | 5.0 | 6.00 | -20.0 | .212 | -0.5566 | -0.5628 |
| 853 | 2.05 | .154 | -5.0 | 8.00 | -15.0 | .288 | -0.4201 | -0.4051 |
| 855 | 3.01 | .226 | -5.0 | 2.00 | 5.0 | .074 | 0.0823 | 0.0817 |
| 856 | 2.53 | .190 | -12.5 | 4.00 | -10.0 | .182 | -0.3671 | -0.3789 |
| 857 | 3.00 | .225 | -2.5 | 3.00 | -5.0 | .049 | -0.1836 | -0.1896 |
| 858 | 2.99 | .224 | -5.0 | 4.00 | 0.0 | .157 | -0.1170 | -0.1325 |
| 859 | 2.53 | .190 | -5.0 | 6.00 | -5.0 | .169 | -0.2238 | -0.2280 |
| 861 | 2.54 | .190 | -12.5 | 4.00 | -5.0 | .209 | -0.2746 | -0.2898 |
| 862 | 2.97 | .223 | -12.5 | 5.00 | -20.0 | .057 | -0.6950 | -0.6693* |
| 863 | 3.00 | .225 | -5.0 | 4.00 | -5.0 | .026 | -0.8141 | -0.1808 |

MEAN ERROR= -0.0111
 STANDARD DEVIATION= 0.0925

TABLE A-11

MEASURED AND FITTED LONGITUDINAL FORCE
BETA=15. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|------|-------|------|-------|----------|-----------|
| 141 | 4.00 | .000 | 5.0 | 3.60 | 5.0 | .050 | -0.0443 | -0.0525* |
| 143 | 3.00 | .000 | 4.7 | 2.60 | 0.0 | .053 | -0.0232 | -0.0461* |
| 144 | 6.00 | .000 | 14.8 | 3.00 | 0.0 | .149 | -0.5141 | -0.5047 |
| 145 | 4.00 | .000 | 4.8 | 3.60 | 0.0 | .050 | -0.0458 | -0.0525 |
| 146 | 4.00 | .000 | -5.2 | 3.60 | 0.0 | .050 | -0.0460 | -0.0531* |
| 153 | 2.00 | .000 | -2.1 | 3.60 | 0.0 | .114 | -0.0230 | -0.0551* |
| 157 | 4.00 | .000 | 9.8 | 3.60 | 0.0 | .035 | -0.0413 | -0.0447 |
| 158 | 4.00 | .000 | 14.7 | 3.60 | 0.0 | .014 | -0.0378 | -0.0377 |
| 159 | 3.00 | .000 | 14.7 | 3.60 | 0.0 | .169 | -0.1457 | -0.1437 |
| 160 | 4.00 | .000 | 19.8 | 3.60 | 0.0 | -.005 | -0.0427 | -0.0415 |
| 161 | 4.00 | .000 | 19.8 | 4.60 | 0.0 | .155 | -0.2309 | -0.2428 |
| 162 | 4.00 | .000 | 19.7 | 4.60 | 0.0 | .162 | -0.2295 | -0.2521 |
| 165 | 2.00 | .000 | 4.7 | 5.60 | 0.0 | .371 | -0.1526 | -0.1520 |
| 166 | 6.00 | .000 | 9.7 | 5.60 | 0.0 | .029 | -0.0788 | -0.0966 |
| 167 | 3.00 | .000 | 19.7 | 5.60 | 0.0 | .161 | -0.1316 | -0.1503 |
| 168 | 3.00 | .000 | 19.7 | 5.60 | 0.0 | .280 | -0.2487 | -0.2418 |
| 169 | 2.00 | .000 | 19.7 | 6.60 | 0.0 | .067 | -0.0226 | -0.0271 |
| 170 | 5.00 | .000 | 9.7 | 6.60 | 0.0 | .030 | -0.0552 | -0.0619 |
| 171 | 4.00 | .000 | 9.7 | 6.60 | 0.0 | .147 | -0.2050 | -0.1872 |
| 172 | 3.00 | .000 | -5.3 | 6.60 | 0.0 | .082 | -0.0516 | -0.0585 |
| 174 | 6.00 | .000 | -5.2 | 6.60 | 0.0 | .039 | -0.0827 | -0.1016* |
| 175 | 4.00 | .000 | 4.7 | 3.60 | 5.0 | .061 | -0.0406 | -0.0665** |
| 185 | 4.00 | .000 | 4.7 | 3.60 | 5.0 | .046 | -0.0285 | -0.0480** |
| 186 | 4.00 | .000 | -0.3 | 3.60 | 5.0 | .065 | -0.0390 | -0.0686** |
| 187 | 3.00 | .000 | -5.3 | 3.60 | 5.0 | .119 | -0.0547 | -0.0879** |
| 189 | 5.00 | .000 | -0.3 | 2.50 | 5.0 | .063 | -0.0693 | -0.1236** |
| 191 | 4.00 | .000 | 9.8 | 3.60 | 5.0 | .173 | -0.2115 | -0.2285 |
| 192 | 4.00 | .000 | 9.7 | 3.60 | 5.0 | .177 | -0.2109 | -0.2327 |
| 193 | 3.00 | .000 | 14.7 | 3.70 | 5.0 | .250 | -0.2057 | -0.2188 |
| 194 | 3.00 | .000 | 14.7 | 3.60 | 5.0 | .017 | -0.0126 | -0.0243** |
| 195 | 3.00 | .000 | 14.7 | 1.60 | 5.0 | .048 | -0.0391 | -0.0692** |
| 196 | 6.00 | .000 | -5.2 | 5.60 | 5.0 | .035 | -0.0609 | -0.0873 |
| 197 | 6.00 | .000 | 9.7 | 5.60 | 5.0 | .026 | -0.0689 | -0.0924 |
| 198 | 6.00 | .000 | 19.8 | 5.60 | 5.0 | -.016 | -0.0644 | -0.0835* |
| 199 | 2.00 | .000 | -0.3 | 5.60 | 5.0 | .101 | -0.0167 | -0.0493** |
| 200 | 2.00 | .000 | -5.3 | 5.60 | 5.0 | .257 | -0.0813 | -0.1057 |
| 201 | 4.00 | .000 | 19.8 | 5.60 | 5.0 | .139 | -0.2280 | -0.2308 |
| 202 | 5.00 | .000 | 14.7 | 6.60 | 5.0 | .010 | -0.0469 | -0.0604 |
| 203 | 5.00 | .000 | 4.7 | 6.60 | 5.0 | .036 | -0.0556 | -0.0578 |
| 204 | 5.00 | .000 | 4.8 | 6.60 | 5.0 | .037 | -0.0568 | -0.0594 |
| 205 | 3.00 | .000 | -5.3 | 6.60 | 5.0 | .279 | -0.2072 | -0.2072 |
| 206 | 4.00 | .000 | 4.7 | 3.60 | 5.0 | .055 | -0.0435 | -0.0584* |
| 207 | 4.00 | .000 | -0.3 | 3.60 | -5.0 | .063 | -0.0422 | -0.0655* |
| 208 | 6.00 | .000 | 14.7 | 3.60 | -5.0 | .155 | -0.4923 | -0.4956 |
| 210 | 5.00 | .000 | -0.3 | 2.50 | -5.0 | .103 | -0.1821 | -0.2077 |
| 211 | 4.00 | .000 | 4.7 | 2.60 | -5.0 | .094 | -0.0929 | -0.1247** |
| 212 | 2.00 | .000 | 4.7 | 2.60 | -5.0 | .162 | -0.0502 | -0.0903** |
| 213 | 4.00 | .000 | 9.8 | 2.60 | -5.0 | .043 | -0.0414 | -0.0684** |
| 214 | 2.00 | .000 | -0.3 | 4.60 | -5.0 | .170 | -0.0388 | -0.0734** |
| 215 | 6.00 | .000 | 14.8 | 4.60 | -5.0 | .126 | -0.3905 | -0.3911 |

TABLE A-11 (cont'd)

MEASURED AND FITTED LONGITUDINAL FORCE
BETA=15. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|------|-------|------|-------|----------|----------|
| 216 | 5.00 | .000 | 14.7 | 5.50 | -5.0 | .150 | -0.3226 | -0.3059 |
| 218 | 3.00 | .000 | 9.7 | 5.60 | -5.0 | .242 | -0.1791 | -0.1786 |
| 219 | 4.00 | .000 | 9.7 | 5.60 | -5.0 | .045 | -0.0565 | -0.0557 |
| 220 | 6.00 | .000 | 14.8 | 5.60 | -5.0 | .007 | -0.0629 | -0.0772 |
| 221 | 6.00 | .000 | 14.8 | 6.60 | -5.0 | .005 | -0.0718 | -0.0639 |
| 222 | 4.00 | .000 | 9.7 | 6.60 | -5.0 | .044 | -0.0603 | -0.0505 |
| 223 | 3.00 | .000 | 19.7 | 6.60 | 10.0 | -.009 | -0.0149 | -0.0111 |
| 224 | 4.00 | .000 | 19.7 | 6.60 | 10.0 | | -0.0347 | -0.0351* |
| 225 | 2.00 | .000 | -5.3 | 6.60 | 10.0 | .104 | -0.0206 | -0.0457* |
| 226 | 3.00 | .000 | 4.7 | 6.60 | 10.0 | .117 | -0.0890 | -0.0912 |
| 227 | 5.00 | .000 | -0.3 | 6.50 | 10.0 | .070 | -0.1204 | -0.1074 |
| 228 | 3.00 | .000 | 14.8 | 6.60 | 10.0 | .191 | -0.2050 | -0.1773 |
| 231 | 3.00 | .000 | 19.8 | 4.60 | 10.0 | .179 | -0.1845 | -0.1677 |
| 232 | 5.00 | .000 | 14.7 | 4.50 | 10.0 | .035 | -0.1138 | -0.1021* |
| 233 | 2.00 | .000 | 14.7 | 4.60 | 10.0 | .037 | -0.0051 | -0.0245* |
| 234 | 4.00 | .000 | 4.8 | 3.60 | 5.0 | .054 | -0.0435 | -0.0583 |
| 235 | 5.00 | .000 | 4.8 | 3.50 | 10.0 | .118 | -0.2258 | -0.2188 |
| 238 | 3.00 | .000 | 9.7 | 3.60 | 10.0 | .240 | -0.1846 | -0.1996 |
| 239 | 4.00 | .000 | 9.8 | 3.60 | 10.0 | .059 | -0.0616 | -0.0766 |
| 240 | 5.00 | .000 | 8.6 | 3.50 | 10.0 | .020 | -0.0692 | -0.0407 |
| 241 | 3.00 | .000 | 4.8 | 3.60 | 10.0 | .131 | -0.0658 | -0.0986* |
| 242 | 4.00 | .000 | -0.3 | 3.60 | 10.0 | .064 | -0.0438 | -0.0702* |
| 243 | 4.00 | .000 | 9.7 | 2.60 | 10.0 | .050 | -0.0443 | -0.0719* |
| 244 | 3.00 | .000 | 19.7 | 5.60 | 10.0 | -.004 | -0.0223 | -0.0250 |
| 245 | 3.00 | .000 | -4.9 | 5.50 | 10.0 | .180 | -0.1040 | -0.1269 |
| 246 | 5.00 | .000 | -5.2 | 5.50 | 15.0 | .077 | -0.1295 | -0.1198 |
| 247 | 3.00 | .000 | -0.3 | 5.60 | 15.0 | .165 | -0.0997 | -0.1171 |
| 248 | 5.00 | .000 | 14.8 | 5.50 | 15.0 | .029 | -0.1080 | -0.0985 |
| 249 | 6.00 | .000 | 14.7 | 5.60 | 15.0 | .016 | -0.0894 | -0.1037 |
| 250 | 5.00 | .000 | -0.3 | 5.50 | 15.0 | .044 | -0.0496 | -0.0619* |
| 251 | 2.00 | .000 | 4.7 | 6.60 | 15.0 | .091 | -0.0155 | -0.0460* |
| 252 | 6.00 | .000 | 3.9 | 6.60 | 15.0 | .026 | -0.0774 | -0.0483 |
| 253 | 3.00 | .000 | 19.7 | 6.60 | 15.0 | .018 | -0.0457 | -0.0463 |
| 254 | 4.00 | .000 | -5.3 | 6.60 | 15.0 | .150 | -0.1786 | -0.1600 |
| 255 | 6.00 | .000 | -5.3 | 4.60 | 15.0 | .067 | -0.1377 | -0.1606 |
| 256 | 3.00 | .000 | 14.7 | 4.60 | 15.0 | .094 | -0.0783 | -0.0893 |
| 257 | 5.00 | .000 | 9.8 | 4.50 | 15.0 | .077 | -0.1493 | -0.1492 |
| 258 | 3.00 | .000 | 4.7 | 4.60 | 15.0 | .266 | -0.2028 | -0.1984 |
| 260 | 4.00 | .000 | -0.3 | 4.60 | 15.0 | .230 | -0.2642 | -0.2654* |
| 261 | 4.00 | .000 | -0.3 | 4.60 | 15.0 | .049 | -0.0290 | -0.0530* |
| 262 | 3.00 | .000 | 9.8 | 4.60 | 15.0 | .056 | -0.0226 | -0.0522* |
| 263 | 6.00 | .000 | 9.8 | 4.60 | 15.0 | .033 | -0.0925 | -0.1005* |
| 264 | 4.00 | .000 | -0.3 | 3.60 | 15.0 | .069 | -0.0432 | -0.0806* |
| 265 | 6.00 | .000 | 19.8 | 3.60 | 15.0 | -.009 | -0.0904 | -0.0775* |
| 266 | 4.00 | .000 | 9.8 | 2.60 | 15.0 | .053 | -0.0486 | -0.0794* |
| 267 | 3.00 | .000 | 9.8 | 2.60 | 15.0 | .095 | -0.0504 | -0.0891* |
| 268 | 3.00 | .000 | 4.7 | 2.60 | 15.0 | .089 | -0.0364 | -0.0817* |
| 270 | 1.00 | .000 | 4.8 | 2.50 | 15.0 | .099 | -0.2680 | -0.2937 |
| 271 | 6.00 | .000 | 4.8 | 2.50 | 15.0 | .097 | -0.2793 | -0.2876 |
| 275 | 4.00 | .000 | 9.8 | 2.50 | 15.0 | .117 | -0.1634 | -0.1704 |

R-1851

TABLE A-11 (cont'd)

MEASURED AND FITTED LONGITUDINAL FORCE
BETA=15.DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|------|----------|----------|
| 276 | 4.00 | .000 | 4.8 | 3.60 | 5.0 | .058 | -0.0456 | -0.0624 |
| 277 | 4.00 | .000 | -0.3 | 3.60 | 20.0 | .068 | -0.0458 | -0.0868 |
| 277 | 3.00 | .000 | 14.7 | 3.50 | 20.0 | .049 | -0.0377 | -0.0565* |
| 279 | 4.00 | .000 | 4.8 | 3.50 | 20.0 | .133 | -0.1629 | -0.1667 |
| 280 | 6.00 | .000 | 4.8 | 2.50 | 20.0 | .100 | -0.2734 | -0.2947 |
| 281 | 5.00 | .000 | 4.8 | 2.50 | 20.0 | .168 | -0.3614 | -0.3529 |
| 282 | 6.00 | .000 | 14.7 | 2.50 | 20.0 | .028 | -0.1313 | -0.1332 |
| 283 | 4.00 | .000 | 14.7 | 2.50 | 20.0 | .034 | -0.0568 | -0.0725* |
| 286 | 4.00 | .000 | 14.7 | 2.50 | 20.0 | .020 | -0.0325 | -0.0545* |
| 286 | 3.00 | .000 | 9.7 | 4.50 | 20.0 | .043 | -0.0144 | -0.0481* |
| 287 | 3.00 | .000 | 9.7 | 4.50 | 20.0 | .075 | -0.0420 | -0.0704* |
| 288 | 4.00 | .000 | 19.8 | 4.50 | 20.0 | **** | -0.0457 | -0.0520* |
| 289 | 2.00 | .000 | 14.7 | 4.50 | 20.0 | .098 | -0.0273 | -0.0555* |
| 290 | 2.00 | .000 | 19.8 | 4.60 | 20.0 | .136 | -0.0695 | -0.0705 |
| 294 | 3.00 | .000 | -0.3 | 5.50 | 20.0 | .090 | -0.0511 | -0.0680* |
| 295 | 3.00 | .000 | -0.3 | 5.60 | 20.0 | .056 | -0.0179 | -0.0447* |
| 296 | 4.00 | .000 | -0.3 | 6.60 | 20.0 | .046 | -0.0328 | -0.0384 |
| 297 | 4.00 | .000 | 4.7 | 3.60 | 5.0 | .059 | -0.0536 | -0.0640 |
| 298 | 4.00 | .000 | 4.8 | 1.60 | 5.0 | .082 | -0.1076 | -0.1350 |
| 299 | 4.00 | .000 | 14.7 | 1.60 | 5.0 | .038 | -0.0703 | -0.0892 |
| 300 | 5.00 | .000 | -0.3 | 1.50 | 15.0 | .051 | -0.2088 | -0.1463 |
| 109 | 2.35 | .059 | 0.0 | 3.00 | 0.0 | .069 | -0.0349 | -0.0419 |
| 110 | 2.92 | .073 | 0.0 | 3.00 | 0.0 | .060 | -0.0461 | -0.0415 |
| 111 | 3.88 | .097 | 0.0 | 3.00 | 0.0 | .052 | -0.0675 | -0.0514 |
| 112 | 4.95 | .124 | 0.0 | 3.00 | 0.0 | .045 | -0.0852 | -0.0774 |
| 113 | 6.02 | .150 | 0.0 | 3.00 | 0.0 | .037 | -0.1650 | -0.1164 |
| 114 | 2.87 | .072 | 0.0 | 3.00 | 0.0 | .049 | -0.0429 | -0.0329 |
| 115 | 3.02 | .076 | 0.0 | 3.00 | 0.0 | .081 | -0.0639 | -0.0598 |
| 116 | 3.01 | .075 | 0.0 | 3.00 | 0.0 | .155 | -0.1337 | -0.1236 |
| 117 | 2.82 | .071 | 0.0 | 3.00 | 0.0 | .156 | -0.1175 | -0.1138 |
| 119 | 4.03 | .101 | 0.0 | 3.00 | 0.0 | .181 | -0.2564 | -0.2466 |
| 120 | 3.03 | .076 | 5.0 | 3.00 | 0.0 | .059 | -0.0561 | -0.0408 |
| 121 | 3.02 | .075 | -5.0 | 3.00 | 0.0 | .056 | -0.0490 | -0.0447 |
| 122 | 2.87 | .072 | -10.0 | 3.00 | 0.0 | .052 | -0.0514 | -0.0472 |
| 123 | 2.89 | .072 | -15.0 | 3.00 | 0.0 | .046 | -0.0642 | -0.0536 |
| 124 | 3.05 | .076 | -20.0 | 3.00 | 0.0 | .040 | -0.0809 | -0.0702* |
| 125 | 3.06 | .076 | 0.0 | 3.00 | 5.0 | .058 | 0.0054 | 0.0110* |
| 127 | 3.01 | .075 | 0.0 | 3.00 | -10.0 | .067 | -0.1504 | -0.1559 |
| 128 | 3.03 | .076 | 0.0 | 3.00 | -15.0 | .066 | -0.2008 | -0.2134 |
| 129 | 3.01 | .075 | 0.0 | 3.00 | -20.0 | .055 | -0.2419 | -0.2594 |
| 130 | 2.99 | .075 | 0.0 | 2.00 | 0.0 | .066 | -0.0621 | -0.0633 |
| 131 | 3.02 | .075 | 0.0 | 4.00 | 0.0 | .063 | -0.0440 | -0.0403 |
| 132 | 3.06 | .076 | 0.0 | 5.00 | 0.0 | .054 | -0.0421 | -0.0352 |
| 133 | 3.06 | .076 | 0.0 | 6.00 | 0.0 | .057 | -0.0565 | -0.0380 |
| 136 | 4.04 | .101 | -5.0 | 3.00 | 0.0 | .095 | -0.1380 | -0.1236 |
| 137 | 6.09 | .152 | -15.0 | 5.00 | -10.0 | .003 | -0.5789 | -0.5578 |
| 138 | 6.05 | .151 | -20.0 | 6.00 | -5.0 | **** | -0.4290 | -0.3781 |
| 139 | 4.02 | .100 | -20.0 | 6.00 | -20.0 | **** | -0.4132 | -0.4393 |
| 140 | 5.00 | .125 | 5.0 | 3.00 | -20.0 | .022 | -0.6081 | -0.6216 |
| 141 | 4.99 | .125 | 5.0 | 3.00 | -20.0 | .021 | -0.6186 | -0.6176 |

TABLE A-11 (cont'd)

MEASURED AND FITTED LONGITUDINAL FORCE.
BETA=15. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|------|----------|----------|
| 142 | 2.91 | .073 | -5.0 | 3.00 | -5.0 | .056 | -0.0930 | -0.0919 |
| 143 | 1.65 | .041 | -10.0 | 6.00 | 0.0 | .153 | -0.0521 | -0.0628 |
| 144 | 3.79 | .095 | -10.0 | 3.00 | -20.0 | .093 | -0.4857 | -0.4515 |
| 145 | 4.76 | .112 | 5.0 | 2.00 | -5.0 | .045 | -0.2229 | -0.2206 |
| 147 | 3.87 | .097 | -5.0 | 6.00 | -20.0 | .026 | -0.3901 | -0.3781 |
| 148 | 5.76 | .141 | -10.0 | 3.00 | 5.0 | .097 | -0.1550 | -0.1255 |
| 150 | 3.94 | .098 | -15.0 | 4.00 | -5.0 | .093 | -0.2698 | -0.2386 |
| 151 | 2.95 | .074 | -10.0 | 2.00 | -10.0 | .105 | -0.2213 | -0.2065 |
| 154 | 4.78 | .120 | -5.0 | 3.00 | -5.0 | .032 | -0.1908 | -0.1884 |
| 156 | 3.00 | .075 | 0.0 | 2.00 | -10.0 | .053 | -0.1521 | -0.1591 |
| 157 | 3.02 | .076 | -5.0 | 6.00 | -15.0 | .050 | -0.2137 | -0.2013 |
| 158 | 3.99 | .100 | -5.0 | 6.00 | -15.0 | .040 | -0.3409 | -0.3277 |
| 160 | 2.40 | .060 | -10.0 | 2.00 | -20.0 | .044 | -0.1721 | -0.1818 |
| 161 | 6.18 | .154 | 5.0 | 3.00 | -20.0 | .044 | -1.1230 | -1.0160* |
| 162 | 6.21 | .155 | 5.0 | 3.00 | -20.0 | .040 | -1.0429 | -1.0137 |
| 163 | 6.18 | .154 | -10.0 | 2.00 | -15.0 | .004 | -0.7509 | -0.7338 |
| 164 | 4.38 | .110 | -10.0 | 5.00 | -20.0 | .041 | -0.5427 | -0.5255 |
| 165 | 3.23 | .081 | -10.0 | 2.00 | -20.0 | .082 | -0.3625 | -0.3392 |
| 166 | 2.15 | .054 | -10.0 | 4.00 | -15.0 | .037 | -0.1068 | -0.1118 |
| 167 | 2.64 | .066 | -5.0 | 3.00 | -5.0 | .065 | -0.0847 | -0.0856* |
| 168 | 5.65 | .141 | -5.0 | 5.00 | 5.0 | .073 | -0.0352 | -0.0029* |
| 169 | 4.72 | .118 | -5.0 | 2.00 | -10.0 | .052 | -0.3601 | -0.3649 |
| 170 | 5.81 | .145 | 5.0 | 3.00 | -5.0 | .040 | -0.3326 | -0.3051 |
| 171 | 4.74 | .118 | 0.0 | 2.00 | 5.0 | .064 | -0.0171 | 0.0020* |
| 173 | 5.91 | .148 | -5.0 | 3.00 | 0.0 | .077 | -0.2854 | -0.2380* |
| 174 | 4.83 | .121 | -20.0 | 5.00 | 5.0 | .045 | -0.0214 | -0.0599* |
| 175 | 6.04 | .151 | -20.0 | 5.00 | -5.0 | .020 | -0.4892 | -0.4608 |
| 177 | 3.75 | .094 | -10.0 | 5.00 | 5.0 | .013 | 0.0423 | 0.0508 |
| 178 | 2.96 | .074 | -5.0 | 3.00 | -5.0 | .048 | -0.0931 | -0.0878 |
| 180 | 3.18 | .079 | -15.0 | 4.00 | -10.0 | .111 | -0.2433 | -0.2318 |
| 181 | 5.11 | .128 | -5.0 | 2.00 | -15.0 | .046 | -0.5709 | -0.5682 |
| 182 | 2.15 | .054 | -15.0 | 3.00 | 5.0 | .002 | 0.0078 | 0.0056 |
| 183 | 4.91 | .123 | -20.0 | 5.00 | -15.0 | .012 | -0.5812 | -0.5604 |
| 184 | 5.08 | .127 | 5.0 | 4.00 | 0.0 | .071 | -0.1704 | -0.1269* |
| 527 | 1.82 | .068 | 0.0 | 3.00 | 0.0 | .112 | -0.0337 | -0.0534* |
| 528 | 2.87 | .108 | 0.0 | 3.00 | 0.0 | .076 | -0.0548 | -0.0491 |
| 529 | 3.87 | .145 | 0.0 | 3.00 | 0.0 | .052 | -0.0680 | -0.0484 |
| 530 | 4.98 | .187 | 0.0 | 3.00 | 0.0 | .043 | -0.0810 | -0.0782 |
| 531 | 5.97 | .224 | 0.0 | 3.00 | 0.0 | .037 | -0.0945 | -0.1282 |
| 532 | 2.96 | .111 | 0.0 | 3.00 | 0.0 | .052 | -0.0285 | -0.0317 |
| 533 | 2.97 | .111 | 0.0 | 3.00 | 0.0 | .104 | -0.0844 | -0.0752 |
| 534 | 2.96 | .111 | 0.0 | 3.00 | 0.0 | .154 | -0.1197 | -0.1190 |
| 536 | 3.98 | .149 | 0.0 | 3.00 | 0.0 | .146 | -0.2045 | -0.1892 |
| 537 | 3.97 | .149 | 0.0 | 3.00 | 0.0 | .195 | -0.2963 | -0.2664 |
| 538 | 2.96 | .111 | 5.0 | 3.00 | 0.0 | .075 | -0.0621 | -0.0476 |
| 539 | 2.96 | .111 | -5.0 | 3.00 | 0.0 | .074 | -0.0618 | -0.0556 |
| 540 | 3.00 | .112 | -10.0 | 3.00 | 0.0 | .063 | -0.0631 | -0.0578 |
| 541 | 2.97 | .111 | -15.0 | 3.00 | 0.0 | .044 | -0.0657 | -0.0563 |
| 542 | 2.98 | .112 | -20.0 | 3.00 | 0.0 | .019 | -0.0571 | -0.0557 |
| 543 | 2.98 | .112 | 0.0 | 3.00 | 5.0 | .074 | 0.0214 | 0.0257 |

R-1851

TABLE A-11 (cont'd)

MEASURED AND FITTED LONGITUDINAL FORCE
BETA=15. DEG

| PLN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|------|----------|----------|
| 544 | 2.98 | .112 | 0.0 | 3.00 | -5.0 | .078 | -0.1312 | -0.1309 |
| 545 | 2.99 | .112 | 0.0 | 3.00 | -10.0 | .079 | -0.2101 | -0.2111 |
| 546 | 2.97 | .112 | 0.0 | 3.00 | -20.0 | .057 | -0.3377 | -0.3509 |
| 547 | 2.99 | .112 | 0.0 | 3.00 | -15.0 | .084 | -0.2872 | -0.2950 |
| 548 | 2.97 | .111 | 0.0 | 2.00 | 0.0 | .080 | -0.0778 | -0.0718 |
| 549 | 2.98 | .112 | 0.0 | 4.00 | 0.0 | .060 | -0.0411 | -0.0354 |
| 550 | 2.97 | .112 | 0.0 | 5.00 | 0.0 | .059 | -0.0503 | -0.0361 |
| 551 | 3.01 | .113 | 0.0 | 6.00 | 0.0 | .055 | -0.0491 | -0.0349 |
| 552 | 1.90 | .071 | -15.0 | 4.00 | 5.0 | .136 | -0.0336 | -0.0261 |
| 553 | 4.03 | .151 | -5.0 | 3.00 | -5.0 | .064 | -0.2279 | -0.2221 |
| 555 | 5.98 | .224 | 5.0 | 4.00 | -20.0 | .064 | -1.3781 | -1.3905 |
| 556 | 4.99 | .187 | -10.0 | 4.00 | 5.0 | .136 | -0.1088 | -0.0904 |
| 558 | 3.99 | .150 | -15.0 | 6.00 | 0.0 | .003 | -0.0572 | -0.0664 |
| 559 | 3.00 | .113 | -5.0 | 3.00 | -5.0 | .071 | -0.1347 | -0.1325 |
| 560 | 6.00 | .225 | 0.0 | 2.00 | -5.0 | .051 | -0.4762 | -0.5061 |
| 561 | 5.00 | .188 | -15.0 | 5.00 | 0.0 | .065 | -0.1945 | -0.2197* |
| 564 | 6.01 | .225 | -20.0 | 3.00 | 5.0 | .054 | -0.0273 | -0.0701* |
| 566 | 6.01 | .225 | 0.0 | 3.00 | 5.0 | .086 | 0.0231 | 0.0298 |
| 567 | 6.00 | .225 | -20.0 | 5.00 | -20.0 | **** | -1.4092 | -1.4219 |
| 568 | 3.98 | .149 | -10.0 | 6.00 | 0.0 | .014 | -0.0461 | -0.0476 |
| 569 | 3.97 | .149 | 5.0 | 4.00 | -10.0 | .169 | -0.5085 | -0.4791* |
| 570 | 2.99 | .112 | -5.0 | 3.00 | 0.0 | .146 | -0.2365 | -0.1174* |
| 571 | 4.97 | .186 | -5.0 | 6.00 | -20.0 | .049 | -0.9344 | -0.9518 |
| 572 | 3.00 | .112 | -5.0 | 3.00 | -5.0 | .071 | -0.1359 | -0.1319 |
| 573 | 5.95 | .223 | -5.0 | 2.00 | -20.0 | .082 | -1.4975 | -1.4976 |
| 577 | 4.97 | .186 | 5.0 | 3.00 | -20.0 | .106 | -1.0436 | -1.0559 |
| 579 | 1.99 | .075 | -15.0 | 6.00 | -5.0 | .186 | -0.1372 | -0.1305 |
| 580 | 2.96 | .111 | 0.0 | 6.00 | -20.0 | .191 | -0.4686 | -0.4374 |
| 581 | 6.00 | .225 | -20.0 | 2.00 | 0.0 | **** | -0.1691 | -0.2105 |
| 583 | 5.95 | .223 | -15.0 | 2.00 | -5.0 | .050 | -0.5889 | -0.5932 |
| 585 | 6.01 | .225 | -10.0 | 3.00 | -5.0 | .058 | -0.5327 | -0.5631 |
| 586 | 2.96 | .111 | -5.0 | 3.00 | -5.0 | .072 | -0.1098 | -0.1295 |
| 588 | 3.91 | .147 | -5.0 | 3.00 | -5.0 | .125 | -0.3186 | -0.2925 |
| 593 | 4.03 | .151 | -10.0 | 6.00 | -5.0 | .021 | -0.2057 | -0.2000 |
| 594 | 2.97 | .111 | -20.0 | 4.00 | 0.0 | .138 | -0.1544 | -0.1388 |
| 595 | 3.01 | .113 | 0.0 | 4.00 | -15.0 | .104 | -0.3123 | -0.3081 |
| 596 | 2.03 | .076 | -5.0 | 5.00 | 5.0 | .276 | -0.1068 | -0.0772 |
| 598 | 3.01 | .113 | -10.0 | 5.00 | -10.0 | .128 | -0.2952 | -0.2692 |
| 599 | 3.02 | .113 | -5.0 | 3.00 | -5.0 | .073 | -0.1371 | -0.1352 |
| 600 | 2.01 | .075 | -10.0 | 6.00 | -10.0 | .254 | -0.2083 | -0.1914 |
| 601 | 5.02 | .188 | -20.0 | 5.00 | -10.0 | .026 | -0.6272 | -0.6427 |
| 602 | 5.05 | .189 | -20.0 | 2.00 | -10.0 | **** | -0.5001 | -0.4963 |
| 603 | 3.05 | .114 | -15.0 | 5.00 | -15.0 | .036 | -0.3104 | -0.3056 |
| 604 | 5.99 | .225 | -10.0 | 4.00 | -15.0 | .052 | -1.1381 | -1.1386 |
| 618 | 1.92 | .144 | 0.0 | 3.00 | 0.0 | .093 | -0.0263 | -0.0346 |
| 619 | 2.99 | .224 | 0.0 | 3.00 | 0.0 | .070 | -0.0298 | -0.0292 |
| 620 | 2.50 | .188 | 0.0 | 3.00 | 0.0 | .078 | -0.0274 | -0.0283 |
| 621 | 3.07 | .230 | 0.0 | 3.00 | 0.0 | .050 | -0.0162 | -0.0115 |
| 622 | 3.06 | .230 | 0.0 | 3.00 | 0.0 | .086 | -0.0473 | -0.0480 |
| 623 | 3.05 | .228 | 0.0 | 3.00 | 0.0 | .136 | -0.0842 | -0.1001 |

TABLE A-11 (cont'd)

MEASURED AND FITTED LONGITUDINAL FORCE
BETA=15.DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|------|----------|----------|
| 625 | 3.01 | .226 | 5.0 | 3.00 | 0.0 | .061 | -0.0273 | -0.0126 |
| 626 | 2.99 | .224 | -5.0 | 3.00 | 0.0 | .066 | -0.0362 | -0.0369 |
| 627 | 3.01 | .226 | -10.0 | 3.00 | 0.0 | .049 | -0.0297 | -0.0380 |
| 628 | 3.00 | .225 | -15.0 | 3.00 | 0.0 | .028 | -0.0284 | -0.0403 |
| 629 | 3.01 | .226 | -20.0 | 3.00 | 0.0 | .003 | -0.0242 | -0.0462 |
| 630 | 2.98 | .223 | 0.0 | 3.00 | 5.0 | .063 | 0.1267 | 0.1295 |
| 631 | 2.97 | .223 | 0.0 | 3.00 | -5.0 | .070 | -0.1811 | -0.1826 |
| 632 | 2.96 | .222 | 0.0 | 3.00 | -10.0 | .071 | -0.3287 | -0.3336 |
| 633 | 2.97 | .223 | 0.0 | 3.00 | -15.0 | .072 | -0.4744 | -0.4876 |
| 634 | 2.97 | .223 | 0.0 | 3.00 | -20.0 | .053 | -0.6102 | -0.6223 |
| 635 | 2.97 | .223 | 0.0 | 2.00 | 0.0 | .062 | -0.0394 | -0.0315 |
| 636 | 2.98 | .223 | 0.0 | 4.00 | 0.0 | .060 | -0.0285 | -0.0209 |
| 637 | 2.98 | .223 | 0.0 | 5.00 | 0.0 | .053 | -0.0260 | -0.0210 |
| 638 | 2.98 | .223 | 0.0 | 6.00 | 0.0 | .048 | -0.0281 | -0.0218 |
| 639 | 2.47 | .185 | 0.0 | 6.00 | -20.0 | .058 | -0.4332 | -0.4356 |
| 640 | 2.48 | .186 | 5.0 | 6.00 | -5.0 | .232 | -0.2334 | -0.2490 |
| 641 | 2.96 | .222 | -5.0 | 3.00 | -5.0 | .108 | -0.2289 | -0.2262 |
| 642 | 2.48 | .186 | -5.0 | 6.00 | 5.0 | .275 | -0.0726 | -0.0615 |
| 643 | 1.97 | .148 | 0.0 | 4.00 | -10.0 | .206 | -0.2113 | -0.2191 |
| 644 | 2.50 | .187 | -20.0 | 3.00 | -10.0 | *** | -0.2300 | -0.2290 |
| 645 | 1.99 | .149 | -20.0 | 3.00 | -10.0 | .069 | -0.1844 | -0.1702 |
| 646 | 2.96 | .222 | -5.0 | 3.00 | -5.0 | .061 | -0.1875 | -0.1822 |
| 660 | 2.99 | .224 | -15.0 | 3.00 | 5.0 | .071 | 0.0776 | 0.0776 |
| 661 | 1.99 | .150 | -5.0 | 3.00 | -15.0 | .106 | -0.2435 | -0.2516 |
| 662 | 2.99 | .224 | -20.0 | 6.00 | -10.0 | .108 | -0.4567 | -0.4823 |
| 665 | 2.51 | .188 | 0.0 | 3.00 | -5.0 | .092 | -0.1524 | -0.1483 |
| 667 | 3.00 | .225 | 5.0 | 6.00 | -10.0 | .181 | -0.4510 | -0.4541 |
| 668 | 2.00 | .150 | -5.0 | 3.00 | -10.0 | .066 | -0.1644 | -0.1656 |
| 670 | 2.99 | .224 | -5.0 | 5.00 | -20.0 | .158 | -0.7585 | -0.7429* |
| 671 | 2.51 | .188 | 5.0 | 5.00 | 0.0 | .043 | -0.0245 | 0.0032* |
| 672 | 2.99 | .224 | -5.0 | 3.00 | -5.0 | .056 | -0.1907 | -0.1818 |
| 673 | 1.99 | .149 | -5.0 | 6.00 | -5.0 | .255 | -0.1913 | -0.1883 |
| 674 | 2.50 | .188 | 5.0 | 5.00 | 0.0 | .091 | -0.0461 | -0.0337 |
| 675 | 2.50 | .188 | -5.0 | 6.00 | 0.0 | .037 | -0.0230 | -0.0176 |
| 676 | 1.99 | .149 | -20.0 | 3.00 | -20.0 | *** | -0.2777 | -0.2689 |
| 678 | 1.99 | .149 | -10.0 | 3.00 | 5.0 | .079 | 0.0318 | 0.0312 |
| 681 | 2.51 | .188 | -10.0 | 6.00 | -15.0 | .034 | -0.3514 | -0.3608 |
| 682 | 2.50 | .187 | 5.0 | 6.00 | -10.0 | .256 | -0.3585 | -0.3735 |
| 683 | 2.97 | .223 | -5.0 | 3.00 | -5.0 | .075 | -0.1877 | -0.1965 |
| 685 | 2.99 | .224 | -15.0 | 6.00 | 0.0 | .229 | -0.2115 | -0.2279 |
| 686 | 2.50 | .188 | -15.0 | 8.00 | 0.0 | .279 | -0.2239 | -0.2294 |
| 688 | 2.99 | .224 | 0.0 | 5.00 | -15.0 | .185 | -0.5974 | -0.6060 |
| 689 | 2.00 | .150 | 0.0 | 5.00 | 5.0 | .077 | 0.0490 | 0.0427 |
| 690 | 3.00 | .225 | 5.0 | 6.00 | -20.0 | .124 | -0.7100 | -0.6938 |
| 691 | 2.02 | .152 | -5.0 | 8.00 | -15.0 | .342 | -0.4088 | -0.4116 |
| 693 | 2.46 | .185 | -10.0 | 2.00 | 5.0 | .086 | 0.0485 | 0.0437 |
| 694 | 2.96 | .222 | -5.0 | 4.00 | -10.0 | .124 | -0.4394 | -0.4444 |
| 695 | 2.96 | .222 | 5.0 | 3.00 | -5.0 | .073 | -0.1856 | -0.1940 |
| 697 | 2.47 | .185 | -10.0 | 6.00 | 0.0 | .224 | -0.1337 | -0.1480 |
| 698 | 2.99 | .224 | -10.0 | 6.00 | -5.0 | .134 | -0.2763 | -0.2949 |

R-1851

TABLE A-11 (cont'd)

MEASURED AND FITTED LONGITUDINAL FORCE
BLTA=15. DEG

| RUN | CV | V | PFI | THETA | PSI | ZI | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|------|----------|---------|
| 699 | 3.00 | .225 | 5.0 | 8.00 | -10.0 | .222 | -0.5112 | -0.5160 |
| 700 | 3.00 | .225 | -20.0 | 4.00 | -5.0 | .177 | -0.3419 | -0.3414 |
| 701 | 2.48 | .186 | -20.0 | 5.00 | -20.0 | .087 | -0.5149 | -0.5163 |

MEAN ERROR= 0.0019
STANDARD DEVIATION= 0.0021

R-1851

TABLE A-12

MEASURED AND FITTED LONGITUDINAL FORCE
BETA=20.DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|------|-------|------|-------|----------|----------|
| 316 | 4.00 | .000 | 4.8 | 3.70 | 5.0 | .086 | -0.0591 | -0.0825 |
| 317 | 4.00 | .000 | 4.7 | 3.70 | 5.0 | .088 | -0.0648 | -0.0847* |
| 318 | 4.00 | .000 | 4.7 | 3.60 | 0.0 | .131 | -0.0632 | -0.1438* |
| 326 | 4.00 | .000 | 4.7 | 3.60 | 0.0 | .116 | -0.1053 | -0.1234 |
| 328 | 4.00 | .000 | 9.7 | 3.70 | 0.0 | .070 | -0.0552 | -0.0690 |
| 329 | 4.00 | .000 | 14.7 | 3.70 | 0.0 | .047 | -0.0432 | -0.0547 |
| 330 | 4.00 | .000 | 19.8 | 3.60 | 0.0 | .025 | -0.0418 | -0.0480 |
| 331 | 4.00 | .000 | 27.2 | 3.60 | 0.0 | -.006 | -0.0457 | -0.0494 |
| 332 | 3.00 | .000 | 19.7 | 3.60 | 0.0 | .191 | -0.1529 | -0.1577 |
| 337 | 4.00 | .000 | 27.3 | 4.70 | 0.0 | .179 | -0.2764 | -0.2845* |
| 340 | 3.00 | .000 | 4.7 | 2.60 | 0.0 | .098 | -0.0437 | -0.0771 |
| 342 | 6.00 | .000 | 19.8 | 3.70 | 0.0 | .141 | -0.4405 | -0.4917 |
| 344 | 3.00 | .000 | 27.3 | 5.70 | 0.0 | .281 | -0.2530 | -0.2429 |
| 345 | 3.00 | .000 | 27.3 | 5.60 | 0.0 | .173 | -0.1460 | -0.1680 |
| 349 | 5.00 | .000 | 4.8 | 5.60 | 0.0 | .053 | -0.0525 | -0.0758* |
| 351 | 6.00 | .000 | -5.3 | 6.70 | 0.0 | .051 | -0.0930 | -0.1920* |
| 353 | 2.00 | .000 | 27.2 | 6.70 | 0.0 | .068 | -0.0272 | -0.0470 |
| 354 | 3.00 | .000 | -5.3 | 6.60 | 0.0 | .110 | -0.0585 | -0.0840 |
| 355 | 4.00 | .000 | 9.8 | 6.70 | 0.0 | .186 | -0.2425 | -0.2172 |
| 356 | 3.00 | .000 | -0.3 | 6.70 | -5.0 | .236 | -0.1564 | -0.1675 |
| 357 | 4.00 | .000 | 9.7 | 6.70 | -5.0 | .069 | -0.0731 | -0.0818 |
| 358 | 4.00 | .000 | 9.7 | 6.70 | -5.0 | .060 | -0.0793 | -0.0705 |
| 359 | 4.00 | .000 | 9.7 | 6.70 | -5.0 | .061 | -0.0785 | -0.0713 |
| 362 | 4.00 | .000 | 9.7 | 5.60 | -5.0 | .065 | -0.0757 | -0.0663 |
| 364 | 3.00 | .000 | 14.7 | 5.70 | -5.0 | .266 | -0.2075 | -0.1845 |
| 365 | 5.00 | .000 | 19.8 | 5.60 | -5.0 | .170 | -0.3824 | -0.3423 |
| 366 | 6.00 | .000 | 19.8 | 4.70 | -5.0 | .132 | -0.4341 | -0.4359 |
| 368 | 4.00 | .000 | 9.7 | 2.60 | -5.0 | .109 | -0.1063 | -0.1402 |
| 369 | 2.00 | .000 | 9.7 | 2.60 | -5.0 | .172 | -0.0509 | -0.0487 |
| 370 | 4.00 | .000 | 14.7 | 2.60 | -5.0 | .045 | -0.0553 | -0.0579 |
| 371 | 5.00 | .000 | 4.7 | 2.60 | -5.0 | .145 | -0.2568 | -0.2956 |
| 374 | 5.00 | .000 | -0.3 | 3.60 | -5.0 | .069 | -0.0877 | -0.0894 |
| 375 | 5.00 | .000 | -0.3 | 3.60 | -5.0 | .067 | -0.0888 | -0.0844 |
| 376 | 4.00 | .000 | -0.3 | 3.60 | -5.0 | .087 | -0.0706 | -0.0794 |
| 377 | 4.00 | .000 | 4.7 | 3.60 | 5.0 | .061 | -0.0640 | -0.0765 |
| 378 | 4.00 | .000 | 4.8 | 3.60 | 5.0 | .064 | -0.0536 | -0.0541 |
| 379 | 4.00 | .000 | -0.3 | 3.60 | 5.0 | .084 | -0.0688 | -0.0761 |
| 380 | 3.00 | .000 | -5.3 | 3.60 | 5.0 | .148 | -0.0710 | -0.0973* |
| 381 | 3.00 | .000 | -0.3 | 2.60 | 5.0 | .117 | -0.0544 | -0.0906* |
| 382 | 5.00 | .000 | 4.7 | 2.60 | 5.0 | .076 | -0.1174 | -0.1291 |
| 383 | 3.00 | .000 | 19.7 | 2.60 | 5.0 | .028 | -0.0258 | -0.0496* |
| 385 | 5.00 | .000 | 14.8 | 2.60 | 5.0 | .153 | -0.3709 | -0.3662 |
| 387 | 6.00 | .000 | 4.8 | 2.60 | 5.0 | .151 | -0.4624 | -0.4866 |
| 388 | 3.00 | .000 | -5.2 | 6.70 | 5.0 | .310 | -0.2266 | -0.2219 |
| 389 | 5.00 | .000 | 9.7 | 6.60 | 5.0 | .040 | -0.0733 | -0.0899 |
| 395 | 4.00 | .000 | 27.4 | 5.60 | 5.0 | .176 | -0.2840 | -0.2966 |
| 396 | 4.00 | .000 | 4.8 | 3.60 | 5.0 | .081 | -0.0586 | -0.0764 |
| 397 | 4.00 | .000 | -0.2 | 3.60 | 10.0 | .084 | -0.0551 | -0.0738 |
| 398 | 3.00 | .000 | -5.3 | 3.60 | 10.0 | .146 | -0.0646 | -0.0914 |
| 399 | 4.00 | .000 | 9.8 | 3.60 | 10.0 | .087 | -0.0945 | -0.0980 |

R-1851

TABLE A-12 (cont'd)

MEASURED AND FITTED LONGITUDINAL FORCE
BETA=20. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|------|-------|------|-------|----------|----------|
| 400 | 5.00 | .000 | 19.7 | 3.60 | 10.0 | .019 | -0.0738 | -0.0622 |
| 401 | 4.00 | .000 | 14.8 | 3.60 | 10.0 | .163 | -0.2198 | -0.2249 |
| 402 | 3.00 | .000 | 14.7 | 6.60 | 10.0 | .223 | -0.1953 | -0.1880 |
| 403 | 3.00 | .000 | 4.7 | 6.60 | 10.0 | .152 | -0.1106 | -0.1167 |
| 404 | 5.00 | .000 | -0.3 | 6.60 | 10.0 | .091 | -0.1525 | -0.1623* |
| 405 | 2.00 | .000 | -5.3 | 6.60 | 10.0 | .120 | -0.0263 | -0.0551 |
| 406 | 4.00 | .000 | 27.3 | 6.60 | 10.0 | -.027 | -0.0444 | -0.0453 |
| 407 | 3.00 | .000 | 27.2 | 6.60 | 10.0 | -.025 | -0.0164 | -0.0194 |
| 408 | 2.00 | .000 | 19.7 | 4.60 | 10.0 | .038 | -0.0068 | -0.0321 |
| 409 | 4.00 | .000 | 9.7 | 2.60 | 10.0 | .063 | -0.0597 | -0.0761 |
| 410 | 3.00 | .000 | 27.3 | 5.60 | 10.0 | -.016 | -0.0310 | -0.0413 |
| 411 | 3.00 | .000 | -5.2 | 5.60 | 10.0 | .211 | -0.1346 | -0.1333 |
| 412 | 3.00 | .000 | -5.3 | 5.60 | 10.0 | .212 | -0.1307 | -0.1336 |
| 413 | 5.00 | .000 | -5.2 | 5.50 | 15.0 | .089 | -0.1326 | -0.1352 |
| 414 | 3.00 | .000 | -0.3 | 5.60 | 15.0 | .201 | -0.1192 | -0.1278 |
| 415 | 5.00 | .000 | 19.7 | 5.50 | 15.0 | .028 | -0.1142 | -0.1161 |
| 417 | 5.00 | .000 | -0.3 | 5.50 | 15.0 | .057 | -0.0730 | -0.0822 |
| 419 | 6.00 | .000 | 27.2 | 3.60 | 15.0 | -.048 | -0.0625 | 0.0159 |
| 420 | 4.00 | .000 | 14.8 | 2.60 | 15.0 | .056 | -0.0649 | -0.0834 |
| 421 | 3.00 | .000 | 4.8 | 2.60 | 15.0 | .109 | -0.0482 | -0.0822 |
| 422 | 3.00 | .000 | 9.8 | 2.60 | 15.0 | .152 | -0.0747 | -0.1283 |
| 423 | 4.00 | .000 | 14.8 | 2.60 | 15.0 | .130 | -0.1925 | -0.1996 |
| 424 | 6.00 | .000 | 4.8 | 2.60 | 15.0 | .125 | -0.3826 | -0.3719 |
| 427 | 5.00 | .000 | 14.8 | 4.50 | 15.0 | .077 | -0.1684 | -0.1609 |
| 428 | 4.00 | .000 | 4.8 | 4.60 | 15.0 | .215 | -0.2523 | -0.2393 |
| 429 | 4.00 | .000 | -0.2 | 4.70 | 15.0 | .290 | -0.3268 | -0.3276 |
| 430 | 6.00 | .000 | -5.2 | 4.60 | 15.0 | .080 | -0.1736 | -0.1971 |
| 431 | 3.00 | .000 | 14.8 | 4.60 | 15.0 | .135 | -0.0913 | -0.1118 |
| 432 | 5.00 | .000 | 14.8 | 4.60 | 15.0 | .033 | -0.0579 | -0.0746 |
| 433 | 3.00 | .000 | 14.7 | 4.60 | 15.0 | .056 | -0.0237 | -0.0593 |
| 434 | 4.00 | .000 | -0.3 | 4.60 | 15.0 | .063 | -0.0243 | -0.0468 |
| 435 | 2.00 | .000 | 4.7 | 6.70 | 15.0 | .123 | -0.0209 | -0.0624 |
| 436 | 6.00 | .000 | 9.7 | 6.70 | 15.0 | .041 | -0.0896 | -0.2005 |
| 437 | 3.00 | .000 | 27.2 | 6.60 | 15.0 | .001 | -0.0462 | -0.0544 |
| 438 | 4.00 | .000 | -5.2 | 6.60 | 15.0 | .185 | -0.2047 | -0.1943 |
| 439 | 4.00 | .000 | -0.3 | 6.60 | 20.0 | .051 | -0.0321 | -0.0576 |
| 440 | 3.00 | .000 | 4.7 | 5.60 | 20.0 | .075 | -0.0201 | -0.0587 |
| 443 | 6.00 | .000 | 27.2 | 5.50 | 20.0 | -.013 | -0.1914 | -0.1722 |
| 445 | 2.00 | .000 | 27.3 | 4.60 | 20.0 | .138 | -0.0770 | -0.0633 |
| 446 | 4.00 | .000 | 27.2 | 4.60 | 20.0 | -.025 | -0.0379 | -0.0412 |
| 447 | 2.00 | .000 | 19.8 | 4.60 | 20.0 | .112 | -0.0352 | -0.0506 |
| 448 | 3.00 | .000 | 4.7 | 4.60 | 20.0 | .115 | -0.0565 | -0.0746* |
| 449 | 3.00 | .000 | 9.7 | 4.60 | 20.0 | .065 | -0.0179 | -0.0549* |
| 450 | 4.00 | .000 | -0.3 | 3.60 | 20.0 | .085 | -0.0572 | -0.0683* |
| 451 | 3.00 | .000 | 19.7 | 3.60 | 20.0 | .057 | -0.0420 | -0.0700* |
| 453 | 6.00 | .000 | 9.8 | 3.60 | 20.0 | .119 | -0.3235 | -0.3373 |
| 454 | 4.00 | .000 | 9.8 | 3.60 | 20.0 | .190 | -0.2369 | -0.2362 |
| 455 | 6.00 | .000 | 19.7 | 2.60 | 20.0 | .032 | -0.1389 | -0.1487 |
| 456 | 4.00 | .000 | 14.8 | 2.60 | 20.0 | .072 | -0.0882 | -0.1057* |
| 457 | 4.00 | .000 | 19.8 | 1.60 | 20.0 | .014 | -0.0250 | -0.0547* |

TABLE A-12 (cont'd)

MEASURED AND FITTED LONGITUDINAL FORCE
BETA=20. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|---------|
| 459 | 4.00 | .000 | 4.8 | 3.60 | 5.0 | .077 | -0.0650 | -0.0718 |
| 211 | 2.07 | .052 | 0.0 | 3.00 | 0.0 | .106 | -0.0435 | -0.0316 |
| 212 | 2.96 | .074 | 0.0 | 3.00 | 0.0 | .079 | -0.0625 | -0.0506 |
| 213 | 3.92 | .098 | 0.0 | 3.00 | 0.0 | .070 | -0.0924 | -0.0641 |
| 214 | 5.00 | .125 | 0.0 | 3.00 | 0.0 | .056 | -0.1137 | -0.0790 |
| 215 | 5.96 | .149 | 0.0 | 3.00 | 0.0 | .047 | -0.1931 | -0.1315 |
| 216 | 2.94 | .074 | 0.0 | 3.00 | 0.0 | .069 | -0.0554 | -0.0434 |
| 217 | 3.01 | .075 | 0.0 | 3.00 | 0.0 | .106 | -0.0898 | -0.0728 |
| 218 | 3.02 | .075 | 0.0 | 3.00 | 0.0 | .146 | -0.1315 | -0.1068 |
| 219 | 3.97 | .099 | 0.0 | 3.00 | 0.0 | .122 | -0.1732 | -0.1423 |
| 220 | 4.00 | .100 | 0.0 | 3.00 | 0.0 | .147 | -0.2135 | -0.1846 |
| 221 | 5.00 | .125 | 0.0 | 3.00 | 0.0 | .120 | -0.2584 | -0.2349 |
| 222 | 4.95 | .124 | 0.0 | 3.00 | 0.0 | .146 | -0.3214 | -0.2934 |
| 223 | 5.96 | .149 | 0.0 | 3.00 | 0.0 | .116 | -0.4409 | -0.3685 |
| 224 | 3.00 | .075 | 5.0 | 3.00 | 0.0 | .074 | -0.0574 | -0.0479 |
| 225 | 2.97 | .074 | -5.0 | 3.00 | 0.0 | .074 | -0.0579 | -0.0503 |
| 226 | 2.99 | .075 | -10.0 | 3.00 | 0.0 | .069 | -0.0628 | -0.0532 |
| 227 | 2.99 | .075 | -15.0 | 3.00 | 0.0 | .060 | -0.0648 | -0.0568 |
| 228 | 2.97 | .074 | -20.0 | 3.00 | 0.0 | .048 | -0.0700 | -0.0606 |
| 229 | 2.95 | .074 | -27.5 | 3.00 | 0.0 | .029 | -0.0843 | -0.0730 |
| 230 | 2.98 | .074 | 0.0 | 3.00 | 5.0 | .079 | -0.0092 | 0.0045* |
| 231 | 2.98 | .074 | 0.0 | 3.00 | -5.0 | .078 | -0.1066 | -0.1052 |
| 232 | 2.94 | .073 | 0.0 | 3.00 | -10.0 | .079 | -0.1483 | -0.1541 |
| 233 | 3.02 | .075 | 0.0 | 3.00 | -15.0 | .078 | -0.2083 | -0.2135 |
| 234 | 3.01 | .075 | 0.0 | 3.00 | -20.0 | .088 | -0.2615 | -0.2678 |
| 235 | 2.98 | .075 | 0.0 | 2.00 | 0.0 | .088 | -0.0851 | -0.0792 |
| 236 | 3.00 | .075 | 0.0 | 4.00 | 0.0 | .078 | -0.0569 | -0.0450 |
| 237 | 3.01 | .075 | 0.0 | 5.00 | 0.0 | .081 | -0.0657 | -0.0493 |
| 238 | 2.97 | .074 | 0.0 | 6.00 | 0.0 | .065 | -0.0494 | -0.0417 |
| 239 | 4.90 | .123 | 5.0 | 2.00 | 0.0 | .123 | -0.3208 | -0.2859 |
| 240 | 4.00 | .100 | -5.0 | 3.00 | 0.0 | .125 | -0.1737 | -0.1533 |
| 241 | 5.99 | .150 | -15.0 | 5.00 | -10.0 | .014 | -0.5463 | -0.5505 |
| 242 | 5.99 | .150 | -27.5 | 6.00 | -5.0 | -.038 | -0.3773 | -0.3901 |
| 243 | 3.97 | .099 | -27.5 | 6.00 | -20.0 | -.046 | -0.4025 | -0.4112 |
| 244 | 2.99 | .075 | -5.0 | 3.00 | -5.0 | .077 | -0.1105 | -0.1093 |
| 245 | 4.91 | .123 | 5.0 | 3.00 | -20.0 | .056 | -0.6164 | -0.6304 |
| 246 | 1.74 | .044 | -15.0 | 6.00 | 0.0 | .155 | -0.0444 | -0.0558 |
| 247 | 3.90 | .098 | -10.0 | 2.00 | -20.0 | .111 | -0.5371 | -0.5317 |
| 248 | 4.96 | .124 | 5.0 | 2.00 | -5.0 | .059 | -0.2494 | -0.2664 |
| 250 | 3.99 | .100 | -5.0 | 6.00 | -20.0 | .058 | -0.4113 | -0.4306 |
| 252 | 6.05 | .151 | -10.0 | 3.00 | 5.0 | .105 | -0.1637 | -0.1435 |
| 254 | 3.98 | .099 | -20.0 | 4.00 | -5.0 | .104 | -0.2828 | -0.2617 |
| 255 | 2.99 | .075 | -10.0 | 3.00 | -10.0 | .136 | -0.2189 | -0.2156 |
| 256 | 2.97 | .074 | -5.0 | 3.00 | -5.0 | .079 | -0.1100 | -0.1095 |
| 259 | 5.02 | .125 | -20.0 | 4.00 | 5.0 | .135 | -0.1838 | -0.1628 |
| 261 | 3.00 | .075 | -5.0 | 2.00 | -10.0 | .067 | -0.1620 | -0.1755 |
| 262 | 4.01 | .100 | -5.0 | 6.00 | -15.0 | .059 | -0.3351 | -0.3434 |
| 263 | 2.10 | .053 | -15.0 | 2.00 | -20.0 | .055 | -0.1336 | -0.1393 |
| 264 | 6.06 | .152 | 5.0 | 3.00 | -20.0 | .052 | -0.9788 | -0.9944 |
| 265 | 6.09 | .152 | -15.0 | 2.00 | -15.0 | .027 | -0.7971 | -0.8277 |

TABLE A-12 (cont'd)

MEASURED AND FITTED LONGITUDINAL FORCE
BETA=20. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|------|----------|----------|
| 266 | 4.00 | .100 | -10.0 | 5.00 | -20.0 | .086 | -0.4888 | -0.4806 |
| 267 | 4.93 | .123 | -15.0 | 2.00 | -20.0 | .063 | -0.7445 | -0.7495 |
| 268 | 2.98 | .074 | -5.0 | 3.00 | -5.0 | .078 | -0.1086 | -0.1091 |
| 269 | 2.03 | .051 | -15.0 | 4.00 | -15.0 | .069 | -0.1034 | -0.1101* |
| 270 | 5.97 | .149 | -5.0 | 5.00 | 5.0 | .095 | -0.5378 | -0.0867* |
| 271 | 4.95 | .124 | -10.0 | 2.00 | -10.0 | .056 | -0.4095 | -0.4289 |
| 272 | 5.93 | .148 | 0.0 | 3.00 | -5.0 | .067 | -0.4270 | -0.4054* |
| 273 | 5.00 | .125 | -5.0 | 2.00 | 5.0 | .069 | -0.0112 | 0.0115* |
| 274 | 5.95 | .149 | -5.0 | 3.00 | 0.0 | .099 | -0.3609 | -0.3147* |
| 275 | 4.97 | .124 | -20.0 | 5.00 | 5.0 | .040 | -0.0083 | 0.0074* |
| 276 | 5.98 | .150 | -25.0 | 5.00 | -5.0 | .031 | -0.5135 | -0.5063 |
| 278 | 5.62 | .140 | 5.0 | 6.00 | -15.0 | .104 | -0.7983 | -0.7842 |
| 279 | 2.75 | .069 | -5.0 | 3.00 | -5.0 | .093 | -0.0945 | -0.1042 |
| 280 | 3.69 | .092 | -15.0 | 5.00 | 5.0 | .021 | 0.0351 | 0.0482 |
| 282 | 4.09 | .102 | -20.0 | 4.00 | -10.0 | .083 | -0.3625 | -0.3521 |
| 283 | 4.92 | .123 | -10.0 | 2.00 | -15.0 | .066 | -0.5281 | -0.5293* |
| 284 | 2.06 | .052 | -20.0 | 3.00 | 5.0 | .062 | -0.0147 | -0.0000 |
| 285 | 4.84 | .121 | -25.0 | 5.00 | -15.0 | .025 | -0.5561 | -0.5765 |
| 312 | 2.26 | .085 | 0.0 | 3.00 | 0.0 | .095 | -0.0519 | -0.0332 |
| 313 | 3.20 | .120 | 0.0 | 3.00 | 0.0 | .084 | -0.0706 | -0.0572 |
| 314 | 4.29 | .161 | 0.0 | 3.00 | 0.0 | .055 | -0.0706 | -0.0523 |
| 315 | 5.24 | .196 | 0.0 | 3.00 | 0.0 | .046 | -0.0864 | -0.0860 |
| 316 | 6.14 | .230 | 0.0 | 3.00 | 0.0 | .037 | -0.1024 | -0.1607* |
| 317 | 3.12 | .117 | 0.0 | 3.00 | 0.0 | .063 | -0.0474 | -0.0370 |
| 318 | 3.01 | .113 | 0.0 | 3.00 | 0.0 | .125 | -0.0982 | -0.0850 |
| 320 | 4.16 | .153 | 0.0 | 3.00 | 0.0 | .125 | -0.1916 | -0.1682 |
| 321 | 4.05 | .152 | 0.0 | 3.00 | 0.0 | .125 | -0.1774 | -0.1596 |
| 324 | 4.99 | .187 | 0.0 | 3.00 | 0.0 | .129 | -0.2730 | -0.2768 |
| 325 | 4.99 | .187 | 0.0 | 3.00 | 0.0 | .152 | -0.3251 | -0.3379 |
| 326 | 3.01 | .113 | 5.0 | 3.00 | 0.0 | .078 | -0.0546 | -0.0472 |
| 327 | 3.01 | .113 | -5.0 | 3.00 | 0.0 | .081 | -0.0565 | -0.0534 |
| 328 | 2.99 | .112 | -10.0 | 3.00 | 0.0 | .071 | -0.0514 | -0.0516 |
| 329 | 3.01 | .113 | -15.0 | 3.00 | 0.0 | .051 | -0.0507 | -0.0482 |
| 330 | 3.02 | .113 | -20.0 | 3.00 | 0.0 | .044 | -0.0600 | -0.0578 |
| 331 | 2.99 | .112 | -27.5 | 3.00 | 0.0 | .021 | -0.0694 | -0.0690 |
| 332 | 2.95 | .111 | 0.0 | 3.00 | 5.0 | .041 | 0.0409 | 0.0631 |
| 333 | 3.05 | .114 | 0.0 | 3.00 | -5.0 | .092 | -0.1393 | -0.1445 |
| 334 | 2.81 | .106 | 0.0 | 3.00 | -10.0 | .097 | -0.1827 | -0.1925 |
| 335 | 2.81 | .105 | 0.0 | 3.00 | -15.0 | .098 | -0.2492 | -0.2668 |
| 336 | 2.83 | .106 | 0.0 | 3.00 | -20.0 | .068 | -0.2969 | -0.3194 |
| 337 | 2.87 | .107 | 0.0 | 2.00 | 0.0 | .105 | -0.0905 | -0.0851 |
| 338 | 2.90 | .109 | 0.0 | 4.00 | 0.0 | .078 | -0.0444 | -0.0392 |
| 341 | 3.06 | .115 | 0.0 | 5.00 | 0.0 | .081 | -0.0568 | -0.0458 |
| 346 | 1.90 | .071 | -20.0 | 4.00 | 5.0 | .136 | -0.0304 | 0.0059* |
| 347 | 4.06 | .152 | -5.0 | 3.00 | -5.0 | .086 | -0.2523 | -0.2529 |
| 348 | 4.97 | .186 | 5.0 | 4.00 | -20.0 | .086 | -0.9381 | -0.9866 |
| 349 | 4.99 | .187 | -15.0 | 4.00 | 5.0 | .175 | -0.1788 | -0.1666 |
| 350 | 3.01 | .113 | -5.0 | 3.00 | -5.0 | .087 | -0.1380 | -0.1429 |
| 351 | 4.05 | .152 | -15.0 | 6.00 | 0.0 | .019 | -0.0728 | -0.0546 |
| 352 | 5.94 | .223 | 0.0 | 2.00 | -5.0 | .040 | -0.4091 | -0.4919 |

R-1851

TABLE A-12 (cont'd)

MEASURED AND FITTED LONGITUDINAL FORCE
BETA=20. DEG

| RUN | GV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|----------|
| 353 | 4.99 | .187 | -20.0 | 5.00 | 0.0 | .072 | -0.2229 | -0.2298 |
| 355 | 5.00 | .187 | -20.0 | 5.00 | 0.0 | .079 | -0.2097 | -0.2446 |
| 359 | 4.00 | .150 | -25.0 | 5.00 | 5.0 | .098 | -0.0564 | -0.0495 |
| 360 | 4.00 | .150 | 0.0 | 4.00 | 5.0 | .209 | -0.1367 | -0.1152 |
| 361 | 5.99 | .225 | -25.0 | 5.00 | -20.0 | -.011 | -1.3448 | -1.4595 |
| 362 | 4.01 | .150 | -15.0 | 6.00 | 0.0 | .016 | -0.0450 | -0.0489 |
| 363 | 4.04 | .152 | 5.0 | 4.00 | -10.0 | .192 | -0.5170 | -0.5175 |
| 364 | 4.03 | .151 | -5.0 | 3.00 | 0.0 | .129 | -0.1817 | -0.1669 |
| 365 | 2.97 | .111 | -5.0 | 3.00 | -5.0 | .091 | -0.1172 | -0.1419 |
| 366 | 4.97 | .187 | -10.0 | 6.00 | -20.0 | .055 | -0.9101 | -0.9888* |
| 370 | 5.52 | .207 | -5.0 | 3.00 | -20.0 | .090 | -1.5010 | -1.3153 |
| 371 | 5.02 | .188 | 5.0 | 3.00 | 0.0 | .069 | -0.1308 | -0.1323 |
| 372 | 2.99 | .112 | 5.0 | 2.00 | -20.0 | .094 | -0.3698 | -0.3889 |
| 373 | 1.97 | .074 | -20.0 | 6.00 | -5.0 | .187 | -0.1299 | -0.1211 |
| 374 | 2.92 | .109 | -20.0 | 6.00 | -5.0 | .105 | -0.1827 | -0.1914 |
| 376 | 5.00 | .187 | -5.0 | 2.00 | 0.0 | .071 | -0.1693 | -0.1689 |
| 378 | 4.02 | .151 | 0.0 | 6.00 | -20.0 | .126 | -0.6711 | -0.6786 |
| 379 | 6.01 | .225 | -20.0 | 2.00 | 0.0 | .004 | -0.1318 | -0.1445 |
| 380 | 4.97 | .187 | -20.0 | 2.00 | -5.0 | .082 | -0.5108 | -0.5046 |
| 381 | 2.99 | .112 | -5.0 | 3.00 | -5.0 | .082 | -0.1325 | -0.1365* |
| 384 | 5.95 | .223 | -10.0 | 3.00 | 5.0 | .094 | 0.0053 | -0.0366* |
| 386 | 4.85 | .182 | -15.0 | 3.00 | -5.0 | .092 | -0.4253 | -0.4347 |
| 387 | 5.12 | .192 | -5.0 | 3.00 | -5.0 | .114 | -0.4726 | -0.5020 |
| 390 | 6.10 | .229 | 5.0 | 5.00 | -15.0 | .089 | -1.1607 | -1.2670 |
| 395 | 4.23 | .158 | -10.0 | 6.00 | -5.0 | .038 | -0.2120 | -0.2191 |
| 396 | 3.19 | .119 | -27.5 | 4.00 | 0.0 | .128 | -0.1688 | -0.1562 |
| 397 | 3.15 | .118 | -5.0 | 4.00 | -15.0 | .097 | -0.3123 | -0.3297 |
| 398 | 4.10 | .154 | -5.0 | 5.00 | 5.0 | .137 | -0.0628 | -0.0118* |
| 399 | 3.07 | .115 | -5.0 | 3.00 | -5.0 | .061 | -0.1227 | -0.1265 |
| 402 | 6.06 | .227 | -10.0 | 2.00 | 5.0 | .040 | 0.1548 | 0.1355 |
| 403 | 3.11 | .117 | -10.0 | 5.00 | -10.0 | .151 | -0.3052 | -0.2879 |
| 404 | 2.98 | .112 | -15.0 | 6.00 | -10.0 | .135 | -0.2249 | -0.2797 |
| 405 | 4.04 | .151 | -20.0 | 5.00 | -10.0 | .090 | -0.4711 | -0.4607 |
| 702 | 2.99 | .224 | 0.0 | 3.00 | 0.0 | .093 | -0.0498 | -0.0375* |
| 703 | 1.98 | .149 | 0.0 | 3.00 | 0.0 | .123 | -0.0382 | -0.0080* |
| 704 | 2.49 | .187 | 0.0 | 3.00 | 0.0 | .103 | -0.0364 | -0.0227 |
| 705 | 3.01 | .226 | 0.0 | 3.00 | 0.0 | .071 | -0.0275 | -0.0177 |
| 706 | 2.99 | .224 | 0.0 | 3.00 | 0.0 | .115 | -0.0651 | -0.0595 |
| 707 | 2.99 | .224 | 0.0 | 3.00 | 0.0 | .176 | -0.1163 | -0.1250 |
| 709 | 3.01 | .226 | 5.0 | 3.00 | 0.0 | .085 | -0.0390 | -0.0294 |
| 710 | 3.01 | .226 | -5.0 | 3.00 | 0.0 | .091 | -0.0448 | -0.0418 |
| 711 | 3.01 | .226 | -10.0 | 3.00 | 0.0 | .076 | -0.0477 | -0.0370 |
| 712 | 3.00 | .225 | -15.0 | 3.00 | 0.0 | .057 | -0.0373 | -0.0329 |
| 713 | 3.00 | .225 | -20.0 | 3.00 | 0.0 | .028 | -0.0279 | -0.0260 |
| 714 | 3.00 | .225 | -27.5 | 3.00 | 0.0 | .006 | -0.0384 | -0.0428 |
| 715 | 3.01 | .226 | 0.0 | 3.00 | 5.0 | .088 | 0.1123 | 0.1353 |
| 716 | 3.00 | .225 | 0.0 | 3.00 | -5.0 | .099 | -0.1920 | -0.2100 |
| 717 | 3.01 | .225 | 0.0 | 3.00 | -10.0 | .099 | -0.3378 | -0.3738 |
| 718 | 3.01 | .225 | 0.0 | 3.00 | -15.0 | .103 | -0.4888 | -0.5353 |
| 719 | 3.01 | .226 | 0.0 | 3.00 | -20.0 | .104 | -0.6345 | -0.6909 |

R-1851

TABLE A-12 (cont'd)

MEASURED AND FITTED LONGITUDINAL FORCE
BETA=20.DEG

| PLN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|----------|
| 720 | 3.01 | .226 | 0.0 | 2.00 | 0.0 | .090 | -0.0543 | -0.0584 |
| 721 | 3.02 | .226 | 0.0 | 4.00 | 0.0 | .100 | -0.0409 | -0.0371 |
| 722 | 3.00 | .225 | 0.0 | 5.00 | 0.0 | .094 | -0.0404 | -0.0323 |
| 723 | 3.01 | .226 | 0.0 | 6.00 | 0.0 | .089 | -0.0408 | -0.0331 |
| 724 | 2.53 | .190 | 0.0 | 6.00 | -20.0 | .084 | -0.4509 | -0.4502 |
| 726 | 2.53 | .189 | 5.0 | 8.00 | -5.0 | .256 | -0.2607 | -0.2630 |
| 728 | 2.99 | .224 | -5.0 | 3.00 | -5.0 | .165 | -0.2629 | -0.2793 |
| 730 | 2.99 | .224 | -5.0 | 6.00 | 5.0 | .267 | -0.0464 | -0.0405 |
| 731 | 1.95 | .147 | 0.0 | 5.00 | -10.0 | .249 | -0.2164 | -0.1971 |
| 732 | 2.49 | .187 | -27.5 | 3.00 | -10.0 | -.010 | -0.2271 | -0.2541 |
| 733 | 3.00 | .225 | -5.0 | 3.00 | -5.0 | .100 | -0.1964 | -0.2182 |
| 735 | 1.97 | .148 | -27.5 | 3.00 | -10.0 | .079 | -0.1813 | -0.1631 |
| 736 | 3.00 | .225 | -20.0 | 3.00 | 5.0 | .094 | 0.0719 | 0.0964 |
| 737 | 3.00 | .225 | -27.5 | 6.00 | -10.0 | .141 | -0.4840 | -0.5066 |
| 738 | 1.99 | .149 | -10.0 | 3.00 | -15.0 | .137 | -0.2365 | -0.2343 |
| 741 | 2.48 | .186 | 0.0 | 3.00 | -5.0 | .132 | -0.1512 | -0.1548 |
| 743 | 2.53 | .190 | 5.0 | 8.00 | -10.0 | .273 | -0.3700 | -0.3799 |
| 744 | 2.04 | .153 | -10.0 | 3.00 | -10.0 | .092 | -0.1546 | -0.1632 |
| 746 | 3.01 | .226 | -5.0 | 5.00 | -20.0 | .242 | -0.7686 | -0.7866 |
| 747 | 3.01 | .226 | -5.0 | 3.00 | -5.0 | .086 | -0.1782 | -0.2064 |
| 749 | 3.07 | .230 | -10.0 | 6.00 | -5.0 | .166 | -0.2789 | -0.2945 |
| 750 | 2.57 | .193 | 5.0 | 5.00 | 0.0 | .129 | -0.0436 | -0.0370 |
| 751 | 2.57 | .193 | -10.0 | 6.00 | 0.0 | .067 | -0.0229 | -0.0285 |
| 752 | 2.07 | .155 | -27.5 | 3.00 | -20.0 | -.018 | -0.2878 | -0.3225 |
| 754 | 2.00 | .150 | 5.0 | 6.00 | 0.0 | .257 | -0.0927 | -0.0877 |
| 755 | 2.14 | .160 | -15.0 | 3.00 | 5.0 | .120 | 0.1204 | 0.0665 |
| 757 | 2.51 | .188 | 0.0 | 8.00 | -20.0 | .339 | -0.6315 | -0.6390 |
| 758 | 2.51 | .189 | -15.0 | 6.00 | -15.0 | .062 | -0.3413 | -0.3742 |
| 759 | 2.51 | .188 | 5.0 | 6.00 | -10.0 | .280 | -0.3621 | -0.3554 |
| 760 | 3.00 | .225 | -5.0 | 3.00 | -5.0 | .094 | -0.1813 | -0.2118 |
| 761 | 3.00 | .225 | -15.0 | 5.00 | 0.0 | .257 | -0.1982 | -0.2007 |
| 763 | 2.51 | .188 | -20.0 | 7.00 | 0.0 | .301 | -0.2111 | -0.2121 |
| 764 | 2.99 | .224 | 0.0 | 5.00 | -5.0 | .103 | -0.1849 | -0.1981 |
| 765 | 2.99 | .224 | -5.0 | 5.00 | -15.0 | .183 | -0.5575 | -0.5820 |
| 766 | 2.02 | .151 | 0.0 | 5.00 | 5.0 | .372 | -1.0166 | -0.1020* |
| 769 | 2.51 | .188 | -10.0 | 8.00 | -15.0 | .234 | -0.4983 | -0.4853 |
| 771 | 3.00 | .225 | -10.0 | 2.00 | 5.0 | .107 | 0.0847 | 0.0901 |
| 772 | 3.00 | .225 | -25.0 | 5.00 | -10.0 | .151 | -0.4637 | -0.4827 |
| 773 | 2.98 | .224 | -5.0 | 3.00 | -5.0 | .103 | -0.1896 | -0.2166 |
| 774 | 2.49 | .186 | -10.0 | 4.00 | 0.0 | .251 | -0.1329 | -0.1223 |
| 775 | 2.98 | .224 | -10.0 | 6.00 | -5.0 | .176 | -0.2767 | -0.2858 |
| 777 | 2.49 | .187 | 5.0 | 8.00 | -10.0 | .330 | -0.4087 | -0.4205 |
| 780 | 2.97 | .223 | -25.0 | 6.00 | -5.0 | .212 | -0.3483 | -0.3710 |
| 781 | 2.48 | .186 | -25.0 | 5.00 | -20.0 | .104 | -0.5112 | -0.5209 |

MEAN ERROR= -0.0129
STANDARD DEVIATION= 0.1385

R-1851

TABLE A-13

MEASURED AND FITTED VERTICAL FORCE
BETA=10. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|------|-------|------|-------|----------|----------|
| 3 | 4.00 | .000 | 2.1 | 2.60 | 0.0 | .043 | -0.1521 | -0.1724 |
| 5 | 4.00 | .000 | 4.6 | 2.50 | 0.0 | .035 | -0.1521 | -0.1297 |
| 6 | 4.00 | .000 | 7.2 | 2.60 | 0.0 | .139 | -0.1521 | -0.9152* |
| 7 | 4.00 | .000 | 9.7 | 2.50 | 0.0 | .020 | -0.1521 | -0.1062 |
| 8 | 4.00 | .000 | 12.2 | 2.40 | 0.0 | .011 | -0.1521 | -0.1119 |
| 1 | 4.00 | .000 | 4.7 | 2.50 | 5.0 | .028 | -0.1521 | -0.0930 |
| 9 | 4.00 | .000 | 0.0 | 2.60 | -5.0 | .046 | -0.1521 | -0.1871 |
| 10 | 4.00 | .000 | 0.0 | 2.60 | 5.0 | .046 | -0.1521 | -0.1892 |
| 11 | 4.00 | .000 | 0.0 | 2.60 | 10.0 | .048 | -0.1521 | -0.2034 |
| 12 | 4.00 | .000 | 0.1 | 2.60 | 15.0 | .047 | -0.1521 | -0.2069 |
| 13 | 4.00 | .000 | 0.1 | 2.60 | 20.0 | .046 | -0.1521 | -0.1956 |
| 24 | 4.00 | .000 | 5.1 | 2.80 | 0.0 | .039 | -0.1521 | -0.1726 |
| 34 | 5.00 | .000 | 2.4 | 2.40 | -5.0 | .076 | -0.6085 | -0.5349 |
| 36 | 2.00 | .000 | 7.4 | 5.50 | -5.0 | .287 | -0.9127 | -0.9485 |
| 37 | 3.00 | .000 | 5.0 | 4.50 | 20.0 | .058 | -0.3042 | -0.3605 |
| 40 | 4.00 | .000 | 12.4 | 4.50 | 20.0 | .007 | -0.3042 | -0.3279 |
| 41 | 3.00 | .000 | 5.0 | 4.50 | 20.0 | .031 | -0.0761 | -0.2147* |
| 42 | 2.00 | .000 | 10.0 | 4.50 | 20.0 | .079 | -0.3042 | -0.3429* |
| 43 | 2.00 | .000 | 10.0 | 4.50 | 20.0 | .056 | -0.0761 | -0.2882* |
| 44 | 5.00 | .000 | 7.4 | 4.50 | 20.0 | .019 | -0.0761 | -0.3751* |
| 45 | 2.00 | .000 | 12.4 | 4.50 | 20.0 | .124 | -0.6085 | -0.5609* |
| 46 | 3.00 | .000 | 10.0 | 3.50 | 20.0 | .110 | -0.3042 | -0.7646* |
| 47 | 4.00 | .000 | 10.0 | 2.50 | 20.0 | .042 | -0.0761 | -0.3813* |
| 48 | 4.00 | .000 | 0.1 | 6.50 | 20.0 | .111 | -0.0761 | -1.1093* |
| 49 | 6.00 | .000 | 9.9 | 2.40 | 20.0 | .034 | -0.6085 | -0.6560* |
| 50 | 4.00 | .000 | 4.9 | 5.60 | 20.0 | .243 | -0.9127 | -2.0319* |
| 51 | 3.00 | .000 | 0.0 | 5.50 | 20.0 | .059 | -0.3042 | -0.2657 |
| 52 | 4.00 | .000 | 7.5 | 2.50 | 20.0 | .056 | -0.3042 | -0.4423 |
| 53 | 4.00 | .000 | 2.4 | 3.50 | 20.0 | .112 | -0.9127 | -0.8386* |
| 54 | 3.00 | .000 | 2.5 | 5.50 | 20.0 | .033 | -0.0761 | -0.1945* |
| 55 | 5.00 | .000 | 0.1 | 6.50 | 10.0 | .045 | -0.6085 | -0.6217* |
| 56 | 2.00 | .000 | 10.0 | 4.60 | 10.0 | .030 | -0.0761 | -0.2011* |
| 57 | 4.00 | .000 | 5.0 | 2.50 | 10.0 | .036 | -0.1521 | -0.1717 |
| 58 | 3.00 | .000 | 12.5 | 6.50 | 10.0 | -.005 | -0.0761 | -0.1052 |
| 59 | 4.00 | .000 | 2.5 | 3.60 | 5.0 | .040 | -0.1521 | -0.1997 |
| 60 | 4.00 | .000 | 2.5 | 3.60 | 5.0 | .029 | -0.0761 | -0.1146 |
| 61 | 4.00 | .000 | 5.1 | 3.50 | 5.0 | .043 | -0.3042 | -0.2583 |
| 62 | 3.00 | .000 | 0.0 | 2.50 | 5.0 | .054 | -0.1521 | -0.1629 |
| 63 | 5.00 | .000 | 2.5 | 2.50 | 5.0 | .035 | -0.1521 | -0.1272 |
| 64 | 3.00 | .000 | 9.9 | 2.60 | 5.0 | .013 | -0.0761 | -0.0924 |
| 65 | 4.00 | .000 | 5.0 | 2.60 | 5.0 | .039 | -0.1521 | -0.1822* |
| 66 | 5.00 | .000 | 5.0 | 6.60 | 5.0 | .022 | -0.1521 | -0.2639* |
| 67 | 3.00 | .000 | 9.9 | 6.60 | 5.0 | .020 | -0.0761 | -0.1998* |
| 68 | 6.00 | .000 | 12.4 | 5.70 | 5.0 | -.006 | -0.0761 | 0.0596* |
| 69 | 3.00 | .000 | -5.1 | 6.60 | 5.0 | .240 | -1.2169 | -1.1211* |
| 70 | 6.00 | .000 | -5.1 | 5.70 | 5.0 | .016 | -0.0761 | 0.0219* |
| 71 | 6.00 | .000 | 7.4 | 5.60 | 5.0 | .012 | -0.0761 | -0.0590 |
| 72 | 4.00 | .000 | 12.4 | 5.60 | 5.0 | .102 | -1.2169 | -1.2807 |
| 73 | 2.00 | .000 | 0.0 | 5.60 | 5.0 | .060 | -0.1521 | -0.2228 |
| 74 | 4.00 | .000 | 2.4 | 3.60 | 5.0 | .041 | -0.1521 | -0.2069 |

TABLE A-13 (cont'd)

MEASURED AND FITTED VERTICAL FORCE
BETA=10. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED* |
|-----|------|------|------|-------|------|-------|----------|----------|
| 76 | 5.00 | .000 | 2.4 | 5.60 | 0.0 | .026 | -0.0761 | -0.1938* |
| 77 | 2.00 | .000 | 4.9 | 5.70 | 0.0 | .329 | -1.2169 | -1.1777 |
| 78 | 6.00 | .000 | 7.5 | 5.70 | 0.0 | .015 | -0.1521 | -0.0632 |
| 79 | 3.00 | .000 | 12.4 | 5.60 | 0.0 | .112 | -0.6085 | -0.6852 |
| 80 | 3.00 | .000 | 12.4 | 5.60 | 0.0 | .247 | -1.2169 | -1.1582 |
| 81 | 4.00 | .000 | 12.4 | 4.60 | 0.0 | .117 | -0.9127 | -1.0549 |
| 82 | 4.00 | .000 | 4.9 | 6.60 | 0.0 | .099 | -1.2169 | -1.0982 |
| 83 | 3.00 | .000 | -5.1 | 6.60 | 0.0 | .049 | -0.3042 | -0.3249 |
| 84 | 3.00 | .000 | 2.4 | 2.60 | 0.0 | .044 | -0.0761 | -0.1315* |
| 85 | 4.00 | .000 | 7.4 | 2.60 | -5.0 | .026 | -0.1521 | -0.0909 |
| 87 | 2.00 | .000 | 4.9 | 2.60 | -5.0 | .135 | -0.3042 | -0.3534 |
| 88 | 4.00 | .000 | 4.9 | 2.60 | -5.0 | .061 | -0.3042 | -0.2965 |
| 89 | 2.00 | .000 | 7.4 | 5.70 | -5.0 | .285 | -0.9127 | -0.9092 |
| 90 | 6.00 | .000 | 7.5 | 6.70 | -5.0 | .014 | -0.1521 | -0.0423* |
| 91 | 2.00 | .000 | 0.0 | 4.60 | -5.0 | .119 | -0.3042 | -0.3277 |
| 92 | 5.00 | .000 | 0.0 | 3.60 | -5.0 | .037 | -0.1521 | -0.1947 |
| 93 | 6.00 | .000 | 9.9 | 3.50 | -5.0 | .110 | -1.2169 | -1.3096 |
| 94 | 6.00 | .000 | 9.9 | 4.60 | -5.0 | .078 | -1.2169 | -1.1530 |
| 95 | 6.00 | .000 | 10.0 | 5.60 | -5.0 | .002 | -0.0761 | 0.1469* |
| 97 | 4.00 | .000 | 9.9 | 5.60 | -5.0 | .037 | -0.3042 | -0.3031 |
| 98 | 5.00 | .000 | 9.9 | 5.50 | -5.0 | .097 | -1.2169 | -1.2413 |
| 99 | 3.00 | .000 | 0.1 | 6.60 | -5.0 | .142 | -0.9127 | -0.9573 |
| 100 | 4.00 | .000 | 4.9 | 6.60 | -5.0 | .034 | -0.3042 | -0.2591 |
| 101 | 4.00 | .000 | 2.4 | 3.50 | 5.0 | .039 | -0.1521 | -0.1892 |
| 102 | 6.00 | .000 | 9.9 | 2.50 | 0.0 | .105 | -1.2169 | -1.1994 |
| 103 | 3.00 | .000 | -5.1 | 2.50 | 10.0 | .122 | -0.3042 | -0.4216 |
| 105 | 5.00 | .000 | 10.0 | 3.50 | 10.0 | .013 | -0.3042 | -0.1672 |
| 106 | 4.00 | .000 | 5.0 | 3.50 | 10.0 | .045 | -0.3042 | -0.2990 |
| 107 | 3.00 | .000 | 7.4 | 6.50 | 10.0 | .158 | -1.2169 | -1.2653 |
| 108 | 4.00 | .000 | 12.5 | 6.60 | 10.0 | -.006 | -0.1521 | -0.1085 |
| 109 | 2.00 | .000 | -5.1 | 6.60 | 10.0 | .057 | -0.1521 | -0.1381 |
| 110 | 3.00 | .000 | 2.4 | 6.50 | 10.0 | .077 | -0.6085 | -0.5676 |
| 111 | 3.00 | .000 | -5.1 | 5.60 | 10.0 | .135 | -0.6085 | -0.6257 |
| 112 | 3.00 | .000 | 12.5 | 5.60 | 10.0 | .006 | -0.1521 | -0.2030 |
| 113 | 4.00 | .000 | 2.4 | 3.60 | 5.0 | .038 | -0.1521 | -0.1846 |
| 114 | 4.00 | .000 | 0.0 | 3.50 | 15.0 | .042 | -0.1521 | -0.1935* |
| 115 | 4.00 | .000 | 12.5 | 3.60 | 15.0 | .001 | -0.0761 | -0.1405* |
| 116 | 3.00 | .000 | 7.4 | 2.60 | 15.0 | .139 | -0.9127 | -0.8166 |
| 117 | 4.00 | .000 | 7.4 | 2.50 | 15.0 | .030 | -0.1521 | -0.1894 |
| 118 | 3.00 | .000 | 5.0 | 2.50 | 15.0 | .067 | -0.3042 | -0.2685 |
| 119 | 3.00 | .000 | 2.4 | 2.50 | 15.0 | .057 | -0.1521 | -0.1890 |
| 120 | 6.00 | .000 | 2.4 | 2.50 | 15.0 | .069 | -0.9127 | -0.7840 |
| 121 | 3.00 | .000 | 0.0 | 2.60 | 15.0 | .172 | -0.9127 | -0.8713 |
| 126 | 6.00 | .000 | 4.9 | 2.50 | 20.0 | .065 | -0.9127 | -0.9859 |
| 127 | 4.00 | .000 | 5.0 | 2.60 | 20.0 | .137 | -1.2169 | -1.1261 |
| 128 | 6.00 | .000 | 12.5 | 5.50 | 20.0 | .022 | -1.2169 | -1.1835 |
| 129 | 2.00 | .000 | 12.5 | 6.60 | 0.0 | .057 | -0.1521 | -0.1555 |
| 130 | 5.00 | .000 | 6.6 | *** | 7.5 | -.181 | -0.1521 | -0.1323 |
| 131 | 6.00 | .000 | -5.0 | 6.70 | 0.0 | .022 | -0.1521 | -0.2279 |
| 132 | 3.00 | .000 | 9.9 | 3.60 | 0.0 | .148 | -0.6085 | -0.6831 |

TABLE A-13 (cont'd)

MEASURED AND FITTED VERTICAL FORCE
BETA=10. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|-----------|
| 133 | 4.00 | .000 | 7.4 | 3.60 | 5.0 | .145 | -1.2169 | -1.1174 |
| 134 | 3.00 | .000 | 9.9 | 3.70 | 5.0 | .224 | -1.2169 | -1.2959 |
| 135 | 4.00 | .000 | 2.4 | 3.60 | 5.0 | .040 | -0.1521 | -0.1978 |
| 138 | 4.00 | .000 | -5.0 | 5.60 | 20.0 | .221 | -0.9127 | -1.0321 |
| 139 | 4.00 | .000 | -5.1 | 3.60 | 5.0 | .044 | -0.3042 | -0.2097 |
| 1 | 1.97 | .049 | 0.0 | 3.00 | 0.0 | .057 | -0.1521 | -0.1395 |
| 2 | 1.98 | .050 | 0.0 | 3.00 | 0.0 | .058 | -0.1521 | -0.1392 |
| 3 | 3.15 | .079 | 0.0 | 3.00 | 0.0 | .029 | -0.1521 | -0.0806 |
| 4 | 4.01 | .100 | 0.0 | 3.00 | 0.0 | .022 | -0.1521 | -0.0419* |
| 6 | 5.30 | .133 | 0.0 | 3.00 | 0.0 | .033 | -0.1521 | -0.2045 |
| 8 | 6.00 | .150 | 0.0 | 3.00 | 0.0 | .032 | -0.1521 | -0.2067 |
| 10 | 3.01 | .075 | -2.5 | 3.00 | 0.0 | .042 | -0.1521 | -0.1336 |
| 9 | 3.12 | .078 | 5.0 | 3.00 | 0.0 | .038 | -0.1521 | -0.0934 |
| 11 | 3.02 | .076 | -5.0 | 3.00 | 0.0 | .037 | -0.1521 | -0.1319 |
| 12 | 2.95 | .074 | -7.5 | 3.00 | 0.0 | .033 | -0.1521 | -0.1283 |
| 13 | 2.98 | .075 | -10.0 | 3.00 | 0.0 | .032 | -0.1521 | -0.1430 |
| 14 | 2.96 | .074 | -12.5 | 3.00 | 0.0 | .026 | -0.1521 | -0.1374 |
| 15 | 2.95 | .074 | 0.0 | 2.00 | 0.0 | .064 | -0.1521 | -0.1965 |
| 16 | 2.99 | .075 | 0.0 | 4.00 | 0.0 | .047 | -0.1521 | -0.1637 |
| 19 | 2.72 | .068 | 0.0 | 5.00 | 0.0 | .041 | -0.1521 | -0.1690 |
| 20 | 2.68 | .067 | 0.0 | 5.00 | 0.0 | .041 | -0.1521 | -0.1695 |
| 21 | 3.14 | .079 | 0.0 | 6.00 | 0.0 | .023 | -0.1521 | -0.1767 |
| 22 | 2.01 | .050 | -7.5 | 6.00 | 0.0 | .089 | -0.3042 | -0.2664 |
| 23 | 2.98 | .074 | 0.0 | 3.00 | 0.0 | .025 | -0.0761 | -0.0742 |
| 24 | 2.97 | .074 | 0.0 | 3.00 | 0.0 | .072 | -0.3042 | -0.2340 |
| 25 | 2.46 | .062 | 0.0 | 3.00 | 0.0 | .151 | -0.6085 | -0.5795 |
| 26 | 3.46 | .087 | 0.0 | 3.00 | 0.0 | .103 | -0.6085 | -0.5135 |
| 27 | 2.96 | .074 | 0.0 | 3.00 | 0.0 | .127 | -0.6085 | -0.5389 |
| 28 | 2.93 | .073 | 0.0 | 3.00 | 0.0 | .181 | -0.9127 | -0.9061 |
| 30 | 4.49 | .110 | 0.0 | 3.00 | 0.0 | .193 | -0.9127 | -1.4121* |
| 31 | 5.03 | .126 | 0.0 | 3.00 | 0.0 | .115 | -1.2169 | -1.0676 |
| 32 | 3.15 | .079 | 0.0 | 3.00 | -5.0 | .055 | -0.1521 | -0.1837 |
| 34 | 3.07 | .077 | -2.5 | 3.00 | -5.0 | .054 | -0.1521 | -0.1962 |
| 35 | 5.22 | .146 | 0.0 | 3.00 | -5.0 | .049 | -0.3042 | -0.4546 |
| 36 | 5.77 | .144 | -12.5 | 6.00 | -5.0 | .008 | -0.3042 | -0.3588 |
| 37 | 4.91 | .123 | 5.0 | 2.00 | -5.0 | .040 | -0.1521 | -0.2278 |
| 38 | 2.87 | .072 | -10.0 | 4.00 | -5.0 | .157 | -0.9127 | -0.8787 |
| 39 | 5.96 | .149 | -12.5 | 5.00 | -5.0 | .045 | -1.2169 | -1.2137 |
| 40 | 3.00 | .075 | 0.0 | 3.00 | -10.0 | .135 | -0.1521 | -0.6051* |
| 41 | 6.02 | .150 | -7.5 | 5.00 | -10.0 | .025 | -0.0761 | -0.4387* |
| 42 | 2.95 | .074 | -2.5 | 2.00 | -10.0 | .057 | -0.0761 | -0.2155* |
| 43 | 5.21 | .130 | -5.0 | 2.00 | -10.0 | .022 | -0.1521 | -0.1657 |
| 46 | 3.09 | .077 | -5.0 | 2.00 | -10.0 | .092 | -0.6085 | -0.4691 |
| 47 | 3.14 | .079 | -2.5 | 3.00 | -5.0 | .036 | -0.1521 | -0.1251 |
| 48 | 3.09 | .077 | 0.0 | 3.00 | -15.0 | .041 | -0.1521 | -0.1101 |
| 56 | 5.23 | .131 | -5.0 | 3.00 | -15.0 | .060 | -1.2169 | -0.7704** |
| 57 | 5.19 | .130 | -5.0 | 2.00 | -15.0 | .027 | -0.1521 | -0.2854** |
| 58 | 5.12 | .128 | -12.5 | 5.00 | -15.0 | .027 | -1.2169 | -0.7543* |
| 59 | 3.05 | .076 | 0.0 | 3.00 | -20.0 | .048 | -0.1521 | -0.1173 |
| 60 | 4.17 | .104 | -12.5 | 6.00 | -20.0 | -.007 | -0.0761 | -0.0382 |

R-1851

TABLE A-13 (cont'd)

MEASURED AND FITTED VERTICAL FORCE
BETA=10. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|----------|
| 62 | 5.18 | .129 | 5.0 | 3.00 | -20.0 | .022 | -0.0761 | -0.0894* |
| 65 | 4.10 | .102 | -2.5 | 6.00 | -20.0 | .033 | -0.0761 | -0.1922* |
| 66 | 6.15 | .154 | -10.0 | 5.00 | -20.0 | .004 | -0.1521 | -0.1699 |
| 67 | 2.11 | .053 | -7.5 | 2.00 | -20.0 | .046 | -0.1521 | -0.2124 |
| 69 | 4.05 | .101 | -5.0 | 5.00 | -20.0 | .047 | -0.6085 | -0.4595* |
| 70 | 3.01 | .075 | -7.5 | 2.00 | -20.0 | .076 | -0.9127 | -0.4519* |
| 71 | 3.00 | .075 | 0.0 | 3.00 | 5.0 | .038 | -0.1521 | -0.1043 |
| 72 | 6.08 | .152 | -5.0 | 3.00 | 5.0 | .057 | -0.9127 | -0.7913* |
| 74 | 5.05 | .126 | -10.0 | 3.00 | 5.0 | .108 | -0.9127 | -1.2249* |
| 75 | 6.03 | .151 | -2.5 | 5.00 | 5.0 | .047 | -1.2169 | -0.8320* |
| 76 | 5.05 | .126 | -2.5 | 2.00 | 5.0 | .038 | -0.3042 | -0.2641 |
| 77 | 5.05 | .126 | -10.0 | 5.00 | 5.0 | .031 | -0.6085 | -0.5105* |
| 78 | 4.02 | .101 | -7.5 | 5.00 | 5.0 | .008 | +0.0761 | 0.0150* |
| 79 | 2.04 | .051 | -10.0 | 3.00 | 5.0 | .016 | -0.0761 | -0.1169 |
| 80 | 5.33 | .133 | -2.5 | 3.00 | 0.0 | .061 | -0.9127 | -0.6030* |
| 82 | 3.87 | .097 | -2.5 | 2.00 | 0.0 | .099 | -0.6085 | -0.6015 |
| 83 | 3.02 | .075 | -2.5 | 3.00 | -5.0 | .038 | -0.1521 | -0.1303 |
| 418 | 1.85 | .069 | 0.0 | 3.00 | 0.0 | .060 | -0.1521 | -0.1298 |
| 419 | 2.96 | .111 | 0.0 | 2.00 | 0.0 | .044 | -0.1521 | -0.1144 |
| 420 | 3.95 | .148 | 0.0 | 3.00 | 0.0 | .033 | -0.1521 | -0.1405 |
| 421 | 5.02 | .188 | 0.0 | 3.00 | 0.0 | .025 | -0.1521 | -0.2009 |
| 422 | 6.09 | .228 | 0.0 | 3.00 | 0.0 | .022 | -0.1521 | -0.2924* |
| 423 | 3.86 | .145 | 0.0 | 3.00 | 0.0 | .028 | -0.0761 | -0.0961 |
| 424 | 3.91 | .146 | 0.0 | 3.00 | 0.0 | .045 | -0.3042 | -0.2287 |
| 425 | 3.96 | .148 | 0.0 | 3.00 | 0.0 | .067 | -0.6085 | -0.4074* |
| 426 | 4.03 | .151 | 0.0 | 3.00 | 0.0 | .117 | -0.9127 | -0.8310 |
| 427 | 4.01 | .150 | 0.0 | 3.00 | 0.0 | .158 | -1.2169 | -1.1262 |
| 428 | 3.99 | .150 | 5.0 | 3.00 | 0.0 | .027 | -0.1521 | -0.0892 |
| 429 | 4.02 | .151 | -2.5 | 3.00 | 0.0 | .031 | -0.1521 | -0.1632 |
| 430 | 3.99 | .150 | -5.0 | 3.00 | 0.0 | .027 | -0.1521 | -0.1662 |
| 431 | 4.01 | .150 | -7.5 | 3.00 | 0.0 | .017 | -0.1521 | -0.1402 |
| 432 | 4.00 | .150 | -10.0 | 3.00 | 0.0 | .011 | -0.1521 | -0.1606 |
| 433 | 4.01 | .150 | -12.5 | 3.00 | 0.0 | .006 | -0.1521 | -0.2081 |
| 434 | 3.99 | .150 | -12.5 | 3.00 | 5.0 | .007 | -0.1521 | -0.2000 |
| 435 | 4.00 | .150 | -12.5 | 3.00 | -5.0 | -.002 | -0.1521 | -0.1386 |
| 436 | 4.02 | .151 | -12.5 | 3.00 | -10.0 | -.004 | -0.1521 | -0.1146 |
| 438 | 3.97 | .149 | 0.0 | 3.00 | 5.0 | .032 | -0.1521 | -0.1410 |
| 440 | 4.01 | .150 | 0.0 | 3.00 | -5.0 | .035 | -0.1521 | -0.1570 |
| 441 | 4.00 | .150 | 0.0 | 3.00 | -10.0 | .036 | -0.1521 | -0.1604 |
| 443 | 3.98 | .149 | 0.0 | 3.00 | -15.0 | .040 | -0.1521 | -0.1780 |
| 444 | 3.98 | .149 | 0.0 | 3.00 | -20.0 | .035 | -0.1521 | -0.1281 |
| 445 | 3.98 | .149 | 0.0 | 2.00 | 0.0 | .036 | -0.1521 | -0.1555 |
| 446 | 3.98 | .149 | 0.0 | 4.00 | 0.0 | .032 | -0.1521 | -0.1767 |
| 448 | 4.02 | .151 | 0.0 | 5.00 | 0.0 | .025 | -0.1521 | -0.1573 |
| 449 | 4.03 | .151 | 0.0 | 6.00 | 0.0 | .024 | -0.1521 | -0.1847 |
| 451 | 1.81 | .068 | -10.0 | 4.00 | 5.0 | .132 | -0.3042 | -0.1624 |
| 452 | 4.01 | .150 | -2.5 | 3.00 | -5.0 | .043 | -0.3042 | -0.2620 |
| 455 | 4.91 | .184 | 5.0 | 4.00 | -20.0 | .131 | -0.6085 | -1.0976* |
| 456 | 4.90 | .184 | -7.5 | 4.00 | 5.0 | .099 | -1.2169 | -1.2696 |
| 457 | 2.92 | .109 | -2.5 | 3.00 | -5.0 | .043 | -0.1521 | -0.1391 |

