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THESIS

**FLOW VISUALIZATION AND DETAILED LOAD
MEASUREMENTS OVER A MANEUVERING UCAV 1303**

by

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March 2011

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MANEUVERING UCAV 1303**

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requirements for the degree of

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ABSTRACT

The unsteady aerodynamic performance of a maneuvering 1/72nd scale model of an unmanned combat air vehicle (UCAV) 1303 geometry has been studied in the Naval Postgraduate School water tunnel. Despite the numerous past publications on UCAV flows, none pertains to the UCAV maneuvering characteristics. Due to its nonslender wing, the flow features over the chosen aircraft are unique in that both features of highly yawed wings and of delta wings are present. Even though the speeds and Reynolds numbers are low in a water tunnel, the results of the present studies attest to the suitability of a water tunnel for performing such studies. Force measurements taken at various Reynolds numbers, model attitudes and maneuvering rates for comparison proved to be valid for data comparison to potential flight scenarios.

The UCAV 1303 model has a 47° leading edge sweep and a cranked trailing edge delta wing with a fuselage. Pitching and rolling maneuvers were performed in various combinations to demonstrate the real flight conditions of a maneuvering UCAV. A five-component strain-gage and flow monitoring software were used to determine force and moment coefficients in real time. These coefficients were analyzed and compared to previous flow visualization tests to correlate the various flow features recorded during that phase of the study, and to determine the overall stability of a delta wing UCAV. These plots demonstrate what is seen visually at Reynolds numbers from 1.17×10^4 to 2.94×10^4 . Where the pitch break occurs on the wings during maneuvers is correlated and dependent on Reynolds number, as initially suspected. Performing unsteady maneuvers helped in retaining the approximate linear variation of lift coefficient to higher angles of attack. Roll maneuvers produced oscillatory side forces and moments at high angles of attack and roll, indicating potentially serious unsteady forces.

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LIST OF ACRONYMS AND ABBREVIATIONS

AoA	=	Angle of attack (degrees)
$\bar{c}$	=	Mean Aerodynamic Chord (in)
C_M	=	Pitching Moment Coefficient
C_N	=	Normal Force Coefficient
C_{RM}	=	Rolling Moment Coefficient
C_S	=	Side Force Coefficient
C_{YM}	=	Yawing Moment Coefficient
LEV	=	Leading Edge Vortex
N	=	Normal Force
PM	=	Pitching Moment
Re	=	Reynolds Number
RM	=	Rolling Moment
S	=	Side Force
U_∞	=	Free-Stream Velocity (in/sec)
UCAV	=	Unmanned Combat Air Vehicle
YM	=	Yawing Moment
α	=	Angle Alpha; AoA (degrees)
α^+	=	Nondimensional Pitch Rate
ϕ	=	Roll Angle (degrees)
$\dot{\phi}$	=	Roll Rate (degrees/sec)
ϕ^+	=	Nondimensional Roll Rate

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I. INTRODUCTION

A. UNMANNED COMBAT AIR VEHICLE (UCAV) AERODYNAMICS

An unmanned combat air vehicle (UCAV) can be called on to perform many unique and different missions. It is likely to encounter serious counter measures and may be required to perform evasive maneuvers. Failure here could mean not only the loss of the flight vehicle, but also could provide access to modern secrets held onboard to the enemy. Thus, it is critical to establish the maneuvering characteristics of the aircraft; as a better understanding of the unsteady flows during a maneuver is always desired. The present study aims to address this shortcoming. Understanding the aerodynamics is essential for engineers to be able to develop an airfoil that meets the above conditions.

Boeing has tested a tailless UCAV design, designated as UCAV 1303, as seen in Figure 1 [1]. This design uses a blended wing-body configuration, with a leading edge sweep of 47° and a cranked trailing edge [2]. The unusual configuration presents difficulties in fully understanding how a UCAV 1303 will perform under certain flight conditions. The aerodynamics knowledge base of a conventional delta wing is well established, but that data for nonslender leading edge wings needs more study. Gursul [3] has provided some insight into the flow past the UCAV 1303 wing at low speeds and indicates that the aerodynamics is dominated by spanwise three-dimensional flow typical of a yawed wing at low angles of attack. However, at higher angles, the characteristics of a delta wing appear; in particular, a conventional delta wing vortex forms, grows with increase in angle of attack, and eventually breaks down causing significant load and moment disturbances. Some of these have been characterized in low speed experiments and computational studies. For example, it has been shown that there exists a pitch break problem on the leading edge radius. Studies by Petterson [4] have shown that the geometry has a tendency for premature tip-stall at very low angles of attack, which can introduce this pitch break. Additional features appear as the flow conditions are changed. In particular, the vortex bursting that seems inevitable at higher angles of attack leads to

changes in the lift curve slope. The onset angles of attack for these events also changes with Reynolds number and Mach number [5]. The effects of unsteady maneuvers on these basic flow aspects and the concomitant loads have not been studied until now. In addition, most previous studies have been limited to the case of a flat plate and no fuselage effects have been included.



Figure 1. UCAV Concept, From [1]

B. NONSLENDER DELTA WING FLOW DESCRIPTION

The UCAV 1303 model has flight characteristics of a delta wing, but it also has flight characteristics of a lambda wing. As a delta wing, the flow consists of two vortex patterns that form over the wings. The vortices form in the vicinity of the swept leading edge at high angles of attack just above the wing surface and are caused by flow shear layers that are unable to negotiate the sharp leading edge. The subsequent vortices that form are Reynolds number dependent and are caused by local boundary layer separation [5].

The low pressure inside the vortex is known to be responsible for the additional lift observed during its presence on the wings upper surface and is known as vortex lift. Depending on flow conditions such as Reynolds number, Mach number, and angle of attack, the vortex remains on the surface or moves down the wake. However, at a large

angle of attack for these flight conditions, the vortex lift ends abruptly with its bursting (breakdown). The angle of attack when this occurs is referred to as the critical angle of attack. The breakdown phenomenon is complex, is influenced by many factors including the wing design, and can be bubble type bursting or spiral breakdown. Regardless of the underlying mechanism, it has an adverse consequence on the flight performance of the vehicle [6] that manifests as strong undesirable loads demanding high frequency response from the control system for stable flight.

In the case of the UCAV 1303 geometry, local maximums in the lift coefficient occur between the outboard crank and the tip and local minimums at the inboard trailing edge crank. At or near these points flow separation also takes place. It is this flow separation that causes the UCAV 1303 to experience undesirable pitch-up behavior at times [7].

C. REVIEW OF BACKGROUND LITERATURE

Results of several studies can be found in the literature, but each has a very different goal from that of the present study. Some simply tested a flat plate planform of the UCAV 1303, others included fuselage. Even engine mass flow has been incorporated in some CFD work. Primarily, the foci of all these were on the aerodynamic characteristics of the UCAV 1303, but confined to low - moderate angles of attack. A study conducted at the Boeing Polysonic Wind Tunnel reached a maximum angle of attack of 20° [7]. Another study conducted by QinetiQ [5] extended up to an angle of attack of 25° , with emphasis on documenting the effects of the leading edge radius. Figure 2a shows the result of this experiment and presents the lift coefficients associated with three leading edge designs. From this figure it can be seen that a sharp leading edge is less sensitive to Mach number than a rounded leading edge. Figure 2b shows the pitching moment coefficients for the same three designs, which confirms that a sharp leading edge design is less sensitive to Reynolds number compared to a rounded leading edge. It can also be seen that at angles of attack of around 10° , the UCAV 1303 exhibits sharp rise in the pitching moment [5].

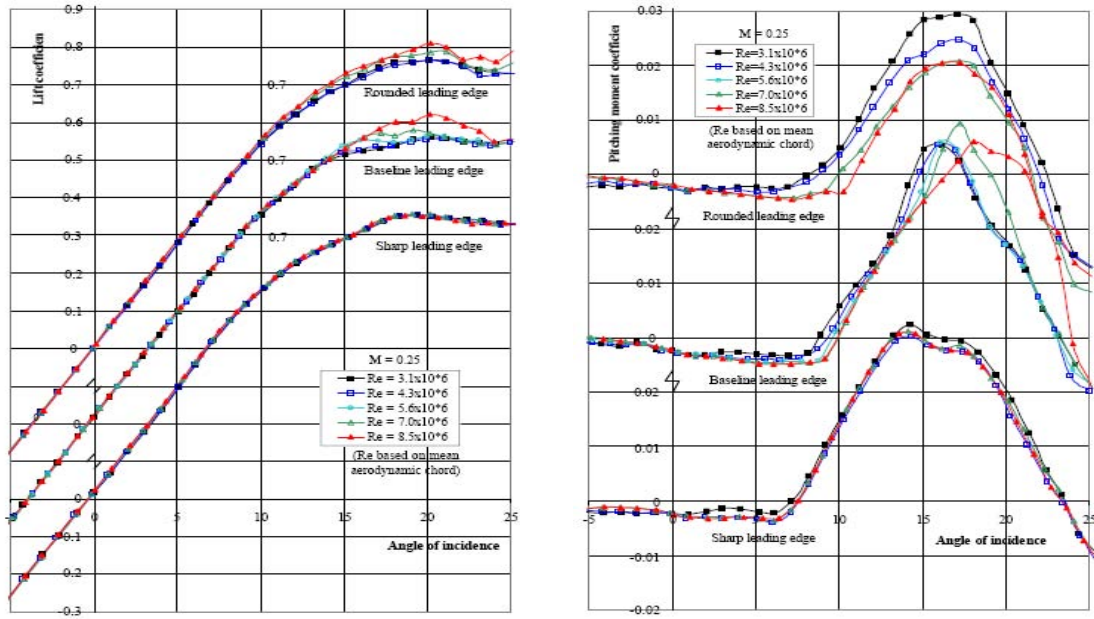


Figure 2. Left (a) Variation of Lift Coefficient; Right (b) Pitching Moment, With Angle of Attack From [5]

Some low speed water tunnel tests conducted have also been performed; mainly for qualitative and quantitative flow visualization. Dye visualization and particle image velocimetry have provided valuable information of the flow field over a UCAV wing, Ol [2] and Nelson, et al [8]. However, the two tests also produced significantly different conclusions. Ol [2] showed only a single case of LEV formation occurring at 12° angles of attack, while Nelson found multiple vortices forming at angles of attack greater than 8° . McLain [9] and Chua [10] utilized a water tunnel with dye visualization that produced convincing evidence of LEV formation at AoA as low as 6° with indications of tip stall at various angles of attack.

Others have conducted computational fluid dynamics (CFD) studies on the UCAV 1303. The results of the CFD studies are similar to the results of the wind tunnel tests under the same conditions. However, only a limited range of flow conditions have been attempted with CFD and thus, exact case-by-case comparisons are not possible. Whereas the fluid mechanics details of the flow around a UCAV are now reasonably well

established, and a modest amount of aerodynamics performance load data is publicly available, a more concentrated effort is still needed for the aerodynamic coefficient data. This is especially critical under maneuvering conditions as a UCAV can be expected to perform such motions when evading threats.

D. GOALS OF THE PRESENT STUDY

As already stated, the available UCAV 1303 configuration load data pertains mostly to steady flight conditions. These are useful in determining how a UCAV operates when in straight, level flight; but not in determining performance during evasive maneuvers. Maneuvers introduce additional loads and moments due to the imposed unsteadiness effects on the flow vorticity field. These forces are relatively easy to measure in one dimensional maneuvers below some angle of attack; the difficulty is introduced when measuring unsteady flow at high angles of attack (AoA). During high angle of attack, pitch-up maneuvers for example, there are effects induced from the side and yaw forces. Likewise, corresponding changes appear in the moments. Since most facilities are indeed steady flow tunnels, it is not possible to execute rapid maneuvers to obtain critical flow induced loads. But, with a model motion system capable of precisely controlling the model attitude dynamically, and a sensitive load balance system, the present experiment can be performed and provide this critical load data.

The information presented herein will focus on obtaining lift and side forces, as well as pitching, yawing, and rolling moments as the UCAV model executes various maneuvers at different free-stream velocity values. Data has been obtained for a large experiment matrix for different Reynolds numbers. The data could be subsequently used to estimate the UCAV stability derivatives. The objectives of this study are the following: to determine the resulting loads on a UCAV during complex maneuvers, to determine the correlations between any pitch breaks and the unusual fluid mechanics aspects like premature tip stall and asymmetric vortex breakdown, and to quantify the role of the bursting of the leading edge vortex generated during complex maneuvers and its effect on the various performance quantities of this tail-less UCAV.

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II. DESCRIPTION OF EXPERIMENTAL FACILITY AND TECHNIQUES

A. THE NPS WATER TUNNEL

The Naval Postgraduate School water tunnel is a 15" x 20" cross-section flow channel – Rolling Hills Research Corp, (RHRC) Model 1520. This facility is a recirculating flow system that allows the operator to assess a model's aerodynamic performance in static or dynamic flight conditions. The water tunnel is constructed out of tempered glass and provides optical access from all sides and from the rear. The horizontal configuration of the tunnel allows ease of model access without having to drain the tunnel completely [11].

The test-section of the tunnel has a cross section of 300 in² and is 60" long. Its sidewalls have a slight divergence to account for the effects of boundary layer growth, which allows for maintaining uniform velocity throughout the test section region. The tunnel was set up so that the viewing section is at eye level, but it also allows a camera to be positioned underneath to record flow field images. The velocity in the test section varies from 0 in/sec to 14 in/sec resulting in a wide Reynolds number range for performing the tests. Typically, dye flow visualization studies are conducted at lower speeds because the shear layer instabilities of the injected dye become turbulent at higher velocities and spoils the dye definition, velocity measurements are conducted at all speeds and load data is obtained at higher speeds using, an attached strain-gage balance system to determine aerodynamic forces and coefficients [11]. As the speeds are in general smaller in a water tunnel compared to a wind tunnel, the strain-gage balance must be very sensitive. Here, a load of a few grams can be measured accurately. Figure 3 shows a schematic and a picture of the water tunnel.

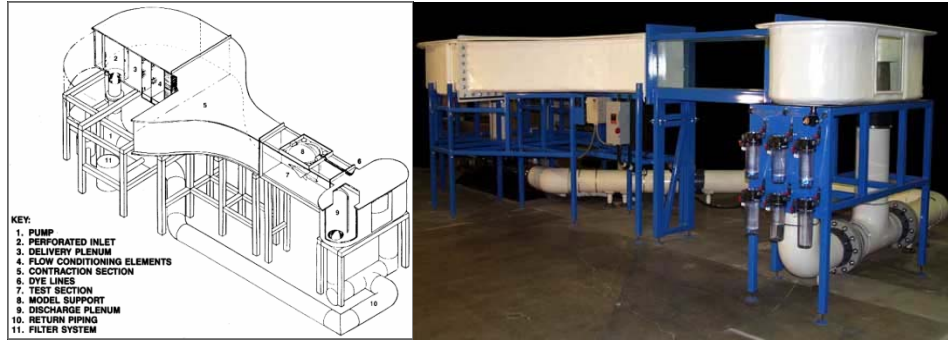


Figure 3. Flow Visualization Water Tunnel, Model 1520, From [11]

B. THE UCAV 1303 MODEL

The models used for experimentation during this research are UCAV 1303 configuration, with a scale of 1:72. The selection of the geometry was dictated by the availability of CAD files (supplied by USAF) and the general interest in it by the The Technical Co-operation Programme group. This particular UCAV geometry is tailless and consists of a low 47° sweep leading edge with $\pm 30^\circ$ and $\pm 47^\circ$ cranked trailing edge. Two separate models were fabricated. The model for flow visualization was constructed from Nylon 12PA using rapid prototyping methods for the upper and lower surface sections that were glued after embedding the dye visualization tubes to form a single piece. Eight symmetric dye ports inserted internally to the model to enable dye injection. Figure 4 shows the dimensions and the internals of the dye tubes within the model [10].

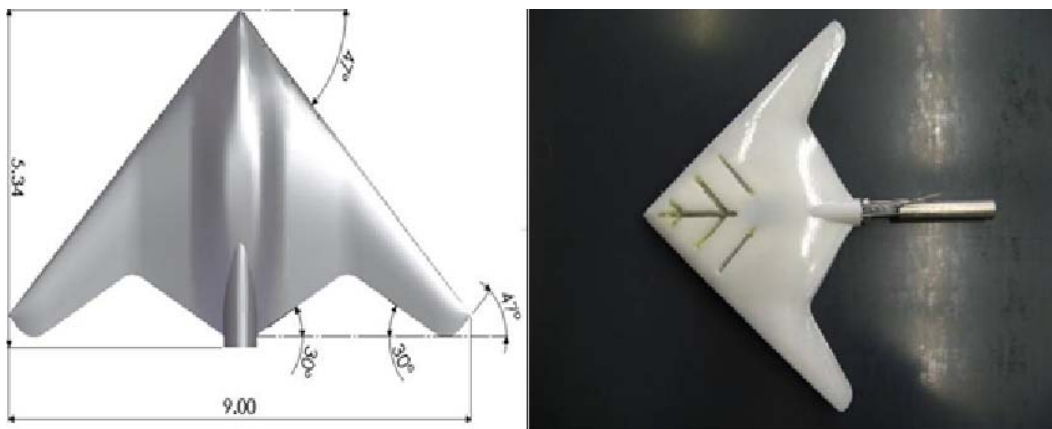


Figure 4. Model Dimensions and Placement of Dye Ports, From [10]

The model for use with the strain-gage was constructed of a solid piece, with provision for accommodating a load balance. This allowed for the insertion of a five-component, water tight strain-gage balance, which will be discussed in the next section. Once inserted, a protective cover designed to properly represent the model external surface was placed over it. A matched screw hole ensures firmly attaching the model to the strain-gage balance and transmitting the loads directly to it [10].

C. LOAD MEASUREMENT INSTRUMENTATION

The balance used for measurement of forces and moments is an internal balance consisting of five strain-gages that are connected using a full Wheatstone bridge for each channel. Each gage has external standard resistors to compensate for gage resistance and changes in temperature when running the tunnel during experimentation. Five wires are attached to each gage, a positive and negative input, a positive and negative output, and a wire used as a potentiometer to balance the strain-gage externally. Table 1 shows the values of each external resistor and Figure 5 shows the full Wheatstone bridge [11].

Channel	R1	R2	R3
CH1 (YM1)	1k Ω	0 Ω	458.7k Ω
CH2 (PM1)	1k Ω	0 Ω	152.5k Ω
CH3 (RM)	1k Ω	0 Ω	756.5k Ω
CH4 (PM2)	1k Ω	0 Ω	38.8k Ω
CH5 (YM2)	1k Ω	0 Ω	351.3k Ω

Table 1. Resistor Values, From [11]

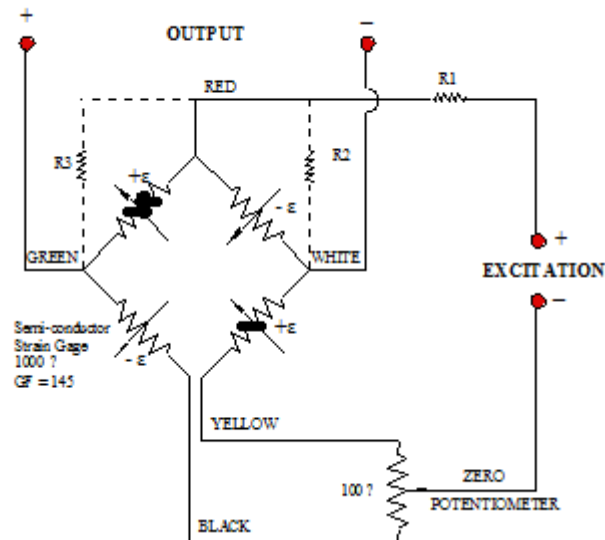


Figure 5. Wheatstone Bridge Circuit, From [11]

The strain-gage balance has five sections and allows for simultaneous measurement of pitching, yawing, and rolling moments as well as normal and side forces. The balance is covered with layers of RTV silicone and waterproofed for reliable operation in the water tunnel. Each gage in the balance has a 1000Ω impedance semiconductor with maximum loadings that meet the manufacturer's specifications. The gage maximum loadings were determined to meet required stress levels and also to allow for proper gage sensitivities. The sensitivities of the gages are identical and listed in Table 2 [11].

<u>Force/Moment</u>	<u>Sensitivity</u>
N	2.4 V/lb
S	16.8 V/lb
PM	5.0 V/in-lb
RM	10.2 V/in-lb
YM	16.4 V/in-lb

Table 2. Balance Sensitivity, From [11]

The system used for monitoring the experiments consisted of a Model 2100 Strain-gage Conditioner and Amplifier made by Vishay Measurements Group. This multi-channel system enabled strain-gage measurements and provided conditioned high level signals [11]. The signal conditioner also included a digital output display and allowed for independent and variable excitation for each channel. In this experiment 5 volts of excitation with a gain of 200 was used. The signals received by the system were then sent to an A/D board for processing. Sampling rates of 100 kilo-samples/sec were possible with the A/D board; a rate of 100 samples/sec was used during this study.

Three separate DC stepper motors control model motion in pitch, roll and yaw; pitch angle is variable between -1° and $+40^\circ$, roll angle is variable between $\pm 360^\circ$ and yaw angle is variable between $\pm 25^\circ$. A C-strut is connected to an arm affixed to the tunnel and controls pitch angle. A turntable mounted on top of the water tunnel was connected to the C-strut and provided control of the yaw angle. The rolling motion was controlled by a DC motor mounted directly to the rear of the model support and was water proofed to allow for full submersion [8]. The arrangement ensured that the model rotational axis coincided with that of the C-strut system, so that no relative motion was present.

Each motor is controlled by a commercial off-the-shelf system and is powered by a nuDriveTM power amplifier. This system uses servo motors to allow position feedback and obtain accurate motion in all three axes. The nuDriveTM unit is connected to an IBM-compatible computer system that uses LabViewTM software commands. LabViewTM allows dynamic testing commands as well as step motion commands [11]. Figure 6 shows the model support and the individual DC motors.

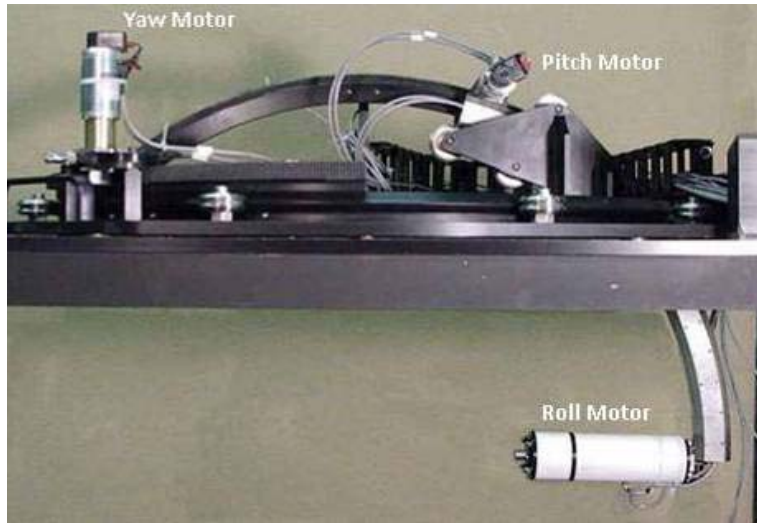


Figure 6. Water Tunnel Model Support, From [11]

D. CALIBRATION OF STRAIN-GAGE SYSTEM

The strain-gage balance is calibrated at the NPS water tunnel facility following the standard procedure recommended by Rolling Hills Research Corporation. The data reduction method that was followed is transparent to the user and is a part of the calibration software supplied by RHRC. The calibration accounts for the interference effects of the gages as the output from one of the pitching moment gages is dependent on a normal force, and a yawing moment or rolling moment.

The balance is attached to the calibration rig shown in Figure 7, and weights representing a full range of expected loads, 0 grams to 150 grams, are hung from the balance support in the normal force (+N) direction at each of the five load points shown in Figure 8. The computer software determines a linear curve fit for the slope at each load point. This procedure is repeated for the -N direction and for the side force ($\pm S$) forces as well. The $\pm N$ and the $\pm S$ forces are used to determine pitching and yawing moment coefficients. Weights hung in the positive and negative direction at the reference center determine the rolling moment coefficient [12].

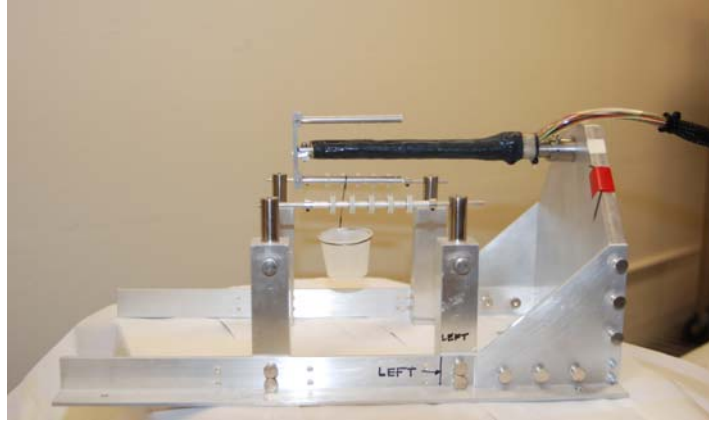


Figure 7. Internal Balance and Calibration Rig, From [12]

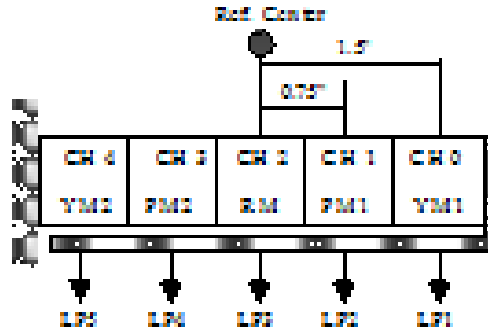


Figure 8. Balance and Load Fixture Geometry, From [12]

To validate the calibration procedure, the acquisition/reduction software develops slopes associated with each channel under load, and the sensitivities of these channels are plotted in Figures 9, 10, and 11. The slope of each plot shows the channel's response to an applied moment in the respective plane, while the y-intercept shows the response to an applied force. In Figure 9, a pitching moment develops while the force is normal. Figure 10 depicts a yawing moment and a side force. Figure 11 shows the rolling moment sensitivity. After creating all graphs, the software automatically builds a calibration input matrix using the coefficients determined as described above. This input matrix is inverted to obtain the output matrix listed in Table 3 as derived by Equation 1. The software uses this matrix to calculate forces and moments from gage readings [12].

Calibration Output Matrix

$$\begin{bmatrix} N \\ PM \\ S \\ YM \\ RM \end{bmatrix} = \begin{bmatrix} \frac{\partial N}{\partial YM1} & \frac{\partial N}{\partial PM1} & \frac{\partial N}{\partial RM} & \frac{\partial N}{\partial PM2} & \frac{\partial N}{\partial YM2} \\ \frac{\partial PM}{\partial YM1} & \frac{\partial PM}{\partial PM1} & \frac{\partial PM}{\partial RM} & \frac{\partial PM}{\partial PM2} & \frac{\partial PM}{\partial YM2} \\ \frac{\partial S}{\partial YM1} & \frac{\partial S}{\partial PM1} & \frac{\partial S}{\partial RM} & \frac{\partial S}{\partial PM2} & \frac{\partial S}{\partial YM2} \\ \frac{\partial YM}{\partial YM1} & \frac{\partial YM}{\partial PM1} & \frac{\partial YM}{\partial RM} & \frac{\partial YM}{\partial PM2} & \frac{\partial YM}{\partial YM2} \\ \frac{\partial RM}{\partial YM1} & \frac{\partial RM}{\partial PM1} & \frac{\partial RM}{\partial RM} & \frac{\partial RM}{\partial PM2} & \frac{\partial RM}{\partial YM2} \end{bmatrix} \cdot \begin{bmatrix} YM1 \\ PM1 \\ RM \\ PM2 \\ YM2 \end{bmatrix} \quad (1)$$

<u>YM1</u>	<u>PM1</u>	<u>RM</u>	<u>PM2</u>	<u>YM2</u>
5.67×10^{-1}	$4.02 \times 10^{+1}$	4.18×10^{-1}	$3.99 \times 10^{+1}$	-9.27×10^{-1}
-6.57×10^{-1}	$-2.20 \times 10^{+1}$	-5.9×10^{-1}	$-1.89 \times 10^{+1}$	-4.93×10^{-1}
$-6.05 \times 10^{+0}$	5.62×10^{-1}	2.29×10^{-2}	-5.40×10^{-1}	$6.33 \times 10^{+0}$
$6.49 \times 10^{+0}$	-1.78×10^{-1}	5.67×10^{-1}	-2.88×10^{-1}	$6.21 \times 10^{+0}$
-7.57×10^{-1}	$-1.00 \times 10^{+0}$	$-9.84 \times 10^{+0}$	7.25×10^{-1}	7.44×10^{-1}

Table 3. Calibration Output Matrix (lbf/V or in-lbf/V)

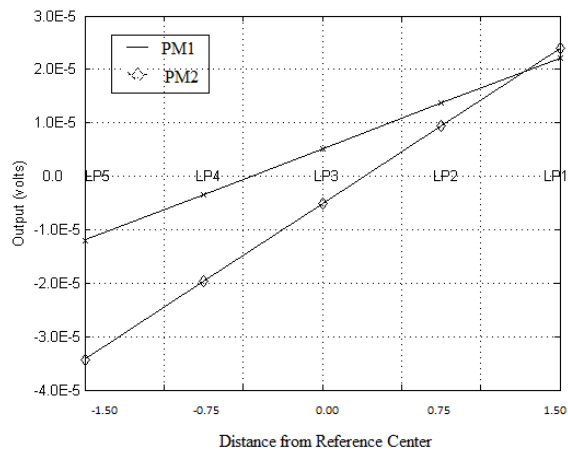


Figure 9. Pitching Moment Sensitivity

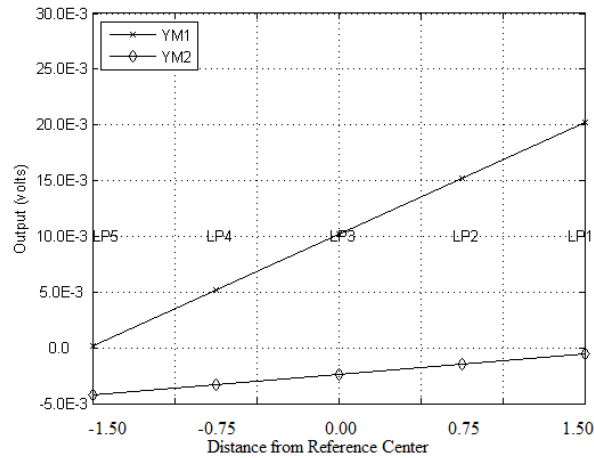


Figure 10. Yawing Moment Sensitivity

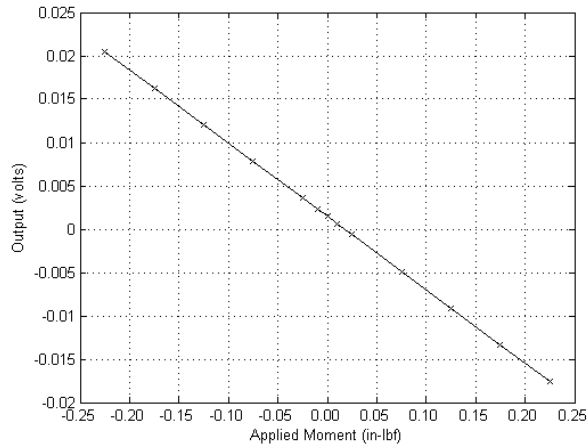


Figure 11. Rolling Moment Sensitivity

E. EXPERIMENTAL TECHNIQUES

1. Flow Visualization

The initial phase of the experiments used dye flow visualization to document the flow field around the steady and maneuvering UCAV 1303 configuration. The flow visualization data provides a qualitative representation of the flow around the UCAV, including spanwise and off-body flows. The technique uses a pressurized water soluble food coloring (dye) that is delivered to the model using the dedicated lines provided by

the model support system in the water tunnel facility. A pressure regulator controls shop air pressurized to 20 psi. The quantity of dye injected is managed depending on the tunnel speed and angle of attack used during testing [9]. Sufficient care was taken to ensure that the dye was neutrally buoyant, injected with the least possible momentum and therefore truly represented the flow streamlines that eventually enter and become the vortical flow around the maneuvering UCAV.

Two cameras recorded the flow visualization studies. The first took pictures of the model's side view and the second of the top view of the model. When the test was performed, two flow images at the same AoA were captured with both cameras properly synchronized. For imaging maneuver flow features, the motion as monitored by the nuDriveTM system was input to a secondary computer, which controlled and synchronized the cameras through software to ensure that the photos were indeed phase-locked [10]. Figure 12 shows the phase locking schematic for data acquisition.

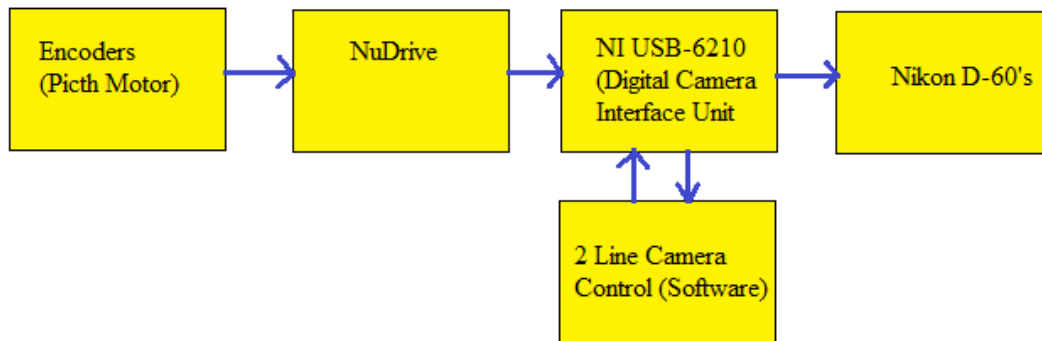


Figure 12. Schematic of Phase-Locked Data Acquisition, From [10]

2. Steady Load Measurements

Steady load measurements consisted of obtaining load data for different flow conditions around the UCAV 1303. The different Reynolds numbers used during the tests corresponded to tunnel speeds of $U_\infty = 6$ [in/s], $U_\infty = 10$ [in/s] and $U_\infty = 14$ [in/s]. The runs consisted of selecting a one dimensional sweep and hold in either the pitch plane or yaw plane of motion from the motion control software. Each run consisted of

establishing the bounds of the test, including tunnel speed, AoA minimum and maximum, and stabilization times. The tunnel was given a stabilization time of 200 seconds, a measurement time at each point of 20 seconds in duration and a 100 Hz static sampling frequency. The model moved in increments of $\Delta\alpha=2^\circ$ and $\Delta\beta=5^\circ$ between the range of 0° - 30° for AoA and 0° - 90° for roll. The software used the calibration output matrix above to determine the force and moment coefficients to be used for later analysis.

3. Maneuver Performance Measurements

Dynamic testing was performed as a main objective of this thesis. The data obtained was also compared with static force and moment data. To remove gravitational and inertial effects, tare data was taken before commencing the test and after the tunnel speed stabilized. Unsteady load measurements were performed at the same tunnel speeds as steady load measurements. The tunnel was again given a stabilization time of 200 seconds and a measurement time at each point of 20 seconds. A systematic investigation of data acquisition at different rates led to a decision to use a sampling frequency of 60 Hz with 120 samples for satisfactory results.

A varying nondimensional pitch rate allowed for comparison between the model of this investigation and other published data. The nondimensional pitch rate, or degree of unsteadiness, is given by Equation (2). Pitch rates of $\alpha^+=0.05$, $\alpha^+=0.10$ and $\alpha^+=0.15$ were used for the maneuvers conducted at $U_\infty = 6$ [in/s]; pitch rates of $\alpha^+=0.05$ and $\alpha^+=0.10$ were chosen for the maneuvers conducted at $U_\infty = 10$ [in/s], but only a pitch rate of $\alpha^+=0.05$ could be selected for the maneuvers conducted at $U_\infty = 14$ [in/s] due to facility limitations.

$$\alpha^+ = \frac{\dot{\alpha}\bar{c}}{U_\infty} \quad (2)$$

The roll maneuver load data was obtained with parameters matching previous work [9]. Roll rates ($\dot{\phi}$) of $3^\circ/\text{sec}$ and $7^\circ/\text{sec}$ were analyzed for rolling motion between 0° and 90° . This corresponded to a nondimensional roll rate of $\phi^+=0.03$ and $\phi^+=0.07$,

respectively. The range of roll angles used matched that used for steady testing making a fair comparison possible. Figure 13 shows typical time histories of the motion used in both the pitch plane and roll plane.

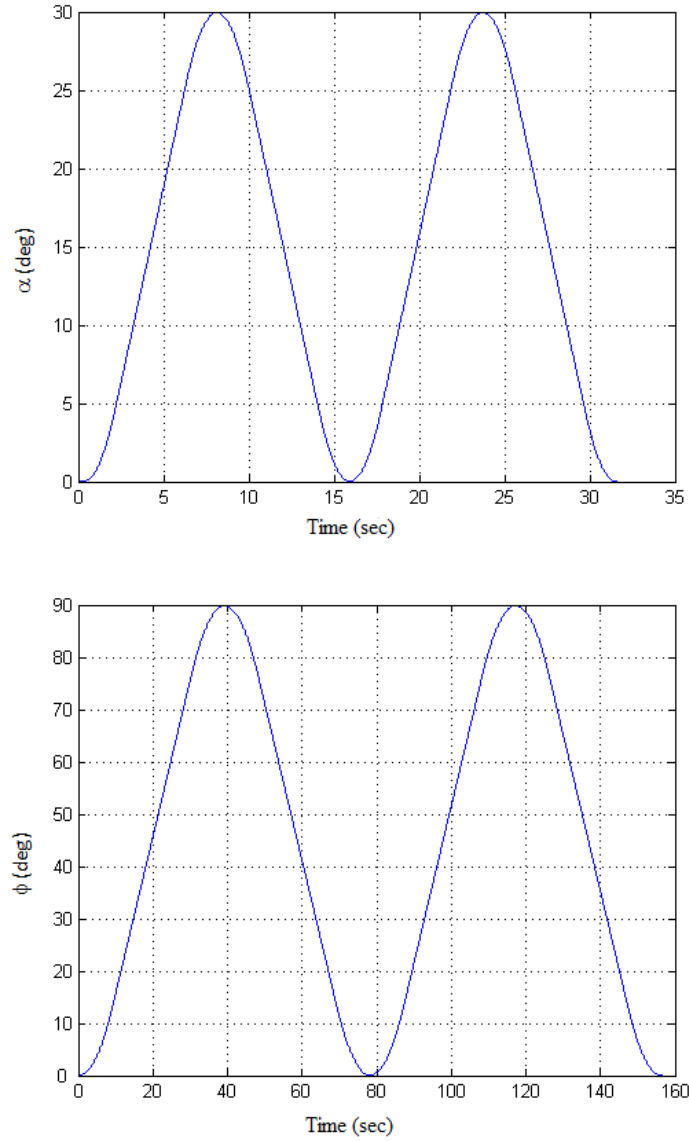


Figure 13. Motion History of the UCAV 1303 Model; Top: AoA Vs. Time (sec), Bottom: Rolling Angle Vs. Time (sec)

4. Data Reduction Method

In steady flow testing, runs at each velocity were performed ten times for the same flow conditions. These runs were averaged to determine where pitch breaks and other phenomenon occurred. Figure 14 shows the typical variation of the normal force coefficient versus AoA for a single pitch-up motion and Figure 15 the results averaged over the ten runs. Reasonable agreement can be seen between the two plots and therefore, it can be taken as a true representation of the flow features. With such averaging, variations between cycles are eliminated, which affect the measured loads. Some differences can be found at post-vortex bursting angles, which can be attributed to difference in flow evolution in each case.

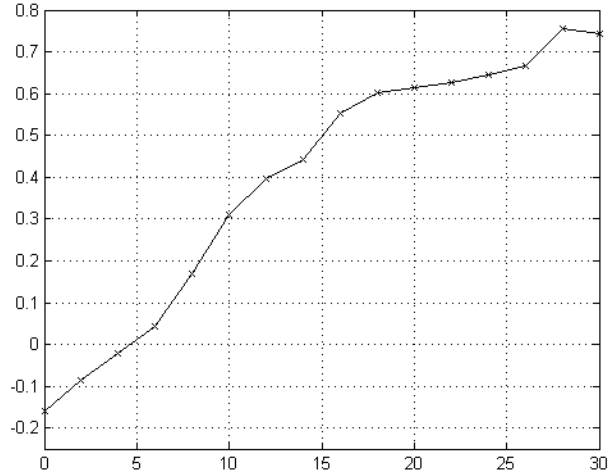


Figure 14. Single Pitch Maneuver, C_N , $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\alpha = 0^\circ$ - 30°

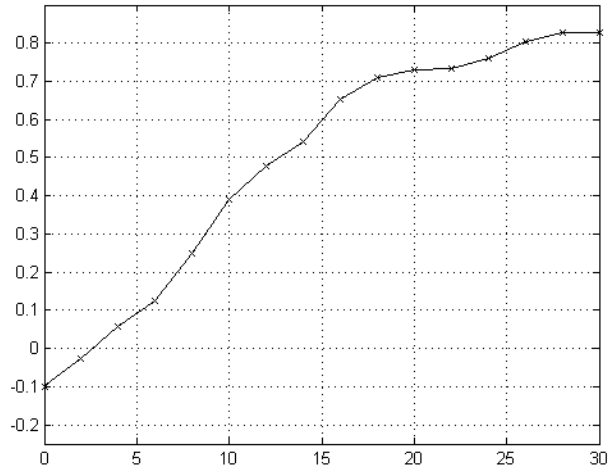


Figure 15. Multiple Pitch Maneuvers, C_N , $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\alpha = 0^\circ$ - 30°

The moments are measured at the point where the strain-gage is attached to the model, $0.53 \bar{c}$ aft of the aerodynamic center. For ease of reference to the data obtained by others, the moments were referenced to the quarter-chord point measured from the model apex. Equation (3) shows how the moments were referenced to the aerodynamic center.

$$PM_{A.C.} = PM - (1.8762 * N * \cos \alpha) \quad (3)$$

Even for maneuver performance measurements, the sampling frequency of 60 Hz and 120 samples were determined as satisfactory after multiple runs of data. Varying the sampling frequency and number of samples did not help capture any unusual features of the aerodynamic phenomenon being studied. Initially, when performing pitch-up maneuvers, each individual dynamic test was performed with 20 replications. The tests were repeated five times for a total of 100 replications. No new flow features could be derived from the results averaged over the 100 runs. It can be seen in Figures 16, 17, and 18 that the average performance deduced from 20 replications is better than a single realization of the event but negligible differences are seen between the averages of 20 and

100 cases. Whereas in reality, each maneuver is performed only once at a time, just such a simulation is likely to give large variations in the measured load and moment values and the angles at which such changes occur. To avoid erroneous interpretation of the results and to also avoid undue smearing of the data at post vortex bursting angles, averaging over 40 repetitive maneuvers was chosen as adequate. Therefore, it became possible to document statistically stationary results and thus, was used as the standard for the studies.

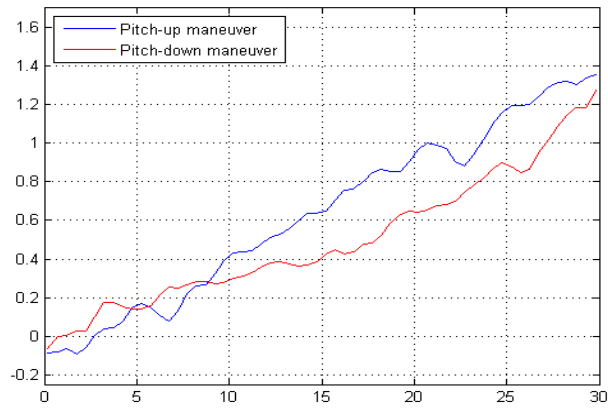


Figure 16. Normal Force Coefficient, Pitch-Up/Down Maneuver, Single Maneuver, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\alpha = 0^\circ$ - 30°

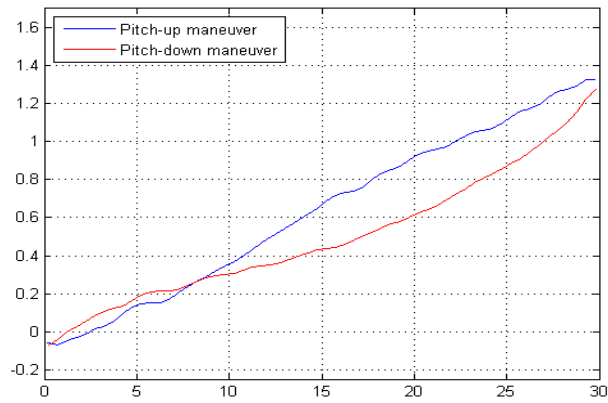


Figure 17. Normal Force Coefficient, Pitch-Up/Down Maneuver, 20 Replications, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\alpha = 0^\circ$ - 30°

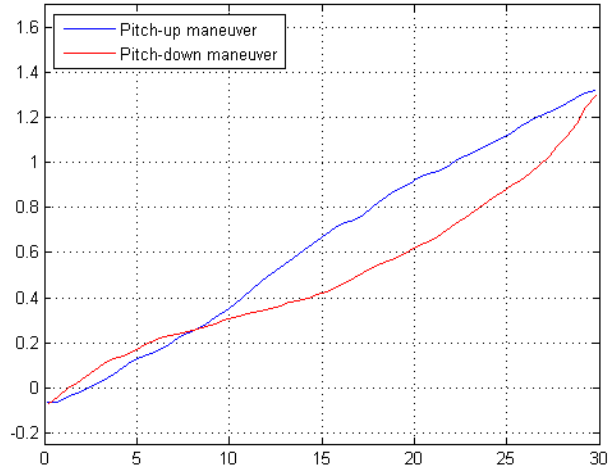


Figure 18. Normal Force Coefficient, Pitch-Up/Down Maneuver, 100 Replications, $U_{\infty} = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\alpha = 0^{\circ}$ - 30°

F. EXPERIMENTAL CONDITIONS

The experiments were conducted for the following conditions.

U_{∞}	6 [in/sec]	10 [in/sec]	14 [in/sec]
Re	1.17×10^4	2.15×10^4	2.94×10^4
Pitch Angles	0° - 30°	0° - 30°	0° - 30°
α^+	0.00, 0.05, 0.10, 0.15	0.00, 0.05, 0.10	0.00, 0.05
$\Delta\alpha$	2°	2°	2°
Roll Angles	0° - 90°	0° - 90°	0° - 90°
$\Delta\phi$	5°	5°	5°
ϕ^+	0.03, 0.07	0.02, 0.04	--

Table 4. Experimental Conditions

G. MEASUREMENT UNCERTAINTY

The experimental uncertainties were estimated in the usual manner by including the uncertainties in each major component that forms the quantity measured and are listed in Table 5.

Parameter or coefficient	% Uncertainty
U_{∞}	$\pm 4 \%$
ρ	$\pm 0.2 \%$
Normal Force	$\pm 2 \%$
Side Force	$\pm 0.5 \%$
Moments	$\pm 1 \%$
C_N	$\pm 5 \%$
C_M	$\pm 3 \%$
C_S	$\pm 1 \%$
C_{YM}	$\pm 3 \%$
C_{RM}	$\pm 3 \%$

Table 5. Table of Measurement Uncertainty

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III. RESULTS

A. KEY STEADY AND UNSTEADY FLOW FEATURES OVER UCAV 1303

Previous testing done at the NPS water tunnel focused mainly on flow visualization. Also, only limited performance data was obtained previously on a maneuvering UCAV. Because it was desirable to validate the new data while also verifying the previous data, some previous tests were repeated. Specific comparisons with tests performed by McLain [9] were drawn. Each test began with taking a zero weight tare measurement while the tunnel had a no flow condition, $U_\infty = 0$ [in/sec]. The tunnel was allowed a warm-up time as previously mentioned; and when the test was completed, the tare data was removed from the measured values. Figure 19 shows previous flow visualization data and strain-gage measurements at $\Delta\alpha = 2^\circ$ during a pitch-up maneuver from 0° - 30° AoA. Figure 20 shows the current study under the same conditions. In comparing these two figures, there are little differences between the two flow visualization images; and the differences in strain-gage measurements, while slightly offset, are attributable to a small difference within the model alignment of different operators and lies within the band of experimental uncertainties.

Hysteresis loops are evident on some of the aerodynamic coefficients consistent with expectations for data runs performed in an oscillating manner. As the model begins to change directions from pitch up to pitch down or from a roll to starboard back to a roll to port; the aerodynamic nonlinearities introduce a finite time delay as the flow adjusts to the changes (like reattach if separated) and so, the hysteresis develops. These loops are evident mainly in the C_N and C_M plots during pitching maneuvers and in the C_M , C_{YM} and C_{RM} plots during roll maneuvers. The expectation is that these loops will decrease in size as the speed of the oscillation increases.

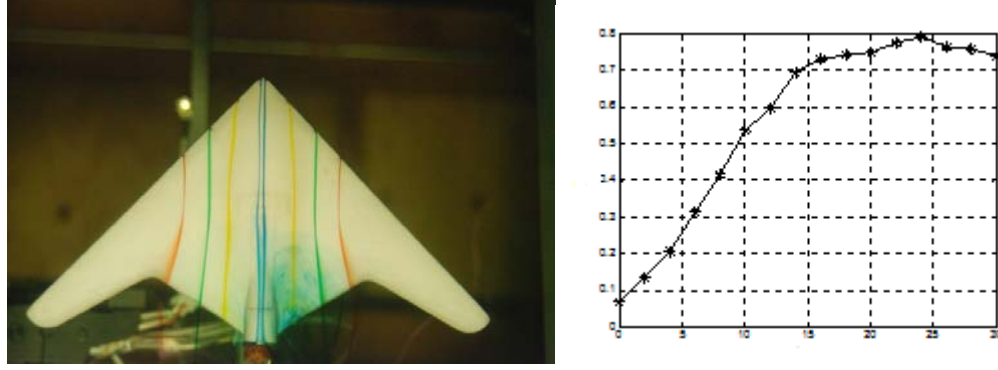


Figure 19. Normal Force Coefficient, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, Left: $\alpha = 2^\circ$, Right: $\alpha = 0^\circ$ - 30°

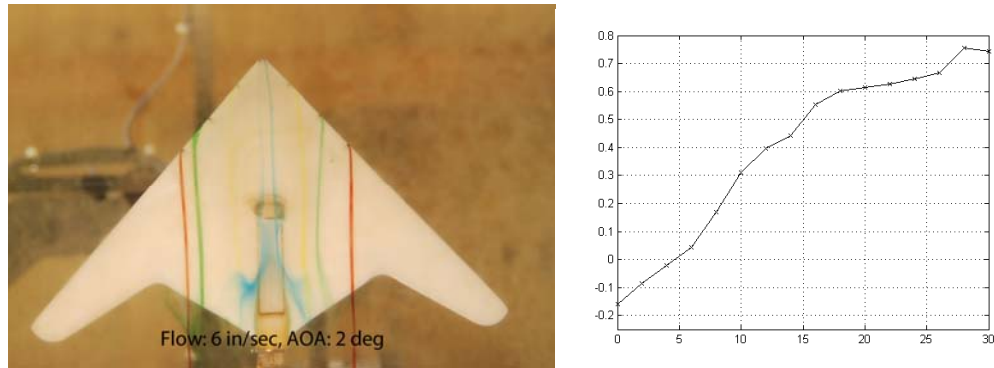


Figure 20. Normal Force Coefficient, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, Left: $\alpha = 2^\circ$, Right: $\alpha = 0^\circ$ - 30°

B. STATIC LOAD MEASUREMENT STUDIES

1. Effect of Reynolds Number

As was done in previous studies, Nelson et al. [8] and McLain [9], the Reynolds number was varied from 1.17×10^4 to 2.94×10^4 by changing the freestream velocity in the water tunnel. The corresponding tunnel speeds were 6 [in/s], 10 [in/s] and 14 [in/s].

Initial testing consisted of a steady flow case of pitching up in step increments from 0° - 30° AoA with the model held stationary during data acquisition at $\Delta\alpha = 2^\circ$. Figure 21 shows C_N , C_M , C_S , C_{YM} and C_{RM} for the pitch-up maneuver as the Reynolds number is changed. It is clear from the C_N plot that the normal force curve is not linear,

even at a low angle of attack a 4° deviation is found, contrary to what can be expected. This is believed to be due to the occurrence of light tip-stall [9] at a very low angle of attack. Several changes in the slope of the curve, $\alpha = 4^\circ, 6^\circ, 8^\circ, 10^\circ$ and beyond, are also seen here for all Reynolds numbers studied. The pitching moment shows a slight positive value and slowly increases over the $0^\circ < \alpha < 6^\circ$ at the lowest Re tested. It can be seen that as the Reynolds number increases, the pitching moment coefficient decreases and approaches a near zero value, increasing slightly with α . The Reynolds number also has an effect on LEV formation and induces the LEV at a lower AoA. It has been shown by Chandrasekhara and McLain [13] that the vortex formation angle is reduced as the Reynolds number is increased.

A side-by-side comparison of C_N & C_M in Figure 21 shows that each normal force slope change is associated with a similar abrupt moment change. As the vortex forms and bursts, a larger C_M is noticed and this is an indication of the effects of the bursting event. The oscillations in the C_M values point to a possibility of asymmetric events occurring on the two sides of the aircraft fuselage. Accordingly, the side force C_S remains near zero as can be expected at low angles of attack, but as the angle of attack increases to post vortex formation values, it becomes sizeable. Reynolds number also appears to cause an increase in the side force. Thus, at higher angles of attack, side-slip and asymmetric forces that could induce forced oscillations could become an issue for this configuration.

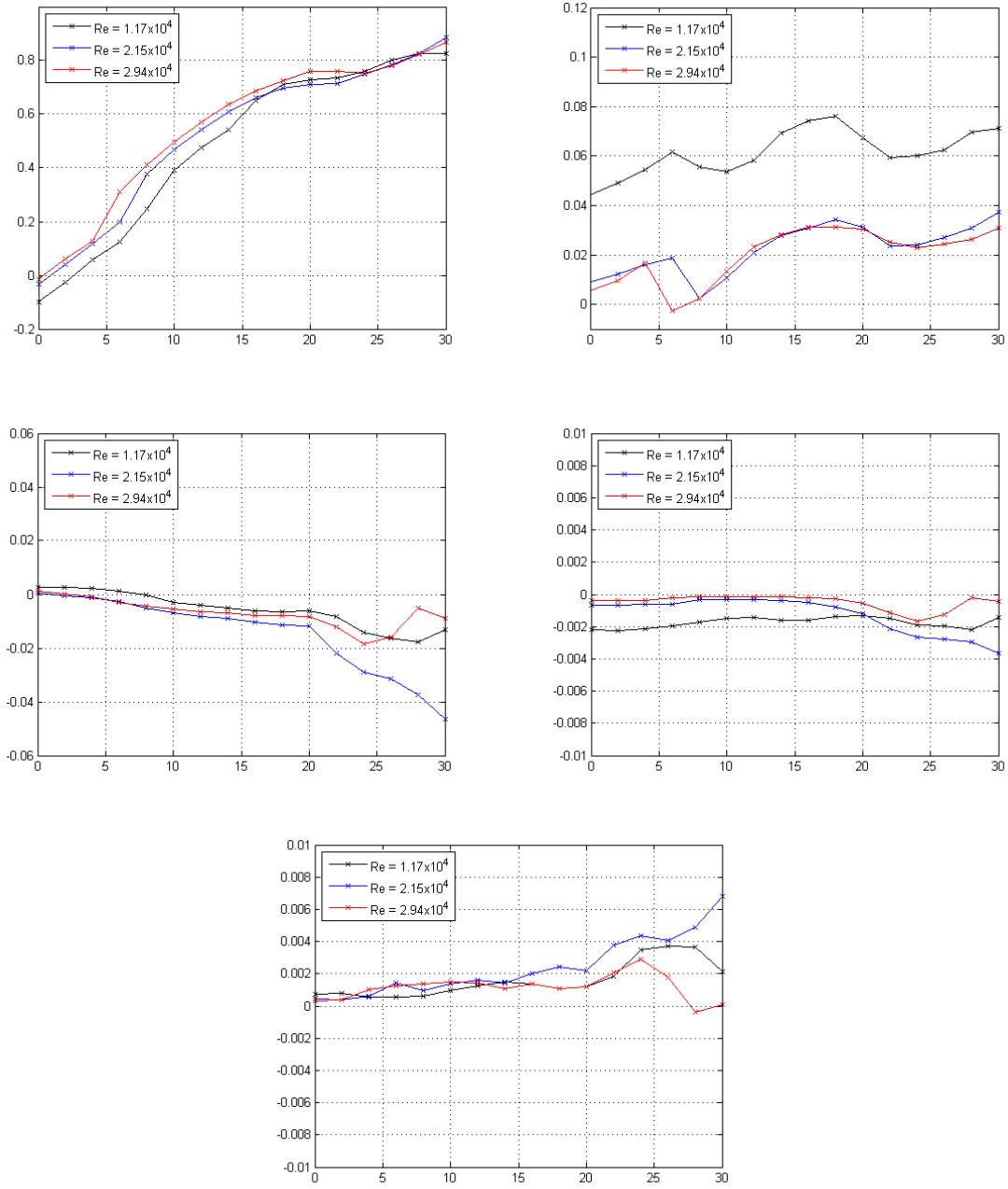


Figure 21. Reynolds Number Effects, $\alpha = 0^\circ$ - 30° , Top: Left – C_N , Right – C_M , Middle: Left – C_S , Right – C_{YM} , Bottom: C_{RM}

In studies by Chandrasekhara and McLain, a similar trend was seen. However, they observed an increase in C_S values as α was increased. It is believed that this

difference is due to the fact that the vortex breakdown mechanism is known to have a random preference to one side of the wing and the fact that the model was removed and reset; even a slight difference in the new orientation could produce these differences. Also, as the vortex bursts, the side forces may change as seen for the highest Reynolds number result presented. These reasons offer support for a premise that a corresponding change in rolling moment can be expected and this is confirmed by the data seen in Figure 21. The effects on yaw seem to be minimal until high angles of attack, which can also be expected given the orientation of the model used for this data set. The formation of multiple vortices on the same side of the wing and their breakdown through multiple structures indicate that yaw effects will become important at the high angles of 20° and above.

Figure 22 shows that the corresponding flow events in the pitching moment coefficient distributions shift slightly to lower angles as the Reynolds number increases. It also shows where bursting commences and finishes. Not shown here is the occurrence of the fluctuations that exist in C_S , C_{YM} , and C_{RM} . These fluctuations are small and are only evident at higher AoA's.

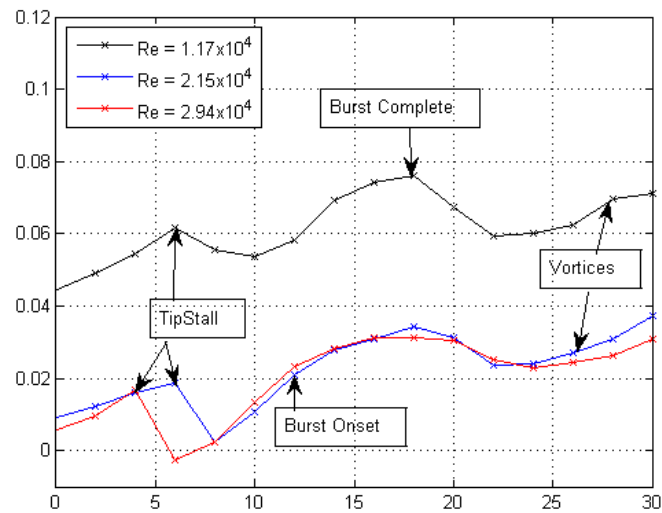


Figure 22. LEV Formation Based on Reynolds Number

2. Effect of Pitch

Establishing the performance characteristics of an aircraft with changes in angle of attack is perhaps the most common study conducted. Following the procedure already outlined, the model was pitched from 0 to 30 degrees in 2° pitch increments. Figure 23 shows the C_M variation in this case at a velocity of $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$. Tip stall occurs as early as $\alpha = 6^\circ$ and a pitch break occurs near $\alpha = 18^\circ$. This result is similar to the one found by Chung and Ghee [14] and appears to be a characteristic of nonslender wings. A series of unstable leading edge vortices have been observed by some on this wing and it is possible that some of the breaks can be due to this behavior [9]. Another likely cause for this early onset of pitch break and the evidence of flow separation observed in the previously mentioned flow visualization studies seems to be due to the wing experiencing tip-stall. The accompanying flow visualization picture indicates that there is also trailing edge stall (the black dye that was injected downstream locally is now flowing upstream from the wake). This phenomenon continues even at higher speeds. In addition, the flow visualization picture also shows asymmetric nose tip vortex bursting, which also could contribute to this result.

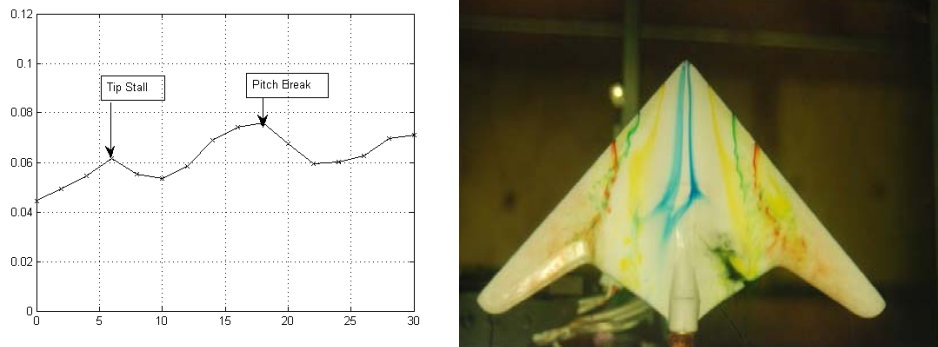


Figure 23. Pitch Break Occurrences, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\alpha = 6^\circ$

In Figure 24 the data obtained in this study is compared to the data obtained by Petterson [4] and by Wong [15] for the C_M . Petterson [4] and Wong [15] both performed studies in a high speed wind tunnels at a Mach number of 0.25 with $Re = 5.74 \times 10^6$ and

10.38×10^6 respectively. It is seen here, that the low speed water tunnel tests are qualitatively similar to what is observed at higher Reynolds numbers and also, higher, but incompressible Mach numbers, except for the tip stall induced effects observed here.

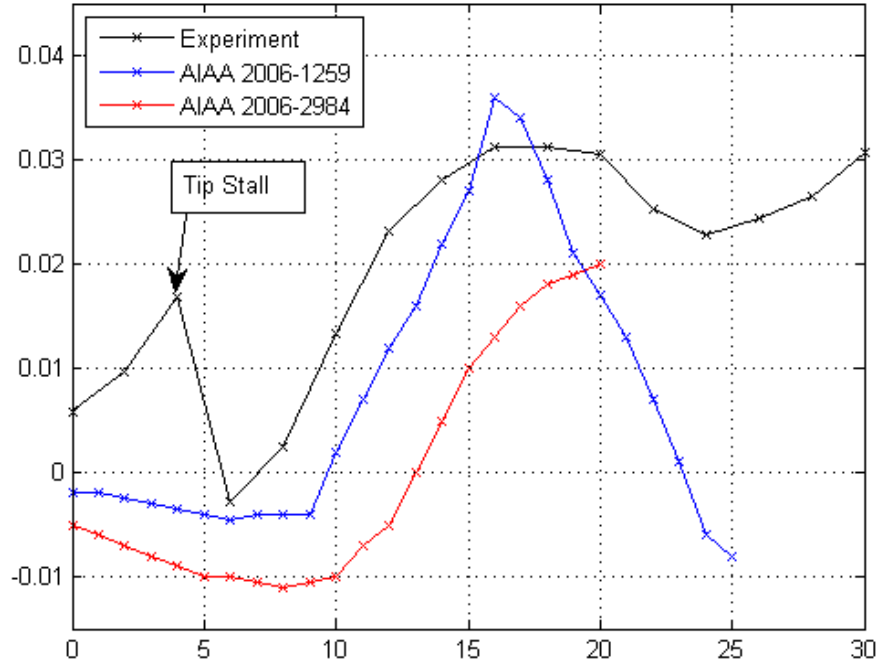


Figure 24. Comparative C_M s; Experiment: $U_\infty = 14$ [in/sec], $Re = 2.94 \times 10^4$, AIAA 2006-1259: $Re = 5.74 \times 10^6$, AIAA 2006-2984: $Re = 10.37 \times 10^6$

3. Effect of Roll

A group of roll tests was performed for various angles of attack starting with $\alpha = 0^\circ$ and ϕ being changed from 0° - 90° by a $\Delta\phi = 5^\circ$ that began with a roll towards the starboard side. Representative results for this case is shown in Figure 25 for $\alpha = 5^\circ$

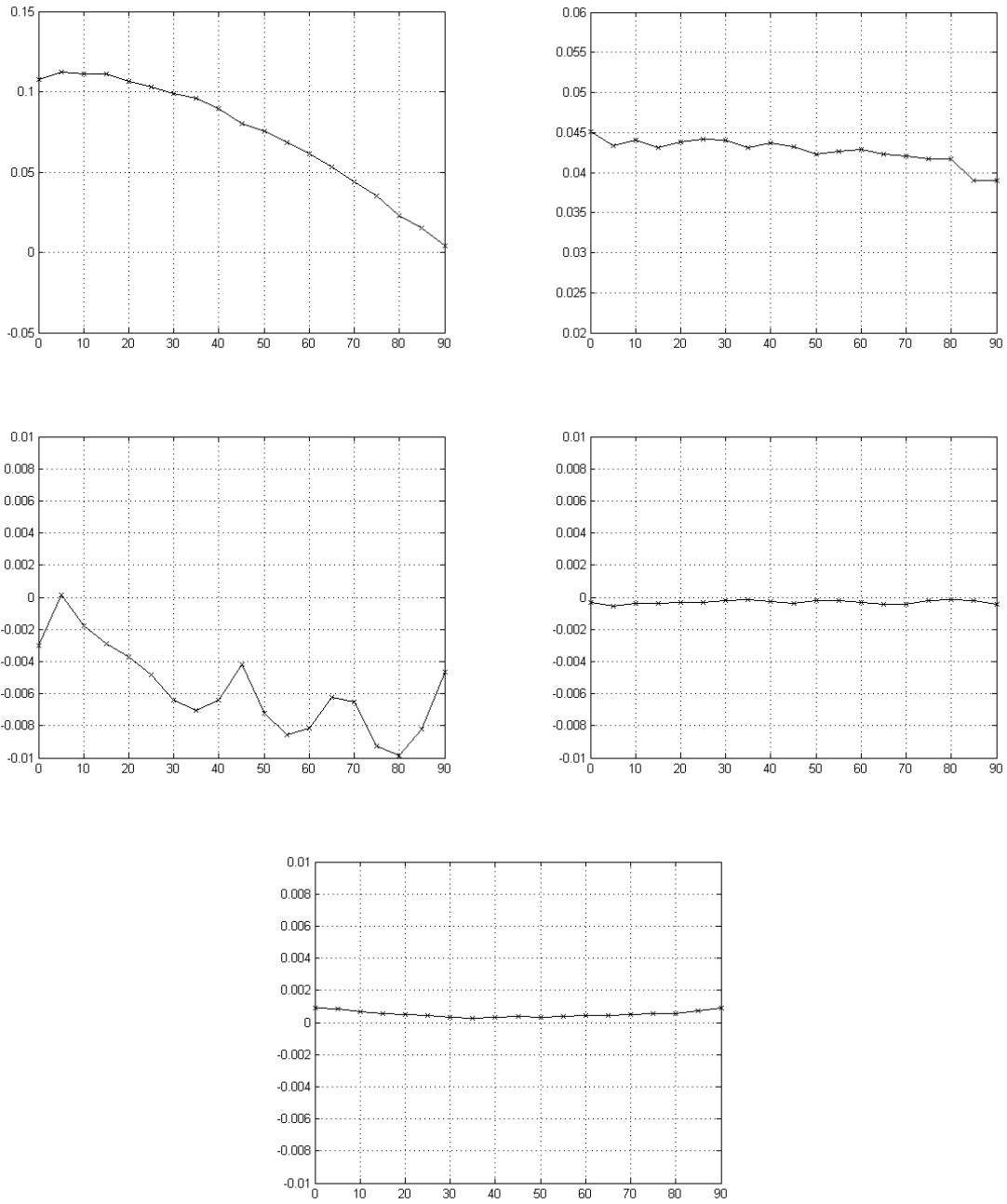


Figure 25. Aerodynamic Coefficients, $U_\infty = 10$ [in/sec], $Re = 2.15 \times 10^4$, $\alpha = 5^\circ$, $\phi = 0^\circ$ - 90° , Top: Left – C_N , Right – C_M , Middle: Left – C_S , Right – C_{YM} , Bottom: C_{RM}

As the aircraft rolls at this angle of attack, small changes in the normal force were measured, and corresponding changes in C_M were also observed. However, the side force showed a large change including some oscillations that indicated the possibility of uneven vortical flow development. In the tunnel arrangement, both 0° and 90° roll positions should correspond to the same flow field if there were no other effects present. However, the figure confirms that additional forces are felt by the model during a roll, even for the steady flow case. As the AoA is increased, the pitching moment steadily increases up to $\alpha = 15^\circ$. In this case, the vortex also forms. As it moves down the wings upper surface, the movement of the wings center of pressure can be expected to induce more adverse moments. When it is shed larger changes in the values occur. As AoA is increased to $\alpha = 20^\circ$, the pitching moment coefficient actually decreases. A simplistic explanation for this can be given by the observed flow visualization results [9] that the vortex on the wing away from the roll direction still remained intact and hence, the effect of vortex bursting one side had a mitigating effect on C_M as shown in Figure 26. However, the flow over the UCAV 1303 geometry is extremely complex, due to tip stall, bi-directional flow [9] on each wing at large angles of attack, reversed flow propagating upstream from the wake and so on. All the results here should be viewed in the context of such complexity being simultaneously present in the flow.

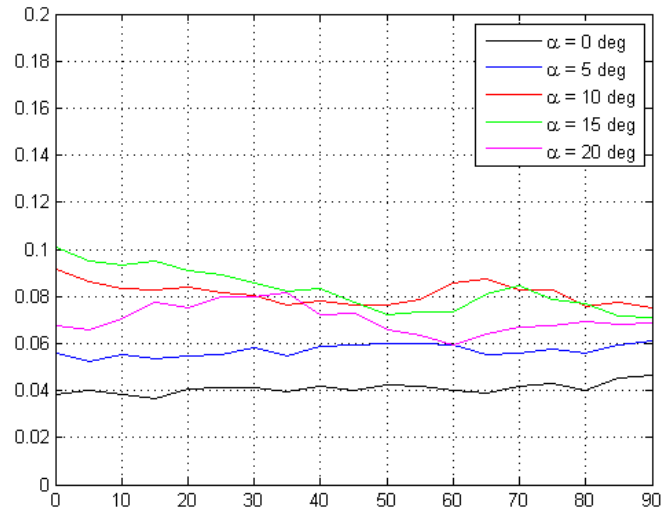


Figure 26. Pitching Moment Coefficient, $U_\infty = 6$ [in/sec], $\phi = 0^\circ$ - 90°

Figure 27 shows the conditions for multiple angles of attack during a roll maneuver at $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$. C_N tends to trend upward as expected due to the higher angle of attack. The effect of this higher angle of attack is noticed in the generation of large side force C_S . It is also evident that oscillations are seen in the side force attributable to the unsteady changes in the pressure field over the wings. Since the model was mounted firmly to the balance, which was held immovably in the sting, it was not possible to conclusively determine the consequence of these oscillatory side forces on the model. It is believed, however, that this could be an indication of later problems with stability. Large deviations also appear in the rolling moment beyond $\alpha = 20^\circ$, and a similar behavior was also observed in the yawing moment.

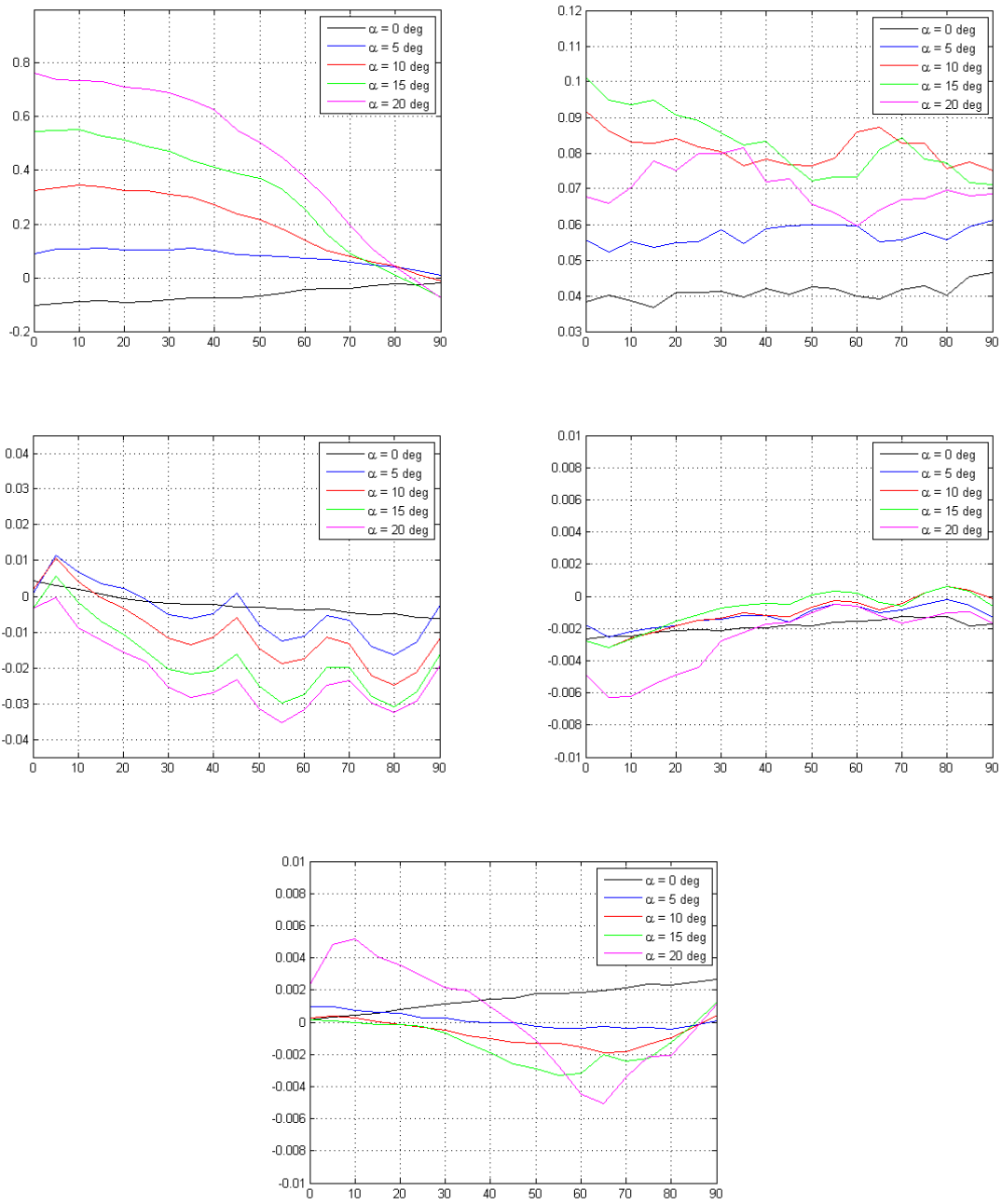


Figure 27. Static Aerodynamic Coefficients, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\phi = 0^\circ$ - 90° , Multiple Angles of Attacks, Top: Left – C_N , Right – C_M , Middle: Left – C_S , Right – C_{YM} , Bottom: C_{RM}

C. DYNAMIC LOAD MEASUREMENT STUDIES

1. Constant Pitch Rate Maneuver

When performing the dynamic load measurement studies, the model was set up as in the static load measurement studies with some parameters altered to allow for dynamic testing, as previously discussed. Various pitch rates were established throughout testing. The pitch rates were selected to allow comparison with previously obtained flow visualization data [9] as well as to allow comparison across multiple tunnel speeds and hence, Reynolds number effects in dynamic testing. At the higher tunnel speed, the pitch or roll rates were sufficiently large and approached the limits of the tunnel; so fewer pitch rates were studied.

Figure 28 shows the data observed in the flow visualization studies comparing pitch angles of $\alpha = 0^\circ$ and $\alpha = 10^\circ$ for $U_\infty = 6$ [in/sec] and $U_\infty = 10$ [in/sec]. It also shows the comparison between the static pitch-up ($\alpha^+ = 0.00$) and the dynamic maneuvers for C_N . The fact that the C_N is higher in the dynamic cases again shows that flow stays attached and the vortex busting is delayed until higher angles of attack. This agrees with the results obtained by Erm [16]. Support for the result is also found in the earlier [9] flow visualization pictures because the bursting location is further back on the fuselage at the higher velocity shown. This result is typical of slender delta wing flow and here we see a similar behavior for the nonslender UCAV 1303 wing. Even then, the C_N variations are not linear indicating that structures are present in all cases that appear at different angles depending upon the pitch rate used.

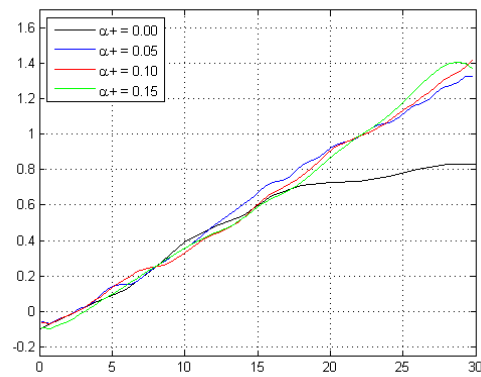
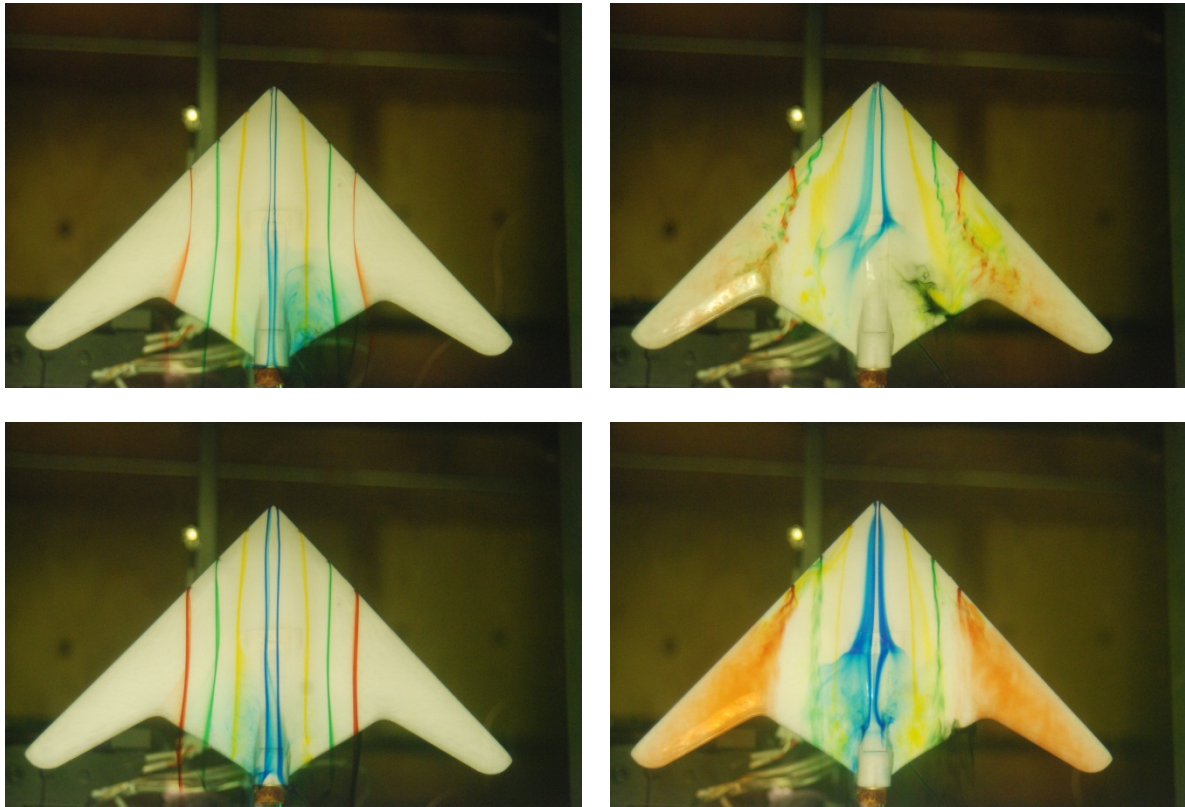


Figure 28. Top: $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, Left - $\alpha = 0^\circ$, Right - $\alpha = 10^\circ$,
Middle: $U_\infty = 10$ [in/sec], $Re = 2.15 \times 10^4$, Left - $\alpha = 0^\circ$, Right - $\alpha = 10^\circ$,
Bottom: Dynamic Aerodynamic Coefficients

Figure 29 compares C_N (on the left) and C_M (on the right) at $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$ for the three pitch rates investigated (increasing in magnitude from top to bottom). A hysteresis loop is present in all cases in the normal force and pitching moment. It is seen that as the nondimensional pitch rate goes up, the area of the hysteresis loop for C_N decreases. On the other hand, the C_M loop becomes wider. For the experimental conditions studied herein, the C_M variations also suggest a positive area under the pitching moment loop and hence, more positive damping at high rates.