TABLE A-13 (cont'd)
 MEASURED AND FITTED VERTICAL FORCE
 BETA=10. DEG

| RUN | CV | W | PHI | THETA | PSI | Z1 | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|----------|
| 458 | 4.00 | .150 | -7.5 | 6.00 | 0.0 | .010 | -0.1521 | -0.0083* |
| 459 | 5.96 | .224 | 0.0 | 2.00 | -5.0 | .025 | -0.1521 | -0.2859* |
| 460 | 5.01 | .188 | -10.0 | 5.00 | 0.0 | .045 | -0.9127 | -0.8653 |
| 463 | 4.02 | .151 | -12.5 | 3.00 | 5.0 | .110 | -0.6085 | -0.9482* |
| 465 | 5.97 | .224 | 0.0 | 2.00 | 5.0 | .090 | -1.2169 | -1.2669 |
| 466 | 5.97 | .224 | -12.5 | 5.00 | -20.0 | .011 | -1.2169 | -0.5896* |
| 467 | 4.00 | .150 | -7.5 | 6.00 | 0.0 | .011 | -0.0761 | -0.0215* |
| 469 | 5.05 | .189 | 5.0 | 4.00 | -10.0 | .083 | -0.9127 | -0.8726 |
| 470 | 3.01 | .113 | -2.5 | 3.00 | 0.0 | .131 | -0.6085 | -0.746 |
| 471 | 2.99 | .112 | -2.5 | 3.00 | -5.0 | .047 | -0.1521 | -0.582 |
| 473 | 4.96 | .186 | -5.0 | 6.00 | -20.0 | .024 | -0.1521 | -0.2163 |
| 475 | 4.97 | .186 | -2.5 | 2.00 | -20.0 | .086 | -1.2169 | -1.1197 |
| 476 | 4.97 | .186 | 5.0 | 3.00 | 0.0 | .031 | -0.3042 | -0.2594 |
| 483 | 1.98 | .074 | -10.0 | 6.00 | -5.0 | .168 | -0.6085 | -0.6349 |
| 484 | 2.91 | .109 | -2.5 | 2.00 | 0.0 | .089 | -0.3042 | -0.3304 |
| 485 | 3.01 | .113 | 0.0 | 6.00 | -20.0 | .133 | -0.9127 | -0.6960* |
| 487 | 3.93 | .148 | -10.0 | 2.00 | -5.0 | .097 | -0.9127 | -0.9377 |
| 488 | 3.00 | .113 | -2.5 | 3.00 | -5.0 | .043 | -0.1521 | -0.1453 |
| 489 | 4.13 | .155 | -5.0 | 2.00 | 5.0 | .112 | -0.9127 | -0.8508 |
| 490 | 6.08 | .228 | -5.0 | 2.00 | 5.0 | .081 | -0.9127 | -1.3747* |
| 491 | 4.10 | .154 | -7.5 | 3.00 | -5.0 | .075 | -0.9127 | -0.7029* |
| 492 | 4.04 | .152 | 0.0 | 3.00 | 0.0 | .028 | -0.0761 | -0.1093 |
| 494 | 3.18 | .119 | -2.5 | 4.00 | -5.0 | .140 | -0.9127 | -0.7850 |
| 496 | 6.07 | .228 | 5.0 | 5.00 | -15.0 | .074 | -1.2169 | -1.1946 |
| 499 | 6.05 | .227 | -10.0 | 5.00 | -15.0 | .001 | -0.0761 | -0.0737 |
| 500 | 4.08 | .153 | -5.0 | 6.00 | -5.0 | .015 | -0.0761 | -0.0522 |
| 502 | 3.09 | .116 | -12.5 | 4.00 | 0.0 | .105 | -0.6085 | -0.5906 |
| 503 | 3.10 | .116 | -2.5 | 4.00 | -15.0 | .053 | -0.3042 | -0.2192 |
| 505 | 3.03 | .114 | -2.5 | 5.00 | 5.0 | .161 | -0.9127 | -0.8546 |
| 506 | 3.02 | .113 | -2.5 | 3.00 | -5.0 | .041 | -0.1521 | -0.1370 |
| 507 | 3.01 | .113 | -5.0 | 2.00 | 5.0 | .092 | -0.3042 | -0.3507 |
| 508 | 2.99 | .112 | -5.0 | 5.00 | -10.0 | .104 | -0.9127 | -0.6363 |
| 512 | 2.01 | .075 | -7.5 | 6.00 | -10.0 | .220 | -0.9127 | -0.9900 |
| 513 | 5.15 | .193 | -10.0 | 5.00 | -10.0 | .042 | -1.2169 | -0.8918* |
| 514 | 5.10 | .191 | -12.5 | 2.00 | -10.0 | -.016 | -0.0761 | -0.0667 |
| 795 | 3.00 | .225 | 0.0 | 3.00 | 0.0 | .055 | -0.1521 | -0.1163 |
| 796 | 2.99 | .224 | 5.0 | 3.00 | 0.0 | .047 | -0.1521 | -0.0081* |
| 797 | 3.01 | .226 | -2.5 | 3.00 | 0.0 | .056 | -0.1521 | -0.1560 |
| 798 | 3.00 | .225 | -5.0 | 3.00 | 0.0 | .051 | -0.1521 | -0.1663 |
| 799 | 3.01 | .226 | -7.5 | 3.00 | 0.0 | .046 | -0.1521 | -0.1786 |
| 800 | 3.00 | .225 | -10.0 | 3.00 | 0.0 | .039 | -0.1521 | -0.1805 |
| 801 | 3.00 | .225 | -12.5 | 3.00 | 0.0 | .033 | -0.1521 | -0.1882 |
| 802 | 2.99 | .224 | 0.0 | 3.00 | 5.0 | .054 | -0.1521 | -0.0936 |
| 803 | 2.99 | .224 | 0.0 | 3.00 | -5.0 | .068 | -0.1521 | -0.1896 |
| 804 | 2.98 | .223 | 0.0 | 3.00 | -10.0 | .072 | -0.1521 | -0.2074 |
| 805 | 2.99 | .224 | 0.0 | 3.00 | -15.0 | .075 | -0.1521 | -0.2177 |
| 806 | 3.00 | .225 | 0.0 | 3.00 | -20.0 | .069 | -0.1521 | -0.1677 |
| 807 | 3.00 | .225 | 0.0 | 2.00 | 0.0 | .067 | -0.1521 | -0.1695 |
| 808 | 2.97 | .223 | 0.0 | 4.00 | 0.0 | .058 | -0.1521 | -0.1645 |
| 809 | 3.00 | .225 | 0.0 | 5.00 | 0.0 | .053 | -0.1521 | -0.2004 |

R-1851

TABLE A-13 (cont'd)

MEASURED AND FITTED VERTICAL FORCE
BETA=10. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|------|----------|---------|
| 810 | 2.99 | .224 | 0.0 | 6.00 | 0.0 | .056 | -0.1521 | -0.2823 |
| 811 | 3.00 | .225 | 0.0 | 3.00 | 0.0 | .051 | -0.0761 | -0.0969 |
| 812 | 3.00 | .225 | 0.0 | 3.00 | 0.0 | .082 | -0.3042 | -0.2675 |
| 813 | 3.00 | .225 | 0.0 | 3.00 | 0.0 | .130 | -0.6085 | -0.6012 |
| 815 | 2.01 | .151 | 0.0 | 3.00 | 0.0 | .104 | -0.1521 | -0.1621 |
| 816 | 2.51 | .188 | -2.5 | 3.00 | 0.0 | .069 | -0.1521 | -0.1206 |
| 817 | 3.01 | .226 | 0.0 | 6.00 | -20.0 | .066 | -0.0761 | -0.1062 |
| 818 | 3.02 | .226 | 5.0 | 6.00 | -5.0 | .175 | -0.9127 | -1.0134 |
| 819 | 3.02 | .226 | -2.5 | 6.00 | 5.0 | .211 | -1.2169 | -1.2805 |
| 820 | 2.03 | .152 | 0.0 | 4.00 | -10.0 | .205 | -0.6085 | -0.8205 |
| 821 | 3.01 | .226 | -12.5 | 3.00 | -10.0 | .017 | -0.0761 | -0.1782 |
| 822 | 3.01 | .226 | -2.5 | 3.00 | -5.0 | .065 | -0.1521 | -0.2308 |
| 823 | 2.02 | .152 | -12.5 | 3.00 | -10.0 | .093 | -0.3042 | -0.2665 |
| 824 | 2.52 | .189 | -10.0 | 3.00 | 5.0 | .111 | -0.3042 | -0.3078 |
| 825 | 2.01 | .150 | -5.0 | 3.00 | -15.0 | .112 | -0.3042 | -0.3464 |
| 826 | 2.48 | .187 | -12.5 | 6.00 | -10.0 | .190 | -1.2169 | -1.1867 |
| 827 | 2.48 | .186 | -12.5 | 5.00 | 5.0 | .281 | -1.2169 | -1.1153 |
| 828 | 2.99 | .224 | 0.0 | 3.00 | -5.0 | .084 | -0.3042 | -0.2833 |
| 829 | 1.99 | .149 | 5.0 | 6.00 | -10.0 | .287 | -0.9127 | -0.8552 |
| 830 | 2.00 | .150 | -5.0 | 3.00 | -10.0 | .076 | -0.0761 | -0.1593 |
| 831 | 2.50 | .187 | -2.5 | 5.00 | -20.0 | .248 | -1.2169 | -1.5507 |
| 832 | 2.99 | .224 | -2.5 | 3.00 | -5.0 | .065 | -0.1521 | -0.2261 |
| 833 | 1.96 | .147 | -5.0 | 6.00 | -5.0 | .263 | -0.9127 | -1.0658 |
| 834 | 2.95 | .221 | 5.0 | 5.00 | 0.0 | .063 | -0.3042 | -0.2534 |
| 835 | 2.26 | .222 | -5.0 | 6.00 | 0.0 | .034 | -0.0761 | -0.0694 |
| 836 | 1.98 | .149 | -12.5 | 3.00 | -20.0 | .019 | -0.0761 | -0.1695 |
| 839 | 2.06 | .155 | 5.0 | 4.00 | 0.0 | .192 | -0.6085 | -0.6212 |
| 840 | 2.03 | .153 | -7.5 | 3.00 | 5.0 | .088 | -0.1521 | -0.0821 |
| 841 | 2.98 | .223 | 0.0 | 5.00 | -20.0 | .219 | -1.2169 | -1.1895 |
| 842 | 2.99 | .224 | -7.5 | 6.00 | -15.0 | .031 | -0.0761 | -0.0385 |
| 845 | 2.98 | .223 | 5.0 | 6.00 | -10.0 | .174 | -0.9127 | -0.8568 |
| 846 | 3.01 | .226 | -2.5 | 3.00 | -5.0 | .053 | -0.1521 | -0.1583 |
| 847 | 2.54 | .190 | -7.5 | 5.00 | 0.0 | .242 | -1.2169 | -1.1937 |
| 848 | 3.01 | .226 | -10.0 | 5.00 | 0.0 | .204 | -1.2169 | -1.2913 |
| 849 | 2.55 | .191 | 0.0 | 5.00 | -5.0 | .046 | -0.1521 | -0.0667 |
| 850 | 2.54 | .191 | -2.5 | 4.00 | -15.0 | .180 | -0.9127 | -0.9114 |
| 851 | 2.08 | .157 | 0.0 | 5.00 | 5.0 | .038 | -0.0761 | -0.0709 |
| 852 | 2.53 | .190 | 5.0 | 6.00 | -20.0 | .212 | -0.6085 | -0.5490 |
| 853 | 2.05 | .154 | -5.0 | 8.00 | -15.0 | .288 | -1.2169 | -1.1789 |
| 855 | 3.01 | .226 | -5.0 | 2.00 | 5.0 | .074 | -0.3042 | -0.2716 |
| 856 | 2.53 | .190 | -12.5 | 4.00 | -10.0 | .182 | -1.2169 | -1.2037 |
| 857 | 3.00 | .225 | -2.5 | 3.00 | -5.0 | .049 | -0.1521 | -0.1381 |
| 858 | 2.99 | .224 | -5.0 | 4.00 | 0.0 | .157 | -0.9127 | -0.8977 |
| 859 | 2.53 | .190 | -5.0 | 6.00 | -5.0 | .169 | -0.9127 | -0.8704 |
| 861 | 2.54 | .190 | -12.5 | 4.00 | -5.0 | .209 | -1.2169 | -1.2790 |
| 862 | 2.97 | .223 | -12.5 | 5.00 | -20.0 | .057 | -0.9127 | -0.4631 |
| 863 | 3.00 | .225 | -5.0 | 4.00 | -5.0 | .026 | -0.0761 | -0.0419 |

MEAN ERROR= 0.0022

STANDARD DEVIATION= 0.0944

R-1851

TABLE A-14

MEASURED AND FITTED VERTICAL FORCE
BETA=15. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|------|-------|------|-------|----------|----------|
| 141 | 4.00 | .000 | 5.0 | 3.60 | 5.0 | .050 | -0.1521 | -0.1654 |
| 143 | 3.00 | .000 | 4.7 | 2.60 | 0.0 | .053 | -0.0761 | -0.0533 |
| 144 | 6.00 | .000 | 14.8 | 3.00 | 0.0 | .149 | -1.2169 | -1.0412 |
| 145 | 4.00 | .000 | 4.8 | 3.60 | 0.0 | .050 | -0.1521 | -0.1363 |
| 146 | 4.00 | .000 | -5.2 | 3.60 | 0.0 | .050 | -0.1521 | -0.1395 |
| 153 | 2.00 | .000 | -2.1 | 3.60 | 0.0 | .114 | -0.1521 | -0.2003 |
| 157 | 4.00 | .000 | 9.8 | 3.60 | 0.0 | .035 | -0.1521 | -0.0778* |
| 158 | 4.00 | .000 | 14.7 | 3.60 | 0.0 | .014 | -0.1521 | -0.0469 |
| 159 | 3.00 | .000 | 14.7 | 3.60 | 0.0 | .169 | -0.6085 | -0.7424 |
| 160 | 4.00 | .000 | 19.8 | 3.60 | 0.0 | -.005 | -0.1521 | -0.1307 |
| 161 | 4.00 | .000 | 19.8 | 4.60 | 0.0 | .155 | -0.9127 | -1.0123 |
| 162 | 4.00 | .000 | 19.7 | 4.60 | 0.0 | .162 | -0.9127 | -1.0360 |
| 165 | 2.00 | .000 | 4.7 | 5.60 | 0.0 | .371 | -1.2169 | -1.2178 |
| 166 | 6.00 | .000 | 9.7 | 5.60 | 0.0 | .029 | -0.1521 | -0.0581 |
| 167 | 3.00 | .000 | 19.7 | 5.60 | 0.0 | .161 | -0.6085 | -0.9639* |
| 168 | 3.00 | .000 | 19.7 | 5.60 | 0.0 | .280 | -1.2169 | -1.1134 |
| 169 | 2.00 | .000 | 19.7 | 6.60 | 0.0 | .067 | -0.1521 | -0.7129 |
| 170 | 5.00 | .000 | 9.7 | 6.60 | 0.0 | .030 | -0.1521 | -0.1420 |
| 171 | 4.00 | .000 | 9.7 | 6.60 | 0.0 | .147 | -1.2169 | -1.1247 |
| 172 | 3.00 | .000 | -5.3 | 6.60 | 0.0 | .082 | -0.3042 | -0.3460 |
| 174 | 6.00 | .000 | -5.2 | 6.60 | 0.0 | .039 | -0.1521 | -0.1361* |
| 175 | 4.00 | .000 | 4.7 | 3.60 | 5.0 | .061 | -0.1521 | -0.2572* |
| 185 | 4.00 | .000 | 4.7 | 3.60 | 5.0 | .046 | -0.0761 | -0.1339 |
| 186 | 4.00 | .000 | -0.3 | 3.60 | 5.0 | .065 | -0.1521 | -0.2420 |
| 187 | 3.00 | .000 | -5.3 | 3.60 | 5.0 | .119 | -0.3042 | -0.3721* |
| 189 | 5.00 | .000 | -0.3 | 2.50 | 5.0 | .063 | -0.1521 | -0.2590* |
| 191 | 4.00 | .000 | 9.8 | 3.60 | 5.0 | .173 | -1.2169 | -1.1517 |
| 192 | 4.00 | .000 | 9.7 | 3.60 | 5.0 | .177 | -1.2169 | -1.1703 |
| 193 | 3.00 | .000 | 14.7 | 3.70 | 5.0 | .250 | -1.2169 | -1.3105 |
| 194 | 3.00 | .000 | 14.7 | 3.60 | 5.0 | .017 | -0.0761 | -0.1926* |
| 195 | 3.00 | .000 | 14.7 | 1.60 | 5.0 | .048 | -0.0761 | -0.3157* |
| 196 | 6.00 | .000 | -5.2 | 5.60 | 5.0 | .035 | -0.0761 | -0.2409* |
| 197 | 6.00 | .000 | 9.7 | 5.60 | 5.0 | .026 | -0.0761 | -0.0964* |
| 198 | 6.00 | .000 | 19.8 | 5.60 | 5.0 | -.016 | -0.0761 | 0.4122 |
| 199 | 2.00 | .000 | -0.3 | 5.60 | 5.0 | .101 | -0.1521 | -0.1728 |
| 200 | 2.00 | .000 | -5.3 | 5.60 | 5.0 | .257 | -0.6085 | -0.7096 |
| 201 | 4.00 | .000 | 19.8 | 5.60 | 5.0 | .139 | -1.2169 | -1.3202* |
| 202 | 5.00 | .000 | 14.7 | 6.60 | 5.0 | .010 | -0.0761 | -0.0398* |
| 203 | 5.00 | .000 | 4.7 | 6.60 | 5.0 | .036 | -0.1521 | -0.2313 |
| 204 | 5.00 | .000 | 4.8 | 6.60 | 5.0 | .037 | -0.1521 | -0.2419 |
| 205 | 3.00 | .000 | -5.3 | 6.60 | 5.0 | .279 | -1.2169 | -1.2178 |
| 206 | 4.00 | .000 | 4.7 | 3.60 | 5.0 | .055 | -0.1521 | -0.2038 |
| 207 | 4.00 | .000 | -0.3 | 3.60 | -5.0 | .063 | -0.1521 | -0.2269 |
| 208 | 6.00 | .000 | 14.7 | 3.60 | -5.0 | .155 | -1.2169 | -0.8961 |
| 210 | 5.00 | .000 | -0.3 | 2.50 | -5.0 | .103 | -0.6085 | -0.6348 |
| 211 | 4.00 | .000 | 4.7 | 2.60 | -5.0 | .094 | -0.3042 | -0.3575 |
| 212 | 2.00 | .000 | 4.7 | 2.60 | -5.0 | .162 | -0.3042 | -0.4229* |
| 213 | 4.00 | .000 | 9.8 | 2.60 | -5.0 | .043 | -0.1521 | -0.0227* |
| 214 | 2.00 | .000 | -0.3 | 4.60 | -5.0 | .170 | -0.3042 | -0.4126 |
| 215 | 6.00 | .000 | 14.8 | 4.60 | -5.0 | .126 | -1.2169 | -0.9500 |

TABLE A-14 (cont'd)

MEASURED AND FITTED VERTICAL FORCE
BETA=15. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|------|-------|------|-------|----------|----------|
| 216 | 5.00 | .000 | 14.7 | 5.50 | -5.0 | .150 | -1.2169 | -1.1467 |
| 218 | 3.00 | .000 | 9.7 | 5.60 | -5.0 | .242 | -0.9127 | -0.9781* |
| 219 | 4.00 | .000 | 9.7 | 5.60 | -5.0 | .045 | -0.3042 | -0.3057 |
| 220 | 6.00 | .000 | 14.8 | 5.60 | -5.0 | .007 | -0.0761 | -0.0452 |
| 221 | 6.00 | .000 | 14.8 | 6.60 | -5.0 | .005 | -0.1521 | -0.0516 |
| 222 | 4.00 | .000 | 9.7 | 6.60 | -5.0 | .044 | -0.3042 | -0.3371 |
| 223 | 3.00 | .000 | 19.7 | 6.60 | 10.0 | -.009 | -0.0761 | -0.4465 |
| 224 | 4.00 | .000 | 19.7 | 6.60 | 10.0 | -.014 | -0.1521 | -0.2314 |
| 225 | 2.00 | .000 | -5.3 | 6.60 | 10.0 | .104 | -0.1521 | -0.2030 |
| 226 | 3.00 | .000 | 4.7 | 6.60 | 10.0 | .117 | -0.6085 | -0.7184 |
| 227 | 5.00 | .000 | -0.3 | 6.50 | 10.0 | .070 | -0.6085 | -0.9117 |
| 228 | 3.00 | .000 | 14.8 | 6.60 | 10.0 | .191 | -1.2169 | -1.4478 |
| 231 | 3.00 | .000 | 19.8 | 4.60 | 10.0 | .179 | -1.2169 | -1.3666 |
| 232 | 5.00 | .000 | 14.7 | 4.50 | 10.0 | .035 | -0.6085 | -0.4730 |
| 233 | 2.00 | .000 | 14.7 | 4.60 | 10.0 | .037 | -0.0761 | -0.4336 |
| 234 | 4.00 | .000 | 4.8 | 3.60 | 5.0 | .054 | -0.1521 | -0.2034* |
| 235 | 5.00 | .000 | 4.8 | 3.50 | 10.0 | .118 | -1.2169 | -0.9855* |
| 238 | 3.00 | .000 | 9.7 | 3.60 | 10.0 | .240 | -1.2169 | -1.3539 |
| 239 | 4.00 | .000 | 9.8 | 3.60 | 10.0 | .059 | -0.3042 | -0.4008* |
| 240 | 5.00 | .000 | 8.6 | 3.50 | 10.0 | .020 | -0.3042 | -0.0295* |
| 241 | 3.00 | .000 | 4.8 | 3.60 | 10.0 | .131 | -0.3042 | -0.5663* |
| 242 | 4.00 | .000 | -0.3 | 3.60 | 10.0 | .064 | -0.1521 | -0.2455 |
| 243 | 4.00 | .000 | 9.7 | 2.60 | 10.0 | .050 | -0.1521 | -0.2167 |
| 244 | 3.00 | .000 | 19.7 | 5.60 | 10.0 | -.003 | -0.1521 | -0.5165 |
| 245 | 3.00 | .000 | -4.9 | 5.50 | 10.0 | .180 | -0.6085 | -0.7786 |
| 246 | 5.00 | .000 | -5.2 | 5.50 | 15.0 | .077 | -0.6085 | -1.0970 |
| 247 | 3.00 | .000 | -0.3 | 5.60 | 15.0 | .165 | -0.6085 | -0.8626 |
| 248 | 5.00 | .000 | 14.8 | 5.50 | 15.0 | .029 | -0.6085 | -0.8017 |
| 249 | 6.00 | .000 | 14.7 | 5.60 | 15.0 | .016 | -0.3042 | -0.7098* |
| 250 | 5.00 | .000 | -0.3 | 5.50 | 15.0 | .044 | -0.1521 | -0.8166* |
| 251 | 2.00 | .000 | 4.7 | 6.60 | 15.0 | .091 | -0.1521 | -0.2915* |
| 252 | 6.00 | .000 | 3.9 | 6.60 | 15.0 | .026 | -0.1521 | -1.1331* |
| 253 | 3.00 | .000 | 19.7 | 6.60 | 15.0 | .018 | -0.3042 | -0.7924 |
| 254 | 4.00 | .000 | -5.3 | 6.60 | 15.0 | .150 | -0.9127 | -1.3441* |
| 255 | 6.00 | .000 | -5.3 | 4.60 | 15.0 | .067 | -0.6085 | -1.0255* |
| 256 | 3.00 | .000 | 14.7 | 4.60 | 15.0 | .094 | -0.6085 | -0.8911* |
| 257 | 5.00 | .000 | 9.8 | 4.50 | 15.0 | .077 | -0.9127 | -1.0843 |
| 258 | 3.00 | .000 | 4.7 | 4.60 | 15.0 | .266 | -1.2169 | -1.4337 |
| 260 | 4.00 | .000 | -0.3 | 4.60 | 15.0 | .230 | -1.2169 | -1.4260 |
| 261 | 4.00 | .000 | -0.3 | 4.60 | 15.0 | .049 | -0.0761 | -0.3644 |
| 262 | 3.00 | .000 | 9.8 | 4.60 | 15.0 | .056 | -0.1521 | -0.4326 |
| 263 | 6.00 | .000 | 9.8 | 4.60 | 15.0 | .033 | -0.1521 | -0.7247 |
| 264 | 4.00 | .000 | -0.3 | 3.60 | 15.0 | .069 | -0.1521 | -0.2949 |
| 265 | 6.00 | .000 | 19.8 | 3.60 | 15.0 | -.009 | -0.0761 | 0.1500 |
| 266 | 4.00 | .000 | 9.8 | 2.60 | 15.0 | .053 | -0.1521 | -0.2585 |
| 267 | 3.00 | .000 | 9.8 | 2.60 | 15.0 | .095 | -0.3042 | -0.4874* |
| 268 | 3.00 | .000 | 4.7 | 2.60 | 15.0 | .089 | -0.1521 | -0.2681* |
| 270 | 6.00 | .000 | 4.8 | 2.50 | 15.0 | .099 | -0.9127 | -0.7432 |
| 271 | 6.00 | .000 | 4.8 | 2.50 | 15.0 | .097 | -0.9127 | -0.7213 |
| 275 | 4.00 | .000 | 9.8 | 2.50 | 15.0 | .117 | -0.9127 | -0.7962 |

R-1851

TABLE A-14 (cont'd)

MEASURED AND FITTED VERTICAL FORCE
BETA=15.DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|----------|
| 276 | 4.00 | .000 | 4.8 | 3.60 | 5.0 | .058 | -0.1521 | -0.2306 |
| 277 | 4.00 | .000 | -0.3 | 3.60 | 20.0 | .068 | -0.1521 | -0.3050 |
| 277 | 3.00 | .000 | 14.7 | 3.50 | 20.0 | .049 | -0.3042 | -0.5633 |
| 279 | 4.00 | .000 | 4.8 | 3.50 | 20.0 | .133 | -0.9127 | -0.9165 |
| 280 | 6.00 | .000 | 4.8 | 2.50 | 20.0 | .100 | -0.9127 | -0.6852 |
| 281 | 5.00 | .000 | 4.8 | 2.50 | 20.0 | .168 | -1.2169 | -1.1079 |
| 282 | 6.00 | .000 | 14.7 | 2.50 | 20.0 | .028 | -0.6085 | -0.1020 |
| 283 | 4.00 | .000 | 14.7 | 2.50 | 20.0 | .034 | -0.3042 | -0.2693 |
| 286 | 4.00 | .000 | 14.7 | 2.50 | 20.0 | .020 | -0.0761 | -0.1341* |
| 286 | 3.00 | .000 | 9.7 | 4.50 | 20.0 | .043 | -0.3042 | -0.4359 |
| 287 | 3.00 | .000 | 9.7 | 4.50 | 20.0 | .075 | -0.3042 | -0.6428 |
| 288 | 4.00 | .000 | 19.8 | 4.50 | 20.0 | -.004 | -0.3042 | -0.5841 |
| 289 | 2.00 | .000 | 14.7 | 4.50 | 20.0 | .098 | -0.3042 | -0.7574 |
| 290 | 2.00 | .000 | 19.8 | 4.60 | 20.0 | .136 | -0.6085 | -1.2118 |
| 294 | 3.00 | .000 | -0.3 | 5.50 | 20.0 | .090 | -0.3042 | -0.5661 |
| 295 | 3.00 | .000 | -0.3 | 5.60 | 20.0 | .056 | -0.0761 | -0.4113 |
| 296 | 4.00 | .000 | -0.3 | 6.60 | 20.0 | .046 | -0.0761 | -1.0028* |
| 297 | 4.00 | .000 | 4.7 | 3.60 | 5.0 | .059 | -0.1521 | -0.2408 |
| 298 | 4.00 | .000 | 4.8 | 1.60 | 5.0 | .082 | -0.1521 | -0.3565* |
| 299 | 4.00 | .000 | 14.7 | 1.60 | 5.0 | .038 | -0.1521 | -0.1796 |
| 300 | 5.00 | .000 | -0.3 | 1.50 | 15.0 | .051 | -0.1521 | 0.1940 |
| 109 | 2.35 | .059 | 0.0 | 3.00 | 0.0 | .069 | -0.1521 | -0.0751 |
| 110 | 2.92 | .073 | 0.0 | 3.00 | 0.0 | .060 | -0.1521 | -0.0684 |
| 111 | 3.88 | .097 | 0.0 | 3.00 | 0.0 | .052 | -0.1521 | -0.1120 |
| 112 | 4.95 | .124 | 0.0 | 3.00 | 0.0 | .045 | -0.1521 | -0.1659 |
| 113 | 6.02 | .150 | 0.0 | 3.00 | 0.0 | .037 | -0.1521 | -0.1309 |
| 114 | 2.87 | .072 | 0.0 | 3.00 | 0.0 | .049 | -0.0761 | -0.0080* |
| 115 | 3.02 | .076 | 0.0 | 3.00 | 0.0 | .081 | -0.3042 | -0.1943 |
| 116 | 3.01 | .075 | 0.0 | 3.00 | 0.0 | .155 | -0.6085 | -0.6256 |
| 117 | 2.82 | .071 | 0.0 | 3.00 | 0.0 | .156 | -0.9127 | -0.5873* |
| 119 | 4.03 | .101 | 0.0 | 3.00 | 0.0 | .181 | -1.2169 | -1.1076 |
| 120 | 3.03 | .076 | 5.0 | 3.00 | 0.0 | .059 | -0.1521 | -0.0850 |
| 121 | 3.02 | .075 | -5.0 | 3.00 | 0.0 | .056 | -0.1521 | -0.0934 |
| 122 | 2.87 | .072 | -10.0 | 3.00 | 0.0 | .052 | -0.1521 | -0.1587 |
| 123 | 2.89 | .072 | -15.0 | 3.00 | 0.0 | .046 | -0.1521 | -0.2833 |
| 124 | 3.05 | .076 | -20.0 | 3.00 | 0.0 | .040 | -0.1521 | -0.4637 |
| 125 | 3.06 | .076 | 0.0 | 3.00 | 5.0 | .058 | -0.1521 | -0.0549* |
| 127 | 3.01 | .075 | 0.0 | 3.00 | -10.0 | .067 | -0.1521 | -0.1072 |
| 128 | 3.03 | .076 | 0.0 | 3.00 | -15.0 | .066 | -0.1521 | -0.0880 |
| 129 | 3.01 | .075 | 0.0 | 3.00 | -20.0 | .055 | -0.1521 | -0.0087* |
| 130 | 2.99 | .075 | 0.0 | 2.00 | 0.0 | .066 | -0.1521 | -0.1279 |
| 131 | 3.02 | .075 | 0.0 | 4.00 | 0.0 | .063 | -0.1521 | -0.1223 |
| 132 | 3.06 | .076 | 0.0 | 5.00 | 0.0 | .054 | -0.1521 | -0.1202 |
| 133 | 3.06 | .076 | 0.0 | 6.00 | 0.0 | .057 | -0.1521 | -0.1643 |
| 136 | 4.04 | .101 | -5.0 | 3.00 | 0.0 | .095 | -0.6085 | -0.5043 |
| 137 | 6.09 | .152 | -15.0 | 5.00 | -10.0 | .003 | -0.0761 | -0.3759* |
| 138 | 6.05 | .151 | -20.0 | 6.00 | -5.0 | -.018 | -0.3042 | 0.2366 |
| 139 | 4.02 | .100 | -20.0 | 6.00 | -20.0 | -.022 | -0.0761 | -0.9276* |
| 140 | 5.00 | .125 | 5.0 | 3.00 | -20.0 | .022 | -0.0761 | -0.0657 |
| 141 | 4.99 | .125 | 5.0 | 3.00 | -20.0 | .021 | -0.0761 | -0.0600 |

R-1851

TABLE A-14 (cont'd)

MEASURED AND FITTED VERTICAL FORCE
BETA=15. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|------|----------|----------|
| 142 | 2.91 | .073 | -5.0 | 3.00 | -5.0 | .056 | -0.1521 | -0.1159 |
| 143 | 1.65 | .041 | -10.0 | 2.00 | 0.0 | .153 | -0.3042 | -0.3937 |
| 144 | 3.79 | .095 | -10.0 | 3.00 | -20.0 | .093 | -1.2169 | -0.7781* |
| 145 | 4.76 | .119 | 5.0 | 2.00 | -5.0 | .045 | -0.1521 | -0.0446 |
| 147 | 3.97 | .097 | -5.0 | 6.00 | -20.0 | .026 | -0.0761 | -1.0053* |
| 148 | 5.86 | .146 | -10.0 | 3.00 | 5.0 | .097 | -0.9127 | -0.7029 |
| 150 | 3.94 | .093 | -15.0 | 4.00 | -5.0 | .093 | -0.9127 | -0.8423 |
| 151 | 2.95 | .074 | -10.0 | 2.00 | -10.0 | .105 | -0.6085 | -0.5525 |
| 154 | 4.73 | .120 | -5.0 | 3.00 | -5.0 | .032 | -0.1521 | -0.0944 |
| 156 | 3.00 | .075 | 0.0 | 2.00 | -10.0 | .053 | -0.0761 | 0.0030 |
| 157 | 3.02 | .076 | -5.0 | 6.00 | -15.0 | .050 | -0.1521 | -0.5167* |
| 158 | 3.99 | .100 | -5.0 | 6.00 | -15.0 | .040 | -0.1521 | -0.8468* |
| 160 | 2.40 | .060 | -10.0 | 2.00 | -20.0 | .044 | -0.1521 | -0.2377* |
| 161 | 6.18 | .154 | 5.0 | 3.00 | -20.0 | .044 | -1.2169 | -0.5571* |
| 162 | 6.21 | .155 | 5.0 | 3.00 | -20.0 | .040 | -1.2169 | -0.5427* |
| 163 | 6.18 | .154 | -10.0 | 2.00 | -15.0 | .004 | -0.6085 | 0.3334* |
| 164 | 4.33 | .110 | -10.0 | 5.00 | -20.0 | .041 | -0.6085 | -1.2429* |
| 165 | 3.23 | .081 | -10.0 | 2.00 | -20.0 | .082 | -0.9127 | -0.3970* |
| 166 | 2.15 | .054 | -10.0 | 4.00 | -15.0 | .037 | -0.1521 | -0.2826 |
| 167 | 2.64 | .066 | -5.0 | 3.00 | -5.0 | .065 | -0.1521 | -0.1427* |
| 168 | 5.65 | .141 | -5.0 | 5.00 | 5.0 | .073 | -1.2169 | -0.6427* |
| 169 | 4.72 | .118 | -5.0 | 2.00 | -10.0 | .052 | -0.1521 | -0.1810* |
| 170 | 5.81 | .145 | 5.0 | 3.00 | -5.0 | .040 | -0.3042 | -0.1969 |
| 171 | 4.74 | .118 | 0.0 | 2.00 | 5.0 | .064 | -0.3042 | -0.2700 |
| 173 | 5.91 | .148 | -5.0 | 3.00 | 0.0 | .077 | -0.9127 | -0.6335* |
| 174 | 4.83 | .121 | -20.0 | 5.00 | 5.0 | .045 | -0.6085 | -0.5469 |
| 175 | 6.04 | .151 | -20.0 | 5.00 | -5.0 | .020 | -1.2169 | -0.3960* |
| 177 | 3.75 | .094 | -10.0 | 5.00 | 5.0 | .013 | -0.0761 | 0.0195* |
| 178 | 2.96 | .074 | -5.0 | 3.00 | -5.0 | .048 | -0.1521 | -0.0745* |
| 180 | 3.18 | .079 | -15.0 | 4.00 | -10.0 | .111 | -0.9127 | -0.9366 |
| 181 | 5.11 | .128 | -5.0 | 2.00 | -15.0 | .046 | -0.1521 | -0.0753* |
| 182 | 2.15 | .054 | -15.0 | 3.00 | 5.0 | .002 | -0.0761 | -0.2681* |
| 183 | 4.91 | .123 | -20.0 | 5.00 | -15.0 | .012 | -1.2169 | -0.9723* |
| 184 | 5.08 | .127 | 5.0 | 4.00 | 0.0 | .071 | -0.9127 | -0.5230* |
| 527 | 1.82 | .068 | 0.0 | 3.00 | 0.0 | .112 | -0.1521 | -0.1961 |
| 528 | 2.37 | .108 | 0.0 | 3.00 | 0.0 | .076 | -0.1521 | -0.1545 |
| 529 | 3.87 | .145 | 0.0 | 3.00 | 0.0 | .052 | -0.1521 | -0.1331 |
| 530 | 4.98 | .187 | 0.0 | 3.00 | 0.0 | .043 | -0.1521 | -0.2110 |
| 531 | 5.97 | .224 | 0.0 | 3.00 | 0.0 | .037 | -0.1521 | -0.2509* |
| 532 | 2.96 | .111 | 0.0 | 3.00 | 0.0 | .052 | -0.0761 | -0.0331 |
| 533 | 2.97 | .111 | 0.0 | 3.00 | 0.0 | .104 | -0.3042 | -0.3327 |
| 534 | 2.96 | .111 | 0.0 | 3.00 | 0.0 | .154 | -0.6085 | -0.6281 |
| 536 | 3.98 | .149 | 0.0 | 3.00 | 0.0 | .146 | -0.9127 | -0.8947 |
| 537 | 3.97 | .149 | 0.0 | 3.00 | 0.0 | .195 | -1.2169 | -1.2417 |
| 538 | 2.96 | .111 | 5.0 | 3.00 | 0.0 | .075 | -0.1521 | -0.1626 |
| 539 | 2.96 | .111 | -5.0 | 3.00 | 0.0 | .074 | -0.1521 | -0.2019 |
| 540 | 3.00 | .112 | -10.0 | 3.00 | 0.0 | .063 | -0.1521 | -0.2386 |
| 541 | 2.97 | .111 | -15.0 | 3.00 | 0.0 | .044 | -0.1521 | -0.2988 |
| 542 | 2.98 | .112 | -20.0 | 3.00 | 0.0 | .019 | -0.1521 | -0.4394 |
| 543 | 2.98 | .112 | 0.0 | 3.00 | 5.0 | .074 | -0.1521 | -0.1433 |

TABLE A-14 (cont'd)

MEASURED AND FITTED VERTICAL FORCE
BETA=15. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|----------|
| 544 | 2.98 | .112 | 0.0 | 3.00 | -5.0 | .078 | -0.1521 | -0.1873 |
| 545 | 2.99 | .112 | 0.0 | 3.00 | -10.0 | .079 | -0.1521 | -0.1859 |
| 546 | 2.97 | .112 | 0.0 | 3.00 | -20.0 | .057 | -0.1521 | -0.0359* |
| 547 | 2.99 | .112 | 0.0 | 3.00 | -15.0 | .084 | -0.1521 | -0.1879 |
| 548 | 2.97 | .111 | 0.0 | 2.00 | 0.0 | .080 | -0.1521 | -0.2150 |
| 549 | 2.98 | .112 | 0.0 | 4.00 | 0.0 | .060 | -0.1521 | -0.1140 |
| 550 | 2.97 | .112 | 0.0 | 5.00 | 0.0 | .059 | -0.1521 | -0.1500 |
| 551 | 3.01 | .113 | 0.0 | 6.00 | 0.0 | .055 | -0.1521 | -0.1564* |
| 552 | 1.90 | .071 | -15.0 | 4.00 | 5.0 | .136 | -0.3042 | -0.4200* |
| 553 | 4.03 | .151 | -5.0 | 3.00 | -5.0 | .064 | -0.3042 | -0.3594* |
| 555 | 5.98 | .224 | 5.0 | 4.00 | -20.0 | .064 | -0.6085 | -1.7804* |
| 556 | 4.99 | .187 | -10.0 | 4.00 | 5.0 | .136 | -1.2169 | -1.0934 |
| 558 | 3.99 | .150 | -15.0 | 6.00 | 0.0 | .003 | -0.1521 | -0.1285 |
| 559 | 3.00 | .113 | -5.0 | 3.00 | -5.0 | .071 | -0.1521 | -0.2308* |
| 560 | 6.00 | .225 | 0.0 | 2.00 | -5.0 | .051 | -0.1521 | -0.3947* |
| 561 | 5.00 | .188 | -15.0 | 5.00 | 0.0 | .065 | -0.9127 | -0.7889* |
| 564 | 6.01 | .225 | -20.0 | 3.00 | 5.0 | .054 | -0.6085 | -0.4243* |
| 566 | 6.01 | .225 | 0.0 | 3.00 | 5.0 | .086 | -1.2169 | -0.8216* |
| 567 | 6.00 | .225 | -20.0 | 5.00 | -20.0 | -.008 | -1.2169 | -1.7460 |
| 568 | 3.98 | .149 | -10.0 | 6.00 | 0.0 | .014 | -0.0761 | -0.0607 |
| 569 | 3.97 | .149 | 5.0 | 4.00 | -10.0 | .169 | -0.9127 | -0.9982 |
| 570 | 2.99 | .112 | -5.0 | 3.00 | 0.0 | .146 | -0.6085 | -0.6281* |
| 571 | 4.97 | .186 | -5.0 | 6.00 | -20.0 | .049 | -0.1521 | -2.3951* |
| 572 | 3.00 | .112 | -5.0 | 3.00 | -5.0 | .071 | -0.1521 | -0.2279 |
| 573 | 5.95 | .223 | -5.0 | 2.00 | -20.0 | .082 | -1.2169 | -0.5268* |
| 577 | 4.97 | .186 | 5.0 | 3.00 | -20.0 | .106 | -0.0761 | -0.5684* |
| 579 | 1.99 | .075 | -15.0 | 6.00 | -5.0 | .186 | -0.6085 | -0.8893 |
| 580 | 2.96 | .111 | 0.0 | 6.00 | -20.0 | .191 | -0.9127 | -1.3414 |
| 581 | 6.00 | .225 | -20.0 | 2.00 | 0.0 | -.006 | -0.3042 | 0.1773 |
| 583 | 5.95 | .223 | -15.0 | 2.00 | -5.0 | .050 | -0.9127 | -0.5679 |
| 585 | 6.01 | .225 | -10.0 | 3.00 | -5.0 | .058 | -0.9127 | -0.7600 |
| 586 | 2.96 | .111 | -5.0 | 3.00 | -5.0 | .072 | -0.1521 | -0.2264 |
| 588 | 3.91 | .147 | -5.0 | 3.00 | -5.0 | .125 | -0.9127 | -0.8175* |
| 593 | 4.03 | .151 | -10.0 | 6.00 | -5.0 | .021 | -0.0761 | -0.2975* |
| 594 | 2.97 | .111 | -20.0 | 4.00 | 0.0 | .138 | -0.6085 | -0.8733 |
| 595 | 3.01 | .113 | 0.0 | 4.00 | -15.0 | .104 | -0.3042 | -0.4563 |
| 596 | 2.03 | .076 | -5.0 | 5.00 | 5.0 | .276 | -0.9127 | -0.8509 |
| 598 | 3.01 | .113 | -10.0 | 5.00 | -10.0 | .128 | -0.9127 | -0.9790 |
| 599 | 3.02 | .113 | -5.0 | 3.00 | -5.0 | .073 | -0.1521 | -0.2445 |
| 600 | 2.01 | .075 | -10.0 | 6.00 | -10.0 | .254 | -0.9127 | -1.1278 |
| 601 | 5.02 | .188 | -20.0 | 5.00 | -10.0 | .026 | -1.2169 | -1.0106 |
| 602 | 5.05 | .189 | -20.0 | 2.00 | -10.0 | -.030 | -0.0761 | 0.3188 |
| 603 | 3.05 | .114 | -15.0 | 5.00 | -15.0 | .036 | -0.3042 | -0.7680 |
| 604 | 5.99 | .225 | -10.0 | 4.00 | -15.0 | .052 | -1.2169 | -1.5670 |
| 618 | 1.92 | .144 | 0.0 | 3.00 | 0.0 | .093 | -0.1521 | -0.1479 |
| 619 | 2.99 | .224 | 0.0 | 3.00 | 0.0 | .070 | -0.1521 | -0.1929 |
| 620 | 2.50 | .188 | 0.0 | 3.00 | 0.0 | .078 | -0.1521 | -0.1500 |
| 621 | 3.07 | .230 | 0.0 | 3.00 | 0.0 | .050 | -0.0761 | -0.0836 |
| 622 | 3.06 | .230 | 0.0 | 3.00 | 0.0 | .086 | -0.3042 | -0.3187 |
| 623 | 3.05 | .228 | 0.0 | 3.00 | 0.0 | .136 | -0.6085 | -0.6479 |

TABLE A-14 (cont'd)

MEASURED AND FITTED VERTICAL FORCE
BETA=15. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|----------|
| 625 | 3.01 | .226 | 5.0 | 3.00 | 0.0 | .061 | -0.1521 | -0.1228 |
| 626 | 2.99 | .224 | -5.0 | 3.00 | 0.0 | .066 | -0.1521 | -0.2366 |
| 627 | 3.01 | .226 | -10.0 | 3.00 | 0.0 | .049 | -0.1521 | -0.2512 |
| 628 | 3.00 | .225 | -15.0 | 3.00 | 0.0 | .028 | -0.1521 | -0.3084 |
| 629 | 3.01 | .226 | -20.0 | 3.00 | 0.0 | .003 | -0.1521 | -0.4517 |
| 630 | 2.98 | .223 | 0.0 | 3.00 | 5.0 | .063 | -0.1521 | -0.1186 |
| 631 | 2.97 | .223 | 0.0 | 3.00 | -5.0 | .070 | -0.1521 | -0.2077 |
| 632 | 2.96 | .222 | 0.0 | 3.00 | -10.0 | .071 | -0.1521 | -0.2079 |
| 633 | 2.97 | .223 | 0.0 | 3.00 | -15.0 | .072 | -0.1521 | -0.2039 |
| 634 | 2.97 | .223 | 0.0 | 3.00 | -20.0 | .053 | -0.1521 | -0.0966 |
| 635 | 2.97 | .223 | 0.0 | 2.00 | 0.0 | .062 | -0.1521 | -0.1533 |
| 636 | 2.98 | .223 | 0.0 | 4.00 | 0.0 | .060 | -0.1521 | -0.1664 |
| 637 | 2.98 | .223 | 0.0 | 5.00 | 0.0 | .053 | -0.1521 | -0.1692 |
| 638 | 2.98 | .223 | 0.0 | 6.00 | 0.0 | .048 | -0.1521 | -0.1593 |
| 639 | 2.47 | .185 | 0.0 | 6.00 | -20.0 | .058 | -0.0761 | -0.6378* |
| 640 | 2.48 | .186 | 5.0 | 6.00 | -5.0 | .232 | -0.9127 | -0.9926 |
| 641 | 2.96 | .222 | -5.0 | 3.00 | -5.0 | .108 | -0.6085 | -0.5491 |
| 642 | 2.48 | .186 | -5.0 | 6.00 | 5.0 | .275 | -1.2169 | -1.1628 |
| 643 | 1.97 | .148 | 0.0 | 4.00 | -10.0 | .206 | -0.6085 | -0.6314* |
| 644 | 2.50 | .187 | -20.0 | 3.00 | -10.0 | -.010 | -0.0761 | -0.6343* |
| 645 | 1.99 | .149 | -20.0 | 3.00 | -10.0 | .069 | -0.3042 | -0.8895 |
| 646 | 2.96 | .222 | -5.0 | 3.00 | -5.0 | .061 | -0.1521 | -0.2427 |
| 660 | 2.99 | .224 | -15.0 | 3.00 | 5.0 | .071 | -0.3042 | -0.4153 |
| 661 | 1.99 | .150 | -5.0 | 3.00 | -15.0 | .106 | -0.3042 | -0.3325 |
| 662 | 2.99 | .224 | -20.0 | 6.00 | -10.0 | .108 | -1.2169 | -1.6672 |
| 665 | 2.51 | .188 | 0.0 | 3.00 | -5.0 | .092 | -0.3042 | -0.2279 |
| 667 | 3.00 | .225 | 5.0 | 6.00 | -10.0 | .181 | -0.9127 | -1.1893* |
| 668 | 2.00 | .150 | -5.0 | 3.00 | -10.0 | .066 | -0.0761 | -0.1749* |
| 670 | 2.99 | .224 | -5.0 | 5.00 | -20.0 | .158 | -1.2169 | -1.5126 |
| 671 | 2.51 | .188 | 5.0 | 5.00 | 0.0 | .043 | -0.1521 | -0.0361* |
| 672 | 2.99 | .224 | -5.0 | 3.00 | -5.0 | .056 | -0.1521 | -0.2196 |
| 673 | 1.99 | .149 | -5.0 | 6.00 | -5.0 | .255 | -0.9127 | -0.9978 |
| 674 | 2.50 | .188 | 5.0 | 5.00 | 0.0 | .091 | -0.3042 | -0.2766* |
| 675 | 2.50 | .188 | -5.0 | 6.00 | 0.0 | .037 | -0.0761 | -0.0440* |
| 676 | 1.99 | .149 | -20.0 | 3.00 | -20.0 | -.023 | -0.0761 | -0.8780* |
| 678 | 1.99 | .149 | -10.0 | 3.00 | 5.0 | .079 | -0.1521 | -0.2304* |
| 681 | 2.51 | .188 | -10.0 | 6.00 | -15.0 | .034 | -0.0761 | -0.6251* |
| 682 | 2.50 | .187 | 5.0 | 6.00 | -10.0 | .256 | -0.9127 | -1.0892* |
| 683 | 2.97 | .223 | -5.0 | 3.00 | -5.0 | .075 | -0.1521 | -0.3377* |
| 685 | 2.99 | .224 | -15.0 | 6.00 | 0.0 | .229 | -1.2169 | -1.5333 |
| 686 | 2.50 | .188 | -15.0 | 8.00 | 0.0 | .279 | -1.2169 | -1.4095 |
| 688 | 2.99 | .224 | 0.0 | 5.00 | -15.0 | .185 | -0.9127 | -1.2696 |
| 689 | 2.00 | .150 | 0.0 | 5.00 | 5.0 | .077 | -0.0761 | -0.0643 |
| 690 | 3.00 | .225 | 5.0 | 6.00 | -20.0 | .124 | -0.6085 | -1.2499 |
| 691 | 2.02 | .152 | -5.0 | 8.00 | -15.0 | .340 | -1.2169 | -1.5901 |
| 693 | 2.46 | .185 | -10.0 | 2.00 | 5.0 | .086 | -0.3042 | -0.3370 |
| 694 | 2.96 | .222 | -20.0 | 4.00 | -10.0 | .124 | -1.2169 | -1.4560* |
| 695 | 2.96 | .222 | -5.0 | 3.00 | -5.0 | .073 | -0.1521 | -0.3236* |
| 697 | 2.47 | .185 | -10.0 | 6.00 | 0.0 | .224 | -0.9127 | -1.1260 |
| 698 | 2.99 | .224 | -10.0 | 6.00 | -5.0 | .134 | -0.9127 | -1.1521 |

R-1851

TABLE A-14 (cont'd)

MEASURED AND FITTED VERTICAL FORCE
BETA=15.DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|------|----------|---------|
| 699 | 3.00 | .225 | 5.0 | 8.00 | -10.0 | .222 | -1.2169 | -1.6539 |
| 700 | 3.00 | .225 | -20.0 | 4.00 | -5.0 | .177 | -1.2169 | -1.5264 |
| 701 | 2.48 | .186 | -20.0 | 5.00 | -20.0 | .087 | -0.9127 | -1.5827 |

MEAN ERROR= 0.4721
STANDARD DEVIATION= 0.1493

R-1851

TABLE A-15

MEASURED AND FITTED VERTICAL FORCE
BETA=20. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|------|-------|------|-------|----------|----------|
| 316 | 4.00 | .000 | 4.8 | 3.70 | 5.0 | .086 | -0.1521 | -0.2888* |
| 317 | 4.00 | .000 | 4.7 | 3.70 | 5.0 | .088 | -0.1521 | -0.2991* |
| 318 | 4.00 | .000 | 4.7 | 3.60 | 0.0 | .131 | -0.1521 | -0.5361* |
| 326 | 4.00 | .000 | 4.7 | 3.60 | 0.0 | .116 | -0.3042 | -0.4424 |
| 328 | 4.00 | .000 | 9.7 | 3.70 | 0.0 | .070 | -0.1521 | -0.1936 |
| 329 | 4.00 | .000 | 14.7 | 3.70 | 0.0 | .047 | -0.1521 | -0.1281 |
| 330 | 4.00 | .000 | 19.8 | 3.60 | 0.0 | .025 | -0.1521 | -0.1085 |
| 331 | 4.00 | .000 | 27.2 | 3.60 | 0.0 | -.006 | -0.1521 | -0.2024 |
| 332 | 3.00 | .000 | 19.7 | 3.60 | 0.0 | .191 | -0.6085 | -0.5763 |
| 337 | 4.00 | .000 | 27.3 | 4.70 | 0.0 | .179 | -0.9127 | -1.0416* |
| 340 | 3.00 | .000 | 4.7 | 2.60 | 0.0 | .098 | -0.0761 | -0.2172* |
| 342 | 6.00 | .000 | 19.8 | 3.70 | 0.0 | .141 | -1.2169 | -1.3201* |
| 344 | 3.00 | .000 | 27.3 | 5.70 | 0.0 | .281 | -1.2169 | -0.9351* |
| 345 | 3.00 | .000 | 27.3 | 5.60 | 0.0 | .173 | -0.6085 | -0.6832* |
| 349 | 5.00 | .000 | 4.8 | 5.60 | 0.0 | .053 | -0.0761 | -0.1746* |
| 351 | 6.00 | .000 | -5.3 | 6.70 | 0.0 | .051 | -0.1521 | -0.1643 |
| 353 | 2.00 | .000 | 27.2 | 6.70 | 0.0 | .068 | -0.1521 | -0.1397 |
| 354 | 3.00 | .000 | -5.3 | 6.60 | 0.0 | .110 | -0.3042 | -0.3555 |
| 355 | 4.00 | .000 | 9.8 | 6.70 | 0.0 | .186 | -1.2169 | -1.1585 |
| 356 | 3.00 | .000 | -0.3 | 6.70 | -5.0 | .236 | -0.9127 | -1.0116 |
| 357 | 4.00 | .000 | 9.7 | 6.70 | -5.0 | .069 | -0.3042 | -0.2850 |
| 358 | 4.00 | .000 | 9.7 | 6.70 | -5.0 | .060 | -0.3042 | -0.2262 |
| 359 | 4.00 | .000 | 9.7 | 6.70 | -5.0 | .061 | -0.3042 | -0.2302 |
| 362 | 4.00 | .000 | 9.7 | 5.60 | -5.0 | .065 | -0.3042 | -0.2473 |
| 364 | 3.00 | .000 | 14.7 | 5.70 | -5.0 | .266 | -0.9127 | -0.7846 |
| 365 | 5.00 | .000 | 19.8 | 5.60 | -5.0 | .170 | -1.2169 | -1.1761 |
| 366 | 6.00 | .000 | 19.8 | 4.70 | -5.0 | .132 | -1.2169 | -1.1488 |
| 368 | 4.00 | .000 | 9.7 | 2.60 | -5.0 | .109 | -0.3042 | -0.2935 |
| 369 | 2.00 | .000 | 9.7 | 2.60 | -5.0 | .172 | -0.3042 | -0.3166* |
| 370 | 4.00 | .000 | 14.7 | 2.60 | -5.0 | .045 | -0.1521 | -0.0014* |
| 371 | 5.00 | .000 | 4.7 | 2.60 | -5.0 | .145 | -0.6085 | -0.7322 |
| 374 | 5.00 | .000 | -0.3 | 3.60 | -5.0 | .069 | -0.1521 | -0.1873 |
| 375 | 5.00 | .000 | -0.3 | 3.60 | -5.0 | .067 | -0.1521 | -0.1685* |
| 376 | 4.00 | .000 | -0.3 | 3.70 | -5.0 | .087 | -0.1521 | -0.2589* |
| 377 | 4.00 | .000 | 4.7 | 3.60 | 5.0 | .081 | -0.1521 | -0.2521* |
| 378 | 4.00 | .000 | 4.8 | 3.60 | 5.0 | .064 | -0.0761 | -0.1505* |
| 379 | 4.00 | .000 | -0.3 | 3.60 | 5.0 | .084 | -0.1521 | -0.2327 |
| 380 | 3.00 | .000 | -5.3 | 3.60 | 5.0 | .148 | -0.3042 | -0.3851* |
| 381 | 3.00 | .000 | -0.3 | 2.60 | 5.0 | .117 | -0.1521 | -0.3004* |
| 382 | 5.00 | .000 | 4.7 | 2.60 | 5.0 | .076 | -0.1521 | -0.2270* |
| 383 | 3.00 | .000 | 19.7 | 2.60 | 5.0 | .028 | -0.0761 | -0.0129* |
| 385 | 5.00 | .000 | 14.8 | 2.60 | 5.0 | .153 | -1.2169 | -1.1435 |
| 387 | 6.00 | .000 | 4.8 | 2.60 | 5.0 | .151 | -1.2169 | -1.1806 |
| 388 | 3.00 | .000 | -5.2 | 6.70 | 5.0 | .310 | -1.2169 | -1.2403 |
| 389 | 5.00 | .000 | 9.7 | 6.60 | 5.0 | .040 | -0.1521 | -0.1695* |
| 395 | 4.00 | .000 | 27.4 | 5.60 | 5.0 | .176 | -1.2169 | -1.4757* |
| 396 | 4.00 | .000 | 4.8 | 3.60 | 5.0 | .081 | -0.1521 | -0.2518* |
| 397 | 4.00 | .000 | -0.2 | 3.60 | 10.0 | .084 | -0.1521 | -0.2279 |
| 398 | 3.00 | .000 | -5.3 | 3.60 | 10.0 | .146 | -0.3042 | -0.2993 |
| 399 | 4.00 | .000 | 9.8 | 3.60 | 10.0 | .087 | -0.3042 | -0.4076 |

R-1851

TABLE A-15 (cont'd)

MEASURED AND FITTED VERTICAL FORCE
BETA=20. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|------|-------|------|-------|----------|----------|
| 400 | 5.00 | .000 | 19.7 | 3.60 | 10.0 | .019 | -0.3042 | -0.1894 |
| 401 | 4.00 | .000 | 14.8 | 3.60 | 10.0 | .163 | -1.2169 | -1.0699 |
| 402 | 3.00 | .000 | 14.7 | 6.60 | 10.0 | .223 | -1.2169 | -1.2637 |
| 403 | 3.00 | .000 | 4.7 | 6.60 | 10.0 | .152 | -0.6085 | -0.6449 |
| 404 | 5.00 | .000 | 5.3 | 6.60 | 10.0 | .091 | -0.6085 | -0.6388 |
| 405 | 2.00 | .000 | -5.3 | 6.60 | 10.0 | .120 | -0.1521 | -0.1196 |
| 406 | 4.00 | .000 | 27.3 | 6.60 | 10.0 | -.027 | -0.1521 | -0.2065 |
| 407 | 3.00 | .000 | 27.2 | 6.60 | 10.0 | -.025 | -0.0761 | -0.0850 |
| 408 | 2.00 | .000 | 19.7 | 4.60 | 10.0 | .038 | -0.0761 | -0.0408 |
| 409 | 4.00 | .000 | 9.7 | 2.60 | 10.0 | .063 | -0.1521 | -0.1949 |
| 410 | 3.00 | .000 | 27.3 | 5.60 | 10.0 | -.016 | -0.1521 | -0.1796 |
| 411 | 3.00 | .000 | -5.2 | 5.60 | 10.0 | .211 | -0.6085 | -0.6381 |
| 412 | 3.00 | .000 | -5.3 | 5.60 | 10.0 | .212 | -0.6085 | -0.6373 |
| 413 | 5.00 | .000 | -5.2 | 5.50 | 15.0 | .089 | -0.6085 | -0.5611 |
| 414 | 3.00 | .000 | -0.3 | 5.60 | 15.0 | .201 | -0.6085 | -0.6523 |
| 415 | 5.00 | .000 | 19.7 | 5.50 | 15.0 | .028 | -0.6085 | -0.5878 |
| 417 | 5.00 | .000 | -0.3 | 5.50 | 15.0 | .057 | -0.1521 | -0.4310* |
| 419 | 6.00 | .000 | 27.2 | 3.60 | 15.0 | -.048 | -0.0761 | 0.2086* |
| 420 | 4.00 | .000 | 14.8 | 2.60 | 15.0 | .056 | -0.1521 | -0.2944* |
| 421 | 3.00 | .000 | 4.8 | 2.60 | 15.0 | .109 | -0.1521 | -0.2969* |
| 422 | 3.00 | .000 | 9.8 | 2.60 | 15.0 | .152 | -0.3042 | -0.6315* |
| 423 | 4.00 | .000 | 14.8 | 2.60 | 15.0 | .130 | -0.9127 | -0.8545 |
| 424 | 6.00 | .000 | 4.8 | 2.60 | 15.0 | .125 | -0.9127 | -0.9195 |
| 427 | 5.00 | .000 | 14.8 | 4.50 | 15.0 | .077 | -0.9127 | -0.8196 |
| 428 | 4.00 | .000 | 4.8 | 4.60 | 15.0 | .215 | -1.2169 | -1.1669 |
| 429 | 4.00 | .000 | -0.2 | 4.70 | 15.0 | .290 | -1.2169 | -1.2764 |
| 430 | 6.00 | .000 | -5.2 | 4.60 | 15.0 | .080 | -0.6085 | -0.6173 |
| 431 | 3.00 | .000 | 14.8 | 4.60 | 15.0 | .135 | -0.6085 | -0.7094* |
| 432 | 5.00 | .000 | 14.8 | 4.60 | 15.0 | .033 | -0.1521 | -0.4148* |
| 433 | 3.00 | .000 | 14.7 | 4.60 | 15.0 | .056 | -0.1521 | -0.2822* |
| 434 | 4.00 | .000 | -0.3 | 4.60 | 15.0 | .063 | -0.0761 | -0.2172* |
| 435 | 2.00 | .000 | 4.7 | 6.70 | 15.0 | .123 | -0.1521 | -0.2334* |
| 436 | 6.00 | .000 | 9.7 | 6.70 | 15.0 | .041 | -0.1521 | -0.6641* |
| 437 | 3.00 | .000 | 27.2 | 6.60 | 15.0 | .001 | -0.3042 | -0.2535 |
| 438 | 4.00 | .000 | -5.2 | 6.60 | 15.0 | .185 | -0.9127 | -0.8218 |
| 439 | 4.00 | .000 | -0.3 | 5.60 | 20.0 | .051 | -0.0761 | -0.3523* |
| 440 | 3.00 | .000 | 4.7 | 5.60 | 20.0 | .075 | -0.0761 | -0.2698* |
| 443 | 6.00 | .000 | 27.2 | 5.50 | 20.0 | -.013 | -1.2169 | -0.7467* |
| 445 | 2.00 | .000 | 27.3 | 4.60 | 20.0 | .138 | -0.6085 | -0.5877 |
| 446 | 4.00 | .000 | 27.2 | 4.60 | 20.0 | -.025 | -0.3042 | -0.2326 |
| 447 | 2.00 | .000 | 19.8 | 4.60 | 20.0 | .112 | -0.3042 | -0.4140 |
| 448 | 3.00 | .000 | 4.7 | 4.60 | 20.0 | .115 | -0.3042 | -0.3743* |
| 449 | 3.00 | .000 | 9.7 | 4.60 | 20.0 | .065 | -0.0761 | -0.2825* |
| 450 | 4.00 | .000 | -0.3 | 3.60 | 20.0 | .085 | -0.1521 | -0.2070 |
| 451 | 3.00 | .000 | 19.7 | 3.60 | 20.0 | .057 | -0.3042 | -0.3588 |
| 453 | 6.00 | .000 | 9.8 | 3.60 | 20.0 | .119 | -1.2169 | -1.3134 |
| 454 | 4.00 | .000 | 9.8 | 3.60 | 20.0 | .190 | -1.2169 | -1.1446 |
| 455 | 6.00 | .000 | 19.7 | 2.60 | 20.0 | .032 | -0.6085 | -0.6147 |
| 456 | 4.00 | .000 | 14.8 | 2.60 | 20.0 | .072 | -0.3042 | -0.4684 |
| 457 | 4.00 | .000 | 19.8 | 1.60 | 20.0 | .014 | -0.0761 | -0.0787 |

TABLE A-15 (cont'd)

MEASURED AND FITTED VERTICAL FORCE
BETA=20. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|----------|
| 459 | 4.00 | .000 | 4.8 | 3.60 | 5.0 | .077 | -0.1521 | -0.2307 |
| 211 | 2.07 | .052 | 0.0 | 3.00 | 0.0 | .106 | -0.1521 | -0.1573 |
| 212 | 2.96 | .074 | 0.0 | 3.00 | 0.0 | .079 | -0.1521 | -0.1159 |
| 213 | 3.92 | .098 | 0.0 | 3.00 | 0.0 | .070 | -0.1521 | -0.1423 |
| 214 | 5.00 | .125 | 0.0 | 3.00 | 0.0 | .056 | -0.1521 | -0.1140 |
| 215 | 5.96 | .149 | 0.0 | 3.00 | 0.0 | .047 | -0.1521 | -0.0865 |
| 216 | 2.94 | .074 | 0.0 | 3.00 | 0.0 | .069 | -0.0761 | -0.0726 |
| 217 | 3.01 | .075 | 0.0 | 3.00 | 0.0 | .106 | -0.3042 | -0.2461 |
| 218 | 3.02 | .075 | 0.0 | 3.00 | 0.0 | .146 | -0.6085 | -0.4494 |
| 219 | 3.97 | .099 | 0.0 | 3.00 | 0.0 | .122 | -0.6085 | -0.4834 |
| 220 | 4.00 | .100 | 0.0 | 3.00 | 0.0 | .147 | -0.9127 | -0.6669 |
| 221 | 5.00 | .125 | 0.0 | 3.00 | 0.0 | .120 | -0.9127 | -0.7035* |
| 222 | 4.95 | .124 | 0.0 | 3.00 | 0.0 | .146 | -1.2169 | -0.9413* |
| 223 | 5.96 | .149 | 0.0 | 3.00 | 0.0 | .116 | -1.2169 | -0.9300* |
| 224 | 3.00 | .075 | 5.0 | 3.00 | 0.0 | .074 | -0.1521 | -0.0748 |
| 225 | 2.97 | .074 | -5.0 | 3.00 | 0.0 | .074 | -0.1521 | -0.1196 |
| 226 | 2.99 | .075 | -10.0 | 3.00 | 0.0 | .069 | -0.1521 | -0.1264 |
| 227 | 2.99 | .075 | -15.0 | 3.00 | 0.0 | .060 | -0.1521 | -0.1266 |
| 228 | 2.97 | .074 | -20.0 | 3.00 | 0.0 | .048 | -0.1521 | -0.1244 |
| 229 | 2.95 | .074 | -27.5 | 3.00 | 0.0 | .029 | -0.1521 | -0.1631 |
| 230 | 2.98 | .074 | 0.0 | 3.00 | 5.0 | .079 | -0.1521 | -0.1067 |
| 231 | 2.98 | .074 | 0.0 | 3.00 | -5.0 | .078 | -0.1521 | -0.1187 |
| 232 | 2.94 | .073 | 0.0 | 3.00 | -10.0 | .079 | -0.1521 | -0.1107 |
| 233 | 3.02 | .075 | 0.0 | 3.00 | -15.0 | .078 | -0.1521 | -0.1004 |
| 234 | 3.01 | .075 | 0.0 | 3.00 | -20.0 | .088 | -0.1521 | -0.1029 |
| 235 | 2.98 | .075 | 0.0 | 2.00 | 0.0 | .088 | -0.1521 | -0.1927 |
| 236 | 3.00 | .075 | 0.0 | 4.00 | 0.0 | .078 | -0.1521 | -0.1320 |
| 237 | 3.01 | .075 | 0.0 | 5.00 | 0.0 | .081 | -0.1521 | -0.1758 |
| 238 | 2.97 | .074 | 0.0 | 6.00 | 0.0 | .065 | -0.1521 | -0.0962 |
| 239 | 4.90 | .123 | 5.0 | 2.00 | 0.0 | .123 | -0.6085 | -0.7018 |
| 240 | 4.00 | .100 | -5.0 | 3.00 | 0.0 | .125 | -0.6085 | -0.5386 |
| 241 | 5.99 | .150 | -15.0 | 5.00 | -10.0 | .014 | -0.0761 | -0.2330* |
| 242 | 5.99 | .150 | -27.5 | 6.00 | -5.0 | -.038 | -0.3042 | -0.2706 |
| 243 | 3.97 | .099 | -27.5 | 6.00 | -20.0 | -.046 | -0.0761 | -0.0787 |
| 244 | 2.99 | .075 | -5.0 | 3.00 | -5.0 | .077 | -0.1521 | -0.1646 |
| 245 | 4.91 | .123 | 5.0 | 3.00 | -20.0 | .056 | -0.0761 | -0.1907* |
| 246 | 1.74 | .044 | -15.0 | 6.00 | 0.0 | .155 | -0.3042 | -0.2674 |
| 247 | 3.90 | .098 | -10.0 | 2.00 | -20.0 | .111 | -1.2169 | -0.7074* |
| 248 | 4.96 | .124 | 5.0 | 2.00 | -5.0 | .059 | -0.1521 | -0.1077 |
| 250 | 3.99 | .100 | -5.0 | 6.00 | -20.0 | .058 | -0.0761 | -0.4145* |
| 252 | 6.05 | .151 | -10.0 | 3.00 | 5.0 | .105 | -0.9127 | -0.7888 |
| 254 | 3.98 | .099 | -20.0 | 4.00 | -5.0 | .104 | -0.9127 | -0.7681 |
| 255 | 2.99 | .075 | -10.0 | 3.00 | -10.0 | .136 | -0.6085 | -0.5703 |
| 256 | 2.97 | .074 | -5.0 | 3.00 | -5.0 | .079 | -0.1521 | -0.1699 |
| 259 | 5.02 | .125 | -20.0 | 4.00 | 5.0 | .135 | -0.9127 | -0.9113 |
| 261 | 3.00 | .075 | -5.0 | 2.00 | -10.0 | .067 | -0.0761 | -0.1565* |
| 262 | 4.01 | .100 | -5.0 | 6.00 | -15.0 | .059 | -0.1521 | -0.3432* |
| 263 | 2.10 | .053 | -15.0 | 2.00 | -20.0 | .055 | -0.1521 | -0.1803 |
| 264 | 6.06 | .152 | 5.0 | 3.00 | -20.0 | .052 | -1.2169 | -0.5751* |
| 265 | 6.09 | .152 | -15.0 | 2.00 | -15.0 | .027 | -0.3042 | -0.4516 |

TABLE 15 (Cont'd)

MEASURED AND FITTED VERTICAL FORCE
BETA=20. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|------|----------|----------|
| 266 | 4.00 | .100 | -10.0 | 5.00 | -20.0 | .086 | -0.6085 | -0.7065 |
| 267 | 4.93 | .123 | -15.0 | 2.00 | -20.0 | .063 | -0.9127 | -0.7536 |
| 268 | 2.98 | .074 | -5.0 | 3.00 | -5.0 | .078 | -0.1521 | -0.1664 |
| 269 | 2.03 | .051 | -15.0 | 4.00 | -15.0 | .069 | -0.1521 | -0.1815 |
| 270 | 5.97 | .149 | -5.0 | 5.00 | 5.0 | .095 | -1.2169 | -0.8641* |
| 271 | 4.95 | .124 | -10.0 | 2.00 | -10.0 | .056 | -0.1521 | -0.3477* |
| 272 | 5.93 | .148 | 0.0 | 3.00 | -5.0 | .067 | -0.3042 | -0.3624 |
| 273 | 5.00 | .125 | -5.0 | 2.00 | 5.0 | .069 | -0.3042 | -0.1901 |
| 274 | 5.95 | .149 | -5.0 | 3.00 | 0.0 | .099 | -0.9127 | -0.7429 |
| 275 | 4.97 | .124 | -20.0 | 5.00 | 5.0 | .040 | -0.6085 | -0.5580* |
| 276 | 5.98 | .150 | -25.0 | 5.00 | -5.0 | .031 | -1.2169 | -0.8744* |
| 278 | 5.62 | .140 | 5.0 | 6.00 | -15.0 | .104 | -1.2169 | -1.0228 |
| 279 | 2.75 | .069 | -5.0 | 3.00 | -5.0 | .093 | -0.1521 | -0.2129* |
| 280 | 3.69 | .092 | -15.0 | 5.00 | 5.0 | .021 | -0.0761 | -0.1384* |
| 282 | 4.09 | .102 | -20.0 | 4.00 | -10.0 | .083 | -0.9127 | -0.7768* |
| 283 | 4.92 | .123 | -10.0 | 2.00 | -15.0 | .066 | -0.1521 | -0.5194* |
| 284 | 2.06 | .052 | -20.0 | 3.00 | 5.0 | .062 | -0.0761 | 0.0431* |
| 285 | 4.84 | .121 | -25.0 | 5.00 | -15.0 | .025 | -1.2169 | -0.7876* |
| 312 | 2.26 | .085 | 0.0 | 3.00 | 0.0 | .095 | -0.1521 | -0.1172 |
| 313 | 3.20 | .120 | 0.0 | 3.00 | 0.0 | .084 | -0.1521 | -0.1526 |
| 314 | 4.29 | .161 | 0.0 | 3.00 | 0.0 | .055 | -0.1521 | -0.1035 |
| 315 | 5.24 | .196 | 0.0 | 3.00 | 0.0 | .046 | -0.1521 | -0.1674* |
| 316 | 6.14 | .230 | 0.0 | 3.00 | 0.0 | .037 | -0.1521 | -0.2562* |
| 317 | 3.12 | .117 | 0.0 | 3.00 | 0.0 | .063 | -0.0761 | -0.0435 |
| 318 | 3.01 | .113 | 0.0 | 3.00 | 0.0 | .125 | -0.3042 | -0.3366 |
| 320 | 4.16 | .156 | 0.0 | 3.00 | 0.0 | .125 | -0.6085 | -0.6048 |
| 321 | 4.05 | .152 | 0.0 | 3.00 | 0.0 | .125 | -0.6085 | -0.5781 |
| 324 | 4.99 | .187 | 0.0 | 3.00 | 0.0 | .129 | -0.9127 | -0.9376 |
| 325 | 4.99 | .187 | 0.0 | 3.00 | 0.0 | .152 | -1.2169 | -1.1806 |
| 326 | 3.01 | .113 | 5.0 | 3.00 | 0.0 | .078 | -0.1521 | -0.0752 |
| 327 | 3.01 | .113 | -5.0 | 3.00 | 0.0 | .081 | -0.1521 | -0.1567 |
| 328 | 2.99 | .112 | -10.0 | 3.00 | 0.0 | .071 | -0.1521 | -0.1445 |
| 329 | 3.01 | .113 | -15.0 | 3.00 | 0.0 | .051 | -0.1521 | -0.1127 |
| 330 | 3.02 | .113 | -20.0 | 3.00 | 0.0 | .044 | -0.1521 | -0.1481 |
| 331 | 2.99 | .112 | -27.5 | 3.00 | 0.0 | .021 | -0.1521 | -0.1978* |
| 332 | 2.95 | .111 | 0.0 | 3.00 | 5.0 | .041 | -0.1521 | 0.0666* |
| 333 | 3.05 | .114 | 0.0 | 3.00 | -5.0 | .092 | -0.1521 | -0.1810 |
| 334 | 2.81 | .106 | 0.0 | 3.00 | -10.0 | .097 | -0.1521 | -0.1729 |
| 335 | 2.81 | .105 | 0.0 | 3.00 | -15.0 | .098 | -0.1521 | -0.1547* |
| 336 | 2.83 | .106 | 0.0 | 3.00 | -20.0 | .068 | -0.1521 | -0.0200* |
| 337 | 2.87 | .107 | 0.0 | 2.00 | 0.0 | .105 | -0.1521 | -0.2642* |
| 338 | 2.90 | .109 | 0.0 | 4.00 | 0.0 | .078 | -0.1521 | -0.1114 |
| 341 | 3.06 | .115 | 0.0 | 5.00 | 0.0 | .081 | -0.1521 | -0.1712* |
| 346 | 1.90 | .071 | -20.0 | 4.00 | 5.0 | .136 | -0.3042 | -0.0776* |
| 347 | 4.06 | .152 | -5.0 | 3.00 | -5.0 | .086 | -0.3042 | -0.3845 |
| 348 | 4.97 | .186 | 5.0 | 4.00 | -20.0 | .086 | -0.6085 | -0.5289 |
| 349 | 4.99 | .187 | -15.0 | 4.00 | 5.0 | .175 | -1.2169 | -1.2978 |
| 350 | 3.01 | .113 | -5.0 | 3.00 | -5.0 | .087 | -0.1521 | -0.2191 |
| 351 | 4.05 | .152 | -15.0 | 6.00 | 0.0 | .019 | -0.1521 | -0.1838 |
| 352 | 5.94 | .223 | 0.0 | 2.00 | -5.0 | .040 | -0.1521 | -0.2769* |

TABLE A-15 (cont'd)

MEASURED AND FITTED VERTICAL FORCE
BETA=20. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|----------|
| 353 | 4.99 | .187 | -20.0 | 5.00 | 0.0 | .072 | -0.9127 | -0.9255 |
| 355 | 5.00 | .187 | -20.0 | 5.00 | 0.0 | .079 | -0.9127 | -0.9858 |
| 359 | 4.00 | .150 | -25.0 | 5.00 | 5.0 | .098 | -0.6085 | -0.7365 |
| 360 | 4.00 | .150 | 0.0 | 4.00 | 5.0 | .209 | -1.2169 | -1.1441 |
| 361 | 5.99 | .225 | -25.0 | 5.00 | -20.0 | -.011 | -1.2169 | -0.8047* |
| 362 | 4.01 | .150 | -15.0 | 6.00 | 0.0 | .016 | -0.0761 | -0.1578* |
| 363 | 4.04 | .152 | 5.0 | 4.00 | -10.0 | .192 | -0.9127 | -0.9020 |
| 364 | 4.03 | .151 | -5.0 | 3.00 | 0.0 | .129 | -0.6085 | -0.6329 |
| 365 | 2.97 | .111 | -5.0 | 3.00 | -5.0 | .091 | -0.1521 | -0.2314 |
| 366 | 4.97 | .187 | -10.0 | 6.00 | -20.0 | .055 | -0.1521 | -0.8710* |
| 370 | 5.52 | .207 | -5.0 | 3.00 | -20.0 | .090 | -1.2169 | -1.0957 |
| 371 | 5.02 | .188 | 5.0 | 3.00 | 0.0 | .069 | -0.3042 | -0.3457 |
| 372 | 2.99 | .112 | 5.0 | 2.00 | -20.0 | .094 | -0.0761 | 0.0194* |
| 373 | 1.97 | .074 | -20.0 | 6.00 | -5.0 | .187 | -0.6085 | -0.5663 |
| 374 | 2.92 | .109 | -20.0 | 6.00 | -5.0 | .105 | -0.6085 | -0.6050 |
| 376 | 5.00 | .187 | -5.0 | 2.00 | 0.0 | .071 | -0.3042 | -0.3911 |
| 378 | 4.02 | .151 | 0.0 | 6.00 | -20.0 | .126 | -0.9127 | -0.6911* |
| 379 | 6.01 | .225 | -20.0 | 2.00 | 0.0 | .004 | -0.3042 | -0.2660 |
| 380 | 4.97 | .187 | -20.0 | 2.00 | -5.0 | .082 | -0.9127 | -0.9467 |
| 381 | 2.99 | .112 | -5.0 | 3.00 | -5.0 | .082 | -0.1521 | -0.1880 |
| 384 | 5.95 | .223 | -10.0 | 3.00 | 5.0 | .094 | -0.9127 | -0.9421 |
| 386 | 4.85 | .182 | -15.0 | 3.00 | -5.0 | .092 | -0.9127 | -0.8711 |
| 387 | 5.12 | .192 | -5.0 | 3.00 | -5.0 | .114 | -0.9127 | -0.9649 |
| 390 | 6.10 | .229 | 5.0 | 5.00 | -15.0 | .089 | -1.2169 | -1.2763* |
| 395 | 4.23 | .158 | -10.0 | 6.00 | -5.0 | .038 | -0.0761 | -0.2135* |
| 396 | 3.19 | .119 | -27.5 | 4.00 | 0.0 | .128 | -0.6085 | -0.6067 |
| 397 | 3.15 | .118 | -5.0 | 4.00 | -15.0 | .097 | -0.3042 | -0.3399 |
| 398 | 4.10 | .154 | -5.0 | 5.00 | 5.0 | .137 | -0.9127 | -0.7490 |
| 399 | 3.07 | .115 | -5.0 | 3.00 | -5.0 | .061 | -0.1521 | -0.0919 |
| 402 | 6.06 | .227 | -10.0 | 2.00 | 5.0 | .040 | -0.3042 | -0.3300 |
| 403 | 3.11 | .117 | -10.0 | 5.00 | -10.0 | .151 | -0.9127 | -0.7671 |
| 404 | 2.98 | .112 | -15.0 | 6.00 | -10.0 | .135 | -0.9127 | -0.7866* |
| 405 | 4.04 | .151 | -20.0 | 5.00 | -10.0 | .090 | -1.2169 | -0.9647* |
| 702 | 2.99 | .224 | 0.0 | 3.00 | 0.0 | .093 | -0.1521 | -0.1279 |
| 703 | 1.98 | .142 | 0.0 | 3.00 | 0.0 | .123 | -0.1521 | -0.1281 |
| 704 | 2.49 | .187 | 0.0 | 3.00 | 0.0 | .103 | -0.1521 | -0.0897 |
| 705 | 3.01 | .226 | 0.0 | 3.00 | 0.0 | .071 | -0.0761 | -0.0058* |
| 706 | 2.99 | .224 | 0.0 | 3.00 | 0.0 | .115 | -0.3042 | -0.2640 |
| 707 | 2.99 | .224 | 0.0 | 3.00 | 0.0 | .176 | -0.6085 | -0.6604* |
| 709 | 3.01 | .226 | 5.0 | 3.00 | 0.0 | .085 | -0.1521 | -0.0218* |
| 710 | 3.01 | .226 | -5.0 | 3.00 | 0.0 | .091 | -0.1521 | -0.1894 |
| 711 | 3.01 | .226 | -10.0 | 3.00 | 0.0 | .076 | -0.1521 | -0.1754 |
| 712 | 3.00 | .225 | -15.0 | 3.00 | 0.0 | .057 | -0.1521 | -0.1516 |
| 713 | 3.00 | .225 | -20.0 | 3.00 | 0.0 | .028 | -0.1521 | -0.1142 |
| 714 | 3.00 | .225 | -27.5 | 3.00 | 0.0 | .006 | -0.1521 | -0.2257 |
| 715 | 3.01 | .226 | 0.0 | 3.00 | 5.0 | .088 | -0.1521 | -0.0757 |
| 716 | 3.00 | .225 | 0.0 | 3.00 | -5.0 | .099 | -0.1521 | -0.1843 |
| 717 | 3.01 | .225 | 0.0 | 3.00 | -10.0 | .099 | -0.1521 | -0.1866 |
| 718 | 3.01 | .225 | 0.0 | 3.00 | -15.0 | .103 | -0.1521 | -0.1901 |
| 719 | 3.01 | .226 | 0.0 | 3.00 | -20.0 | .104 | -0.1521 | -0.1621 |

TABLE A-15 (cont'd)

MEASURED AND FITTED VERTICAL FORCE
BETA=20. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|----------|
| 720 | 3.01 | .226 | 0.0 | 2.00 | 0.0 | .090 | -0.1521 | -0.1529 |
| 721 | 3.02 | .226 | 0.0 | 4.00 | 0.0 | .100 | -0.1521 | -0.1883 |
| 722 | 3.00 | .225 | 0.0 | 5.00 | 0.0 | .094 | -0.1521 | -0.1773 |
| 723 | 3.01 | .226 | 0.0 | 6.00 | 0.0 | .089 | -0.1521 | -0.1621* |
| 724 | 2.53 | .190 | 0.0 | 6.00 | -20.0 | .084 | -0.0761 | 0.0484 |
| 726 | 2.53 | .189 | 5.0 | 8.00 | -5.0 | .256 | -0.9127 | -0.9313 |
| 728 | 2.99 | .224 | -5.0 | 3.00 | -5.0 | .165 | -0.6085 | -0.7233 |
| 730 | 2.99 | .224 | -5.0 | 6.00 | 5.0 | .267 | -1.2169 | -1.2077 |
| 731 | 1.95 | .147 | 0.0 | 5.00 | -10.0 | .249 | -0.6085 | -0.5950 |
| 732 | 2.49 | .187 | -27.5 | 3.00 | -10.0 | -.010 | -0.0761 | -0.0781* |
| 733 | 3.00 | .225 | -5.0 | 3.00 | -5.0 | .100 | -0.1521 | -0.2933* |
| 735 | 1.97 | .148 | -27.5 | 3.00 | -10.0 | .079 | -0.3042 | -0.2556 |
| 736 | 3.00 | .225 | -20.0 | 3.00 | 5.0 | .094 | -0.3042 | -0.2573 |
| 737 | 3.00 | .225 | -27.5 | 6.00 | -10.0 | .141 | -1.2169 | -1.2712 |
| 738 | 1.99 | .149 | -10.0 | 3.00 | -15.0 | .137 | -0.3042 | -0.4283 |
| 741 | 2.48 | .186 | 0.0 | 3.00 | -5.0 | .132 | -0.3042 | -0.2551 |
| 743 | 2.53 | .190 | 5.0 | 8.00 | -10.0 | .273 | -0.9127 | -0.9345* |
| 744 | 2.04 | .153 | -10.0 | 3.00 | -10.0 | .092 | -0.0761 | -0.1811* |
| 746 | 3.01 | .226 | -5.0 | 5.00 | -20.0 | .242 | -1.2169 | -1.2642 |
| 747 | 3.01 | .226 | -5.0 | 3.00 | -5.0 | .086 | -0.1521 | -0.2068 |
| 749 | 3.07 | .230 | -10.0 | 6.00 | -5.0 | .166 | -0.9127 | -0.9089 |
| 750 | 2.57 | .193 | 5.0 | 5.00 | 0.0 | .129 | -0.3042 | -0.2038 |
| 751 | 2.57 | .193 | -10.0 | 6.00 | 0.0 | .067 | -0.0761 | -0.0576* |
| 752 | 2.07 | .155 | -27.5 | 3.00 | -20.0 | -.018 | -0.0761 | 0.0320* |
| 754 | 2.00 | .150 | 5.0 | 6.00 | 0.0 | .257 | -0.6085 | -0.6249 |
| 755 | 2.14 | .160 | -15.0 | 3.00 | 5.0 | .120 | -0.1521 | -0.1283 |
| 757 | 2.51 | .188 | 0.0 | 8.00 | -20.0 | .339 | -1.2169 | -1.2536* |
| 758 | 2.51 | .189 | -15.0 | 6.00 | -15.0 | .062 | -0.0761 | -0.1974* |
| 759 | 2.51 | .188 | 5.0 | 6.00 | -10.0 | .280 | -0.9127 | -0.8315* |
| 760 | 3.00 | .225 | -5.0 | 3.00 | -5.0 | .094 | -0.1521 | -0.2533* |
| 761 | 3.00 | .225 | -15.0 | 5.00 | 0.0 | .257 | -1.2169 | -1.2610 |
| 763 | 2.51 | .183 | -20.0 | 7.00 | 0.0 | .301 | -1.2169 | -1.1969 |
| 764 | 2.99 | .224 | 0.0 | 5.00 | -5.0 | .103 | -0.1521 | -0.2310 |
| 765 | 2.99 | .224 | -5.0 | 5.00 | -15.0 | .183 | -0.9127 | -0.8904* |
| 766 | 2.02 | .151 | 0.0 | 5.00 | 5.0 | .372 | -0.0761 | -1.0326* |
| 769 | 2.51 | .188 | -10.0 | 8.00 | -15.0 | .234 | -1.2169 | -1.1944 |
| 771 | 3.00 | .225 | -10.0 | 2.00 | 5.0 | .107 | -0.3042 | -0.2740 |
| 772 | 3.00 | .225 | -25.0 | 5.00 | -10.0 | .151 | -1.2169 | -1.2098* |
| 773 | 2.98 | .224 | -5.0 | 3.00 | -5.0 | .103 | -0.1521 | -0.3031* |
| 774 | 2.49 | .186 | -10.0 | 4.00 | 0.0 | .251 | -0.9127 | -0.8983 |
| 775 | 2.98 | .224 | -10.0 | 6.00 | -5.0 | .176 | -0.9127 | -0.9282 |
| 777 | 2.49 | .187 | 5.0 | 8.00 | -10.0 | .330 | -1.2169 | -1.1784* |
| 780 | 2.97 | .223 | -25.0 | 6.00 | -5.0 | .212 | -1.2169 | -1.4072* |
| 781 | 2.48 | .186 | -25.0 | 5.00 | -20.0 | .104 | -0.9127 | -0.8096 |

MEAN ERROR= 0.0360
STANDARD DEVIATION= 0.1573

TABLE A-16

MEASURED AND FITTED PITCH MOMENT
BETA=10. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|------|-------|------|-------|----------|----------|
| 3 | 4.00 | .000 | 2.1 | 2.60 | 0.0 | .043 | -0.2400 | -0.2350 |
| 5 | 4.00 | .000 | 4.6 | 2.50 | 0.0 | .035 | -0.2480 | -0.2274 |
| 6 | 4.00 | .000 | 7.2 | 2.60 | 0.0 | .139 | 0.1059 | 0.1381 |
| 7 | 4.00 | .000 | 9.7 | 2.50 | 0.0 | .020 | -0.2467 | -0.2507 |
| 8 | 4.00 | .000 | 12.2 | 2.40 | 0.0 | .011 | -0.2331 | -0.2870 |
| 1 | 4.00 | .000 | 4.7 | 2.50 | 5.0 | .028 | -0.2411 | -0.2155 |
| 9 | 4.00 | .000 | 0.0 | 2.60 | -5.0 | .046 | -0.2439 | -0.2375 |
| 10 | 4.00 | .000 | 0.0 | 2.60 | 5.0 | .046 | -0.2394 | -0.2380 |
| 11 | 4.00 | .000 | 0.0 | 2.60 | 10.0 | .048 | -0.2383 | -0.2420 |
| 12 | 4.00 | .000 | 0.1 | 2.60 | 15.0 | .047 | -0.2375 | -0.2413 |
| 13 | 4.00 | .000 | 0.1 | 2.60 | 20.0 | .046 | -0.2328 | -0.2294 |
| 24 | 4.00 | .000 | 5.1 | 2.80 | 0.0 | .039 | -0.2044 | -0.2481 |
| 34 | 5.00 | .000 | 2.4 | 2.40 | -5.0 | .076 | -0.4721 | -0.2921* |
| 36 | 2.00 | .000 | 7.4 | 5.50 | -5.0 | .287 | -0.0067 | 0.3943* |
| 37 | 3.00 | .000 | 5.0 | 4.50 | 20.0 | .058 | -0.3425 | -0.3335 |
| 40 | 4.00 | .000 | 12.4 | 4.50 | 20.0 | .007 | -0.4050 | -0.4294 |
| 41 | 3.00 | .000 | 5.0 | 4.50 | 20.0 | .031 | -0.1142 | -0.2045* |
| 42 | 2.00 | .000 | 10.0 | 4.50 | 20.0 | .079 | -0.2564 | -0.2589 |
| 43 | 2.00 | .000 | 10.0 | 4.50 | 20.0 | .056 | -0.2030 | -0.2349* |
| 44 | 5.00 | .000 | 7.4 | 4.50 | 20.0 | .019 | -0.2070 | -0.5756 |
| 45 | 2.00 | .000 | 12.4 | 4.50 | 20.0 | .124 | -0.2623 | -0.1974 |
| 46 | 3.00 | .000 | 10.0 | 3.50 | 20.0 | .110 | -0.3763 | -0.2504* |
| 47 | 4.00 | .000 | 10.0 | 2.50 | 20.0 | .042 | -0.4192 | -0.3542 |
| 48 | 4.00 | .000 | 0.1 | 6.50 | 20.0 | .111 | -1.0277 | -0.9911 |
| 49 | 6.00 | .000 | 9.9 | 2.40 | 20.0 | .034 | -0.7851 | -0.7987 |
| 50 | 4.00 | .000 | 4.9 | 5.60 | 20.0 | .243 | 0.2145 | -0.4103* |
| 51 | 3.00 | .000 | 0.0 | 5.50 | 20.0 | .059 | -0.3816 | -0.3092* |
| 52 | 4.00 | .000 | 7.5 | 2.50 | 20.0 | .056 | -0.4647 | -0.3194* |
| 53 | 4.00 | .000 | 2.4 | 3.50 | 20.0 | .112 | -0.5002 | -0.3576* |
| 54 | 3.00 | .000 | 2.5 | 5.50 | 20.0 | .033 | -0.1404 | -0.2065 |
| 55 | 5.00 | .000 | 0.1 | 6.50 | 10.0 | .045 | -0.8163 | -0.8045 |
| 56 | 2.00 | .000 | 10.0 | 4.60 | 10.0 | .030 | -0.1328 | -0.1395 |
| 57 | 4.00 | .000 | 5.0 | 2.50 | 10.0 | .036 | -0.1957 | -0.2512 |
| 58 | 3.00 | .000 | 12.5 | 6.50 | 10.0 | -.005 | -0.1332 | -0.1554 |
| 59 | 4.00 | .000 | 2.5 | 3.60 | 5.0 | .040 | -0.2228 | -0.2769* |
| 60 | 4.00 | .000 | 2.5 | 3.60 | 5.0 | .029 | -0.1335 | -0.2150* |
| 61 | 4.00 | .000 | 5.1 | 3.50 | 5.0 | .043 | -0.3650 | -0.3115 |
| 62 | 3.00 | .000 | 0.0 | 2.50 | 5.0 | .054 | -0.1712 | -0.1832 |
| 63 | 5.00 | .000 | 2.5 | 2.50 | 5.0 | .035 | -0.2217 | -0.2571* |
| 64 | 3.00 | .000 | 9.9 | 2.60 | 5.0 | .013 | -0.1170 | -0.1919* |
| 65 | 4.00 | .000 | 5.0 | 2.60 | 5.0 | .039 | -0.2067 | -0.2517* |
| 66 | 5.00 | .000 | 5.0 | 6.60 | 5.0 | .022 | -0.2733 | -0.4266* |
| 67 | 3.00 | .000 | 9.9 | 6.60 | 5.0 | .020 | -0.3041 | -0.2685* |
| 68 | 6.00 | .000 | 12.4 | 5.70 | 5.0 | -.006 | -0.1966 | -0.0591* |
| 69 | 3.00 | .000 | -5.1 | 6.60 | 5.0 | .240 | -0.1981 | -0.1286 |
| 70 | 6.00 | .000 | -5.1 | 5.70 | 5.0 | .016 | -0.1947 | -0.2439* |
| 71 | 6.00 | .000 | 7.4 | 5.60 | 5.0 | .012 | -0.1860 | -0.2786* |
| 72 | 4.00 | .000 | 12.4 | 5.60 | 5.0 | .102 | -0.8876 | -0.8720 |
| 73 | 2.00 | .000 | 0.0 | 5.60 | 5.0 | .060 | -0.1758 | -0.1991 |
| 74 | 4.00 | .000 | 2.4 | 3.60 | 5.0 | .041 | -0.2303 | -0.2814 |

TABLE A-16 (cont'd)

MEASURED AND FITTED PITCH MOMENT
BETA=10. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|------|-------|------|-------|----------|----------|
| 76 | 5.00 | .000 | 2.4 | 5.60 | 0.0 | .026 | -0.1887 | -0.3449* |
| 77 | 2.00 | .000 | 4.9 | 5.70 | 0.0 | .329 | 0.1908 | 0.3475* |
| 78 | 6.00 | .000 | 7.5 | 5.70 | 0.0 | .015 | -0.2884 | -0.2646 |
| 79 | 3.00 | .000 | 12.4 | 5.60 | 0.0 | .112 | -0.4103 | -0.4212* |
| 80 | 3.00 | .000 | 12.4 | 5.60 | 0.0 | .247 | 0.0654 | 0.4309 |
| 81 | 4.00 | .000 | 12.4 | 4.60 | 0.0 | .117 | -0.4867 | -0.5161 |
| 82 | 4.00 | .000 | 4.9 | 6.60 | 0.0 | .099 | -1.1119 | -0.9627* |
| 83 | 3.00 | .000 | -5.1 | 6.60 | 0.0 | .049 | -0.4079 | -0.3874* |
| 84 | 3.00 | .000 | 2.4 | 2.60 | 0.0 | .044 | -0.1149 | -0.1856 |
| 85 | 4.00 | .000 | 7.4 | 2.60 | -5.0 | .026 | -0.2117 | -0.2194* |
| 87 | 2.00 | .000 | 4.9 | 2.60 | -5.0 | .135 | -0.0726 | 0.0620 |
| 88 | 4.00 | .000 | 4.9 | 2.60 | -5.0 | .061 | -0.3013 | -0.2456* |
| 89 | 2.00 | .000 | 7.4 | 5.70 | -5.0 | .285 | -0.0217 | 0.3686 |
| 90 | 6.00 | .000 | 7.5 | 6.70 | -5.0 | .014 | -0.2861 | -0.2926 |
| 91 | 2.00 | .000 | 0.0 | 4.60 | -5.0 | .119 | -0.1890 | -0.2173 |
| 92 | 5.00 | .000 | 0.0 | 3.60 | -5.0 | .037 | -0.2457 | -0.3298 |
| 93 | 6.00 | .000 | 9.9 | 3.50 | -5.0 | .110 | -0.5516 | -0.7715* |
| 94 | 6.00 | .000 | 9.9 | 4.60 | -5.0 | .078 | -1.0115 | -1.0695* |
| 95 | 6.00 | .000 | 10.0 | 5.60 | -5.0 | .002 | -0.1683 | -0.0190* |
| 97 | 4.00 | .000 | 9.9 | 5.60 | -5.0 | .037 | -0.4179 | -0.3855 |
| 98 | 5.00 | .000 | 9.9 | 5.50 | -5.0 | .097 | -0.9770 | -1.0305 |
| 99 | 3.00 | .000 | 0.1 | 6.60 | -5.0 | .142 | -0.5872 | -0.6407 |
| 100 | 4.00 | .000 | 4.9 | 6.60 | -5.0 | .034 | -0.4414 | -0.3876 |
| 101 | 4.00 | .000 | 2.4 | 3.50 | 5.0 | .039 | -0.1985 | -0.2683* |
| 102 | 6.00 | .000 | 9.9 | 2.50 | 0.0 | .105 | -0.2529 | -0.3938* |
| 103 | 3.00 | .000 | -5.1 | 2.50 | 10.0 | .122 | -0.0706 | 0.0935* |
| 105 | 5.00 | .000 | 10.0 | 3.50 | 10.0 | .013 | -0.3862 | -0.3273 |
| 106 | 4.00 | .000 | 5.0 | 3.50 | 10.0 | .045 | -0.3703 | -0.3385 |
| 107 | 3.00 | .000 | 7.4 | 6.50 | 10.0 | .158 | -0.6062 | -0.6549* |
| 108 | 4.00 | .000 | 12.5 | 6.60 | 10.0 | -.006 | -0.2266 | -0.2280* |
| 109 | 2.00 | .000 | -5.1 | 6.60 | 10.0 | .057 | -0.1838 | -0.1582 |
| 110 | 3.00 | .000 | 2.4 | 6.50 | 10.0 | .077 | -0.6328 | -0.5585 |
| 111 | 3.00 | .000 | -5.1 | 5.60 | 10.0 | .135 | -0.3783 | -0.3815 |
| 112 | 3.00 | .000 | 12.5 | 5.60 | 10.0 | .006 | -0.2270 | -0.2269 |
| 113 | 4.00 | .000 | 2.4 | 3.60 | 5.0 | .038 | -0.2097 | -0.2669 |
| 114 | 4.00 | .000 | 0.0 | 3.50 | 15.0 | .042 | -0.2050 | -0.2742 |
| 115 | 4.00 | .000 | 12.5 | 3.60 | 15.0 | .001 | -0.2662 | -0.2785 |
| 116 | 3.00 | .000 | 7.4 | 2.60 | 15.0 | .139 | 0.1986 | 0.1095 |
| 117 | 4.00 | .000 | 7.4 | 2.50 | 15.0 | .030 | -0.2073 | -0.2779 |
| 118 | 3.00 | .000 | 5.0 | 2.50 | 15.0 | .067 | -0.2583 | -0.1783 |
| 119 | 3.00 | .000 | 2.4 | 2.50 | 15.0 | .057 | -0.1703 | -0.1694* |
| 120 | 6.00 | .000 | 2.4 | 2.50 | 15.0 | .069 | -0.8764 | -0.6815 |
| 121 | 3.00 | .000 | 0.0 | 2.60 | 15.0 | .172 | 0.2694 | 0.3655 |
| 126 | 6.00 | .000 | 4.9 | 2.50 | 20.0 | .065 | -0.8722 | -0.8687* |
| 127 | 4.00 | .000 | 5.0 | 2.60 | 20.0 | .137 | 0.1227 | 0.0094 |
| 128 | 6.00 | .000 | 12.5 | 5.50 | 20.0 | .022 | -1.4173 | -1.4234 |
| 129 | 2.00 | .000 | 12.5 | 6.60 | 0.0 | .057 | -0.1887 | -0.2259 |
| 130 | 5.00 | .000 | 6.6 | *** | 7.5 | -.181 | -0.2645 | -0.2537* |
| 131 | 6.00 | .000 | -5.0 | 6.70 | 0.0 | .022 | -0.2786 | -0.4816* |
| 132 | 3.00 | .000 | 9.9 | 3.60 | 0.0 | .148 | -0.1112 | 0.0525* |

TABLE A-16 (cont'd)