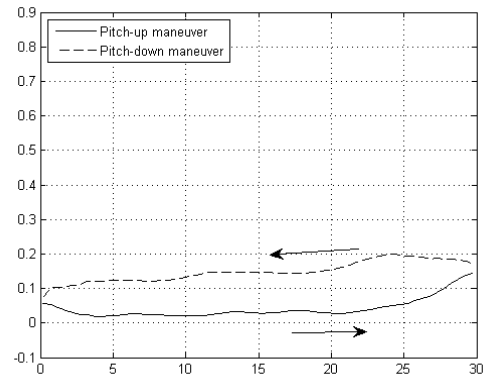
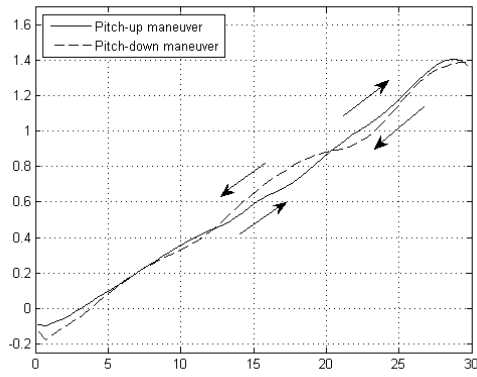
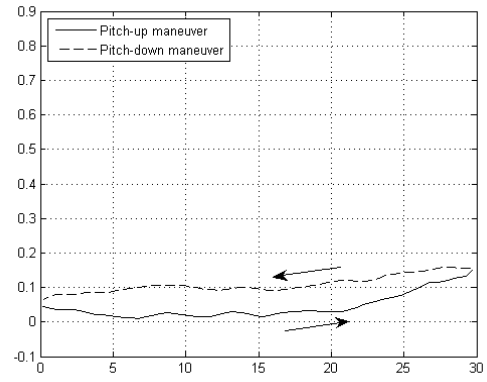
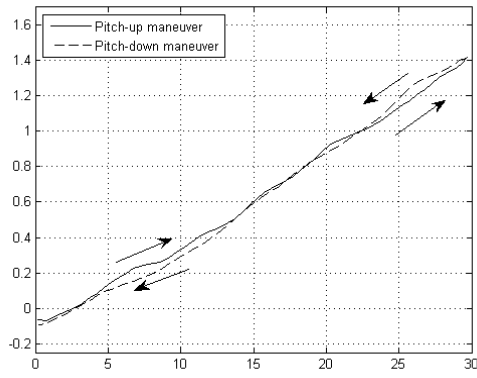
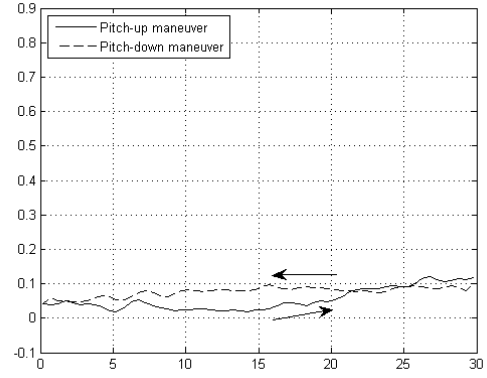
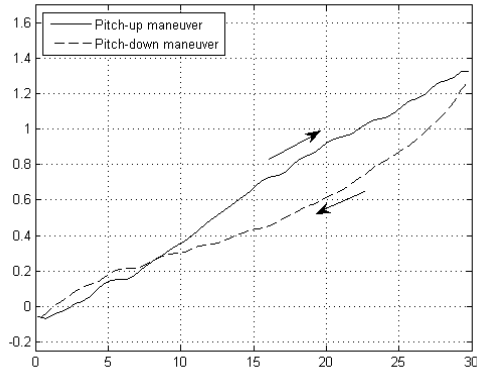


Figure 29. Left: C_N and Right: C_M For Varying Pitch Rates, $U_\infty = 6$ [in/sec],
 $Re = 1.17 \times 10^4$, Top - $\alpha^+ = 0.05$, Middle - $\alpha^+ = 0.10$, Bottom - $\alpha^+ = 0.15$

2. Effect of Roll

When conducting the tests for roll, the model was positioned at varying angles of attack and allowed to roll from 0° - 90° just as in the static measurements and allowed to maneuver just as in the dynamic pitch tests. As seen in the dynamic pitch maneuvers, there is a hysteresis loop that develops during roll as well. It can be seen in the rolling moment vs. rolling angle variations plotted for different angles of attack, Reynolds numbers, and roll rates in Figures 30, 31, 32, and 33 that as the angle of attack is increased, the hysteresis loop shape changes with the angle of attack and roll rate due to corresponding changes in the flow features. At $\alpha = 0^\circ$, the loop is symmetric indicating that the flow at all roll angles is attached. As the angle of attack increases, notable asymmetry sets in due to the differing flow characteristics on the two sides. As the rate of the roll increases, the size of the loop decreases but as the Reynolds number increases the size of the loop increases. Since the size of the loop is related to the vortical flow development and its bursting, it can be expected that at high maneuver rates, the higher roll rate helps to maintain the flow over the wing without bursting more than at lower rates. The fact that the area of the loop is larger at the higher Re suggests that the UCAV 1303 is more stable both at higher speeds and at higher unsteadiness. The wing does not experience the severity of stall at higher speeds.

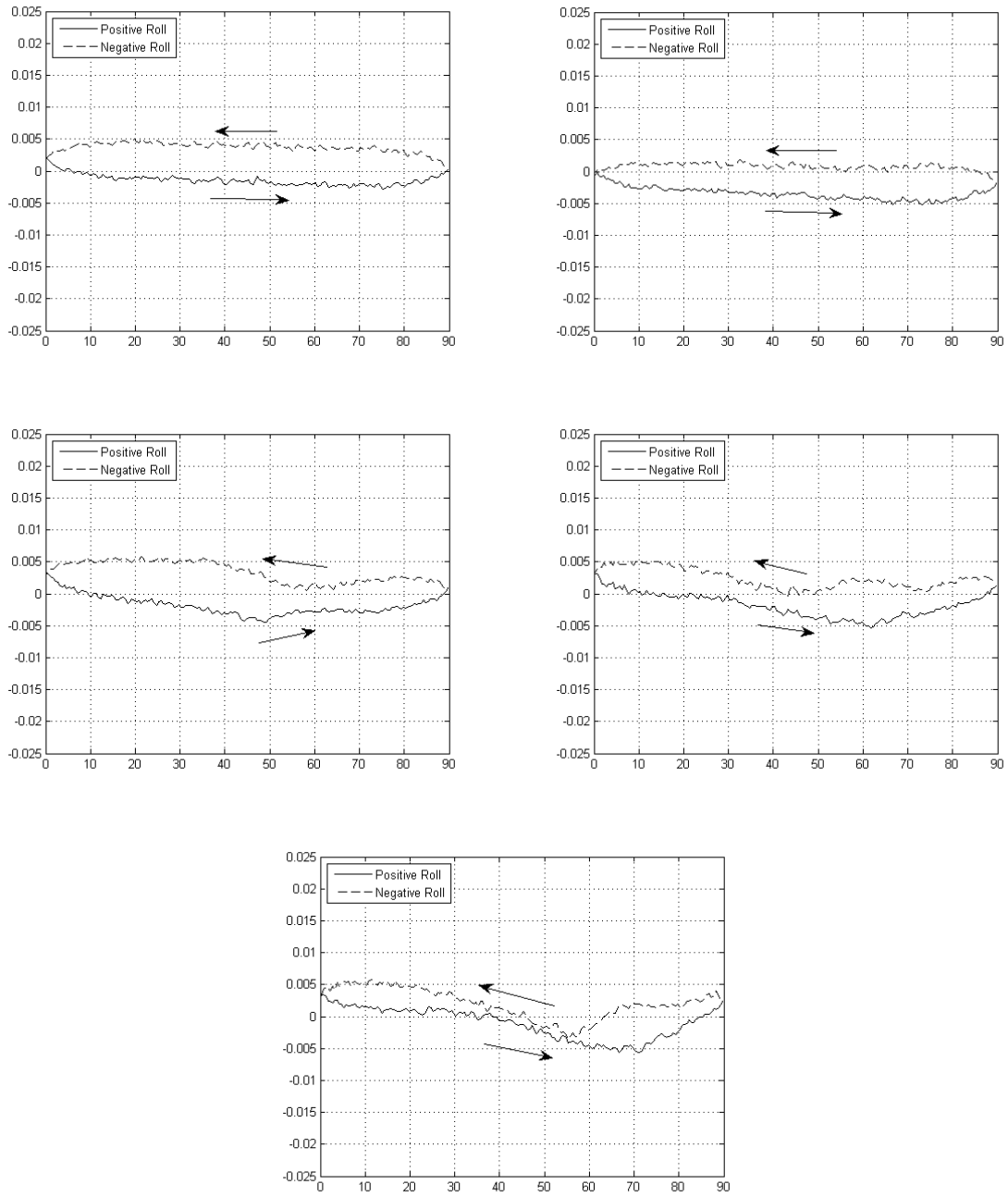


Figure 30. Rolling Moment Coefficient for $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\phi = 0^\circ - 90^\circ$, Top Left $\alpha = 0^\circ$, Top Right $\alpha = 5^\circ$, Middle Left $\alpha = 10^\circ$, Middle Right $\alpha = 15^\circ$, Bottom $\alpha = 20^\circ$, $\dot{\phi} = 3^\circ/\text{sec}$

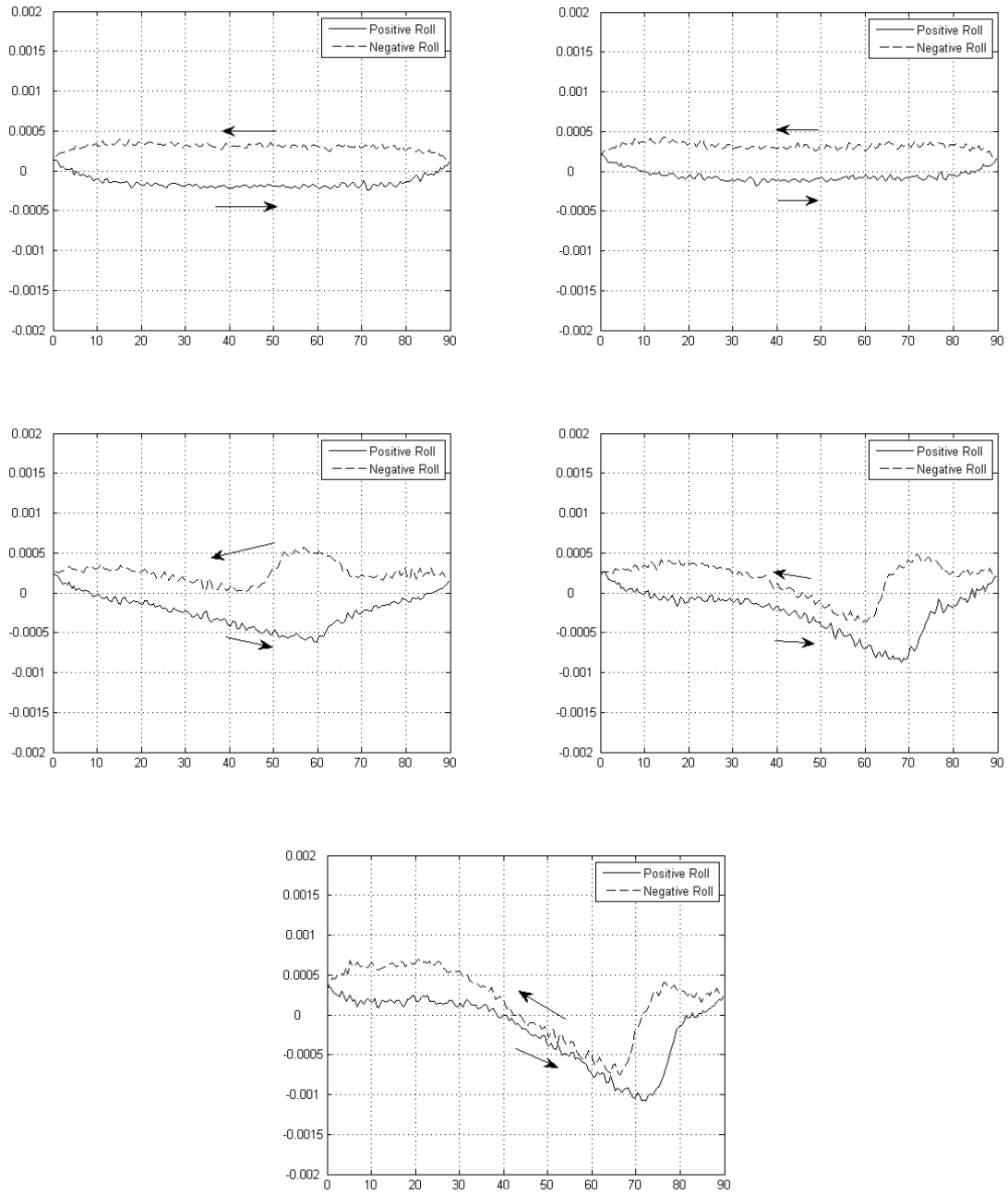


Figure 31. Rolling Moment Coefficient for $U_{\infty} = 10$ [in/sec], $Re = 2.15 \times 10^4$, $\phi = 0^\circ - 90^\circ$, Top Left $\alpha = 0^\circ$, Top Right $\alpha = 5^\circ$, Middle Left $\alpha = 10^\circ$, Middle Right $\alpha = 15^\circ$, Bottom $\alpha = 20^\circ$, $\dot{\phi} = 3^\circ/\text{sec}$

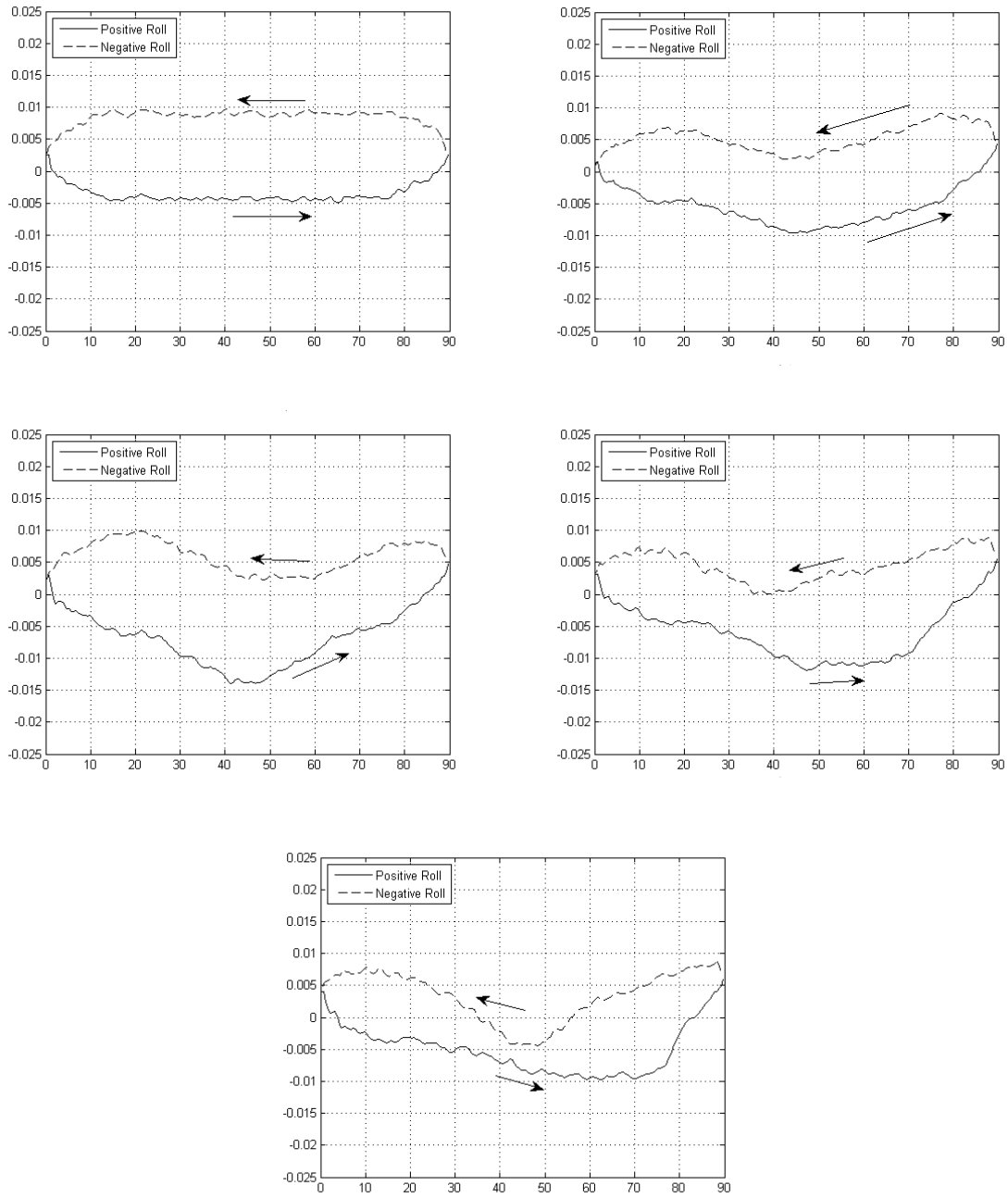


Figure 32. Rolling Moment Coefficient for $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\phi = 0^\circ$ - 90° , Top Left $\alpha = 0^\circ$, Top Right $\alpha = 5^\circ$, Middle Left $\alpha = 10^\circ$, Middle Right $\alpha = 15^\circ$, Bottom $\alpha = 20^\circ$, $\dot{\phi} = 7^\circ/\text{sec}$

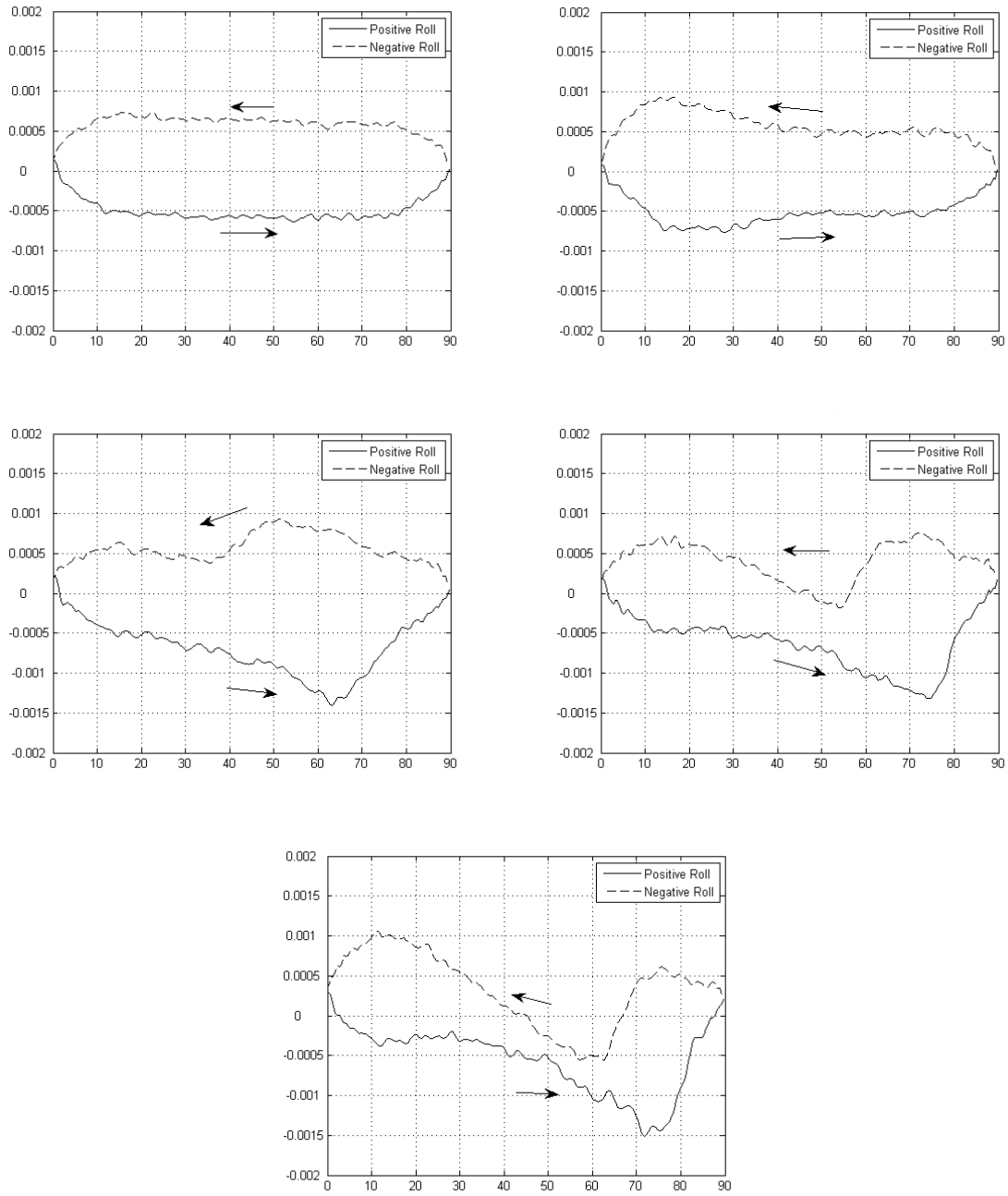


Figure 33. Rolling Moment Coefficient for $U_{\infty} = 10$ [in/sec], $Re = 2.15 \times 10^4$, $\phi = 0^\circ - 90^\circ$, Top Left $\alpha = 0^\circ$, Top Right $\alpha = 5^\circ$, Middle Left $\alpha = 10^\circ$, Middle Right $\alpha = 15^\circ$, Bottom $\alpha = 20^\circ$, $\dot{\phi} = 7^\circ/\text{sec}$

IV. CONCLUDING REMARKS

This study provided a detailed look at the aerodynamic coefficients that are developed by a maneuvering UCAV 1303. The flow around a UCAV while in steady, level flight for a tailless UCAV is well understood and can be found in literature, however, this is the first time that such knowledge has been obtained for an air wing while performing rapid maneuvers. It was attempted through this investigation to show a more complete picture about the forces and moments that are experienced by a UCAV 1303 during maneuvering flight conditions.

It was shown that unsteady motion aids in achieving stall delay. Similar results were seen for the model both in a pitching motion and in a rolling motion. It was found that, as the airplane maneuvers faster, the onset of stall is delayed. This is supported by the flow visualization studies that have been performed previously. The study also showed what was seen previously in visualization work in that at higher angles of attack, the airfoil begins to exhibit unsteadiness and so unsteady forces even in steady flow, possibly attributed to recirculating flow regions caused by flow separation and an increase in pressure fluctuations.

Through this investigation, it became clear that cycle to cycle variations in flow events are always present. Since a UCAV will need to perform evasive maneuvers only once at a time, this is not a major concern. We have a large experimental data base of the aerodynamic loads on a maneuvering UCAV 1303 model now. The changes observed were large, but it appeared that the rates of change were not unusual. However, it has to be investigated by calculating stability derivatives. The high resolution data in hand should enable this to be completed for a clearer picture about these critical aspects of its flight mechanics

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APPENDIX A. FORCE AND MOMENT DISTRIBUTIONS FOR VARIOUS TEST CASES STUDIED

A. STATIC AERODYNAMIC COEFFICIENTS, PITCH

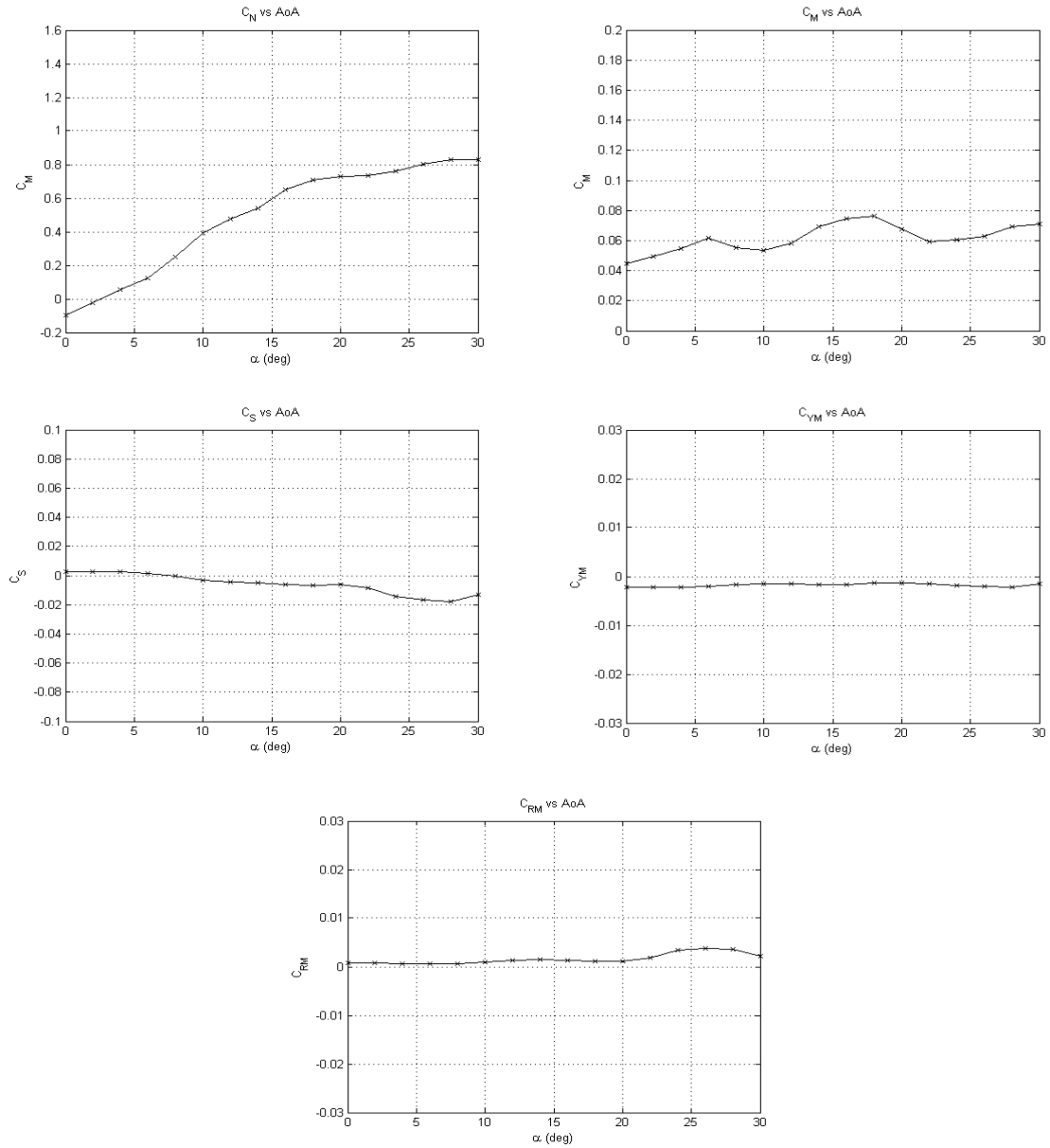


Figure 34. Static Aerodynamic Coefficients, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\alpha = 0^\circ - 30^\circ$

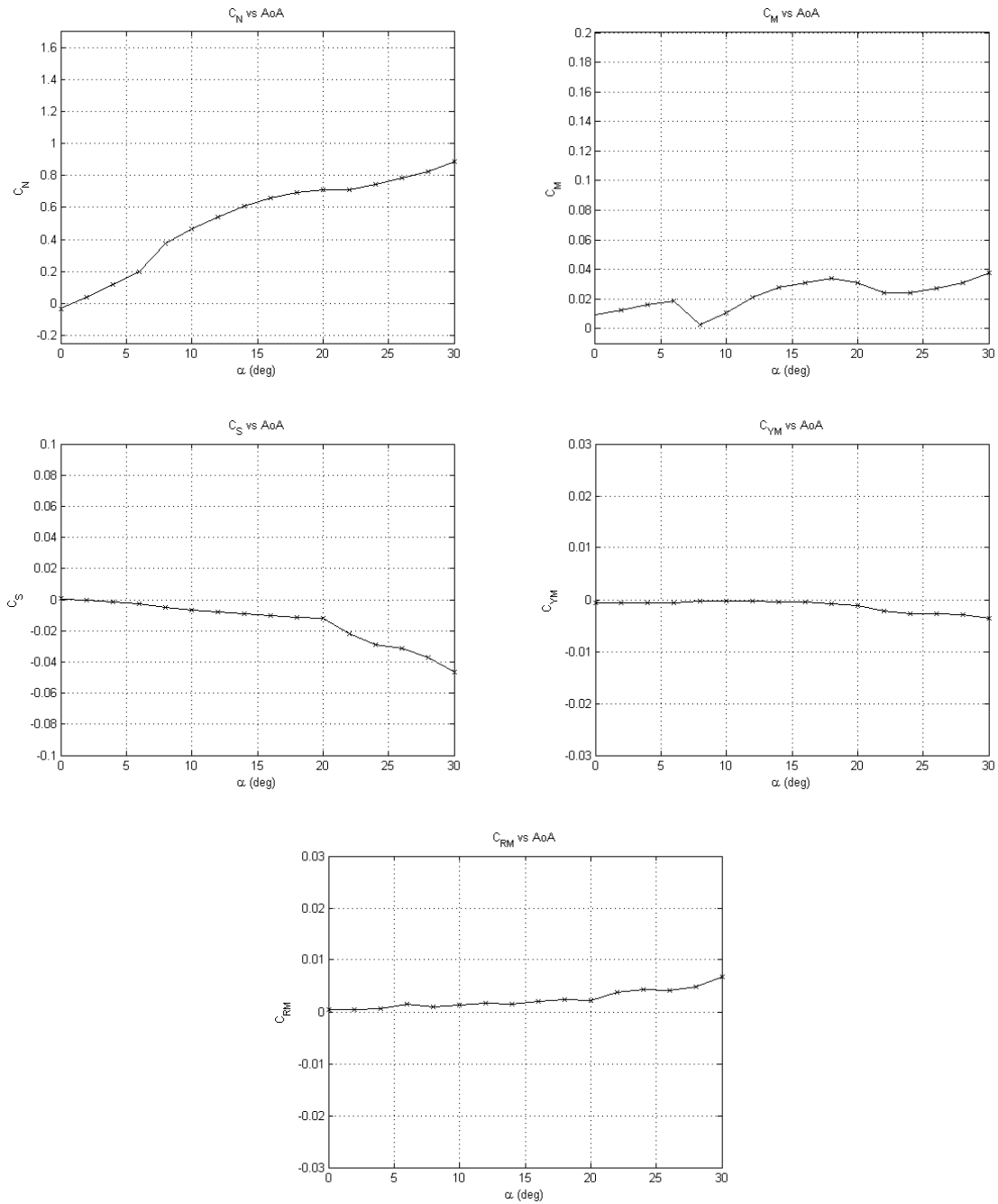


Figure 35. Static Aerodynamic Coefficients, $U_\infty = 10$ [in/sec], $Re = 2.15 \times 10^4$, $\alpha = 0^\circ - 30^\circ$

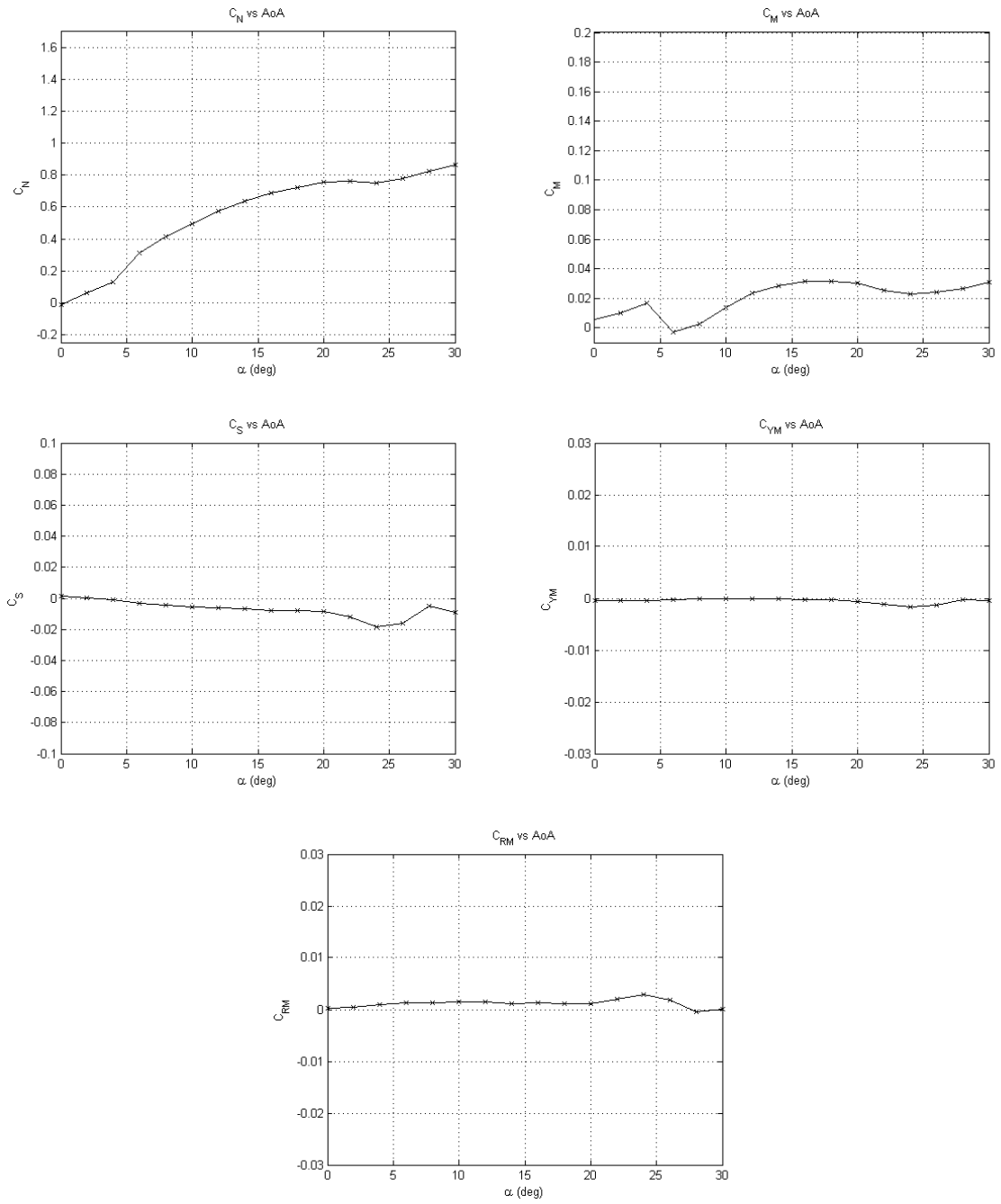


Figure 36. Static Aerodynamic Coefficients, $U_\infty = 14$ [in/sec], $Re = 2.94 \times 10^4$, $\alpha = 0^\circ$ - 30°

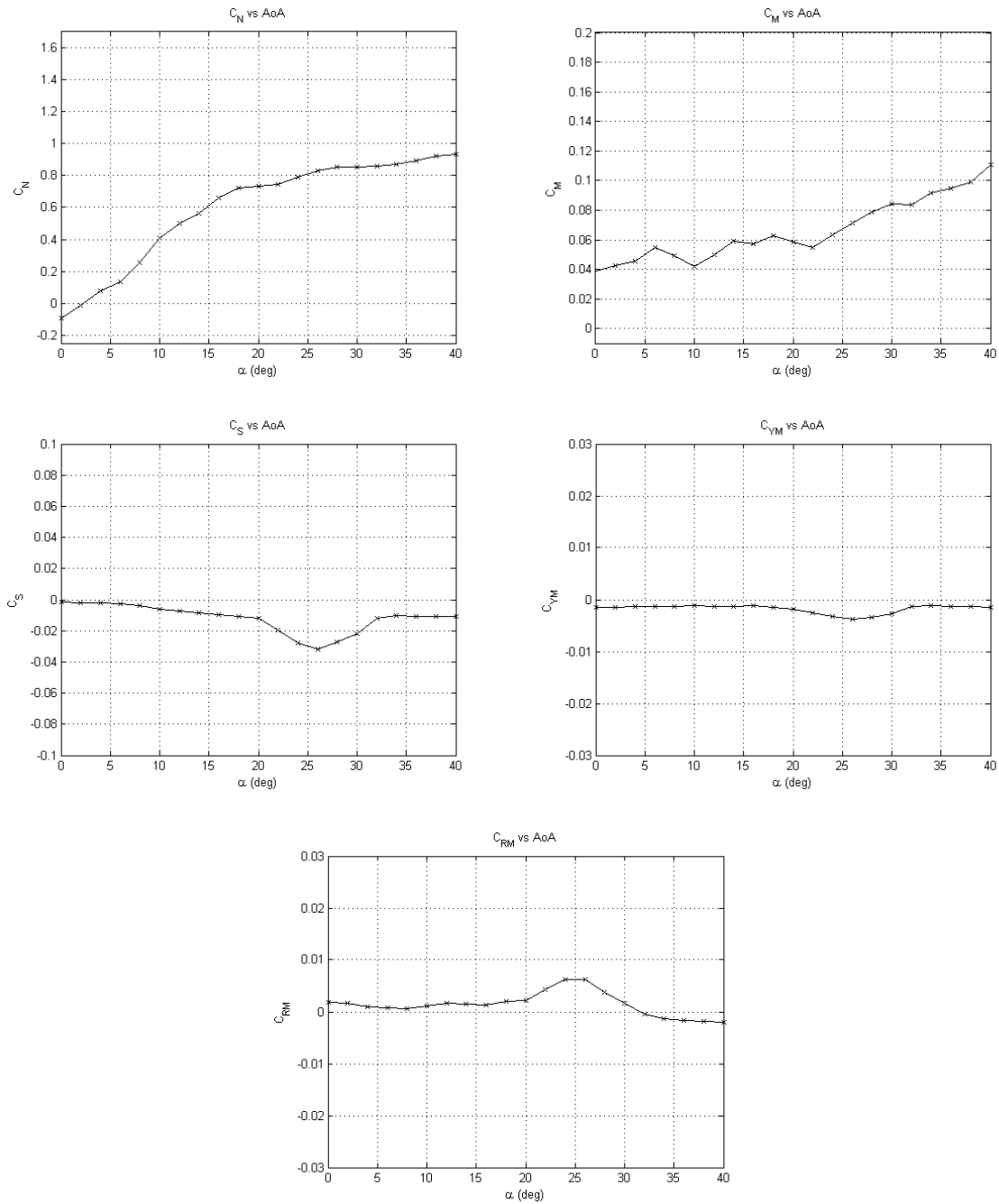


Figure 37. Static Aerodynamic Coefficients, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\alpha = 0^\circ - 40^\circ$

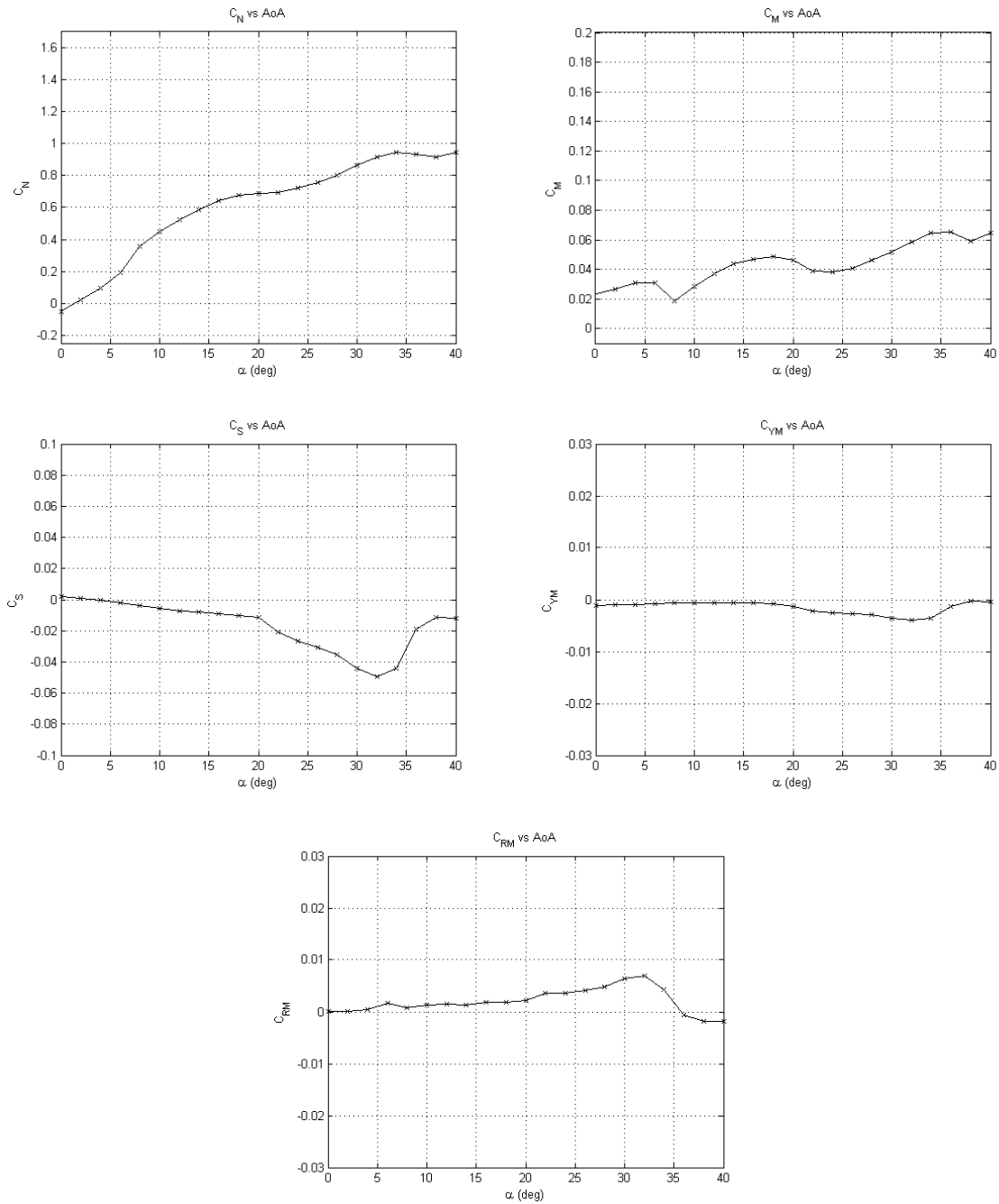


Figure 38. Static Aerodynamic Coefficients, $U_\infty = 10$ [in/sec], $Re = 2.15 \times 10^4$, $\alpha = 0^\circ$ - 40°

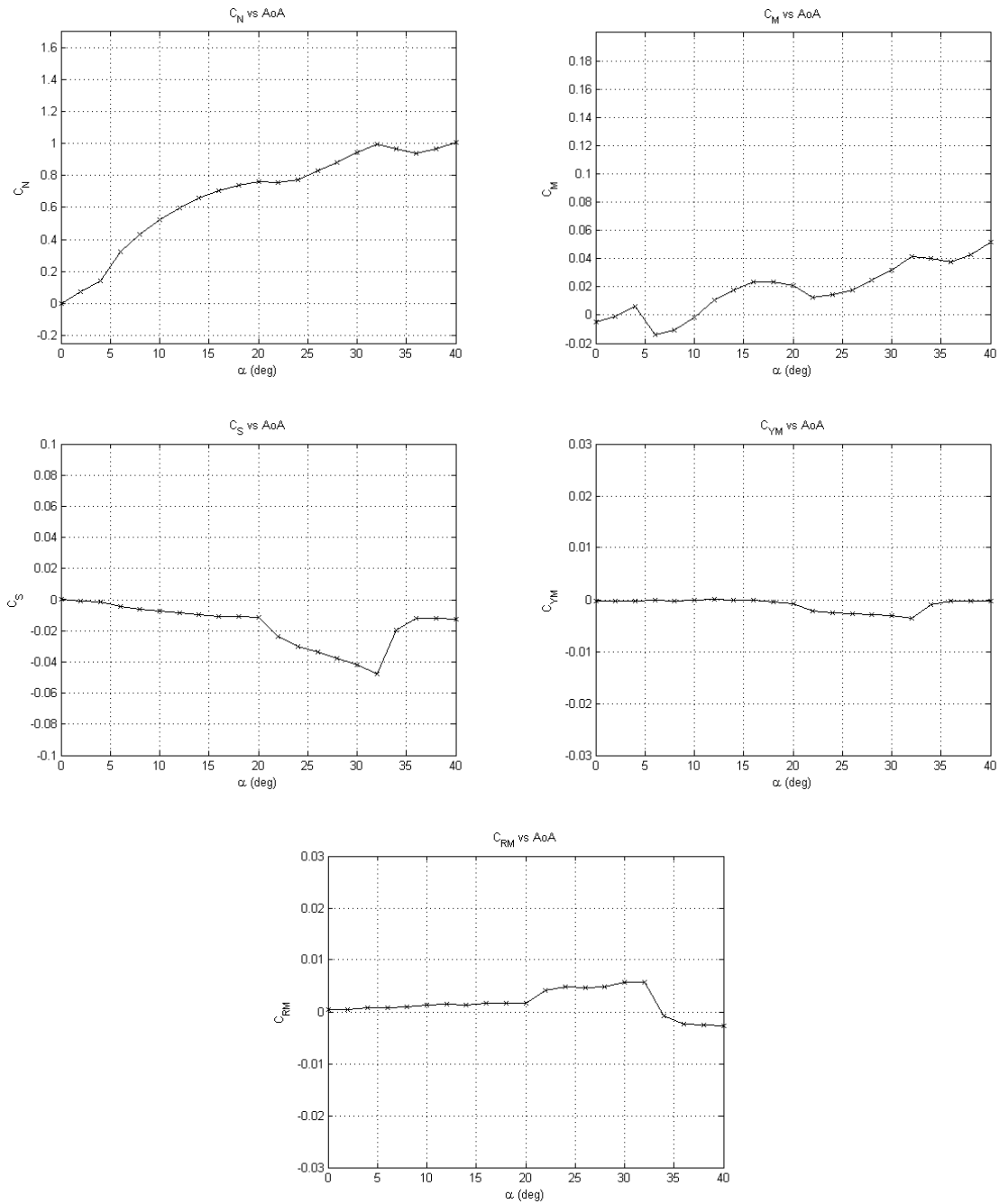


Figure 39. Static Aerodynamic Coefficients, $U_\infty = 14$ [in/sec], $Re = 2.94 \times 10^4$, $\alpha = 0^\circ$ - 40°

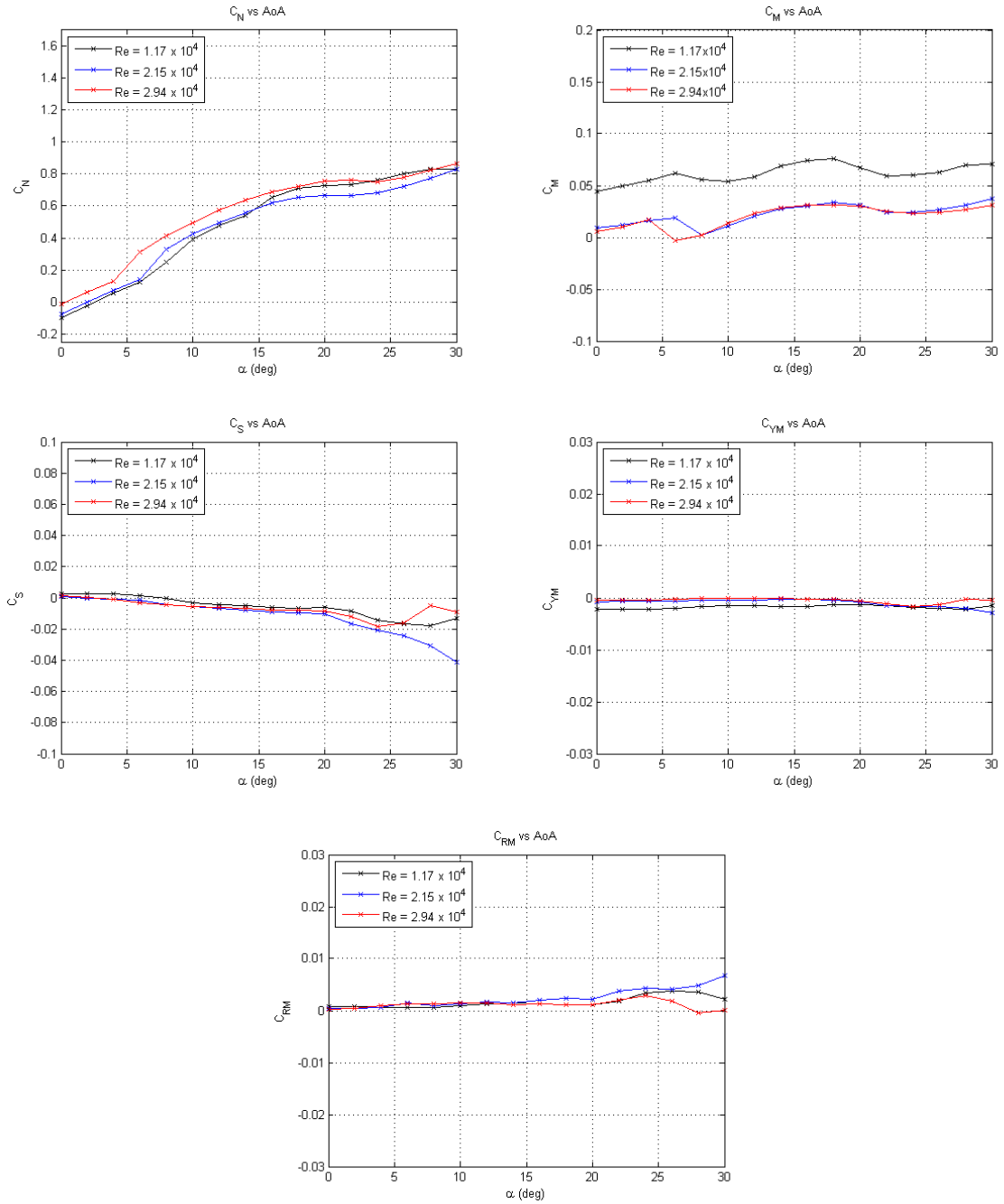


Figure 40. Static Aerodynamic Coefficients, Reynolds Number Effects, $\alpha = 0^\circ$ - 30°

B. STATIC AERODYNAMIC COEFFICIENTS, ROLL

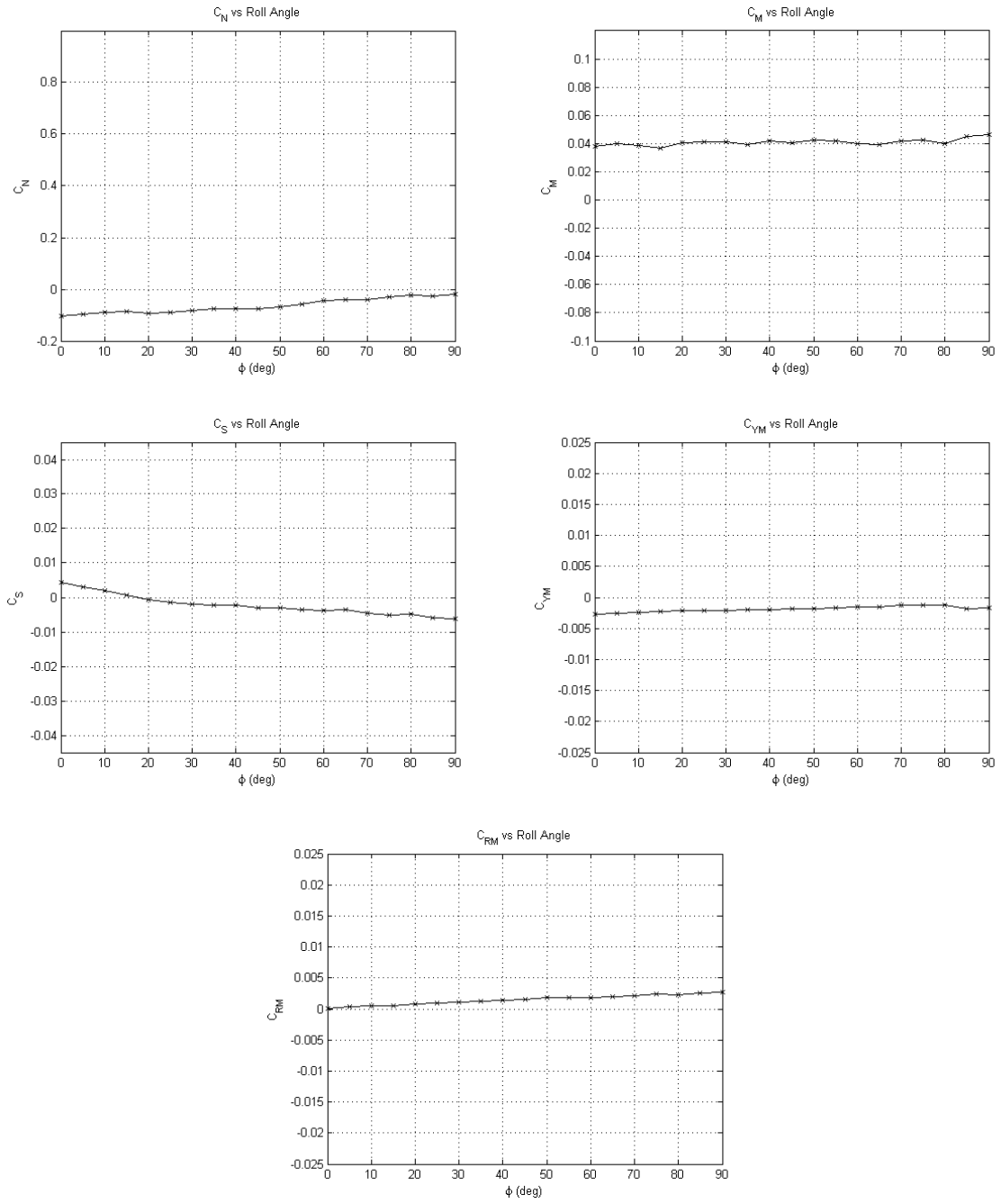


Figure 41. Static Aerodynamic Coefficients, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\alpha = 0^\circ$, $\phi = 0^\circ - 90^\circ$

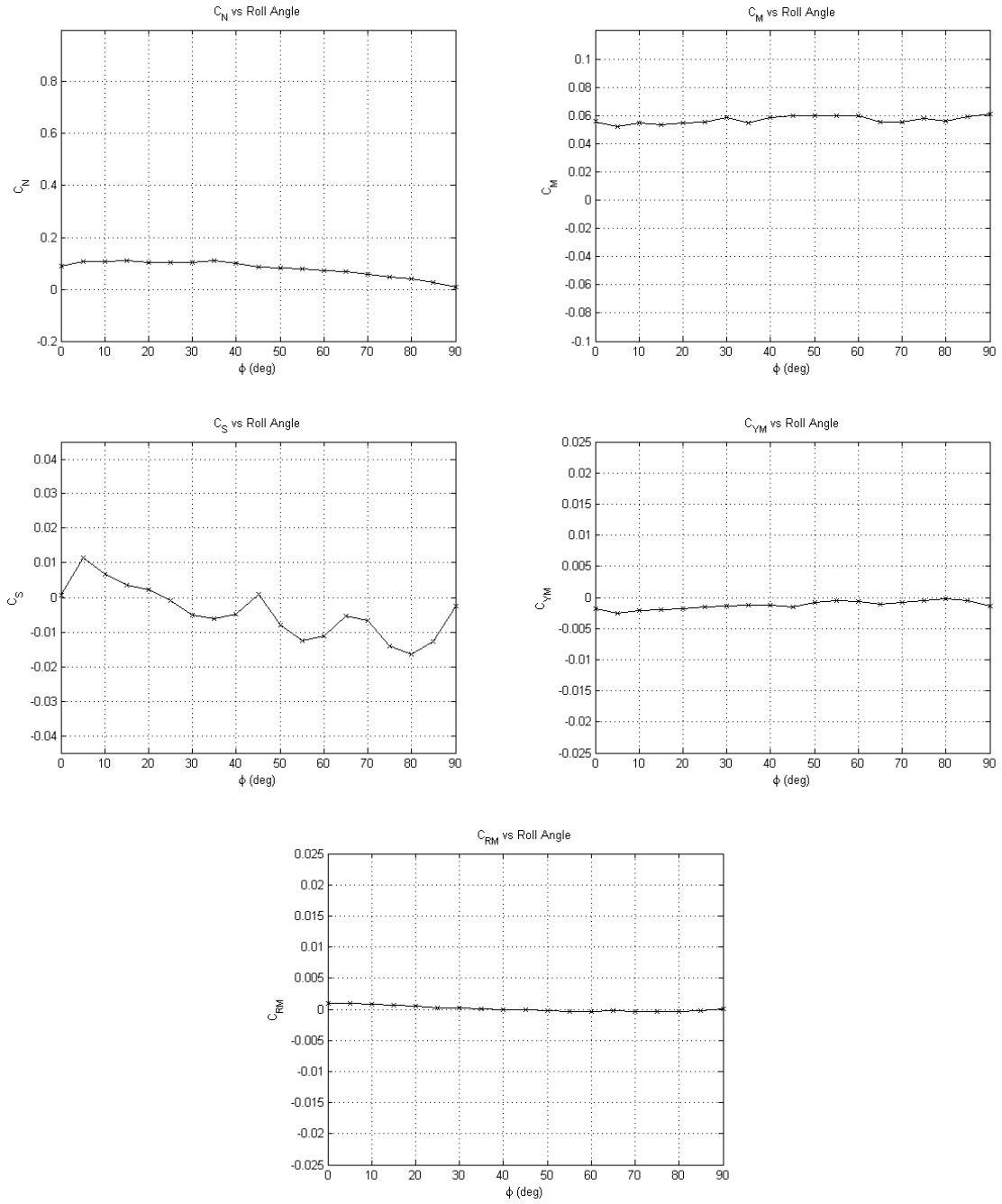


Figure 42. Static Aerodynamic Coefficients, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\alpha = 5^\circ$, $\phi = 0^\circ - 90^\circ$

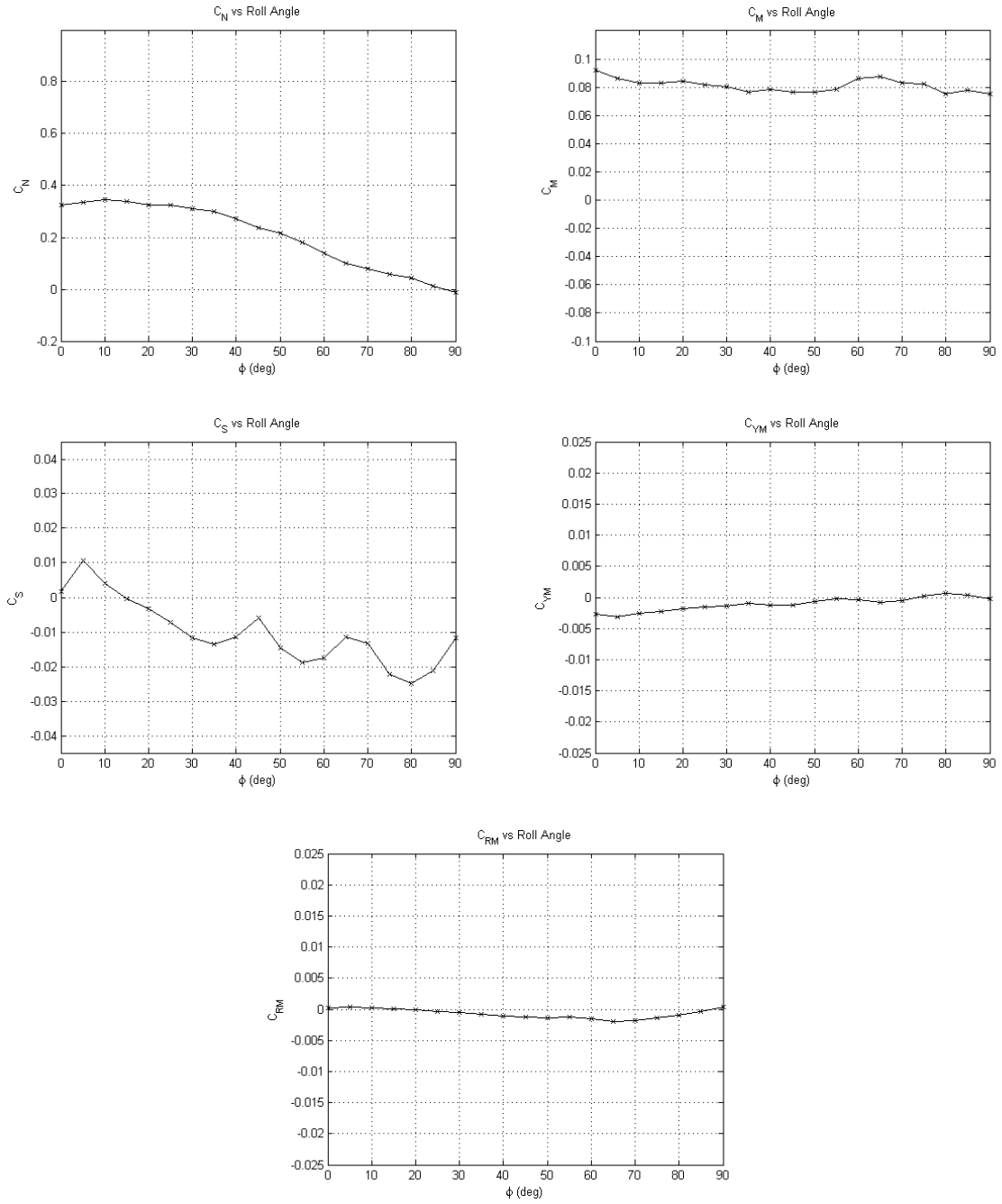


Figure 43. Static Aerodynamic Coefficients, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\alpha = 10^\circ$, $\phi = 0^\circ$ - 90°

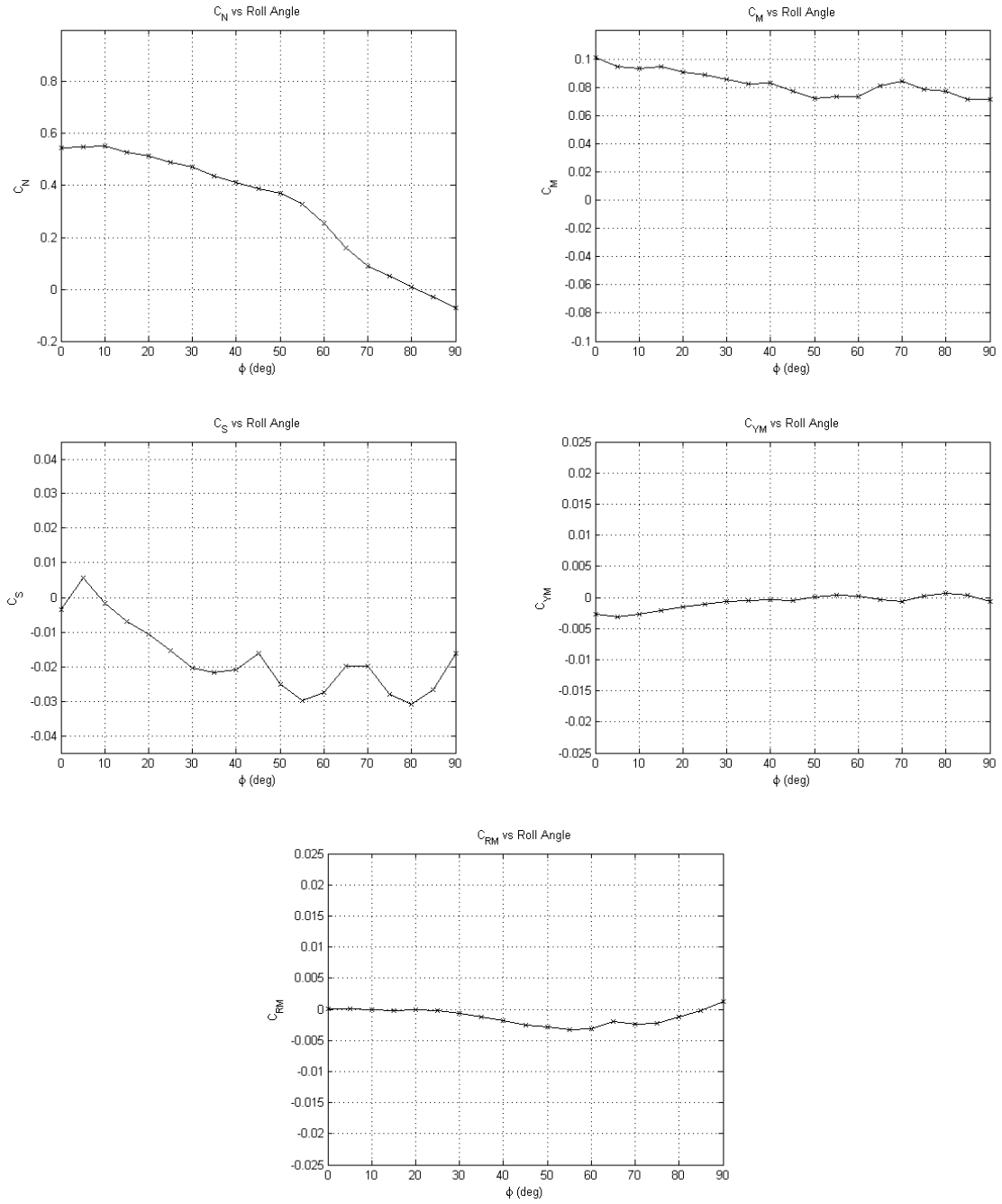


Figure 44. Static Aerodynamic Coefficients, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\alpha = 15^\circ$, $\phi = 0^\circ$ - 90°

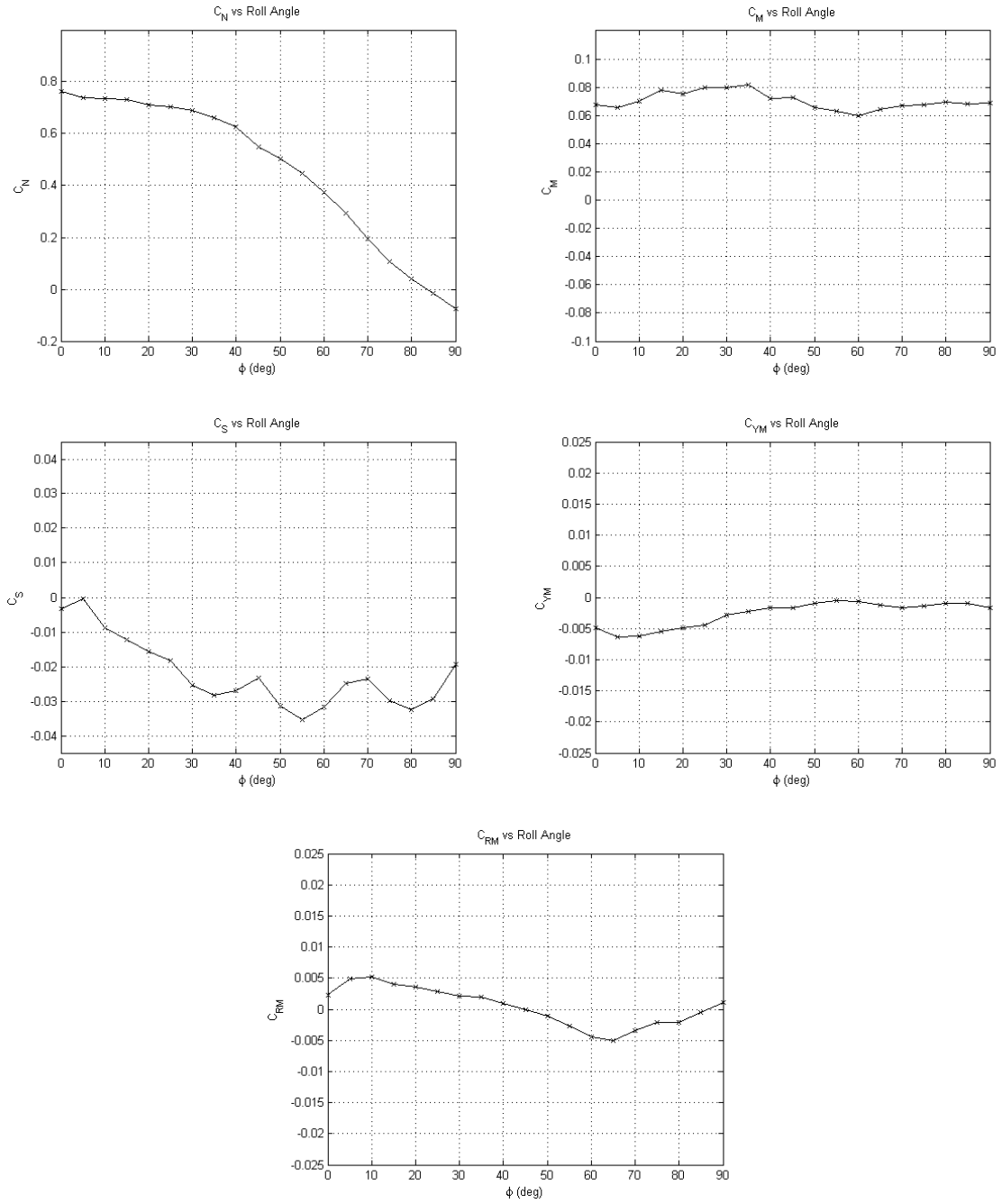


Figure 45. Static Aerodynamic Coefficients, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$,
 $\alpha = 20^\circ$, $\phi = 0^\circ$ - 90°

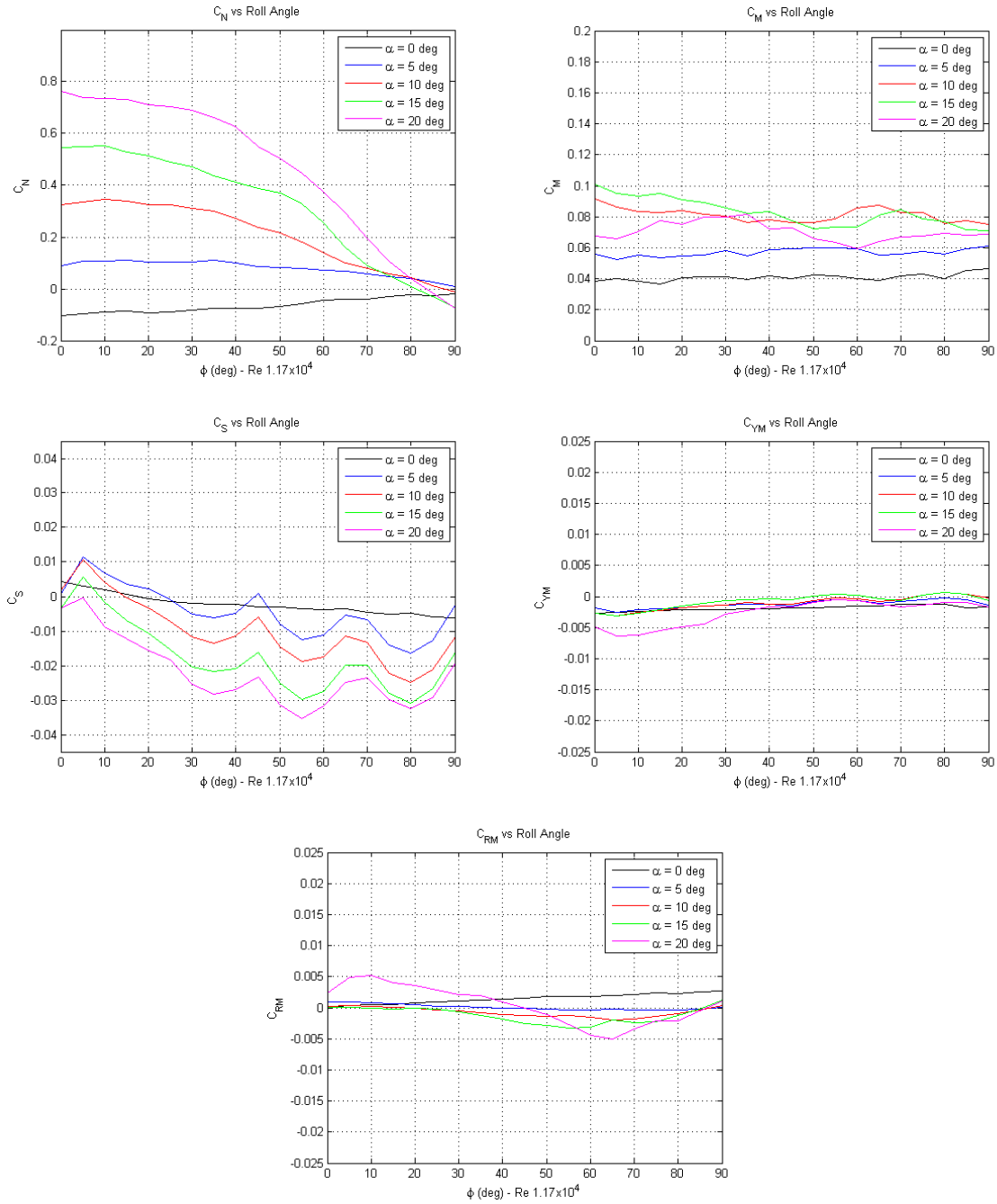


Figure 46. Static Aerodynamic Coefficients, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\phi = 0^\circ$ - 90° , Multiple Angles of Attacks

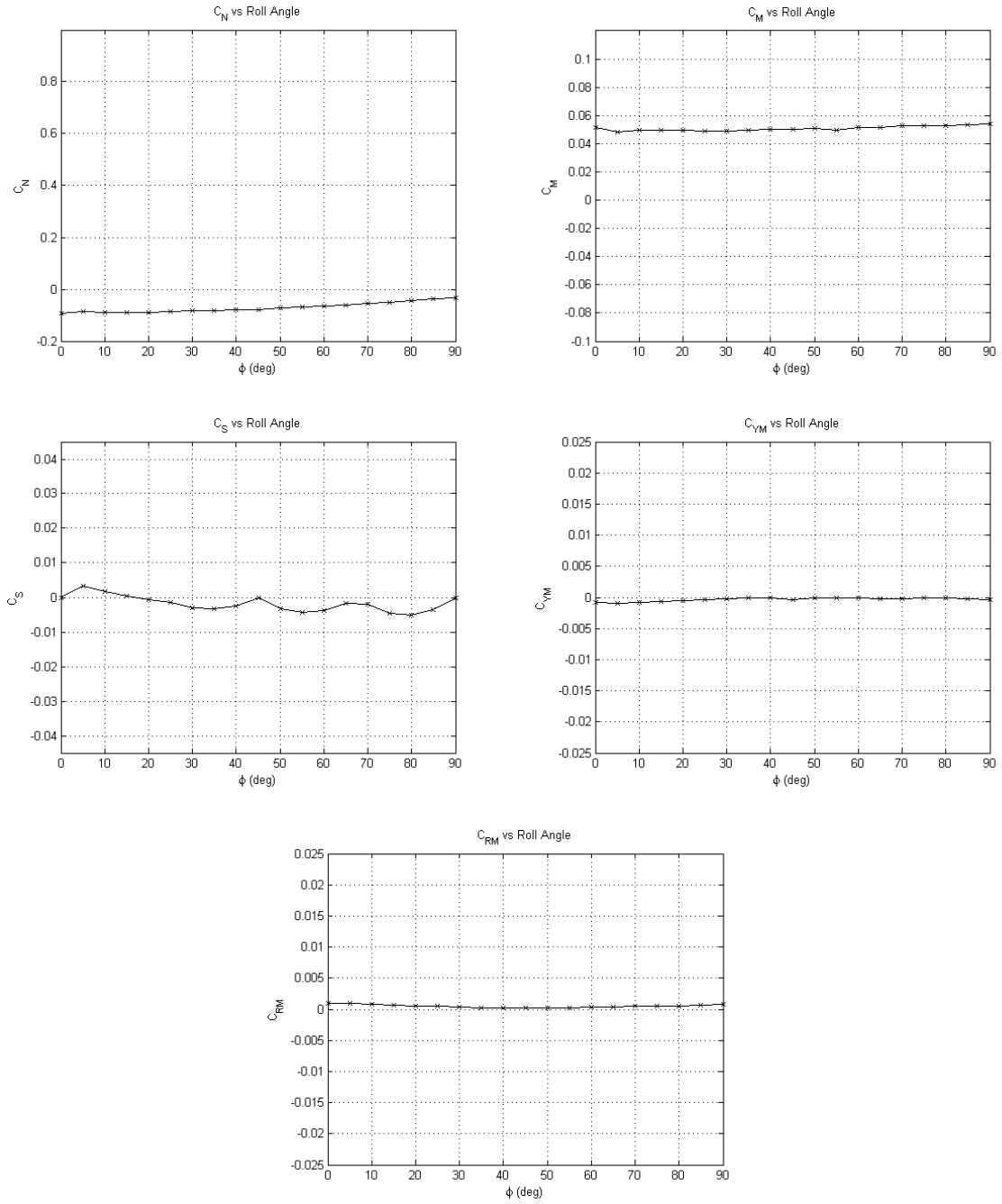


Figure 47. Static Aerodynamic Coefficients, $U_\infty = 10$ [in/sec], $Re = 2.15 \times 10^4$,
 $\alpha = 0^\circ$, $\phi = 0^\circ - 90^\circ$

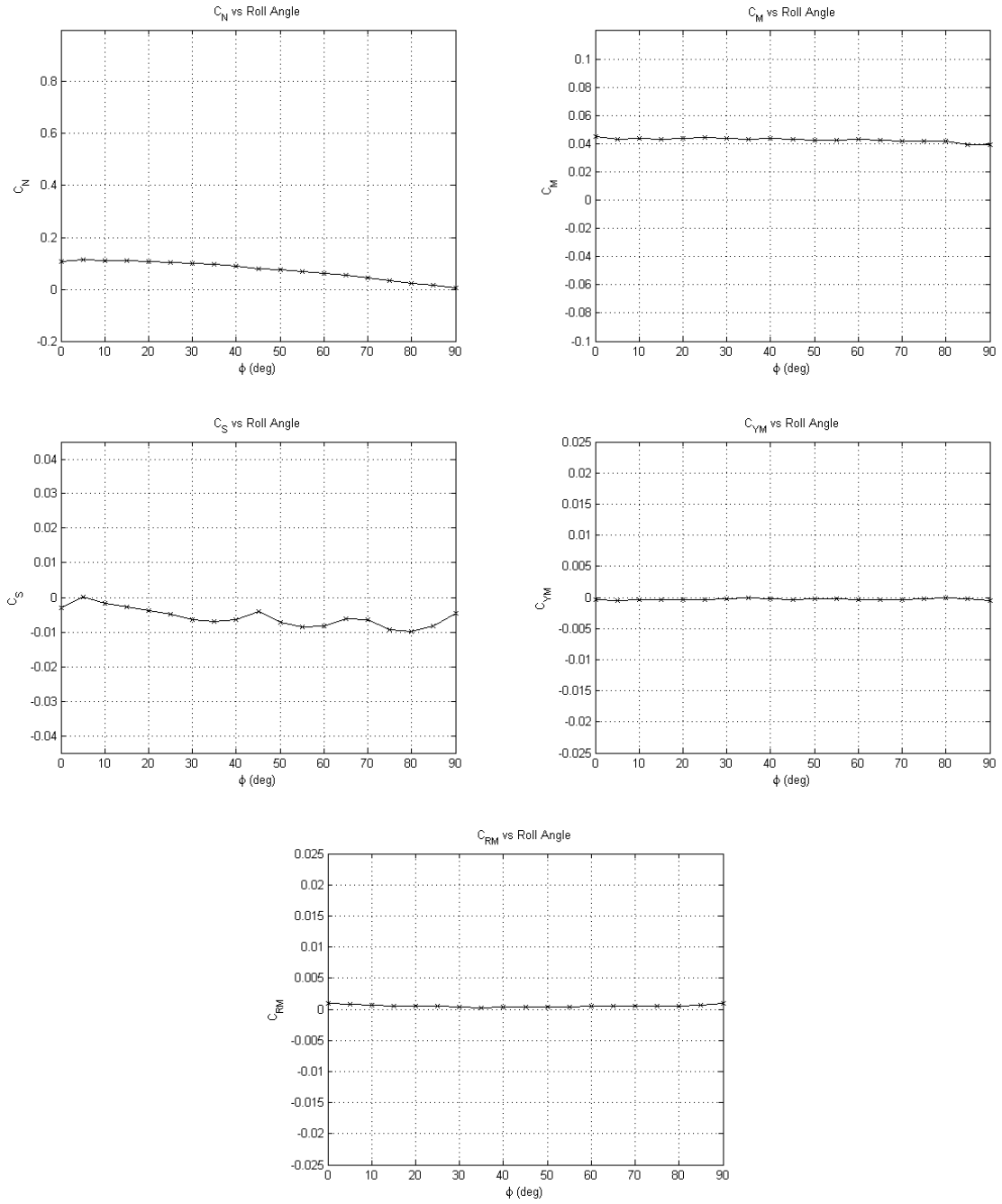


Figure 48. Static Aerodynamic Coefficients, $U_\infty = 10$ [in/sec], $Re = 2.15 \times 10^4$,
 $\alpha = 5^\circ$, $\phi = 0^\circ - 90^\circ$

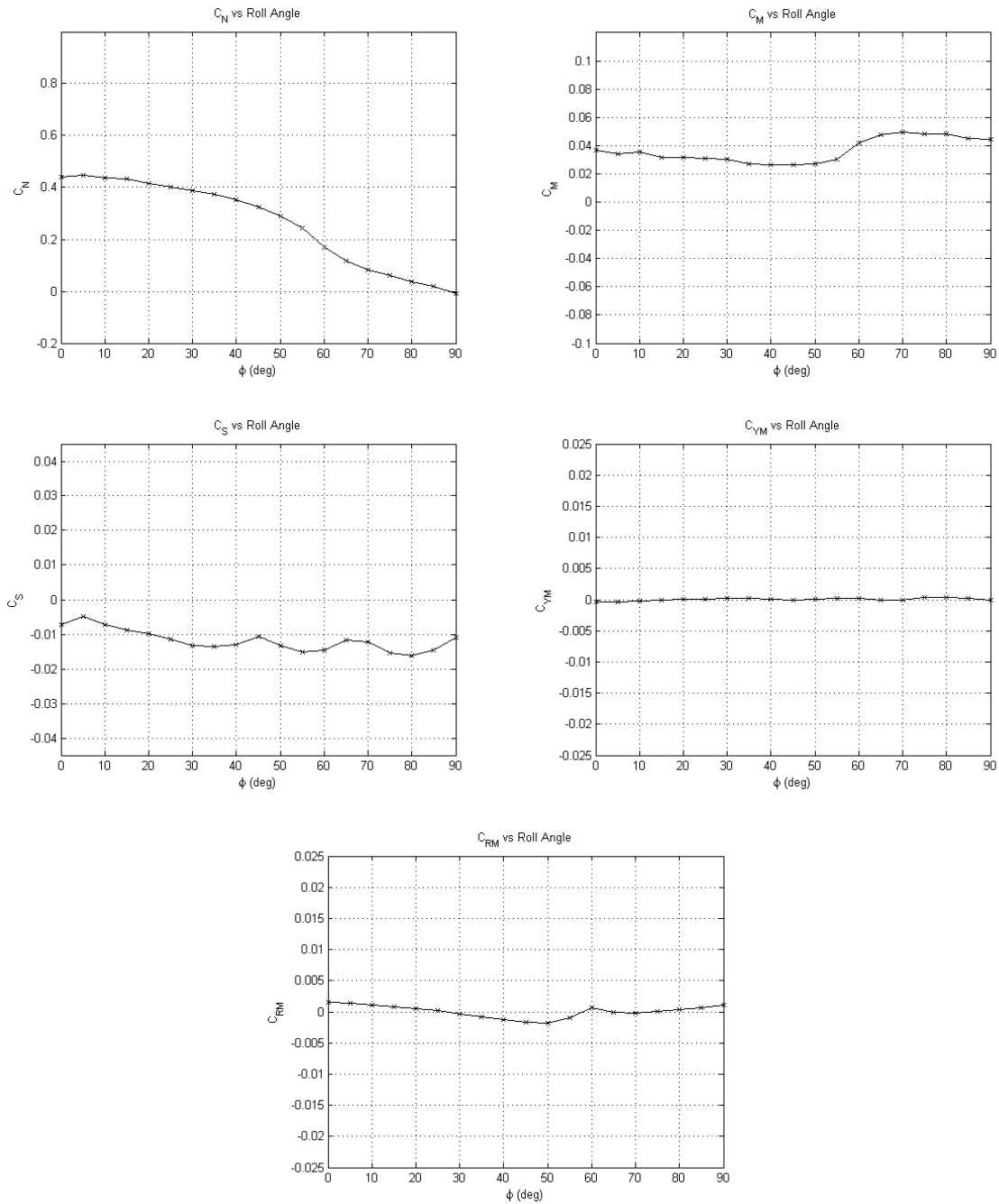


Figure 49. Static Aerodynamic Coefficients, $U_\infty = 10$ [in/sec], $Re = 2.15 \times 10^4$, $\alpha = 10^\circ$, $\phi = 0^\circ - 90^\circ$

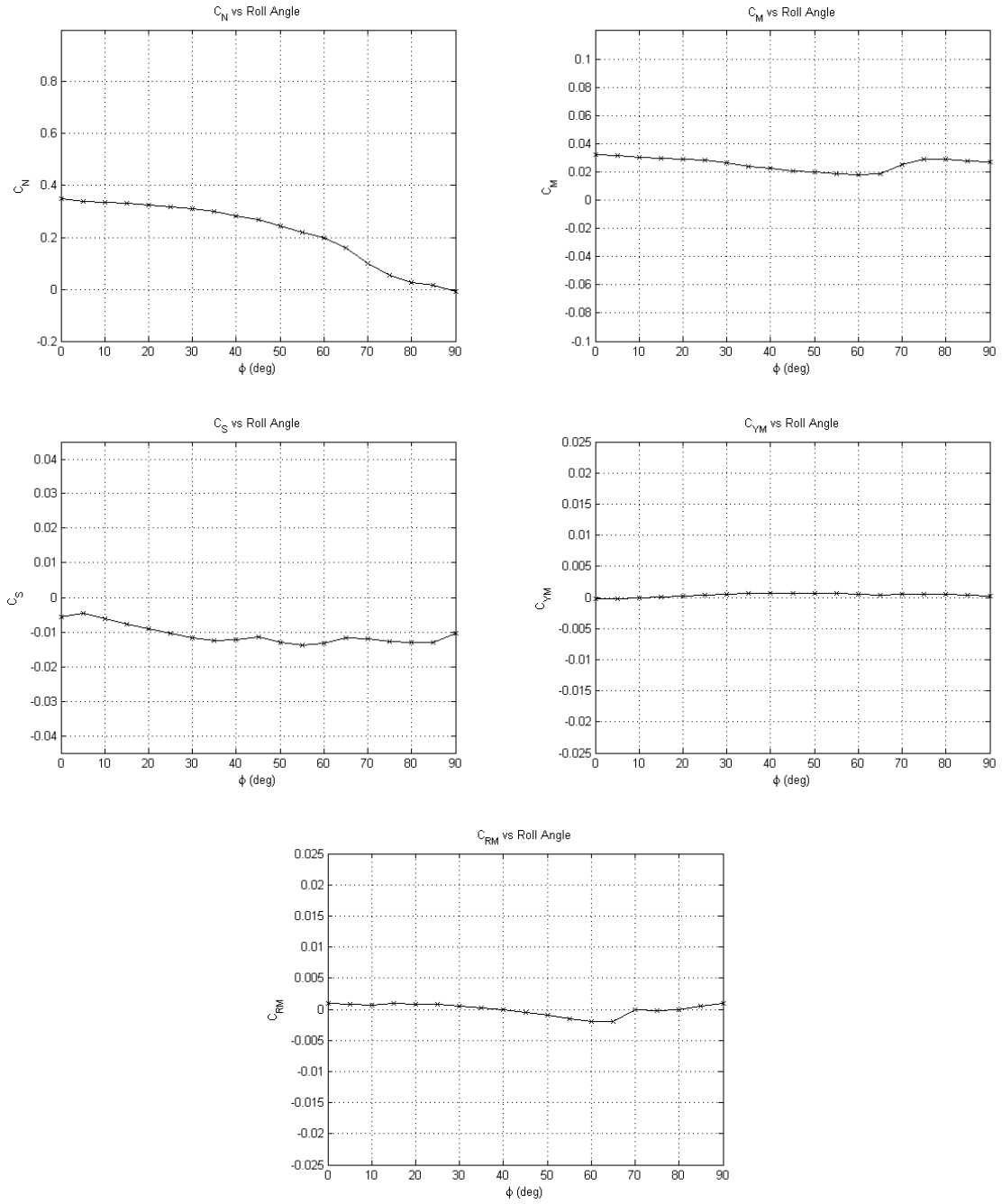


Figure 50. Static Aerodynamic Coefficients, $U_\infty = 10$ [in/sec], $Re = 2.15 \times 10^4$, $\alpha = 15^\circ$, $\phi = 0^\circ - 90^\circ$

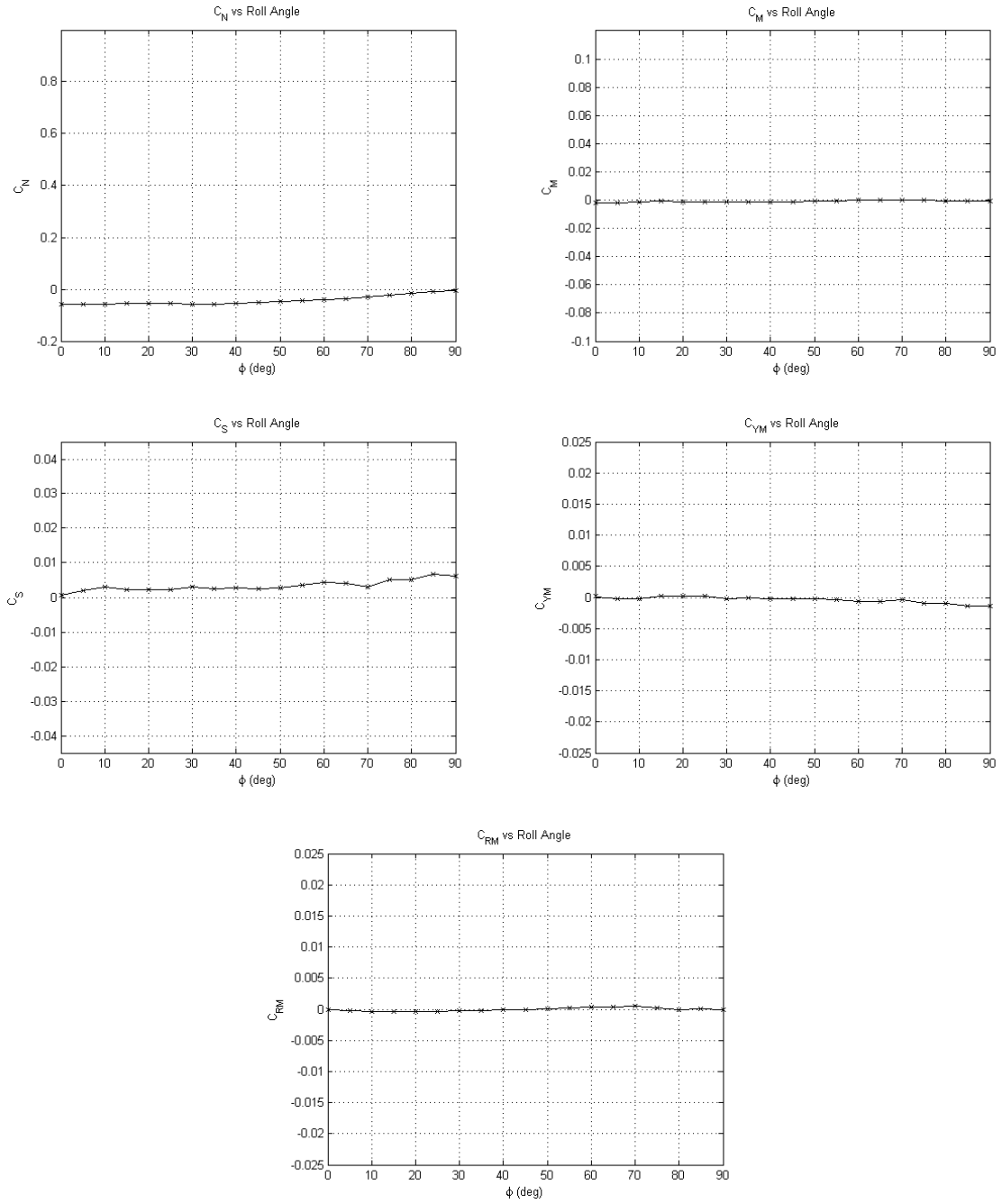


Figure 51. Static Aerodynamic Coefficients, $U_\infty = 10$ [in/sec], $Re = 2.15 \times 10^4$, $\alpha = 20^\circ$, $\phi = 0^\circ - 90^\circ$

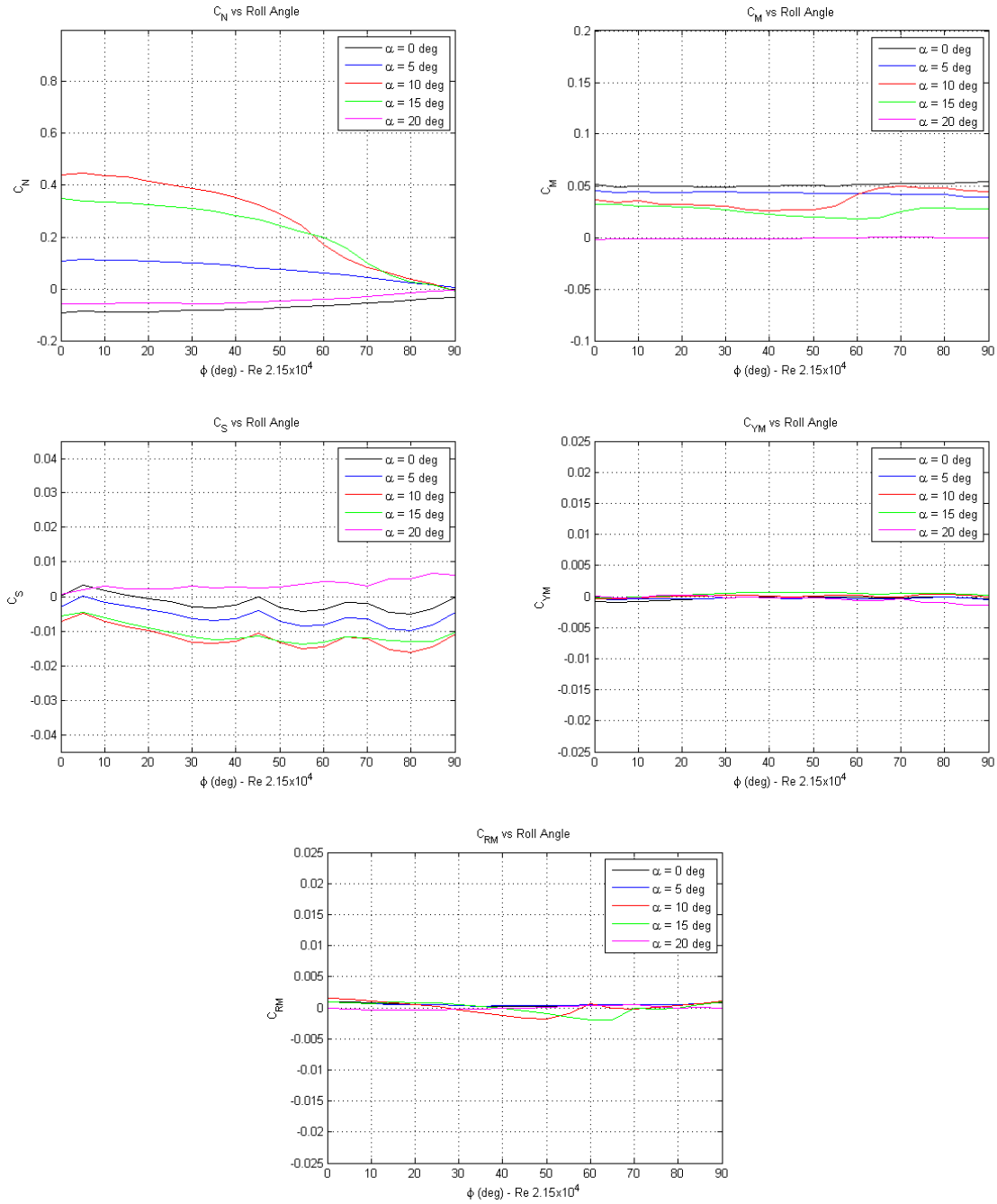


Figure 52. Static Aerodynamic Coefficients, $U_\infty = 10$ [in/sec], $\text{Re} = 2.15 \times 10^4$, $\phi = 0^\circ$ - 90° , Multiple Angles of Attacks

C. DYNAMIC AERODYNAMIC COEFFICIENTS, PITCH MANEUVERS

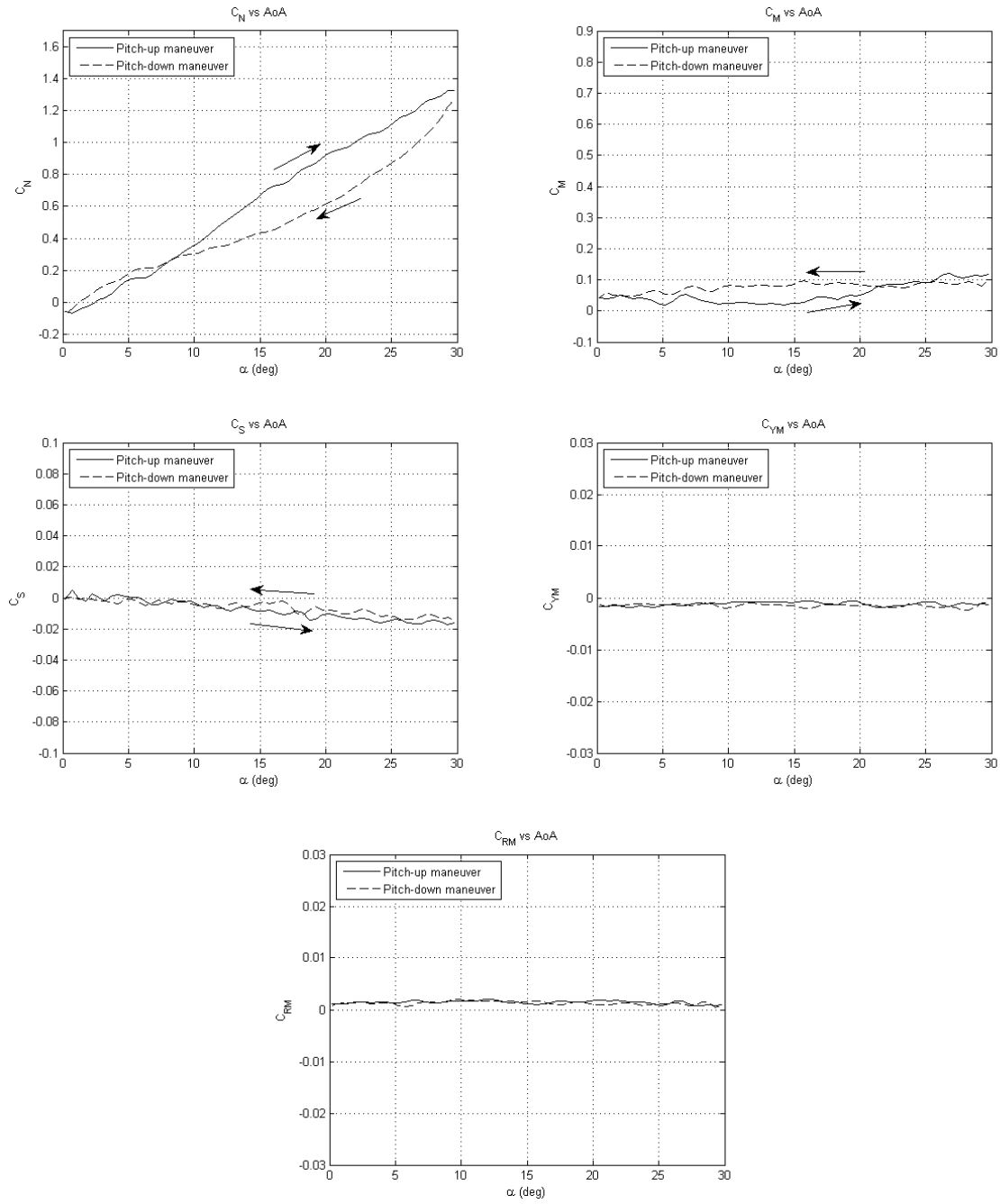


Figure 53. Dynamic Aerodynamic Coefficients, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\alpha = 0^\circ$ - 30° , $\alpha^+ = 0.05$

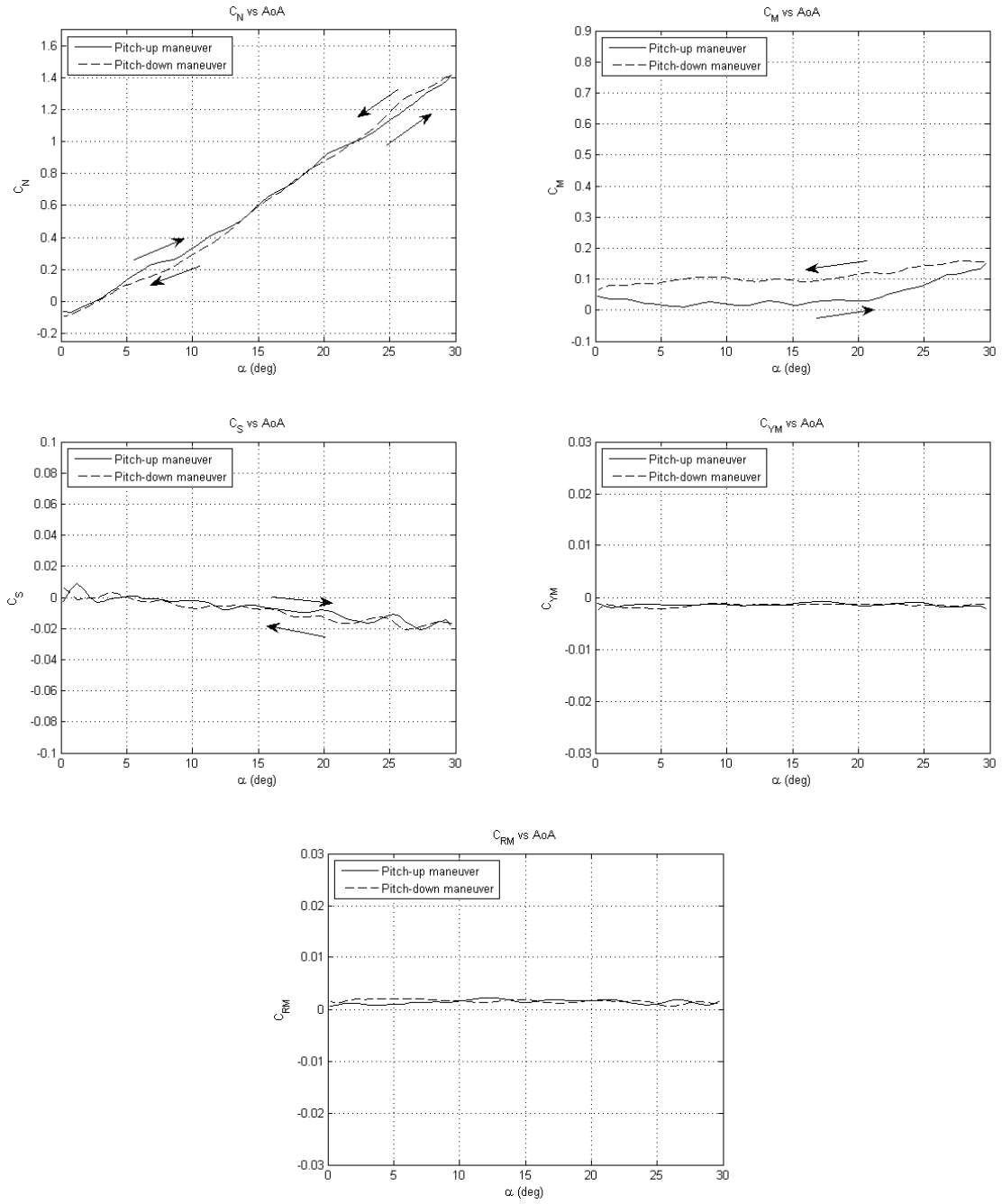


Figure 54. Dynamic Aerodynamic Coefficients, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\alpha = 0^\circ$ - 30° , $\alpha^+ = 0.10$

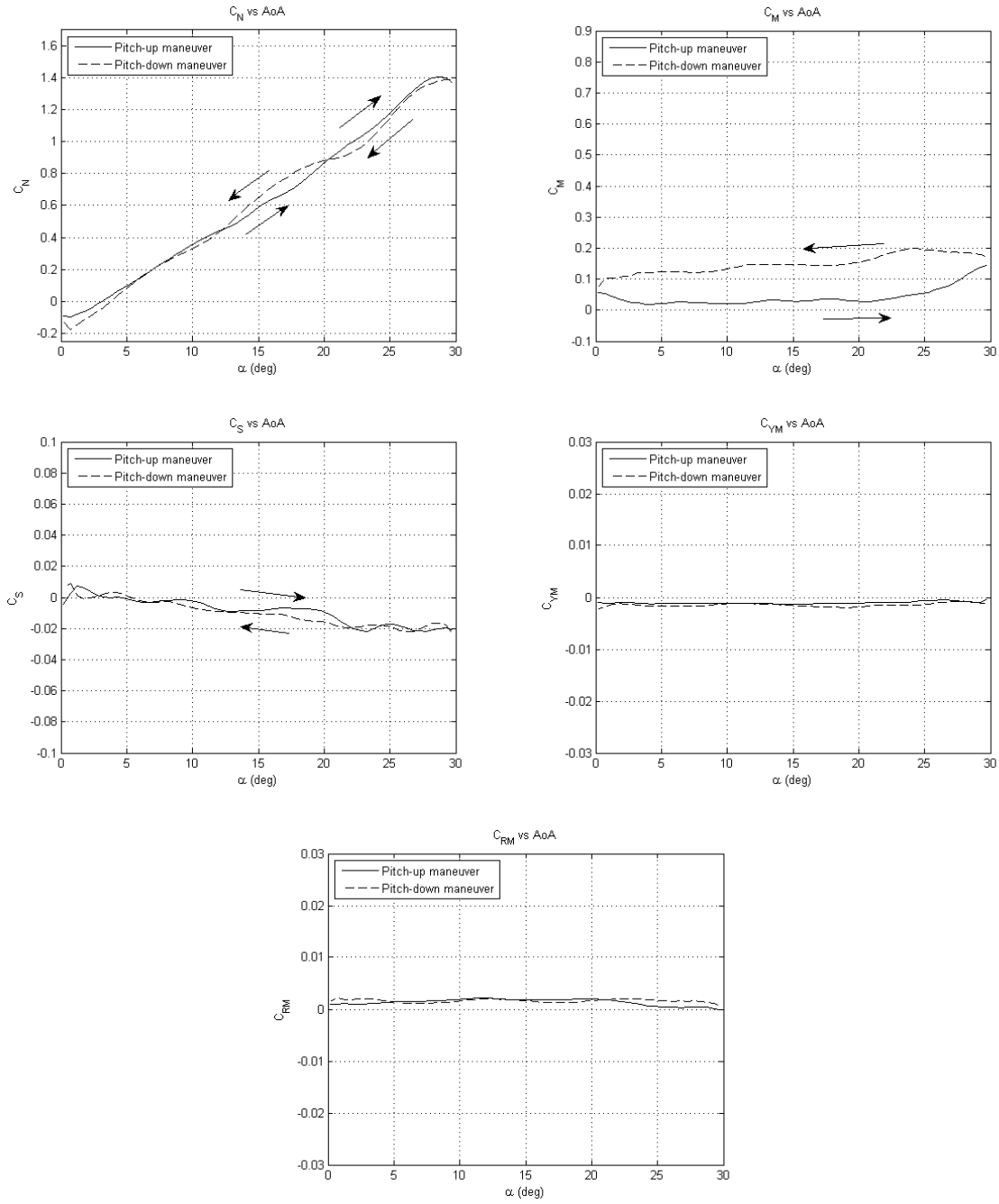


Figure 55. Dynamic Aerodynamic Coefficient, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\alpha = 0^\circ$ - 30° , $\alpha^+ = 0.15$

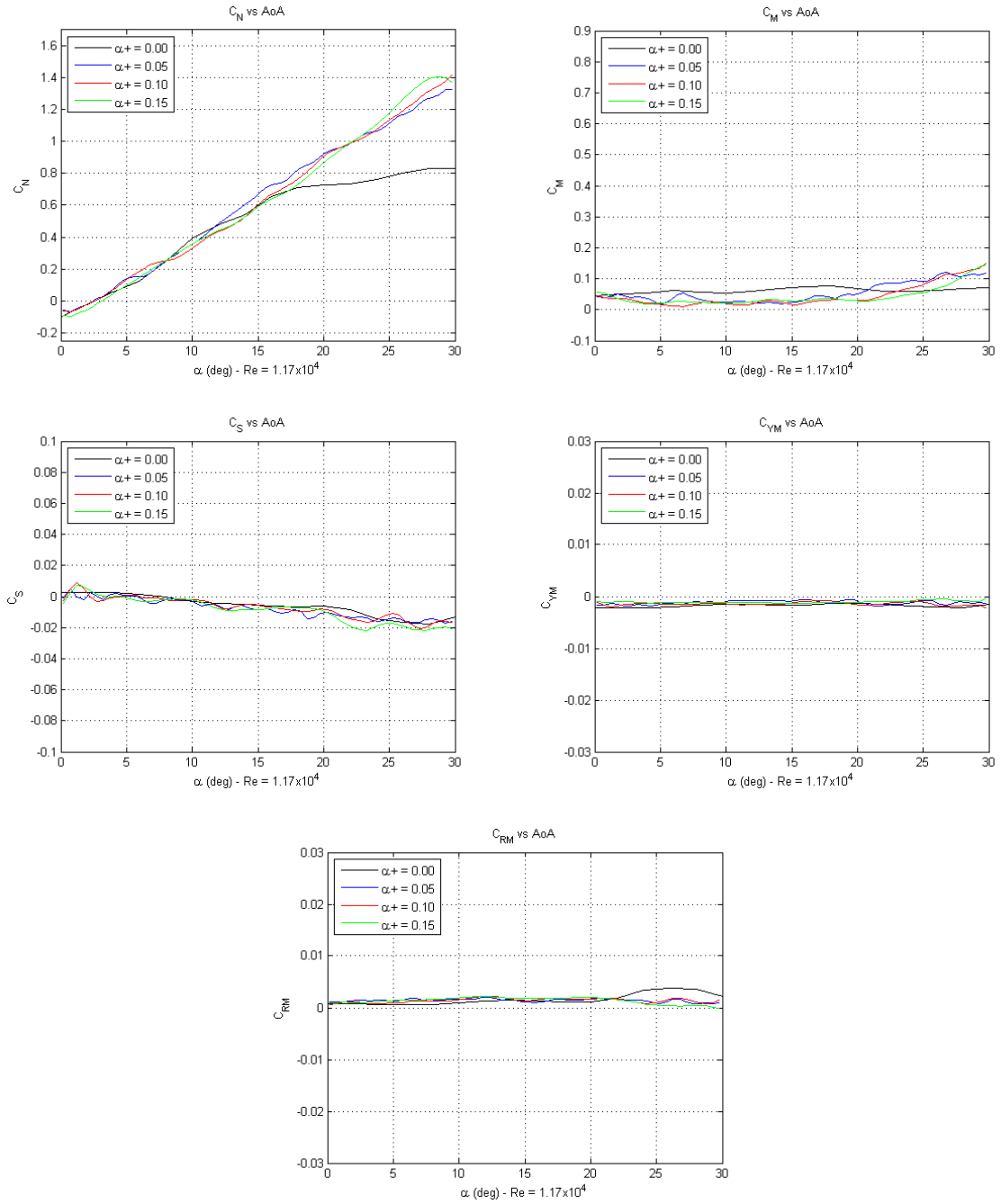


Figure 56. Dynamic Aerodynamic Coefficients, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\alpha = 0^\circ$ - 30° , Comparing α^+

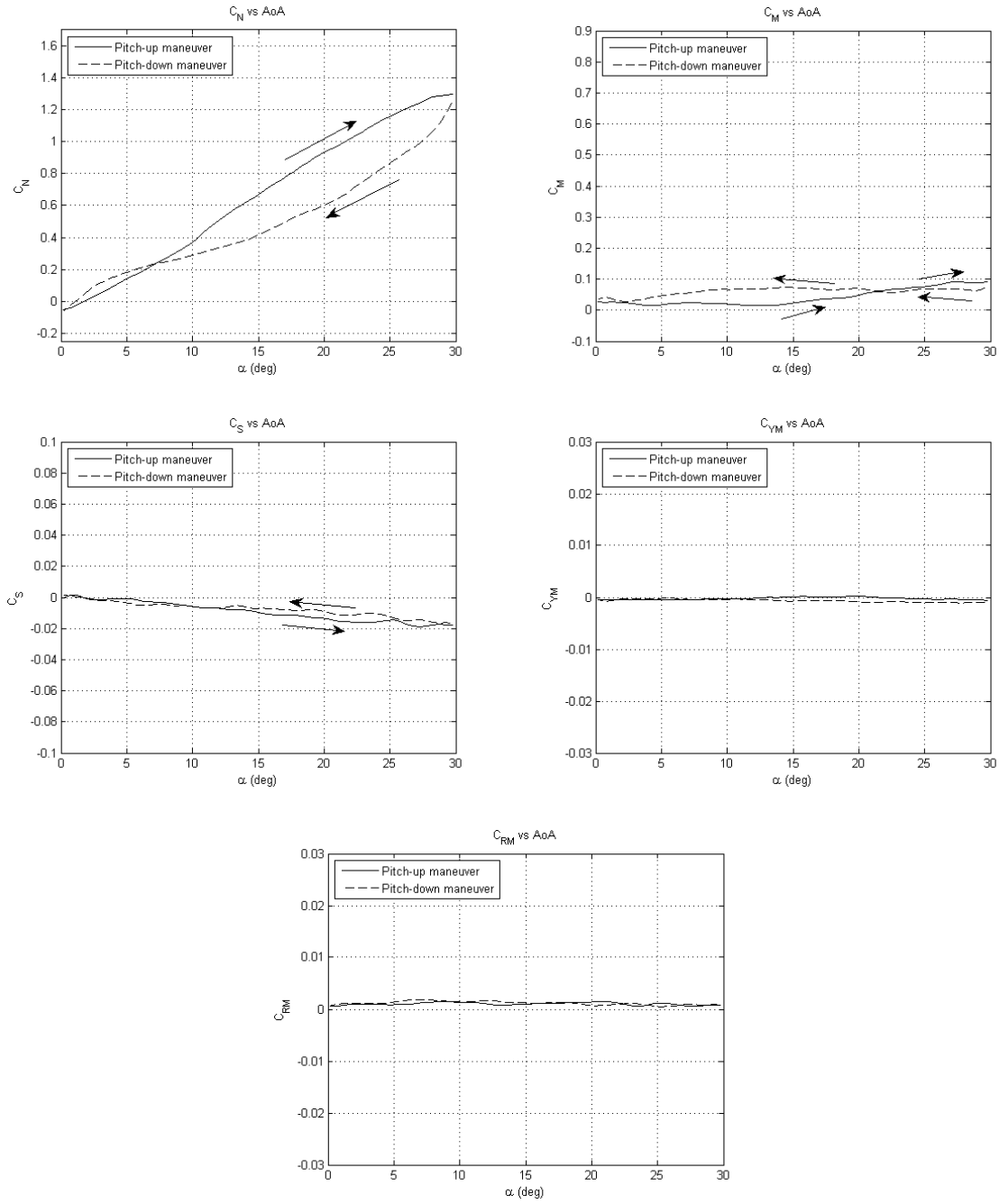


Figure 57. Dynamic Aerodynamic Coefficients, $U_\infty = 10$ [in/sec], $Re = 2.15 \times 10^4$, $\alpha = 0^\circ$ - 30° , $\alpha^+ = 0.05$

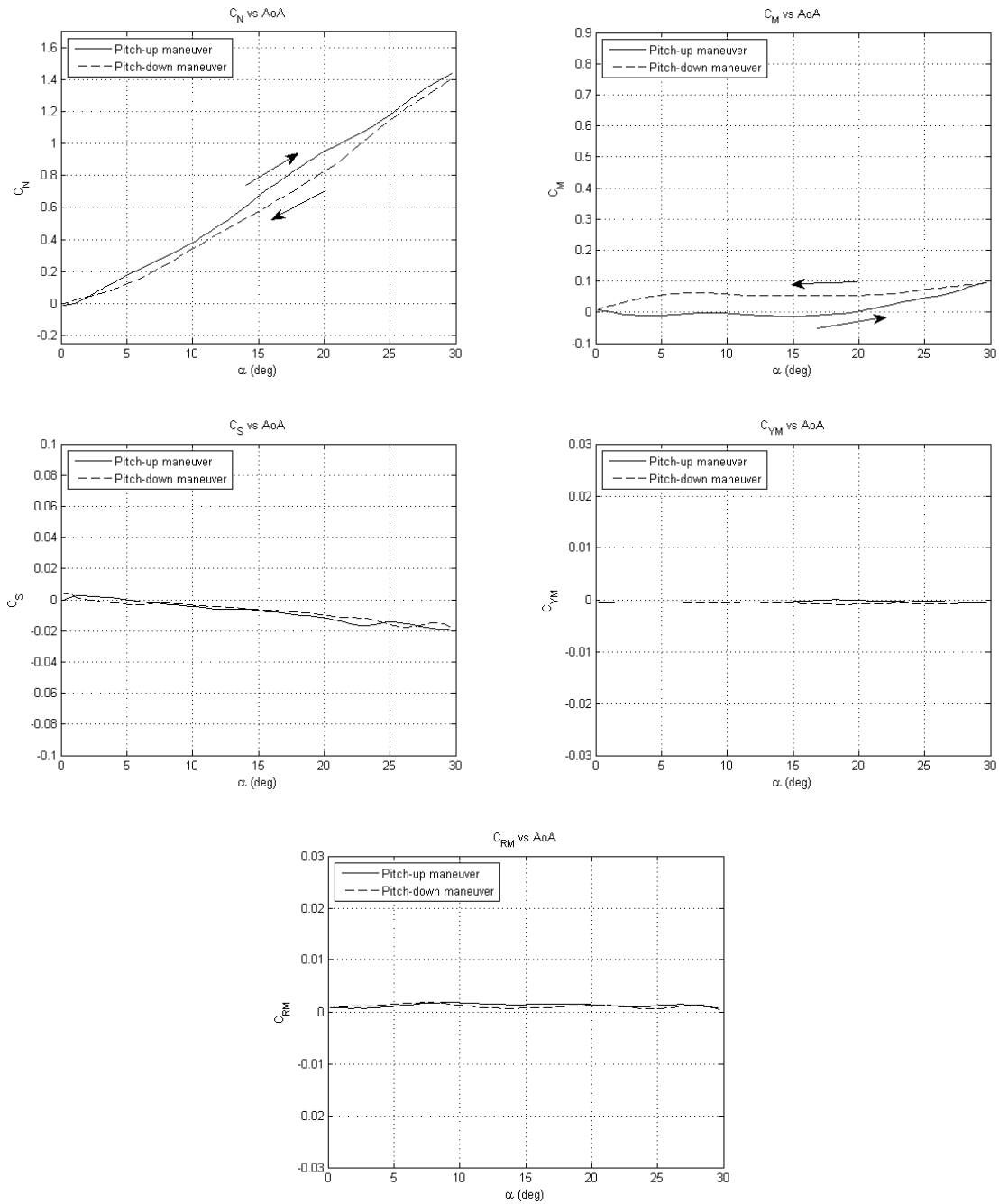


Figure 58. Dynamic Aerodynamic Coefficients, $U_\infty = 10$ [in/sec], $Re = 2.15 \times 10^4$, $\alpha = 0^\circ$ - 30° , $\alpha^+ = 0.10$

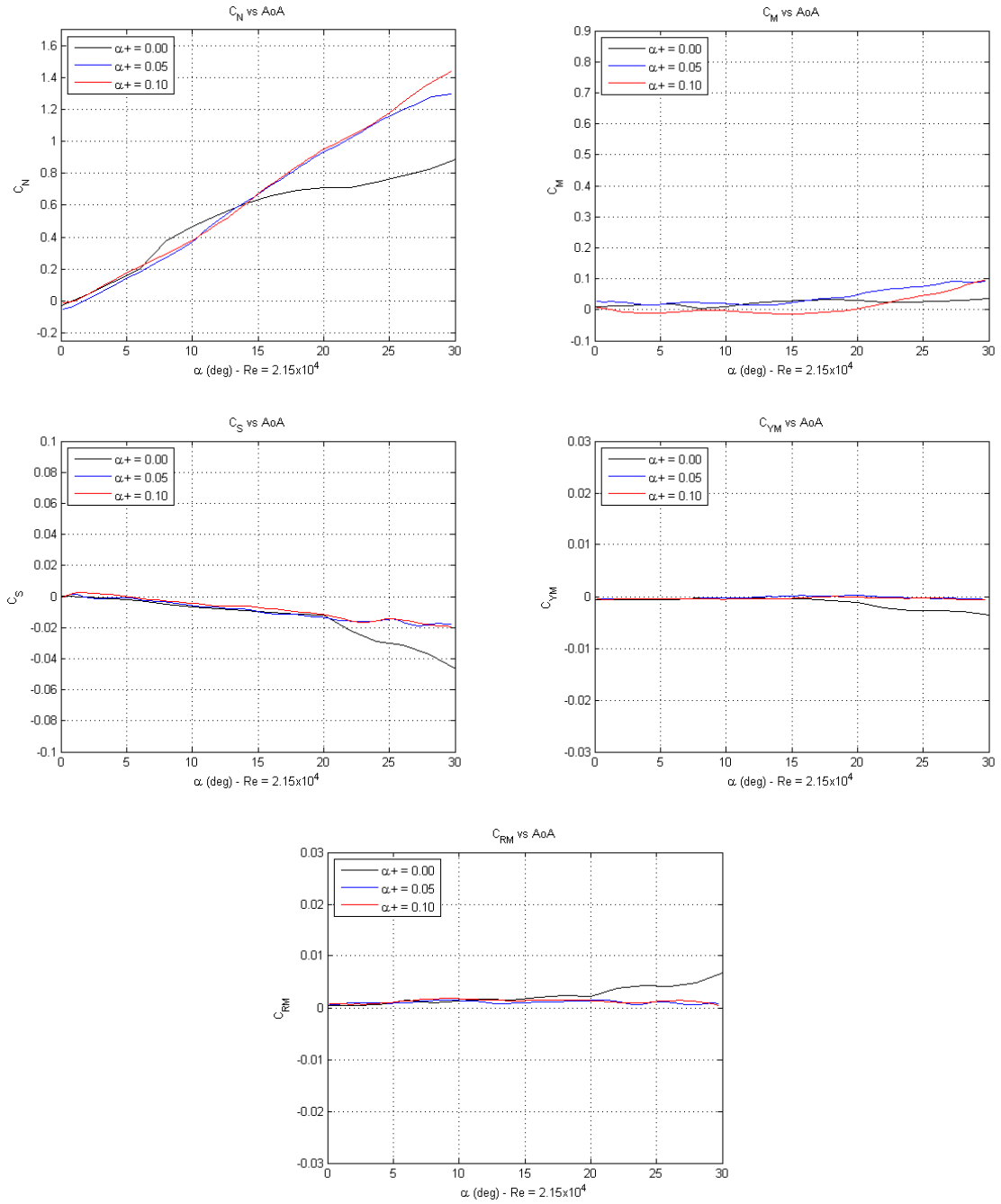


Figure 59. Dynamic Aerodynamic Coefficients, $U_\infty = 10$ [in/sec], $Re = 2.15 \times 10^4$, $\alpha = 0^\circ$ - 30° , Compare α^+

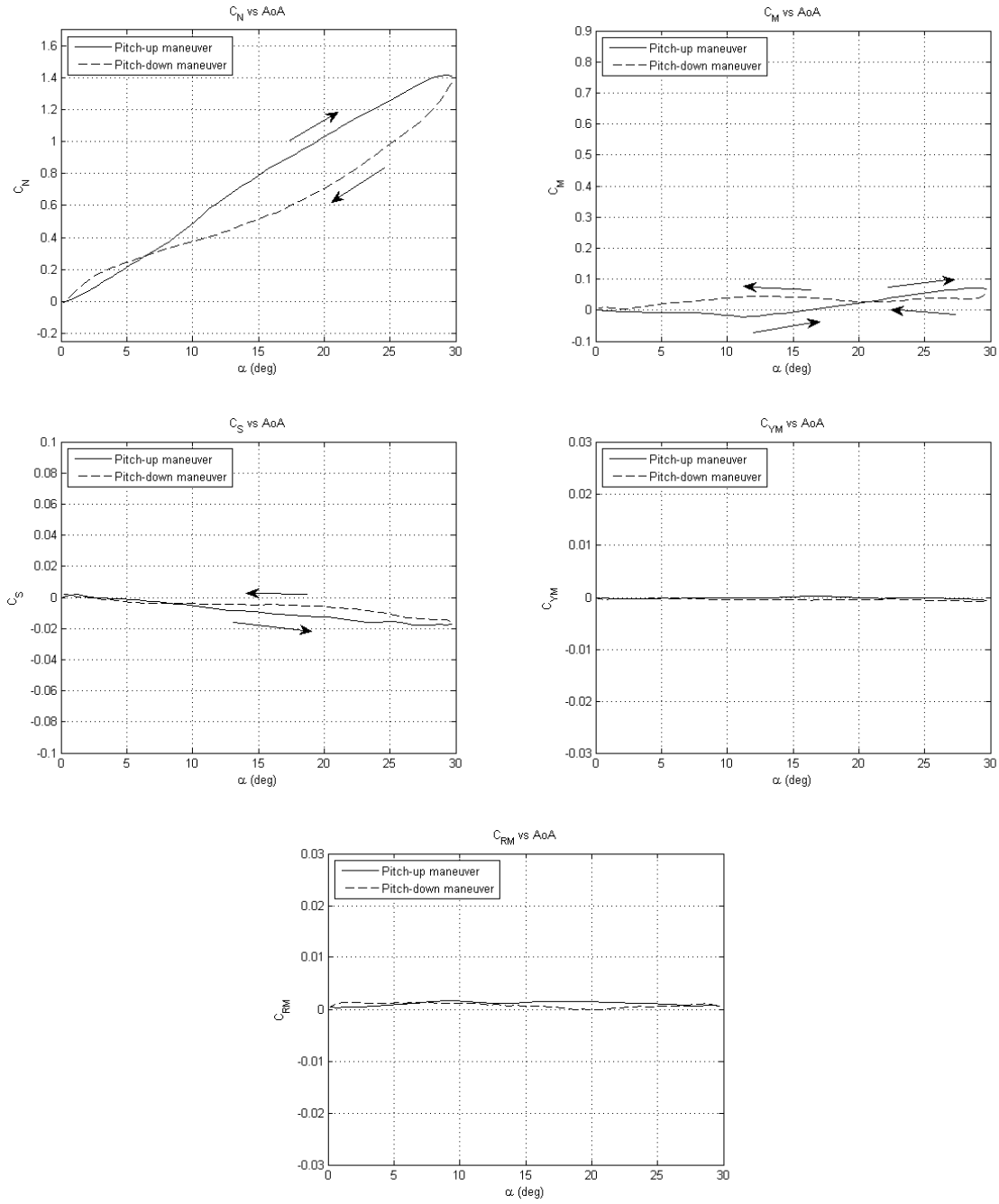


Figure 60. Dynamic Aerodynamic Coefficients, $U_\infty = 14$ [in/sec], $Re = 2.94 \times 10^4$, $\alpha = 0^\circ$ - 30° , $\alpha^+ = 0.05$

D. DYNAMIC AERODYNAMIC COEFFICIENTS, ROLL MANEUVERS

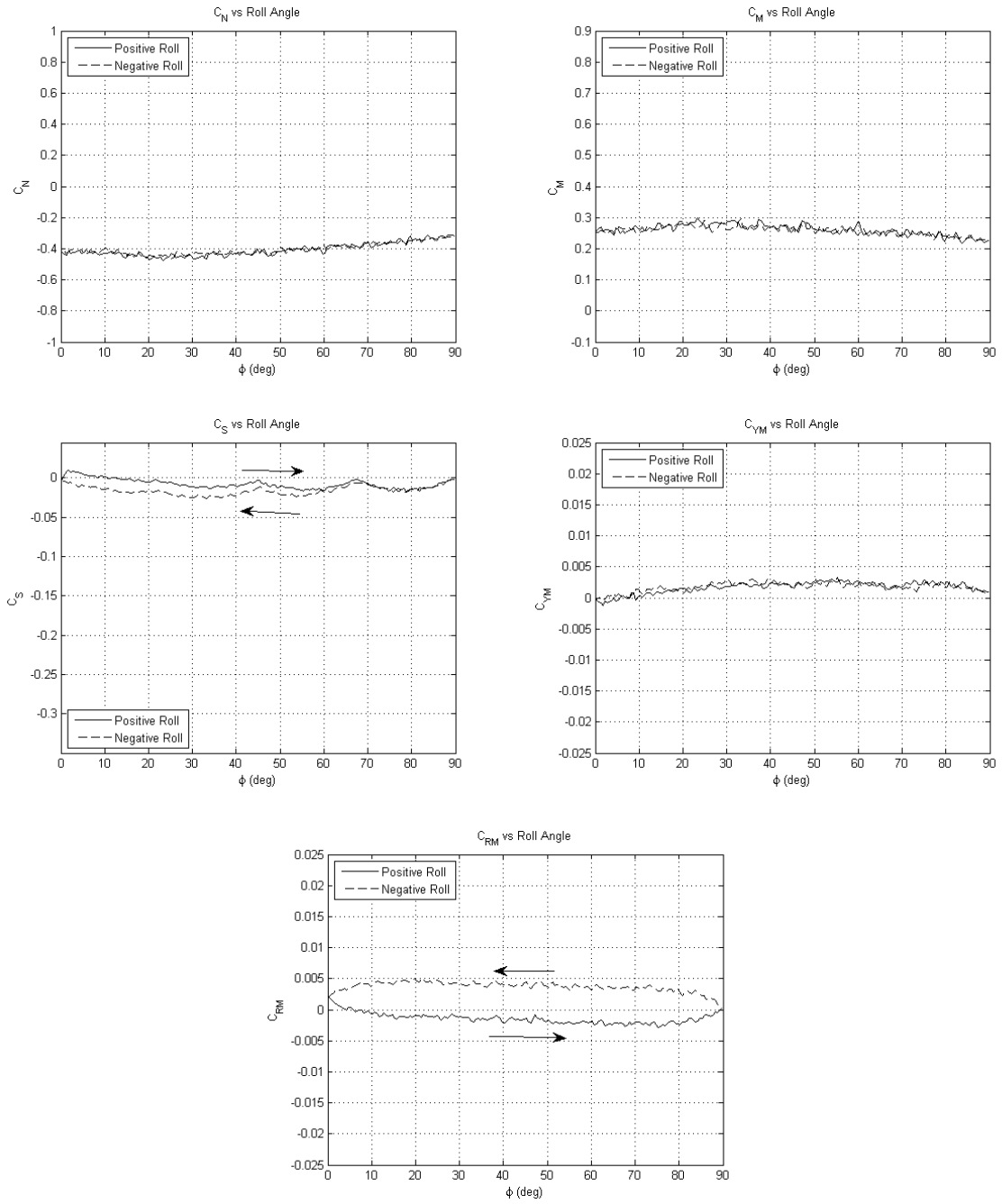


Figure 61. Dynamic Aerodynamic Coefficients, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\alpha = 0^\circ$, $\phi = 0^\circ - 90^\circ$, $\dot{\phi} = 3^\circ/\text{sec}$

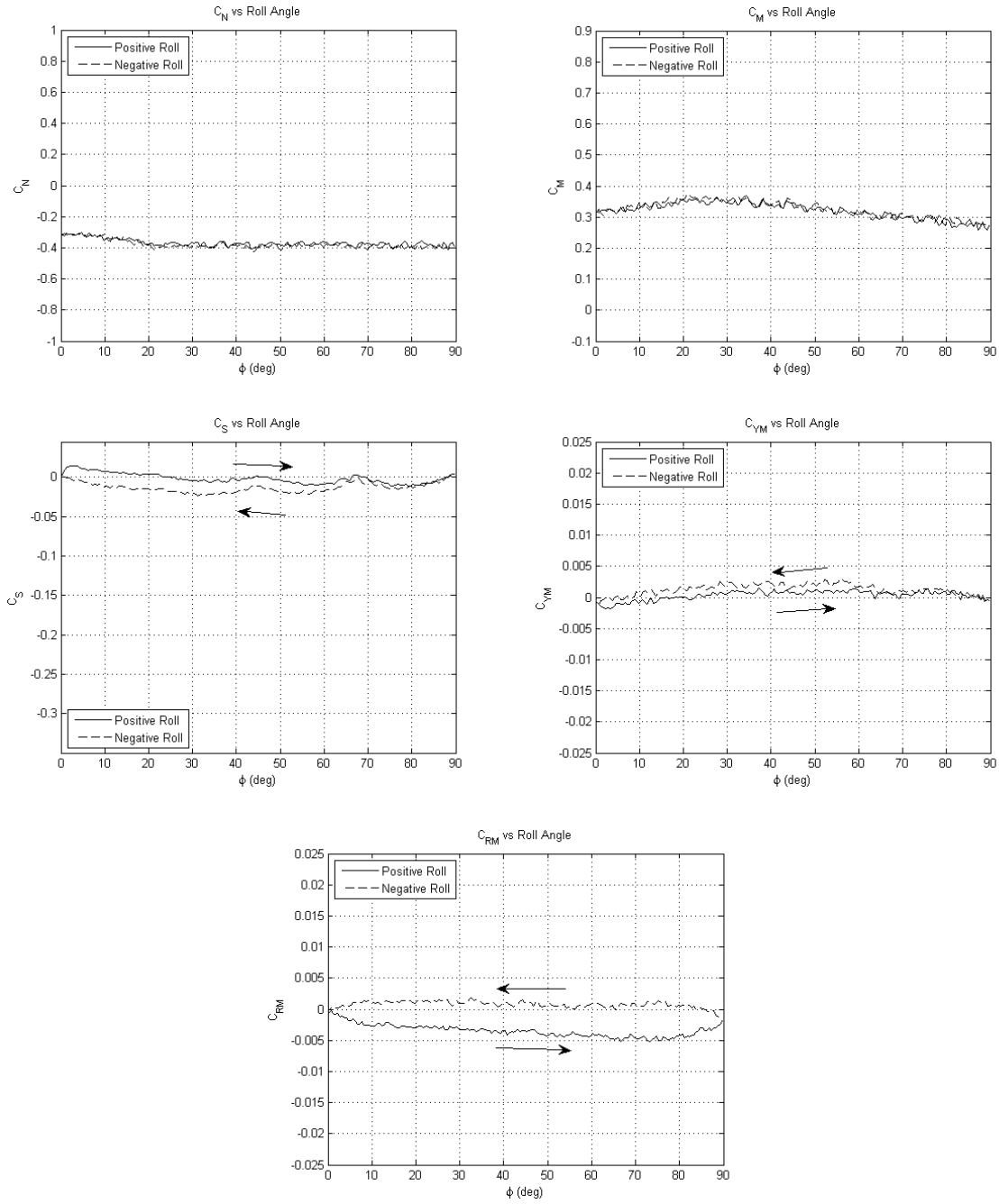


Figure 62. Dynamic Aerodynamic Coefficients, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\alpha = 5^\circ$, $\phi = 0^\circ - 90^\circ$, $\dot{\phi} = 3^\circ/\text{sec}$

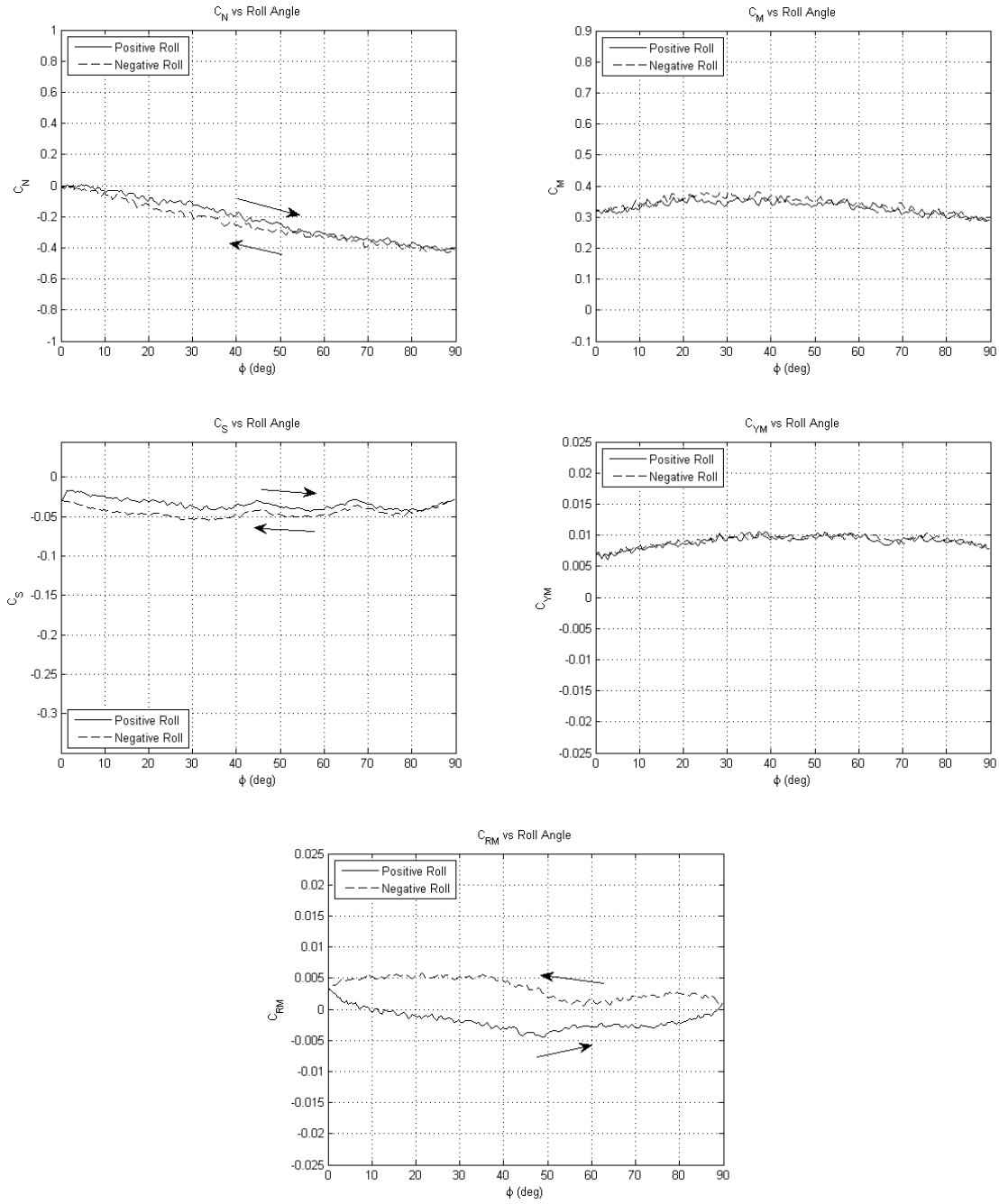


Figure 63. Dynamic Aerodynamic Coefficients, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\alpha = 10^\circ$, $\phi = 0^\circ - 90^\circ$, $\dot{\phi} = 3^\circ/\text{sec}$

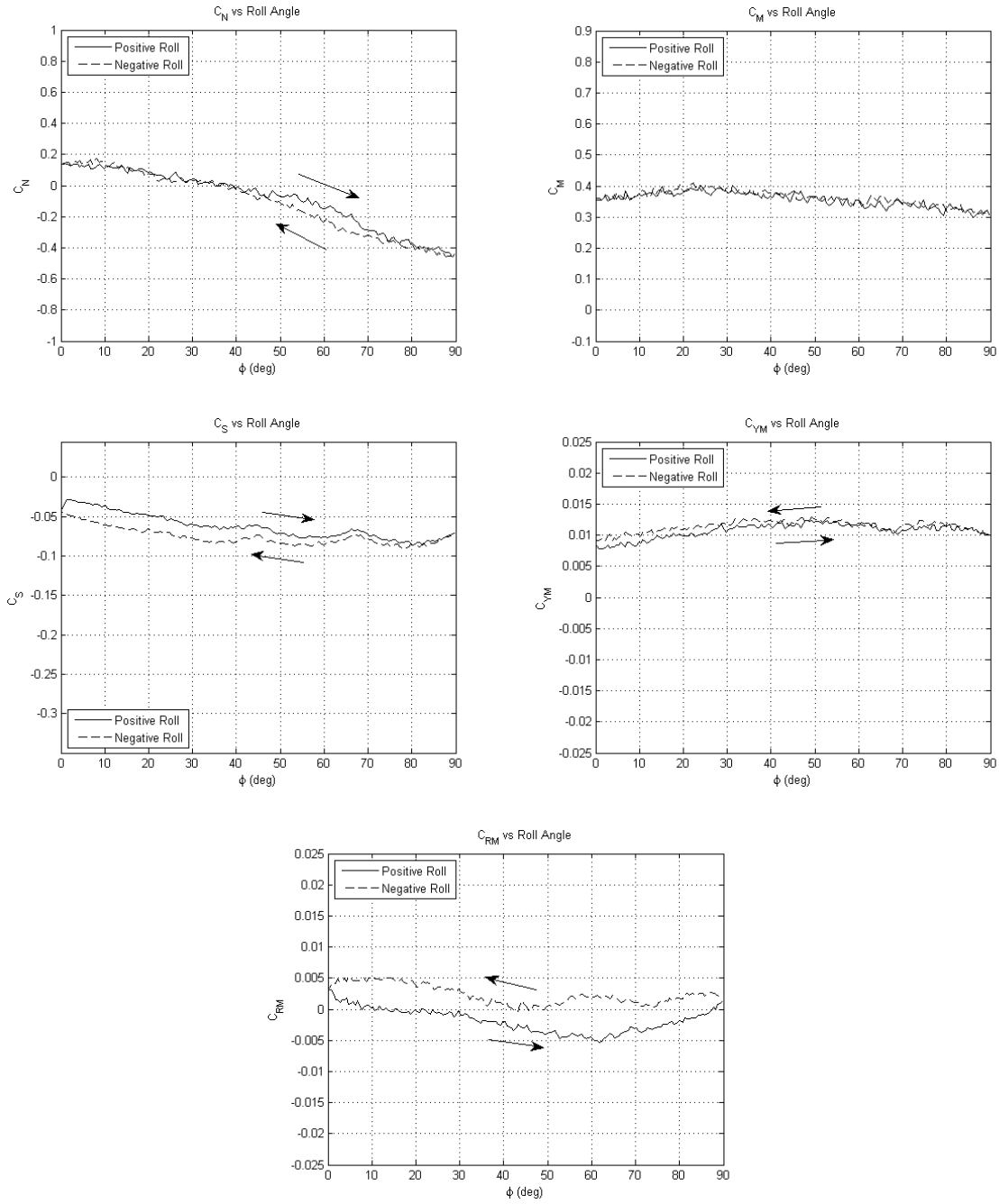


Figure 64. Dynamic Aerodynamic Coefficients, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\alpha = 15^\circ$, $\phi = 0^\circ$ - 90° , $\dot{\phi} = 3^\circ/\text{sec}$

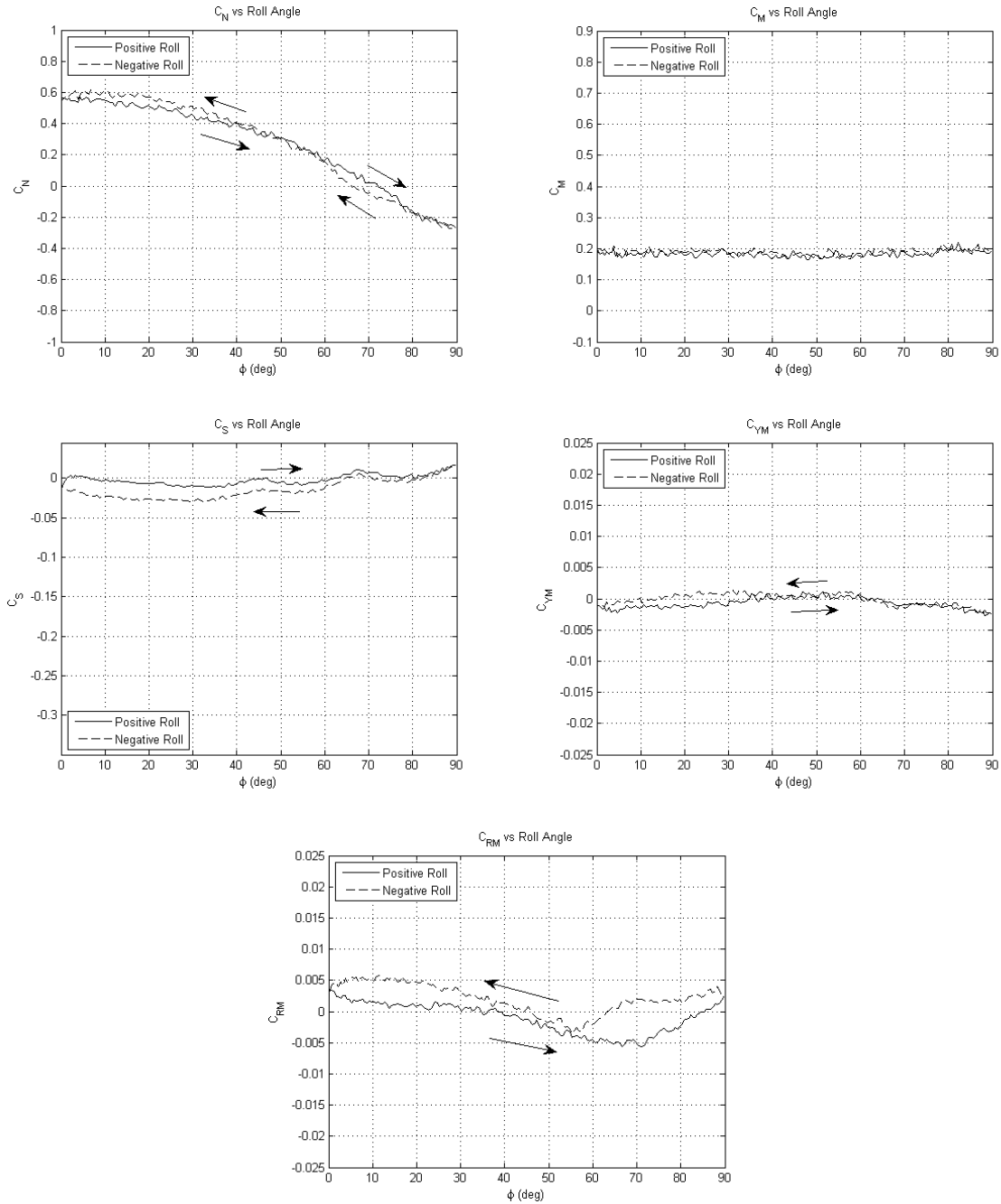


Figure 65. Dynamic Aerodynamic Coefficients, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\alpha = 20^\circ$, $\phi = 0^\circ - 90^\circ$, $\dot{\phi} = 3^\circ/\text{sec}$

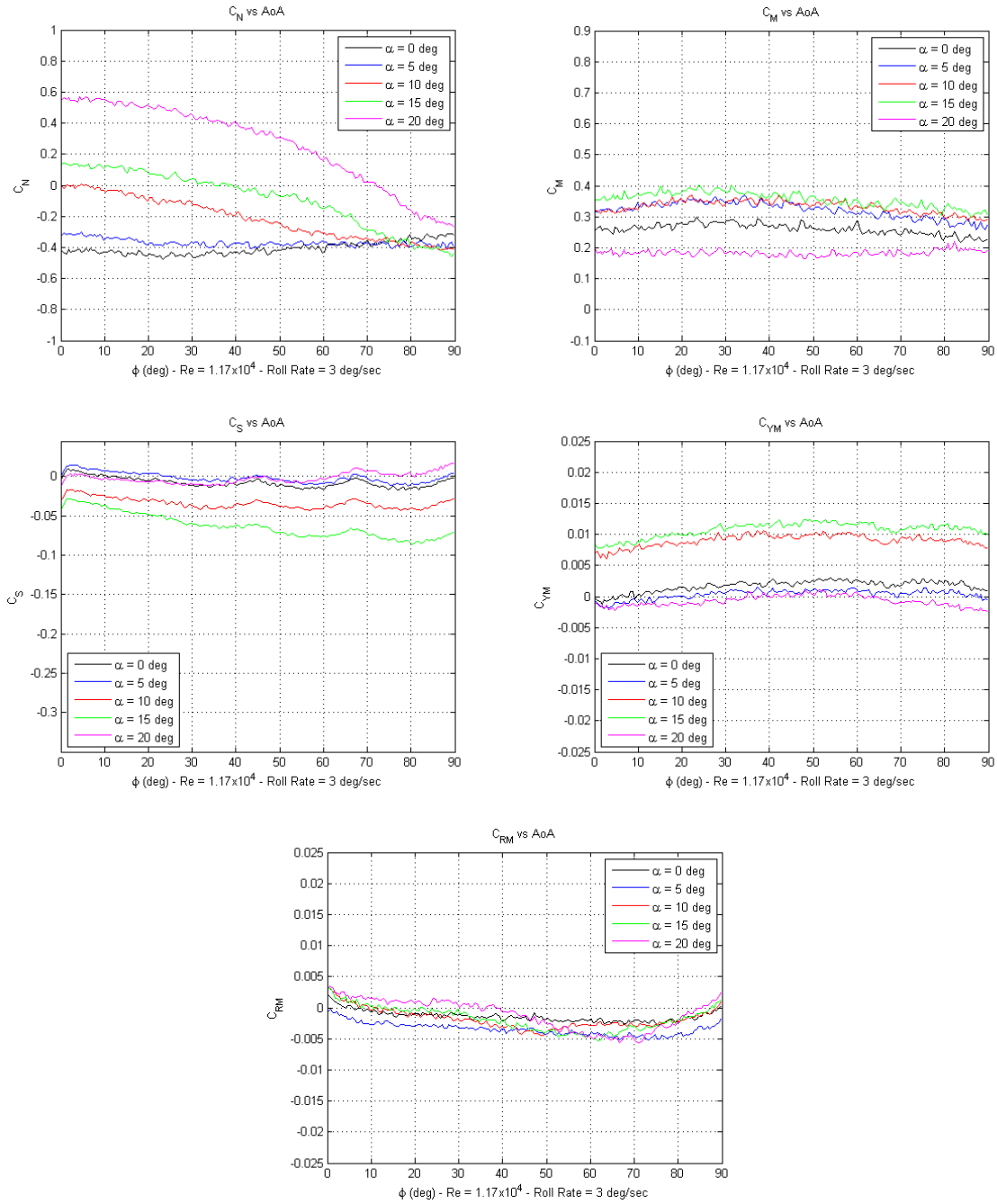


Figure 66. Dynamic Aerodynamic Coefficients, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, Multiple α 's, $\phi = 0^\circ$ - 90° , $\dot{\phi} = 3^\circ/\text{sec}$

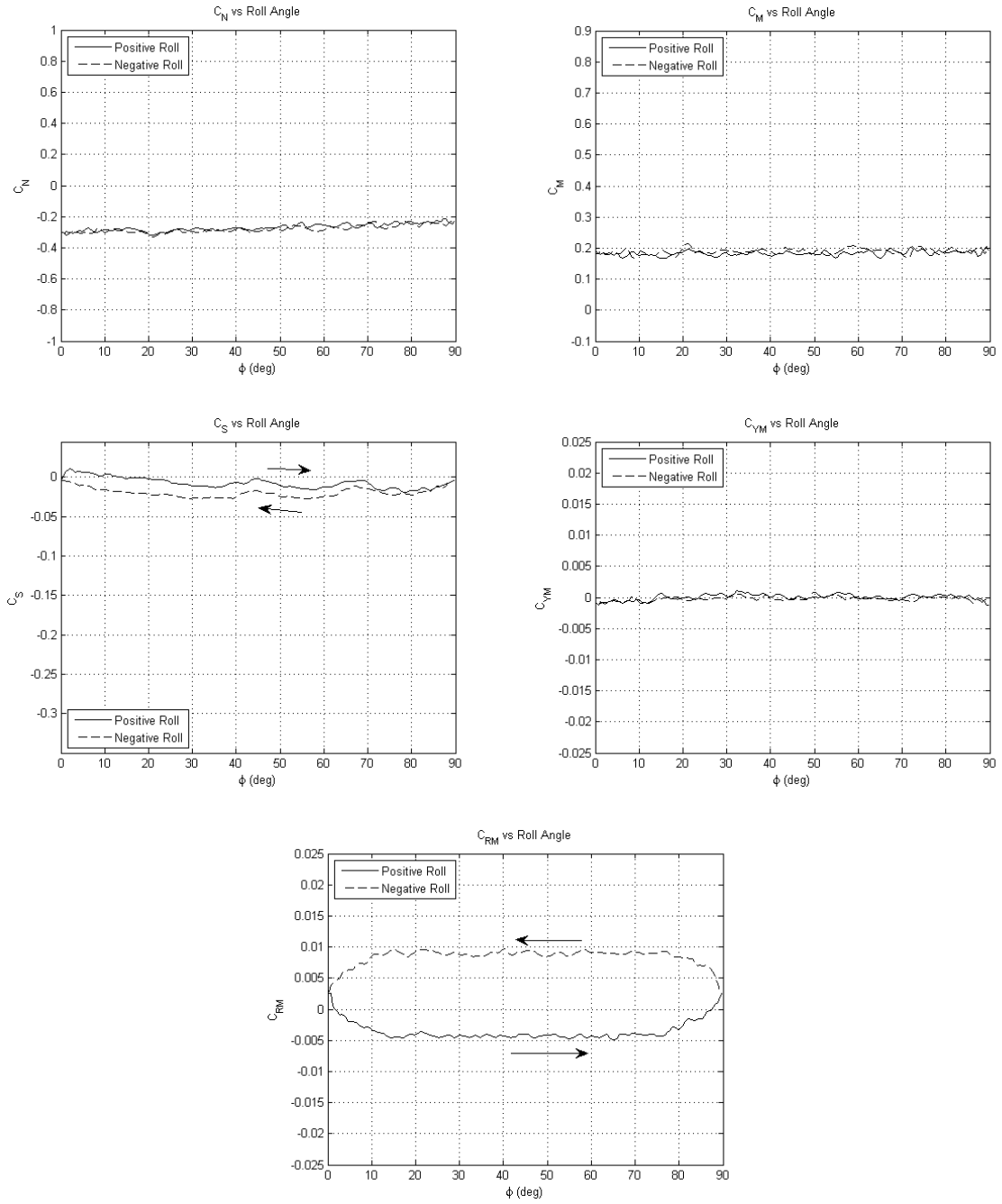


Figure 67. Dynamic Aerodynamic Coefficients, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$,
 $\alpha = 0^\circ$, $\phi = 0^\circ - 90^\circ$, $\dot{\phi} = 7^\circ/\text{sec}$

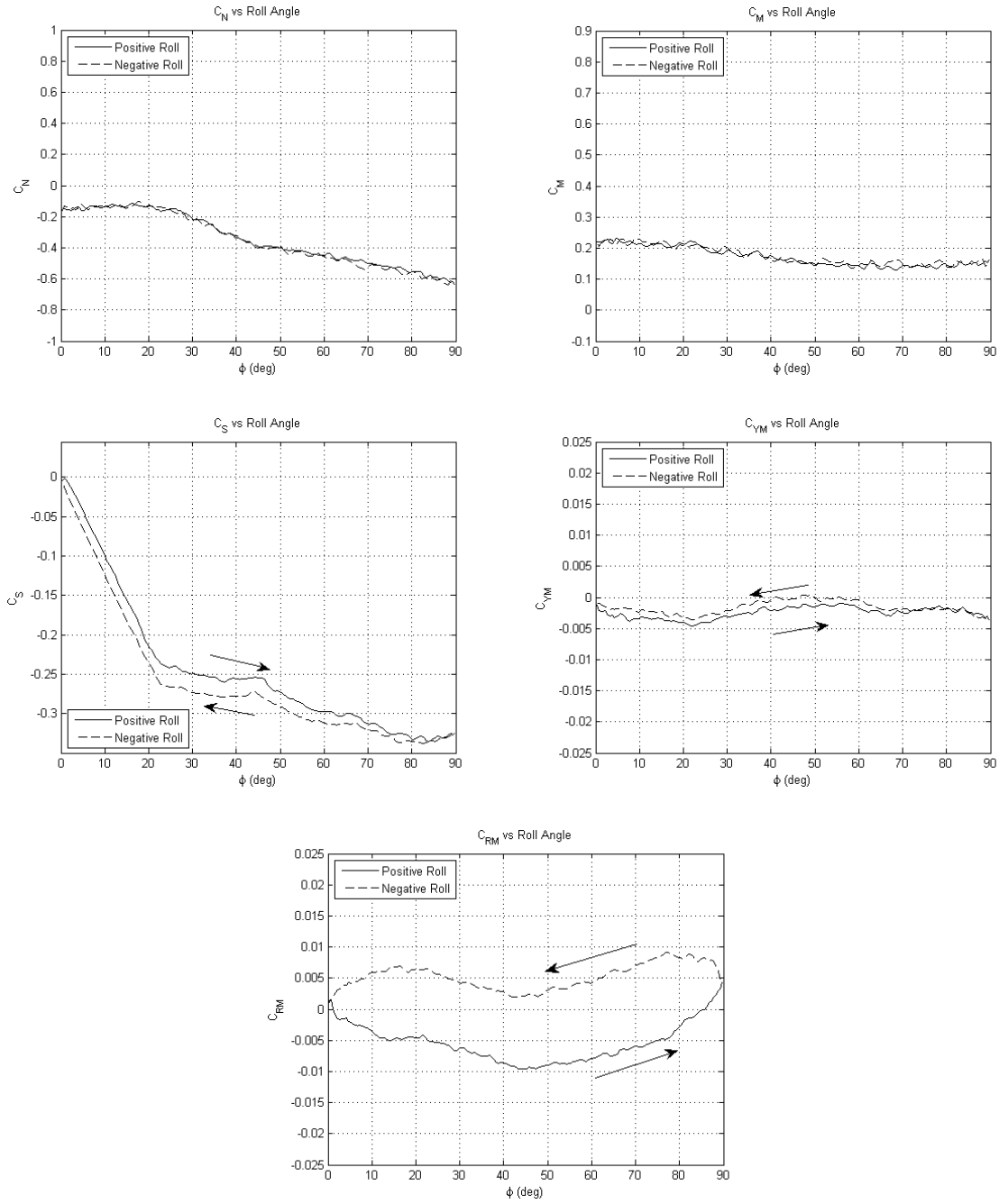


Figure 68. Dynamic Aerodynamic Coefficients, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\alpha = 5^\circ$, $\phi = 0^\circ - 90^\circ$, $\dot{\phi} = 7^\circ/\text{sec}$

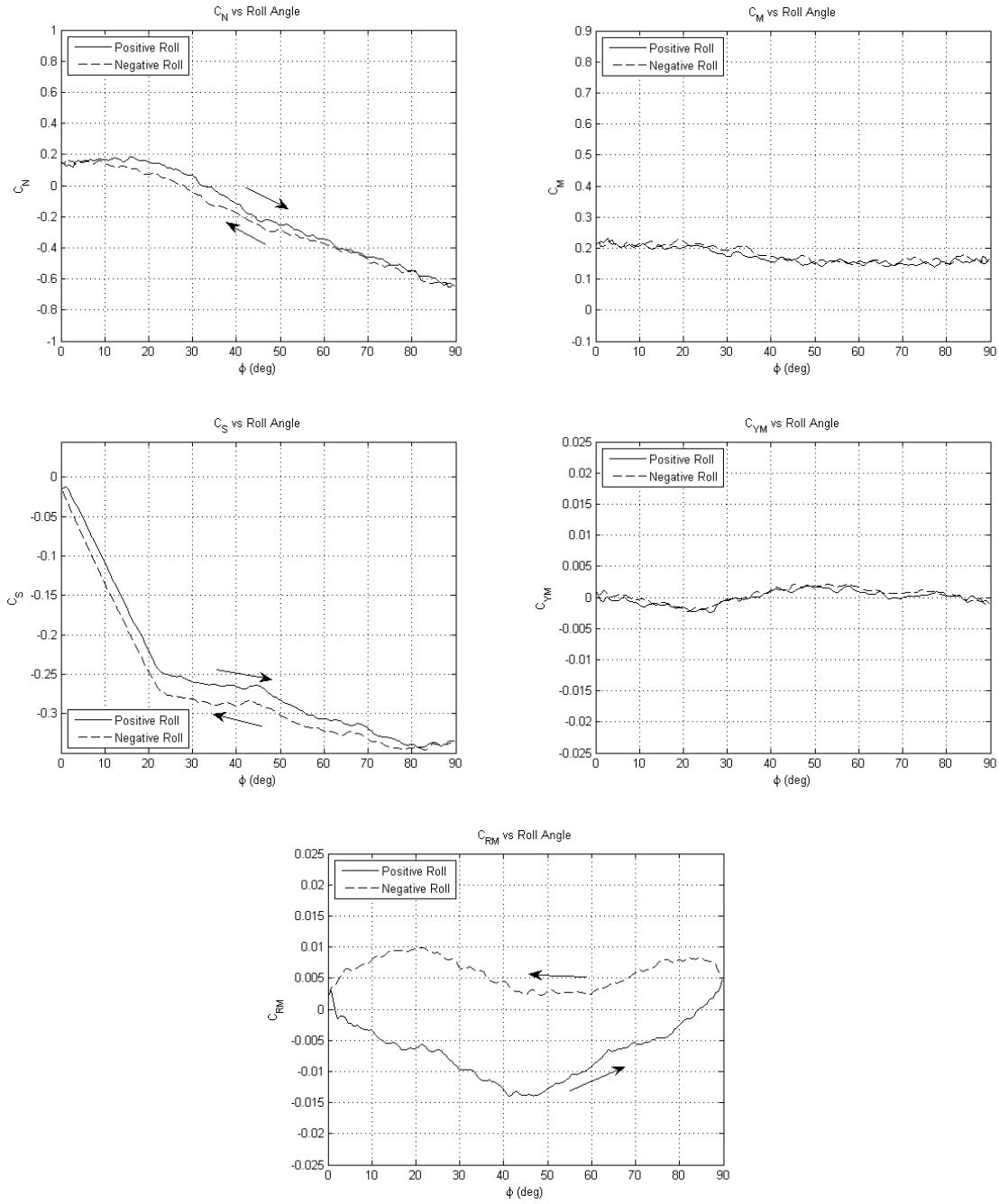


Figure 69. Dynamic Aerodynamic Coefficients, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\alpha = 10^\circ$, $\phi = 0^\circ$ - 90° , $\dot{\phi} = 7^\circ/\text{sec}$