MEASURED AND FITTED PITCH MOMENT
BETA=10. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|----------|
| 133 | 4.00 | .000 | 7.4 | 3.60 | 5.0 | .145 | -0.1557 | -0.1819 |
| 134 | 3.00 | .000 | 9.9 | 3.70 | 5.0 | .224 | 0.6193 | 0.6002 |
| 135 | 4.00 | .000 | 2.4 | 3.60 | 5.0 | .040 | -0.2126 | -0.2756* |
| 138 | 4.00 | .000 | -5.0 | 5.60 | 20.0 | .221 | 0.0392 | -0.1468* |
| 139 | 4.00 | .000 | -5.1 | 3.60 | 5.0 | .044 | -0.3703 | -0.2821 |
| 1 | 1.97 | .049 | 0.0 | 3.00 | 0.0 | .057 | -0.1265 | -0.1384 |
| 2 | 1.98 | .050 | 0.0 | 3.00 | 0.0 | .058 | -0.1231 | -0.1395* |
| 3 | 3.15 | .079 | 0.0 | 3.00 | 0.0 | .029 | -1.0258 | -0.1540 |
| 4 | 4.01 | .100 | 0.0 | 3.00 | 0.0 | .022 | -0.1859 | -0.1615 |
| 6 | 5.30 | .133 | 0.0 | 3.00 | 0.0 | .033 | -0.2765 | -0.2951 |
| 8 | 6.00 | .150 | 0.0 | 3.00 | 0.0 | .032 | -0.3355 | -0.3239 |
| 10 | 3.01 | .075 | -2.5 | 3.00 | 0.0 | .042 | -0.1719 | -0.1835 |
| 9 | 3.12 | .073 | 5.0 | 3.00 | 0.0 | .038 | -0.1888 | -0.1921 |
| 11 | 3.02 | .076 | -5.0 | 3.00 | 0.0 | .037 | -0.1763 | -0.1798 |
| 12 | 2.95 | .074 | -7.5 | 3.00 | 0.0 | .033 | -0.1785 | -0.1738 |
| 13 | 2.98 | .075 | -10.0 | 3.00 | 0.0 | .032 | -0.1681 | -0.1953 |
| 14 | 2.96 | .074 | -12.5 | 3.00 | 0.0 | .026 | -0.1554 | -0.2062 |
| 15 | 2.95 | .074 | 0.0 | 2.00 | 0.0 | .064 | -0.1675 | -0.1559 |
| 16 | 2.99 | .075 | 0.0 | 4.00 | 0.0 | .047 | -0.2200 | -0.2170 |
| 19 | 2.72 | .068 | 0.0 | 5.00 | 0.0 | .041 | -0.2557 | -0.1923 |
| 20 | 2.68 | .067 | 0.0 | 5.00 | 0.0 | .041 | -0.2508 | -0.1901 |
| 21 | 3.14 | .079 | 0.0 | 6.00 | 0.0 | .033 | -0.2863 | -0.2331 |
| 22 | 2.01 | .050 | -7.5 | 6.00 | 0.0 | .089 | -0.2615 | -0.2800 |
| 23 | 2.98 | .074 | 0.0 | 3.00 | 0.0 | .025 | -0.0941 | -0.1286 |
| 24 | 2.97 | .074 | 0.0 | 3.00 | 0.0 | .072 | -0.2471 | -0.2005 |
| 25 | 2.46 | .062 | 0.0 | 3.00 | 0.0 | .151 | 0.0795 | 0.0720 |
| 26 | 3.46 | .087 | 0.0 | 3.00 | 0.0 | .103 | -0.1814 | -0.1786* |
| 27 | 2.96 | .074 | 0.0 | 3.00 | 0.0 | .127 | -0.0043 | -0.0406* |
| 28 | 2.93 | .073 | 0.0 | 3.00 | 0.0 | .181 | 0.4390 | 0.2998* |
| 30 | 4.49 | .112 | 0.0 | 3.00 | 0.0 | .193 | -0.3932 | 0.4358* |
| 31 | 5.03 | .126 | 0.0 | 3.00 | 0.0 | .115 | -0.4065 | -0.3549 |
| 32 | 3.15 | .079 | 0.0 | 3.00 | -5.0 | .055 | -0.2401 | -0.2674 |
| 34 | 3.07 | .077 | -2.5 | 3.00 | -5.0 | .054 | -0.2419 | -0.2668 |
| 35 | 5.82 | .146 | 0.0 | 3.00 | -5.0 | .049 | -0.6677 | -0.5840 |
| 36 | 5.77 | .144 | -12.5 | 6.00 | -5.0 | .008 | -0.8830 | -0.8656 |
| 37 | 4.91 | .123 | 5.0 | 2.00 | -5.0 | .040 | -0.3708 | -0.3584 |
| 38 | 2.87 | .072 | -10.0 | 4.00 | -5.0 | .157 | -0.1347 | -0.1142 |
| 39 | 5.96 | .149 | -12.5 | 5.00 | -5.0 | .045 | -1.5612 | -1.4807* |
| 40 | 3.00 | .075 | 0.0 | 3.00 | -10.0 | .135 | -0.2594 | -0.1056* |
| 41 | 6.02 | .150 | -7.5 | 5.00 | -10.0 | .025 | -0.8718 | -1.0676* |
| 42 | 2.95 | .074 | -2.5 | 2.00 | -10.0 | .057 | -0.2207 | -0.2694 |
| 43 | 5.21 | .130 | -5.0 | 2.00 | -10.0 | .022 | -0.5358 | -0.5248* |
| 46 | 3.09 | .077 | -5.0 | 2.00 | -10.0 | .092 | -0.1102 | -0.1775* |
| 47 | 3.14 | .079 | -2.5 | 3.00 | -5.0 | .036 | -0.2444 | -0.2374 |
| 48 | 3.09 | .077 | 0.0 | 3.00 | -15.0 | .041 | -0.3289 | -0.3223* |
| 56 | 5.23 | .131 | -5.0 | 3.00 | -15.0 | .060 | -1.4362 | -0.9909* |
| 57 | 5.19 | .130 | -5.0 | 2.00 | -15.0 | .027 | -0.7027 | -0.7144* |
| 58 | 5.12 | .128 | -12.5 | 5.00 | -15.0 | .027 | -1.7423 | -1.3500* |
| 59 | 3.05 | .076 | 0.0 | 3.00 | -20.0 | .048 | -0.3975 | -0.3570 |
| 60 | 4.17 | .104 | -12.5 | 6.00 | -20.0 | -.007 | -0.7773 | -0.7923 |

TABLE A-16 (cont'd)

MEASURED AND FITTED PITCH MOMENT
BETA=10. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|----------|
| 62 | 5.18 | .129 | 5.0 | 3.00 | -20.0 | .022 | -0.8021 | -0.7522 |
| 65 | 4.10 | .102 | -2.5 | 6.00 | -20.0 | .033 | -0.7043 | -0.7951 |
| 66 | 6.15 | .154 | -10.0 | 5.00 | -20.0 | .004 | -1.5378 | -1.4785 |
| 67 | 2.11 | .053 | -7.5 | 2.00 | -20.0 | .046 | -0.2271 | -0.2373* |
| 69 | 4.05 | .101 | -5.0 | 5.00 | -20.0 | .047 | -1.0879 | -0.9221* |
| 70 | 3.01 | .075 | -7.5 | 2.00 | -20.0 | .076 | -0.3185 | -0.3274 |
| 71 | 3.00 | .075 | 0.0 | 3.00 | 5.0 | .038 | -0.1155 | -0.1147 |
| 72 | 6.08 | .152 | -5.0 | 3.00 | 5.0 | .057 | -0.6194 | -0.6054* |
| 74 | 5.05 | .126 | -10.0 | 3.00 | 5.0 | .108 | -0.1045 | -0.4162* |
| 75 | 6.03 | .151 | -2.5 | 5.00 | 5.0 | .047 | -1.2614 | -0.8119* |
| 76 | 5.05 | .126 | -2.5 | 2.00 | 5.0 | .038 | -0.2348 | -0.1937 |
| 77 | 5.05 | .126 | -10.0 | 5.00 | 5.0 | .031 | -0.5945 | -0.5517* |
| 78 | 4.02 | .101 | -7.5 | 5.00 | 5.0 | .008 | -0.1048 | -0.0108* |
| 79 | 2.04 | .051 | -10.0 | 3.00 | 5.0 | .016 | -0.0566 | -0.0061* |
| 80 | 5.33 | .133 | -2.5 | 3.00 | 0.0 | .061 | -0.8295 | -0.4941* |
| 82 | 3.87 | .097 | -2.5 | 2.00 | 0.0 | .099 | -0.0184 | -0.0445* |
| 83 | 3.02 | .075 | -2.5 | 3.00 | -5.0 | .038 | -0.2174 | -0.2310 |
| 418 | 1.85 | .069 | 0.0 | 3.00 | 0.0 | .060 | -0.1114 | -0.1315 |
| 419 | 2.96 | .111 | 0.0 | 3.00 | 0.0 | .044 | -0.2056 | -0.1808 |
| 420 | 3.95 | .148 | 0.0 | 3.00 | 0.0 | .033 | -0.2504 | -0.2238 |
| 421 | 5.02 | .188 | 0.0 | 3.00 | 0.0 | .025 | -0.2408 | -0.2568 |
| 422 | 6.09 | .228 | 0.0 | 3.00 | 0.0 | .022 | -0.2481 | -0.2911 |
| 423 | 3.86 | .145 | 0.0 | 3.00 | 0.0 | .028 | -0.1717 | -0.1944 |
| 424 | 3.91 | .146 | 0.0 | 3.00 | 0.0 | .045 | -0.3584 | -0.2656* |
| 425 | 3.96 | .148 | 0.0 | 3.00 | 0.0 | .067 | -0.4607 | -0.3063* |
| 426 | 4.03 | .151 | 0.0 | 3.00 | 0.0 | .117 | -0.0853 | -0.1961* |
| 427 | 4.01 | .150 | 0.0 | 3.00 | 0.0 | .158 | 0.4823 | 0.0872 |
| 428 | 3.99 | .150 | 5.0 | 3.00 | 0.0 | .027 | -0.2705 | -0.2016 |
| 429 | 4.02 | .151 | -2.5 | 3.00 | 0.0 | .031 | -0.2477 | -0.2390 |
| 430 | 3.99 | .150 | -5.0 | 3.00 | 0.0 | .027 | -0.3052 | -0.2421 |
| 431 | 4.01 | .150 | -7.5 | 3.00 | 0.0 | .017 | -0.2684 | -0.2247 |
| 432 | 4.00 | .150 | -10.0 | 3.00 | 0.0 | .011 | -0.2611 | -0.2428 |
| 433 | 4.01 | .150 | -12.5 | 3.00 | 0.0 | .006 | -0.2630 | -0.2891 |
| 434 | 3.99 | .150 | -12.5 | 3.00 | 5.0 | .007 | -0.1283 | -0.1517 |
| 435 | 4.00 | .150 | -12.5 | 3.00 | -5.0 | -.002 | -0.3949 | -0.3599 |
| 436 | 4.02 | .151 | -12.5 | 3.00 | -10.0 | -.004 | -0.5452 | -0.4790 |
| 438 | 3.97 | .149 | 0.0 | 3.00 | 5.0 | .032 | -0.1128 | -0.1062 |
| 440 | 4.01 | .150 | 0.0 | 3.00 | -5.0 | .035 | -0.3566 | -0.3552 |
| 441 | 4.00 | .150 | 0.0 | 3.00 | -10.0 | .036 | -0.4612 | -0.4791 |
| 443 | 3.98 | .149 | 0.0 | 3.00 | -15.0 | .040 | -0.5922 | -0.6069 |
| 444 | 3.98 | .149 | 0.0 | 3.00 | -20.0 | .035 | -0.7297 | -0.7008 |
| 445 | 3.98 | .149 | 0.0 | 2.00 | 0.0 | .036 | -0.1804 | -0.2303 |
| 446 | 3.98 | .149 | 0.0 | 4.00 | 0.0 | .032 | -0.2906 | -0.2474 |
| 448 | 4.02 | .151 | 0.0 | 5.00 | 0.0 | .025 | -0.2535 | -0.2245 |
| 449 | 4.03 | .151 | 0.0 | 6.00 | 0.0 | .024 | -0.2706 | -0.2629* |
| 451 | 1.81 | .068 | -10.0 | 4.00 | 5.0 | .132 | -0.1024 | 0.0611* |
| 452 | 4.01 | .150 | -2.5 | 3.00 | -5.0 | .043 | -0.4833 | -0.4116* |
| 455 | 4.91 | .184 | 5.0 | 4.00 | -20.0 | .131 | -0.6883 | -1.1331* |
| 456 | 4.90 | .184 | -7.5 | 4.00 | 5.0 | .099 | -0.4641 | -0.7235* |
| 457 | 2.92 | .109 | -2.5 | 3.00 | -5.0 | .043 | -0.2554 | -0.2562 |

R-1851

TABLE A-16 (cont'd)

MEASURED AND FITTED PITCH MØMENT
BETA=10. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|----------|
| 458 | 4.00 | .150 | -7.5 | 6.00 | 0.0 | .010 | -0.2979 | -0.2138 |
| 459 | 5.96 | .224 | 0.0 | 2.00 | -5.0 | .025 | -0.4356 | -0.4747 |
| 460 | 5.01 | .188 | -10.0 | 5.00 | 0.0 | .045 | -0.9124 | -0.9596* |
| 463 | 4.02 | .151 | -12.5 | 3.00 | 5.0 | .110 | -0.0373 | -0.1393* |
| 465 | 5.97 | .224 | 0.0 | 2.00 | 5.0 | .090 | 0.0738 | -0.2532* |
| 466 | 5.97 | .224 | -12.5 | 5.00 | -20.0 | .011 | -2.5029 | -2.1212 |
| 467 | 4.00 | .150 | -7.5 | 6.00 | 0.0 | .011 | -0.1664 | -0.2279 |
| 469 | 5.05 | .189 | 5.0 | 4.00 | -10.0 | .083 | -0.9535 | -0.8996 |
| 470 | 3.01 | .113 | -2.5 | 3.00 | 0.0 | .131 | 0.0059 | -0.0311* |
| 471 | 2.99 | .112 | -2.5 | 3.00 | -5.0 | .047 | -0.2761 | -0.2734* |
| 473 | 4.96 | .186 | -5.0 | 6.00 | -20.0 | .024 | -1.1278 | -1.3888 |
| 475 | 4.97 | .186 | -2.5 | 2.00 | -20.0 | .086 | -0.9896 | -1.0559* |
| 476 | 4.97 | .186 | 5.0 | 3.00 | 0.0 | .031 | -0.3896 | -0.2566 |
| 483 | 1.98 | .074 | -10.0 | 6.00 | -5.0 | .168 | -0.2375 | -0.2391 |
| 484 | 2.91 | .109 | -2.5 | 2.00 | 0.0 | .089 | -0.0765 | -0.0675 |
| 485 | 3.01 | .113 | 0.0 | 6.00 | -20.0 | .133 | -0.7557 | -0.8179* |
| 487 | 3.93 | .148 | -10.0 | 2.00 | -5.0 | .097 | -0.0787 | -0.2496 |
| 488 | 3.00 | .113 | -2.5 | 3.00 | -5.0 | .043 | -0.2610 | -0.2677 |
| 489 | 4.13 | .155 | -5.0 | 2.00 | 5.0 | .112 | 0.1807 | 0.1292* |
| 490 | 6.08 | .228 | -5.0 | 2.00 | 5.0 | .081 | -0.0185 | -0.4686* |
| 491 | 4.10 | .154 | -7.5 | 3.00 | -5.0 | .075 | -0.6135 | -0.5516 |
| 492 | 4.04 | .152 | 0.0 | 3.00 | 0.0 | .028 | -0.1790 | -0.2051 |
| 494 | 3.18 | .119 | -2.5 | 4.00 | -5.0 | .140 | -0.1924 | -0.3248* |
| 496 | 6.07 | .228 | 5.0 | 5.00 | -15.0 | .074 | -1.9056 | -1.6821* |
| 499 | 6.05 | .227 | -10.0 | 5.00 | -15.0 | .001 | -1.2515 | -1.2978 |
| 500 | 4.08 | .153 | -5.0 | 6.00 | -5.0 | .015 | -0.3465 | -0.3809 |
| 502 | 3.09 | .116 | -12.5 | 4.00 | 0.0 | .105 | -0.2636 | -0.2866 |
| 503 | 3.10 | .116 | -2.5 | 4.00 | -15.0 | .053 | -0.5560 | -0.5087 |
| 505 | 3.03 | .114 | -2.5 | 5.00 | 5.0 | .161 | -0.1227 | -0.2432* |
| 506 | 3.02 | .113 | -2.5 | 3.00 | -5.0 | .041 | -0.2644 | -0.2641 |
| 507 | 3.01 | .113 | -5.0 | 2.00 | 5.0 | .092 | 0.0009 | 0.0525* |
| 508 | 2.99 | .112 | -5.0 | 5.00 | -10.0 | .104 | -0.6479 | -0.6508 |
| 512 | 2.01 | .075 | -7.5 | 6.00 | -10.0 | .220 | -0.1289 | -0.2101* |
| 513 | 5.15 | .193 | -10.0 | 5.00 | -10.0 | .042 | -1.6565 | -1.4059* |
| 514 | 5.10 | .191 | -12.5 | 2.00 | -10.0 | -.016 | -0.5553 | -0.6036 |
| 795 | 3.00 | .225 | 0.0 | 3.00 | 0.0 | .055 | -0.1908 | -0.1982 |
| 796 | 2.99 | .224 | 5.0 | 3.00 | 0.0 | .047 | -0.1498 | -0.1966 |
| 797 | 3.01 | .226 | -2.5 | 3.00 | 0.0 | .056 | -0.2016 | -0.2008 |
| 798 | 3.00 | .225 | -5.0 | 3.00 | 0.0 | .051 | -0.1868 | -0.1956 |
| 799 | 3.01 | .226 | -7.5 | 3.00 | 0.0 | .046 | -0.1822 | -0.1939 |
| 800 | 3.00 | .225 | -10.0 | 3.00 | 0.0 | .039 | -0.1732 | -0.1890 |
| 801 | 3.00 | .225 | -12.5 | 3.00 | 0.0 | .033 | -0.1643 | -0.1937 |
| 802 | 2.99 | .224 | 0.0 | 3.00 | 5.0 | .054 | -0.0435 | -0.0305 |
| 803 | 2.99 | .224 | 0.0 | 3.00 | -5.0 | .068 | -0.3657 | -0.3620 |
| 804 | 2.98 | .223 | 0.0 | 3.00 | -10.0 | .072 | -0.4807 | -0.5091 |
| 805 | 2.99 | .224 | 0.0 | 3.00 | -15.0 | .075 | -0.6101 | -0.6566 |
| 806 | 3.00 | .225 | 0.0 | 3.00 | -20.0 | .069 | -0.7997 | -0.7947 |
| 807 | 3.00 | .225 | 0.0 | 2.00 | 0.0 | .067 | -0.1496 | -0.1492 |
| 808 | 2.97 | .223 | 0.0 | 4.00 | 0.0 | .058 | -0.2548 | -0.2483 |
| 809 | 3.00 | .225 | 0.0 | 5.00 | 0.0 | .053 | -0.2773 | -0.2933 |

TABLE A-16 (cont'd)

MEASURED AND FITTED PITCH MOMENT
BETA=10. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|------|----------|----------|
| 810 | 2.99 | .224 | 0.0 | 6.00 | 0.0 | .056 | -0.3571 | -0.3761 |
| 811 | 3.00 | .225 | 0.0 | 3.00 | 0.0 | .051 | -0.1458 | -0.1933 |
| 812 | 3.00 | .225 | 0.0 | 3.00 | 0.0 | .082 | -0.2316 | -0.1952 |
| 813 | 3.00 | .225 | 0.0 | 3.00 | 0.0 | .130 | -0.0538 | -0.0425 |
| 815 | 2.01 | .151 | 0.0 | 3.00 | 0.0 | .104 | -0.1012 | -0.0941 |
| 816 | 2.51 | .188 | -2.5 | 3.00 | 0.0 | .069 | -0.1694 | -0.1471 |
| 817 | 3.01 | .226 | 0.0 | 6.00 | -20.0 | .066 | -0.9759 | -0.9670 |
| 818 | 3.02 | .226 | 5.0 | 6.00 | -5.0 | .175 | -0.4322 | -0.4408 |
| 819 | 3.02 | .226 | -2.5 | 6.00 | 5.0 | .211 | -0.0469 | -0.2253* |
| 820 | 2.03 | .152 | 0.0 | 4.00 | -10.0 | .205 | -0.0521 | -0.0920* |
| 821 | 3.01 | .226 | -12.5 | 3.00 | -10.0 | .017 | -0.4644 | -0.4967 |
| 822 | 3.01 | .226 | -2.5 | 3.00 | -5.0 | .065 | -0.3720 | -0.3760 |
| 823 | 2.02 | .152 | -12.5 | 3.00 | -10.0 | .093 | -0.2425 | -0.1772 |
| 824 | 2.52 | .189 | -10.0 | 3.00 | 5.0 | .111 | -0.0352 | 0.1493* |
| 825 | 2.01 | .150 | -5.0 | 3.00 | -15.0 | .112 | -0.2863 | -0.3231* |
| 826 | 2.48 | .186 | -12.5 | 6.00 | -10.0 | .190 | -0.4462 | -0.6351* |
| 827 | 2.48 | .186 | -12.5 | 5.00 | 5.0 | .281 | 0.1753 | 0.7749* |
| 828 | 2.99 | .224 | 0.0 | 3.00 | -5.0 | .084 | -0.3535 | -0.3509* |
| 829 | 1.99 | .149 | 5.0 | 6.00 | -10.0 | .287 | -0.0679 | 0.1890* |
| 830 | 2.00 | .150 | -5.0 | 3.00 | -10.0 | .076 | -0.2558 | -0.2704* |
| 831 | 2.50 | .187 | -2.5 | 5.00 | -20.0 | .248 | -0.0371 | -0.4556* |
| 832 | 2.99 | .224 | -2.5 | 3.00 | -5.0 | .065 | -0.3866 | -0.3721 |
| 833 | 1.96 | .147 | -5.0 | 6.00 | -5.0 | .263 | -0.0734 | -0.0992 |
| 834 | 2.95 | .221 | 5.0 | 5.00 | 0.0 | .063 | -0.3277 | -0.2878 |
| 835 | 2.96 | .222 | -5.0 | 6.00 | 0.0 | .034 | -0.2557 | -0.2796 |
| 836 | 1.98 | .148 | -12.5 | 3.00 | -20.0 | .019 | -0.3775 | -0.3158 |
| 839 | 2.06 | .155 | 5.0 | 4.00 | 0.0 | .192 | 0.0678 | 0.1298* |
| 840 | 2.03 | .153 | -7.5 | 3.00 | 5.0 | .088 | -0.0361 | 0.0606* |
| 841 | 2.98 | .223 | 0.0 | 5.00 | -20.0 | .219 | -0.2335 | -0.6755* |
| 842 | 2.99 | .224 | -7.5 | 6.00 | -15.0 | .031 | -0.7687 | -0.8367 |
| 845 | 2.98 | .223 | 5.0 | 6.00 | -10.0 | .174 | -0.5082 | -0.5327 |
| 846 | 3.01 | .226 | -2.5 | 3.00 | -5.0 | .053 | -0.3743 | -0.3628 |
| 847 | 2.54 | .190 | -7.5 | 5.00 | 0.0 | .242 | 0.1454 | 0.1167 |
| 848 | 3.01 | .226 | -10.0 | 5.00 | 0.0 | .204 | -0.0051 | -0.1914* |
| 849 | 2.55 | .191 | 0.0 | 5.00 | -5.0 | .046 | -0.3410 | -0.2950 |
| 850 | 2.54 | .191 | -2.5 | 4.00 | -15.0 | .180 | -0.1436 | -0.4135* |
| 851 | 2.08 | .156 | 0.0 | 5.00 | 5.0 | .038 | -0.0627 | 0.0066* |
| 852 | 2.53 | .190 | 5.0 | 6.00 | -20.0 | .212 | -0.3779 | -0.3398 |
| 853 | 2.05 | .154 | -5.0 | 8.00 | -15.0 | .288 | -0.3018 | -0.2769 |
| 855 | 3.01 | .226 | -5.0 | 2.00 | 5.0 | .074 | 0.0272 | 0.0690* |
| 856 | 2.53 | .190 | -12.5 | 4.00 | -10.0 | .182 | 0.0022 | -0.2095* |
| 857 | 3.00 | .225 | -2.5 | 3.00 | -5.0 | .049 | -0.3724 | -0.3546 |
| 858 | 2.99 | .224 | -5.0 | 4.00 | 0.0 | .157 | -0.0237 | -0.172* |
| 859 | 2.53 | .190 | -5.0 | 6.00 | -5.0 | .169 | -0.3624 | -0.5734* |
| 861 | 2.54 | .190 | -12.5 | 4.00 | -5.0 | .209 | 0.1236 | 0.1428 |
| 862 | 2.97 | .223 | -12.5 | 5.00 | -20.0 | .057 | -1.2734 | -1.2213 |
| 863 | 3.00 | .225 | -5.0 | 4.00 | -5.0 | .026 | -0.3002 | -0.2988 |

MEAN ERROR= 0.0177
STANDARD DEVIATION= 0.1568

TABLE A-17

MEASURED AND FITTED PITCH MØMENT
BETA=15. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|------|-------|------|-------|----------|----------|
| 141 | 4.00 | .000 | 5.0 | 3.60 | 5.0 | .050 | -0.2375 | -0.2248 |
| 143 | 3.00 | .000 | 4.7 | 2.60 | 0.0 | .053 | -0.1227 | -0.1451* |
| 144 | 6.00 | .000 | 14.8 | 3.00 | 0.0 | .149 | 0.1003 | -0.1342* |
| 145 | 4.00 | .000 | 4.8 | 3.60 | 0.0 | .050 | -0.2396 | -0.2169 |
| 146 | 4.00 | .000 | -5.2 | 3.60 | 0.0 | .050 | -0.2467 | -0.2199 |
| 153 | 2.00 | .000 | -2.1 | 3.60 | 0.0 | .114 | -0.1449 | -0.2032 |
| 157 | 4.00 | .000 | 9.8 | 3.60 | 0.0 | .035 | -0.2512 | -0.1868 |
| 158 | 4.00 | .000 | 14.7 | 3.60 | 0.0 | .014 | -0.2506 | -0.1714* |
| 159 | 3.00 | .000 | 14.7 | 3.60 | 0.0 | .169 | -0.0617 | 0.0416* |
| 160 | 4.00 | .000 | 19.8 | 3.60 | 0.0 | -.005 | -0.2519 | -0.2575 |
| 161 | 4.00 | .000 | 19.8 | 4.60 | 0.0 | .155 | -0.2261 | -0.2932 |
| 162 | 4.00 | .000 | 19.7 | 4.60 | 0.0 | .162 | -0.2440 | -0.2288 |
| 165 | 2.00 | .000 | 4.7 | 5.60 | 0.0 | .371 | 0.2066 | 0.2261 |
| 166 | 6.00 | .000 | 9.7 | 5.60 | 0.0 | .029 | -0.3344 | -0.3047 |
| 167 | 3.00 | .000 | 19.7 | 5.60 | 0.0 | .161 | -0.2815 | -0.2940* |
| 168 | 3.00 | .000 | 19.7 | 5.60 | 0.0 | .280 | 0.0973 | 0.7929* |
| 169 | 2.00 | .000 | 19.7 | 6.60 | 0.0 | .067 | -0.2003 | -0.3125* |
| 170 | 5.00 | .000 | 9.7 | 6.60 | 0.0 | .030 | -0.3008 | -0.3308* |
| 171 | 4.00 | .000 | 9.7 | 6.60 | 0.0 | .147 | -0.8982 | -0.8136 |
| 172 | 3.00 | .000 | -5.3 | 6.60 | 0.0 | .082 | -0.4194 | -0.4282 |
| 174 | 6.00 | .000 | -5.2 | 6.60 | 0.0 | .039 | -0.3517 | -0.3581 |
| 175 | 4.00 | .000 | 4.7 | 3.60 | 5.0 | .061 | -0.2495 | -0.2812 |
| 185 | 4.00 | .000 | 4.7 | 3.60 | 5.0 | .046 | -0.1568 | -0.2027 |
| 186 | 4.00 | .000 | -0.3 | 3.60 | 5.0 | .065 | -0.2429 | -0.2756 |
| 187 | 3.00 | .000 | -5.3 | 3.60 | 5.0 | .119 | -0.2293 | -0.2481 |
| 189 | 5.00 | .000 | -0.3 | 2.50 | 5.0 | .063 | -0.2604 | -0.3044 |
| 191 | 4.00 | .000 | 9.8 | 3.60 | 5.0 | .173 | -0.0922 | -0.1060 |
| 192 | 4.00 | .000 | 9.7 | 3.60 | 5.0 | .177 | -0.1014 | -0.0830 |
| 193 | 3.00 | .000 | 14.7 | 3.70 | 5.0 | .250 | 0.6273 | 0.6154 |
| 194 | 3.00 | .000 | 14.7 | 3.60 | 5.0 | .017 | -0.1492 | -0.1387 |
| 195 | 3.00 | .000 | 14.7 | 1.60 | 5.0 | .048 | -0.1314 | -0.1438 |
| 196 | 6.00 | .000 | -5.2 | 5.60 | 5.0 | .035 | -0.2410 | -0.2994 |
| 197 | 6.00 | .000 | 9.7 | 5.60 | 5.0 | .026 | -0.2231 | -0.2740 |
| 198 | 6.00 | .000 | 19.8 | 5.60 | 5.0 | -.016 | -0.2472 | -0.2192 |
| 199 | 2.00 | .000 | -0.3 | 5.60 | 5.0 | .101 | -0.1982 | -0.2217 |
| 200 | 2.00 | .000 | -5.3 | 5.60 | 5.0 | .257 | -0.1356 | -0.0906* |
| 201 | 4.00 | .000 | 19.8 | 5.60 | 5.0 | .139 | -0.6296 | -0.7426* |
| 202 | 5.00 | .000 | 14.7 | 6.60 | 5.0 | .010 | -0.2279 | -0.2822 |
| 203 | 5.00 | .000 | 4.7 | 6.60 | 5.0 | .036 | -0.3090 | -0.2858 |
| 204 | 5.00 | .000 | 4.8 | 6.60 | 5.0 | .037 | -0.3131 | -0.2969 |
| 205 | 3.00 | .000 | -5.3 | 6.60 | 5.0 | .279 | -0.1197 | -0.1096 |
| 206 | 4.00 | .000 | 4.7 | 3.60 | 5.0 | .055 | -0.2397 | -0.2500 |
| 207 | 4.00 | .000 | -0.3 | 3.60 | -5.0 | .063 | -0.2462 | -0.2666 |
| 208 | 6.00 | .000 | 14.7 | 3.60 | -5.0 | .155 | -0.1470 | -0.1653* |
| 210 | 5.00 | .000 | -0.3 | 2.50 | -5.0 | .103 | -0.5451 | -0.3114* |
| 211 | 4.00 | .000 | 4.7 | 2.60 | -5.0 | .094 | -0.2999 | -0.2438 |
| 212 | 2.00 | .000 | 4.7 | 2.60 | -5.0 | .162 | -0.0699 | -0.0488 |
| 213 | 4.00 | .000 | 9.8 | 2.60 | -5.0 | .043 | -0.2461 | -0.1885 |
| 214 | 2.00 | .000 | -0.3 | 4.60 | -5.0 | .170 | -0.1696 | -0.2271 |
| 215 | 6.00 | .000 | 14.8 | 4.60 | -5.0 | .126 | -0.7053 | -0.6957 |

TABLE A-17 (cont'd)

MEASURED AND FITTED PITCH MOMENT
BETA=15. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|------|-------|------|-------|----------|----------|
| 216 | 5.00 | .000 | 14.7 | 5.50 | -5.0 | .150 | -0.6777 | -0.6373* |
| 218 | 3.00 | .000 | 9.7 | 5.60 | -5.0 | .242 | -0.1283 | 0.0239* |
| 219 | 4.00 | .000 | 9.7 | 5.60 | -5.0 | .045 | -0.4594 | -0.3435 |
| 220 | 6.00 | .000 | 14.8 | 5.60 | -5.0 | .007 | -0.2613 | -0.3487 |
| 221 | 6.00 | .000 | 14.8 | 6.60 | -5.0 | .005 | -0.3574 | -0.3397 |
| 222 | 4.00 | .000 | 9.7 | 6.60 | -5.0 | .044 | -0.4921 | -0.4041 |
| 223 | 3.00 | .000 | 19.7 | 6.60 | 10.0 | -.009 | -0.2009 | -0.2514 |
| 224 | 4.00 | .000 | 19.7 | 6.60 | 10.0 | -.014 | -0.3119 | -0.2429 |
| 225 | 2.00 | .000 | -5.3 | 6.60 | 10.0 | .104 | -0.2122 | -0.1949 |
| 226 | 3.00 | .000 | 4.7 | 6.60 | 10.0 | .117 | -0.6270 | -0.5662* |
| 227 | 5.00 | .000 | -0.3 | 6.50 | 10.0 | .070 | -0.8317 | -0.6364* |
| 228 | 3.00 | .000 | 14.8 | 6.60 | 10.0 | .191 | -0.5410 | -0.5808* |
| 231 | 3.00 | .000 | 19.8 | 4.60 | 10.0 | .179 | -0.0379 | -0.1320* |
| 232 | 5.00 | .000 | 14.7 | 4.50 | 10.0 | .035 | -0.7332 | -0.4971 |
| 233 | 2.00 | .000 | 14.7 | 4.60 | 10.0 | .037 | -0.1298 | -0.1548 |
| 234 | 4.00 | .000 | 4.8 | 3.60 | 5.0 | .054 | -0.2282 | -0.2497* |
| 235 | 5.00 | .000 | 4.8 | 3.50 | 10.0 | .118 | -0.8876 | -0.4728* |
| 238 | 3.00 | .000 | 9.7 | 3.60 | 10.0 | .240 | 0.5252 | 0.2798* |
| 239 | 4.00 | .000 | 9.8 | 3.60 | 10.0 | .059 | -0.3770 | -0.3525* |
| 240 | 5.00 | .000 | 8.6 | 3.50 | 10.0 | .020 | -0.4321 | -0.1443* |
| 241 | 3.00 | .000 | 4.8 | 3.60 | 10.0 | .131 | -0.1767 | -0.2884* |
| 242 | 4.00 | .000 | -0.3 | 3.60 | 10.0 | .064 | -0.2405 | -0.2787* |
| 243 | 4.00 | .000 | 9.7 | 2.60 | 10.0 | .050 | -0.2532 | -0.2634 |
| 244 | 3.00 | .000 | 19.7 | 5.60 | 10.0 | -.003 | -0.2368 | -0.2630 |
| 245 | 3.00 | .000 | -4.9 | 5.50 | 10.0 | .180 | -0.3021 | -0.3351 |
| 246 | 5.00 | .000 | -5.2 | 5.50 | 15.0 | .077 | -0.9213 | -0.6393* |
| 247 | 3.00 | .000 | -0.3 | 5.60 | 15.0 | .165 | -0.4002 | -0.4246* |
| 248 | 5.00 | .000 | 14.8 | 5.50 | 15.0 | .029 | -0.7938 | -0.5145* |
| 249 | 6.00 | .000 | 14.7 | 5.60 | 15.0 | .016 | -0.5066 | -0.4730 |
| 250 | 5.00 | .000 | -0.3 | 5.50 | 15.0 | .044 | -0.2876 | -0.3620 |
| 251 | 2.00 | .000 | 4.7 | 6.60 | 15.0 | .091 | -0.2087 | -0.1863 |
| 252 | 6.00 | .000 | 3.9 | 6.60 | 15.0 | .026 | -0.3107 | -0.3105 |
| 253 | 3.00 | .000 | 19.7 | 6.60 | 15.0 | .018 | -0.4184 | -0.4544 |
| 254 | 4.00 | .000 | -5.3 | 6.60 | 15.0 | .150 | -0.7226 | -0.6958 |
| 255 | 6.00 | .000 | -5.3 | 4.60 | 15.0 | .067 | -0.8496 | -0.7701 |
| 256 | 3.00 | .000 | 14.7 | 4.60 | 15.0 | .094 | -0.4702 | -0.4597 |
| 257 | 5.00 | .000 | 9.8 | 4.50 | 15.0 | .077 | -0.9602 | -0.6913* |
| 258 | 3.00 | .000 | 4.7 | 4.60 | 15.0 | .266 | 0.3267 | 0.1471* |
| 260 | 4.00 | .000 | -0.3 | 4.60 | 15.0 | .230 | 0.0466 | 0.0901* |
| 261 | 4.00 | .000 | -0.3 | 4.60 | 15.0 | .049 | -0.1921 | -0.2416 |
| 262 | 3.00 | .000 | 9.8 | 4.60 | 15.0 | .056 | -0.2363 | -0.2780 |
| 263 | 6.00 | .000 | 9.8 | 4.60 | 15.0 | .033 | -0.2945 | -0.5285* |
| 264 | 4.00 | .000 | -0.3 | 3.60 | 15.0 | .069 | -0.2568 | -0.3050 |
| 265 | 6.00 | .000 | 19.8 | 3.60 | 15.0 | -.009 | -0.4188 | -0.4275 |
| 266 | 4.00 | .000 | 9.8 | 2.60 | 15.0 | .053 | -0.2430 | -0.3053 |
| 267 | 3.00 | .000 | 9.8 | 2.60 | 15.0 | .095 | -0.2523 | -0.2597 |
| 268 | 3.00 | .000 | 4.7 | 2.60 | 15.0 | .089 | -0.2019 | -0.2322 |
| 270 | 6.00 | .000 | 4.8 | 2.50 | 15.0 | .099 | -0.8529 | -0.7250* |
| 271 | 6.00 | .000 | 4.8 | 2.50 | 15.0 | .097 | -0.8546 | -0.7299* |
| 275 | 4.00 | .000 | 9.8 | 2.50 | 15.0 | .117 | -0.4130 | -0.3363 |

TABLE A-17 (cont'd)

MEASURED AND FITTED PITCH MOMENT
BETA=15.DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|----------|
| 276 | 4.00 | .000 | 4.8 | 3.60 | 5.0 | .058 | -0.2466 | -0.2662 |
| 277 | 4.00 | .000 | -0.3 | 3.60 | 20.0 | .068 | -0.2662 | -0.3061 |
| 277 | 3.00 | .000 | 14.7 | 3.50 | 20.0 | .049 | -0.3197 | -0.2952* |
| 279 | 4.00 | .000 | 4.8 | 3.50 | 20.0 | .133 | -0.5162 | -0.4095* |
| 280 | 6.00 | .000 | 4.8 | 2.50 | 20.0 | .100 | -0.8935 | -0.9198* |
| 281 | 5.00 | .000 | 4.8 | 2.50 | 20.0 | .168 | 0.2786 | -0.2065* |
| 282 | 6.00 | .000 | 14. | 2.50 | 20.0 | .028 | -0.7198 | -0.8439* |
| 283 | 4.00 | .000 | 14.7 | 2.50 | 20.0 | .034 | -0.3713 | -0.3310 |
| 286 | 4.00 | .000 | 14.7 | 2.50 | 20.0 | .020 | -0.2372 | -0.2418 |
| 286 | 3.00 | .000 | 9.7 | 4.50 | 20.0 | .043 | -0.1585 | -0.1990 |
| 287 | 3.00 | .000 | 9.7 | 4.50 | 20.0 | .075 | -0.3474 | -0.3482* |
| 288 | 4.00 | .000 | 19.8 | 4.50 | 20.0 | -.004 | -0.4258 | -0.2560* |
| 289 | 2.00 | .000 | 14.7 | 4.50 | 20.0 | .098 | -0.2495 | -0.2435 |
| 290 | 2.00 | .000 | 19.8 | 4.60 | 20.0 | .136 | -0.2265 | -0.1666 |
| 294 | 3.00 | .000 | -0.3 | 5.50 | 20.0 | .090 | -0.3832 | -0.3094 |
| 295 | 3.00 | .000 | -0.3 | 5.60 | 20.0 | .056 | -0.1669 | -0.1592 |
| 296 | 4.00 | .000 | -0.3 | 6.60 | 20.0 | .046 | -0.2038 | -0.2551 |
| 297 | 4.00 | .000 | 4.7 | 3.60 | 5.0 | .059 | -0.2681 | -0.2720 |
| 298 | 4.00 | .000 | 4.8 | 1.60 | 5.0 | .082 | -0.2252 | -0.2020 |
| 299 | 4.00 | .000 | 14.7 | 1.60 | 5.0 | .038 | -0.2037 | -0.2268 |
| 300 | 5.00 | .000 | -0.3 | 1.50 | 15.0 | .051 | -0.3942 | -0.3673 |
| 109 | 2.35 | .059 | 0.0 | 3.00 | 0.0 | .069 | -0.1120 | -0.1621 |
| 110 | 2.92 | .073 | 0.0 | 3.00 | 0.0 | .060 | -0.1469 | -0.1662 |
| 111 | 3.88 | .097 | 0.0 | 3.00 | 0.0 | .052 | -0.2260 | -0.1965 |
| 112 | 4.95 | .124 | 0.0 | 3.00 | 0.0 | .045 | -0.2918 | -0.2682 |
| 113 | 6.02 | .150 | 0.0 | 3.00 | 0.0 | .037 | -0.3893 | -0.3819 |
| 114 | 2.87 | .072 | 0.0 | 3.00 | 0.0 | .049 | -0.1179 | -0.1269 |
| 115 | 3.02 | .076 | 0.0 | 3.00 | 0.0 | .081 | -0.2434 | -0.2170* |
| 116 | 3.01 | .075 | 0.0 | 3.00 | 0.0 | .155 | 0.0147 | -0.1188* |
| 117 | 2.82 | .071 | 0.0 | 3.00 | 0.0 | .156 | -0.0003 | -0.1176* |
| 119 | 4.03 | .101 | 0.0 | 3.00 | 0.0 | .181 | 0.4397 | 0.0933* |
| 120 | 3.03 | .076 | 5.0 | 3.00 | 0.0 | .059 | -0.2007 | -0.1794 |
| 121 | 3.02 | .075 | -5.0 | 3.00 | 0.0 | .056 | -0.2025 | -0.1611 |
| 122 | 2.87 | .072 | -10.0 | 3.00 | 0.0 | .052 | -0.1662 | -0.1545 |
| 123 | 2.89 | .072 | -15.0 | 3.00 | 0.0 | .046 | -0.1552 | -0.1760* |
| 124 | 3.05 | .076 | -20.0 | 3.00 | 0.0 | .040 | -0.1506 | -0.2585* |
| 125 | 3.06 | .076 | 0.0 | 3.00 | 5.0 | .058 | -0.1040 | -0.1110 |
| 127 | 3.01 | .075 | 0.0 | 3.00 | -10.0 | .067 | -0.2525 | -0.2858 |
| 128 | 3.03 | .076 | 0.0 | 3.00 | -15.0 | .066 | -0.3200 | -0.3300 |
| 129 | 3.01 | .075 | 0.0 | 3.00 | -20.0 | .055 | -0.3994 | -0.3400* |
| 130 | 2.99 | .075 | 0.0 | 2.00 | 0.0 | .066 | -0.0549 | -0.1463* |
| 131 | 3.02 | .075 | 0.0 | 4.00 | 0.0 | .063 | -0.2026 | -0.2145 |
| 132 | 3.06 | .076 | 0.0 | 5.00 | 0.0 | .054 | -0.1997 | -0.2085 |
| 133 | 3.06 | .076 | 0.0 | 6.00 | 0.0 | .057 | -0.2755 | -0.2596 |
| 136 | 4.04 | .101 | -5.0 | 3.00 | 0.0 | .095 | -0.3547 | -0.3088 |
| 137 | 6.09 | .152 | -15.0 | 5.00 | -10.0 | .003 | -1.0072 | -0.9831 |
| 138 | 6.05 | .151 | -20.0 | 6.00 | -5.0 | -.018 | -0.9063 | -0.8828 |
| 139 | 4.02 | .100 | -20.0 | 6.00 | -20.0 | -.022 | -0.6866 | -0.6968* |
| 140 | 5.00 | .125 | 5.0 | 3.00 | -20.0 | .022 | -0.6637 | -0.9002* |
| 141 | 4.99 | .125 | 5.0 | 3.00 | -20.0 | .021 | -0.7066 | -0.8912* |

TABLE A-17 (cont'd)

MEASURED AND FITTED PITCH MOMENT
BETA=15. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|------|----------|----------|
| 142 | 2.91 | .073 | -5.0 | 3.00 | -5.0 | .056 | -0.2193 | -0.2122 |
| 143 | 1.65 | .041 | -10.0 | 6.00 | 0.0 | .153 | -0.1571 | -0.1565* |
| 144 | 3.79 | .095 | -10.0 | 3.00 | -20.0 | .093 | -0.9466 | -0.6944* |
| 145 | 4.76 | .119 | 5.0 | 2.00 | -5.0 | .045 | -0.3421 | -0.3702 |
| 147 | 3.87 | .097 | -5.0 | 6.00 | -20.0 | .026 | -0.5976 | -0.5338* |
| 148 | 5.86 | .146 | -10.0 | 3.00 | 5.0 | .097 | -0.2077 | -0.5094* |
| 150 | 3.94 | .098 | -15.0 | 4.00 | -5.0 | .093 | -0.5311 | -0.6158* |
| 151 | 2.95 | .074 | -10.0 | 2.00 | -10.0 | .105 | -0.0958 | -0.2160* |
| 154 | 4.78 | .120 | -5.0 | 3.00 | -5.0 | .032 | -0.3333 | -0.3342 |
| 156 | 3.00 | .075 | 0.0 | 2.00 | -10.0 | .053 | -0.2027 | -0.2223 |
| 157 | 3.02 | .076 | -5.0 | 6.00 | -15.0 | .050 | -0.4438 | -0.4052 |
| 158 | 3.99 | .100 | -5.0 | 6.00 | -15.0 | .040 | -0.6029 | -0.6139 |
| 160 | 2.40 | .060 | -10.0 | 2.00 | -20.0 | .044 | -0.2686 | -0.2504 |
| 161 | 6.18 | .154 | 5.0 | 3.00 | -20.0 | .044 | -1.9841 | -1.7346* |
| 162 | 6.21 | .155 | 5.0 | 3.00 | -20.0 | .040 | -1.9283 | -1.7495* |
| 163 | 6.18 | .154 | -10.0 | 2.00 | -15.0 | .004 | -0.6953 | -1.2146* |
| 164 | 4.38 | .110 | -10.0 | 5.00 | -20.0 | .041 | -1.1258 | -0.9378* |
| 165 | 3.23 | .081 | -10.0 | 2.00 | -20.0 | .082 | -0.4067 | -0.4408 |
| 166 | 2.15 | .054 | -10.0 | 4.00 | -15.0 | .037 | -0.2051 | -0.1953 |
| 167 | 2.64 | .066 | -5.0 | 3.00 | -5.0 | .065 | -0.1882 | -0.2109* |
| 168 | 5.65 | .141 | -5.0 | 5.00 | 5.0 | .073 | -1.0763 | -0.5797* |
| 169 | 4.72 | .118 | -5.0 | 2.00 | -10.0 | .052 | -0.4699 | -0.5435 |
| 170 | 5.81 | .145 | 5.0 | 3.00 | -5.0 | .040 | -0.6292 | -0.5817 |
| 171 | 4.74 | .118 | 0.0 | 2.00 | 5.0 | .064 | -0.2015 | -0.1808* |
| 173 | 5.91 | .148 | -5.0 | 3.00 | 0.0 | .077 | -0.8220 | -0.5832* |
| 174 | 4.83 | .121 | -20.0 | 5.00 | 5.0 | .045 | -0.4189 | -0.8651* |
| 175 | 6.04 | .151 | -20.0 | 5.00 | -5.0 | .020 | -1.4943 | -1.3565* |
| 177 | 3.75 | .094 | -10.0 | 5.00 | 5.0 | .013 | -0.0912 | 0.0122* |
| 178 | 2.96 | .074 | -5.0 | 3.00 | -5.0 | .048 | -0.1927 | -0.1889 |
| 180 | 3.18 | .079 | -15.0 | 4.00 | -10.0 | .111 | -0.5299 | -0.5030* |
| 181 | 5.11 | .128 | -5.0 | 2.00 | -15.0 | .046 | -0.6681 | -0.8482* |
| 182 | 2.15 | .054 | -15.0 | 3.00 | 5.0 | .002 | -0.0409 | 0.0230* |
| 183 | 4.91 | .123 | -20.0 | 5.00 | -15.0 | .012 | -1.5942 | -1.2210* |
| 184 | 5.08 | .127 | 5.0 | 4.00 | 0.0 | .071 | -0.8155 | -0.4606* |
| 527 | 1.82 | .068 | 0.0 | 3.00 | 0.0 | .112 | -0.0950 | -0.1606* |
| 528 | 2.87 | .108 | 0.0 | 3.00 | 0.0 | .076 | -0.1965 | -0.1937 |
| 529 | 3.87 | .145 | 0.0 | 3.00 | 0.0 | .052 | -0.2347 | -0.2099 |
| 530 | 4.98 | .187 | 0.0 | 3.00 | 0.0 | .043 | -0.2708 | -0.3266* |
| 531 | 5.97 | .224 | 0.0 | 3.00 | 0.0 | .037 | -0.3112 | -0.5221* |
| 532 | 2.96 | .111 | 0.0 | 3.00 | 0.0 | .052 | -0.1315 | -0.1382 |
| 533 | 2.97 | .111 | 0.0 | 3.00 | 0.0 | .104 | -0.2103 | -0.2163* |
| 534 | 2.96 | .111 | 0.0 | 3.00 | 0.0 | .154 | 0.0134 | -0.1055* |
| 536 | 3.98 | .149 | 0.0 | 3.00 | 0.0 | .146 | -0.0005 | -0.1519* |
| 537 | 3.97 | .149 | 0.0 | 3.00 | 0.0 | .195 | 0.5571 | 0.2261* |
| 538 | 2.96 | .111 | 5.0 | 3.00 | 0.0 | .075 | -0.1887 | -0.2044 |
| 539 | 2.96 | .111 | -5.0 | 3.00 | 0.0 | .074 | -0.2052 | -0.1921 |
| 540 | 3.00 | .112 | -10.0 | 3.00 | 0.0 | .063 | -0.1880 | -0.1810 |
| 541 | 2.97 | .111 | -15.0 | 3.00 | 0.0 | .044 | -0.1689 | -0.1752 |
| 542 | 2.98 | .112 | -20.0 | 3.00 | 0.0 | .019 | -0.1539 | -0.2161 |
| 543 | 2.98 | .112 | 0.0 | 3.00 | 5.0 | .074 | -0.1545 | -0.1235 |

TABLE A-17 (cont'd)

MEASURED AND FITTED PITCH MOMENT
BETA=15. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|----------|
| 544 | 2.98 | .112 | 0.0 | 3.00 | -5.0 | .073 | -0.2864 | -0.2748 |
| 545 | 2.99 | .112 | 0.0 | 3.00 | -10.0 | .079 | -0.3455 | -0.3427 |
| 546 | 2.97 | .112 | 0.0 | 3.00 | -20.0 | .057 | -0.5041 | -0.4360 |
| 547 | 2.99 | .112 | 0.0 | 3.00 | -15.0 | .084 | -0.4052 | -0.4056 |
| 548 | 2.97 | .111 | 0.0 | 2.00 | 0.0 | .080 | -0.1484 | -0.1474 |
| 549 | 2.98 | .112 | 0.0 | 4.00 | 0.0 | .060 | -0.2184 | -0.2036 |
| 550 | 2.97 | .112 | 0.0 | 5.00 | 0.0 | .059 | -0.2777 | -0.2323 |
| 551 | 3.01 | .113 | 0.0 | 6.00 | 0.0 | .055 | -0.3020 | -0.2531* |
| 552 | 1.90 | .071 | -15.0 | 4.00 | 5.0 | .136 | -0.0894 | 0.0623 |
| 553 | 4.03 | .151 | -5.0 | 3.00 | -5.0 | .064 | -0.4918 | -0.4309* |
| 555 | 5.98 | .224 | 5.0 | 4.00 | -20.0 | .064 | -1.9044 | -2.0884* |
| 556 | 4.99 | .187 | -10.0 | 4.00 | 5.0 | .136 | -0.1867 | -0.4102 |
| 558 | 3.99 | .150 | -15.0 | 6.00 | 0.0 | .003 | -0.4067 | -0.3653 |
| 559 | 3.00 | .113 | -5.0 | 3.00 | -5.0 | .071 | -0.2848 | -0.2764* |
| 560 | 6.00 | .225 | 0.0 | 2.00 | -5.0 | .051 | -0.6242 | -0.8870* |
| 561 | 5.00 | .188 | -15.0 | 5.00 | 0.0 | .065 | -0.7946 | -1.0154* |
| 564 | 6.01 | .225 | -20.0 | 3.00 | 5.0 | .054 | -0.1600 | -1.0694* |
| 566 | 6.01 | .225 | 0.0 | 3.00 | 5.0 | .086 | -0.7283 | -0.4928* |
| 567 | 6.00 | .225 | -20.0 | 5.00 | -20.0 | -.008 | -2.7085 | -2.4815 |
| 568 | 3.98 | .149 | -10.0 | 6.00 | 0.0 | .014 | -0.2743 | -0.2438 |
| 569 | 3.97 | .149 | 5.0 | 4.00 | -10.0 | .169 | -0.2275 | -0.2653* |
| 570 | 2.99 | .112 | -5.0 | 3.00 | 0.0 | .146 | -0.0208 | -0.1123* |
| 571 | 4.97 | .186 | -5.0 | 6.00 | -20.0 | .049 | -1.3481 | -1.6153 |
| 572 | 3.00 | .112 | -5.0 | 3.00 | -5.0 | .071 | -0.2791 | -0.2752 |
| 573 | 5.95 | .223 | -5.0 | 2.00 | -20.0 | .082 | -1.9351 | -1.9319* |
| 577 | 4.97 | .186 | 5.0 | 3.00 | -20.0 | .106 | -0.7246 | -1.0836* |
| 579 | 1.99 | .075 | -15.0 | 6.00 | -5.0 | .186 | -0.2352 | -0.1991 |
| 580 | 2.96 | .111 | 0.0 | 6.00 | -20.0 | .191 | -0.5185 | -0.5550* |
| 581 | 6.00 | .225 | -20.0 | 2.00 | 0.0 | -.006 | -0.3873 | -0.9120* |
| 583 | 5.95 | .223 | -15.0 | 2.00 | -5.0 | .050 | -0.6993 | -1.1543 |
| 585 | 6.01 | .225 | -10.0 | 3.00 | -5.0 | .058 | -1.1041 | -1.1287 |
| 586 | 2.96 | .111 | -5.0 | 3.00 | -5.0 | .072 | -0.2776 | -0.2713 |
| 588 | 3.91 | .147 | -5.0 | 3.00 | -5.0 | .125 | -0.3448 | -0.3575 |
| 593 | 4.03 | .151 | -10.0 | 6.00 | -5.0 | .021 | -0.4811 | -0.4879 |
| 594 | 2.97 | .111 | -20.0 | 4.00 | 0.0 | .138 | -0.1185 | -0.1094 |
| 595 | 3.01 | .113 | 0.0 | 4.00 | -15.0 | .104 | -0.4968 | -0.4808 |
| 596 | 2.03 | .076 | -5.0 | 5.00 | 5.0 | .276 | 0.0985 | 0.0810 |
| 598 | 3.01 | .113 | -10.0 | 5.00 | -10.0 | .128 | -0.6541 | -0.6102 |
| 599 | 3.02 | .113 | -5.0 | 3.00 | -5.0 | .073 | -0.2843 | -0.2812* |
| 600 | 2.01 | .075 | -10.0 | 6.00 | -10.0 | .254 | -0.0808 | -0.1902 |
| 601 | 5.02 | .188 | -20.0 | 5.00 | -10.0 | .026 | -1.5415 | -1.5474 |
| 602 | 5.05 | .189 | -20.0 | 2.00 | -10.0 | -.030 | -0.6962 | -0.7221 |
| 603 | 3.05 | .114 | -15.0 | 5.00 | -15.0 | .036 | -0.6580 | -0.6373* |
| 604 | 5.99 | .225 | -10.0 | 4.00 | -15.0 | .052 | -2.1114 | -1.9305* |
| 618 | 1.92 | .144 | 0.0 | 3.00 | 0.0 | .073 | -0.0879 | -0.1152 |
| 619 | 2.99 | .224 | 0.0 | 3.00 | 0.0 | .070 | -0.1550 | -0.1690 |
| 620 | 2.50 | .188 | 0.0 | 3.00 | 0.0 | .078 | -0.1232 | -0.1323 |
| 621 | 3.07 | .230 | 0.0 | 3.00 | 0.0 | .050 | -0.0888 | -0.1390* |
| 622 | 3.06 | .230 | 0.0 | 3.00 | 0.0 | .086 | -0.2170 | -0.1884 |
| 623 | 3.05 | .228 | 0.0 | 3.00 | 0.0 | .136 | -0.0823 | -0.0945 |

TABLE A-17 (cont'd)

MEASURED AND FITTED PITCH MOMENT
BETA=15. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|----------|
| 625 | 3.01 | .226 | 5.0 | 3.00 | 0.0 | .061 | -0.1595 | -0.1728 |
| 626 | 2.99 | .224 | -5.0 | 3.00 | 0.0 | .066 | -0.1699 | -0.1562 |
| 627 | 3.01 | .226 | -10.0 | 3.00 | 0.0 | .049 | -0.1598 | -0.1363 |
| 628 | 3.00 | .225 | -15.0 | 3.00 | 0.0 | .028 | -0.1487 | -0.1303 |
| 629 | 3.01 | .226 | -20.0 | 3.00 | 0.0 | .003 | -0.1360 | -0.1756 |
| 630 | 2.98 | .223 | 0.0 | 3.00 | 5.0 | .063 | -0.0191 | -0.0017* |
| 631 | 2.97 | .223 | 0.0 | 3.00 | -5.0 | .070 | -0.2862 | -0.3126 |
| 632 | 2.96 | .222 | 0.0 | 3.00 | -10.0 | .071 | -0.4039 | -0.4486 |
| 633 | 2.97 | .223 | 0.0 | 3.00 | -15.0 | .072 | -0.5345 | -0.5809 |
| 634 | 2.97 | .223 | 0.0 | 3.00 | -20.0 | .053 | -0.7671 | -0.7192 |
| 635 | 2.97 | .223 | 0.0 | 2.00 | 0.0 | .062 | -0.0974 | -0.0896 |
| 636 | 2.98 | .223 | 0.0 | 4.00 | 0.0 | .060 | -0.2019 | -0.2120 |
| 637 | 2.98 | .223 | 0.0 | 5.00 | 0.0 | .053 | -0.2194 | -0.2405 |
| 638 | 2.98 | .223 | 0.0 | 6.00 | 0.0 | .048 | -0.2362 | -0.2670 |
| 639 | 2.47 | .185 | 0.0 | 6.00 | -20.0 | .058 | -0.5429 | -0.5813 |
| 640 | 2.48 | .186 | 5.0 | 6.00 | -5.0 | .232 | -0.1693 | -0.1359 |
| 641 | 2.96 | .222 | -5.0 | 3.00 | -5.0 | .108 | -0.3290 | -0.2811 |
| 642 | 2.48 | .186 | -5.0 | 6.00 | 5.0 | .275 | 0.1262 | 0.0515* |
| 643 | 1.97 | .148 | 0.0 | 4.00 | -10.0 | .206 | -0.0607 | -0.0743 |
| 644 | 2.50 | .187 | -20.0 | 3.00 | -10.0 | -.010 | -0.3341 | -0.3275 |
| 645 | 1.99 | .149 | -20.0 | 3.00 | -10.0 | .069 | -0.1979 | -0.1417 |
| 646 | 2.96 | .222 | -5.0 | 3.00 | -5.0 | .061 | -0.3079 | -0.3027 |
| 660 | 2.99 | .224 | -15.0 | 3.00 | 5.0 | .071 | 0.0057 | 0.0304* |
| 661 | 1.99 | .150 | -5.0 | 3.00 | -15.0 | .106 | -0.2908 | -0.2813 |
| 662 | 2.99 | .224 | -20.0 | 6.00 | -10.0 | .108 | -0.9002 | -1.1697* |
| 665 | 2.51 | .188 | 0.0 | 3.00 | -5.0 | .092 | -0.2129 | -0.2344 |
| 667 | 3.00 | .225 | 5.0 | 6.00 | -10.0 | .181 | -0.4627 | -0.4943 |
| 668 | 2.00 | .150 | -5.0 | 3.00 | -10.0 | .066 | -0.2219 | -0.2274 |
| 670 | 2.99 | .224 | -5.0 | 5.00 | -20.0 | .158 | -0.7886 | -0.7935 |
| 671 | 2.51 | .188 | 5.0 | 5.00 | 0.0 | .043 | -0.1885 | -0.1039 |
| 672 | 2.99 | .224 | -5.0 | 3.00 | -5.0 | .056 | -0.3174 | -0.3030 |
| 673 | 1.99 | .149 | -5.0 | 6.00 | -5.0 | .255 | -0.0886 | -0.1725* |
| 674 | 2.50 | .188 | 5.0 | 5.00 | 0.0 | .091 | -0.2237 | -0.2489 |
| 675 | 2.50 | .188 | -5.0 | 6.00 | 0.0 | .037 | -0.1837 | -0.1307 |
| 676 | 1.99 | .149 | -20.0 | 3.00 | -20.0 | -.023 | -0.3678 | -0.3544* |
| 678 | 1.99 | .149 | -10.0 | 3.00 | 5.0 | .079 | -0.0268 | 0.0489* |
| 681 | 2.51 | .188 | -10.0 | 6.00 | -15.0 | .034 | -0.5295 | -0.6007* |
| 682 | 2.50 | .187 | 5.0 | 6.00 | -10.0 | .256 | -0.2027 | -0.0111* |
| 683 | 2.97 | .223 | -5.0 | 3.00 | -5.0 | .075 | -0.3090 | -0.3155 |
| 685 | 2.99 | .224 | -15.0 | 6.00 | 0.0 | .229 | -0.2123 | -0.1645 |
| 686 | 2.50 | .188 | -15.0 | 8.00 | 0.0 | .279 | -0.3299 | -0.3611 |
| 688 | 2.99 | .224 | 0.0 | 5.00 | -15.0 | .185 | -0.5370 | -0.4624 |
| 689 | 2.00 | .150 | 0.0 | 5.00 | 5.0 | .077 | -0.0778 | -0.0608 |
| 690 | 3.00 | .225 | 5.0 | 6.00 | -20.0 | .124 | -1.0224 | -0.8255* |
| 691 | 2.02 | .152 | -5.0 | 8.00 | -15.0 | .342 | -0.2144 | -0.3934* |
| 693 | 2.46 | .185 | -10.0 | 2.00 | 5.0 | .086 | -0.0070 | 0.1579* |
| 694 | 2.96 | .222 | -20.0 | 4.00 | -10.0 | .124 | -0.5366 | -0.5280 |
| 695 | 2.96 | .222 | -5.0 | 3.00 | -5.0 | .073 | -0.3077 | -0.3138 |
| 697 | 2.47 | .185 | -10.0 | 6.00 | 0.0 | .224 | -0.1812 | -0.2001 |
| 698 | 2.99 | .224 | -10.0 | 6.00 | -5.0 | .134 | -0.7414 | -0.7866 |

R-1851

TABLE A-17 (cont'd)

MEASURED AND FITTED PITCH MOMENT
BETA=15. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|------|----------|----------|
| 699 | 3.00 | .225 | 5.0 | 8.00 | -10.0 | .222 | -0.7089 | -0.6948* |
| 700 | 3.00 | .225 | -20.0 | 4.00 | -5.0 | .177 | -0.2130 | 0.0300 |
| 701 | 2.48 | .186 | -20.0 | 5.00 | -20.0 | .087 | -0.8531 | -0.8816 |

MEAN ERROR= -0.0762
STANDARD DEVIATION= 0.1192

DATA FILE

R-1851

TABLE A-18

MEASURED AND FITTED PITCH MOMENT
BETA=20. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|------|-------|------|-------|----------|----------|
| 316 | 4.00 | .000 | 4.8 | 3.70 | 5.0 | .086 | -0.2579 | -0.3012 |
| 317 | 4.00 | .000 | 4.7 | 3.70 | 5.0 | .088 | -0.2570 | -0.3059 |
| 318 | 4.00 | .000 | 4.7 | 3.60 | 0.0 | .131 | -0.2629 | -0.3210 |
| 326 | 4.00 | .000 | 4.7 | 3.60 | 0.0 | .116 | -0.3902 | -0.3246 |
| 328 | 4.00 | .000 | 9.7 | 3.70 | 0.0 | .070 | -0.2676 | -0.2534 |
| 329 | 4.00 | .000 | 14.7 | 3.70 | 0.0 | .047 | -0.2636 | -0.2107 |
| 330 | 4.00 | .000 | 19.8 | 3.60 | 0.0 | .025 | -0.2811 | -0.1975 |
| 331 | 4.00 | .000 | 27.2 | 3.60 | 0.0 | -.006 | -0.2546 | -0.2900 |
| 332 | 3.00 | .000 | 19.7 | 3.60 | 0.0 | .191 | -0.0092 | 0.1269* |
| 337 | 4.00 | .000 | 27.3 | 4.70 | 0.0 | .179 | -0.0715 | -0.0944 |
| 340 | 3.00 | .000 | 4.7 | 2.60 | 0.0 | .098 | -0.1555 | -0.1928 |
| 342 | 6.00 | .000 | 19.8 | 3.70 | 0.0 | .141 | -0.3005 | -0.5464* |
| 344 | 3.00 | .000 | 27.3 | 5.70 | 0.0 | .281 | 0.1502 | 0.8080* |
| 345 | 3.00 | .000 | 27.3 | 5.60 | 0.0 | .173 | -0.2005 | -0.1289 |
| 349 | 5.00 | .000 | 4.8 | 5.60 | 0.0 | .053 | -0.2234 | -0.3338* |
| 351 | 6.00 | .000 | -5.3 | 6.70 | 0.0 | .051 | -0.3626 | -0.4812* |
| 353 | 2.00 | .000 | 27.2 | 6.70 | 0.0 | .068 | -0.1777 | -0.2073 |
| 354 | 3.00 | .000 | -5.3 | 6.60 | 0.0 | .110 | -0.4030 | -0.3837* |
| 355 | 4.00 | .000 | 9.8 | 6.70 | 0.0 | .186 | -0.8032 | -0.6015* |
| 356 | 3.00 | .000 | -0.3 | 6.70 | -5.0 | .236 | -0.4295 | -0.4303 |
| 357 | 4.00 | .000 | 9.7 | 6.70 | -5.0 | .069 | -0.4614 | -0.3314* |
| 358 | 4.00 | .000 | 9.7 | 6.70 | -5.0 | .060 | -0.4572 | -0.2654* |
| 359 | 4.00 | .000 | 9.7 | 6.70 | -5.0 | .061 | -0.4601 | -0.2700* |
| 362 | 4.00 | .000 | 9.7 | 5.60 | -5.0 | .065 | -0.4333 | -0.3041* |
| 364 | 3.00 | .000 | 14.7 | 5.70 | -5.0 | .266 | -0.0626 | 0.1431 |
| 365 | 5.00 | .000 | 19.8 | 5.60 | -5.0 | .170 | -0.4498 | -0.5065* |
| 366 | 6.00 | .000 | 19.8 | 4.70 | -5.0 | .132 | -0.5586 | -0.7361* |
| 368 | 4.00 | .000 | 9.7 | 2.60 | -5.0 | .109 | -0.2191 | -0.2275* |
| 369 | 2.00 | .000 | 9.7 | 2.60 | -5.0 | .172 | -0.0494 | -0.0094* |
| 370 | 4.00 | .000 | 14.7 | 2.60 | -5.0 | .045 | -0.2658 | -0.1308* |
| 371 | 5.00 | .000 | 4.7 | 2.60 | -5.0 | .145 | -0.2833 | -0.2630 |
| 374 | 5.00 | .000 | -0.3 | 3.60 | -5.0 | .069 | -0.3068 | -0.3051 |
| 375 | 5.00 | .000 | -0.3 | 3.60 | -5.0 | .067 | -0.3081 | -0.2933 |
| 376 | 4.00 | .000 | -0.3 | 3.70 | -5.0 | .087 | -0.2909 | -0.2871 |
| 377 | 4.00 | .000 | 4.7 | 3.60 | 5.0 | .081 | -0.2847 | -0.2784 |
| 378 | 4.00 | .000 | 4.8 | 3.60 | 5.0 | .064 | -0.2159 | -0.2130 |
| 379 | 4.00 | .000 | -0.3 | 3.60 | 5.0 | .084 | -0.2853 | -0.2698 |
| 380 | 3.00 | .000 | -5.3 | 3.60 | 5.0 | .148 | -0.2093 | -0.2106 |
| 381 | 3.00 | .000 | -0.3 | 2.60 | 5.0 | .117 | -0.1811 | -0.2013 |
| 382 | 5.00 | .000 | 4.7 | 2.60 | 5.0 | .076 | -0.3142 | -0.2770 |
| 383 | 3.00 | .000 | 19.7 | 2.60 | 5.0 | .028 | -0.1655 | -0.1442 |
| 385 | 5.00 | .000 | 14.8 | 2.60 | 5.0 | .153 | 0.0590 | -0.2377* |
| 387 | 6.00 | .000 | 4.8 | 2.60 | 5.0 | .151 | -0.5328 | -0.3668* |
| 388 | 3.00 | .000 | -5.2 | 6.70 | 5.0 | .310 | -0.0798 | -0.0420 |
| 389 | 5.00 | .000 | 9.7 | 6.60 | 5.0 | .040 | -0.3241 | -0.3446* |
| 395 | 4.00 | .000 | 27.4 | 5.60 | 5.0 | .176 | -0.2408 | -0.4159* |
| 396 | 4.00 | .000 | 4.8 | 3.60 | 5.0 | .081 | -0.2733 | -0.2783 |
| 397 | 4.00 | .000 | -0.2 | 3.60 | 10.0 | .084 | -0.2705 | -0.2753 |
| 398 | 3.00 | .000 | -5.3 | 3.60 | 10.0 | .146 | -0.1922 | -0.1937 |
| 399 | 4.00 | .000 | 9.8 | 3.60 | 10.0 | .087 | -0.3687 | -0.3588 |

R-1851

TABLE A-18 (cont'd)

MEASURED AND FITTED PITCH MØMENT
BETA=20. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED * |
|-----|------|------|------|-------|------|-------|----------|-----------|
| 400 | 5.00 | .000 | 19.7 | 3.60 | 10.0 | .019 | -0.4737 | -0.3668 * |
| 401 | 4.00 | .000 | 14.8 | 3.60 | 10.0 | .163 | -0.2664 | -0.2952 |
| 402 | 3.00 | .000 | 14.7 | 6.60 | 10.0 | .223 | -0.4636 | -0.4348 |
| 403 | 3.00 | .000 | 4.7 | 6.60 | 10.0 | .152 | -0.5929 | -0.5250 * |
| 404 | 5.00 | .000 | -0.3 | 6.60 | 10.0 | .091 | -0.8299 | -0.6958 |
| 405 | 2.00 | .000 | -5.3 | 6.60 | 10.0 | .120 | -0.2098 | -0.1598 |
| 406 | 4.00 | .000 | 27.3 | 6.60 | 10.0 | -.027 | -0.3044 | -0.3230 |
| 407 | 3.00 | .000 | 27.2 | 6.60 | 10.0 | -.025 | -0.1822 | -0.1548 |
| 408 | 2.00 | .000 | 19.7 | 4.60 | 10.0 | .038 | -0.1305 | -0.1006 |
| 409 | 4.00 | .000 | 9.7 | 2.60 | 10.0 | .063 | -0.1935 | -0.2147 |
| 410 | 3.00 | .000 | 27.3 | 5.60 | 10.0 | -.016 | -0.2656 | -0.2931 |
| 411 | 3.00 | .000 | -5.2 | 5.60 | 10.0 | .211 | -0.2567 | -0.2890 |
| 412 | 3.00 | .000 | -5.3 | 5.60 | 10.0 | .212 | -0.2524 | -0.2861 * |
| 413 | 5.00 | .000 | -5.2 | 5.50 | 15.0 | .089 | -0.7890 | -0.6413 |
| 414 | 3.00 | .000 | -0.3 | 5.60 | 15.0 | .201 | -0.3158 | -0.3695 |
| 415 | 5.00 | .000 | 19.7 | 5.50 | 15.0 | .028 | -0.8089 | -0.7595 * |
| 417 | 5.00 | .000 | -0.3 | 5.50 | 15.0 | .057 | -0.3302 | -0.4872 * |
| 419 | 6.00 | .000 | 27.2 | 3.60 | 15.0 | -.048 | -0.1797 | -0.2948 * |
| 420 | 4.00 | .000 | 14.8 | 2.60 | 15.0 | .056 | -0.2638 | -0.2740 |
| 421 | 3.00 | .000 | 4.8 | 2.60 | 15.0 | .109 | -0.1851 | -0.1995 |
| 422 | 3.00 | .000 | 9.8 | 2.60 | 15.0 | .152 | -0.2176 | -0.1588 |
| 423 | 4.00 | .000 | 14.8 | 2.60 | 15.0 | .130 | -0.2691 | -0.3117 |
| 424 | 6.00 | .000 | 4.8 | 2.60 | 15.0 | .125 | -0.7605 | -0.7274 * |
| 427 | 5.00 | .000 | 14.8 | 4.50 | 15.0 | .077 | -0.9228 | -0.7838 |
| 428 | 4.00 | .000 | 4.8 | 4.60 | 15.0 | .215 | -0.2833 | -0.3041 * |
| 429 | 4.00 | .000 | -0.2 | 4.70 | 15.0 | .290 | 0.4770 | 0.2603 |
| 430 | 6.00 | .000 | -5.2 | 4.60 | 15.0 | .080 | -0.8541 | -0.8427 |
| 431 | 3.00 | .000 | 14.8 | 4.60 | 15.0 | .135 | -0.4272 | -0.3994 * |
| 432 | 5.00 | .000 | 14.8 | 4.60 | 15.0 | .033 | -0.2933 | -0.5288 |
| 433 | 3.00 | .000 | 14.7 | 4.60 | 15.0 | .056 | -0.2345 | -0.2742 |
| 434 | 4.00 | .000 | -0.3 | 4.60 | 15.0 | .063 | -0.1950 | -0.2512 |
| 435 | 2.00 | .000 | 4.7 | 6.70 | 15.0 | .123 | -0.2169 | -0.2254 * |
| 436 | 6.00 | .000 | 9.7 | 6.70 | 15.0 | .041 | -0.3615 | -0.9171 * |
| 437 | 3.00 | .000 | 27.2 | 6.60 | 15.0 | .001 | -0.4360 | -0.4467 |
| 438 | 4.00 | .000 | -5.2 | 6.60 | 15.0 | .185 | -0.6305 | -0.5993 |
| 439 | 4.00 | .000 | -0.3 | 6.60 | 20.0 | .051 | -0.2264 | -0.2129 |
| 440 | 3.00 | .000 | 4.7 | 5.60 | 20.0 | .075 | -0.1825 | -0.2368 * |
| 443 | 6.00 | .000 | 27.2 | 5.50 | 20.0 | -.013 | -1.4481 | -1.2968 |
| 445 | 2.00 | .000 | 27.3 | 4.60 | 20.0 | .138 | -0.1144 | -0.1114 |
| 446 | 4.00 | .000 | 27.2 | 4.60 | 20.0 | -.025 | -0.4240 | -0.4546 |
| 447 | 2.00 | .000 | 19.8 | 4.60 | 20.0 | .112 | -0.2229 | -0.2139 |
| 448 | 3.00 | .000 | 4.7 | 4.60 | 20.0 | .115 | -0.3603 | -0.3231 |
| 449 | 3.00 | .000 | 9.7 | 4.60 | 20.0 | .065 | -0.1655 | -0.2349 |
| 450 | 4.00 | .000 | -0.3 | 3.60 | 20.0 | .085 | -0.2977 | -0.2876 |
| 451 | 3.00 | .000 | 19.7 | 3.60 | 20.0 | .057 | -0.3283 | -0.3109 |
| 453 | 6.00 | .000 | 9.8 | 3.60 | 20.0 | .119 | -1.1551 | -1.1710 |
| 454 | 4.00 | .000 | 9.8 | 3.60 | 20.0 | .190 | -0.2876 | -0.3064 * |
| 455 | 6.00 | .000 | 19.7 | 2.60 | 20.0 | .032 | -0.7097 | -0.8218 * |
| 456 | 4.00 | .000 | 14.8 | 2.60 | 20.0 | .072 | -0.3487 | -0.3407 |
| 457 | 4.00 | .000 | 19.8 | 1.60 | 20.0 | .014 | -0.1598 | -0.1447 |

TABLE A-18 (cont'd)

MEASURED AND FITTED PITCH MOMENT
BETA=20. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|----------|
| 459 | 4.00 | .000 | 4.8 | 3.60 | 5.0 | .077 | -0.2832 | -0.2667 |
| 211 | 2.07 | .052 | 0.0 | 3.00 | 0.0 | .106 | -0.0992 | -0.1385 |
| 212 | 2.96 | .074 | 0.0 | 3.00 | 0.0 | .079 | -0.1521 | -0.1554 |
| 213 | 3.92 | .098 | 0.0 | 3.00 | 0.0 | .070 | -0.2333 | -0.1944 |
| 214 | 5.00 | .125 | 0.0 | 3.00 | 0.0 | .056 | -0.2895 | -0.2281 |
| 215 | 5.96 | .149 | 0.0 | 3.00 | 0.0 | .047 | -0.3853 | -0.3130 |
| 216 | 2.94 | .074 | 0.0 | 3.00 | 0.0 | .069 | -0.1272 | -0.1261 |
| 217 | 3.01 | .075 | 0.0 | 3.00 | 0.0 | .106 | -0.2064 | -0.2059 |
| 218 | 3.02 | .075 | 0.0 | 3.00 | 0.0 | .146 | -0.1713 | -0.1927 |
| 219 | 3.97 | .099 | 0.0 | 3.00 | 0.0 | .122 | -0.3405 | -0.2848 |
| 220 | 4.00 | .100 | 0.0 | 3.00 | 0.0 | .147 | -0.1936 | -0.2554* |
| 221 | 5.00 | .125 | 0.0 | 3.00 | 0.0 | .120 | -0.5343 | -0.3992* |
| 222 | 4.95 | .124 | 0.0 | 3.00 | 0.0 | .146 | -0.2826 | -0.3492* |
| 223 | 5.96 | .149 | 0.0 | 3.00 | 0.0 | .116 | -0.8505 | -0.5667* |
| 224 | 3.00 | .075 | 5.0 | 3.00 | 0.0 | .074 | -0.1558 | -0.1458 |
| 225 | 2.97 | .074 | -5.0 | 3.00 | 0.0 | .074 | -0.1524 | -0.1471 |
| 226 | 2.99 | .075 | -10.0 | 3.00 | 0.0 | .069 | -0.1751 | -0.1466 |
| 227 | 2.99 | .075 | -15.0 | 3.00 | 0.0 | .060 | -0.2245 | -0.1525 |
| 228 | 2.97 | .074 | -20.0 | 3.00 | 0.0 | .048 | -0.1454 | -0.1760* |
| 229 | 2.95 | .074 | -27.5 | 3.00 | 0.0 | .029 | -0.1360 | -0.2942* |
| 230 | 2.98 | .074 | 0.0 | 3.00 | 5.0 | .079 | -0.1128 | -0.1125 |
| 231 | 2.98 | .074 | 0.0 | 3.00 | -5.0 | .078 | -0.1854 | -0.1944 |
| 232 | 2.94 | .073 | 0.0 | 3.00 | -10.0 | .079 | -0.2218 | -0.2213 |
| 233 | 3.02 | .075 | 0.0 | 3.00 | -15.0 | .078 | -0.2764 | -0.2555 |
| 234 | 3.01 | .075 | 0.0 | 3.00 | -20.0 | .088 | -0.3136 | -0.2939* |
| 235 | 2.98 | .075 | 0.0 | 2.00 | 0.0 | .088 | -0.1174 | -0.1863* |
| 236 | 3.00 | .075 | 0.0 | 4.00 | 0.0 | .078 | -0.1953 | -0.1788 |
| 237 | 3.01 | .075 | 0.0 | 5.00 | 0.0 | .081 | -0.2612 | -0.2261 |
| 238 | 2.97 | .074 | 0.0 | 6.00 | 0.0 | .065 | -0.2192 | -0.1437* |
| 239 | 4.90 | .123 | 5.0 | 2.00 | 0.0 | .123 | -0.1430 | -0.3250* |
| 240 | 4.00 | .100 | -5.0 | 3.00 | 0.0 | .125 | -0.2790 | -0.2769* |
| 241 | 5.99 | .150 | -15.0 | 5.00 | -10.0 | .014 | -0.7777 | -0.9051* |
| 242 | 5.99 | .150 | -27.5 | 6.00 | -5.0 | -.038 | -0.9335 | -0.7926* |
| 243 | 3.97 | .099 | -27.5 | 6.00 | -20.0 | -.046 | -0.6932 | -0.6580 |
| 244 | 2.99 | .075 | -5.0 | 3.00 | -5.0 | .077 | -0.1968 | -0.2058 |
| 245 | 4.91 | .123 | 5.0 | 3.00 | -20.0 | .056 | -0.6897 | -0.7863 |
| 246 | 1.74 | .044 | -15.0 | 6.00 | 0.0 | .155 | -0.1504 | -0.1846* |
| 247 | 3.90 | .098 | -10.0 | 2.00 | -20.0 | .111 | -0.7443 | -0.5999 |
| 248 | 4.96 | .124 | 5.0 | 2.00 | -5.0 | .059 | -0.3546 | -0.3696 |
| 250 | 3.99 | .100 | -5.0 | 6.00 | -20.0 | .058 | -0.5798 | -0.6171* |
| 252 | 6.05 | .151 | -10.0 | 3.00 | 5.0 | .105 | -0.1958 | -0.3756* |
| 254 | 3.98 | .099 | -20.0 | 4.00 | -5.0 | .104 | -0.4174 | -0.5568* |
| 255 | 2.99 | .075 | -10.0 | 3.00 | -10.0 | .136 | -0.2646 | -0.2927 |
| 256 | 2.97 | .074 | -5.0 | 3.00 | -5.0 | .079 | -0.1935 | -0.2079* |
| 259 | 5.02 | .125 | -20.0 | 4.00 | 5.0 | .135 | 0.0194 | -0.3304* |
| 261 | 3.00 | .075 | -5.0 | 2.00 | -10.0 | .067 | -0.1772 | -0.2317 |
| 262 | 4.01 | .100 | -5.0 | 6.00 | -15.0 | .059 | -0.5368 | -0.5543 |
| 263 | 2.10 | .053 | -15.0 | 2.00 | -20.0 | .055 | -0.1824 | -0.1922* |
| 264 | 6.06 | .152 | 5.0 | 3.00 | -20.0 | .052 | -1.0941 | -1.5473* |
| 265 | 6.09 | .152 | -15.0 | 2.00 | -15.0 | .027 | -0.9915 | -1.0961 |

TABLE A-18 (cont'd)

MEASURED AND FITTED PITCH MOMENT
BETA=20. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|------|----------|----------|
| 266 | 4.00 | .100 | -10.0 | 5.00 | -20.0 | .086 | -1.0076 | -0.8793* |
| 267 | 4.93 | .123 | -15.0 | 2.00 | -20.0 | .063 | -1.0194 | -0.9627 |
| 268 | 2.98 | .074 | -5.0 | 3.00 | -5.0 | .078 | -0.1852 | -0.2062 |
| 269 | 2.03 | .051 | -15.0 | 4.00 | -15.0 | .069 | -0.2069 | -0.1873* |
| 270 | 5.97 | .149 | -5.0 | 5.00 | 5.0 | .095 | -1.5204 | -0.6728* |
| 271 | 4.95 | .124 | -10.0 | 2.00 | -10.0 | .056 | -0.2832 | -0.5297 |
| 272 | 5.93 | .148 | 0.0 | 3.00 | -5.0 | .067 | -0.6657 | -0.6588 |
| 273 | 5.00 | .125 | -5.0 | 2.00 | 5.0 | .069 | -0.1696 | -0.1025* |
| 274 | 5.95 | .149 | -5.0 | 3.00 | 0.0 | .099 | -0.7600 | -0.5435* |
| 275 | 4.97 | .124 | -20.0 | 5.00 | 5.0 | .040 | -0.4955 | -0.4697* |
| 276 | 5.98 | .150 | -25.0 | 5.00 | -5.0 | .031 | -1.3758 | -1.2675* |
| 278 | 5.62 | .140 | 5.0 | 6.00 | -15.0 | .104 | -1.7829 | -1.4121* |
| 279 | 2.75 | .069 | -5.0 | 3.00 | -5.0 | .093 | -0.1686 | -0.2136 |
| 280 | 3.69 | .092 | -15.0 | 5.00 | 5.0 | .021 | -0.0806 | -0.0356 |
| 282 | 4.09 | .102 | -20.0 | 4.00 | -10.0 | .083 | -0.7326 | -0.7244* |
| 283 | 4.92 | .123 | -10.0 | 2.00 | -15.0 | .066 | -0.5640 | -0.7461* |
| 284 | 2.06 | .052 | -20.0 | 3.00 | 5.0 | .062 | -0.0596 | -0.0513* |
| 285 | 4.84 | .121 | -25.0 | 5.00 | -15.0 | .025 | -1.4676 | -1.2803* |
| 312 | 2.26 | .085 | 0.0 | 3.00 | 0.0 | .095 | -0.1188 | -0.1313 |
| 313 | 3.20 | .120 | 0.0 | 3.00 | 0.0 | .084 | -0.1719 | -0.1800 |
| 314 | 4.29 | .161 | 0.0 | 3.00 | 0.0 | .055 | -0.1680 | -0.1788 |
| 315 | 5.24 | .196 | 0.0 | 3.00 | 0.0 | .046 | -0.2047 | -0.2735* |
| 316 | 6.14 | .230 | 0.0 | 3.00 | 0.0 | .037 | -0.2170 | -0.4334* |
| 317 | 3.12 | .117 | 0.0 | 3.00 | 0.0 | .063 | -0.1119 | -0.1109 |
| 318 | 3.01 | .113 | 0.0 | 3.00 | 0.0 | .125 | -0.2034 | -0.2053 |
| 320 | 4.16 | .156 | 0.0 | 3.00 | 0.0 | .125 | -0.3788 | -0.3226 |
| 321 | 4.05 | .152 | 0.0 | 3.00 | 0.0 | .125 | -0.3561 | -0.3091 |
| 324 | 4.99 | .187 | 0.0 | 3.00 | 0.0 | .129 | -0.5104 | -0.4569 |
| 325 | 4.99 | .187 | 0.0 | 3.00 | 0.0 | .152 | -0.3294 | -0.4020 |
| 326 | 3.01 | .113 | 5.0 | 3.00 | 0.0 | .078 | -0.1461 | -0.1533 |
| 327 | 3.01 | .113 | -5.0 | 3.00 | 0.0 | .081 | -0.1240 | -0.1625 |
| 328 | 2.99 | .112 | -10.0 | 3.00 | 0.0 | .071 | -0.1600 | -0.1464 |
| 329 | 3.01 | .113 | -15.0 | 3.00 | 0.0 | .051 | -0.1635 | -0.1284 |
| 330 | 3.02 | .113 | -20.0 | 3.00 | 0.0 | .044 | -0.1553 | -0.1724 |
| 331 | 2.99 | .112 | -27.5 | 3.00 | 0.0 | .021 | -0.1420 | -0.2958* |
| 332 | 2.95 | .111 | 0.0 | 3.00 | 5.0 | .041 | -0.0029 | 0.0551* |
| 333 | 3.05 | .114 | 0.0 | 3.00 | -5.0 | .092 | -0.2250 | -0.2481 |
| 334 | 2.81 | .106 | 0.0 | 3.00 | -10.0 | .097 | -0.2572 | -0.2748 |
| 335 | 2.81 | .105 | 0.0 | 3.00 | -15.0 | .098 | -0.3077 | -0.3131 |
| 336 | 2.83 | .106 | 0.0 | 3.00 | -20.0 | .068 | -0.2803 | -0.2579* |
| 337 | 2.87 | .107 | 0.0 | 2.00 | 0.0 | .105 | -0.1128 | -0.1872* |
| 338 | 2.90 | .109 | 0.0 | 4.00 | 0.0 | .078 | -0.1625 | -0.1647 |
| 341 | 3.06 | .115 | 0.0 | 5.00 | 0.0 | .081 | -0.2377 | -0.2299* |
| 346 | 1.90 | .071 | -20.0 | 4.00 | 5.0 | .136 | -0.0824 | 0.0436* |
| 347 | 4.06 | .152 | -5.0 | 3.00 | -5.0 | .086 | -0.4083 | -0.4108 |
| 348 | 4.97 | .186 | 5.0 | 4.00 | -20.0 | .086 | -1.2403 | -1.3009* |
| 349 | 4.99 | .187 | -15.0 | 4.00 | 5.0 | .175 | 0.1987 | -0.1203* |
| 350 | 3.01 | .113 | -5.0 | 3.00 | -5.0 | .087 | -0.2179 | -0.2460 |
| 351 | 4.05 | .152 | -15.0 | 6.00 | 0.0 | .019 | -0.2673 | -0.2492 |
| 352 | 5.94 | .223 | 0.0 | 2.00 | -5.0 | .040 | -0.4115 | -0.6746* |

R-1851

TABLE A-18 (cont'd)

MEASURED AND FITTED PITCH MOMENT
BETA=20.DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|----------|
| 353 | 4.99 | .187 | -20.0 | 5.00 | 0.0 | | | |
| 355 | 5.00 | .187 | -20.0 | 5.00 | 0.0 | .072 | -0.7129 | -0.8613* |
| 359 | 4.00 | .150 | -25.0 | 5.00 | 5.0 | .079 | -0.6554 | -0.8792* |
| 360 | 4.00 | .150 | 0.0 | 4.00 | 5.0 | .098 | -0.1948 | -0.5226* |
| 361 | 5.99 | .225 | -25.0 | 5.00 | -20.0 | .209 | 0.2053 | -0.0266* |
| 362 | 4.01 | .150 | -15.0 | 6.00 | 0.0 | -.011 | -2.4763 | -2.2604* |
| 363 | 4.04 | .152 | 5.0 | 4.00 | -10.0 | .016 | -0.1945 | -0.2111 |
| 364 | 4.03 | .151 | -5.0 | 3.00 | 0.0 | .192 | -0.1711 | -0.4975* |
| 365 | 2.97 | .111 | -5.0 | 3.00 | -5.0 | .129 | -0.2928 | -0.2901 |
| 366 | 4.97 | .187 | -10.0 | 6.00 | -20.0 | .091 | -0.2162 | -0.2472 |
| 370 | 5.52 | .207 | -5.0 | 3.00 | -20.0 | .055 | -1.1119 | -1.5075* |
| 371 | 5.02 | .188 | 5.0 | 3.00 | 0.0 | .090 | -1.7805 | -1.8520 |
| 372 | 2.99 | .112 | 5.0 | 2.00 | -20.0 | .069 | -0.3529 | -0.3928 |
| 373 | 1.97 | .074 | -20.0 | 6.00 | -5.0 | .094 | -0.3640 | -0.3784 |
| 374 | 2.92 | .109 | -20.0 | 6.00 | -5.0 | .187 | -0.2213 | -0.2081 |
| 376 | 5.00 | .187 | -5.0 | 2.00 | 0.0 | .105 | -0.4734 | -0.6085* |
| 378 | 4.02 | .151 | 0.0 | 6.00 | -20.0 | .071 | -0.2688 | -0.2988 |
| 379 | 6.01 | .225 | -20.0 | 2.00 | 0.0 | .126 | -1.2185 | -1.0320* |
| 380 | 4.97 | .187 | -20.0 | 2.00 | -5.0 | .004 | -0.3748 | -0.2481* |
| 381 | 2.99 | .112 | -5.0 | 3.00 | -5.0 | .082 | -0.2200 | -0.5822* |
| 384 | 5.95 | .223 | -10.0 | 3.00 | 5.0 | .082 | -0.2135 | -0.2309 |
| 386 | 4.85 | .182 | -15.0 | 3.00 | -5.0 | .094 | -0.2436 | -0.3895* |
| 387 | 5.12 | .192 | -5.0 | 3.00 | -5.0 | .092 | -0.6041 | -0.6601 |
| 390 | 6.10 | .229 | 5.0 | 5.00 | -15.0 | .114 | -0.7709 | -0.7261 |
| 395 | 4.23 | .158 | -10.0 | 6.00 | -5.0 | .089 | -2.0056 | -2.0142 |
| 396 | 3.19 | .119 | -27.5 | 4.00 | 0.0 | .038 | -0.4074 | -0.4454* |
| 397 | 3.15 | .118 | -5.0 | 4.00 | -15.0 | .128 | -0.0719 | -0.1993 |
| 398 | 4.10 | .154 | -5.0 | 5.00 | 5.0 | .097 | -0.4595 | -0.4669 |
| 399 | 3.07 | .115 | -5.0 | 3.00 | -5.0 | .137 | -0.5012 | -0.4227 |
| 402 | 6.06 | .227 | -10.0 | 2.00 | 5.0 | .061 | -0.1710 | -0.1759 |
| 403 | 3.11 | .117 | -10.0 | 5.00 | -10.0 | .040 | -0.0739 | -0.0788 |
| 404 | 2.98 | .112 | -15.0 | 6.00 | -10.0 | .151 | -0.6332 | -0.5697 |
| 405 | 4.04 | .151 | -20.0 | 5.00 | -10.0 | .135 | -0.6906 | -0.6877 |
| 702 | 2.99 | .224 | 0.0 | 3.00 | 0.0 | .090 | -0.9857 | -0.9883 |
| 703 | 1.98 | .149 | 0.0 | 3.00 | 0.0 | .093 | -0.1467 | -0.1476 |
| 704 | 2.49 | .187 | 0.0 | 3.00 | 0.0 | .123 | -0.0921 | -0.0801 |
| 705 | 3.01 | .226 | 0.0 | 3.00 | 0.0 | .103 | -0.1124 | -0.1055 |
| 706 | 2.99 | .224 | 0.0 | 3.00 | 0.0 | .071 | -0.0946 | -0.0981 |
| 707 | 2.99 | .224 | 0.0 | 3.00 | 0.0 | .115 | -0.1923 | -0.1714 |
| 709 | 3.01 | .226 | 5.0 | 3.00 | 0.0 | .176 | -0.0317 | -0.0898* |
| 710 | 3.01 | .226 | -5.0 | 3.00 | 0.0 | .085 | -0.1500 | -0.1356 |
| 711 | 3.01 | .226 | -10.0 | 3.00 | 0.0 | .091 | -0.1520 | -0.1483 |
| 712 | 3.00 | .225 | -15.0 | 3.00 | 0.0 | .076 | -0.1654 | -0.1291 |
| 713 | 3.00 | .225 | -20.0 | 3.00 | 0.0 | .057 | -0.1571 | -0.1170 |
| 714 | 3.00 | .225 | -27.5 | 3.00 | 0.0 | .028 | -0.1385 | -0.1144 |
| 715 | 3.01 | .226 | 0.0 | 3.00 | 5.0 | .006 | -0.1405 | -0.2748* |
| 716 | 3.00 | .225 | 0.0 | 3.00 | -5.0 | .088 | -0.0034 | -0.0087* |
| 717 | 3.01 | .225 | 0.0 | 3.00 | -10.0 | .099 | -0.2652 | -0.2865 |
| 718 | 3.01 | .225 | 0.0 | 3.00 | -15.0 | .099 | -0.3880 | -0.4063 |
| 719 | 3.01 | .226 | 0.0 | 3.00 | -20.0 | .103 | -0.5050 | -0.5203 |
| | | | | | | .104 | -0.6063 | -0.6181 |

TABLE A-18 (cont'd)

MEASURED AND FITTED PITCH MOMENT
BETA=20. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|----------|
| 720 | 3.01 | .226 | 0.0 | 2.00 | 0.0 | .090 | -0.1033 | -0.1426 |
| 721 | 3.02 | .226 | 0.0 | 4.00 | 0.0 | .100 | -0.1988 | -0.2125 |
| 722 | 3.00 | .225 | 0.0 | 5.00 | 0.0 | .094 | -0.2291 | -0.2518 |
| 723 | 3.01 | .226 | 0.0 | 6.00 | 0.0 | .089 | -0.2572 | -0.2710 |
| 724 | 2.53 | .190 | 0.0 | 6.00 | -20.0 | .084 | -0.5912 | -0.2916* |
| 726 | 2.53 | .189 | 5.0 | 8.00 | -5.0 | .256 | -0.4159 | -0.4165 |
| 728 | 2.99 | .224 | -5.0 | 3.00 | -5.0 | .165 | -0.2403 | -0.2517* |
| 730 | 2.99 | .224 | -5.0 | 6.00 | 5.0 | .267 | 0.0070 | -0.0399* |
| 731 | 1.95 | .147 | 0.0 | 5.00 | -10.0 | .249 | -0.1662 | -0.1801 |
| 732 | 2.49 | .187 | -27.5 | 3.00 | -10.0 | -.010 | -0.3327 | -0.3884 |
| 733 | 3.00 | .225 | -5.0 | 3.00 | -5.0 | .100 | -0.2743 | -0.2976 |
| 735 | 1.97 | .148 | -27.5 | 3.00 | -10.0 | .079 | -0.1730 | -0.1875 |
| 736 | 3.00 | .225 | -20.0 | 3.00 | 5.0 | .094 | 0.0169 | 0.0302* |
| 737 | 3.00 | .225 | -27.5 | 6.00 | -10.0 | .141 | -0.7554 | -0.9976* |
| 738 | 1.99 | .149 | -10.0 | 3.00 | -15.0 | .137 | -0.2827 | -0.2257 |
| 741 | 2.48 | .186 | 0.0 | 3.00 | -5.0 | .132 | -0.2102 | -0.2036 |
| 743 | 2.53 | .190 | 5.0 | 8.00 | -10.0 | .273 | -0.4365 | -0.4476 |
| 744 | 2.04 | .153 | -10.0 | 3.00 | -10.0 | .092 | -0.1966 | -0.1841* |
| 746 | 3.01 | .226 | -5.0 | 5.00 | -20.0 | .242 | -0.4124 | -0.7366* |
| 747 | 3.01 | .226 | -5.0 | 3.00 | -5.0 | .086 | -0.1740 | -0.2759* |
| 749 | 3.07 | .230 | -10.0 | 6.00 | -5.0 | .166 | -0.6895 | -0.6803 |
| 750 | 2.57 | .193 | 5.0 | 5.00 | 0.0 | .129 | -0.2234 | -0.2099 |
| 751 | 2.57 | .193 | -10.0 | 6.00 | 0.0 | .067 | -0.1791 | -0.1920 |
| 752 | 2.07 | .155 | -27.5 | 3.00 | -20.0 | -.018 | -0.3867 | -0.3991 |
| 754 | 2.00 | .150 | 5.0 | 6.00 | 0.0 | .257 | -0.1395 | -0.1455* |
| 755 | 2.14 | .160 | -15.0 | 3.00 | 5.0 | .120 | 0.0162 | 0.0700* |
| 757 | 2.51 | .188 | 0.0 | 8.00 | -20.0 | .339 | -0.3583 | -0.6419* |
| 758 | 2.51 | .189 | -15.0 | 6.00 | -15.0 | .062 | -0.4857 | -0.5176 |
| 759 | 2.51 | .188 | 5.0 | 6.00 | -10.0 | .230 | -0.1810 | -0.2221 |
| 760 | 3.00 | .225 | -5.0 | 3.00 | -5.0 | .094 | -0.2777 | -0.2878* |
| 761 | 3.00 | .225 | -15.0 | 5.00 | 0.0 | .257 | 0.0057 | 0.1511* |
| 763 | 2.51 | .188 | -20.0 | 7.00 | 0.0 | .301 | -0.1738 | 0.1187* |
| 764 | 2.99 | .224 | 0.0 | 5.00 | -5.0 | .103 | -0.3757 | -0.3798 |
| 765 | 2.99 | .224 | -5.0 | 5.00 | -15.0 | .183 | -0.7271 | -0.7264 |
| 766 | 2.02 | .151 | 0.0 | 5.00 | 5.0 | .372 | 0.4033 | 0.4192 |
| 769 | 2.51 | .188 | -10.0 | 8.00 | -15.0 | .234 | -0.8239 | -0.8548 |
| 771 | 3.00 | .225 | -10.0 | 2.00 | 5.0 | .107 | 0.0735 | 0.0740 |
| 772 | 3.00 | .225 | -25.0 | 5.00 | -10.0 | .151 | -0.5956 | -0.6948 |
| 773 | 2.98 | .224 | -5.0 | 3.00 | -5.0 | .103 | -0.2708 | -0.2951 |
| 774 | 2.49 | .186 | -10.0 | 4.00 | 0.0 | .251 | 0.1088 | 0.2149* |
| 775 | 2.98 | .224 | -10.0 | 6.00 | -5.0 | .176 | -0.6459 | -0.6397 |
| 777 | 2.49 | .187 | 5.0 | 8.00 | -10.0 | .330 | -0.3009 | -0.3314 |
| 780 | 2.97 | .223 | -25.0 | 6.00 | -5.0 | .212 | -0.3900 | -0.3809 |
| 781 | 2.48 | .186 | -25.0 | 5.00 | -20.0 | .104 | -0.7515 | -0.8094 |