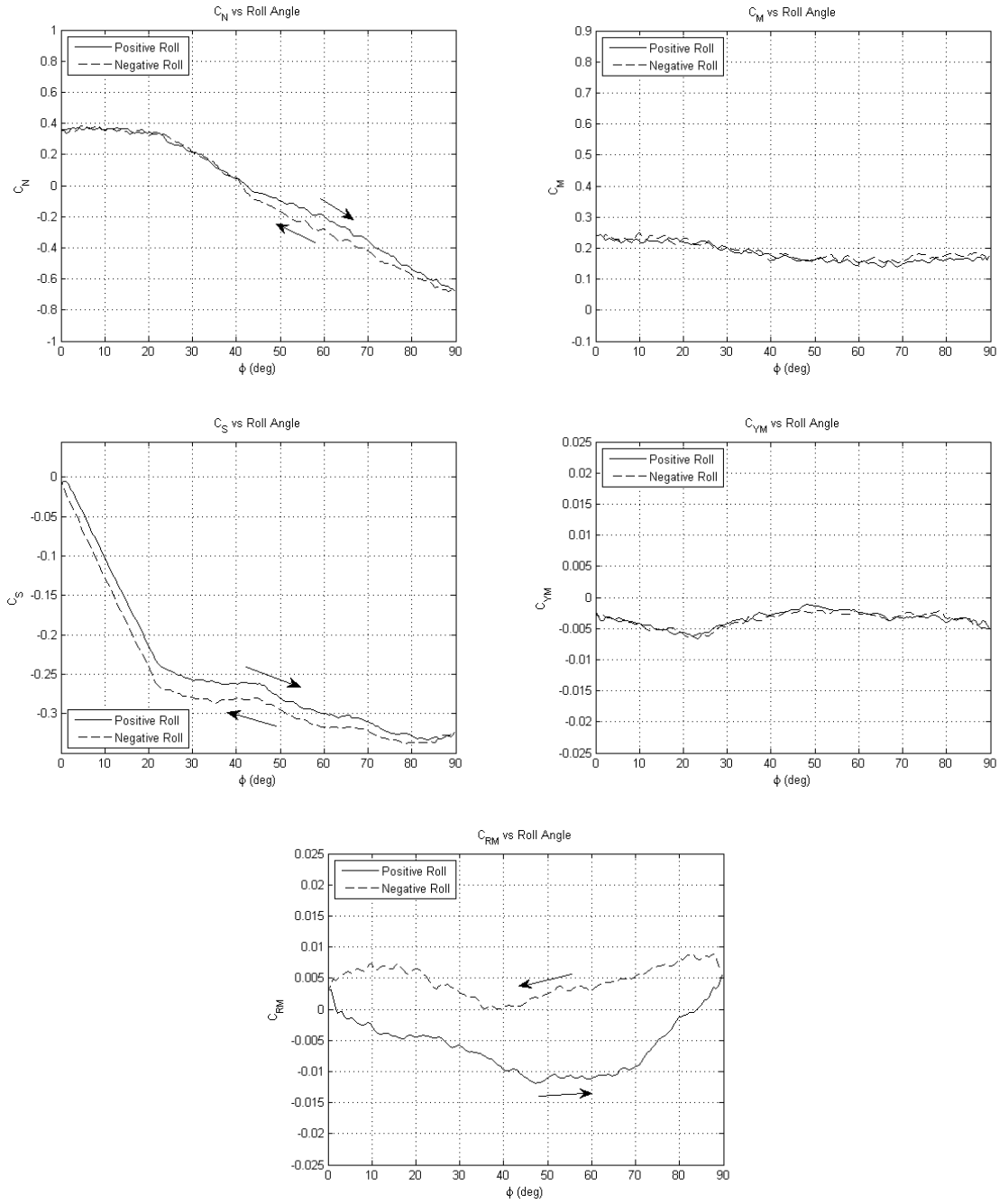


Figure 70. Dynamic Aerodynamic Coefficients, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\alpha = 15^\circ$, $\phi = 0^\circ - 90^\circ$, $\dot{\phi} = 7^\circ/\text{sec}$

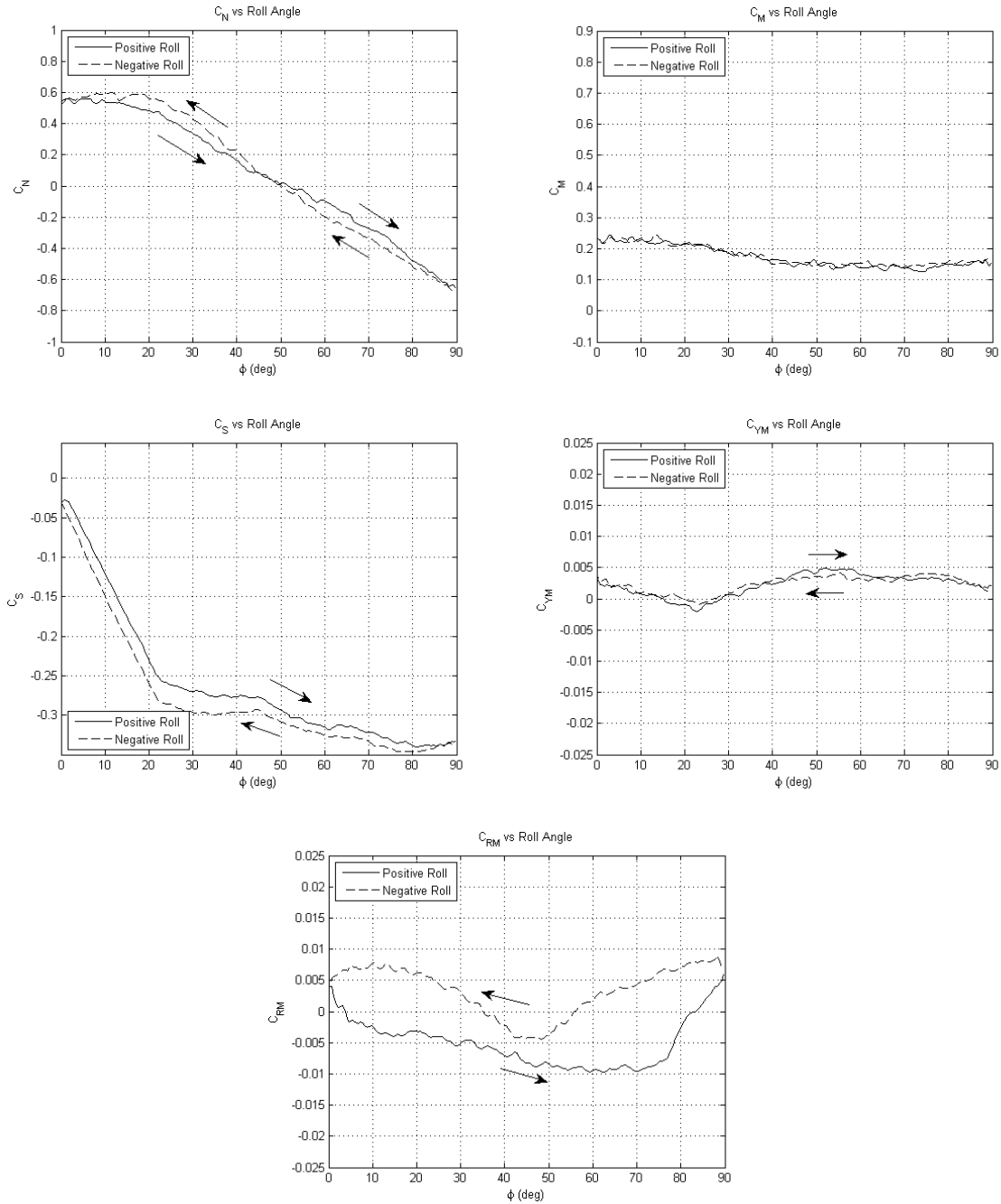


Figure 71. Dynamic Aerodynamic Coefficients, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\alpha = 20^\circ$, $\phi = 0^\circ$ - 90° , $\dot{\phi} = 7^\circ/\text{sec}$

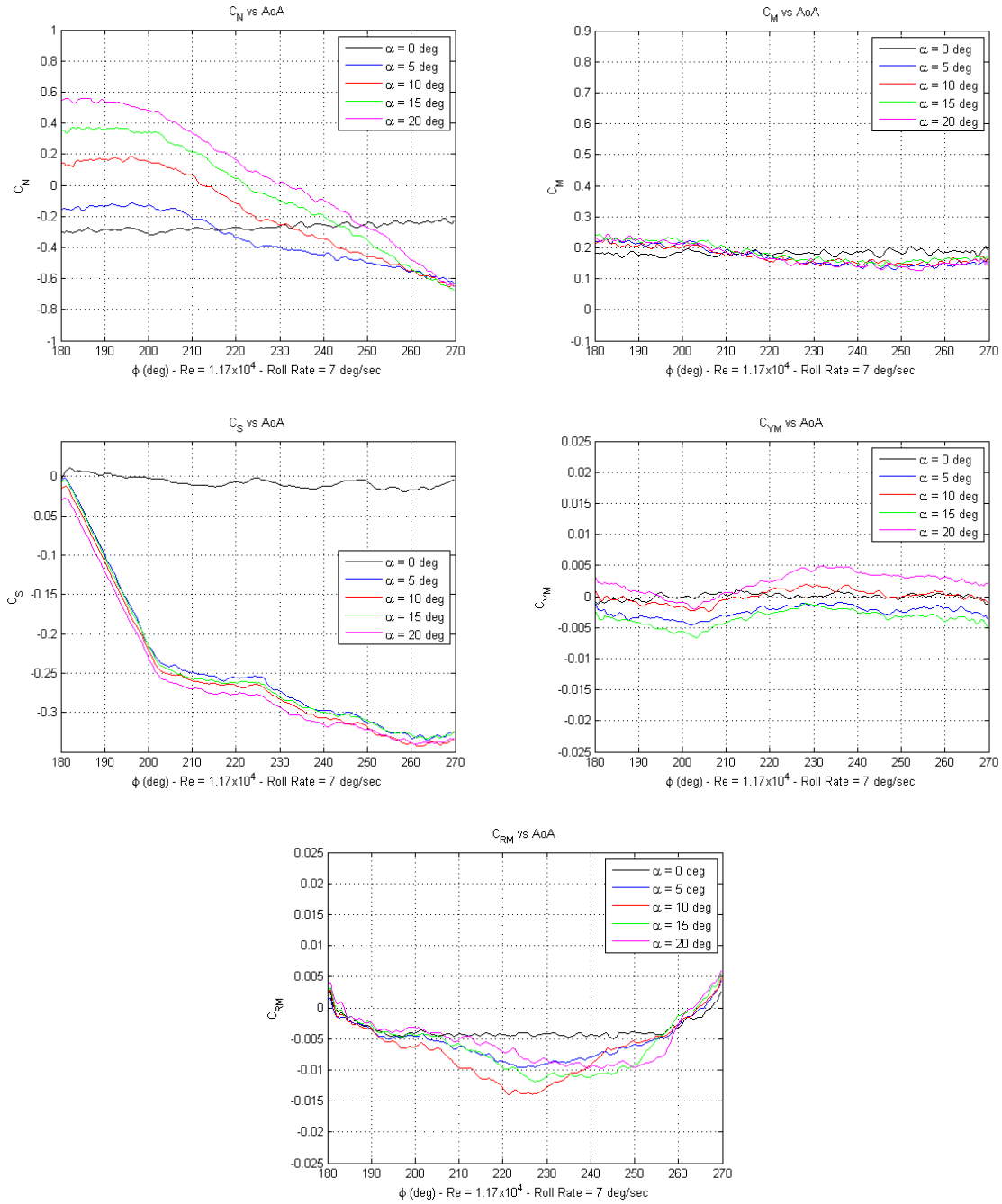


Figure 72. Dynamic Aerodynamic Coefficients, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, Multiple α 's, $\phi = 0^\circ$ - 90° , $\dot{\phi} = 7^\circ/\text{sec}$

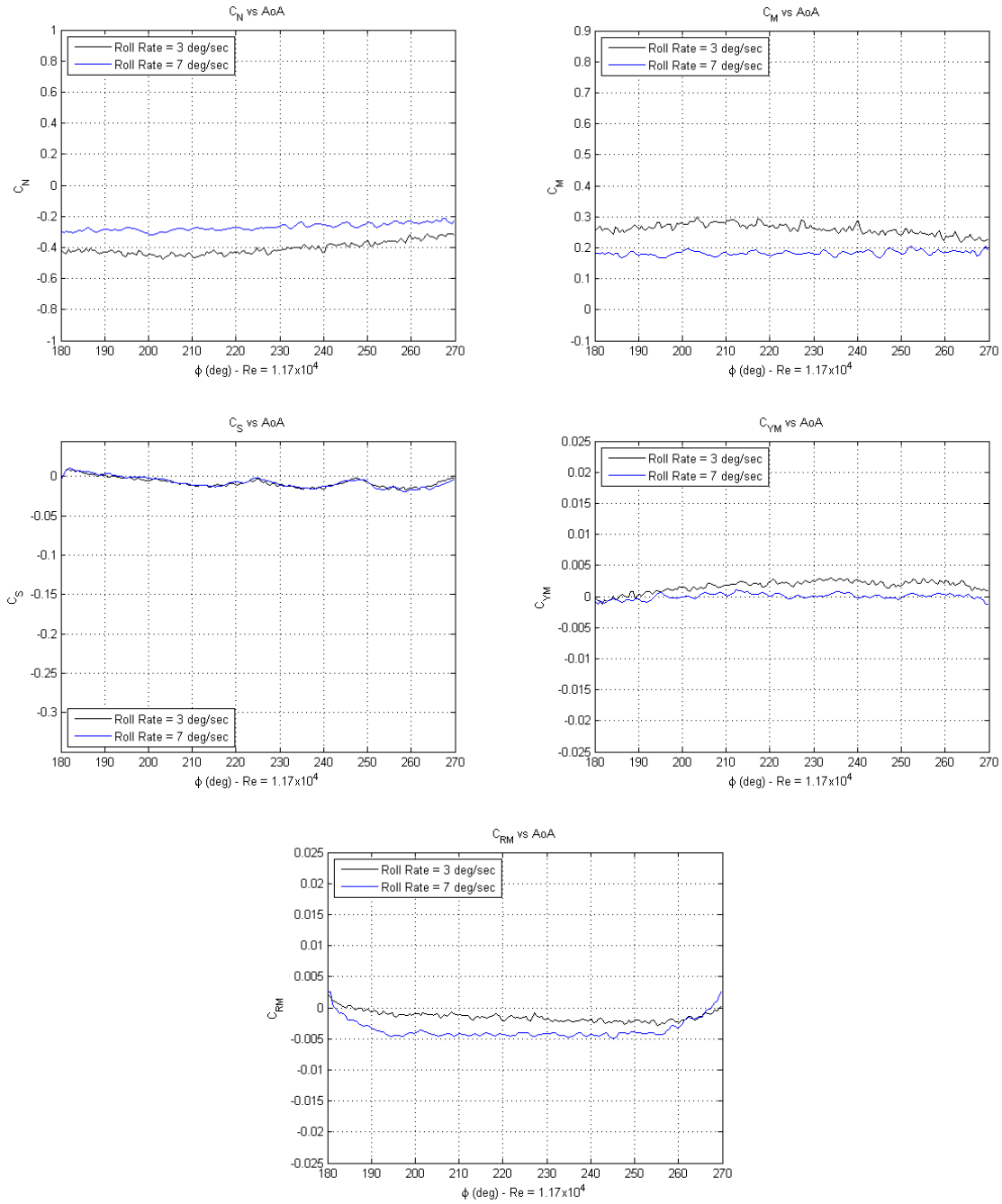


Figure 73. Dynamic Aerodynamic Coefficients, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\alpha = 0^\circ$, $\phi = 0^\circ - 90^\circ$, $\dot{\phi} = 3^\circ/\text{sec}$ & $7^\circ/\text{sec}$

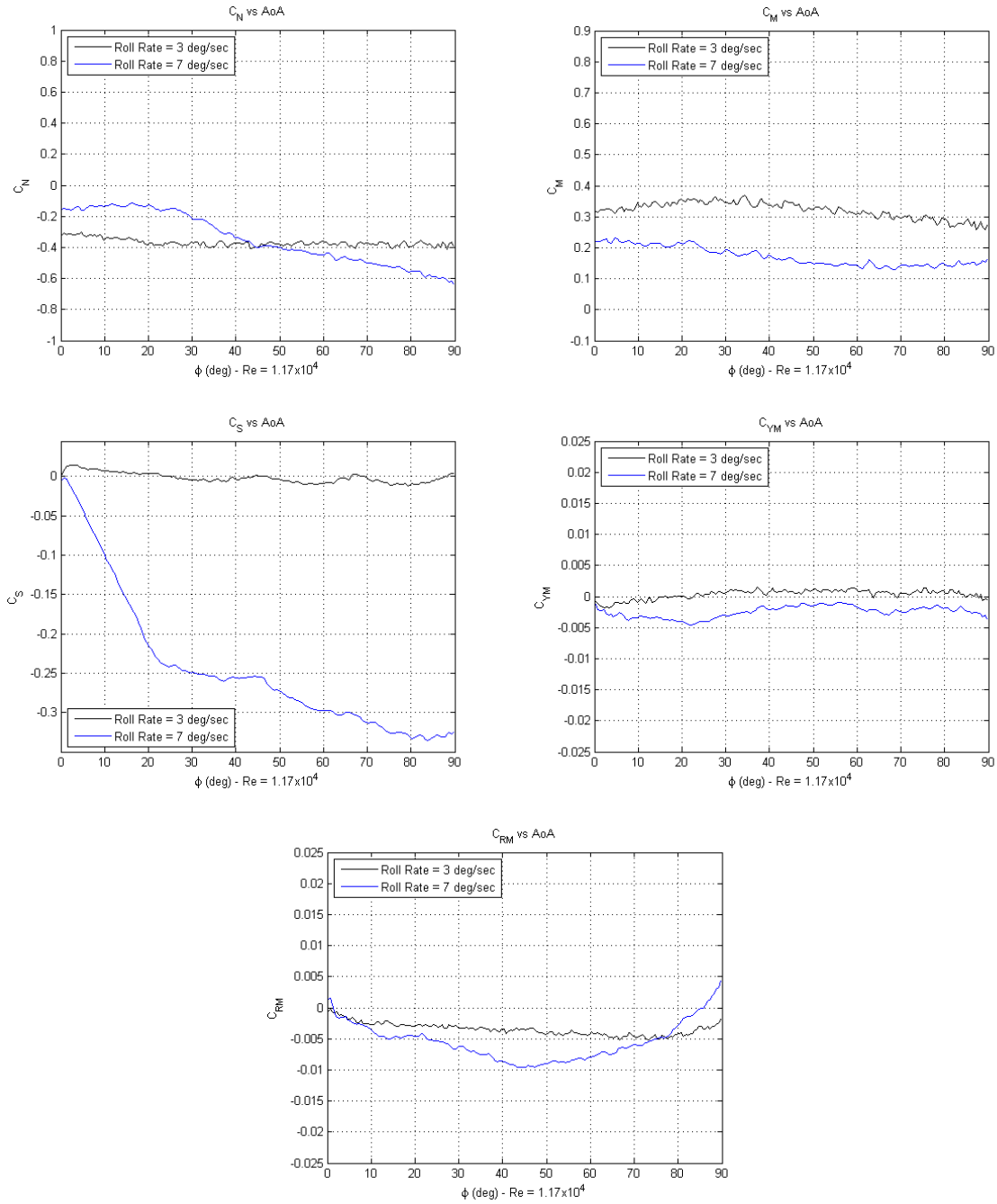


Figure 74. Dynamic Aerodynamic Coefficients, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\alpha = 5^\circ$, $\phi = 0^\circ - 90^\circ$, $\dot{\phi} = 3^\circ/\text{sec}$ & $7^\circ/\text{sec}$

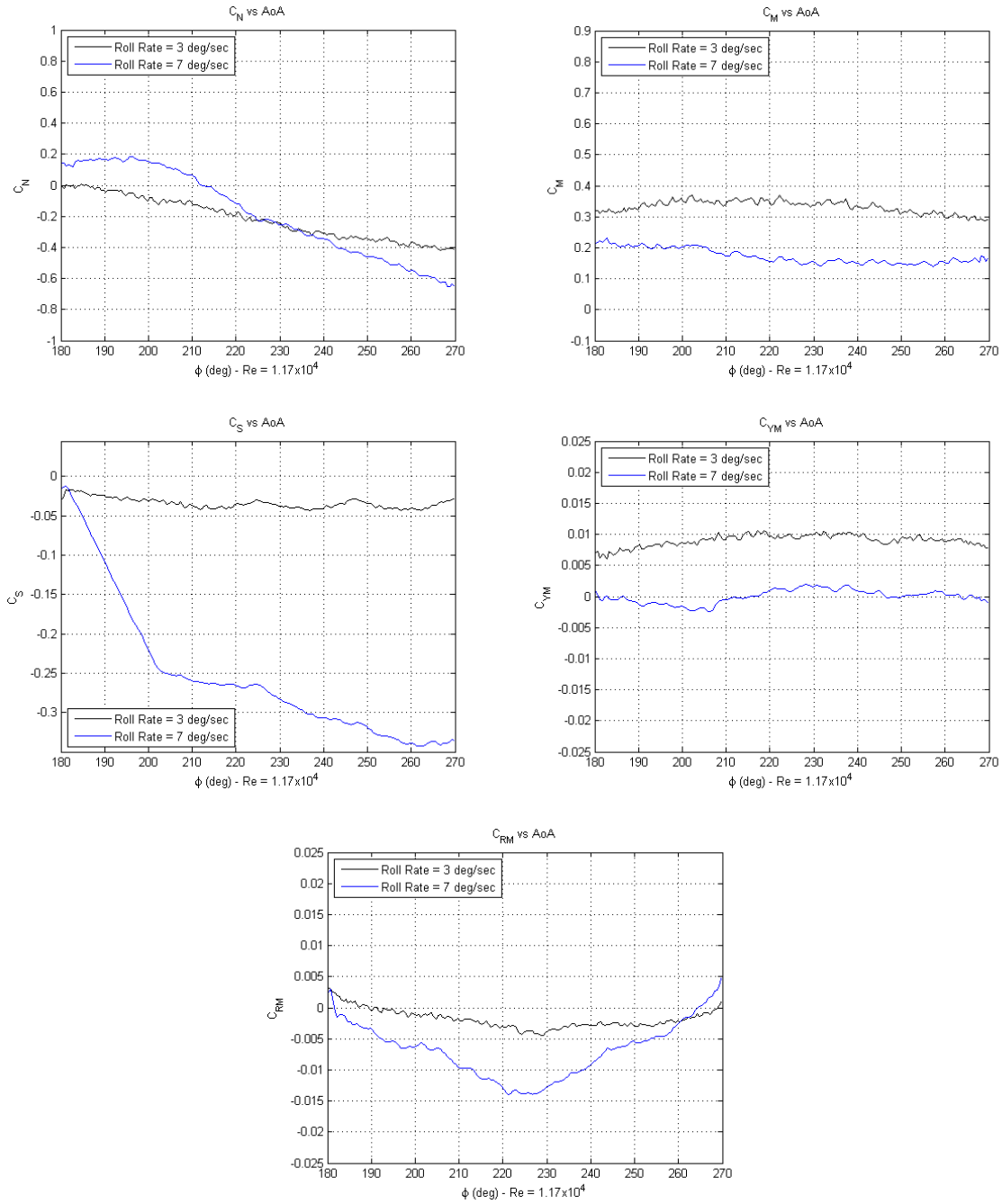


Figure 75. Dynamic Aerodynamic Coefficients, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\alpha = 10^\circ$, $\phi = 0^\circ$ - 90° , $\dot{\phi} = 3^\circ/\text{sec}$ & $7^\circ/\text{sec}$

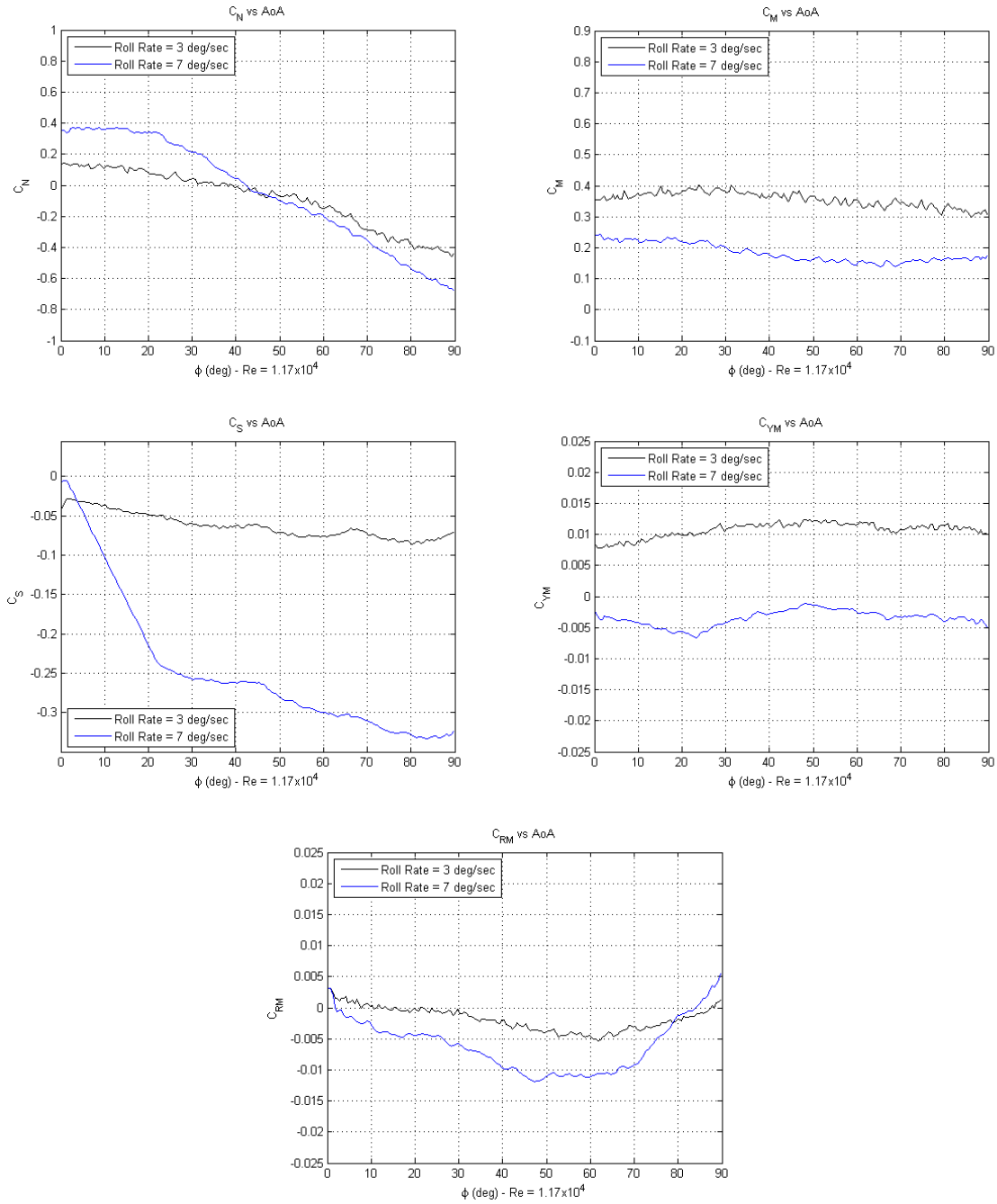


Figure 76. Dynamic Aerodynamic Coefficients, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\alpha = 15^\circ$, $\phi = 0^\circ$ - 90° , $\dot{\phi} = 3^\circ/\text{sec}$ & $7^\circ/\text{sec}$

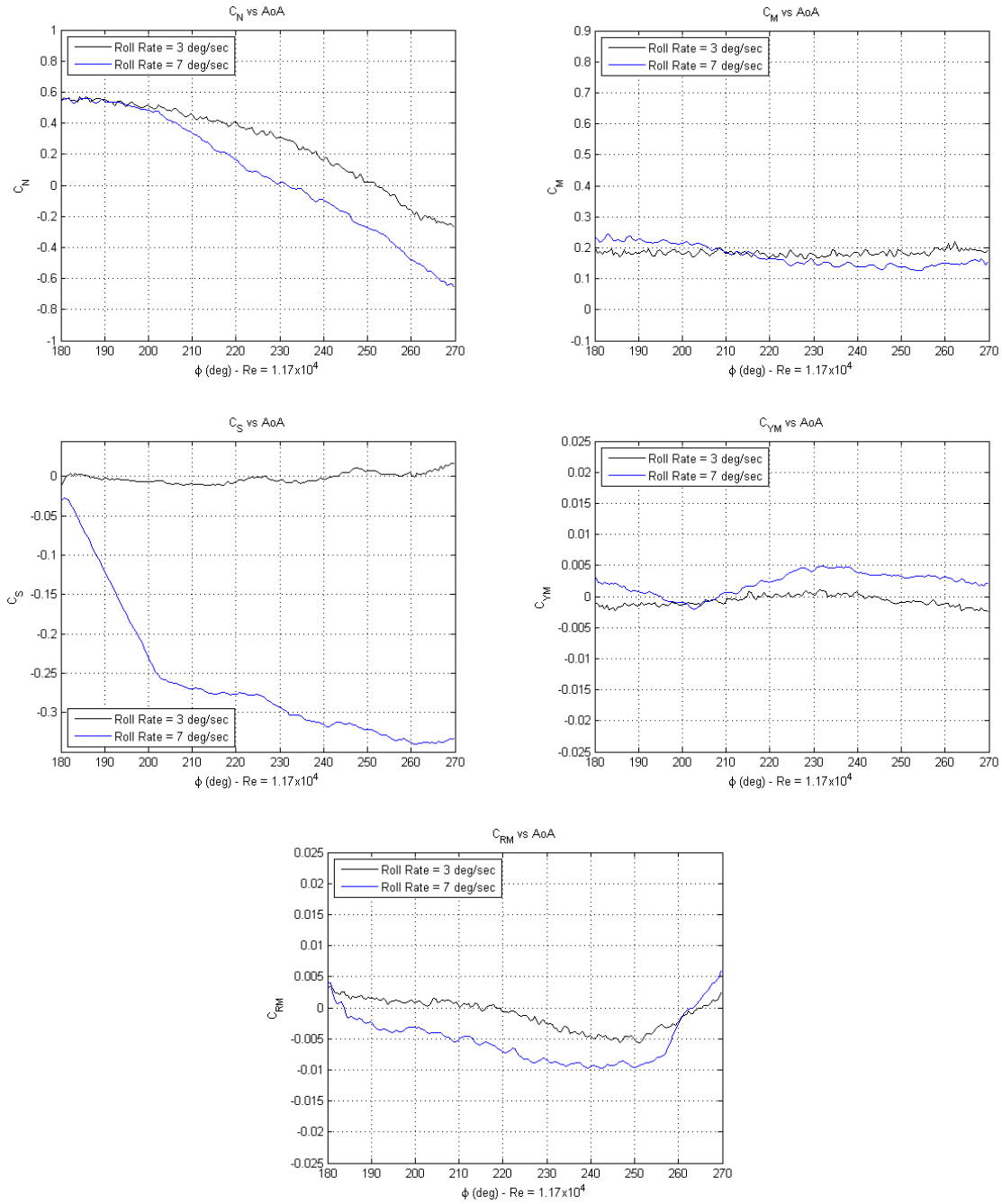


Figure 77. Dynamic Aerodynamic Coefficients, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\alpha = 20^\circ$, $\phi = 0^\circ$ - 90° , $\dot{\phi} = 3^\circ/\text{sec}$ & $7^\circ/\text{sec}$

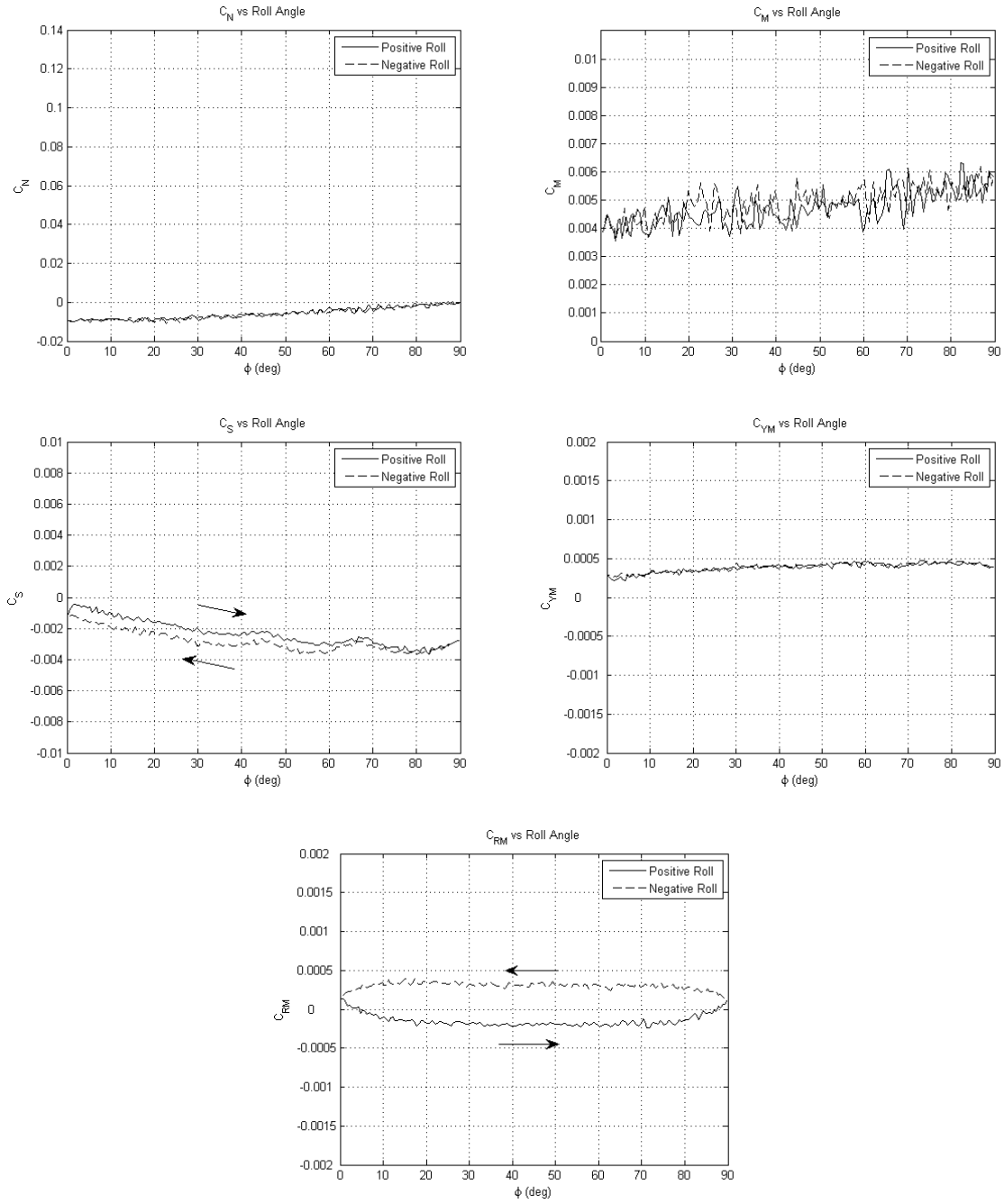


Figure 78. Dynamic Aerodynamic Coefficients, $U_\infty = 10$ [in/sec], $Re = 2.15 \times 10^4$, $\alpha = 0^\circ$, $\phi = 0^\circ - 90^\circ$, $\dot{\phi} = 3^\circ/\text{sec}$

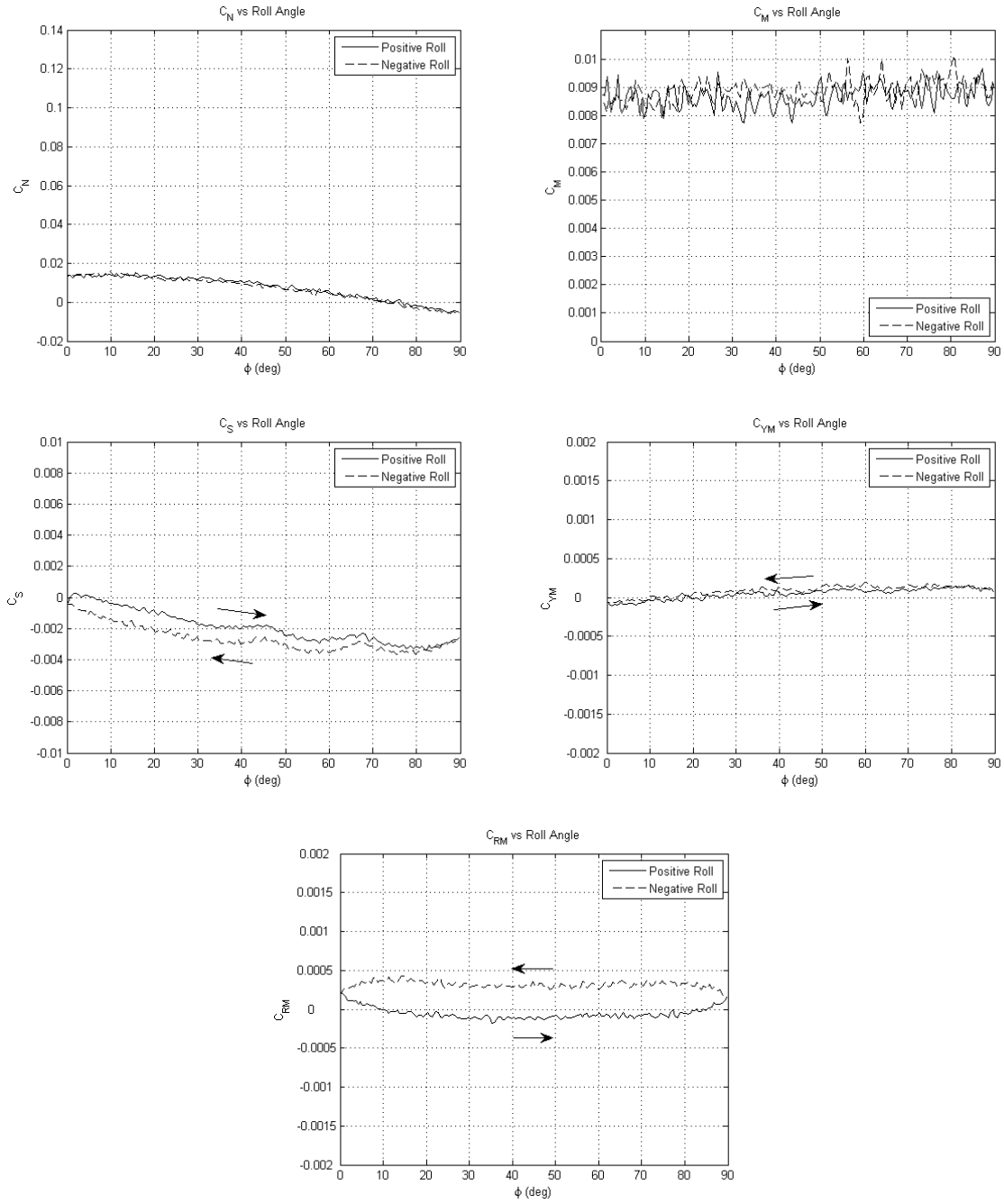


Figure 79. Dynamic Aerodynamic Coefficients, $U_\infty = 10$ [in/sec], $Re = 2.15 \times 10^4$, $\alpha = 5^\circ$, $\phi = 0^\circ - 90^\circ$, $\dot{\phi} = 3^\circ/\text{sec}$

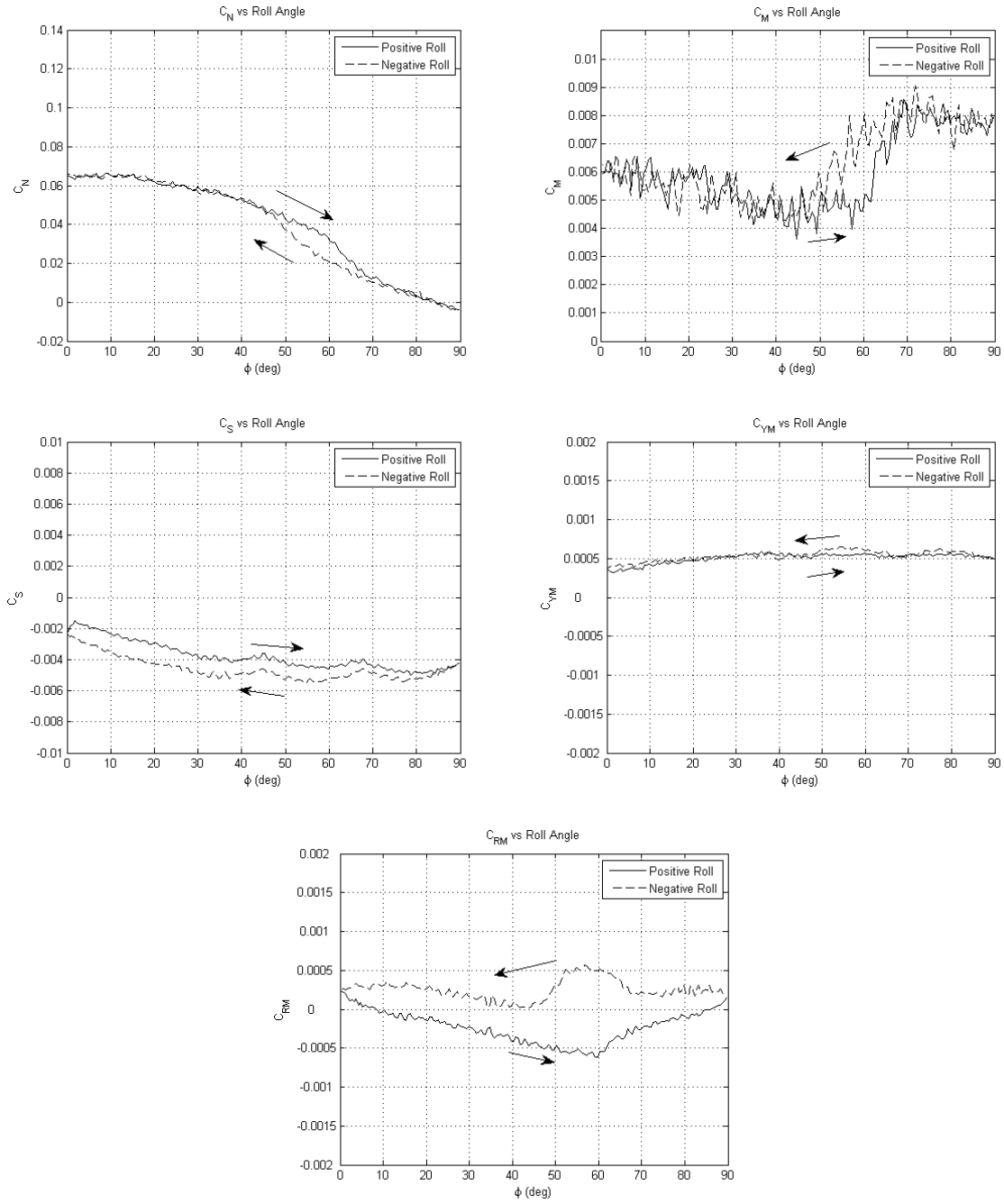


Figure 80. Dynamic Aerodynamic Coefficients, $U_\infty = 10$ [in/sec], $Re = 2.15 \times 10^4$, $\alpha = 10^\circ$, $\phi = 0^\circ - 90^\circ$, $\dot{\phi} = 3^\circ/\text{sec}$

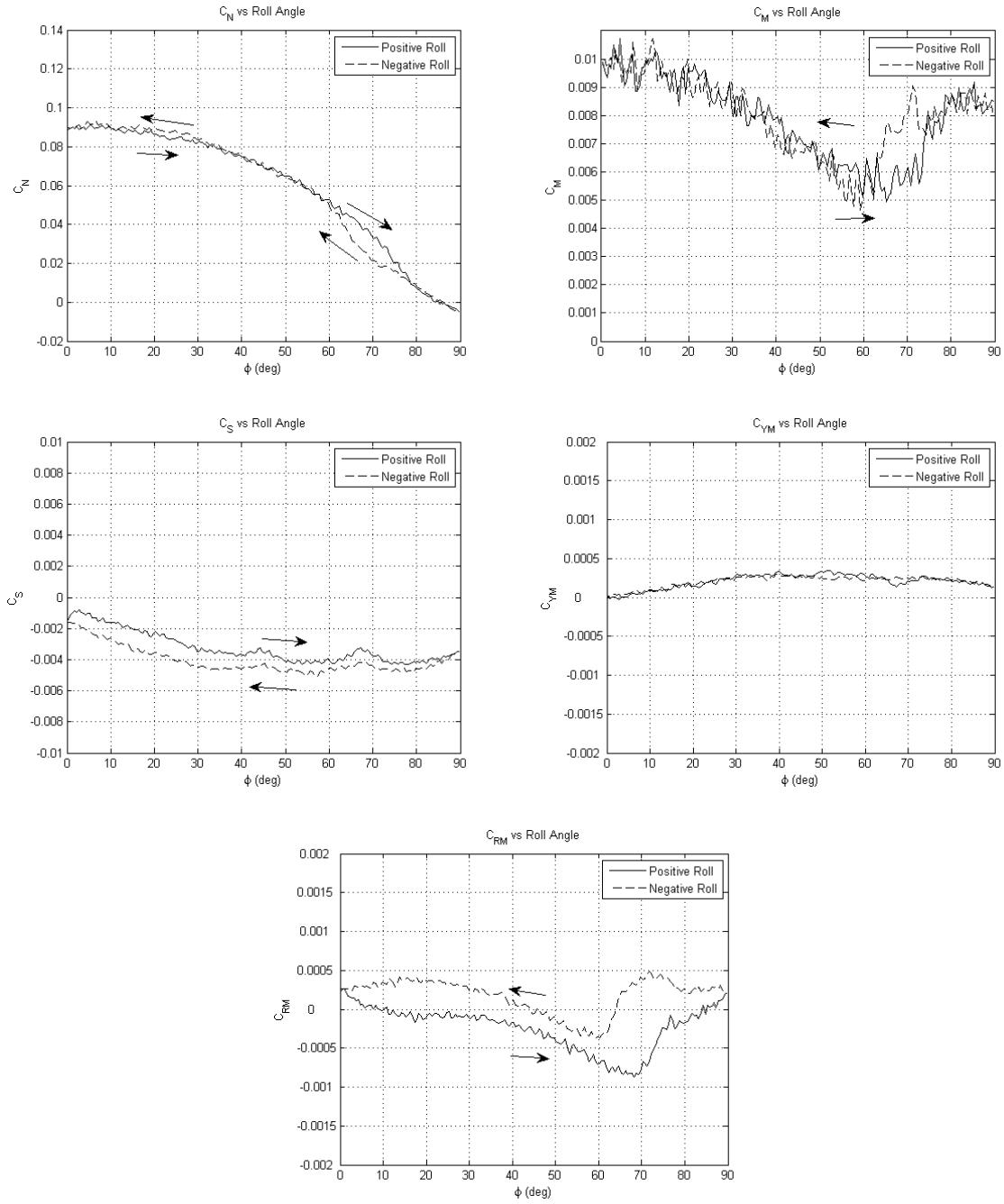


Figure 81. Dynamic Aerodynamic Coefficients, $U_\infty = 10$ [in/sec], $Re = 2.15 \times 10^4$, $\alpha = 15^\circ$, $\phi = 0^\circ - 90^\circ$, $\dot{\phi} = 3^\circ/\text{sec}$

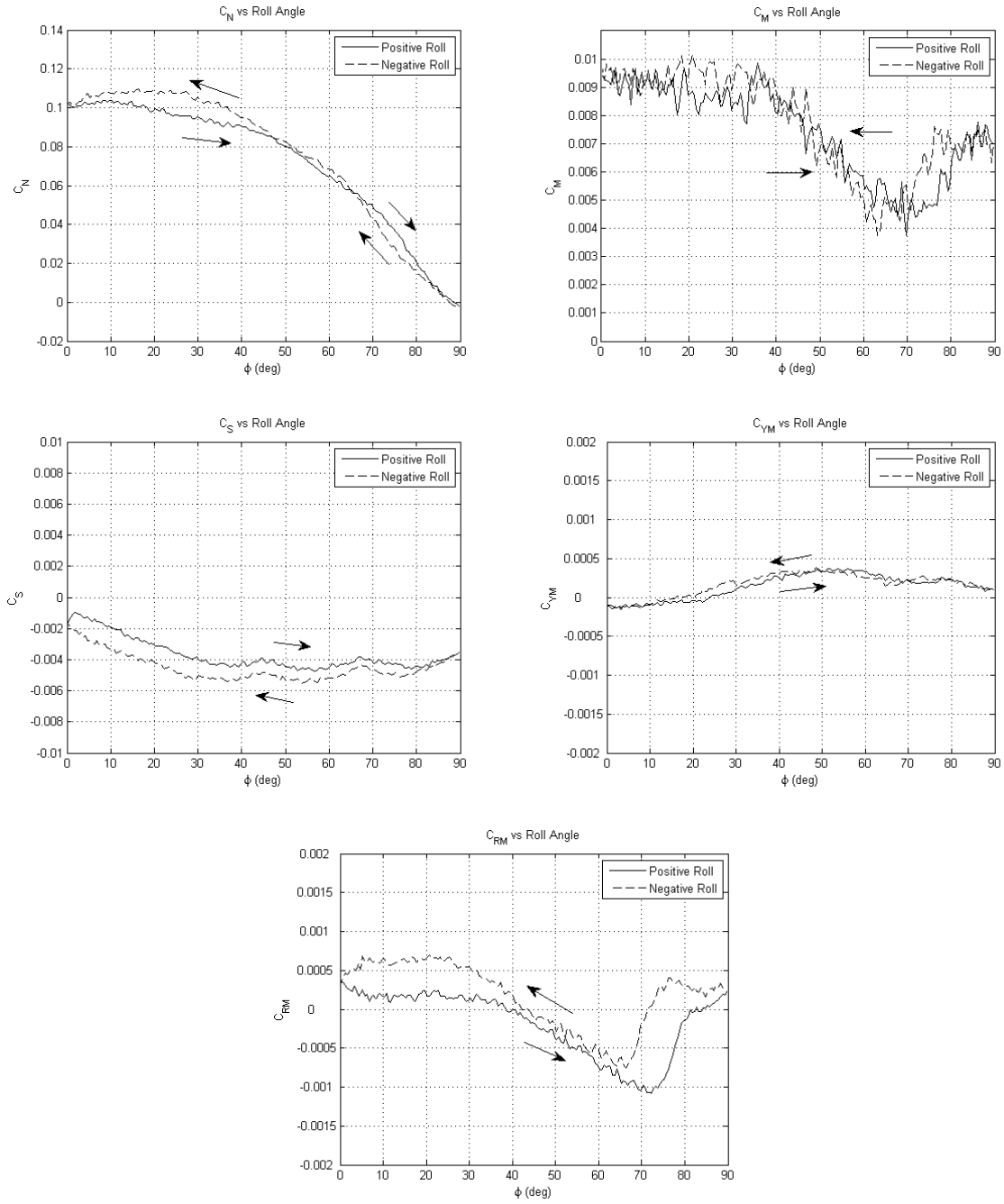


Figure 82. Dynamic Aerodynamic Coefficients, $U_\infty = 10$ [in/sec], $Re = 2.15 \times 10^4$, $\alpha = 20^\circ$, $\phi = 0^\circ - 90^\circ$, $\dot{\phi} = 3^\circ/\text{sec}$

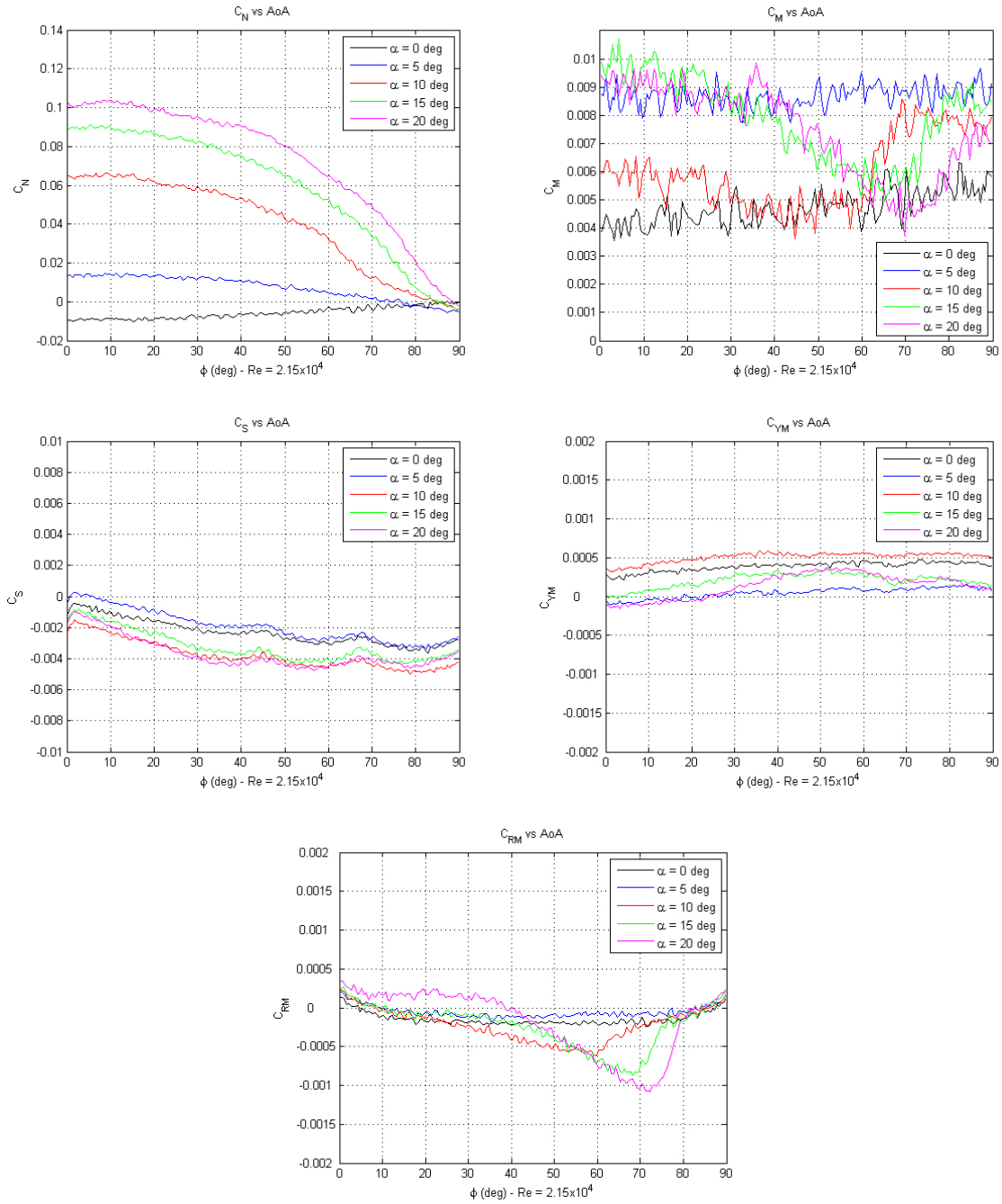


Figure 83. Dynamic Aerodynamic Coefficients, $U_\infty = 10$ [in/sec], $Re = 2.15 \times 10^4$, Multiple α 's, $\phi = 0^\circ$ - 90° , $\dot{\phi} = 3^\circ/\text{sec}$

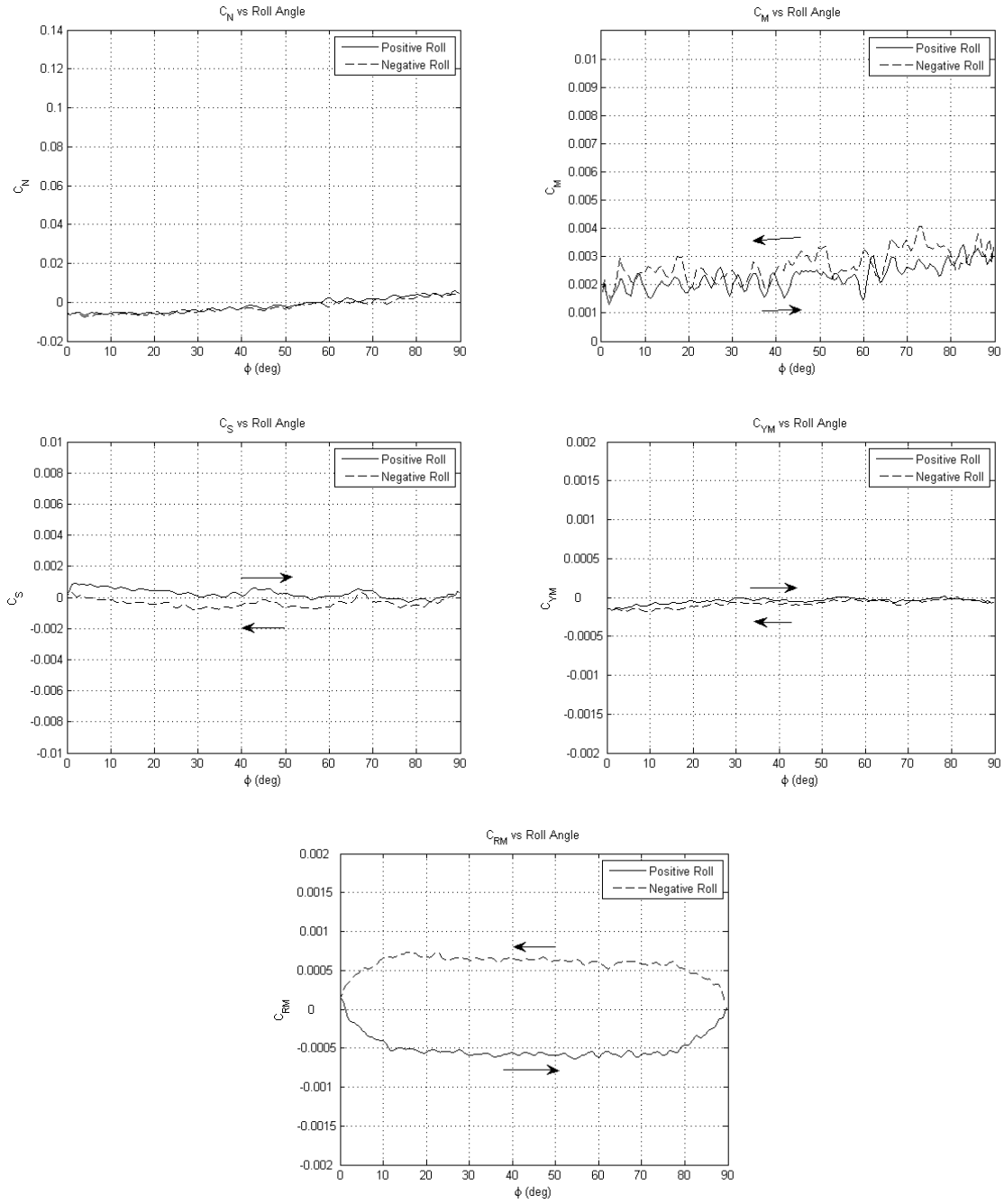


Figure 84. Dynamic Aerodynamic Coefficients, $U_\infty = 10$ [in/sec], $Re = 2.15 \times 10^4$, $\alpha = 0^\circ$, $\phi = 0^\circ - 90^\circ$, $\dot{\phi} = 7^\circ/\text{sec}$

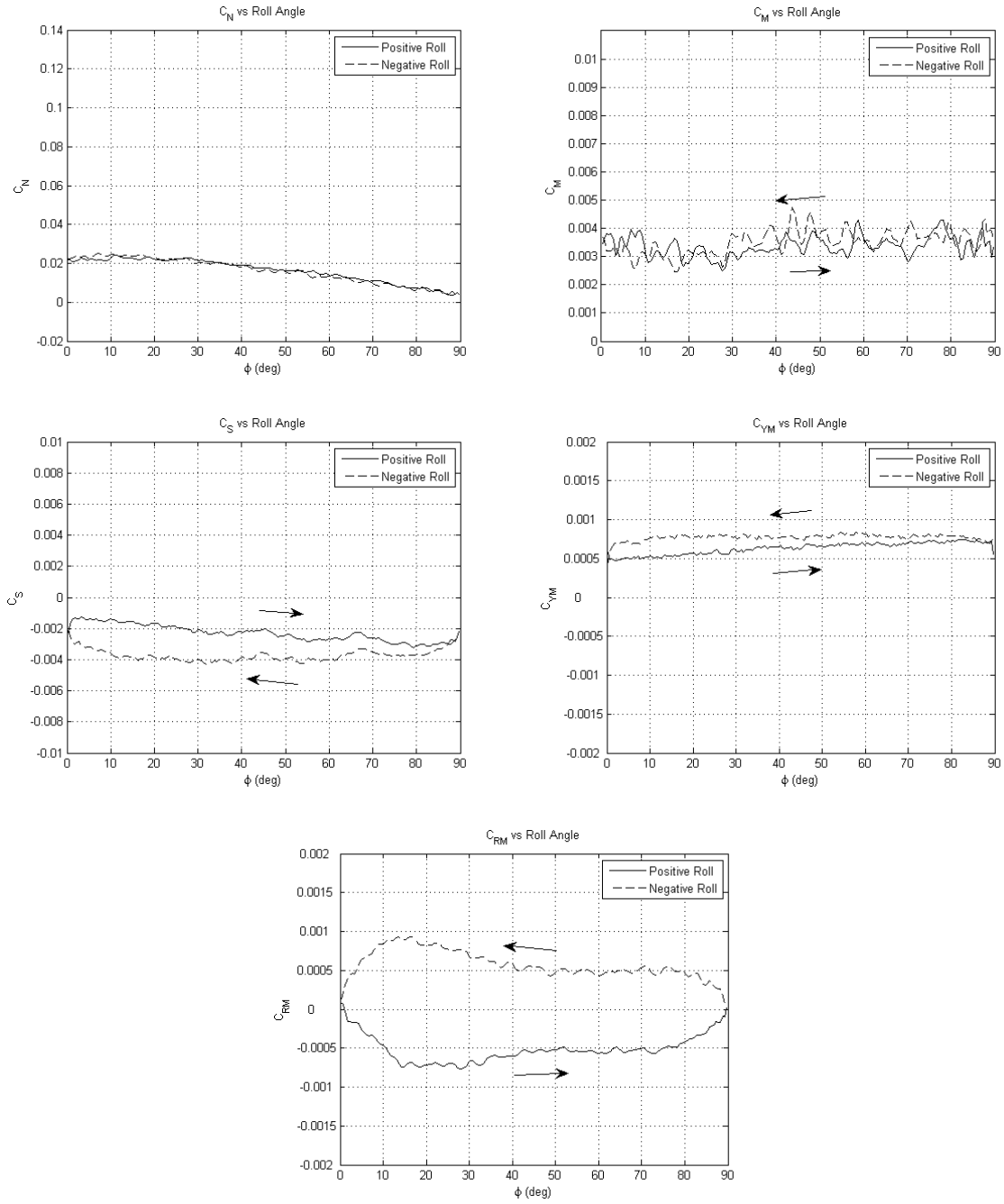


Figure 85. Dynamic Aerodynamic Coefficients, $U_\infty = 10$ [in/sec], $Re = 2.15 \times 10^4$, $\alpha = 5^\circ$, $\phi = 0^\circ-90^\circ$, $\dot{\phi} = 7^\circ/\text{sec}$

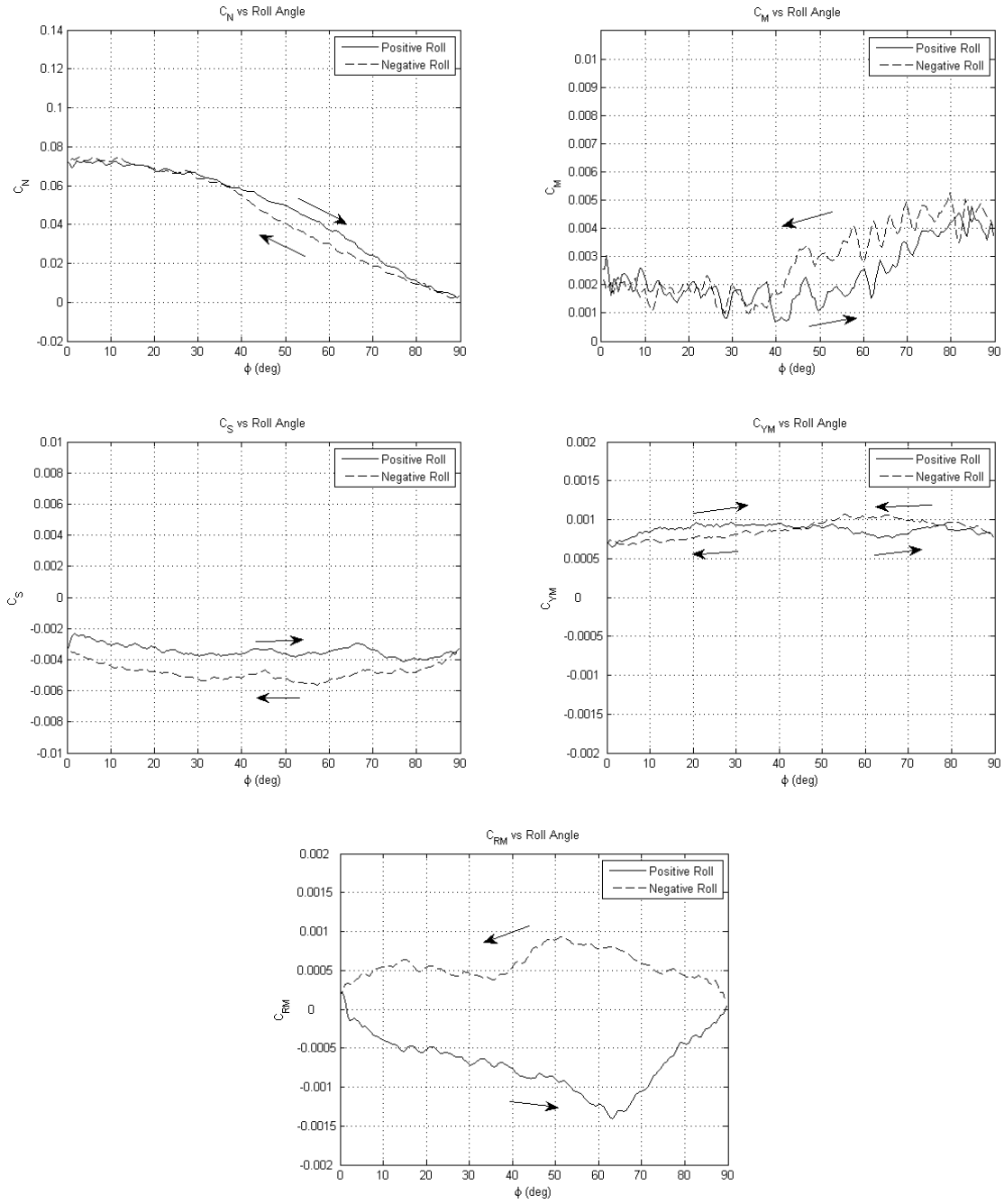


Figure 86. Dynamic Aerodynamic Coefficients, $U_\infty = 10$ [in/sec], $Re = 2.15 \times 10^4$, $\alpha = 10^\circ$, $\phi = 0^\circ - 90^\circ$, $\dot{\phi} = 7^\circ/\text{sec}$

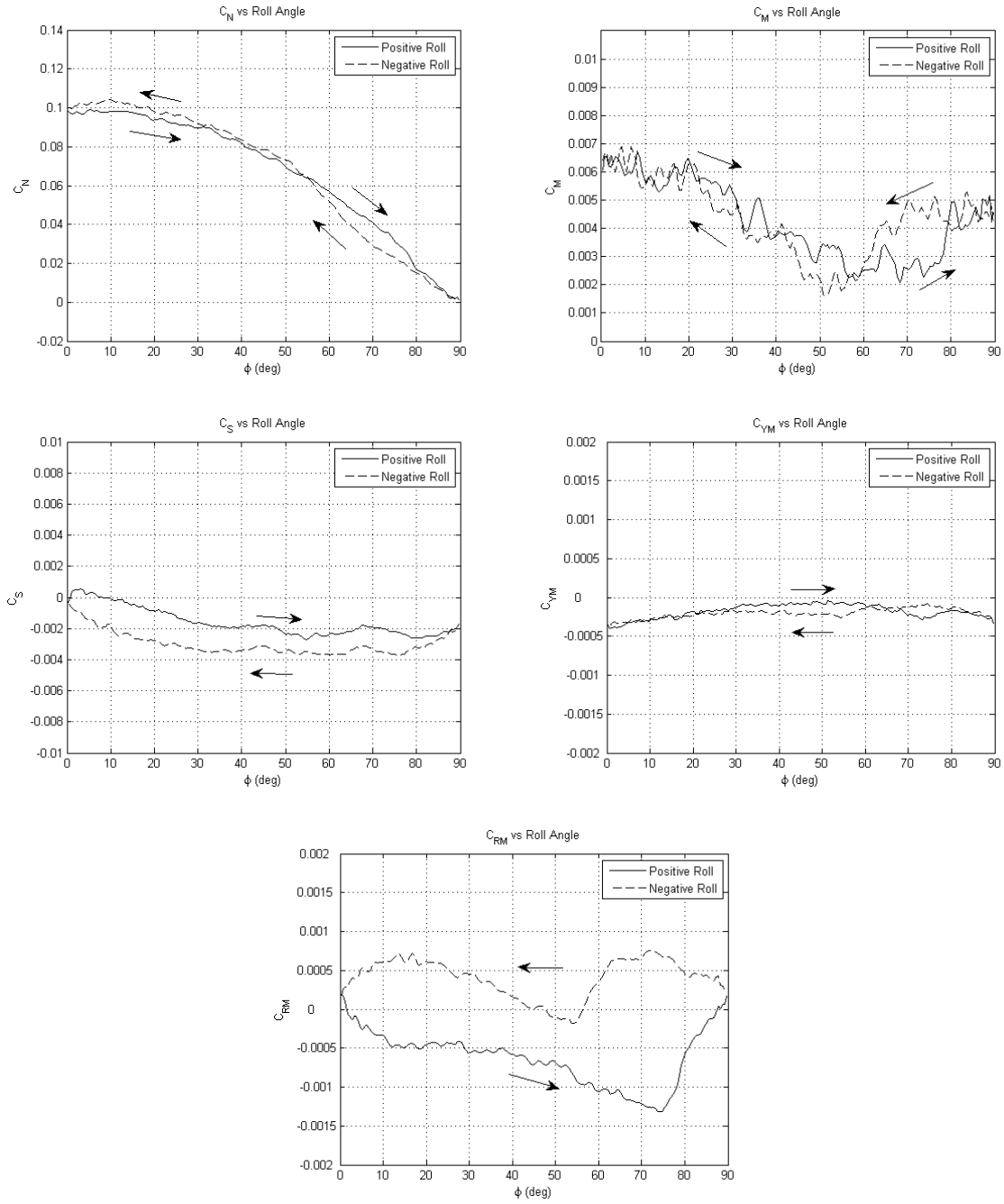


Figure 87. Dynamic Aerodynamic Coefficients, $U_\infty = 10$ [in/sec], $Re = 2.15 \times 10^4$, $\alpha = 15^\circ$, $\phi = 0^\circ - 90^\circ$, $\dot{\phi} = 7^\circ/\text{sec}$

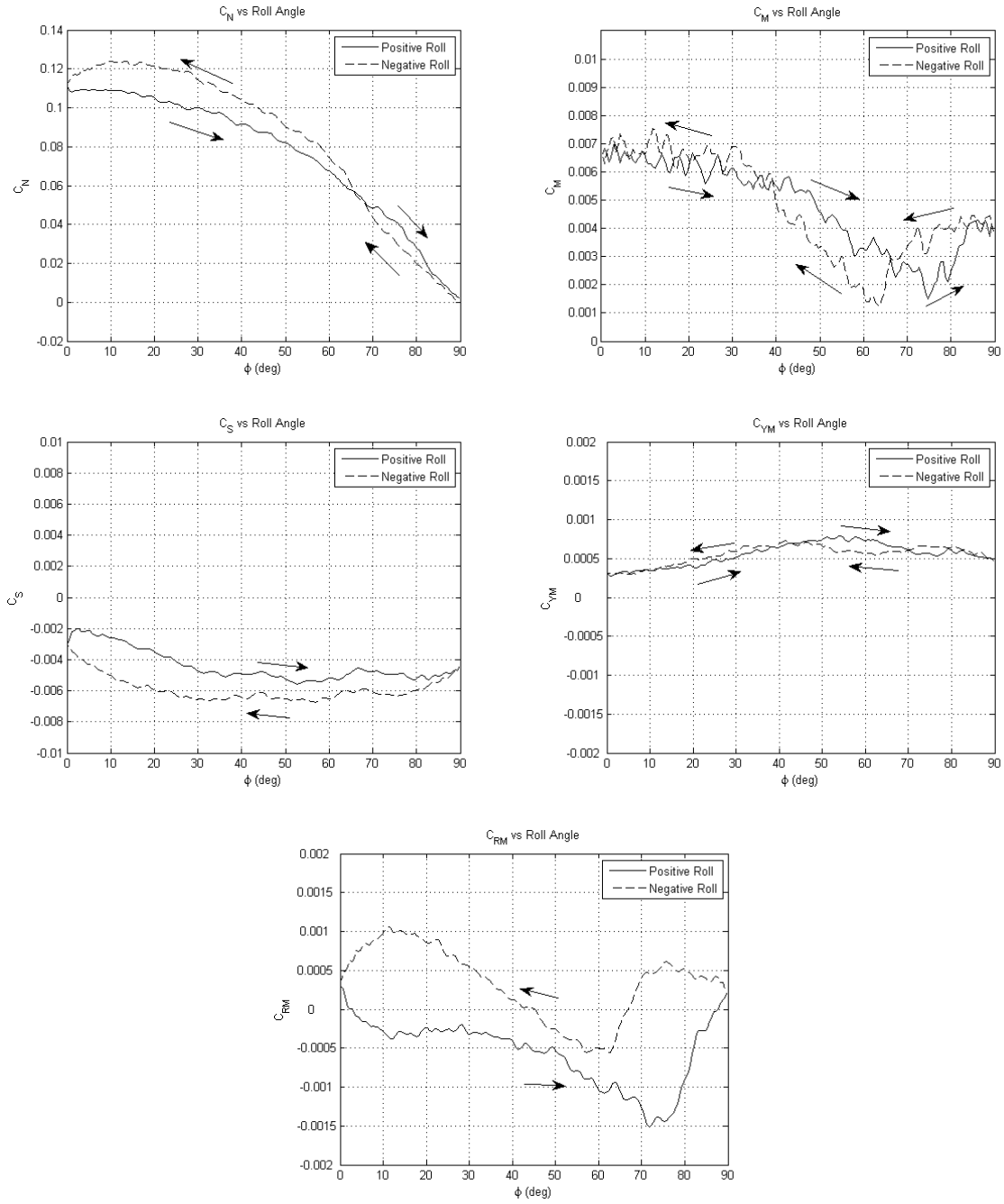


Figure 88. Dynamic Aerodynamic Coefficients, $U_\infty = 10$ [in/sec], $Re = 2.15 \times 10^4$, $\alpha = 20^\circ$, $\phi = 0^\circ - 90^\circ$, $\dot{\phi} = 7^\circ/\text{sec}$

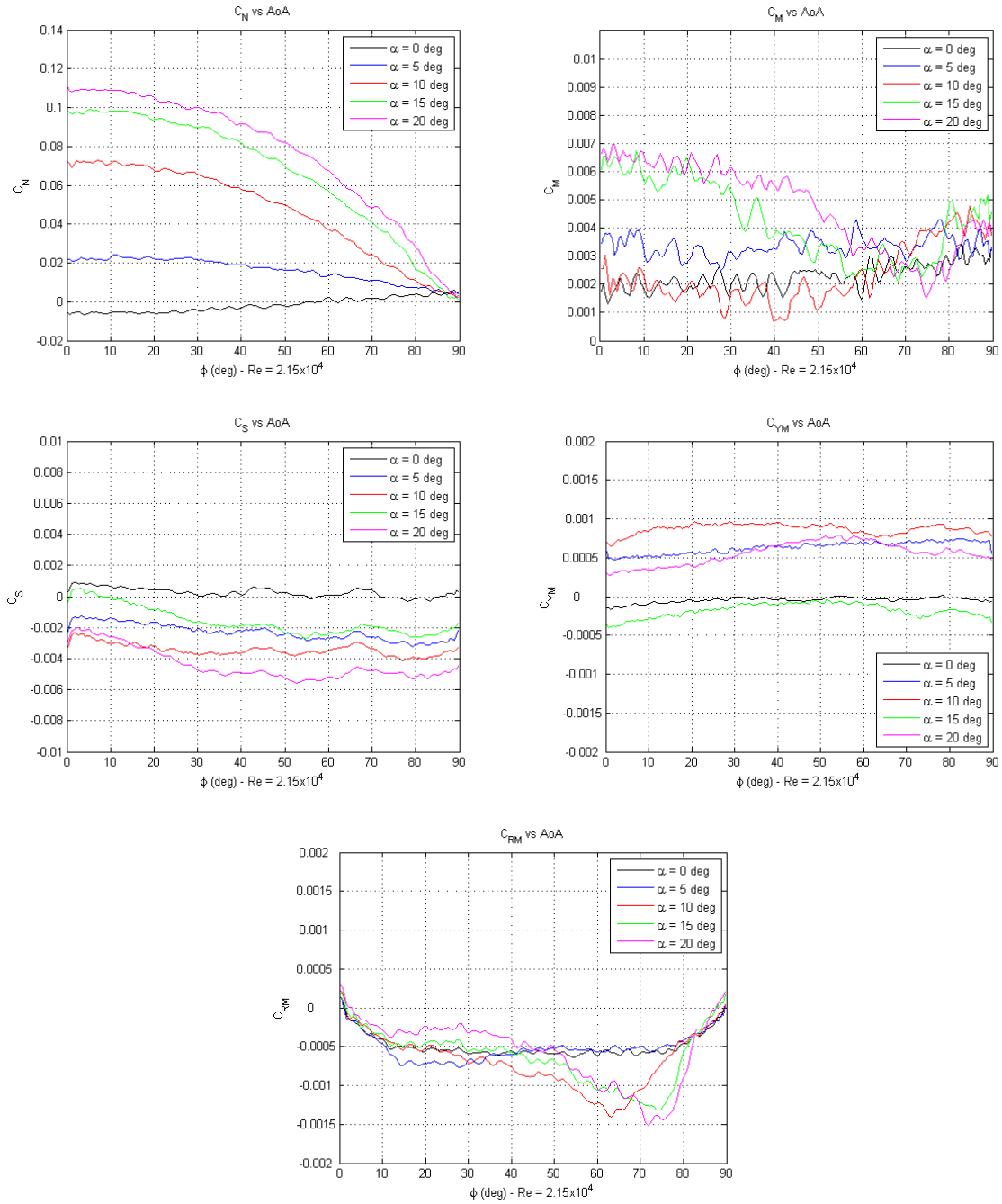


Figure 89. Dynamic Aerodynamic Coefficients, $U_\infty = 10$ [in/sec], $Re = 2.15 \times 10^4$, Multiple α 's, $\phi = 0^\circ$ - 90° , $\dot{\phi} = 7^\circ/\text{sec}$

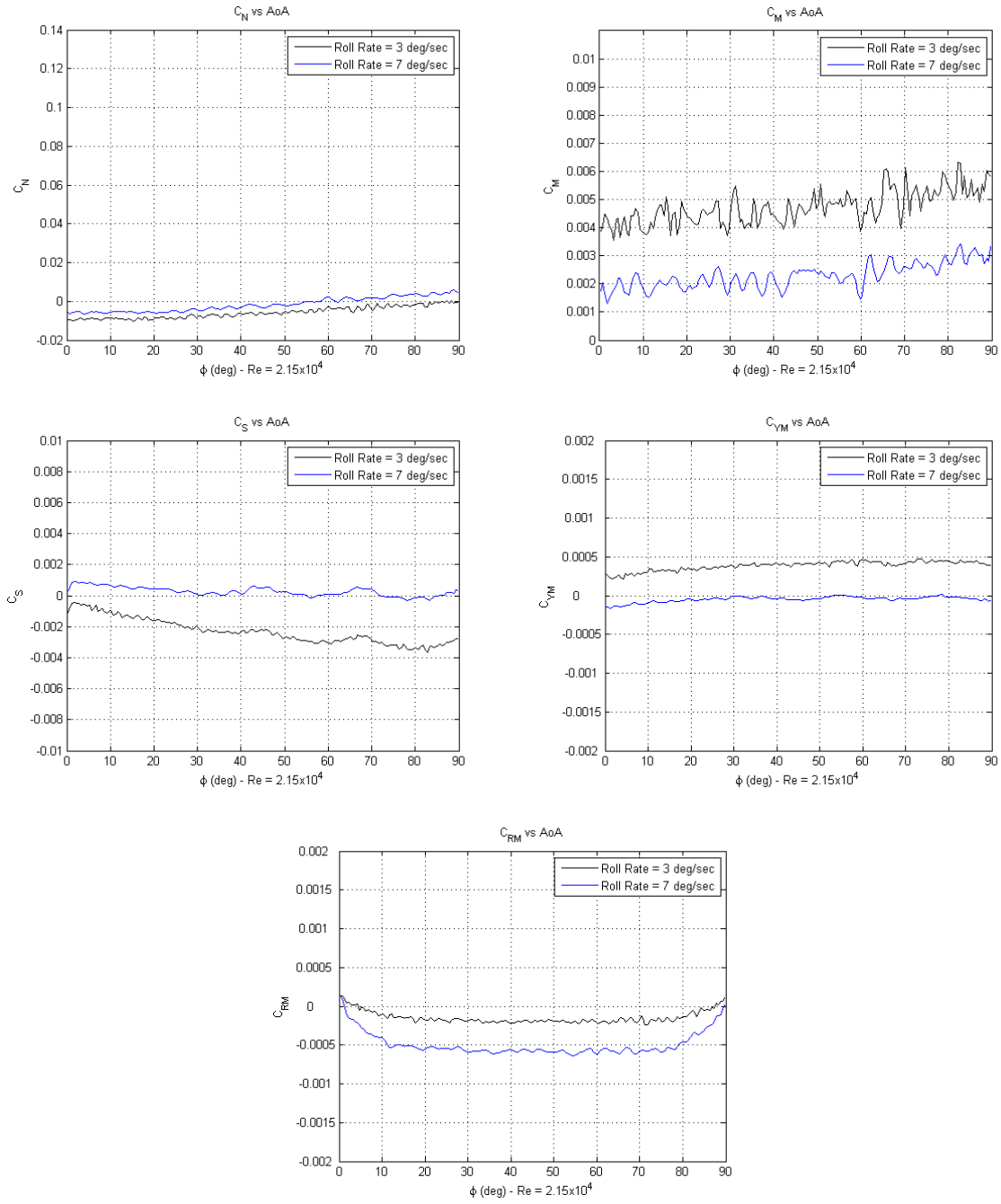


Figure 90. Dynamic Aerodynamic Coefficients, $U_\infty = 10$ [in/sec], $Re = 2.15 \times 10^4$, $\alpha = 0^\circ$, $\phi = 0^\circ$ - 90° , $\dot{\phi} = 3^\circ/\text{sec}$ & $7^\circ/\text{sec}$