MEAN ERROR= 0.0122
STANDARD DEVIATION= 0.1056

TABLE A-19

MEASURED AND FITTED SIDE FORCE
BETA=10. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|------|-------|------|-------|----------|---------|
| 3 | 4.00 | .000 | 2.1 | 2.60 | 0.0 | .043 | 0.0085 | 0.0090 |
| 5 | 4.00 | .000 | 4.6 | 2.50 | 0.0 | .035 | 0.0082 | 0.0103 |
| 6 | 4.00 | .000 | 7.2 | 2.60 | 0.0 | .139 | 0.0864 | 0.0753 |
| 7 | 4.00 | .000 | 9.7 | 2.50 | 0.0 | .020 | 0.0182 | 0.0213 |
| 8 | 4.00 | .000 | 12.2 | 2.40 | 0.0 | .011 | 0.0222* | 0.0327 |
| 1 | 4.00 | .000 | 4.7 | 2.50 | 5.0 | .028 | 0.0242 | 0.0237 |
| 2 | 4.00 | .000 | 0.1 | 2.60 | 0.0 | .048 | 0.0095 | 0.0068 |
| 9 | 4.00 | .000 | 0.0 | 2.60 | -5.0 | .046 | -0.0101* | -0.0166 |
| 10 | 4.00 | .000 | 0.0 | 2.60 | 5.0 | .046 | 0.0271 | 0.0302 |
| 11 | 4.00 | .000 | 0.0 | 2.60 | 10.0 | .048 | 0.0468 | 0.0529 |
| 12 | 4.00 | .000 | 0.1 | 2.60 | 15.0 | .047 | 0.0663 | 0.0681 |
| 13 | 4.00 | .000 | 0.1 | 2.60 | 20.0 | .046 | 0.0841 | 0.0705 |
| 14 | 4.00 | .000 | 0.1 | 1.60 | 0.0 | .062 | 0.0102 | 0.0068 |
| 15 | 4.00 | .000 | 0.0 | 3.70 | 0.0 | .039 | 0.0084 | 0.0067 |
| 16 | 4.00 | .000 | 0.0 | 4.70 | 0.0 | .036 | 0.0078 | 0.0067 |
| 17 | 4.00 | .000 | 0.0 | 5.70 | 0.0 | .032 | 0.0078 | 0.0067 |
| 18 | 4.00 | .000 | 0.0 | 2.60 | 0.0 | .038 | 0.0073 | 0.0067 |
| 19 | 4.00 | .000 | 0.1 | 2.60 | 0.0 | .061 | 0.0099 | 0.0069 |
| 21 | 4.00 | .000 | 0.0 | 1.60 | 0.0 | .048 | 0.0082 | 0.0067 |
| 23 | 4.00 | .000 | 0.0 | 1.60 | 0.0 | .049 | 0.0076 | 0.0067 |
| 24 | 4.00 | .000 | 5.1 | 2.80 | 0.0 | .039 | 0.0150 | 0.0147 |
| 25 | 4.00 | .000 | 0.1 | 2.70 | 0.0 | .101 | 0.0133* | 0.0072 |
| 26 | 4.00 | .000 | 0.1 | 2.70 | 0.0 | .159 | 0.0124* | 0.0077 |
| 27 | 4.00 | .000 | 0.1 | 2.70 | 0.0 | .170 | 0.0130* | 0.0078 |
| 29 | 2.00 | .000 | 0.0 | 2.60 | 0.0 | .083 | 0.0063 | 0.0067 |
| 30 | 3.00 | .000 | 0.0 | 2.60 | 0.0 | .057 | 0.0069 | 0.0067 |
| 31 | 5.00 | .000 | 0.0 | 2.60 | 0.0 | .040 | 0.0102 | 0.0067 |
| 32 | 6.00 | .000 | 0.0 | 2.60 | 0.0 | .035 | 0.0124* | 0.0067 |
| 34 | 5.00 | .000 | 2.4 | 2.40 | -5.0 | .076 | -0.0350* | -0.0667 |
| 36 | 2.00 | .000 | 7.4 | 5.50 | -5.0 | .287 | -0.0576* | -0.0987 |
| 37 | 3.00 | .000 | 5.0 | 4.50 | 20.0 | .058 | 0.0739 | 0.0745 |
| 40 | 4.00 | .000 | 12.4 | 4.50 | 20.0 | .007 | 0.0604* | 0.1780 |
| 41 | 3.00 | .000 | 5.0 | 4.50 | 20.0 | .031 | 0.0243* | 0.0503 |
| 42 | 2.00 | .000 | 10.0 | 4.50 | 20.0 | .079 | 0.0734* | 0.0827 |
| 43 | 2.00 | .000 | 10.0 | 4.50 | 20.0 | .056 | 0.0462* | 0.0736 |
| 44 | 5.00 | .000 | 7.4 | 4.50 | 20.0 | .019 | 0.0658 | 0.0633 |
| 45 | 2.00 | .000 | 12.4 | 4.50 | 20.0 | .124 | 0.1688 | 0.1754 |
| 46 | 3.00 | .000 | 10.0 | 3.50 | 20.0 | .110 | 0.3068 | 0.2782 |
| 47 | 4.00 | .000 | 10.0 | 2.50 | 20.0 | .042 | 0.1281 | 0.1688 |
| 48 | 4.00 | .000 | 0.1 | 6.50 | 20.0 | .111 | 0.2391 | 0.2497 |
| 49 | 6.00 | .000 | 9.9 | 2.40 | 20.0 | .034 | 0.2067 | 0.1790 |
| 50 | 4.00 | .000 | 4.9 | 5.60 | 20.0 | .243 | 1.3425 | 1.3152 |
| 51 | 3.00 | .000 | 0.0 | 5.50 | 20.0 | .059 | 0.0656 | 0.0425 |
| 52 | 4.00 | .000 | 7.5 | 2.50 | 20.0 | .056 | 0.1642 | 0.1663 |
| 53 | 4.00 | .000 | 2.4 | 3.50 | 20.0 | .112 | 0.3105 | 0.3409 |
| 54 | 3.00 | .000 | 2.5 | 5.50 | 20.0 | .033 | 0.0314 | 0.0342 |
| 55 | 5.00 | .000 | 0.1 | 6.50 | 10.0 | .045 | 0.0635 | 0.0636 |
| 56 | 2.00 | .000 | 10.0 | 4.60 | 10.0 | .030 | 0.0161* | 0.0533 |
| 57 | 4.00 | .000 | 5.0 | 2.50 | 10.0 | .036 | 0.0275* | 0.0507 |
| 58 | 3.00 | .000 | 12.5 | 6.50 | 10.0 | -.005 | 0.0160* | 0.1274 |

TABLE A-19 (cont'd)

MEASURED AND FITTED SIDE FORCE
BETA=10. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|------|-------|------|-------|----------|---------|
| 59 | 4.00 | .000 | 2.5 | 3.60 | 5.0 | .040 | 0.0146* | 0.0305 |
| 60 | 4.00 | .000 | 2.5 | 3.60 | 5.0 | .029 | 0.0099* | 0.0228 |
| 61 | 4.00 | .000 | 5.1 | 3.50 | 5.0 | .043 | 0.0237* | 0.0449 |
| 62 | 3.00 | .000 | 0.0 | 2.50 | 5.0 | .054 | 0.0173 | 0.0233 |
| 63 | 5.00 | .000 | 2.5 | 2.50 | 5.0 | .035 | 0.0209* | 0.0317 |
| 64 | 3.00 | .000 | 9.9 | 2.60 | 5.0 | .013 | 0.0083* | 0.0373 |
| 65 | 4.00 | .000 | 5.0 | 2.60 | 5.0 | .039 | 0.0107* | 0.0365 |
| 66 | 5.00 | .000 | 5.0 | 6.60 | 5.0 | .022 | 0.0212* | 0.0358 |
| 67 | 3.00 | .000 | 9.9 | 6.60 | 5.0 | .020 | 0.0341* | 0.0629 |
| 68 | 6.00 | .000 | 12.4 | 5.70 | 5.0 | -.006 | 0.0378 | 0.0469 |
| 69 | 3.00 | .000 | -5.1 | 6.60 | 5.0 | .240 | 0.0198* | 0.1442 |
| 70 | 6.00 | .000 | -5.1 | 5.70 | 5.0 | .016 | 0.0253* | 0.0093 |
| 71 | 6.00 | .000 | 7.4 | 5.60 | 5.0 | .012 | 0.0191* | 0.0289 |
| 72 | 4.00 | .000 | 12.4 | 5.60 | 5.0 | .102 | 0.2321 | 0.2250 |
| 73 | 2.00 | .000 | 0.0 | 5.60 | 5.0 | .060 | 0.0137 | 0.0098 |
| 74 | 4.00 | .000 | 2.4 | 3.60 | 5.0 | .041 | 0.0227 | 0.0309 |
| 76 | 5.00 | .000 | 2.4 | 5.60 | 0.0 | .026 | 0.0125 | 0.0123 |
| 77 | 2.00 | .000 | 4.9 | 5.70 | 0.0 | .329 | 0.0392 | 0.0405 |
| 78 | 6.00 | .000 | 7.5 | 5.70 | 0.0 | .015 | 0.0004* | 0.0185 |
| 79 | 3.00 | .000 | 12.4 | 5.60 | 0.0 | .112 | 0.1046 | 0.1013 |
| 80 | 3.00 | .000 | 12.4 | 5.60 | 0.0 | .247 | 0.1880 | 0.1762 |
| 81 | 4.00 | .000 | 12.4 | 4.60 | 0.0 | .117 | 0.1775 | 0.1410 |
| 82 | 4.00 | .000 | 4.9 | 6.60 | 0.0 | .099 | 0.0898* | 0.0386 |
| 83 | 3.00 | .000 | -5.1 | 6.60 | 0.0 | .049 | 0.0041* | -0.0064 |
| 84 | 3.00 | .000 | 2.4 | 2.60 | 0.0 | .044 | 0.0024* | 0.0062 |
| 85 | 4.00 | .000 | 7.4 | 2.60 | -5.0 | .026 | -0.0125* | -0.0062 |
| 87 | 2.00 | .000 | 4.9 | 2.60 | -5.0 | .135 | -0.0184* | -0.0290 |
| 88 | 4.00 | .000 | 4.9 | 2.60 | -5.0 | .061 | -0.0215 | -0.0208 |
| 89 | 2.00 | .000 | 7.4 | 5.70 | -5.0 | .285 | -0.0551* | -0.0964 |
| 90 | 6.00 | .000 | 7.5 | 6.70 | -5.0 | .014 | -0.0277* | 0.0005 |
| 91 | 2.00 | .000 | 0.0 | 4.60 | -5.0 | .119 | -0.0042* | -0.0108 |
| 92 | 5.00 | .000 | 0.0 | 3.60 | -5.0 | .037 | -0.0181 | -0.0169 |
| 93 | 6.00 | .000 | 9.9 | 3.50 | -5.0 | .110 | -0.0497* | -0.1112 |
| 94 | 6.00 | .000 | 9.9 | 4.60 | -5.0 | .078 | 0.0144* | -0.0534 |
| 95 | 6.00 | .000 | 10.0 | 5.60 | -5.0 | .002 | -0.0177* | 0.0056 |
| 97 | 4.00 | .000 | 9.9 | 5.60 | -5.0 | .037 | -0.0099* | 0.0204 |
| 98 | 5.00 | .000 | 9.9 | 5.50 | -5.0 | .097 | 0.0614* | -0.0261 |
| 99 | 3.00 | .000 | 0.1 | 6.60 | -5.0 | .142 | -0.0195* | -0.0505 |
| 100 | 4.00 | .000 | 4.9 | 6.60 | -5.0 | .034 | -0.0080* | 0.0037 |
| 101 | 4.00 | .000 | 2.4 | 3.50 | 5.0 | .039 | 0.0171* | 0.0296 |
| 102 | 6.00 | .000 | 9.9 | 2.50 | 0.0 | .105 | 0.1410 | 0.1204 |
| 103 | 3.00 | .000 | -5.1 | 2.50 | 10.0 | .122 | 0.1264* | 0.1170 |
| 105 | 5.00 | .000 | 10.0 | 3.50 | 10.0 | .013 | 0.0448* | 0.0740 |
| 106 | 4.00 | .000 | 5.0 | 3.50 | 10.0 | .045 | 0.0524 | 0.0689 |
| 107 | 3.00 | .000 | 7.4 | 6.50 | 10.0 | .158 | 0.2103 | 0.2152 |
| 108 | 4.00 | .000 | 12.5 | 6.60 | 10.0 | -.006 | 0.0349* | 0.1294 |
| 109 | 2.00 | .000 | -5.1 | 6.60 | 10.0 | .057 | 0.0157 | 0.0135 |
| 110 | 3.00 | .000 | 2.4 | 6.50 | 10.0 | .077 | 0.0657 | 0.0470 |
| 111 | 3.00 | .000 | -5.1 | 5.60 | 10.0 | .135 | 0.0796* | 0.0974 |
| 112 | 3.00 | .000 | 12.5 | 5.60 | 10.0 | .006 | 0.0236* | 0.1236 |

TABLE A-19 (cont'd)
 MEASURED AND FITTED SIDE FORCE
 BETA=10.DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|------|-------|----------|---------|
| 113 | 4.00 | .000 | 2.4 | 3.60 | 5.0 | .038 | 0.0209 | 0.0288 |
| 114 | 4.00 | .000 | 0.0 | 3.50 | 15.0 | .042 | 0.0524 | 0.0525 |
| 115 | 4.00 | .000 | 12.5 | 3.60 | 15.0 | .001 | 0.0400* | 0.1356 |
| 116 | 3.00 | .000 | 7.4 | 2.60 | 15.0 | .139 | 0.2775* | 0.2911 |
| 117 | 4.00 | .000 | 7.4 | 2.50 | 15.0 | .030 | 0.0491 | 0.0758 |
| 118 | 3.00 | .000 | 5.0 | 2.50 | 15.0 | .067 | 0.0796 | 0.0826 |
| 119 | 3.00 | .000 | 2.4 | 2.50 | 15.0 | .057 | 0.0475 | 0.0564 |
| 120 | 6.00 | .000 | 2.4 | 2.50 | 15.0 | .069 | 0.2704 | 0.2890 |
| 121 | 3.00 | .000 | 0.0 | 2.60 | 15.0 | .172 | 0.3721 | 0.3446 |
| 126 | 6.00 | .000 | 4.9 | 2.50 | 20.0 | .065 | 0.3229 | 0.3297 |
| 127 | 4.00 | .000 | 5.0 | 2.60 | 20.0 | .137 | 0.5450 | 0.5506 |
| 128 | 6.00 | .000 | 12.5 | 5.50 | 20.0 | .022 | 0.2217 | 0.2221 |
| 129 | 2.00 | .000 | 12.5 | 6.60 | 0.0 | .057 | 0.0231* | 0.0497 |
| 130 | 5.00 | .000 | 6.6 | *** | 7.5 | -.181 | 0.0033* | -0.1856 |
| 131 | 6.00 | .000 | -5.0 | 6.70 | 0.0 | .022 | -0.0015 | -0.0019 |
| 132 | 3.00 | .000 | 9.9 | 3.60 | 0.0 | .148 | 0.0752 | 0.0826 |
| 133 | 4.00 | .000 | 7.4 | 3.60 | 5.0 | .145 | 0.1929* | 0.2369 |
| 134 | 3.00 | .000 | 9.9 | 3.70 | 5.0 | .224 | 0.2241* | 0.3234 |
| 135 | 4.00 | .000 | 2.4 | 3.60 | 5.0 | .040 | 0.0158* | 0.0301 |
| 138 | 4.00 | .000 | -5.0 | 5.60 | 20.0 | .221 | 1.0989* | 0.9670 |
| 139 | 4.00 | .000 | -5.1 | 3.60 | 5.0 | .044 | 0.0186 | 0.0186 |
| 1 | 1.97 | .049 | 0.0 | 3.00 | 0.0 | .057 | 0.2562 | 0.2636 |
| 2 | 1.98 | .050 | 0.0 | 3.00 | 0.0 | .058 | 0.2610 | 0.2662 |
| 3 | 3.15 | .079 | 0.0 | 3.00 | 0.0 | .029 | 0.6588 | 0.6581 |
| 4 | 4.01 | .100 | 0.0 | 3.00 | 0.0 | .022 | 1.0600 | 1.0576 |
| 6 | 5.30 | .133 | 0.0 | 3.00 | 0.0 | .033 | 1.8350 | 1.8497 |
| 8 | 6.00 | .150 | 0.0 | 3.00 | 0.0 | .032 | 2.3791 | 2.3773 |
| 10 | 3.01 | .075 | -2.5 | 3.00 | 0.0 | .042 | 0.5943 | 0.5992 |
| 9 | 3.12 | .078 | 5.0 | 3.00 | 0.0 | .038 | 0.6447* | 0.6464 |
| 11 | 3.02 | .076 | -5.0 | 3.00 | 0.0 | .037 | 0.7775* | 0.6027 |
| 12 | 2.95 | .074 | -7.5 | 3.00 | 0.0 | .033 | 0.5746 | 0.5703 |
| 13 | 2.98 | .075 | -10.0 | 3.00 | 0.0 | .032 | 0.5741 | 0.5705 |
| 14 | 2.96 | .074 | -12.5 | 3.00 | 0.0 | .026 | 0.5522 | 0.5445 |
| 15 | 2.95 | .074 | 0.0 | 2.00 | 0.0 | .064 | 0.5679 | 0.5731 |
| 16 | 2.99 | .075 | 0.0 | 4.00 | 0.0 | .047 | 0.5847 | 0.5895 |
| 19 | 2.72 | .068 | 0.0 | 5.00 | 0.0 | .041 | 0.4933 | 0.4912 |
| 20 | 2.68 | .067 | 0.0 | 5.00 | 0.0 | .041 | 0.4768 | 0.4770 |
| 21 | 3.14 | .079 | 0.0 | 6.00 | 0.0 | .033 | 0.6556 | 0.6553 |
| 22 | 2.01 | .050 | -7.5 | 6.00 | 0.0 | .089 | 0.2440 | 0.2560 |
| 23 | 2.98 | .074 | 0.0 | 3.00 | 0.0 | .025 | 0.5919 | 0.5899 |
| 24 | 2.97 | .074 | 0.0 | 3.00 | 0.0 | .072 | 0.5843 | 0.5757 |
| 25 | 2.46 | .062 | 0.0 | 3.00 | 0.0 | .151 | 0.4027 | 0.3917 |
| 26 | 3.46 | .087 | 0.0 | 3.00 | 0.0 | .103 | 0.7997 | 0.7799 |
| 27 | 2.96 | .074 | 0.0 | 3.00 | 0.0 | .127 | 0.5782 | 0.5665 |
| 28 | 2.93 | .073 | 0.0 | 3.00 | 0.0 | .181 | 0.5709 | 0.5576 |
| 30 | 4.49 | .112 | 0.0 | 3.00 | 0.0 | .193 | 1.3192 | 1.3329 |
| 31 | 5.03 | .126 | 0.0 | 3.00 | 0.0 | .115 | 1.6998 | 1.6609 |
| 32 | 3.15 | .079 | 0.0 | 3.00 | -5.0 | .055 | 0.6368 | 0.6290 |
| 34 | 3.07 | .077 | -2.5 | 3.00 | -5.0 | .054 | 0.6030 | 0.5976 |
| 35 | 5.82 | .146 | 0.0 | 3.00 | -5.0 | .049 | 2.2071 | 2.1692 |

TABLE A-19 (cont'd)

MEASURED AND FITTED SIDE FORCE
BETA=10. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|--------|
| 36 | 5.77 | .144 | -12.5 | 6.00 | -5.0 | .008 | 2.1530 | 2.1498 |
| 37 | 4.91 | .123 | 5.0 | 2.00 | -5.0 | .040 | 1.5511 | 1.5413 |
| 38 | 2.87 | .072 | -10.0 | 4.00 | -5.0 | .157 | 0.3882 | 0.3599 |
| 39 | 5.96 | .149 | -12.5 | 5.00 | -5.0 | .045 | 2.1908 | 2.1885 |
| 40 | 3.00 | .075 | 0.0 | 3.00 | -10.0 | .135 | 0.5497* | 0.4288 |
| 41 | 6.02 | .150 | -7.5 | 5.00 | -10.0 | .025 | 2.2902 | 2.2821 |
| 42 | 2.95 | .074 | -2.5 | 2.00 | -10.0 | .057 | 0.5318 | 0.5286 |
| 43 | 5.21 | .130 | -5.0 | 2.00 | -10.0 | .022 | 1.7189 | 1.7250 |
| 46 | 3.09 | .077 | -5.0 | 2.00 | -10.0 | .092 | 0.5096 | 0.5133 |
| 47 | 3.14 | .079 | -2.5 | 3.00 | -5.0 | .036 | 0.6346 | 0.6378 |
| 48 | 3.09 | .077 | 0.0 | 3.00 | -15.0 | .041 | 0.5655 | 0.5686 |
| 56 | 5.23 | .131 | -5.0 | 3.00 | -15.0 | .060 | 1.5033 | 1.4943 |
| 57 | 5.19 | .130 | -5.0 | 2.00 | -15.0 | .027 | 1.6242 | 1.6337 |
| 58 | 5.12 | .128 | -12.5 | 5.00 | -15.0 | .027 | 1.4597 | 1.4363 |
| 59 | 3.05 | .076 | 0.0 | 3.00 | -20.0 | .048 | 0.5100 | 0.5217 |
| 60 | 4.17 | .104 | -12.5 | 6.00 | -20.0 | -.007 | 0.8708 | 0.8834 |
| 62 | 5.18 | .129 | 5.0 | 3.00 | -20.0 | .022 | 1.5902 | 1.5855 |
| 65 | 4.10 | .102 | -2.5 | 6.00 | -20.0 | .033 | 0.9768 | 0.9741 |
| 66 | 6.15 | .154 | -10.0 | 5.00 | -20.0 | .004 | 2.2523 | 2.2566 |
| 67 | 2.11 | .053 | -7.5 | 2.00 | -20.0 | .046 | 0.2156 | 0.2474 |
| 69 | 4.05 | .101 | -5.0 | 5.00 | -20.0 | .047 | 0.8860 | 0.8874 |
| 70 | 3.01 | .075 | -7.5 | 2.00 | -20.0 | .076 | 0.3250* | 0.4070 |
| 71 | 3.00 | .075 | 0.0 | 3.00 | 5.0 | .038 | 0.6041 | 0.6032 |
| 72 | 6.08 | .152 | -5.0 | 3.00 | 5.0 | .057 | 2.5081 | 2.4889 |
| 74 | 5.05 | .126 | -10.0 | 3.00 | 5.0 | .108 | 1.7411 | 1.7289 |
| 75 | 6.03 | .151 | -2.5 | 5.00 | 5.0 | .047 | 2.4835 | 2.4510 |
| 76 | 5.05 | .126 | -2.5 | 2.00 | 5.0 | .038 | 1.7194 | 1.6837 |
| 77 | 5.05 | .126 | -10.0 | 5.00 | 5.0 | .031 | 1.6877 | 1.6768 |
| 78 | 4.02 | .101 | -7.5 | 5.00 | 5.0 | .008 | 1.0803 | 1.0677 |
| 79 | 2.04 | .051 | -10.0 | 3.00 | 5.0 | .016 | 0.2931 | 0.3018 |
| 80 | 5.33 | .133 | -2.5 | 3.00 | 0.0 | .061 | 1.9165 | 1.8586 |
| 82 | 3.87 | .097 | -2.5 | 2.00 | 0.0 | .099 | 0.9849 | 0.9634 |
| 83 | 3.02 | .075 | -2.5 | 3.00 | -5.0 | .038 | 0.5946 | 0.5883 |
| 418 | 1.85 | .069 | 0.0 | 3.00 | 0.0 | .060 | 0.3322 | 0.3438 |
| 419 | 2.96 | .111 | 0.0 | 3.00 | 0.0 | .044 | 0.8528 | 0.8601 |
| 420 | 3.95 | .148 | 0.0 | 3.00 | 0.0 | .033 | 1.5250 | 1.5264 |
| 421 | 5.02 | .188 | 0.0 | 3.00 | 0.0 | .025 | 2.4884 | 2.4782 |
| 422 | 6.09 | .228 | 0.0 | 3.00 | 0.0 | .022 | 3.6423 | 3.6609 |
| 423 | 3.86 | .145 | 0.0 | 3.00 | 0.0 | .023 | 1.4559 | 1.4628 |
| 424 | 3.91 | .146 | 0.0 | 3.00 | 0.0 | .045 | 1.4838 | 1.4916 |
| 425 | 3.96 | .148 | 0.0 | 3.00 | 0.0 | .067 | 1.5493 | 1.5275 |
| 426 | 4.03 | .151 | 0.0 | 3.00 | 0.0 | .117 | 1.5870 | 1.5812 |
| 427 | 4.01 | .150 | 0.0 | 3.00 | 0.0 | .158 | 1.5763 | 1.5718 |
| 428 | 3.99 | .150 | 5.0 | 3.00 | 0.0 | .027 | 1.5600 | 1.5693 |
| 429 | 4.02 | .151 | -2.5 | 3.00 | 0.0 | .031 | 1.5786 | 1.5797 |
| 430 | 3.99 | .150 | -5.0 | 3.00 | 0.0 | .027 | 1.5544 | 1.5616 |
| 431 | 4.01 | .150 | -7.5 | 3.00 | 0.0 | .017 | 1.5650 | 1.5754 |
| 432 | 4.00 | .150 | -10.0 | 3.00 | 0.0 | .011 | 1.5503 | 1.5666 |
| 433 | 4.01 | .150 | -12.5 | 3.00 | 0.0 | .006 | 1.5456 | 1.5597 |
| 434 | 3.99 | .150 | -12.5 | 3.00 | 5.0 | .007 | 1.5617 | 1.5673 |

TABLE A-19 (cont'd)

MEASURED AND FITTED SIDE FORCE
BETA=10. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|--------|
| 435 | 4.00 | .150 | -12.5 | 3.00 | -5.0 | -.002 | 1.5386 | 1.5249 |
| 436 | 4.02 | .151 | -12.5 | 3.00 | -10.0 | -.004 | 1.5209 | 1.4881 |
| 438 | 3.97 | .149 | 0.0 | 3.00 | 5.0 | .032 | 1.5525 | 1.5469 |
| 440 | 4.01 | .150 | 0.0 | 3.00 | -5.0 | .035 | 1.5439 | 1.5498 |
| 441 | 4.00 | .150 | 0.0 | 3.00 | -10.0 | .036 | 1.4917 | 1.5034 |
| 443 | 3.98 | .149 | 0.0 | 3.00 | -15.0 | .040 | 1.4231 | 1.4297 |
| 444 | 3.98 | .149 | 0.0 | 3.00 | -20.0 | .035 | 1.3771 | 1.3824 |
| 445 | 3.98 | .149 | 0.0 | 2.00 | 0.0 | .036 | 1.5439 | 1.5538 |
| 446 | 3.98 | .149 | 0.0 | 4.00 | 0.0 | .032 | 1.5562 | 1.5571 |
| 448 | 4.02 | .151 | 0.0 | 5.00 | 0.0 | .025 | 1.5857 | 1.5960 |
| 449 | 4.03 | .151 | 0.0 | 6.00 | 0.0 | .024 | 1.5929 | 1.6130 |
| 451 | 1.81 | .068 | -10.0 | 4.00 | 5.0 | .132 | 0.3358 | 0.3301 |
| 452 | 4.01 | .150 | -2.5 | 3.00 | -5.0 | .043 | 1.5401 | 1.5412 |
| 455 | 4.91 | .184 | 5.0 | 4.00 | -20.0 | .131 | 1.2519* | 1.5600 |
| 456 | 4.90 | .184 | -7.5 | 4.00 | 5.0 | .099 | 2.3036* | 2.4092 |
| 457 | 2.92 | .109 | -2.5 | 3.00 | -5.0 | .043 | 0.8104 | 0.8231 |
| 458 | 4.00 | .150 | -7.5 | 6.00 | 0.0 | .010 | 1.5568 | 1.5718 |
| 459 | 5.96 | .224 | 0.0 | 2.00 | -5.0 | .025 | 1.8315* | 3.4688 |
| 460 | 5.01 | .188 | -10.0 | 5.00 | 0.0 | .045 | 2.3901 | 2.4344 |
| 463 | 4.02 | .151 | -12.5 | 3.00 | 5.0 | .110 | 1.5995 | 1.5652 |
| 465 | 5.97 | .224 | 0.0 | 2.00 | 5.0 | .090 | 3.5771 | 3.6344 |
| 466 | 5.97 | .224 | -12.5 | 5.00 | -20.0 | .011 | 3.0490 | 3.0481 |
| 467 | 4.00 | .150 | -7.5 | 6.00 | 0.0 | .011 | 1.5807 | 1.5733 |
| 469 | 5.05 | .189 | 5.0 | 4.00 | -10.0 | .083 | 2.2624 | 2.2962 |
| 470 | 3.01 | .113 | -2.5 | 3.00 | 0.0 | .131 | 0.8553 | 0.8629 |
| 471 | 2.99 | .112 | -2.5 | 3.00 | -5.0 | .047 | 0.8531 | 0.8620 |
| 473 | 4.96 | .186 | -5.0 | 6.00 | -20.0 | .024 | 2.1864 | 2.1692 |
| 475 | 4.97 | .186 | -2.5 | 2.00 | -20.0 | .086 | 1.8166 | 1.8197 |
| 476 | 4.97 | .186 | 5.0 | 3.00 | 0.0 | .031 | 2.4257 | 2.4258 |
| 483 | 1.98 | .074 | -10.0 | 6.00 | -5.0 | .168 | 0.2859 | 0.2994 |
| 484 | 2.91 | .109 | -2.5 | 2.00 | 0.0 | .089 | 0.8173 | 0.8244 |
| 485 | 3.01 | .113 | 0.0 | 6.00 | -20.0 | .133 | 0.6064 | 0.6250 |
| 487 | 3.93 | .148 | -10.0 | 2.00 | -5.0 | .097 | 1.3241 | 1.3423 |
| 488 | 3.00 | .113 | -2.5 | 3.00 | -5.0 | .043 | 0.8658 | 0.8701 |
| 489 | 4.13 | .155 | -5.0 | 2.00 | 5.0 | .112 | 1.7391 | 1.7299 |
| 490 | 6.08 | .228 | -5.0 | 2.00 | 5.0 | .081 | 3.7408 | 3.7275 |
| 491 | 4.10 | .154 | -7.5 | 3.00 | -5.0 | .075 | 1.5079 | 1.5289 |
| 492 | 4.04 | .152 | 0.0 | 3.00 | 0.0 | .028 | 1.6040 | 1.6037 |
| 494 | 3.18 | .117 | -2.5 | 4.00 | -5.0 | .140 | 0.9106 | 0.8741 |
| 496 | 6.07 | .228 | 5.0 | 5.00 | -15.0 | .074 | 3.2019 | 3.1986 |
| 499 | 6.05 | .227 | -10.0 | 5.00 | -15.0 | .001 | 3.4356 | 3.4328 |
| 500 | 4.08 | .153 | -5.0 | 6.00 | -5.0 | .015 | 1.6107 | 1.6263 |
| 502 | 3.09 | .116 | -12.5 | 4.00 | 0.0 | .105 | 0.8229 | 0.8390 |
| 503 | 3.10 | .116 | -2.5 | 4.00 | -15.0 | .053 | 0.8475 | 0.8562 |
| 505 | 3.03 | .114 | -2.5 | 5.00 | 5.0 | .161 | 0.8924 | 0.9556 |
| 506 | 3.02 | .113 | -2.5 | 3.00 | -5.0 | .041 | 0.8684 | 0.8804 |
| 507 | 3.01 | .113 | -5.0 | 2.00 | 5.0 | .092 | 0.9052 | 0.9125 |
| 508 | 2.99 | .112 | -5.0 | 5.00 | -10.0 | .104 | 0.7436 | 0.7536 |
| 512 | 2.01 | .075 | -7.5 | 6.00 | -10.0 | .220 | 0.2251 | 0.2007 |
| 513 | 5.15 | .193 | -10.0 | 5.00 | -10.0 | .042 | 2.3818 | 2.4159 |

TABLE A-19 (cont'd)

MEASURED AND FITTED SIDE FORCE
BETA=10. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|--------|
| 514 | 5.10 | .191 | -12.5 | 2.00 | -10.0 | -.016 | 2.4699 | 2.5077 |
| 795 | 3.00 | .225 | 0.0 | 3.00 | 0.0 | .055 | 1.7423 | 1.7391 |
| 796 | 2.99 | .224 | 5.0 | 3.00 | 0.0 | .047 | 1.7446 | 1.7421 |
| 797 | 3.01 | .226 | -2.5 | 3.00 | 0.0 | .056 | 1.7344 | 1.7492 |
| 798 | 3.00 | .225 | -5.0 | 3.00 | 0.0 | .051 | 1.7388 | 1.7401 |
| 799 | 3.01 | .226 | -7.5 | 3.00 | 0.0 | .046 | 1.7467 | 1.7521 |
| 800 | 3.00 | .225 | -10.0 | 3.00 | 0.0 | .039 | 1.7282 | 1.7331 |
| 801 | 3.00 | .225 | -12.5 | 3.00 | 0.0 | .033 | 1.7217 | 1.7201 |
| 802 | 2.99 | .224 | 0.0 | 3.00 | 5.0 | .054 | 1.7475 | 1.7349 |
| 803 | 2.99 | .224 | 0.0 | 3.00 | -5.0 | .068 | 1.7098 | 1.6974 |
| 804 | 2.98 | .223 | 0.0 | 3.00 | -10.0 | .072 | 1.6521 | 1.6339 |
| 805 | 2.99 | .224 | 0.0 | 3.00 | -15.0 | .075 | 1.6036 | 1.5829 |
| 806 | 3.00 | .225 | 0.0 | 3.00 | -20.0 | .069 | 1.5444 | 1.5282 |
| 807 | 3.00 | .225 | 0.0 | 2.00 | 0.0 | .067 | 1.7389 | 1.7410 |
| 808 | 2.97 | .223 | 0.0 | 4.00 | 0.0 | .058 | 1.7166 | 1.7072 |
| 809 | 3.00 | .225 | 0.0 | 5.00 | 0.0 | .053 | 1.7471 | 1.7402 |
| 810 | 2.99 | .224 | 0.0 | 6.00 | 0.0 | .056 | 1.7313 | 1.7290 |
| 811 | 3.00 | .225 | 0.0 | 3.00 | 0.0 | .051 | 1.7427 | 1.7441 |
| 812 | 3.00 | .225 | 0.0 | 3.00 | 0.0 | .082 | 1.7355 | 1.7306 |
| 813 | 3.00 | .225 | 0.0 | 3.00 | 0.0 | .130 | 1.7293 | 1.7160 |
| 815 | 2.01 | .151 | 0.0 | 3.00 | 0.0 | .104 | 0.7746 | 0.7803 |
| 816 | 2.51 | .188 | -2.5 | 3.00 | 0.0 | .069 | 1.2151 | 1.2229 |
| 817 | 3.01 | .226 | 0.0 | 6.00 | -20.0 | .066 | 1.5786 | 1.5810 |
| 818 | 3.02 | .226 | 5.0 | 6.00 | -5.0 | .175 | 1.6827 | 1.6797 |
| 819 | 3.02 | .226 | -2.5 | 6.00 | 5.0 | .211 | 1.7457 | 1.8770 |
| 820 | 2.03 | .152 | 0.0 | 4.00 | -10.0 | .205 | 0.6277 | 0.6144 |
| 821 | 3.01 | .226 | -12.5 | 3.00 | -10.0 | .017 | 1.7058 | 1.6679 |
| 822 | 3.01 | .226 | -2.5 | 3.00 | -5.0 | .065 | 1.7269 | 1.7192 |
| 823 | 2.02 | .152 | -12.5 | 3.00 | -10.0 | .093 | 0.6801 | 0.6951 |
| 824 | 2.52 | .189 | -10.0 | 3.00 | 5.0 | .111 | 1.2235 | 1.2209 |
| 825 | 2.01 | .150 | -5.0 | 3.00 | -15.0 | .112 | 0.6645 | 0.6826 |
| 826 | 2.48 | .186 | -12.5 | 6.00 | -10.0 | .190 | 0.8937 | 0.8776 |
| 827 | 2.48 | .186 | -12.5 | 5.00 | 5.0 | .281 | 1.2508 | 1.2680 |
| 828 | 2.99 | .224 | 0.0 | 3.00 | -5.0 | .084 | 1.6927 | 1.6799 |
| 829 | 1.99 | .149 | 5.0 | 6.00 | -10.0 | .287 | 0.5056 | 0.5001 |
| 830 | 2.00 | .150 | -5.0 | 3.00 | -10.0 | .076 | 0.7271 | 0.7538 |
| 831 | 2.50 | .187 | -2.5 | 5.00 | -20.0 | .248 | 0.5080 | 0.5106 |
| 832 | 2.99 | .224 | -2.5 | 3.00 | -5.0 | .065 | 1.6971 | 1.7002 |
| 833 | 1.96 | .147 | -5.0 | 6.00 | -5.0 | .263 | 0.6099 | 0.6023 |
| 834 | 2.95 | .221 | 5.0 | 5.00 | 0.0 | .063 | 1.7243 | 1.6955 |
| 835 | 2.96 | .222 | -5.0 | 6.00 | 0.0 | .034 | 1.7256 | 1.7067 |
| 836 | 1.98 | .148 | -12.5 | 3.00 | -20.0 | .019 | 0.6740 | 0.6477 |
| 839 | 2.06 | .155 | 5.0 | 4.00 | 0.0 | .192 | 0.8187 | 0.8140 |
| 840 | 2.03 | .153 | -7.5 | 3.00 | 5.0 | .088 | 0.8044 | 0.8199 |
| 841 | 2.98 | .223 | 0.0 | 5.00 | -20.0 | .219 | 0.8232 | 0.9760 |
| 842 | 2.99 | .224 | -7.5 | 6.00 | -15.0 | .031 | 1.6334 | 1.6111 |
| 845 | 2.98 | .223 | 5.0 | 6.00 | -10.0 | .174 | 1.4724 | 1.5199 |
| 846 | 3.01 | .226 | -2.5 | 3.00 | -5.0 | .053 | 1.7353 | 1.7348 |
| 847 | 2.54 | .190 | -7.5 | 5.00 | 0.0 | .242 | 1.1488 | 1.1795 |
| 848 | 3.01 | .226 | -10.0 | 5.00 | 0.0 | .204 | 1.5472 | 1.6471 |

R-1851

TABLE A-19 (cont'd)

MEASURED AND FITTED SIDE FORCE
BETA=10. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|------|----------|--------|
| 849 | 2.55 | .191 | 0.0 | 5.00 | -5.0 | .046 | 1.2464 | 1.2537 |
| 850 | 2.54 | .191 | -2.5 | 4.00 | -15.0 | .180 | 0.8884 | 0.9187 |
| 851 | 2.08 | .156 | 0.0 | 5.00 | 5.0 | .038 | 0.8402 | 0.8491 |
| 852 | 2.53 | .190 | 5.0 | 6.00 | -20.0 | .212 | 0.5840 * | 0.7676 |
| 853 | 2.05 | .154 | -5.0 | 8.00 | -15.0 | .288 | 0.4339 | 0.4074 |
| 855 | 3.01 | .220 | -5.0 | 2.00 | 5.0 | .074 | 1.7616 | 1.7693 |
| 856 | 2.53 | .190 | -12.5 | 4.00 | -10.0 | .182 | 0.9102 | 0.8975 |
| 857 | 3.00 | .225 | -2.5 | 3.00 | -5.0 | .049 | 1.7218 | 1.7285 |
| 858 | 2.99 | .224 | -5.0 | 4.00 | 0.0 | .157 | 1.6800 | 1.6747 |
| 859 | 2.53 | .190 | -5.0 | 6.00 | -5.0 | .169 | 1.1408 | 1.1326 |
| 861 | 2.54 | .190 | -12.5 | 4.00 | -5.0 | .209 | 0.9987 | 0.9792 |
| 862 | 2.97 | .223 | -12.5 | 5.00 | -20.0 | .057 | 1.3532 | 1.3872 |
| 863 | 3.00 | .225 | -5.0 | 4.00 | -5.0 | .026 | 0.5568 * | 1.7433 |

MEAN ERROR= -0.1071
STANDARD DEVIATION= 0.3157

TABLE A-20

MEASURED AND FITTED SIDE FORCE
BETA=15. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED* | FITTED |
|-----|------|------|------|-------|-----|-------|-----------|---------|
| 141 | 4.00 | .000 | 5.0 | 3.60 | 5.0 | .050 | 0.0306 | 0.0124 |
| 142 | 4.00 | .000 | -0.3 | 2.60 | 0.0 | .063 | 0.0121 | -0.0153 |
| 143 | 3.00 | .000 | 4.7 | 2.60 | 0.0 | .053 | 0.0074 | -0.0197 |
| 144 | 6.00 | .000 | 14.8 | 3.00 | 0.0 | .149 | 0.2005 | 0.1560 |
| 145 | 4.00 | .000 | 4.8 | 3.60 | 0.0 | .050 | 0.0087 | -0.0140 |
| 146 | 4.00 | .000 | -5.2 | 3.60 | 0.0 | .050 | 0.0129 | -0.0166 |
| 147 | 4.00 | .000 | -0.3 | 3.60 | 0.0 | .058 | 0.0104 | -0.0154 |
| 148 | 4.00 | .000 | -0.3 | 3.60 | 0.0 | .061 | 0.0112 | -0.0154 |
| 149 | 4.00 | .000 | -0.3 | 3.60 | 0.0 | .076 | 0.0116 | -0.0157 |
| 150 | 4.00 | .000 | -0.3 | 3.60 | 0.0 | .113 | 0.0113 | -0.0163 |
| 151 | 4.00 | .000 | -0.3 | 3.60 | 0.0 | .163 | 0.0129 | -0.0170 |
| 152 | 4.00 | .000 | -0.3 | 3.70 | 0.0 | .216 | 0.0117 | -0.0175 |
| 153 | 2.00 | .000 | -2.1 | 3.60 | 0.0 | .114 | 0.0051 | -0.0121 |
| 154 | 3.00 | .000 | -0.3 | 3.60 | 0.0 | .077 | 0.0077 | -0.0151 |
| 155 | 5.00 | .000 | -0.3 | 3.60 | 0.0 | .051 | 0.0135 | -0.0158 |
| 156 | 6.00 | .000 | -0.3 | 3.60 | 0.0 | .043 | 0.0132 | -0.0163 |
| 157 | 4.00 | .000 | 9.8 | 3.60 | 0.0 | .035 | 0.0086 | -0.0187 |
| 158 | 4.00 | .000 | 14.7 | 3.60 | 0.0 | .014 | 0.0134 | -0.0317 |
| 159 | 3.00 | .000 | 14.7 | 3.60 | 0.0 | .169 | 0.0596 | 0.0405 |
| 160 | 4.00 | .000 | 19.8 | 3.60 | 0.0 | -.005 | 0.0234 | -0.0459 |
| 161 | 4.00 | .000 | 19.8 | 4.60 | 0.0 | .155 | 0.1665 | 0.1585 |
| 162 | 4.00 | .000 | 19.7 | 4.60 | 0.0 | .162 | 0.1736 | 0.1644 |
| 163 | 4.00 | .000 | -0.3 | 4.60 | 0.0 | .058 | 0.0087 | -0.0157 |
| 164 | 4.00 | .000 | -0.3 | 5.60 | 0.0 | .056 | 0.0083 | -0.0160 |
| 165 | 2.00 | .000 | 4.7 | 5.60 | 0.0 | .371 | 0.0374 | -0.0051 |
| 166 | 6.00 | .000 | 9.7 | 5.60 | 0.0 | .029 | 0.0094 | 0.0520 |
| 167 | 3.00 | .000 | 19.7 | 5.60 | 0.0 | .161 | 0.1088 | 0.1175 |
| 168 | 3.00 | .000 | 19.7 | 5.60 | 0.0 | .280 | 0.1732 | 0.1889 |
| 169 | 2.00 | .000 | 19.7 | 6.60 | 0.0 | .067 | 0.0265 | -0.0256 |
| 170 | 5.00 | .000 | 9.7 | 6.60 | 0.0 | .030 | 0.0157 | 0.0393 |
| 171 | 4.00 | .000 | 9.7 | 6.60 | 0.0 | .147 | 0.1360 | 0.0929 |
| 172 | 3.00 | .000 | -5.3 | 6.60 | 0.0 | .082 | 0.0148 | -0.0269 |
| 173 | 4.00 | .000 | -0.3 | 6.60 | 0.0 | .055 | 0.0093 | -0.0164 |
| 174 | 6.00 | .000 | -5.2 | 6.60 | 0.0 | .039 | 0.0098 | -0.0707 |
| 175 | 4.00 | .000 | 4.7 | 3.60 | 5.0 | .061 | 0.0338 | 0.0289 |
| 185 | 4.00 | .000 | 4.7 | 3.60 | 5.0 | .046 | 0.0254 | 0.0068 |
| 186 | 4.00 | .000 | -0.3 | 3.60 | 5.0 | .065 | 0.0349 | 0.0263 |
| 187 | 3.00 | .000 | -5.3 | 3.60 | 5.0 | .119 | 0.0452 | 0.0477 |
| 189 | 5.00 | .000 | -0.3 | 2.50 | 5.0 | .063 | 0.0447 | 0.0643 |
| 191 | 4.00 | .000 | 9.8 | 3.60 | 5.0 | .173 | 0.2603 | 0.2465 |
| 192 | 4.00 | .000 | 9.7 | 3.60 | 5.0 | .177 | 0.2589 | 0.2508 |
| 193 | 3.00 | .000 | 14.7 | 3.70 | 5.0 | .250 | 0.2992 | 0.2655 |
| 194 | 3.00 | .000 | 14.7 | 3.60 | 5.0 | .017 | 0.0178 | -0.0260 |
| 195 | 3.00 | .000 | 14.7 | 1.60 | 5.0 | .048 | 0.0256 | 0.0556 |
| 196 | 6.00 | .000 | -5.2 | 5.60 | 5.0 | .035 | 0.0357 | -0.0465 |
| 197 | 6.00 | .000 | 9.7 | 5.60 | 5.0 | .026 | 0.0315 | 0.0523 |
| 198 | 6.00 | .000 | 19.8 | 5.60 | 5.0 | -.016 | 0.0396 | 0.0426 |
| 199 | 2.00 | .000 | -0.3 | 5.60 | 5.0 | .101 | 0.0211 | 0.0042 |
| 200 | 2.00 | .000 | -5.3 | 5.60 | 5.0 | .257 | 0.0532 | 0.0559 |
| 201 | 4.00 | .000 | 19.8 | 5.60 | 5.0 | .139 | 0.3649 | 0.3522 |

TABLE A-20 (cont'd)

MEASURED AND FITTED SIDE FORCE
BETA=15. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|------|-------|------|-------|-----------|---------|
| 202 | 5.00 | .000 | 14.7 | 6.60 | 5.0 | .010 | 0.0253 * | 0.0695 |
| 203 | 5.00 | .000 | 4.7 | 6.60 | 5.0 | .036 | 0.0341 | 0.0310 |
| 204 | 5.00 | .000 | 4.8 | 6.60 | 5.0 | .037 | 0.0308 * | 0.0331 |
| 205 | 3.00 | .000 | -5.3 | 6.60 | 5.0 | .279 | 0.0554 | 0.0941 |
| 206 | 4.00 | .000 | 4.7 | 3.60 | 5.0 | .055 | 0.0267 | 0.0193 |
| 207 | 4.00 | .000 | -0.3 | 3.60 | -5.0 | .063 | -0.0170 * | -0.0542 |
| 208 | 6.00 | .000 | 14.7 | 3.60 | -5.0 | .155 | -0.2395 | -0.1917 |
| 210 | 5.00 | .000 | -0.3 | 2.50 | -5.0 | .103 | -0.1039 * | -0.1728 |
| 211 | 4.00 | .000 | 4.7 | 2.60 | -5.0 | .094 | -0.0412 * | -0.1041 |
| 212 | 2.00 | .000 | 4.7 | 2.60 | -5.0 | .162 | -0.0193 * | -0.0813 |
| 213 | 4.00 | .000 | 9.8 | 2.60 | -5.0 | .043 | -0.0081 * | -0.0634 |
| 214 | 2.00 | .000 | -0.3 | 4.60 | -5.0 | .170 | -0.0139 * | -0.0630 |
| 215 | 6.00 | .000 | 14.8 | 4.60 | -5.0 | .126 | -0.1005 | -0.0918 |
| 216 | 5.00 | .000 | 14.7 | 5.50 | -5.0 | .150 | -0.0420 | -0.0560 |
| 218 | 3.00 | .000 | 9.7 | 5.60 | -5.0 | .242 | -0.0394 * | -0.0963 |
| 219 | 4.00 | .000 | 9.7 | 5.60 | -5.0 | .045 | -0.0131 * | -0.0313 |
| 220 | 6.00 | .000 | 14.8 | 5.60 | -5.0 | .007 | -0.0009 * | 0.0397 |
| 221 | 6.00 | .000 | 14.8 | 6.60 | -5.0 | .005 | -0.0125 * | 0.0610 |
| 222 | 4.00 | .000 | 9.7 | 6.60 | -5.0 | .044 | -0.0167 * | -0.0263 |
| 223 | 3.00 | .000 | 19.7 | 6.60 | 10.0 | -.009 | 0.0274 * | 0.0011 |
| 224 | 4.00 | .000 | 19.7 | 6.60 | 10.0 | -.014 | 0.0412 | 0.0405 |
| 225 | 2.00 | .000 | -5.3 | 6.60 | 10.0 | .104 | 0.0315 | 0.0398 |
| 226 | 3.00 | .000 | 4.7 | 6.60 | 10.0 | .117 | 0.1154 | 0.1163 |
| 227 | 5.00 | .000 | -0.3 | 6.50 | 10.0 | .070 | 0.1151 | 0.0967 |
| 228 | 3.00 | .000 | 14.8 | 6.60 | 10.0 | .191 | 0.3800 | 0.3698 |
| 231 | 3.00 | .000 | 19.8 | 4.60 | 10.0 | .179 | 0.4462 | 0.3987 |
| 232 | 5.00 | .000 | 14.7 | 4.50 | 10.0 | .035 | 0.0976 | 0.1170 |
| 233 | 2.00 | .000 | 14.7 | 4.60 | 10.0 | .037 | 0.0195 * | -0.0267 |
| 234 | 4.00 | .000 | 4.8 | 3.60 | 5.0 | .054 | 0.0267 | 0.0192 |
| 235 | 5.00 | .000 | 4.8 | 3.50 | 10.0 | .118 | 0.3345 | 0.3364 |
| 238 | 3.00 | .000 | 9.7 | 3.60 | 10.0 | .240 | 0.3635 | 0.3838 |
| 239 | 4.00 | .000 | 9.8 | 3.60 | 10.0 | .059 | 0.0680 | 0.0903 |
| 240 | 5.00 | .000 | 8.6 | 3.50 | 10.0 | .020 | 0.0515 * | -0.0228 |
| 241 | 3.00 | .000 | 4.8 | 3.60 | 10.0 | .131 | 0.1088 | 0.1435 |
| 242 | 4.00 | .000 | -0.3 | 3.60 | 10.0 | .064 | 0.0640 | 0.0635 |
| 243 | 4.00 | .000 | 9.7 | 2.60 | 10.0 | .050 | 0.0561 * | 0.0816 |
| 244 | 3.00 | .000 | 19.7 | 5.60 | 10.0 | -.003 | 0.0352 * | -0.0075 |
| 245 | 3.00 | .000 | -4.9 | 5.50 | 10.0 | .180 | 0.1457 | 0.1616 |
| 246 | 5.00 | .000 | -5.2 | 5.50 | 15.0 | .077 | 0.2083 | 0.1725 |
| 247 | 3.00 | .000 | -0.3 | 5.60 | 15.0 | .165 | 0.2074 | 0.2328 |
| 248 | 5.00 | .000 | 14.8 | 5.50 | 15.0 | .029 | 0.1088 | 0.1293 |
| 249 | 6.00 | .000 | 14.7 | 5.60 | 15.0 | .016 | 0.0858 | 0.0705 |
| 250 | 5.00 | .000 | -0.3 | 5.50 | 15.0 | .044 | 0.0881 * | 0.0237 |
| 251 | 2.00 | .000 | 4.7 | 6.60 | 15.0 | .091 | 0.0416 | 0.0359 |
| 252 | 6.00 | .000 | 3.9 | 6.60 | 15.0 | .026 | 0.0870 * | -0.0296 |
| 253 | 3.00 | .000 | 19.7 | 6.60 | 15.0 | .018 | 0.0694 * | 0.1097 |
| 254 | 4.00 | .000 | -5.3 | 6.60 | 15.0 | .150 | 0.2899 | 0.3103 |
| 255 | 6.00 | .000 | -5.3 | 4.60 | 15.0 | .067 | 0.2039 | 0.1888 |
| 256 | 3.00 | .000 | 14.7 | 4.60 | 15.0 | .094 | 0.1909 | 0.1935 |
| 257 | 5.00 | .000 | 9.8 | 4.50 | 15.0 | .077 | 0.2519 | 0.2773 |

TABLE A-20 (cont'd)

MEASURED AND FITTED SIDE FORCE
BETA=15. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|------|-------|----------|---------|
| 258 | 3.00 | .000 | 4.7 | 4.60 | 15.0 | .266 | 0.5347 | 0.5338 |
| 260 | 4.00 | .000 | -0.3 | 4.60 | 15.0 | .230 | 0.6739 | 0.6726 |
| 261 | 4.00 | .000 | -0.3 | 4.60 | 15.0 | .049 | 0.0561* | 0.0308 |
| 262 | 3.00 | .000 | 9.8 | 4.60 | 15.0 | .056 | 0.0457* | 0.0402 |
| 263 | 6.00 | .000 | 9.8 | 4.60 | 15.0 | .033 | 0.0955* | 0.0435 |
| 264 | 4.00 | .000 | -0.3 | 3.60 | 15.0 | .069 | 0.0892* | 0.1139 |
| 265 | 6.00 | .000 | 19.8 | 3.60 | 15.0 | -.009 | 0.0940* | -0.0235 |
| 266 | 4.00 | .000 | 9.8 | 2.60 | 15.0 | .053 | 0.0787* | 0.1282 |
| 267 | 3.00 | .000 | 9.8 | 2.60 | 15.0 | .095 | 0.1376 | 0.1826 |
| 268 | 3.00 | .000 | 4.7 | 2.60 | 15.0 | .089 | 0.0996 | 0.1340 |
| 270 | 6.00 | .000 | 4.8 | 2.50 | 15.0 | .099 | 0.5475 | 0.5761 |
| 271 | 6.00 | .000 | 4.8 | 2.50 | 15.0 | .097 | 0.5266 | 0.5592 |
| 275 | 4.00 | .000 | 9.8 | 2.50 | 15.0 | .117 | 0.4025 | 0.4126 |
| 276 | 4.00 | .000 | 4.8 | 3.60 | 5.0 | .058 | 0.0294 | 0.0241 |
| 277 | 4.00 | .000 | -0.3 | 3.60 | 20.0 | .068 | 0.1236 | 0.1418 |
| 277 | 3.00 | .000 | 14.7 | 3.50 | 20.0 | .049 | 0.0963 | 0.1029 |
| 279 | 4.00 | .000 | 4.8 | 3.50 | 20.0 | .133 | 0.5099 | 0.4814 |
| 280 | 6.00 | .000 | 4.8 | 2.50 | 20.0 | .100 | 0.7260 | 0.7315 |
| 281 | 5.00 | .000 | 4.8 | 2.50 | 20.0 | .168 | 1.2512* | 1.0867 |
| 282 | 6.00 | .000 | 14.7 | 2.50 | 20.0 | .028 | 0.1978 | 0.1660 |
| 282 | 6.00 | .000 | 14.7 | 2.50 | 20.0 | .034 | 0.1082 | 0.1415 |
| 283 | 4.00 | .000 | 14.7 | 2.50 | 20.0 | .020 | 0.0571* | 0.0639 |
| 286 | 4.00 | .000 | 14.7 | 2.50 | 20.0 | .043 | 0.0420 | 0.0095 |
| 286 | 3.00 | .000 | 9.7 | 4.50 | 20.0 | .075 | 0.1099 | 0.1081 |
| 287 | 3.00 | .000 | 9.7 | 4.50 | 20.0 | .075 | 0.1099 | 0.1081 |
| 287 | 3.00 | .000 | 9.7 | 4.50 | 20.0 | -.004 | 0.0638* | 0.0311 |
| 288 | 4.00 | .000 | 19.8 | 4.50 | 20.0 | .098 | 0.1058 | 0.1037 |
| 289 | 2.00 | .000 | 14.7 | 4.50 | 20.0 | .136 | 0.2482 | 0.2498 |
| 290 | 2.00 | .000 | 19.8 | 4.60 | 20.0 | .136 | 0.2482 | 0.2498 |
| 294 | 3.00 | .000 | -0.3 | 5.50 | 20.0 | .090 | 0.1267* | 0.1110 |
| 295 | 3.00 | .000 | -0.3 | 5.60 | 20.0 | .056 | 0.0601* | 0.0337 |
| 296 | 4.00 | .000 | -0.3 | 6.60 | 20.0 | .046 | 0.0690 | 0.0622 |
| 297 | 4.00 | .000 | 4.7 | 3.60 | 5.0 | .059 | 0.0286* | 0.0260 |
| 298 | 4.00 | .000 | 4.8 | 1.60 | 5.0 | .082 | 0.0525* | 0.0924 |
| 299 | 4.00 | .000 | 14.7 | 1.60 | 5.0 | .038 | 0.0346* | 0.0673 |
| 300 | 5.00 | .000 | -0.3 | 1.50 | 15.0 | .051 | 0.3336* | 0.2153 |
| 109 | 2.35 | .059 | 0.0 | 3.00 | 0.0 | .069 | 0.3564 | 0.3592 |
| 110 | 2.92 | .073 | 0.0 | 3.00 | 0.0 | .060 | 0.5560 | 0.5589 |
| 111 | 3.88 | .097 | 0.0 | 3.00 | 0.0 | .052 | 0.9785 | 0.9867 |
| 112 | 4.95 | .124 | 0.0 | 3.00 | 0.0 | .045 | 1.5965 | 1.6218 |
| 113 | 6.02 | .150 | 0.0 | 3.00 | 0.0 | .037 | 2.3683 | 2.4151 |
| 114 | 2.87 | .072 | 0.0 | 3.00 | 0.0 | .049 | 0.5312 | 0.5395 |
| 115 | 3.02 | .076 | 0.0 | 3.00 | 0.0 | .081 | 0.5854 | 0.5951 |
| 116 | 3.01 | .075 | 0.0 | 3.00 | 0.0 | .155 | 0.5901 | 0.5858 |
| 117 | 2.82 | .071 | 0.0 | 3.00 | 0.0 | .156 | 0.5166 | 0.5154 |
| 119 | 4.03 | .101 | 0.0 | 3.00 | 0.0 | .181 | 1.0613 | 1.0632 |
| 120 | 3.03 | .076 | 5.0 | 3.00 | 0.0 | .059 | 0.5987 | 0.5984 |
| 121 | 3.02 | .075 | -5.0 | 3.00 | 0.0 | .056 | 0.5959 | 0.5992 |
| 122 | 2.87 | .072 | -10.0 | 3.00 | 0.0 | .052 | 0.5350 | 0.5421 |
| 123 | 2.89 | .072 | -15.0 | 3.00 | 0.0 | .046 | 0.5265 | 0.5423 |
| 124 | 3.05 | .076 | -20.0 | 3.00 | 0.0 | .040 | 0.5782 | 0.5796 |
| 125 | 3.06 | .076 | 0.0 | 3.00 | 5.0 | .058 | 0.6235 | 0.6296 |

TABLE A-20 (cont'd)

MEASURED AND FITTED SIDE FORCE
BETA=15. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|--------|
| 127 | 3.01 | .075 | 0.0 | 3.00 | -10.0 | .067 | 0.5218 | 0.5261 |
| 128 | 3.03 | .076 | 0.0 | 3.00 | -15.0 | .066 | 0.4907 | 0.4912 |
| 129 | 3.01 | .075 | 0.0 | 3.00 | -20.0 | .055 | 0.4602 | 0.4788 |
| 130 | 2.99 | .075 | 0.0 | 2.00 | 0.0 | .066 | 0.5775 | 0.5876 |
| 131 | 3.02 | .075 | 0.0 | 4.00 | 0.0 | .063 | 0.5833 | 0.5939 |
| 132 | 3.06 | .076 | 0.0 | 5.00 | 0.0 | .054 | 0.6048 | 0.6109 |
| 132 | 3.06 | .076 | 0.0 | 6.00 | 0.0 | .057 | 0.6081 | 0.6114 |
| 133 | 3.06 | .076 | 0.0 | 6.00 | 0.0 | .095 | 1.0313 | 1.0564 |
| 136 | 4.04 | .101 | -5.0 | 3.00 | 0.0 | .003 | 2.3311 | 2.3760 |
| 137 | 6.09 | .152 | -15.0 | 5.00 | -10.0 | .003 | 2.3311 | 2.3760 |
| 138 | 6.05 | .151 | -20.0 | 6.00 | -5.0 | -.018 | 2.3088 | 2.3519 |
| 139 | 4.02 | .100 | -20.0 | 6.00 | -20.0 | -.022 | 0.9206 | 0.8983 |
| 140 | 5.00 | .125 | 5.0 | 3.00 | -20.0 | .022 | 1.4357 | 1.4728 |
| 141 | 4.99 | .125 | 5.0 | 3.00 | -20.0 | .021 | 1.4322 | 1.4686 |
| 142 | 2.91 | .073 | -5.0 | 3.00 | -5.0 | .056 | 0.5343 | 0.5346 |
| 143 | 1.65 | .041 | -10.0 | 6.00 | 0.0 | .153 | 0.1533 | 0.1617 |
| 144 | 3.79 | .095 | -10.0 | 3.00 | -20.0 | .093 | 0.4371 | 0.4870 |
| 145 | 4.76 | .119 | 5.0 | 2.00 | -5.0 | .045 | 1.4341 | 1.4337 |
| 147 | 3.87 | .097 | -5.0 | 6.00 | -20.0 | .026 | 0.8477 | 0.8957 |
| 148 | 5.86 | .146 | -10.0 | 3.00 | 5.0 | .097 | 2.3495 | 2.3925 |
| 150 | 3.94 | .098 | -15.0 | 4.00 | -5.0 | .093 | 0.8105 | 0.8217 |
| 151 | 2.95 | .074 | -10.0 | 2.00 | -10.0 | .105 | 0.3982 | 0.3693 |
| 154 | 4.78 | .120 | -5.0 | 3.00 | -5.0 | .032 | 1.4490 | 1.4847 |
| 156 | 3.00 | .075 | 0.0 | 2.00 | -10.0 | .053 | 0.5299 | 0.5262 |
| 157 | 3.02 | .076 | -5.0 | 6.00 | -15.0 | .050 | 0.5077 | 0.5245 |
| 158 | 3.99 | .100 | -5.0 | 6.00 | -15.0 | .040 | 0.9102 | 0.9436 |
| 160 | 2.40 | .060 | -10.0 | 2.00 | -20.0 | .044 | 0.2694 | 0.2770 |
| 161 | 6.18 | .154 | 5.0 | 3.00 | -20.0 | .044 | 2.0359 | 2.0660 |
| 162 | 6.21 | .155 | 5.0 | 3.00 | -20.0 | .040 | 2.0655 | 2.1241 |
| 163 | 6.18 | .154 | -10.0 | 2.00 | -15.0 | .004 | 2.3004 | 2.4070 |
| 164 | 4.38 | .110 | -10.0 | 5.00 | -20.0 | .041 | 0.9948 | 1.0278 |
| 165 | 3.23 | .081 | -10.0 | 2.00 | -20.0 | .082 | 0.2611 | 0.3366 |
| 166 | 2.15 | .054 | -10.0 | 4.00 | -15.0 | .037 | 0.2561 | 0.2979 |
| 167 | 2.64 | .066 | -5.0 | 3.00 | -5.0 | .065 | 0.4262 | 0.4321 |
| 168 | 5.65 | .141 | -5.0 | 5.00 | 5.0 | .073 | 2.1459 | 2.1579 |
| 169 | 4.72 | .118 | -5.0 | 2.00 | -10.0 | .052 | 1.3042 | 1.2906 |
| 170 | 5.81 | .145 | 5.0 | 3.00 | -5.0 | .040 | 2.1435 | 2.2155 |
| 171 | 4.74 | .118 | 0.0 | 2.00 | 5.0 | .064 | 1.5122 | 1.5490 |
| 173 | 5.91 | .148 | -5.0 | 3.00 | 0.0 | .077 | 2.2818 | 2.2995 |
| 174 | 4.83 | .121 | -20.0 | 5.00 | 5.0 | .045 | 1.5351 | 1.5508 |
| 175 | 6.04 | .151 | -20.0 | 5.00 | -5.0 | .020 | 2.1315 | 2.2045 |
| 177 | 3.75 | .094 | -10.0 | 5.00 | 5.0 | .013 | -0.2455 | 0.9435 |
| 178 | 2.96 | .074 | -5.0 | 3.00 | -5.0 | .048 | 0.5412 | 0.5587 |
| 180 | 3.18 | .079 | -15.0 | 4.00 | -10.0 | .111 | 0.4228 | 0.3996 |
| 181 | 5.11 | .128 | -5.0 | 2.00 | -15.0 | .046 | 1.5016 | 1.4299 |
| 182 | 2.15 | .054 | -15.0 | 3.00 | 5.0 | .002 | 0.3009 | 0.3411 |
| 183 | 4.91 | .123 | -20.0 | 5.00 | -15.0 | .012 | 1.2205 | 1.2759 |
| 184 | 5.08 | .127 | 5.0 | 4.00 | 0.0 | .071 | 1.6655 | 1.7331 |
| 527 | 1.82 | .068 | 0.0 | 3.00 | 0.0 | .112 | 0.3257 | 0.3138 |
| 528 | 2.87 | .108 | 0.0 | 3.00 | 0.0 | .076 | 0.8086 | 0.8119 |
| 529 | 3.87 | .145 | 0.0 | 3.00 | 0.0 | .052 | 1.4502 | 1.4807 |

TABLE A-20 (cont'd)

MEASURED AND FITTED SIDE FORCE
BETA=15. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|--------|
| 530 | 4.98 | .187 | 0.0 | 3.00 | 0.0 | .043 | 2.3953 | 2.4541 |
| 531 | 5.97 | .224 | 0.0 | 3.00 | 0.0 | .037 | 3.4632 | 3.5541 |
| 532 | 2.96 | .111 | 0.0 | 3.00 | 0.0 | .052 | 0.8427 | 0.8667 |
| 533 | 2.97 | .111 | 0.0 | 3.00 | 0.0 | .104 | 0.8407 | 0.8642 |
| 534 | 2.96 | .111 | 0.0 | 3.00 | 0.0 | .154 | 0.8385 | 0.8536 |
| 536 | 3.98 | .149 | 0.0 | 3.00 | 0.0 | .146 | 1.5240 | 1.5565 |
| 537 | 3.97 | .149 | 0.0 | 3.00 | 0.0 | .195 | 1.5623 | 1.5495 |
| 538 | 2.96 | .111 | 5.0 | 3.00 | 0.0 | .075 | 0.8364 | 0.8598 |
| 539 | 2.96 | .111 | -5.0 | 3.00 | 0.0 | .074 | 0.8368 | 0.8589 |
| 540 | 3.00 | .112 | -10.0 | 3.00 | 0.0 | .063 | 0.8566 | 0.8781 |
| 541 | 2.97 | .111 | -15.0 | 3.00 | 0.0 | .044 | 0.8310 | 0.8613 |
| 542 | 2.98 | .112 | -20.0 | 3.00 | 0.0 | .019 | 0.8259 | 0.8603 |
| 543 | 2.98 | .112 | 0.0 | 3.00 | 5.0 | .074 | 0.8756 | 0.8986 |
| 544 | 2.98 | .112 | 0.0 | 3.00 | -5.0 | .078 | 0.7969 | 0.8338 |
| 545 | 2.99 | .112 | 0.0 | 3.00 | -10.0 | .079 | 0.7623 | 0.7847 |
| 546 | 2.97 | .112 | 0.0 | 3.00 | -20.0 | .057 | 0.6960 | 0.7326 |
| 547 | 2.99 | .112 | 0.0 | 3.00 | -15.0 | .084 | 0.7049 | 0.7167 |
| 548 | 2.97 | .111 | 0.0 | 2.00 | 0.0 | .080 | 0.8398 | 0.8736 |
| 549 | 2.98 | .112 | 0.0 | 4.00 | 0.0 | .060 | 0.8475 | 0.8755 |
| 550 | 2.97 | .112 | 0.0 | 5.00 | 0.0 | .059 | 0.8450 | 0.8689 |
| 551 | 3.01 | .113 | 0.0 | 6.00 | 0.0 | .055 | 0.8650 | 0.8946 |
| 552 | 1.90 | .071 | -15.0 | 4.00 | 5.0 | .136 | 0.3709* | 0.3912 |
| 553 | 4.03 | .151 | -5.0 | 3.00 | -5.0 | .064 | 0.2336* | 1.5305 |
| 555 | 5.98 | .224 | 5.0 | 4.00 | -20.0 | .064 | 2.8715 | 2.9134 |
| 556 | 4.99 | .187 | -10.0 | 4.00 | 5.0 | .136 | 2.3772* | 2.5556 |
| 558 | 3.99 | .150 | -15.0 | 6.00 | 0.0 | .003 | 1.5328 | 1.5858 |
| 559 | 3.00 | .113 | -5.0 | 3.00 | -5.0 | .071 | 0.8223 | 0.8464 |
| 560 | 3.00 | .225 | 0.0 | 2.00 | -5.0 | .051 | 3.3728 | 3.4717 |
| 561 | 5.00 | .188 | -15.0 | 5.00 | 0.0 | .065 | 2.2481 | 2.3708 |
| 564 | 6.01 | .225 | -20.0 | 3.00 | 5.0 | .054 | 3.5427 | 3.6089 |
| 566 | 6.01 | .225 | 0.0 | 3.00 | 5.0 | .086 | 3.5901 | 3.6938 |
| 567 | 6.00 | .225 | -20.0 | 5.00 | -20.0 | -.008 | 2.9609 | 3.0501 |
| 568 | 3.98 | .149 | -10.0 | 6.00 | 0.0 | .014 | 1.5224 | 1.5760 |
| 569 | 3.97 | .149 | 5.0 | 4.00 | -10.0 | .169 | 1.1105 | 1.2115 |
| 570 | 2.99 | .112 | -5.0 | 3.00 | 0.0 | .146 | 0.8312 | 0.8584 |
| 571 | 4.97 | .186 | -5.0 | 6.00 | -20.0 | .049 | 2.0491 | 2.0806 |
| 572 | 3.00 | .112 | -5.0 | 3.00 | -5.0 | .071 | 0.8158 | 0.8445 |
| 573 | 5.95 | .223 | -5.0 | 2.00 | -20.0 | .082 | 2.3595 | 2.4407 |
| 577 | 4.97 | .186 | 5.0 | 3.00 | -20.0 | .106 | 1.5460 | 1.6447 |
| 579 | 1.99 | .075 | -15.0 | 6.00 | -5.0 | .186 | 0.2451 | 0.2394 |
| 580 | 2.96 | .111 | 0.0 | 6.00 | -20.0 | .191 | 0.3478 | 0.3847 |
| 581 | 6.00 | .225 | -20.0 | 2.00 | 0.0 | -.006 | 3.4145 | 3.5259 |
| 583 | 5.95 | .223 | -15.0 | 2.00 | -5.0 | .050 | 3.1955 | 3.2507 |
| 585 | 6.01 | .225 | -10.0 | 3.00 | -5.0 | .058 | 3.3150 | 3.3960 |
| 586 | 2.96 | .111 | -5.0 | 3.00 | -5.0 | .072 | 0.7957 | 0.8224 |
| 588 | 3.91 | .147 | -5.0 | 3.00 | -5.0 | .125 | 1.3063 | 1.3471 |
| 593 | 4.03 | .151 | -10.0 | 6.00 | -5.0 | .021 | 1.5242 | 1.5763 |
| 594 | 2.97 | .111 | -20.0 | 4.00 | 0.0 | .138 | 0.7504 | 0.7454 |
| 595 | 3.01 | .113 | 0.0 | 4.00 | -15.0 | .104 | 0.6959 | 0.6978 |
| 596 | 2.03 | .076 | -5.0 | 5.00 | 5.0 | .276 | 0.4616 | 0.4707 |

TABLE A-20 (cont'd)

MEASURED AND FITTED SIDE FORCE
BETA=15.DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|--------|
| 598 | 3.01 | .113 | -10.0 | 5.00 | -10.0 | .128 | 0.6266 | 0.6627 |
| 599 | 3.02 | .113 | -5.0 | 3.00 | -5.0 | .073 | 0.8304 | 0.8518 |
| 600 | 2.01 | .075 | -10.0 | 6.00 | -10.0 | .254 | 0.1752 | 0.1500 |
| 601 | 5.02 | .188 | -20.0 | 5.00 | -10.0 | .026 | 2.1164 | 2.1587 |
| 602 | 5.05 | .189 | -20.0 | 2.00 | -10.0 | -.030 | 2.3567 | 2.4265 |
| 603 | 3.05 | .114 | -15.0 | 5.00 | -15.0 | .036 | 0.7605 | 0.7729 |
| 604 | 5.99 | .225 | -10.0 | 4.00 | -15.0 | .052 | 3.0583 | 3.0873 |
| 618 | 1.92 | .144 | 0.0 | 3.00 | 0.0 | .093 | 0.6970 | 0.7297 |
| 619 | 2.99 | .224 | 0.0 | 3.00 | 0.0 | .070 | 1.7081 | 1.7479 |
| 620 | 2.50 | .188 | 0.0 | 3.00 | 0.0 | .078 | 1.1957 | 1.2290 |
| 621 | 3.07 | .230 | 0.0 | 3.00 | 0.0 | .050 | 1.8069 | 1.8423 |
| 622 | 3.06 | .230 | 0.0 | 3.00 | 0.0 | .086 | 1.7861 | 1.8249 |
| 623 | 3.05 | .228 | 0.0 | 3.00 | 0.0 | .136 | 1.7688 | 1.7952 |
| 625 | 3.01 | .226 | 5.0 | 3.00 | 0.0 | .061 | 1.7335 | 1.7717 |
| 626 | 2.99 | .224 | -5.0 | 3.00 | 0.0 | .066 | 1.7198 | 1.7426 |
| 627 | 3.01 | .226 | -10.0 | 3.00 | 0.0 | .049 | 1.7298 | 1.7554 |
| 628 | 3.00 | .225 | -15.0 | 3.00 | 0.0 | .028 | 1.7169 | 1.7410 |
| 629 | 3.01 | .226 | -20.0 | 3.00 | 0.0 | .003 | 1.7125 | 1.7397 |
| 630 | 2.98 | .223 | 0.0 | 3.00 | 5.0 | .063 | 1.7095 | 1.7364 |
| 631 | 2.97 | .223 | 0.0 | 3.00 | -5.0 | .070 | 1.6494 | 1.6949 |
| 632 | 2.96 | .222 | 0.0 | 3.00 | -10.0 | .071 | 1.5855 | 1.6294 |
| 633 | 2.97 | .223 | 0.0 | 3.00 | -15.0 | .072 | 1.5229 | 1.5611 |
| 634 | 2.97 | .223 | 0.0 | 3.00 | -20.0 | .053 | 1.4849 | 1.5446 |
| 635 | 2.97 | .223 | 0.0 | 2.00 | 0.0 | .062 | 1.6896 | 1.7387 |
| 636 | 2.98 | .223 | 0.0 | 4.00 | 0.0 | .060 | 1.6962 | 1.7282 |
| 637 | 2.98 | .223 | 0.0 | 5.00 | 0.0 | .053 | 1.7002 | 1.7278 |
| 638 | 2.98 | .223 | 0.0 | 6.00 | 0.0 | .048 | 1.7005 | 1.7316 |
| 639 | 2.47 | .185 | 0.0 | 6.00 | -20.0 | .058 | 1.0236 | 1.0587 |
| 640 | 2.48 | .186 | 5.0 | 6.00 | -5.0 | .232 | 1.0744 | 1.0851 |
| 641 | 2.96 | .222 | -5.0 | 3.00 | -5.0 | .108 | 1.5813 | 1.6186 |
| 642 | 2.48 | .186 | -5.0 | 6.00 | 5.0 | .275 | 1.1719 | 1.2269 |
| 643 | 1.97 | .148 | 0.0 | 4.00 | -10.0 | .206 | 0.5848 | 0.6006 |
| 644 | 2.50 | .187 | -20.0 | 3.00 | -10.0 | -.010 | 1.1481 | 1.1544 |
| 645 | 1.99 | .149 | -20.0 | 3.00 | -10.0 | .069 | 0.6385 | 0.6189 |
| 646 | 2.96 | .222 | -5.0 | 3.00 | -5.0 | .061 | 1.6380 | 1.6773 |
| 660 | 2.99 | .224 | -15.0 | 3.00 | 5.0 | .071 | 1.7025 | 1.7424 |
| 661 | 1.99 | .150 | -5.0 | 3.00 | -15.0 | .106 | 0.6321 | 0.6680 |
| 662 | 2.99 | .224 | -20.0 | 6.00 | -10.0 | .108 | 1.2473 | 1.3057 |
| 665 | 2.51 | .188 | 0.0 | 3.00 | -5.0 | .092 | 1.1617 | 1.1992 |
| 667 | 3.00 | .225 | 5.0 | 6.00 | -10.0 | .181 | 1.4438 | 1.5266 |
| 668 | 2.00 | .150 | -5.0 | 3.00 | -10.0 | .066 | 0.7182 | 0.7684 |
| 670 | 2.99 | .224 | -5.0 | 5.00 | -20.0 | .158 | 1.1389 | 1.2114 |
| 671 | 2.51 | .188 | 5.0 | 5.00 | 0.0 | .043 | 1.2104 | 1.2270 |
| 672 | 2.99 | .224 | -5.0 | 3.00 | -5.0 | .056 | 1.6703 | 1.7173 |
| 673 | 1.99 | .149 | -5.0 | 6.00 | -5.0 | .255 | 0.6309 | 0.6278 |
| 674 | 2.50 | .188 | 5.0 | 5.00 | 0.0 | .091 | 0.6825* | 1.2104 |
| 675 | 2.50 | .188 | -5.0 | 6.00 | 0.0 | .037 | 1.2035 | 1.2404 |
| 676 | 1.99 | .149 | -20.0 | 3.00 | -20.0 | -.023 | 0.6701 | 0.7066 |
| 678 | 1.99 | .149 | -10.0 | 3.00 | 5.0 | .079 | 0.7651 | 0.8096 |
| 681 | 2.51 | .188 | -10.0 | 6.00 | -15.0 | .034 | 1.1089 | 1.1486 |

R-1851

TABLE A-20 (cont'd)

MEASURED AND FITTED SIDE FORCE
BETA=15. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|------|----------|--------|
| 682 | 2.50 | .187 | 5.0 | 6.00 | -10.0 | .256 | 0.9101 | 0.9576 |
| 683 | 2.97 | .223 | -5.0 | 3.00 | -5.0 | .075 | 1.6642 | 1.6660 |
| 685 | 2.99 | .224 | -15.0 | 6.00 | 0.0 | .229 | 1.4102 | 1.5103 |
| 686 | 2.50 | .188 | -15.0 | 8.00 | 0.0 | .279 | 0.9182 | 0.9199 |
| 688 | 2.99 | .224 | 0.0 | 5.00 | -15.0 | .185 | 1.3061 | 1.3269 |
| 689 | 2.00 | .150 | 0.0 | 5.00 | 5.0 | .077 | 0.7780 | 0.7864 |
| 690 | 3.00 | .225 | 5.0 | 6.00 | -20.0 | .124 | 1.3795 | 1.3880 |
| 691 | 2.02 | .152 | -5.0 | 8.00 | -15.0 | .342 | 0.3305 | 0.3214 |
| 693 | 2.46 | .185 | -10.0 | 2.00 | 5.0 | .086 | 1.1727 | 1.2260 |
| 694 | 2.96 | .222 | -20.0 | 4.00 | -10.0 | .124 | 1.2395 | 1.2719 |
| 695 | 2.96 | .222 | -5.0 | 3.00 | -5.0 | .073 | 1.6440 | 1.6629 |
| 697 | 2.47 | .185 | -10.0 | 6.00 | 0.0 | .224 | 1.0554 | 1.0707 |
| 698 | 2.99 | .224 | -10.0 | 6.00 | -5.0 | .134 | 1.5291 | 1.5522 |
| 699 | 3.00 | .225 | 5.0 | 8.00 | -10.0 | .222 | 1.4467 | 1.4910 |
| 700 | 3.00 | .225 | -20.0 | 4.00 | -5.0 | .177 | 1.3237 | 1.3777 |
| 701 | 2.48 | .186 | -20.0 | 5.00 | -20.0 | .087 | 0.7470 | 0.7496 |

MEAN ERROR= -0.0265
STANDARD DEVIATION= 0.0270

TABLE A-21
 MEASURED AND FITTED SIDE FORCE
 BETA=20. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|------|-------|------|-------|----------|----------|
| 316 | 4.00 | .000 | 4.8 | 3.70 | 5.0 | .086 | 0.0496 | 0.0451 |
| 317 | 4.00 | .000 | 4.7 | 3.70 | 5.0 | .088 | 0.0542 | 0.0480 |
| 318 | 4.00 | .000 | 4.7 | 3.60 | 0.0 | .131 | 0.0123 | -0.0174* |
| 319 | 4.00 | .000 | -0.3 | 3.60 | 0.0 | .095 | 0.0166 | -0.0270* |
| 320 | 2.00 | .000 | -0.3 | 3.60 | 0.0 | .152 | 0.0077 | -0.0266* |
| 321 | 2.00 | .000 | -0.3 | 3.70 | 0.0 | .151 | 0.0076 | -0.0265* |
| 322 | 3.00 | .000 | -0.3 | 3.60 | 0.0 | .113 | 0.0089 | -0.0267* |
| 323 | 5.00 | .000 | -0.3 | 3.60 | 0.0 | .076 | 0.0138 | -0.0273* |
| 324 | 6.00 | .000 | -0.3 | 3.70 | 0.0 | .067 | 0.0153 | -0.0278* |
| 325 | 4.00 | .000 | -0.3 | 3.60 | 0.0 | .075 | 0.0106 | -0.0268* |
| 326 | 4.00 | .000 | 4.7 | 3.60 | 0.0 | .116 | 0.0144 | -0.0201* |
| 328 | 4.00 | .000 | 9.7 | 3.70 | 0.0 | .070 | 0.0032 | -0.0255* |
| 329 | 4.00 | .000 | 14.7 | 3.70 | 0.0 | .047 | 0.0048 | -0.0248* |
| 330 | 4.00 | .000 | 19.8 | 3.60 | 0.0 | .025 | 0.0160 | -0.0166* |
| 331 | 4.00 | .000 | 27.2 | 3.60 | 0.0 | -.006 | 0.0275 | 0.0239 |
| 332 | 3.00 | .000 | 19.7 | 3.60 | 0.0 | .191 | 0.0410 | 0.0875* |
| 333 | 4.00 | .000 | -0.3 | 3.60 | 0.0 | .153 | 0.0145 | -0.0277* |
| 335 | 5.00 | .000 | -0.3 | 3.60 | 0.0 | .183 | 0.0066 | -0.0285* |
| 336 | 4.00 | .000 | -0.3 | 3.60 | 0.0 | .200 | 0.0124 | -0.0282* |
| 337 | 4.00 | .000 | 27.3 | 4.70 | 0.0 | .179 | 0.1196 | 0.2583* |
| 338 | 4.00 | .000 | -0.3 | 4.60 | 0.0 | .076 | 0.0057 | -0.0270* |
| 339 | 4.00 | .000 | -0.3 | 2.60 | 0.0 | .105 | 0.0051 | -0.0270* |
| 340 | 3.00 | .000 | 4.7 | 2.60 | 0.0 | .098 | 0.0031 | -0.0323* |
| 342 | 6.00 | .000 | 19.8 | 3.70 | 0.0 | .141 | 0.1848 | 0.1393 |
| 344 | 3.00 | .000 | 27.3 | 5.70 | 0.0 | .281 | 0.1052 | 0.3079* |
| 345 | 3.00 | .000 | 27.3 | 5.60 | 0.0 | .173 | 0.0723 | 0.2133* |
| 347 | 6.00 | .000 | -0.3 | 5.60 | 0.0 | .059 | 0.0235 | -0.0291* |
| 348 | 4.00 | .000 | -0.3 | 5.60 | 0.0 | .074 | 0.0128 | -0.0273* |
| 349 | 5.00 | .000 | 4.8 | 5.60 | 0.0 | .053 | 0.0132 | -0.0085* |
| 350 | 4.00 | .000 | -0.3 | 6.70 | 0.0 | .068 | 0.0107 | -0.0277* |
| 351 | 6.00 | .000 | -5.3 | 6.70 | 0.0 | .051 | 0.0263 | -0.0795* |
| 353 | 2.00 | .000 | 27.2 | 6.70 | 0.0 | .068 | 0.0207 | 0.0145 |
| 354 | 3.00 | .000 | -5.3 | 6.60 | 0.0 | .110 | 0.0169 | -0.0320* |
| 355 | 4.00 | .000 | 9.8 | 6.70 | 0.0 | .186 | 0.0998 | 0.0469* |
| 356 | 3.00 | .000 | -0.3 | 6.70 | -5.0 | .236 | -0.0920 | -0.1862* |
| 357 | 4.00 | .000 | 9.7 | 6.70 | -5.0 | .069 | -0.0304 | -0.0582* |
| 358 | 4.00 | .000 | 9.7 | 6.70 | -5.0 | .060 | -0.0238 | -0.0510* |
| 359 | 4.00 | .000 | 9.7 | 6.70 | -5.0 | .061 | -0.0200 | -0.0514* |
| 362 | 4.00 | .000 | 9.7 | 5.60 | -5.0 | .065 | -0.0237 | -0.0603* |
| 364 | 3.00 | .000 | 14.7 | 5.70 | -5.0 | .266 | -0.1196 | -0.1270 |
| 365 | 5.00 | .000 | 19.8 | 5.60 | -5.0 | .170 | -0.2110 | -0.1608 |
| 366 | 6.00 | .000 | 19.8 | 4.70 | -5.0 | .132 | -0.2184 | -0.1880 |
| 368 | 4.00 | .000 | 9.7 | 2.60 | -5.0 | .109 | -0.0591 | -0.1477* |
| 369 | 2.00 | .000 | 9.7 | 2.60 | -5.0 | .172 | -0.0272 | -0.0872* |
| 370 | 4.00 | .000 | 14.7 | 2.60 | -5.0 | .045 | -0.0096 | -0.0868* |
| 371 | 5.00 | .000 | 4.7 | 2.60 | -5.0 | .145 | -0.1495 | -0.2821* |
| 374 | 5.00 | .000 | -0.3 | 3.60 | -5.0 | .069 | -0.0387 | -0.0951* |
| 375 | 5.00 | .000 | -0.3 | 3.60 | -5.0 | .067 | -0.0395 | -0.0898* |
| 376 | 4.00 | .000 | -0.3 | 3.70 | -5.0 | .087 | -0.0397 | -0.0969* |
| 377 | 4.00 | .000 | 4.7 | 3.60 | 5.0 | .081 | 0.0507 | 0.0371 |

TABLE A-21 (cont'd)

MEASURED AND FITTED SIDE FORCE
BETA=20. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|------|-------|------|-------|----------|-----------|
| 378 | 4.00 | .000 | 4.8 | 3.60 | 5.0 | .064 | 0.0363 | 0.0085 * |
| 379 | 4.00 | .000 | -0.3 | 3.60 | 5.0 | .084 | 0.0611 | 0.0397 |
| 380 | 3.00 | .000 | -5.3 | 3.60 | 5.0 | .148 | 0.0780 | 0.0675 |
| 381 | 3.00 | .000 | -0.3 | 2.60 | 5.0 | .117 | 0.0641 | 0.0495 |
| 382 | 5.00 | .000 | 4.7 | 2.60 | 5.0 | .076 | 0.0728 | 0.0792 |
| 383 | 3.00 | .000 | 19.7 | 2.60 | 5.0 | .028 | 0.0207 | -0.0139 * |
| 385 | 5.00 | .000 | 14.8 | 2.60 | 5.0 | .153 | 0.3629 | 0.3692 |
| 387 | 6.00 | .000 | 4.8 | 2.60 | 5.0 | .151 | 0.3746 | 0.3877 |
| 388 | 3.00 | .000 | -5.2 | 6.70 | 5.0 | .310 | 0.1143 | 0.1550 |
| 389 | 5.00 | .000 | 9.7 | 6.60 | 5.0 | .040 | 0.0232 | 0.0480 * |
| 395 | 4.00 | .000 | 27.4 | 5.60 | 5.0 | .176 | 0.6101 | 0.5447 |
| 396 | 4.00 | .000 | 4.8 | 3.60 | 5.0 | .081 | 0.0512 | 0.0369 |
| 397 | 4.00 | .000 | -0.2 | 3.60 | 10.0 | .084 | 0.1034 | 0.1054 |
| 398 | 3.00 | .000 | -5.3 | 3.60 | 10.0 | .146 | 0.1440 | 0.1637 |
| 399 | 4.00 | .000 | 9.8 | 3.60 | 10.0 | .087 | 0.0831 | 0.1459 * |
| 400 | 5.00 | .000 | 19.7 | 3.60 | 10.0 | .019 | 0.0496 | 0.0636 |
| 401 | 4.00 | .000 | 14.8 | 3.60 | 10.0 | .163 | 0.4902 | 0.4681 |
| 402 | 3.00 | .000 | 14.7 | 6.60 | 10.0 | .223 | 0.4020 | 0.4015 |
| 403 | 3.00 | .000 | 4.7 | 6.60 | 10.0 | .152 | 0.1746 | 0.1711 |
| 404 | 5.00 | .000 | -0.3 | 6.60 | 10.0 | .091 | 0.1840 | 0.1766 |
| 405 | 2.00 | .000 | -5.3 | 6.60 | 10.0 | .120 | 0.0524 | 0.0557 * |
| 406 | 4.00 | .000 | 27.3 | 6.60 | 10.0 | -.027 | 0.0526 | 0.1262 * |
| 407 | 3.00 | .000 | 27.2 | 6.60 | 10.0 | -.025 | 0.0338 | 0.0426 * |
| 408 | 2.00 | .000 | 19.7 | 4.60 | 10.0 | .038 | 0.0201 | -0.0428 * |
| 409 | 4.00 | .000 | 9.7 | 2.60 | 10.0 | .063 | 0.0656 | 0.0782 |
| 410 | 3.00 | .000 | 27.3 | 5.60 | 10.0 | -.016 | 0.0430 | 0.0424 |
| 411 | 3.00 | .000 | -5.2 | 5.60 | 10.0 | .211 | 0.2206 | 0.2370 |
| 412 | 3.00 | .000 | -5.3 | 5.60 | 10.0 | .212 | 0.2209 | 0.2376 |
| 413 | 5.00 | .000 | -5.2 | 5.50 | 15.0 | .089 | 0.2873 | 0.2712 |
| 414 | 3.00 | .000 | -0.3 | 5.60 | 15.0 | .201 | 0.3481 | 0.3565 |
| 415 | 5.00 | .000 | 19.7 | 5.50 | 15.0 | .028 | 0.1111 | 0.1870 * |
| 417 | 5.00 | .000 | -0.3 | 5.50 | 15.0 | .057 | 0.1235 | 0.0811 |
| 419 | 6.00 | .000 | 27.2 | 3.60 | 15.0 | -.048 | 0.0639 | -0.1932 * |
| 420 | 4.00 | .000 | 14.8 | 2.60 | 15.0 | .056 | 0.1045 | 0.1575 * |
| 421 | 3.00 | .000 | 4.8 | 2.60 | 15.0 | .109 | 0.1676 | 0.1744 * |
| 422 | 3.00 | .000 | 9.8 | 2.60 | 15.0 | .152 | 0.2435 | 0.3376 * |
| 423 | 4.00 | .000 | 14.8 | 2.60 | 15.0 | .130 | 0.5697 | 0.5404 |
| 424 | 6.00 | .000 | 4.8 | 2.60 | 15.0 | .125 | 0.8731 | 0.9026 |
| 427 | 5.00 | .000 | 14.8 | 4.50 | 15.0 | .077 | 0.3131 | 0.3578 |
| 428 | 4.00 | .000 | 4.8 | 4.60 | 15.0 | .215 | 0.7305 | 0.7461 * |
| 429 | 4.00 | .000 | -0.2 | 4.70 | 15.0 | .290 | 1.1766 | 1.0497 * |
| 430 | 6.00 | .000 | -5.2 | 4.60 | 15.0 | .080 | 0.3226 | 0.3340 |
| 431 | 3.00 | .000 | 14.8 | 4.60 | 15.0 | .135 | 0.2788 | 0.2917 |
| 432 | 5.00 | .000 | 14.8 | 4.60 | 15.0 | .033 | 0.0664 | 0.0723 |
| 433 | 3.00 | .000 | 14.7 | 4.60 | 15.0 | .056 | 0.0550 | 0.0481 |
| 434 | 4.00 | .000 | -0.3 | 4.60 | 15.0 | .063 | 0.0944 | 0.0663 |
| 435 | 2.00 | .000 | 4.7 | 6.70 | 15.0 | .123 | 0.0732 | 0.0676 |
| 436 | 6.00 | .000 | 9.7 | 6.70 | 15.0 | .041 | 0.1021 | 0.1190 |
| 437 | 3.00 | .000 | 27.2 | 6.60 | 15.0 | .001 | 0.0761 | 0.1702 * |
| 438 | 4.00 | .000 | -5.2 | 6.60 | 15.0 | .185 | 0.5139 | 0.5345 |

TABLE A-21 (cont'd)

MEASURED AND FITTED SIDE FORCE
BETA=20. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|---------|
| 439 | 4.00 | .000 | -0.3 | 6.60 | 20.0 | .051 | 0.0868 | 0.0846 |
| 440 | 3.00 | .000 | 4.7 | 5.60 | 20.0 | .075 | 0.0902 | 0.0787 |
| 443 | 6.00 | .000 | 27.2 | 5.50 | 20.0 | -.013 | 0.2486 | 0.2302* |
| 445 | 2.00 | .000 | 27.3 | 4.60 | 20.0 | .138 | 0.3098 | 0.4225 |
| 446 | 4.00 | .000 | 27.2 | 4.60 | 20.0 | -.025 | 0.0795 | 0.0732 |
| 447 | 2.00 | .000 | 19.8 | 4.60 | 20.0 | .112 | 0.1502 | 0.1755 |
| 448 | 3.00 | .000 | 4.7 | 4.60 | 20.0 | .115 | 0.2364 | 0.2063 |
| 449 | 3.00 | .000 | 9.7 | 4.60 | 20.0 | .065 | 0.0830 | 0.0554 |
| 450 | 4.00 | .000 | -0.3 | 3.60 | 20.0 | .085 | 0.2344 | 0.2497 |
| 451 | 3.00 | .000 | 19.7 | 3.60 | 20.0 | .057 | 0.1380 | 0.1705 |
| 453 | 6.00 | .000 | 9.8 | 3.60 | 20.0 | .119 | 1.0838 | 1.0623* |
| 454 | 4.00 | .000 | 9.8 | 3.60 | 20.0 | .190 | 1.0960 | 0.9299* |
| 455 | 6.00 | .000 | 19.7 | 2.60 | 20.0 | .032 | 0.2110 | 0.3312* |
| 456 | 4.00 | .000 | 14.8 | 2.60 | 20.0 | .072 | 0.2788 | 0.3205* |
| 457 | 4.00 | .000 | 19.8 | 1.60 | 20.0 | .014 | 0.0488 | 0.1029 |
| 459 | 4.00 | .000 | 4.8 | 3.60 | 5.0 | .077 | 0.0439 | 0.0310 |
| 211 | 2.07 | .052 | 0.0 | 3.00 | 0.0 | .106 | 0.2649 | 0.2551 |
| 212 | 2.96 | .074 | 0.0 | 3.00 | 0.0 | .079 | 0.5424 | 0.5353 |
| 213 | 3.92 | .098 | 0.0 | 3.00 | 0.0 | .070 | 0.9555 | 0.9542 |
| 214 | 5.00 | .125 | 0.0 | 3.00 | 0.0 | .056 | 1.5583 | 1.5660 |
| 215 | 5.96 | .149 | 0.0 | 3.00 | 0.0 | .047 | 2.2594 | 2.2491 |
| 216 | 2.94 | .074 | 0.0 | 3.00 | 0.0 | .069 | 0.5381 | 0.5281 |
| 217 | 3.01 | .075 | 0.0 | 3.00 | 0.0 | .106 | 0.5613 | 0.5570 |
| 218 | 3.02 | .075 | 0.0 | 3.00 | 0.0 | .146 | 0.5684 | 0.5585 |
| 219 | 3.97 | .099 | 0.0 | 3.00 | 0.0 | .122 | 0.9735 | 0.9753 |
| 220 | 4.00 | .100 | 0.0 | 3.00 | 0.0 | .147 | 0.9974 | 0.9879 |
| 221 | 5.00 | .125 | 0.0 | 3.00 | 0.0 | .120 | 1.5415 | 1.5575 |
| 222 | 4.95 | .124 | 0.0 | 3.00 | 0.0 | .146 | 1.5315 | 1.5190 |
| 223 | 5.96 | .149 | 0.0 | 3.00 | 0.0 | .116 | 2.2380 | 2.2245 |
| 224 | 3.00 | .075 | 5.0 | 3.00 | 0.0 | .074 | 0.5526 | 0.5411 |
| 225 | 2.97 | .074 | -5.0 | 3.00 | 0.0 | .074 | 0.5572 | 0.5516 |
| 226 | 2.99 | .075 | -10.0 | 3.00 | 0.0 | .069 | 0.5645 | 0.5684 |
| 227 | 2.99 | .075 | -15.0 | 3.00 | 0.0 | .060 | 0.5551 | 0.5715 |
| 228 | 2.97 | .074 | -20.0 | 3.00 | 0.0 | .048 | 0.5352 | 0.5588 |
| 229 | 2.95 | .074 | -27.5 | 3.00 | 0.0 | .029 | 0.5215 | 0.5061 |
| 230 | 2.98 | .074 | 0.0 | 3.00 | 5.0 | .079 | 0.5882 | 0.5717 |
| 231 | 2.98 | .074 | 0.0 | 3.00 | -5.0 | .078 | 0.5120 | 0.5064 |
| 232 | 2.94 | .073 | 0.0 | 3.00 | -10.0 | .079 | 0.4534 | 0.4486 |
| 233 | 3.02 | .075 | 0.0 | 3.00 | -15.0 | .078 | 0.4199 | 0.4219 |
| 234 | 3.01 | .075 | 0.0 | 3.00 | -20.0 | .088 | 0.3015 | 0.3284 |
| 235 | 2.98 | .075 | 0.0 | 2.00 | 0.0 | .088 | 0.5548 | 0.5494 |
| 236 | 3.00 | .075 | 0.0 | 4.00 | 0.0 | .078 | 0.5595 | 0.5490 |
| 237 | 3.01 | .075 | 0.0 | 5.00 | 0.0 | .081 | 0.5676 | 0.5578 |
| 238 | 2.97 | .074 | 0.0 | 6.00 | 0.0 | .065 | 0.5517 | 0.5488 |
| 239 | 4.90 | .123 | 5.0 | 2.00 | 0.0 | .123 | 1.5111 | 1.5265 |
| 240 | 4.00 | .100 | -5.0 | 3.00 | 0.0 | .125 | 0.9847 | 0.9802 |
| 241 | 5.99 | .150 | -15.0 | 5.00 | -10.0 | .014 | 2.1832 | 2.2123 |
| 242 | 5.99 | .150 | -27.5 | 6.00 | -5.0 | -.038 | 2.1501 | 2.1493 |
| 243 | 3.97 | .099 | -27.5 | 6.00 | -20.0 | -.046 | 0.8487 | 0.8527 |
| 244 | 2.99 | .075 | -5.0 | 3.00 | -5.0 | .077 | 0.5186 | 0.5171 |

TABLE A-21 (cont'd)

MEASURED AND FITTED SIDE FORCE
BETA=20. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|------|----------|---------|
| 245 | 4.91 | .123 | 5.0 | 3.00 | -20.0 | .056 | 1.1198 | 1.0851 |
| 246 | 1.74 | .044 | -15.0 | 6.00 | 0.0 | .155 | 0.1756 | 0.1839 |
| 247 | 3.90 | .098 | -10.0 | 2.00 | -20.0 | .111 | 0.0355 | 0.2964* |
| 248 | 4.96 | .124 | 5.0 | 2.00 | -5.0 | .059 | 1.4599 | 1.4698 |
| 250 | 3.99 | .100 | -5.0 | 6.00 | -20.0 | .058 | 0.7667 | 0.7531 |
| 252 | 6.05 | .151 | -10.0 | 3.00 | 5.0 | .105 | 2.4590 | 2.4783 |
| 254 | 3.98 | .099 | -20.0 | 4.00 | -5.0 | .104 | 0.7736 | 0.7646 |
| 255 | 2.99 | .075 | -10.0 | 3.00 | -10.0 | .136 | 0.3386 | 0.3298 |
| 256 | 2.97 | .074 | -5.0 | 3.00 | -5.0 | .079 | 0.5146 | 0.5109 |
| 259 | 5.02 | .125 | -20.0 | 4.00 | 5.0 | .135 | 1.7503 | 1.7068 |
| 261 | 3.00 | .075 | -5.0 | 2.00 | -10.0 | .067 | 0.4881 | 0.4828 |
| 262 | 4.01 | .100 | -5.0 | 6.00 | -15.0 | .059 | 0.8444 | 0.8438 |
| 263 | 2.10 | .053 | -15.0 | 2.00 | -20.0 | .055 | 0.1707 | 0.1815 |
| 264 | 6.06 | .152 | 5.0 | 3.00 | -20.0 | .052 | 1.7126 | 1.6946 |
| 265 | 6.09 | .152 | -15.0 | 2.00 | -15.0 | .027 | 2.0185 | 2.0191 |
| 266 | 4.00 | .100 | -10.0 | 5.00 | -20.0 | .086 | 0.5749 | 0.5720 |
| 267 | 4.93 | .123 | -15.0 | 2.00 | -20.0 | .063 | 0.8090 | 0.8506 |
| 268 | 2.98 | .074 | -5.0 | 3.00 | -5.0 | .078 | 0.5138 | 0.5128 |
| 269 | 2.03 | .051 | -15.0 | 4.00 | -15.0 | .069 | 0.1941 | 0.2104 |
| 270 | 5.97 | .149 | -5.0 | 5.00 | 5.0 | .095 | 2.0709 | 2.3222* |
| 271 | 4.95 | .124 | -10.0 | 2.00 | -10.0 | .056 | 1.3569 | 1.3281 |
| 272 | 5.95 | .148 | 0.0 | 3.00 | -5.0 | .067 | 2.1125 | 2.1108 |
| 273 | 5.00 | .125 | -5.0 | 2.00 | 5.0 | .069 | 1.6507 | 1.6585 |
| 274 | 5.95 | .149 | -5.0 | 3.00 | 0.0 | .099 | 2.2643 | 2.2060 |
| 275 | 4.97 | .124 | -20.0 | 5.00 | 5.0 | .040 | 1.5923 | 1.5483 |
| 276 | 5.98 | .150 | -25.0 | 5.00 | -5.0 | .031 | 1.9838 | 1.9941 |
| 278 | 5.62 | .140 | 5.0 | 6.00 | -15.0 | .104 | 1.3980 | 1.3872 |
| 279 | 2.75 | .069 | -5.0 | 3.00 | -5.0 | .093 | 0.4456 | 0.4249 |
| 280 | 3.69 | .092 | -15.0 | 5.00 | 5.0 | .021 | 0.8778 | 0.8738 |
| 282 | 4.09 | .102 | -20.0 | 4.00 | -10.0 | .083 | 0.7795 | 0.7216 |
| 283 | 4.92 | .123 | -10.0 | 2.00 | -15.0 | .066 | 1.2233 | 1.0569* |
| 284 | 2.06 | .052 | -20.0 | 3.00 | 5.0 | .062 | 0.2806 | 0.3154* |
| 285 | 4.84 | .121 | -25.0 | 5.00 | -15.0 | .025 | 1.1558 | 1.0709 |
| 312 | 2.26 | .085 | 0.0 | 3.00 | 0.0 | .095 | 0.4683 | 0.4711 |
| 313 | 3.20 | .120 | 0.0 | 3.00 | 0.0 | .084 | 0.9530 | 0.9514 |
| 314 | 4.29 | .161 | 0.0 | 3.00 | 0.0 | .055 | 1.7325 | 1.7241 |
| 315 | 5.24 | .196 | 0.0 | 3.00 | 0.0 | .046 | 2.5880 | 2.5804 |
| 316 | 6.14 | .230 | 0.0 | 3.00 | 0.0 | .037 | 3.5489 | 3.5622 |
| 317 | 3.12 | .117 | 0.0 | 3.00 | 0.0 | .063 | 0.9094 | 0.9021 |
| 318 | 3.01 | .113 | 0.0 | 3.00 | 0.0 | .125 | 0.8335 | 0.8413 |
| 320 | 4.16 | .156 | 0.0 | 3.00 | 0.0 | .125 | 1.5891 | 1.6085 |
| 321 | 4.05 | .152 | 0.0 | 3.00 | 0.0 | .125 | 1.5267 | 1.5300 |
| 324 | 4.99 | .187 | 0.0 | 3.00 | 0.0 | .129 | 2.2923 | 2.3151 |
| 325 | 4.99 | .187 | 0.0 | 3.00 | 0.0 | .152 | 2.3103 | 2.3037 |
| 326 | 3.01 | .113 | 5.0 | 3.00 | 0.0 | .078 | 0.8424 | 0.8391 |
| 327 | 3.01 | .113 | -5.0 | 3.00 | 0.0 | .081 | 0.8487 | 0.8514 |
| 328 | 2.99 | .112 | -10.0 | 3.00 | 0.0 | .071 | 0.8465 | 0.8468 |
| 329 | 3.01 | .113 | -15.0 | 3.00 | 0.0 | .051 | 0.8482 | 0.8682 |
| 330 | 3.02 | .113 | -20.0 | 3.00 | 0.0 | .044 | 0.8358 | 0.8666 |
| 331 | 2.99 | .112 | -27.5 | 3.00 | 0.0 | .021 | 0.8083 | 0.8184 |

R-1851

TABLE A-21 (cont'd)

MEASURED AND FITTED SIDE FORCE
BETA=20. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|---------|
| 332 | 2.95 | .111 | 0.0 | 3.00 | 5.0 | .041 | 0.8317 | 0.7943 |
| 333 | 3.05 | .114 | 0.0 | 3.00 | -5.0 | .092 | 0.8106 | 0.8118 |
| 334 | 2.81 | .106 | 0.0 | 3.00 | -10.0 | .097 | 0.6326 | 0.6285 |
| 335 | 2.81 | .105 | 0.0 | 3.00 | -15.0 | .098 | 0.5603 | 0.5595 |
| 336 | 2.83 | .106 | 0.0 | 3.00 | -20.0 | .068 | 0.5799 | 0.5862 |
| 337 | 2.87 | .107 | 0.0 | 2.00 | 0.0 | .105 | 0.7594 | 0.7722 |
| 338 | 2.90 | .109 | 0.0 | 4.00 | 0.0 | .078 | 0.7798 | 0.7794 |
| 341 | 3.06 | .115 | 0.0 | 5.00 | 0.0 | .081 | 0.8698 | 0.8712 |
| 346 | 1.90 | .071 | -20.0 | 4.00 | 5.0 | .136 | 0.3638 | 0.3774 |
| 347 | 4.06 | .152 | -5.0 | 3.00 | -5.0 | .086 | 1.4462 | 1.4453 |
| 348 | 4.97 | .186 | 5.0 | 4.00 | -20.0 | .086 | 1.6951 | 1.6133* |
| 349 | 4.99 | .187 | -15.0 | 4.00 | 5.0 | .175 | 2.4595 | 2.4868 |
| 350 | 3.01 | .113 | -5.0 | 3.00 | -5.0 | .087 | 0.7995 | 0.7996 |
| 351 | 4.05 | .152 | -15.0 | 6.00 | 0.0 | .019 | 1.5435 | 1.5473 |
| 352 | 5.94 | .223 | -0.0 | 2.00 | -5.0 | .040 | 3.2620 | 3.2892 |
| 353 | 4.99 | .187 | -20.0 | 5.00 | 0.0 | .072 | 2.1786 | 2.2309 |
| 355 | 5.00 | .187 | -20.0 | 5.00 | 0.0 | .079 | 2.2013 | 2.2355 |
| 359 | 4.00 | .150 | -25.0 | 5.00 | 5.0 | .098 | 1.5355 | 1.5326 |
| 360 | 4.00 | .150 | 0.0 | 4.00 | 5.0 | .209 | 1.6505 | 1.6828 |
| 361 | 5.99 | .225 | -25.0 | 5.00 | -20.0 | -.011 | 2.9348 | 2.9057 |
| 362 | 4.01 | .150 | -15.0 | 6.00 | 0.0 | .016 | 1.5144 | 1.5152 |
| 363 | 4.04 | .152 | 5.0 | 4.00 | -10.0 | .192 | 1.0204 | 1.0229 |
| 364 | 4.03 | .151 | -5.0 | 3.00 | 0.0 | .129 | 1.4898 | 1.4951 |
| 365 | 2.97 | .111 | -5.0 | 3.00 | -5.0 | .091 | 0.7706 | 0.7747 |
| 366 | 4.97 | .187 | -10.0 | 6.00 | -20.0 | .055 | 1.9684 | 1.8154* |
| 370 | 5.52 | .207 | -5.0 | 3.00 | -20.0 | .090 | 1.7890 | 1.8361 |
| 371 | 5.02 | .188 | 5.0 | 3.00 | 0.0 | .069 | 2.3686 | 2.3861 |
| 372 | 2.99 | .112 | 5.0 | 2.00 | -20.0 | .094 | 0.5017 | 0.5175 |
| 373 | 1.97 | .074 | -20.0 | 6.00 | -5.0 | .187 | 0.2374 | 0.2176 |
| 374 | 2.92 | .109 | -20.0 | 6.00 | -5.0 | .105 | 0.6882 | 0.6683 |
| 376 | 5.00 | .187 | -5.0 | 2.00 | 0.0 | .071 | 2.3546 | 2.3457 |
| 378 | 4.02 | .151 | 0.0 | 6.00 | -20.0 | .126 | 0.8694 | 0.8767 |
| 379 | 6.01 | .225 | -20.0 | 2.00 | 0.0 | .004 | 3.3995 | 3.4206 |
| 380 | 4.97 | .187 | -20.0 | 2.00 | -5.0 | .082 | 2.0494 | 2.0667 |
| 381 | 2.99 | .112 | -5.0 | 3.00 | -5.0 | .082 | 0.7873 | 0.7926 |
| 384 | 5.95 | .223 | -10.0 | 3.00 | 5.0 | .094 | 3.4555 | 3.4309 |
| 386 | 4.85 | .182 | -15.0 | 3.00 | -5.0 | .092 | 2.0087 | 1.9869 |
| 387 | 5.12 | .192 | -5.0 | 3.00 | -5.0 | .114 | 2.2275 | 2.2136 |
| 390 | 6.10 | .229 | 5.0 | 5.00 | -15.0 | .089 | 2.8433 | 2.8384 |
| 395 | 4.23 | .158 | -10.0 | 6.00 | -5.0 | .038 | 1.6378 | 1.6478 |
| 396 | 3.19 | .119 | -27.5 | 4.00 | 0.0 | .128 | 0.8534 | 0.8081 |
| 397 | 3.15 | .118 | -5.0 | 4.00 | -15.0 | .097 | 0.7044 | 0.7130 |
| 398 | 4.10 | .154 | -5.0 | 5.00 | 5.0 | .137 | 1.6412 | 1.6564 |
| 399 | 3.07 | .115 | -5.0 | 3.00 | -5.0 | .061 | 0.8476 | 0.8596 |
| 402 | 6.06 | .227 | -10.0 | 2.00 | 5.0 | .040 | 3.5093 | 3.4850 |
| 403 | 3.11 | .117 | -10.0 | 5.00 | -10.0 | .151 | 0.6090 | 0.6383 |
| 404 | 2.98 | .112 | -15.0 | 6.00 | -10.0 | .135 | 0.5595 | 0.5789 |
| 405 | 4.04 | .151 | -20.0 | 5.00 | -10.0 | .090 | 1.1725 | 1.1717 |
| 702 | 2.99 | .224 | 0.0 | 3.00 | 0.0 | .093 | 1.6427 | 1.6413 |
| 703 | 1.98 | .149 | 0.0 | 3.00 | 0.0 | .123 | 0.7154 | 0.7389 |

TABLE A-21 (cont'd)
 MEASURED AND FITTED SIDE FORCE
 BETA=20. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|---------|
| 704 | 2.49 | .187 | 0.0 | 3.00 | 0.0 | .103 | 1.1362 | 1.1481 |
| 705 | 3.01 | .226 | 0.0 | 3.00 | 0.0 | .071 | 1.6779 | 1.6579 |
| 706 | 2.99 | .224 | 0.0 | 3.00 | 0.0 | .115 | 1.6353 | 1.6492 |
| 707 | 2.99 | .224 | 0.0 | 3.00 | 0.0 | .176 | 1.6487 | 1.6403 |
| 709 | 3.01 | .226 | 5.0 | 3.00 | 0.0 | .085 | 1.6595 | 1.6812 |
| 710 | 3.01 | .226 | -5.0 | 3.00 | 0.0 | .091 | 1.6723 | 1.6622 |
| 711 | 3.01 | .226 | -10.0 | 3.00 | 0.0 | .076 | 1.6706 | 1.6573 |
| 712 | 3.00 | .225 | -15.0 | 3.00 | 0.0 | .057 | 1.6630 | 1.6511 |
| 713 | 3.00 | .225 | -20.0 | 3.00 | 0.0 | .028 | 1.6587 | 1.6617 |
| 714 | 3.00 | .225 | -27.5 | 3.00 | 0.0 | .006 | 1.6349 | 1.6482 |
| 715 | 3.01 | .226 | 0.0 | 3.00 | 5.0 | .088 | 1.7039 | 1.6868 |
| 716 | 3.00 | .225 | 0.0 | 3.00 | -5.0 | .099 | 1.6033 | 1.6031 |
| 717 | 3.01 | .225 | 0.0 | 3.00 | -10.0 | .099 | 1.5355 | 1.5296 |
| 718 | 3.01 | .225 | 0.0 | 3.00 | -15.0 | .103 | 1.4291 | 1.4204 |
| 719 | 3.01 | .226 | 0.0 | 3.00 | -20.0 | .104 | 1.2802 | 1.2950 |
| 720 | 3.01 | .226 | 0.0 | 2.00 | 0.0 | .090 | 1.6821 | 1.6808 |
| 721 | 3.02 | .226 | 0.0 | 4.00 | 0.0 | .100 | 1.6706 | 1.6666 |
| 722 | 3.00 | .225 | 0.0 | 5.00 | 0.0 | .094 | 1.6567 | 1.6540 |
| 723 | 3.01 | .226 | 0.0 | 6.00 | 0.0 | .089 | 1.6766 | 1.6826 |
| 724 | 2.53 | .190 | 0.0 | 6.00 | -20.0 | .084 | 1.0008 | 0.9981 |
| 726 | 2.53 | .189 | 5.0 | 8.00 | -5.0 | .256 | 1.0827 | 1.0719 |
| 728 | 2.99 | .224 | -5.0 | 3.00 | -5.0 | .165 | 1.5275 | 1.4956 |
| 730 | 2.99 | .224 | -5.0 | 6.00 | 5.0 | .267 | 1.6874 | 1.6786 |
| 731 | 1.95 | .147 | 0.0 | 5.00 | -10.0 | .249 | 0.5316 | 0.5199 |
| 732 | 2.49 | .187 | -27.5 | 3.00 | -10.0 | -.010 | 1.0945 | 1.0811 |
| 733 | 3.00 | .225 | -5.0 | 3.00 | -5.0 | .100 | 1.6100 | 1.5925 |
| 735 | 1.97 | .148 | -27.5 | 3.00 | -10.0 | .079 | 0.5842 | 0.5497 |
| 736 | 3.00 | .225 | -20.0 | 3.00 | 5.0 | .094 | 1.6835 | 1.7064 |
| 737 | 3.00 | .225 | -27.5 | 6.00 | -10.0 | .141 | 1.0846 | 1.1791* |
| 738 | 1.99 | .149 | -10.0 | 3.00 | -15.0 | .137 | 0.5573 | 0.5764 |
| 741 | 2.48 | .186 | 0.0 | 3.00 | -5.0 | .132 | 1.0700 | 1.0876 |
| 743 | 2.53 | .190 | 5.0 | 8.00 | -10.0 | .273 | 0.8927 | 0.9021 |
| 744 | 2.04 | .153 | -10.0 | 3.00 | -10.0 | .092 | 0.7127 | 0.7260 |
| 746 | 3.01 | .226 | -5.0 | 5.00 | -20.0 | .242 | 0.7445 | 0.7627 |
| 747 | 3.01 | .226 | -5.0 | 3.00 | -5.0 | .086 | 1.6238 | 1.6141 |
| 749 | 3.07 | .230 | -10.0 | 6.00 | -5.0 | .166 | 1.5289 | 1.5448 |
| 750 | 2.57 | .193 | 5.0 | 5.00 | 0.0 | .129 | 1.1936 | 1.2359 |
| 751 | 2.57 | .193 | -10.0 | 6.00 | 0.0 | .067 | 1.2247 | 1.2510 |
| 752 | 2.07 | .155 | -27.5 | 3.00 | -20.0 | -.018 | 0.6933 | 0.6795 |
| 754 | 2.00 | .150 | 5.0 | 6.00 | 0.0 | .257 | 0.7431 | 0.7456 |
| 755 | 2.14 | .160 | -15.0 | 3.00 | 5.0 | .120 | 0.7414 | 0.9100* |
| 757 | 2.51 | .188 | 0.0 | 8.00 | -20.0 | .339 | 0.2652 | 0.3050 |
| 758 | 2.51 | .189 | -15.0 | 6.00 | -15.0 | .062 | 1.0774 | 1.0594 |
| 759 | 2.51 | .188 | 5.0 | 6.00 | -10.0 | .280 | 0.8342 | 0.8412 |
| 760 | 3.00 | .225 | -5.0 | 3.00 | -5.0 | .094 | 1.6167 | 1.5941 |
| 761 | 3.00 | .225 | -15.0 | 5.00 | 0.0 | .257 | 1.4674 | 1.4714 |
| 763 | 2.51 | .188 | -20.0 | 7.00 | 0.0 | .301 | 0.9215 | 0.9118 |
| 764 | 2.99 | .224 | 0.0 | 5.00 | -5.0 | .103 | 1.5935 | 1.5951 |
| 765 | 2.99 | .224 | -5.0 | 5.00 | -15.0 | .183 | 1.2177 | 1.1701* |
| 766 | 2.02 | .151 | 0.0 | 5.00 | 5.0 | .372 | -1.8533 | 0.8008* |

R-1851

TABLE A-21 (cont'd)

MEASURED AND FITTED SIDE FORCE
BETA=20. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|------|----------|---------|
| 769 | 2.51 | .188 | -10.0 | 8.00 | -15.0 | .234 | 0.7300 | 0.6811 |
| 771 | 3.00 | .225 | -10.0 | 2.00 | 5.0 | .107 | 1.7051 | 1.7217 |
| 772 | 3.00 | .225 | -25.0 | 5.00 | -10.0 | .151 | 1.1175 | 1.1943* |
| 773 | 2.98 | .224 | -5.0 | 3.00 | -5.0 | .103 | 1.5817 | 1.5654 |
| 774 | 2.49 | .186 | -10.0 | 4.00 | 0.0 | .251 | 1.0820 | 1.0624 |
| 775 | 2.98 | .224 | -10.0 | 6.00 | -5.0 | .176 | 1.4397 | 1.4467 |
| 777 | 2.49 | .187 | 5.0 | 8.00 | -10.0 | .330 | 0.7696 | 0.7600* |
| 780 | 2.97 | .223 | -25.0 | 6.00 | -5.0 | .212 | 1.0557 | 1.2066 |
| 781 | 2.48 | .186 | -25.0 | 5.00 | -20.0 | .104 | 0.6311 | 0.6817 |

MEAN ERROR= -0.0230
STANDARD DEVIATION= 0.0576

TABLE A-22

MEASURED AND FITTED ROLL MOMENT
BETA=10. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|------|-------|------|-------|----------|----------|
| 3 | 4.00 | .000 | 2.1 | 2.60 | 0.0 | .043 | -0.0005 | 0.0113* |
| 5 | 4.00 | .000 | 4.6 | 2.50 | 0.0 | .035 | -0.0135 | -0.0002* |
| 6 | 4.00 | .000 | 7.2 | 2.60 | 0.0 | .139 | -0.1293 | -0.0908 |
| 7 | 4.00 | .000 | 9.7 | 2.50 | 0.0 | .020 | -0.0360 | -0.0135* |
| 8 | 4.00 | .000 | 12.2 | 2.40 | 0.0 | .011 | -0.0521 | -0.0083* |
| 1 | 4.00 | .000 | 4.7 | 2.50 | 5.0 | .028 | -0.0204 | 0.0010* |
| 2 | 4.00 | .000 | 0.1 | 2.60 | 0.0 | .048 | 0.0107 | 0.0256* |
| 9 | 4.00 | .000 | 0.0 | 2.60 | -5.0 | .046 | 0.0163 | 0.0299* |
| 10 | 4.00 | .000 | 0.0 | 2.60 | 5.0 | .046 | -0.0066 | 0.0227* |
| 11 | 4.00 | .000 | 0.0 | 2.60 | 10.0 | .048 | -0.0145 | 0.0181* |
| 12 | 4.00 | .000 | 0.1 | 2.60 | 15.0 | .047 | -0.0288 | 0.0157* |
| 13 | 4.00 | .000 | 0.1 | 2.60 | 20.0 | .046 | -0.0392 | 0.0198* |
| 14 | 4.00 | .000 | 0.1 | 1.60 | 0.0 | .062 | 0.0068 | 0.0260* |
| 15 | 4.00 | .000 | 0.0 | 3.70 | 0.0 | .039 | 0.0101 | 0.0264* |
| 16 | 4.00 | .000 | 0.0 | 4.70 | 0.0 | .036 | 0.0118 | 0.0264* |
| 17 | 4.00 | .000 | 0.0 | 5.70 | 0.0 | .032 | 0.0122 | 0.0264* |
| 18 | 4.00 | .000 | 0.0 | 2.60 | 0.0 | .038 | 0.0089 | 0.0264* |
| 19 | 4.00 | .000 | 0.1 | 2.60 | 0.0 | .061 | 0.0088 | 0.0254* |
| 21 | 4.00 | .000 | 0.0 | 1.60 | 0.0 | .048 | 0.0112 | 0.0264* |
| 23 | 4.00 | .000 | 0.0 | 1.60 | 0.0 | .049 | 0.0078 | 0.0264* |
| 24 | 4.00 | .000 | 5.1 | 2.80 | 0.0 | .039 | 0.0250 | -0.0125* |
| 25 | 4.00 | .000 | 0.1 | 2.70 | 0.0 | .101 | 0.0153 | 0.0250* |
| 26 | 4.00 | .000 | 0.1 | 2.70 | 0.0 | .159 | 0.0185 | 0.0246 |
| 27 | 4.00 | .000 | 0.1 | 2.70 | 0.0 | .170 | 0.0255 | 0.0245 |
| 29 | 2.00 | .000 | 0.0 | 2.60 | 0.0 | .083 | 0.0062 | 0.0264* |
| 30 | 3.00 | .000 | 0.0 | 2.60 | 0.0 | .057 | 0.0103 | 0.0264* |
| 31 | 5.00 | .000 | 0.0 | 2.60 | 0.0 | .040 | 0.0075 | 0.0264* |
| 32 | 6.00 | .000 | 0.0 | 2.60 | 0.0 | .035 | 0.0068 | 0.0264* |
| 34 | 5.00 | .000 | 2.4 | 2.40 | -5.0 | .076 | -0.0231 | 0.0404* |
| 36 | 2.00 | .000 | 7.4 | 5.50 | -5.0 | .287 | 0.0094 | 0.1036* |
| 37 | 3.00 | .000 | 5.0 | 4.50 | 20.0 | .058 | -0.0629 | -0.0295* |
| 40 | 4.00 | .000 | 12.4 | 4.50 | 20.0 | .007 | -0.1132 | -0.2143* |
| 41 | 3.00 | .000 | 5.0 | 4.50 | 20.0 | .031 | -0.0158 | -0.0017* |
| 42 | 2.00 | .000 | 10.0 | 4.50 | 20.0 | .079 | -0.0814 | -0.0688 |
| 43 | 2.00 | .000 | 10.0 | 4.50 | 20.0 | .056 | -0.0543 | -0.0540 |
| 44 | 5.00 | .000 | 7.4 | 4.50 | 20.0 | .019 | -0.0564 | -0.0738 |
| 45 | 2.00 | .000 | 12.4 | 4.50 | 20.0 | .124 | -0.1760 | -0.1738 |
| 46 | 3.00 | .000 | 10.0 | 3.50 | 20.0 | .110 | -0.2548 | -0.2852 |
| 47 | 4.00 | .000 | 10.0 | 2.50 | 20.0 | .042 | -0.1585 | -0.2006 |
| 48 | 4.00 | .000 | 0.1 | 6.50 | 20.0 | .111 | -0.0506 | -0.0980* |
| 49 | 6.00 | .000 | 9.9 | 2.40 | 20.0 | .034 | -0.2907 | -0.2419 |
| 50 | 4.00 | .000 | 4.9 | 5.60 | 20.0 | .243 | -1.2447 | -1.2156 |
| 51 | 3.00 | .000 | 0.0 | 5.50 | 20.0 | .059 | -0.0093 | 0.0593* |
| 52 | 4.00 | .000 | 7.5 | 2.50 | 20.0 | .056 | -0.1524 | -0.1586* |
| 53 | 4.00 | .000 | 2.4 | 3.50 | 20.0 | .112 | -0.1103 | -0.2406* |
| 54 | 3.00 | .000 | 2.5 | 5.50 | 20.0 | .033 | -0.0151 | 0.0515* |
| 55 | 5.00 | .000 | 0.1 | 6.50 | 10.0 | .045 | -0.0186 | 0.0584 |
| 56 | 2.00 | .000 | 10.0 | 4.60 | 10.0 | .030 | -0.0203 | -0.0177 |
| 57 | 4.00 | .000 | 5.0 | 2.50 | 10.0 | .036 | -0.0226 | -0.0190 |
| 58 | 3.00 | .000 | 12.5 | 6.50 | 10.0 | -.005 | -0.0163 | 0.0599* |

TABLE A-22 (cont'd)

MEASURED AND FITTED ROLL MOMENT
BETA=10. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|------|-------|------|-------|----------|-----------|
| 59 | 4.00 | .000 | 2.5 | 3.60 | 5.0 | .040 | -0.0080 | 0.0011 * |
| 60 | 4.00 | .000 | 2.5 | 3.60 | 5.0 | .029 | -0.0045 | 0.0101 * |
| 61 | 4.00 | .000 | 5.1 | 3.50 | 5.0 | .043 | 0.0461 | -0.0364 * |
| 62 | 3.00 | .000 | 0.0 | 2.50 | 5.0 | .054 | 0.0028 | 0.0249 * |
| 63 | 5.00 | .000 | 2.5 | 2.50 | 5.0 | .035 | -0.0126 | 0.0107 * |
| 64 | 3.00 | .000 | 9.9 | 2.60 | 5.0 | .013 | -0.0129 | -0.0304 * |
| 65 | 4.00 | .000 | 5.0 | 2.60 | 5.0 | .039 | -0.0132 | -0.0167 * |
| 66 | 5.00 | .000 | 5.0 | 6.60 | 5.0 | .022 | -0.0114 | -0.0185 * |
| 67 | 3.00 | .000 | 9.9 | 6.60 | 5.0 | .020 | 0.0463 | 0.0430 * |
| 68 | 6.00 | .000 | 12.4 | 5.70 | 5.0 | -.006 | 0.0388 | -0.1395 * |
| 69 | 3.00 | .000 | -5.1 | 6.60 | 5.0 | .240 | 0.1183 | 0.0082 * |
| 70 | 6.00 | .000 | -5.1 | 5.70 | 5.0 | .016 | 0.0020 | 0.1894 * |
| 71 | 6.00 | .000 | 7.4 | 5.60 | 5.0 | .012 | -0.0114 | -0.0852 * |
| 72 | 4.00 | .000 | 12.4 | 5.60 | 5.0 | .102 | -0.3540 | -0.3600 * |
| 73 | 2.00 | .000 | 0.0 | 5.60 | 5.0 | .060 | 0.0088 | 0.0374 * |
| 74 | 4.00 | .000 | 2.4 | 3.60 | 5.0 | .041 | -0.0147 | 0.0014 * |
| 76 | 5.00 | .000 | 2.4 | 5.60 | 0.0 | .026 | 0.0024 | -0.0126 * |
| 77 | 2.00 | .000 | 4.9 | 5.70 | 0.0 | .329 | -0.0488 | 0.0117 * |
| 78 | 6.00 | .000 | 7.5 | 5.70 | 0.0 | .015 | -0.0148 | -0.1339 * |
| 79 | 3.00 | .000 | 12.4 | 5.60 | 0.0 | .112 | -0.1807 | -0.1662 * |
| 80 | 3.00 | .000 | 12.4 | 5.60 | 0.0 | .247 | -0.2961 | -0.2708 * |
| 81 | 4.00 | .000 | 12.4 | 4.60 | 0.0 | .117 | -0.2882 | -0.2776 * |
| 82 | 4.00 | .000 | 4.9 | 6.60 | 0.0 | .099 | -0.1316 | -0.0872 * |
| 83 | 3.00 | .000 | -5.1 | 6.60 | 0.0 | .049 | 0.0574 | 0.0407 * |
| 84 | 3.00 | .000 | 2.4 | 2.60 | 0.0 | .044 | 0.0073 | 0.0135 * |
| 85 | 4.00 | .000 | 7.4 | 2.60 | -5.0 | .026 | -0.0084 | 0.0001 * |
| 87 | 2.00 | .000 | 4.9 | 2.60 | -5.0 | .135 | -0.0030 | 0.0242 * |
| 88 | 4.00 | .000 | 4.9 | 2.60 | -5.0 | .061 | -0.0197 | 0.0020 * |
| 89 | 2.00 | .000 | 7.4 | 5.70 | -5.0 | .285 | 0.0117 | 0.0949 * |
| 90 | 6.00 | .000 | 7.5 | 6.70 | -5.0 | .014 | 0.0074 | -0.1824 * |
| 91 | 2.00 | .000 | 0.0 | 4.60 | -5.0 | .119 | 0.0100 | 0.0264 * |
| 92 | 5.00 | .000 | 0.0 | 3.60 | -5.0 | .037 | 0.0231 | 0.0180 * |
| 93 | 6.00 | .000 | 9.9 | 3.50 | -5.0 | .110 | -0.1293 | -0.1356 * |
| 94 | 6.00 | .000 | 9.9 | 4.60 | -5.0 | .078 | 2138 | -0.2255 * |
| 95 | 6.00 | .000 | 10.0 | 5.60 | -5.0 | .002 | 0.0035 | -0.1711 * |
| 97 | 4.00 | .000 | 9.9 | 5.60 | -5.0 | .037 | -0.0218 | -0.0620 * |
| 98 | 5.00 | .000 | 9.9 | 5.50 | -5.0 | .097 | -0.2303 | -0.2030 * |
| 99 | 3.00 | .000 | 0.1 | 6.60 | -5.0 | .142 | 0.0204 | 0.0539 * |
| 100 | 4.00 | .000 | 4.9 | 6.60 | -5.0 | .034 | -0.0102 | -0.0244 * |
| 101 | 4.00 | .000 | 2.4 | 3.50 | 5.0 | .039 | -0.0117 | 0.0031 * |
| 102 | 6.00 | .000 | 9.9 | 2.50 | 0.0 | .105 | -0.2613 | -0.2355 * |
| 103 | 3.00 | .000 | -5.1 | 2.50 | 10.0 | .122 | -0.0487 | -0.0136 * |
| 105 | 5.00 | .000 | 10.0 | 3.50 | 10.0 | .013 | -0.0853 | -0.1004 * |
| 106 | 4.00 | .000 | 5.0 | 3.50 | 10.0 | .045 | -0.0547 | -0.0472 * |
| 107 | 3.00 | .000 | 7.4 | 6.50 | 10.0 | .158 | -0.2001 | -0.2309 * |
| 108 | 4.00 | .000 | 12.5 | 6.60 | 10.0 | -.006 | -0.0493 | -0.0048 * |
| 109 | 2.00 | .000 | -5.1 | 6.60 | 10.0 | .057 | 0.0252 | 0.0236 * |
| 110 | 3.00 | .000 | 2.4 | 6.50 | 10.0 | .077 | -0.0340 | 0.0177 * |
| 111 | 3.00 | .000 | -5.1 | 5.60 | 10.0 | .135 | 0.0177 | 0.0420 * |
| 112 | 3.00 | .000 | 12.5 | 5.60 | 10.0 | .006 | -0.0427 | -0.0267 * |

TABLE A-22 (cont'd)

MEASURED AND FITTED ROLL MOMENT
BETA=10. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED * |
|-----|------|------|-------|-------|------|-------|----------|-----------|
| 113 | 4.00 | .000 | 2.4 | 3.60 | 5.0 | .038 | -0.0078 | 0.0038 * |
| 114 | 4.00 | .000 | 0.0 | 3.50 | 15.0 | .042 | -0.0289 | 0.0323 * |
| 115 | 4.00 | .000 | 12.5 | 3.60 | 15.0 | .001 | -0.0693 | -0.1578 * |
| 116 | 3.00 | .000 | 7.4 | 2.60 | 15.0 | .139 | -0.1839 | -0.2280 |
| 117 | 4.00 | .000 | 7.4 | 2.50 | 15.0 | .030 | -0.0538 | -0.0640 |
| 118 | 3.00 | .000 | 5.0 | 2.50 | 15.0 | .067 | -0.0539 | -0.0424 * |
| 119 | 3.00 | .000 | 2.4 | 2.50 | 15.0 | .057 | -0.0282 | 0.0022 * |
| 120 | 6.00 | .000 | 2.4 | 2.50 | 15.0 | .069 | -0.1313 | -0.1633 |
| 121 | 3.00 | .000 | 0.0 | 2.60 | 15.0 | .172 | -0.2539 | -0.2102 |
| 126 | 6.00 | .000 | 4.9 | 2.50 | 20.0 | .065 | -0.2354 | -0.2620 * |
| 127 | 4.00 | .000 | 5.0 | 2.60 | 20.0 | .137 | -0.2813 | -0.4478 * |
| 128 | 6.00 | .000 | 12.5 | 5.50 | 20.0 | .022 | -0.4283 | -0.4042 * |
| 129 | 2.00 | .000 | 12.5 | 6.60 | 0.0 | .057 | -0.0470 | 0.0707 * |
| 130 | 5.00 | .000 | 6.6 | **** | 7.5 | -.181 | -0.0083 | 0.3988 * |
| 131 | 6.00 | .000 | -5.0 | 6.70 | 0.0 | .022 | 0.0274 | 0.1518 * |
| 132 | 3.00 | .000 | 9.9 | 3.60 | 0.0 | .148 | -0.1179 | -0.1180 |
| 133 | 4.00 | .000 | 7.4 | 3.60 | 5.0 | .145 | -0.1995 | -0.2677 |
| 134 | 3.00 | .000 | 9.9 | 3.70 | 5.0 | .224 | -0.2553 | -0.2917 * |
| 135 | 4.00 | .000 | 2.4 | 3.60 | 5.0 | .040 | -0.0119 | 0.0024 * |
| 138 | 4.00 | .000 | -5.0 | 5.60 | 20.0 | .221 | -0.9830 | -0.6555 * |
| 139 | 4.00 | .000 | -5.1 | 3.60 | 5.0 | .044 | 0.0463 | 0.0731 * |
| 1 | 1.97 | .049 | 0.0 | 3.00 | 0.0 | .057 | -0.1892 | -0.1983 |
| 2 | 1.98 | .050 | 0.0 | 3.00 | 0.0 | .058 | -0.1902 | -0.2004 |
| 3 | 3.15 | .079 | 0.0 | 3.00 | 0.0 | .029 | -0.5120 | -0.5110 |
| 4 | 4.01 | .100 | 0.0 | 3.00 | 0.0 | .022 | -0.8395 | -0.8275 |
| 6 | 5.30 | .133 | 0.0 | 3.00 | 0.0 | .033 | -1.4630 | -1.4653 |
| 8 | 6.00 | .150 | 0.0 | 3.00 | 0.0 | .032 | -1.8879 | -1.8949 |
| 10 | 3.01 | .075 | -2.5 | 3.00 | 0.0 | .042 | -0.4422 | -0.4498 |
| 9 | 3.12 | .078 | 5.0 | 3.00 | 0.0 | .038 | -0.5162 | -0.5306 |
| 11 | 3.02 | .076 | -5.0 | 3.00 | 0.0 | .037 | -0.4363 | -0.4392 |
| 12 | 2.95 | .074 | -7.5 | 3.00 | 0.0 | .033 | -0.4090 | -0.4044 |
| 13 | 2.98 | .075 | -10.0 | 3.00 | 0.0 | .032 | -0.4029 | -0.3977 |
| 14 | 2.96 | .074 | -12.5 | 3.00 | 0.0 | .026 | -0.3791 | -0.3802 |
| 15 | 2.95 | .074 | 0.0 | 2.00 | 0.0 | .064 | -0.4414 | -0.4499 |
| 16 | 2.99 | .075 | 0.0 | 4.00 | 0.0 | .047 | -0.4466 | -0.4525 |
| 19 | 2.72 | .068 | 0.0 | 5.00 | 0.0 | .041 | -0.3744 | -0.3690 |
| 20 | 2.68 | .067 | 0.0 | 5.00 | 0.0 | .041 | -0.3602 | -0.3578 |
| 21 | 3.14 | .079 | 0.0 | 6.00 | 0.0 | .033 | -0.4997 | -0.4924 |
| 22 | 2.01 | .050 | -7.5 | 6.00 | 0.0 | .089 | -0.1379 | -0.1667 |
| 23 | 2.98 | .074 | 0.0 | 3.00 | 0.0 | .025 | -0.4511 | -0.4567 |
| 24 | 2.97 | .074 | 0.0 | 3.00 | 0.0 | .072 | -0.4584 | -0.4471 |
| 25 | 2.46 | .062 | 0.0 | 3.00 | 0.0 | .151 | -0.3081 | -0.2943 |
| 26 | 3.46 | .087 | 0.0 | 3.00 | 0.0 | .103 | -0.6298 | -0.6084 |
| 27 | 2.96 | .074 | 0.0 | 3.00 | 0.0 | .127 | -0.4535 | -0.4365 |
| 28 | 2.93 | .073 | 0.0 | 3.00 | 0.0 | .181 | -0.4456 | -0.4209 |
| 30 | 4.49 | .112 | 0.0 | 3.00 | 0.0 | .193 | -1.0609 | -1.0338 |
| 31 | 5.03 | .126 | 0.0 | 3.00 | 0.0 | .115 | -1.3458 | -1.3151 |
| 32 | 3.15 | .079 | 0.0 | 3.00 | -5.0 | .055 | -0.4974 | -0.5009 |
| 34 | 3.07 | .077 | -2.5 | 3.00 | -5.0 | .054 | -0.4579 | -0.4575 |
| 35 | 5.82 | .146 | 0.0 | 3.00 | -5.0 | .049 | -1.7708 | -1.7618 |

TABLE A-22 (cont'd)

MEASURED AND FITTED ROLL MOMENT
BETA=10. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|---------|
| 36 | 5.77 | .144 | -12.5 | 6.00 | -5.0 | .008 | -1.5408 | -1.5122 |
| 37 | 4.91 | .123 | 5.0 | 2.00 | -5.0 | .040 | -1.2770 | -1.2616 |
| 38 | 2.87 | .072 | -10.0 | 4.00 | -5.0 | .157 | -0.2127 | -0.1688 |
| 39 | 5.96 | .149 | -12.5 | 5.00 | -5.0 | .045 | -1.4310 | -1.4390 |
| 40 | 3.00 | .075 | 0.0 | 3.00 | -10.0 | .135 | -0.4350 | -0.3485 |
| 41 | 6.02 | .150 | -7.5 | 5.00 | -10.0 | .025 | -1.7312 | -1.7014 |
| 42 | 2.95 | .074 | -2.5 | 2.00 | -10.0 | .057 | -0.4102 | -0.4214 |
| 43 | 5.21 | .130 | -5.0 | 2.00 | -10.0 | .022 | -1.3393 | -1.3694 |
| 46 | 3.09 | .077 | -5.0 | 2.00 | -10.0 | .092 | -0.4078 | -0.3942 |
| 47 | 3.14 | .079 | -2.5 | 3.00 | -5.0 | .036 | -0.4814 | -0.4902 |
| 48 | 3.09 | .077 | 0.0 | 3.00 | -15.0 | .041 | -0.4510 | -0.4677 |
| 56 | 5.23 | .131 | -5.0 | 3.00 | -15.0 | .060 | -1.1716 | -1.1244 |
| 57 | 5.19 | .130 | -5.0 | 2.00 | -15.0 | .027 | -1.2652 | -1.2838 |
| 58 | 5.12 | .128 | -12.5 | 5.00 | -15.0 | .027 | -0.8540 | -0.9106 |
| 59 | 3.05 | .076 | 0.0 | 3.00 | -20.0 | .048 | -0.4253 | -0.4372 |
| 60 | 4.17 | .104 | -12.5 | 6.00 | -20.0 | -.007 | -0.6842 | -0.6313 |
| 62 | 5.18 | .129 | 5.0 | 3.00 | -20.0 | .022 | -1.3112 | -1.3115 |
| 65 | 4.10 | .102 | -2.5 | 6.00 | -20.0 | .033 | -0.7424 | -0.7849 |
| 66 | 6.15 | .154 | -10.0 | 5.00 | -20.0 | .004 | -1.6047 | -1.5955 |
| 67 | 2.11 | .053 | -7.5 | 2.00 | -20.0 | .046 | -0.1321 | -0.1553 |
| 69 | 4.05 | .101 | -5.0 | 5.00 | -20.0 | .047 | -0.6447 | -0.6521 |
| 70 | 3.01 | .075 | -7.5 | 2.00 | -20.0 | .076 | -0.2460 | -0.2841 |
| 71 | 3.00 | .075 | 0.0 | 3.00 | 5.0 | .038 | -0.4626 | -0.4569 |
| 72 | 6.08 | .152 | -5.0 | 3.00 | 5.0 | .057 | -1.8725 | -1.8547 |
| 74 | 5.05 | .126 | -10.0 | 3.00 | 5.0 | .108 | -1.2652 | -1.2122 |
| 75 | 6.03 | .151 | -2.5 | 5.00 | 5.0 | .047 | -1.8458 | -1.8275 |
| 76 | 5.05 | .126 | -2.5 | 2.00 | 5.0 | .038 | -1.3336 | -1.2952 |
| 77 | 5.05 | .126 | -10.0 | 5.00 | 5.0 | .031 | -1.1725 | -1.1550 |
| 78 | 4.02 | .101 | -7.5 | 5.00 | 5.0 | .008 | -0.8160 | -0.7781 |
| 79 | 2.04 | .051 | -10.0 | 3.00 | 5.0 | .016 | -0.1891 | -0.1893 |
| 80 | 5.33 | .133 | -2.5 | 3.00 | 0.0 | .061 | -1.4868 | -1.4388 |
| 82 | 3.87 | .097 | -2.5 | 2.00 | 0.0 | .099 | -0.7648 | -0.7448 |
| 83 | 3.02 | .075 | -2.5 | 3.00 | -5.0 | .038 | -0.4465 | -0.4509 |
| 418 | 1.85 | .069 | 0.0 | 3.00 | 0.0 | .060 | -0.2500 | -0.2713 |
| 419 | 2.96 | .111 | 0.0 | 3.00 | 0.0 | .044 | -0.6671 | -0.6813 |
| 420 | 3.95 | .148 | 0.0 | 3.00 | 0.0 | .033 | -1.2076 | -1.2071 |
| 421 | 5.02 | .188 | 0.0 | 3.00 | 0.0 | .025 | -1.9660 | -1.9639 |
| 422 | 6.09 | .228 | 0.0 | 3.00 | 0.0 | .022 | -2.9043 | -2.9175 |
| 423 | 3.86 | .145 | 0.0 | 3.00 | 0.0 | .028 | -1.1470 | -1.1560 |
| 424 | 3.91 | .146 | 0.0 | 3.00 | 0.0 | .045 | -1.1747 | -1.1811 |
| 425 | 3.96 | .148 | 0.0 | 3.00 | 0.0 | .067 | -1.2348 | -1.2111 |
| 426 | 4.03 | .151 | 0.0 | 3.00 | 0.0 | .117 | -1.2598 | -1.2507 |
| 427 | 4.01 | .150 | 0.0 | 3.00 | 0.0 | .158 | -1.2540 | -1.2338 |
| 428 | 3.99 | .150 | 5.0 | 3.00 | 0.0 | .027 | -1.2689 | -1.2722 |
| 429 | 4.02 | .151 | -2.5 | 3.00 | 0.0 | .031 | -1.2284 | -1.2308 |
| 430 | 3.99 | .150 | -5.0 | 3.00 | 0.0 | .027 | -1.1890 | -1.2006 |
| 431 | 4.01 | .150 | -7.5 | 3.00 | 0.0 | .017 | -1.1996 | -1.2033 |
| 432 | 4.00 | .150 | -10.0 | 3.00 | 0.0 | .011 | -1.1762 | -1.1938 |
| 433 | 4.01 | .150 | -12.5 | 3.00 | 0.0 | .006 | -1.1648 | -1.1922 |
| 434 | 3.99 | .150 | -12.5 | 3.00 | 5.0 | .007 | -1.1837 | -1.2089 |

TABLE A-22 (cont'd)

MEASURED AND FITTED ROLL MOMENT
BETA=10. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|----------|
| 435 | 4.00 | .150 | -12.5 | 3.00 | -5.0 | -.002 | -1.1570 | -1.1572 |
| 436 | 4.02 | .151 | -12.5 | 3.00 | -10.0 | -.004 | -1.1268 | -1.1034 |
| 438 | 3.97 | .149 | 0.0 | 3.00 | 5.0 | .032 | -1.2237 | -1.2068 |
| 440 | 4.01 | .150 | 0.0 | 3.00 | -5.0 | .035 | -1.2242 | -1.2388 |
| 441 | 4.00 | .150 | 0.0 | 3.00 | -10.0 | .036 | -1.1901 | -1.2095 |
| 443 | 3.98 | .149 | 0.0 | 3.00 | -15.0 | .040 | -1.1457 | -1.1523 |
| 444 | 3.98 | .149 | 0.0 | 3.00 | -20.0 | .035 | -1.1079 | -1.1071 |
| 445 | 3.98 | .149 | 0.0 | 2.00 | 0.0 | .036 | -1.2294 | -1.2372 |
| 446 | 3.98 | .149 | 0.0 | 4.00 | 0.0 | .032 | -1.2214 | -1.2232 |
| 448 | 4.02 | .151 | 0.0 | 5.00 | 0.0 | .025 | -1.2347 | -1.2441 |
| 449 | 4.03 | .151 | 0.0 | 6.00 | 0.0 | .024 | -1.2329 | -1.2486 |
| 451 | 1.81 | .068 | -10.0 | 4.00 | 5.0 | .132 | -0.2016 | -0.1933 |
| 452 | 4.01 | .150 | -2.5 | 3.00 | -5.0 | .043 | -1.2018 | -1.2110 |
| 455 | 4.91 | .184 | 5.0 | 4.00 | -20.0 | .131 | -0.8183 | -1.2862* |
| 456 | 4.90 | .184 | -7.5 | 4.00 | 5.0 | .099 | -1.6857 | -1.7391 |
| 457 | 2.92 | .109 | -2.5 | 3.00 | -5.0 | .043 | -0.6231 | -0.6452 |
| 458 | 4.00 | .150 | -7.5 | 6.00 | 0.0 | .010 | -1.1687 | -1.1907 |
| 459 | 5.96 | .224 | 0.0 | 2.00 | -5.0 | .025 | -2.7643 | -2.8021 |
| 460 | 5.01 | .188 | -10.0 | 5.00 | 0.0 | .045 | -1.7040 | -1.7440 |
| 463 | 4.02 | .151 | -12.5 | 3.00 | 5.0 | .110 | -1.1652 | -1.1209 |
| 465 | 5.97 | .224 | 0.0 | 2.00 | 5.0 | .090 | -2.8304 | -2.8752 |
| 466 | 5.97 | .224 | -12.5 | 5.00 | -20.0 | .011 | -2.0552 | -2.0725 |
| 467 | 4.00 | .150 | -7.5 | 6.00 | 0.0 | .011 | -1.2020 | -1.1906 |
| 469 | 5.05 | .189 | 5.0 | 4.00 | -10.0 | .083 | -1.9184 | -1.9358 |
| 470 | 3.01 | .113 | -2.5 | 3.00 | 0.0 | .131 | -0.6531 | -0.6580 |
| 471 | 2.99 | .112 | -2.5 | 3.00 | -5.0 | .047 | -0.6569 | -0.6758 |
| 473 | 4.96 | .186 | -5.0 | 6.00 | -20.0 | .024 | -1.6603 | -1.6597 |
| 475 | 4.97 | .186 | -2.5 | 2.00 | -20.0 | .086 | -1.6109 | -1.4008* |
| 476 | 4.97 | .186 | 5.0 | 3.00 | 0.0 | .031 | -1.9797 | -1.9725 |
| 483 | 1.98 | .074 | -10.0 | 6.00 | -5.0 | .168 | -0.1452 | -0.1607 |
| 484 | 2.91 | .109 | -2.5 | 2.00 | 0.0 | .089 | -0.6249 | -0.6475 |
| 485 | 3.01 | .113 | 0.0 | 6.00 | -20.0 | .133 | -0.5100 | -0.5183 |
| 487 | 3.93 | .148 | -10.0 | 2.00 | -5.0 | .097 | -0.9742 | -1.0089 |
| 488 | 3.00 | .113 | -2.5 | 3.00 | -5.0 | .043 | -0.6670 | -0.6822 |
| 489 | 4.13 | .155 | -5.0 | 2.00 | 5.0 | .112 | -1.3205 | -1.3314 |
| 490 | 6.08 | .228 | -5.0 | 2.00 | 5.0 | .081 | -2.9033 | -2.8795 |
| 491 | 4.10 | .154 | -7.5 | 3.00 | -5.0 | .075 | -1.1399 | -1.1354 |
| 492 | 4.04 | .152 | 0.0 | 3.00 | 0.0 | .028 | -1.2725 | -1.2675 |
| 494 | 3.18 | .119 | -2.5 | 4.00 | -5.0 | .140 | -0.7164 | -0.6578 |
| 496 | 6.07 | .228 | 5.0 | 5.00 | -15.0 | .074 | -2.7324 | -2.7344 |
| 499 | 6.05 | .227 | -10.0 | 5.00 | -15.0 | .001 | -2.6055 | -2.5532 |
| 500 | 4.08 | .153 | -5.0 | 6.00 | -5.0 | .015 | -1.2350 | -1.2517 |
| 502 | 3.09 | .116 | -12.5 | 4.00 | 0.0 | .105 | -0.5342 | -0.5398 |
| 503 | 3.10 | .116 | -2.5 | 4.00 | -15.0 | .053 | -0.6634 | -0.6768 |
| 505 | 3.03 | .114 | -2.5 | 5.00 | 5.0 | .161 | -0.6466 | -0.6878 |
| 506 | 3.02 | .113 | -2.5 | 3.00 | -5.0 | .041 | -0.6727 | -0.6904 |
| 507 | 3.01 | .113 | -5.0 | 2.00 | 5.0 | .092 | -0.6732 | -0.6951 |
| 508 | 2.99 | .112 | -5.0 | 5.00 | -10.0 | .104 | -0.5682 | -0.5451 |
| 512 | 2.01 | .075 | -7.5 | 6.00 | -10.0 | .220 | -0.0949 | -0.0879 |
| 513 | 5.15 | .193 | -10.0 | 5.00 | -10.0 | .042 | -1.6610 | -1.7256 |

TABLE A-22 (cont'd)

MEASURED AND FITTED ROLL MOMENT
BETA=10. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|----------|
| 514 | 5.10 | .191 | -12.5 | 2.00 | -10.0 | -.016 | -1.9220 | -1.9440 |
| 795 | 3.00 | .225 | 0.0 | 3.00 | 0.0 | .055 | -1.3912 | -1.3910 |
| 796 | 2.99 | .224 | 5.0 | 3.00 | 0.0 | .047 | -1.4128 | -1.4302 |
| 797 | 3.01 | .226 | -2.5 | 3.00 | 0.0 | .056 | -1.3816 | -1.3775 |
| 798 | 3.00 | .225 | -5.0 | 3.00 | 0.0 | .051 | -1.3584 | -1.3507 |
| 799 | 3.01 | .226 | -7.5 | 3.00 | 0.0 | .046 | -1.3524 | -1.3433 |
| 800 | 3.00 | .225 | -10.0 | 3.00 | 0.0 | .039 | -1.3279 | -1.3174 |
| 801 | 3.00 | .225 | -12.5 | 3.00 | 0.0 | .033 | -1.3131 | -1.3025 |
| 802 | 2.99 | .224 | 0.0 | 3.00 | 5.0 | .054 | -1.3869 | -1.3755 |
| 803 | 2.99 | .224 | 0.0 | 3.00 | -5.0 | .068 | -1.3810 | -1.3683 |
| 804 | 2.98 | .223 | 0.0 | 3.00 | -10.0 | .072 | -1.3508 | -1.3251 |
| 805 | 2.99 | .224 | 0.0 | 3.00 | -15.0 | .075 | -1.3220 | -1.2878 |
| 806 | 3.00 | .225 | 0.0 | 3.00 | -20.0 | .069 | -1.2874 | -1.2435 |
| 807 | 3.00 | .225 | 0.0 | 2.00 | 0.0 | .067 | -1.3993 | -1.4075 |
| 808 | 2.97 | .223 | 0.0 | 4.00 | 0.0 | .058 | -1.3577 | -1.3512 |
| 809 | 3.00 | .225 | 0.0 | 5.00 | 0.0 | .053 | -1.3759 | -1.3607 |
| 810 | 2.99 | .224 | 0.0 | 6.00 | 0.0 | .056 | -1.3518 | -1.3370 |
| 811 | 3.00 | .225 | 0.0 | 3.00 | 0.0 | .051 | -1.3888 | -1.3946 |
| 812 | 3.00 | .225 | 0.0 | 3.00 | 0.0 | .082 | -1.3944 | -1.3839 |
| 813 | 3.00 | .225 | 0.0 | 3.00 | 0.0 | .130 | -1.3822 | -1.3619 |
| 815 | 2.01 | .151 | 0.0 | 3.00 | 0.0 | .104 | -0.6103 | -0.6393 |
| 816 | 2.51 | .188 | -2.5 | 3.00 | 0.0 | .069 | -0.9757 | -0.9701 |
| 817 | 3.01 | .226 | 0.0 | 6.00 | -20.0 | .066 | -1.2694 | -1.2600 |
| 818 | 3.02 | .226 | 5.0 | 6.00 | -5.0 | .175 | -1.3775 | -1.3723 |
| 819 | 3.02 | .226 | -2.5 | 6.00 | 5.0 | .211 | -1.3207 | -1.3654 |
| 820 | 2.03 | .152 | 0.0 | 4.00 | -10.0 | .205 | -0.4669 | -0.4852 |
| 821 | 3.01 | .226 | -12.5 | 3.00 | -10.0 | .017 | -1.2884 | -1.2368 |
| 822 | 3.01 | .226 | -2.5 | 3.00 | -5.0 | .065 | -1.3736 | -1.3620 |
| 823 | 2.02 | .152 | -12.5 | 3.00 | -10.0 | .093 | -0.4781 | -0.4942 |
| 824 | 2.52 | .189 | -10.0 | 3.00 | 5.0 | .111 | -0.9233 | -0.9085 |
| 825 | 2.01 | .150 | -5.0 | 3.00 | -15.0 | .112 | -0.5192 | -0.5548 |
| 826 | 2.48 | .186 | -12.5 | 6.00 | -10.0 | .190 | -0.5713 | -0.5055 |
| 827 | 2.48 | .186 | -12.5 | 5.00 | 5.0 | .281 | -0.8617 | -0.8675 |
| 828 | 2.99 | .224 | 0.0 | 3.00 | -5.0 | .084 | -1.3765 | -1.3541 |
| 829 | 1.99 | .149 | 5.0 | 6.00 | -10.0 | .287 | -0.3664 | -0.3276 |
| 830 | 2.00 | .150 | -5.0 | 3.00 | -10.0 | .076 | -0.5631 | -0.6014 |
| 831 | 2.50 | .187 | -2.5 | 5.00 | -20.0 | .248 | -0.2660 | -0.3171 |
| 832 | 2.99 | .224 | -2.5 | 3.00 | -5.0 | .065 | -1.3486 | -1.3475 |
| 833 | 1.96 | .147 | -5.0 | 6.00 | -5.0 | .263 | -0.4035 | -0.3872 |
| 834 | 2.95 | .221 | 5.0 | 5.00 | 0.0 | .063 | -1.3944 | -1.3692 |
| 835 | 2.96 | .222 | -5.0 | 6.00 | 0.0 | .034 | -1.3071 | -1.3026 |
| 836 | 1.98 | .148 | -12.5 | 3.00 | -20.0 | .019 | -0.4733 | -0.4363 |
| 839 | 2.06 | .155 | 5.0 | 4.00 | 0.0 | .192 | -0.6656 | -0.6531 |
| 840 | 2.03 | .153 | -7.5 | 3.00 | 5.0 | .088 | -0.6006 | -0.6132 |
| 841 | 2.98 | .223 | 0.0 | 5.00 | -20.0 | .219 | -0.4844 | -0.6988* |
| 842 | 2.99 | .224 | -7.5 | 6.00 | -15.0 | .031 | -1.2117 | -1.2377 |
| 845 | 2.98 | .223 | 5.0 | 6.00 | -10.0 | .174 | -1.1728 | -1.2460 |
| 846 | 3.01 | .226 | -2.5 | 3.00 | -5.0 | .053 | -1.3726 | -1.3746 |
| 847 | 2.54 | .190 | -7.5 | 5.00 | 0.0 | .242 | -0.7936 | -0.7967 |
| 848 | 3.01 | .226 | -10.0 | 5.00 | 0.0 | .204 | -1.0560 | -1.0998 |

R-1851

TABLE A-22 (cont'd)

MEASURED AND FITTED ROLL MOMENT
BETA=10. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|------|----------|----------|
| 849 | 2.55 | .191 | 0.0 | 5.00 | -5.0 | .046 | -0.9819 | -0.9953 |
| 850 | 2.54 | .191 | -2.5 | 4.00 | -15.0 | .180 | -0.6555 | -0.7071 |
| 851 | 2.08 | .156 | 0.0 | 5.00 | 5.0 | .038 | -0.6436 | -0.6575 |
| 852 | 2.53 | .190 | 5.0 | 6.00 | -20.0 | .212 | -0.3049 | -0.6224* |
| 853 | 2.05 | .154 | -5.0 | 8.00 | -15.0 | .288 | -0.2283 | -0.1920 |
| 855 | 3.01 | .226 | -5.0 | 2.00 | 5.0 | .074 | -1.3731 | -1.3868 |
| 856 | 2.53 | .190 | -12.5 | 4.00 | -10.0 | .182 | -0.5732 | -0.5788 |
| 857 | 3.00 | .225 | -2.5 | 3.00 | -5.0 | .049 | -1.3649 | -1.3698 |
| 858 | 2.99 | .224 | -5.0 | 4.00 | 0.0 | .157 | -1.2857 | -1.2440 |
| 859 | 2.53 | .190 | -5.0 | 6.00 | -5.0 | .169 | -0.8658 | -0.8102 |
| 861 | 2.54 | .190 | -12.5 | 4.00 | -5.0 | .209 | -0.6193 | -0.6529 |
| 862 | 2.97 | .223 | -12.5 | 5.00 | -20.0 | .057 | -0.9045 | -0.9459 |
| 863 | 3.00 | .225 | -5.0 | 4.00 | -5.0 | .026 | -1.3508 | -1.3477 |

MEAN ERROR= 0.0276
STANDARD DEVIATION= 0.0891

TABLE A-23

 MEASURED AND FITTED ROLL MOMENT
 BETA=15. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED * |
|-----|------|------|------|-------|-----|-------|----------|-----------|
| 141 | 4.00 | .000 | 5.0 | 3.60 | 5.0 | .050 | -0.0222 | 0.0047 * |
| 142 | 4.00 | .000 | -0.3 | 2.60 | 0.0 | .063 | 0.0066 | 0.0588 * |
| 143 | 3.00 | .000 | 4.7 | 2.60 | 0.0 | .053 | 0.0034 | 0.0539 * |
| 144 | 6.00 | .000 | 14.3 | 3.00 | 0.0 | .149 | -0.3737 | -0.3867 * |
| 145 | 4.00 | .000 | 4.8 | 3.60 | 0.0 | .050 | 0.0017 | 0.0360 * |
| 146 | 4.00 | .000 | -5.2 | 3.60 | 0.0 | .050 | 0.0168 | 0.0808 * |
| 147 | 4.00 | .000 | -0.3 | 3.60 | 0.0 | .058 | 0.0104 | 0.0591 * |
| 148 | 4.00 | .000 | -0.3 | 3.60 | 0.0 | .061 | 0.0117 | 0.0592 * |
| 149 | 4.00 | .000 | -0.3 | 3.60 | 0.0 | .076 | 0.0110 | 0.0598 * |
| 150 | 4.00 | .000 | -0.3 | 3.60 | 0.0 | .113 | 0.0133 | 0.0612 * |
| 151 | 4.00 | .000 | -0.3 | 3.60 | 0.0 | .163 | 0.0279 | 0.0626 * |
| 152 | 4.00 | .000 | -0.3 | 3.70 | 0.0 | .216 | 0.0331 | 0.0638 * |
| 153 | 2.00 | .000 | -2.1 | 3.60 | 0.0 | .114 | 0.0120 | 0.0638 * |
| 154 | 3.00 | .000 | -0.3 | 3.60 | 0.0 | .077 | 0.0096 | 0.0585 * |
| 155 | 5.00 | .000 | -0.3 | 3.60 | 0.0 | .051 | 0.0062 | 0.0605 * |
| 156 | 6.00 | .000 | -0.3 | 3.60 | 0.0 | .043 | 0.0067 | 0.0621 * |
| 157 | 4.00 | .000 | 9.8 | 3.60 | 0.0 | .035 | -0.0166 | 0.0332 * |
| 158 | 4.00 | .000 | 14.7 | 3.60 | 0.0 | .014 | -0.0313 | 0.0621 * |
| 159 | 3.00 | .000 | 14.7 | 3.60 | 0.0 | .169 | -0.1406 | -0.1135 * |
| 160 | 4.00 | .000 | 19.8 | 3.60 | 0.0 | -.005 | -0.0491 | 0.1134 * |
| 161 | 4.00 | .000 | 19.8 | 4.60 | 0.0 | .155 | -0.3332 | -0.3367 * |
| 162 | 4.00 | .000 | 19.7 | 4.60 | 0.0 | .162 | -0.3336 | -0.3488 * |
| 163 | 4.00 | .000 | -0.3 | 4.60 | 0.0 | .058 | 0.0121 | 0.0598 * |
| 164 | 4.00 | .000 | -0.3 | 5.60 | 0.0 | .056 | 0.0161 | 0.0604 * |
| 165 | 2.00 | .000 | 4.7 | 5.60 | 0.0 | .371 | -0.0361 | 0.0248 * |
| 166 | 6.00 | .000 | 9.7 | 5.60 | 0.0 | .029 | -0.0065 | -0.1696 * |
| 167 | 3.00 | .000 | 19.7 | 5.60 | 0.0 | .161 | -0.2243 | -0.2295 * |
| 168 | 3.00 | .000 | 19.7 | 5.60 | 0.0 | .280 | -0.3484 | -0.3483 * |
| 169 | 2.00 | .000 | 19.7 | 6.60 | 0.0 | .067 | -0.0597 | 0.0638 * |
| 170 | 5.00 | .000 | 9.7 | 6.60 | 0.0 | .030 | -0.0061 | -0.1140 * |
| 171 | 4.00 | .000 | 9.7 | 6.60 | 0.0 | .147 | -0.2420 | -0.1837 * |
| 172 | 3.00 | .000 | -5.3 | 6.60 | 0.0 | .082 | 0.0426 | 0.0967 * |
| 173 | 4.00 | .000 | -0.3 | 6.60 | 0.0 | .055 | 0.0168 | 0.0612 * |
| 174 | 6.00 | .000 | -5.2 | 6.60 | 0.0 | .039 | 0.0210 | 0.2228 * |
| 175 | 4.00 | .000 | 4.7 | 3.60 | 5.0 | .061 | -0.0216 | -0.0110 * |
| 185 | 4.00 | .000 | 4.7 | 3.60 | 5.0 | .046 | -0.0085 | 0.0119 * |
| 186 | 4.00 | .000 | -0.3 | 3.60 | 5.0 | .065 | -0.0140 | 0.0204 * |
| 187 | 3.00 | .000 | -5.3 | 3.60 | 5.0 | .119 | 0.0211 | 0.0407 * |
| 189 | 5.00 | .000 | -0.3 | 2.50 | 5.0 | .063 | -0.0261 | -0.0056 * |
| 191 | 4.00 | .000 | 9.8 | 3.60 | 5.0 | .173 | -0.2818 | -0.2784 * |
| 192 | 4.00 | .000 | 9.7 | 3.60 | 5.0 | .177 | -0.2846 | -0.2811 * |
| 193 | 3.00 | .000 | 14.7 | 3.70 | 5.0 | .250 | -0.3779 | -0.3228 * |
| 194 | 3.00 | .000 | 14.7 | 3.60 | 5.0 | .017 | -0.0165 | 0.0604 * |
| 195 | 3.00 | .000 | 14.7 | 1.60 | 5.0 | .048 | -0.0287 | -0.0144 * |
| 196 | 6.00 | .000 | -5.2 | 5.60 | 5.0 | .035 | -0.0028 | 0.2394 * |
| 197 | 6.00 | .000 | 9.7 | 5.60 | 5.0 | .026 | -0.0172 | -0.1202 * |
| 198 | 6.00 | .000 | 19.8 | 5.60 | 5.0 | -.016 | -0.0702 | -0.2124 * |
| 199 | 2.00 | .000 | -0.3 | 5.60 | 5.0 | .101 | 0.0014 | 0.0419 * |
| 200 | 2.00 | .000 | -5.3 | 5.60 | 5.0 | .257 | 0.0216 | 0.0434 * |
| 201 | 4.00 | .000 | 19.8 | 5.60 | 5.0 | .139 | -0.5776 | -0.5421 * |

TABLE A-23 (cont'd)

MEASURED AND FITTED ROLL MOMENT
BETA=15. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED * |
|-----|------|------|------|-------|------|-------|----------|-----------|
| 202 | 5.00 | .000 | 14.7 | 6.60 | 5.0 | .010 | -0.0266 | -0.1591 * |
| 203 | 5.00 | .000 | 4.7 | 6.60 | 5.0 | .036 | -0.0191 | -0.0131 |
| 204 | 5.00 | .000 | 4.8 | 6.60 | 5.0 | .037 | -0.0167 | -0.0167 * |
| 205 | 3.00 | .000 | -5.3 | 6.60 | 5.0 | .279 | 0.0900 | 0.0485 * |
| 206 | 4.00 | .000 | 4.7 | 3.60 | 5.0 | .055 | -0.0204 | -0.0010 * |
| 207 | 4.00 | .000 | -0.3 | 3.60 | -5.0 | .063 | 0.0319 | 0.0961 * |
| 208 | 6.00 | .000 | 14.7 | 3.60 | -5.0 | .155 | 0.0224 | -0.1563 * |
| 210 | 5.00 | .000 | -0.3 | 2.50 | -5.0 | .103 | 0.0745 | 0.1799 * |
| 211 | 4.00 | .000 | 4.7 | 2.60 | -5.0 | .094 | 0.0119 | 0.1009 * |
| 212 | 2.00 | .000 | 4.7 | 2.60 | -5.0 | .162 | 0.0111 | 0.0639 * |
| 213 | 4.00 | .000 | 9.8 | 2.60 | -5.0 | .043 | -0.0000 | 0.0922 * |
| 214 | 2.00 | .000 | -0.3 | 4.60 | -5.0 | .170 | 0.0231 | 0.0920 * |
| 215 | 6.00 | .000 | 14.8 | 4.60 | -5.0 | .126 | -0.1293 | -0.2562 * |
| 216 | 5.00 | .000 | 14.7 | 5.50 | -5.0 | .150 | -0.1616 | -0.2130 * |
| 218 | 3.00 | .000 | 9.7 | 5.60 | -5.0 | .242 | -0.0466 | 0.0056 * |
| 219 | 4.00 | .000 | 9.7 | 5.60 | -5.0 | .045 | -0.0312 | 0.0200 * |
| 220 | 6.00 | .000 | 14.8 | 5.60 | -5.0 | .007 | -0.0153 | -0.2264 * |
| 221 | 6.00 | .000 | 14.8 | 6.60 | -5.0 | .005 | -0.0179 | -0.3220 * |
| 222 | 4.00 | .000 | 9.7 | 6.60 | -5.0 | .044 | -0.0237 | -0.0051 * |
| 223 | 3.00 | .000 | 19.7 | 6.60 | 10.0 | -.009 | -0.0398 | 0.0391 |
| 224 | 4.00 | .000 | 19.7 | 6.60 | 10.0 | -.014 | -0.0757 | -0.0696 |
| 225 | 2.00 | .000 | -5.3 | 6.60 | 10.0 | .104 | 0.0138 | 0.0180 |
| 226 | 3.00 | .000 | 4.7 | 6.60 | 10.0 | .117 | -0.0939 | -0.0963 * |
| 227 | 5.00 | .000 | -0.3 | 6.50 | 10.0 | .070 | -0.0604 | 0.0389 * |
| 228 | 3.00 | .000 | 14.8 | 6.60 | 10.0 | .191 | -0.4654 | -0.4546 |
| 231 | 3.00 | .000 | 19.8 | 4.60 | 10.0 | .179 | -0.5706 | -0.5187 |
| 232 | 5.00 | .000 | 14.7 | 4.50 | 10.0 | .035 | -0.1954 | -0.2190 * |
| 233 | 2.00 | .000 | 14.7 | 4.60 | 10.0 | .037 | -0.0193 | 0.0577 * |
| 234 | 4.00 | .000 | 4.8 | 3.60 | 5.0 | .054 | -0.0161 | -0.0015 * |
| 235 | 5.00 | .000 | 4.8 | 3.50 | 10.0 | .118 | -0.2447 | -0.2741 |
| 238 | 3.00 | .000 | 9.7 | 3.60 | 10.0 | .240 | -0.3186 | -0.3382 |
| 239 | 4.00 | .000 | 9.8 | 3.60 | 10.0 | .059 | -0.0887 | -0.1083 * |
| 240 | 5.00 | .000 | 8.6 | 3.50 | 10.0 | .020 | -0.1001 | -0.0009 * |
| 241 | 3.00 | .000 | 4.8 | 3.60 | 10.0 | .131 | -0.0198 | -0.0984 * |
| 242 | 4.00 | .000 | -0.3 | 3.60 | 10.0 | .064 | -0.0387 | -0.0132 * |
| 243 | 4.00 | .000 | 9.7 | 2.60 | 10.0 | .050 | -0.0555 | -0.0759 * |
| 244 | 3.00 | .000 | 19.7 | 5.60 | 10.0 | -.003 | -0.0550 | 0.0324 * |
| 245 | 3.00 | .000 | -4.9 | 5.50 | 10.0 | .180 | -0.0162 | -0.0375 * |
| 246 | 5.00 | .000 | -5.2 | 5.50 | 15.0 | .077 | -0.0287 | 0.0317 * |
| 247 | 3.00 | .000 | -0.3 | 5.60 | 15.0 | .165 | -0.0844 | -0.1405 * |
| 248 | 5.00 | .000 | 14.8 | 5.50 | 15.0 | .029 | -0.1994 | -0.2382 |
| 249 | 6.00 | .000 | 14.7 | 5.60 | 15.0 | .016 | -0.1216 | -0.1630 * |
| 250 | 5.00 | .000 | -0.3 | 5.50 | 15.0 | .044 | -0.0612 | 0.0879 * |
| 251 | 2.00 | .000 | 4.7 | 6.60 | 15.0 | .091 | -0.0261 | -0.0021 * |
| 252 | 6.00 | .000 | 3.9 | 6.60 | 15.0 | .026 | -0.0464 | 0.2493 * |
| 253 | 3.00 | .000 | 19.7 | 6.60 | 15.0 | .018 | -0.1188 | -0.1324 |
| 254 | 4.00 | .000 | -5.3 | 6.60 | 15.0 | .150 | -0.0921 | -0.1061 * |
| 255 | 6.00 | .000 | -5.3 | 4.60 | 15.0 | .067 | -0.0669 | 0.1141 |
| 256 | 3.00 | .000 | 14.7 | 4.60 | 15.0 | .094 | -0.2418 | -0.2475 |
| 257 | 5.00 | .000 | 9.8 | 4.50 | 15.0 | .077 | -0.3074 | -0.3082 |

R-1851

TABLE A-23 (cont'd)

MEASURED AND FITTED ROLL MOMENT
BETA=15. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|------|-------|----------|----------|
| 258 | 3.00 | .000 | 4.7 | 4.60 | 15.0 | .266 | -0.3844 | -0.3849 |
| 260 | 4.00 | .000 | -0.3 | 4.60 | 15.0 | .230 | -0.4266 | -0.4256 |
| 261 | 4.00 | .000 | -0.3 | 4.60 | 15.0 | .049 | -0.0373 | 0.0127* |
| 262 | 3.00 | .000 | 9.8 | 4.60 | 15.0 | .056 | -0.0476 | -0.0460 |
| 263 | 6.00 | .000 | 9.8 | 4.60 | 15.0 | .033 | -0.0795 | -0.0520 |
| 264 | 4.00 | .000 | -0.3 | 3.60 | 15.0 | .069 | -0.0595 | -0.0521 |
| 265 | 6.00 | .000 | 19.8 | 3.60 | 15.0 | -.009 | -0.1678 | -0.1724* |
| 266 | 4.00 | .000 | 9.8 | 2.60 | 15.0 | .053 | -0.0775 | -0.1238* |
| 267 | 3.00 | .000 | 9.8 | 2.60 | 15.0 | .095 | -0.1295 | -0.1420 |
| 268 | 3.00 | .000 | 4.7 | 2.60 | 15.0 | .089 | -0.0708 | -0.0610 |
| 270 | 6.00 | .000 | 4.8 | 2.50 | 15.0 | .099 | -0.3924 | -0.4023 |
| 271 | 6.00 | .000 | 4.8 | 2.50 | 15.0 | .097 | -0.3845 | -0.3897 |
| 275 | 4.00 | .000 | 9.8 | 2.50 | 15.0 | .117 | -0.3418 | -0.3688* |
| 276 | 4.00 | .000 | 4.8 | 3.60 | 5.0 | .058 | -0.0152 | -0.0066* |
| 277 | 4.00 | .000 | -0.3 | 3.60 | 20.0 | .068 | -0.0816 | -0.0682 |
| 277 | 3.00 | .000 | 14.7 | 3.50 | 20.0 | .049 | -0.1224 | -0.1262 |
| 279 | 4.00 | .000 | 4.8 | 3.50 | 20.0 | .133 | -0.3046 | -0.3677 |
| 280 | 6.00 | .000 | 4.8 | 2.50 | 20.0 | .100 | -0.5232 | -0.4822 |
| 281 | 5.00 | .000 | 4.8 | 2.50 | 20.0 | .168 | -0.7487 | -0.7763 |
| 282 | 6.00 | .000 | 14.7 | 2.50 | 20.0 | .028 | -0.2815 | -0.2627 |
| 283 | 4.00 | .000 | 14.7 | 2.50 | 20.0 | .034 | -0.1431 | -0.1825* |
| 286 | 4.00 | .000 | 14.7 | 2.50 | 20.0 | .020 | -0.0675 | -0.1046* |
| 286 | 3.00 | .000 | 9.7 | 4.50 | 20.0 | .043 | -0.0289 | -0.0143* |
| 287 | 3.00 | .000 | 9.7 | 4.50 | 20.0 | .075 | -0.1144 | -0.1156 |
| 288 | 4.00 | .000 | 19.8 | 4.50 | 20.0 | -.004 | -0.1257 | -0.1477 |
| 289 | 2.00 | .000 | 14.7 | 4.50 | 20.0 | .098 | -0.1240 | -0.1143 |
| 290 | 2.00 | .000 | 19.8 | 4.60 | 20.0 | .136 | -0.3144 | -0.3131 |
| 294 | 3.00 | .000 | -0.3 | 5.50 | 20.0 | .090 | -0.0666 | -0.0531* |
| 295 | 3.00 | .000 | -0.3 | 5.60 | 20.0 | .056 | -0.0369 | 0.0094* |
| 296 | 4.00 | .000 | -0.3 | 6.60 | 20.0 | .046 | -0.0406 | 0.0331* |
| 297 | 4.00 | .000 | 4.7 | 3.60 | 5.0 | .059 | -0.0228 | -0.0079* |
| 298 | 4.00 | .000 | 4.8 | 1.60 | 5.0 | .082 | -0.0428 | -0.0443 |
| 299 | 4.00 | .000 | 14.7 | 1.60 | 5.0 | .038 | -0.0423 | -0.0375 |
| 300 | 5.00 | .000 | -0.3 | 1.50 | 15.0 | .051 | -0.1718 | -0.1190 |
| 109 | 2.35 | .059 | 0.0 | 3.00 | 0.0 | .069 | -0.2630 | -0.2484 |
| 110 | 2.92 | .073 | 0.0 | 3.00 | 0.0 | .060 | -0.4176 | -0.4090 |
| 111 | 3.88 | .097 | 0.0 | 3.00 | 0.0 | .052 | -0.7520 | -0.7492 |
| 112 | 4.95 | .124 | 0.0 | 3.00 | 0.0 | .045 | -1.2337 | -1.2436 |
| 113 | 6.02 | .150 | 0.0 | 3.00 | 0.0 | .037 | -1.8466 | -1.8469 |
| 114 | 2.87 | .072 | 0.0 | 3.00 | 0.0 | .049 | -0.3991 | -0.3913 |
| 115 | 3.02 | .076 | 0.0 | 3.00 | 0.0 | .081 | -0.4482 | -0.4411 |
| 116 | 3.01 | .075 | 0.0 | 3.00 | 0.0 | .155 | -0.4531 | -0.4331 |
| 117 | 2.82 | .071 | 0.0 | 3.00 | 0.0 | .156 | -0.3996 | -0.3772 |
| 119 | 4.03 | .101 | 0.0 | 3.00 | 0.0 | .181 | -0.8358 | -0.7957 |
| 120 | 3.03 | .076 | 5.0 | 3.00 | 0.0 | .059 | -0.4747 | -0.4507 |
| 121 | 3.02 | .075 | -5.0 | 3.00 | 0.0 | .056 | -0.4305 | -0.4295 |
| 122 | 2.87 | .072 | -10.0 | 3.00 | 0.0 | .052 | -0.3710 | -0.3744 |
| 123 | 2.89 | .072 | -15.0 | 3.00 | 0.0 | .046 | -0.3353 | -0.3680* |
| 124 | 3.05 | .076 | -20.0 | 3.00 | 0.0 | .040 | -0.1772 | -0.3910 |
| 125 | 3.06 | .076 | 0.0 | 3.00 | 5.0 | .058 | -0.4730 | -0.4643 |

A100

TABLE A-23 (cont'd)

MEASURED AND FITTED ROLL MOMENT
BETA=15. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|-----------|
| 127 | 3.01 | .075 | 0.0 | 3.00 | -10.0 | .067 | -0.4028 | -0.3895 |
| 128 | 3.03 | .076 | 0.0 | 3.00 | -15.0 | .066 | -0.3782 | -0.3674 |
| 129 | 3.01 | .075 | 0.0 | 3.00 | -20.0 | .055 | -0.3534 | -0.3642 |
| 130 | 2.99 | .075 | 0.0 | 2.00 | 0.0 | .066 | -0.4409 | -0.4346 |
| 131 | 3.02 | .075 | 0.0 | 4.00 | 0.0 | .063 | -0.4453 | -0.4358 |
| 132 | 3.06 | .076 | 0.0 | 5.00 | 0.0 | .054 | -0.4540 | -0.4454 |
| 133 | 3.06 | .076 | 0.0 | 6.00 | 0.0 | .057 | -0.4579 | -0.4440 |
| 136 | 4.04 | .101 | -5.0 | 3.00 | 0.0 | .095 | -0.7626 | -0.7692 |
| 137 | 6.09 | .152 | -15.0 | 5.00 | -10.0 | .003 | -1.6974 | -1.5350 * |
| 138 | 6.05 | .151 | -20.0 | 6.00 | -5.0 | -.018 | -1.5981 | -1.3809 * |
| 139 | 4.02 | .100 | -20.0 | 6.00 | -20.0 | -.022 | -0.5836 | -0.4548 * |
| 140 | 5.00 | .125 | 5.0 | 3.00 | -20.0 | .022 | -1.1186 | -1.1372 |
| 141 | 4.99 | .125 | 5.0 | 3.00 | -20.0 | .021 | -1.1117 | -1.1328 |
| 142 | 2.91 | .073 | -5.0 | 3.00 | -5.0 | .056 | -0.3852 | -0.3775 |
| 143 | 1.65 | .041 | -10.0 | 6.00 | 0.0 | .153 | -0.0644 | -0.0603 |
| 144 | 3.79 | .095 | -10.0 | 3.00 | -20.0 | .093 | -0.2053 | -0.2487 |
| 145 | 4.76 | .119 | 5.0 | 2.00 | -5.0 | .045 | -1.1368 | -1.1201 |
| 147 | 3.87 | .097 | -5.0 | 6.00 | -20.0 | .026 | 0.7379 | -0.6266 * |
| 148 | 5.86 | .146 | -10.0 | 3.00 | 5.0 | .097 | -1.6458 | -1.6634 |
| 150 | 3.94 | .098 | -15.0 | 4.00 | -5.0 | .093 | -0.4461 | -0.4442 |
| 151 | 2.95 | .074 | -10.0 | 2.00 | -10.0 | .105 | -0.2535 | -0.2207 |
| 154 | 4.78 | .120 | -5.0 | 3.00 | -5.0 | .032 | -1.1025 | -1.1006 |
| 156 | 3.00 | .075 | 0.0 | 2.00 | -10.0 | .053 | -0.4025 | -0.4009 |
| 157 | 3.02 | .076 | -5.0 | 6.00 | -15.0 | .050 | -0.3489 | -0.3415 |
| 158 | 3.99 | .100 | -5.0 | 6.00 | -15.0 | .040 | -0.6539 | -0.6504 |
| 160 | 2.40 | .060 | -10.0 | 2.00 | -20.0 | .044 | -0.1593 | -0.1969 |
| 161 | 6.18 | .154 | 5.0 | 3.00 | -20.0 | .044 | -1.7892 | -1.7433 |
| 162 | 6.21 | .155 | 5.0 | 3.00 | -20.0 | .040 | -1.8044 | -1.7884 |
| 163 | 6.18 | .154 | -10.0 | 2.00 | -15.0 | .004 | -1.7846 | -1.7819 |
| 164 | 4.38 | .110 | -10.0 | 5.00 | -20.0 | .041 | -0.6158 | -0.6299 |
| 165 | 3.23 | .081 | -10.0 | 2.00 | -20.0 | .082 | -0.1216 | -0.2022 * |
| 166 | 2.15 | .054 | -10.0 | 4.00 | -15.0 | .037 | -0.1573 | -0.1850 |
| 167 | 2.64 | .066 | -5.0 | 3.00 | -5.0 | .065 | -0.3018 | -0.2979 |
| 168 | 5.65 | .141 | -5.0 | 5.00 | 5.0 | .073 | -1.5219 | -1.4744 |
| 169 | 4.72 | .118 | -5.0 | 2.00 | -10.0 | .052 | -0.9944 | -0.9631 |
| 170 | 5.81 | .145 | 5.0 | 3.00 | -5.0 | .040 | -1.7103 | -1.7504 |
| 171 | 4.74 | .118 | 0.0 | 2.00 | 5.0 | .064 | -1.1719 | -1.2088 |
| 173 | 5.91 | .148 | -5.0 | 3.00 | 0.0 | .077 | -0.5496 | -1.6841 * |
| 174 | 4.83 | .121 | -20.0 | 5.00 | 5.0 | .045 | -1.0326 | -0.9972 |
| 175 | 6.04 | .151 | -20.0 | 5.00 | -5.0 | .020 | 0.5451 | -1.2540 * |
| 177 | 3.75 | .094 | -10.0 | 5.00 | 5.0 | .013 | -0.6848 | -0.6872 |
| 178 | 2.96 | .074 | -5.0 | 3.00 | -5.0 | .048 | -0.3961 | -0.3972 |
| 180 | 3.18 | .079 | -15.0 | 4.00 | -10.0 | .111 | -0.2402 | -0.1260 * |
| 181 | 5.11 | .128 | -5.0 | 2.00 | -15.0 | .046 | -1.0987 | -1.0693 |
| 182 | 2.15 | .054 | -15.0 | 3.00 | 5.0 | .002 | -0.2110 | -0.2583 |
| 183 | 4.91 | .123 | -20.0 | 5.00 | -15.0 | .012 | -0.5434 | -0.6179 |
| 184 | 5.08 | .127 | 5.0 | 4.00 | 0.0 | .071 | -1.3966 | -1.3666 |
| 527 | 1.82 | .068 | 0.0 | 3.00 | 0.0 | .112 | -0.2425 | -0.2247 |
| 528 | 2.87 | .108 | 0.0 | 3.00 | 0.0 | .076 | -0.6242 | -0.6156 |
| 529 | 3.87 | .145 | 0.0 | 3.00 | 0.0 | .052 | -1.1317 | -1.1402 |

TABLE A-23 (cont'd)

MEASURED AND FITTED ROLL MOMENT
BETA=15. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|---------|
| 530 | 4.98 | .187 | 0.0 | 3.00 | 0.0 | .043 | -1.8887 | -1.8901 |
| 531 | 5.97 | .224 | 0.0 | 3.00 | 0.0 | .037 | -2.7344 | -2.7166 |
| 532 | 2.96 | .111 | 0.0 | 3.00 | 0.0 | .052 | -0.6523 | -0.6537 |
| 533 | 2.97 | .111 | 0.0 | 3.00 | 0.0 | .104 | -0.6600 | -0.6610 |
| 534 | 2.96 | .111 | 0.0 | 3.00 | 0.0 | .154 | -0.6553 | -0.6496 |
| 536 | 3.98 | .149 | 0.0 | 3.00 | 0.0 | .146 | -1.2016 | -1.1957 |
| 537 | 3.97 | .149 | 0.0 | 3.00 | 0.0 | .195 | -1.2206 | -1.1671 |
| 538 | 2.96 | .111 | 5.0 | 3.00 | 0.0 | .075 | -0.6762 | -0.6682 |
| 539 | 2.96 | .111 | -5.0 | 3.00 | 0.0 | .074 | -0.6271 | -0.6351 |
| 540 | 3.00 | .112 | -10.0 | 3.00 | 0.0 | .063 | -0.6248 | -0.6339 |
| 541 | 2.97 | .111 | -15.0 | 3.00 | 0.0 | .044 | -0.5921 | -0.6167 |
| 542 | 2.98 | .112 | -20.0 | 3.00 | 0.0 | .019 | -0.5851 | -0.6326 |
| 543 | 2.98 | .112 | 0.0 | 3.00 | 5.0 | .074 | -0.6712 | -0.6817 |
| 544 | 2.98 | .112 | 0.0 | 3.00 | -5.0 | .078 | -0.6372 | -0.6369 |
| 545 | 2.99 | .112 | 0.0 | 3.00 | -10.0 | .079 | -0.6172 | -0.6024 |
| 546 | 2.97 | .112 | 0.0 | 3.00 | -20.0 | .057 | -0.5475 | -0.5695 |
| 547 | 2.99 | .112 | 0.0 | 3.00 | -15.0 | .084 | -0.5840 | -0.5572 |
| 548 | 2.97 | .111 | 0.0 | 2.00 | 0.0 | .080 | -0.6618 | -0.6678 |
| 549 | 2.98 | .112 | 0.0 | 4.00 | 0.0 | .060 | -0.6513 | -0.6607 |
| 550 | 2.97 | .112 | 0.0 | 5.00 | 0.0 | .059 | -0.6442 | -0.6525 |
| 551 | 3.01 | .113 | 0.0 | 6.00 | 0.0 | .055 | -0.6579 | -0.6682 |
| 552 | 1.90 | .071 | -15.0 | 4.00 | 5.0 | .136 | -0.2270 | -0.2098 |
| 553 | 4.03 | .151 | -5.0 | 3.00 | -5.0 | .064 | -1.1401 | -1.1445 |
| 555 | 5.98 | .224 | 5.0 | 4.00 | -20.0 | .064 | -2.4324 | -2.4020 |
| 556 | 4.99 | .187 | -10.0 | 4.00 | 5.0 | .136 | -1.6930 | -1.7548 |
| 558 | 3.99 | .150 | -15.0 | 6.00 | 0.0 | .003 | -1.0988 | -1.1003 |
| 559 | 3.00 | .113 | -5.0 | 3.00 | -5.0 | .071 | -0.6177 | -0.6239 |
| 560 | 6.00 | .225 | 0.0 | 2.00 | -5.0 | .051 | -2.6841 | -2.7120 |
| 561 | 5.00 | .188 | -15.0 | 5.00 | 0.0 | .065 | -1.5140 | -1.5477 |
| 564 | 6.01 | .225 | -20.0 | 3.00 | 5.0 | .054 | -2.6857 | -2.5406 |
| 566 | 6.01 | .225 | 0.0 | 3.00 | 5.0 | .086 | -2.8147 | -2.7890 |
| 567 | 6.00 | .225 | -20.0 | 5.00 | -20.0 | -.008 | -1.8092 | -1.8143 |
| 568 | 3.98 | .149 | -10.0 | 6.00 | 0.0 | .014 | -1.1378 | -1.1095 |
| 569 | 3.97 | .149 | 5.0 | 4.00 | -10.0 | .169 | -0.9218 | -0.9793 |
| 570 | 2.99 | .112 | -5.0 | 3.00 | 0.0 | .146 | -0.6061 | -0.6158 |
| 571 | 4.97 | .186 | -5.0 | 6.00 | -20.0 | .049 | -1.5132 | -1.5284 |
| 572 | 3.00 | .112 | -5.0 | 3.00 | -5.0 | .071 | -0.6164 | -0.6225 |
| 573 | 5.95 | .223 | -5.0 | 2.00 | -20.0 | .082 | -1.8986 | -1.8762 |
| 577 | 4.97 | .186 | 5.0 | 3.00 | -20.0 | .106 | -1.2832 | -1.3540 |
| 579 | 1.99 | .075 | -15.0 | 6.00 | -5.0 | .186 | -0.0751 | -0.0533 |
| 580 | 2.96 | .111 | 0.0 | 6.00 | -20.0 | .191 | -0.2730 | -0.2695 |
| 581 | 6.00 | .225 | -20.0 | 2.00 | 0.0 | -.006 | -2.6244 | -2.6502 |
| 583 | 5.95 | .223 | -15.0 | 2.00 | -5.0 | .050 | -2.3339 | -2.3299 |
| 585 | 01 | .225 | -10.0 | 3.00 | -5.0 | .058 | -2.4547 | -2.4432 |
| 586 | 2.96 | .111 | -5.0 | 3.00 | -5.0 | .072 | -0.6028 | -0.6055 |
| 588 | 3.91 | .147 | -5.0 | 3.00 | -5.0 | .125 | -1.0049 | -0.9877 |
| 593 | 4.03 | .151 | -10.0 | 6.00 | -5.0 | .021 | -1.1233 | -1.0898 |
| 594 | 2.97 | .111 | -20.0 | 4.00 | 0.0 | .138 | -0.4282 | -0.3898 |
| 595 | 3.01 | .113 | 0.0 | 4.00 | -15.0 | .104 | -0.5849 | -0.5293 |
| 596 | 2.03 | .076 | -5.0 | 5.00 | 5.0 | .276 | -0.2956 | -0.2743 |

TABLE A-23 (cont'd)

MEASURED AND FITTED ROLL MOMENT
BETA=15. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|----------|
| 598 | 3.01 | .113 | -10.0 | 5.00 | -10.0 | .128 | -0.3973 | -0.3839 |
| 599 | 3.02 | .113 | -5.0 | 3.00 | -5.0 | .073 | -0.6242 | -0.6278* |
| 600 | 2.01 | .075 | -10.0 | 6.00 | -10.0 | .254 | -0.0296 | 0.0004 |
| 601 | 5.02 | .188 | -20.0 | 5.00 | -10.0 | .026 | -1.2615 | -1.2612 |
| 602 | 5.05 | .189 | -20.0 | 2.00 | -10.0 | -.030 | -1.7568 | -1.7397 |
| 603 | 3.05 | .114 | -15.0 | 5.00 | -15.0 | .036 | -0.4692 | -0.4519 |
| 604 | 5.99 | .225 | -10.0 | 4.00 | -15.0 | .052 | -2.1649 | -2.1632 |
| 618 | 1.92 | .144 | 0.0 | 3.00 | 0.0 | .093 | -0.5386 | -0.5491 |
| 619 | 2.99 | .224 | 0.0 | 3.00 | 0.0 | .070 | -.3353 | -1.3411 |
| 620 | 2.50 | .188 | 0.0 | 3.00 | 0.0 | .078 | -0.9294 | -0.9404 |
| 621 | 3.07 | .230 | 0.0 | 3.00 | 0.0 | .050 | -1.4088 | -1.4041 |
| 622 | 3.06 | .230 | 0.0 | 3.00 | 0.0 | .086 | -1.4085 | -1.4059 |
| 623 | 3.05 | .228 | 0.0 | 3.00 | 0.0 | .136 | -1.3867 | -1.3844 |
| 625 | 3.01 | .226 | 5.0 | 3.00 | 0.0 | .061 | -1.3803 | -1.3635 |
| 626 | 2.99 | .224 | -5.0 | 3.00 | 0.0 | .066 | -1.3151 | -1.3174 |
| 627 | 3.01 | .226 | -10.0 | 3.00 | 0.0 | .049 | -1.3142 | -1.3052 |
| 628 | 3.00 | .225 | -15.0 | 3.00 | 0.0 | .028 | -1.2970 | -1.2793 |
| 629 | 3.01 | .226 | -20.0 | 3.00 | 0.0 | .003 | -1.2917 | -1.2768 |
| 630 | 2.98 | .223 | 0.0 | 3.00 | 5.0 | .063 | -1.3350 | -1.3259 |
| 631 | 2.97 | .223 | 0.0 | 3.00 | -5.0 | .070 | -1.2940 | -1.3029 |
| 632 | 2.96 | .222 | 0.0 | 3.00 | -10.0 | .071 | -1.2518 | -1.2558 |
| 633 | 2.97 | .223 | 0.0 | 3.00 | -15.0 | .072 | -1.2087 | -1.2091 |
| 634 | 2.97 | .223 | 0.0 | 3.00 | -20.0 | .053 | -1.1703 | -1.1930 |
| 635 | 2.97 | .223 | 0.0 | 2.00 | 0.0 | .062 | -1.3316 | -1.3350 |
| 636 | 2.98 | .223 | 0.0 | 4.00 | 0.0 | .060 | -1.3181 | -1.3163 |
| 637 | 2.98 | .223 | 0.0 | 5.00 | 0.0 | .053 | -1.3071 | -1.3067 |
| 638 | 2.98 | .223 | 0.0 | 6.00 | 0.0 | .048 | -1.3014 | -1.3010 |
| 639 | 2.47 | .185 | 0.0 | 6.00 | -20.0 | .058 | -0.7829 | -0.8005 |
| 640 | 2.48 | .186 | 5.0 | 6.00 | -5.0 | .232 | -0.8563 | -0.8495 |
| 641 | 2.96 | .222 | -5.0 | 3.00 | -5.0 | .108 | -1.2335 | -1.2190 |
| 642 | 2.48 | .186 | -5.0 | 6.00 | 5.0 | .275 | -0.8103 | -0.8184 |
| 643 | 1.97 | .148 | 0.0 | 4.00 | -10.0 | .206 | -0.4317 | -0.4735 |
| 644 | 2.50 | .187 | -20.0 | 3.00 | -10.0 | -.010 | -0.8288 | -0.7831 |
| 645 | 1.99 | .149 | -20.0 | 3.00 | -10.0 | .069 | -0.3896 | -0.3371 |
| 646 | 2.96 | .222 | -5.0 | 3.00 | -5.0 | .061 | -1.2578 | -1.2636 |
| 660 | 2.99 | .224 | -15.0 | 3.00 | 5.0 | .071 | -1.2669 | -1.2831 |
| 661 | 1.99 | .150 | -5.0 | 3.00 | -15.0 | .106 | -0.4834 | -0.5112 |
| 662 | 2.99 | .224 | -20.0 | 6.00 | -10.0 | .108 | -0.6613 | -0.7009 |
| 665 | 2.51 | .188 | 0.0 | 3.00 | -5.0 | .092 | -0.9165 | -0.9294 |
| 667 | 3.00 | .225 | 5.0 | 6.00 | -10.0 | .181 | -1.1418 | -1.1937 |
| 668 | 2.00 | .150 | -5.0 | 3.00 | -10.0 | .066 | -0.5413 | -0.5740 |
| 670 | 2.99 | .224 | -5.0 | 5.00 | -20.0 | .158 | -0.8701 | -0.8546 |
| 671 | 2.51 | .188 | 5.0 | 5.00 | 0.0 | .043 | -0.9516 | -0.9237 |
| 672 | 2.99 | .224 | -5.0 | 3.00 | -5.0 | .056 | -1.2809 | -1.2931 |
| 673 | 1.99 | .149 | -5.0 | 6.00 | -5.0 | .255 | -0.4199 | -0.4199 |
| 674 | 2.50 | .188 | 5.0 | 5.00 | 0.0 | .091 | -0.9582 | -0.9508 |
| 675 | 2.50 | .188 | -5.0 | 6.00 | 0.0 | .037 | -0.8965 | -0.9270 |
| 676 | 1.99 | .149 | -20.0 | 3.00 | -20.0 | -.023 | -0.4476 | -0.4413 |
| 678 | 1.99 | .149 | -10.0 | 3.00 | 5.0 | .079 | -0.5614 | -0.5693 |
| 681 | 2.51 | .188 | -10.0 | 6.00 | -15.0 | .034 | -0.7961 | -0.8108 |

TABLE A-23 (cont'd)

MEASURED AND FITTED ROLL MOMENT
BETA=15. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|------|----------|---------|
| 682 | 2.50 | .187 | 5.0 | 6.00 | -10.0 | .256 | -0.6967 | -0.7378 |
| 683 | 2.97 | .223 | -5.0 | 3.00 | -5.0 | .075 | -1.2834 | -1.2566 |
| 685 | 2.99 | .224 | -15.0 | 6.00 | 0.0 | .229 | -0.8474 | -0.8746 |
| 686 | 2.50 | .188 | -15.0 | 8.00 | 0.0 | .279 | -0.4544 | -0.4468 |
| 688 | 2.99 | .224 | 0.0 | 5.00 | -15.0 | .185 | -1.0253 | -1.0015 |
| 689 | 2.00 | .150 | 0.0 | 5.00 | 5.0 | .077 | -0.5871 | -0.6011 |
| 690 | 3.00 | .225 | 5.0 | 6.00 | -20.0 | .124 | -1.1257 | -1.0841 |
| 691 | 2.02 | .152 | -5.0 | 8.00 | -15.0 | .342 | -0.1319 | -0.1187 |
| 693 | 2.46 | .185 | -10.0 | 2.00 | 5.0 | .086 | -0.8660 | -0.8889 |
| 694 | 2.96 | .222 | -20.0 | 4.00 | -10.0 | .124 | -0.7128 | -0.6936 |
| 695 | 2.96 | .222 | -5.0 | 3.00 | -5.0 | .073 | -1.2613 | -1.2541 |
| 697 | 2.47 | .185 | -10.0 | 6.00 | 0.0 | .224 | -0.7035 | -0.6934 |
| 698 | 2.99 | .224 | -10.0 | 6.00 | -5.0 | .134 | -1.0847 | -1.0610 |
| 699 | 3.00 | .225 | 5.0 | 8.00 | -10.0 | .222 | -1.1510 | -1.1422 |
| 700 | 3.00 | .225 | -20.0 | 4.00 | -5.0 | .177 | -0.7608 | -0.7535 |
| 701 | 2.48 | .186 | -20.0 | 5.00 | -20.0 | .087 | -0.3284 | -0.3157 |

MEAN ERROR= -0.0061
STANDARD DEVIATION= 0.0212

TABLE A-24

MEASURED AND FITTED ROLL MOMENT
BETA=20. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|------|-------|------|-------|----------|-----------|
| 316 | 4.00 | .000 | 4.8 | 3.70 | 5.0 | .086 | -0.0416 | -0.0441 |
| 317 | 4.00 | .000 | 4.7 | 3.70 | 5.0 | .088 | -0.0410 | -0.0463 * |
| 318 | 4.00 | .000 | 4.7 | 3.60 | 0.0 | .131 | 0.0026 | -0.0066 * |
| 319 | 4.00 | .000 | -0.3 | 3.60 | 0.0 | .095 | 0.0069 | 0.0440 * |
| 320 | 2.00 | .000 | -0.3 | 3.60 | 0.0 | .152 | 0.0141 | 0.0432 * |
| 321 | 2.00 | .000 | -0.3 | 3.70 | 0.0 | .151 | 0.0136 | 0.0432 * |
| 322 | 3.00 | .000 | -0.3 | 3.60 | 0.0 | .113 | 0.0107 | 0.0434 * |
| 323 | 5.00 | .000 | -0.3 | 3.60 | 0.0 | .076 | 0.0079 | 0.0447 * |
| 324 | 6.00 | .000 | -0.3 | 3.70 | 0.0 | .067 | 0.0031 | 0.0463 * |
| 325 | 4.00 | .000 | -0.3 | 3.60 | 0.0 | .075 | 0.0096 | 0.0433 * |
| 326 | 4.00 | .000 | 4.7 | 3.60 | 0.0 | .116 | 0.0107 | -0.0009 * |
| 328 | 4.00 | .000 | 9.7 | 3.70 | 0.0 | .070 | -0.0002 | -0.0046 * |
| 329 | 4.00 | .000 | 14.7 | 3.70 | 0.0 | .047 | -0.0139 | 0.0114 * |
| 330 | 4.00 | .000 | 19.8 | 3.60 | 0.0 | .025 | -0.0401 | 0.0632 * |
| 331 | 4.00 | .000 | 27.2 | 3.60 | 0.0 | -.006 | -0.0643 | 0.2006 * |
| 332 | 3.00 | .000 | 19.7 | 3.60 | 0.0 | .191 | -0.1451 | -0.1434 * |
| 333 | 4.00 | .000 | -0.3 | 3.60 | 0.0 | .153 | 0.0153 | 0.0454 * |
| 335 | 5.00 | .000 | -0.3 | 3.60 | 0.0 | .183 | 0.0354 | 0.0476 * |
| 336 | 4.00 | .000 | -0.3 | 3.60 | 0.0 | .200 | 0.0255 | 0.0462 * |
| 337 | 4.00 | .000 | 27.3 | 4.70 | 0.0 | .179 | -0.3322 | -0.3701 * |
| 338 | 4.00 | .000 | -0.3 | 4.60 | 0.0 | .076 | 0.0115 | 0.0442 * |
| 339 | 4.00 | .000 | -0.3 | 2.60 | 0.0 | .105 | 0.0157 | 0.0435 * |
| 340 | 3.00 | .000 | 4.7 | 2.60 | 0.0 | .098 | 0.0074 | 0.0249 * |
| 342 | 6.00 | .000 | 19.8 | 3.70 | 0.0 | .141 | -0.4192 | -0.3904 * |
| 344 | 3.00 | .000 | 27.3 | 5.70 | 0.0 | .281 | -0.3441 | -0.3564 * |
| 345 | 3.00 | .000 | 27.3 | 5.60 | 0.0 | .173 | -0.2137 | -0.2386 * |
| 347 | 6.00 | .000 | -0.3 | 5.60 | 0.0 | .059 | 0.0016 | 0.0499 * |
| 348 | 4.00 | .000 | -0.3 | 5.60 | 0.0 | .074 | 0.0074 | 0.0450 * |
| 349 | 5.00 | .000 | 4.8 | 5.60 | 0.0 | .053 | 0.0085 | -0.0363 * |
| 350 | 4.00 | .000 | -0.3 | 6.70 | 0.0 | .068 | 0.0090 | 0.0458 * |
| 351 | 6.00 | .000 | -5.3 | 6.70 | 0.0 | .051 | 0.0046 | 0.2211 * |
| 353 | 2.00 | .000 | 27.2 | 6.70 | 0.0 | .068 | -0.0545 | 0.1592 * |
| 354 | 3.00 | .000 | -5.3 | 6.60 | 0.0 | .110 | 0.0273 | 0.0879 * |
| 355 | 4.00 | .000 | 9.8 | 6.70 | 0.0 | .186 | -0.2022 | -0.2019 * |
| 356 | 3.00 | .000 | -0.3 | 6.70 | -5.0 | .236 | 0.0880 | 0.1509 * |
| 357 | 4.00 | .000 | 9.7 | 6.70 | -5.0 | .069 | 0.0116 | -0.0186 * |
| 358 | 4.00 | .000 | 9.7 | 6.70 | -5.0 | .060 | 0.0173 | -0.0140 * |
| 359 | 4.00 | .000 | 9.7 | 6.70 | -5.0 | .061 | 0.0142 | -0.0143 * |
| 362 | 4.00 | .000 | 9.7 | 5.60 | -5.0 | .065 | 0.0167 | 0.0102 * |
| 364 | 3.00 | .000 | 14.7 | 5.70 | -5.0 | .266 | 0.0040 | 0.0055 * |
| 365 | 5.00 | .000 | 19.8 | 5.60 | -5.0 | .170 | -0.0173 | -0.1572 * |
| 366 | 6.00 | .000 | 19.8 | 4.70 | -5.0 | .132 | -0.0219 | -0.1448 * |
| 368 | 4.00 | .000 | 9.7 | 2.60 | -5.0 | .109 | 0.0215 | 0.1168 * |
| 369 | 2.00 | .000 | 9.7 | 2.60 | -5.0 | .172 | 0.0159 | 0.0455 * |
| 370 | 4.00 | .000 | 14.7 | 2.60 | -5.0 | .045 | -0.0064 | 0.1271 * |
| 371 | 5.00 | .000 | 4.7 | 2.60 | -5.0 | .145 | 0.0882 | 0.2135 * |
| 374 | 5.00 | .000 | -0.3 | 3.60 | -5.0 | .069 | 0.0602 | 0.0830 * |
| 375 | 5.00 | .000 | -0.3 | 3.60 | -5.0 | .067 | 0.0622 | 0.0787 * |
| 376 | 4.00 | .000 | -0.3 | 3.70 | -5.0 | .087 | 0.0597 | 0.0968 * |
| 377 | 4.00 | .000 | 4.7 | 3.60 | 5.0 | .081 | -0.0450 | -0.0345 * |

TABLE A-24 (cont'd)