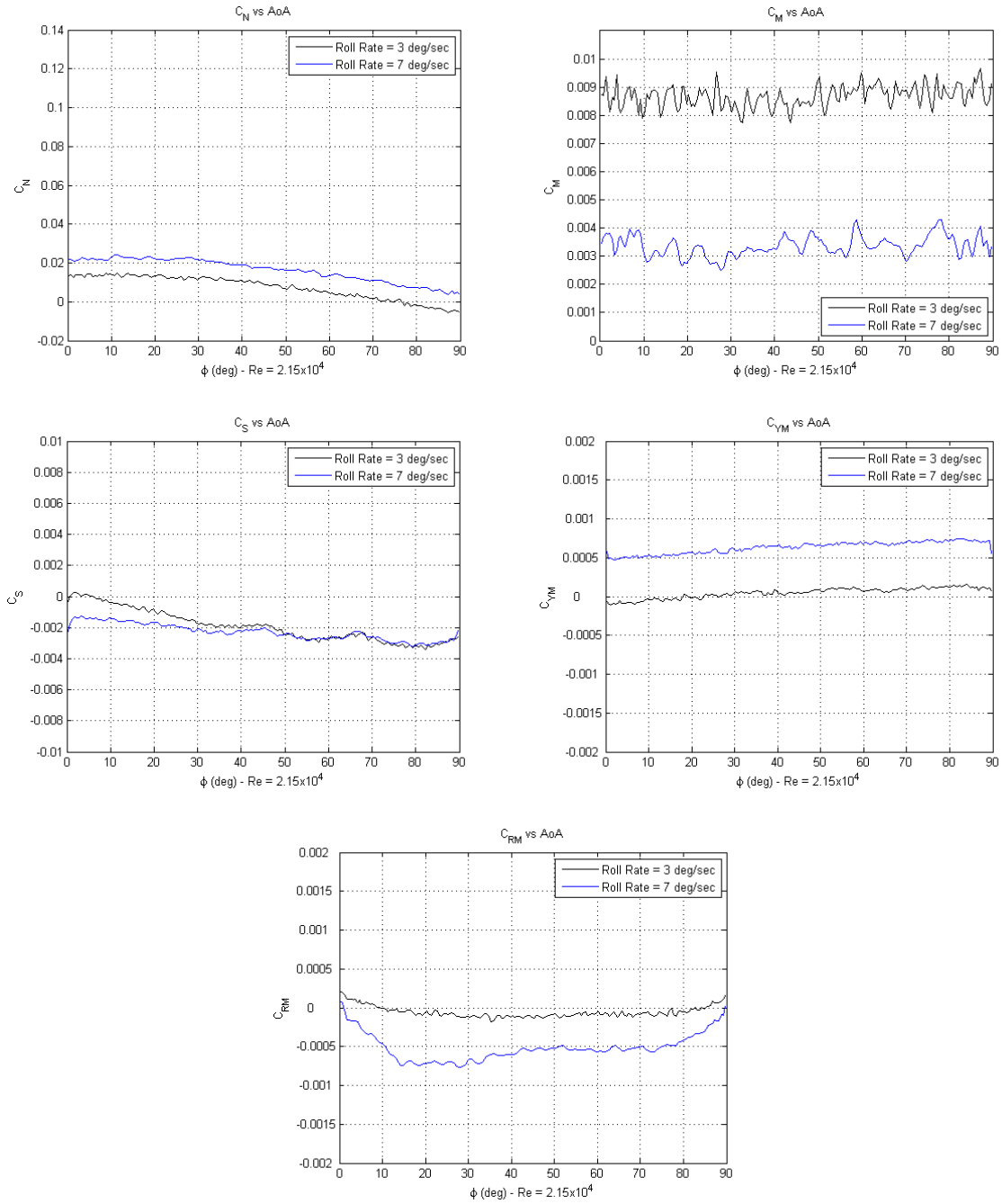


Figure 91. Dynamic Aerodynamic Coefficients, $U_\infty = 10$ [in/sec], $Re = 2.15 \times 10^4$, $\alpha = 5^\circ$, $\phi = 0^\circ$ - 90° , $\dot{\phi} = 3^\circ/\text{sec}$ & $7^\circ/\text{sec}$

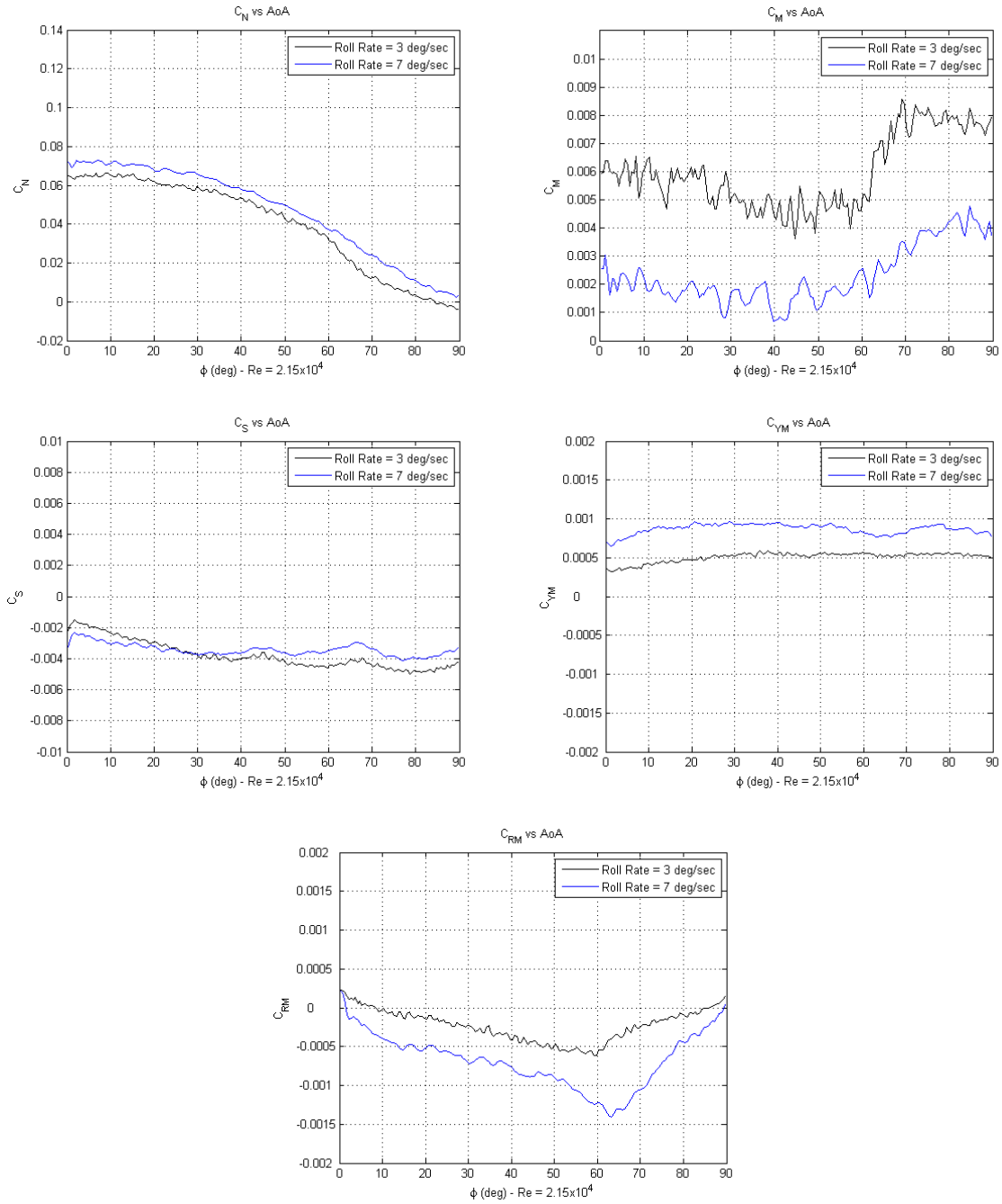


Figure 92. Dynamic Aerodynamic Coefficients, $U_\infty = 10$ [in/sec], $Re = 2.15 \times 10^4$, $\alpha = 10^\circ$, $\phi = 0^\circ$ - 90° , $\dot{\phi} = 3^\circ/\text{sec}$ & $7^\circ/\text{sec}$

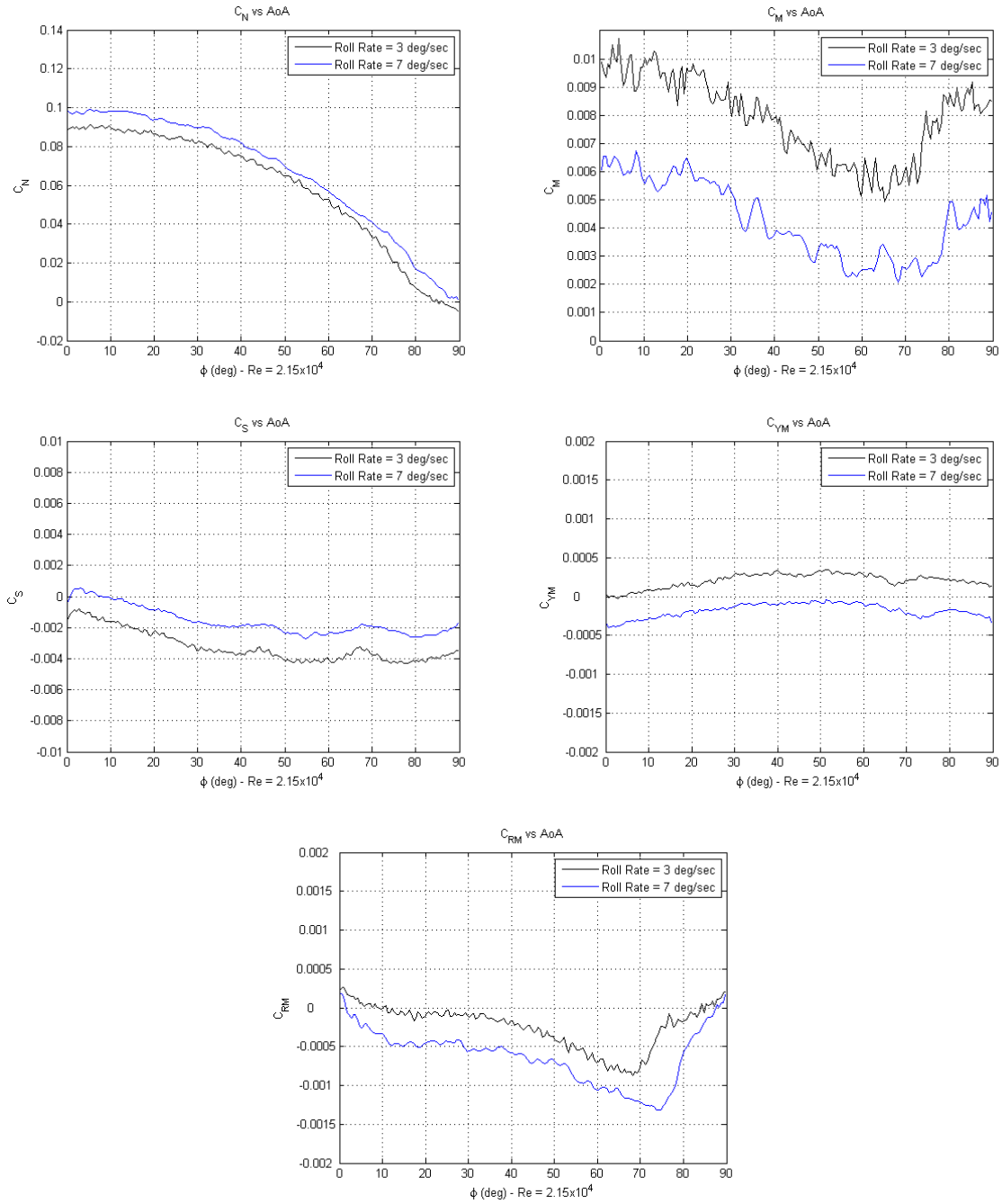


Figure 93. Dynamic Aerodynamic Coefficients, $U_\infty = 10$ [in/sec], $Re = 2.15 \times 10^4$, $\alpha = 15^\circ$, $\phi = 0^\circ$ - 90° , $\dot{\phi} = 3^\circ/\text{sec}$ & $7^\circ/\text{sec}$

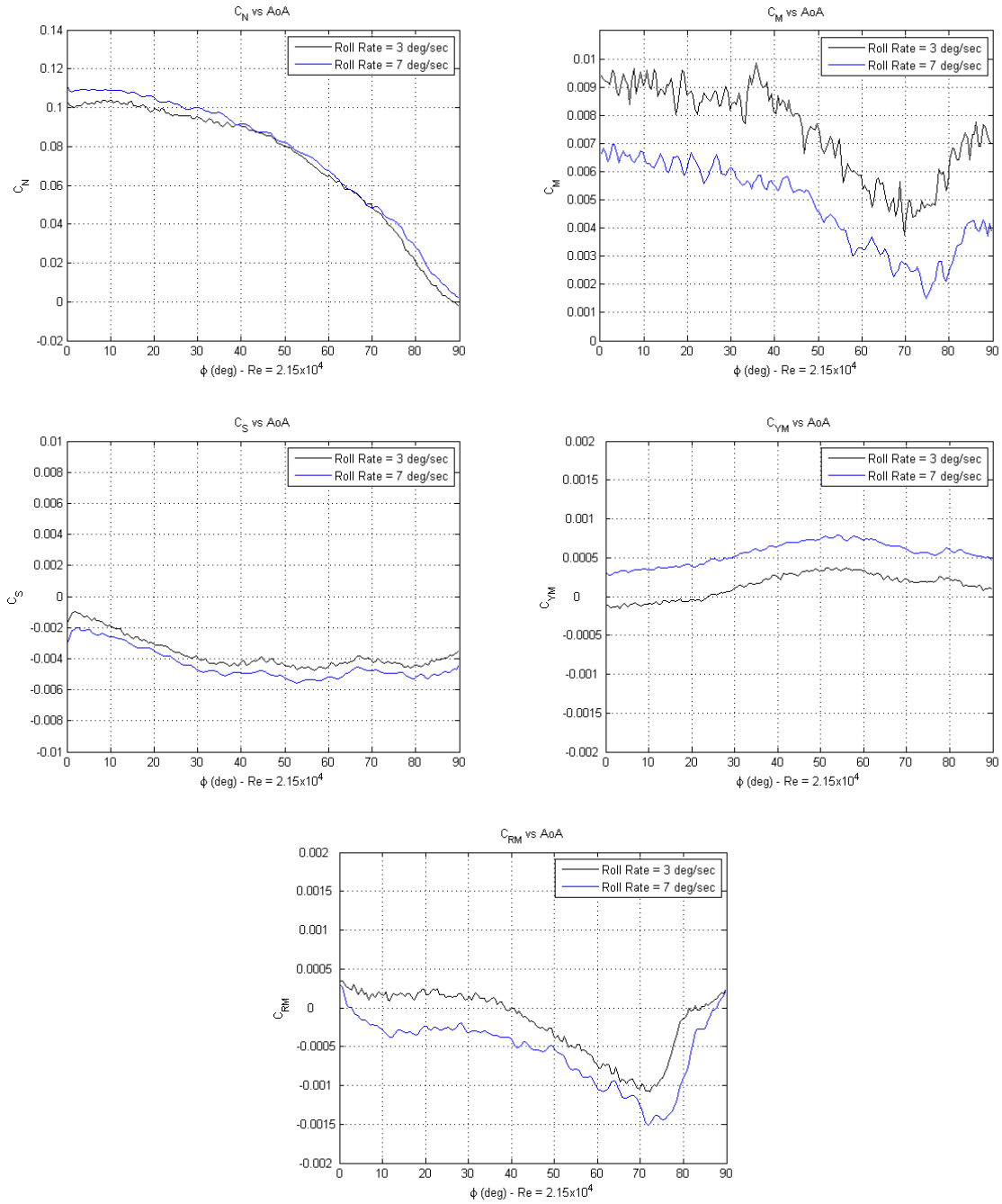


Figure 94. Dynamic Aerodynamic Coefficients, $U_\infty = 10$ [in/sec], $Re = 2.15 \times 10^4$, $\alpha = 20^\circ$, $\phi = 0^\circ$ - 90° , $\dot{\phi} = 3^\circ/\text{sec}$ & $7^\circ/\text{sec}$

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APPENDIX B. DATA TABLES WITH AERODYNAMIC COEFFICIENTS

A. STATIC AERODYNAMIC COEFFICIENTS, PITCH

STEADY PITCH-UP $\alpha = 0^\circ$ - 30°					
α ($^\circ$)	C_N	C_M	C_S	C_{YM}	C_{RM}
0	-0.09954	0.04448	0.00273	-0.00217	0.00073
2	-0.02513	0.04924	0.00246	-0.00226	0.00081
4	0.05640	0.05461	0.00236	-0.00216	0.00052
6	0.12332	0.06159	0.00138	-0.00197	0.00056
8	0.24846	0.05542	-0.00022	-0.00174	0.00064
10	0.38967	0.05357	-0.00297	-0.00148	0.00097
12	0.47673	0.05840	-0.00415	-0.00143	0.00126
14	0.54085	0.06911	-0.00498	-0.00161	0.00146
16	0.65254	0.07435	-0.00628	-0.00160	0.00138
18	0.70984	0.07604	-0.00644	-0.00135	0.00105
20	0.72915	0.06737	-0.00599	-0.00133	0.00118
22	0.73361	0.05955	-0.00821	-0.00151	0.00182
24	0.75926	0.06028	-0.01423	-0.00187	0.00347
26	0.80331	0.06258	-0.01648	-0.00196	0.00372
28	0.82778	0.06950	-0.01770	-0.00222	0.00366
30	0.827634	0.07098	-0.01301	-0.00145	0.00211

Table 6. Aerodynamic Coefficients, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\alpha = 0^\circ$ - 30°

STEADY PITCH-UP $\alpha = 0^\circ\text{-}30^\circ$					
α ($^\circ$)	C_N	C_M	C_S	C_{YM}	C_{RM}
0	-0.03425	0.00933	0.00059	-0.00065	0.00044
2	0.040619	0.01214	-0.00050	-0.00065	0.00040
4	0.116348	0.01620	-0.00139	-0.00063	0.00063
6	0.198369	0.01882	-0.00265	-0.00062	0.00143
8	0.376300	0.00249	-0.00508	-0.00033	0.00095
10	0.467850	0.01075	-0.00671	-0.00032	0.00135
12	0.542270	0.02095	-0.00814	-0.00030	0.00163
14	0.607057	0.02794	-0.00885	-0.00035	0.00140
16	0.661494	0.03069	-0.01021	-0.00047	0.00202
18	0.695524	0.03420	-0.01122	-0.00077	0.00239
20	0.710977	0.03106	-0.01186	-0.00119	0.00217
22	0.713364	0.02381	-0.02194	-0.00213	0.00378
24	0.747608	0.02387	-0.02881	-0.00263	0.00433
26	0.783538	0.02695	-0.03156	-0.00276	0.00404
28	0.826964	0.03083	-0.03725	-0.00297	0.00488
30	0.886150	0.03741	-0.04635	-0.00365	0.00680

Table 7. Aerodynamic Coefficients, $U_\infty = 10$ [in/sec], $Re = 2.15 \times 10^4$, $\alpha = 0^\circ\text{-}30^\circ$

STEADY PITCH-UP $\alpha = 0^\circ\text{-}30^\circ$					
α ($^\circ$)	C_N	C_M	C_S	C_{YM}	C_{RM}
0	-0.01441	0.00583	0.001353	-0.00035	0.00032
2	0.06155	0.00967	0.000327	-0.00037	0.00039
4	0.12717	0.01685	-0.00080	-0.00035	0.00099
6	0.31142	-0.00277	-0.00306	-0.00021	0.00125
8	0.41339	0.00237	-0.00446	-0.00014	0.00137
10	0.49614	0.01340	-0.00559	-0.00016	0.00149
12	0.57111	0.02319	-0.00636	-0.00015	0.00144
14	0.63530	0.02813	-0.00674	-0.00016	0.00108
16	0.68548	0.03122	-0.00793	-0.00021	0.00139
18	0.72361	0.03123	-0.00789	-0.00027	0.00110
20	0.75827	0.03047	-0.00840	-0.00053	0.00116
22	0.76082	0.02531	-0.01209	-0.00114	0.00206
24	0.75181	0.02286	-0.01859	-0.00168	0.00287
26	0.77971	0.02433	-0.01600	-0.00126	0.00178
28	0.82235	0.02647	-0.00521	-0.00017	-0.00037
30	0.86709	0.03076	-0.00882	-0.00046	0.00008

Table 8. Aerodynamic Coefficients, $U_\infty = 14$ [in/sec], $Re = 2.94 \times 10^4$, $\alpha = 0^\circ\text{-}30^\circ$

STEADY PITCH-UP $\alpha = 0^\circ\text{-}40^\circ$					
α ($^\circ$)	C_N	C_M	C_S	C_{YM}	C_{RM}
0	-0.09267	0.03893	-0.00153	-0.00145	0.00182
2	-0.01286	0.04249	-0.00192	-0.00156	0.00172
4	0.07516	0.04531	-0.00219	-0.00138	0.00104
6	0.13771	0.05457	-0.00286	-0.00133	0.00076
8	0.25625	0.04899	-0.00380	-0.00123	0.00056
10	0.40771	0.04203	-0.00595	-0.00120	0.00120
12	0.49779	0.04978	-0.00734	-0.00124	0.00160
14	0.56406	0.05889	-0.00824	-0.00138	0.00145
16	0.65844	0.05717	-0.00969	-0.00114	0.00128
18	0.72061	0.06247	-0.01069	-0.00144	0.00197
20	0.73584	0.05835	-0.01203	-0.00179	0.00226
22	0.74589	0.05486	-0.01943	-0.00255	0.00423
24	0.78944	0.06338	-0.02793	-0.00322	0.00619
26	0.83193	0.07165	-0.03184	-0.00369	0.00622
28	0.85551	0.07889	-0.02718	-0.00334	0.00381
30	0.85478	0.08451	-0.02174	-0.00272	0.00160
32	0.86012	0.08386	-0.01220	-0.00132	-0.00051
34	0.86828	0.09148	-0.01035	-0.00120	-0.00127
36	0.89052	0.09483	-0.01068	-0.00137	-0.00162
38	0.92283	0.09920	-0.01076	-0.00138	-0.00187
40	0.93439	0.11089	-0.01092	-0.00154	-0.00200

Table 9. Aerodynamic Coefficients, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\alpha = 0^\circ\text{-}40^\circ$

STEADY PITCH-UP $\alpha = 0^\circ\text{-}40^\circ$					
α ($^\circ$)	C_N	C_M	C_S	C_{YM}	C_{RM}
0	-0.05183	0.023141	0.00221	-0.00105	0.00012
2	0.02177	0.026591	0.00080	-0.00102	0.00016
4	0.09651	0.030857	-0.00012	-0.00095	0.00044
6	0.19009	0.030895	-0.00190	-0.00078	0.00173
8	0.35836	0.018622	-0.00393	-0.00064	0.00081
10	0.45036	0.028430	-0.00553	-0.00066	0.00129
12	0.52297	0.037178	-0.00703	-0.00054	0.00142
14	0.58480	0.043650	-0.00776	-0.00059	0.00129
16	0.64454	0.046828	-0.00929	-0.00065	0.00176
18	0.67446	0.048537	-0.01004	-0.00083	0.00189
20	0.68714	0.046217	-0.01123	-0.00127	0.00217
22	0.69490	0.038808	-0.02092	-0.00214	0.00361
24	0.72165	0.038324	-0.02644	-0.00248	0.00366
26	0.75826	0.040945	-0.03095	-0.00273	0.00405
28	0.80459	0.046448	-0.03549	-0.00292	0.00477
30	0.86745	0.051843	-0.04410	-0.00355	0.00647
32	0.91597	0.058726	-0.04916	-0.00393	0.00692
34	0.94455	0.064730	-0.04418	-0.00351	0.00430
36	0.93422	0.065202	-0.01900	-0.00123	-0.00061
38	0.91405	0.059233	-0.01158	-0.00034	-0.00185
40	0.94538	0.064469	-0.01198	-0.00038	-0.00190

Table 10. Aerodynamic Coefficients, $U_\infty = 10$ [in/sec], $Re = 2.15 \times 10^4$, $\alpha = 0^\circ\text{-}40^\circ$

STEADY PITCH-UP $\alpha = 0^\circ\text{-}40^\circ$					
α ($^\circ$)	C_N	C_M	C_S	C_{YM}	C_{RM}
0	-0.00333	-0.00466	0.00032	-0.00028	0.00047
2	0.07439	-0.00098	-0.00083	-0.00031	0.00038
4	0.14252	0.00587	-0.00173	-0.00030	0.00070
6	0.32396	-0.01402	-0.00421	-0.00013	0.00082
8	0.43323	-0.01064	-0.00591	-0.00019	0.00095
10	0.52137	-0.00159	-0.00749	-0.00003	0.00137
12	0.59484	0.01045	-0.00861	0.00001	0.00156
14	0.66048	0.01740	-0.00940	-0.00002	0.00132
16	0.70328	0.02315	-0.01061	-0.00010	0.00170
18	0.73682	0.02371	-0.01089	-0.00038	0.00171
20	0.76195	0.02096	-0.01144	-0.00078	0.00159
22	0.75542	0.01262	-0.02342	-0.00217	0.00411
24	0.77578	0.01422	-0.03039	-0.00247	0.00474
26	0.82960	0.01789	-0.03389	-0.00264	0.00456
28	0.88016	0.02454	-0.03761	-0.00289	0.00483
30	0.94344	0.03148	-0.04182	-0.00305	0.00564
32	0.99418	0.04126	-0.04767	-0.00354	0.00573
34	0.96952	0.04023	-0.01936	-0.00104	-0.00077
36	0.93853	0.03743	-0.01173	-0.00018	-0.00239
38	0.96747	0.04276	-0.01180	-0.00024	-0.00257
40	1.00851	0.05186	-0.01234	-0.00029	-0.00272

Table 11. Aerodynamic Coefficients, $U_\infty = 14$ [in/sec], $Re = 2.94 \times 10^4$, $\alpha = 0^\circ\text{-}40^\circ$

B. STATIC AERODYNAMIC COEFFICIENTS, ROLL

STEADY ROLL $\phi = 0^\circ\text{-}90^\circ$					
$\phi (^\circ)$	C_N	C_M	C_S	C_{YM}	C_{RM}
0	-0.10218	0.03819	0.00443	-0.00267	0.00012
5	-0.09750	0.04012	0.00290	-0.00250	0.00031
10	-0.08885	0.03849	0.00189	-0.00247	0.00046
15	-0.08674	0.03677	0.00056	-0.00227	0.00055
20	-0.09343	0.04079	-0.00059	-0.00215	0.00076
25	-0.09084	0.04102	-0.00138	-0.00206	0.00095
30	-0.08252	0.04129	-0.00194	-0.00211	0.00112
35	-0.07562	0.03958	-0.00220	-0.00194	0.00123
40	-0.07586	0.04190	-0.00228	-0.00198	0.00142
45	-0.07466	0.04027	-0.00302	-0.00179	0.00151
50	-0.06669	0.04256	-0.00306	-0.00185	0.00175
55	-0.05763	0.04204	-0.00343	-0.00163	0.00179
60	-0.04550	0.03991	-0.00379	-0.00154	0.00185
65	-0.04101	0.03909	-0.00362	-0.00149	0.00195
70	-0.03891	0.04178	-0.00469	-0.00123	0.00212
75	-0.03108	0.04277	-0.00502	-0.00130	0.00234
80	-0.02271	0.04008	-0.00488	-0.00122	0.00229
85	-0.02534	0.04530	-0.00579	-0.00186	0.00248
90	-0.02098	0.04655	-0.00628	-0.00173	0.00268

Table 12. Aerodynamic Coefficients, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\alpha = 0^\circ$,
 $\phi = 0^\circ\text{-}90^\circ$

STEADY ROLL $\phi = 0^\circ\text{-}90^\circ$					
$\phi (^\circ)$	C_N	C_M	C_S	C_{YM}	C_{RM}
0	0.08894	0.05568	0.00078	-0.00178	0.00098
5	0.10647	0.05234	0.01156	-0.00255	0.00094
10	0.10653	0.05501	0.00669	-0.00219	0.00075
15	0.10885	0.05358	0.00347	-0.00193	0.00061
20	0.10477	0.05478	0.00224	-0.00184	0.00055
25	0.10402	0.05513	-0.00088	-0.00149	0.00028
30	0.10388	0.05846	-0.00505	-0.00140	0.00027
35	0.11080	0.05473	-0.00621	-0.00120	0.00006
40	0.09966	0.05875	-0.00490	-0.00120	-0.0000008
45	0.08611	0.05964	0.00096	-0.00158	-0.00004
50	0.08416	0.05982	-0.00799	-0.00087	-0.00024
55	0.07831	0.05996	-0.01247	-0.00047	-0.00037
60	0.07050	0.05953	-0.01118	-0.00058	-0.00038
65	0.06734	0.05506	-0.00526	-0.00103	-0.00027
70	0.05644	0.05566	-0.00667	-0.00086	-0.00036
75	0.04692	0.05778	-0.01411	-0.00051	-0.00030
80	0.04004	0.05572	-0.01656	-0.00020	-0.00042
85	0.02500	0.05936	-0.01289	-0.00057	-0.00019
90	0.01012	0.06105	-0.00258	-0.00133	0.00010

Table 13. Aerodynamic Coefficients, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\alpha = 5^\circ$,
 $\phi = 0^\circ\text{-}90^\circ$

STEADY ROLL $\phi = 0^\circ\text{-}90^\circ$					
$\phi (^\circ)$	C_N	C_M	C_S	C_{YM}	C_{RM}
0	0.32453	0.09190	0.00173	-0.00274	0.00028
5	0.33374	0.08616	0.01072	-0.00319	0.00035
10	0.34440	0.08310	0.00413	-0.00261	0.00023
15	0.33866	0.08275	-0.00040	-0.00225	0.00003
20	0.32585	0.08416	-0.00332	-0.00184	-0.00012
25	0.32340	0.08170	-0.00728	-0.00150	-0.00034
30	0.31180	0.08049	-0.01172	-0.00138	-0.00047
35	0.29840	0.07656	-0.01346	-0.00102	-0.00083
40	0.27259	0.07824	-0.01149	-0.00119	-0.00103
45	0.23853	0.07659	-0.00588	-0.00124	-0.00128
50	0.21462	0.07632	-0.01451	-0.00068	-0.00133
55	0.18106	0.07852	-0.01879	-0.00025	-0.00130
60	0.13711	0.08593	-0.01752	-0.00040	-0.00153
65	0.10003	0.08736	-0.01131	-0.00082	-0.00190
70	0.07745	0.08280	-0.01329	-0.00044	-0.00183
75	0.05720	0.08267	-0.02236	0.00021	-0.00137
80	0.04268	0.07554	-0.02481	0.00060	-0.00099
85	0.01304	0.07761	-0.02125	0.00036	-0.00031
90	-0.01396	0.07525	-0.01159	-0.00016	0.00042

Table 14. Aerodynamic Coefficients, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\alpha = 10^\circ$,
 $\phi = 0^\circ\text{-}90^\circ$

STEADY ROLL $\phi = 0^\circ\text{-}90^\circ$					
$\phi (^\circ)$	C_N	C_M	C_S	C_{YM}	C_{RM}
0	0.54391	0.10127	-0.00356	-0.00274	0.00012
5	0.54933	0.09490	0.005638	-0.00317	0.00009
10	0.55135	0.09347	-0.00158	-0.00263	-0.00004
15	0.52762	0.09481	-0.00684	-0.00214	-0.00017
20	0.51271	0.09076	-0.01062	-0.00157	-0.00014
25	0.48939	0.08906	-0.01545	-0.00111	-0.00025
30	0.47145	0.08561	-0.02028	-0.00072	-0.00068
35	0.43855	0.08234	-0.02177	-0.00054	-0.00128
40	0.41074	0.08318	-0.02103	-0.00042	-0.00189
45	0.38734	0.07728	-0.01627	-0.00049	-0.00257
50	0.36915	0.07218	-0.02522	0.00011	-0.00291
55	0.32707	0.07328	-0.02999	0.00034	-0.00331
60	0.25366	0.07316	-0.02747	0.00021	-0.00319
65	0.16109	0.08102	-0.01999	-0.00035	-0.00204
70	0.08846	0.08440	-0.01992	-0.00058	-0.00240
75	0.05006	0.07836	-0.02809	0.00018	-0.00227
80	0.00859	0.07714	-0.03102	0.00058	-0.00126
85	-0.02935	0.07167	-0.02662	0.00030	-0.00015
90	-0.07176	0.07120	-0.01627	-0.00059	0.00128

Table 15. Aerodynamic Coefficients, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\alpha = 15^\circ$,
 $\phi = 0^\circ\text{-}90^\circ$

STEADY ROLL $\phi = 0^\circ\text{-}90^\circ$					
$\phi (^\circ)$	C_N	C_M	C_S	C_{YM}	C_{RM}
0	0.76225	0.06786	-0.00332	-0.00484	0.00229
5	0.74023	0.06588	-0.00034	-0.00630	0.00483
10	0.73671	0.07038	-0.00885	-0.00620	0.00518
15	0.73222	0.07777	-0.01215	-0.00546	0.00408
20	0.71048	0.07502	-0.01557	-0.00486	0.00352
25	0.70289	0.07982	-0.01818	-0.00439	0.00283
30	0.69040	0.07984	-0.02541	-0.00279	0.00212
35	0.66037	0.08141	-0.02827	-0.00223	0.00194
40	0.62668	0.07208	-0.02692	-0.00174	0.00097
45	0.55041	0.07274	-0.02338	-0.00162	-0.00004
50	0.50513	0.06563	-0.03142	-0.00101	-0.00113
55	0.44710	0.06331	-0.03545	-0.00047	-0.00270
60	0.37428	0.05963	-0.03168	-0.00063	-0.00447
65	0.29472	0.06405	-0.02475	-0.00120	-0.00505
70	0.19645	0.06701	-0.02346	-0.00165	-0.00342
75	0.10850	0.06732	-0.02996	-0.00136	-0.00215
80	0.03927	0.06948	-0.03242	-0.00101	-0.00208
85	-0.01750	0.06800	-0.02931	-0.00099	-0.00056
90	-0.07541	0.06866	-0.01928	-0.00164	0.00112

Table 16. Aerodynamic Coefficients, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\alpha = 20^\circ$,
 $\phi = 0^\circ\text{-}90^\circ$

STEADY ROLL $\phi = 0^\circ\text{-}90^\circ$					
$\phi (^\circ)$	C_N	C_M	C_S	C_{YM}	C_{RM}
0	-0.09310	0.05134	-0.00002	-0.00082	0.00101
5	-0.08722	0.04828	0.00330	-0.00098	0.00094
10	-0.08926	0.04952	0.00168	-0.00083	0.00082
15	-0.08836	0.04930	0.00048	-0.00071	0.00064
20	-0.08921	0.04943	-0.00056	-0.00044	0.00053
25	-0.08705	0.04910	-0.00157	-0.00035	0.00045
30	-0.08308	0.04899	-0.00293	-0.00022	0.00034
35	-0.08116	0.04937	-0.00337	-0.00013	0.00024
40	-0.07969	0.04988	-0.00261	-0.00014	0.00023
45	-0.07874	0.05001	-0.00013	-0.00035	0.00027
50	-0.07310	0.05067	-0.00332	-0.0000	0.00022
55	-0.06715	0.04985	-0.00437	-0.00005	0.00026
60	-0.06499	0.05153	-0.00375	-0.00013	0.00033
65	-0.06007	0.05153	-0.00165	-0.00027	0.00040
70	-0.05607	0.05255	-0.00207	-0.00022	0.00043
75	-0.04983	0.05256	-0.00451	-0.00009	0.00049
80	-0.04304	0.05254	-0.00513	-0.00008	0.00056
85	-0.03786	0.05320	-0.00361	-0.00020	0.00070
90	-0.03382	0.05421	-0.00011	-0.00043	0.00087

Table 17. Aerodynamic Coefficients, $U_\infty = 10$ [in/sec], $Re = 2.15 \times 10^4$, $\alpha = 0^\circ$,
 $\phi = 0^\circ\text{-}90^\circ$

STEADY ROLL $\phi = 0^\circ\text{-}90^\circ$					
$\phi (^\circ)$	C_N	C_M	C_S	C_{YM}	C_{RM}
0	0.10773	0.04508	-0.00299	-0.00032	0.00092
5	0.11230	0.04332	0.00012	-0.00055	0.00084
10	0.11086	0.04399	-0.00179	-0.00039	0.00067
15	0.11092	0.04310	-0.00287	-0.00035	0.00056
20	0.10658	0.04375	-0.00371	-0.00034	0.00050
25	0.10285	0.04418	-0.00480	-0.00031	0.00044
30	0.09874	0.04404	-0.00641	-0.00021	0.00032
35	0.09574	0.04305	-0.00703	-0.00013	0.00027
40	0.08969	0.04368	-0.00642	-0.00023	0.00032
45	0.08006	0.04324	-0.00419	-0.00038	0.00036
50	0.07543	0.04226	-0.00720	-0.00020	0.00033
55	0.06870	0.04265	-0.00857	-0.00019	0.00038
60	0.06125	0.04292	-0.00817	-0.00029	0.00043
65	0.05308	0.04227	-0.00622	-0.00042	0.00046
70	0.04404	0.04199	-0.00654	-0.00040	0.00050
75	0.03490	0.04164	-0.00924	-0.00021	0.00053
80	0.02290	0.04171	-0.00985	-0.00011	0.00058
85	0.01519	0.03899	-0.00820	-0.00022	0.00070
90	0.00405	0.03903	-0.00464	-0.00046	0.00092

Table 18. Aerodynamic Coefficients, $U_\infty = 10$ [in/sec], $Re = 2.15 \times 10^4$, $\alpha = 5^\circ$,
 $\phi = 0^\circ\text{-}90^\circ$

STEADY ROLL $\phi = 0^\circ\text{-}90^\circ$					
$\phi (^\circ)$	C_N	C_M	C_S	C_{YM}	C_{RM}
0	0.44137	0.03672	-0.00728	-0.00029	0.00147
5	0.44701	0.03391	-0.00483	-0.00043	0.00137
10	0.43734	0.03531	-0.00714	-0.00024	0.00110
15	0.43316	0.03176	-0.00872	-0.00011	0.00076
20	0.41541	0.03181	-0.00996	0.00002	0.00046
25	0.40342	0.03111	-0.01140	0.00005	0.00015
30	0.38875	0.02994	-0.01321	0.00016	-0.00039
35	0.37261	0.02690	-0.01365	0.00017	-0.00085
40	0.35118	0.02622	-0.01302	0.00010	-0.00128
45	0.32480	0.02654	-0.01055	-0.00013	-0.00168
50	0.29109	0.02680	-0.01338	0.00002	-0.00183
55	0.24353	0.03025	-0.01502	0.00024	-0.00091
60	0.16955	0.04166	-0.01454	0.00026	0.00062
65	0.11748	0.04754	-0.01165	-0.00013	-0.00013
70	0.08281	0.04983	-0.01230	-0.000007	-0.00023
75	0.06203	0.04812	-0.01537	0.00032	0.00009
80	0.03744	0.04824	-0.01620	0.00034	0.00034
85	0.01811	0.04514	-0.01471	0.00019	0.00067
90	-0.00825	0.04418	-0.01091	-0.00009	0.00115

Table 19. Aerodynamic Coefficients, $U_\infty = 10$ [in/sec], $Re = 2.15 \times 10^4$, $\alpha = 10^\circ$,
 $\phi = 0^\circ\text{-}90^\circ$

STEADY ROLL $\phi = 0^\circ\text{-}90^\circ$					
$\phi (^\circ)$	C_N	C_M	C_S	C_{YM}	C_{RM}
0	0.34847	0.03230	-0.00575	-0.00016	0.00088
5	0.33883	0.03179	-0.00466	-0.00019	0.00082
10	0.33351	0.03045	-0.00618	-0.00003	0.00063
15	0.33020	0.02985	-0.00785	0.00010	0.00088
20	0.32428	0.02899	-0.00919	0.00027	0.00087
25	0.31649	0.02863	-0.01039	0.00039	0.00074
30	0.31161	0.02657	-0.01182	0.00052	0.00057
35	0.30071	0.02408	-0.01238	0.00058	0.00028
40	0.28279	0.02260	-0.01236	0.00065	-0.00001
45	0.26751	0.02050	-0.01137	0.00060	-0.00046
50	0.24478	0.01992	-0.01313	0.00067	-0.00102
55	0.22016	0.01874	-0.01370	0.00064	-0.00158
60	0.19692	0.01777	-0.01322	0.00045	-0.00201
65	0.15915	0.01871	-0.01170	0.00033	-0.00193
70	0.10108	0.02532	-0.01201	0.00049	-0.00002
75	0.05319	0.02885	-0.01283	0.00047	-0.00019
80	0.02758	0.02879	-0.01313	0.00052	-0.00014
85	0.01625	0.02780	-0.01297	0.00041	0.00048
90	-0.00887	0.02730	-0.01051	0.00021	0.00093

Table 20. Aerodynamic Coefficients, $U_\infty = 10$ [in/sec], $Re = 2.15 \times 10^4$, $\alpha = 15^\circ$,
 $\phi = 0^\circ\text{-}90^\circ$

STEADY ROLL $\phi = 0^\circ\text{-}90^\circ$					
$\phi (^\circ)$	C_N	C_M	C_S	C_{YM}	C_{RM}
0	-0.05871	-0.00195	0.00066	0.00014	-0.00013
5	-0.05795	-0.00157	0.00196	-0.00021	-0.00018
10	-0.05655	-0.00107	0.00291	-0.00017	-0.00035
15	-0.05590	-0.00093	0.00214	0.00021	-0.00042
20	-0.05527	-0.00094	0.00216	0.00022	-0.00041
25	-0.05496	-0.00099	0.00223	0.00019	-0.00039
30	-0.05647	-0.00115	0.00305	-0.00017	-0.00026
35	-0.05637	-0.00156	0.00243	-0.00006	-0.00017
40	-0.05424	-0.00139	0.00287	-0.00023	-0.00011
45	-0.05093	-0.00115	0.00252	-0.00019	-0.000002
50	-0.04777	-0.00079	0.00288	-0.00027	0.00011
55	-0.04414	-0.00054	0.00350	-0.00043	0.00021
60	-0.04037	-0.00012	0.00425	-0.00067	0.00032
65	-0.03619	0.00018	0.00411	-0.00066	0.00041
70	-0.03032	0.00030	0.00308	-0.00032	0.00045
75	-0.02242	0.00003	0.00507	-0.00094	0.00021
80	-0.01492	-0.00044	0.00516	-0.00095	-0.00001
85	-0.00932	-0.00049	0.00661	-0.00145	0.00003
90	-0.00447	-0.00032	0.00614	-0.00138	-0.00007

Table 21. Aerodynamic Coefficients, $U_\infty = 10$ [in/sec], $Re = 2.15 \times 10^4$, $\alpha = 20^\circ$,
 $\phi = 0^\circ\text{-}90^\circ$

C. DYNAMIC AERODYNAMIC COEFFICIENTS, PITCH-UP MANEUVER

DYNAMIC PITCH-UP $\alpha = 0^\circ\text{-}30^\circ$					
α ($^\circ$)	C_N	C_M	C_S	C_{YM}	C_{RM}
0.16	-0.06149	0.04183	-0.00080	-0.00164	0.00116
0.73	-0.06955	0.03980	0.005177	-0.00168	0.00111
1.24	-0.04668	0.04323	-0.00015	-0.00139	0.00122
1.74	-0.03102	0.04960	-0.00176	-0.00142	0.00133
2.24	-0.01062	0.04476	0.00279	-0.00189	0.00147
2.74	0.01291	0.03885	0.00017	-0.00178	0.00148
3.24	0.02542	0.04134	-0.00193	-0.00149	0.00133
3.74	0.05565	0.04032	0.00126	-0.00171	0.00150
4.24	0.09231	0.03295	0.00211	-0.00187	0.00156
4.74	0.12820	0.02100	0.00091	-0.00162	0.00137
5.24	0.14752	0.01847	0.00036	-0.00131	0.00130
5.74	0.15178	0.02996	0.00010	-0.00125	0.00148
6.24	0.14999	0.04877	-0.00229	-0.00145	0.00183
6.74	0.16718	0.05376	-0.00430	-0.00144	0.00183
7.24	0.20364	0.04370	-0.00450	-0.00108	0.00151
7.74	0.23918	0.03486	-0.00283	-0.00094	0.00128
8.24	0.26570	0.03140	-0.00077	-0.00107	0.00132
8.74	0.29140	0.02683	-0.00180	-0.00101	0.00146
9.24	0.31958	0.02263	-0.00270	-0.00111	0.00162
9.74	0.34453	0.02386	-0.00198	-0.00112	0.00171
10.26	0.37078	0.02495	-0.00436	-0.00084	0.00172
10.74	0.39666	0.02754	-0.00585	-0.00072	0.00163
11.24	0.42967	0.02621	-0.00497	-0.00073	0.00172
11.74	0.46550	0.02455	-0.00515	-0.00082	0.00202
12.24	0.49976	0.02257	-0.00712	-0.00087	0.00205
12.74	0.53006	0.02081	-0.00858	-0.00083	0.00175
13.24	0.55460	0.02324	-0.00657	-0.00076	0.00157
13.74	0.58741	0.02173	-0.00540	-0.00074	0.00159
14.24	0.62095	0.01953	-0.00755	-0.00086	0.00141
14.74	0.64838	0.02354	-0.00875	-0.00095	0.00118
15.24	0.68621	0.02382	-0.00829	-0.00085	0.00109
15.74	0.71784	0.02657	-0.00790	-0.00061	0.00104
16.24	0.73085	0.03584	-0.00977	-0.00058	0.00115
16.74	0.73804	0.04400	-0.01097	-0.00086	0.00134
17.24	0.76041	0.04604	-0.01027	-0.00113	0.00158
17.74	0.80007	0.04054	-0.00834	-0.00129	0.00162
18.25	0.83424	0.03688	-0.00956	-0.00123	0.00151
18.74	0.85237	0.04465	-0.01452	-0.00086	0.00146

19.24	0.87284	0.04960	-0.01360	-0.00056	0.00152
19.74	0.90393	0.04878	-0.01069	-0.00053	0.00164
20.24	0.93344	0.05353	-0.01016	-0.00109	0.00188
20.74	0.95154	0.06353	-0.01154	-0.00157	0.00177
21.24	0.95889	0.07621	-0.01257	-0.00180	0.00164
21.74	0.97416	0.08399	-0.01323	-0.00177	0.00175
22.24	1.00141	0.08670	-0.01372	-0.00158	0.00170
22.75	1.03186	0.08554	-0.01312	-0.00156	0.00157
23.25	1.05369	0.08422	-0.01381	-0.00149	0.00157
23.75	1.06051	0.09039	-0.01557	-0.00125	0.00150
24.24	1.07228	0.09408	-0.01597	-0.00105	0.00126
24.74	1.09984	0.09176	-0.01511	-0.00085	0.00090
25.25	1.13530	0.09088	-0.01382	-0.00072	0.00082
25.75	1.16140	0.09957	-0.01431	-0.00085	0.00120
26.25	1.17046	0.11546	-0.01616	-0.00140	0.00169
26.75	1.19342	0.12112	-0.01689	-0.00165	0.00166
27.25	1.23430	0.11188	-0.01642	-0.00124	0.00107
27.75	1.26459	0.10726	-0.01494	-0.00101	0.00077
28.25	1.27720	0.10978	-0.01458	-0.00105	0.00079
28.75	1.29213	0.11393	-0.01550	-0.00125	0.00100
29.26	1.32472	0.11288	-0.01747	-0.00117	0.00078
29.75	1.32443	0.11646	-0.01630	-0.00132	0.00102

Table 22. Aerodynamic Coefficients, $U_{\infty} = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\alpha^+ = 0.05$

DYNAMIC PITCH-UP $\alpha = 0^\circ\text{-}30^\circ$					
α ($^\circ$)	C_N	C_M	C_S	C_{YM}	C_{RM}
0.16	-0.06555	0.04571	-0.00275	-0.00121	0.00060
0.73	-0.06784	0.03846	0.00490	-0.00171	0.00074
1.24	-0.05259	0.03623	0.00905	-0.00201	0.00114
1.74	-0.03146	0.03604	0.00504	-0.00181	0.00122
2.25	-0.01181	0.03532	-0.00046	-0.00154	0.00118
2.74	0.00587	0.03219	-0.00318	-0.00141	0.00104
3.24	0.02635	0.02804	-0.00239	-0.00132	0.00085
3.75	0.05793	0.02191	-0.00073	-0.00131	0.00077
4.24	0.08613	0.01995	-0.00046	-0.00132	0.00077
4.74	0.11560	0.01879	0.000007	-0.00136	0.00091
5.24	0.14476	0.01636	0.00103	-0.00143	0.00098
5.74	0.17501	0.01187	0.00083	-0.00145	0.00102
6.23	0.19991	0.01155	-0.00067	-0.00150	0.00123
6.73	0.22375	0.01077	-0.00094	-0.00152	0.00128
7.23	0.24010	0.01424	-0.00066	-0.00154	0.00135
7.73	0.24989	0.01985	-0.00118	-0.00148	0.00140
8.23	0.25711	0.02480	-0.00248	-0.00137	0.00141
8.73	0.26819	0.02672	-0.00281	-0.00130	0.00140
9.23	0.28777	0.02485	-0.00207	-0.00129	0.00139
9.73	0.31485	0.02086	-0.00190	-0.00134	0.00145
10.23	0.34522	0.01705	-0.00232	-0.00143	0.00159
10.73	0.37538	0.01463	-0.00252	-0.00155	0.00181
11.23	0.40232	0.01456	-0.00326	-0.00160	0.00204
11.73	0.42551	0.01657	-0.00547	-0.00157	0.00219
12.24	0.44507	0.02112	-0.00763	-0.00154	0.00220
12.74	0.46206	0.02601	-0.00797	-0.00151	0.00213
13.24	0.48087	0.02901	-0.00685	-0.00153	0.00199
13.74	0.50690	0.02822	-0.00562	-0.00153	0.00177
14.24	0.54273	0.02379	-0.00499	-0.00146	0.00155
14.73	0.58368	0.01892	-0.00520	-0.00130	0.00140
15.23	0.62207	0.01693	-0.00595	-0.00110	0.00135
15.73	0.65265	0.01884	-0.00676	-0.00095	0.00144
16.23	0.67630	0.02316	-0.00756	-0.00087	0.00162
16.73	0.69751	0.02761	-0.00808	-0.00085	0.00178
17.24	0.72046	0.03050	-0.00820	-0.00081	0.00187
17.74	0.74642	0.03146	-0.00893	-0.00080	0.00183
18.24	0.77696	0.03179	-0.00970	-0.00090	0.00173
18.74	0.81202	0.03167	-0.00971	-0.00108	0.00162
19.24	0.84991	0.03082	-0.00890	-0.00129	0.00158
19.74	0.88792	0.02902	-0.00814	-0.00150	0.00163

20.24	0.91989	0.02865	-0.00830	-0.00164	0.00175
20.74	0.94415	0.03112	-0.00980	-0.00168	0.00185
21.24	0.96355	0.03549	-0.01195	-0.00155	0.00187
21.75	0.97971	0.04285	-0.01355	-0.00142	0.00177
22.25	0.99599	0.04998	-0.01462	-0.00128	0.00160
22.75	1.01531	0.05652	-0.01572	-0.00118	0.00139
23.25	1.03714	0.06238	-0.01640	-0.00110	0.00116
23.74	1.06111	0.06733	-0.01587	-0.00102	0.00095
24.24	1.08871	0.07124	-0.01420	-0.00093	0.00082
24.75	1.11847	0.07608	-0.01208	-0.00098	0.00089
25.25	1.14760	0.08569	-0.01105	-0.00117	0.00118
25.74	1.17442	0.09586	-0.01225	-0.00152	0.00153
26.24	1.20480	0.10440	-0.01584	-0.00176	0.00178
26.75	1.23254	0.11373	-0.01869	-0.00186	0.00191
27.25	1.26842	0.11620	-0.02069	-0.00177	0.00166
27.75	1.30211	0.11899	-0.02046	-0.00176	0.00127
28.25	1.32623	0.12408	-0.01777	-0.00168	0.00091
28.75	1.34711	0.12888	-0.01552	-0.00161	0.00081
29.25	1.37768	0.13262	-0.01579	-0.00171	0.00093
29.71	1.41788	0.14877	-0.01668	-0.00213	0.00151

Table 23. Aerodynamic Coefficients, $U_{\infty} = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\alpha^+ = 0.10$

DYNAMIC PITCH-UP $\alpha = 0^\circ\text{-}30^\circ$					
α ($^\circ$)	C_N	C_M	C_S	C_{YM}	C_{RM}
0.17	-0.09357	0.05578	-0.00414	-0.00104	0.00091
0.72	-0.09718	0.05291	0.00289	-0.00111	0.00102
1.23	-0.08098	0.04335	0.00731	-0.00108	0.00108
1.74	-0.06211	0.03474	0.00636	-0.00102	0.00098
2.24	-0.04637	0.03035	0.00360	-0.00099	0.00100
2.74	-0.02089	0.02442	0.00148	-0.00100	0.00104
3.24	0.00172	0.02351	0.00036	-0.00110	0.00114
3.75	0.03362	0.01808	-0.00005	-0.00105	0.00117
4.25	0.05824	0.01985	0.00031	-0.00124	0.00131
4.75	0.08571	0.01997	-0.00051	-0.00120	0.00139
5.25	0.10824	0.02270	-0.00155	-0.00114	0.00143
5.75	0.13378	0.02476	-0.00253	-0.00110	0.00148
6.25	0.16088	0.02599	-0.00301	-0.00106	0.00149
6.74	0.18786	0.02709	-0.00295	-0.00108	0.00156
7.24	0.21577	0.02571	-0.00266	-0.00107	0.00154
7.75	0.24140	0.02510	-0.00225	-0.00116	0.00161
8.24	0.26707	0.02378	-0.00183	-0.00113	0.00165
8.75	0.29252	0.02279	-0.00149	-0.00116	0.00173
9.25	0.31831	0.02174	-0.00155	-0.00119	0.00182
9.75	0.34416	0.02075	-0.00197	-0.00121	0.00191
10.24	0.36892	0.02025	-0.00271	-0.00120	0.00201
10.74	0.39131	0.02083	-0.00400	-0.00117	0.00209
11.24	0.41114	0.02258	-0.00579	-0.00113	0.00216
11.74	0.42902	0.02548	-0.00739	-0.00118	0.00215
12.25	0.44598	0.02798	-0.00863	-0.00112	0.00216
12.75	0.46276	0.03058	-0.00905	-0.00113	0.00209
13.25	0.48297	0.03217	-0.00899	-0.00118	0.00201
13.75	0.50918	0.03204	-0.00867	-0.00125	0.00192
14.25	0.54031	0.03060	-0.00840	-0.00130	0.00186
14.75	0.57242	0.02906	-0.00837	-0.00131	0.00184
15.25	0.60164	0.02848	-0.00839	-0.00130	0.00184
15.75	0.62624	0.02938	-0.00803	-0.00128	0.00185
16.25	0.64668	0.03146	-0.00727	-0.00125	0.00186
16.75	0.66564	0.03384	-0.00676	-0.00119	0.00186
17.25	0.68654	0.03557	-0.00689	-0.00113	0.00186
17.75	0.71173	0.03616	-0.00720	-0.00110	0.00187
18.25	0.74244	0.03536	-0.00737	-0.00110	0.00191
18.74	0.77721	0.03360	-0.00745	-0.00110	0.00195
19.24	0.81359	0.03143	-0.00775	-0.00111	0.00199
19.74	0.84965	0.02937	-0.00860	-0.00110	0.00199

20.24	0.88415	0.02812	-0.01024	-0.00106	0.00195
20.74	0.91666	0.02817	-0.01258	-0.00100	0.00188
21.24	0.94720	0.02962	-0.01527	-0.00092	0.00178
21.74	0.97595	0.03242	-0.01797	-0.00087	0.00165
22.24	1.00334	0.03617	-0.02023	-0.00088	0.00151
22.74	1.03045	0.04011	-0.02163	-0.00091	0.00134
23.24	1.05851	0.04384	-0.02166	-0.00094	0.00112
23.74	1.08895	0.04723	-0.02034	-0.00090	0.00089
24.25	1.12291	0.05038	-0.01870	-0.00077	0.00069
24.75	1.16172	0.05365	-0.01745	-0.00067	0.00056
25.24	1.20318	0.05684	-0.01732	-0.00057	0.00046
25.74	1.24265	0.06435	-0.01827	-0.00056	0.00049
26.24	1.28303	0.06972	-0.01957	-0.00052	0.00036
26.75	1.31984	0.07807	-0.02111	-0.00044	0.00030
27.25	1.35769	0.08856	-0.02158	-0.00075	0.00042
27.74	1.38090	0.10041	-0.02191	-0.00071	0.00036
28.25	1.40047	0.11386	-0.02101	-0.00075	0.00049
28.74	1.40686	0.12777	-0.02018	-0.00095	0.00040
29.24	1.40286	0.13734	-0.01957	-0.00090	0.00012
29.71	1.37271	0.14552	-0.02049	-0.00051	-0.00007

Table 24. Aerodynamic Coefficients, $U_{\infty} = 6$ [in/sec], $Re = 1.17 \times 10^4$, $\alpha^+ = 0.15$

DYNAMIC PITCH-UP $\alpha = 0^\circ\text{-}30^\circ$					
α ($^\circ$)	C_N	C_M	C_S	C_{YM}	C_{RM}
0.16	-0.05450	0.02598	-0.00052	-0.00038	0.00062
0.73	-0.04237	0.02529	0.00120	-0.00039	0.00063
1.23	-0.02661	0.02579	0.00160	-0.00041	0.00084
1.74	-0.00254	0.02518	-0.00052	-0.00035	0.00088
2.24	0.01936	0.02436	-0.00097	-0.00038	0.00094
2.75	0.03970	0.02143	-0.00170	-0.00040	0.00091
3.24	0.05878	0.01968	-0.00125	-0.00046	0.00093
3.74	0.08313	0.01613	-0.00064	-0.00048	0.00092
4.24	0.10666	0.01486	-0.00064	-0.00045	0.00090
4.74	0.13013	0.01523	-0.00095	-0.00042	0.00085
5.25	0.15011	0.01800	-0.00111	-0.00040	0.00089
5.74	0.17007	0.02055	-0.00153	-0.00042	0.00096
6.24	0.19074	0.02268	-0.00235	-0.00041	0.00104
6.74	0.21346	0.02383	-0.00288	-0.00042	0.00116
7.25	0.23679	0.02401	-0.00299	-0.00042	0.00127
7.75	0.26024	0.02359	-0.00323	-0.00035	0.00136
8.24	0.28270	0.02220	-0.00360	-0.00026	0.00146
8.74	0.30618	0.02157	-0.00435	-0.00026	0.00149
9.25	0.33095	0.02135	-0.00506	-0.00027	0.00154
9.74	0.35633	0.02139	-0.00558	-0.00027	0.00152
10.24	0.38849	0.01936	-0.00621	-0.00027	0.00137
10.75	0.42288	0.01720	-0.00653	-0.00027	0.00129
11.25	0.45918	0.01565	-0.00657	-0.00022	0.00123
11.74	0.49110	0.01425	-0.00671	-0.00020	0.00112
12.24	0.52250	0.01459	-0.00753	-0.00012	0.00097
12.75	0.55215	0.01478	-0.00811	-0.00001	0.00083
13.25	0.57958	0.01558	-0.00802	0.00001	0.00080
13.74	0.60315	0.01644	-0.00808	-0.000001	0.00082
14.24	0.62928	0.01836	-0.00846	0.000008	0.00089
14.75	0.65295	0.02246	-0.00935	0.00006	0.00097
15.25	0.68173	0.02558	-0.01017	0.00016	0.00102
15.74	0.71053	0.02775	-0.01055	0.00018	0.00116
16.25	0.73849	0.03135	-0.01119	0.00015	0.00114
16.75	0.76401	0.03341	-0.01145	0.00012	0.00112
17.24	0.79087	0.03475	-0.01121	0.00012	0.00120
17.74	0.81591	0.03592	-0.01162	0.00016	0.00122
18.24	0.84480	0.03788	-0.01222	0.00014	0.00128
18.75	0.87264	0.03969	-0.01283	0.00017	0.00128
19.24	0.89960	0.04199	-0.01295	0.00022	0.00130
19.74	0.92122	0.04570	-0.01323	0.00025	0.00133

20.25	0.94275	0.05100	-0.01400	0.00021	0.00145
20.75	0.96229	0.05527	-0.01477	0.00011	0.00151
21.25	0.98459	0.05977	-0.01536	0.000006	0.00147
21.74	1.00538	0.06286	-0.01572	-0.00004	0.00131
22.24	1.02796	0.06602	-0.01592	-0.00011	0.00105
22.74	1.05239	0.06703	-0.01613	-0.00010	0.00080
23.24	1.07913	0.06806	-0.01608	-0.00013	0.00067
23.75	1.10235	0.06989	-0.01590	-0.00021	0.00061
24.25	1.12414	0.07288	-0.01542	-0.00024	0.00082
24.74	1.14701	0.07457	-0.01474	-0.00028	0.00106
25.24	1.16831	0.07719	-0.01461	-0.00030	0.00118
25.75	1.19009	0.08032	-0.01544	-0.00035	0.00119
26.25	1.20643	0.08390	-0.01702	-0.00035	0.00102
26.74	1.22477	0.08787	-0.01838	-0.00034	0.00080
27.25	1.24299	0.09084	-0.01903	-0.00033	0.00064
27.75	1.26263	0.09103	-0.01858	-0.00036	0.00066
28.25	1.28152	0.08878	-0.01763	-0.00037	0.00069
28.75	1.28930	0.08800	-0.01732	-0.00035	0.00087
29.26	1.29446	0.09001	-0.01771	-0.00039	0.00103
29.72	1.29997	0.09109	-0.01811	-0.00059	0.00084

Table 25. Aerodynamic Coefficients, $U_\infty = 10$ [in/sec], $Re = 2.15 \times 10^4$, $\alpha^+ = 0.05$

DYNAMIC PITCH-UP $\alpha = 0^\circ\text{-}30^\circ$					
α ($^\circ$)	C_N	C_M	C_S	C_{YM}	C_{RM}
0.17	-0.01604	0.00782	-0.00020	-0.00051	0.00083
0.72	-0.00896	0.00435	0.00120	-0.00052	0.00080
1.23	0.00321	0.00012	0.00254	-0.00054	0.00076
1.74	0.02406	-0.00433	0.00255	-0.00049	0.00065
2.25	0.04812	-0.00658	0.00193	-0.00047	0.00072
2.74	0.07163	-0.00931	0.00186	-0.00047	0.00068
3.24	0.09777	-0.01103	0.00160	-0.00048	0.00083
3.74	0.12060	-0.01163	0.00138	-0.00048	0.00085
4.24	0.14313	-0.01181	0.00090	-0.00049	0.00096
4.75	0.16506	-0.01200	0.00039	-0.00045	0.00104
5.25	0.18527	-0.01066	-0.00021	-0.00044	0.00114
5.75	0.20536	-0.00924	-0.00084	-0.00042	0.00124
6.25	0.22504	-0.00720	-0.00131	-0.00041	0.00137
6.74	0.24487	-0.00589	-0.00179	-0.00038	0.00148
7.24	0.26411	-0.00395	-0.00230	-0.00040	0.00158
7.74	0.28302	-0.00195	-0.00279	-0.00042	0.00168
8.24	0.30323	-0.00154	-0.00308	-0.00045	0.00174
8.74	0.32406	-0.00132	-0.00339	-0.00049	0.00178
9.25	0.34613	-0.00190	-0.00376	-0.00052	0.00178
9.74	0.36940	-0.00312	-0.00417	-0.00053	0.00176
10.24	0.39358	-0.00467	-0.00461	-0.00052	0.00172
10.76	0.41848	-0.00628	-0.00514	-0.00050	0.00168
11.24	0.44392	-0.00774	-0.00570	-0.00047	0.00162
11.74	0.46931	-0.00883	-0.00615	-0.00045	0.00153
12.25	0.49721	-0.00991	-0.00628	-0.00044	0.00150
12.75	0.52540	-0.01089	-0.00627	-0.00045	0.00144
13.25	0.55546	-0.01187	-0.00623	-0.00045	0.00140
13.75	0.58750	-0.01280	-0.00625	-0.00045	0.00138
14.25	0.62072	-0.01345	-0.00638	-0.00042	0.00137
14.75	0.65389	-0.01363	-0.00669	-0.00038	0.00138
15.25	0.68614	-0.01338	-0.00716	-0.00032	0.00140
15.75	0.71700	-0.01275	-0.00766	-0.00025	0.00143
16.24	0.74640	-0.01180	-0.00810	-0.00018	0.00146
16.74	0.77474	-0.01064	-0.00859	-0.00011	0.00148
17.24	0.80254	-0.00933	-0.00921	-0.00006	0.00150
17.74	0.83025	-0.00787	-0.00981	-0.00001	0.00151
18.24	0.85795	-0.00619	-0.01023	0.0000004	0.00150
18.74	0.88531	-0.00426	-0.01049	-0.00001	0.00150
19.24	0.91155	-0.00189	-0.01076	-0.00005	0.00147
19.74	0.93617	0.00103	-0.01123	-0.00009	0.00143

20.24	0.95914	0.00458	-0.01194	-0.00015	0.00136
20.74	0.98076	0.00868	-0.01286	-0.00020	0.00128
21.24	1.00162	0.01315	-0.01390	-0.00024	0.00118
21.74	1.02229	0.01784	-0.01496	-0.00027	0.00110
22.24	1.04319	0.02266	-0.01590	-0.00030	0.00103
22.74	1.06474	0.02747	-0.01650	-0.00032	0.00098
23.24	1.08758	0.03202	-0.01653	-0.00034	0.00095
23.74	1.11222	0.03617	-0.01601	-0.00035	0.00096
24.24	1.13903	0.03979	-0.01521	-0.00033	0.00103
24.75	1.16760	0.04354	-0.01452	-0.00032	0.00111
25.24	1.19798	0.04699	-0.01437	-0.00030	0.00123
25.74	1.22935	0.05106	-0.01468	-0.00030	0.00131
26.24	1.26010	0.05474	-0.01549	-0.00033	0.00139
26.75	1.29121	0.06012	-0.01636	-0.00040	0.00149
27.25	1.31976	0.06580	-0.01729	-0.00041	0.00134
27.75	1.34693	0.07242	-0.01804	-0.00053	0.00134
28.25	1.37155	0.07946	-0.01837	-0.00054	0.00109
28.74	1.39634	0.08476	-0.01872	-0.00058	0.00093
29.24	1.42056	0.09150	-0.01893	-0.00064	0.00075
29.71	1.44012	0.09397	-0.01987	-0.00059	0.00042

Table 26. Aerodynamic Coefficients, $U_{\infty} = 10$ [in/sec], $Re = 2.15 \times 10^4$, $\alpha^+ = 0.10$

DYNAMIC PITCH-UP $\alpha = 0^\circ\text{-}30^\circ$					
α ($^\circ$)	C_N	C_M	C_S	C_{YM}	C_{RM}
0.17	-0.00859	0.00223	0.00016	-0.00025	0.00041
0.72	0.00936	-0.00274	0.00139	-0.00016	0.00033
1.24	0.02644	-0.00316	0.00180	-0.00018	0.00037
1.74	0.04934	-0.00392	0.00106	-0.00024	0.00041
2.24	0.07275	-0.00491	0.00014	-0.00026	0.00044
2.74	0.09722	-0.00594	-0.00039	-0.00027	0.00048
3.24	0.12064	-0.00635	-0.00055	-0.00028	0.00056
3.74	0.14658	-0.00677	-0.00073	-0.00025	0.00065
4.24	0.17311	-0.00764	-0.00089	-0.00022	0.00073
4.74	0.19836	-0.00829	-0.00103	-0.00019	0.00084
5.24	0.22452	-0.00925	-0.00123	-0.00017	0.00089
5.75	0.24922	-0.00900	-0.00151	-0.00018	0.00101
6.25	0.27481	-0.00920	-0.00193	-0.00017	0.00112
6.74	0.29827	-0.00865	-0.00244	-0.00015	0.00121
7.25	0.32353	-0.00829	-0.00274	-0.00016	0.00140
7.75	0.34951	-0.00871	-0.00329	-0.00014	0.00149
8.24	0.37639	-0.00938	-0.00377	-0.00015	0.00155
8.74	0.40697	-0.01149	-0.00417	-0.00015	0.00160
9.24	0.43906	-0.01383	-0.00461	-0.00016	0.00160
9.75	0.47154	-0.01570	-0.00517	-0.00015	0.00161
10.25	0.50787	-0.01802	-0.00564	-0.00017	0.00155
10.74	0.54249	-0.02008	-0.00640	-0.00012	0.00143
11.25	0.57819	-0.02146	-0.00697	-0.00010	0.00133
11.75	0.60790	-0.02069	-0.00751	-0.00010	0.00125
12.24	0.63857	-0.01935	-0.00810	-0.00011	0.00117
12.74	0.66727	-0.01800	-0.00831	-0.00007	0.00110
13.25	0.69260	-0.01486	-0.00831	-0.00009	0.00108
13.74	0.71963	-0.01214	-0.00852	-0.00004	0.00113
14.24	0.74753	-0.00976	-0.00901	0.00002	0.00118
14.74	0.77578	-0.00761	-0.00930	0.00010	0.00130
15.25	0.80254	-0.00546	-0.00978	0.00013	0.00135
15.75	0.82977	-0.00312	-0.01033	0.00021	0.00146
16.25	0.85273	0.00003	-0.01068	0.00020	0.00150
16.74	0.87652	0.00262	-0.01092	0.00022	0.00156
17.25	0.89936	0.00534	-0.01120	0.00022	0.00155
17.74	0.91862	0.00983	-0.01159	0.00018	0.00157
18.24	0.94189	0.01287	-0.01196	0.00014	0.00152
18.75	0.96592	0.01621	-0.01226	0.00008	0.00149
19.24	0.99134	0.01936	-0.01228	0.00002	0.00141
19.74	1.01622	0.02256	-0.01242	-0.00005	0.00142

20.24	1.04240	0.02505	-0.01266	-0.00014	0.00142
20.75	1.06708	0.02812	-0.01324	-0.00016	0.00138
21.25	1.09296	0.03140	-0.01386	-0.00016	0.00129
21.74	1.11514	0.03418	-0.01429	-0.00017	0.00130
22.25	1.13862	0.03767	-0.01502	-0.00014	0.00123
22.75	1.16144	0.04100	-0.01560	-0.00009	0.00117
23.24	1.18301	0.04400	-0.01588	-0.00008	0.00108
23.74	1.20018	0.04729	-0.01601	-0.00008	0.00112
24.25	1.22335	0.05020	-0.01584	-0.00006	0.00106
24.74	1.24509	0.05329	-0.01551	-0.00009	0.00114
25.24	1.26998	0.05579	-0.01568	-0.00007	0.00099
25.74	1.29354	0.05831	-0.01630	-0.00011	0.00099
26.24	1.31751	0.06123	-0.01692	-0.00015	0.00087
26.75	1.34000	0.06397	-0.01755	-0.00019	0.00074
27.25	1.36130	0.06634	-0.01781	-0.00023	0.00063
27.75	1.38088	0.06841	-0.01787	-0.00028	0.00063
28.25	1.39938	0.07003	-0.01762	-0.00033	0.00065
28.75	1.41048	0.07142	-0.01740	-0.00040	0.00075
29.25	1.41960	0.07082	-0.01761	-0.00051	0.00076
29.71	1.41482	0.06717	-0.01724	-0.00055	0.00055

Table 27. Aerodynamic Coefficients, $U_{\infty} = 14$ [in/sec], $Re = 2.94 \times 10^4$, $\alpha^+ = 0.05$

D. DYNAMIC AERODYNAMIC COEFFICIENTS, ROLL MANEUVER

DYNAMIC ROLL $\phi = 0^\circ\text{-}90^\circ$					
$\phi (^\circ)$	C_N	C_M	C_S	C_{YM}	C_{RM}
0.24	-0.42449	0.25959	-0.00206	-0.00036	0.00199
0.74	-0.43418	0.26263	0.00414	-0.00064	0.00173
1.25	-0.44311	0.26886	0.00826	-0.00086	0.00120
1.74	-0.41311	0.25477	0.01005	-0.00121	0.00099
2.25	-0.43157	0.26042	0.00783	-0.00057	0.00086
2.75	-0.42671	0.26167	0.00848	-0.00078	0.00054
3.25	-0.42278	0.25837	0.00799	-0.00062	0.00034
3.74	-0.41078	0.24846	0.00707	-0.00034	0.00010
4.25	-0.40943	0.24314	0.00668	0.00002	-0.00004
4.74	-0.42783	0.26615	0.00646	-0.00058	0.00032
5.25	-0.42428	0.26140	0.00376	-0.00030	0.00034
5.75	-0.40931	0.24876	0.00396	0.00008	0.00001
6.24	-0.42368	0.25822	0.00328	0.00037	-0.00030
6.75	-0.40710	0.25020	0.00336	0.00013	-0.00022
7.25	-0.41539	0.25626	0.00308	-0.00013	-0.00005
7.75	-0.41891	0.25890	0.00272	-0.00006	-0.00005
8.25	-0.42839	0.26194	0.00037	0.00084	-0.00056
8.75	-0.44081	0.27014	0.00116	0.00078	-0.00038
9.25	-0.43301	0.27202	0.00254	-0.00040	-0.00016
9.75	-0.42943	0.26431	0.00122	0.00024	-0.00063
10.25	-0.42745	0.26128	0.00183	0.00032	-0.00059
10.75	-0.43016	0.26938	-0.00031	0.00004	-0.00032
11.25	-0.41577	0.25684	-0.00092	0.00047	-0.00069
11.75	-0.41591	0.25750	0.00011	0.00077	-0.00111
12.25	-0.43476	0.26695	0.00040	0.00077	-0.00088
12.75	-0.43261	0.26392	-0.00052	0.00071	-0.00055
13.25	-0.42343	0.26012	-0.00075	0.00043	-0.00074
13.75	-0.43221	0.26698	-0.00133	0.00087	-0.00110
14.25	-0.45347	0.28022	-0.00139	0.00098	-0.00098
14.75	-0.45895	0.28090	-0.00198	0.00075	-0.00083
15.25	-0.43587	0.26313	-0.00177	0.00063	-0.00137
15.75	-0.43946	0.26627	-0.00112	0.00092	-0.00159
16.25	-0.43349	0.27204	-0.00338	0.00114	-0.00117
16.75	-0.44217	0.27465	-0.00377	0.00121	-0.00116
17.25	-0.45028	0.27438	-0.00242	0.00112	-0.00112
17.75	-0.41834	0.25544	-0.00142	0.00097	-0.00128
18.25	-0.42803	0.26259	-0.00358	0.00123	-0.00123
18.75	-0.45027	0.27806	-0.00457	0.00115	-0.00095

19.25	-0.45365	0.27549	-0.00471	0.00151	-0.00120
19.75	-0.45316	0.28101	-0.00575	0.00155	-0.00089
20.25	-0.44151	0.27502	-0.00530	0.00147	-0.00095
20.75	-0.44805	0.27601	-0.00361	0.00132	-0.00101
21.25	-0.44878	0.27519	-0.00245	0.00101	-0.00120
21.75	-0.46155	0.28332	-0.00221	0.00084	-0.00084
22.25	-0.46074	0.28388	-0.00416	0.00145	-0.00096
22.75	-0.45480	0.28477	-0.00521	0.00153	-0.00117
23.25	-0.47762	0.29804	-0.00487	0.00114	-0.00108
23.75	-0.46582	0.28951	-0.00545	0.00123	-0.00116
24.25	-0.45967	0.28480	-0.00589	0.00154	-0.00131
24.75	-0.44881	0.27771	-0.00490	0.00124	-0.00097
25.24	-0.42764	0.26267	-0.00513	0.00133	-0.00115
25.74	-0.44126	0.26935	-0.00730	0.00206	-0.00164
26.24	-0.45859	0.27877	-0.00790	0.00209	-0.00135
26.74	-0.45278	0.28131	-0.00861	0.00193	-0.00108
27.25	-0.44639	0.28307	-0.00943	0.00178	-0.00136
27.75	-0.45437	0.28319	-0.00899	0.00171	-0.00107
28.25	-0.45823	0.28224	-0.00859	0.00143	-0.00061
28.75	-0.44410	0.28071	-0.00949	0.00159	-0.00093
29.25	-0.43596	0.28040	-0.01086	0.00173	-0.00115
29.75	-0.44519	0.27897	-0.01139	0.00189	-0.00117
30.25	-0.46456	0.28786	-0.01119	0.00180	-0.00106
30.75	-0.46222	0.28833	-0.01207	0.00181	-0.00120
31.25	-0.45973	0.29089	-0.01242	0.00196	-0.00117
31.75	-0.45461	0.28993	-0.01103	0.00203	-0.00125
32.25	-0.44722	0.28340	-0.01073	0.00191	-0.00139
32.75	-0.45280	0.28042	-0.01152	0.00227	-0.00184
33.25	-0.43273	0.26622	-0.01097	0.00244	-0.00195
33.75	-0.43735	0.27421	-0.01290	0.00238	-0.00157
34.25	-0.43086	0.27063	-0.01344	0.00222	-0.00139
34.75	-0.41573	0.26160	-0.01190	0.00214	-0.00168
35.25	-0.42520	0.27111	-0.01046	0.00175	-0.00136
35.75	-0.44138	0.27697	-0.00935	0.00183	-0.00152
36.25	-0.43451	0.27015	-0.01066	0.00205	-0.00167
36.75	-0.43496	0.27292	-0.01077	0.00217	-0.00154
37.25	-0.46063	0.29187	-0.01100	0.00203	-0.00136
37.75	-0.45479	0.28955	-0.01194	0.00211	-0.00128
38.25	-0.43937	0.28229	-0.00992	0.00151	-0.00101
38.75	-0.43221	0.27215	-0.00824	0.00149	-0.00114
39.25	-0.43840	0.27359	-0.00871	0.00181	-0.00143
39.75	-0.42750	0.26629	-0.01025	0.00232	-0.00191

40.25	-0.43252	0.27024	-0.01104	0.00260	-0.00214
40.75	-0.43866	0.27149	-0.00985	0.00283	-0.00179
41.25	-0.42822	0.26419	-0.00830	0.00252	-0.00152
41.75	-0.42072	0.26522	-0.00861	0.00204	-0.00123
42.25	-0.43530	0.27506	-0.00811	0.00206	-0.00137
42.75	-0.43850	0.27308	-0.00629	0.00221	-0.00173
43.25	-0.43861	0.27320	-0.00560	0.00214	-0.00158
43.75	-0.44149	0.27492	-0.00633	0.00227	-0.00162
44.25	-0.42487	0.26509	-0.00525	0.00218	-0.00167
44.75	-0.40190	0.25135	-0.00271	0.00176	-0.00150
45.25	-0.42208	0.26410	-0.00329	0.00154	-0.00145
45.75	-0.41958	0.26227	-0.00619	0.00201	-0.00199
46.25	-0.40041	0.25158	-0.00731	0.00246	-0.00219
46.75	-0.42316	0.26887	-0.00683	0.00208	-0.00143
47.25	-0.44499	0.28920	-0.00996	0.00204	-0.00084
47.75	-0.43914	0.28394	-0.01120	0.00243	-0.00135
48.25	-0.42338	0.26514	-0.00843	0.00253	-0.00149
48.75	-0.41556	0.26265	-0.00849	0.00222	-0.00132
49.25	-0.42365	0.27189	-0.01192	0.00229	-0.00188
49.75	-0.41649	0.26498	-0.01207	0.00251	-0.00191
50.25	-0.41645	0.26121	-0.00962	0.00240	-0.00166
50.75	-0.41375	0.25791	-0.01052	0.00264	-0.00199
51.25	-0.41395	0.26087	-0.01261	0.00291	-0.00225
51.75	-0.40150	0.25605	-0.01266	0.00269	-0.00199
52.25	-0.40840	0.26114	-0.01202	0.00259	-0.00196
52.75	-0.40443	0.25611	-0.01227	0.00271	-0.00223
53.25	-0.40009	0.25533	-0.01374	0.00263	-0.00216
53.75	-0.39878	0.25574	-0.01480	0.00296	-0.00222
54.25	-0.39932	0.25818	-0.01475	0.00279	-0.00207
54.75	-0.40667	0.26422	-0.01588	0.00249	-0.00201
55.25	-0.38613	0.25143	-0.01662	0.00261	-0.00213
55.75	-0.38213	0.24703	-0.01476	0.00289	-0.00229
56.25	-0.40207	0.25835	-0.01422	0.00279	-0.00222
56.75	-0.41188	0.26451	-0.01539	0.00259	-0.00213
57.25	-0.39136	0.25138	-0.01354	0.00275	-0.00218
57.75	-0.40294	0.26049	-0.01487	0.00289	-0.00203
58.25	-0.41308	0.27125	-0.01540	0.00248	-0.00184
58.75	-0.38814	0.25634	-0.01352	0.00211	-0.00199
59.25	-0.40879	0.26740	-0.01439	0.00261	-0.00205
59.75	-0.43740	0.28585	-0.01558	0.00275	-0.00194
60.25	-0.43069	0.28474	-0.01551	0.00251	-0.00186
60.75	-0.39151	0.25703	-0.01210	0.00236	-0.00237