MEASURED AND FITTED ROLL MOMENT
BETA=20. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED* |
|-----|------|------|------|-------|------|-------|----------|----------|
| 378 | 4.00 | .000 | 4.8 | 3.60 | 5.0 | .064 | -0.0309 | -0.0059* |
| 379 | 4.00 | .000 | -0.3 | 3.60 | 5.0 | .084 | -0.0386 | -0.0071 |
| 380 | 3.00 | .000 | -5.3 | 3.60 | 5.0 | .148 | -0.0088 | -0.0063 |
| 381 | 3.00 | .000 | -0.3 | 2.60 | 5.0 | .117 | -0.0290 | -0.0200 |
| 382 | 5.00 | .000 | 4.7 | 2.60 | 5.0 | .076 | -0.0594 | -0.0550 |
| 383 | 3.00 | .000 | 19.7 | 2.60 | 5.0 | .028 | -0.0314 | 0.0389* |
| 385 | 5.00 | .000 | 14.8 | 2.60 | 5.0 | .153 | -0.4471 | -0.4275 |
| 387 | 6.00 | .000 | 4.8 | 2.60 | 5.0 | .151 | -0.3042 | -0.3264* |
| 388 | 3.00 | .000 | -5.2 | 6.70 | 5.0 | .310 | 0.0324 | -0.0147* |
| 389 | 5.00 | .000 | 9.7 | 6.60 | 5.0 | .040 | -0.0143 | -0.1500* |
| 395 | 4.00 | .000 | 27.4 | 5.60 | 5.0 | .176 | -0.9092 | -0.7415* |
| 396 | 4.00 | .000 | 4.8 | 3.60 | 5.0 | .081 | -0.0397 | -0.0349 |
| 397 | 4.00 | .000 | -0.2 | 3.60 | 10.0 | .084 | -0.0828 | -0.0687* |
| 398 | 3.00 | .000 | -5.3 | 3.60 | 10.0 | .146 | -0.0588 | -0.0999* |
| 399 | 4.00 | .000 | 9.8 | 3.60 | 10.0 | .087 | -0.0826 | -0.1628* |
| 400 | 5.00 | .000 | 19.7 | 3.60 | 10.0 | .019 | -0.0327 | -0.0991 |
| 401 | 4.00 | .000 | 14.8 | 3.60 | 10.0 | .163 | -0.5464 | -0.5295 |
| 402 | 3.00 | .000 | 14.7 | 6.60 | 10.0 | .223 | -0.4761 | -0.4538 |
| 403 | 3.00 | .000 | 4.7 | 6.60 | 10.0 | .152 | -0.1537 | -0.1396* |
| 404 | 5.00 | .000 | -0.3 | 6.60 | 10.0 | .091 | -0.1577 | -0.0667* |
| 405 | 2.00 | .000 | -5.3 | 6.60 | 10.0 | .120 | -0.0131 | -0.0016* |
| 406 | 4.00 | .000 | 27.3 | 6.60 | 10.0 | -.027 | -0.0994 | -0.1127* |
| 407 | 3.00 | .000 | 27.2 | 6.60 | 10.0 | -.025 | -0.0485 | 0.0945* |
| 408 | 2.00 | .000 | 19.7 | 4.60 | 10.0 | .038 | -0.0233 | 0.0570* |
| 409 | 4.00 | .000 | 9.7 | 2.60 | 10.0 | .063 | -0.0645 | -0.0718* |
| 410 | 3.00 | .000 | 27.3 | 5.60 | 10.0 | -.016 | -0.0765 | 0.0757* |
| 411 | 3.00 | .000 | -5.2 | 5.60 | 10.0 | .211 | -0.0992 | -0.1177 |
| 412 | 3.00 | .000 | -5.3 | 5.60 | 10.0 | .212 | -0.1000 | -0.1175 |
| 413 | 5.00 | .000 | -5.2 | 5.50 | 15.0 | .089 | -0.1800 | -0.1961 |
| 414 | 3.00 | .000 | -0.3 | 5.60 | 15.0 | .201 | -0.2361 | -0.2554* |
| 415 | 5.00 | .000 | 19.7 | 5.50 | 15.0 | .028 | -0.2223 | -0.3502* |
| 417 | 5.00 | .000 | -0.3 | 5.50 | 15.0 | .057 | -0.1178 | -0.0714* |
| 419 | 6.00 | .000 | 27.2 | 3.60 | 15.0 | -.048 | -0.0868 | 0.1867* |
| 420 | 4.00 | .000 | 14.8 | 2.60 | 15.0 | .056 | -0.1201 | -0.1647 |
| 421 | 3.00 | .000 | 4.8 | 2.60 | 15.0 | .109 | -0.1385 | -0.1544* |
| 422 | 3.00 | .000 | 9.8 | 2.60 | 15.0 | .152 | -0.2223 | -0.3485* |
| 423 | 4.00 | .000 | 14.8 | 2.60 | 15.0 | .130 | -0.6039 | -0.5665 |
| 424 | 6.00 | .000 | 4.8 | 2.60 | 15.0 | .125 | -0.7351 | -0.7718 |
| 427 | 5.00 | .000 | 14.8 | 4.50 | 15.0 | .077 | -0.4399 | -0.4305* |
| 428 | 4.00 | .000 | 4.8 | 4.60 | 15.0 | .215 | -0.5406 | -0.6586* |
| 429 | 4.00 | .000 | -0.2 | 4.70 | 15.0 | .290 | -0.8821 | -0.8639 |
| 430 | 6.00 | .000 | -5.2 | 4.60 | 15.0 | .080 | -0.2284 | -0.2455 |
| 431 | 3.00 | .000 | 14.8 | 4.60 | 15.0 | .135 | -0.3171 | -0.3365* |
| 432 | 5.00 | .000 | 14.8 | 4.60 | 15.0 | .033 | -0.0681 | -0.1589* |
| 433 | 3.00 | .000 | 14.7 | 4.60 | 15.0 | .056 | -0.0631 | -0.0803 |
| 434 | 4.00 | .000 | -0.3 | 4.60 | 15.0 | .063 | -0.0780 | -0.0628* |
| 435 | 2.00 | .000 | 4.7 | 6.70 | 15.0 | .123 | -0.0604 | -0.0258* |
| 436 | 6.00 | .000 | 9.7 | 6.70 | 15.0 | .041 | -0.0978 | -0.2031* |
| 437 | 3.00 | .000 | 27.2 | 6.60 | 15.0 | .001 | -0.1491 | -0.1284 |
| 438 | 4.00 | .000 | -5.2 | 6.60 | 15.0 | .185 | -0.3181 | -0.3128 |

TABLE A-24 (cont'd)

MEASURED AND FITTED ROLL MOMENT
BETA=20. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED* |
|-----|------|------|-------|-------|-------|-------|----------|---------|
| 439 | 4.00 | .000 | -0.3 | 6.60 | 20.0 | .051 | -0.0755 | -0.1409 |
| 440 | 3.00 | .000 | 4.7 | 5.60 | 20.0 | .075 | -0.0827 | -0.0755 |
| 443 | 6.00 | .000 | 27.2 | 5.50 | 20.0 | -.013 | -0.5430 | -0.5408 |
| 445 | 2.00 | .000 | 27.3 | 4.00 | 20.0 | .138 | -0.4348 | -0.4412 |
| 446 | 4.00 | .000 | 27.2 | 4.60 | 20.0 | -.025 | -0.1604 | -0.1118 |
| 447 | 2.00 | .000 | 19.8 | 4.60 | 20.0 | .112 | -0.1962 | -0.2042 |
| 448 | 3.00 | .000 | 4.7 | 4.60 | 20.0 | .115 | -0.2394 | -0.1866 |
| 449 | 3.00 | .000 | 9.7 | 4.60 | 20.0 | .065 | -0.0785 | -0.0707 |
| 450 | 4.00 | .000 | -0.3 | 3.60 | 20.0 | .085 | -0.2177 | -0.2732 |
| 451 | 3.00 | .000 | 19.7 | 3.60 | 20.0 | .057 | -0.1914 | -0.2114 |
| 453 | 6.00 | .000 | 9.8 | 3.60 | 20.0 | .119 | -1.0668 | -1.0249 |
| 454 | 4.00 | .000 | 9.8 | 3.60 | 20.0 | .190 | -0.9105 | -0.9149 |
| 455 | 6.00 | .000 | 19.7 | 2.60 | 20.0 | .032 | -0.3195 | -0.3532 |
| 456 | 4.00 | .000 | 14.8 | 2.60 | 20.0 | .072 | -0.3243 | -0.3431 |
| 457 | 4.00 | .000 | 19.8 | 1.60 | 20.0 | .014 | -0.0530 | -0.0571 |
| 459 | 4.00 | .000 | 4.8 | 3.60 | 5.0 | .077 | -0.0397 | -0.0289 |
| 211 | 2.07 | .052 | 0.0 | 3.00 | 0.0 | .106 | -0.1824 | -0.1819 |
| 212 | 2.96 | .074 | 0.0 | 3.00 | 0.0 | .079 | -0.3998 | -0.3972 |
| 213 | 3.92 | .098 | 0.0 | 3.00 | 0.0 | -.070 | -0.7196 | -0.7167 |
| 214 | 5.00 | .125 | 0.0 | 3.00 | 0.0 | .056 | -1.1834 | -1.1878 |
| 215 | 5.96 | .149 | 0.0 | 3.00 | 0.0 | .047 | -1.7224 | -1.7193 |
| 216 | 2.94 | .074 | 0.0 | 3.00 | 0.0 | .069 | -0.3964 | -0.3928 |
| 217 | 3.01 | .075 | 0.0 | 3.00 | 0.0 | .106 | -0.4177 | -0.4113 |
| 218 | 3.02 | .075 | 0.0 | 3.00 | 0.0 | .146 | -0.4239 | -0.4118 |
| 219 | 3.97 | .099 | 0.0 | 3.00 | 0.0 | .122 | -0.7423 | -0.7326 |
| 220 | 4.00 | .100 | 0.0 | 3.00 | 0.0 | .147 | -0.7643 | -0.7449 |
| 221 | 5.00 | .125 | 0.0 | 3.00 | 0.0 | .120 | -1.1856 | -1.1875 |
| 222 | 4.95 | .124 | 0.0 | 3.00 | 0.0 | .146 | -1.1839 | -1.1638 |
| 223 | 5.96 | .149 | 0.0 | 3.00 | 0.0 | .116 | -1.7339 | -1.7168 |
| 224 | 3.00 | .075 | 5.0 | 3.00 | 0.0 | .074 | -0.4184 | -0.4133 |
| 225 | 2.97 | .074 | -5.0 | 3.00 | 0.0 | .074 | -0.4025 | -0.3905 |
| 226 | 2.99 | .075 | -10.0 | 3.00 | 0.0 | .069 | -0.3941 | -0.3844 |
| 227 | 2.99 | .075 | -15.0 | 3.00 | 0.0 | .060 | -0.3782 | -0.3770 |
| 228 | 2.97 | .074 | -20.0 | 3.00 | 0.0 | .048 | -0.3510 | -0.3777 |
| 229 | 2.95 | .074 | -27.5 | 3.00 | 0.0 | .029 | -0.3241 | -0.3997 |
| 230 | 2.98 | .074 | 0.0 | 3.00 | 5.0 | .079 | -0.4381 | -0.4211 |
| 231 | 2.98 | .074 | 0.0 | 3.00 | -5.0 | .078 | -0.3761 | -0.3782 |
| 232 | 2.94 | .073 | 0.0 | 3.00 | -10.0 | .079 | -0.3257 | -0.3331 |
| 233 | 3.02 | .075 | 0.0 | 3.00 | -15.0 | .078 | -0.2917 | -0.3008 |
| 234 | 3.01 | .075 | 0.0 | 3.00 | -20.0 | .088 | -0.1911 | -0.2008 |
| 235 | 2.98 | .075 | 0.0 | 2.00 | 0.0 | .088 | -0.4095 | -0.4114 |
| 236 | 3.00 | .075 | 0.0 | 4.00 | 0.0 | .078 | -0.4086 | -0.4055 |
| 237 | 3.01 | .075 | 0.0 | 5.00 | 0.0 | .081 | -0.4120 | -0.4117 |
| 238 | 2.97 | .074 | 0.0 | 6.00 | 0.0 | .065 | -0.3954 | -0.4100 |
| 239 | 4.90 | .123 | 5.0 | 2.00 | 0.0 | .123 | -1.2110 | -1.1749 |
| 240 | 4.00 | .100 | -5.0 | 3.00 | 0.0 | .125 | -0.7063 | -0.6998 |
| 241 | 5.99 | .150 | -15.0 | 5.00 | -10.0 | .014 | -1.5994 | -1.5723 |
| 242 | 5.99 | .150 | -27.5 | 6.00 | -5.0 | -.038 | -1.4059 | -1.3887 |
| 243 | 3.97 | .099 | -27.5 | 6.00 | -20.0 | -.046 | -0.4896 | -0.4655 |
| 244 | 2.99 | .075 | -5.0 | 3.00 | -5.0 | .077 | -0.3653 | -0.3646 |

TABLE A-24 (cont'd)

MEASURED AND FITTED ROLL MOMENT
BETA=20. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED * |
|-----|------|------|-------|-------|-------|------|----------|-----------|
| 245 | 4.91 | .123 | 5.0 | 3.00 | -20.0 | .056 | -0.8102 | -0.5597 * |
| 246 | 1.74 | .044 | -15.0 | 3.00 | 0.0 | .155 | -0.0672 | -0.0608 * |
| 247 | 3.90 | .098 | -10.0 | 2.00 | -20.0 | .111 | 0.1197 | -0.0561 * |
| 248 | 4.96 | .124 | 5.0 | 2.00 | -5.0 | .059 | -1.1203 | -1.1003 |
| 250 | 3.99 | .100 | -5.0 | 6.00 | -20.0 | .058 | -0.5020 | -0.4823 |
| 252 | 6.05 | .151 | -10.0 | 3.00 | 5.0 | .105 | -1.7447 | -1.7729 |
| 254 | 3.98 | .099 | -20.0 | 4.00 | -5.0 | .104 | -0.3649 | -0.3502 |
| 255 | 2.99 | .075 | -10.0 | 3.00 | -10.0 | .136 | -0.1162 | -0.1418 |
| 256 | 2.97 | .074 | -5.0 | 3.00 | -5.0 | .079 | -0.3632 | -0.3592 |
| 259 | 5.02 | .125 | -20.0 | 4.00 | 5.0 | .135 | -1.1970 | -1.1025 |
| 261 | 3.00 | .075 | -5.0 | 2.00 | -10.0 | .067 | -0.3392 | -0.3543 |
| 262 | 4.01 | .100 | -5.0 | 6.00 | -15.0 | .059 | -0.5698 | -0.5935 |
| 263 | 2.10 | .053 | -15.0 | 2.00 | -20.0 | .055 | -0.0624 | -0.0703 |
| 264 | 6.06 | .152 | 5.0 | 3.00 | -20.0 | .052 | -0.5375 | -0.9152 * |
| 265 | 6.79 | .152 | -15.0 | 2.00 | -15.0 | .027 | -2.1494 | -1.4978 * |
| 266 | 4.00 | .100 | -10.0 | 5.00 | -20.0 | .086 | -0.2628 | -0.2840 |
| 267 | 4.93 | .123 | -15.0 | 2.00 | -20.0 | .063 | -0.3145 | -0.4583 * |
| 268 | 2.98 | .074 | -5.0 | 3.00 | -5.0 | .078 | -0.3646 | -0.3610 |
| 269 | 2.03 | .051 | -15.0 | 4.00 | -15.0 | .069 | -0.0901 | -0.0877 * |
| 270 | 5.97 | .149 | -5.0 | 5.00 | 5.0 | .095 | -1.4585 | -1.6685 * |
| 271 | 4.95 | .124 | -10.0 | 2.00 | -10.0 | .056 | -0.9782 | -0.9711 |
| 272 | 5.93 | .148 | 0.0 | 3.00 | -5.0 | .067 | -1.5979 | -1.6554 |
| 273 | 5.00 | .125 | -5.0 | 2.00 | 5.0 | .069 | -1.2545 | -1.2344 |
| 274 | 5.95 | .149 | -5.0 | 3.00 | 0.0 | .099 | -1.6687 | -1.6392 |
| 275 | 4.97 | .124 | -20.0 | 5.00 | 5.0 | .040 | -1.0717 | -1.0885 |
| 276 | 5.98 | .150 | -25.0 | 5.00 | -5.0 | .031 | -1.0891 | -1.1305 * |
| 278 | 5.62 | .140 | 5.0 | 6.00 | -15.0 | .104 | 0.4337 | -1.1535 * |
| 279 | 2.75 | .069 | -5.0 | 3.00 | -5.0 | .093 | -0.3220 | -0.2884 |
| 280 | 3.69 | .092 | -15.0 | 5.00 | 5.0 | .021 | -0.6434 | -0.6699 |
| 282 | 4.09 | .102 | -20.0 | 4.00 | -10.0 | .083 | -0.3399 | -0.3023 * |
| 283 | 4.92 | .123 | -10.0 | 2.00 | -5.0 | .066 | -1.5612 | -0.7528 * |
| 284 | 2.06 | .052 | -20.0 | 3.00 | 5.0 | .062 | -0.1788 | -0.1999 |
| 285 | 4.84 | .121 | -25.0 | 5.00 | -15.0 | .025 | -0.4731 | -0.4573 |
| 312 | 2.26 | .085 | 0.0 | 3.00 | 0.0 | .095 | -0.3317 | -0.3522 |
| 313 | 3.20 | .120 | 0.0 | 3.00 | 0.0 | .084 | -0.7068 | -0.7183 |
| 314 | 4.29 | .161 | 0.0 | 3.00 | 0.0 | .055 | -1.3147 | -1.3117 |
| 315 | 5.24 | .196 | 0.0 | 3.00 | 0.0 | .046 | -1.9748 | -1.9718 |
| 316 | 6.14 | .230 | 0.0 | 3.00 | 0.0 | .037 | -2.7286 | -2.7368 |
| 317 | 3.12 | .117 | 0.0 | 3.00 | 0.0 | .063 | -0.6769 | -0.6845 |
| 318 | 3.01 | .113 | 0.0 | 3.00 | 0.0 | .125 | -0.6196 | -0.6309 |
| 320 | 4.16 | .156 | 0.0 | 3.00 | 0.0 | .125 | -1.2141 | -1.2229 |
| 321 | 4.05 | .152 | 0.0 | 3.00 | 0.0 | .125 | -1.1633 | -1.1620 |
| 324 | 4.99 | .187 | 0.0 | 3.00 | 0.0 | .129 | -1.7728 | -1.7786 |
| 325 | 4.99 | .187 | 0.0 | 3.00 | 0.0 | .152 | -1.7863 | -1.7796 |
| 326 | 3.01 | .113 | 5.0 | 3.00 | 0.0 | .078 | -0.6340 | -0.6412 |
| 327 | 3.01 | .113 | -5.0 | 3.00 | 0.0 | .081 | -0.6316 | -0.6220 |
| 328 | 2.99 | .112 | -10.0 | 3.00 | 0.0 | .071 | -0.6087 | -0.5981 |
| 329 | 3.01 | .113 | -15.0 | 3.00 | 0.0 | .051 | -0.6051 | -0.6093 |
| 330 | 3.02 | .113 | -20.0 | 3.00 | 0.0 | .044 | -0.5848 | -0.6021 |
| 331 | 2.99 | .112 | -27.5 | 3.00 | 0.0 | .021 | -0.5495 | -0.6171 |

TABLE A-24 (cont'd)

MEASURED AND FITTED ROLL MOMENT
BETA=20. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|----------|
| 332 | 2.95 | .111 | 0.0 | 3.00 | 5.0 | .041 | -0.6268 | -0.5978 |
| 333 | 3.05 | .114 | 0.0 | 3.00 | -5.0 | .092 | -0.5988 | -0.6126 |
| 334 | 2.81 | .106 | 0.0 | 3.00 | -10.0 | .097 | -0.4588 | -0.4704 |
| 335 | 2.81 | .105 | 0.0 | 3.00 | -15.0 | .098 | -0.3975 | -0.4080 |
| 336 | 2.83 | .106 | 0.0 | 3.00 | -20.0 | .068 | -0.3978 | -0.4322 |
| 337 | 2.87 | .107 | 0.0 | 2.00 | 0.0 | .105 | -0.5591 | -0.5879 |
| 338 | 2.90 | .109 | 0.0 | 4.00 | 0.0 | .078 | -0.5721 | -0.5849 |
| 341 | 3.06 | .115 | 0.0 | 5.00 | 0.0 | .081 | -0.6396 | -0.6549 |
| 346 | 1.90 | .071 | -20.0 | 4.00 | 5.0 | .136 | -0.2054 | -0.1982 |
| 347 | 4.06 | .152 | -5.0 | 3.00 | -5.0 | .086 | -1.0703 | -1.0725* |
| 348 | 4.97 | .186 | 5.0 | 4.00 | -20.0 | .086 | -1.3223 | -0.9918 |
| 349 | 4.99 | .187 | -15.0 | 4.00 | 5.0 | .175 | -1.6829 | -1.7157 |
| 350 | 3.01 | .113 | -5.0 | 3.00 | -5.0 | .087 | -0.5762 | -0.5813 |
| 351 | 4.05 | .152 | -15.0 | 6.00 | 0.0 | .019 | -1.1289 | -1.1283 |
| 352 | 5.94 | .223 | 0.0 | 2.00 | -5.0 | .040 | -2.5017 | -2.5404 |
| 353 | 4.99 | .187 | -20.0 | 5.00 | 0.0 | .072 | -1.4452 | -1.4461 |
| 355 | 5.00 | .187 | -20.0 | 5.00 | 0.0 | .079 | -1.4348 | -1.4351 |
| 359 | 4.00 | .150 | -25.0 | 5.00 | 5.0 | .098 | -1.0320 | -1.0128 |
| 360 | 4.00 | .150 | 0.0 | 4.00 | 5.0 | .209 | -1.2223 | -1.3033 |
| 361 | 5.99 | .225 | -25.0 | 5.00 | -20.0 | -.011 | -1.8156 | -1.8239 |
| 362 | 4.01 | .150 | -15.0 | 6.00 | 0.0 | .016 | -1.1173 | -1.1122 |
| 363 | 4.04 | .152 | 5.0 | 4.00 | -10.0 | .192 | -0.8146 | -0.7753 |
| 364 | 4.03 | .151 | -5.0 | 3.00 | 0.0 | .129 | -1.0866 | -1.0996 |
| 365 | 2.97 | .111 | -5.0 | 3.00 | -5.0 | .091 | -0.5559 | -0.5607 |
| 366 | 4.97 | .187 | -10.0 | 6.00 | -20.0 | .055 | -1.3699 | -1.2586* |
| 370 | 5.52 | .207 | -5.0 | 3.00 | -20.0 | .090 | -1.1949 | -1.2207 |
| 371 | 5.02 | .188 | 5.0 | 3.00 | 0.0 | .069 | -1.8285 | -1.8258 |
| 372 | 2.99 | .112 | 5.0 | 2.00 | -20.0 | .094 | -0.3158 | -0.3263* |
| 373 | 1.97 | .074 | -20.0 | 6.00 | -5.0 | .187 | -0.0297 | -0.0045* |
| 374 | 2.92 | .109 | -20.0 | 6.00 | -5.0 | .105 | -0.3591 | -0.3100 |
| 376 | 5.00 | .187 | -5.0 | 2.00 | 0.0 | .071 | -1.8004 | -1.7682 |
| 378 | 4.02 | .151 | 0.0 | 6.00 | -20.0 | .126 | -0.6567 | -0.6038 |
| 379 | 6.01 | .225 | -20.0 | 2.00 | 0.0 | .004 | -2.5850 | -2.5777 |
| 380 | 4.97 | .187 | -20.0 | 2.00 | -5.0 | .082 | -1.3691 | -1.3941 |
| 381 | 2.99 | .112 | -5.0 | 3.00 | -5.0 | .082 | -0.5715 | -0.5791 |
| 384 | 5.95 | .223 | -10.0 | 3.00 | 5.0 | .094 | -2.5477 | -2.5196 |
| 386 | 4.85 | .182 | -15.0 | 3.00 | -5.0 | .092 | -1.3706 | -1.3604 |
| 387 | 5.12 | .192 | -5.0 | 3.00 | -5.0 | .114 | -1.6565 | -1.6667 |
| 390 | 6.10 | .229 | 5.0 | 5.00 | -15.0 | .089 | -2.2693 | -2.2551 |
| 395 | 4.23 | .158 | -10.0 | 6.00 | -5.0 | .038 | -1.2010 | -1.2059 |
| 396 | 3.19 | .119 | -27.5 | 4.00 | 0.0 | .128 | -0.4561 | -0.4055 |
| 397 | 3.15 | .118 | -5.0 | 4.00 | -15.0 | .097 | -0.4856 | -0.4936 |
| 398 | 4.10 | .154 | -5.0 | 5.00 | 5.0 | .137 | -1.1790 | -1.1983 |
| 399 | 3.07 | .115 | -5.0 | 3.00 | -5.0 | .061 | -0.6270 | -0.6426* |
| 402 | 6.06 | .227 | -10.0 | 2.00 | 5.0 | .040 | -2.7201 | -2.6007* |
| 403 | 3.11 | .117 | -10.0 | 5.00 | -10.0 | .151 | -0.3454 | -0.3568 |
| 404 | 2.98 | .112 | -15.0 | 6.00 | -10.0 | .135 | -0.2463 | -0.2490 |
| 405 | 4.04 | .151 | -20.0 | 5.00 | -10.0 | .090 | -0.5854 | -0.5970 |
| 702 | 2.99 | .224 | 0.0 | 3.00 | 0.0 | .093 | -1.2513 | -1.2571 |
| 703 | 1.98 | .149 | 0.0 | 3.00 | 0.0 | .123 | -0.5394 | -0.5643 |

TABLE A-24 (cont'd)

MEASURED AND FITTED ROLL MOMENT
BETA=20. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|----------|
| 704 | 2.49 | .187 | 0.0 | 3.00 | 0.0 | .103 | -0.8606 | -0.8800 |
| 705 | 3.01 | .226 | 0.0 | 3.00 | 0.0 | .071 | -1.2762 | -1.2765 |
| 706 | 2.99 | .224 | 0.0 | 3.00 | 0.0 | .115 | -1.2556 | -1.2590 |
| 707 | 2.99 | .224 | 0.0 | 3.00 | 0.0 | .176 | -1.2623 | -1.2560 |
| 709 | 3.01 | .226 | 5.0 | 3.00 | 0.0 | .085 | -1.2851 | -1.2767 |
| 710 | 3.01 | .226 | -5.0 | 3.00 | 0.0 | .091 | -1.2614 | -1.2597 |
| 711 | 3.01 | .226 | -10.0 | 3.00 | 0.0 | .076 | -1.2599 | -1.2338 |
| 712 | 3.00 | .225 | -15.0 | 3.00 | 0.0 | .057 | -1.2387 | -1.2085 |
| 713 | 3.00 | .225 | -20.0 | 3.00 | 0.0 | .028 | -1.2335 | -1.2246 |
| 714 | 3.00 | .225 | -27.5 | 3.00 | 0.0 | .006 | -1.1991 | -1.2191 |
| 715 | 3.01 | .226 | 0.0 | 3.00 | 5.0 | .088 | -1.3015 | -1.2827 |
| 716 | 3.00 | .225 | 0.0 | 3.00 | -5.0 | .099 | -1.2185 | -1.2327 |
| 717 | 3.01 | .225 | 0.0 | 3.00 | -10.0 | .099 | -1.1660 | -1.1764 |
| 718 | 3.01 | .225 | 0.0 | 3.00 | -15.0 | .103 | -1.0775 | -1.0801 |
| 719 | 3.01 | .226 | 0.0 | 3.00 | -20.0 | .104 | -0.9575 | -0.9587 |
| 720 | 3.01 | .226 | 0.0 | 2.00 | 0.0 | .090 | -1.2883 | -1.3017 |
| 721 | 3.02 | .226 | 0.0 | 4.00 | 0.0 | .100 | -1.2632 | -1.2658 |
| 722 | 3.00 | .225 | 0.0 | 5.00 | 0.0 | .094 | -1.2503 | -1.2558 |
| 723 | 3.01 | .226 | 0.0 | 6.00 | 0.0 | .089 | -1.2498 | -1.2843 |
| 724 | 2.53 | .190 | 0.0 | 6.00 | -20.0 | .084 | -0.7225 | -0.7474 |
| 726 | 2.53 | .189 | 5.0 | 8.00 | -5.0 | .256 | -0.8552 | -0.8031 |
| 728 | 2.99 | .224 | -5.0 | 3.00 | -5.0 | .165 | -1.1429 | -1.1101 |
| 730 | 2.99 | .224 | -5.0 | 6.00 | 5.0 | .267 | -1.1944 | -1.1958 |
| 731 | 1.95 | .147 | 0.0 | 5.00 | -10.0 | .249 | -0.3687 | -0.3512 |
| 732 | 2.49 | .187 | -27.5 | 3.00 | -10.0 | -.010 | -0.8231 | -0.7471 |
| 733 | 3.00 | .225 | -5.0 | 3.00 | -5.0 | .100 | -1.2060 | -1.2070* |
| 735 | 1.97 | .148 | -27.5 | 3.00 | -10.0 | .079 | -0.3201 | -0.1787* |
| 736 | 3.00 | .225 | -20.0 | 5.00 | 5.0 | .094 | -1.2309 | -1.2026 |
| 737 | 3.00 | .225 | -27.5 | 6.00 | -10.0 | .141 | -0.3908 | -0.4155 |
| 738 | 1.99 | .149 | -10.0 | 3.00 | -15.0 | .137 | -0.3689 | -0.3637 |
| 741 | 2.48 | .186 | 0.0 | 3.00 | -5.0 | .132 | -0.8232 | -0.8300 |
| 743 | 2.53 | .190 | 5.0 | 8.00 | -10.0 | .273 | -0.6812 | -0.6970 |
| 744 | 2.04 | .153 | -10.0 | 3.00 | -10.0 | .092 | -0.5162 | -0.5114 |
| 746 | 3.01 | .226 | -5.0 | 5.00 | -20.0 | .242 | -0.4856 | -0.4887 |
| 747 | 3.01 | .226 | -5.0 | 3.00 | -5.0 | .086 | -1.2235 | -1.2323 |
| 749 | 3.07 | .230 | -10.0 | 6.00 | -5.0 | .166 | -1.0464 | -1.0469 |
| 750 | 2.57 | .193 | 5.0 | 5.00 | 0.0 | .129 | -0.9263 | -0.9190 |
| 751 | 2.57 | .193 | -10.0 | 5.00 | 0.0 | .067 | -0.8862 | -0.9225 |
| 752 | 2.07 | .155 | -27.5 | 3.00 | -10.0 | -.018 | -0.4487 | -0.4329 |
| 754 | 2.00 | .150 | 5.0 | 6.00 | 0.0 | .257 | -0.5818 | -0.5161 |
| 755 | 2.14 | .160 | -15.0 | 3.00 | 5.0 | .120 | -0.5870 | -0.6034* |
| 757 | 2.51 | .188 | 0.0 | 8.00 | -20.0 | .339 | -0.0507 | -0.2834* |
| 758 | 2.51 | .189 | -15.0 | 6.00 | -15.0 | .062 | -0.7471 | -0.7239 |
| 759 | 2.51 | .188 | 5.0 | 6.00 | 0.0 | .280 | -0.6254 | -0.6172 |
| 760 | 3.00 | .225 | -5.0 | 3.00 | 5.0 | .094 | -1.2555 | -1.2118 |
| 761 | 3.00 | .225 | -15.0 | 5.00 | 0.0 | .257 | -0.9106 | -0.9353 |
| 763 | 2.51 | .188 | -20.0 | 7.00 | 0.0 | .301 | -0.4232 | -0.4002 |
| 764 | 2.99 | .224 | 0.0 | 5.00 | -5.0 | .103 | -1.1960 | -1.2149 |
| 765 | 2.99 | .224 | -5.0 | 5.00 | -15.0 | .183 | -0.8991 | -0.8266* |
| 766 | 2.02 | .151 | 0.0 | 5.00 | 5.0 | .372 | -0.3287 | -0.6272* |

R-1851

TABLE A-24 (cont'd)

MEASURED AND FITTED ROLL MOMENT
BETA=20. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|------|----------|---------|
| 769 | 2.51 | .188 | -10.0 | 8.00 | -15.0 | .234 | -0.4116 | -0.3966 |
| 771 | 3.00 | .225 | -10.0 | 2.00 | 5.0 | .107 | -1.2864 | -1.2926 |
| 772 | 3.00 | .225 | -25.0 | 5.00 | -10.0 | .151 | -0.4892 | -0.4881 |
| 773 | 2.98 | .224 | -5.0 | 3.00 | -5.0 | .103 | -1.1846 | -1.1847 |
| 774 | 2.49 | .186 | -10.0 | 4.00 | 0.0 | .251 | -0.7090 | -0.7277 |
| 775 | 2.98 | .224 | -10.0 | 6.00 | -5.0 | .176 | -0.9817 | -0.9670 |
| 777 | 2.49 | .187 | 5.0 | 8.00 | -10.0 | .330 | -0.5592 | -0.6042 |
| 780 | 2.97 | .223 | -25.0 | 6.00 | -5.0 | .212 | -0.4021 | -0.4741 |
| 781 | 2.48 | .186 | -25.0 | 5.00 | -20.0 | .104 | -0.1535 | -0.1714 |

MEAN ERROR= 0.0143
STANDARD DEVIATION= 0.0269

TABLE A-25

MEASURED AND FITTED YAW MOMENT
BETA=10. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|------|-------|------|-------|----------|-----------|
| 3 | 4.00 | .000 | 2.1 | 2.60 | 0.0 | .043 | 0.0762 | 0.0870 |
| 5 | 4.00 | .000 | 4.6 | 2.50 | 0.0 | .035 | 0.0817 | 0.0883 |
| 6 | 4.00 | .000 | 7.2 | 2.60 | 0.0 | .139 | 0.1094 | 0.1060 |
| 7 | 4.00 | .000 | 9.7 | 2.50 | 0.0 | .020 | 0.0807 | 0.0901 |
| 8 | 4.00 | .000 | 12.2 | 2.40 | 0.0 | .011 | 0.0805 | 0.0927 |
| 1 | 4.00 | .000 | 4.7 | 2.50 | 5.0 | .028 | 0.0808 | 0.0865 |
| 2 | 4.00 | .000 | 0.1 | 2.60 | 0.0 | .048 | 0.0788 | 0.0860 |
| 9 | 4.00 | .000 | 0.0 | 2.60 | -5.0 | .046 | 0.0854 | 0.0907 |
| 10 | 4.00 | .000 | 0.0 | 2.60 | 5.0 | .046 | 0.0764 | 0.0812 |
| 11 | 4.00 | .000 | 0.0 | 2.60 | 10.0 | .048 | 0.0709 | 0.0770 |
| 12 | 4.00 | .000 | 0.1 | 2.60 | 15.0 | .047 | 0.0671 | 0.0748 |
| 13 | 4.00 | .000 | 0.1 | 2.60 | 20.0 | .046 | 0.0664 | 0.0756 |
| 14 | 4.00 | .000 | 0.1 | 1.60 | 0.0 | .062 | 0.0838 | 0.0862 |
| 15 | 4.00 | .000 | 0.0 | 3.70 | 0.0 | .039 | 0.0850 | 0.0860 |
| 16 | 4.00 | .000 | 0.0 | 4.70 | 0.0 | .036 | 0.0887 | 0.0860 |
| 17 | 4.00 | .000 | 0.0 | 5.70 | 0.0 | .032 | 0.0884 | 0.0860 |
| 18 | 4.00 | .000 | 0.0 | 2.60 | 0.0 | .038 | 0.0852 | 0.0860 |
| 19 | 4.00 | .000 | 0.1 | 2.60 | 0.0 | .061 | 0.0819 | 0.0861 |
| 21 | 4.00 | .000 | 0.0 | 1.60 | 0.0 | .048 | 0.0850 | 0.0860 |
| 23 | 4.00 | .000 | 0.0 | 1.60 | 0.0 | .049 | 0.0801 | 0.0860 |
| 24 | 4.00 | .000 | 5.1 | 2.80 | 0.0 | .039 | 0.1019 | 0.0870 |
| 25 | 4.00 | .000 | 0.1 | 2.70 | 0.0 | .101 | 0.0994 | 0.0861 |
| 26 | 4.00 | .000 | 0.1 | 2.70 | 0.0 | .159 | 0.1121 | 0.0863 |
| 27 | 4.00 | .000 | 0.1 | 2.70 | 0.0 | .170 | 0.1099 | 0.0864 |
| 29 | 2.00 | .000 | 0.0 | 2.60 | 0.0 | .083 | 0.0824 | 0.0860 |
| 30 | 3.00 | .000 | 0.0 | 2.60 | 0.0 | .057 | 0.0843 | 0.0860 |
| 31 | 5.00 | .000 | 0.0 | 2.60 | 0.0 | .040 | 0.0853 | 0.0860 |
| 32 | 6.00 | .000 | 0.0 | 2.60 | 0.0 | .035 | 0.0861 | 0.0860 |
| 34 | 5.00 | .000 | 2.4 | 2.40 | -5.0 | .076 | 0.0869 | 0.1007 |
| 36 | 2.00 | .000 | 7.4 | 5.50 | -5.0 | .287 | 0.1594 | 0.1945 * |
| 37 | 3.00 | .000 | 5.0 | 4.50 | 20.0 | .058 | 0.0410 | 0.0613 * |
| 40 | 4.00 | .000 | 12.4 | 4.50 | 20.0 | .007 | 0.0980 | 0.1209 |
| 41 | 3.00 | .000 | 5.0 | 4.50 | 20.0 | .031 | 0.0868 | 0.0741 * |
| 42 | 2.00 | .000 | 10.0 | 4.50 | 20.0 | .079 | 0.0348 | 0.0770 * |
| 43 | 2.00 | .000 | 10.0 | 4.50 | 20.0 | .056 | 0.0545 | 0.0677 |
| 44 | 5.00 | .000 | 7.4 | 4.50 | 20.0 | .019 | 0.1250 | 0.1220 * |
| 45 | 2.00 | .000 | 12.4 | 4.50 | 20.0 | .124 | 0.0053 | 0.1045 ** |
| 46 | 3.00 | .000 | 10.0 | 3.50 | 20.0 | .110 | -0.0268 | 0.0828 ** |
| 47 | 4.00 | .000 | 10.0 | 2.50 | 20.0 | .042 | 0.0376 | 0.0912 ** |
| 48 | 4.00 | .000 | 0.1 | 6.50 | 20.0 | .111 | -0.0905 | -0.1121 * |
| 49 | 6.00 | .000 | 9.9 | 2.40 | 20.0 | .034 | 0.0338 | 0.1254 * |
| 50 | 4.00 | .000 | 4.9 | 5.60 | 20.0 | .243 | -0.4109 | -0.3925 * |
| 51 | 3.00 | .000 | 0.0 | 5.50 | 20.0 | .059 | 0.0492 | 0.0686 * |
| 52 | 4.00 | .000 | 7.5 | 2.50 | 20.0 | .056 | 0.0179 | 0.0845 * |
| 53 | 4.00 | .000 | 2.4 | 3.50 | 20.0 | .112 | -0.0534 | -0.0018 * |
| 54 | 3.00 | .000 | 2.5 | 5.50 | 20.0 | .033 | 0.0878 | 0.0963 |
| 55 | 5.00 | .000 | 0.1 | 6.50 | 10.0 | .045 | 0.0699 | 0.0568 |
| 56 | 2.00 | .000 | 10.0 | 4.60 | 10.0 | .030 | 0.0765 | 0.0650 |
| 57 | 4.00 | .000 | 5.0 | 2.50 | 10.0 | .036 | 0.0856 | 0.0843 * |
| 58 | 3.00 | .000 | 12.5 | 6.50 | 10.0 | -.005 | 0.0921 | 0.1397 * |

TABLE A-25 (cont'd)

MEASURED AND FITTED YAW MOMENT
BETA=10. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|------|-------|------|-------|----------|----------|
| 59 | 4.00 | .000 | 2.5 | 3.60 | 5.0 | .040 | 0.0826 | 0.0782 |
| 60 | 4.00 | .000 | 2.5 | 3.60 | 5.0 | .029 | 0.0871 | 0.0813 |
| 61 | 4.00 | .000 | 5.1 | 3.50 | 5.0 | .043 | 0.0827 | 0.0771 |
| 62 | 3.00 | .000 | 0.0 | 2.50 | 5.0 | .054 | 0.0775 | 0.0812 |
| 63 | 5.00 | .000 | 2.5 | 2.50 | 5.0 | .035 | 0.0929 | 0.0854 |
| 64 | 3.00 | .000 | 9.9 | 2.60 | 5.0 | .013 | 0.0901 | 0.0842 |
| 65 | 4.00 | .000 | 5.0 | 2.60 | 5.0 | .039 | 0.0857 | 0.0847 |
| 66 | 5.00 | .000 | 5.0 | 6.60 | 5.0 | .022 | 0.0971 | 0.1088 |
| 67 | 3.00 | .000 | 9.9 | 6.60 | 5.0 | .020 | 0.0976 | 0.1063 |
| 68 | 6.00 | .000 | 12.4 | 5.70 | 5.0 | -.006 | 0.1102 | 0.1301* |
| 69 | 3.00 | .000 | -5.1 | 6.60 | 5.0 | .240 | 0.0395 | -0.0427* |
| 70 | 6.00 | .000 | -5.1 | 5.70 | 5.0 | .016 | 0.0976 | 0.1078 |
| 71 | 6.00 | .000 | 7.4 | 5.60 | 5.0 | .012 | 0.1001 | 0.0991* |
| 72 | 4.00 | .000 | 12.4 | 5.60 | 5.0 | .102 | -0.0575 | 0.0571* |
| 73 | 2.00 | .000 | 0.0 | 5.60 | 5.0 | .060 | 0.0837 | 0.0854 |
| 74 | 4.00 | .000 | 2.4 | 3.60 | 5.0 | .041 | 0.0943 | 0.0780 |
| 76 | 5.00 | .000 | 2.4 | 5.60 | 0.0 | .026 | 0.1015 | 0.0852 |
| 77 | 2.00 | .000 | 4.9 | 5.70 | 0.0 | .329 | 0.1552 | 0.1595 |
| 78 | 6.00 | .000 | 7.5 | 5.70 | 0.0 | .015 | 0.0870 | 0.0774* |
| 79 | 3.00 | .000 | 12.4 | 5.60 | 0.0 | .112 | 0.0393 | 0.1047* |
| 80 | 3.00 | .000 | 12.4 | 5.60 | 0.0 | .247 | 0.1941 | 0.1842* |
| 81 | 4.00 | .000 | 12.4 | 4.60 | 0.0 | .117 | 0.0269 | 0.0979* |
| 82 | 4.00 | .000 | 4.9 | 6.60 | 0.0 | .099 | 0.0251 | 0.0973* |
| 83 | 3.00 | .000 | -5.1 | 6.60 | 0.0 | .049 | 0.0971 | 0.0822* |
| 84 | 3.00 | .000 | 2.4 | 6.60 | 0.0 | .044 | 0.0890 | 0.0886 |
| 85 | 4.00 | .000 | 7.4 | 2.60 | -5.0 | .026 | 0.0896 | 0.0896 |
| 87 | 2.00 | .000 | 4.9 | 2.60 | -5.0 | .135 | 0.1074 | 0.1028 |
| 88 | 4.00 | .000 | 4.9 | 2.60 | -5.0 | .061 | 0.0937 | 0.0964 |
| 89 | 2.00 | .000 | 7.4 | 5.70 | -5.0 | .285 | 0.1748 | 0.1957 |
| 90 | 6.00 | .000 | 7.5 | 6.70 | -5.0 | .014 | 0.0775 | 0.0636 |
| 91 | 2.00 | .000 | 0.0 | 4.60 | -5.0 | .119 | 0.0922 | 0.0897 |
| 92 | 5.00 | .000 | 0.0 | 3.60 | -5.0 | .037 | 0.0882 | 0.0931 |
| 93 | 6.00 | .000 | 9.9 | 3.50 | -5.0 | .110 | 0.1516 | 0.1507* |
| 94 | 6.00 | .000 | 9.9 | 4.60 | -5.0 | .078 | 0.0751 | 0.1380* |
| 95 | 6.00 | .000 | 10.0 | 5.60 | -5.0 | .002 | 0.0676 | 0.0332* |
| 97 | 4.00 | .000 | 9.9 | 5.60 | -5.0 | .037 | 0.0919 | 0.0877* |
| 98 | 5.00 | .000 | 9.9 | 5.50 | -5.0 | .097 | 0.0576 | 0.1642* |
| 99 | 3.00 | .000 | 0.1 | 6.60 | -5.0 | .142 | 0.0964 | 0.1269* |
| 100 | 4.00 | .000 | 4.9 | 6.60 | -5.0 | .034 | 0.0937 | 0.0846* |
| 101 | 4.00 | .000 | 2.4 | 3.50 | 5.0 | .039 | 0.0857 | 0.0787 |
| 102 | 6.00 | .000 | 9.9 | 2.50 | 0.0 | .105 | 0.0648 | 0.0561 |
| 103 | 3.00 | .000 | -5.1 | 2.50 | 10.0 | .122 | 0.0650 | 0.0686 |
| 105 | 5.00 | .000 | 10.0 | 3.50 | 10.0 | .013 | 0.1033 | 0.0962 |
| 106 | 4.00 | .000 | 5.0 | 3.50 | 10.0 | .045 | 0.0886 | 0.0700 |
| 107 | 3.00 | .000 | 7.4 | 6.50 | 10.0 | .158 | 0.0112 | 0.0232* |
| 108 | 4.00 | .000 | 12.5 | 6.60 | 10.0 | -.006 | 0.1127 | 0.1833* |
| 109 | 2.00 | .000 | -5.1 | 6.60 | 10.0 | .057 | 0.0909 | 0.0968 |
| 110 | 3.00 | .000 | 2.4 | 6.50 | 10.0 | .077 | 0.0542 | 0.0691* |
| 111 | 3.00 | .000 | -5.1 | 5.60 | 10.0 | .135 | 0.0409 | 0.0151* |
| 112 | 3.00 | .000 | 12.5 | 5.60 | 10.0 | .006 | 0.0987 | 0.1023 |

R-1851

TABLE A-25 (cont'd)

MEASURED AND FITTED YAW MOMENT
BETA=10. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|------|-------|----------|----------|
| 113 | 4.00 | .000 | 2.4 | 3.60 | 5.0 | .038 | 0.1005 | 0.0788 |
| 114 | 4.00 | .000 | 0.0 | 3.50 | 15.0 | .042 | 0.0999 | 0.0682 * |
| 115 | 4.00 | .000 | 12.5 | 3.60 | 15.0 | .001 | 0.1145 | 0.1014 |
| 116 | 3.00 | .000 | 7.4 | 2.60 | 15.0 | .139 | 0.1456 | 0.1280 |
| 117 | 4.00 | .000 | 7.4 | 2.50 | 15.0 | .030 | 0.1084 | 0.0875 |
| 118 | 3.00 | .000 | 5.0 | 2.50 | 15.0 | .067 | 0.0653 | 0.0873 * |
| 119 | 3.00 | .000 | 2.4 | 2.50 | 15.0 | .057 | 0.0815 | 0.0781 * |
| 120 | 6.00 | .000 | 2.4 | 2.50 | 15.0 | .069 | -0.0020 | 0.0196 * |
| 121 | 3.00 | .000 | 0.0 | 2.60 | 15.0 | .172 | 0.1242 | 0.0992 * |
| 126 | 6.00 | .000 | 4.9 | 2.50 | 20.0 | .065 | -0.0479 | 0.0294 * |
| 127 | 4.00 | .000 | 5.0 | 2.60 | 20.0 | .137 | 0.0489 | 0.0545 * |
| 128 | 6.00 | .000 | 12.5 | 5.50 | 20.0 | .022 | 0.0462 | 0.1365 * |
| 129 | 2.00 | .000 | 12.5 | 6.60 | 0.0 | .057 | 0.0781 | 0.0827 |
| 130 | 5.00 | .000 | 6.6 | **** | 7.5 | -.181 | 0.0943 | 0.0961 |
| 131 | 6.00 | .000 | -5.0 | 6.70 | 0.0 | .022 | 0.0879 | 0.0820 |
| 132 | 3.00 | .000 | 9.9 | 3.60 | 0.0 | .148 | 0.1171 | 0.1196 * |
| 133 | 4.00 | .000 | 7.4 | 3.60 | 5.0 | .145 | 0.0881 | 0.0591 * |
| 134 | 3.00 | .000 | 9.9 | 3.70 | 5.0 | .224 | 0.2431 | 0.1373 * |
| 135 | 4.00 | .000 | 2.4 | 3.60 | 5.0 | .040 | 0.0951 | 0.0783 |
| 138 | 4.00 | .000 | -5.0 | 5.60 | 20.0 | .221 | -0.4006 | -0.3955 |
| 139 | 4.00 | .000 | -5.1 | 3.60 | 5.0 | .044 | 0.0904 | 0.0801 |
| 1 | 1.97 | .049 | 0.0 | 3.00 | 0.0 | .057 | 0.1363 | 0.1430 |
| 2 | 1.98 | .050 | 0.0 | 3.00 | 0.0 | .058 | 0.1326 | 0.1439 |
| 3 | 3.15 | .079 | 0.0 | 3.00 | 0.0 | .029 | 0.2612 | 0.2553 |
| 4 | 4.01 | .100 | 0.0 | 3.00 | 0.0 | .022 | 0.3821 | 0.3788 |
| 6 | 5.30 | .133 | 0.0 | 3.00 | 0.0 | .033 | 0.6284 | 0.6362 |
| 8 | 6.00 | .150 | 0.0 | 3.00 | 0.0 | .032 | 0.7936 | 0.8053 |
| 10 | 3.01 | .075 | -2.5 | 3.00 | 0.0 | .042 | 0.2374 | 0.2402 |
| 9 | 3.12 | .078 | 5.0 | 3.00 | 0.0 | .038 | 0.2532 | 0.2556 |
| 11 | 3.02 | .076 | -5.0 | 3.00 | 0.0 | .037 | 0.3425 | 0.2403 * |
| 12 | 2.95 | .074 | -7.5 | 3.00 | 0.0 | .033 | 0.2318 | 0.2307 |
| 13 | 2.98 | .075 | -10.0 | 3.00 | 0.0 | .032 | 0.2405 | 0.2347 |
| 14 | 2.96 | .074 | -12.5 | 3.00 | 0.0 | .026 | 0.2352 | 0.2316 |
| 15 | 2.95 | .074 | 0.0 | 2.00 | 0.0 | .064 | 0.2281 | 0.2357 |
| 16 | 2.99 | .075 | 0.0 | 4.00 | 0.0 | .047 | 0.2326 | 0.2409 |
| 19 | 2.72 | .068 | 0.0 | 5.00 | 0.0 | .041 | 0.2030 | 0.2101 |
| 20 | 2.68 | .067 | 0.0 | 5.00 | 0.0 | .041 | 0.1968 | 0.2060 |
| 21 | 3.14 | .079 | 0.0 | 6.00 | 0.0 | .033 | 0.2416 | 0.2571 |
| 22 | 2.01 | .050 | -7.5 | 6.00 | 0.0 | .089 | 0.1554 | 0.1552 |
| 23 | 2.98 | .074 | 0.0 | 3.00 | 0.0 | .025 | 0.2354 | 0.2327 |
| 24 | 2.97 | .074 | 0.0 | 3.00 | 0.0 | .072 | 0.2322 | 0.2410 |
| 25 | 2.46 | .062 | 0.0 | 3.00 | 0.0 | .151 | 0.1742 | 0.1932 |
| 26 | 3.46 | .087 | 0.0 | 3.00 | 0.0 | .103 | 0.3032 | 0.3098 |
| 27 | 2.96 | .074 | 0.0 | 3.00 | 0.0 | .127 | 0.2312 | 0.2456 |
| 28 | 2.93 | .073 | 0.0 | 3.00 | 0.0 | .181 | 0.2351 | 0.2425 |
| 30 | 4.49 | .112 | 0.0 | 3.00 | 0.0 | .193 | 0.4692 | 0.4703 |
| 31 | 5.03 | .126 | 0.0 | 3.00 | 0.0 | .115 | 0.5865 | 0.5850 |
| 32 | 3.15 | .079 | 0.0 | 3.00 | -5.0 | .055 | 0.2626 | 0.2667 |
| 34 | 3.07 | .077 | -2.5 | 3.00 | -5.0 | .054 | 0.2475 | 0.2556 |
| 35 | 5.82 | .146 | 0.0 | 3.00 | -5.0 | .049 | 0.7666 | 0.7806 |

TABLE A-25 (cont'd)

MEASURED AND FITTED YAW MOMENT
BETA=10. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|---------|
| 36 | 5.77 | .144 | -12.5 | 6.00 | -5.0 | .008 | 0.6890 | 0.7202 |
| 37 | 4.91 | .123 | 5.0 | 2.00 | -5.0 | .040 | 0.5526 | 0.5460 |
| 38 | 2.87 | .072 | -10.0 | 4.00 | -5.0 | .157 | 0.2258 | 0.2236 |
| 39 | 5.96 | .149 | -12.5 | 5.00 | -5.0 | .045 | 0.8784 | 0.8677 |
| 40 | 3.00 | .075 | 0.0 | 3.00 | -10.0 | .135 | 0.2412 | 0.2589 |
| 41 | 6.02 | .150 | -7.5 | 5.00 | -10.0 | .025 | 0.7433 | 0.8349* |
| 42 | 2.95 | .074 | -2.5 | 2.00 | -10.0 | .057 | 0.2316 | 0.2333 |
| 43 | 5.21 | .130 | -5.0 | 2.00 | -10.0 | .022 | 0.6089 | 0.5983 |
| 46 | 3.09 | .077 | -5.0 | 2.00 | -10.0 | .092 | 0.2364 | 0.2343 |
| 47 | 3.14 | .079 | -2.5 | 3.00 | -5.0 | .036 | 0.2533 | 0.2617 |
| 48 | 3.09 | .077 | 0.0 | 3.00 | -15.0 | .041 | 0.2547 | 0.2656 |
| 56 | 5.23 | .131 | -5.0 | 3.00 | -15.0 | .060 | 0.7169 | 0.6903 |
| 57 | 5.19 | .130 | -5.0 | 2.00 | -15.0 | .027 | 0.5922 | 0.5889 |
| 58 | 5.12 | .128 | -12.5 | 5.00 | -15.0 | .027 | 0.6770 | 0.6144* |
| 59 | 3.05 | .076 | 0.0 | 3.00 | -20.0 | .048 | 0.2541 | 0.2647 |
| 60 | 4.17 | .104 | -12.5 | 6.00 | -20.0 | -.007 | 0.2445 | 0.2626 |
| 62 | 5.18 | .129 | 5.0 | 3.00 | -20.0 | .022 | 0.5675 | 0.5566 |
| 65 | 4.10 | .102 | -2.5 | 6.00 | -20.0 | .033 | 0.3751 | 0.3718 |
| 66 | 6.15 | .154 | -10.0 | 5.00 | -20.0 | .004 | 0.7198 | 0.7351 |
| 67 | 2.11 | .053 | -7.5 | 2.00 | -20.0 | .046 | 0.1485 | 0.1543 |
| 69 | 4.05 | .101 | -5.0 | 5.00 | -20.0 | .047 | 0.4392 | 0.4276 |
| 70 | 3.01 | .075 | -7.5 | 2.00 | -20.0 | .076 | 0.2522 | 0.2151 |
| 71 | 3.00 | .075 | 0.0 | 3.00 | 5.0 | .038 | 0.2283 | 0.2320 |
| 72 | 6.08 | .152 | -5.0 | 3.00 | 5.0 | .057 | 0.8201 | 0.8231 |
| 74 | 5.05 | .126 | -10.0 | 3.00 | 5.0 | .108 | 0.5548 | 0.5538 |
| 75 | 6.03 | .151 | -2.5 | 5.00 | 5.0 | .047 | 0.7812 | 0.7815 |
| 76 | 5.05 | .126 | -2.5 | 2.00 | 5.0 | .038 | 0.5624 | 0.5867 |
| 77 | 5.05 | .126 | -10.0 | 5.00 | 5.0 | .031 | 0.5821 | 0.5872 |
| 78 | 4.02 | .101 | -7.5 | 5.00 | 5.0 | .008 | 0.3619 | 0.3937 |
| 79 | 2.04 | .051 | -10.0 | 3.00 | 5.0 | .016 | 0.1340 | 0.1377 |
| 80 | 5.33 | .133 | -2.5 | 3.00 | 0.0 | .061 | 0.6683 | 0.6536 |
| 82 | 3.87 | .097 | -2.5 | 2.00 | 0.0 | .099 | 0.3631 | 0.3610 |
| 83 | 3.02 | .075 | -2.5 | 3.00 | -5.0 | .038 | 0.2392 | 0.2468 |
| 418 | 1.85 | .069 | 0.0 | 3.00 | 0.0 | .060 | 0.1482 | 0.1595 |
| 419 | 2.96 | .111 | 0.0 | 3.00 | 0.0 | .044 | 0.3145 | 0.3125 |
| 420 | 3.95 | .148 | 0.0 | 3.00 | 0.0 | .033 | 0.5271 | 0.5231 |
| 421 | 5.02 | .188 | 0.0 | 3.00 | 0.0 | .025 | 0.8393 | 0.8349 |
| 422 | 6.09 | .228 | 0.0 | 3.00 | 0.0 | .022 | 1.2063 | 1.2303 |
| 423 | 3.86 | .145 | 0.0 | 3.00 | 0.0 | .028 | 0.5067 | 0.4998 |
| 424 | 3.91 | .146 | 0.0 | 3.00 | 0.0 | .045 | 0.5162 | 0.5174 |
| 425 | 3.96 | .148 | 0.0 | 3.00 | 0.0 | .067 | 0.5357 | 0.5373 |
| 426 | 4.03 | .151 | 0.0 | 3.00 | 0.0 | .117 | 0.5465 | 0.5636 |
| 427 | 4.01 | .150 | 0.0 | 3.00 | 0.0 | .158 | 0.5458 | 0.5577 |
| 428 | 3.99 | .150 | 5.0 | 3.00 | 0.0 | .027 | 0.5411 | 0.5320 |
| 429 | 4.02 | .151 | -2.5 | 3.00 | 0.0 | .031 | 0.5427 | 0.5417 |
| 430 | 3.99 | .150 | -5.0 | 3.00 | 0.0 | .027 | 0.5309 | 0.5361 |
| 431 | 4.01 | .150 | -7.5 | 3.00 | 0.0 | .017 | 0.5336 | 0.5386 |
| 432 | 4.00 | .150 | -10.0 | 3.00 | 0.0 | .011 | 0.5405 | 0.5380 |
| 433 | 4.01 | .150 | -12.5 | 3.00 | 0.0 | .006 | 0.5476 | 0.5416 |
| 434 | 3.99 | .150 | -12.5 | 3.00 | 5.0 | .007 | 0.5318 | 0.5350 |

TABLE A-25 (cont'd)

MEASURED AND FITTED YAW MØMENT
BETA=10·DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|---------|
| 435 | 4.00 | .150 | -12.5 | 3.00 | -5.0 | -.002 | 0.5371 | 0.5351 |
| 436 | 4.02 | .151 | -12.5 | 3.00 | -10.0 | -.004 | 0.5321 | 0.5372 |
| 438 | 3.97 | .149 | 0.0 | 3.00 | 5.0 | .032 | 0.5205 | 0.5244 |
| 440 | 4.01 | .150 | 0.0 | 3.00 | -5.0 | .035 | 0.5473 | 0.5440 |
| 441 | 4.00 | .150 | 0.0 | 3.00 | -10.0 | .036 | 0.5459 | 0.5468 |
| 443 | 3.98 | .149 | 0.0 | 3.00 | -15.0 | .040 | 0.5413 | 0.5470 |
| 444 | 3.98 | .149 | 0.0 | 3.00 | -20.0 | .035 | 0.5280 | 0.5430 |
| 445 | 3.98 | .149 | 0.0 | 2.00 | 0.0 | .036 | 0.5305 | 0.5316 |
| 446 | 3.98 | .149 | 0.0 | 4.00 | 0.0 | .032 | 0.5339 | 0.5330 |
| 448 | 4.02 | .151 | 0.0 | 5.00 | 0.0 | .025 | 0.5431 | 0.5399 |
| 449 | 4.03 | .151 | 0.0 | 6.00 | 0.0 | .024 | 0.5510 | 0.5412 |
| 451 | 1.81 | .068 | -10.0 | 4.00 | 5.0 | .132 | 0.1222 | 0.1465 |
| 452 | 4.01 | .150 | -2.5 | 3.00 | -5.0 | .043 | 0.5515 | 0.5519 |
| 455 | 4.91 | .184 | 5.0 | 4.00 | -20.0 | .131 | 1.3718 | 1.0823* |
| 456 | 4.90 | .184 | -7.5 | 4.00 | 5.0 | .099 | 0.8403 | 0.7694* |
| 457 | 2.92 | .109 | -2.5 | 3.00 | -5.0 | .043 | 0.3110 | 0.3116 |
| 458 | 4.00 | .150 | -7.5 | 6.00 | 0.0 | .010 | 0.5325 | 0.5261* |
| 459 | 5.96 | .224 | 0.0 | 2.00 | -5.0 | .025 | 0.1833 | 1.1657* |
| 460 | 5.01 | .188 | -10.0 | 5.00 | 0.0 | .045 | 0.8923 | 0.8570 |
| 463 | 4.02 | .151 | -12.5 | 3.00 | 5.0 | .110 | 0.5324 | 0.5287 |
| 465 | 5.97 | .224 | 0.0 | 2.00 | 5.0 | .090 | 1.1816 | 1.1615 |
| 466 | 5.97 | .224 | -12.5 | 5.00 | -20.0 | .011 | 1.1574 | 1.1509 |
| 467 | 4.00 | .150 | -7.5 | 6.00 | 0.0 | .011 | 0.5371 | 0.5273 |
| 469 | 5.05 | .189 | 5.0 | 4.00 | -10.0 | .083 | 0.9472 | 0.9398 |
| 470 | 3.01 | .113 | -2.5 | 3.00 | 0.0 | .131 | 0.3095 | 0.3308 |
| 471 | 2.99 | .112 | -2.5 | 3.00 | -5.0 | .047 | 0.3227 | 0.3261 |
| 473 | 4.90 | .186 | -5.0 | 6.00 | -20.0 | .024 | 0.7801 | 0.7754 |
| 475 | 4.97 | .186 | -2.5 | 2.00 | -20.0 | .086 | 0.8635 | 0.8655 |
| 476 | 4.97 | .186 | 5.0 | 3.00 | 0.0 | .031 | 0.8238 | 0.8109 |
| 483 | 1.98 | .074 | -10.0 | 6.00 | -5.0 | .168 | 0.1769 | 0.1796 |
| 484 | 2.91 | .109 | -2.5 | 2.00 | 0.0 | .089 | 0.2953 | 0.3033 |
| 485 | 3.01 | .113 | 0.0 | 6.00 | -20.0 | .133 | 0.4644 | 0.4619 |
| 487 | 3.93 | .148 | -10.0 | 2.00 | -5.0 | .097 | 0.4931 | 0.5209 |
| 488 | 3.00 | .113 | -2.5 | 3.00 | -5.0 | .043 | 0.3230 | 0.3271 |
| 489 | 4.13 | .155 | -5.0 | 2.00 | 5.0 | .112 | 0.5967 | 0.5658 |
| 490 | 6.08 | .228 | -5.0 | 2.00 | 5.0 | .081 | 1.2262 | 1.2282 |
| 491 | 4.10 | .154 | -7.5 | 3.00 | -5.0 | .075 | 0.6225 | 0.5936 |
| 492 | 4.04 | .152 | 0.0 | 3.00 | 0.0 | .028 | 0.5512 | 0.5459 |
| 494 | 3.18 | .119 | -2.5 | 4.00 | -5.0 | .140 | 0.3633 | 0.3930 |
| 496 | 6.07 | .228 | 5.0 | 5.00 | -15.0 | .074 | 1.4319 | 1.4483 |
| 499 | 6.05 | .227 | -10.0 | 5.00 | -15.0 | .001 | 1.1363 | 1.1427 |
| 500 | 4.08 | .153 | -5.0 | 6.00 | -5.0 | .015 | 0.5570 | 0.5356 |
| 502 | 3.09 | .116 | -12.5 | 4.00 | 0.0 | .105 | 0.3643 | 0.3474 |
| 503 | 3.10 | .116 | -2.5 | 4.00 | -15.0 | .053 | 0.3658 | 0.3663 |
| 505 | 3.03 | .114 | -2.5 | 5.00 | 5.0 | .161 | 0.3243 | 0.3106 |
| 506 | 3.02 | .113 | -2.5 | 3.00 | -5.0 | .041 | 0.3282 | 0.3293 |
| 507 | 3.01 | .113 | -5.0 | 2.00 | 5.0 | .092 | 0.3060 | 0.3149 |
| 508 | 2.99 | .112 | -5.0 | 5.00 | -10.0 | .104 | 0.3787 | 0.3741 |
| 512 | 2.01 | .075 | -7.5 | 6.00 | -10.0 | .220 | 0.1788 | 0.1962 |
| 513 | 5.15 | .193 | -10.0 | 5.00 | -10.0 | .042 | 0.9846 | 0.9467 |

R-1851

TABLE A-25 (cont'd)

MEASURED AND FITTED YAW MOMENT
BETA=10. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|---------|
| 514 | 5.10 | .191 | -12.5 | 2.00 | -10.0 | -.016 | 0.8239 | 0.8230 |
| 795 | 3.00 | .225 | 0.0 | 3.00 | 0.0 | .055 | 0.6048 | 0.6052 |
| 796 | 2.99 | .224 | 5.0 | 3.00 | 0.0 | .047 | 0.6026 | 0.5999 |
| 797 | 3.01 | .226 | -2.5 | 3.00 | 0.0 | .056 | 0.5940 | 0.6095 |
| 798 | 3.00 | .225 | -5.0 | 3.00 | 0.0 | .051 | 0.6015 | 0.6046 |
| 799 | 3.01 | .226 | -7.5 | 3.00 | 0.0 | .046 | 0.6079 | 0.6092 |
| 800 | 3.00 | .225 | -10.0 | 3.00 | 0.0 | .039 | 0.6067 | 0.6045 |
| 801 | 3.00 | .225 | -12.5 | 3.00 | 0.0 | .033 | 0.6135 | 0.6056 |
| 802 | 2.99 | .224 | 0.0 | 3.00 | 5.0 | .054 | 0.5916 | 0.5939 |
| 803 | 2.99 | .224 | 0.0 | 3.00 | -5.0 | .068 | 0.6156 | 0.6155 |
| 804 | 2.98 | .223 | 0.0 | 3.00 | -10.0 | .072 | 0.6187 | 0.6162 |
| 805 | 2.99 | .224 | 0.0 | 3.00 | -15.0 | .075 | 0.6297 | 0.6244 |
| 806 | 3.00 | .225 | 0.0 | 3.00 | -20.0 | .069 | 0.6256 | 0.6235 |
| 807 | 3.00 | .225 | 0.0 | 2.00 | 0.0 | .067 | 0.6093 | 0.6053 |
| 808 | 2.97 | .223 | 0.0 | 4.00 | 0.0 | .058 | 0.6013 | 0.6014 |
| 809 | 3.00 | .225 | 0.0 | 5.00 | 0.0 | .053 | 0.6076 | 0.6120 |
| 810 | 2.99 | .224 | 0.0 | 6.00 | 0.0 | .056 | 0.5981 | 0.6110 |
| 811 | 3.00 | .225 | 0.0 | 3.00 | 0.0 | .051 | 0.6060 | 0.6038 |
| 812 | 3.00 | .225 | 0.0 | 3.00 | 0.0 | .082 | 0.6124 | 0.6201 |
| 813 | 3.00 | .225 | 0.0 | 3.00 | 0.0 | .130 | 0.6210 | 0.6322 |
| 815 | 2.01 | .151 | 0.0 | 3.00 | 0.0 | .104 | 0.2993 | 0.2983 |
| 816 | 2.51 | .188 | -2.5 | 3.00 | 0.0 | .069 | 0.4377 | 0.4300 |
| 817 | 3.01 | .226 | 0.0 | 6.00 | -20.0 | .066 | 0.6265 | 0.6436 |
| 818 | 3.02 | .226 | 5.0 | 6.00 | -5.0 | .175 | 0.7148 | 0.7354 |
| 819 | 3.02 | .226 | -2.5 | 6.00 | 5.0 | .211 | 0.6052 | 0.5857 |
| 820 | 2.03 | .152 | 0.0 | 4.00 | -10.0 | .205 | 0.3608 | 0.3150 |
| 821 | 3.01 | .226 | -12.5 | 3.00 | -10.0 | .017 | 0.6081 | 0.6251 |
| 822 | 3.01 | .226 | -2.5 | 3.00 | -5.0 | .065 | 0.6176 | 0.6229 |
| 823 | 2.02 | .152 | -12.5 | 3.00 | -10.0 | .093 | 0.3172 | 0.2817 |
| 824 | 2.52 | .189 | -10.0 | 3.00 | 5.0 | .111 | 0.4287 | 0.4262 |
| 825 | 2.01 | .150 | -5.0 | 3.00 | -15.0 | .112 | 0.3080 | 0.2754 |
| 826 | 2.48 | .186 | -12.5 | 6.00 | -10.0 | .190 | 0.4839 | 0.4902 |
| 827 | 2.48 | .186 | -12.5 | 5.00 | 5.0 | .281 | 0.4509 | 0.2746* |
| 828 | 2.99 | .224 | 0.0 | 3.00 | -5.0 | .084 | 0.6188 | 0.6216 |
| 829 | 1.99 | .149 | 5.0 | 6.00 | -10.0 | .287 | 0.4365 | 0.4254 |
| 830 | 2.00 | .150 | -5.0 | 3.00 | -10.0 | .076 | 0.3027 | 0.2858 |
| 831 | 2.50 | .187 | -2.5 | 5.00 | -20.0 | .248 | 0.6668 | 0.5360* |
| 832 | 2.99 | .224 | -2.5 | 3.00 | -5.0 | .065 | 0.6175 | 0.6158 |
| 833 | 1.96 | .147 | -5.0 | 6.00 | -5.0 | .263 | 0.3219 | 0.2919 |
| 834 | 2.95 | .221 | 5.0 | 5.00 | 0.0 | .063 | 0.5870 | 0.5978 |
| 835 | 2.96 | .222 | -5.0 | 6.00 | 0.0 | .034 | 0.5819 | 0.5902 |
| 836 | 1.98 | .148 | -12.5 | 3.00 | -20.0 | .019 | 0.2874 | 0.3076 |
| 839 | 2.06 | .155 | 5.0 | 4.00 | 0.0 | .192 | 0.3548 | 0.3584 |
| 840 | 2.03 | .153 | -7.5 | 3.00 | 5.0 | .088 | 0.2945 | 0.2869 |
| 841 | 2.98 | .223 | 0.0 | 5.00 | -20.0 | .219 | 0.9766 | 0.7958* |
| 842 | 2.99 | .224 | -7.5 | 6.00 | -15.0 | .031 | 0.6047 | 0.5880 |
| 845 | 2.98 | .223 | 5.0 | 6.00 | -10.0 | .174 | 0.8010 | 0.7603 |
| 846 | 3.01 | .226 | -2.5 | 3.00 | -5.0 | .053 | 0.6248 | 0.6176 |
| 847 | 2.54 | .190 | -7.5 | 5.00 | 0.0 | .242 | 0.4091 | 0.4166 |
| 848 | 3.01 | .226 | -10.0 | 5.00 | 0.0 | .204 | 0.6079 | 0.645 |

R-1851

TABLE A-25 (cont'd)

MEASURED AND FITTED YAW MOMENT
BETA=10. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|------|----------|---------|
| 849 | 2.55 | .191 | 0.0 | 5.00 | -5.0 | .046 | 0.4627 | 0.4425* |
| 850 | 2.54 | .191 | -2.5 | 4.00 | -15.0 | .180 | 0.5704 | 0.4860* |
| 851 | 2.08 | .156 | 0.0 | 5.00 | 5.0 | .038 | 0.3059 | 0.2922* |
| 852 | 2.53 | .190 | 5.0 | 6.00 | -20.0 | .212 | 0.7852 | 0.6437* |
| 853 | 2.05 | .154 | -5.0 | 8.00 | -15.0 | .288 | 0.4533 | 0.4693 |
| 855 | 3.01 | .226 | -5.0 | 2.00 | 5.0 | .074 | 0.6025 | 0.6002 |
| 856 | 2.53 | .190 | -12.5 | 4.00 | -10.0 | .182 | 0.4117 | 0.4438 |
| 857 | 3.00 | .225 | -2.5 | 3.00 | -5.0 | .049 | 0.6181 | 0.6121 |
| 858 | 2.99 | .224 | -5.0 | 4.00 | 0.0 | .157 | 0.6009 | 0.6283 |
| 859 | 2.53 | .190 | -5.0 | 6.00 | -5.0 | .169 | 0.4729 | 0.5028 |
| 861 | 2.54 | .190 | -12.5 | 4.00 | -5.0 | .209 | 0.4092 | 0.4130* |
| 862 | 2.97 | .223 | -12.5 | 5.00 | -20.0 | .057 | 0.7389 | 0.6521* |
| 863 | 3.00 | .225 | -5.0 | 4.00 | -5.0 | .026 | -0.1180 | 0.6065* |

MEAN ERROR= -0.0368
STANDARD DEVIATION= 0.2049

TABLE A-26

MEASURED AND FITTED YAW MOMENT
BETA=15. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|------|-------|-----|-------|----------|----------|
| 141 | 4.00 | .000 | 5.0 | 3.60 | 5.0 | .050 | 0.0893 | 0.1128 |
| 142 | 4.00 | .000 | -0.3 | 2.60 | 0.0 | .063 | 0.0943 | 0.1110 * |
| 143 | 3.00 | .000 | 4.7 | 2.60 | 0.0 | .053 | 0.0916 | 0.1218 |
| 144 | 6.00 | .000 | 14.8 | 3.00 | 0.0 | .149 | 0.1848 | 0.1794 |
| 145 | 4.00 | .000 | 4.8 | 3.60 | 0.0 | .050 | 0.1040 | 0.1164 |
| 146 | 4.00 | .000 | -5.2 | 3.60 | 0.0 | .050 | 0.0943 | 0.1064 |
| 147 | 4.00 | .000 | -0.3 | 3.60 | 0.0 | .058 | 0.0998 | 0.1112 |
| 148 | 4.00 | .000 | -0.3 | 3.60 | 0.0 | .061 | 0.1010 | 0.1112 |
| 149 | 4.00 | .000 | -0.3 | 3.60 | 0.0 | .076 | 0.1000 | 0.1112 |
| 150 | 4.00 | .000 | -0.3 | 3.60 | 0.0 | .113 | 0.1052 | 0.1109 |
| 151 | 4.00 | .000 | -0.3 | 3.60 | 0.0 | .163 | 0.1159 | 0.1102 |
| 152 | 4.00 | .000 | -0.3 | 3.70 | 0.0 | .216 | 0.1263 | 0.1091 |
| 153 | 2.00 | .000 | -2.1 | 3.60 | 0.0 | .114 | 0.0950 | 0.1038 |
| 154 | 3.00 | .000 | -0.3 | 3.60 | 0.0 | .077 | 0.0977 | 0.1110 |
| 155 | 5.00 | .000 | -0.3 | 3.60 | 0.0 | .051 | 0.1076 | 0.1113 |
| 156 | 6.00 | .000 | -0.3 | 3.60 | 0.0 | .043 | 0.1066 | 0.1112 |
| 157 | 4.00 | .000 | 9.8 | 3.60 | 0.0 | .035 | 0.1117 | 0.1200 |
| 158 | 4.00 | .000 | 14.7 | 3.60 | 0.0 | .014 | 0.1180 | 0.1234 |
| 159 | 3.00 | .000 | 14.7 | 3.60 | 0.0 | .169 | 0.1479 | 0.1791 |
| 160 | 4.00 | .000 | 19.8 | 3.60 | 0.0 | -.005 | 0.1108 | 0.1263 |
| 161 | 4.00 | .000 | 19.8 | 4.60 | 0.0 | .155 | 0.1228 | 0.1304 |
| 162 | 4.00 | .000 | 19.7 | 4.60 | 0.0 | .162 | 0.1339 | 0.1377 |
| 163 | 4.00 | .000 | -0.3 | 4.60 | 0.0 | .058 | 0.1198 | 0.1115 |
| 164 | 4.00 | .000 | -0.3 | 5.60 | 0.0 | .056 | 0.1241 | 0.1117 |
| 165 | 2.00 | .000 | 4.7 | 5.60 | 0.0 | .371 | 0.1897 | 0.2179 |
| 166 | 6.00 | .000 | 9.7 | 5.60 | 0.0 | .029 | 0.1226 | 0.1060 |
| 167 | 3.00 | .000 | 19.7 | 5.60 | 0.0 | .161 | 0.1249 | 0.1111 |
| 168 | 3.00 | .000 | 19.7 | 5.60 | 0.0 | .280 | 0.2818 | 0.2750 |
| 169 | 2.00 | .000 | 19.7 | 6.60 | 0.0 | .067 | 0.1076 | 0.1037 |
| 170 | 5.00 | .000 | 9.7 | 6.60 | 0.0 | .030 | 0.1249 | 0.1015 |
| 171 | 4.00 | .000 | 9.7 | 6.60 | 0.0 | .147 | 0.0329 | 0.0953 * |
| 172 | 3.00 | .000 | -5.3 | 6.60 | 0.0 | .082 | 0.1147 | 0.1158 |
| 173 | 4.00 | .000 | -0.3 | 6.60 | 0.0 | .055 | 0.1327 | 0.1119 |
| 174 | 6.00 | .000 | -5.2 | 6.60 | 0.0 | .039 | 0.1198 | 0.1195 |
| 175 | 4.00 | .000 | 4.7 | 3.60 | 5.0 | .061 | 0.1244 | 0.1074 |
| 185 | 4.00 | .000 | 4.7 | 3.60 | 5.0 | .046 | 0.1256 | 0.1145 |
| 186 | 4.00 | .000 | -0.3 | 3.60 | 5.0 | .065 | 0.1170 | 0.1019 |
| 187 | 3.00 | .000 | -5.3 | 3.60 | 5.0 | .119 | 0.1166 | 0.0798 * |
| 189 | 5.00 | .000 | -0.3 | 2.50 | 5.0 | .062 | 0.0948 | 0.0917 |
| 191 | 4.00 | .000 | 9.8 | 3.60 | 5.0 | .173 | 0.1062 | 0.1200 |
| 192 | 4.00 | .000 | 9.7 | 3.60 | 5.0 | .177 | 0.1030 | 0.1219 |
| 193 | 3.00 | .000 | 14.7 | 3.70 | 5.0 | .250 | 0.3020 | 0.2662 |
| 194 | 3.00 | .000 | 14.7 | 3.60 | 5.0 | .017 | 0.1138 | 0.1264 |
| 195 | 3.00 | .000 | 14.7 | 1.60 | 5.0 | .048 | 0.1059 | 0.1188 |
| 196 | 6.00 | .000 | -5.2 | 5.60 | 5.0 | .035 | 0.1299 | 0.1152 |
| 197 | 6.00 | .000 | 9.7 | 5.60 | 5.0 | .026 | 0.1222 | 0.1130 |
| 198 | 6.00 | .000 | 19.8 | 5.60 | 5.0 | -.016 | 0.1263 | 0.1425 |
| 199 | 2.00 | .000 | -0.3 | 5.60 | 5.0 | .101 | 0.0950 | 0.0941 |
| 200 | 2.00 | .000 | -5.3 | 5.60 | 5.0 | .257 | 0.1044 | 0.0545 * |
| 201 | 4.00 | .000 | 19.8 | 5.60 | 5.0 | .139 | -0.0282 | 0.0046 * |

TABLE A-26 (cont'd)

MEASURED AND FITTED YAW MOMENT
BETA=15. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|------|-------|------|-------|----------|----------|
| 202 | 5.00 | .000 | 14.7 | 6.60 | 5.0 | .010 | 0.1283 | 0.1066 |
| 203 | 5.00 | .000 | 4.7 | 6.60 | 5.0 | .036 | 0.1113 | 0.1030 |
| 204 | 5.00 | .000 | 4.8 | 6.60 | 5.0 | .037 | 0.1166 | 0.1019 |
| 205 | 3.00 | .000 | -5.3 | 6.60 | 5.0 | .279 | 0.0958 | 0.0355* |
| 206 | 4.00 | .000 | 4.7 | 3.60 | 5.0 | .055 | 0.1081 | 0.1103 |
| 207 | 4.00 | .000 | -0.3 | 3.60 | -5.0 | .063 | 0.1236 | 0.1194 |
| 208 | 6.00 | .000 | 14.7 | 3.60 | -5.0 | .155 | 0.2976 | 0.2914 |
| 210 | 5.00 | .000 | -0.3 | 2.50 | -5.0 | .103 | 0.1606 | 0.1473 |
| 211 | 4.00 | .000 | 4.7 | 2.60 | -5.0 | .094 | 0.1407 | 0.1451 |
| 212 | 2.00 | .000 | 4.7 | 2.60 | -5.0 | .162 | 0.1331 | 0.1494 |
| 213 | 4.00 | .000 | 9.8 | 2.60 | -5.0 | .043 | 0.1272 | 0.1380 |
| 214 | 2.00 | .000 | -0.3 | 4.60 | -5.0 | .170 | 0.1289 | 0.1222 |
| 215 | 6.00 | .000 | 14.8 | 4.60 | -5.0 | .126 | 0.2470 | 0.2410 |
| 216 | 5.00 | .000 | 14.7 | 5.50 | -5.0 | .150 | 0.2149 | 0.2124 |
| 218 | 3.00 | .000 | 9.7 | 5.60 | -5.0 | .242 | 0.1900 | 0.2053 |
| 219 | 4.00 | .000 | 9.7 | 5.60 | -5.0 | .045 | 0.1343 | 0.1252 |
| 220 | 6.00 | .000 | 14.8 | 5.60 | -5.0 | .007 | 0.1126 | 0.1073 |
| 221 | 6.00 | .000 | 14.8 | 6.60 | -5.0 | .005 | 0.1022 | 0.0990 |
| 222 | 4.00 | .000 | 9.7 | 6.60 | -5.0 | .044 | 0.1362 | 0.1270 |
| 223 | 3.00 | .000 | 19.7 | 6.60 | 10.0 | -.009 | 0.1230 | 0.1349 |
| 224 | 4.00 | .000 | 19.7 | 6.60 | 10.0 | -.014 | 0.1359 | 0.1417* |
| 225 | 2.00 | .000 | -5.3 | 6.60 | 10.0 | .104 | 0.0938 | 0.0569* |
| 226 | 3.00 | .000 | 4.7 | 6.60 | 10.0 | .117 | 0.0434 | 0.0268 |
| 227 | 5.00 | .000 | -0.3 | 6.50 | 10.0 | .070 | 0.0573 | 0.0480 |
| 228 | 3.00 | .000 | 14.8 | 6.60 | 10.0 | .191 | -0.0187 | -0.0156* |
| 231 | 3.00 | .000 | 19.8 | 4.60 | 10.0 | .179 | 0.1155 | 0.0682 |
| 232 | 5.00 | .000 | 14.7 | 4.50 | 10.0 | .035 | 0.0906 | 0.0816 |
| 233 | 2.00 | .000 | 14.7 | 4.60 | 10.0 | .037 | 0.1038 | 0.1173 |
| 234 | 4.00 | .000 | 4.8 | 3.60 | 5.0 | .054 | 0.1125 | 0.1104* |
| 235 | 5.00 | .000 | 4.8 | 3.50 | 10.0 | .118 | -0.0426 | 0.0404* |
| 238 | 3.00 | .000 | 9.7 | 3.60 | 10.0 | .240 | 0.2873 | 0.2068* |
| 239 | 4.00 | .000 | 9.8 | 3.60 | 10.0 | .059 | 0.0959 | 0.0943 |
| 240 | 5.00 | .000 | 8.6 | 3.50 | 10.0 | .020 | 0.1321 | 0.1462 |
| 241 | 3.00 | .000 | 4.8 | 3.60 | 10.0 | .131 | 0.0864 | 0.0962 |
| 242 | 4.00 | .000 | -0.3 | 3.60 | 10.0 | .064 | 0.0959 | 0.0950 |
| 243 | 4.00 | .000 | 9.7 | 2.60 | 10.0 | .050 | 0.1131 | 0.1061 |
| 244 | 3.00 | .000 | 19.7 | 5.60 | 10.0 | -.003 | 0.1221 | 0.1265* |
| 245 | 3.00 | .000 | -4.9 | 5.50 | 10.0 | .180 | 0.0778 | 0.0277 |
| 246 | 5.00 | .000 | -5.2 | 5.50 | 15.0 | .077 | 0.0149 | 0.0118* |
| 247 | 3.00 | .000 | -0.3 | 5.60 | 15.0 | .165 | 0.0325 | 0.0103 |
| 248 | 5.00 | .000 | 14.8 | 5.50 | 15.0 | .029 | 0.1128 | 0.0926 |
| 249 | 6.00 | .000 | 14.7 | 5.60 | 15.0 | .016 | 0.1772 | 0.1576 |
| 250 | 5.00 | .000 | -0.3 | 5.50 | 15.0 | .044 | 0.1213 | 0.1137* |
| 251 | 2.00 | .000 | 4.7 | 6.60 | 15.0 | .091 | 0.0967 | 0.0451 |
| 252 | 6.00 | .000 | 3.9 | 6.60 | 15.0 | .026 | 0.1544 | 0.1770* |
| 253 | 3.00 | .000 | 19.7 | 6.60 | 15.0 | .018 | 0.1032 | 0.0523* |
| 254 | 4.00 | .000 | -5.3 | 6.60 | 15.0 | .150 | -0.0619 | -0.0882* |
| 255 | 6.00 | .000 | -5.3 | 4.60 | 15.0 | .067 | 0.0441 | 0.0126* |
| 256 | 3.00 | .000 | 14.7 | 4.60 | 15.0 | .094 | 0.0207 | 0.0357* |
| 257 | 5.00 | .000 | 9.8 | 4.50 | 15.0 | .077 | -0.0091 | 0.0341* |

TABLE A-26 (cont'd)

MEASURED AND FITTED YAW MOMENT
BETA=15. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|------|-------|----------|----------|
| 258 | 3.00 | .000 | 4.7 | 4.60 | 15.0 | .266 | 0.1721 | 0.1474* |
| 260 | 4.00 | .000 | -0.3 | 4.60 | 15.0 | .230 | 0.0133 | 0.0083 |
| 261 | 4.00 | .000 | -0.3 | 4.60 | 15.0 | .049 | 0.1303 | 0.1062 |
| 262 | 3.00 | .000 | 9.8 | 4.60 | 15.0 | .056 | 0.1191 | 0.0920 |
| 263 | 6.00 | .000 | 9.8 | 4.60 | 15.0 | .033 | 0.1627 | 0.1461 |
| 264 | 4.00 | .000 | -0.3 | 3.60 | 15.0 | .069 | 0.0993 | 0.0851 |
| 265 | 6.00 | .000 | 19.8 | 3.60 | 15.0 | -.009 | 0.1788 | 0.1795 |
| 266 | 4.00 | .000 | 9.8 | 2.60 | 15.0 | .053 | 0.1193 | 0.1033 |
| 267 | 3.00 | .000 | 9.8 | 2.60 | 15.0 | .095 | 0.0902 | 0.1036 |
| 268 | 3.00 | .000 | 4.7 | 2.60 | 15.0 | .089 | 0.1023 | 0.1039* |
| 270 | 6.00 | .000 | 4.8 | 2.50 | 15.0 | .099 | -0.0525 | -0.0129* |
| 271 | 6.00 | .000 | 4.8 | 2.50 | 15.0 | .097 | -0.0693 | -0.0099* |
| 275 | 4.00 | .000 | 9.8 | 2.50 | 15.0 | .117 | 0.0358 | 0.0745* |
| 276 | 4.00 | .000 | 4.8 | 3.60 | 5.0 | .058 | 0.1267 | 0.1089 |
| 277 | 4.00 | .000 | -0.3 | 3.60 | 20.0 | .068 | 0.0838 | 0.0850 |
| 277 | 3.00 | .000 | 14.7 | 3.50 | 20.0 | .049 | 0.0905 | 0.0868* |
| 279 | 4.00 | .000 | 4.8 | 3.50 | 20.0 | .133 | -0.0319 | 0.0421* |
| 280 | 6.00 | .000 | 4.8 | 2.50 | 20.0 | .100 | -0.1558 | -0.0226* |
| 281 | 5.00 | .000 | 4.8 | 2.50 | 20.0 | .168 | 0.3047 | 0.0141 |
| 282 | 6.00 | .000 | 14.7 | 2.50 | 20.0 | .028 | 0.1024 | 0.1253 |
| 283 | 4.00 | .000 | 14.7 | 2.50 | 20.0 | .034 | 0.1060 | 0.1030 |
| 286 | 4.00 | .000 | 14.7 | 2.50 | 20.0 | .020 | 0.1517 | 0.1301 |
| 286 | 3.00 | .000 | 9.7 | 4.50 | 20.0 | .043 | 0.1307 | 0.1113 |
| 287 | 3.00 | .000 | 9.7 | 4.50 | 20.0 | .075 | 0.0722 | 0.0694 |
| 288 | 4.00 | .000 | 19.8 | 4.50 | 20.0 | -.004 | 0.1537 | 0.1497 |
| 289 | 2.00 | .000 | 14.7 | 4.50 | 20.0 | .098 | 0.0631 | 0.0646 |
| 290 | 2.00 | .000 | 19.8 | 4.60 | 20.0 | .136 | 0.0424 | 0.0348 |
| 294 | 3.00 | .000 | -0.3 | 5.50 | 20.0 | .090 | 0.0427 | 0.0320* |
| 295 | 3.00 | .000 | -0.3 | 5.60 | 20.0 | .056 | 0.1022 | 0.0715* |
| 296 | 4.00 | .000 | -0.3 | 6.60 | 20.0 | .046 | 0.1227 | 0.0706* |
| 297 | 4.00 | .000 | 4.7 | 3.60 | 5.0 | .059 | 0.1071 | 0.1082 |
| 298 | 4.00 | .000 | 4.8 | 1.60 | 5.0 | .082 | 0.1158 | 0.1077 |
| 299 | 4.00 | .000 | 14.7 | 1.60 | 5.0 | .038 | 0.1086 | 0.1053* |
| 300 | 5.00 | .000 | -0.3 | 1.50 | 15.0 | .051 | 0.1137 | 0.0636* |
| 109 | 2.35 | .059 | 0.0 | 3.00 | 0.0 | .069 | 0.1637 | 0.1887 |
| 110 | 2.92 | .073 | 0.0 | 3.00 | 0.0 | .060 | 0.2221 | 0.2408 |
| 111 | 3.88 | .097 | 0.0 | 3.00 | 0.0 | .052 | 0.3552 | 0.3588 |
| 112 | 4.95 | .124 | 0.0 | 3.00 | 0.0 | .045 | 0.5421 | 0.5422 |
| 113 | 6.02 | .150 | 0.0 | 3.00 | 0.0 | .037 | 0.7817 | 0.7788 |
| 114 | 2.87 | .072 | 0.0 | 3.00 | 0.0 | .049 | 0.2113 | 0.2345 |
| 115 | 3.02 | .076 | 0.0 | 3.00 | 0.0 | .081 | 0.2357 | 0.2531 |
| 116 | 3.01 | .075 | 0.0 | 3.00 | 0.0 | .155 | 0.2296 | 0.2593 |
| 117 | 2.82 | .071 | 0.0 | 3.00 | 0.0 | .156 | 0.2133 | 0.2389 |
| 119 | 4.03 | .101 | 0.0 | 3.00 | 0.0 | .181 | 0.3944 | 0.4105 |
| 120 | 3.03 | .076 | 5.0 | 3.00 | 0.0 | .059 | 0.2289 | 0.2617 |
| 121 | 3.02 | .075 | -5.0 | 3.00 | 0.0 | .056 | 0.2244 | 0.2417 |
| 122 | 2.87 | .072 | -10.0 | 3.00 | 0.0 | .052 | 0.2088 | 0.2191 |
| 123 | 2.89 | .072 | -15.0 | 3.00 | 0.0 | .046 | 0.2170 | 0.2213 |
| 124 | 3.05 | .076 | -20.0 | 3.00 | 0.0 | .040 | 0.2279 | 0.2488 |
| 125 | 3.06 | .076 | 0.0 | 3.00 | 5.0 | .058 | 0.2279 | 0.2514 |

TABLE A-26 (cont'd)

MEASURED AND FITTED YAW MOMENT
BETA=15. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|---------|
| 127 | 3.01 | .075 | 0.0 | 3.00 | -10.0 | .067 | 0.2619 | 0.2613 |
| 128 | 3.03 | .076 | 0.0 | 3.00 | -15.0 | .066 | 0.2723 | 0.2658 |
| 129 | 3.01 | .075 | 0.0 | 3.00 | -20.0 | .055 | 0.2668 | 0.2533 |
| 130 | 2.99 | .075 | 0.0 | 2.00 | 0.0 | .066 | 0.2313 | 0.2439 |
| 131 | 3.02 | .075 | 0.0 | 4.00 | 0.0 | .063 | 0.2263 | 0.2530 |
| 132 | 3.06 | .075 | 0.0 | 5.00 | 0.0 | .054 | 0.2172 | 0.2555 |
| 133 | 3.06 | .075 | 0.0 | 6.00 | 0.0 | .057 | 0.2150 | 0.2526 |
| 136 | 4.04 | .101 | -5.0 | 3.00 | 0.0 | .095 | 0.3917 | 0.3839 |
| 137 | 6.09 | .152 | -15.0 | 5.00 | -10.0 | .003 | 0.7154 | 0.7816* |
| 138 | 6.05 | .151 | -20.0 | 6.00 | -5.0 | -.018 | 0.7734 | 0.7686 |
| 139 | 4.02 | .100 | -20.0 | 6.00 | -20.0 | -.022 | 0.3028 | 0.2851 |
| 140 | 5.00 | .125 | 5.0 | 3.00 | -20.0 | .022 | 0.5240 | 0.5272 |
| 141 | 4.99 | .125 | 5.0 | 3.00 | -20.0 | .021 | 0.5281 | 0.5230 |
| 142 | 2.91 | .073 | -5.0 | 3.00 | -5.0 | .056 | 0.2295 | 0.2351 |
| 143 | 1.65 | .041 | -10.0 | 6.00 | 0.0 | .153 | 0.1127 | 0.1285 |
| 144 | 3.79 | .095 | -10.0 | 3.00 | -20.0 | .093 | 0.5155 | 0.4117* |
| 145 | 4.76 | .119 | 5.0 | 2.00 | -5.0 | .045 | 0.5326 | 0.5177 |
| 147 | 3.87 | .097 | -5.0 | 6.00 | -20.0 | .026 | 0.3344 | 0.3299 |
| 148 | 5.86 | .146 | -10.0 | 3.00 | 5.0 | .097 | 0.7170 | 0.6751 |
| 150 | 3.94 | .098 | -15.0 | 4.00 | -5.0 | .093 | 0.4509 | 0.4273 |
| 151 | 2.95 | .074 | -10.0 | 2.00 | -10.0 | .105 | 0.2137 | 0.2364 |
| 154 | 4.78 | .120 | -5.0 | 3.00 | -5.0 | .032 | 0.5186 | 0.5033 |
| 156 | 3.00 | .075 | 0.0 | 2.00 | -10.0 | .053 | 0.2463 | 0.2498 |
| 157 | 3.02 | .076 | -5.0 | 6.00 | -15.0 | .050 | 0.2555 | 0.2803 |
| 158 | 3.99 | .100 | -5.0 | 6.00 | -15.0 | .040 | 0.3826 | 0.3935 |
| 160 | 2.40 | .060 | -10.0 | 2.00 | -20.0 | .044 | 0.1840 | 0.1791 |
| 161 | 6.18 | .154 | 5.0 | 3.00 | -20.0 | .044 | 0.9292 | 0.9240 |
| 162 | 6.21 | .155 | 5.0 | 3.00 | -20.0 | .040 | 0.9187 | 0.9148 |
| 163 | 6.18 | .154 | -10.0 | 2.00 | -15.0 | .004 | 0.7651 | 0.7728 |
| 164 | 4.38 | .110 | -10.0 | 5.00 | -20.0 | .041 | 0.5120 | 0.4637 |
| 165 | 3.23 | .081 | -10.0 | 2.00 | -20.0 | .082 | 0.2975 | 0.2932 |
| 166 | 2.15 | .054 | -10.0 | 4.00 | -15.0 | .037 | 0.1517 | 0.1628 |
| 167 | 2.64 | .066 | -5.0 | 3.00 | -5.0 | .065 | 0.1972 | 0.2078 |
| 168 | 5.65 | .141 | -5.0 | 5.00 | 5.0 | .073 | 0.6551 | 0.6906 |
| 169 | 4.72 | .118 | -5.0 | 2.00 | -10.0 | .052 | 0.5310 | 0.5161 |
| 170 | 5.81 | .145 | 5.0 | 3.00 | -5.0 | .040 | 0.7741 | 0.7513 |
| 171 | 4.74 | .118 | 0.0 | 2.00 | 5.0 | .064 | 0.4870 | 0.4735 |
| 173 | 5.91 | .148 | -5.0 | 3.00 | 0.0 | .077 | 0.7726 | 0.7670 |
| 174 | 4.83 | .121 | -20.0 | 5.00 | 5.0 | .045 | 0.4661 | 0.4945 |
| 175 | 6.04 | .151 | -20.0 | 5.00 | -5.0 | .020 | 0.9062 | 0.8659 |
| 177 | 3.75 | .094 | -10.0 | 5.00 | 5.0 | .013 | -0.3904 | 0.3311* |
| 178 | 2.96 | .074 | -5.0 | 3.00 | -5.0 | .048 | 0.2312 | 0.2372 |
| 180 | 3.18 | .079 | -15.0 | 4.00 | -10.0 | .111 | 0.3520 | 0.3333 |
| 181 | 5.11 | .128 | -5.0 | 2.00 | -15.0 | .046 | 0.6763 | 0.6019* |
| 182 | 2.15 | .054 | -15.0 | 3.00 | 5.0 | .002 | 0.1376 | 0.1300 |
| 183 | 4.91 | .123 | -20.0 | 5.00 | -15.0 | .012 | 0.6682 | 0.6021* |
| 184 | 5.08 | .127 | 5.0 | 4.00 | 0.0 | .071 | 0.5780 | 0.5867 |
| 527 | 1.82 | .068 | 0.0 | 3.00 | 0.0 | .112 | 0.1525 | 0.1750 |
| 528 | 2.87 | .108 | 0.0 | 3.00 | 0.0 | .076 | 0.3045 | 0.3045 |
| 529 | 3.87 | .145 | 0.0 | 3.00 | 0.0 | .052 | 0.5049 | 0.4946 |

R-1851

TABLE A-26 (cont'd)

MEASURED AND FITTED YAW MOMENT
BETA=15. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|---------|
| 530 | 4.98 | .187 | 0.0 | 3.00 | 0.0 | .043 | 0.8102 | 0.7910 |
| 531 | 5.97 | .224 | 0.0 | 3.00 | 0.0 | .037 | 1.1433 | 1.1416 |
| 532 | 2.96 | .111 | 0.0 | 3.00 | 0.0 | .052 | 0.3122 | 0.3160 |
| 533 | 2.97 | .111 | 0.0 | 3.00 | 0.0 | .104 | 0.3190 | 0.3244 |
| 534 | 2.96 | .111 | 0.0 | 3.00 | 0.0 | .154 | 0.3152 | 0.3299 |
| 536 | 3.98 | .149 | 0.0 | 3.00 | 0.0 | .146 | 0.5475 | 0.5492 |
| 537 | 3.97 | .149 | 0.0 | 3.00 | 0.0 | .195 | 0.5882 | 0.5632 |
| 538 | 2.96 | .111 | 5.0 | 3.00 | 0.0 | .075 | 0.3143 | 0.3278 |
| 539 | 2.96 | .111 | -5.0 | 3.00 | 0.0 | .074 | 0.3155 | 0.3091 |
| 540 | 3.00 | .112 | -10.0 | 3.00 | 0.0 | .063 | 0.3212 | 0.3104 |
| 541 | 2.97 | .111 | -15.0 | 3.00 | 0.0 | .044 | 0.3188 | 0.3068 |
| 542 | 2.98 | .112 | -20.0 | 3.00 | 0.0 | .019 | 0.3161 | 0.3113 |
| 543 | 2.98 | .112 | 0.0 | 3.00 | 5.0 | .074 | 0.2972 | 0.3139 |
| 544 | 2.98 | .112 | 0.0 | 3.00 | -5.0 | .078 | 0.3298 | 0.3310 |
| 545 | 2.99 | .112 | 0.0 | 3.00 | -10.0 | .079 | 0.3501 | 0.3396 |
| 546 | 2.97 | .112 | 0.0 | 3.00 | -20.0 | .057 | 0.3491 | 0.3269 |
| 547 | 2.99 | .112 | 0.0 | 3.00 | -15.0 | .084 | 0.3621 | 0.3488 |
| 548 | 2.97 | .111 | 0.0 | 2.00 | 0.0 | .080 | 0.3159 | 0.3141 |
| 549 | 2.98 | .112 | 0.0 | 4.00 | 0.0 | .060 | 0.3141 | 0.3234 |
| 550 | 2.97 | .112 | 0.0 | 5.00 | 0.0 | .059 | 0.3152 | 0.3201 |
| 551 | 3.01 | .113 | 0.0 | 6.00 | 0.0 | .055 | 0.3141 | 0.3208 |
| 552 | 1.90 | .071 | -15.0 | 4.00 | 5.0 | .136 | 0.1385 | 0.1194 |
| 553 | 4.03 | .151 | -5.0 | 3.00 | -5.0 | .064 | -0.1920 | 0.5482* |
| 555 | 5.98 | .224 | 5.0 | 4.00 | -20.0 | .064 | 1.3253 | 1.3493* |
| 556 | 4.99 | .187 | -10.0 | 4.00 | 5.0 | .136 | 0.8539 | 0.7774* |
| 558 | 3.99 | .150 | -15.0 | 6.00 | 0.0 | .003 | 0.5038 | 0.5042 |
| 559 | 3.00 | .113 | -5.0 | 3.00 | -5.0 | .071 | 0.3332 | 0.3267 |
| 560 | 6.00 | .225 | 0.0 | 2.00 | -5.0 | .051 | 1.1802 | 1.1811 |
| 561 | 5.00 | .188 | -15.0 | 5.00 | 0.0 | .065 | 0.9312 | 0.8619* |
| 564 | 6.01 | .225 | -20.0 | 3.00 | 5.0 | .054 | 1.0764 | 1.0778 |
| 566 | 6.01 | .225 | 0.0 | 3.00 | 5.0 | .086 | 1.1178 | 1.1385 |
| 567 | 6.00 | .225 | -20.0 | 5.00 | -20.0 | .008 | 1.1497 | 1.1565 |
| 568 | 3.98 | .149 | -10.0 | 6.00 | 0.0 | .014 | 0.4889 | 0.5091 |
| 569 | 3.97 | .149 | 5.0 | 4.00 | -10.0 | .169 | 0.6767 | 0.6625 |
| 570 | 2.99 | .112 | -5.0 | 3.00 | 0.0 | .146 | 0.3313 | 0.3110 |
| 571 | 4.97 | .186 | -5.0 | 6.00 | -20.0 | .049 | 0.8642 | 0.8779 |
| 572 | 3.00 | .112 | -5.0 | 3.00 | -5.0 | .071 | 0.3287 | 0.3259 |
| 573 | 5.95 | .223 | -5.0 | 2.00 | -20.0 | .082 | 1.2635 | 1.3535* |
| 577 | 4.97 | .186 | 5.0 | 3.00 | -20.0 | .106 | 1.1107 | 1.0030* |
| 579 | 1.99 | .075 | -15.0 | 6.00 | -5.0 | .186 | 0.2024 | 0.2098 |
| 580 | 2.96 | .111 | 0.0 | 6.00 | -20.0 | .191 | 0.5193 | 0.4975 |
| 581 | 6.00 | .225 | -20.0 | 2.00 | 0.0 | -.006 | 1.1237 | 1.1116 |
| 583 | 5.95 | .223 | -15.0 | 2.00 | -5.0 | .050 | 1.1710 | 1.2009 |
| 585 | 6.01 | .225 | -10.0 | 3.00 | -5.0 | .058 | 1.2145 | 1.2342 |
| 586 | 2.96 | .111 | -5.0 | 3.00 | -5.0 | .072 | 0.3208 | 0.3191 |
| 588 | 3.91 | .147 | -5.0 | 3.00 | -5.0 | .125 | 0.5433 | 0.5427 |
| 593 | 4.03 | .151 | -10.0 | 6.00 | -5.0 | .021 | 0.4993 | 0.5310 |
| 594 | 2.97 | .111 | -20.0 | 4.00 | 0.0 | .138 | 0.3088 | 0.3128 |
| 595 | 3.01 | .113 | 0.0 | 4.00 | -15.0 | .104 | 0.3828 | 0.3799 |
| 596 | 2.03 | .076 | -5.0 | 5.00 | 5.0 | .276 | 0.1391 | 0.1547 |