61.25	-0.37686	0.24447	-0.01056	0.00228	-0.00224
61.75	-0.37864	0.24628	-0.01148	0.00238	-0.00187
62.25	-0.38289	0.25371	-0.01050	0.00193	-0.00171
62.75	-0.39131	0.25691	-0.00940	0.00196	-0.00193
63.25	-0.38388	0.24777	-0.00959	0.00252	-0.00251
63.75	-0.38431	0.25108	-0.00872	0.00237	-0.00247
64.25	-0.37921	0.24897	-0.00830	0.00181	-0.00224
64.75	-0.37389	0.24155	-0.00789	0.00219	-0.00241
65.25	-0.38721	0.25223	-0.00657	0.00238	-0.00210
65.75	-0.39333	0.25597	-0.00531	0.00225	-0.00214
66.25	-0.36888	0.24054	-0.00323	0.00170	-0.00229
66.74	-0.37583	0.24879	-0.00258	0.00137	-0.00213
67.25	-0.38594	0.25666	-0.00150	0.00139	-0.00227
67.75	-0.39056	0.25594	-0.00184	0.00179	-0.00265
68.25	-0.39426	0.25864	-0.00454	0.00203	-0.00239
68.75	-0.38864	0.25872	-0.00413	0.00159	-0.00193
69.25	-0.37399	0.24697	-0.00480	0.00187	-0.00240
69.75	-0.35893	0.24082	-0.00681	0.00175	-0.00216
70.25	-0.35955	0.24224	-0.00733	0.00180	-0.00194
70.75	-0.39403	0.26128	-0.00940	0.00237	-0.00204
71.25	-0.38859	0.25988	-0.01080	0.00237	-0.00208
71.75	-0.36366	0.24621	-0.01064	0.00219	-0.00244
72.25	-0.38412	0.25837	-0.01212	0.00242	-0.00214
72.75	-0.37546	0.25015	-0.01328	0.00289	-0.00232
73.25	-0.36899	0.24683	-0.01249	0.00251	-0.00250
73.75	-0.36084	0.24493	-0.01209	0.00205	-0.00214
74.25	-0.36823	0.25338	-0.01391	0.00216	-0.00194
74.75	-0.36046	0.24709	-0.01633	0.00267	-0.00242
75.25	-0.36101	0.24570	-0.01580	0.00287	-0.00278
75.75	-0.35732	0.24285	-0.01214	0.00225	-0.00264
76.25	-0.35901	0.24140	-0.01312	0.00229	-0.00243
76.75	-0.36734	0.24655	-0.01640	0.00276	-0.00262
77.25	-0.35304	0.24235	-0.01690	0.00260	-0.00231
77.75	-0.34041	0.23587	-0.01433	0.00221	-0.00199
78.25	-0.36117	0.24900	-0.01382	0.00198	-0.00179
78.75	-0.36984	0.25504	-0.01727	0.00260	-0.00190
79.25	-0.33004	0.22842	-0.01562	0.00246	-0.00222
79.75	-0.32021	0.22169	-0.01410	0.00210	-0.00233
80.25	-0.34587	0.23629	-0.01449	0.00251	-0.00247
80.75	-0.33737	0.23602	-0.01370	0.00237	-0.00199
81.25	-0.34079	0.23873	-0.01276	0.00187	-0.00193
81.75	-0.33960	0.23809	-0.01641	0.00233	-0.00188

82.25	-0.35948	0.25363	-0.01348	0.00186	-0.00134
82.75	-0.34262	0.23901	-0.01360	0.00194	-0.00136
83.25	-0.32583	0.22345	-0.01331	0.00216	-0.00174
83.75	-0.31161	0.21725	-0.01181	0.00252	-0.00202
84.26	-0.32851	0.22557	-0.01195	0.00241	-0.00180
84.75	-0.32963	0.23397	-0.01219	0.00179	-0.00136
85.25	-0.33383	0.23432	-0.00933	0.00169	-0.00134
85.75	-0.34661	0.24462	-0.00966	0.00160	-0.00095
86.25	-0.32262	0.23168	-0.00644	0.00088	-0.00086
86.76	-0.31626	0.22196	-0.00679	0.00159	-0.00099
87.25	-0.32097	0.22684	-0.00493	0.00117	-0.00106
87.76	-0.33242	0.23376	-0.00522	0.00119	-0.00087
88.25	-0.31539	0.22464	-0.00347	0.00092	-0.00034
88.75	-0.31015	0.22058	-0.00253	0.00126	-0.00051
89.26	-0.31074	0.22296	-0.00231	0.00098	-0.00003
89.74	-0.31880	0.22544	-0.00128	0.00100	0.00016

Table 28. Aerodynamic Coefficients, $U_{\infty} = 6$ [in/sec], $Re = 1.17 \times 10^4$,
 $\alpha = 0^{\circ}$, $\dot{\phi} = 3^{\circ}/\text{sec}$

DYNAMIC ROLL $\phi = 0^\circ\text{-}90^\circ$					
ϕ ($^\circ$)	C_N	C_M	C_S	C_{YM}	C_{RM}
0.24	-0.31663	0.31803	0.00304	-0.00084	-0.00051
0.74	-0.30760	0.31517	0.00839	-0.00112	-0.00019
1.25	-0.31942	0.32212	0.01297	-0.00156	-0.00074
1.74	-0.31526	0.32381	0.01369	-0.00165	-0.00086
2.25	-0.31448	0.32217	0.01481	-0.00182	-0.00064
2.75	-0.31976	0.32434	0.01419	-0.00163	-0.00118
3.25	-0.31979	0.32636	0.01462	-0.00181	-0.00115
3.74	-0.31575	0.32243	0.01387	-0.00166	-0.00141
4.25	-0.31298	0.31781	0.01255	-0.00133	-0.00142
4.74	-0.29943	0.30939	0.01125	-0.00101	-0.00186
5.25	-0.32308	0.32368	0.01098	-0.00097	-0.00179
5.75	-0.32981	0.32815	0.01028	-0.00114	-0.00151
6.24	-0.32285	0.33004	0.00882	-0.00112	-0.00194
6.75	-0.31619	0.31721	0.00969	-0.00076	-0.00239
7.25	-0.32355	0.32424	0.00975	-0.00103	-0.00238
7.75	-0.31679	0.32273	0.00931	-0.00104	-0.00203
8.25	-0.32763	0.32388	0.00980	-0.00071	-0.00250
8.75	-0.31876	0.31884	0.00808	-0.00034	-0.00254
9.25	-0.32607	0.32593	0.00795	-0.00055	-0.00256
9.75	-0.35375	0.34614	0.00756	-0.00098	-0.00264
10.25	-0.33948	0.33341	0.00796	-0.00069	-0.00275
10.75	-0.33575	0.33115	0.00691	-0.00041	-0.00274
11.25	-0.34360	0.34323	0.00579	-0.00081	-0.00227
11.75	-0.34255	0.34134	0.00621	-0.00106	-0.00230
12.25	-0.33652	0.33080	0.00590	-0.00027	-0.00276
12.75	-0.33408	0.33390	0.00637	-0.00027	-0.00256
13.25	-0.34112	0.34522	0.00505	-0.00088	-0.00212
13.75	-0.34736	0.34902	0.00491	-0.00080	-0.00208
14.25	-0.34780	0.34607	0.00643	-0.00054	-0.00243
14.75	-0.34867	0.33828	0.00508	-0.00006	-0.00252
15.25	-0.34278	0.33275	0.00388	-0.00002	-0.00280
15.75	-0.33577	0.33165	0.00357	-0.00004	-0.00296
16.25	-0.35029	0.34374	0.00411	0.00001	-0.00299
16.75	-0.35441	0.34472	0.00476	-0.00023	-0.00269
17.25	-0.35076	0.33436	0.00409	-0.00007	-0.00276

17.75	-0.36767	0.34555	0.00245	-0.00006	-0.00286
18.25	-0.36410	0.34551	0.00296	0.00010	-0.00289
18.75	-0.35811	0.34082	0.00400	-0.00007	-0.00281
19.25	-0.37735	0.35139	0.00361	0.00012	-0.00302
19.75	-0.38583	0.35891	0.00354	0.00013	-0.00302
20.25	-0.37269	0.35316	0.00402	0.00001	-0.00286
20.75	-0.37364	0.35026	0.00402	-0.00005	-0.00270
21.25	-0.38835	0.35809	0.00413	-0.00031	-0.00272
21.75	-0.38524	0.35549	0.00454	-0.00032	-0.00296
22.25	-0.38054	0.35459	0.00386	-0.00023	-0.00273
22.75	-0.38278	0.35617	0.00193	0.00009	-0.00282
23.25	-0.38691	0.35414	0.00081	0.00052	-0.00297
23.75	-0.37215	0.34719	0.00077	0.00056	-0.00306
24.24	-0.37637	0.35351	0.00083	0.00026	-0.00276
24.74	-0.37230	0.34927	0.00035	0.00011	-0.00279
25.24	-0.36265	0.34127	-0.00046	0.00041	-0.00310
25.74	-0.36299	0.34047	0.00018	0.00036	-0.00293
26.24	-0.37200	0.34964	-0.00120	0.00042	-0.00276
26.75	-0.36928	0.34983	-0.00285	0.00079	-0.00328
27.25	-0.38589	0.36094	-0.00231	0.00070	-0.00329
27.75	-0.38819	0.36237	-0.00239	0.00032	-0.00273
28.25	-0.38104	0.35191	-0.00347	0.00080	-0.00301
28.75	-0.38866	0.35651	-0.00324	0.00080	-0.00306
29.25	-0.37620	0.35304	-0.00369	0.00047	-0.00281
29.75	-0.36595	0.34584	-0.00439	0.00055	-0.00313
30.25	-0.37321	0.34576	-0.00355	0.00063	-0.00322
30.75	-0.36799	0.34160	-0.00450	0.00088	-0.00324
31.25	-0.36430	0.34396	-0.00554	0.00109	-0.00329
31.75	-0.38793	0.35543	-0.00451	0.00102	-0.00318
32.25	-0.37242	0.33975	-0.00383	0.00117	-0.00337
32.75	-0.36800	0.33944	-0.00286	0.00088	-0.00327
33.25	-0.39358	0.35786	-0.00473	0.00095	-0.00335
33.75	-0.39774	0.36232	-0.00685	0.00098	-0.00357
34.25	-0.39819	0.36817	-0.00651	0.00066	-0.00337
34.75	-0.39627	0.36251	-0.00521	0.00070	-0.00313
35.25	-0.39631	0.35268	-0.00423	0.00079	-0.00311
35.75	-0.37207	0.33630	-0.00308	0.00048	-0.00323

36.25	-0.36016	0.33096	-0.00412	0.00059	-0.00342
36.75	-0.36221	0.33203	-0.00587	0.00103	-0.00351
37.25	-0.37218	0.33358	-0.00556	0.00149	-0.00386
37.75	-0.39581	0.35408	-0.00618	0.00112	-0.00348
38.25	-0.39799	0.35782	-0.00493	0.00081	-0.00346
38.75	-0.38079	0.34461	-0.00229	0.00035	-0.00377
39.25	-0.37928	0.34255	-0.00079	0.00017	-0.00388
39.76	-0.37149	0.33639	-0.00277	0.00059	-0.00346
40.26	-0.37205	0.33577	-0.00415	0.00099	-0.00336
40.75	-0.37190	0.33131	-0.00353	0.00140	-0.00413
41.25	-0.37598	0.33802	-0.00223	0.00081	-0.00383
41.75	-0.37430	0.33958	-0.00208	0.00060	-0.00357
42.25	-0.36712	0.33259	-0.00164	0.00087	-0.00379
42.75	-0.36602	0.32840	-0.00026	0.00088	-0.00351
43.25	-0.40376	0.34756	-0.00133	0.00103	-0.00331
43.75	-0.40738	0.35073	-0.00082	0.00103	-0.00358
44.25	-0.39604	0.34641	0.00073	0.00072	-0.00345
44.75	-0.39799	0.34514	0.00147	0.00075	-0.00342
45.25	-0.39446	0.34598	0.00008	0.00079	-0.00362
45.75	-0.37850	0.33652	0.00037	0.00045	-0.00349
46.25	-0.38325	0.33747	0.00106	0.00045	-0.00329
46.75	-0.38590	0.33951	0.00063	0.00071	-0.00333
47.25	-0.37294	0.32906	0.00046	0.00043	-0.00345
47.75	-0.36476	0.31785	-0.00144	0.00083	-0.00384
48.25	-0.36649	0.31850	-0.00256	0.00118	-0.00401
48.75	-0.37562	0.32693	-0.00269	0.00090	-0.00400
49.25	-0.37792	0.32480	-0.00284	0.00082	-0.00412
49.75	-0.37841	0.32108	-0.00332	0.00097	-0.00435
50.25	-0.38298	0.32865	-0.00452	0.00117	-0.00409
50.75	-0.38812	0.33265	-0.00502	0.00108	-0.00384
51.25	-0.38444	0.33180	-0.00573	0.00081	-0.00390
51.75	-0.37436	0.32553	-0.00529	0.00070	-0.00438
52.25	-0.38031	0.32497	-0.00561	0.00106	-0.00447
52.75	-0.39033	0.33349	-0.00721	0.00103	-0.00409
53.25	-0.37444	0.32776	-0.00786	0.00108	-0.00431
53.75	-0.37195	0.32273	-0.00660	0.00098	-0.00445
54.25	-0.36572	0.31489	-0.00621	0.00073	-0.00412

54.75	-0.35706	0.30779	-0.00878	0.00116	-0.00414
55.25	-0.36807	0.31742	-0.00975	0.00107	-0.00400
55.75	-0.38400	0.33146	-0.01011	0.00085	-0.00357
56.25	-0.38454	0.32721	-0.01005	0.00114	-0.00406
56.75	-0.38171	0.32302	-0.00920	0.00091	-0.00401
57.25	-0.36966	0.31529	-0.00834	0.00062	-0.00410
57.75	-0.36551	0.31156	-0.00957	0.00108	-0.00437
58.25	-0.37634	0.31679	-0.01034	0.00124	-0.00434
58.75	-0.37615	0.31430	-0.00935	0.00134	-0.00432
59.25	-0.36603	0.30988	-0.00883	0.00137	-0.00445
59.75	-0.36071	0.30817	-0.00903	0.00117	-0.00438
60.25	-0.36733	0.31202	-0.00827	0.00076	-0.00393
60.75	-0.36452	0.30870	-0.00751	0.00076	-0.00417
61.25	-0.38150	0.31875	-0.00792	0.00097	-0.00411
61.75	-0.38229	0.31525	-0.00744	0.00089	-0.00405
62.25	-0.37625	0.31106	-0.00819	0.00095	-0.00437
62.75	-0.37779	0.30646	-0.00634	0.00111	-0.00451
63.25	-0.39023	0.31447	-0.00425	0.00051	-0.00422
63.75	-0.36933	0.30409	-0.00206	-0.00017	-0.00441
64.25	-0.36552	0.29641	-0.00181	0.00045	-0.00473
64.75	-0.36558	0.29467	-0.00204	0.00074	-0.00478
65.25	-0.37053	0.29904	-0.00260	0.00072	-0.00494
65.75	-0.39401	0.31605	-0.00390	0.00076	-0.00466
66.25	-0.39127	0.31358	0.00077	0.00063	-0.00477
66.75	-0.39295	0.30943	0.00315	0.00076	-0.00518
67.26	-0.40419	0.31496	0.00233	0.00061	-0.00477
67.75	-0.37667	0.29510	0.00233	0.00039	-0.00464
68.25	-0.36708	0.28982	0.00098	0.00047	-0.00462
68.75	-0.37352	0.29999	0.00066	0.00006	-0.00405
69.25	-0.37501	0.30339	0.00018	-0.00025	-0.00411
69.75	-0.37227	0.29476	-0.00055	0.00051	-0.00458
70.25	-0.37346	0.29565	-0.00250	0.00055	-0.00469
70.75	-0.38481	0.30334	-0.00526	0.00047	-0.00468
71.25	-0.37867	0.29965	-0.00597	0.00057	-0.00464
71.75	-0.38418	0.30533	-0.00414	0.00015	-0.00436
72.25	-0.38320	0.30022	-0.00462	0.00041	-0.00466
72.75	-0.36765	0.28314	-0.00485	0.00071	-0.00511

73.25	-0.36568	0.28059	-0.00585	0.00088	-0.00517
73.75	-0.37104	0.28719	-0.00765	0.00103	-0.00495
74.25	-0.37495	0.29286	-0.00753	0.00064	-0.00455
74.75	-0.36965	0.28618	-0.00815	0.00070	-0.00434
75.25	-0.39877	0.30084	-0.01058	0.00136	-0.00504
75.75	-0.40880	0.30574	-0.01056	0.00139	-0.00506
76.25	-0.39472	0.29911	-0.00965	0.00071	-0.00451
76.75	-0.38247	0.29273	-0.00914	0.00047	-0.00454
77.25	-0.39445	0.29882	-0.00952	0.00094	-0.00485
77.75	-0.37896	0.28753	-0.00955	0.00075	-0.00490
78.25	-0.35800	0.27353	-0.01010	0.00053	-0.00464
78.75	-0.36427	0.27863	-0.00925	0.00062	-0.00470
79.25	-0.39330	0.29630	-0.01250	0.00089	-0.00433
79.75	-0.39651	0.29354	-0.01053	0.00097	-0.00437
80.25	-0.39588	0.29445	-0.00879	0.00051	-0.00417
80.75	-0.38482	0.28528	-0.01029	0.00055	-0.00397
81.25	-0.37133	0.26835	-0.01017	0.00111	-0.00458
81.75	-0.36744	0.27052	-0.00984	0.00117	-0.00429
82.25	-0.35436	0.26591	-0.00738	0.00059	-0.00446
82.75	-0.37379	0.27619	-0.00765	0.00057	-0.00418
83.25	-0.37871	0.27856	-0.00887	0.00094	-0.00414
83.75	-0.38135	0.27895	-0.00704	0.00042	-0.00367
84.26	-0.37907	0.27635	-0.00764	0.00032	-0.00350
84.75	-0.39135	0.28534	-0.00541	-0.00012	-0.00306
85.25	-0.40370	0.29386	-0.00506	0.00007	-0.00305
85.75	-0.39571	0.28106	-0.00303	0.00030	-0.00340
86.25	-0.37827	0.27102	-0.00353	0.00018	-0.00341
86.76	-0.39831	0.28345	-0.00127	0.00009	-0.00306
87.25	-0.36576	0.25810	-0.00200	0.00057	-0.00347
87.76	-0.38193	0.26979	0.00084	-0.00016	-0.00294
88.25	-0.41028	0.28472	-0.00087	0.00036	-0.00306
88.75	-0.37652	0.26622	0.00312	-0.00060	-0.00270
89.26	-0.36729	0.25872	0.00419	-0.00030	-0.00248
89.74	-0.39168	0.27411	0.00390	-0.00050	-0.00190

Table 29. Aerodynamic Coefficients, $U_{\infty} = 6$ [in/sec], $Re = 1.17 \times 10^4$,
 $\alpha = 5^\circ$, $\dot{\phi} = 3^\circ/\text{sec}$

DYNAMIC ROLL $\phi = 0^\circ\text{-}90^\circ$					
ϕ ($^\circ$)	C_N	C_M	C_S	C_{YM}	C_{RM}
0.24	-0.00901	0.31850	-0.02807	0.00711	0.00309
0.74	-0.01822	0.31967	-0.02389	0.00729	0.00304
1.25	0.00477	0.31104	-0.01730	0.00626	0.00253
1.74	-0.00513	0.31878	-0.01841	0.00674	0.00247
2.25	-0.01030	0.31730	-0.01677	0.00671	0.00196
2.75	0.00012	0.31650	-0.01643	0.00606	0.00187
3.25	-0.01870	0.32686	-0.01919	0.00718	0.00131
3.74	-0.00069	0.31639	-0.01781	0.00690	0.00113
4.25	-0.00340	0.31709	-0.01869	0.00665	0.00143
4.74	0.00827	0.30947	-0.01807	0.00676	0.00082
5.25	-0.00386	0.31772	-0.02069	0.00720	0.00112
5.75	0.00068	0.31340	-0.02167	0.00779	0.00075
6.24	-0.00134	0.32027	-0.02201	0.00744	0.00103
6.75	-0.01621	0.32706	-0.02439	0.00743	0.00054
7.25	-0.00858	0.31797	-0.02227	0.00759	0.00014
7.75	-0.02658	0.32846	-0.02268	0.00760	0.00033
8.25	-0.01325	0.32657	-0.02422	0.00716	0.00048
8.75	-0.01324	0.32662	-0.02365	0.00746	0.00043
9.25	-0.03026	0.32906	-0.02365	0.00790	0.00027
9.75	-0.03310	0.32219	-0.02407	0.00810	-0.00032
10.25	-0.04297	0.33111	-0.02585	0.00836	-0.00041
10.75	-0.03173	0.33995	-0.02589	0.00773	0.00014
11.25	-0.03498	0.34556	-0.02626	0.00772	0.00014
11.75	-0.03333	0.33600	-0.02705	0.00793	-0.00049
12.25	-0.02928	0.33111	-0.02654	0.00811	-0.00078
12.75	-0.03284	0.33675	-0.02617	0.00805	-0.00006
13.25	-0.03684	0.33940	-0.02810	0.00815	-0.00016
13.75	-0.03053	0.33559	-0.03062	0.00843	-0.00031
14.25	-0.04987	0.34664	-0.02890	0.00842	-0.00039
14.75	-0.06560	0.35411	-0.02703	0.00838	-0.00028
15.25	-0.05712	0.34811	-0.02639	0.00797	-0.00053
15.75	-0.05144	0.34094	-0.02887	0.00840	-0.00090
16.25	-0.05236	0.33713	-0.02975	0.00881	-0.00092
16.75	-0.05812	0.33768	-0.03004	0.00888	-0.00072
17.25	-0.07682	0.35266	-0.03091	0.00853	-0.00052

17.75	-0.08590	0.36373	-0.03136	0.00851	-0.00081
18.25	-0.06546	0.34989	-0.03061	0.00846	-0.00151
18.75	-0.06914	0.34839	-0.02815	0.00817	-0.00123
19.25	-0.08575	0.35207	-0.02801	0.00836	-0.00083
19.75	-0.09992	0.36006	-0.03080	0.00867	-0.00112
20.25	-0.07977	0.34831	-0.03094	0.00855	-0.00121
20.75	-0.08103	0.34467	-0.02855	0.00862	-0.00116
21.25	-0.10305	0.36099	-0.02905	0.00884	-0.00147
21.75	-0.11033	0.36704	-0.03005	0.00856	-0.00121
22.25	-0.12492	0.36803	-0.03134	0.00859	-0.00088
22.75	-0.11022	0.35428	-0.03160	0.00885	-0.00132
23.25	-0.09337	0.35024	-0.02965	0.00833	-0.00100
23.75	-0.09617	0.35089	-0.03229	0.00880	-0.00082
24.25	-0.11192	0.35864	-0.03479	0.00919	-0.00136
24.75	-0.09551	0.34686	-0.03372	0.00928	-0.00184
25.24	-0.10131	0.34954	-0.03214	0.00920	-0.00124
25.74	-0.11099	0.35318	-0.03334	0.00918	-0.00108
26.24	-0.10624	0.34730	-0.03561	0.00935	-0.00158
26.74	-0.10037	0.34484	-0.03509	0.00938	-0.00168
27.25	-0.09649	0.34142	-0.03208	0.00902	-0.00145
27.75	-0.11673	0.35052	-0.03543	0.00958	-0.00142
28.25	-0.12399	0.35151	-0.03945	0.01024	-0.00167
28.75	-0.10869	0.34427	-0.03823	0.00977	-0.00208
29.25	-0.09599	0.33440	-0.03526	0.00916	-0.00199
29.75	-0.10851	0.33811	-0.03640	0.00907	-0.00163
30.25	-0.12735	0.34774	-0.03781	0.00953	-0.00209
30.75	-0.12819	0.35052	-0.03868	0.00977	-0.00215
31.25	-0.12788	0.35051	-0.03988	0.00976	-0.00185
31.75	-0.13503	0.35660	-0.04202	0.00977	-0.00181
32.25	-0.14569	0.35973	-0.04109	0.00962	-0.00180
32.75	-0.14946	0.35844	-0.03759	0.00908	-0.00183
33.25	-0.13887	0.34921	-0.03680	0.00921	-0.00219
33.75	-0.15124	0.35026	-0.03941	0.00966	-0.00224
34.25	-0.15785	0.35470	-0.04153	0.01015	-0.00219
34.75	-0.15051	0.35362	-0.04160	0.01032	-0.00251
35.25	-0.16900	0.35759	-0.04123	0.01047	-0.00275
35.75	-0.17308	0.36144	-0.04041	0.00974	-0.00239

36.25	-0.15960	0.35387	-0.03915	0.00953	-0.00216
36.75	-0.15600	0.34001	-0.03794	0.01018	-0.00269
37.25	-0.16328	0.33810	-0.04040	0.01058	-0.00315
37.75	-0.19190	0.35968	-0.04074	0.01018	-0.00279
38.25	-0.19108	0.36058	-0.03914	0.01011	-0.00265
38.75	-0.18078	0.35282	-0.03950	0.01056	-0.00291
39.25	-0.19664	0.35609	-0.03822	0.01026	-0.00326
39.76	-0.19871	0.35261	-0.03528	0.00975	-0.00300
40.26	-0.17459	0.33590	-0.03445	0.00976	-0.00307
40.76	-0.17658	0.34134	-0.03501	0.00940	-0.00318
41.25	-0.19769	0.35253	-0.03527	0.00934	-0.00286
41.75	-0.21999	0.36051	-0.03659	0.00985	-0.00307
42.25	-0.23206	0.37003	-0.03528	0.00940	-0.00292
42.75	-0.21411	0.35643	-0.03404	0.00950	-0.00298
43.25	-0.20929	0.34842	-0.03407	0.00977	-0.00340
43.75	-0.23204	0.35541	-0.03265	0.00976	-0.00396
44.25	-0.22329	0.34592	-0.03031	0.00999	-0.00436
44.75	-0.22407	0.34099	-0.03004	0.00999	-0.00401
45.25	-0.23254	0.34354	-0.03011	0.00940	-0.00367
45.75	-0.21839	0.33851	-0.03192	0.00928	-0.00366
46.25	-0.22088	0.34168	-0.03288	0.00935	-0.00377
46.75	-0.23020	0.34332	-0.03241	0.00933	-0.00378
47.25	-0.23906	0.34084	-0.03301	0.00977	-0.00411
47.75	-0.24022	0.34014	-0.03362	0.00973	-0.00411
48.25	-0.24609	0.34427	-0.03528	0.00986	-0.00430
48.75	-0.23599	0.33730	-0.03575	0.00982	-0.00440
49.25	-0.23611	0.33146	-0.03673	0.01003	-0.00448
49.75	-0.24456	0.33648	-0.03803	0.00992	-0.00404
50.25	-0.25013	0.33668	-0.03781	0.01018	-0.00373
50.75	-0.26664	0.34543	-0.03869	0.01026	-0.00357
51.25	-0.27106	0.34678	-0.03808	0.00980	-0.00348
51.75	-0.26770	0.33754	-0.03836	0.00989	-0.00343
52.25	-0.28463	0.34426	-0.04013	0.01044	-0.00355
52.75	-0.29276	0.35155	-0.04034	0.01028	-0.00358
53.25	-0.29429	0.35382	-0.03992	0.00971	-0.00341
53.75	-0.29249	0.35367	-0.03887	0.00928	-0.00294
54.25	-0.28009	0.34164	-0.03924	0.00965	-0.00303

54.75	-0.28898	0.33985	-0.04007	0.00991	-0.00308
55.25	-0.29530	0.34223	-0.04048	0.01007	-0.00288
55.75	-0.29387	0.34470	-0.04189	0.01014	-0.00253
56.25	-0.30109	0.34880	-0.04241	0.00999	-0.00249
56.75	-0.30226	0.34471	-0.04383	0.01031	-0.00294
57.25	-0.32497	0.35848	-0.04262	0.01004	-0.00292
57.75	-0.30825	0.34176	-0.04092	0.01029	-0.00282
58.25	-0.29455	0.32836	-0.04075	0.01030	-0.00273
58.75	-0.29272	0.32354	-0.04078	0.01010	-0.00276
59.25	-0.30136	0.33134	-0.04150	0.00986	-0.00265
59.75	-0.30705	0.33744	-0.04141	0.01003	-0.00282
60.25	-0.30685	0.33089	-0.03818	0.00963	-0.00285
60.75	-0.31889	0.33028	-0.03631	0.00966	-0.00285
61.25	-0.31390	0.32450	-0.03825	0.01011	-0.00281
61.75	-0.31188	0.32729	-0.03955	0.00991	-0.00234
62.25	-0.31046	0.32707	-0.03725	0.00926	-0.00233
62.75	-0.32948	0.33508	-0.03588	0.00911	-0.00266
63.25	-0.34976	0.34527	-0.03542	0.00904	-0.00283
63.75	-0.34896	0.34194	-0.03412	0.00895	-0.00268
64.25	-0.33720	0.33374	-0.03459	0.00910	-0.00263
64.75	-0.33738	0.33265	-0.03472	0.00894	-0.00256
65.25	-0.34522	0.33342	-0.03151	0.00865	-0.00243
65.75	-0.33522	0.32432	-0.02968	0.00841	-0.00242
66.24	-0.32674	0.31770	-0.02965	0.00843	-0.00239
66.75	-0.33564	0.32044	-0.02787	0.00837	-0.00291
67.25	-0.33251	0.31806	-0.02830	0.00851	-0.00283
67.75	-0.33685	0.32095	-0.02974	0.00886	-0.00260
68.25	-0.33958	0.31888	-0.03118	0.00927	-0.00293
68.75	-0.34949	0.32446	-0.03198	0.00905	-0.00268
69.25	-0.35076	0.32398	-0.03217	0.00862	-0.00247
69.75	-0.33592	0.30848	-0.03373	0.00935	-0.00289
70.25	-0.34695	0.31456	-0.03453	0.00957	-0.00301
70.75	-0.35269	0.31654	-0.03465	0.00948	-0.00296
71.25	-0.35036	0.31368	-0.03700	0.00934	-0.00260
71.75	-0.36580	0.32228	-0.03992	0.00957	-0.00272
72.25	-0.35872	0.32013	-0.03900	0.00937	-0.00275
72.75	-0.34881	0.31306	-0.03682	0.00905	-0.00278

73.25	-0.35359	0.31211	-0.03850	0.00946	-0.00280
73.75	-0.34982	0.30713	-0.04155	0.00992	-0.00301
74.25	-0.33644	0.29831	-0.04161	0.00982	-0.00303
74.75	-0.34386	0.30291	-0.04020	0.00911	-0.00276
75.25	-0.36015	0.31110	-0.04025	0.00893	-0.00270
75.75	-0.35987	0.31028	-0.04084	0.00902	-0.00229
76.25	-0.36128	0.30740	-0.04034	0.00927	-0.00255
76.75	-0.37337	0.31023	-0.04017	0.00939	-0.00251
77.25	-0.38680	0.31852	-0.04214	0.00916	-0.00210
77.75	-0.38379	0.31760	-0.04387	0.00905	-0.00212
78.25	-0.37581	0.30900	-0.04141	0.00900	-0.00196
78.75	-0.38838	0.31398	-0.04106	0.00896	-0.00213
79.25	-0.39542	0.31451	-0.04221	0.00928	-0.00236
79.75	-0.37477	0.30294	-0.04135	0.00885	-0.00206
80.25	-0.36387	0.29559	-0.04001	0.00890	-0.00232
80.75	-0.36971	0.29620	-0.04117	0.00896	-0.00215
81.25	-0.38174	0.30268	-0.04166	0.00900	-0.00196
81.75	-0.38567	0.30451	-0.04256	0.00924	-0.00180
82.25	-0.39991	0.31359	-0.04339	0.00903	-0.00160
82.75	-0.39336	0.30352	-0.04086	0.00933	-0.00171
83.25	-0.39000	0.29671	-0.03955	0.00926	-0.00148
83.75	-0.39173	0.29770	-0.04113	0.00935	-0.00155
84.26	-0.39971	0.30153	-0.03904	0.00875	-0.00099
84.75	-0.39458	0.29794	-0.03688	0.00899	-0.00138
85.25	-0.38739	0.28869	-0.03646	0.00834	-0.00122
85.75	-0.40183	0.29741	-0.03647	0.00882	-0.00077
86.25	-0.41172	0.29813	-0.03438	0.00854	-0.00075
86.76	-0.41898	0.30158	-0.03211	0.00829	-0.00085
87.25	-0.41113	0.28938	-0.03249	0.00854	-0.00107
87.76	-0.40953	0.29106	-0.03150	0.00849	-0.00053
88.25	-0.40888	0.29262	-0.03100	0.00805	-0.00033
88.75	-0.40617	0.28801	-0.03056	0.00821	-0.00010
89.26	-0.40685	0.28782	-0.02909	0.00788	0.00034
89.74	-0.41191	0.28923	-0.02820	0.00782	0.00091

Table 30. Aerodynamic Coefficients, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$,
 $\alpha = 10^\circ$, $\dot{\phi} = 3^\circ/\text{sec}$

DYNAMIC ROLL $\phi = 0^\circ\text{-}90^\circ$					
ϕ ($^\circ$)	C_N	C_M	C_S	C_{YM}	C_{RM}
0.24	0.14012	0.35517	-0.03938	0.00822	0.00319
0.74	0.14182	0.35554	-0.03379	0.00780	0.00309
1.25	0.13756	0.35405	-0.02873	0.00775	0.00238
1.73	0.12889	0.36173	-0.02782	0.00785	0.00156
2.25	0.12358	0.36569	-0.02890	0.00795	0.00154
2.75	0.13830	0.35228	-0.02928	0.00834	0.00109
3.25	0.13955	0.35352	-0.02993	0.00797	0.00156
3.75	0.13590	0.36161	-0.03210	0.00816	0.00152
4.25	0.11879	0.37081	-0.03165	0.00813	0.00184
4.74	0.13174	0.35772	-0.03156	0.00845	0.00077
5.25	0.12128	0.36944	-0.03194	0.00839	0.00102
5.75	0.12455	0.35723	-0.03252	0.00880	0.00117
6.24	0.13771	0.35685	-0.03281	0.00836	0.00064
6.75	0.10527	0.38404	-0.03396	0.00811	0.00135
7.25	0.11018	0.37483	-0.03541	0.00887	0.00062
7.74	0.11583	0.35880	-0.03436	0.00888	-0.00008
8.25	0.12458	0.36095	-0.03428	0.00853	0.00042
8.75	0.13714	0.36279	-0.03560	0.00833	0.00063
9.25	0.12395	0.36770	-0.03725	0.00821	0.00060
9.75	0.10596	0.37435	-0.03699	0.00882	0.00026
10.25	0.11775	0.36790	-0.03657	0.00872	0.00031
10.75	0.12459	0.36891	-0.04002	0.00922	-0.00021
11.25	0.12009	0.37380	-0.04101	0.00894	0.00011
11.75	0.11465	0.37608	-0.04099	0.00870	0.00049
12.25	0.11220	0.37815	-0.04127	0.00900	-0.00011
12.75	0.11403	0.37673	-0.04173	0.00924	-0.00001
13.25	0.11741	0.37416	-0.04117	0.00933	0.00018
13.75	0.12370	0.36611	-0.04258	0.00966	-0.00022
14.25	0.12061	0.36846	-0.04502	0.00987	-0.00042
14.75	0.08916	0.38919	-0.04492	0.00965	-0.00034
15.25	0.08070	0.39761	-0.04466	0.00936	0.00011
15.75	0.11220	0.37701	-0.04597	0.00964	0.00004
16.25	0.11015	0.37432	-0.04677	0.01001	-0.00041
16.75	0.09407	0.38586	-0.04625	0.00976	-0.00052
17.25	0.09765	0.37966	-0.04604	0.00988	-0.00055

17.75	0.11105	0.36653	-0.04709	0.01024	-0.00047
18.25	0.10701	0.37303	-0.04704	0.00981	-0.00042
18.75	0.10161	0.37382	-0.04722	0.00997	-0.00080
19.25	0.09686	0.37352	-0.04729	0.01012	-0.00044
19.75	0.08608	0.37933	-0.04748	0.00987	-0.00009
20.25	0.07394	0.38517	-0.04914	0.00986	-0.00036
20.75	0.07476	0.38396	-0.04860	0.00994	-0.00049
21.25	0.07189	0.39018	-0.04881	0.00990	0.00013
21.75	0.06743	0.39332	-0.05018	0.01024	0.00010
22.25	0.06611	0.39118	-0.05025	0.01023	-0.00029
22.75	0.06928	0.38552	-0.04863	0.00973	-0.00051
23.25	0.06209	0.38545	-0.04915	0.01008	-0.00077
23.75	0.04478	0.40004	-0.05232	0.01003	0.00000
24.25	0.04090	0.39987	-0.05501	0.01019	-0.00033
24.75	0.04784	0.38824	-0.05322	0.01027	-0.00062
25.24	0.06406	0.37947	-0.05243	0.01018	-0.00049
25.74	0.07653	0.37503	-0.05470	0.01037	-0.00070
26.24	0.08259	0.36917	-0.05525	0.01057	-0.00102
26.74	0.06118	0.37878	-0.05591	0.01070	-0.00081
27.25	0.04297	0.38573	-0.05715	0.01110	-0.00064
27.75	0.03230	0.39169	-0.05870	0.01108	-0.00032
28.25	0.02554	0.39274	-0.06024	0.01147	-0.00065
28.75	0.02811	0.39040	-0.06145	0.01175	-0.00125
29.25	0.03874	0.38370	-0.06004	0.01093	-0.00060
29.75	0.03913	0.38316	-0.06001	0.01046	-0.00025
30.25	0.04434	0.37824	-0.06039	0.01082	-0.00092
30.75	0.03911	0.38168	-0.06089	0.01100	-0.00090
31.25	0.00959	0.40117	-0.06240	0.01097	-0.00061
31.75	0.01319	0.39155	-0.06321	0.01139	-0.00096
32.25	0.01625	0.38310	-0.06304	0.01162	-0.00135
32.75	0.02174	0.37677	-0.06231	0.01138	-0.00136
33.25	0.01898	0.37377	-0.06196	0.01131	-0.00150
33.75	0.01187	0.37478	-0.06186	0.01131	-0.00185
34.25	0.02133	0.37322	-0.06371	0.01133	-0.00199
34.75	0.01264	0.37689	-0.06299	0.01162	-0.00233
35.25	-0.00049	0.38079	-0.06219	0.01156	-0.00188
35.75	-0.00257	0.37601	-0.06363	0.01160	-0.00178

36.25	-0.00042	0.37431	-0.06629	0.01164	-0.00203
36.75	0.01411	0.37231	-0.06467	0.01112	-0.00198
37.25	0.01194	0.36788	-0.06331	0.01116	-0.00197
37.75	0.00646	0.36165	-0.06479	0.01177	-0.00195
38.25	-0.00917	0.37511	-0.06563	0.01140	-0.00192
38.75	0.00749	0.36411	-0.06316	0.01126	-0.00248
39.25	-0.00207	0.36174	-0.06410	0.01175	-0.00254
39.75	-0.01674	0.36571	-0.06348	0.01156	-0.00199
40.25	-0.01000	0.36222	-0.06165	0.01113	-0.00200
40.75	-0.02193	0.37373	-0.06340	0.01151	-0.00267
41.25	-0.02901	0.37850	-0.06489	0.01182	-0.00289
41.75	-0.04134	0.37526	-0.06515	0.01211	-0.00295
42.25	-0.03870	0.36519	-0.06252	0.01232	-0.00339
42.75	-0.02288	0.36043	-0.06021	0.01159	-0.00305
43.25	-0.03573	0.37483	-0.06136	0.01101	-0.00244
43.75	-0.02774	0.36357	-0.06161	0.01134	-0.00272
44.25	-0.01291	0.34928	-0.06122	0.01159	-0.00304
44.75	-0.03059	0.36041	-0.06033	0.01141	-0.00299
45.25	-0.05940	0.37963	-0.06233	0.01144	-0.00260
45.75	-0.06670	0.37906	-0.06471	0.01198	-0.00324
46.25	-0.05686	0.37496	-0.06467	0.01162	-0.00369
46.75	-0.07689	0.38357	-0.06379	0.01117	-0.00358
47.25	-0.07649	0.37307	-0.06430	0.01178	-0.00365
47.75	-0.05116	0.35406	-0.06665	0.01228	-0.00363
48.25	-0.03362	0.34466	-0.06897	0.01231	-0.00369
48.75	-0.04728	0.35946	-0.07097	0.01220	-0.00366
49.25	-0.06007	0.36559	-0.07182	0.01237	-0.00409
49.75	-0.06624	0.36503	-0.07106	0.01207	-0.00404
50.25	-0.07548	0.36547	-0.07145	0.01219	-0.00380
50.75	-0.07313	0.35696	-0.07094	0.01220	-0.00378
51.25	-0.06818	0.35101	-0.07226	0.01203	-0.00351
51.75	-0.06193	0.35125	-0.07451	0.01176	-0.00348
52.25	-0.07092	0.35682	-0.07446	0.01205	-0.00406
52.75	-0.06317	0.34327	-0.07271	0.01241	-0.00471
53.25	-0.05467	0.33702	-0.07334	0.01186	-0.00451
53.75	-0.06337	0.34283	-0.07616	0.01188	-0.00453
54.25	-0.08225	0.34943	-0.07673	0.01216	-0.00446

54.75	-0.10523	0.36258	-0.07699	0.01224	-0.00431
55.25	-0.10962	0.36126	-0.07637	0.01204	-0.00400
55.75	-0.10010	0.35406	-0.07663	0.01169	-0.00385
56.25	-0.08169	0.33753	-0.07515	0.01150	-0.00423
56.75	-0.10424	0.34932	-0.07503	0.01153	-0.00434
57.25	-0.12796	0.35907	-0.07585	0.01175	-0.00413
57.75	-0.10822	0.34067	-0.07606	0.01179	-0.00407
58.25	-0.10293	0.33321	-0.07530	0.01168	-0.00444
58.75	-0.12186	0.34292	-0.07587	0.01165	-0.00479
59.25	-0.14241	0.35543	-0.07669	0.01165	-0.00462
59.75	-0.14624	0.35591	-0.07582	0.01155	-0.00448
60.25	-0.14639	0.35163	-0.07589	0.01160	-0.00471
60.75	-0.14303	0.34213	-0.07719	0.01207	-0.00502
61.25	-0.12886	0.32768	-0.07592	0.01179	-0.00500
61.75	-0.13652	0.32846	-0.07467	0.01188	-0.00528
62.25	-0.15108	0.33428	-0.07412	0.01186	-0.00519
62.75	-0.16643	0.34425	-0.07425	0.01149	-0.00476
63.25	-0.16994	0.33834	-0.07357	0.01186	-0.00465
63.75	-0.17253	0.33256	-0.07291	0.01198	-0.00421
64.25	-0.19277	0.34728	-0.07153	0.01108	-0.00383
64.75	-0.20245	0.35150	-0.07062	0.01056	-0.00421
65.25	-0.20124	0.34133	-0.06967	0.01111	-0.00454
65.75	-0.18856	0.32703	-0.06738	0.01097	-0.00451
66.25	-0.18545	0.32030	-0.06545	0.01059	-0.00425
66.74	-0.21182	0.33019	-0.06729	0.01093	-0.00389
67.25	-0.22935	0.33724	-0.06734	0.01087	-0.00371
67.75	-0.23714	0.34066	-0.06690	0.01036	-0.00356
68.25	-0.26411	0.35502	-0.06877	0.01042	-0.00343
68.75	-0.28013	0.36088	-0.06833	0.01021	-0.00284
69.25	-0.28245	0.35283	-0.06939	0.01033	-0.00279
69.75	-0.28100	0.34386	-0.07137	0.01081	-0.00312
70.25	-0.28747	0.34831	-0.07470	0.01081	-0.00296
70.75	-0.28697	0.34182	-0.07440	0.01079	-0.00356
71.25	-0.29239	0.33607	-0.07383	0.01086	-0.00375
71.75	-0.29379	0.33338	-0.07456	0.01121	-0.00360
72.25	-0.31702	0.34387	-0.07685	0.01133	-0.00346
72.75	-0.31481	0.34028	-0.07837	0.01086	-0.00305

73.25	-0.30790	0.33193	-0.07913	0.01086	-0.00310
73.75	-0.31130	0.32788	-0.07941	0.01130	-0.00330
74.25	-0.34127	0.34643	-0.07942	0.01119	-0.00293
74.75	-0.36355	0.35564	-0.08101	0.01141	-0.00297
75.25	-0.34210	0.33535	-0.08037	0.01131	-0.00292
75.75	-0.32971	0.32169	-0.07914	0.01121	-0.00282
76.25	-0.34956	0.33451	-0.07913	0.01089	-0.00238
76.75	-0.36663	0.34223	-0.08299	0.01159	-0.00247
77.25	-0.36997	0.34020	-0.08430	0.01159	-0.00245
77.75	-0.35338	0.32991	-0.08265	0.01070	-0.00207
78.25	-0.35246	0.32658	-0.08220	0.01069	-0.00198
78.75	-0.34893	0.31475	-0.08109	0.01127	-0.00242
79.25	-0.34950	0.30625	-0.08136	0.01147	-0.00228
79.75	-0.37602	0.32362	-0.08386	0.01153	-0.00198
80.25	-0.38244	0.33140	-0.08566	0.01141	-0.00183
80.75	-0.41267	0.34284	-0.08536	0.01176	-0.00210
81.25	-0.39967	0.33536	-0.08277	0.01089	-0.00141
81.75	-0.38941	0.32618	-0.08289	0.01069	-0.00147
82.25	-0.40194	0.33003	-0.08494	0.01126	-0.00147
82.75	-0.39419	0.32228	-0.08349	0.01129	-0.00136
83.25	-0.40753	0.32658	-0.08112	0.01078	-0.00140
83.75	-0.40344	0.32409	-0.08033	0.01073	-0.00142
84.26	-0.40444	0.31333	-0.08132	0.01116	-0.00090
84.75	-0.41424	0.32358	-0.08070	0.01103	-0.00093
85.25	-0.40622	0.31248	-0.08090	0.01103	-0.00083
85.75	-0.39835	0.30374	-0.07975	0.01113	-0.00092
86.25	-0.39673	0.29981	-0.07855	0.01074	-0.00080
86.76	-0.41699	0.30915	-0.07895	0.01094	-0.00050
87.25	-0.42397	0.31063	-0.07688	0.01064	-0.00023
87.76	-0.43007	0.31319	-0.07547	0.01009	0.00032
88.25	-0.42857	0.30733	-0.07484	0.01069	-0.00011
88.75	-0.43772	0.31693	-0.07382	0.01002	0.00081
89.26	-0.45809	0.32165	-0.07257	0.01009	0.00101
89.73	-0.44130	0.30863	-0.07157	0.00995	0.00118

Table 31. Aerodynamic Coefficients, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$,
 $\alpha = 15^\circ$, $\dot{\phi} = 3^\circ/\text{sec}$

DYNAMIC ROLL $\phi = 0^\circ\text{-}90^\circ$					
ϕ ($^\circ$)	C_N	C_M	C_S	C_{YM}	C_{RM}
0.24	0.55395	0.19255	-0.00954	-0.00110	0.00322
0.74	0.56242	0.18126	-0.00384	-0.00131	0.00337
1.25	0.54973	0.18691	0.00035	-0.00166	0.00312
1.74	0.56563	0.18007	0.00226	-0.00142	0.00239
2.25	0.54711	0.18696	0.00369	-0.00195	0.00248
2.75	0.54937	0.18575	0.00098	-0.00135	0.00218
3.25	0.54791	0.18675	0.00389	-0.00206	0.00260
3.75	0.53602	0.19788	0.00158	-0.00199	0.00249
4.25	0.56729	0.17528	0.00261	-0.00179	0.00201
4.74	0.55216	0.18496	0.00282	-0.00234	0.00198
5.25	0.55957	0.17966	0.00186	-0.00169	0.00143
5.75	0.57296	0.17193	0.00222	-0.00164	0.00178
6.24	0.55707	0.17966	0.00002	-0.00148	0.00169
6.75	0.53237	0.19490	-0.00203	-0.00116	0.00171
7.25	0.54870	0.18269	-0.00107	-0.00124	0.00184
7.74	0.55363	0.18375	-0.00165	-0.00154	0.00199
8.25	0.55793	0.17840	-0.00153	-0.00133	0.00160
8.75	0.55872	0.17798	-0.00257	-0.00114	0.00145
9.25	0.55056	0.18422	-0.00370	-0.00139	0.00171
9.75	0.55055	0.18148	-0.00324	-0.00149	0.00151
10.25	0.54773	0.18193	-0.00208	-0.00136	0.00158
10.75	0.53959	0.18945	-0.00310	-0.00096	0.00133
11.25	0.53456	0.19223	-0.00378	-0.00145	0.00152
11.75	0.53301	0.18538	-0.00323	-0.00125	0.00126
12.25	0.50915	0.19759	-0.00430	-0.00107	0.00123
12.75	0.53228	0.18199	-0.00350	-0.00130	0.00147
13.25	0.54271	0.17471	-0.00325	-0.00130	0.00124
13.75	0.53826	0.17325	-0.00427	-0.00093	0.00057
14.25	0.52465	0.18680	-0.00417	-0.00154	0.00101
14.75	0.50842	0.19511	-0.00379	-0.00165	0.00109
15.25	0.51319	0.18853	-0.00395	-0.00142	0.00117
15.75	0.52926	0.17782	-0.00483	-0.00131	0.00118
16.25	0.53647	0.17554	-0.00495	-0.00144	0.00106
16.75	0.52092	0.18474	-0.00477	-0.00153	0.00093
17.25	0.51153	0.18836	-0.00583	-0.00112	0.00085

17.75	0.50535	0.19302	-0.00626	-0.00102	0.00077
18.25	0.49977	0.19298	-0.00619	-0.00115	0.00101
18.75	0.50099	0.18562	-0.00631	-0.00105	0.00109
19.25	0.50600	0.18730	-0.00675	-0.00144	0.00120
19.75	0.51463	0.17961	-0.00680	-0.00134	0.00081
20.25	0.50771	0.17966	-0.00601	-0.00126	0.00090
20.75	0.50126	0.18071	-0.00586	-0.00131	0.00107
21.25	0.49073	0.18681	-0.00695	-0.00095	0.00095
21.75	0.49511	0.18477	-0.00531	-0.00115	0.00062
22.25	0.51662	0.16928	-0.00494	-0.00110	0.00034
22.75	0.50866	0.17096	-0.00509	-0.00119	0.00021
23.25	0.49732	0.17946	-0.00560	-0.00117	0.00056
23.75	0.49544	0.18440	-0.00793	-0.00105	0.00103
24.25	0.47975	0.19672	-0.00837	-0.00150	0.00148
24.75	0.48065	0.19005	-0.00867	-0.00109	0.00133
25.24	0.47773	0.18571	-0.00988	-0.00047	0.00080
25.74	0.49200	0.17789	-0.00966	-0.00068	0.00110
26.24	0.49637	0.17420	-0.00884	-0.00075	0.00125
26.74	0.48085	0.17882	-0.00851	-0.00065	0.00109
27.24	0.46528	0.18631	-0.00982	-0.00058	0.00125
27.75	0.45982	0.18847	-0.01142	-0.00054	0.00129
28.25	0.44196	0.20070	-0.01076	-0.00093	0.00102
28.75	0.43966	0.19828	-0.00933	-0.00101	0.00070
29.25	0.45349	0.19050	-0.00950	-0.00123	0.00094
29.75	0.45820	0.18240	-0.00923	-0.00115	0.00058
30.25	0.44931	0.18192	-0.01034	-0.00042	0.00002
30.75	0.42638	0.18937	-0.00981	-0.00034	0.00047
31.25	0.42436	0.18755	-0.01002	-0.00055	0.00059
31.75	0.43869	0.17934	-0.01012	-0.00034	0.00053
32.25	0.43166	0.18764	-0.01003	-0.00049	0.00059
32.75	0.43241	0.18644	-0.01100	-0.00067	0.00012
33.25	0.44379	0.17677	-0.01158	-0.00046	0.00031
33.75	0.42029	0.18607	-0.01075	-0.00049	0.00086
34.25	0.41190	0.18851	-0.01114	-0.00023	0.00053
34.75	0.41519	0.18360	-0.01011	-0.00001	-0.00013
35.25	0.41086	0.17866	-0.01067	0.00076	-0.00053
35.75	0.42086	0.16949	-0.01040	0.00071	-0.00035

36.25	0.41185	0.18005	-0.00991	-0.00005	0.00012
36.75	0.40877	0.18910	-0.01093	-0.00048	0.00039
37.25	0.40122	0.19024	-0.01147	0.00006	0.00030
37.75	0.39706	0.18010	-0.00736	-0.00014	0.00053
38.25	0.37937	0.18309	-0.00641	0.00017	0.00014
38.75	0.38405	0.18073	-0.00924	0.00063	-0.00013
39.25	0.40014	0.17339	-0.00912	0.00008	-0.00005
39.75	0.40677	0.16682	-0.00757	0.00008	-0.00058
40.25	0.39803	0.17225	-0.00500	-0.00015	-0.00062
40.75	0.37497	0.18040	-0.00422	-0.00003	-0.00067
41.25	0.37345	0.17050	-0.00443	0.00041	-0.00082
41.75	0.37221	0.17183	-0.00511	0.00039	-0.00047
42.25	0.36196	0.18187	-0.00398	0.00000	-0.00054
42.75	0.36509	0.17941	-0.00209	-0.00009	-0.00060
43.25	0.36414	0.17458	-0.00170	0.00002	-0.00097
43.75	0.36965	0.16623	-0.00114	0.00026	-0.00120
44.25	0.33653	0.18588	-0.00169	0.00060	-0.00138
44.75	0.32386	0.19481	-0.00093	0.00008	-0.00128
45.25	0.33905	0.18327	-0.00088	-0.00004	-0.00126
45.75	0.34872	0.17671	-0.00140	0.00021	-0.00149
46.25	0.34863	0.17136	0.00017	0.00043	-0.00209
46.75	0.32296	0.17971	0.00021	0.00043	-0.00191
47.25	0.32614	0.18019	-0.00193	0.00011	-0.00142
47.75	0.34519	0.16589	-0.00410	0.00067	-0.00214
48.25	0.33866	0.16316	-0.00455	0.00090	-0.00272
48.75	0.31256	0.17857	-0.00556	0.00046	-0.00210
49.25	0.30115	0.18279	-0.00636	0.00065	-0.00195
49.75	0.30666	0.17894	-0.00562	0.00043	-0.00243
50.25	0.30424	0.17716	-0.00462	0.00028	-0.00272
50.75	0.30286	0.16710	-0.00433	0.00060	-0.00250
51.25	0.29437	0.16764	-0.00771	0.00103	-0.00271
51.75	0.28929	0.17199	-0.00774	0.00094	-0.00324
52.25	0.28809	0.17100	-0.00733	0.00093	-0.00325
52.75	0.28322	0.17086	-0.00726	0.00076	-0.00391
53.25	0.27741	0.17451	-0.00574	-0.00001	-0.00380
53.75	0.26050	0.17617	-0.00527	0.00016	-0.00320
54.25	0.23082	0.19257	-0.00744	0.00010	-0.00301

54.75	0.23251	0.19122	-0.00849	0.00000	-0.00325
55.25	0.24884	0.17339	-0.00721	0.00034	-0.00415
55.75	0.22963	0.18319	-0.00729	0.00055	-0.00404
56.25	0.22998	0.17839	-0.00503	0.00026	-0.00381
56.75	0.22355	0.17467	-0.00563	0.00050	-0.00397
57.25	0.21013	0.17702	-0.00544	0.00055	-0.00426
57.75	0.20932	0.17665	-0.00484	0.00039	-0.00406
58.25	0.21663	0.17154	-0.00509	0.00009	-0.00381
58.75	0.19247	0.18023	-0.00373	0.00012	-0.00453
59.25	0.16978	0.18425	-0.00235	0.00052	-0.00474
59.75	0.16216	0.18530	-0.00337	0.00075	-0.00450
60.25	0.17370	0.18239	-0.00427	0.00037	-0.00472
60.75	0.17682	0.17424	-0.00260	0.00022	-0.00505
61.25	0.14687	0.18484	-0.00054	0.00001	-0.00480
61.75	0.13075	0.19452	-0.00072	-0.00034	-0.00438
62.25	0.12731	0.19023	0.00006	-0.00005	-0.00453
62.75	0.13507	0.17861	0.00025	0.00000	-0.00469
63.25	0.13658	0.17697	0.00008	-0.00018	-0.00453
63.75	0.12809	0.17768	0.00241	0.00006	-0.00494
64.25	0.11511	0.17800	0.00483	-0.00005	-0.00508
64.75	0.09950	0.18015	0.00565	-0.00014	-0.00522
65.25	0.09129	0.18393	0.00500	-0.00043	-0.00493
65.75	0.08504	0.18820	0.00544	-0.00049	-0.00487
66.25	0.08422	0.18295	0.00781	-0.00059	-0.00519
66.74	0.08395	0.17469	0.01011	-0.00053	-0.00567
67.24	0.04553	0.19506	0.01137	-0.00061	-0.00517
67.74	0.05086	0.18940	0.01054	-0.00089	-0.00465
68.25	0.07326	0.17132	0.00936	-0.00113	-0.00458
68.75	0.05752	0.17520	0.00962	-0.00122	-0.00476
69.25	0.02208	0.19437	0.00778	-0.00114	-0.00450
69.75	0.01856	0.19155	0.00645	-0.00101	-0.00485
70.25	0.02059	0.18428	0.00703	-0.00099	-0.00531
70.75	0.01908	0.17983	0.00776	-0.00091	-0.00569
71.25	0.01770	0.17731	0.00722	-0.00075	-0.00559
71.75	0.01342	0.17482	0.00766	-0.00083	-0.00527
72.25	-0.01105	0.18445	0.00595	-0.00092	-0.00456
72.75	-0.01660	0.18066	0.00432	-0.00070	-0.00419

73.25	-0.01520	0.17832	0.00277	-0.00080	-0.00418
73.75	-0.03093	0.18245	0.00331	-0.00076	-0.00436
74.25	-0.03750	0.18047	0.00313	-0.00075	-0.00388
74.75	-0.05116	0.18317	0.00249	-0.00088	-0.00342
75.25	-0.06789	0.18726	0.00242	-0.00106	-0.00313
75.75	-0.06038	0.17592	0.00299	-0.00135	-0.00282
76.25	-0.06157	0.17220	0.00234	-0.00124	-0.00271
76.75	-0.09230	0.18424	0.00167	-0.00085	-0.00314
77.25	-0.11371	0.19218	0.00080	-0.00058	-0.00324
77.75	-0.13060	0.19987	0.00011	-0.00086	-0.00320
78.25	-0.13386	0.19899	0.00127	-0.00141	-0.00302
78.75	-0.13290	0.19278	0.00268	-0.00146	-0.00258
79.25	-0.15258	0.19719	0.00408	-0.00117	-0.00283
79.75	-0.15343	0.19167	0.00482	-0.00121	-0.00244
80.25	-0.16699	0.19519	0.00211	-0.00104	-0.00211
80.75	-0.18835	0.21340	-0.00046	-0.00116	-0.00144
81.25	-0.17042	0.19308	0.00430	-0.00172	-0.00129
81.75	-0.20150	0.20367	0.00305	-0.00144	-0.00109
82.25	-0.22552	0.22162	0.00334	-0.00163	-0.00053
82.75	-0.20463	0.19840	0.00349	-0.00149	-0.00098
83.25	-0.19316	0.18720	0.00290	-0.00117	-0.00101
83.75	-0.20698	0.19878	0.00677	-0.00228	-0.00048
84.25	-0.20170	0.19084	0.00730	-0.00217	-0.00020
84.75	-0.21747	0.19545	0.00609	-0.00180	-0.00009
85.25	-0.21192	0.19064	0.00931	-0.00183	-0.00008
85.75	-0.24293	0.20107	0.00838	-0.00180	0.00033
86.25	-0.23104	0.19389	0.00734	-0.00189	0.00033
86.76	-0.24485	0.19520	0.01292	-0.00220	0.00040
87.25	-0.23636	0.19078	0.00946	-0.00205	0.00071
87.76	-0.24956	0.19086	0.01384	-0.00228	0.00124
88.25	-0.25550	0.18951	0.01286	-0.00185	0.00104
88.75	-0.25028	0.18517	0.01590	-0.00229	0.00129
89.26	-0.25361	0.18466	0.01639	-0.00229	0.00183
89.74	-0.26328	0.18981	0.01637	-0.00243	0.00234

Table 32. Aerodynamic Coefficients, $U_{\infty} = 6$ [in/sec], $Re = 1.17 \times 10^4$,
 $\alpha = 20^\circ$, $\dot{\phi} = 3^\circ/\text{sec}$

DYNAMIC ROLL $\phi = 0^\circ\text{-}90^\circ$					
$\phi (^\circ)$	C_N	C_M	C_S	C_{YM}	C_{RM}
0.22	-0.29938	0.18095	-0.00122	-0.00090	0.00249
0.73	-0.30627	0.18149	0.00444	-0.00129	0.00261
1.24	-0.29775	0.17880	0.00799	-0.00062	0.00057
1.74	-0.29993	0.18425	0.01031	-0.00098	-0.00002
2.25	-0.29909	0.17802	0.01052	-0.00115	-0.00035
2.74	-0.30548	0.18277	0.00832	-0.00082	-0.00088
3.25	-0.30284	0.18558	0.00609	-0.00068	-0.00076
3.74	-0.29476	0.17925	0.00721	-0.00052	-0.00107
4.25	-0.29181	0.17584	0.00738	-0.00033	-0.00136
4.75	-0.29597	0.18140	0.00677	-0.00040	-0.00190
5.25	-0.29084	0.18090	0.00651	-0.00071	-0.00201
5.74	-0.27501	0.17065	0.00647	-0.00087	-0.00205
6.25	-0.27345	0.16782	0.00631	-0.00095	-0.00216
6.75	-0.28175	0.17032	0.00557	-0.00074	-0.00226
7.25	-0.29011	0.17284	0.00498	-0.00047	-0.00253
7.75	-0.30358	0.18255	0.00424	-0.00047	-0.00291
8.25	-0.30389	0.18846	0.00327	-0.00064	-0.00298
8.75	-0.29654	0.18765	0.00217	-0.00060	-0.00279
9.25	-0.28681	0.18251	0.00211	-0.00037	-0.00287
9.75	-0.28128	0.17687	0.00322	-0.00031	-0.00317
10.25	-0.28144	0.17512	0.00422	-0.00056	-0.00339
10.75	-0.28588	0.17794	0.00421	-0.00078	-0.00349
11.25	-0.28703	0.17904	0.00342	-0.00082	-0.00370
11.75	-0.28795	0.18018	0.00195	-0.00089	-0.00372
12.25	-0.28189	0.17523	0.00139	-0.00079	-0.00383
12.75	-0.28982	0.17791	0.00108	-0.00063	-0.00392
13.25	-0.29115	0.17670	0.00081	-0.00038	-0.00419
13.75	-0.29172	0.17557	0.00009	0.00003	-0.00450
14.25	-0.28412	0.17183	-0.00112	0.00041	-0.00467
14.75	-0.27334	0.16624	-0.00137	0.00059	-0.00460
15.25	-0.27376	0.16715	-0.00142	0.00060	-0.00450
15.75	-0.27467	0.16726	-0.00054	0.00031	-0.00440
16.25	-0.27723	0.16890	-0.00018	0.00004	-0.00453
16.75	-0.28014	0.17284	-0.00033	-0.00014	-0.00462
17.25	-0.28360	0.17597	-0.00012	-0.00022	-0.00459
17.75	-0.28917	0.17974	-0.00012	-0.00025	-0.00436
18.25	-0.29369	0.18226	-0.00048	-0.00023	-0.00415
18.75	-0.30132	0.18552	-0.00024	-0.00032	-0.00408
19.25	-0.30554	0.18554	-0.00084	-0.00023	-0.00406
19.75	-0.30857	0.18550	-0.00134	-0.00006	-0.00411

20.25	-0.31769	0.19120	-0.00162	-0.00009	-0.00397
20.75	-0.32010	0.19516	-0.00244	0.00000	-0.00379
21.25	-0.31758	0.19723	-0.00347	0.00005	-0.00357
21.75	-0.31249	0.19464	-0.00296	-0.00009	-0.00366
22.25	-0.30686	0.19067	-0.00278	-0.00016	-0.00390
22.75	-0.30294	0.18892	-0.00260	-0.00039	-0.00405
23.25	-0.30388	0.18864	-0.00331	-0.00019	-0.00414
23.75	-0.30580	0.18827	-0.00381	0.00004	-0.00426
24.25	-0.30271	0.18542	-0.00422	0.00034	-0.00437
24.75	-0.29713	0.18194	-0.00541	0.00054	-0.00446
25.25	-0.28942	0.17829	-0.00720	0.00071	-0.00455
25.75	-0.28313	0.17631	-0.00795	0.00057	-0.00453
26.25	-0.28322	0.17604	-0.00802	0.00036	-0.00450
26.75	-0.28013	0.17325	-0.00842	0.00036	-0.00438
27.25	-0.27998	0.17185	-0.00820	0.00034	-0.00417
27.75	-0.27908	0.17071	-0.00825	0.00038	-0.00415
28.25	-0.28188	0.17352	-0.00876	0.00061	-0.00438
28.75	-0.28795	0.17974	-0.00916	0.00068	-0.00458
29.25	-0.28945	0.18486	-0.00986	0.00053	-0.00445
29.75	-0.28428	0.18558	-0.01049	0.00028	-0.00425
30.25	-0.27548	0.18175	-0.01085	0.00010	-0.00417
30.75	-0.27019	0.17739	-0.01067	0.00024	-0.00427
31.25	-0.27244	0.17733	-0.01054	0.00041	-0.00434
31.75	-0.27748	0.17831	-0.01080	0.00070	-0.00452
32.25	-0.27993	0.17668	-0.01113	0.00104	-0.00465
32.75	-0.28292	0.17854	-0.01108	0.00095	-0.00449
33.25	-0.28640	0.18184	-0.01142	0.00093	-0.00431
33.75	-0.28199	0.18103	-0.01171	0.00074	-0.00421
34.25	-0.27751	0.17935	-0.01224	0.00073	-0.00440
34.75	-0.27862	0.18024	-0.01266	0.00081	-0.00453
35.25	-0.28660	0.18788	-0.01284	0.00059	-0.00431
35.75	-0.28953	0.19175	-0.01250	0.00042	-0.00415
36.25	-0.28847	0.19237	-0.01208	0.00032	-0.00403
36.75	-0.28761	0.19284	-0.01192	0.00032	-0.00410
37.25	-0.28532	0.18830	-0.01103	0.00043	-0.00431
37.75	-0.28107	0.18262	-0.01013	0.00056	-0.00447
38.25	-0.27836	0.17916	-0.00915	0.00060	-0.00455
38.75	-0.28049	0.18080	-0.00806	0.00046	-0.00435
39.25	-0.27345	0.17668	-0.00729	0.00036	-0.00423
39.74	-0.27110	0.17605	-0.00660	0.00011	-0.00425
40.25	-0.27148	0.17474	-0.00617	0.00004	-0.00438
40.75	-0.27464	0.17665	-0.00707	0.00020	-0.00446

41.25	-0.27871	0.17835	-0.00796	0.00049	-0.00452
41.75	-0.28306	0.18232	-0.00821	0.00049	-0.00454
42.25	-0.28353	0.18279	-0.00767	0.00045	-0.00453
42.75	-0.28371	0.18332	-0.00582	0.00026	-0.00451
43.25	-0.29102	0.18942	-0.00426	0.00001	-0.00422
43.75	-0.29106	0.19156	-0.00298	-0.00018	-0.00405
44.25	-0.28462	0.18699	-0.00151	-0.00033	-0.00399
44.75	-0.27905	0.18394	-0.00135	-0.00039	-0.00399
45.24	-0.27581	0.18078	-0.00216	-0.00027	-0.00398
45.75	-0.27411	0.17785	-0.00357	0.00006	-0.00407
46.25	-0.27617	0.17807	-0.00459	0.00026	-0.00439
46.75	-0.27438	0.17897	-0.00516	0.00010	-0.00453
47.25	-0.27093	0.17844	-0.00529	-0.00010	-0.00458
47.75	-0.27008	0.18137	-0.00641	-0.00020	-0.00444
48.25	-0.27097	0.18267	-0.00701	-0.00026	-0.00430
48.75	-0.27304	0.18365	-0.00807	-0.00011	-0.00425
49.25	-0.26995	0.18209	-0.00899	-0.00006	-0.00418
49.75	-0.26587	0.18082	-0.01016	0.00006	-0.00418
50.25	-0.25938	0.17879	-0.01116	0.00012	-0.00420
50.75	-0.25680	0.17978	-0.01201	-0.00001	-0.00412
51.25	-0.25420	0.17894	-0.01199	0.00000	-0.00403
51.75	-0.26886	0.18752	-0.01210	0.00002	-0.00404
52.25	-0.27986	0.19466	-0.01134	-0.00007	-0.00416
52.75	-0.27552	0.19090	-0.01186	0.00016	-0.00440
53.25	-0.26660	0.18574	-0.01246	0.00025	-0.00443
53.75	-0.25406	0.17819	-0.01338	0.00036	-0.00450
54.25	-0.24471	0.17235	-0.01381	0.00052	-0.00462
54.75	-0.23975	0.16851	-0.01455	0.00068	-0.00473
55.25	-0.24531	0.17077	-0.01430	0.00083	-0.00481
55.75	-0.26022	0.18044	-0.01434	0.00075	-0.00467
56.25	-0.26942	0.18653	-0.01468	0.00063	-0.00443
56.75	-0.26805	0.18741	-0.01525	0.00047	-0.00417
57.25	-0.26311	0.18524	-0.01578	0.00056	-0.00405
57.75	-0.25582	0.18118	-0.01607	0.00065	-0.00407
58.25	-0.25092	0.17920	-0.01512	0.00059	-0.00435
58.75	-0.24961	0.18017	-0.01403	0.00037	-0.00454
59.25	-0.25129	0.18357	-0.01278	0.00006	-0.00454
59.75	-0.25337	0.18657	-0.01214	-0.00027	-0.00430
60.25	-0.25249	0.18439	-0.01167	-0.00028	-0.00433
60.75	-0.25986	0.18743	-0.01203	-0.00015	-0.00439
61.25	-0.25890	0.18505	-0.01229	0.00005	-0.00453
61.75	-0.26497	0.18911	-0.01236	0.00007	-0.00455

62.25	-0.26930	0.19283	-0.01139	-0.00010	-0.00443
62.75	-0.26568	0.19096	-0.01010	-0.00016	-0.00427
63.25	-0.26122	0.18739	-0.00871	-0.00013	-0.00405
63.75	-0.25178	0.18010	-0.00756	0.00000	-0.00420
64.25	-0.24352	0.17223	-0.00635	0.00015	-0.00459
64.75	-0.23978	0.16849	-0.00554	0.00021	-0.00493
65.25	-0.23615	0.16770	-0.00498	0.00009	-0.00494
65.75	-0.24430	0.17539	-0.00490	-0.00017	-0.00468
66.25	-0.25826	0.18768	-0.00578	-0.00030	-0.00422
66.75	-0.26701	0.19369	-0.00562	-0.00026	-0.00408
67.25	-0.27438	0.19834	-0.00514	-0.00019	-0.00397
67.75	-0.27460	0.19801	-0.00458	-0.00016	-0.00400
68.25	-0.26404	0.18989	-0.00382	-0.00019	-0.00420
68.75	-0.25922	0.18675	-0.00361	-0.00028	-0.00414
69.25	-0.25670	0.18790	-0.00398	-0.00046	-0.00392
69.75	-0.24576	0.18240	-0.00550	-0.00037	-0.00383
70.25	-0.23843	0.18066	-0.00812	-0.00012	-0.00399
70.75	-0.23999	0.18355	-0.01004	0.00003	-0.00409
71.25	-0.25145	0.19209	-0.01230	0.00021	-0.00407
71.75	-0.26571	0.20114	-0.01406	0.00040	-0.00413
72.25	-0.27483	0.20562	-0.01545	0.00054	-0.00420
72.75	-0.26537	0.19930	-0.01597	0.00051	-0.00421
73.25	-0.25180	0.19123	-0.01670	0.00043	-0.00408
73.75	-0.24559	0.18969	-0.01632	0.00019	-0.00398
74.25	-0.25153	0.19548	-0.01588	0.00013	-0.00406
74.75	-0.25176	0.19538	-0.01497	0.00018	-0.00427
75.25	-0.24927	0.19211	-0.01315	0.00000	-0.00438
75.75	-0.23668	0.18182	-0.01276	0.00000	-0.00433
76.25	-0.23162	0.17717	-0.01283	0.00003	-0.00432
76.75	-0.23079	0.17650	-0.01411	0.00008	-0.00416
77.24	-0.24121	0.18477	-0.01577	0.00018	-0.00377
77.75	-0.24066	0.18506	-0.01807	0.00043	-0.00351
78.25	-0.24566	0.19261	-0.01928	0.00050	-0.00304
78.75	-0.23903	0.18959	-0.01881	0.00051	-0.00292
79.25	-0.23277	0.18549	-0.01754	0.00041	-0.00302
79.75	-0.23262	0.18303	-0.01667	0.00036	-0.00327
80.25	-0.23871	0.18508	-0.01649	0.00022	-0.00316
80.75	-0.24218	0.18620	-0.01681	0.00032	-0.00270
81.25	-0.24448	0.18784	-0.01706	0.00051	-0.00212
81.75	-0.24632	0.19204	-0.01563	0.00028	-0.00174
82.25	-0.24027	0.18975	-0.01370	0.00008	-0.00159
82.75	-0.23748	0.18880	-0.01345	0.00015	-0.00172

83.25	-0.23753	0.18910	-0.01497	0.00024	-0.00182
83.75	-0.23209	0.18541	-0.01593	0.00006	-0.00179
84.25	-0.23538	0.18588	-0.01648	-0.00002	-0.00159
84.75	-0.24272	0.19081	-0.01549	0.00020	-0.00152
85.25	-0.23143	0.18527	-0.01341	0.00041	-0.00151
85.75	-0.22310	0.18257	-0.01196	0.00010	-0.00110
86.25	-0.23362	0.19082	-0.01172	-0.00025	-0.00055
86.75	-0.23358	0.18779	-0.01080	-0.00029	-0.00029
87.25	-0.21318	0.17326	-0.00992	-0.00002	-0.00019
87.76	-0.21599	0.17673	-0.00832	-0.00019	0.00034
88.26	-0.22910	0.18722	-0.00786	-0.00039	0.00084
88.76	-0.24028	0.19674	-0.00608	-0.00062	0.00108
89.27	-0.25114	0.20629	-0.00534	-0.00117	0.00199
89.70	-0.22839	0.19317	-0.00408	-0.00128	0.00258

Table 33. Aerodynamic Coefficients, $U_{\infty} = 6$ [in/sec], $Re = 1.17 \times 10^4$,
 $\alpha = 0^\circ$, $\dot{\phi} = 7^\circ/\text{sec}$

DYNAMIC ROLL $\phi = 0^\circ\text{-}90^\circ$					
ϕ ($^\circ$)	C_N	C_M	C_S	C_{YM}	C_{RM}
0.22	-0.15471	0.22122	-0.00460	-0.00124	0.00139
0.74	-0.14814	0.22029	-0.00206	-0.00208	0.00161
1.24	-0.15517	0.22036	-0.00313	-0.00224	0.00011
1.74	-0.15582	0.22339	-0.00752	-0.00223	-0.00106
2.25	-0.16094	0.22697	-0.01220	-0.00216	-0.00156
2.74	-0.15782	0.22893	-0.01746	-0.00284	-0.00161
3.24	-0.14188	0.21711	-0.02287	-0.00298	-0.00155
3.74	-0.13951	0.21487	-0.02824	-0.00281	-0.00155
4.25	-0.14576	0.22290	-0.03275	-0.00322	-0.00142
4.75	-0.15822	0.23050	-0.03845	-0.00310	-0.00199
5.25	-0.16076	0.22819	-0.04509	-0.00281	-0.00218
5.75	-0.14933	0.21976	-0.05215	-0.00258	-0.00237
6.25	-0.13982	0.21842	-0.05797	-0.00283	-0.00262
6.75	-0.13415	0.21804	-0.06298	-0.00318	-0.00274
7.25	-0.13167	0.21886	-0.06829	-0.00360	-0.00263
7.75	-0.13575	0.22173	-0.07350	-0.00380	-0.00277
8.25	-0.13622	0.22113	-0.07971	-0.00351	-0.00287
8.75	-0.13131	0.21429	-0.08492	-0.00340	-0.00300
9.25	-0.12907	0.21102	-0.09070	-0.00344	-0.00317
9.75	-0.13466	0.21427	-0.09686	-0.00337	-0.00341
10.25	-0.13307	0.21323	-0.10303	-0.00321	-0.00367
10.75	-0.13082	0.21111	-0.10802	-0.00319	-0.00407
11.25	-0.12383	0.20595	-0.11268	-0.00326	-0.00438
11.75	-0.12205	0.20580	-0.11824	-0.00327	-0.00459
12.25	-0.12521	0.20935	-0.12331	-0.00349	-0.00455
12.75	-0.12970	0.21417	-0.12946	-0.00351	-0.00462
13.25	-0.12888	0.21460	-0.13660	-0.00350	-0.00474
13.75	-0.13462	0.21424	-0.14274	-0.00342	-0.00504
14.25	-0.13547	0.21330	-0.14902	-0.00334	-0.00500
14.75	-0.14004	0.21547	-0.15365	-0.00339	-0.00489
15.25	-0.13417	0.21125	-0.15795	-0.00343	-0.00482
15.75	-0.12186	0.20516	-0.16279	-0.00367	-0.00463
16.25	-0.11667	0.20173	-0.16773	-0.00379	-0.00471
16.75	-0.11940	0.20258	-0.17268	-0.00376	-0.00483
17.24	-0.12434	0.20375	-0.17862	-0.00382	-0.00472

17.75	-0.12909	0.20500	-0.18589	-0.00372	-0.00461
18.26	-0.13276	0.20802	-0.19331	-0.00383	-0.00443
18.75	-0.13649	0.21404	-0.20025	-0.00405	-0.00448
19.25	-0.13709	0.21721	-0.20696	-0.00406	-0.00452
19.75	-0.13037	0.21379	-0.21228	-0.00397	-0.00466
20.25	-0.12837	0.21243	-0.21633	-0.00403	-0.00467
20.74	-0.13821	0.21770	-0.21968	-0.00435	-0.00455
21.25	-0.14326	0.21932	-0.22412	-0.00443	-0.00430
21.75	-0.15206	0.22274	-0.22874	-0.00458	-0.00419
22.25	-0.15737	0.22112	-0.23294	-0.00457	-0.00459
22.75	-0.16410	0.22000	-0.23638	-0.00442	-0.00500
23.25	-0.15992	0.21171	-0.23832	-0.00432	-0.00516
23.75	-0.15902	0.20747	-0.24006	-0.00418	-0.00524
24.25	-0.15730	0.20346	-0.24139	-0.00409	-0.00527
24.75	-0.15572	0.20017	-0.24179	-0.00407	-0.00527
25.25	-0.15132	0.19386	-0.24098	-0.00401	-0.00530
25.75	-0.15063	0.18911	-0.23997	-0.00396	-0.00544
26.25	-0.15066	0.18523	-0.24011	-0.00397	-0.00554
26.75	-0.15889	0.18653	-0.24215	-0.00378	-0.00564
27.25	-0.16349	0.18486	-0.24429	-0.00360	-0.00581
27.75	-0.17198	0.18584	-0.24611	-0.00345	-0.00589
28.25	-0.17750	0.18348	-0.24674	-0.00335	-0.00632
28.75	-0.18265	0.18065	-0.24771	-0.00308	-0.00666
29.25	-0.19395	0.18364	-0.24857	-0.00296	-0.00662
29.75	-0.20958	0.19077	-0.24972	-0.00297	-0.00637
30.25	-0.21752	0.19298	-0.24937	-0.00313	-0.00616
30.75	-0.22019	0.19119	-0.24984	-0.00310	-0.00619
31.25	-0.22014	0.18638	-0.25068	-0.00298	-0.00635
31.75	-0.22094	0.18108	-0.25159	-0.00286	-0.00676
32.25	-0.22173	0.17616	-0.25125	-0.00278	-0.00692
32.75	-0.22640	0.17319	-0.25161	-0.00269	-0.00705
33.25	-0.23123	0.17216	-0.25260	-0.00264	-0.00701
33.75	-0.24534	0.17707	-0.25343	-0.00263	-0.00715
34.25	-0.25238	0.17810	-0.25385	-0.00254	-0.00741
34.75	-0.25903	0.17619	-0.25376	-0.00243	-0.00759
35.25	-0.26961	0.17993	-0.25382	-0.00255	-0.00756
35.75	-0.28079	0.18410	-0.25531	-0.00264	-0.00750

36.25	-0.29375	0.18754	-0.25790	-0.00240	-0.00747
36.75	-0.30594	0.19035	-0.25987	-0.00220	-0.00743
37.25	-0.31153	0.18709	-0.26027	-0.00183	-0.00773
37.75	-0.31080	0.17810	-0.25863	-0.00164	-0.00819
38.25	-0.30802	0.16937	-0.25695	-0.00160	-0.00859
38.75	-0.30950	0.16534	-0.25611	-0.00156	-0.00867
39.25	-0.31789	0.16819	-0.25520	-0.00193	-0.00854
39.75	-0.33350	0.17572	-0.25582	-0.00213	-0.00858
40.25	-0.33807	0.17264	-0.25600	-0.00216	-0.00869
40.75	-0.34208	0.16784	-0.25648	-0.00196	-0.00889
41.25	-0.34764	0.16522	-0.25614	-0.00206	-0.00899
41.75	-0.35088	0.16229	-0.25563	-0.00207	-0.00908
42.25	-0.35887	0.16341	-0.25562	-0.00195	-0.00916
42.75	-0.35827	0.15871	-0.25442	-0.00185	-0.00936
43.24	-0.36734	0.16049	-0.25465	-0.00162	-0.00958
43.75	-0.37836	0.16306	-0.25479	-0.00136	-0.00963
44.25	-0.39215	0.16769	-0.25407	-0.00146	-0.00954
44.75	-0.40073	0.16844	-0.25425	-0.00149	-0.00959
45.25	-0.40344	0.16467	-0.25459	-0.00161	-0.00951
45.75	-0.39601	0.15735	-0.25440	-0.00171	-0.00933
46.25	-0.38914	0.15175	-0.25639	-0.00171	-0.00938
46.75	-0.38685	0.14868	-0.25978	-0.00149	-0.00942
47.25	-0.38895	0.14925	-0.26445	-0.00116	-0.00956
47.75	-0.38997	0.15001	-0.26746	-0.00113	-0.00947
48.25	-0.39189	0.15137	-0.26993	-0.00129	-0.00931
48.75	-0.39445	0.15249	-0.27153	-0.00145	-0.00921
49.25	-0.39526	0.15187	-0.27097	-0.00154	-0.00909
49.75	-0.39915	0.15096	-0.27182	-0.00151	-0.00899
50.25	-0.40137	0.14808	-0.27303	-0.00141	-0.00897
50.75	-0.40948	0.15009	-0.27537	-0.00133	-0.00881
51.25	-0.41386	0.14935	-0.27778	-0.00113	-0.00859
51.75	-0.41692	0.14979	-0.27977	-0.00106	-0.00852
52.25	-0.41677	0.14996	-0.28166	-0.00108	-0.00861
52.75	-0.41388	0.14708	-0.28179	-0.00124	-0.00879
53.25	-0.41585	0.14801	-0.28275	-0.00146	-0.00874
53.75	-0.41548	0.14570	-0.28435	-0.00139	-0.00876
54.25	-0.41849	0.14391	-0.28524	-0.00132	-0.00878

54.75	-0.42010	0.14192	-0.28672	-0.00127	-0.00875
55.25	-0.42261	0.14138	-0.28870	-0.00110	-0.00871
55.75	-0.42367	0.14221	-0.29102	-0.00099	-0.00844
56.25	-0.43107	0.14639	-0.29259	-0.00101	-0.00841
56.75	-0.43377	0.14797	-0.29375	-0.00108	-0.00827
57.25	-0.43937	0.15016	-0.29534	-0.00113	-0.00809
57.75	-0.44009	0.14825	-0.29584	-0.00123	-0.00816
58.25	-0.44062	0.14526	-0.29607	-0.00124	-0.00833
58.75	-0.44473	0.14539	-0.29706	-0.00127	-0.00834
59.25	-0.44566	0.14410	-0.29788	-0.00139	-0.00815
59.75	-0.45029	0.14551	-0.29794	-0.00161	-0.00796
60.25	-0.44599	0.14076	-0.29765	-0.00179	-0.00795
60.75	-0.43759	0.13452	-0.29710	-0.00201	-0.00786
61.25	-0.43453	0.13284	-0.29723	-0.00217	-0.00766
61.75	-0.44561	0.14000	-0.29773	-0.00230	-0.00746
62.24	-0.46398	0.15114	-0.29962	-0.00237	-0.00724
62.75	-0.48130	0.16036	-0.30224	-0.00219	-0.00711
63.25	-0.48038	0.15694	-0.30267	-0.00211	-0.00706
63.75	-0.47179	0.14837	-0.30298	-0.00214	-0.00718
64.25	-0.46235	0.13686	-0.30278	-0.00206	-0.00754
64.75	-0.46151	0.13239	-0.30113	-0.00223	-0.00754
65.25	-0.46665	0.13313	-0.29984	-0.00250	-0.00741
65.74	-0.47524	0.13660	-0.29989	-0.00276	-0.00718
66.25	-0.47928	0.13985	-0.30088	-0.00294	-0.00672
66.76	-0.48090	0.14108	-0.30190	-0.00291	-0.00653
67.25	-0.48200	0.13899	-0.30285	-0.00296	-0.00637
67.75	-0.48051	0.13379	-0.30423	-0.00277	-0.00644
68.25	-0.47810	0.12859	-0.30578	-0.00245	-0.00645
68.75	-0.48222	0.13007	-0.30878	-0.00218	-0.00634
69.25	-0.49025	0.13475	-0.31122	-0.00224	-0.00616
69.75	-0.49918	0.14064	-0.31284	-0.00244	-0.00597
70.25	-0.50107	0.14287	-0.31357	-0.00254	-0.00594
70.75	-0.50291	0.14284	-0.31243	-0.00261	-0.00613
71.25	-0.50556	0.14340	-0.31267	-0.00257	-0.00605
71.75	-0.50318	0.13939	-0.31287	-0.00229	-0.00610
72.25	-0.50946	0.14123	-0.31467	-0.00209	-0.00582
72.75	-0.51320	0.14251	-0.31746	-0.00204	-0.00557

73.25	-0.51777	0.14304	-0.31881	-0.00205	-0.00551
73.75	-0.51895	0.14275	-0.32063	-0.00202	-0.00531
74.25	-0.51818	0.13993	-0.32362	-0.00184	-0.00524
74.75	-0.52377	0.14256	-0.32572	-0.00180	-0.00506
75.25	-0.52345	0.14243	-0.32658	-0.00175	-0.00498
75.75	-0.52948	0.14640	-0.32676	-0.00188	-0.00475
76.25	-0.53111	0.14647	-0.32655	-0.00202	-0.00473
76.75	-0.52349	0.13880	-0.32510	-0.00199	-0.00486
77.25	-0.52506	0.13527	-0.32532	-0.00183	-0.00477
77.75	-0.52713	0.13335	-0.32547	-0.00154	-0.00455
78.25	-0.53874	0.13819	-0.32605	-0.00145	-0.00413
78.75	-0.54857	0.14334	-0.32634	-0.00153	-0.00361
79.25	-0.56031	0.14967	-0.32873	-0.00179	-0.00322
79.75	-0.56028	0.14900	-0.33114	-0.00192	-0.00294
80.25	-0.55285	0.14298	-0.33286	-0.00187	-0.00269
80.75	-0.55100	0.14118	-0.33201	-0.00188	-0.00217
81.25	-0.55243	0.14041	-0.33053	-0.00215	-0.00163
81.75	-0.54979	0.13797	-0.32824	-0.00247	-0.00148
82.25	-0.56091	0.14208	-0.32877	-0.00242	-0.00145
82.75	-0.58282	0.15343	-0.33143	-0.00207	-0.00142
83.25	-0.59393	0.15870	-0.33423	-0.00176	-0.00120
83.75	-0.58462	0.14987	-0.33560	-0.00157	-0.00098
84.25	-0.57790	0.14360	-0.33399	-0.00199	-0.00051
84.75	-0.58566	0.14741	-0.33258	-0.00231	-0.00017
85.25	-0.59006	0.14941	-0.33054	-0.00237	-0.00009
85.75	-0.58961	0.14823	-0.32811	-0.00245	-0.00004
86.25	-0.59897	0.15408	-0.32821	-0.00270	0.00038
86.75	-0.60135	0.15355	-0.33062	-0.00261	0.00106
87.25	-0.59299	0.14558	-0.33135	-0.00258	0.00130
87.75	-0.59659	0.14616	-0.33093	-0.00269	0.00195
88.25	-0.60855	0.15014	-0.32797	-0.00284	0.00233
88.76	-0.62016	0.15850	-0.32536	-0.00323	0.00304
89.27	-0.61824	0.15180	-0.32755	-0.00301	0.00336
89.71	-0.63224	0.16188	-0.32515	-0.00359	0.00433

Table 34. Aerodynamic Coefficients, $U_{\infty} = 6$ [in/sec], $Re = 1.17 \times 10^4$
 $\alpha = 5^\circ$, $\dot{\phi} = 7^\circ/\text{sec}$

DYNAMIC ROLL $\phi = 0^\circ\text{-}90^\circ$					
ϕ ($^\circ$)	C_N	C_M	C_S	C_{YM}	C_{RM}
0.22	0.14229	0.21352	-0.01419	0.00085	0.00250
0.74	0.14371	0.21628	-0.01354	0.00017	0.00294
1.24	0.12581	0.22424	-0.01229	-0.00053	0.00159
1.74	0.13042	0.21749	-0.01513	-0.00062	-0.00070
2.25	0.12677	0.22294	-0.02194	-0.00010	-0.00150
2.75	0.11959	0.23042	-0.02820	0.00006	-0.00114
3.25	0.14934	0.21745	-0.03308	-0.00031	-0.00116
3.74	0.16195	0.21147	-0.03786	-0.00052	-0.00125
4.25	0.15764	0.21486	-0.04196	-0.00057	-0.00162
4.75	0.15740	0.21306	-0.04794	-0.00045	-0.00223
5.25	0.16151	0.20641	-0.05404	-0.00048	-0.00230
5.75	0.15959	0.20405	-0.06003	-0.00017	-0.00272
6.25	0.15919	0.20559	-0.06640	0.00010	-0.00274
6.75	0.16665	0.20378	-0.07194	-0.00002	-0.00261
7.25	0.16069	0.20936	-0.07716	-0.00040	-0.00284
7.75	0.15824	0.21068	-0.08216	-0.00071	-0.00321
8.25	0.16581	0.20550	-0.08814	-0.00070	-0.00330
8.75	0.17063	0.20252	-0.09380	-0.00075	-0.00330
9.25	0.16809	0.20475	-0.10007	-0.00074	-0.00337
9.75	0.16764	0.20676	-0.10550	-0.00102	-0.00334
10.25	0.16718	0.20954	-0.11070	-0.00141	-0.00354
10.75	0.16266	0.21447	-0.11654	-0.00158	-0.00397
11.25	0.16630	0.21231	-0.12276	-0.00151	-0.00444
11.75	0.17459	0.20602	-0.12941	-0.00121	-0.00476
12.25	0.17928	0.20006	-0.13502	-0.00108	-0.00500
12.75	0.17425	0.19742	-0.13975	-0.00111	-0.00518
13.25	0.17043	0.19718	-0.14525	-0.00099	-0.00545
13.75	0.16000	0.20186	-0.15065	-0.00093	-0.00550
14.25	0.15085	0.21095	-0.15634	-0.00112	-0.00543
14.75	0.15821	0.20850	-0.16244	-0.00130	-0.00532
15.25	0.16879	0.20374	-0.16863	-0.00126	-0.00542
15.74	0.18164	0.19766	-0.17514	-0.00125	-0.00559
16.25	0.18351	0.19629	-0.18121	-0.00114	-0.00608
16.75	0.17892	0.19864	-0.18598	-0.00125	-0.00648
17.25	0.16902	0.20394	-0.19005	-0.00155	-0.00650

17.75	0.16334	0.20541	-0.19492	-0.00160	-0.00644
18.25	0.16008	0.20553	-0.19981	-0.00177	-0.00629
18.75	0.16131	0.20081	-0.20512	-0.00170	-0.00628
19.25	0.16170	0.19789	-0.21142	-0.00164	-0.00629
19.75	0.15528	0.20144	-0.21796	-0.00155	-0.00629
20.25	0.14967	0.20237	-0.22352	-0.00164	-0.00618
20.75	0.14092	0.20843	-0.22987	-0.00184	-0.00589
21.25	0.14332	0.20840	-0.23544	-0.00207	-0.00568
21.75	0.14469	0.20655	-0.23972	-0.00229	-0.00580
22.25	0.14350	0.20720	-0.24394	-0.00228	-0.00614
22.75	0.13832	0.20742	-0.24658	-0.00220	-0.00657
23.25	0.13010	0.20868	-0.24884	-0.00211	-0.00673
23.75	0.12336	0.20672	-0.24987	-0.00194	-0.00684
24.25	0.11628	0.20563	-0.25051	-0.00180	-0.00673
24.75	0.11273	0.20322	-0.25103	-0.00179	-0.00657
25.25	0.10614	0.20207	-0.25199	-0.00202	-0.00647
25.75	0.10467	0.19944	-0.25286	-0.00236	-0.00668
26.25	0.10706	0.19129	-0.25315	-0.00248	-0.00707
26.75	0.09829	0.18802	-0.25289	-0.00223	-0.00740
27.25	0.09161	0.18412	-0.25282	-0.00172	-0.00780
27.75	0.08181	0.18287	-0.25390	-0.00118	-0.00811
28.25	0.07395	0.18244	-0.25532	-0.00085	-0.00841
28.75	0.06916	0.18197	-0.25663	-0.00063	-0.00881
29.24	0.06715	0.17942	-0.25802	-0.00055	-0.00912
29.75	0.06893	0.17425	-0.25925	-0.00050	-0.00951
30.25	0.06311	0.17278	-0.26004	-0.00051	-0.00966
30.75	0.04762	0.17481	-0.26003	-0.00041	-0.00974
31.25	0.02681	0.18155	-0.26072	-0.00024	-0.00976
31.75	0.00550	0.18868	-0.26132	-0.00012	-0.00974
32.25	-0.00169	0.18905	-0.26174	-0.00027	-0.00968
32.75	-0.00569	0.18785	-0.26253	-0.00028	-0.00973
33.25	-0.00705	0.18359	-0.26331	-0.00028	-0.00999
33.75	-0.00617	0.17754	-0.26352	-0.00032	-0.01045
34.25	-0.01068	0.17323	-0.26297	-0.00017	-0.01109
34.74	-0.02050	0.17093	-0.26277	-0.00016	-0.01136
35.25	-0.03266	0.17113	-0.26326	-0.00008	-0.01153
35.75	-0.04374	0.16983	-0.26388	0.00009	-0.01155

36.25	-0.05446	0.17201	-0.26512	0.00008	-0.01141
36.75	-0.06199	0.17259	-0.26542	0.00013	-0.01137
37.25	-0.06585	0.16890	-0.26466	0.00014	-0.01156
37.75	-0.07259	0.16573	-0.26385	0.00028	-0.01169
38.24	-0.08405	0.16428	-0.26393	0.00054	-0.01195
38.75	-0.09578	0.16243	-0.26408	0.00065	-0.01208
39.25	-0.10230	0.15857	-0.26422	0.00073	-0.01232
39.75	-0.11214	0.15702	-0.26561	0.00094	-0.01269
40.25	-0.11744	0.15494	-0.26673	0.00103	-0.01318
40.75	-0.12221	0.15212	-0.26792	0.00124	-0.01371
41.25	-0.13801	0.15744	-0.26851	0.00133	-0.01397
41.75	-0.15934	0.16651	-0.26854	0.00128	-0.01383
42.25	-0.17232	0.17021	-0.26801	0.00125	-0.01343
42.75	-0.18488	0.17117	-0.26657	0.00131	-0.01325
43.25	-0.18301	0.16174	-0.26502	0.00120	-0.01333
43.75	-0.18796	0.15780	-0.26454	0.00108	-0.01365
44.25	-0.20442	0.16236	-0.26382	0.00079	-0.01377
44.75	-0.21766	0.16308	-0.26351	0.00078	-0.01379
45.25	-0.22844	0.16390	-0.26496	0.00094	-0.01375
45.75	-0.22813	0.15913	-0.26631	0.00122	-0.01363
46.25	-0.22309	0.15305	-0.26813	0.00140	-0.01380
46.75	-0.21851	0.14717	-0.27078	0.00164	-0.01391
47.25	-0.21661	0.14432	-0.27306	0.00170	-0.01379
47.75	-0.22261	0.14568	-0.27590	0.00185	-0.01381
48.25	-0.23017	0.14741	-0.27773	0.00193	-0.01372
48.75	-0.23560	0.14861	-0.27891	0.00178	-0.01341
49.25	-0.24423	0.15288	-0.28020	0.00166	-0.01323
49.75	-0.25416	0.15616	-0.28211	0.00159	-0.01291
50.25	-0.25560	0.15259	-0.28391	0.00170	-0.01264
50.75	-0.25398	0.14668	-0.28557	0.00177	-0.01244
51.25	-0.24771	0.14011	-0.28708	0.00175	-0.01225
51.74	-0.25165	0.14026	-0.28786	0.00159	-0.01199
52.25	-0.26030	0.14573	-0.28876	0.00155	-0.01192
52.75	-0.27186	0.15365	-0.29002	0.00153	-0.01186
53.25	-0.28097	0.15987	-0.29178	0.00147	-0.01175
53.75	-0.28428	0.15942	-0.29329	0.00124	-0.01157
54.25	-0.28971	0.15886	-0.29487	0.00097	-0.01137

54.75	-0.29447	0.15823	-0.29608	0.00078	-0.01102
55.25	-0.30791	0.16257	-0.29798	0.00074	-0.01061
55.75	-0.31996	0.16439	-0.30020	0.00103	-0.01051
56.25	-0.32372	0.16065	-0.30155	0.00133	-0.01050
56.75	-0.32385	0.15485	-0.30191	0.00162	-0.01050
57.24	-0.32160	0.14935	-0.30258	0.00185	-0.01031
57.75	-0.32544	0.14935	-0.30367	0.00181	-0.01010
58.25	-0.33585	0.15390	-0.30506	0.00164	-0.00999
58.75	-0.34083	0.15575	-0.30644	0.00126	-0.00982
59.25	-0.34268	0.15261	-0.30649	0.00103	-0.00959
59.75	-0.34403	0.14961	-0.30673	0.00092	-0.00928
60.25	-0.34892	0.14862	-0.30687	0.00082	-0.00893
60.74	-0.34845	0.14544	-0.30709	0.00082	-0.00866
61.25	-0.35240	0.14494	-0.30853	0.00075	-0.00844
61.75	-0.36427	0.14929	-0.30889	0.00061	-0.00811
62.25	-0.38315	0.15576	-0.30799	0.00051	-0.00780
62.75	-0.39706	0.15943	-0.30828	0.00052	-0.00739
63.25	-0.40811	0.16153	-0.30855	0.00051	-0.00690
63.75	-0.40912	0.15750	-0.30913	0.00056	-0.00655
64.25	-0.40913	0.15280	-0.31112	0.00078	-0.00660
64.75	-0.41036	0.15076	-0.31320	0.00093	-0.00676
65.25	-0.41710	0.15250	-0.31418	0.00079	-0.00667
65.75	-0.42743	0.15786	-0.31521	0.00030	-0.00644
66.25	-0.43276	0.15808	-0.31580	0.00001	-0.00634
66.75	-0.43141	0.15215	-0.31467	-0.00015	-0.00631
67.25	-0.43119	0.14752	-0.31325	-0.00023	-0.00624
67.75	-0.43088	0.14277	-0.31249	-0.00012	-0.00627
68.25	-0.43593	0.14370	-0.31337	-0.00009	-0.00611
68.75	-0.44398	0.14691	-0.31431	-0.00005	-0.00584
69.25	-0.45310	0.15133	-0.31549	-0.00019	-0.00545
69.75	-0.45846	0.15123	-0.31734	-0.00015	-0.00539
70.25	-0.45768	0.14710	-0.32017	0.00001	-0.00562
70.75	-0.46179	0.14785	-0.32225	0.00001	-0.00568
71.25	-0.46120	0.14483	-0.32536	0.00024	-0.00565
71.75	-0.46673	0.14673	-0.32718	0.00017	-0.00555
72.25	-0.47111	0.14793	-0.32833	0.00005	-0.00531
72.75	-0.46860	0.14331	-0.32902	0.00019	-0.00527

73.25	-0.47333	0.14347	-0.32932	0.00022	-0.00515
73.75	-0.47963	0.14564	-0.32955	0.00027	-0.00494
74.24	-0.49323	0.15140	-0.32950	0.00030	-0.00483
74.75	-0.50240	0.15393	-0.33041	0.00030	-0.00464
75.25	-0.51049	0.15513	-0.33107	0.00034	-0.00460
75.75	-0.51145	0.15180	-0.33174	0.00036	-0.00453
76.25	-0.50930	0.14601	-0.33284	0.00053	-0.00464
76.75	-0.51213	0.14508	-0.33451	0.00068	-0.00456
77.25	-0.50664	0.13874	-0.33570	0.00072	-0.00444
77.75	-0.51759	0.14361	-0.33823	0.00090	-0.00424
78.25	-0.52657	0.14693	-0.33948	0.00079	-0.00382
78.75	-0.54344	0.15482	-0.34019	0.00085	-0.00335
79.25	-0.55044	0.15504	-0.33991	0.00078	-0.00303
79.75	-0.55231	0.15321	-0.33891	0.00057	-0.00271
80.25	-0.54839	0.14888	-0.33880	0.00028	-0.00239
80.75	-0.55130	0.14902	-0.34009	0.00022	-0.00204
81.25	-0.56644	0.15816	-0.34204	0.00027	-0.00171
81.75	-0.57911	0.16623	-0.34277	0.00029	-0.00151
82.25	-0.58108	0.16534	-0.34297	0.00029	-0.00148
82.75	-0.58117	0.16055	-0.34194	0.00036	-0.00139
83.25	-0.58164	0.15639	-0.34084	0.00027	-0.00108
83.75	-0.58210	0.15432	-0.33898	-0.00019	-0.00057
84.25	-0.58877	0.15676	-0.33774	-0.00047	-0.00004
84.75	-0.59177	0.15640	-0.33656	-0.00033	0.00015
85.25	-0.59291	0.15344	-0.33650	0.00000	0.00041
85.75	-0.60621	0.15685	-0.33819	0.00026	0.00069
86.25	-0.61445	0.15781	-0.34023	0.00026	0.00078
86.75	-0.62651	0.16644	-0.34085	-0.00025	0.00153
87.25	-0.62375	0.16182	-0.33876	-0.00033	0.00173
87.75	-0.62371	0.15410	-0.33847	-0.00006	0.00194
88.25	-0.65456	0.17478	-0.33914	-0.00059	0.00271
88.76	-0.65093	0.17113	-0.33719	-0.00054	0.00289
89.27	-0.63612	0.15552	-0.33473	-0.00066	0.00357
89.71	-0.64620	0.16317	-0.33533	-0.00093	0.00476

Table 35. Aerodynamic Coefficients, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$,
 $\alpha = 10^\circ$, $\dot{\phi} = 7^\circ/\text{sec}$

DYNAMIC ROLL $\phi = 0^\circ\text{-}90^\circ$					
ϕ ($^\circ$)	C_N	C_M	C_S	C_{YM}	C_{RM}
0.22	0.35553	0.23987	-0.00614	-0.00257	0.00315
0.73	0.35672	0.23984	-0.00575	-0.00311	0.00313
1.24	0.33736	0.24392	-0.00509	-0.00377	0.00198
1.74	0.34336	0.23550	-0.00817	-0.00368	0.00009
2.25	0.36434	0.22708	-0.01506	-0.00308	-0.00066
2.74	0.37008	0.22835	-0.01866	-0.00323	-0.00031
3.25	0.36799	0.23091	-0.02504	-0.00334	-0.00030
3.74	0.37277	0.22511	-0.03224	-0.00345	-0.00119
4.25	0.37295	0.22274	-0.03682	-0.00364	-0.00151
4.75	0.36250	0.22996	-0.04116	-0.00376	-0.00159
5.25	0.36153	0.23012	-0.04688	-0.00387	-0.00134
5.74	0.37400	0.21773	-0.05310	-0.00380	-0.00148
6.25	0.37225	0.22000	-0.06033	-0.00380	-0.00200
6.75	0.36466	0.22541	-0.06678	-0.00370	-0.00234
7.25	0.36018	0.22924	-0.07180	-0.00367	-0.00247
7.75	0.36060	0.23015	-0.07618	-0.00383	-0.00254
8.25	0.36668	0.22782	-0.08139	-0.00394	-0.00256
8.75	0.36846	0.22574	-0.08722	-0.00403	-0.00227
9.25	0.36127	0.22776	-0.09383	-0.00411	-0.00218
9.75	0.35777	0.22491	-0.09946	-0.00421	-0.00235
10.25	0.36000	0.21856	-0.10460	-0.00429	-0.00295
10.74	0.36338	0.21750	-0.11065	-0.00442	-0.00345
11.25	0.36551	0.22052	-0.11690	-0.00452	-0.00382
11.75	0.36529	0.22473	-0.12262	-0.00451	-0.00399
12.25	0.36725	0.22281	-0.12757	-0.00453	-0.00398
12.75	0.37035	0.22270	-0.13312	-0.00457	-0.00394
13.25	0.36806	0.22251	-0.13870	-0.00486	-0.00391
13.75	0.36536	0.22352	-0.14421	-0.00513	-0.00393
14.25	0.36358	0.22176	-0.15009	-0.00522	-0.00413
14.75	0.36611	0.21691	-0.15533	-0.00526	-0.00430
15.25	0.36342	0.21662	-0.16084	-0.00526	-0.00435
15.75	0.35255	0.22296	-0.16672	-0.00517	-0.00444
16.25	0.34142	0.22961	-0.17228	-0.00515	-0.00463
16.75	0.33515	0.23354	-0.17711	-0.00543	-0.00482
17.24	0.34087	0.22934	-0.18183	-0.00580	-0.00470

17.75	0.34047	0.22854	-0.18741	-0.00596	-0.00449
18.25	0.33667	0.23134	-0.19407	-0.00597	-0.00423
18.75	0.33591	0.22858	-0.19985	-0.00579	-0.00423
19.25	0.34052	0.22385	-0.20648	-0.00556	-0.00430
19.75	0.33894	0.22091	-0.21179	-0.00561	-0.00439
20.25	0.33984	0.21817	-0.21725	-0.00565	-0.00447
20.75	0.33771	0.21836	-0.22247	-0.00591	-0.00435
21.25	0.34093	0.21557	-0.22816	-0.00592	-0.00426
21.75	0.34213	0.21234	-0.23298	-0.00606	-0.00422
22.25	0.33707	0.21434	-0.23728	-0.00633	-0.00428
22.75	0.33001	0.21556	-0.24024	-0.00656	-0.00438
23.25	0.31957	0.21588	-0.24161	-0.00663	-0.00440
23.75	0.30125	0.21962	-0.24283	-0.00639	-0.00454
24.25	0.28588	0.22195	-0.24447	-0.00592	-0.00458
24.75	0.27391	0.22274	-0.24552	-0.00568	-0.00460
25.25	0.26991	0.22157	-0.24696	-0.00569	-0.00451
25.75	0.26113	0.22356	-0.24832	-0.00559	-0.00457
26.24	0.26185	0.21663	-0.24962	-0.00529	-0.00493
26.75	0.25789	0.21185	-0.25112	-0.00498	-0.00523
27.25	0.25723	0.20491	-0.25165	-0.00478	-0.00565
27.75	0.25188	0.20046	-0.25283	-0.00454	-0.00598
28.25	0.23914	0.20327	-0.25420	-0.00447	-0.00618
28.75	0.22382	0.20752	-0.25463	-0.00451	-0.00609
29.25	0.21698	0.20586	-0.25570	-0.00443	-0.00589
29.75	0.21270	0.20400	-0.25728	-0.00428	-0.00578
30.25	0.21189	0.19832	-0.25790	-0.00414	-0.00591
30.75	0.21188	0.19002	-0.25710	-0.00395	-0.00618
31.25	0.20442	0.18810	-0.25703	-0.00376	-0.00646
31.75	0.20000	0.18510	-0.25694	-0.00366	-0.00679
32.25	0.19377	0.18427	-0.25709	-0.00361	-0.00689
32.75	0.18678	0.18397	-0.25874	-0.00353	-0.00683
33.25	0.18014	0.18200	-0.25957	-0.00340	-0.00688
33.75	0.16319	0.18738	-0.25941	-0.00364	-0.00688
34.25	0.14382	0.19278	-0.25870	-0.00384	-0.00704
34.75	0.12901	0.19563	-0.25926	-0.00392	-0.00716
35.25	0.11780	0.19402	-0.26031	-0.00361	-0.00738
35.75	0.10794	0.19085	-0.26033	-0.00334	-0.00758

36.25	0.10027	0.18528	-0.26141	-0.00288	-0.00777
36.75	0.09372	0.18262	-0.26268	-0.00263	-0.00791
37.25	0.09094	0.17707	-0.26332	-0.00248	-0.00802
37.75	0.08227	0.17702	-0.26295	-0.00259	-0.00845
38.25	0.06811	0.17971	-0.26240	-0.00269	-0.00874
38.75	0.05918	0.18146	-0.26197	-0.00277	-0.00903
39.25	0.04883	0.18241	-0.26118	-0.00294	-0.00921
39.75	0.04571	0.17803	-0.26162	-0.00288	-0.00953
40.25	0.04542	0.17284	-0.26249	-0.00272	-0.00984
40.75	0.03630	0.17050	-0.26208	-0.00269	-0.00993
41.25	0.02863	0.16711	-0.26092	-0.00263	-0.00988
41.75	0.01580	0.16858	-0.26067	-0.00249	-0.00979
42.25	0.00018	0.17185	-0.26046	-0.00244	-0.00964
42.75	-0.01452	0.17503	-0.26127	-0.00239	-0.00967
43.24	-0.02728	0.17632	-0.26121	-0.00240	-0.00993
43.75	-0.03600	0.17468	-0.26212	-0.00222	-0.01027
44.25	-0.04223	0.17153	-0.26212	-0.00216	-0.01057
44.75	-0.04549	0.16685	-0.26232	-0.00200	-0.01089
45.25	-0.04861	0.16103	-0.26218	-0.00200	-0.01110
45.75	-0.04843	0.15743	-0.26345	-0.00192	-0.01135
46.25	-0.05649	0.15882	-0.26441	-0.00199	-0.01157
46.75	-0.06301	0.15992	-0.26660	-0.00175	-0.01174
47.25	-0.06715	0.16026	-0.26959	-0.00137	-0.01189
47.75	-0.07339	0.16264	-0.27174	-0.00129	-0.01183
48.25	-0.07691	0.16199	-0.27389	-0.00114	-0.01176
48.75	-0.07959	0.16002	-0.27525	-0.00122	-0.01161
49.25	-0.08237	0.15716	-0.27621	-0.00127	-0.01151
49.75	-0.09360	0.16161	-0.27850	-0.00139	-0.01114
50.25	-0.10196	0.16471	-0.28147	-0.00136	-0.01093
50.75	-0.11063	0.16686	-0.28351	-0.00144	-0.01075
51.25	-0.11916	0.16915	-0.28461	-0.00155	-0.01052
51.75	-0.11935	0.16496	-0.28459	-0.00163	-0.01050
52.25	-0.11444	0.15858	-0.28482	-0.00166	-0.01079
52.75	-0.11165	0.15437	-0.28517	-0.00186	-0.01109
53.25	-0.12164	0.15683	-0.28625	-0.00195	-0.01107
53.75	-0.13182	0.15963	-0.28871	-0.00199	-0.01099
54.25	-0.14253	0.16248	-0.29103	-0.00206	-0.01081

54.75	-0.14494	0.15813	-0.29241	-0.00218	-0.01075
55.25	-0.14234	0.15271	-0.29399	-0.00215	-0.01067
55.75	-0.14937	0.15186	-0.29452	-0.00193	-0.01088
56.25	-0.15995	0.15460	-0.29452	-0.00197	-0.01103
56.75	-0.17468	0.16010	-0.29454	-0.00199	-0.01103
57.25	-0.18834	0.16440	-0.29565	-0.00191	-0.01094
57.75	-0.18859	0.15909	-0.29655	-0.00196	-0.01073
58.25	-0.18875	0.15447	-0.29761	-0.00210	-0.01088
58.75	-0.18670	0.14803	-0.29912	-0.00201	-0.01121
59.25	-0.18359	0.14298	-0.30004	-0.00217	-0.01124
59.75	-0.18823	0.14459	-0.30012	-0.00247	-0.01125
60.25	-0.20536	0.15346	-0.30008	-0.00268	-0.01107
60.75	-0.21583	0.15562	-0.30087	-0.00269	-0.01092
61.25	-0.22887	0.15828	-0.30150	-0.00260	-0.01071
61.75	-0.23202	0.15328	-0.30136	-0.00268	-0.01053
62.24	-0.23583	0.15050	-0.30265	-0.00268	-0.01066
62.75	-0.24872	0.15291	-0.30396	-0.00277	-0.01061
63.25	-0.25835	0.15342	-0.30530	-0.00261	-0.01058
63.75	-0.26446	0.15040	-0.30445	-0.00263	-0.01045
64.25	-0.26638	0.14585	-0.30377	-0.00263	-0.01065
64.75	-0.26872	0.13991	-0.30274	-0.00265	-0.01080
65.25	-0.27520	0.13900	-0.30207	-0.00290	-0.01061
65.74	-0.28591	0.14155	-0.30245	-0.00305	-0.01042
66.25	-0.30880	0.15342	-0.30522	-0.00325	-0.00989
66.75	-0.32226	0.15750	-0.30510	-0.00366	-0.00962
67.25	-0.32679	0.15530	-0.30501	-0.00376	-0.00941
67.74	-0.32746	0.14928	-0.30526	-0.00362	-0.00946
68.25	-0.32519	0.14136	-0.30662	-0.00336	-0.00966
68.75	-0.32753	0.13730	-0.30746	-0.00320	-0.00973
69.25	-0.33446	0.13977	-0.30903	-0.00323	-0.00955
69.75	-0.34823	0.14578	-0.31047	-0.00328	-0.00927
70.25	-0.36167	0.14920	-0.31090	-0.00338	-0.00921
70.75	-0.37624	0.15230	-0.31222	-0.00321	-0.00905
71.24	-0.38928	0.15506	-0.31331	-0.00323	-0.00858
71.75	-0.39799	0.15574	-0.31555	-0.00313	-0.00798
72.25	-0.40444	0.15683	-0.31646	-0.00326	-0.00745
72.75	-0.41389	0.16040	-0.31859	-0.00311	-0.00701

73.25	-0.42196	0.16015	-0.32030	-0.00300	-0.00664
73.75	-0.42768	0.15890	-0.32175	-0.00302	-0.00624
74.25	-0.43765	0.16036	-0.32289	-0.00317	-0.00578
74.75	-0.44294	0.15815	-0.32418	-0.00315	-0.00535
75.25	-0.45103	0.15674	-0.32527	-0.00332	-0.00487
75.75	-0.45404	0.15321	-0.32542	-0.00330	-0.00455
76.25	-0.46423	0.15368	-0.32637	-0.00306	-0.00449
76.75	-0.48601	0.16151	-0.32671	-0.00292	-0.00420
77.25	-0.49725	0.16376	-0.32610	-0.00292	-0.00392
77.75	-0.51071	0.16649	-0.32566	-0.00293	-0.00355
78.25	-0.50952	0.16145	-0.32495	-0.00318	-0.00311
78.75	-0.51425	0.16075	-0.32538	-0.00349	-0.00240
79.24	-0.51672	0.15914	-0.32590	-0.00380	-0.00180
79.75	-0.52756	0.16194	-0.32704	-0.00398	-0.00142
80.25	-0.54165	0.16600	-0.32871	-0.00403	-0.00118
80.75	-0.55163	0.16683	-0.33057	-0.00372	-0.00103
81.25	-0.55783	0.16593	-0.33192	-0.00348	-0.00089
81.75	-0.55744	0.16254	-0.33125	-0.00363	-0.00074
82.25	-0.56191	0.16322	-0.33148	-0.00370	-0.00049
82.75	-0.57564	0.16567	-0.33240	-0.00348	-0.00046
83.25	-0.58859	0.16552	-0.33312	-0.00324	-0.00045
83.75	-0.59836	0.16532	-0.33289	-0.00327	-0.00026
84.25	-0.60651	0.16685	-0.33172	-0.00331	0.00016
84.75	-0.60866	0.16677	-0.33080	-0.00345	0.00047
85.25	-0.60461	0.16468	-0.32926	-0.00393	0.00105
85.75	-0.60361	0.15846	-0.32992	-0.00391	0.00158
86.25	-0.62045	0.16010	-0.33197	-0.00360	0.00159
86.75	-0.63989	0.16877	-0.33226	-0.00381	0.00195
87.25	-0.63917	0.16912	-0.33064	-0.00444	0.00290
87.76	-0.64867	0.17056	-0.32866	-0.00413	0.00351
88.26	-0.64706	0.16258	-0.32802	-0.00368	0.00335
88.76	-0.66144	0.16939	-0.32980	-0.00385	0.00376
89.27	-0.66282	0.16529	-0.32771	-0.00442	0.00463
89.70	-0.67377	0.17362	-0.32401	-0.00491	0.00550

Table 36. Aerodynamic Coefficients, $U_\infty = 6$ [in/sec], $Re = 1.17 \times 10^4$,
 $\alpha = 15^\circ$, $\dot{\phi} = 7^\circ/\text{sec}$

DYNAMIC ROLL $\phi = 0^\circ\text{-}90^\circ$					
ϕ ($^\circ$)	C_N	C_M	C_S	C_{YM}	C_{RM}
0.22	0.54425	0.23053	-0.02913	0.00296	0.00400
0.73	0.55295	0.22477	-0.02772	0.00233	0.00404
1.24	0.56134	0.21693	-0.02820	0.00231	0.00240
1.74	0.55850	0.22188	-0.02970	0.00199	0.00113
2.25	0.54798	0.22861	-0.03516	0.00224	0.00063
2.74	0.52787	0.24354	-0.03992	0.00217	0.00078
3.25	0.53195	0.24224	-0.04587	0.00195	0.00097
3.75	0.54465	0.23195	-0.05166	0.00206	-0.00013
4.25	0.55426	0.22365	-0.05665	0.00203	-0.00116
4.75	0.55803	0.22238	-0.06238	0.00206	-0.00165
5.25	0.55647	0.22549	-0.06863	0.00195	-0.00145
5.74	0.55950	0.22322	-0.07391	0.00169	-0.00147
6.25	0.56066	0.22002	-0.07830	0.00161	-0.00182
6.75	0.55585	0.22116	-0.08433	0.00166	-0.00198
7.25	0.53841	0.23244	-0.09080	0.00128	-0.00172
7.75	0.52907	0.23812	-0.09648	0.00096	-0.00188
8.25	0.52690	0.23708	-0.10102	0.00083	-0.00229
8.75	0.54214	0.22698	-0.10601	0.00091	-0.00250
9.25	0.55261	0.22164	-0.11174	0.00091	-0.00239
9.75	0.54509	0.22595	-0.11791	0.00078	-0.00221
10.25	0.53553	0.22848	-0.12344	0.00069	-0.00255
10.75	0.53276	0.22468	-0.12831	0.00059	-0.00304
11.25	0.53414	0.22037	-0.13324	0.00054	-0.00349
11.75	0.53617	0.21666	-0.13853	0.00057	-0.00363
12.25	0.53609	0.21606	-0.14471	0.00076	-0.00364
12.75	0.53137	0.21690	-0.15079	0.00065	-0.00338
13.25	0.53404	0.21426	-0.15630	0.00052	-0.00349
13.75	0.53008	0.21645	-0.16195	0.00035	-0.00367
14.25	0.52783	0.21624	-0.16755	0.00020	-0.00392
14.75	0.51652	0.22081	-0.17320	0.00012	-0.00405
15.25	0.51499	0.22255	-0.17896	-0.00006	-0.00393
15.75	0.50911	0.22518	-0.18426	-0.00046	-0.00363
16.25	0.50782	0.22261	-0.18928	-0.00064	-0.00381
16.75	0.50346	0.21922	-0.19350	-0.00075	-0.00387
17.25	0.50189	0.21367	-0.19828	-0.00075	-0.00371

17.75	0.49449	0.21502	-0.20407	-0.00082	-0.00339
18.25	0.48967	0.21431	-0.20882	-0.00096	-0.00321
18.75	0.48765	0.21273	-0.21433	-0.00106	-0.00318
19.25	0.48981	0.21087	-0.22085	-0.00099	-0.00320
19.75	0.48438	0.21387	-0.22740	-0.00099	-0.00317
20.25	0.48184	0.21574	-0.23340	-0.00096	-0.00325
20.74	0.46988	0.22121	-0.23897	-0.00105	-0.00317
21.25	0.47215	0.21656	-0.24437	-0.00122	-0.00337
21.75	0.47515	0.21172	-0.24867	-0.00161	-0.00341
22.25	0.47491	0.20977	-0.25264	-0.00192	-0.00375
22.75	0.46196	0.21215	-0.25579	-0.00205	-0.00402
23.25	0.44590	0.21352	-0.25826	-0.00180	-0.00421
23.75	0.43339	0.21357	-0.25855	-0.00163	-0.00407
24.24	0.42587	0.21046	-0.25956	-0.00119	-0.00397
24.75	0.42039	0.20729	-0.26135	-0.00086	-0.00402
25.25	0.41248	0.20500	-0.26172	-0.00082	-0.00400
25.75	0.40406	0.20288	-0.26245	-0.00087	-0.00405
26.25	0.40325	0.19598	-0.26312	-0.00079	-0.00429
26.75	0.39514	0.19179	-0.26371	-0.00058	-0.00460
27.25	0.38274	0.19415	-0.26474	-0.00044	-0.00477
27.75	0.36920	0.19815	-0.26631	-0.00029	-0.00479
28.25	0.35892	0.19870	-0.26792	-0.00002	-0.00516
28.75	0.35400	0.19514	-0.26911	0.00030	-0.00543
29.25	0.34725	0.19126	-0.26967	0.00055	-0.00544
29.75	0.34420	0.18564	-0.26999	0.00066	-0.00528
30.25	0.33073	0.18423	-0.26951	0.00065	-0.00494
30.75	0.32326	0.17898	-0.26883	0.00070	-0.00472
31.25	0.31695	0.17709	-0.26921	0.00068	-0.00462
31.75	0.30505	0.18130	-0.26984	0.00055	-0.00459
32.25	0.29196	0.18809	-0.27069	0.00034	-0.00457
32.75	0.28389	0.18760	-0.27191	0.00056	-0.00472
33.25	0.28053	0.18289	-0.27391	0.00095	-0.00510
33.75	0.27252	0.17734	-0.27499	0.00134	-0.00559
34.25	0.25448	0.17952	-0.27577	0.00160	-0.00588
34.75	0.23550	0.18549	-0.27656	0.00171	-0.00600
35.25	0.22435	0.18677	-0.27680	0.00163	-0.00576
35.75	0.21985	0.18320	-0.27652	0.00166	-0.00566

36.25	0.21402	0.18055	-0.27552	0.00164	-0.00555
36.75	0.21242	0.17402	-0.27445	0.00177	-0.00571
37.25	0.21194	0.16685	-0.27458	0.00218	-0.00591
37.75	0.20614	0.16347	-0.27550	0.00256	-0.00609
38.25	0.19608	0.16444	-0.27669	0.00255	-0.00626
38.75	0.18849	0.16518	-0.27763	0.00246	-0.00647
39.25	0.18081	0.16260	-0.27699	0.00238	-0.00674
39.75	0.16918	0.16329	-0.27651	0.00231	-0.00698
40.25	0.15897	0.16379	-0.27613	0.00237	-0.00728
40.75	0.14346	0.16517	-0.27489	0.00244	-0.00726
41.25	0.13260	0.16342	-0.27504	0.00259	-0.00704
41.75	0.11932	0.16283	-0.27577	0.00269	-0.00677
42.25	0.10514	0.16281	-0.27646	0.00273	-0.00656
42.75	0.09329	0.16193	-0.27725	0.00288	-0.00671
43.25	0.08904	0.15789	-0.27778	0.00322	-0.00720
43.75	0.08618	0.15416	-0.27786	0.00341	-0.00761
44.25	0.09011	0.14512	-0.27731	0.00372	-0.00797
44.75	0.08792	0.14149	-0.27722	0.00395	-0.00820
45.24	0.07934	0.14320	-0.27790	0.00408	-0.00832
45.75	0.06696	0.14993	-0.27936	0.00415	-0.00831
46.25	0.05503	0.15266	-0.28056	0.00432	-0.00863
46.75	0.05354	0.14902	-0.28216	0.00450	-0.00880
47.25	0.04956	0.14855	-0.28429	0.00456	-0.00880
47.75	0.04369	0.14762	-0.28621	0.00454	-0.00871
48.25	0.03285	0.15147	-0.28872	0.00448	-0.00851
48.75	0.01814	0.15984	-0.29082	0.00426	-0.00829
49.25	0.00891	0.16560	-0.29210	0.00396	-0.00812
49.75	0.00957	0.16088	-0.29299	0.00401	-0.00825
50.25	0.01784	0.15088	-0.29418	0.00437	-0.00853
50.75	0.02025	0.14459	-0.29594	0.00470	-0.00882
51.25	0.01035	0.14499	-0.29697	0.00481	-0.00878
51.75	-0.00037	0.14779	-0.29980	0.00493	-0.00864
52.25	-0.01091	0.15158	-0.30286	0.00495	-0.00874
52.75	-0.02092	0.15379	-0.30357	0.00482	-0.00895
53.25	-0.02282	0.15231	-0.30329	0.00461	-0.00911
53.75	-0.02490	0.14997	-0.30317	0.00455	-0.00919
54.25	-0.01972	0.14239	-0.30301	0.00456	-0.00937

54.75	-0.02216	0.13768	-0.30396	0.00463	-0.00925
55.25	-0.03092	0.13722	-0.30620	0.00473	-0.00912
55.75	-0.04111	0.13819	-0.30846	0.00474	-0.00906
56.25	-0.05515	0.14080	-0.31032	0.00476	-0.00897
56.75	-0.06883	0.14355	-0.31010	0.00466	-0.00887
57.25	-0.08824	0.15020	-0.31112	0.00475	-0.00884
57.75	-0.09936	0.15312	-0.31162	0.00481	-0.00892
58.25	-0.10592	0.15377	-0.31222	0.00478	-0.00924
58.75	-0.09759	0.14726	-0.31241	0.00445	-0.00954
59.25	-0.09159	0.14026	-0.31365	0.00416	-0.00967
59.75	-0.09327	0.13809	-0.31448	0.00382	-0.00953
60.25	-0.09977	0.13756	-0.31581	0.00375	-0.00941
60.75	-0.10871	0.13918	-0.31822	0.00386	-0.00934
61.25	-0.11395	0.13902	-0.31842	0.00377	-0.00939
61.75	-0.12307	0.13920	-0.31642	0.00367	-0.00954
62.25	-0.13104	0.13981	-0.31427	0.00356	-0.00969
62.75	-0.14470	0.14318	-0.31259	0.00345	-0.00968
63.25	-0.15510	0.14419	-0.31200	0.00339	-0.00940
63.75	-0.16382	0.14425	-0.31255	0.00347	-0.00919
64.25	-0.16840	0.13966	-0.31305	0.00345	-0.00925
64.75	-0.17061	0.13367	-0.31460	0.00348	-0.00930
65.25	-0.17711	0.13086	-0.31436	0.00347	-0.00925
65.75	-0.18605	0.12856	-0.31413	0.00361	-0.00918
66.25	-0.20813	0.13557	-0.31468	0.00353	-0.00890
66.75	-0.23002	0.14509	-0.31536	0.00345	-0.00867
67.25	-0.24386	0.14918	-0.31645	0.00348	-0.00857
67.75	-0.24971	0.14970	-0.31785	0.00331	-0.00866
68.25	-0.25304	0.14519	-0.31924	0.00338	-0.00896
68.75	-0.25759	0.14225	-0.32024	0.00334	-0.00915
69.25	-0.26313	0.13917	-0.32133	0.00338	-0.00944
69.75	-0.26978	0.13751	-0.32219	0.00325	-0.00952
70.25	-0.27716	0.13733	-0.32219	0.00315	-0.00953
70.75	-0.28538	0.13891	-0.32218	0.00305	-0.00944
71.25	-0.28666	0.13552	-0.32270	0.00298	-0.00928
71.75	-0.28832	0.13113	-0.32355	0.00303	-0.00908
72.25	-0.29690	0.13014	-0.32567	0.00315	-0.00897
72.75	-0.30588	0.13061	-0.32693	0.00316	-0.00887

73.25	-0.31000	0.12560	-0.32839	0.00329	-0.00887
73.75	-0.32017	0.12661	-0.32864	0.00322	-0.00868
74.25	-0.32840	0.12618	-0.32919	0.00328	-0.00859
74.75	-0.33954	0.12758	-0.33107	0.00326	-0.00831
75.25	-0.35865	0.13527	-0.33256	0.00310	-0.00802
75.75	-0.37082	0.13704	-0.33437	0.00325	-0.00790
76.25	-0.38340	0.13950	-0.33581	0.00339	-0.00785
76.75	-0.40071	0.14541	-0.33583	0.00334	-0.00747
77.25	-0.40649	0.14238	-0.33426	0.00331	-0.00688
77.75	-0.41621	0.14141	-0.33393	0.00327	-0.00623
78.25	-0.42885	0.14299	-0.33361	0.00309	-0.00529
78.75	-0.44728	0.14828	-0.33442	0.00289	-0.00427
79.25	-0.46280	0.15046	-0.33637	0.00298	-0.00344
79.75	-0.47380	0.15037	-0.33816	0.00318	-0.00282
80.25	-0.48364	0.14976	-0.33929	0.00317	-0.00228
80.75	-0.49067	0.14937	-0.33971	0.00306	-0.00153
81.25	-0.49723	0.14785	-0.34063	0.00294	-0.00096
81.75	-0.50462	0.14796	-0.33917	0.00269	-0.00056
82.25	-0.51426	0.14852	-0.33870	0.00248	-0.00022
82.75	-0.52370	0.14802	-0.33789	0.00241	-0.00006
83.25	-0.53475	0.14539	-0.33751	0.00261	-0.00005
83.75	-0.55150	0.14900	-0.33843	0.00290	0.00016
84.25	-0.55469	0.14747	-0.33857	0.00273	0.00061
84.75	-0.55787	0.14760	-0.33810	0.00228	0.00115
85.25	-0.57318	0.15286	-0.33915	0.00220	0.00164
85.75	-0.58841	0.15666	-0.33893	0.00212	0.00211
86.25	-0.59906	0.15818	-0.33716	0.00193	0.00243
86.75	-0.61531	0.16172	-0.33800	0.00221	0.00285
87.25	-0.61600	0.15858	-0.33796	0.00208	0.00339
87.76	-0.62063	0.15726	-0.33659	0.00167	0.00400
88.26	-0.64489	0.16320	-0.33599	0.00200	0.00399
88.76	-0.63510	0.15514	-0.33270	0.00175	0.00455
89.27	-0.63367	0.14470	-0.33421	0.00206	0.00489
89.71	-0.64988	0.15437	-0.33346	0.00211	0.00587

Table 37. Aerodynamic Coefficients, $U_{\infty} = 6$ [in/sec], $Re = 1.17 \times 10^4$,
 $\alpha = 20^\circ$, $\dot{\phi} = 7^\circ/\text{sec}$

DYNAMIC ROLL $\phi = 0^\circ\text{-}90^\circ$					
ϕ ($^\circ$)	C_N	C_M	C_S	C_{YM}	C_{RM}
0.22	0.54425	0.23053	-0.02913	0.00296	0.00400
0.73	0.55295	0.22477	-0.02772	0.00233	0.00404
1.24	0.56134	0.21693	-0.02820	0.00231	0.00240
1.74	0.55850	0.22188	-0.02970	0.00199	0.00113
2.25	0.54798	0.22861	-0.03516	0.00224	0.00063
2.74	0.52787	0.24354	-0.03992	0.00217	0.00078
3.25	0.53195	0.24224	-0.04587	0.00195	0.00097
3.75	0.54465	0.23195	-0.05166	0.00206	-0.00013
4.25	0.55426	0.22365	-0.05665	0.00203	-0.00116
4.75	0.55803	0.22238	-0.06238	0.00206	-0.00165
5.25	0.55647	0.22549	-0.06863	0.00195	-0.00145
5.74	0.55950	0.22322	-0.07391	0.00169	-0.00147
6.25	0.56066	0.22002	-0.07830	0.00161	-0.00182
6.75	0.55585	0.22116	-0.08433	0.00166	-0.00198
7.25	0.53841	0.23244	-0.09080	0.00128	-0.00172
7.75	0.52907	0.23812	-0.09648	0.00096	-0.00188
8.25	0.52690	0.23708	-0.10102	0.00083	-0.00229
8.75	0.54214	0.22698	-0.10601	0.00091	-0.00250
9.25	0.55261	0.22164	-0.11174	0.00091	-0.00239
9.75	0.54509	0.22595	-0.11791	0.00078	-0.00221
10.25	0.53553	0.22848	-0.12344	0.00069	-0.00255
10.75	0.53276	0.22468	-0.12831	0.00059	-0.00304
11.25	0.53414	0.22037	-0.13324	0.00054	-0.00349
11.75	0.53617	0.21666	-0.13853	0.00057	-0.00363
12.25	0.53609	0.21606	-0.14471	0.00076	-0.00364
12.75	0.53137	0.21690	-0.15079	0.00065	-0.00338
13.25	0.53404	0.21426	-0.15630	0.00052	-0.00349
13.75	0.53008	0.21645	-0.16195	0.00035	-0.00367
14.25	0.52783	0.21624	-0.16755	0.00020	-0.00392
14.75	0.51652	0.22081	-0.17320	0.00012	-0.00405
15.25	0.51499	0.22255	-0.17896	-0.00006	-0.00393
15.75	0.50911	0.22518	-0.18426	-0.00046	-0.00363
16.25	0.50782	0.22261	-0.18928	-0.00064	-0.00381
16.75	0.50346	0.21922	-0.19350	-0.00075	-0.00387
17.25	0.50189	0.21367	-0.19828	-0.00075	-0.00371

17.75	0.49449	0.21502	-0.20407	-0.00082	-0.00339
18.25	0.48967	0.21431	-0.20882	-0.00096	-0.00321
18.75	0.48765	0.21273	-0.21433	-0.00106	-0.00318
19.25	0.48981	0.21087	-0.22085	-0.00099	-0.00320
19.75	0.48438	0.21387	-0.22740	-0.00099	-0.00317
20.25	0.48184	0.21574	-0.23340	-0.00096	-0.00325
20.74	0.46988	0.22121	-0.23897	-0.00105	-0.00317
21.25	0.47215	0.21656	-0.24437	-0.00122	-0.00337
21.75	0.47515	0.21172	-0.24867	-0.00161	-0.00341
22.25	0.47491	0.20977	-0.25264	-0.00192	-0.00375
22.75	0.46196	0.21215	-0.25579	-0.00205	-0.00402
23.25	0.44590	0.21352	-0.25826	-0.00180	-0.00421
23.75	0.43339	0.21357	-0.25855	-0.00163	-0.00407
24.24	0.42587	0.21046	-0.25956	-0.00119	-0.00397
24.75	0.42039	0.20729	-0.26135	-0.00086	-0.00402
25.25	0.41248	0.20500	-0.26172	-0.00082	-0.00400
25.75	0.40406	0.20288	-0.26245	-0.00087	-0.00405
26.25	0.40325	0.19598	-0.26312	-0.00079	-0.00429
26.75	0.39514	0.19179	-0.26371	-0.00058	-0.00460
27.25	0.38274	0.19415	-0.26474	-0.00044	-0.00477
27.75	0.36920	0.19815	-0.26631	-0.00029	-0.00479
28.25	0.35892	0.19870	-0.26792	-0.00002	-0.00516
28.75	0.35400	0.19514	-0.26911	0.00030	-0.00543
29.25	0.34725	0.19126	-0.26967	0.00055	-0.00544
29.75	0.34420	0.18564	-0.26999	0.00066	-0.00528
30.25	0.33073	0.18423	-0.26951	0.00065	-0.00494
30.75	0.32326	0.17898	-0.26883	0.00070	-0.00472
31.25	0.31695	0.17709	-0.26921	0.00068	-0.00462
31.75	0.30505	0.18130	-0.26984	0.00055	-0.00459
32.25	0.29196	0.18809	-0.27069	0.00034	-0.00457
32.75	0.28389	0.18760	-0.27191	0.00056	-0.00472
33.25	0.28053	0.18289	-0.27391	0.00095	-0.00510
33.75	0.27252	0.17734	-0.27499	0.00134	-0.00559
34.25	0.25448	0.17952	-0.27577	0.00160	-0.00588
34.75	0.23550	0.18549	-0.27656	0.00171	-0.00600
35.25	0.22435	0.18677	-0.27680	0.00163	-0.00576
35.75	0.21985	0.18320	-0.27652	0.00166	-0.00566

36.25	0.21402	0.18055	-0.27552	0.00164	-0.00555
36.75	0.21242	0.17402	-0.27445	0.00177	-0.00571
37.25	0.21194	0.16685	-0.27458	0.00218	-0.00591
37.75	0.20614	0.16347	-0.27550	0.00256	-0.00609
38.25	0.19608	0.16444	-0.27669	0.00255	-0.00626
38.75	0.18849	0.16518	-0.27763	0.00246	-0.00647
39.25	0.18081	0.16260	-0.27699	0.00238	-0.00674
39.75	0.16918	0.16329	-0.27651	0.00231	-0.00698
40.25	0.15897	0.16379	-0.27613	0.00237	-0.00728
40.75	0.14346	0.16517	-0.27489	0.00244	-0.00726
41.25	0.13260	0.16342	-0.27504	0.00259	-0.00704
41.75	0.11932	0.16283	-0.27577	0.00269	-0.00677
42.25	0.10514	0.16281	-0.27646	0.00273	-0.00656
42.75	0.09329	0.16193	-0.27725	0.00288	-0.00671
43.25	0.08904	0.15789	-0.27778	0.00322	-0.00720
43.75	0.08618	0.15416	-0.27786	0.00341	-0.00761
44.25	0.09011	0.14512	-0.27731	0.00372	-0.00797
44.75	0.08792	0.14149	-0.27722	0.00395	-0.00820
45.24	0.07934	0.14320	-0.27790	0.00408	-0.00832
45.75	0.06696	0.14993	-0.27936	0.00415	-0.00831
46.25	0.05503	0.15266	-0.28056	0.00432	-0.00863
46.75	0.05354	0.14902	-0.28216	0.00450	-0.00880
47.25	0.04956	0.14855	-0.28429	0.00456	-0.00880
47.75	0.04369	0.14762	-0.28621	0.00454	-0.00871
48.25	0.03285	0.15147	-0.28872	0.00448	-0.00851
48.75	0.01814	0.15984	-0.29082	0.00426	-0.00829
49.25	0.00891	0.16560	-0.29210	0.00396	-0.00812
49.75	0.00957	0.16088	-0.29299	0.00401	-0.00825
50.25	0.01784	0.15088	-0.29418	0.00437	-0.00853
50.75	0.02025	0.14459	-0.29594	0.00470	-0.00882
51.25	0.01035	0.14499	-0.29697	0.00481	-0.00878
51.75	-0.00037	0.14779	-0.29980	0.00493	-0.00864
52.25	-0.01091	0.15158	-0.30286	0.00495	-0.00874
52.75	-0.02092	0.15379	-0.30357	0.00482	-0.00895
53.25	-0.02282	0.15231	-0.30329	0.00461	-0.00911
53.75	-0.02490	0.14997	-0.30317	0.00455	-0.00919
54.25	-0.01972	0.14239	-0.30301	0.00456	-0.00937

54.75	-0.02216	0.13768	-0.30396	0.00463	-0.00925
55.25	-0.03092	0.13722	-0.30620	0.00473	-0.00912
55.75	-0.04111	0.13819	-0.30846	0.00474	-0.00906
56.25	-0.05515	0.14080	-0.31032	0.00476	-0.00897
56.75	-0.06883	0.14355	-0.31010	0.00466	-0.00887
57.25	-0.08824	0.15020	-0.31112	0.00475	-0.00884
57.75	-0.09936	0.15312	-0.31162	0.00481	-0.00892
58.25	-0.10592	0.15377	-0.31222	0.00478	-0.00924
58.75	-0.09759	0.14726	-0.31241	0.00445	-0.00954
59.25	-0.09159	0.14026	-0.31365	0.00416	-0.00967
59.75	-0.09327	0.13809	-0.31448	0.00382	-0.00953
60.25	-0.09977	0.13756	-0.31581	0.00375	-0.00941
60.75	-0.10871	0.13918	-0.31822	0.00386	-0.00934
61.25	-0.11395	0.13902	-0.31842	0.00377	-0.00939
61.75	-0.12307	0.13920	-0.31642	0.00367	-0.00954
62.25	-0.13104	0.13981	-0.31427	0.00356	-0.00969
62.75	-0.14470	0.14318	-0.31259	0.00345	-0.00968
63.25	-0.15510	0.14419	-0.31200	0.00339	-0.00940
63.75	-0.16382	0.14425	-0.31255	0.00347	-0.00919
64.25	-0.16840	0.13966	-0.31305	0.00345	-0.00925
64.75	-0.17061	0.13367	-0.31460	0.00348	-0.00930
65.25	-0.17711	0.13086	-0.31436	0.00347	-0.00925
65.75	-0.18605	0.12856	-0.31413	0.00361	-0.00918
66.25	-0.20813	0.13557	-0.31468	0.00353	-0.00890
66.75	-0.23002	0.14509	-0.31536	0.00345	-0.00867
67.25	-0.24386	0.14918	-0.31645	0.00348	-0.00857
67.75	-0.24971	0.14970	-0.31785	0.00331	-0.00866
68.25	-0.25304	0.14519	-0.31924	0.00338	-0.00896
68.75	-0.25759	0.14225	-0.32024	0.00334	-0.00915
69.25	-0.26313	0.13917	-0.32133	0.00338	-0.00944
69.75	-0.26978	0.13751	-0.32219	0.00325	-0.00952
70.25	-0.27716	0.13733	-0.32219	0.00315	-0.00953
70.75	-0.28538	0.13891	-0.32218	0.00305	-0.00944
71.25	-0.28666	0.13552	-0.32270	0.00298	-0.00928
71.75	-0.28832	0.13113	-0.32355	0.00303	-0.00908
72.25	-0.29690	0.13014	-0.32567	0.00315	-0.00897
72.75	-0.30588	0.13061	-0.32693	0.00316	-0.00887

73.25	-0.31000	0.12560	-0.32839	0.00329	-0.00887
73.75	-0.32017	0.12661	-0.32864	0.00322	-0.00868
74.25	-0.32840	0.12618	-0.32919	0.00328	-0.00859
74.75	-0.33954	0.12758	-0.33107	0.00326	-0.00831
75.25	-0.35865	0.13527	-0.33256	0.00310	-0.00802
75.75	-0.37082	0.13704	-0.33437	0.00325	-0.00790
76.25	-0.38340	0.13950	-0.33581	0.00339	-0.00785
76.75	-0.40071	0.14541	-0.33583	0.00334	-0.00747
77.25	-0.40649	0.14238	-0.33426	0.00331	-0.00688
77.75	-0.41621	0.14141	-0.33393	0.00327	-0.00623
78.25	-0.42885	0.14299	-0.33361	0.00309	-0.00529
78.75	-0.44728	0.14828	-0.33442	0.00289	-0.00427
79.25	-0.46280	0.15046	-0.33637	0.00298	-0.00344
79.75	-0.47380	0.15037	-0.33816	0.00318	-0.00282
80.25	-0.48364	0.14976	-0.33929	0.00317	-0.00228
80.75	-0.49067	0.14937	-0.33971	0.00306	-0.00153
81.25	-0.49723	0.14785	-0.34063	0.00294	-0.00096
81.75	-0.50462	0.14796	-0.33917	0.00269	-0.00056
82.25	-0.51426	0.14852	-0.33870	0.00248	-0.00022
82.75	-0.52370	0.14802	-0.33789	0.00241	-0.00006
83.25	-0.53475	0.14539	-0.33751	0.00261	-0.00005
83.75	-0.55150	0.14900	-0.33843	0.00290	0.00016
84.25	-0.55469	0.14747	-0.33857	0.00273	0.00061
84.75	-0.55787	0.14760	-0.33810	0.00228	0.00115
85.25	-0.57318	0.15286	-0.33915	0.00220	0.00164
85.75	-0.58841	0.15666	-0.33893	0.00212	0.00211
86.25	-0.59906	0.15818	-0.33716	0.00193	0.00243
86.75	-0.61531	0.16172	-0.33800	0.00221	0.00285
87.25	-0.61600	0.15858	-0.33796	0.00208	0.00339
87.76	-0.62063	0.15726	-0.33659	0.00167	0.00400
88.26	-0.64489	0.16320	-0.33599	0.00200	0.00399
88.76	-0.63510	0.15514	-0.33270	0.00175	0.00455
89.27	-0.63367	0.14470	-0.33421	0.00206	0.00489
89.71	-0.64988	0.15437	-0.33346	0.00211	0.00587

Table 38. Aerodynamic Coefficients, $U_\infty = 10$ [in/sec], $Re = 2.15 \times 10^4$,
 $\alpha = 0^\circ$, $\dot{\phi} = 3^\circ/\text{sec}$

DYNAMIC ROLL $\phi = 0^\circ\text{-}90^\circ$					
$\phi (^\circ)$	C_N	C_M	C_S	C_{YM}	C_{RM}
0.24	0.01330	0.00874	-0.00035	-0.00007	0.00020
0.74	0.01384	0.00869	0.00001	-0.00010	0.00019
1.25	0.01251	0.00937	0.00019	-0.00012	0.00017
1.74	0.01372	0.00868	0.00026	-0.00009	0.00011
2.25	0.01398	0.00812	0.00023	-0.00009	0.00011
2.74	0.01384	0.00864	0.00017	-0.00009	0.00012
3.25	0.01403	0.00852	0.00003	-0.00005	0.00010
3.75	0.01239	0.00945	0.00009	-0.00009	0.00011
4.25	0.01406	0.00827	0.00013	-0.00009	0.00007
4.74	0.01452	0.00809	0.00012	-0.00008	0.00010
5.25	0.01422	0.00833	0.00005	-0.00008	0.00005
5.75	0.01301	0.00869	0.00002	-0.00008	0.00005
6.24	0.01333	0.00896	-0.00005	-0.00008	0.00007
6.75	0.01319	0.00903	-0.00015	-0.00010	0.00006
7.25	0.01371	0.00855	-0.00017	-0.00008	0.00004
7.74	0.01329	0.00896	-0.00017	-0.00007	0.00005
8.25	0.01368	0.00873	-0.00031	-0.00007	0.00003
8.75	0.01491	0.00798	-0.00023	-0.00006	0.00000
9.25	0.01412	0.00859	-0.00029	-0.00004	0.00001
9.74	0.01420	0.00788	-0.00041	-0.00003	-0.00001
10.25	0.01384	0.00815	-0.00039	-0.00004	-0.00001
10.75	0.01332	0.00876	-0.00042	-0.00004	-0.00001
11.25	0.01500	0.00857	-0.00046	-0.00002	-0.00005
11.75	0.01406	0.00886	-0.00045	-0.00003	-0.00003
12.25	0.01246	0.00889	-0.00053	-0.00003	-0.00003
12.75	0.01294	0.00886	-0.00058	-0.00006	-0.00003
13.25	0.01387	0.00880	-0.00048	-0.00007	-0.00002
13.75	0.01487	0.00793	-0.00051	-0.00003	-0.00005
14.25	0.01404	0.00808	-0.00061	-0.00002	-0.00005
14.75	0.01369	0.00860	-0.00066	-0.00004	-0.00005
15.25	0.01374	0.00890	-0.00061	-0.00005	-0.00006
15.75	0.01334	0.00894	-0.00070	-0.00003	-0.00002
16.25	0.01312	0.00898	-0.00083	-0.00001	-0.00003
16.75	0.01315	0.00908	-0.00083	-0.00004	-0.00005
17.25	0.01402	0.00836	-0.00065	-0.00006	-0.00007

17.75	0.01387	0.00813	-0.00069	-0.00001	-0.00010
18.25	0.01382	0.00823	-0.00092	0.00003	-0.00008
18.75	0.01299	0.00902	-0.00103	0.00002	-0.00007
19.25	0.01266	0.00902	-0.00091	-0.00001	-0.00010
19.75	0.01342	0.00842	-0.00081	-0.00001	-0.00008
20.25	0.01344	0.00875	-0.00098	-0.00002	-0.00004
20.75	0.01391	0.00833	-0.00113	0.00000	-0.00008
21.25	0.01384	0.00841	-0.00101	-0.00002	-0.00010
21.75	0.01354	0.00832	-0.00088	-0.00004	-0.00006
22.25	0.01278	0.00860	-0.00097	-0.00004	-0.00003
22.75	0.01199	0.00896	-0.00107	0.00001	-0.00004
23.25	0.01225	0.00870	-0.00120	0.00003	-0.00010
23.75	0.01242	0.00888	-0.00126	0.00002	-0.00011
24.25	0.01263	0.00893	-0.00124	0.00002	-0.00008
24.74	0.01218	0.00863	-0.00127	0.00002	-0.00008
25.24	0.01201	0.00840	-0.00135	0.00002	-0.00009
25.74	0.01302	0.00803	-0.00137	0.00002	-0.00008
26.24	0.01253	0.00879	-0.00135	0.00000	-0.00006
26.75	0.01124	0.00953	-0.00143	0.00000	-0.00009
27.25	0.01211	0.00887	-0.00148	0.00002	-0.00011
27.75	0.01322	0.00817	-0.00156	0.00003	-0.00011
28.25	0.01269	0.00829	-0.00157	0.00004	-0.00012
28.75	0.01251	0.00870	-0.00149	0.00002	-0.00012
29.25	0.01213	0.00864	-0.00155	0.00002	-0.00013
29.75	0.01126	0.00839	-0.00170	0.00004	-0.00012
30.25	0.01196	0.00812	-0.00176	0.00006	-0.00012
30.75	0.01294	0.00849	-0.00173	0.00004	-0.00011
31.25	0.01304	0.00832	-0.00178	0.00005	-0.00010
31.75	0.01242	0.00803	-0.00182	0.00006	-0.00011
32.25	0.01267	0.00776	-0.00184	0.00004	-0.00013
32.75	0.01255	0.00773	-0.00181	0.00005	-0.00013
33.25	0.01153	0.00856	-0.00176	0.00004	-0.00010
33.75	0.01100	0.00894	-0.00188	0.00004	-0.00008
34.25	0.01120	0.00839	-0.00197	0.00007	-0.00008
34.75	0.01191	0.00819	-0.00195	0.00007	-0.00012
35.25	0.01234	0.00807	-0.00185	0.00008	-0.00019
35.75	0.01150	0.00846	-0.00182	0.00007	-0.00016

36.25	0.01093	0.00862	-0.00197	0.00006	-0.00013
36.75	0.01091	0.00878	-0.00188	0.00002	-0.00010
37.25	0.01133	0.00863	-0.00182	0.00001	-0.00010
37.75	0.01116	0.00876	-0.00200	0.00006	-0.00014
38.25	0.01084	0.00887	-0.00193	0.00003	-0.00013
38.75	0.01059	0.00829	-0.00183	0.00003	-0.00010
39.24	0.01074	0.00796	-0.00203	0.00008	-0.00010
39.75	0.01127	0.00806	-0.00201	0.00008	-0.00013
40.26	0.01039	0.00850	-0.00187	0.00003	-0.00011
40.76	0.01008	0.00857	-0.00189	0.00004	-0.00012
41.25	0.01058	0.00895	-0.00187	0.00002	-0.00011
41.75	0.01098	0.00855	-0.00185	0.00002	-0.00011
42.25	0.01012	0.00837	-0.00189	0.00004	-0.00013
42.75	0.00954	0.00843	-0.00189	0.00005	-0.00013
43.25	0.01019	0.00792	-0.00187	0.00006	-0.00011
43.75	0.01056	0.00774	-0.00181	0.00004	-0.00010
44.25	0.00971	0.00837	-0.00185	0.00005	-0.00010
44.75	0.00923	0.00846	-0.00190	0.00006	-0.00012
45.25	0.00891	0.00860	-0.00183	0.00004	-0.00013
45.75	0.00900	0.00831	-0.00176	0.00004	-0.00010
46.25	0.00831	0.00848	-0.00191	0.00006	-0.00009
46.75	0.00817	0.00845	-0.00192	0.00005	-0.00013
47.25	0.00875	0.00841	-0.00196	0.00006	-0.00013
47.75	0.00896	0.00850	-0.00215	0.00008	-0.00012
48.25	0.00879	0.00830	-0.00219	0.00007	-0.00011
48.75	0.00771	0.00844	-0.00213	0.00008	-0.00010
49.25	0.00713	0.00877	-0.00214	0.00008	-0.00008
49.75	0.00671	0.00918	-0.00240	0.00009	-0.00009
50.25	0.00637	0.00938	-0.00249	0.00007	-0.00008
50.75	0.00756	0.00859	-0.00246	0.00006	-0.00011
51.25	0.00868	0.00799	-0.00244	0.00008	-0.00013
51.75	0.00823	0.00805	-0.00236	0.00010	-0.00011
52.25	0.00719	0.00848	-0.00252	0.00010	-0.00009
52.75	0.00653	0.00884	-0.00271	0.00011	-0.00011
53.25	0.00623	0.00908	-0.00264	0.00010	-0.00011
53.75	0.00611	0.00893	-0.00256	0.00009	-0.00011
54.25	0.00643	0.00854	-0.00266	0.00011	-0.00010

54.75	0.00675	0.00848	-0.00278	0.00012	-0.00009
55.25	0.00562	0.00909	-0.00279	0.00011	-0.00007
55.75	0.00547	0.00913	-0.00275	0.00010	-0.00007
56.25	0.00674	0.00852	-0.00274	0.00010	-0.00010
56.75	0.00613	0.00882	-0.00272	0.00009	-0.00007
57.25	0.00553	0.00873	-0.00282	0.00011	-0.00005
57.75	0.00506	0.00887	-0.00294	0.00013	-0.00010
58.25	0.00507	0.00896	-0.00275	0.00010	-0.00009
58.75	0.00551	0.00886	-0.00264	0.00009	-0.00007
59.25	0.00537	0.00897	-0.00270	0.00008	-0.00009
59.75	0.00445	0.00950	-0.00276	0.00006	-0.00006
60.25	0.00398	0.00927	-0.00263	0.00006	-0.00005
60.75	0.00467	0.00842	-0.00256	0.00008	-0.00009
61.25	0.00366	0.00893	-0.00266	0.00008	-0.00009
61.75	0.00357	0.00907	-0.00271	0.00009	-0.00006
62.25	0.00395	0.00893	-0.00263	0.00008	-0.00007
62.75	0.00350	0.00907	-0.00266	0.00010	-0.00011
63.25	0.00349	0.00908	-0.00271	0.00009	-0.00009
63.75	0.00291	0.00932	-0.00262	0.00009	-0.00005
64.25	0.00338	0.00922	-0.00246	0.00006	-0.00008
64.75	0.00388	0.00885	-0.00245	0.00006	-0.00012
65.25	0.00296	0.00874	-0.00242	0.00007	-0.00008
65.75	0.00267	0.00893	-0.00243	0.00005	-0.00004
66.24	0.00397	0.00830	-0.00258	0.00007	-0.00010
66.74	0.00348	0.00820	-0.00249	0.00009	-0.00011
67.25	0.00251	0.00864	-0.00234	0.00009	-0.00007
67.75	0.00205	0.00921	-0.00229	0.00008	-0.00009
68.25	0.00252	0.00882	-0.00240	0.00010	-0.00012
68.75	0.00215	0.00870	-0.00262	0.00011	-0.00010
69.25	0.00195	0.00889	-0.00282	0.00010	-0.00008
69.75	0.00195	0.00885	-0.00266	0.00009	-0.00009
70.25	0.00189	0.00889	-0.00254	0.00007	-0.00008
70.75	0.00209	0.00860	-0.00271	0.00009	-0.00007
71.25	0.00093	0.00881	-0.00282	0.00009	-0.00006
71.75	0.00037	0.00907	-0.00290	0.00009	-0.00006
72.25	0.00014	0.00921	-0.00301	0.00011	-0.00008
72.75	0.00051	0.00880	-0.00305	0.00011	-0.00010

73.25	0.00109	0.00824	-0.00300	0.00013	-0.00012
73.75	0.00075	0.00857	-0.00298	0.00014	-0.00010
74.25	-0.00029	0.00942	-0.00310	0.00012	-0.00005
74.75	-0.00007	0.00934	-0.00315	0.00010	-0.00006
75.25	0.00030	0.00897	-0.00305	0.00009	-0.00007
75.75	0.00107	0.00830	-0.00316	0.00012	-0.00009
76.25	0.00150	0.00809	-0.00319	0.00012	-0.00011
76.75	-0.00075	0.00899	-0.00307	0.00011	-0.00004
77.25	-0.00222	0.00947	-0.00313	0.00011	0.00000
77.75	-0.00072	0.00867	-0.00329	0.00012	-0.00009
78.25	-0.00088	0.00856	-0.00317	0.00012	-0.00011
78.75	-0.00227	0.00909	-0.00314	0.00013	-0.00005
79.25	-0.00172	0.00881	-0.00328	0.00013	-0.00004
79.75	-0.00168	0.00872	-0.00320	0.00012	-0.00005
80.25	-0.00205	0.00861	-0.00319	0.00013	-0.00006
80.75	-0.00201	0.00860	-0.00327	0.00015	-0.00006
81.25	-0.00204	0.00886	-0.00313	0.00013	-0.00005
81.75	-0.00278	0.00917	-0.00328	0.00012	-0.00002
82.25	-0.00310	0.00915	-0.00340	0.00014	-0.00001
82.75	-0.00326	0.00910	-0.00310	0.00013	0.00001
83.25	-0.00271	0.00840	-0.00326	0.00014	-0.00002
83.75	-0.00284	0.00833	-0.00323	0.00016	-0.00003
84.26	-0.00404	0.00886	-0.00314	0.00014	0.00001
84.75	-0.00362	0.00894	-0.00302	0.00012	-0.00001
85.25	-0.00336	0.00859	-0.00313	0.00012	0.00000
85.75	-0.00402	0.00935	-0.00298	0.00012	0.00002
86.25	-0.00454	0.00911	-0.00304	0.00013	0.00003
86.76	-0.00497	0.00949	-0.00289	0.00007	0.00009
87.25	-0.00570	0.00966	-0.00295	0.00011	0.00006
87.76	-0.00497	0.00879	-0.00285	0.00012	0.00006
88.25	-0.00476	0.00843	-0.00276	0.00011	0.00007
88.75	-0.00437	0.00836	-0.00272	0.00010	0.00009
89.26	-0.00476	0.00858	-0.00273	0.00011	0.00011
89.74	-0.00550	0.00912	-0.00262	0.00008	0.00016

Table 39. Aerodynamic Coefficients, $U_\infty = 10$ [in/sec], $Re = 2.15 \times 10^4$,
 $\alpha = 5^\circ$, $\dot{\phi} = 3^\circ/\text{sec}$

DYNAMIC ROLL $\phi = 0^\circ\text{-}90^\circ$					
ϕ ($^\circ$)	C_N	C_M	C_S	C_{YM}	C_{RM}
0.24	0.06507	0.00592	-0.00220	0.00036	0.00023
0.74	0.06460	0.00595	-0.00184	0.00034	0.00022
1.25	0.06409	0.00639	-0.00174	0.00033	0.00021
1.74	0.06288	0.00639	-0.00151	0.00032	0.00015
2.25	0.06456	0.00603	-0.00160	0.00033	0.00011
2.75	0.06423	0.00593	-0.00171	0.00035	0.00012
3.25	0.06471	0.00596	-0.00173	0.00037	0.00010
3.75	0.06460	0.00591	-0.00179	0.00034	0.00013
4.25	0.06565	0.00547	-0.00177	0.00036	0.00006
4.74	0.06471	0.00584	-0.00181	0.00036	0.00009
5.25	0.06509	0.00599	-0.00199	0.00037	0.00003
5.75	0.06454	0.00646	-0.00195	0.00038	0.00005
6.24	0.06470	0.00622	-0.00194	0.00037	0.00004
6.75	0.06630	0.00550	-0.00203	0.00036	0.00002
7.25	0.06464	0.00601	-0.00202	0.00036	0.00003
7.74	0.06465	0.00594	-0.00213	0.00038	0.00003
8.25	0.06483	0.00653	-0.00216	0.00036	0.00001
8.75	0.06641	0.00508	-0.00214	0.00041	-0.00002
9.25	0.06620	0.00530	-0.00226	0.00042	-0.00005
9.74	0.06564	0.00596	-0.00232	0.00043	-0.00003
10.25	0.06490	0.00616	-0.00238	0.00042	-0.00001
10.75	0.06427	0.00642	-0.00250	0.00040	-0.00005
11.25	0.06453	0.00652	-0.00236	0.00041	-0.00007
11.75	0.06606	0.00572	-0.00239	0.00044	-0.00006
12.25	0.06550	0.00570	-0.00255	0.00042	-0.00005
12.75	0.06389	0.00608	-0.00266	0.00044	-0.00010
13.25	0.06455	0.00577	-0.00261	0.00047	-0.00011
13.75	0.06525	0.00545	-0.00259	0.00044	-0.00005
14.25	0.06503	0.00526	-0.00277	0.00043	-0.00005
14.75	0.06533	0.00492	-0.00280	0.00044	-0.00013
15.25	0.06597	0.00467	-0.00271	0.00046	-0.00014
15.75	0.06453	0.00541	-0.00266	0.00045	-0.00008
16.25	0.06307	0.00614	-0.00279	0.00044	-0.00005
16.75	0.06319	0.00561	-0.00282	0.00044	-0.00009
17.25	0.06237	0.00590	-0.00277	0.00045	-0.00014

17.75	0.06228	0.00612	-0.00280	0.00047	-0.00012
18.25	0.06312	0.00573	-0.00286	0.00047	-0.00010
18.75	0.06336	0.00576	-0.00303	0.00047	-0.00011
19.25	0.06270	0.00563	-0.00302	0.00047	-0.00011
19.75	0.06193	0.00580	-0.00293	0.00048	-0.00014
20.25	0.06159	0.00590	-0.00290	0.00048	-0.00015
20.75	0.06047	0.00616	-0.00303	0.00048	-0.00010
21.25	0.06062	0.00581	-0.00311	0.00048	-0.00010
21.75	0.06036	0.00610	-0.00318	0.00050	-0.00014
22.25	0.06040	0.00574	-0.00314	0.00050	-0.00015
22.75	0.06009	0.00573	-0.00306	0.00046	-0.00014
23.25	0.06023	0.00619	-0.00322	0.00047	-0.00018
23.75	0.05967	0.00623	-0.00336	0.00050	-0.00017
24.25	0.05896	0.00569	-0.00331	0.00050	-0.00016
24.74	0.05957	0.00491	-0.00329	0.00052	-0.00019
25.24	0.06009	0.00484	-0.00331	0.00053	-0.00019
25.74	0.05991	0.00513	-0.00348	0.00052	-0.00020
26.24	0.05994	0.00468	-0.00360	0.00051	-0.00024
26.74	0.06002	0.00469	-0.00357	0.00052	-0.00024
27.25	0.05927	0.00532	-0.00352	0.00053	-0.00020
27.75	0.05837	0.00553	-0.00360	0.00053	-0.00021
28.25	0.05826	0.00550	-0.00368	0.00052	-0.00023
28.75	0.05746	0.00601	-0.00375	0.00052	-0.00023
29.25	0.05763	0.00565	-0.00368	0.00053	-0.00025
29.75	0.05916	0.00486	-0.00372	0.00052	-0.00023
30.25	0.05876	0.00510	-0.00390	0.00052	-0.00023
30.75	0.05742	0.00524	-0.00395	0.00054	-0.00026
31.25	0.05717	0.00513	-0.00377	0.00054	-0.00028
31.75	0.05806	0.00491	-0.00375	0.00054	-0.00031
32.25	0.05781	0.00492	-0.00392	0.00057	-0.00028
32.75	0.05672	0.00501	-0.00401	0.00055	-0.00026
33.25	0.05653	0.00488	-0.00390	0.00056	-0.00032
33.75	0.05778	0.00434	-0.00372	0.00056	-0.00032
34.25	0.05763	0.00460	-0.00381	0.00053	-0.00026
34.75	0.05650	0.00500	-0.00405	0.00051	-0.00022
35.25	0.05549	0.00475	-0.00405	0.00056	-0.00032
35.75	0.05527	0.00438	-0.00389	0.00058	-0.00036