TABLE A-26 (cont'd)

MEASURED AND FITTED YAW MOMENT
BETA=15. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|---------|
| 598 | 3.01 | .113 | -10.0 | 5.00 | -10.0 | .128 | 0.4395 | 0.4042 |
| 599 | 3.02 | .113 | -5.0 | 3.00 | -5.0 | .073 | 0.3360 | 0.3298 |
| 600 | 2.01 | .075 | -10.0 | 6.00 | -10.0 | .254 | 0.1668 | 0.1904 |
| 601 | 5.02 | .188 | -20.0 | 5.00 | -10.0 | .026 | 0.9658 | 0.9393 |
| 602 | 5.05 | .189 | -20.0 | 2.00 | -10.0 | -.030 | 0.7807 | 0.7996 |
| 603 | 3.05 | .114 | -15.0 | 5.00 | -15.0 | .036 | 0.3672 | 0.3757 |
| 604 | 5.99 | .225 | -10.0 | 4.00 | -15.0 | .052 | 1.3143 | 1.3046 |
| 618 | 1.92 | .144 | 0.0 | 3.00 | 0.0 | .093 | 0.2680 | 0.2722 |
| 619 | 2.99 | .224 | 0.0 | 3.00 | 0.0 | .070 | 0.5996 | 0.5981 |
| 620 | 2.50 | .188 | 0.0 | 3.00 | 0.0 | .078 | 0.4371 | 0.4253 |
| 621 | 3.07 | .230 | 0.0 | 3.00 | 0.0 | .050 | 0.6189 | 0.6236 |
| 622 | 3.06 | .230 | 0.0 | 3.00 | 0.0 | .086 | 0.6269 | 0.6314 |
| 623 | 3.05 | .228 | 0.0 | 3.00 | 0.0 | .136 | 0.6179 | 0.6397 |
| 625 | 3.01 | .226 | 5.0 | 3.00 | 0.0 | .061 | 0.6056 | 0.6051 |
| 626 | 2.99 | .224 | -5.0 | 3.00 | 0.0 | .066 | 0.5961 | 0.5954 |
| 627 | 3.01 | .226 | -10.0 | 3.00 | 0.0 | .049 | 0.5941 | 0.6008 |
| 628 | 3.00 | .225 | -15.0 | 3.00 | 0.0 | .028 | 0.5918 | 0.6003 |
| 629 | 3.01 | .226 | -20.0 | 3.00 | 0.0 | .003 | 0.5940 | 0.6055 |
| 630 | 2.98 | .223 | 0.0 | 3.00 | 5.0 | .063 | 0.5724 | 0.5801 |
| 631 | 2.97 | .223 | 0.0 | 3.00 | -5.0 | .070 | 0.6086 | 0.6021 |
| 632 | 2.96 | .222 | 0.0 | 3.00 | -10.0 | .071 | 0.6159 | 0.6069 |
| 633 | 2.97 | .223 | 0.0 | 3.00 | -15.0 | .072 | 0.6266 | 0.6174 |
| 634 | 2.97 | .223 | 0.0 | 3.00 | -20.0 | .053 | 0.6177 | 0.6050 |
| 635 | 2.97 | .223 | 0.0 | 2.00 | 0.0 | .062 | 0.5856 | 0.5759 |
| 636 | 2.98 | .223 | 0.0 | 4.00 | 0.0 | .060 | 0.5933 | 0.5947 |
| 637 | 2.98 | .223 | 0.0 | 5.00 | 0.0 | .053 | 0.5922 | 0.5884 |
| 638 | 2.98 | .223 | 0.0 | 6.00 | 0.0 | .048 | 0.5897 | 0.5749 |
| 639 | 2.47 | .185 | 0.0 | 6.00 | -20.0 | .058 | 0.4518 | 0.4542 |
| 640 | 2.48 | .186 | 5.0 | 6.00 | -5.0 | .232 | 0.5064 | 0.5236 |
| 641 | 2.96 | .222 | -5.0 | 3.00 | -5.0 | .108 | 0.6021 | 0.6083 |
| 642 | 2.48 | .186 | -5.0 | 6.00 | 5.0 | .275 | 0.4098 | 0.4315 |
| 643 | 1.97 | .148 | 0.0 | 4.00 | -10.0 | .206 | 0.3141 | 0.3118 |
| 644 | 2.50 | .187 | -20.0 | 3.00 | -10.0 | -.010 | 0.4202 | 0.4362 |
| 645 | 1.99 | .149 | -20.0 | 3.00 | -10.0 | .069 | 0.2965 | 0.3242 |
| 646 | 2.96 | .222 | -5.0 | 3.00 | -5.0 | .061 | 0.5925 | 0.5938 |
| 660 | 2.99 | .224 | -15.0 | 3.00 | 5.0 | .071 | 0.5759 | 0.5648 |
| 661 | 1.99 | .150 | -5.0 | 3.00 | -15.0 | .106 | 0.2930 | 0.2938 |
| 662 | 2.99 | .224 | -20.0 | 6.00 | -10.0 | .108 | 0.8203 | 0.8079 |
| 665 | 2.51 | .188 | 0.0 | 3.00 | -5.0 | .092 | 0.4344 | 0.4405 |
| 667 | 3.00 | .225 | 5.0 | 6.00 | -10.0 | .181 | 0.7530 | 0.7469 |
| 668 | 2.00 | .150 | -5.0 | 3.00 | -10.0 | .066 | 0.3025 | 0.2892 |
| 670 | 2.99 | .224 | -5.0 | 5.00 | -20.0 | .158 | 0.7493 | 0.7617 |
| 671 | 2.51 | .188 | 5.0 | 5.00 | 0.0 | .043 | 0.4350 | 0.4215 |
| 672 | 2.99 | .224 | -5.0 | 3.00 | -5.0 | .056 | 0.6041 | 0.6044 |
| 673 | 1.99 | .149 | -5.0 | 6.00 | -5.0 | .255 | 0.3121 | 0.3138* |
| 674 | 2.50 | .188 | 5.0 | 5.00 | 0.0 | .091 | 0.1140 | 0.4301 |
| 675 | 2.50 | .188 | -5.0 | 6.00 | 0.0 | .037 | 0.4204 | 0.4008 |
| 676 | 1.99 | .149 | -20.0 | 3.00 | -20.0 | -.023 | 0.2782 | 0.2724 |
| 678 | 1.99 | .149 | -10.0 | 3.00 | 5.0 | .079 | 0.2756 | 0.2534 |
| 681 | 2.51 | .188 | -10.0 | 6.00 | -15.0 | .034 | 0.4456 | 0.4416 |

TABLE A-26 (cont'd)

MEASURED AND FITTED YAW MOMENT
BETA=15. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|------|----------|---------|
| 682 | 2.50 | .187 | 5.0 | 6.00 | -10.0 | .256 | 0.5902 | 0.5708 |
| 683 | 2.97 | .223 | -5.0 | 3.00 | -5.0 | .075 | 0.6070 | 0.6024 |
| 685 | 2.99 | .224 | -15.0 | 6.00 | 0.0 | .229 | 0.6766 | 0.6576 |
| 686 | 2.50 | .188 | -15.0 | 8.00 | 0.0 | .279 | 0.4896 | 0.4826 |
| 688 | 2.99 | .224 | 0.0 | 5.00 | -15.0 | .185 | 0.7493 | 0.7467 |
| 689 | 2.00 | .150 | 0.0 | 5.00 | 5.0 | .077 | 0.2802 | 0.2755 |
| 690 | 3.00 | .225 | 5.0 | 6.00 | -20.0 | .124 | 0.7742 | 0.7671 |
| 691 | 2.02 | .152 | -5.0 | 8.00 | -15.0 | .342 | 0.4217 | 0.4077 |
| 693 | 2.46 | .185 | -10.0 | 2.00 | 5.0 | .086 | 0.4054 | 0.3644 |
| 694 | 2.96 | .222 | -20.0 | 4.00 | -10.0 | .124 | 0.7026 | 0.7329 |
| 695 | 2.96 | .222 | -5.0 | 3.00 | -5.0 | .073 | 0.5943 | 0.5995 |
| 697 | 2.47 | .185 | -10.0 | 6.00 | 0.0 | .224 | 0.4374 | 0.4400 |
| 698 | 2.99 | .224 | -10.0 | 6.00 | -5.0 | .134 | 0.7094 | 0.6983 |
| 699 | 3.00 | .225 | 5.0 | 8.00 | -10.0 | .222 | 0.7879 | 0.8111 |
| 700 | 3.00 | .225 | -20.0 | 4.00 | -5.0 | .177 | 0.6146 | 0.6700* |
| 701 | 2.48 | .186 | -20.0 | 5.00 | -20.0 | .087 | 0.6029 | 0.6026 |

MEAN ERROR= 0.0009
STANDARD DEVIATION= 0.0216

TABLE A-27

MEASURED AND FITTED YAW MOMENT
BETA=20. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|------|-------|------|-------|----------|---------|
| 316 | 4.00 | .000 | 4.8 | 3.70 | 5.0 | .086 | 0.0834 | 0.0943 |
| 317 | 4.00 | .000 | 4.7 | 3.70 | 5.0 | .088 | 0.0820 | 0.0935 |
| 318 | 4.00 | .000 | 4.7 | 3.60 | 0.0 | .131 | 0.1208 | 0.1332 |
| 319 | 4.00 | .000 | -0.3 | 3.60 | 0.0 | .095 | 0.1148 | 0.1212 |
| 320 | 2.00 | .000 | -0.3 | 3.60 | 0.0 | .152 | 0.1062 | 0.1211 |
| 321 | 2.00 | .000 | -0.3 | 3.70 | 0.0 | .151 | 0.1117 | 0.1211 |
| 322 | 3.00 | .000 | -0.3 | 3.60 | 0.0 | .113 | 0.1138 | 0.1212 |
| 323 | 5.00 | .000 | -0.3 | 3.60 | 0.0 | .076 | 0.1045 | 0.1213 |
| 324 | 6.00 | .000 | -0.3 | 3.70 | 0.0 | .067 | 0.0995 | 0.1212 |
| 325 | 4.00 | .000 | -0.3 | 3.60 | 0.0 | .075 | 0.1180 | 0.1214 |
| 326 | 4.00 | .000 | 4.7 | 3.60 | 0.0 | .116 | 0.1148 | 0.1316 |
| 328 | 4.00 | .000 | 9.7 | 3.70 | 0.0 | .070 | 0.1312 | 0.1313 |
| 329 | 4.00 | .000 | 14.7 | 3.70 | 0.0 | .047 | 0.1300 | 0.1298 |
| 330 | 4.00 | .000 | 19.8 | 3.60 | 0.0 | .025 | 0.1195 | 0.1269 |
| 331 | 4.00 | .000 | 27.2 | 3.60 | 0.0 | -.006 | 0.1177 | 0.1156 |
| 332 | 3.00 | .000 | 19.7 | 3.60 | 0.0 | .191 | 0.1767 | 0.1845 |
| 333 | 4.00 | .000 | -0.3 | 3.60 | 0.0 | .153 | 0.1277 | 0.1208 |
| 335 | 5.00 | .000 | -0.3 | 3.60 | 0.0 | .183 | 0.1365 | 0.1203 |
| 336 | 4.00 | .000 | -0.3 | 3.60 | 0.0 | .200 | 0.1436 | 0.1205 |
| 337 | 4.00 | .000 | 27.3 | 4.70 | 0.0 | .179 | 0.2192 | 0.2305 |
| 338 | 4.00 | .000 | -0.3 | 4.60 | 0.0 | .076 | 0.1224 | 0.1216 |
| 339 | 4.00 | .000 | -0.3 | 2.60 | 0.0 | .105 | 0.1277 | 0.1208 |
| 340 | 3.00 | .000 | 4.7 | 2.60 | 0.0 | .098 | 0.1319 | 0.1334* |
| 342 | 6.00 | .000 | 19.8 | 3.70 | 0.0 | .141 | 0.1471 | 0.2249* |
| 344 | 3.00 | .000 | 27.3 | 5.70 | 0.0 | .281 | 0.2740 | 0.2572 |
| 345 | 3.00 | .000 | 27.3 | 5.60 | 0.0 | .173 | 0.1875 | 0.2111 |
| 347 | 6.00 | .000 | -0.3 | 5.60 | 0.0 | .059 | 0.1188 | 0.1218 |
| 348 | 4.00 | .000 | -0.3 | 5.60 | 0.0 | .074 | 0.1198 | 0.1216 |
| 349 | 5.00 | .000 | 4.8 | 5.60 | 0.0 | .053 | 0.1352 | 0.1178 |
| 350 | 4.00 | .000 | -0.3 | 6.70 | 0.0 | .068 | 0.1302 | 0.1217 |
| 351 | 6.00 | .000 | -5.3 | 6.70 | 0.0 | .051 | 0.1229 | 0.1287* |
| 353 | 2.00 | .000 | 27.2 | 6.70 | 0.0 | .068 | 0.1064 | 0.1782* |
| 354 | 3.00 | .000 | -5.3 | 6.60 | 0.0 | .110 | 0.1023 | 0.1126* |
| 355 | 4.00 | .000 | 9.8 | 6.70 | 0.0 | .186 | 0.0655 | 0.1654* |
| 356 | 3.00 | .000 | -0.3 | 6.70 | -5.0 | .236 | 0.1768 | 0.1710 |
| 357 | 4.00 | .000 | 9.7 | 6.70 | -5.0 | .069 | 0.1680 | 0.1543 |
| 358 | 4.00 | .000 | 9.7 | 6.70 | -5.0 | .060 | 0.1541 | 0.1417 |
| 359 | 4.00 | .000 | 9.7 | 6.70 | -5.0 | .061 | 0.1702 | 0.1425 |
| 362 | 4.00 | .000 | 9.7 | 5.60 | -5.0 | .065 | 0.1718 | 0.1499 |
| 364 | 3.00 | .000 | 14.7 | 5.70 | -5.0 | .266 | 0.2198 | 0.2143 |
| 365 | 5.00 | .000 | 19.8 | 5.60 | -5.0 | .170 | 0.3718 | 0.3512 |
| 366 | 6.00 | .000 | 19.8 | 4.70 | -5.0 | .132 | 0.3780 | 0.3542 |
| 368 | 4.00 | .000 | 9.7 | 2.60 | -5.0 | .109 | 0.1827 | 0.1864 |
| 369 | 2.00 | .000 | 9.7 | 2.60 | -5.0 | .172 | 0.1492 | 0.1483 |
| 370 | 4.00 | .000 | 14.7 | 2.60 | -5.0 | .045 | 0.1504 | 0.1666 |
| 371 | 5.00 | .000 | 4.7 | 2.60 | -5.0 | .145 | 0.1721 | 0.2032 |
| 374 | 5.00 | .000 | -0.3 | 3.60 | -5.0 | .069 | 0.1515 | 0.1534 |
| 375 | 5.00 | .000 | -0.3 | 3.60 | -5.0 | .067 | 0.1577 | 0.1513 |
| 376 | 4.00 | .000 | -0.3 | 3.70 | -5.0 | .087 | 0.1643 | 0.1543 |
| 377 | 4.00 | .000 | 4.7 | 3.60 | 5.0 | .081 | 0.1089 | 0.0970 |

TABLE A-27 (cont'd)
 MEASURED AND FITTED YAW MOMENT
 BETA=20. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|------|-------|------|-------|----------|----------|
| 378 | 4.00 | .000 | 4.8 | 3.60 | 5.0 | .064 | 0.1136 | 0.1042 |
| 379 | 4.00 | .000 | -0.3 | 3.60 | 5.0 | .084 | 0.0997 | 0.0903 |
| 380 | 3.00 | .000 | -5.3 | 3.60 | 5.0 | .148 | 0.1255 | 0.0849* |
| 381 | 3.00 | .000 | -0.3 | 2.60 | 5.0 | .117 | 0.1198 | 0.1068 |
| 382 | 5.00 | .000 | 4.7 | 2.60 | 5.0 | .076 | 0.1079 | 0.1017 |
| 383 | 3.00 | .000 | 19.7 | 2.60 | 5.0 | .028 | 0.1233 | 0.1434 |
| 385 | 5.00 | .000 | 14.8 | 2.60 | 5.0 | .153 | 0.1485 | 0.1232* |
| 387 | 6.00 | .000 | 4.8 | 2.60 | 5.0 | .151 | 0.1019 | 0.0562* |
| 388 | 3.00 | .000 | -5.2 | 6.70 | 5.0 | .310 | 0.1417 | 0.0738* |
| 389 | 5.00 | .000 | 9.7 | 6.60 | 5.0 | .040 | 0.1270 | 0.1142* |
| 395 | 4.00 | .000 | 27.4 | 5.60 | 5.0 | .176 | 0.0479 | 0.1287* |
| 396 | 4.00 | .000 | 4.8 | 3.60 | 5.0 | .081 | 0.1090 | 0.0971 |
| 397 | 4.00 | .000 | -0.2 | 3.60 | 10.0 | .084 | 0.0761 | 0.0580 |
| 398 | 3.00 | .000 | -5.3 | 3.60 | 10.0 | .146 | 0.0991 | 0.0599* |
| 399 | 4.00 | .000 | 9.8 | 3.60 | 10.0 | .087 | 0.0780 | 0.0590 |
| 400 | 5.00 | .000 | 19.7 | 3.60 | 10.0 | .019 | 0.1319 | 0.1048* |
| 401 | 4.00 | .000 | 14.8 | 3.60 | 10.0 | .163 | 0.0279 | 0.0531* |
| 402 | 3.00 | .000 | 14.7 | 6.60 | 10.0 | .223 | -0.0077 | 0.0661* |
| 403 | 3.00 | .000 | 4.7 | 6.60 | 10.0 | .152 | 0.0022 | 0.0292* |
| 404 | 5.00 | .000 | -0.3 | 6.60 | 10.0 | .091 | -0.0139 | 0.0031* |
| 405 | 2.00 | .000 | -5.3 | 6.60 | 10.0 | .120 | 0.0749 | 0.0599 |
| 406 | 4.00 | .000 | 27.3 | 6.60 | 10.0 | -.027 | 0.1247 | 0.1333 |
| 407 | 3.00 | .000 | 27.2 | 6.60 | 10.0 | -.025 | 0.1171 | 0.1329 |
| 408 | 2.00 | .000 | 19.7 | 4.60 | 10.0 | .038 | 0.1057 | 0.1097 |
| 409 | 4.00 | .000 | 9.7 | 2.60 | 10.0 | .063 | 0.0912 | 0.0999 |
| 410 | 3.00 | .000 | 27.3 | 5.60 | 10.0 | -.016 | 0.1106 | 0.1073* |
| 411 | 3.00 | .000 | -5.2 | 5.60 | 10.0 | .211 | 0.0543 | 0.0234* |
| 412 | 3.00 | .000 | -5.3 | 5.60 | 10.0 | .212 | 0.0592 | 0.0232* |
| 413 | 5.00 | .000 | -5.2 | 5.50 | 15.0 | .089 | -0.0656 | -0.0720* |
| 414 | 3.00 | .000 | -0.3 | 5.60 | 15.0 | .201 | 0.0082 | -0.0046* |
| 415 | 5.00 | .000 | 19.7 | 5.50 | 15.0 | .028 | 0.1038 | 0.0612 |
| 417 | 5.00 | .000 | -0.3 | 5.50 | 15.0 | .057 | 0.0561 | 0.0456* |
| 419 | 6.00 | .000 | 27.2 | 3.60 | 15.0 | -.048 | 0.1764 | 0.3141 |
| 420 | 4.00 | .000 | 14.8 | 2.60 | 15.0 | .056 | 0.0782 | 0.0723 |
| 421 | 3.00 | .000 | 4.8 | 2.60 | 15.0 | .109 | 0.0784 | 0.0872 |
| 422 | 3.00 | .000 | 9.8 | 2.60 | 15.0 | .152 | 0.0813 | 0.1101* |
| 423 | 4.00 | .000 | 14.8 | 2.60 | 15.0 | .130 | 0.0407 | 0.0379* |
| 424 | 6.00 | .000 | 4.8 | 2.60 | 15.0 | .125 | -0.1381 | -0.1306* |
| 427 | 5.00 | .000 | 14.8 | 4.50 | 15.0 | .077 | -0.0990 | -0.0486* |
| 428 | 4.00 | .000 | 4.8 | 4.60 | 15.0 | .215 | 0.0570 | -0.0320* |
| 429 | 4.00 | .000 | -0.2 | 4.70 | 15.0 | .290 | 0.2404 | 0.0698* |
| 430 | 6.00 | .000 | -5.2 | 4.60 | 15.0 | .080 | -0.1004 | -0.0964* |
| 431 | 3.00 | .000 | 14.8 | 4.60 | 15.0 | .135 | -0.0152 | 0.0194* |
| 432 | 5.00 | .000 | 14.8 | 4.60 | 15.0 | .033 | 0.1247 | 0.0688* |
| 433 | 3.00 | .000 | 14.7 | 4.60 | 15.0 | .056 | 0.1044 | 0.0592* |
| 434 | 4.00 | .000 | -0.3 | 4.60 | 15.0 | .063 | 0.0871 | 0.0482* |
| 435 | 2.00 | .000 | 4.7 | 6.70 | 15.0 | .123 | 0.0717 | 0.0550 |
| 436 | 6.00 | .000 | 9.7 | 6.70 | 15.0 | .041 | 0.1103 | 0.1238 |
| 437 | 3.00 | .000 | 27.2 | 6.60 | 15.0 | .001 | 0.1062 | 0.1075 |
| 438 | 4.00 | .000 | -5.2 | 6.60 | 15.0 | .185 | -0.1571 | -0.1755 |

TABLE A-27 (cont'd)

MEASURED AND FITTED YAW MOMENT
BETA=20. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|-----------|
| 439 | 4.00 | .000 | -0.3 | 6.60 | 20.0 | .051 | 0.0908 | 0.0712 * |
| 440 | 3.00 | .000 | 4.7 | 5.60 | 20.0 | .075 | 0.0630 | 0.0246 * |
| 443 | 6.00 | .000 | 27.2 | 5.50 | 20.0 | -.013 | 0.0773 | 0.1792 * |
| 445 | 2.00 | .000 | 27.3 | 4.60 | 20.0 | .138 | 0.0505 | 0.0440 |
| 446 | 4.00 | .000 | 27.2 | 4.60 | 20.0 | -.025 | 0.1414 | 0.1360 |
| 447 | 2.00 | .000 | 19.8 | 4.60 | 20.0 | .112 | 0.0447 | 0.0498 * |
| 448 | 3.00 | .000 | 4.7 | 4.60 | 20.0 | .115 | -0.0283 | -0.0057 * |
| 449 | 3.00 | .000 | 9.7 | 4.60 | 20.0 | .065 | 0.0796 | 0.0364 * |
| 450 | 4.00 | .000 | -0.3 | 3.60 | 20.0 | .085 | -0.0088 | -0.0222 * |
| 451 | 3.00 | .000 | 19.7 | 3.60 | 20.0 | .057 | 0.0455 | 0.0301 * |
| 453 | 6.00 | .000 | 9.8 | 3.60 | 20.0 | .119 | -0.4445 | -0.3001 * |
| 454 | 4.00 | .000 | 9.8 | 3.60 | 20.0 | .190 | 0.0500 | -0.0368 * |
| 455 | 6.00 | .000 | 19.7 | 2.60 | 20.0 | .032 | 0.0495 | -0.0006 * |
| 456 | 4.00 | .000 | 14.8 | 2.60 | 20.0 | .072 | -0.0169 | 0.0135 * |
| 457 | 4.00 | .000 | 19.8 | 1.60 | 20.0 | .014 | 0.1482 | 0.1356 |
| 459 | 4.00 | .000 | 4.8 | 3.60 | 5.0 | .077 | 0.1107 | 0.0985 * |
| 211 | 2.07 | .052 | 0.0 | 3.00 | 0.0 | .106 | 0.1258 | 0.1653 * |
| 212 | 2.96 | .074 | 0.0 | 3.00 | 0.0 | .079 | 0.2182 | 0.2368 |
| 213 | 3.92 | .098 | 0.0 | 3.00 | 0.0 | .070 | 0.3499 | 0.3561 |
| 214 | 5.00 | .125 | 0.0 | 3.00 | 0.0 | .056 | 0.5290 | 0.5363 |
| 215 | 5.96 | .149 | 0.0 | 3.00 | 0.0 | .047 | 0.7510 | 0.7454 |
| 216 | 2.94 | .074 | 0.0 | 3.00 | 0.0 | .069 | 0.2161 | 0.2328 |
| 217 | 3.01 | .075 | 0.0 | 3.00 | 0.0 | .106 | 0.2222 | 0.2479 |
| 218 | 3.02 | .075 | 0.0 | 3.00 | 0.0 | .146 | 0.2243 | 0.2532 |
| 219 | 3.97 | .099 | 0.0 | 3.00 | 0.0 | .122 | 0.3587 | 0.3771 |
| 220 | 4.70 | .100 | 0.0 | 3.00 | 0.0 | .147 | 0.3717 | 0.3862 |
| 221 | 5.00 | .125 | 0.0 | 3.00 | 0.0 | .120 | 0.5479 | 0.5635 |
| 222 | 4.95 | .124 | 0.0 | 3.00 | 0.0 | .146 | 0.5519 | 0.5596 |
| 223 | 5.96 | .149 | 0.0 | 3.00 | 0.0 | .116 | 0.7829 | 0.7834 |
| 224 | 3.00 | .075 | 5.0 | 3.00 | 0.0 | .074 | 0.2269 | 0.2481 |
| 225 | 2.97 | .074 | -5.0 | 3.00 | 0.0 | .074 | 0.2149 | 0.2303 |
| 226 | 2.99 | .075 | -10.0 | 3.00 | 0.0 | .069 | 0.2132 | 0.2261 |
| 227 | 2.99 | .075 | -15.0 | 3.00 | 0.0 | .060 | 0.2127 | 0.2206 |
| 228 | 2.97 | .074 | -20.0 | 3.00 | 0.0 | .048 | 0.2158 | 0.2142 |
| 229 | 2.95 | .074 | -27.5 | 3.00 | 0.0 | .029 | 0.2002 | 0.2062 |
| 230 | 2.98 | .074 | 0.0 | 3.00 | 5.0 | .079 | 0.2008 | 0.2251 |
| 231 | 2.98 | .074 | 0.0 | 3.00 | -5.0 | .078 | 0.2421 | 0.2530 |
| 232 | 2.94 | .073 | 0.0 | 3.00 | -10.0 | .079 | 0.2554 | 0.2630 |
| 233 | 3.02 | .075 | 0.0 | 3.00 | -15.0 | .078 | 0.2926 | 0.2903 |
| 234 | 3.01 | .075 | 0.0 | 3.00 | -20.0 | .088 | 0.3324 | 0.3168 |
| 235 | 2.98 | .075 | 0.0 | 2.00 | 0.0 | .088 | 0.2181 | 0.2380 |
| 236 | 3.00 | .075 | 0.0 | 4.00 | 0.0 | .078 | 0.2265 | 0.2416 |
| 237 | 3.01 | .075 | 0.0 | 5.00 | 0.0 | .081 | 0.2313 | 0.2436 |
| 238 | 2.97 | .074 | 0.0 | 6.00 | 0.0 | .065 | 0.2237 | 0.2297 |
| 239 | 4.90 | .123 | 5.0 | 2.00 | 0.0 | .123 | 0.5484 | 0.5496 |
| 240 | 4.00 | .100 | -5.0 | 3.00 | 0.0 | .125 | 0.3795 | 0.3701 |
| 241 | 5.99 | .150 | -15.0 | 5.00 | -10.0 | .014 | 0.7332 | 0.7557 |
| 242 | 5.99 | .150 | -27.5 | 6.00 | -5.0 | -.038 | 0.7823 | 0.7953 |
| 243 | 3.97 | .099 | -27.5 | 6.00 | -20.0 | -.046 | 0.2995 | 0.2006 * |
| 244 | 2.99 | .075 | -5.0 | 3.00 | -5.0 | .077 | 0.2381 | 0.2481 |

TABLE A-27 (cont'd)

MEASURED AND FITTED YAW MØMENT
BETA=20·DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|------|----------|---------|
| 245 | 4.91 | .123 | 5.0 | 3.00 | -20.0 | .056 | 0.6887 | 0.6726 |
| 246 | 1.74 | .044 | -15.0 | 6.00 | 0.0 | .155 | 0.1059 | 0.1188* |
| 247 | 3.90 | .098 | -10.0 | 2.00 | -20.0 | .111 | 0.5305 | 0.4593 |
| 248 | 4.96 | .124 | 5.0 | 2.00 | -5.0 | .059 | 0.5583 | 0.5531 |
| 250 | 3.99 | .100 | -5.0 | 6.00 | -20.0 | .058 | 0.4640 | 0.4763 |
| 252 | 6.05 | .151 | -10.0 | 3.00 | 5.0 | .105 | 0.7206 | 0.6883 |
| 254 | 3.98 | .099 | -20.0 | 4.00 | -5.0 | .104 | 0.4322 | 0.4303 |
| 255 | 2.99 | .075 | -10.0 | 3.00 | -10.0 | .136 | 0.2593 | 0.2739 |
| 256 | 2.97 | .074 | -5.0 | 3.00 | -5.0 | .079 | 0.2348 | 0.2470 |
| 259 | 5.02 | .125 | -20.0 | 4.00 | 5.0 | .135 | 0.4447 | 0.4368 |
| 261 | 3.00 | .075 | -5.0 | 2.00 | -10.0 | .067 | 0.2400 | 0.2393 |
| 262 | 4.01 | .100 | -5.0 | 6.00 | -15.0 | .059 | 0.4494 | 0.4465 |
| 263 | 2.10 | .053 | -15.0 | 2.00 | -20.0 | .055 | 0.1565 | 0.1530 |
| 264 | 6.06 | .152 | 5.0 | 3.00 | -20.0 | .052 | 0.9983 | 1.0048 |
| 265 | 6.09 | .152 | -15.0 | 2.00 | -15.0 | .027 | 0.8190 | 0.8213 |
| 266 | 4.00 | .100 | -10.0 | 5.00 | -20.0 | .086 | 0.6035 | 0.5946 |
| 267 | 4.93 | .123 | -15.0 | 2.00 | -20.0 | .063 | 0.7240 | 0.6988 |
| 268 | 2.98 | .074 | -5.0 | 3.00 | -5.0 | .078 | 0.2337 | 0.2471 |
| 269 | 2.03 | .051 | -15.0 | 4.00 | -15.0 | .069 | 0.1563 | 0.1920* |
| 270 | 5.97 | .149 | -5.0 | 5.00 | 5.0 | .095 | 0.8881 | 0.7336* |
| 271 | 4.95 | .124 | -10.0 | 2.00 | -10.0 | .056 | 0.5710 | 0.5513 |
| 272 | 5.93 | .148 | 0.0 | 3.00 | -5.0 | .067 | 0.8201 | 0.7916 |
| 273 | 5.00 | .125 | -5.0 | 2.00 | 5.0 | .069 | 0.4979 | 0.4915 |
| 274 | 5.95 | .149 | -5.0 | 3.00 | 0.0 | .099 | 0.7584 | 0.7593* |
| 275 | 4.97 | .124 | -20.0 | 5.00 | 5.0 | .040 | 0.4877 | 0.5415* |
| 276 | 5.98 | .150 | -25.0 | 5.00 | -5.0 | .031 | 0.9015 | 0.8629 |
| 278 | 5.62 | .140 | 5.0 | 6.00 | -15.0 | .104 | 1.0839 | 1.0616 |
| 279 | 2.75 | .069 | -5.0 | 3.00 | -5.0 | .093 | 0.2094 | 0.2258 |
| 280 | 3.69 | .092 | -15.0 | 5.00 | 5.0 | .021 | 0.3056 | 0.3269 |
| 282 | 4.09 | .102 | -20.0 | 4.00 | -10.0 | .083 | 0.5139 | 0.5071 |
| 283 | 4.92 | .123 | -10.0 | 2.00 | -15.0 | .066 | 0.6063 | 0.6105 |
| 284 | 2.06 | .052 | -20.0 | 3.00 | 5.0 | .062 | 0.1179 | 0.1115 |
| 285 | 4.84 | .121 | -25.0 | 5.00 | -15.0 | .025 | 0.6552 | 0.6578 |
| 312 | 2.26 | .085 | 0.0 | 3.00 | 0.0 | .095 | 0.1900 | 0.2085 |
| 313 | 3.20 | .120 | 0.0 | 3.00 | 0.0 | .084 | 0.3403 | 0.3447 |
| 314 | 4.29 | .161 | 0.0 | 3.00 | 0.0 | .055 | 0.5886 | 0.5733 |
| 315 | 5.24 | .196 | 0.0 | 3.00 | 0.0 | .046 | 0.8540 | 0.8487 |
| 316 | 6.14 | .230 | 0.0 | 3.00 | 0.0 | .037 | 1.1458 | 1.1760 |
| 317 | 3.12 | .117 | 0.0 | 3.00 | 0.0 | .063 | 0.3225 | 0.3228 |
| 318 | 3.01 | .113 | 0.0 | 3.00 | 0.0 | .125 | 0.3095 | 0.3214 |
| 320 | 4.16 | .156 | 0.0 | 3.00 | 0.0 | .125 | 0.5661 | 0.5710 |
| 321 | 4.05 | .152 | 0.0 | 3.00 | 0.0 | .125 | 0.5515 | 0.5447 |
| 324 | 4.99 | .187 | 0.0 | 3.00 | 0.0 | .129 | 0.8143 | 0.8185 |
| 325 | 4.99 | .187 | 0.0 | 3.00 | 0.0 | .152 | 0.8226 | 0.8260 |
| 326 | 3.01 | .113 | 5.0 | 3.00 | 0.0 | .078 | 0.3111 | 0.3187 |
| 327 | 3.01 | .113 | -5.0 | 3.00 | 0.0 | .081 | 0.3003 | 0.3055 |
| 328 | 2.99 | .112 | -10.0 | 3.00 | 0.0 | .071 | 0.2948 | 0.2947 |
| 329 | 3.01 | .113 | -15.0 | 3.00 | 0.0 | .051 | 0.2995 | 0.2923 |
| 330 | 3.02 | .113 | -20.0 | 3.00 | 0.0 | .044 | 0.3074 | 0.2925 |
| 331 | 2.99 | .112 | -27.5 | 3.00 | 0.0 | .021 | 0.2958 | 0.2852 |

TABLE A-27 (cont'd)

MEASURED AND FITTED YAW MOMENT
BETA=20. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|----------|
| 332 | 2.95 | .111 | 0.0 | 3.00 | 5.0 | .041 | 0.2919 | 0.2834 |
| 333 | 3.05 | .114 | 0.0 | 3.00 | -5.0 | .092 | 0.3336 | 0.3381 |
| 334 | 2.81 | .106 | 0.0 | 3.00 | -10.0 | .097 | 0.3066 | 0.3150 |
| 335 | 2.81 | .105 | 0.0 | 3.00 | -15.0 | .098 | 0.3284 | 0.3320 |
| 336 | 2.83 | .106 | 0.0 | 3.00 | -20.0 | .068 | 0.3355 | 0.3284 |
| 337 | 2.87 | .107 | 0.0 | 2.00 | 0.0 | .105 | 0.2791 | 0.2882 |
| 338 | 2.90 | .109 | 0.0 | 4.00 | 0.0 | .078 | 0.2899 | 0.2930 |
| 341 | 3.06 | .115 | 0.0 | 5.00 | 0.0 | .081 | 0.3252 | 0.3202 |
| 346 | 1.90 | .071 | -20.0 | 4.00 | 5.0 | .136 | 0.1213 | 0.1289 |
| 347 | 4.06 | .152 | -5.0 | 3.00 | -5.0 | .086 | 0.5615 | 0.5585 |
| 348 | 4.97 | .186 | 5.0 | 4.00 | -20.0 | .086 | 1.0923 | 1.0906 * |
| 349 | 4.99 | .187 | -15.0 | 4.00 | 5.0 | .175 | 0.8165 | 0.7190 |
| 350 | 3.01 | .113 | -5.0 | 3.00 | -5.0 | .087 | 0.3221 | 0.3251 |
| 351 | 4.05 | .152 | -15.0 | 6.00 | 0.0 | .019 | 0.5050 | 0.5262 |
| 352 | 5.94 | .223 | 0.0 | 2.00 | -5.0 | .040 | 1.0956 | 1.0806 |
| 353 | 4.99 | .187 | -20.0 | 5.00 | 0.0 | .072 | 0.8760 | 0.8423 |
| 355 | 5.00 | .187 | -20.0 | 5.00 | 0.0 | .079 | 0.8818 | 0.8480 |
| 359 | 4.00 | .150 | -25.0 | 5.00 | 5.0 | .098 | 0.4452 | 0.4617 |
| 360 | 4.00 | .150 | 0.0 | 4.00 | 5.0 | .209 | 0.6036 | 0.5201 * |
| 361 | 5.99 | .225 | -25.0 | 5.00 | -20.0 | -.011 | 1.0619 | 1.2013 * |
| 362 | 4.01 | .150 | -15.0 | 6.00 | 0.0 | .016 | 0.4990 | 0.5118 |
| 363 | 4.04 | .152 | 5.0 | 4.00 | -10.0 | .192 | 0.6229 | 0.7006 * |
| 364 | 4.03 | .151 | -5.0 | 3.00 | 0.0 | .129 | 0.5441 | 0.5279 |
| 365 | 2.97 | .111 | -5.0 | 3.00 | -5.0 | .091 | 0.3106 | 0.3190 * |
| 366 | 4.97 | .187 | -10.0 | 6.00 | -20.0 | .055 | 0.8791 | 1.0003 * |
| 370 | 5.52 | .207 | -5.0 | 3.00 | -20.0 | .090 | 1.4952 | 1.3388 |
| 371 | 5.02 | .188 | 5.0 | 3.00 | 0.0 | .069 | 0.8082 | 0.8047 |
| 372 | 2.99 | .112 | 5.0 | 2.00 | -20.0 | .094 | 0.3374 | 0.3629 |
| 373 | 1.97 | .074 | -20.0 | 6.00 | -5.0 | .187 | 0.1831 | 0.1844 |
| 374 | 2.92 | .109 | -20.0 | 6.00 | -5.0 | .105 | 0.3663 | 0.3463 |
| 376 | 5.00 | .187 | -5.0 | 2.00 | 0.0 | .071 | 0.7756 | 0.7565 |
| 378 | 4.02 | .151 | 0.0 | 6.00 | -20.0 | .126 | 0.8677 | 0.8636 |
| 379 | 6.01 | .225 | -20.0 | 2.00 | 0.0 | .004 | 1.0799 | 1.0752 |
| 380 | 4.97 | .187 | -20.0 | 2.00 | -5.0 | .082 | 0.7625 | 0.7983 |
| 381 | 2.99 | .112 | -5.0 | 3.00 | -5.0 | .082 | 0.3216 | 0.3181 |
| 384 | 5.95 | .223 | -10.0 | 3.00 | 5.0 | .094 | 1.0498 | 1.0653 |
| 386 | 4.85 | .182 | -15.0 | 3.00 | -5.0 | .092 | 0.8105 | 0.8109 |
| 387 | 5.12 | .192 | -5.0 | 3.00 | -5.0 | .114 | 0.9108 | 0.9127 |
| 390 | 6.10 | .229 | 5.0 | 5.00 | -15.0 | .089 | 1.5533 | 1.5910 |
| 395 | 4.23 | .158 | -10.0 | 6.00 | -5.0 | .038 | 0.5652 | 0.5752 |
| 396 | 3.19 | .119 | -27.5 | 4.00 | 0.0 | .128 | 0.3179 | 0.3385 |
| 397 | 3.15 | .118 | -5.0 | 4.00 | -15.0 | .097 | 0.4288 | 0.4314 |
| 398 | 4.10 | .154 | -5.0 | 5.00 | 5.0 | .137 | 0.5160 | 0.5168 |
| 399 | 3.07 | .115 | -5.0 | 3.00 | -5.0 | .061 | 0.3252 | 0.3215 |
| 402 | 6.06 | .227 | -10.0 | 2.00 | 5.0 | .040 | 1.0797 | 1.0987 |
| 403 | 3.11 | .117 | -10.0 | 5.00 | -10.0 | .151 | 0.4651 | 0.4437 |
| 404 | 2.93 | .112 | -15.0 | 6.00 | -10.0 | .135 | 0.4615 | 0.4240 |
| 405 | 4.04 | .151 | -20.0 | 5.00 | -10.0 | .090 | 0.7272 | 0.6930 |
| 702 | 2.99 | .224 | 0.0 | 3.00 | 0.0 | .093 | 0.5793 | 0.5793 |
| 703 | 1.98 | .149 | 0.0 | 3.00 | 0.0 | .123 | 0.2748 | 0.2673 |

R-1851

TABLE A-27 (cont'd)

MEASURED AND FITTED YAW MOMENT
BETA=20. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|-------|----------|---------|
| 704 | 2.49 | .187 | 0.0 | 3.00 | 0.0 | .103 | 0.4164 | 0.4004 |
| 705 | 3.01 | .226 | 0.0 | 3.00 | 0.0 | .071 | 0.5778 | 0.5734 |
| 706 | 2.99 | .224 | 0.0 | 3.00 | 0.0 | .115 | 0.5905 | 0.5927 |
| 707 | 2.99 | .224 | 0.0 | 3.00 | 0.0 | .176 | 0.6057 | 0.6056 |
| 709 | 3.01 | .226 | 5.0 | 3.00 | 0.0 | .085 | 0.5902 | 0.5906 |
| 710 | 3.01 | .226 | -5.0 | 3.00 | 0.0 | .091 | 0.5842 | 0.5873 |
| 711 | 3.01 | .226 | -10.0 | 3.00 | 0.0 | .076 | 0.5723 | 0.5806 |
| 712 | 3.00 | .225 | -15.0 | 3.00 | 0.0 | .057 | 0.5630 | 0.5734 |
| 713 | 3.00 | .225 | -20.0 | 3.00 | 0.0 | .028 | 0.5626 | 0.5681 |
| 714 | 3.00 | .225 | -27.5 | 3.00 | 0.0 | .006 | 0.5736 | 0.5794 |
| 715 | 3.01 | .226 | 0.0 | 3.00 | 5.0 | .088 | 0.5606 | 0.5599 |
| 716 | 3.00 | .225 | 0.0 | 3.00 | -5.0 | .099 | 0.6084 | 0.6076 |
| 717 | 3.01 | .225 | 0.0 | 3.00 | -10.0 | .099 | 0.6339 | 0.6303 |
| 718 | 3.01 | .225 | 0.0 | 3.00 | -15.0 | .103 | 0.6640 | 0.6557 |
| 719 | 3.01 | .226 | 0.0 | 3.00 | -20.0 | .104 | 0.7088 | 0.6836 |
| 720 | 3.01 | .226 | 0.0 | 2.00 | 0.0 | .090 | 0.5862 | 0.5767 |
| 722 | 3.00 | .225 | 0.0 | 4.00 | 0.0 | .100 | 0.6067 | 0.6023 |
| 723 | 3.01 | .226 | 0.0 | 5.00 | 0.0 | .094 | 0.6020 | 0.5913 |
| 724 | 2.53 | .190 | 0.0 | 6.00 | 0.0 | .089 | 0.6037 | 0.5858 |
| 726 | 2.53 | .189 | 5.0 | 8.00 | -20.0 | .084 | 0.4982 | 0.4822 |
| 728 | 2.99 | .224 | -5.0 | 3.00 | -5.0 | .256 | 0.4723 | 0.5956* |
| 730 | 2.99 | .224 | -5.0 | 6.00 | 5.0 | .165 | 0.6016 | 0.578 |
| 731 | 1.95 | .147 | 0.0 | 5.00 | -10.0 | .267 | 0.6226 | 0.6521 |
| 732 | 2.49 | .187 | -27.5 | 3.00 | -10.0 | .249 | 0.2982 | 0.2795 |
| 733 | 3.00 | .225 | -5.0 | 3.00 | -5.0 | -.010 | 0.4080 | 0.3995 |
| 735 | 1.97 | .148 | -27.5 | 3.00 | -10.0 | .100 | 0.6065 | 0.6105 |
| 736 | 3.00 | .225 | -20.0 | 3.00 | 5.0 | .079 | 0.2816 | 0.3035 |
| 737 | 3.00 | .225 | -27.5 | 6.00 | -10.0 | .094 | 0.5629 | 0.5618 |
| 738 | 1.99 | .149 | -10.0 | 3.00 | -15.0 | .141 | 0.7921 | 0.8069 |
| 741 | 2.48 | .186 | 0.0 | 3.00 | -5.0 | .137 | 0.3060 | 0.2817 |
| 743 | 2.53 | .190 | 5.0 | 8.00 | -10.0 | .132 | 0.4215 | 0.4196 |
| 744 | 2.04 | .153 | -10.0 | 3.00 | -10.0 | .273 | 0.5742 | 0.6442* |
| 746 | 3.01 | .226 | -5.0 | 5.00 | -20.0 | .092 | 0.3032 | 0.2859 |
| 747 | 3.01 | .226 | -5.0 | 3.00 | -5.0 | .242 | 0.7352 | 0.7591 |
| 749 | 3.07 | .230 | -10.0 | 6.00 | -5.0 | .086 | 0.5973 | 0.6048 |
| 750 | 2.57 | .193 | 5.0 | 5.00 | 0.0 | .166 | 0.7332 | 0.7435 |
| 751 | 2.57 | .193 | -10.0 | 6.00 | 0.0 | .129 | 0.4463 | 0.4537 |
| 752 | 2.07 | .155 | -27.5 | 3.00 | -20.0 | .067 | 0.4221 | 0.3952 |
| 754 | 2.00 | .150 | 5.0 | 6.00 | 0.0 | -.018 | 0.2744 | 0.2740 |
| 755 | 2.14 | .160 | -15.0 | 3.00 | 5.0 | .257 | 0.2863 | 0.3299 |
| 757 | 2.51 | .188 | 0.0 | 8.00 | -20.0 | .120 | 0.2811 | 0.2765 |
| 758 | 2.51 | .189 | -15.0 | 6.00 | -15.0 | .339 | 0.7416 | 0.5706* |
| 759 | 2.51 | .188 | 5.0 | 6.00 | -10.0 | .062 | 0.4431 | 0.4517 |
| 760 | 3.00 | .225 | -5.0 | 3.00 | -5.0 | .280 | 0.5531 | 0.5181 |
| 761 | 3.00 | .225 | -15.0 | 5.00 | 0.0 | .094 | 0.6094 | 0.6049 |
| 763 | 2.51 | .188 | -20.0 | 7.00 | 0.0 | .257 | 0.6409 | 0.6500 |
| 764 | 2.99 | .224 | 0.0 | 5.00 | -5.0 | .301 | 0.4649 | 0.4405 |
| 765 | 2.99 | .224 | -5.0 | 5.00 | -15.0 | .103 | 0.6287 | 0.6295* |
| 766 | 2.02 | .151 | 0.0 | 5.00 | 5.0 | .183 | 0.7014 | 0.7701* |
| | | | | | | .372 | 0.2068 | 0.3409 |

R-1851

TABLE A-27 (cont'd)

MEASURED AND FITTED YAW MOMENT
BETA=20. DEG

| RUN | CV | W | PHI | THETA | PSI | ZT | MEASURED | FITTED |
|-----|------|------|-------|-------|-------|------|----------|--------|
| 769 | 2.51 | .188 | -10.0 | 8.00 | -15.0 | .234 | 0.5913 | 0.6166 |
| 771 | 3.00 | .225 | -10.0 | 2.00 | 5.0 | .107 | 0.5744 | 0.5477 |
| 772 | 3.00 | .225 | -25.0 | 5.00 | -10.0 | .151 | 0.7550 | 0.7921 |
| 773 | 2.98 | .224 | -5.0 | 3.00 | -5.0 | .103 | 0.5959 | 0.6014 |
| 774 | 2.49 | .186 | -10.0 | 4.00 | 0.0 | .251 | 0.4454 | 0.4123 |
| 775 | 2.98 | .224 | -10.0 | 6.00 | -5.0 | .176 | 0.6982 | 0.7049 |
| 777 | 2.49 | .187 | 5.0 | 8.00 | -10.0 | .330 | 0.5949 | 0.5922 |
| 780 | 2.97 | .223 | -25.0 | 6.00 | -5.0 | .212 | 0.7389 | 0.7222 |
| 781 | 2.48 | .186 | -25.0 | 5.00 | -20.0 | .104 | 0.6147 | 0.6081 |

MEAN ERROR= 0.0012
STANDARD DEVIATION= 0.0216

APPENDIX B

The measured dimensionless hydrodynamic forces and moments acting on the three prismatic hulls used in this study are listed in Appendix A in the balance coordinates shown in Figure 1. To obtain corresponding results in hull fixed coordinates, the following transformation is used for the force components:

$$\begin{bmatrix} X_H^i \\ Y_H^i \\ Z_H^i \end{bmatrix} = C \begin{bmatrix} X_S^i \\ Y_S^i \\ Z_S^i \end{bmatrix}, \text{ where } C = \begin{bmatrix} \cos\theta & 0 & -\sin\theta \\ \sin\phi\sin\theta & \cos\phi & \sin\phi\cos\theta \\ \cos\phi\sin\theta & -\sin\phi & \cos\phi\cos\theta \end{bmatrix} \quad (\text{B-1})$$

in which subscript "H" denotes hull fixed coordinates, subscript "S" denotes balance coordinates, and ϕ and θ are the pitch and roll angles, respectively. If $(x_{RS}^i, y_{RS}^i, z_{RS}^i)$ are the dimensionless coordinates of the balance axes origin in hull coordinates, the corresponding transformation of moments is given by

$$\begin{bmatrix} K_H^i \\ M_H^i \\ N_H^i \end{bmatrix} = C \begin{bmatrix} K_S^i \\ M_S^i \\ N_S^i \end{bmatrix} + \begin{bmatrix} y_{RS}^i z_{RS}^i - z_{RS}^i y_{RS}^i \\ z_{RS}^i x_{RS}^i - x_{RS}^i z_{RS}^i \\ z_{RS}^i y_{RS}^i - y_{RS}^i x_{RS}^i \end{bmatrix} \quad (\text{B-2})$$

where

$$\begin{aligned} x_{RS}^i &= -\xi_R^i + \zeta_S^i \sin\theta \\ y_{RS}^i &= -(\zeta_P^i + \zeta_S^i \cos\theta) \sin\phi \\ z_{RS}^i &= -\zeta_R^i - (\zeta_P^i + \zeta_S^i \cos\theta) \cos\phi \end{aligned}$$

For the balance setup used in these tests, and taking the hull fixed coordinate origin at the transom-keel intersection,

$$\xi_R^i = 1.333 \quad \zeta_S^i = 1.042 \quad \zeta_P^i = 0.25 \quad \zeta_R^i = 0.125$$

which are shown in Figure 1.

The hydrodynamic forces and moments for symmetric and nonsymmetric steady planing were assumed to be functions of the following dimensionless trajectory variables:

- u' = surge velocity in hull fixed coordinates,
- v' = sideslip velocity in hull fixed coordinates,
- ω' = turning rate in earth fixed coordinates,
- φ = roll angle,
- θ = pitch angle, and
- z_T' = draft at transom-keel intersection.

The trajectory variables used in the tests and listed in Appendix A were:

- C_V = planing speed coefficient,
- ω' = turning rate in earth fixed coordinates,
- φ = roll angle,
- θ = pitch angle,
- β = sideslip angle, and
- z_T' = draft at transom-keel intersection.

To obtain z_T' from the measured vertical translation ζ_O' of the free-to-heave apparatus, the following transformation was used:

$$z_T' = \zeta_O' - \xi_R' \sin\theta - \zeta_R'(1 - \cos\varphi \cos\theta) - \zeta_P'(1 - \cos\theta) \quad (B-3)$$

The relationship between the curve fitting variables and the test variables is given by

$$\begin{aligned} p' &= -\omega' \sin\theta \\ q' &= \omega' \sin\varphi \cos\theta \\ r' &= \omega' \cos\varphi \cos\theta \\ u' &= C_V \cos\theta \cos\beta + z_{RS}' q' - y_{RS}' r' \\ v' &= C_V (\sin\varphi \sin\theta \cos\beta - \cos\varphi \sin\beta) + x_{RS}' r' - z_{RS}' p' \end{aligned} \quad (B-4)$$

where C_V is simply the dimensionless carriage speed in the straight course tests while for the circular course tests

$$C_V = R' \omega'$$

where R' is the dimensionless turning radius to the balance center.

The fitting functions were obtained by using a Taylor Series Expansion about a chosen reference point, in the trajectory variable space $(u', v', w', \varphi, \theta, z_T')$. In general, a Taylor Series Expansion of a scalar valued function f in an n -dimensional space $(x_i; i=1, 2, \dots, n)$ about a given point $(x_i = \xi_i; i=1, 2, \dots, n)$ is given by

$$f(x_i; i=1, 2, \dots, n) = \sum_{j=0}^{\infty} \frac{1}{j!} \left[\sum_{k=1}^n (x_k - \xi_k) \frac{\partial}{\partial \xi_k} \right]^j f(\xi_i; i=1, 2, \dots, n) \quad (B-5)$$

This expansion was truncated at third order terms. In addition, the centerline plane was assumed to be a plane of symmetry so that X_S^i, Z_S^i and M_S^i contained only even order combinations of (v', w', φ) while Y_S^i, K_S^i and N_S^i contained only odd order combinations. The expansion point was arbitrarily chosen as

$$(C_V, w', \varphi, \theta, \beta, z_T') = (4, 0, 0, 3, 0, 0.1) \quad (B-6)$$

or

$$(u', v', w', \varphi, \theta, z_T') = (3.9945, 0, 0, 0, 3, 0.1)$$

The resulting families of fitting functions are listed in tables B-1 and B-2 for X_S^i, Z_S^i, M_S^i and Y_S^i, K_S^i, N_S^i , respectively.

In the circular course tests, the forces and moments at the balance were effected by the centrifugal force acting on the portion of the apparatus below the balance, in addition to the hydrodynamic forces acting on the model. This centrifugal force contribution was accounted for by including one additional term in the fitting functions, defined as the corresponding component due to centrifugal force on the apparatus. These functions are given by

$$\begin{aligned} X_S^i : f_{45} &= -2C_{\Delta a} w' v' \\ Y_S^i : g_{42} &= 2C_{\Delta a} w' u' / \cos \theta \\ Z_S^i : f_{45} &= 0 \\ K_S^i : g_{42} &= -2z_a' C_{\Delta a} w' u' / \cos \theta \\ M_S^i : f_{45} &= -2z_a' C_{\Delta a} w' v' \\ N_S^i : g_{42} &= 2x_a' C_{\Delta a} w' u' / \cos \theta \end{aligned} \quad (B-7)$$

where $C_{\Delta a}, x'_a, z'_a$ are the load coefficient and center of gravity location in balance coordinates, of the portion of apparatus below the balance center. These weights and dimensions were found to be

| B_H | $C_{\Delta a}$ | x'_a | z'_a |
|------------|----------------|--------|--------|
| 10° | 1.221 | 0.32 | 0.827 |
| 15 | 1.252 | 0.32 | 0.827 |
| 20 | 1.289 | 0.307 | 0.813 |

where half the balance has been included and the change in CG location with roll and pitch angles was neglected. It is seen that the centrifugal force on the apparatus affects only the term $j=33$ in the fitting functions for X'_S and M'_S so that these coefficients must be corrected by

$$B_{X33} = B'_{X33} - (B'_{X45} - 1)2C_{\Delta a}$$

$$B_{M33} = B'_{M33} - (B'_{X45} - 1)2z'_a C_{\Delta a}$$
(B-8)

where the prime denotes coefficients determined in the least squared fit while the unprimed B's are final values corrected for centrifugal force effects. For the case of Y'_S, K'_S and N'_S , the functional dependence of the centrifugal force effects above, was expanded in a Taylor Series expansion about the same expansion point as given in Eq.(B-6) and the corrections to the various fitting function coefficients were found to be

$$B_{Y26} = B'_{Y26} + (B'_{Y42} - 1)2C_{\Delta a} u'_o / \cos \theta_o$$

$$B_{Y27} = B'_{Y27} + (B'_{Y42} - 1)2C_{\Delta a} / \cos \theta_o$$

$$B_{Y29} = B'_{Y29} + (B'_{Y42} - 1)2C_{\Delta a} u'_o \sin \theta_o / \cos^2 \theta_o$$

$$B_{Y32} = B'_{Y32} + (B'_{Y42} - 1)2C_{\Delta a} \sin \theta_o / \cos^2 \theta_o$$

$$B_{Y41} = B'_{Y41} + (B'_{Y42} - 1)2C_{\Delta a} u'_o (1 + \sin^2 \theta_o) / 2\cos^3 \theta_o$$
(B-9)

where u'_o and θ_o are values of u' and θ at the expansion point. The corresponding corrections for K'_S and N'_S are obtained by multiplying the Y'_S correction by $-z'_a$ and x'_a , respectively.

TABLE B-1

FITTING FUNCTIONS FOR
LONGITUDINAL AND VERTICAL FORCES AND PITCH MOMENT

| j | $f_j(u', v', w', \varphi, \theta, z_T')$ | j | $f_j(u', v', w', \varphi, \theta, z_T')$ |
|----|--|----|--|
| 1 | 1 | 23 | $\tilde{\theta}^3$ |
| 2 | \tilde{u} | 24 | $\tilde{u}v'^2$ |
| 3 | \tilde{z} | 25 | $\tilde{u}v'\varphi$ |
| 4 | $\tilde{\theta}$ | 26 | $\tilde{u}\varphi^2$ |
| 5 | \tilde{u}^2 | 27 | $\tilde{z}v'^2$ |
| 6 | $\tilde{u}\tilde{z}$ | 28 | $\tilde{\theta}v'^2$ |
| 7 | $\tilde{u}\tilde{\theta}$ | 29 | $\tilde{z}v'\varphi$ |
| 8 | \tilde{z}^2 | 30 | $\tilde{\theta}v'\varphi$ |
| 9 | $\tilde{z}\tilde{\theta}$ | 31 | $\tilde{z}\varphi^2$ |
| 10 | $\tilde{\theta}^2$ | 32 | $\tilde{\theta}\varphi^2$ |
| 11 | v'^2 | 33 | $v'w'$ |
| 12 | $v'\varphi$ | 34 | w'^2 |
| 13 | φ^2 | 35 | $\varphi w'$ |
| 14 | \tilde{u}^3 | 36 | $\tilde{u}v'w'$ |
| 15 | $\tilde{u}^2\tilde{z}$ | 37 | $\tilde{u}w'^2$ |
| 16 | $\tilde{u}^2\tilde{\theta}$ | 38 | $\tilde{u}\varphi w'$ |
| 17 | $\tilde{u}\tilde{z}^2$ | 39 | $\tilde{z}v'w'$ |
| 18 | $\tilde{u}\tilde{z}\tilde{\theta}$ | 40 | $\tilde{\theta}v'w'$ |
| 19 | $\tilde{u}\tilde{\theta}^2$ | 41 | $\tilde{z}w'^2$ |
| 20 | \tilde{z}^3 | 42 | $\tilde{\theta}w'^2$ |
| 21 | $\tilde{z}^2\tilde{\theta}$ | 43 | $\tilde{z}\varphi w'$ |
| 22 | $\tilde{z}\tilde{\theta}\varphi$ | 44 | $\tilde{\theta}\varphi w'$ |

where

$$\tilde{u} = u' - 3.9945$$

$$\tilde{z} = z_T' - 0.1$$

$$\tilde{\theta} = \theta - 3$$

TABLE B-2FITTING FUNCTIONS FOR
SIDE FORCE AND ROLL AND YAW MOMENTS

| j | $g_j(u', v', w', \varphi, \theta, z_T')$ | j | $g_j(u', v', w', \varphi, \theta, z_T')$ |
|----|--|----|--|
| 1 | 1 | 21 | $\tilde{\theta}^a v'$ |
| 2 | v' | 22 | $\tilde{z}^a \varphi$ |
| 3 | φ | 23 | $\tilde{z} \tilde{\theta} \varphi$ |
| 4 | $\tilde{u} v'$ | 24 | φ^3 |
| 5 | $\tilde{u} \varphi$ | 25 | $\theta^2 \varphi$ |
| 6 | $\tilde{z} v'$ | 26 | w' |
| 7 | $\tilde{\theta} v'$ | 27 | $\tilde{u} w'$ |
| 8 | $\tilde{z} \varphi$ | 28 | $\tilde{z} w'$ |
| 9 | $\tilde{\theta} \varphi$ | 29 | $\tilde{\theta} w'$ |
| 10 | $\tilde{u}^2 v'$ | 30 | $\tilde{u}^2 w'$ |
| 11 | $\tilde{u}^2 \varphi$ | 31 | $\tilde{u} \tilde{z} w'$ |
| 12 | $\tilde{u} \tilde{z} v'$ | 32 | $\tilde{u} \tilde{\theta} w'$ |
| 13 | $\tilde{u} \tilde{\theta} v'$ | 33 | $v'^2 w'$ |
| 14 | $\tilde{u} \tilde{z} \varphi$ | 34 | $v' w'^2$ |
| 15 | $\tilde{u} \tilde{\theta} \varphi$ | 35 | $v \varphi w'$ |
| 16 | v'^3 | 36 | w'^3 |
| 17 | v'^2 | 37 | $\varphi w'^2$ |
| 18 | $\tilde{z}^2 v'$ | 38 | $\tilde{z}^2 w'$ |
| 19 | $\tilde{z} \tilde{\theta} v'$ | 39 | $\tilde{z} \tilde{\theta} w'$ |
| 20 | $v' \varphi^2$ | 40 | $\varphi^2 w'$ |
| | | 41 | $\theta^2 w'$ |

APPENDIX C

COEFFICIENTS OF LEAST SQUARED FITS

The empirical coefficients for the fitting functions described in Appendix B were evaluated by the least squared error technique for the forces and moments tabulated in Appendix A. The approach used in applying the least squares technique is described in the main text of this report. The data points not used in the final step of this approach are marked with an asterisk in the listings in Appendix A.

Also, in applying the least squares technique it was found that using all terms (45 for X_S^i , M_S^i and 42 for Y_S^i, K_S^i, N_S^i) led to ill-conditioned matrices due to the close correlation between the centrifugal force term and term 33 in X_S^i and M_S^i and term 27 in Y_S^i, K_S^i and N_S^i . Consequently, these two coefficients were set equal to zero and deleted from the fitting procedure. The resulting coefficients were then corrected for centrifugal force effects as described in Appendix B. The final, corrected values of the coefficients are listed in Tables C-1 through C-6.

Using the fitting functions f_j and g_j listed in Tables B-1 and B-2, the dimensionless hydrodynamic forces and moments acting on the hull, relative to balance coordinates are given by

$$\begin{aligned}
 X_S^i &= \sum_{j=1}^{44} B_{Xj} f_j & K_S^i &= \sum_{j=1}^{41} B_{Kj} g_j \\
 Y_S^i &= \sum_{j=1}^{41} B_{Yj} g_j & M_S^i &= \sum_{j=1}^{44} B_{Mj} f_j \\
 Z_S^i &= \sum_{j=1}^{44} B_{Zj} f_j & N_S^i &= \sum_{j=1}^{41} B_{Nj} g_j
 \end{aligned} \tag{C-1}$$

TABLE C-1

COEFFICIENTS FOR ALL TERM FIT

BETA = 10.

| J | X | Z | M |
|----|------------|------------|------------|
| 1 | -.1300E+00 | -.6040E+00 | -.2350E+00 |
| 2 | -.6230E-01 | -.2240E+00 | -.1120E+00 |
| 3 | -.1470E+01 | -.7390E+01 | .3420E+01 |
| 4 | .9530E-02 | -.6230E-01 | -.2120E+00 |
| 5 | -.9100E-02 | .7530E-02 | -.2570E-01 |
| 6 | -.6820E+00 | -.1800E+01 | -.7830E-01 |
| 7 | .2760E-02 | -.3860E-01 | -.7770E-01 |
| 8 | -.1070E+01 | .4290E+01 | .5240E+02 |
| 9 | .1620E+00 | .6640E-01 | -.2830E+01 |
| 10 | -.1030E-01 | -.2910E-01 | -.1460E-02 |
| 11 | -.9290E-02 | -.3820E-01 | -.2730E-01 |
| 12 | .4580E-04 | .2640E-01 | .1150E-01 |
| 13 | -.2230E-03 | -.1090E-02 | .1080E-03 |
| 14 | .1140E-03 | .1260E-01 | .8480E-03 |
| 15 | -.6540E-01 | .8410E-01 | -.4710E+00 |
| 16 | .7350E-04 | -.1730E-02 | -.1870E-02 |
| 17 | .1850E+01 | .2080E+02 | .1380E+02 |
| 18 | .2440E-01 | -.2890E+00 | -.6880E+00 |
| 19 | -.9480E-03 | -.2260E-02 | .5910E-03 |
| 20 | .1320E+02 | .4590E+02 | -.6650E+02 |
| 21 | .7030E+00 | .9060E+01 | .1800E+01 |
| 22 | -.4730E-01 | -.2110E+00 | .1810E+00 |
| 23 | .1550E-02 | .2440E-02 | .8550E-03 |
| 24 | .8340E-03 | -.3990E-01 | -.5700E-01 |
| 25 | -.6540E-03 | -.3650E-02 | -.2140E-02 |
| 26 | -.1830E-03 | -.1000E-02 | -.3640E-03 |
| 27 | .2020E-01 | -.3620E+00 | -.1410E+00 |
| 28 | -.1250E-02 | .4260E-02 | -.9770E-02 |
| 29 | .7800E-03 | .2360E+00 | .6320E-01 |
| 30 | .7520E-03 | .6210E-02 | .5170E-02 |
| 31 | -.6310E-03 | .7340E-03 | .1470E-01 |
| 32 | -.8290E-05 | -.1310E-03 | -.8520E-04 |
| 33 | -.2308E+00 | .5190E-01 | -.2571E+00 |
| 34 | -.4270E+00 | -.3620E+01 | -.1170E+01 |
| 35 | .1970E-01 | .4260E-01 | .4910E-01 |
| 36 | .2060E-01 | .3270E+00 | .6510E+00 |
| 37 | -.7580E+00 | -.4030E+01 | -.1800E+01 |
| 38 | .4000E-02 | .3020E-02 | .4370E-01 |
| 39 | -.1180E+01 | -.1900E+01 | -.1150E+01 |
| 40 | .3020E-01 | .2920E+00 | .1320E+00 |
| 41 | -.6420E-01 | -.2230E+02 | -.3740E+01 |
| 42 | .1620E-01 | -.4620E+00 | -.1830E+00 |
| 43 | .6720E-01 | .2640E-01 | .4080E+00 |
| 44 | -.5050E-02 | -.4030E-01 | .1320E-01 |

TABLE C-2

COEFFICIENTS FOR ALL TERM FIT

BETA = 10.

| J | Y | K | N |
|----|------------|------------|------------|
| 1 | .0000E+00 | .0000E+00 | .0000E+00 |
| 2 | -.2270E+00 | .1420E+00 | .5550E-01 |
| 3 | .6310E-02 | -.1600E-01 | .8630E-03 |
| 4 | -.6740E-01 | .5910E-01 | .3660E-01 |
| 5 | .2950E-02 | -.6370E-02 | -.1660E-02 |
| 6 | -.3770E+01 | .3230E+01 | .6810E+00 |
| 7 | .1470E-01 | -.1270E-01 | .4000E-01 |
| 8 | .8920E-01 | -.1090E+00 | .2240E-01 |
| 9 | .9900E-03 | -.5460E-02 | -.1270E-02 |
| 10 | .7870E-04 | -.6140E-02 | .2750E-02 |
| 11 | -.3600E-03 | -.5560E-03 | -.4100E-03 |
| 12 | -.9370E+00 | .9760E+00 | .7100E+00 |
| 13 | -.1030E-02 | -.4360E-04 | .8130E-02 |
| 14 | .3360E-01 | -.5660E-01 | -.1330E-01 |
| 15 | .1120E-04 | -.1700E-02 | .2360E-03 |
| 16 | .9830E-02 | -.2660E-02 | -.4190E-02 |
| 17 | -.2250E-04 | -.1320E-02 | -.2170E-04 |
| 18 | -.1490E+02 | .1390E+02 | .3750E+00 |
| 19 | .1890E+00 | -.9860E-01 | .5070E+00 |
| 20 | -.5920E-03 | .1040E-02 | -.3470E-04 |
| 21 | -.3690E-03 | -.1550E-02 | -.4200E-02 |
| 22 | .1300E+00 | .3210E+00 | .1140E+00 |
| 23 | -.2840E-02 | -.3200E-01 | -.5120E-02 |
| 24 | .2560E-04 | -.8630E-05 | .1140E-05 |
| 25 | -.1780E-03 | .8770E-03 | .3750E-03 |
| 26 | .9080E+00 | -.7400E+00 | -.4900E-01 |
| 27 | .3390E+00 | -.2220E+00 | .6950E-01 |
| 28 | .4710E+01 | -.3440E+01 | -.8080E-01 |
| 29 | .5910E-01 | .3400E-02 | -.1320E-01 |
| 30 | .3810E-01 | -.5550E-01 | -.5930E-02 |
| 31 | .2330E+01 | -.2360E+01 | -.1470E+01 |
| 32 | .4930E-01 | -.5430E-01 | -.1620E-01 |
| 33 | -.2360E+00 | .2750E+00 | .1210E+00 |
| 34 | .9100E+00 | -.8940E+00 | -.2140E+00 |
| 35 | .3720E-02 | .3120E-02 | -.8030E-02 |
| 36 | -.2770E+01 | .4520E+01 | .5170E+01 |
| 37 | -.1520E-01 | -.2840E-01 | -.3850E-02 |
| 38 | .3310E+02 | -.1660E+02 | -.1420E+02 |
| 39 | -.1550E+00 | -.1600E+00 | -.4100E+00 |
| 40 | .9760E-03 | -.1340E-02 | .4430E-03 |
| 41 | .6920E+00 | -.4520E+00 | .1430E+00 |

TABLE C-3

COEFFICIENTS FOR ALL TERM FIT

BETA = 15.

| J | X | Z | M |
|----|------------|------------|------------|
| 1 | -.1200E+00 | -.4730E+00 | -.2890E+00 |
| 2 | -.5480E-01 | -.1930E+00 | -.5790E-01 |
| 3 | -.1380E+01 | -.7520E+01 | .4820E+00 |
| 4 | .1720E-01 | -.4700E-01 | -.1000E+00 |
| 5 | -.1210E-01 | .3530E-02 | -.4540E-02 |
| 6 | -.6420E+00 | -.1720E+01 | .6920E+00 |
| 7 | .4640E-02 | -.2910E-01 | -.1600E-01 |
| 8 | -.9530E+00 | .5060E+01 | .5200E+02 |
| 9 | .1520E+00 | .1440E+00 | -.1400E+01 |
| 10 | -.7800E-02 | -.2730E-01 | -.3420E-02 |
| 11 | -.1330E-01 | .4520E-01 | -.3860E-01 |
| 12 | -.3640E-03 | .2890E-01 | .1020E-01 |
| 13 | -.1560E-03 | -.4370E-03 | -.8970E-04 |
| 14 | -.5070E-03 | .1150E-01 | -.7940E-03 |
| 15 | -.7660E-01 | .1540E+00 | .1490E+00 |
| 16 | .8650E-03 | .9320E-02 | .1060E-01 |
| 17 | -.2830E+00 | .7880E+01 | .1520E+02 |
| 18 | .3660E-01 | -.7970E-01 | -.3070E+00 |
| 19 | -.8710E-03 | .3550E-02 | -.3720E-02 |
| 20 | -.1590E+01 | .9550E-01 | -.2760E+02 |
| 21 | .3880E+00 | .3710E+01 | -.8320E-01 |
| 22 | -.3480E-01 | -.1470E+00 | .6120E-03 |
| 23 | .9860E-03 | .5990E-02 | -.5290E-04 |
| 24 | .4190E-02 | -.3000E-01 | -.4680E-01 |
| 25 | -.1060E-03 | -.3100E-02 | -.2190E-02 |
| 26 | -.8600E-04 | .3420E-03 | -.3080E-03 |
| 27 | .7870E-02 | .6100E+00 | .1150E-01 |
| 28 | .3710E-02 | -.1330E+00 | .8660E-02 |
| 29 | .4340E-02 | .2440E+00 | .1150E+00 |
| 30 | .5490E-03 | -.1930E-02 | -.4520E-03 |
| 31 | -.1040E-03 | .6880E-02 | .1120E-01 |
| 32 | -.7930E-05 | -.1470E-03 | -.2080E-03 |
| 33 | -.1072E+00 | -.4840E+00 | .1292E+00 |
| 34 | -.4320E-01 | -.2780E+01 | -.5460E+00 |
| 35 | .8250E-02 | .6070E-02 | -.3920E-02 |
| 36 | -.1380E-01 | -.4330E-01 | .2970E+00 |
| 37 | -.3920E+00 | -.1180E+01 | -.2130E+01 |
| 38 | .1370E-02 | .2030E-02 | .1850E-01 |
| 39 | -.3190E+00 | .1910E+01 | .1080E+02 |
| 40 | -.1540E-01 | -.2510E+00 | -.1140E+00 |
| 41 | -.3660E+01 | -.2210E+02 | .6990E+01 |
| 42 | -.1200E+00 | .3340E+00 | -.5490E+00 |
| 43 | -.6390E-01 | -.1170E+00 | -.9340E-01 |
| 44 | .8380E-03 | .2100E-03 | .1860E-01 |

TABLE C-4

COEFFICIENTS FOR ALL TERM FIT

BETA = 15.

| J | Y | K | N |
|----|------------|------------|------------|
| 1 | .0000E+00 | .0000E+00 | .0000E+00 |
| 2 | -.2720E+00 | .2190E+00 | .5830E-01 |
| 3 | .3430E-02 | -.1020E-01 | .2190E-02 |
| 4 | -.5190E-01 | .4340E-01 | .2130E-01 |
| 5 | .2560E-02 | -.5260E-02 | -.4120E-03 |
| 6 | -.3830E+01 | .2640E+01 | .6800E+00 |
| 7 | .4920E-01 | -.2740E-01 | .4890E-02 |
| 8 | .6120E-01 | -.1200E+00 | .3070E-01 |
| 9 | .8420E-03 | -.2300E-02 | -.1290E-02 |
| 10 | .5560E-02 | -.2060E-01 | .2720E-02 |
| 11 | .1120E-03 | -.7200E-03 | .2070E-03 |
| 12 | -.5640E+00 | .3840E+00 | .2560E+00 |
| 13 | .5580E-02 | -.1870E-01 | -.5400E-02 |
| 14 | .2130E-01 | -.2880E-01 | -.4510E-03 |
| 15 | .6950E-03 | -.1450E-02 | -.1290E-03 |
| 16 | .4260E-02 | -.1160E-01 | -.5240E-02 |
| 17 | -.2040E-02 | .1540E-02 | .1740E-02 |
| 18 | -.2060E+01 | -.2590E+00 | -.6000E+01 |
| 19 | .2880E+00 | -.1180E+00 | .2150E+00 |
| 20 | -.5680E-03 | .8130E-03 | .3050E-03 |
| 21 | -.8940E-02 | .2430E-02 | .4380E-02 |
| 22 | -.8700E-01 | .2370E+00 | .3140E+00 |
| 23 | .1030E-01 | -.1010E-01 | -.1320E-01 |
| 24 | .7500E-05 | -.6290E-05 | -.4780E-05 |
| 25 | .2230E-03 | -.1470E-03 | -.3270E-04 |
| 26 | .1018E+01 | -.6630E+00 | -.5970E+00 |
| 27 | .2520E+00 | -.3500E-01 | .3400E-01 |
| 28 | .4550E+01 | -.2750E+01 | .1240E+01 |
| 29 | -.2450E-01 | .1260E+00 | .8100E-01 |
| 30 | .3320E-01 | .3140E-01 | .1570E-01 |
| 31 | .1230E+01 | .7940E-01 | .4930E+00 |
| 32 | .3840E-01 | .6420E-01 | .3220E-01 |
| 33 | -.2900E+00 | .2720E+00 | .1440E+00 |
| 34 | .1420E+01 | -.1280E+01 | .8420E-01 |
| 35 | .2390E-01 | -.2850E-01 | -.1280E-01 |
| 36 | -.5140E+01 | .8090E+01 | .7020E+01 |
| 37 | -.3960E-02 | .1350E-01 | -.2050E-01 |
| 38 | .9250E+01 | .1580E+02 | .9850E+01 |
| 39 | -.6880E+00 | .3650E+00 | .1060E+00 |
| 40 | .1410E-03 | .1470E-03 | -.3080E-03 |
| 41 | .5250E+00 | -.7780E-01 | .4510E-01 |

TABLE C-5

COEFFICIENTS FOR ALL TERM FIT

BETA = 20.

| J | X | Z | M |
|----|------------|------------|------------|
| 1 | -.1090E+00 | -.3130E+00 | -.2640E+00 |
| 2 | -.4590E-01 | -.9330E-01 | -.6270E-01 |
| 3 | -.1480E+01 | -.6390E+01 | -.1330E+01 |
| 4 | .2310E-01 | -.2070E-01 | -.6100E-01 |
| 5 | -.1180E-01 | -.1640E-02 | -.5840E-02 |
| 6 | -.8080E+00 | -.2150E+01 | -.9720E-01 |
| 7 | .7290E-02 | -.2270E-01 | -.3150E-01 |
| 8 | -.6740E+00 | -.5250E+01 | .4000E+02 |
| 9 | .2210E+00 | .3250E+00 | -.7060E+00 |
| 10 | -.9780E-02 | -.2610E-01 | -.1950E-01 |
| 11 | .2830E-02 | .3770E-01 | -.3040E-01 |
| 12 | .1210E-02 | .2220E-01 | .7050E-02 |
| 13 | -.1290E-03 | -.3350E-03 | -.8920E-04 |
| 14 | -.4310E-02 | .1350E-02 | -.3410E-02 |
| 15 | -.7520E-01 | -.3110E+00 | .1060E-01 |
| 16 | -.1620E-02 | .2710E-02 | .3830E-02 |
| 17 | .7330E-01 | -.7590E-01 | .8600E+01 |
| 18 | .8500E-01 | -.4790E-01 | .2320E-01 |
| 19 | -.2200E-02 | -.4110E-03 | .8320E-03 |
| 20 | -.4460E+01 | .5590E+01 | -.3050E+02 |
| 21 | .5270E+00 | .1940E+01 | .9400E+00 |
| 22 | -.3860E-01 | -.1960E+00 | -.6790E-01 |
| 23 | .9280E-03 | .5360E-02 | .4780E-02 |
| 24 | -.2620E-02 | -.4130E-01 | -.5710E-01 |
| 25 | .3270E-04 | -.1940E-02 | -.5290E-03 |
| 26 | -.6260E-04 | -.2830E-03 | -.1400E-03 |
| 27 | -.9130E-02 | .1440E+01 | -.2060E+00 |
| 28 | -.3420E-02 | -.3580E-01 | -.1120E-01 |
| 29 | .7630E-02 | .2250E+00 | .1870E-01 |
| 30 | .4600E-04 | -.9970E-03 | .2200E-02 |
| 31 | .1580E-05 | .2110E-02 | .7300E-02 |
| 32 | -.5850E-05 | -.1330E-03 | -.1050E-03 |
| 33 | -.2425E+00 | -.5340E+00 | -.1610E+00 |
| 34 | -.2420E+00 | -.2390E+01 | -.1240E+01 |
| 35 | .4070E-03 | .1670E-01 | -.1750E-01 |
| 36 | .3410E-01 | .1190E+00 | .1750E-01 |
| 37 | -.7800E+00 | -.4060E+01 | -.2080E+01 |
| 38 | -.7480E-03 | -.1250E-01 | -.6950E-02 |
| 39 | .2280E+00 | -.8250E+01 | -.3950E+01 |
| 40 | .7230E-01 | .2950E+00 | .2680E+00 |
| 41 | -.5010E+01 | -.2250E+02 | .4390E+01 |
| 42 | -.7370E-01 | -.2580E+00 | -.5180E+00 |
| 43 | -.4790E-01 | -.3200E+00 | -.1370E+00 |
| 44 | .1510E-02 | -.4020E-02 | .1300E-01 |

TABLE C-6

COEFFICIENTS FOR ALL TERM FIT

BETA = 20.

| J | Y | K | N |
|----|------------|------------|------------|
| 1 | .0000E+00 | .0000E+00 | .0000E+00 |
| 2 | -.2820E+00 | .2220E+00 | .9110E-01 |
| 3 | .1280E-02 | -.6980E-02 | .1980E-02 |
| 4 | -.6530E-01 | .3980E-01 | .2380E-01 |
| 5 | .2000E-02 | -.3180E-02 | .2660E-03 |
| 6 | -.4550E+01 | .4030E+01 | .8200E+00 |
| 7 | .4110E-01 | -.4290E-01 | .2860E-01 |
| 8 | .5970E-01 | -.1040E+00 | .1860E-01 |
| 9 | .6480E-03 | -.2530E-02 | -.1370E-02 |
| 10 | .4580E-02 | -.1900E-01 | -.1590E-02 |
| 11 | -.1860E-04 | -.5840E-03 | .1450E-03 |
| 12 | -.8580E+00 | .5780E+00 | .4330E+00 |
| 13 | .8000E-02 | -.1300E-01 | -.3800E-02 |
| 14 | .5640E-02 | -.1890E-01 | .4960E-02 |
| 15 | .6170E-03 | -.1960E-02 | -.1500E-03 |
| 16 | -.9240E-02 | .4890E-01 | .1020E-01 |
| 17 | -.1040E-02 | .5800E-02 | -.1900E-03 |
| 18 | -.1080E+01 | .1840E+01 | -.9810E+01 |
| 19 | .2350E+00 | -.4730E+00 | .3750E+00 |
| 20 | -.4560E-03 | .8180E-03 | .1780E-03 |
| 21 | -.8350E-02 | .5830E-02 | -.3740E-02 |
| 22 | -.5080E-01 | .2080E+00 | .2140E-01 |
| 23 | .2690E-02 | -.7380E-02 | .6010E-03 |
| 24 | .1060E-04 | -.1820E-05 | .3120E-06 |
| 25 | .1660E-03 | -.1740E-03 | .2420E-03 |
| 26 | .3180E+00 | .3060E+00 | -.9590E+00 |
| 27 | -.3380E-01 | .1340E+00 | .1270E-01 |
| 28 | .5360E+01 | -.4910E+01 | .1560E+01 |
| 29 | -.1020E+00 | .1190E+00 | .5120E-01 |
| 30 | -.1370E-01 | -.2060E-01 | .8000E-02 |
| 31 | .7440E-02 | -.9250E+00 | -.3030E+00 |
| 32 | -.1120E-01 | -.3500E-01 | .4730E-01 |
| 33 | -.3240E+00 | .1670E+00 | .1400E+00 |
| 34 | .1800E+01 | -.2000E+01 | -.3160E+00 |
| 35 | .1210E-01 | -.2200E-01 | -.6180E-02 |
| 36 | -.7160E+01 | .6270E+01 | .9570E+01 |
| 37 | .5600E-01 | .4790E-01 | -.1510E-01 |
| 38 | -.9380E+01 | -.7620E+01 | -.2000E+01 |
| 39 | -.8710E+00 | .1600E+01 | .4720E+00 |
| 40 | .1470E-02 | .5060E-03 | .2270E-03 |
| 41 | .1030E+00 | .2300E+00 | .1940E-01 |

APPENDIX D

PROPULSION AND CONTROL SYSTEM RELATIONS

Propulsion and control of most recreational planing craft of interest in this study are propelled by a single unit, the outboard motor, which can be divided into four subsystems, namely, the torque-rpm relation for the engine, the thrust-torque-speed-rpm relation for the propeller, the side force and drag on the rudder and the geometrical relationship defining the propeller thrust direction and the rudder side force and drag directions. These relationships are described in this Appendix.

The torque-rpm relationship for the engine was obtained from a least-squared-error curve fit to non-dimensional measured data for six different size engines, which were supplied by one outboard manufacturer. The data are shown in Table D-1 and Figure 2. At each rpm, the measured torques were averaged giving the values shown in the table, then these averages were fitted with a quadratic in engine rpm giving the coefficients shown in Table D-1. The dimensionless values of torque predicted by this fit are shown in the table and plotted in Figure 2. The maximum fitting error compared with averaged torques is seen to be 3.1 percent of the average rated torque and the root mean square error of the fit is 1.2 percent of the average rated torque. The data scatter for the individual engines is seen to be larger than that of the averaged data and some engines are seen to be consistently higher or lower than the fit of the averaged data. Consequently, for accurate engine speed predictions with a particular engine it may be more appropriate to fit the data for that engine. The data shown in Table D-1 and Figure 2 were obtained with finely-tuned, new engines at full throttle. To simulate partial throttle settings of actual outboards, the rated horsepower HP_{ER} was reduced, with constant values of n_{ER} , b_1 , b_2 and b_3 . Additional engine data are needed to substantiate this assumption. Engine stall characteristics and high engine speed limitations should be included to complete the engine characterization. However, for the purposes of this study, the overall average fit was used

since engine speed per se was not essential but rather boat speed reduction at constant power in a turn was required.

The propeller characteristics were assumed to be given by the charts presented in Reference 7, for the case of no cavitation. The thrust coefficient, K_T , and torque coefficient, K_Q , for a pitch ratio of 1.2 were fitted with quadratic functions of propeller advance coefficient, J_p , as shown in Table D-2, for five different blade area ratios, BAR. The rms errors of the fits are seen to be well within acceptable limits (less than two percent of K_{T0} and K_{Q0} , for example). It was assumed that the forces and moments due to the propeller were only the thrust force along the propeller axis and a torque about that axis. No interactions between rudder and propeller or between hull and propeller were included. The latter assumption is probably valid for outboard engines since the propeller is usually more than one diameter aft of the transom. The importance of propeller-rudder interactions however should be investigated further as well, as the significance of side or vertical forces on the propeller due to inclined flow. In both of these cases, there may be sufficient data available to estimate the importance of these effects.

The side force and drag on the rudder was assumed to be described by a lift coefficient C_{LR} and drag coefficient C_{DR} which were estimated from finite aspect ratio wing theory. The expressions used are

$$C_{LR} = \frac{2\pi A_R \alpha_R}{A_R + 2} \quad (D-1)$$

and

$$C_{DR} = C_{DoR} + \frac{C_{LR}^2}{\pi A_R} \quad (D-2)$$

where A_R was taken as the aspect ratio of the side elevation of the lower unit of the outboard motor, below the ventilation plate and α_R is the inflow angle of attack in a plane normal to the engine turning axis. The free water surface was assumed to have no effect on the rudder side force and drag as was the ventilation plate, the propeller and the hull. Measurements of actual rudder forces are needed to verify these assumptions.

To complete the description of the effects of this propulsion and control system, the geometric relationship defining the engine position, tilt

and turn are required. If $(\xi_{TP}^i, 0, \zeta_{TP}^i)$ are the dimensionless coordinates of the engine tilt pin in hull axes (a single engine on centerline was assumed here), and if $(\xi_{TA}^i, 0, \zeta_{TA}^i)$ are the distances at zero tilt angle (propeller shaft parallel to keel) from the tilt pin axis to the point of application of propeller thrust, parallel to the hull axes, then the hull coordinates (x_T^i, y_T^i, z_T^i) of the point of application of propeller thrust are given by

$$\begin{aligned}x_T^i &= \xi_{TP}^i + \xi_{TA}^i \cos \theta_p + \zeta_{TA}^i \sin \theta_p \\y_T^i &= 0 \\z_T^i &= \zeta_{TP}^i - \xi_{TA}^i \sin \theta_p + \zeta_{TA}^i \cos \theta_p\end{aligned}\tag{D-3}$$

where θ_p is the engine tilt angle, positive for lower unit forward. Then letting $(\xi_{RP}^i, 0, \zeta_{RP}^i)$ represent the distance from the point of thrust application to the point of rudder force application, the hull coordinates (x_R^i, y_R^i, z_R^i) of the point of application of rudder forces are given by

$$\begin{aligned}x_R^i &= x_T^i + \xi_{RP}^i \cos \theta_p \cos \psi_p + \zeta_{RP}^i \sin \theta_p \\y_R^i &= y_T^i - \xi_{RP}^i \sin \psi_p \\z_R^i &= z_T^i - \xi_{RP}^i \sin \theta_p \cos \psi_p + \zeta_{RP}^i \cos \theta_p\end{aligned}\tag{D-4}$$

where ψ_p is the engine turn angle such that a positive ψ_p results in a turn to starboard. With (u^i, v^i, w^i) denoting the hull velocity components and (p^i, q^i, r^i) denoting the hull rotational velocity components in hull fixed axes, the corresponding velocity components at the propeller are given by

$$\begin{aligned}u_p^i &= u^i + z_T^i q^i - y_T^i r^i \\v_p^i &= v^i + x_T^i r^i - z_T^i p^i \\w_p^i &= w^i + y_T^i p^i - x_T^i q^i\end{aligned}\tag{D-5}$$

while at the rudder the corresponding velocity components are given by

$$\begin{aligned}u_R^i &= u^i + z_R^i q^i - y_R^i r^i \\v_R^i &= v^i + x_R^i r^i - z_R^i p^i \\w_R^i &= w^i + y_R^i p^i - x_R^i q^i\end{aligned}\tag{D-6}$$

The propeller speed of advance was taken as the velocity component parallel to the propeller axis at (x_T^i, y_T^i, z_T^i) which is given by

$$V_{PA}^i = u_p^i \cos \theta_p \cos \psi_p - v_p^i \sin \psi_p - w_p^i \sin \theta_p \cos \psi_p \quad (D-7)$$

which leads to the propeller advance coefficient J_p in the form

$$J_p = 2\pi V_{PA}^i / \omega_p^i D_p^i \quad (D-8)$$

where ω_p^i is the dimensionless propeller rotational speed and D_p^i is the dimensionless propeller diameter. Once J_p is defined, the propeller thrust and torque coefficients can be calculated from the results shown in Table D-2 and the corresponding dimensionless thrust and torque are given by

$$\begin{aligned} T_p^i &= \omega_p^{i2} D_p^{i4} K_T / 2\pi^2 \\ Q_p^i &= -\omega_p^{i2} D_p^{i5} K_Q / 2\pi^2 \end{aligned} \quad (D-9)$$

The corresponding forces and moments in hull coordinates then are obtained from

$$\begin{aligned} X_p^i &= T_p^i \cos \theta_p \cos \psi_p \\ Y_p^i &= -T_p^i \sin \psi_p \\ Z_p^i &= -T_p^i \sin \theta_p \cos \psi_p \\ K_p^i &= Q_p^i \cos \theta_p \cos \psi_p + y_T^i Z_p^i - z_T^i Y_p^i \\ M_p^i &= -Q_p^i \sin \psi_p + z_T^i X_p^i - x_T^i Z_p^i \\ N_p^i &= -Q_p^i \sin \theta_p \cos \psi_p + x_T^i Y_p^i - y_T^i X_p^i \end{aligned} \quad (D-10)$$

Similarly, the rudder speed of advance is given by

$$V_{RA}^i = u_R^i \cos \theta_p \cos \psi_p - v_R^i \sin \psi_p - w_R^i \sin \theta_p \cos \psi_p \quad (D-11)$$

and the velocity component normal to the rudder centerline plane at the point (x_R^i, y_R^i, z_R^i) is given by

$$V_{RN}^i = u_R^i \cos \theta_p \sin \psi_p + v_R^i \cos \psi_p - w_R^i \sin \theta_p \sin \psi_p \quad (D-12)$$

so that the rudder angle of attack is

$$\alpha_R = \arctan (V_{RN}^i / V_{RA}^i) \quad (D-13)$$

from which the lift and drag coefficients can be calculated using Eqs. (D-1) and (D-2). The corresponding dimensionless lift and resistance are

$$\begin{aligned} L_R^i &= -(V_{RN}^i{}^2 + V_{RA}^i{}^2) S_R^i C_{LR} \\ R_R^i &= -(V_{RN}^i + V_{RA}^i) S_R^i (C_{DoR} + C_{LR}^2 / \pi A_R) \end{aligned} \quad (D-14)$$

which are assumed to act normal and parallel to the inflow velocity component in a plane normal to the engine turn axis. The normal and drag force components are then

$$\begin{aligned} N_{FR}^i &= R_R^i \sin \alpha_R + L_R^i \cos \alpha_R \\ D_{FR}^i &= R_R^i \cos \alpha_R - L_R^i \sin \alpha_R \end{aligned} \quad (D-15)$$

acting normal and parallel to the rudder centerline plane, at the point (x_R^i, y_R^i, z_R^i) . Finally, the corresponding force and moment components in hull coordinates are given by

$$\begin{aligned} X_R^i &= D_{FR}^i \cos \theta_P \cos \psi_P + N_{FR}^i \cos \theta_P \sin \psi_P \\ Y_R^i &= -D_{FR}^i \sin \psi_P + N_{FR}^i \cos \psi_P \\ Z_R^i &= -D_{FR}^i \sin \theta_P \cos \psi_P - N_{FR}^i \sin \theta_P \sin \psi_P \\ K_R^i &= y_R^i z_R^i - z_R^i y_R^i \\ M_R^i &= z_R^i x_R^i - x_R^i z_R^i \\ N_R^i &= x_R^i y_R^i - y_R^i x_R^i \end{aligned} \quad (D-16)$$

The engine speed ω_E^i is determined by the propeller speed ω_P^i and the gear ratio γ_E in the form

$$\omega_E^i = \gamma_E \omega_P^i \quad (D-17)$$

and the engine torque is then given by

$$Q_E^i = Q_{ER}^i \left[1 + b_1 + b_2 \left(\frac{\omega_E^i - \omega_{ER}^i}{\omega_{ER}^i} \right) + b_3 \left(\frac{\omega_E^i - \omega_{ER}^i}{\omega_{ER}^i} \right)^2 \right] \quad (D-18)$$

where ω_{ER}^i is the dimensionless engine speed at the rated rpm and Q_{ER}^i is given by

$$Q_{ER}^i = HP_{ER}^i / \omega_{ER}^i \quad (D-19)$$

where HP_{ER}^i is the dimensionless rated power, for the case of full throttle or a reduced value for partial throttle settings.

TABLE D-1

MEASURED TORQUE-SPEED CHARACTERISTICS
FOR OUTBOARD ENGINES

$$\text{Dimensionless Torque} = \frac{Q_E - Q_{ER}}{Q_{ER}}$$

| $\frac{n_E - n_{ER}}{n_{ER}}$ | -0.6 | -0.5 | -0.4 | -0.3 | -0.2 | -0.1 | 0 | 0.1 | 0.2 |
|-------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Engine | | | | | | | | | |
| A | -0.131 | -0.124 | -0.062 | -0.024 | -0.088 | -0.105 | -0.136 | -0.176 | |
| B | -0.265 | -0.219 | -0.156 | -0.057 | 0 | 0.008 | -0.040 | -0.105 | |
| C | -0.288 | -0.170 | -0.064 | 0.142 | 0.067 | 0.085 | 0.038 | -0.057 | |
| D | -0.147 | -0.094 | 0.019 | 0.041 | 0 | -0.059 | -0.112 | -0.182 | -0.221 |
| E | -0.478 | -0.148 | -0.044 | 0.068 | 0.087 | 0.053 | -0.026 | -0.122 | -0.210 |
| F | -0.383 | -0.254 | -0.223 | -0.124 | -0.092 | -0.112 | -0.087 | -0.122 | -0.228 |
| Average | -0.282 | -0.168 | -0.088 | 0.007 | -0.004 | -0.022 | -0.060 | -0.127 | -0.220 |
| Fit | -0.281 | -0.164 | -0.078 | -0.024 | -0.002 | -0.011 | -0.052 | -0.124 | -0.228 |
| Error | -0.001 | -0.004 | -0.010 | 0.031 | -0.002 | -0.011 | -0.008 | -0.003 | 0.008 |

RMS Error = 0.012

 n_E = engine speed (rpm) Q_E = engine torque (ft-lb) n_{ER} = engine speed at rated power = 5000 rpm Q_{ER} = engine torque at rated power given by

$$Q_{ER} = \frac{33000 \times \text{HP}_{ER}}{2\pi n_{ER}}$$

 HP_{ER} = rated power.

$$\frac{Q_E - Q_{ER}}{Q_{ER}} = b_1 + b_2 \left(\frac{n_E - n_{ER}}{n_{ER}} \right) + b_3 \left(\frac{n_E - n_{ER}}{n_{ER}} \right)^2$$

$$b_1 = -0.05170$$

$$b_2 = -0.5658$$

$$b_3 = -1.5803$$

TABLE D-2

PROPELLER THRUST AND TORQUE
NO CAVITATION, PITCH RADIUS = 1.2

| BAR | K_{T0} | K_{TJ} | K_{TJJ} | RMS Error | K_{Q0} | K_{QJ} | K_{QJJ} | RMS Error |
|------|----------|----------|-----------|--------------|----------|-----------|-----------|--------------|
| 0.50 | 0.317 | -0.04754 | 0.0001786 | 0.0026 | 0.0580 | -0.008286 | 0.0001429 | 0.00044 |
| 0.65 | 0.339 | -0.05739 | 0.0008928 | 0.0037 | 0.0620 | -0.009536 | 0.0001786 | 0.00034 |
| 0.80 | 0.349 | -0.06025 | 0.0008929 | 0.0020 | 0.0670 | -0.01125 | 0.0003214 | 0.00015 |
| 0.95 | 0.367 | -0.06754 | 0.001607 | 0.0014 | 0.0703 | -0.01275 | 0.0004821 | 0.00026 |
| 1.10 | 0.397 | -0.08289 | 0.003393 | 0.0026 | 0.0754 | -0.01397 | 0.0005714 | 0.00032 |

$$K_T = K_{T0} + J_P K_{TJ} + J_P^2 K_{TJJ}$$

$$K_Q = K_{Q0} + J_P K_{QJ} + J_P^2 K_{QJJ}$$

APPENDIX E
APPLICATIONS

Three applications of the relations derived in this study were carried out and the equations used and results obtained are described in this section. Equilibrium conditions for straight course operation were calculated from pitch and heave equilibrium. At these equilibrium conditions the directional stability was calculated for the case of fixed roll. Finally, turning equilibrium conditions were calculated with six-degrees-of-freedom together with engine-propeller torque equilibrium.

To find the straight course equilibrium condition, the dimensionless heave and pitch equations in hull fixed coordinates are given by

$$\begin{aligned} Z_H^i + 2C_\Delta \cos\theta &= 0 \\ M_H^i - 2C_\Delta(x_G^i \cos\theta + z_G^i \sin\theta) &= 0 \end{aligned} \tag{E-1}$$

where C_Δ is the planing load coefficient and $(x_G^i, 0, z_G^i)$ are the coordinates of the center of gravity in hull coordinates. The heave force Z_H^i and pitch moment M_H^i can be evaluated using the transformation shown in Eqs. (B-1) and (B-2) where X_S^i , Z_S^i and M_S^i are given by the least-squared-error fits described in Appendix C. The parameters describing the straight course equilibrium are $(C_V, \theta, C_\Delta, z_T^i)$ so by specifying two of these parameters, the remaining two values at equilibrium can be calculated from Eqs. (E-1). Since these equations are nonlinear, an iterative solution technique was developed using the Newton-Raphson technique to update an initial guess at the unknown values. It was found that the numerical solution technique was most often successful when C_Δ and z_T^i were considered unknown and C_V and θ were specified. A series of calculations were carried out for the three deadrises tested and for center of gravity location given by

$$\begin{aligned} x_G^i &= 0.8, \quad 1.2, \quad 1.6 \\ z_G^i &= -0.5, \quad -0.75, \quad -1.0 \end{aligned}$$

The results are shown in Tables E-1 through E-24. Also shown is the dimensionless effective horsepower, EHP, obtained from the relation

$$EHP = |X_S^1| C_V \quad (E-2)$$

evaluated at the equilibrium condition. (For the present illustration, no correction is included for extrapolating these drag data to full-scale Reynolds numbers.)

Although the data listed in Appendix A and the least squared error fits described in Appendix C require additional analysis as described in the main text, the usefulness of the final results in the design of recreational planing craft can be demonstrated by the following design problem. Suppose a designer wishes to evaluate the equilibrium trim, draft and power for a craft with the following characteristics:

| | |
|------------------------|------|
| Beam, ft | 6 |
| Deadrise, deg | 15 |
| LCG, ft fwd of transom | 7.2 |
| VCG, ft above baseline | 3.0 |
| Speed, knots | 41 |
| Weight, lb | 2800 |

The corresponding dimensionless quantities are evaluated as follows:

$$x_G^1 = 7.2 \text{ ft} / 6 \text{ ft} = 1.2$$

$$z_G^1 = -3.0 \text{ ft} / 6 \text{ ft} = -0.5$$

$$C_V = 41.0 \text{ knots} \times 1.689 \frac{\text{ft/sec}}{\text{knot}} / \sqrt{32.2 \frac{\text{ft}}{\text{sec}^2} \times 6 \text{ ft}} = 4.98$$

$$C_\Delta = 2800 \text{ lb} / 62.4 \frac{\text{lb}}{\text{ft}^3} \times (6 \text{ ft})^3 = 0.208$$

The equilibrium conditions for the given deadrise and center of gravity location are listed in Table E-13 where for $C_V = 5$, the values of C_Δ, θ, z_T^1 and EHP^1 which straddle the desired value of C_Δ are

| C_Δ | θ | z_T^1 | EHP^1 |
|------------|----------|---------|---------|
| 0.196 | 2 | 0.076 | 0.826 |
| 0.326 | 3 | 0.099 | 0.926 |

By linear interpolation the desired values of trim, draft and power in dimensionless form are found to be

$$\theta = 2.00 + \frac{(0.208-0.196)}{0.326-0.196} (3.00-2.00) = 2.06$$

$$z_T^1 = 0.076 + \frac{(0.208-0.196)}{0.326-0.196} (0.099-0.076) = 0.078$$

$$\text{EHP}^1 = 0.826 + \frac{(0.208-0.196)}{0.326-0.196} (0.926-0.826) = 0.835$$

and the corresponding dimensional values of draft and power are

$$z_T = 0.078 \times 6 \text{ ft} = 0.47 \text{ ft}$$

$$\text{EHP} = 0.835 \times \frac{62.4}{2} \frac{\text{lb}}{\text{ft}^3} \times (6 \text{ ft})^3 \times \sqrt{32.2 \frac{\text{ft}}{\text{sec}^2} \times 6 \text{ ft}} \times \frac{1}{550} \frac{\text{HP}}{\text{ft lb/sec}} = 142$$

Allowing for a propeller efficiency of 70 percent and a gear and transmission efficiency of 85 percent yields an engine horsepower of about 240 for this design. Since the drag used to calculate the dimensionless EHP in these tables is for the model Reynolds number, this horsepower is somewhat higher than would actually be required. However the above example illustrates the usefulness of these empirical results.

The directional stability of each straight course equilibrium condition was calculated from the linearized equations of motion in sideslip and yaw. In dimensionless form, these equations are

$$2C_{\Delta}^{\dot{v}^1} + 2C_{\Delta}^{\dot{r}^1} = (Y_{Hr}^1 + Y_{Rv}^1)\tilde{v}^1 + (v_{Hr}^1 + Y_{Rr}^1 - 2C_{\Delta}^{\dot{v}^1} \cos\theta)\tilde{r}^1 \quad (\text{E-3})$$

$$2C_{\Delta}^{\dot{v}^1} + 2C_{\Delta}^{\dot{r}^1} = (N_{Hv}^1 + N_{Rv}^1)\tilde{v}^1 + (N_{Hr}^1 + N_{Rr}^1 - 2C_{\Delta}^{\dot{v}^1} \cos\theta)\tilde{r}^1$$

where " $\tilde{\sim}$ " denotes a small perturbation, " $\dot{\sim}$ " denotes time differentiation, subscript " v " denotes the hydrodynamic force or moment derivative with respect to v^1 ; similarly, " r " denotes the derivative with respect to r^1 , subscript " H " are hull forces and moments while subscript " R " denotes rudder forces and moments. These force and moment derivatives are evaluated at the equilibrium condition so that $w^1 = \varphi = \beta = 0$ while C_V , θ and z_T^1 are the values given in each line of the tables. Using the results in Appendices B and D, it is seen that

$$Y'_{Hv} = \frac{\partial}{\partial v'} Y'_S$$

$$Y'_{Rv} = -2\pi A_R S'_R C'_V \cos\theta / (A_R + 2)$$

$$Y'_{Hr} = \frac{\partial}{\partial \omega'} Y'_S$$

$$Y'_{Rr} = x'_R Y'_{Rv}$$

(E-4)

$$N'_{Hv} = \frac{\partial}{\partial v'} K'_S \sin\theta + \frac{\partial}{\partial v'} N'_S \cos\theta + x'_{RS} Y'_{Hv}$$

$$N'_{Rv} = x'_R Y'_{Rv}$$

$$N'_{Hr} = \frac{\partial}{\partial \omega'} K'_S \sin\theta + \frac{\partial}{\partial \omega'} N'_S \cos\theta + x'_{RS} Y'_{Hr}$$

$$N'_{Rr} = x'^a_R Y'_{Rv}$$

The directional stability roots are then obtained by finding the roots of the second order characteristic equation for the equations of motion (E-3). A root with positive real part indicates an unstable response while a negative real part means the equilibrium condition is directionally stable. Also, a complex root indicates an oscillatory uncontrolled response while a real root means the response will give an exponential response.

The trends observed in the results listed in Tables E-1 through E-24 agree with previous experience with planing craft. The equilibrium conditions and directional stability are not sensitive to VCG. As the LCG moves forward, at constant deadrise, speed and trim, the load coefficient increases, the draft increases, the required power increases, and the craft becomes more directionally stable (that is, the real part of the stability roots moves toward more negative values). Increasing deadrise for the same CG position and load yields an increase in draft and power, while the trim may increase or decrease.

Turning equilibrium conditions were evaluated using six force and moment equations together with engine-propeller torque equilibrium and zero vertical velocity. In dimensionless form,

$$x'_H + x'_R + x'_P + x'_G - 2C_\Delta [q'w' - r'v' - x'_G(q'^2 + r'^2) + y'_G p'q' + z'_G p'r'] = 0 \quad (E-5)$$

[Cont'd]

$$\begin{aligned}
Y_H^i + Y_R^i + Y_P^i + Y_G^i - 2C_{\Delta} [r^i u^i - p^i w^i - y_G^i (r^{i2} + p^{i2}) + z_G^i q^i r^i + x_G^i q^i p^i] &= 0 \\
Z_H^i + Z_R^i + Z_P^i + Z_G^i - 2C_{\Delta} [p^i v^i - q^i u^i - z_G^i (p^{i2} + q^{i2}) + x_G^i r^i p^i + y_G^i r^i q^i] &= 0 \\
K_H^i + K_R^i + K_P^i + K_G^i - 2C_{\Delta} [(R_Z^{i2} - R_Y^{i2}) q^i r^i + y_G^i (p^i v^i - q^i u^i) - z_G^i (r^i u^i - p^i w^i)] &= 0 \\
M_H^i + M_R^i + M_P^i + M_G^i - 2C_{\Delta} [(R_X^{i2} - R_Z^{i2}) r^i p^i + z_G^i (q^i w^i - r^i v^i) - x_G^i (p^i v^i - q^i u^i)] &= 0 \\
N_H^i + N_R^i + N_P^i + N_G^i - 2C_{\Delta} [(R_Y^{i2} - R_X^{i2}) p^i q^i + x_G^i (r^i u^i - p^i w^i) - y_G^i (q^i w^i - r^i v^i)] &= 0 \\
Q_P^i + \eta_E Y_E Q_E^i &= 0
\end{aligned} \tag{E-5}$$

$$-u^i \sin \theta + v^i \sin \varphi \cos \theta + w^i \cos \varphi \cos \theta = 0$$

where η_E is the ratio of power input to the propeller to the power output of the engine, which accounts for gearing and transmission losses, and where subscript "G" denotes force and moment components due to gravitational force in hull coordinates, which are given by

$$\begin{aligned}
X_G^i &= -2C_{\Delta} \sin \theta \\
Y_G^i &= 2C_{\Delta} \cos \theta \sin \varphi \\
Z_G^i &= 2C_{\Delta} \cos \theta \cos \varphi \\
K_G^i &= y_G^i Z_G^i - z_G^i Y_G^i \\
M_G^i &= z_G^i X_G^i - x_G^i Z_G^i \\
N_G^i &= x_G^i Y_G^i - y_G^i X_G^i
\end{aligned} \tag{E-6}$$

The hull force and moment components denoted by subscript "H" were evaluated using the balance to hull transformation in Appendix B together with the coefficients and fitting functions listed in Appendices C and B, respectively. The rudder and propeller force and moment components denoted by subscripts "R" and "P" were evaluated by means of the analytical results shown in Appendix D as were the propeller and engine torque Q_P^i and Q_E^i . In satisfying the eight equations, (E-5), the following parameters were considered the unknowns:

$$C_V, \theta, z_T^i, C_{\Delta}, \omega_P^i, HP_{ER}^i, \omega^i, \alpha, \varphi, \psi_P, \beta \tag{E-7}$$

where α is the angle of attack of the projection of the resultant velocity

vector in the hull centerline plane with respect to the x-axis and β is the angle between this projection and the resultant velocity vector. The rectilinear and rotational velocity components in hull coordinates are then given by

$$\begin{aligned} u' &= C_V \cos \alpha \cos \beta & p' &= -\omega' \sin \theta \\ v' &= -C_V \sin \beta & q' &= \omega' \cos \theta \sin \varphi \\ w' &= C_V \sin \alpha \cos \beta & r' &= \omega' \cos \theta \cos \varphi \end{aligned} \quad (\text{E-8})$$

for the case of a steady turn with turning rate ω' . The sideslip angle β was eliminated as an unknown by solving the last of Eqs.(E-5) which gives

$$\beta = \arctan \left(\frac{\sin \alpha \cos \varphi \cos \theta - \cos \alpha \sin \theta}{\sin \varphi \cos \theta} \right) \quad (\text{E-9})$$

The remaining seven of Eqs.(E-5) were used to find equilibrium values for seven of the unknowns (E-7) for given values of three of these unknowns.

The craft chosen for this illustration was used in a full-scale turning test program reported in Reference 9. Craft parameters used here are listed in Table E-26. Straight course equilibrium conditions are shown in lines 1 through 14 of Table E-26 as well as lines 24 and 29, as computed from Eqs. (E-5) for given values of C_V , C_Δ and ω' . The straight course equilibrium conditions in Table E-26 are in very good agreement with those estimated by interpolation from Tables E-1 through E-24. Consequently, the simplifications assumed in using only the pitch and heave equations are justified for estimating straight course equilibrium conditions.

In lines 1 through 6 of Table E-26, it is seen that as speed coefficient increases at constant load on straight course, the equilibrium trim angle is reduced, the draft decreases, the propeller rpm increases, the required power setting increases, the angle of attack is very nearly the same as the trim, the roll angle increases, and the very small engine angle required to maintain straight course increases. Comparing lines 2, 7 and 8 in Table E-26 shows that increasing load at constant speed on straight course requires greater trim angle at equilibrium, greater draft, higher propeller speed and power setting, yields larger roll angle but requires less engine turn angle to maintain straight course. In lines 9 through 14 together with lines 2, 3 and 4, the effect of deadrise at different speeds for the same

load on straight course is seen to have a scattered effect on equilibrium trim angle, while draft increases with deadrise. Propeller rpm and power setting also do not change monotonically with deadrise nor roll angle.

In lines 15 through 32, the engine turn angle is increased from the straight course value for four different cases, where C_{Δ} and HP_{ER}^1 were held constant in each case. As engine turn angle increases, speed decreases and trim decreases. For straight course speed coefficients 3.836 and 4, the draft increases with engine turn angle while for a straight course speed coefficient of 2.850 the draft decreases as engine turn angle increases. The propeller rpm decreases, the turning rate increases, the angle of attack decreases, and the roll angle increases except for lines 19 through 23 where the roll angle increases to 4.5 degrees, then drops off and increases again as engine turn angle increases. With the exception of this last trend, all parameters change in the expected manner.

In attempting to find solutions of Eqs.(E-5) for engine turn angles larger than those shown in Table E-26, unexplained difficulties arose giving unrealistic solutions. The source of these difficulties could possibly be the same inconsistencies in the planing data described previously. However, the results obtained are considered encouraging in that the trends of trim, roll, speed, rpm and draft are correctly predicted and the results appear reasonable. Again, for more accurate and reliable results, further work on the data reduction is recommended, followed by an investigation of any difficulties in solving Eqs.(E-5).

TABLE E-1

STRAIGHT COURSE EQUILIBRIUM AND STABILITY

BETA=10. DEG XG= .8 ZG=-0.50

| CV | T | CDEL | DRAFT | EHP | DIRECTIONAL STABILITY ROOTS | | | |
|----|----|-------|-------|-------|-----------------------------|----------|-----------|----------|
| | | | | | REAL | IMAG | REAL | IMAG |
| 2. | 2. | .084 | .058 | 0.091 | .775E+00 | .000E+00 | -.298E+00 | .000E+00 |
| 2. | 3. | .086 | .078 | 0.074 | -.490E-01 | .000E+00 | -.373E+00 | .000E+00 |
| 2. | 4. | .116 | .096 | 0.088 | .994E+00 | .000E+00 | -.230E+00 | .000E+00 |
| 2. | 5. | .159 | .107 | 0.116 | .433E+01 | .000E+00 | -.237E+00 | .000E+00 |
| 2. | 6. | .204 | .113 | 0.139 | .988E+01 | .000E+00 | -.244E+00 | .000E+00 |
| 3. | 2. | .088 | .056 | 0.171 | .112E+01 | .000E+00 | -.342E+00 | .000E+00 |
| 3. | 3. | .118 | .070 | 0.162 | .911E-01 | .000E+00 | -.258E+00 | .000E+00 |
| 3. | 4. | .183 | .086 | 0.203 | .131E+01 | .000E+00 | -.302E+00 | .000E+00 |
| 3. | 5. | .273 | .103 | 0.270 | .472E+01 | .000E+00 | -.368E+00 | .000E+00 |
| 3. | 6. | .375 | .117 | 0.339 | .103E+02 | .000E+00 | -.422E+00 | .000E+00 |
| 4. | 2. | .102 | .049 | 0.290 | .150E+01 | .000E+00 | -.380E+00 | .000E+00 |
| 4. | 3. | .164 | .063 | 0.309 | .335E+00 | .000E+00 | -.164E+00 | .000E+00 |
| 4. | 4. | .273 | .080 | 0.410 | .163E+01 | .000E+00 | -.281E+00 | .000E+00 |
| 4. | 5. | .422 | .101 | 0.563 | .511E+01 | .000E+00 | -.434E+00 | .000E+00 |
| 4. | 6. | .594 | .123 | 0.729 | .108E+02 | .000E+00 | -.559E+00 | .000E+00 |
| 5. | 2. | .098 | .045 | 0.463 | .198E+01 | .000E+00 | -.435E+00 | .000E+00 |
| 5. | 3. | .202 | .059 | 0.552 | .723E+00 | .000E+00 | -.137E+00 | .000E+00 |
| 5. | 4. | .373 | .080 | 0.783 | .193E+01 | .000E+00 | -.183E+00 | .000E+00 |
| 5. | 5. | .602 | .107 | 1.110 | .547E+01 | .000E+00 | -.429E+00 | .000E+00 |
| 5. | 6. | .858 | .137 | 1.473 | .112E+02 | .000E+00 | -.664E+00 | .000E+00 |
| 6. | 2. | .062 | .044 | 0.761 | .258E+01 | .000E+00 | -.557E+00 | .000E+00 |
| 6. | 3. | .230 | .062 | 1.014 | .125E+01 | .000E+00 | -.195E+00 | .000E+00 |
| 6. | 4. | .491 | .089 | 1.509 | .220E+01 | .000E+00 | -.232E-01 | .000E+00 |
| 6. | 5. | .815 | .125 | 2.177 | .577E+01 | .000E+00 | -.376E+00 | .000E+00 |
| 6. | 6. | 1.129 | .172 | 2.913 | .116E+02 | .000E+00 | -.843E+00 | .000E+00 |

TABLE E-2

STRAIGHT COURSE EQUILIBRIUM AND STABILITY

BETA=10. DEG XG= .8 ZG=-0.75

| CV | T | CDEL | DRAFT | EHP | DIRECTIONAL STABILITY ROOTS | | | |
|----|----|-------|-------|-------|-----------------------------|----------|-----------|----------|
| | | | | | REAL | IMAG | REAL | IMAG |
| 2. | 2. | .084 | .057 | 0.091 | .770E+00 | .000E+00 | -.304E+00 | .000E+00 |
| 2. | 3. | .085 | .077 | 0.074 | -.469E-01 | .000E+00 | -.384E+00 | .000E+00 |
| 2. | 4. | .113 | .094 | 0.087 | .985E+00 | .000E+00 | -.231E+00 | .000E+00 |
| 2. | 5. | .154 | .104 | 0.114 | .431E+01 | .000E+00 | -.235E+00 | .000E+00 |
| 2. | 6. | .196 | .108 | 0.135 | .986E+01 | .000E+00 | -.238E+00 | .000E+00 |
| 3. | 2. | .088 | .055 | 0.170 | .112E+01 | .000E+00 | -.342E+00 | .000E+00 |
| 3. | 3. | .117 | .069 | 0.160 | .919E-01 | .000E+00 | -.263E+00 | .000E+00 |
| 3. | 4. | .178 | .084 | 0.199 | .131E+01 | .000E+00 | -.303E+00 | .000E+00 |
| 3. | 5. | .264 | .100 | 0.263 | .471E+01 | .000E+00 | -.364E+00 | .000E+00 |
| 3. | 6. | .361 | .112 | 0.327 | .103E+02 | .000E+00 | -.411E+00 | .000E+00 |
| 4. | 2. | .102 | .049 | 0.288 | .150E+01 | .000E+00 | -.381E+00 | .000E+00 |
| 4. | 3. | .161 | .062 | 0.304 | .340E+00 | .000E+00 | -.171E+00 | .000E+00 |
| 4. | 4. | .265 | .078 | 0.400 | .162E+01 | .000E+00 | -.283E+00 | .000E+00 |
| 4. | 5. | .407 | .097 | 0.543 | .510E+01 | .000E+00 | -.427E+00 | .000E+00 |
| 4. | 6. | .570 | .117 | 0.697 | .108E+02 | .000E+00 | -.541E+00 | .000E+00 |
| 5. | 2. | .097 | .044 | 0.461 | .198E+01 | .000E+00 | -.436E+00 | .000E+00 |
| 5. | 3. | .197 | .058 | 0.543 | .733E+00 | .000E+00 | -.148E+00 | .000E+00 |
| 5. | 4. | .361 | .078 | 0.759 | .194E+01 | .000E+00 | -.192E+00 | .000E+00 |
| 5. | 5. | .579 | .102 | 1.065 | .547E+01 | .000E+00 | -.422E+00 | .000E+00 |
| 5. | 6. | .827 | .130 | 1.403 | .112E+02 | .000E+00 | -.635E+00 | .000E+00 |
| 6. | 2. | .061 | .044 | 0.758 | .258E+01 | .000E+00 | -.557E+00 | .000E+00 |
| 6. | 3. | .224 | .061 | 0.998 | .127E+01 | .000E+00 | -.208E+00 | .000E+00 |
| 6. | 4. | .475 | .086 | 1.463 | .222E+01 | .000E+00 | -.420E-01 | .000E+00 |
| 6. | 5. | .789 | .120 | 2.092 | .577E+01 | .000E+00 | -.364E+00 | .000E+00 |
| 6. | 6. | 1.110 | .162 | 2.794 | .116E+02 | .000E+00 | -.776E+00 | .000E+00 |

TABLE E-3

STRAIGHT COURSE EQUILIBRIUM AND STABILITY

BETA=10. DEG XG= .8 ZG=-1.00

| CV | T | CDEL | DRAFT | EHP | DIRECTIONAL STABILITY ROOTS | | | |
|----|----|-------|-------|-------|-----------------------------|----------|-----------|----------|
| | | | | | REAL | IMAG | REAL | IMAG |
| 2. | 2. | .084 | .055 | 0.091 | .763E+00 | .000E+00 | -.311E+00 | .000E+00 |
| 2. | 3. | .083 | .075 | 0.074 | -.445E-01 | .000E+00 | -.397E+00 | .000E+00 |
| 2. | 4. | .110 | .092 | 0.086 | .976E+00 | .000E+00 | -.233E+00 | .000E+00 |
| 2. | 5. | .148 | .101 | 0.111 | .430E+01 | .000E+00 | -.233E+00 | .000E+00 |
| 2. | 6. | .188 | .103 | 0.130 | .985E+01 | .000E+00 | -.232E+00 | .000E+00 |
| 3. | 2. | .087 | .055 | 0.170 | .112E+01 | .000E+00 | -.343E+00 | .000E+00 |
| 3. | 3. | .115 | .068 | 0.159 | .929E-01 | .000E+00 | -.268E+00 | .000E+00 |
| 3. | 4. | .174 | .083 | 0.196 | .130E+01 | .000E+00 | -.303E+00 | .000E+00 |
| 3. | 5. | .255 | .097 | 0.256 | .470E+01 | .000E+00 | -.360E+00 | .000E+00 |
| 3. | 6. | .346 | .108 | 0.315 | .103E+02 | .000E+00 | -.401E+00 | .000E+00 |
| 4. | 2. | .101 | .049 | 0.287 | .150E+01 | .000E+00 | -.381E+00 | .000E+00 |
| 4. | 3. | .158 | .061 | 0.300 | .345E+00 | .000E+00 | -.179E+00 | .000E+00 |
| 4. | 4. | .257 | .078 | 0.390 | .162E+01 | .000E+00 | -.286E+00 | .000E+00 |
| 4. | 5. | .391 | .094 | 0.523 | .510E+01 | .000E+00 | -.422E+00 | .000E+00 |
| 4. | 6. | .546 | .111 | 0.664 | .108E+02 | .000E+00 | -.525E+00 | .000E+00 |
| 5. | 2. | .096 | .044 | 0.458 | .198E+01 | .000E+00 | -.437E+00 | .000E+00 |
| 5. | 3. | .193 | .058 | 0.534 | .743E+00 | .000E+00 | -.159E+00 | .000E+00 |
| 5. | 4. | .349 | .076 | 0.735 | .125E+01 | .000E+00 | -.201E+00 | .000E+00 |
| 5. | 5. | .556 | .098 | 1.019 | .547E+01 | .000E+00 | -.418E+00 | .000E+00 |
| 5. | 6. | .792 | .122 | 1.330 | .112E+02 | .000E+00 | -.609E+00 | .000E+00 |
| 6. | 2. | .060 | .043 | 0.756 | .259E+01 | .000E+00 | -.558E+00 | .000E+00 |
| 6. | 3. | .219 | .060 | 0.982 | .128E+01 | .000E+00 | -.221E+00 | .000E+00 |
| 6. | 4. | .458 | .084 | 1.419 | .224E+01 | .000E+00 | -.615E-01 | .000E+00 |
| 6. | 5. | .761 | .114 | 2.006 | .578E+01 | .000E+00 | -.356E+00 | .000E+00 |
| 6. | 6. | 1.083 | .152 | 2.666 | .115E+02 | .000E+00 | -.717E+00 | .000E+00 |

TABLE E-4

STRAIGHT COURSE EQUILIBRIUM AND STABILITY

BETA=10. DEG XG=1.2 ZG=-0.50

| CV | T | CDEL | DRAFT | EHP | DIRECTIONAL STABILITY ROOTS | | | |
|----|----|------|-------|-------|-----------------------------|----------|-----------|-----------|
| | | | | | REAL | IMAG | REAL | IMAG |
| 2. | 2. | .107 | .086 | 0.102 | .213E+00 | .000E+00 | -.606E+00 | .000E+00 |
| 2. | 3. | .132 | .109 | 0.093 | -.150E+00 | .000E+00 | -.584E+00 | .000E+00 |
| 2. | 4. | .193 | .136 | 0.121 | .317E+00 | .000E+00 | -.467E+00 | .000E+00 |
| 2. | 5. | .266 | .159 | 0.168 | .197E+01 | .000E+00 | -.569E+00 | .000E+00 |
| 2. | 6. | .331 | .175 | 0.214 | .470E+01 | .000E+00 | -.697E+00 | .000E+00 |
| 3. | 2. | .124 | .073 | 0.209 | .311E+00 | .000E+00 | -.738E+00 | .000E+00 |
| 3. | 3. | .187 | .097 | 0.224 | -.433E+00 | .190E+00 | -.433E+00 | -.190E+00 |
| 3. | 4. | .298 | .128 | 0.302 | .390E-01 | .000E+00 | -.439E+00 | .000E+00 |
| 3. | 5. | .428 | .160 | 0.410 | .183E+01 | .000E+00 | -.841E+00 | .000E+00 |
| 3. | 6. | .550 | .189 | 0.517 | .454E+01 | .000E+00 | -.118E+01 | .000E+00 |
| 4. | 2. | .162 | .066 | 0.389 | .326E+00 | .000E+00 | -.683E+00 | .000E+00 |
| 4. | 3. | .285 | .094 | 0.488 | -.466E+00 | .690E+00 | -.466E+00 | -.690E+00 |
| 4. | 4. | .461 | .131 | 0.683 | -.336E+00 | .864E+00 | -.336E+00 | -.864E+00 |
| 4. | 5. | .643 | .171 | 0.907 | .113E+01 | .000E+00 | -.692E+00 | .000E+00 |
| 4. | 6. | .784 | .210 | 1.103 | .401E+01 | .000E+00 | -.154E+01 | .000E+00 |
| 5. | 2. | .183 | .061 | 0.657 | .350E+00 | .000E+00 | -.598E+00 | .000E+00 |
| 5. | 3. | .391 | .096 | 0.963 | -.511E+00 | .120E+01 | -.511E+00 | -.120E+01 |
| 5. | 4. | .641 | .140 | 1.390 | -.531E+00 | .166E+01 | -.531E+00 | -.166E+01 |
| 5. | 5. | .848 | .188 | 1.802 | -.171E+00 | .134E+01 | -.171E+00 | -.134E+01 |
| 5. | 6. | .932 | .238 | 2.092 | .310E+01 | .000E+00 | -.192E+01 | .000E+00 |
| 6. | 2. | .144 | .056 | 1.007 | .752E+00 | .000E+00 | -.861E+00 | .000E+00 |
| 6. | 3. | .478 | .102 | 1.772 | -.598E+00 | .170E+01 | -.598E+00 | -.170E+01 |
| 6. | 4. | .789 | .155 | 2.595 | -.829E+00 | .247E+01 | -.829E+00 | -.247E+01 |
| 6. | 5. | .956 | .212 | 3.262 | -.729E+00 | .227E+01 | -.729E+00 | -.227E+01 |
| 6. | 6. | .836 | .273 | 3.578 | .276E+01 | .000E+00 | -.338E+01 | .000E+00 |

TABLE E-5

STRAIGHT COURSE EQUILIBRIUM AND STABILITY

BETA=10. DEG XG=1.2 ZG=-0.75

| CV | T | CDEL | DRAFT | EHP | DIRECTIONAL STABILITY ROOTS | | | |
|----|----|------|-------|-------|-----------------------------|----------|-----------|-----------|
| | | | | | REAL | IMAG | REAL | IMAG |
| 2. | 2. | .106 | .086 | 0.101 | .213E+00 | .000E+00 | -.611E+00 | .000E+00 |
| 2. | 3. | .130 | .108 | 0.092 | -.146E+00 | .000E+00 | -.594E+00 | .000E+00 |
| 2. | 4. | .189 | .134 | 0.119 | .315E+00 | .000E+00 | -.464E+00 | .000E+00 |
| 2. | 5. | .259 | .156 | 0.164 | .197E+01 | .000E+00 | -.563E+00 | .000E+00 |
| 2. | 6. | .322 | .171 | 0.208 | .470E+01 | .000E+00 | -.680E+00 | .000E+00 |
| 3. | 2. | .123 | .073 | 0.208 | .312E+00 | .000E+00 | -.741E+00 | .000E+00 |
| 3. | 3. | .184 | .096 | 0.221 | -.434E+00 | .176E+00 | -.434E+00 | -.176E+00 |
| 3. | 4. | .292 | .126 | 0.297 | .525E-01 | .000E+00 | -.449E+00 | .000E+00 |
| 3. | 5. | .420 | .157 | 0.402 | .183E+01 | .000E+00 | -.830E+00 | .000E+00 |
| 3. | 6. | .541 | .185 | 0.507 | .455E+01 | .000E+00 | -.115E+01 | .000E+00 |
| 4. | 2. | .161 | .066 | 0.386 | .331E+00 | .000E+00 | -.688E+00 | .000E+00 |
| 4. | 3. | .280 | .093 | 0.481 | -.464E+00 | .679E+00 | -.464E+00 | -.679E+00 |
| 4. | 4. | .454 | .129 | 0.671 | -.328E+00 | .849E+00 | -.328E+00 | -.849E+00 |
| 4. | 5. | .635 | .167 | 0.891 | .115E+01 | .000E+00 | -.676E+00 | .000E+00 |
| 4. | 6. | .782 | .205 | 1.088 | .402E+01 | .000E+00 | -.149E+01 | .000E+00 |
| 5. | 2. | .181 | .060 | 0.651 | .364E+00 | .000E+00 | -.610E+00 | .000E+00 |
| 5. | 3. | .384 | .095 | 0.946 | -.505E+00 | .118E+01 | -.505E+00 | -.118E+01 |
| 5. | 4. | .632 | .137 | 1.364 | -.515E+00 | .164E+01 | -.515E+00 | -.164E+01 |
| 5. | 5. | .843 | .184 | 1.775 | -.139E+00 | .135E+01 | -.139E+00 | -.135E+01 |
| 5. | 6. | .945 | .233 | 2.077 | .308E+01 | .000E+00 | -.179E+01 | .000E+00 |
| 6. | 2. | .141 | .055 | 0.997 | .768E+00 | .000E+00 | -.873E+00 | .000E+00 |
| 6. | 3. | .469 | .100 | 1.741 | -.588E+00 | .168E+01 | -.588E+00 | -.168E+01 |
| 6. | 4. | .782 | .152 | 2.554 | -.805E+00 | .245E+01 | -.805E+00 | -.245E+01 |
| 6. | 5. | .961 | .208 | 3.229 | -.688E+00 | .231E+01 | -.688E+00 | -.231E+01 |
| 6. | 6. | .865 | .269 | 3.576 | .265E+01 | .000E+00 | -.316E+01 | .000E+00 |

TABLE E-6

STRAIGHT COURSE EQUILIBRIUM AND STABILITY

BETA=10. DEG XG=1.2 ZG=-1.00

| CV | T | CDEL | DRAFT | EHP | DIRECTIONAL STABILITY ROOTS | | | |
|----|----|------|-------|-------|-----------------------------|----------|-----------|-----------|
| | | | | | REAL | IMAG | REAL | IMAG |
| 2. | 2. | .105 | .085 | 0.101 | .213E+00 | .000E+00 | -.616E+00 | .000E+00 |
| 2. | 3. | .128 | .107 | 0.091 | -.143E+00 | .000E+00 | -.604E+00 | .000E+00 |
| 2. | 4. | .184 | .132 | 0.117 | .313E+00 | .000E+00 | -.468E+00 | .000E+00 |
| 2. | 5. | .252 | .153 | 0.161 | .196E+01 | .000E+00 | -.557E+00 | .000E+00 |
| 2. | 6. | .313 | .167 | 0.203 | .470E+01 | .000E+00 | -.664E+00 | .000E+00 |
| 3. | 2. | .122 | .072 | 0.207 | .312E+00 | .000E+00 | -.744E+00 | .000E+00 |
| 3. | 3. | .181 | .095 | 0.219 | -.435E+00 | .161E+00 | -.435E+00 | -.161E+00 |
| 3. | 4. | .287 | .124 | 0.291 | .655E-01 | .000E+00 | -.459E+00 | .000E+00 |
| 3. | 5. | .412 | .153 | 0.394 | .184E+01 | .000E+00 | -.819E+00 | .000E+00 |
| 3. | 6. | .532 | .180 | 0.497 | .456E+01 | .000E+00 | -.112E+01 | .000E+00 |
| 4. | 2. | .159 | .065 | 0.383 | .335E+00 | .000E+00 | -.693E+00 | .000E+00 |
| 4. | 3. | .275 | .092 | 0.473 | -.463E+00 | .668E+00 | -.463E+00 | -.668E+00 |
| 4. | 4. | .446 | .126 | 0.658 | -.321E+00 | .834E+00 | -.321E+00 | -.834E+00 |
| 4. | 5. | .626 | .163 | 0.874 | .118E+01 | .000E+00 | -.662E+00 | .000E+00 |
| 4. | 6. | .778 | .200 | 1.071 | .404E+01 | .000E+00 | -.143E+01 | .000E+00 |
| 5. | 2. | .178 | .060 | 0.645 | .377E+00 | .000E+00 | -.622E+00 | .000E+00 |
| 5. | 3. | .377 | .093 | 0.929 | -.500E+00 | .116E+01 | -.500E+00 | -.116E+01 |
| 5. | 4. | .622 | .135 | 1.338 | -.500E+00 | .162E+01 | -.500E+00 | -.162E+01 |
| 5. | 5. | .838 | .180 | 1.746 | -.107E+00 | .135E+01 | -.107E+00 | -.135E+01 |
| 5. | 6. | .956 | .228 | 2.060 | .306E+01 | .000E+00 | -.167E+01 | .000E+00 |
| 6. | 2. | .138 | .055 | 0.987 | .783E+00 | .000E+00 | -.884E+00 | .000E+00 |
| 6. | 3. | .460 | .098 | 1.711 | -.578E+00 | .165E+01 | -.578E+00 | -.165E+01 |
| 6. | 4. | .774 | .149 | 2.511 | -.780E+00 | .244E+01 | -.780E+00 | -.244E+01 |
| 6. | 5. | .966 | .204 | 3.193 | -.646E+00 | .235E+01 | -.646E+00 | -.235E+01 |
| 6. | 6. | .894 | .265 | 3.571 | .253E+01 | .000E+00 | -.293E+01 | .000E+00 |

TABLE E-7

STRAIGHT COURSE EQUILIBRIUM AND STABILITY

BETA=10. DEG XG=1.6 ZG=-0.50

| CV | T | CDEL | DRAFT | EHP | DIRECTIONAL STABILITY ROOTS | | | |
|----|----|------|-------|-------|-----------------------------|----------|-----------|-----------|
| | | | | | REAL | IMAG | REAL | IMAG |
| 2. | 2. | .170 | .115 | 0.132 | -.300E-01 | .000E+00 | -.139E+01 | .000E+00 |
| 2. | 3. | .255 | .153 | 0.147 | -.330E+00 | .000E+00 | -.105E+01 | .000E+00 |
| 2. | 4. | .395 | .201 | 0.207 | -.241E+00 | .000E+00 | -.165E+01 | .000E+00 |
| 2. | 5. | .496 | .243 | 0.266 | .213E+00 | .000E+00 | -.306E+01 | .000E+00 |
| 2. | 6. | .504 | .266 | 0.303 | .921E+00 | .000E+00 | -.457E+01 | .000E+00 |
| 3. | 2. | .188 | .097 | 0.275 | -.680E-01 | .000E+00 | -.182E+01 | .000E+00 |
| 3. | 3. | .301 | .135 | 0.330 | -.667E+00 | .000E+00 | -.145E+01 | .000E+00 |
| 3. | 4. | .449 | .180 | 0.439 | -.605E+00 | .000E+00 | -.229E+01 | .000E+00 |
| 3. | 5. | .562 | .224 | 0.542 | -.342E-01 | .000E+00 | -.410E+01 | .000E+00 |
| 3. | 6. | .604 | .260 | 0.610 | .775E+00 | .000E+00 | -.631E+01 | .000E+00 |
| 4. | 2. | .267 | .094 | 0.568 | -.380E+00 | .000E+00 | -.193E+01 | .000E+00 |
| 4. | 3. | .442 | .138 | 0.746 | -.150E+01 | .782E+00 | -.150E+01 | -.782E+00 |
| 4. | 4. | .614 | .186 | 0.958 | -.186E+01 | .000E+00 | -.249E+01 | .000E+00 |
| 4. | 5. | .710 | .232 | 1.115 | -.659E+00 | .000E+00 | -.550E+01 | .000E+00 |
| 4. | 6. | .703 | .273 | 1.179 | .426E+00 | .000E+00 | -.864E+01 | .000E+00 |
| 5. | 2. | .346 | .094 | 1.060 | -.141E+01 | .233E-01 | -.141E+01 | -.233E-01 |
| 5. | 3. | .588 | .145 | 1.489 | -.207E+01 | .156E+01 | -.207E+01 | -.156E+01 |
| 5. | 4. | .763 | .196 | 1.862 | -.307E+01 | .116E+01 | -.307E+01 | -.116E+01 |
| 5. | 5. | .806 | .245 | 2.080 | -.134E+01 | .000E+00 | -.730E+01 | .000E+00 |
| 5. | 6. | .697 | .290 | 2.107 | .206E+00 | .000E+00 | -.116E+02 | .000E+00 |
| 6. | 2. | .369 | .092 | 1.758 | -.158E+01 | .633E+00 | -.168E+01 | -.633E+00 |
| 6. | 3. | .685 | .152 | 2.657 | -.275E+01 | .217E+01 | -.275E+01 | -.217E+01 |
| 6. | 4. | .833 | .208 | 3.268 | -.414E+01 | .137E+01 | -.414E+01 | -.137E+01 |
| 6. | 5. | .783 | .259 | 3.557 | -.155E+01 | .000E+00 | -.994E+01 | .000E+00 |
| 6. | 6. | .524 | .307 | 3.508 | .524E+00 | .000E+00 | -.155E+02 | .000E+00 |

TABLE E-8

STRAIGHT COURSE EQUILIBRIUM AND STABILITY

BETA=10. DEG XG=1.6 ZG=-0.75

| CV | T | CDEL | DRAFT | EHP | DIRECTIONAL STABILITY ROOTS | | | |
|----|----|------|-------|-------|-----------------------------|----------|-----------|-----------|
| | | | | | REAL | IMAG | REAL | IMAG |
| 2. | 2. | .167 | .114 | 0.131 | -.274E-01 | .000E+00 | -.140E+01 | .000E+00 |
| 2. | 3. | .248 | .151 | 0.144 | -.317E+00 | .000E+00 | -.106E+01 | .000E+00 |
| 2. | 4. | .379 | .196 | 0.200 | -.221E+00 | .000E+00 | -.162E+01 | .000E+00 |
| 2. | 5. | .474 | .236 | 0.258 | -.236E+00 | .000E+00 | -.294E+01 | .000E+00 |
| 2. | 6. | .491 | .257 | 0.298 | -.933E+00 | .000E+00 | -.438E+01 | .000E+00 |
| 3. | 2. | .186 | .096 | 0.273 | -.645E-01 | .000E+00 | -.183E+01 | .000E+00 |
| 3. | 3. | .296 | .134 | 0.325 | -.649E+00 | .000E+00 | -.145E+01 | .000E+00 |
| 3. | 4. | .442 | .178 | 0.432 | -.590E+00 | .000E+00 | -.226E+01 | .000E+00 |
| 3. | 5. | .556 | .220 | 0.537 | -.242E-01 | .000E+00 | -.402E+01 | .000E+00 |
| 3. | 6. | .605 | .255 | 0.608 | -.776E+00 | .000E+00 | -.617E+01 | .000E+00 |
| 4. | 2. | .264 | .093 | 0.563 | -.370E+00 | .000E+00 | -.194E+01 | .000E+00 |
| 4. | 3. | .437 | .136 | 0.736 | -.149E+01 | .770E+00 | -.149E+01 | -.770E+00 |
| 4. | 4. | .609 | .184 | 0.947 | -.189E+01 | .000E+00 | -.239E+01 | .000E+00 |
| 4. | 5. | .710 | .229 | 1.108 | -.664E+00 | .000E+00 | -.539E+01 | .000E+00 |
| 4. | 6. | .712 | .270 | 1.181 | -.409E+00 | .000E+00 | -.849E+01 | .000E+00 |
| 5. | 2. | .342 | .093 | 1.050 | -.124E+01 | .000E+00 | -.156E+01 | .000E+00 |
| 5. | 3. | .583 | .143 | 1.472 | -.205E+01 | .155E+01 | -.205E+01 | -.155E+01 |
| 5. | 4. | .760 | .194 | 1.846 | -.303E+01 | .121E+01 | -.303E+01 | -.121E+01 |
| 5. | 5. | .812 | .243 | 2.072 | -.137E+01 | .000E+00 | -.715E+01 | .000E+00 |
| 5. | 6. | .712 | .287 | 2.112 | -.167E+00 | .000E+00 | -.114E+02 | .000E+00 |
| 6. | 2. | .363 | .091 | 1.738 | -.167E+01 | .589E+00 | -.167E+01 | -.589E+00 |
| 6. | 3. | .681 | .151 | 2.632 | -.273E+01 | .217E+01 | -.273E+01 | -.217E+01 |
| 6. | 4. | .835 | .206 | 3.248 | -.409E+01 | .146E+01 | -.409E+01 | -.146E+01 |
| 6. | 5. | .793 | .257 | 3.550 | -.161E+01 | .000E+00 | -.978E+01 | .000E+00 |
| 6. | 6. | .539 | .305 | 3.514 | -.481E+00 | .000E+00 | -.154E+02 | .000E+00 |

R-1851

TABLE E-9

STRAIGHT COURSE EQUILIBRIUM AND STABILITY

BETA=10. DEG XG=1.6 ZG=-1.00

| CV | T | COEL | DRAFT | EMP | DIRECTIONAL STABILITY ROOTS | | | |
|----|----|------|-------|-------|-----------------------------|----------|-----------|-----------|
| | | | | | REAL | IMAG | REAL | IMAG |
| 2. | 2. | .165 | .113 | 0.130 | -.249E-01 | .000E+00 | -.140E+01 | .000E+00 |
| 2. | 3. | .241 | .149 | 0.141 | -.306E+00 | .000E+00 | -.106E+01 | .000E+00 |
| 2. | 4. | .363 | .192 | 0.194 | -.202E+00 | .000E+00 | -.159E+01 | .000E+00 |
| 2. | 5. | .455 | .229 | 0.251 | .257E+00 | .000E+00 | -.283E+01 | .000E+00 |
| 2. | 6. | .478 | .250 | 0.293 | .943E+00 | .000E+00 | -.421E+01 | .000E+00 |
| 3. | 2. | .184 | .096 | 0.271 | -.611E-01 | .000E+00 | -.183E+01 | .000E+00 |
| 3. | 3. | .291 | .132 | 0.321 | -.632E+00 | .000E+00 | -.146E+01 | .000E+00 |
| 3. | 4. | .435 | .175 | 0.426 | -.574E+00 | .000E+00 | -.224E+01 | .000E+00 |
| 3. | 5. | .550 | .216 | 0.530 | -.139E-01 | .000E+00 | -.394E+01 | .000E+00 |
| 3. | 6. | .606 | .251 | 0.605 | .777E+00 | .000E+00 | -.604E+01 | .000E+00 |
| 4. | 2. | .262 | .093 | 0.558 | -.360E+00 | .000E+00 | -.194E+01 | .000E+00 |
| 4. | 3. | .432 | .135 | 0.727 | -.148E+01 | .758E+00 | -.148E+01 | -.758E+00 |
| 4. | 4. | .603 | .181 | 0.930 | -.193E+01 | .000E+00 | -.229E+01 | .000E+00 |
| 4. | 5. | .710 | .226 | 1.101 | -.669E+00 | .000E+00 | -.529E+01 | .000E+00 |
| 4. | 6. | .721 | .267 | 1.182 | .322E+00 | .000E+00 | -.833E+01 | .000E+00 |
| 5. | 2. | .338 | .092 | 1.039 | -.116E+01 | .000E+00 | -.162E+01 | .000E+00 |
| 5. | 3. | .577 | .142 | 1.455 | -.203E+01 | .154E+01 | -.203E+01 | -.154E+01 |
| 5. | 4. | .758 | .192 | 1.830 | -.299E+01 | .125E+01 | -.299E+01 | -.125E+01 |
| 5. | 5. | .817 | .240 | 2.065 | -.141E+01 | .000E+00 | -.701E+01 | .000E+00 |
| 5. | 6. | .727 | .285 | 2.116 | .128E+00 | .000E+00 | -.113E+02 | .000E+00 |
| 6. | 2. | .358 | .090 | 1.718 | -.165E+01 | .541E+00 | -.165E+01 | -.541E+00 |
| 6. | 3. | .676 | .149 | 2.607 | -.270E+01 | .216E+01 | -.270E+01 | -.216E+01 |
| 6. | 4. | .836 | .204 | 3.228 | -.405E+01 | .155E+01 | -.405E+01 | -.155E+01 |
| 6. | 5. | .804 | .256 | 3.543 | -.166E+01 | .000E+00 | -.962E+01 | .000E+00 |
| 6. | 6. | .554 | .304 | 3.520 | .436E+00 | .000E+00 | -.152E+02 | .000E+00 |

R-1851

TABLE E-10

STRAIGHT COURSE EQUILIBRIUM AND STABILITY

BETA=15. DEG XG= .8 ZG=-0.50

| CV | T | CDEL | DRAFT | EHP | DIRECTIONAL STABILITY ROOTS | | | |
|----|----|------|-------|-------|-----------------------------|----------|-----------|----------|
| | | | | | REAL | IMAG | REAL | IMAG |
| 2. | 2. | .053 | .054 | 0.102 | .326E+00 | .000E+00 | -.400E+00 | .000E+00 |
| 2. | 3. | .097 | .107 | 0.115 | -.202E+00 | .000E+00 | -.586E+00 | .000E+00 |
| 2. | 4. | .127 | .130 | 0.118 | .262E+00 | .000E+00 | -.377E+00 | .000E+00 |
| 2. | 5. | .159 | .143 | 0.129 | .242E+01 | .000E+00 | -.395E+00 | .000E+00 |
| 2. | 6. | .192 | .155 | 0.145 | .620E+01 | .000E+00 | -.456E+00 | .000E+00 |
| 3. | 2. | .053 | .063 | 0.192 | .279E+00 | .000E+00 | -.571E+00 | .000E+00 |
| 3. | 3. | .123 | .092 | 0.211 | -.207E+00 | .000E+00 | -.647E+00 | .000E+00 |
| 3. | 4. | .191 | .110 | 0.230 | .397E+00 | .000E+00 | -.433E+00 | .000E+00 |
| 3. | 5. | .267 | .126 | 0.265 | .274E+01 | .000E+00 | -.466E+00 | .000E+00 |
| 3. | 6. | .350 | .144 | 0.317 | .674E+01 | .000E+00 | -.536E+00 | .000E+00 |
| 4. | 2. | .055 | .055 | 0.313 | .348E+00 | .000E+00 | -.742E+00 | .000E+00 |
| 4. | 3. | .135 | .073 | 0.333 | -.232E+00 | .000E+00 | -.599E+00 | .000E+00 |
| 4. | 4. | .221 | .086 | 0.369 | .498E+00 | .000E+00 | -.371E+00 | .000E+00 |
| 4. | 5. | .322 | .101 | 0.439 | .306E+01 | .000E+00 | -.463E+00 | .000E+00 |
| 4. | 6. | .442 | .122 | 0.552 | .727E+01 | .000E+00 | -.558E+00 | .000E+00 |
| 5. | 2. | .077 | .052 | 0.564 | .461E+00 | .000E+00 | -.819E+00 | .000E+00 |
| 5. | 3. | .136 | .060 | 0.526 | -.197E+00 | .000E+00 | -.484E+00 | .000E+00 |
| 5. | 4. | .204 | .066 | 0.531 | .754E+00 | .000E+00 | -.350E+00 | .000E+00 |
| 5. | 5. | .302 | .076 | 0.622 | .348E+01 | .000E+00 | -.447E+00 | .000E+00 |
| 5. | 6. | .451 | .099 | 0.833 | .787E+01 | .000E+00 | -.549E+00 | .000E+00 |
| 6. | 2. | .115 | .057 | 1.116 | .655E+00 | .000E+00 | -.798E+00 | .000E+00 |
| 6. | 3. | .147 | .058 | 0.965 | .586E-01 | .000E+00 | -.412E+00 | .000E+00 |
| 6. | 4. | .180 | .058 | 0.870 | .128E+01 | .000E+00 | -.429E+00 | .000E+00 |
| 6. | 5. | .235 | .061 | 0.897 | .411E+01 | .000E+00 | -.501E+00 | .000E+00 |
| 6. | 6. | .381 | .081 | 1.197 | .865E+01 | .000E+00 | -.568E+00 | .000E+00 |

TABLE E-11

STRAIGHT COURSE EQUILIBRIUM AND STABILITY

BETA=15. DEG XG= .8 ZG=-0.75

| CV | T | CDEL | DRAFT | EHP | DIRECTIONAL STABILITY ROOTS | | | |
|----|----|------|-------|-------|-----------------------------|----------|-----------|----------|
| | | | | | REAL | IMAG | REAL | IMAG |
| 2. | 2. | .048 | .051 | 0.099 | .336E+00 | .000E+00 | -.407E+00 | .000E+00 |
| 2. | 3. | .095 | .106 | 0.115 | -.197E+00 | .000E+00 | -.594E+00 | .000E+00 |
| 2. | 4. | .124 | .128 | 0.117 | .261E+00 | .000E+00 | -.381E+00 | .000E+00 |
| 2. | 5. | .154 | .140 | 0.127 | .241E+01 | .000E+00 | -.395E+00 | .000E+00 |
| 2. | 6. | .183 | .150 | 0.141 | .618E+01 | .000E+00 | -.455E+00 | .000E+00 |
| 3. | 2. | .052 | .063 | 0.191 | .280E+00 | .000E+00 | -.573E+00 | .000E+00 |
| 3. | 3. | .120 | .091 | 0.208 | -.202E+00 | .000E+00 | -.655E+00 | .000E+00 |
| 3. | 4. | .186 | .108 | 0.226 | .392E+00 | .000E+00 | -.435E+00 | .000E+00 |
| 3. | 5. | .258 | .123 | 0.258 | .272E+01 | .000E+00 | -.463E+00 | .000E+00 |
| 3. | 6. | .337 | .140 | 0.306 | .671E+01 | .000E+00 | -.531E+00 | .000E+00 |
| 4. | 2. | .054 | .055 | 0.312 | .349E+00 | .000E+00 | -.744E+00 | .000E+00 |
| 4. | 3. | .131 | .072 | 0.328 | -.218E+00 | .000E+00 | -.617E+00 | .000E+00 |
| 4. | 4. | .213 | .084 | 0.358 | .498E+00 | .000E+00 | -.380E+00 | .000E+00 |
| 4. | 5. | .307 | .097 | 0.421 | .304E+01 | .000E+00 | -.461E+00 | .000E+00 |
| 4. | 6. | .421 | .117 | 0.526 | .723E+01 | .000E+00 | -.551E+00 | .000E+00 |
| 5. | 2. | .076 | .052 | 0.562 | .463E+00 | .000E+00 | -.822E+00 | .000E+00 |
| 5. | 3. | .132 | .059 | 0.518 | -.162E+00 | .000E+00 | -.523E+00 | .000E+00 |
| 5. | 4. | .192 | .063 | 0.510 | .767E+00 | .000E+00 | -.372E+00 | .000E+00 |
| 5. | 5. | .279 | .072 | 0.583 | .346E+01 | .000E+00 | -.452E+00 | .000E+00 |
| 5. | 6. | .422 | .093 | 0.782 | .784E+01 | .000E+00 | -.544E+00 | .000E+00 |
| 6. | 2. | .114 | .056 | 1.111 | .658E+00 | .000E+00 | -.803E+00 | .000E+00 |
| 6. | 3. | .144 | .058 | 0.954 | .871E+01 | .000E+00 | -.444E+00 | .000E+00 |
| 6. | 4. | .171 | .056 | 0.846 | .130E+01 | .000E+00 | -.451E+00 | .000E+00 |
| 6. | 5. | .211 | .058 | 0.843 | .411E+01 | .000E+00 | -.514E+00 | .000E+00 |
| 6. | 6. | .349 | .076 | 1.121 | .862E+01 | .000E+00 | -.568E+00 | .000E+00 |

TABLE E-12

STRAIGHT COURSE EQUILIBRIUM AND STABILITY

BETA=15. DEG XG= .8 ZG=-1.00

| CV | T | CDEL | DRAFT | EHP | DIRECTIONAL STABILITY ROOTS | | | |
|----|----|------|-------|-------|-----------------------------|----------|-----------|----------|
| | | | | | REAL | IMAG | REAL | IMAG |
| 2. | 3. | .093 | .105 | 0.114 | -.192E+00 | .000E+00 | -.602E+00 | .000E+00 |
| 2. | 4. | .121 | .126 | 0.116 | .260E+00 | .000E+00 | -.386E+00 | .000E+00 |
| 2. | 5. | .148 | .138 | 0.124 | .240E+01 | .000E+00 | -.396E+00 | .000E+00 |
| 2. | 6. | .174 | .146 | 0.137 | .616E+01 | .000E+00 | -.453E+00 | .000E+00 |
| 3. | 2. | .051 | .063 | 0.190 | .281E+00 | .000E+00 | -.574E+00 | .000E+00 |
| 3. | 3. | .118 | .090 | 0.206 | -.197E+00 | .000E+00 | -.663E+00 | .000E+00 |
| 3. | 4. | .181 | .107 | 0.222 | .388E+00 | .000E+00 | -.438E+00 | .000E+00 |
| 3. | 5. | .249 | .120 | 0.251 | .271E+01 | .000E+00 | -.461E+00 | .000E+00 |
| 3. | 6. | .323 | .135 | 0.296 | .668E+01 | .000E+00 | -.526E+00 | .000E+00 |
| 4. | 2. | .052 | .055 | 0.310 | .350E+00 | .000E+00 | -.746E+00 | .000E+00 |
| 4. | 3. | .128 | .071 | 0.323 | -.204E+00 | .000E+00 | -.634E+00 | .000E+00 |
| 4. | 4. | .205 | .082 | 0.348 | .499E+00 | .000E+00 | -.389E+00 | .000E+00 |
| 4. | 5. | .292 | .094 | 0.403 | .303E+01 | .000E+00 | -.460E+00 | .000E+00 |
| 4. | 6. | .401 | .111 | 0.501 | .720E+01 | .000E+00 | -.544E+00 | .000E+00 |
| 5. | 2. | .075 | .052 | 0.559 | .465E+00 | .000E+00 | -.826E+00 | .000E+00 |
| 5. | 3. | .127 | .058 | 0.509 | -.134E+00 | .000E+00 | -.555E+00 | .000E+00 |
| 5. | 4. | .181 | .061 | 0.491 | .781E+00 | .000E+00 | -.395E+00 | .000E+00 |
| 5. | 5. | .256 | .068 | 0.543 | .345E+01 | .000E+00 | -.458E+00 | .000E+00 |
| 5. | 6. | .392 | .087 | 0.731 | .781E+01 | .000E+00 | -.539E+00 | .000E+00 |
| 6. | 2. | .112 | .056 | 1.107 | .661E+00 | .000E+00 | -.808E+00 | .000E+00 |
| 6. | 3. | .140 | .057 | 0.944 | .112E+00 | .000E+00 | -.473E+00 | .000E+00 |
| 6. | 4. | .161 | .055 | 0.823 | .131E+01 | .000E+00 | -.472E+00 | .000E+00 |
| 6. | 5. | .188 | .054 | 0.790 | .410E+01 | .000E+00 | -.528E+00 | .000E+00 |
| 6. | 6. | .316 | .071 | 1.047 | .859E+01 | .000E+00 | -.569E+00 | .000E+00 |

TABLE E-13

STRAIGHT COURSE EQUILIBRIUM AND STABILITY

BETA=15. DEG XG=1.2 ZG=-0.50

| CV | T | CDEL | DRAFT | EHP | DIRECTIONAL STABILITY ROOTS | | | |
|----|----|-------|-------|-------|-----------------------------|----------|-----------|-----------|
| | | | | | REAL | IMAG | REAL | IMAG |
| 2. | 2. | .145 | .108 | 0.155 | -.744E-01 | .000E+00 | -.127E+01 | .000E+00 |
| 2. | 3. | .177 | .147 | 0.149 | -.260E+00 | .000E+00 | -.131E+01 | .000E+00 |
| 2. | 4. | .226 | .178 | 0.155 | -.128E+00 | .000E+00 | -.107E+01 | .000E+00 |
| 2. | 5. | .289 | .209 | 0.175 | .765E+00 | .000E+00 | -.923E+00 | .000E+00 |
| 2. | 6. | -.017 | .048 | 0.042 | .231E+01 | .000E+00 | -.881E+00 | .000E+00 |
| 3. | 2. | .138 | .093 | 0.273 | -.858E-01 | .000E+00 | -.163E+01 | .000E+00 |
| 3. | 3. | .229 | .129 | 0.303 | -.416E+00 | .000E+00 | -.144E+01 | .000E+00 |
| 3. | 4. | .227 | .152 | 0.341 | -.413E+00 | .000E+00 | -.997E+00 | .000E+00 |
| 3. | 5. | .432 | .187 | 0.400 | .624E+00 | .000E+00 | -.960E+00 | .000E+00 |
| 3. | 6. | .535 | .213 | 0.479 | .276E+01 | .000E+00 | -.110E+01 | .000E+00 |
| 4. | 2. | .158 | .081 | 0.468 | -.158E+00 | .000E+00 | -.184E+01 | .000E+00 |
| 4. | 3. | .227 | .113 | 0.550 | -.102E+01 | .205E+00 | -.102E+01 | -.205E+00 |
| 4. | 4. | .420 | .140 | 0.644 | -.755E+00 | .716E+00 | -.755E+00 | -.716E+00 |
| 4. | 5. | .557 | .168 | 0.766 | -.244E-01 | .000E+00 | -.257E+00 | .000E+00 |
| 4. | 6. | .687 | .196 | 0.915 | .271E+01 | .000E+00 | -.969E+00 | .000E+00 |
| 5. | 2. | .196 | .076 | 0.826 | -.333E+00 | .000E+00 | -.186E+01 | .000E+00 |
| 5. | 3. | .326 | .099 | 0.926 | -.107E+01 | .77E+00 | -.107E+01 | -.77E+00 |
| 5. | 4. | .473 | .122 | 1.079 | -.751E+00 | .120E+01 | -.751E+00 | -.120E+01 |
| 5. | 5. | .628 | .147 | 1.282 | -.860E-01 | .103E+01 | -.860E-01 | -.103E+01 |
| 5. | 6. | .777 | .174 | 1.528 | .258E+01 | .000E+00 | -.621E+00 | .000E+00 |
| 6. | 2. | .228 | .076 | 1.473 | -.621E+00 | .000E+00 | -.170E+01 | .000E+00 |
| 6. | 3. | .327 | .089 | 1.502 | -.107E+01 | .106E+01 | -.107E+01 | -.106E+01 |
| 6. | 4. | .460 | .106 | 1.664 | -.693E+00 | .146E+01 | -.693E+00 | -.146E+01 |
| 6. | 5. | .613 | .127 | 1.939 | .263E-01 | .134E+01 | .263E-01 | -.134E+01 |
| 6. | 6. | .768 | .152 | 2.301 | .261E+01 | .000E+00 | -.322E+00 | .000E+00 |

TABLE E-14

STRAIGHT COURSE EQUILIBRIUM AND STABILITY

BETA=15. DEG XG=1.2 ZG=-0.75

| CV | T | CDEL | DRAFT | EHP | DIRECTIONAL STABILITY ROOTS | | | |
|----|----|------|-------|-------|-----------------------------|----------|-----------|-----------|
| | | | | | REAL | IMAG | REAL | IMAG |
| 2. | 2. | .143 | .107 | 0.154 | -.706E-01 | .000E+00 | -.128E+01 | .000E+00 |
| 2. | 3. | .173 | .145 | 0.148 | -.254E+00 | .000E+00 | -.132E+01 | .000E+00 |
| 2. | 4. | .220 | .176 | 0.152 | -.123E+00 | .000E+00 | -.109E+01 | .000E+00 |
| 2. | 5. | .280 | .204 | 0.172 | .754E+00 | .000E+00 | -.941E+00 | .000E+00 |
| 3. | 2. | .135 | .092 | 0.271 | -.813E-01 | .000E+00 | -.163E+01 | .000E+00 |
| 3. | 3. | .225 | .127 | 0.299 | -.406E+00 | .000E+00 | -.145E+01 | .000E+00 |
| 3. | 4. | .321 | .157 | 0.336 | -.394E+00 | .000E+00 | -.102E+01 | .000E+00 |
| 3. | 5. | .423 | .185 | 0.392 | .674E+00 | .000E+00 | -.972E+00 | .000E+00 |
| 3. | 6. | .524 | .213 | 0.468 | .272E+01 | .000E+00 | -.111E+01 | .000E+00 |
| 4. | 2. | .155 | .080 | 0.463 | -.149E+00 | .000E+00 | -.184E+01 | .000E+00 |
| 4. | 3. | .281 | .111 | 0.541 | -.103E+01 | .135E+00 | -.103E+01 | -.135E+00 |
| 4. | 4. | .411 | .138 | 0.631 | -.758E+00 | .694E+00 | -.758E+00 | -.694E+00 |
| 4. | 5. | .546 | .164 | 0.748 | .225E-01 | .000E+00 | -.321E+00 | .000E+00 |
| 4. | 6. | .675 | .192 | 0.892 | .268E+01 | .000E+00 | -.972E+00 | .000E+00 |
| 5. | 2. | .192 | .075 | 0.817 | -.317E+00 | .000E+00 | -.188E+01 | .000E+00 |
| 5. | 3. | .319 | .097 | 0.910 | -.107E+01 | .745E+00 | -.107E+01 | -.745E+00 |
| 5. | 4. | .462 | .120 | 1.054 | -.753E+00 | .117E+01 | -.753E+00 | -.117E+01 |
| 5. | 5. | .614 | .144 | 1.249 | -.924E-01 | .100E+01 | -.924E-01 | -.100E+01 |
| 5. | 6. | .762 | .170 | 1.487 | .256E+01 | .000E+00 | -.632E+00 | .000E+00 |
| 6. | 2. | .224 | .075 | 1.461 | -.592E+00 | .000E+00 | -.173E+01 | .000E+00 |
| 6. | 3. | .319 | .088 | 1.478 | -.107E+01 | .103E+01 | -.107E+01 | -.103E+01 |
| 6. | 4. | .448 | .104 | 1.625 | -.694E+00 | .143E+01 | -.694E+00 | -.143E+01 |
| 6. | 5. | .597 | .124 | 1.885 | .218E-01 | .130E+01 | .218E-01 | -.130E+01 |
| 6. | 6. | .749 | .147 | 2.235 | .263E+01 | .000E+00 | -.356E+00 | .000E+00 |

TABLE E-15

STRAIGHT COURSE EQUILIBRIUM AND STABILITY

BETA=15. DEG XG=1.2 ZG=-1.00

| CV | T | CDEL | DRAFT | EHP | DIRECTIONAL STABILITY ROOTS | | | |
|----|----|------|-------|-------|-----------------------------|----------|-----------|-----------|
| | | | | | REAL | IMAG | REAL | IMAG |
| 2. | 2. | .140 | .106 | 0.153 | -.669E-01 | .000E+00 | -.128E+01 | .000E+00 |
| 2. | 3. | .170 | .143 | 0.146 | -.249E+00 | .000E+00 | -.133E+01 | .000E+00 |
| 2. | 4. | .215 | .173 | 0.151 | -.117E+00 | .000E+00 | -.111E+01 | .000E+00 |
| 2. | 5. | .271 | .200 | 0.169 | .744E+00 | .000E+00 | -.958E+00 | .000E+00 |
| 3. | 2. | .132 | .091 | 0.268 | -.769E-01 | .000E+00 | -.163E+01 | .000E+00 |
| 3. | 3. | .221 | .126 | 0.295 | -.397E+00 | .000E+00 | -.147E+01 | .000E+00 |
| 3. | 4. | .314 | .154 | 0.330 | -.377E+00 | .000E+00 | -.105E+01 | .000E+00 |
| 3. | 5. | .414 | .181 | 0.384 | .666E+00 | .000E+00 | -.983E+00 | .000E+00 |
| 3. | 6. | .513 | .209 | 0.458 | .269E+01 | .000E+00 | -.112E+01 | .000E+00 |
| 4. | 2. | .151 | .079 | 0.458 | -.141E+00 | .000E+00 | -.185E+01 | .000E+00 |
| 4. | 3. | .275 | .109 | 0.532 | -.951E+00 | .000E+00 | -.110E+01 | .000E+00 |
| 4. | 4. | .403 | .135 | 0.619 | -.761E+00 | .672E+00 | -.761E+00 | -.672E+00 |
| 4. | 5. | .534 | .161 | 0.731 | .623E-01 | .000E+00 | -.376E+00 | .000E+00 |
| 4. | 6. | .662 | .187 | 0.870 | .266E+01 | .000E+00 | -.975E+00 | .000E+00 |
| 5. | 2. | .188 | .074 | 0.808 | -.302E+00 | .000E+00 | -.189E+01 | .000E+00 |
| 5. | 3. | .311 | .096 | 0.894 | -.107E+01 | .713E+00 | -.107E+01 | -.713E+00 |
| 5. | 4. | .451 | .117 | 1.029 | -.755E+00 | .114E+01 | -.755E+00 | -.114E+01 |
| 5. | 5. | .600 | .140 | 1.215 | -.984E-01 | .971E+00 | -.984E-01 | -.971E+00 |
| 5. | 6. | .746 | .165 | 1.445 | .255E+01 | .000E+00 | -.645E+00 | .000E+00 |
| 6. | 2. | .221 | .075 | 1.450 | -.564E+00 | .000E+00 | -.175E+01 | .000E+00 |
| 6. | 3. | .312 | .087 | 1.455 | -.107E+01 | .991E+00 | -.107E+01 | -.991E+00 |
| 6. | 4. | .435 | .102 | 1.586 | -.695E+00 | .139E+01 | -.695E+00 | -.139E+01 |
| 6. | 5. | .580 | .120 | 1.831 | .178E-01 | .124E+01 | .178E-01 | -.124E+01 |
| 6. | 6. | .730 | .143 | 2.167 | .265E+01 | .000E+00 | -.393E+00 | .000E+00 |

R-1851

TABLE E-16

STRAIGHT COURSE EQUILIBRIUM AND STABILITY

BETA=15. DEG XG=1.6 ZG=-0.50

| CV | T | CDEL | DRAFT | EHP | DIRECTIONAL STABILITY ROOTS | | | |
|----|----|------|-------|-------|-----------------------------|----------|-----------|-----------|
| | | | | | REAL | IMAG | REAL | IMAG |
| 2. | 2. | .326 | .178 | 0.238 | -.298E+00 | .000E+00 | -.286E+01 | .000E+00 |
| 2. | 3. | .363 | .217 | 0.220 | -.441E+00 | .000E+00 | -.236E+01 | .000E+00 |
| 2. | 4. | .436 | .262 | 0.227 | -.387E+00 | .000E+00 | -.224E+01 | .000E+00 |
| 2. | 5. | .526 | .314 | 0.256 | -.802E-01 | .000E+00 | -.237E+01 | .000E+00 |
| 2. | 6. | .613 | .379 | 0.311 | .434E+00 | .000E+00 | -.242E+01 | .000E+00 |
| 3. | 2. | .301 | .144 | 0.430 | -.378E+00 | .000E+00 | -.345E+01 | .000E+00 |
| 3. | 3. | .383 | .182 | 0.446 | -.692E+00 | .000E+00 | -.285E+01 | .000E+00 |
| 3. | 4. | .488 | .218 | 0.487 | -.735E+00 | .000E+00 | -.274E+01 | .000E+00 |
| 4. | 2. | .348 | .130 | 0.775 | -.641E+00 | .000E+00 | -.379E+01 | .000E+00 |
| 4. | 3. | .471 | .164 | 0.848 | -.136E+01 | .000E+00 | -.278E+01 | .000E+00 |
| 4. | 4. | .599 | .196 | 0.948 | -.203E+01 | .412E+00 | -.203E+01 | -.412E+00 |
| 4. | 5. | .721 | .228 | 1.076 | -.131E+01 | .000E+00 | -.282E+01 | .000E+00 |
| 5. | 2. | .403 | .120 | 1.335 | -.107E+01 | .000E+00 | -.392E+01 | .000E+00 |
| 5. | 3. | .538 | .148 | 1.459 | -.232E+01 | .938E+00 | -.232E+01 | -.938E+00 |
| 5. | 4. | .681 | .177 | 1.632 | -.226E+01 | .152E+01 | -.226E+01 | -.152E+01 |
| 5. | 5. | .819 | .205 | 1.846 | -.228E+01 | .145E+01 | -.228E+01 | -.145E+01 |
| 6. | 2. | .420 | .111 | 2.158 | -.148E+01 | .000E+00 | -.399E+01 | .000E+00 |
| 6. | 3. | .547 | .133 | 2.293 | -.251E+01 | .147E+01 | -.251E+01 | -.147E+01 |
| 6. | 4. | .692 | .157 | 2.531 | -.243E+01 | .207E+01 | -.243E+01 | -.207E+01 |
| 6. | 5. | .835 | .182 | 2.840 | -.242E+01 | .216E+01 | -.242E+01 | -.216E+01 |
| 6. | 6. | .961 | .208 | 3.197 | -.244E+01 | .166E+01 | -.244E+01 | -.166E+01 |

TABLE E-17

STRAIGHT COURSE EQUILIBRIUM AND STABILITY

BETA=15. DEG XG=1.6 ZG=-0.75

| CV | T | CDEL | DRAFT | EHP | DIRECTIONAL STABILITY ROOTS | | | |
|----|----|------|-------|-------|-----------------------------|----------|-----------|-----------|
| | | | | | REAL | IMAG | REAL | IMAG |
| 2. | 2. | .320 | .176 | 0.236 | -.291E+00 | .000E+00 | -.287E+01 | .000E+00 |
| 2. | 3. | .353 | .214 | 0.216 | -.430E+00 | .000E+00 | -.238E+01 | .000E+00 |
| 2. | 4. | .422 | .257 | 0.222 | -.373E+00 | .000E+00 | -.228E+01 | .000E+00 |
| 2. | 5. | .508 | .306 | 0.249 | -.716E-01 | .000E+00 | -.246E+01 | .000E+00 |
| 2. | 6. | .590 | .366 | 0.301 | -.428E+00 | .000E+00 | -.260E+01 | .000E+00 |
| 3. | 2. | .296 | .143 | 0.426 | -.371E+00 | .000E+00 | -.345E+01 | .000E+00 |
| 3. | 3. | .382 | .180 | 0.441 | -.679E+00 | .000E+00 | -.286E+01 | .000E+00 |
| 3. | 4. | .481 | .215 | 0.480 | -.718E+00 | .000E+00 | -.276E+01 | .000E+00 |
| 3. | 5. | .580 | .250 | 0.542 | -.360E+00 | .000E+00 | -.318E+01 | .000E+00 |
| 3. | 6. | .664 | .285 | 0.627 | -.254E+00 | .000E+00 | -.388E+01 | .000E+00 |
| 4. | 2. | .344 | .128 | 0.767 | -.629E+00 | .000E+00 | -.379E+01 | .000E+00 |
| 4. | 3. | .465 | .162 | 0.837 | -.132E+01 | .000E+00 | -.281E+01 | .000E+00 |
| 4. | 4. | .592 | .194 | 0.934 | -.203E+01 | .337E+00 | -.203E+01 | -.337E+00 |
| 4. | 5. | .714 | .225 | 1.059 | -.127E+01 | .000E+00 | -.286E+01 | .000E+00 |
| 4. | 6. | .819 | .255 | 1.210 | -.358E+00 | .000E+00 | -.388E+01 | .000E+00 |
| 5. | 2. | .393 | .119 | 1.323 | -.104E+01 | .000E+00 | -.393E+01 | .000E+00 |
| 5. | 3. | .531 | .147 | 1.441 | -.231E+01 | .899E+00 | -.231E+01 | -.899E+00 |
| 5. | 4. | .674 | .175 | 1.609 | -.226E+01 | .149E+01 | -.226E+01 | -.149E+01 |
| 5. | 5. | .811 | .202 | 1.817 | -.228E+01 | .141E+01 | -.228E+01 | -.141E+01 |
| 5. | 6. | .931 | .230 | 2.057 | -.180E+01 | .000E+00 | -.284E+01 | .000E+00 |
| 6. | 2. | .416 | .110 | 2.141 | -.145E+01 | .000E+00 | -.401E+01 | .000E+00 |
| 6. | 3. | .540 | .132 | 2.266 | -.250E+01 | .143E+01 | -.250E+01 | -.143E+01 |
| 6. | 4. | .683 | .155 | 2.495 | -.242E+01 | .204E+01 | -.242E+01 | -.204E+01 |
| 6. | 5. | .826 | .179 | 2.795 | -.241E+01 | .212E+01 | -.241E+01 | -.212E+01 |
| 6. | 6. | .952 | .204 | 3.144 | -.244E+01 | .161E+01 | -.244E+01 | -.161E+01 |

TABLE E-18

STRAIGHT COURSE EQUILIBRIUM AND STABILITY

BETA=15. DEG XG=1.6 ZG=-1.00

| CV | T | CDEL | DRAFT | EHP | DIRECTIONAL STABILITY ROOTS | | | |
|----|----|------|-------|-------|-----------------------------|----------|-----------|-----------|
| | | | | | REAL | IMAG | REAL | IMAG |
| 2. | 2. | .314 | .174 | 0.233 | -.284E+00 | .000E+00 | -.287E+01 | .000E+00 |
| 2. | 3. | .344 | .211 | 0.213 | -.419E+00 | .000E+00 | -.239E+01 | .000E+00 |
| 2. | 4. | .408 | .252 | 0.217 | -.360E+00 | .000E+00 | -.232E+01 | .000E+00 |
| 2. | 5. | .490 | .298 | 0.243 | -.622E-01 | .000E+00 | -.253E+01 | .000E+00 |
| 2. | 6. | .568 | .354 | 0.291 | .427E+00 | .000E+00 | -.276E+01 | .000E+00 |
| 3. | 2. | .292 | .142 | 0.421 | -.364E+00 | .000E+00 | -.345E+01 | .000E+00 |
| 3. | 3. | .376 | .178 | 0.435 | -.666E+00 | .000E+00 | -.287E+01 | .000E+00 |
| 3. | 4. | .474 | .213 | 0.473 | -.702E+00 | .000E+00 | -.278E+01 | .000E+00 |
| 3. | 5. | .571 | .247 | 0.534 | -.349E+00 | .000E+00 | -.321E+01 | .000E+00 |
| 3. | 6. | .656 | .281 | 0.616 | .256E+00 | .000E+00 | -.391E+01 | .000E+00 |
| 4. | 2. | .339 | .127 | 0.760 | -.617E+00 | .000E+00 | -.380E+01 | .000E+00 |
| 4. | 3. | .459 | .160 | 0.827 | -.129E+01 | .000E+00 | -.283E+01 | .000E+00 |
| 4. | 4. | .584 | .191 | 0.921 | -.203E+01 | .240E+00 | -.202E+01 | -.240E+00 |
| 4. | 5. | .706 | .221 | 1.043 | -.123E+01 | .000E+00 | -.290E+01 | .000E+00 |
| 4. | 6. | .812 | .251 | 1.190 | -.347E+00 | .000E+00 | -.391E+01 | .000E+00 |
| 5. | 2. | .393 | .118 | 1.310 | -.102E+01 | .000E+00 | -.394E+01 | .000E+00 |
| 5. | 3. | .525 | .145 | 1.423 | -.231E+01 | .858E+00 | -.231E+01 | -.858E+00 |
| 5. | 4. | .666 | .172 | 1.585 | -.225E+01 | .145E+01 | -.225E+01 | -.145E+01 |
| 5. | 5. | .803 | .199 | 1.788 | -.228E+01 | .137E+01 | -.228E+01 | -.137E+01 |
| 5. | 6. | .923 | .226 | 2.023 | -.172E+01 | .000E+00 | -.293E+01 | .000E+00 |
| 6. | 2. | .411 | .110 | 2.124 | -.142E+01 | .000E+00 | -.403E+01 | .000E+00 |
| 6. | 3. | .533 | .130 | 2.239 | -.250E+01 | .139E+01 | -.250E+01 | -.139E+01 |
| 6. | 4. | .675 | .153 | 2.458 | -.241E+01 | .200E+01 | -.241E+01 | -.200E+01 |
| 6. | 5. | .817 | .177 | 2.749 | -.241E+01 | .208E+01 | -.241E+01 | -.208E+01 |
| 6. | 6. | .943 | .201 | 3.091 | -.243E+01 | .155E+01 | -.243E+01 | -.155E+01 |

TABLE E-19

STRAIGHT COURSE EQUILIBRIUM AND STABILITY

BETA=20. DEG XG= .8 ZG=-0.50

| CV | T | CDEL | DRAFT | EHP | DIRECTIONAL STABILITY ROOTS | | | |
|----|----|------|-------|-------|-----------------------------|----------|-----------|-----------|
| | | | | | REAL | IMAG | REAL | IMAG |
| 2. | 2. | .115 | .104 | 0.079 | -.285E+00 | .000E+00 | -.118E+01 | .000E+00 |
| 2. | 3. | .092 | .111 | 0.064 | -.247E+00 | .000E+00 | -.154E+01 | .000E+00 |
| 2. | 4. | .108 | .127 | 0.073 | -.254E+00 | .000E+00 | -.138E+01 | .000E+00 |
| 2. | 5. | .043 | .085 | 0.073 | -.850E-01 | .000E+00 | -.149E+01 | .000E+00 |
| 2. | 6. | .050 | .094 | 0.090 | .240E+00 | .000E+00 | -.722E+00 | .000E+00 |
| 3. | 2. | .061 | .072 | 0.205 | -.264E+00 | .000E+00 | -.179E+01 | .000E+00 |
| 3. | 3. | .092 | .091 | 0.191 | -.320E+00 | .000E+00 | -.186E+01 | .000E+00 |
| 3. | 4. | .152 | .114 | 0.216 | -.414E+00 | .000E+00 | -.147E+01 | .000E+00 |
| 3. | 5. | .220 | .135 | 0.259 | -.585E+00 | .207E+00 | -.585E+00 | -.207E+00 |
| 3. | 6. | .281 | .150 | 0.311 | .453E+00 | .000E+00 | -.425E+00 | .000E+00 |
| 4. | 2. | .023 | .058 | 0.283 | -.268E+00 | .000E+00 | -.208E+01 | .000E+00 |
| 4. | 3. | .102 | .082 | 0.330 | -.430E+00 | .000E+00 | -.192E+01 | .000E+00 |
| 4. | 4. | .190 | .103 | 0.395 | -.723E+00 | .000E+00 | -.129E+01 | .000E+00 |
| 4. | 5. | .278 | .120 | 0.471 | -.631E+00 | .595E+00 | -.631E+00 | -.595E+00 |
| 4. | 6. | .352 | .132 | 0.552 | -.114E-01 | .387E+00 | -.114E-01 | -.387E+00 |
| 5. | 2. | .006 | .057 | 0.488 | -.286E+00 | .000E+00 | -.215E+01 | .000E+00 |
| 5. | 3. | .103 | .076 | 0.577 | -.545E+00 | .000E+00 | -.187E+01 | .000E+00 |
| 5. | 4. | .208 | .093 | 0.689 | -.102E+01 | .471E+00 | -.102E+01 | -.471E+00 |
| 5. | 5. | .306 | .105 | 0.815 | -.620E+00 | .892E+00 | -.620E+00 | -.892E+00 |
| 5. | 6. | .382 | .113 | 0.940 | .250E-01 | .777E+00 | .250E-01 | -.777E+00 |
| 6. | 3. | .081 | .071 | 1.100 | -.573E+00 | .000E+00 | -.181E+01 | .000E+00 |
| 6. | 4. | .191 | .083 | 1.263 | -.979E+00 | .685E+00 | -.979E+00 | -.685E+00 |
| 6. | 5. | .288 | .091 | 1.446 | -.552E+00 | .107E+01 | -.552E+00 | -.107E+01 |
| 6. | 6. | .350 | .094 | 1.623 | .125E+00 | .929E+00 | .125E+00 | -.929E+00 |

TABLE E-20

STRAIGHT COURSE EQUILIBRIUM AND STABILITY

BETA=20. DEG XG= .8 ZG=-0.75

| CV | T | CDEL | DRAFT | EHP | DIRECTIONAL STABILITY ROOTS | | | |
|----|----|------|-------|-------|-----------------------------|----------|-----------|-----------|
| | | | | | REAL | IMAG | REAL | IMAG |
| 2. | 2. | .113 | .104 | 0.079 | -.281E+00 | .000E+00 | -.119E+01 | .000E+00 |
| 2. | 3. | .089 | .110 | 0.063 | -.242E+00 | .000E+00 | -.156E+01 | .000E+00 |
| 2. | 4. | .103 | .124 | 0.072 | -.245E+00 | .000E+00 | -.142E+01 | .000E+00 |
| 2. | 5. | .045 | .087 | 0.074 | -.874E-01 | .000E+00 | -.147E+01 | .000E+00 |
| 2. | 6. | .054 | .096 | 0.091 | .246E+00 | .000E+00 | -.712E+00 | .000E+00 |
| 3. | 2. | .059 | .071 | 0.203 | -.261E+00 | .000E+00 | -.181E+01 | .000E+00 |
| 3. | 3. | .089 | .089 | 0.188 | -.313E+00 | .000E+00 | -.188E+01 | .000E+00 |
| 3. | 4. | .147 | .111 | 0.211 | -.403E+00 | .000E+00 | -.150E+01 | .000E+00 |
| 3. | 5. | .211 | .131 | 0.253 | -.600E+00 | .174E+00 | -.600E+00 | -.174E+00 |
| 3. | 6. | .268 | .145 | 0.301 | .407E+00 | .000E+00 | -.418E+00 | .000E+00 |
| 4. | 2. | .022 | .057 | 0.282 | -.266E+00 | .000E+00 | -.208E+01 | .000E+00 |
| 4. | 3. | .099 | .031 | 0.324 | -.423E+00 | .000E+00 | -.194E+01 | .000E+00 |
| 4. | 4. | .184 | .101 | 0.385 | -.692E+00 | .000E+00 | -.134E+01 | .000E+00 |
| 4. | 5. | .268 | .117 | 0.457 | -.641E+00 | .580E+00 | -.641E+00 | -.580E+00 |
| 4. | 6. | .336 | .127 | 0.532 | -.251E-01 | .397E+00 | -.251E-01 | -.397E+00 |
| 5. | 2. | .006 | .057 | 0.487 | -.285E+00 | .000E+00 | -.215E+01 | .000E+00 |
| 5. | 3. | .101 | .076 | 0.570 | -.536E+00 | .000E+00 | -.188E+01 | .000E+00 |
| 5. | 4. | .201 | .091 | 0.674 | -.102E+01 | .441E+00 | -.102E+01 | -.441E+00 |
| 5. | 5. | .294 | .103 | 0.791 | -.627E+00 | .872E+00 | -.627E+00 | -.872E+00 |
| 5. | 6. | .362 | .109 | 0.906 | .161E-01 | .760E+00 | .161E-01 | -.760E+00 |
| 6. | 3. | .079 | .070 | 1.094 | -.564E+00 | .000E+00 | -.182E+01 | .000E+00 |
| 6. | 4. | .185 | .082 | 1.245 | -.981E+00 | .660E+00 | -.981E+00 | -.660E+00 |
| 6. | 5. | .276 | .089 | 1.414 | -.555E+00 | .105E+01 | -.555E+00 | -.105E+01 |
| 6. | 6. | .330 | .091 | 1.577 | .120E+00 | .890E+00 | .120E+00 | -.890E+00 |

TABLE E-21

STRAIGHT COURSE EQUILIBRIUM AND STABILITY

BETA=20. DEG XG= .8 ZG=-1.00

| CV | T | CDEL | DRAFT | EHP | DIRECTIONAL STABILITY ROOTS | | | |
|----|----|-------|-------|-------|-----------------------------|----------|-----------|-----------|
| | | | | | REAL | IMAG | REAL | IMAG |
| 2. | 2. | .111 | .103 | 0.079 | -.277E+00 | .000E+00 | -.121E+01 | .000E+00 |
| 2. | 3. | .086 | .108 | 0.063 | -.237E+00 | .000E+00 | -.158E+01 | .000E+00 |
| 2. | 4. | .098 | .121 | 0.071 | -.236E+00 | .000E+00 | -.146E+01 | .000E+00 |
| 2. | 5. | .048 | .088 | 0.075 | -.901E-01 | .000E+00 | -.145E+01 | .000E+00 |
| 2. | 6. | .058 | .098 | 0.093 | .253E+00 | .000E+00 | -.699E+00 | .000E+00 |
| 3. | 2. | .058 | .070 | 0.201 | -.257E+00 | .000E+00 | -.182E+01 | .000E+00 |
| 3. | 3. | .086 | .088 | 0.185 | -.307E+00 | .000E+00 | -.190E+01 | .000E+00 |
| 3. | 4. | .141 | .109 | 0.207 | -.391E+00 | .000E+00 | -.154E+01 | .000E+00 |
| 3. | 5. | .203 | .127 | 0.246 | -.614E+00 | .124E+00 | -.614E+00 | -.124E+00 |
| 3. | 6. | .255 | .140 | 0.291 | .364E+00 | .000E+00 | -.414E+00 | .000E+00 |
| 4. | 2. | .022 | .057 | 0.280 | -.264E+00 | .000E+00 | -.209E+01 | .000E+00 |
| 4. | 3. | .096 | .080 | 0.319 | -.416E+00 | .000E+00 | -.195E+01 | .000E+00 |
| 4. | 4. | .178 | .099 | 0.375 | -.664E+00 | .000E+00 | -.138E+01 | .000E+00 |
| 4. | 5. | .258 | .114 | 0.442 | -.651E+00 | .562E+00 | -.651E+00 | -.562E+00 |
| 4. | 6. | .319 | .123 | 0.512 | -.388E-01 | .401E+00 | -.388E-01 | -.401E+00 |
| 5. | 2. | .006 | .057 | 0.487 | -.285E+00 | .000E+00 | -.215E+01 | .000E+00 |
| 5. | 3. | .098 | .075 | 0.563 | -.527E+00 | .000E+00 | -.189E+01 | .000E+00 |
| 5. | 4. | .195 | .090 | 0.659 | -.103E+01 | .409E+00 | -.103E+01 | -.409E+00 |
| 5. | 5. | .283 | .100 | 0.767 | -.633E+00 | .852E+00 | -.633E+00 | -.852E+00 |
| 5. | 6. | .344 | .105 | 0.873 | .734E-02 | .740E+00 | .734E-02 | -.740E+00 |
| 6. | 3. | -.077 | .070 | 1.087 | -.555E+00 | .000E+00 | -.183E+01 | .000E+00 |
| 6. | 4. | .179 | .081 | 1.228 | -.983E+00 | .635E+00 | -.983E+00 | -.635E+00 |
| 6. | 5. | .265 | .087 | 1.384 | -.559E+00 | .102E+01 | -.559E+00 | -.102E+01 |
| 6. | 6. | .312 | .088 | 1.533 | .116E+00 | .851E+00 | .116E+00 | -.851E+00 |

TABLE E-22

STRAIGHT COURSE EQUILIBRIUM AND STABILITY

BETA=20. DEG XG=1.2 ZG=-0.50

| CV | T | CDEL | DRAFT | EHP | DIRECTIONAL STABILITY ROOTS | | | |
|----|----|------|-------|-------|-----------------------------|----------|-----------|-----------|
| | | | | | REAL | IMAG | REAL | IMAG |
| 2. | 2. | .222 | .154 | 0.114 | -.409E+00 | .000E+00 | -.148E+01 | .000E+00 |
| 2. | 3. | .192 | .165 | 0.091 | -.376E+00 | .000E+00 | -.170E+01 | .000E+00 |
| 2. | 4. | .218 | .191 | 0.104 | -.396E+00 | .000E+00 | -.153E+01 | .000E+00 |
| 2. | 5. | .025 | .074 | 0.068 | -.526E-01 | .000E+00 | -.225E+01 | .000E+00 |
| 2. | 6. | .028 | .082 | 0.081 | -.833E-01 | .000E+00 | -.173E+01 | .000E+00 |
| 3. | 2. | .176 | .117 | 0.329 | -.438E+00 | .000E+00 | -.214E+01 | .000E+00 |
| 3. | 3. | .210 | .140 | 0.307 | -.536E+00 | .000E+00 | -.212E+01 | .000E+00 |
| 3. | 4. | .283 | .170 | 0.334 | -.730E+00 | .000E+00 | -.173E+01 | .000E+00 |
| 3. | 5. | .375 | .200 | 0.387 | -.968E+00 | .452E+00 | -.968E+00 | -.452E+00 |
| 3. | 6. | .473 | .227 | 0.460 | -.514E+00 | .593E+00 | -.514E+00 | -.593E+00 |
| 4. | 2. | .135 | .091 | 0.512 | -.478E+00 | .000E+00 | -.253E+01 | .000E+00 |
| 4. | 3. | .240 | .124 | 0.582 | -.856E+00 | .000E+00 | -.218E+01 | .000E+00 |
| 4. | 4. | .358 | .155 | 0.666 | -.141E+01 | .653E+00 | -.141E+01 | -.653E+00 |
| 4. | 5. | .484 | .181 | 0.763 | -.114E+01 | .117E+01 | -.114E+01 | -.117E+01 |
| 4. | 6. | .608 | .204 | 0.870 | -.686E+00 | .142E+01 | -.686E+00 | -.142E+01 |
| 5. | 3. | .252 | .110 | 0.970 | -.141E+01 | .000E+00 | -.188E+01 | .000E+00 |
| 5. | 4. | .414 | .139 | 1.171 | -.152E+01 | .127E+01 | -.152E+01 | -.127E+01 |
| 5. | 5. | .573 | .163 | 1.356 | -.124E+01 | .183E+01 | -.124E+01 | -.183E+01 |
| 5. | 6. | .720 | .182 | 1.534 | -.767E+00 | .216E+01 | -.767E+00 | -.216E+01 |
| 6. | 3. | .214 | .093 | 1.555 | -.170E+01 | .207E+00 | -.170E+01 | -.207E+00 |
| 6. | 4. | .421 | .121 | 1.957 | -.156E+01 | .167E+01 | -.156E+01 | -.167E+01 |
| 6. | 5. | .608 | .142 | 2.289 | -.126E+01 | .234E+01 | -.126E+01 | -.234E+01 |
| 6. | 6. | .770 | .157 | 2.585 | -.759E+00 | .275E+01 | -.759E+00 | -.275E+01 |

TABLE E-23

STRAIGHT COURSE EQUILIBRIUM AND STABILITY

BETA=20. DEG XG=1.2 ZG=-0.75

| CV | T | CDEL | DRAFT | EHP | DIRECTIONAL STABILITY ROOTS | | | |
|----|----|------|-------|-------|-----------------------------|----------|-----------|-----------|
| | | | | | REAL | IMAG | REAL | IMAG |
| 2. | 2. | .219 | .152 | 0.113 | -.404E+00 | .000E+00 | -.150E+01 | .000E+00 |
| 2. | 3. | .188 | .163 | 0.090 | -.369E+00 | .000E+00 | -.172E+01 | .000E+00 |
| 2. | 4. | .212 | .188 | 0.102 | -.386E+00 | .000E+00 | -.156E+01 | .000E+00 |
| 2. | 5. | .026 | .075 | 0.068 | -.531E-01 | .000E+00 | -.225E+01 | .000E+00 |
| 2. | 6. | .029 | .083 | 0.081 | .833E-01 | .000E+00 | -.173E+01 | .000E+00 |
| 3. | 2. | .173 | .116 | 0.326 | -.432E+00 | .000E+00 | -.215E+01 | .000E+00 |
| 3. | 3. | .206 | .139 | 0.303 | -.526E+00 | .000E+00 | -.213E+01 | .000E+00 |
| 3. | 4. | .277 | .168 | 0.328 | -.711E+00 | .000E+00 | -.176E+01 | .000E+00 |
| 3. | 5. | .366 | .196 | 0.380 | -.977E+00 | .426E+00 | -.977E+00 | -.426E+00 |
| 3. | 6. | .461 | .222 | 0.450 | -.529E+00 | .591E+00 | -.529E+00 | -.591E+00 |
| 4. | 2. | .131 | .090 | 0.504 | -.468E+00 | .000E+00 | -.254E+01 | .000E+00 |
| 4. | 3. | .234 | .123 | 0.572 | -.833E+00 | .000E+00 | -.221E+01 | .000E+00 |
| 4. | 4. | .350 | .152 | 0.652 | -.141E+01 | .618E+00 | -.141E+01 | -.618E+00 |
| 4. | 5. | .472 | .178 | 0.745 | .115E+01 | .115E+01 | -.115E+01 | -.115E+01 |
| 4. | 6. | .591 | .199 | 0.848 | -.693E+00 | .140E+01 | -.693E+00 | -.140E+01 |
| 5. | 3. | .244 | .108 | 0.951 | -.131E+01 | .000E+00 | -.197E+01 | .000E+00 |
| 5. | 4. | .403 | .136 | 1.145 | -.152E+01 | .123E+01 | -.152E+01 | -.123E+01 |
| 5. | 5. | .556 | .159 | 1.322 | -.124E+01 | .179E+01 | -.124E+01 | -.179E+01 |
| 5. | 6. | .696 | .177 | 1.492 | -.768E+00 | .212E+01 | -.768E+00 | -.212E+01 |
| 6. | 3. | .206 | .092 | 1.528 | -.151E+01 | .000E+00 | -.189E+01 | .000E+00 |
| 6. | 4. | .407 | .118 | 1.915 | -.156E+01 | .162E+01 | -.156E+01 | -.162E+01 |
| 6. | 5. | .585 | .138 | 2.231 | -.125E+01 | .228E+01 | -.125E+01 | -.228E+01 |
| 6. | 6. | .737 | .152 | 2.510 | -.752E+00 | .267E+01 | -.752E+00 | -.267E+01 |

TABLE E-24

STRAIGHT COURSE EQUILIBRIUM AND STABILITY

BETA=20. DEG XG=1.2 ZG=-1.00

| CV | T | CDEL | DRAFT | EHP | DIRECTIONAL STABILITY ROOTS | | | |
|----|----|------|-------|-------|-----------------------------|----------|-----------|-----------|
| | | | | | REAL | IMAG | REAL | IMAG |
| 2. | 2. | .216 | .151 | 0.112 | -.398E+00 | .000E+00 | -.151E+01 | .000E+00 |
| 2. | 3. | .184 | .161 | 0.089 | -.362E+00 | .000E+00 | -.174E+01 | .000E+00 |
| 2. | 4. | .207 | .185 | 0.100 | -.377E+00 | .000E+00 | -.159E+01 | .000E+00 |
| 2. | 5. | .026 | .075 | 0.068 | -.536E-01 | .000E+00 | -.225E+01 | .000E+00 |
| 2. | 6. | .030 | .083 | 0.082 | .834E-01 | .000E+00 | -.173E+01 | .000E+00 |
| 3. | 2. | .170 | .115 | 0.322 | -.426E+00 | .000E+00 | -.216E+01 | .000E+00 |
| 3. | 3. | .201 | .137 | 0.298 | -.517E+00 | .000E+00 | -.215E+01 | .000E+00 |
| 3. | 4. | .271 | .165 | 0.322 | -.692E+00 | .000E+00 | -.179E+01 | .000E+00 |
| 3. | 5. | .357 | .193 | 0.372 | -.987E+00 | .396E+00 | -.987E+00 | -.396E+00 |
| 3. | 6. | .448 | .217 | 0.439 | -.544E+00 | .585E+00 | -.544E+00 | -.585E+00 |
| 4. | 2. | .127 | .089 | 0.496 | -.458E+00 | .000E+00 | -.255E+01 | .000E+00 |
| 4. | 3. | .228 | .121 | 0.562 | -.811E+00 | .000E+00 | -.223E+01 | .000E+00 |
| 4. | 4. | .341 | .150 | 0.639 | -.141E+01 | .581E+00 | -.141E+01 | -.581E+00 |
| 4. | 5. | .460 | .174 | 0.728 | -.115E+01 | .113E+01 | -.115E+01 | -.113E+01 |
| 4. | 6. | .574 | .194 | 0.826 | -.700E+00 | .138E+01 | -.700E+00 | -.138E+01 |
| 5. | 3. | .238 | .107 | 0.933 | -.124E+01 | .000E+00 | -.205E+01 | .000E+00 |
| 5. | 4. | .392 | .134 | 1.119 | -.152E+01 | .120E+01 | -.152E+01 | -.120E+01 |
| 5. | 5. | .539 | .156 | 1.288 | -.124E+01 | .175E+01 | -.124E+01 | -.175E+01 |
| 5. | 6. | .672 | .172 | 1.450 | -.768E+00 | .207E+01 | -.768E+00 | -.207E+01 |
| 6. | 3. | .199 | .091 | 1.503 | -.136E+01 | .000E+00 | -.204E+01 | .000E+00 |
| 6. | 4. | .393 | .116 | 1.873 | -.155E+01 | .157E+01 | -.155E+01 | -.157E+01 |
| 6. | 5. | .564 | .135 | 2.174 | -.125E+01 | .222E+01 | -.125E+01 | -.222E+01 |
| 6. | 6. | .705 | .147 | 2.437 | -.744E+00 | .259E+01 | -.744E+00 | -.259E+01 |

TABLE E-25

CRAFT PARAMETERS FOR BOAT TESTED IN REFERENCE 9

| <u>Boat Parameters</u> | | | <u>Engine Parameters</u> | |
|-----------------------------|-----------|-----------|---|----------|
| x'_G | 1.099 | | b_1 | -0.05170 |
| y'_G | 0 | | b_2 | -0.5658 |
| z'_G | -0.442 | | b_3 | -1.5803 |
| R'_x | 2.68 | | θ_P | 0 |
| R'_y | 19.3 | | η_E | 0.85 |
| R'_z | 18.4 | | γ_E | 1.923 |
| | | | ω'_{ER} | 218 |
| <u>Propeller Parameters</u> | | | <u>Rudder Parameters</u> | |
| ϵ'_{TP} | -0.0626 | | ϵ'_{RP} | -0.0543 |
| G'_{TP} | -0.322 | | G'_{RP} | 0 |
| ϵ'_{TA} | -0.0562 | | A_R | 1.25 |
| η'_{TA} | 0 | | S'_R | 0.0362 |
| G'_{TA} | 0.450 | | C_{DoR} | 0.008 |
| D'_P | 0.2 | | | |
| Pitch | 1.2 | | | |
| BAR | 0.65 | 0.50 | | |
| $K_{T\sigma}$ | 0.339 | 0.317 | | |
| K_{TJ} | -0.05739 | -0.04754 | | |
| K_{TJJ} | 0.0008928 | 0.0001786 | | |
| $K_{Q\sigma}$ | 0.062 | 0.058 | | |
| K_{QJ} | -0.009536 | -0.008286 | | |
| K_{QJJ} | 0.0001786 | 0.0001429 | | |
| | | | <u>Boat Parameters in Engineering Units</u> | |
| | | | Beam, ft | 5.56 |
| | | | Weight, lb | 2356 |
| | | | LCG, ft fwd of transom | 6.11 |
| | | | VCG, ft above keel | 2.46 |
| | | | n'_{ER} , rpm | 5000 |

TABLE E-26

TURNING EQUILIBRIUM CONDITIONS

| | θ_H | BAR | C_V | θ | z_T^1 | C_A | ω_P^1 | HP_{ER}^1 | ω^1 | α | φ | ψ_P |
|----|------------|-----|-------|----------|---------|-------|--------------|-------------|------------|----------|-----------|----------|
| 1 | 15 | .65 | 3.836 | 2.960 | .09925 | .22 | 75.51 | .6062 | 0 | 2.960 | 1.856 | -.0614 |
| 2 | 15 | .65 | 4.000 | 2.915 | .09535 | .22 | 77.20 | .6253 | 0 | 2.915 | 1.935 | -.0633 |
| 3 | 15 | .65 | 2.000 | 4.585 | .1763 | .22 | 58.26 | .4486 | 0 | 4.584 | 1.126 | -.0557 |
| 4 | 15 | .65 | 3.000 | 3.339 | .1249 | .22 | 67.28 | .5230 | 0 | 3.338 | 1.491 | -.0543 |
| 5 | 15 | .65 | 5.000 | 2.752 | .07834 | .22 | 89.14 | .7886 | 0 | 2.752 | 2.562 | -.0839 |
| 6 | 15 | .65 | 6.000 | 2.725 | .07198 | .22 | 105.86 | 1.1289 | 0 | 2.726 | 3.770 | -.1348 |
| 7 | 15 | .65 | 4.000 | 3.545 | .1117 | .3 | 80.68 | .6837 | 0 | 3.545 | 1.547 | -.0568 |
| 8 | 15 | .65 | 4.000 | 1.978 | .06650 | .1 | 71.66 | .5399 | 0 | 1.980 | 3.883 | -.1142 |
| 9 | 10 | .65 | 4.000 | 2.838 | .07854 | .22 | 73.05 | .5607 | 0 | 2.838 | 1.663 | -.0614 |
| 10 | 10 | .65 | 2.000 | 4.856 | .1409 | .22 | 57.06 | .4340 | 0 | 4.853 | 1.050 | -.0772 |
| 11 | 10 | .65 | 3.000 | 3.630 | .1044 | .22 | 63.01 | .4657 | 0 | 3.629 | 1.233 | -.0516 |
| 12 | 20 | .65 | 2.000 | 1.522 | .1363 | .22 | 53.54 | .3923 | 0 | 1.522 | 0.935 | -.0264 |
| 13 | 20 | .65 | 3.000 | 3.743 | .1447 | .22 | 67.87 | .5314 | 0 | 3.743 | 1.509 | -.0642 |
| 14 | 20 | .65 | 4.000 | 3.326 | .1173 | .22 | 80.40 | .6788 | 0 | 3.326 | 2.162 | -.0779 |
| 15 | 15 | .65 | 3.817 | 2.936 | .09960 | .22 | 75.46 | .6062 | -.01855 | 2.900 | 3.680 | -1. |
| 16 | 15 | .65 | 3.757 | 2.858 | .1007 | .22 | 75.28 | .6062 | -.03915 | 2.787 | 5.281 | -2. |
| 17 | 15 | .65 | 3.663 | 2.711 | .1021 | .22 | 74.99 | .6062 | -.06251 | 2.614 | 6.816 | -3. |
| 18 | 15 | .65 | 3.555 | 2.408 | .1023 | .22 | 74.66 | .6062 | -.09796 | 2.312 | 9.971 | -3.9 |
| 19 | 15 | .65 | 3.976 | 3.520 | .1124 | .3 | 80.62 | .6837 | -.01730 | 3.470 | 3.305 | -1. |
| 20 | 15 | .65 | 3.901 | 3.444 | .1144 | .3 | 80.40 | .6837 | -.03558 | 3.343 | 4.357 | -2. |
| 21 | 15 | .65 | 3.784 | 3.323 | .1174 | .3 | 80.06 | .6837 | -.05397 | 3.172 | 4.503 | -3. |
| 22 | 15 | .65 | 3.639 | 3.153 | .1208 | .3 | 79.64 | .6837 | -.07317 | 2.957 | 4.240 | -4. |
| 23 | 15 | .65 | 3.473 | 2.903 | .1237 | .3 | 79.16 | .6837 | -.09577 | 2.672 | 4.356 | -5. |
| 24 | 15 | .65 | 2.850 | 3.447 | .1308 | .22 | 65.82 | .5096 | 0 | 3.446 | 1.428 | -.0535 |
| 25 | 15 | .65 | 2.849 | 3.403 | .1306 | .22 | 65.82 | .5096 | -.02361 | 3.368 | 3.566 | -1. |
| 26 | 15 | .65 | 2.836 | 3.278 | .1300 | .22 | 65.78 | .5096 | -.04699 | 3.203 | 4.516 | -2. |
| 27 | 15 | .65 | 2.816 | 3.081 | .1284 | .22 | 65.71 | .5096 | -.06943 | 2.968 | 4.791 | -3. |
| 28 | 15 | .65 | 2.809 | 2.742 | .1241 | .22 | 65.69 | .5096 | -.09816 | 2.610 | 6.210 | -4. |
| 29 | 15 | .50 | 3.836 | 2.960 | .09925 | .22 | 76.60 | .5957 | 0 | 2.960 | 1.833 | -.0606 |
| 30 | 15 | .50 | 3. | 2.936 | .09960 | .22 | 76.55 | .5957 | -.01856 | 2.900 | 3.658 | -1. |
| 31 | 15 | .50 | 3.757 | 2.858 | .1007 | .22 | 76.38 | .5957 | -.03917 | 2.787 | 5.261 | -2. |
| 32 | 15 | .50 | 3.662 | 2.711 | .1021 | .22 | 76.12 | .5957 | -.06253 | 2.614 | 6.799 | -3. |