36.25	0.05569	0.00440	-0.00387	0.00056	-0.00035
36.75	0.05506	0.00476	-0.00398	0.00054	-0.00033
37.25	0.05416	0.00437	-0.00414	0.00057	-0.00033
37.75	0.05369	0.00482	-0.00416	0.00059	-0.00035
38.25	0.05380	0.00515	-0.00406	0.00057	-0.00034
38.75	0.05283	0.00521	-0.00407	0.00056	-0.00032
39.25	0.05266	0.00495	-0.00407	0.00054	-0.00035
39.75	0.05352	0.00455	-0.00398	0.00054	-0.00042
40.25	0.05313	0.00430	-0.00393	0.00057	-0.00041
40.76	0.05177	0.00463	-0.00394	0.00057	-0.00036
41.25	0.05155	0.00495	-0.00393	0.00052	-0.00037
41.75	0.05287	0.00409	-0.00395	0.00053	-0.00045
42.25	0.05161	0.00407	-0.00391	0.00056	-0.00045
42.75	0.05065	0.00406	-0.00374	0.00055	-0.00038
43.25	0.04977	0.00478	-0.00382	0.00053	-0.00041
43.75	0.04834	0.00514	-0.00392	0.00054	-0.00048
44.25	0.04861	0.00407	-0.00383	0.00056	-0.00044
44.75	0.04947	0.00361	-0.00362	0.00053	-0.00043
45.25	0.04787	0.00444	-0.00358	0.00052	-0.00043
45.75	0.04579	0.00549	-0.00389	0.00052	-0.00043
46.25	0.04660	0.00500	-0.00405	0.00053	-0.00047
46.75	0.04741	0.00448	-0.00389	0.00051	-0.00049
47.25	0.04713	0.00421	-0.00380	0.00050	-0.00051
47.75	0.04576	0.00440	-0.00395	0.00052	-0.00050
48.25	0.04467	0.00460	-0.00406	0.00053	-0.00046
48.75	0.04518	0.00435	-0.00417	0.00053	-0.00047
49.25	0.04601	0.00381	-0.00408	0.00055	-0.00053
49.75	0.04402	0.00465	-0.00408	0.00055	-0.00052
50.25	0.04210	0.00528	-0.00428	0.00054	-0.00047
50.75	0.04127	0.00519	-0.00444	0.00056	-0.00051
51.25	0.04164	0.00503	-0.00431	0.00056	-0.00055
51.75	0.04272	0.00458	-0.00423	0.00053	-0.00054
52.25	0.04217	0.00464	-0.00434	0.00054	-0.00055
52.75	0.04078	0.00473	-0.00439	0.00056	-0.00055
53.25	0.04015	0.00488	-0.00438	0.00054	-0.00057
53.75	0.03947	0.00536	-0.00435	0.00054	-0.00055
54.25	0.04033	0.00475	-0.00439	0.00055	-0.00054

54.75	0.03937	0.00469	-0.00445	0.00054	-0.00053
55.25	0.03713	0.00538	-0.00453	0.00055	-0.00050
55.75	0.03793	0.00482	-0.00440	0.00054	-0.00054
56.25	0.03837	0.00474	-0.00442	0.00053	-0.00057
56.75	0.03718	0.00488	-0.00453	0.00054	-0.00058
57.25	0.03706	0.00396	-0.00446	0.00054	-0.00059
57.75	0.03509	0.00454	-0.00453	0.00055	-0.00057
58.25	0.03436	0.00504	-0.00449	0.00055	-0.00056
58.75	0.03480	0.00497	-0.00445	0.00055	-0.00057
59.25	0.03435	0.00461	-0.00456	0.00056	-0.00061
59.75	0.03297	0.00461	-0.00461	0.00057	-0.00061
60.25	0.03135	0.00519	-0.00442	0.00055	-0.00055
60.75	0.03093	0.00519	-0.00440	0.00056	-0.00054
61.25	0.03058	0.00498	-0.00447	0.00056	-0.00055
61.75	0.02933	0.00494	-0.00439	0.00054	-0.00050
62.25	0.02666	0.00593	-0.00433	0.00054	-0.00043
62.75	0.02522	0.00671	-0.00433	0.00052	-0.00041
63.25	0.02453	0.00675	-0.00434	0.00051	-0.00040
63.75	0.02341	0.00677	-0.00443	0.00054	-0.00037
64.25	0.02190	0.00708	-0.00430	0.00053	-0.00034
64.75	0.02101	0.00711	-0.00412	0.00051	-0.00034
65.25	0.02155	0.00626	-0.00407	0.00053	-0.00038
65.75	0.02002	0.00665	-0.00411	0.00053	-0.00039
66.24	0.01793	0.00728	-0.00414	0.00051	-0.00034
66.74	0.01628	0.00779	-0.00423	0.00051	-0.00025
67.25	0.01701	0.00701	-0.00410	0.00053	-0.00029
67.75	0.01562	0.00746	-0.00393	0.00052	-0.00032
68.25	0.01347	0.00804	-0.00412	0.00053	-0.00025
68.75	0.01342	0.00791	-0.00431	0.00053	-0.00022
69.25	0.01274	0.00857	-0.00428	0.00051	-0.00026
69.75	0.01212	0.00841	-0.00437	0.00054	-0.00026
70.25	0.01253	0.00756	-0.00453	0.00056	-0.00023
70.75	0.01278	0.00723	-0.00442	0.00055	-0.00022
71.25	0.01200	0.00727	-0.00430	0.00056	-0.00021
71.75	0.01074	0.00778	-0.00447	0.00055	-0.00023
72.25	0.00929	0.00838	-0.00455	0.00053	-0.00022
72.75	0.00881	0.00824	-0.00456	0.00054	-0.00017

73.25	0.00901	0.00807	-0.00469	0.00055	-0.00016
73.75	0.00872	0.00811	-0.00465	0.00054	-0.00019
74.25	0.00810	0.00800	-0.00458	0.00054	-0.00017
74.75	0.00749	0.00801	-0.00471	0.00056	-0.00016
75.25	0.00650	0.00827	-0.00480	0.00055	-0.00015
75.75	0.00667	0.00803	-0.00473	0.00054	-0.00015
76.25	0.00663	0.00794	-0.00469	0.00054	-0.00016
76.75	0.00600	0.00761	-0.00482	0.00056	-0.00012
77.25	0.00514	0.00765	-0.00485	0.00056	-0.00011
77.75	0.00567	0.00772	-0.00468	0.00055	-0.00013
78.25	0.00596	0.00771	-0.00476	0.00055	-0.00013
78.75	0.00422	0.00809	-0.00502	0.00055	-0.00012
79.25	0.00294	0.00819	-0.00485	0.00056	-0.00007
79.75	0.00381	0.00774	-0.00474	0.00056	-0.00008
80.25	0.00332	0.00789	-0.00484	0.00055	-0.00009
80.75	0.00218	0.00799	-0.00483	0.00055	-0.00012
81.25	0.00169	0.00787	-0.00487	0.00055	-0.00008
81.75	0.00148	0.00797	-0.00485	0.00056	-0.00006
82.25	0.00107	0.00767	-0.00482	0.00056	-0.00008
82.75	0.00123	0.00767	-0.00478	0.00054	-0.00005
83.25	0.00187	0.00745	-0.00470	0.00052	-0.00009
83.75	0.00113	0.00732	-0.00475	0.00053	-0.00006
84.26	0.00021	0.00776	-0.00486	0.00055	-0.00001
84.75	-0.00089	0.00824	-0.00458	0.00052	-0.00001
85.25	-0.00089	0.00795	-0.00464	0.00052	-0.00001
85.75	-0.00076	0.00760	-0.00451	0.00053	-0.00001
86.25	-0.00109	0.00777	-0.00464	0.00053	0.00000
86.76	-0.00155	0.00772	-0.00463	0.00052	0.00002
87.25	-0.00235	0.00769	-0.00441	0.00053	0.00003
87.76	-0.00180	0.00750	-0.00457	0.00052	0.00005
88.25	-0.00221	0.00729	-0.00443	0.00052	0.00005
88.75	-0.00292	0.00763	-0.00439	0.00052	0.00009
89.26	-0.00378	0.00775	-0.00427	0.00051	0.00011
89.74	-0.00404	0.00792	-0.00426	0.00050	0.00015

Table 40. Aerodynamic Coefficients, $U_\infty = 10$ [in/sec], $Re = 2.15 \times 10^4$,
 $\alpha = 10^\circ$, $\dot{\phi} = 3^\circ/\text{sec}$

DYNAMIC ROLL $\phi = 0^\circ\text{-}90^\circ$					
$\phi (^\circ)$	C_N	C_M	C_S	C_{YM}	C_{RM}
0.24	0.08897	0.00988	-0.00142	0.00001	0.00024
0.74	0.08919	0.00960	-0.00112	-0.00002	0.00026
1.25	0.09005	0.00935	-0.00097	0.00001	0.00025
1.74	0.08935	0.00982	-0.00085	0.00000	0.00017
2.25	0.09035	0.00966	-0.00095	-0.00001	0.00016
2.75	0.08868	0.01050	-0.00080	-0.00003	0.00015
3.25	0.08939	0.01007	-0.00098	-0.00001	0.00014
3.75	0.08999	0.00990	-0.00101	0.00001	0.00011
4.25	0.08892	0.01074	-0.00114	0.00000	0.00012
4.74	0.08952	0.00995	-0.00101	0.00000	0.00005
5.25	0.09091	0.00906	-0.00103	0.00003	0.00007
5.75	0.09067	0.00922	-0.00133	0.00006	0.00002
6.24	0.08935	0.00977	-0.00129	0.00006	0.00004
6.75	0.08973	0.01011	-0.00131	0.00004	0.00005
7.25	0.08984	0.01015	-0.00155	0.00004	0.00005
7.74	0.09079	0.00886	-0.00141	0.00006	0.00001
8.25	0.09043	0.00888	-0.00130	0.00004	0.00005
8.75	0.08936	0.00910	-0.00159	0.00006	0.00001
9.25	0.08957	0.00968	-0.00161	0.00007	-0.00001
9.74	0.09051	0.00970	-0.00158	0.00008	-0.00002
10.25	0.08916	0.01002	-0.00160	0.00009	0.00000
10.75	0.08862	0.00981	-0.00163	0.00007	0.00002
11.25	0.08807	0.01003	-0.00168	0.00007	-0.00006
11.75	0.08862	0.00993	-0.00164	0.00009	-0.00007
12.25	0.08823	0.01027	-0.00177	0.00010	0.00000
12.75	0.08717	0.01022	-0.00198	0.00009	-0.00006
13.25	0.08670	0.00987	-0.00190	0.00010	-0.00008
13.75	0.08839	0.00933	-0.00177	0.00010	-0.00009
14.25	0.08868	0.00950	-0.00188	0.00010	-0.00004
14.75	0.08780	0.00952	-0.00202	0.00009	-0.00007
15.25	0.08799	0.00911	-0.00210	0.00013	-0.00010
15.75	0.08852	0.00883	-0.00206	0.00016	-0.00007
16.25	0.08704	0.00948	-0.00209	0.00014	-0.00003
16.75	0.08620	0.00963	-0.00221	0.00013	-0.00008
17.25	0.08695	0.00888	-0.00230	0.00016	-0.00017

17.75	0.08814	0.00833	-0.00215	0.00017	-0.00013
18.25	0.08719	0.00953	-0.00218	0.00014	-0.00006
18.75	0.08714	0.00972	-0.00251	0.00016	-0.00008
19.25	0.08808	0.00876	-0.00255	0.00018	-0.00014
19.75	0.08658	0.00965	-0.00230	0.00015	-0.00013
20.25	0.08636	0.00957	-0.00218	0.00014	-0.00007
20.75	0.08604	0.00957	-0.00239	0.00014	-0.00006
21.25	0.08506	0.00982	-0.00247	0.00013	-0.00009
21.75	0.08545	0.00961	-0.00239	0.00013	-0.00007
22.25	0.08562	0.00943	-0.00238	0.00016	-0.00005
22.75	0.08452	0.00942	-0.00258	0.00018	-0.00006
23.25	0.08351	0.00958	-0.00269	0.00019	-0.00010
23.75	0.08360	0.00962	-0.00266	0.00020	-0.00012
24.25	0.08399	0.00924	-0.00269	0.00022	-0.00010
24.74	0.08408	0.00889	-0.00270	0.00018	-0.00004
25.24	0.08452	0.00854	-0.00281	0.00017	-0.00003
25.74	0.08503	0.00841	-0.00291	0.00021	-0.00011
26.24	0.08511	0.00851	-0.00294	0.00024	-0.00011
26.75	0.08373	0.00885	-0.00302	0.00024	-0.00007
27.25	0.08339	0.00864	-0.00311	0.00022	-0.00010
27.75	0.08303	0.00854	-0.00326	0.00025	-0.00009
28.25	0.08276	0.00855	-0.00320	0.00024	-0.00010
28.75	0.08352	0.00857	-0.00305	0.00023	-0.00010
29.25	0.08187	0.00917	-0.00318	0.00025	-0.00006
29.75	0.08159	0.00836	-0.00349	0.00028	-0.00009
30.25	0.08255	0.00795	-0.00345	0.00030	-0.00013
30.75	0.08226	0.00868	-0.00327	0.00029	-0.00009
31.25	0.08168	0.00867	-0.00335	0.00027	-0.00008
31.75	0.08085	0.00798	-0.00346	0.00029	-0.00015
32.25	0.07956	0.00876	-0.00347	0.00029	-0.00012
32.75	0.08070	0.00844	-0.00338	0.00027	-0.00008
33.25	0.08143	0.00765	-0.00346	0.00026	-0.00008
33.75	0.08035	0.00763	-0.00361	0.00027	-0.00009
34.25	0.07912	0.00801	-0.00355	0.00028	-0.00012
34.75	0.07901	0.00795	-0.00344	0.00029	-0.00014
35.25	0.07877	0.00786	-0.00350	0.00028	-0.00014
35.75	0.07695	0.00864	-0.00362	0.00028	-0.00015

36.25	0.07624	0.00861	-0.00355	0.00027	-0.00017
36.75	0.07697	0.00806	-0.00358	0.00030	-0.00018
37.25	0.07745	0.00774	-0.00362	0.00030	-0.00017
37.75	0.07624	0.00807	-0.00358	0.00029	-0.00016
38.25	0.07517	0.00839	-0.00364	0.00027	-0.00013
38.75	0.07542	0.00811	-0.00376	0.00029	-0.00020
39.25	0.07550	0.00784	-0.00374	0.00033	-0.00022
39.75	0.07526	0.00785	-0.00365	0.00033	-0.00017
40.25	0.07465	0.00795	-0.00370	0.00032	-0.00018
40.76	0.07354	0.00771	-0.00376	0.00029	-0.00022
41.26	0.07223	0.00794	-0.00360	0.00028	-0.00020
41.75	0.07291	0.00733	-0.00348	0.00028	-0.00021
42.25	0.07345	0.00676	-0.00351	0.00028	-0.00025
42.75	0.07346	0.00663	-0.00362	0.00029	-0.00029
43.25	0.07229	0.00724	-0.00356	0.00028	-0.00026
43.75	0.07058	0.00749	-0.00331	0.00026	-0.00023
44.25	0.07043	0.00733	-0.00326	0.00025	-0.00023
44.75	0.07046	0.00704	-0.00350	0.00028	-0.00027
45.25	0.06883	0.00726	-0.00359	0.00029	-0.00032
45.75	0.06826	0.00712	-0.00351	0.00027	-0.00030
46.25	0.06856	0.00696	-0.00344	0.00025	-0.00025
46.75	0.06911	0.00697	-0.00370	0.00027	-0.00028
47.25	0.06896	0.00683	-0.00384	0.00028	-0.00038
47.75	0.06779	0.00671	-0.00377	0.00028	-0.00036
48.25	0.06689	0.00709	-0.00378	0.00029	-0.00030
48.75	0.06726	0.00678	-0.00386	0.00031	-0.00036
49.25	0.06582	0.00651	-0.00397	0.00033	-0.00037
49.75	0.06479	0.00606	-0.00408	0.00033	-0.00037
50.25	0.06472	0.00644	-0.00412	0.00033	-0.00042
50.75	0.06475	0.00668	-0.00405	0.00033	-0.00044
51.25	0.06458	0.00641	-0.00417	0.00034	-0.00045
51.75	0.06278	0.00620	-0.00425	0.00034	-0.00041
52.25	0.06101	0.00661	-0.00422	0.00032	-0.00038
52.75	0.06219	0.00682	-0.00405	0.00029	-0.00048
53.25	0.06326	0.00586	-0.00409	0.00031	-0.00058
53.75	0.06085	0.00583	-0.00430	0.00032	-0.00048
54.25	0.05896	0.00625	-0.00426	0.00032	-0.00045

54.75	0.05858	0.00621	-0.00407	0.00030	-0.00051
55.25	0.05832	0.00622	-0.00413	0.00028	-0.00054
55.75	0.05722	0.00624	-0.00426	0.00030	-0.00055
56.25	0.05565	0.00624	-0.00420	0.00030	-0.00053
56.75	0.05536	0.00602	-0.00408	0.00030	-0.00052
57.25	0.05577	0.00604	-0.00410	0.00029	-0.00059
57.75	0.05561	0.00621	-0.00413	0.00028	-0.00067
58.25	0.05374	0.00633	-0.00423	0.00029	-0.00062
58.75	0.05250	0.00605	-0.00421	0.00031	-0.00058
59.25	0.05254	0.00551	-0.00403	0.00031	-0.00066
59.75	0.05272	0.00513	-0.00394	0.00029	-0.00070
60.25	0.05208	0.00562	-0.00410	0.00026	-0.00070
60.75	0.04960	0.00647	-0.00426	0.00025	-0.00067
61.25	0.04822	0.00604	-0.00424	0.00029	-0.00066
61.75	0.04875	0.00571	-0.00412	0.00030	-0.00073
62.25	0.04941	0.00526	-0.00395	0.00027	-0.00081
62.75	0.04653	0.00604	-0.00400	0.00026	-0.00077
63.25	0.04472	0.00648	-0.00405	0.00025	-0.00075
63.75	0.04563	0.00551	-0.00381	0.00026	-0.00080
64.25	0.04504	0.00532	-0.00363	0.00025	-0.00075
64.75	0.04375	0.00547	-0.00378	0.00024	-0.00074
65.25	0.04392	0.00494	-0.00375	0.00022	-0.00082
65.75	0.04271	0.00518	-0.00346	0.00018	-0.00083
66.24	0.04201	0.00524	-0.00335	0.00016	-0.00079
66.74	0.04099	0.00576	-0.00329	0.00015	-0.00084
67.25	0.03903	0.00620	-0.00325	0.00014	-0.00083
67.75	0.03745	0.00623	-0.00345	0.00017	-0.00083
68.25	0.03784	0.00553	-0.00350	0.00019	-0.00087
68.75	0.03774	0.00554	-0.00338	0.00017	-0.00083
69.25	0.03654	0.00564	-0.00349	0.00018	-0.00084
69.75	0.03404	0.00603	-0.00369	0.00020	-0.00080
70.25	0.03267	0.00617	-0.00376	0.00021	-0.00068
70.75	0.03373	0.00550	-0.00378	0.00022	-0.00070
71.25	0.03197	0.00602	-0.00369	0.00022	-0.00074
71.75	0.02881	0.00664	-0.00389	0.00022	-0.00066
72.25	0.02801	0.00619	-0.00412	0.00022	-0.00056
72.75	0.02869	0.00557	-0.00413	0.00026	-0.00052

73.25	0.02778	0.00595	-0.00412	0.00028	-0.00046
73.75	0.02486	0.00696	-0.00421	0.00025	-0.00038
74.25	0.02213	0.00758	-0.00428	0.00024	-0.00031
74.75	0.02016	0.00816	-0.00416	0.00023	-0.00024
75.25	0.02068	0.00750	-0.00418	0.00025	-0.00023
75.75	0.02057	0.00715	-0.00429	0.00025	-0.00026
76.25	0.01727	0.00779	-0.00420	0.00023	-0.00020
76.75	0.01535	0.00774	-0.00417	0.00024	-0.00008
77.25	0.01531	0.00790	-0.00429	0.00024	-0.00016
77.75	0.01496	0.00734	-0.00432	0.00023	-0.00026
78.25	0.01192	0.00776	-0.00431	0.00022	-0.00021
78.75	0.00940	0.00872	-0.00424	0.00022	-0.00015
79.25	0.00862	0.00863	-0.00414	0.00022	-0.00017
79.75	0.00788	0.00837	-0.00417	0.00023	-0.00018
80.25	0.00695	0.00875	-0.00410	0.00020	-0.00017
80.75	0.00592	0.00846	-0.00418	0.00022	-0.00015
81.25	0.00507	0.00830	-0.00409	0.00022	-0.00009
81.75	0.00409	0.00897	-0.00415	0.00019	-0.00005
82.25	0.00350	0.00853	-0.00425	0.00020	-0.00009
82.75	0.00256	0.00816	-0.00401	0.00020	-0.00008
83.25	0.00294	0.00822	-0.00396	0.00021	-0.00012
83.75	0.00062	0.00869	-0.00391	0.00018	-0.00004
84.26	0.00007	0.00895	-0.00400	0.00017	0.00005
84.75	0.00131	0.00873	-0.00392	0.00019	-0.00007
85.25	-0.00099	0.00919	-0.00400	0.00019	0.00005
85.75	0.00041	0.00817	-0.00392	0.00019	0.00003
86.25	-0.00008	0.00835	-0.00376	0.00015	0.00004
86.76	-0.00165	0.00839	-0.00385	0.00017	0.00009
87.25	-0.00135	0.00806	-0.00377	0.00018	0.00002
87.76	-0.00240	0.00820	-0.00370	0.00016	0.00011
88.25	-0.00272	0.00824	-0.00364	0.00017	0.00011
88.75	-0.00286	0.00830	-0.00365	0.00016	0.00014
89.26	-0.00367	0.00854	-0.00348	0.00012	0.00019
89.74	-0.00465	0.00851	-0.00350	0.00014	0.00021

Table 41. Aerodynamic Coefficients, $U_{\infty} = 10$ [in/sec], $Re = 2.15 \times 10^4$,
 $\alpha = 15^\circ$, $\dot{\phi} = 3^\circ/\text{sec}$

DYNAMIC ROLL $\phi = 0^\circ\text{-}90^\circ$					
ϕ ($^\circ$)	C_N	C_M	C_S	C_{YM}	C_{RM}
0.24	0.10245	0.00941	-0.00162	-0.00011	0.00034
0.74	0.10074	0.00929	-0.00134	-0.00012	0.00035
1.25	0.10048	0.00921	-0.00110	-0.00014	0.00030
1.74	0.10018	0.00917	-0.00095	-0.00013	0.00026
2.25	0.10095	0.00908	-0.00102	-0.00013	0.00025
2.75	0.10085	0.00959	-0.00111	-0.00013	0.00022
3.25	0.10093	0.00950	-0.00116	-0.00016	0.00030
3.75	0.10247	0.00879	-0.00133	-0.00013	0.00026
4.25	0.10272	0.00869	-0.00134	-0.00009	0.00017
4.74	0.10164	0.00902	-0.00127	-0.00011	0.00021
5.25	0.10174	0.00947	-0.00141	-0.00013	0.00025
5.75	0.10227	0.00927	-0.00155	-0.00010	0.00017
6.24	0.10180	0.00910	-0.00137	-0.00010	0.00019
6.75	0.10309	0.00838	-0.00156	-0.00008	0.00010
7.25	0.10318	0.00919	-0.00158	-0.00010	0.00016
7.74	0.10243	0.00966	-0.00159	-0.00012	0.00018
8.25	0.10361	0.00878	-0.00165	-0.00012	0.00014
8.75	0.10356	0.00921	-0.00186	-0.00011	0.00018
9.25	0.10281	0.00953	-0.00188	-0.00010	0.00021
9.75	0.10354	0.00906	-0.00183	-0.00010	0.00017
10.25	0.10359	0.00923	-0.00193	-0.00009	0.00016
10.75	0.10245	0.00960	-0.00200	-0.00010	0.00021
11.25	0.10333	0.00901	-0.00207	-0.00009	0.00010
11.75	0.10320	0.00892	-0.00210	-0.00007	0.00009
12.25	0.10189	0.00962	-0.00209	-0.00010	0.00017
12.75	0.10186	0.00950	-0.00232	-0.00010	0.00019
13.25	0.10214	0.00867	-0.00247	-0.00005	0.00015
13.75	0.10125	0.00894	-0.00241	-0.00006	0.00016
14.25	0.10265	0.00891	-0.00247	-0.00006	0.00019
14.75	0.10310	0.00873	-0.00264	-0.00008	0.00017
15.25	0.10084	0.00909	-0.00271	-0.00005	0.00015
15.75	0.10073	0.00905	-0.00259	-0.00005	0.00018
16.25	0.10043	0.00931	-0.00263	-0.00007	0.00019
16.75	0.10057	0.00885	-0.00278	-0.00005	0.00014
17.25	0.10128	0.00803	-0.00282	-0.00003	0.00010

17.75	0.10111	0.00832	-0.00277	-0.00006	0.00014
18.25	0.10006	0.00911	-0.00288	-0.00006	0.00020
18.75	0.09877	0.00961	-0.00301	-0.00007	0.00020
19.25	0.09752	0.00955	-0.00296	-0.00006	0.00023
19.75	0.09871	0.00872	-0.00303	-0.00004	0.00024
20.25	0.09934	0.00878	-0.00311	-0.00005	0.00017
20.75	0.09846	0.00886	-0.00313	-0.00006	0.00016
21.25	0.09834	0.00869	-0.00313	-0.00004	0.00021
21.75	0.09935	0.00824	-0.00316	-0.00005	0.00024
22.25	0.09903	0.00802	-0.00318	-0.00006	0.00023
22.75	0.09730	0.00845	-0.00318	-0.00004	0.00024
23.25	0.09732	0.00848	-0.00328	-0.00003	0.00017
23.75	0.09628	0.00879	-0.00339	-0.00001	0.00016
24.24	0.09596	0.00869	-0.00348	0.00002	0.00017
24.74	0.09634	0.00858	-0.00358	0.00003	0.00014
25.24	0.09604	0.00850	-0.00359	0.00003	0.00014
25.74	0.09564	0.00870	-0.00362	0.00001	0.00015
26.24	0.09575	0.00886	-0.00373	0.00003	0.00014
26.74	0.09569	0.00884	-0.00380	0.00005	0.00015
27.25	0.09584	0.00832	-0.00380	0.00004	0.00015
27.75	0.09590	0.00833	-0.00382	0.00005	0.00018
28.25	0.09570	0.00876	-0.00393	0.00007	0.00018
28.75	0.09436	0.00903	-0.00395	0.00006	0.00015
29.25	0.09449	0.00879	-0.00388	0.00007	0.00010
29.75	0.09529	0.00820	-0.00382	0.00010	0.00011
30.25	0.09498	0.00840	-0.00401	0.00011	0.00015
30.75	0.09436	0.00848	-0.00415	0.00013	0.00010
31.25	0.09351	0.00839	-0.00406	0.00015	0.00015
31.75	0.09256	0.00881	-0.00400	0.00013	0.00020
32.25	0.09351	0.00849	-0.00416	0.00013	0.00016
32.75	0.09434	0.00784	-0.00430	0.00013	0.00013
33.25	0.09352	0.00769	-0.00432	0.00017	0.00013
33.75	0.09223	0.00877	-0.00432	0.00017	0.00012
34.25	0.09242	0.00940	-0.00436	0.00016	0.00008
34.75	0.09247	0.00909	-0.00428	0.00016	0.00009
35.25	0.09107	0.00937	-0.00426	0.00017	0.00011
35.75	0.09010	0.00984	-0.00427	0.00017	0.00014

36.25	0.09107	0.00959	-0.00433	0.00019	0.00011
36.75	0.09231	0.00916	-0.00437	0.00021	0.00004
37.25	0.09150	0.00900	-0.00447	0.00023	0.00007
37.75	0.09034	0.00903	-0.00441	0.00022	0.00008
38.25	0.09002	0.00918	-0.00429	0.00023	0.00002
38.75	0.09124	0.00850	-0.00437	0.00028	-0.00003
39.24	0.09119	0.00877	-0.00449	0.00027	-0.00004
39.75	0.09050	0.00817	-0.00428	0.00026	-0.00002
40.25	0.09025	0.00807	-0.00412	0.00024	0.00000
40.76	0.09014	0.00870	-0.00418	0.00022	-0.00002
41.25	0.08963	0.00836	-0.00439	0.00030	-0.00008
41.75	0.08842	0.00853	-0.00436	0.00029	-0.00004
42.25	0.08813	0.00848	-0.00423	0.00029	-0.00008
42.75	0.08843	0.00815	-0.00415	0.00030	-0.00012
43.25	0.08751	0.00854	-0.00416	0.00030	-0.00011
43.75	0.08731	0.00812	-0.00412	0.00029	-0.00015
44.25	0.08711	0.00795	-0.00397	0.00028	-0.00019
44.75	0.08676	0.00805	-0.00388	0.00026	-0.00017
45.25	0.08603	0.00805	-0.00411	0.00030	-0.00019
45.75	0.08570	0.00799	-0.00422	0.00032	-0.00022
46.25	0.08557	0.00753	-0.00411	0.00032	-0.00025
46.75	0.08554	0.00663	-0.00402	0.00033	-0.00026
47.25	0.08454	0.00713	-0.00402	0.00032	-0.00025
47.75	0.08368	0.00749	-0.00423	0.00033	-0.00029
48.25	0.08181	0.00761	-0.00435	0.00034	-0.00030
48.75	0.08107	0.00751	-0.00437	0.00035	-0.00026
49.25	0.08097	0.00747	-0.00426	0.00034	-0.00027
49.75	0.08034	0.00769	-0.00434	0.00032	-0.00035
50.25	0.07965	0.00742	-0.00450	0.00033	-0.00039
50.75	0.07953	0.00687	-0.00446	0.00034	-0.00036
51.25	0.07953	0.00663	-0.00451	0.00037	-0.00041
51.75	0.07823	0.00681	-0.00439	0.00036	-0.00043
52.25	0.07699	0.00698	-0.00448	0.00035	-0.00037
52.75	0.07646	0.00724	-0.00470	0.00034	-0.00042
53.25	0.07555	0.00713	-0.00462	0.00036	-0.00051
53.75	0.07513	0.00647	-0.00454	0.00037	-0.00049
54.25	0.07421	0.00682	-0.00458	0.00035	-0.00049

54.75	0.07315	0.00717	-0.00460	0.00033	-0.00052
55.25	0.07205	0.00640	-0.00452	0.00035	-0.00047
55.75	0.07133	0.00561	-0.00459	0.00037	-0.00047
56.25	0.07074	0.00598	-0.00470	0.00035	-0.00055
56.75	0.06975	0.00628	-0.00476	0.00036	-0.00055
57.25	0.06887	0.00606	-0.00464	0.00033	-0.00055
57.75	0.06788	0.00600	-0.00455	0.00035	-0.00060
58.25	0.06690	0.00602	-0.00452	0.00035	-0.00060
58.75	0.06602	0.00592	-0.00460	0.00035	-0.00062
59.25	0.06521	0.00587	-0.00463	0.00035	-0.00069
59.75	0.06449	0.00587	-0.00455	0.00034	-0.00072
60.25	0.06490	0.00538	-0.00439	0.00034	-0.00078
60.75	0.06411	0.00553	-0.00427	0.00031	-0.00078
61.25	0.06278	0.00533	-0.00434	0.00029	-0.00072
61.75	0.06183	0.00531	-0.00447	0.00030	-0.00074
62.25	0.06218	0.00474	-0.00435	0.00028	-0.00073
62.75	0.06154	0.00498	-0.00433	0.00028	-0.00074
63.25	0.05940	0.00570	-0.00431	0.00029	-0.00085
63.75	0.05797	0.00579	-0.00426	0.00028	-0.00084
64.25	0.05780	0.00554	-0.00427	0.00025	-0.00077
64.75	0.05789	0.00562	-0.00422	0.00022	-0.00083
65.25	0.05734	0.00527	-0.00416	0.00025	-0.00096
65.74	0.05606	0.00480	-0.00414	0.00027	-0.00092
66.24	0.05602	0.00457	-0.00397	0.00022	-0.00094
66.75	0.05543	0.00486	-0.00382	0.00021	-0.00098
67.25	0.05357	0.00506	-0.00384	0.00023	-0.00094
67.75	0.05287	0.00443	-0.00394	0.00023	-0.00092
68.25	0.05179	0.00479	-0.00400	0.00020	-0.00092
68.75	0.05012	0.00565	-0.00398	0.00018	-0.00096
69.25	0.05062	0.00469	-0.00396	0.00022	-0.00104
69.75	0.05041	0.00376	-0.00407	0.00023	-0.00105
70.25	0.04792	0.00445	-0.00424	0.00021	-0.00098
70.75	0.04674	0.00500	-0.00417	0.00019	-0.00100
71.25	0.04598	0.00489	-0.00402	0.00019	-0.00107
71.75	0.04569	0.00440	-0.00409	0.00018	-0.00108
72.25	0.04481	0.00441	-0.00426	0.00018	-0.00108
72.75	0.04303	0.00465	-0.00429	0.00018	-0.00102

73.25	0.04152	0.00458	-0.00423	0.00019	-0.00099
73.75	0.03971	0.00498	-0.00419	0.00019	-0.00102
74.25	0.03888	0.00471	-0.00431	0.00019	-0.00096
74.75	0.03787	0.00482	-0.00430	0.00018	-0.00092
75.25	0.03637	0.00484	-0.00424	0.00019	-0.00090
75.75	0.03503	0.00477	-0.00431	0.00019	-0.00082
76.25	0.03343	0.00486	-0.00430	0.00018	-0.00077
76.75	0.03201	0.00482	-0.00433	0.00020	-0.00069
77.25	0.02949	0.00539	-0.00450	0.00023	-0.00058
77.75	0.02671	0.00609	-0.00453	0.00026	-0.00047
78.25	0.02592	0.00589	-0.00446	0.00023	-0.00037
78.75	0.02423	0.00599	-0.00456	0.00022	-0.00027
79.25	0.02317	0.00532	-0.00451	0.00024	-0.00018
79.75	0.02167	0.00555	-0.00440	0.00024	-0.00014
80.25	0.01946	0.00642	-0.00444	0.00022	-0.00013
80.75	0.01785	0.00682	-0.00445	0.00021	-0.00009
81.25	0.01623	0.00680	-0.00452	0.00021	-0.00001
81.75	0.01575	0.00641	-0.00440	0.00020	-0.00004
82.25	0.01375	0.00643	-0.00432	0.00021	-0.00003
82.75	0.01179	0.00701	-0.00439	0.00018	0.00003
83.25	0.01076	0.00716	-0.00418	0.00014	-0.00003
83.75	0.00878	0.00738	-0.00415	0.00014	-0.00003
84.26	0.00835	0.00714	-0.00418	0.00013	0.00002
84.75	0.00835	0.00642	-0.00408	0.00014	0.00001
85.25	0.00566	0.00733	-0.00405	0.00014	0.00006
85.75	0.00526	0.00732	-0.00408	0.00013	0.00003
86.25	0.00330	0.00776	-0.00402	0.00012	0.00006
86.76	0.00324	0.00691	-0.00394	0.00014	0.00007
87.25	0.00210	0.00688	-0.00394	0.00013	0.00010
87.76	0.00108	0.00767	-0.00376	0.00008	0.00012
88.25	0.00024	0.00761	-0.00381	0.00009	0.00016
88.75	-0.00016	0.00725	-0.00373	0.00009	0.00019
89.26	-0.00100	0.00705	-0.00366	0.00011	0.00019
89.73	-0.00187	0.00699	-0.00356	0.00010	0.00023

Table 42. Aerodynamic Coefficients, $U_{\infty} = 10$ [in/sec], $Re = 2.15 \times 10^4$,
 $\alpha = 20^\circ$, $\dot{\phi} = 3^\circ/\text{sec}$

DYNAMIC ROLL $\phi = 0^\circ\text{-}90^\circ$					
ϕ ($^\circ$)	C_N	C_M	C_S	C_{YM}	C_{RM}
0.22	-0.00586	0.00175	0.00030	-0.00015	0.00014
0.74	-0.00665	0.00203	0.00054	-0.00014	0.00010
1.24	-0.00593	0.00166	0.00084	-0.00017	0.00002
1.74	-0.00579	0.00131	0.00092	-0.00015	-0.00011
2.25	-0.00545	0.00145	0.00090	-0.00014	-0.00015
2.74	-0.00529	0.00168	0.00081	-0.00013	-0.00017
3.24	-0.00587	0.00180	0.00085	-0.00015	-0.00017
3.74	-0.00644	0.00194	0.00084	-0.00015	-0.00020
4.25	-0.00673	0.00222	0.00076	-0.00013	-0.00021
4.75	-0.00635	0.00221	0.00078	-0.00013	-0.00024
5.25	-0.00575	0.00194	0.00083	-0.00013	-0.00027
5.75	-0.00541	0.00167	0.00079	-0.00012	-0.00030
6.25	-0.00557	0.00167	0.00071	-0.00010	-0.00034
6.75	-0.00541	0.00160	0.00067	-0.00009	-0.00036
7.25	-0.00560	0.00192	0.00069	-0.00010	-0.00035
7.75	-0.00591	0.00227	0.00072	-0.00011	-0.00036
8.25	-0.00617	0.00240	0.00071	-0.00011	-0.00039
8.75	-0.00624	0.00236	0.00073	-0.00012	-0.00040
9.25	-0.00599	0.00210	0.00073	-0.00011	-0.00040
9.75	-0.00580	0.00189	0.00070	-0.00010	-0.00041
10.25	-0.00558	0.00174	0.00063	-0.00009	-0.00042
10.74	-0.00520	0.00155	0.00058	-0.00007	-0.00045
11.25	-0.00507	0.00153	0.00056	-0.00007	-0.00050
11.75	-0.00506	0.00160	0.00061	-0.00007	-0.00053
12.25	-0.00522	0.00181	0.00065	-0.00008	-0.00053
12.75	-0.00542	0.00190	0.00064	-0.00008	-0.00052
13.25	-0.00537	0.00202	0.00064	-0.00009	-0.00050
13.75	-0.00553	0.00213	0.00056	-0.00009	-0.00049
14.25	-0.00538	0.00204	0.00051	-0.00009	-0.00050
14.75	-0.00546	0.00197	0.00046	-0.00008	-0.00051
15.25	-0.00560	0.00194	0.00044	-0.00007	-0.00052
15.75	-0.00580	0.00200	0.00046	-0.00007	-0.00051
16.25	-0.00617	0.00216	0.00055	-0.00007	-0.00051
16.75	-0.00614	0.00228	0.00055	-0.00007	-0.00051
17.25	-0.00585	0.00224	0.00055	-0.00007	-0.00052

17.75	-0.00552	0.00217	0.00052	-0.00007	-0.00053
18.25	-0.00512	0.00189	0.00049	-0.00006	-0.00054
18.75	-0.00528	0.00183	0.00044	-0.00005	-0.00056
19.25	-0.00553	0.00173	0.00044	-0.00005	-0.00056
19.75	-0.00565	0.00171	0.00043	-0.00004	-0.00056
20.25	-0.00616	0.00189	0.00044	-0.00005	-0.00055
20.75	-0.00619	0.00195	0.00044	-0.00006	-0.00053
21.25	-0.00595	0.00181	0.00046	-0.00006	-0.00053
21.75	-0.00586	0.00187	0.00045	-0.00007	-0.00052
22.25	-0.00565	0.00191	0.00044	-0.00006	-0.00053
22.75	-0.00567	0.00214	0.00046	-0.00005	-0.00055
23.25	-0.00556	0.00229	0.00043	-0.00005	-0.00055
23.75	-0.00525	0.00234	0.00039	-0.00005	-0.00055
24.25	-0.00487	0.00218	0.00035	-0.00006	-0.00054
24.75	-0.00480	0.00201	0.00026	-0.00004	-0.00054
25.25	-0.00500	0.00187	0.00021	-0.00003	-0.00055
25.75	-0.00554	0.00212	0.00021	-0.00003	-0.00055
26.25	-0.00579	0.00237	0.00023	-0.00003	-0.00055
26.75	-0.00570	0.00254	0.00026	-0.00004	-0.00054
27.25	-0.00531	0.00263	0.00027	-0.00004	-0.00053
27.75	-0.00465	0.00245	0.00030	-0.00006	-0.00052
28.25	-0.00423	0.00215	0.00026	-0.00005	-0.00053
28.75	-0.00391	0.00186	0.00022	-0.00004	-0.00056
29.25	-0.00398	0.00158	0.00017	-0.00002	-0.00058
29.75	-0.00448	0.00176	0.00010	-0.00001	-0.00059
30.25	-0.00494	0.00208	0.00002	-0.00001	-0.00059
30.75	-0.00499	0.00221	0.00001	0.00000	-0.00059
31.25	-0.00503	0.00237	0.00004	-0.00001	-0.00058
31.75	-0.00445	0.00221	0.00008	-0.00001	-0.00057
32.25	-0.00375	0.00191	0.00013	-0.00001	-0.00058
32.75	-0.00337	0.00176	0.00017	-0.00002	-0.00058
33.25	-0.00309	0.00182	0.00020	-0.00003	-0.00057
33.75	-0.00346	0.00210	0.00018	-0.00004	-0.00056
34.25	-0.00388	0.00231	0.00016	-0.00004	-0.00056
34.75	-0.00409	0.00241	0.00011	-0.00004	-0.00058
35.25	-0.00409	0.00238	0.00005	-0.00002	-0.00060
35.75	-0.00393	0.00228	0.00001	-0.00001	-0.00061

36.25	-0.00319	0.00191	0.00002	0.00000	-0.00062
36.75	-0.00282	0.00171	0.00010	-0.00001	-0.00061
37.25	-0.00259	0.00156	0.00023	-0.00002	-0.00060
37.75	-0.00271	0.00167	0.00032	-0.00003	-0.00060
38.25	-0.00322	0.00195	0.00033	-0.00003	-0.00058
38.75	-0.00370	0.00232	0.00029	-0.00004	-0.00057
39.25	-0.00374	0.00243	0.00022	-0.00004	-0.00056
39.75	-0.00342	0.00237	0.00015	-0.00004	-0.00055
40.25	-0.00273	0.00206	0.00012	-0.00004	-0.00056
40.75	-0.00241	0.00194	0.00015	-0.00003	-0.00058
41.25	-0.00208	0.00183	0.00025	-0.00003	-0.00059
41.74	-0.00169	0.00154	0.00041	-0.00003	-0.00059
42.25	-0.00168	0.00162	0.00055	-0.00005	-0.00057
42.75	-0.00196	0.00182	0.00062	-0.00006	-0.00056
43.25	-0.00217	0.00198	0.00061	-0.00006	-0.00056
43.75	-0.00264	0.00226	0.00053	-0.00005	-0.00057
44.25	-0.00306	0.00243	0.00049	-0.00005	-0.00058
44.75	-0.00327	0.00247	0.00049	-0.00006	-0.00059
45.24	-0.00330	0.00238	0.00053	-0.00005	-0.00059
45.75	-0.00320	0.00248	0.00057	-0.00006	-0.00057
46.25	-0.00267	0.00246	0.00057	-0.00006	-0.00056
46.75	-0.00224	0.00248	0.00048	-0.00006	-0.00055
47.25	-0.00172	0.00246	0.00037	-0.00005	-0.00056
47.75	-0.00148	0.00248	0.00028	-0.00005	-0.00057
48.25	-0.00139	0.00247	0.00021	-0.00004	-0.00059
48.75	-0.00156	0.00247	0.00024	-0.00004	-0.00059
49.25	-0.00202	0.00254	0.00023	-0.00004	-0.00059
49.75	-0.00213	0.00242	0.00028	-0.00004	-0.00059
50.25	-0.00227	0.00232	0.00026	-0.00004	-0.00059
50.75	-0.00248	0.00245	0.00021	-0.00003	-0.00059
51.25	-0.00221	0.00238	0.00013	-0.00002	-0.00058
51.75	-0.00190	0.00228	0.00011	-0.00002	-0.00057
52.25	-0.00157	0.00222	0.00008	-0.00001	-0.00057
52.75	-0.00132	0.00220	0.00010	0.00000	-0.00058
53.25	-0.00137	0.00241	0.00009	0.00000	-0.00061
53.75	-0.00099	0.00240	0.00010	0.00001	-0.00063
54.25	-0.00076	0.00234	0.00006	0.00001	-0.00064

54.75	-0.00030	0.00212	0.00003	0.00001	-0.00064
55.25	-0.00015	0.00200	-0.00003	0.00001	-0.00062
55.75	-0.00028	0.00205	-0.00012	0.00000	-0.00060
56.25	-0.00033	0.00220	-0.00014	0.00000	-0.00059
56.75	-0.00038	0.00225	-0.00011	0.00000	-0.00059
57.25	-0.00035	0.00231	-0.00005	-0.00001	-0.00057
57.75	-0.00025	0.00237	0.00001	-0.00002	-0.00055
58.25	0.00010	0.00233	0.00003	-0.00002	-0.00055
58.75	0.00082	0.00212	0.00004	-0.00002	-0.00056
59.25	0.00181	0.00168	0.00006	-0.00002	-0.00060
59.75	0.00237	0.00146	0.00007	-0.00002	-0.00061
60.25	0.00217	0.00160	0.00011	-0.00003	-0.00061
60.75	0.00120	0.00208	0.00010	-0.00004	-0.00058
61.25	0.00022	0.00266	0.00009	-0.00004	-0.00056
61.75	-0.00035	0.00297	0.00009	-0.00004	-0.00055
62.25	-0.00037	0.00304	0.00007	-0.00004	-0.00055
62.75	0.00041	0.00262	0.00011	-0.00004	-0.00057
63.25	0.00110	0.00229	0.00017	-0.00003	-0.00057
63.75	0.00163	0.00207	0.00019	-0.00002	-0.00058
64.25	0.00203	0.00210	0.00023	-0.00002	-0.00059
64.75	0.00187	0.00233	0.00029	-0.00003	-0.00060
65.25	0.00167	0.00244	0.00035	-0.00003	-0.00061
65.75	0.00096	0.00270	0.00044	-0.00005	-0.00059
66.25	0.00049	0.00296	0.00050	-0.00006	-0.00056
66.75	0.00028	0.00298	0.00053	-0.00007	-0.00053
67.25	0.00042	0.00293	0.00049	-0.00006	-0.00053
67.75	0.00101	0.00256	0.00045	-0.00005	-0.00056
68.25	0.00144	0.00242	0.00045	-0.00004	-0.00059
68.75	0.00181	0.00237	0.00045	-0.00003	-0.00061
69.25	0.00191	0.00243	0.00047	-0.00004	-0.00061
69.75	0.00170	0.00261	0.00043	-0.00004	-0.00059
70.25	0.00167	0.00263	0.00041	-0.00004	-0.00057
70.75	0.00159	0.00257	0.00028	-0.00004	-0.00057
71.25	0.00170	0.00253	0.00017	-0.00004	-0.00057
71.75	0.00144	0.00257	0.00005	-0.00004	-0.00058
72.25	0.00118	0.00285	-0.00002	-0.00004	-0.00058
72.75	0.00124	0.00292	-0.00005	-0.00004	-0.00056

73.25	0.00194	0.00278	-0.00007	-0.00003	-0.00055
73.75	0.00251	0.00272	-0.00007	-0.00002	-0.00055
74.25	0.00338	0.00257	-0.00007	-0.00002	-0.00057
74.75	0.00358	0.00260	-0.00007	-0.00002	-0.00059
75.25	0.00342	0.00274	-0.00008	-0.00001	-0.00059
75.75	0.00321	0.00266	-0.00008	-0.00001	-0.00058
76.25	0.00287	0.00261	-0.00009	-0.00001	-0.00055
76.75	0.00272	0.00249	-0.00012	-0.00001	-0.00053
77.25	0.00290	0.00231	-0.00018	0.00000	-0.00054
77.75	0.00324	0.00232	-0.00028	0.00001	-0.00055
78.25	0.00318	0.00264	-0.00030	0.00001	-0.00055
78.75	0.00348	0.00283	-0.00028	0.00000	-0.00052
79.25	0.00342	0.00303	-0.00020	-0.00001	-0.00048
79.75	0.00370	0.00287	-0.00013	-0.00002	-0.00046
80.25	0.00388	0.00271	-0.00012	-0.00002	-0.00046
80.75	0.00375	0.00268	-0.00011	-0.00002	-0.00046
81.25	0.00329	0.00288	-0.00011	-0.00002	-0.00044
81.75	0.00280	0.00307	-0.00011	-0.00002	-0.00041
82.25	0.00256	0.00329	-0.00017	-0.00002	-0.00036
82.75	0.00288	0.00343	-0.00024	-0.00003	-0.00034
83.25	0.00374	0.00319	-0.00030	-0.00003	-0.00036
83.75	0.00457	0.00276	-0.00020	-0.00002	-0.00037
84.25	0.00463	0.00270	-0.00007	-0.00002	-0.00035
84.75	0.00416	0.00302	-0.00002	-0.00004	-0.00032
85.25	0.00364	0.00315	-0.00001	-0.00004	-0.00029
85.75	0.00328	0.00321	0.00000	-0.00004	-0.00026
86.25	0.00363	0.00330	0.00000	-0.00004	-0.00026
86.76	0.00477	0.00308	0.00005	-0.00005	-0.00024
87.25	0.00474	0.00299	0.00021	-0.00007	-0.00021
87.76	0.00417	0.00305	0.00023	-0.00006	-0.00013
88.26	0.00548	0.00272	0.00018	-0.00005	-0.00012
88.76	0.00579	0.00290	0.00017	-0.00006	-0.00011
89.27	0.00511	0.00280	0.00036	-0.00007	-0.00004
89.71	0.00465	0.00334	0.00033	-0.00006	0.00002

Table 43. Aerodynamic Coefficients, $U_{\infty} = 10$ [in/sec], $Re = 2.15 \times 10^4$,
 $\alpha = 0^\circ$, $\dot{\phi} = 7^\circ/\text{sec}$

DYNAMIC ROLL $\phi = 0^\circ\text{-}90^\circ$					
$\phi (^\circ)$	C_N	C_M	C_S	C_{YM}	C_{RM}
0.22	0.02178	0.00345	-0.00224	0.00058	0.00007
0.73	0.02189	0.00368	-0.00175	0.00049	0.00006
1.24	0.02106	0.00383	-0.00146	0.00049	-0.00003
1.74	0.02111	0.00378	-0.00133	0.00048	-0.00015
2.25	0.02126	0.00381	-0.00137	0.00048	-0.00016
2.74	0.02198	0.00363	-0.00138	0.00048	-0.00017
3.25	0.02271	0.00305	-0.00126	0.00049	-0.00017
3.75	0.02240	0.00320	-0.00131	0.00050	-0.00017
4.25	0.02168	0.00365	-0.00145	0.00051	-0.00018
4.75	0.02161	0.00372	-0.00144	0.00051	-0.00022
5.25	0.02222	0.00344	-0.00140	0.00050	-0.00028
5.74	0.02254	0.00332	-0.00141	0.00050	-0.00030
6.25	0.02200	0.00370	-0.00144	0.00052	-0.00034
6.75	0.02155	0.00396	-0.00139	0.00051	-0.00034
7.25	0.02172	0.00383	-0.00149	0.00053	-0.00034
7.75	0.02197	0.00369	-0.00147	0.00050	-0.00035
8.25	0.02162	0.00388	-0.00154	0.00051	-0.00038
8.75	0.02118	0.00393	-0.00153	0.00051	-0.00042
9.25	0.02127	0.00382	-0.00148	0.00053	-0.00044
9.75	0.02223	0.00335	-0.00138	0.00052	-0.00046
10.25	0.02343	0.00298	-0.00141	0.00053	-0.00048
10.74	0.02418	0.00278	-0.00144	0.00051	-0.00051
11.25	0.02428	0.00284	-0.00152	0.00050	-0.00056
11.75	0.02393	0.00297	-0.00162	0.00052	-0.00059
12.25	0.02342	0.00318	-0.00162	0.00051	-0.00061
12.75	0.02291	0.00319	-0.00159	0.00051	-0.00062
13.25	0.02273	0.00317	-0.00163	0.00054	-0.00066
13.75	0.02271	0.00302	-0.00157	0.00053	-0.00071
14.25	0.02281	0.00296	-0.00153	0.00053	-0.00074
14.75	0.02262	0.00309	-0.00154	0.00053	-0.00075
15.25	0.02225	0.00331	-0.00155	0.00052	-0.00072
15.75	0.02216	0.00342	-0.00167	0.00054	-0.00070
16.25	0.02200	0.00354	-0.00169	0.00054	-0.00068
16.75	0.02206	0.00366	-0.00173	0.00053	-0.00069
17.25	0.02239	0.00354	-0.00176	0.00054	-0.00071

17.75	0.02275	0.00328	-0.00181	0.00056	-0.00073
18.25	0.02324	0.00276	-0.00180	0.00056	-0.00074
18.75	0.02312	0.00266	-0.00176	0.00056	-0.00075
19.25	0.02263	0.00278	-0.00170	0.00056	-0.00073
19.75	0.02230	0.00276	-0.00167	0.00057	-0.00072
20.25	0.02199	0.00286	-0.00166	0.00057	-0.00072
20.75	0.02192	0.00297	-0.00168	0.00055	-0.00071
21.25	0.02171	0.00323	-0.00179	0.00056	-0.00071
21.75	0.02168	0.00332	-0.00191	0.00057	-0.00070
22.25	0.02154	0.00340	-0.00188	0.00055	-0.00069
22.75	0.02151	0.00336	-0.00187	0.00055	-0.00071
23.25	0.02142	0.00337	-0.00182	0.00055	-0.00072
23.75	0.02170	0.00320	-0.00188	0.00057	-0.00073
24.25	0.02201	0.00295	-0.00183	0.00057	-0.00073
24.75	0.02212	0.00285	-0.00185	0.00059	-0.00071
25.25	0.02231	0.00273	-0.00195	0.00062	-0.00070
25.75	0.02238	0.00277	-0.00195	0.00060	-0.00069
26.25	0.02240	0.00274	-0.00194	0.00057	-0.00070
26.75	0.02251	0.00278	-0.00200	0.00055	-0.00072
27.25	0.02271	0.00262	-0.00204	0.00056	-0.00075
27.75	0.02268	0.00251	-0.00208	0.00055	-0.00077
28.25	0.02258	0.00258	-0.00210	0.00056	-0.00077
28.75	0.02214	0.00284	-0.00223	0.00060	-0.00076
29.25	0.02164	0.00317	-0.00223	0.00063	-0.00073
29.75	0.02168	0.00314	-0.00212	0.00061	-0.00069
30.25	0.02151	0.00315	-0.00209	0.00059	-0.00066
30.75	0.02169	0.00302	-0.00213	0.00059	-0.00066
31.25	0.02151	0.00289	-0.00227	0.00062	-0.00068
31.75	0.02109	0.00298	-0.00221	0.00058	-0.00071
32.25	0.02090	0.00313	-0.00236	0.00061	-0.00072
32.75	0.02079	0.00317	-0.00240	0.00062	-0.00072
33.25	0.02079	0.00319	-0.00236	0.00061	-0.00070
33.75	0.02067	0.00334	-0.00229	0.00060	-0.00066
34.25	0.02065	0.00325	-0.00227	0.00063	-0.00063
34.75	0.02045	0.00327	-0.00228	0.00065	-0.00061
35.25	0.02029	0.00316	-0.00221	0.00064	-0.00060
35.75	0.01992	0.00321	-0.00227	0.00064	-0.00060

36.25	0.01959	0.00322	-0.00237	0.00065	-0.00060
36.75	0.01932	0.00325	-0.00251	0.00067	-0.00061
37.25	0.01929	0.00321	-0.00243	0.00063	-0.00062
37.75	0.01918	0.00317	-0.00244	0.00064	-0.00061
38.25	0.01911	0.00313	-0.00234	0.00064	-0.00061
38.75	0.01912	0.00322	-0.00228	0.00065	-0.00060
39.25	0.01905	0.00325	-0.00219	0.00065	-0.00060
39.75	0.01923	0.00329	-0.00220	0.00065	-0.00060
40.25	0.01927	0.00323	-0.00226	0.00067	-0.00060
40.75	0.01907	0.00334	-0.00221	0.00064	-0.00060
41.25	0.01842	0.00357	-0.00215	0.00062	-0.00058
41.75	0.01793	0.00366	-0.00217	0.00063	-0.00056
42.25	0.01727	0.00387	-0.00216	0.00063	-0.00054
42.75	0.01745	0.00373	-0.00221	0.00065	-0.00052
43.25	0.01761	0.00359	-0.00214	0.00062	-0.00053
43.75	0.01760	0.00356	-0.00214	0.00063	-0.00054
44.25	0.01759	0.00356	-0.00214	0.00063	-0.00056
44.75	0.01765	0.00345	-0.00205	0.00062	-0.00055
45.25	0.01778	0.00334	-0.00204	0.00064	-0.00055
45.75	0.01783	0.00312	-0.00210	0.00066	-0.00053
46.25	0.01769	0.00306	-0.00220	0.00068	-0.00052
46.75	0.01733	0.00328	-0.00227	0.00068	-0.00052
47.25	0.01690	0.00350	-0.00231	0.00067	-0.00053
47.75	0.01663	0.00374	-0.00243	0.00068	-0.00054
48.25	0.01647	0.00390	-0.00252	0.00067	-0.00054
48.75	0.01654	0.00386	-0.00249	0.00065	-0.00053
49.25	0.01662	0.00370	-0.00251	0.00066	-0.00052
49.75	0.01626	0.00369	-0.00246	0.00066	-0.00052
50.25	0.01634	0.00356	-0.00239	0.00065	-0.00052
50.75	0.01622	0.00358	-0.00236	0.00064	-0.00051
51.25	0.01619	0.00341	-0.00242	0.00066	-0.00049
51.75	0.01634	0.00335	-0.00255	0.00067	-0.00049
52.25	0.01646	0.00317	-0.00262	0.00067	-0.00050
52.75	0.01652	0.00309	-0.00264	0.00067	-0.00052
53.25	0.01620	0.00315	-0.00267	0.00067	-0.00054
53.75	0.01589	0.00310	-0.00274	0.00070	-0.00055
54.25	0.01551	0.00319	-0.00267	0.00067	-0.00055

54.75	0.01540	0.00326	-0.00282	0.00070	-0.00054
55.25	0.01568	0.00326	-0.00282	0.00070	-0.00054
55.75	0.01601	0.00313	-0.00282	0.00070	-0.00054
56.25	0.01619	0.00296	-0.00271	0.00067	-0.00055
56.75	0.01568	0.00307	-0.00269	0.00068	-0.00055
57.25	0.01499	0.00333	-0.00271	0.00069	-0.00054
57.75	0.01417	0.00371	-0.00267	0.00067	-0.00053
58.25	0.01314	0.00416	-0.00271	0.00067	-0.00053
58.75	0.01282	0.00430	-0.00274	0.00068	-0.00054
59.25	0.01299	0.00404	-0.00277	0.00071	-0.00056
59.75	0.01323	0.00375	-0.00266	0.00068	-0.00056
60.25	0.01359	0.00355	-0.00269	0.00069	-0.00056
60.75	0.01379	0.00350	-0.00268	0.00069	-0.00056
61.25	0.01441	0.00330	-0.00262	0.00068	-0.00056
61.75	0.01447	0.00327	-0.00261	0.00068	-0.00056
62.25	0.01411	0.00327	-0.00268	0.00069	-0.00056
62.75	0.01357	0.00330	-0.00274	0.00071	-0.00054
63.25	0.01290	0.00330	-0.00273	0.00070	-0.00051
63.75	0.01247	0.00340	-0.00268	0.00068	-0.00049
64.25	0.01232	0.00353	-0.00258	0.00068	-0.00049
64.75	0.01241	0.00354	-0.00250	0.00068	-0.00051
65.25	0.01241	0.00365	-0.00238	0.00067	-0.00054
65.75	0.01264	0.00352	-0.00224	0.00065	-0.00056
66.25	0.01223	0.00348	-0.00224	0.00067	-0.00055
66.75	0.01187	0.00350	-0.00227	0.00068	-0.00054
67.25	0.01175	0.00338	-0.00226	0.00067	-0.00054
67.75	0.01135	0.00338	-0.00239	0.00068	-0.00053
68.25	0.01108	0.00337	-0.00247	0.00068	-0.00053
68.75	0.01090	0.00334	-0.00259	0.00069	-0.00052
69.25	0.01078	0.00318	-0.00258	0.00069	-0.00051
69.75	0.01101	0.00293	-0.00259	0.00069	-0.00050
70.25	0.01110	0.00283	-0.00262	0.00071	-0.00049
70.75	0.01124	0.00295	-0.00263	0.00072	-0.00051
71.25	0.01104	0.00310	-0.00260	0.00070	-0.00053
71.75	0.01091	0.00321	-0.00267	0.00070	-0.00055
72.25	0.01049	0.00336	-0.00277	0.00071	-0.00057
72.75	0.01014	0.00339	-0.00281	0.00070	-0.00057

73.25	0.00996	0.00335	-0.00287	0.00070	-0.00056
73.75	0.00949	0.00333	-0.00294	0.00071	-0.00054
74.25	0.00885	0.00352	-0.00301	0.00072	-0.00052
74.75	0.00867	0.00358	-0.00302	0.00073	-0.00051
75.25	0.00807	0.00379	-0.00299	0.00072	-0.00049
75.75	0.00804	0.00391	-0.00303	0.00073	-0.00049
76.25	0.00805	0.00402	-0.00296	0.00072	-0.00048
76.75	0.00812	0.00403	-0.00292	0.00071	-0.00048
77.25	0.00800	0.00419	-0.00291	0.00070	-0.00049
77.75	0.00756	0.00430	-0.00298	0.00070	-0.00048
78.25	0.00745	0.00429	-0.00304	0.00070	-0.00048
78.75	0.00743	0.00401	-0.00315	0.00071	-0.00046
79.25	0.00743	0.00379	-0.00323	0.00073	-0.00044
79.75	0.00739	0.00361	-0.00311	0.00071	-0.00043
80.25	0.00733	0.00361	-0.00311	0.00073	-0.00042
80.75	0.00697	0.00377	-0.00301	0.00072	-0.00040
81.25	0.00717	0.00363	-0.00301	0.00073	-0.00038
81.75	0.00744	0.00321	-0.00304	0.00074	-0.00038
82.25	0.00724	0.00289	-0.00312	0.00075	-0.00035
82.75	0.00669	0.00293	-0.00316	0.00074	-0.00033
83.25	0.00589	0.00335	-0.00312	0.00074	-0.00033
83.75	0.00564	0.00354	-0.00303	0.00073	-0.00033
84.25	0.00575	0.00360	-0.00303	0.00072	-0.00032
84.75	0.00618	0.00327	-0.00301	0.00071	-0.00031
85.25	0.00628	0.00296	-0.00294	0.00071	-0.00027
85.75	0.00558	0.00319	-0.00290	0.00073	-0.00023
86.25	0.00493	0.00363	-0.00291	0.00072	-0.00022
86.75	0.00428	0.00393	-0.00298	0.00071	-0.00020
87.25	0.00366	0.00408	-0.00296	0.00070	-0.00016
87.76	0.00519	0.00337	-0.00273	0.00071	-0.00017
88.26	0.00554	0.00349	-0.00271	0.00070	-0.00016
88.76	0.00412	0.00354	-0.00283	0.00072	-0.00009
89.27	0.00500	0.00298	-0.00255	0.00072	-0.00010
89.71	0.00412	0.00334	-0.00221	0.00056	0.00001

Table 44. Aerodynamic Coefficients, $U_{\infty} = 10$ [in/sec], $Re = 2.15 \times 10^4$,
 $\alpha = 5^\circ$, $\dot{\phi} = 7^\circ/\text{sec}$

DYNAMIC ROLL $\phi = 0^\circ\text{-}90^\circ$					
$\phi (^\circ)$	C_N	C_M	C_S	C_{YM}	C_{RM}
0.22	0.07173	0.00256	-0.00322	0.00070	0.00022
0.73	0.07103	0.00257	-0.00286	0.00067	0.00020
1.24	0.06899	0.00305	-0.00247	0.00065	0.00011
1.74	0.07085	0.00223	-0.00230	0.00066	-0.00009
2.25	0.07265	0.00162	-0.00243	0.00070	-0.00014
2.75	0.07215	0.00221	-0.00249	0.00073	-0.00014
3.25	0.07213	0.00219	-0.00243	0.00072	-0.00011
3.75	0.07247	0.00174	-0.00245	0.00072	-0.00013
4.25	0.07213	0.00202	-0.00261	0.00075	-0.00016
4.75	0.07199	0.00236	-0.00256	0.00074	-0.00019
5.25	0.07176	0.00240	-0.00256	0.00076	-0.00022
5.75	0.07144	0.00234	-0.00264	0.00077	-0.00022
6.24	0.07170	0.00216	-0.00273	0.00078	-0.00024
6.75	0.07239	0.00197	-0.00282	0.00079	-0.00027
7.25	0.07283	0.00176	-0.00284	0.00082	-0.00030
7.74	0.07261	0.00180	-0.00279	0.00083	-0.00033
8.25	0.07171	0.00223	-0.00278	0.00083	-0.00034
8.75	0.07049	0.00258	-0.00292	0.00085	-0.00035
9.25	0.07043	0.00257	-0.00299	0.00084	-0.00037
9.75	0.07078	0.00241	-0.00303	0.00084	-0.00039
10.25	0.07159	0.00212	-0.00304	0.00085	-0.00040
10.74	0.07229	0.00179	-0.00301	0.00087	-0.00041
11.25	0.07222	0.00176	-0.00298	0.00088	-0.00043
11.75	0.07166	0.00178	-0.00295	0.00088	-0.00044
12.25	0.07077	0.00204	-0.00310	0.00091	-0.00045
12.75	0.07014	0.00215	-0.00310	0.00088	-0.00045
13.25	0.06984	0.00214	-0.00321	0.00089	-0.00047
13.75	0.07032	0.00187	-0.00320	0.00089	-0.00051
14.25	0.07073	0.00170	-0.00310	0.00087	-0.00053
14.75	0.07096	0.00162	-0.00305	0.00089	-0.00054
15.25	0.07104	0.00169	-0.00303	0.00089	-0.00052
15.75	0.07073	0.00171	-0.00298	0.00087	-0.00049
16.25	0.07057	0.00155	-0.00306	0.00088	-0.00048
16.75	0.07032	0.00145	-0.00313	0.00089	-0.00047
17.25	0.07043	0.00136	-0.00322	0.00089	-0.00049

17.75	0.07021	0.00152	-0.00322	0.00087	-0.00052
18.25	0.07018	0.00163	-0.00328	0.00088	-0.00054
18.75	0.06980	0.00177	-0.00326	0.00089	-0.00056
19.25	0.06907	0.00176	-0.00314	0.00089	-0.00055
19.75	0.06815	0.00184	-0.00316	0.00092	-0.00053
20.25	0.06739	0.00202	-0.00322	0.00094	-0.00050
20.74	0.06703	0.00212	-0.00337	0.00097	-0.00049
21.25	0.06732	0.00212	-0.00340	0.00094	-0.00048
21.75	0.06807	0.00194	-0.00352	0.00095	-0.00049
22.25	0.06850	0.00183	-0.00353	0.00093	-0.00051
22.75	0.06877	0.00154	-0.00343	0.00091	-0.00054
23.25	0.06830	0.00166	-0.00340	0.00092	-0.00056
23.75	0.06777	0.00163	-0.00339	0.00093	-0.00057
24.24	0.06735	0.00177	-0.00338	0.00094	-0.00056
24.75	0.06669	0.00191	-0.00337	0.00091	-0.00056
25.25	0.06655	0.00186	-0.00349	0.00094	-0.00057
25.75	0.06623	0.00196	-0.00355	0.00093	-0.00058
26.24	0.06597	0.00194	-0.00357	0.00091	-0.00059
26.75	0.06574	0.00180	-0.00363	0.00092	-0.00061
27.25	0.06612	0.00146	-0.00362	0.00093	-0.00062
27.75	0.06659	0.00102	-0.00364	0.00094	-0.00062
28.25	0.06694	0.00081	-0.00358	0.00094	-0.00062
28.75	0.06680	0.00081	-0.00368	0.00096	-0.00065
29.25	0.06655	0.00114	-0.00372	0.00095	-0.00068
29.75	0.06585	0.00157	-0.00370	0.00093	-0.00070
30.25	0.06535	0.00176	-0.00376	0.00093	-0.00071
30.75	0.06476	0.00183	-0.00373	0.00093	-0.00071
31.25	0.06430	0.00182	-0.00373	0.00093	-0.00069
31.75	0.06376	0.00183	-0.00367	0.00092	-0.00067
32.25	0.06377	0.00153	-0.00366	0.00093	-0.00064
32.75	0.06364	0.00139	-0.00360	0.00094	-0.00064
33.25	0.06355	0.00125	-0.00357	0.00093	-0.00064
33.75	0.06327	0.00131	-0.00363	0.00094	-0.00065
34.25	0.06291	0.00132	-0.00370	0.00094	-0.00067
34.75	0.06221	0.00152	-0.00368	0.00093	-0.00070
35.25	0.06155	0.00168	-0.00377	0.00094	-0.00073
35.75	0.06092	0.00187	-0.00371	0.00092	-0.00074

36.25	0.06045	0.00187	-0.00373	0.00092	-0.00073
36.75	0.05992	0.00199	-0.00369	0.00092	-0.00070
37.25	0.05946	0.00202	-0.00368	0.00093	-0.00068
37.75	0.05875	0.00210	-0.00368	0.00094	-0.00068
38.25	0.05869	0.00181	-0.00363	0.00093	-0.00070
38.75	0.05887	0.00138	-0.00362	0.00094	-0.00072
39.25	0.05875	0.00097	-0.00363	0.00095	-0.00074
39.75	0.05842	0.00070	-0.00363	0.00095	-0.00076
40.25	0.05749	0.00074	-0.00362	0.00095	-0.00078
40.75	0.05728	0.00075	-0.00359	0.00094	-0.00081
41.25	0.05700	0.00084	-0.00352	0.00092	-0.00084
41.75	0.05696	0.00077	-0.00340	0.00091	-0.00086
42.25	0.05712	0.00073	-0.00338	0.00091	-0.00086
42.75	0.05701	0.00075	-0.00332	0.00091	-0.00087
43.25	0.05625	0.00098	-0.00328	0.00090	-0.00088
43.75	0.05529	0.00147	-0.00331	0.00089	-0.00088
44.25	0.05453	0.00154	-0.00335	0.00090	-0.00089
44.75	0.05371	0.00163	-0.00334	0.00090	-0.00089
45.25	0.05330	0.00167	-0.00334	0.00090	-0.00088
45.75	0.05246	0.00201	-0.00336	0.00091	-0.00085
46.25	0.05161	0.00220	-0.00329	0.00089	-0.00083
46.75	0.05127	0.00228	-0.00331	0.00088	-0.00083
47.25	0.05126	0.00209	-0.00337	0.00089	-0.00086
47.75	0.05102	0.00183	-0.00350	0.00092	-0.00087
48.25	0.05081	0.00156	-0.00354	0.00092	-0.00088
48.75	0.05041	0.00153	-0.00357	0.00092	-0.00087
49.25	0.05061	0.00118	-0.00363	0.00092	-0.00087
49.75	0.05009	0.00106	-0.00363	0.00090	-0.00088
50.25	0.04955	0.00116	-0.00363	0.00089	-0.00091
50.75	0.04890	0.00122	-0.00370	0.00091	-0.00094
51.25	0.04807	0.00149	-0.00376	0.00092	-0.00093
51.75	0.04744	0.00174	-0.00379	0.00093	-0.00092
52.25	0.04697	0.00174	-0.00383	0.00094	-0.00093
52.75	0.04665	0.00178	-0.00380	0.00093	-0.00096
53.25	0.04578	0.00187	-0.00373	0.00091	-0.00099
53.75	0.04492	0.00195	-0.00369	0.00089	-0.00102
54.25	0.04460	0.00185	-0.00367	0.00089	-0.00105

54.75	0.04398	0.00175	-0.00361	0.00090	-0.00106
55.25	0.04353	0.00166	-0.00353	0.00089	-0.00107
55.75	0.04285	0.00158	-0.00357	0.00089	-0.00108
56.25	0.04231	0.00164	-0.00355	0.00087	-0.00110
56.75	0.04184	0.00169	-0.00357	0.00084	-0.00114
57.25	0.04133	0.00188	-0.00361	0.00082	-0.00117
57.75	0.04130	0.00187	-0.00366	0.00082	-0.00120
58.25	0.04045	0.00211	-0.00366	0.00082	-0.00122
58.75	0.03931	0.00232	-0.00362	0.00083	-0.00123
59.25	0.03838	0.00247	-0.00358	0.00084	-0.00125
59.75	0.03753	0.00251	-0.00349	0.00083	-0.00124
60.25	0.03669	0.00257	-0.00346	0.00081	-0.00123
60.75	0.03653	0.00231	-0.00343	0.00081	-0.00124
61.25	0.03665	0.00194	-0.00339	0.00080	-0.00126
61.75	0.03684	0.00154	-0.00336	0.00080	-0.00130
62.25	0.03608	0.00173	-0.00331	0.00078	-0.00136
62.75	0.03510	0.00219	-0.00328	0.00077	-0.00140
63.25	0.03392	0.00258	-0.00325	0.00077	-0.00141
63.75	0.03278	0.00287	-0.00327	0.00078	-0.00136
64.25	0.03223	0.00276	-0.00323	0.00078	-0.00132
64.75	0.03182	0.00252	-0.00318	0.00079	-0.00130
65.25	0.03133	0.00240	-0.00309	0.00079	-0.00130
65.74	0.03054	0.00245	-0.00301	0.00078	-0.00132
66.25	0.02945	0.00256	-0.00295	0.00077	-0.00131
66.76	0.02818	0.00272	-0.00294	0.00078	-0.00127
67.25	0.02735	0.00262	-0.00300	0.00080	-0.00123
67.75	0.02637	0.00269	-0.00301	0.00080	-0.00118
68.25	0.02531	0.00314	-0.00313	0.00081	-0.00113
68.75	0.02450	0.00345	-0.00323	0.00081	-0.00109
69.24	0.02426	0.00353	-0.00333	0.00082	-0.00107
69.75	0.02415	0.00348	-0.00336	0.00082	-0.00106
70.26	0.02387	0.00327	-0.00339	0.00084	-0.00105
70.75	0.02342	0.00310	-0.00342	0.00086	-0.00104
71.25	0.02261	0.00305	-0.00349	0.00087	-0.00101
71.75	0.02150	0.00322	-0.00357	0.00087	-0.00096
72.25	0.02048	0.00338	-0.00373	0.00088	-0.00091
72.75	0.01955	0.00364	-0.00381	0.00088	-0.00086

73.25	0.01881	0.00390	-0.00387	0.00089	-0.00083
73.75	0.01839	0.00392	-0.00384	0.00089	-0.00080
74.25	0.01827	0.00391	-0.00386	0.00091	-0.00077
74.74	0.01816	0.00389	-0.00381	0.00090	-0.00073
75.25	0.01759	0.00393	-0.00381	0.00090	-0.00070
75.75	0.01703	0.00390	-0.00394	0.00092	-0.00067
76.25	0.01641	0.00381	-0.00401	0.00091	-0.00064
76.75	0.01552	0.00371	-0.00411	0.00092	-0.00062
77.25	0.01435	0.00372	-0.00412	0.00093	-0.00060
77.75	0.01292	0.00389	-0.00408	0.00093	-0.00056
78.25	0.01214	0.00388	-0.00402	0.00093	-0.00050
78.75	0.01168	0.00395	-0.00399	0.00091	-0.00044
79.25	0.01152	0.00404	-0.00389	0.00088	-0.00042
79.75	0.01118	0.00419	-0.00395	0.00087	-0.00044
80.25	0.01067	0.00423	-0.00399	0.00088	-0.00045
80.75	0.00987	0.00434	-0.00397	0.00086	-0.00043
81.25	0.00898	0.00443	-0.00400	0.00086	-0.00039
81.75	0.00836	0.00456	-0.00402	0.00086	-0.00035
82.25	0.00801	0.00445	-0.00400	0.00087	-0.00033
82.75	0.00809	0.00414	-0.00397	0.00088	-0.00033
83.25	0.00814	0.00382	-0.00389	0.00087	-0.00036
83.75	0.00759	0.00372	-0.00388	0.00088	-0.00035
84.25	0.00599	0.00435	-0.00386	0.00088	-0.00029
84.75	0.00511	0.00477	-0.00385	0.00087	-0.00025
85.25	0.00570	0.00442	-0.00380	0.00085	-0.00025
85.75	0.00558	0.00429	-0.00377	0.00082	-0.00024
86.25	0.00500	0.00431	-0.00367	0.00081	-0.00020
86.75	0.00499	0.00417	-0.00356	0.00081	-0.00017
87.25	0.00510	0.00395	-0.00355	0.00083	-0.00018
87.76	0.00431	0.00380	-0.00349	0.00083	-0.00013
88.26	0.00429	0.00360	-0.00352	0.00084	-0.00007
88.76	0.00333	0.00404	-0.00353	0.00083	-0.00006
89.27	0.00243	0.00424	-0.00339	0.00081	-0.00002
89.71	0.00339	0.00376	-0.00330	0.00078	0.00004

Table 45. Aerodynamic Coefficients, $U_{\infty} = 10$ [in/sec], $Re = 2.15 \times 10^4$,
 $\alpha = 10^\circ$, $\dot{\phi} = 7^\circ/\text{sec}$

DYNAMIC ROLL $\phi = 0^\circ\text{-}90^\circ$					
ϕ ($^\circ$)	C_N	C_M	C_S	C_{YM}	C_{RM}
0.22	0.09818	0.00606	-0.00030	-0.00036	0.00018
0.73	0.09701	0.00655	-0.00001	-0.00040	0.00017
1.24	0.09665	0.00654	0.00040	-0.00040	0.00010
1.74	0.09718	0.00618	0.00049	-0.00038	-0.00007
2.25	0.09800	0.00617	0.00049	-0.00039	-0.00009
2.74	0.09742	0.00638	0.00049	-0.00038	-0.00014
3.25	0.09662	0.00655	0.00054	-0.00038	-0.00009
3.74	0.09693	0.00644	0.00042	-0.00037	-0.00009
4.25	0.09781	0.00635	0.00020	-0.00034	-0.00017
4.75	0.09881	0.00615	0.00019	-0.00033	-0.00024
5.25	0.09903	0.00587	0.00031	-0.00032	-0.00026
5.74	0.09881	0.00590	0.00032	-0.00032	-0.00022
6.25	0.09830	0.00604	0.00024	-0.00032	-0.00020
6.75	0.09855	0.00593	0.00015	-0.00032	-0.00025
7.25	0.09811	0.00603	0.00004	-0.00030	-0.00028
7.75	0.09766	0.00634	0.00005	-0.00032	-0.00031
8.25	0.09743	0.00673	-0.00002	-0.00031	-0.00033
8.75	0.09775	0.00649	-0.00002	-0.00031	-0.00033
9.25	0.09789	0.00608	-0.00001	-0.00030	-0.00033
9.75	0.09810	0.00574	-0.00003	-0.00030	-0.00034
10.25	0.09826	0.00559	-0.00014	-0.00028	-0.00035
10.74	0.09822	0.00577	-0.00019	-0.00029	-0.00039
11.25	0.09808	0.00587	-0.00018	-0.00029	-0.00044
11.75	0.09802	0.00576	-0.00013	-0.00029	-0.00047
12.25	0.09821	0.00552	-0.00017	-0.00027	-0.00048
12.75	0.09806	0.00535	-0.00016	-0.00027	-0.00046
13.25	0.09835	0.00528	-0.00034	-0.00023	-0.00046
13.75	0.09804	0.00538	-0.00031	-0.00025	-0.00046
14.25	0.09769	0.00552	-0.00041	-0.00023	-0.00048
14.75	0.09752	0.00552	-0.00047	-0.00022	-0.00049
15.25	0.09708	0.00561	-0.00044	-0.00025	-0.00048
15.75	0.09702	0.00583	-0.00051	-0.00026	-0.00046
16.25	0.09693	0.00603	-0.00062	-0.00024	-0.00044
16.75	0.09654	0.00619	-0.00059	-0.00025	-0.00044
17.24	0.09641	0.00615	-0.00056	-0.00026	-0.00046

17.75	0.09634	0.00594	-0.00068	-0.00023	-0.00049
18.25	0.09598	0.00586	-0.00081	-0.00020	-0.00051
18.75	0.09500	0.00602	-0.00086	-0.00020	-0.00051
19.25	0.09394	0.00636	-0.00087	-0.00019	-0.00049
19.75	0.09365	0.00649	-0.00087	-0.00018	-0.00046
20.25	0.09375	0.00637	-0.00088	-0.00018	-0.00045
20.74	0.09413	0.00608	-0.00078	-0.00021	-0.00044
21.25	0.09446	0.00586	-0.00086	-0.00020	-0.00043
21.75	0.09434	0.00568	-0.00098	-0.00017	-0.00043
22.25	0.09376	0.00567	-0.00093	-0.00018	-0.00043
22.75	0.09299	0.00577	-0.00097	-0.00018	-0.00046
23.25	0.09262	0.00579	-0.00100	-0.00017	-0.00048
23.75	0.09211	0.00579	-0.00105	-0.00017	-0.00047
24.25	0.09197	0.00570	-0.00109	-0.00018	-0.00045
24.75	0.09181	0.00567	-0.00116	-0.00019	-0.00043
25.25	0.09159	0.00558	-0.00133	-0.00016	-0.00043
25.75	0.09131	0.00565	-0.00135	-0.00017	-0.00044
26.25	0.09103	0.00564	-0.00137	-0.00017	-0.00045
26.75	0.09100	0.00555	-0.00144	-0.00016	-0.00045
27.25	0.09082	0.00547	-0.00150	-0.00015	-0.00042
27.75	0.09093	0.00519	-0.00154	-0.00016	-0.00041
28.25	0.09080	0.00519	-0.00157	-0.00017	-0.00043
28.75	0.09032	0.00534	-0.00165	-0.00015	-0.00048
29.25	0.08977	0.00555	-0.00166	-0.00015	-0.00053
29.75	0.08975	0.00537	-0.00164	-0.00013	-0.00056
30.25	0.08969	0.00524	-0.00164	-0.00013	-0.00056
30.75	0.08975	0.00507	-0.00164	-0.00012	-0.00054
31.25	0.08998	0.00471	-0.00170	-0.00010	-0.00053
31.75	0.08985	0.00446	-0.00175	-0.00009	-0.00054
32.25	0.08971	0.00420	-0.00179	-0.00010	-0.00056
32.75	0.08963	0.00397	-0.00178	-0.00010	-0.00056
33.25	0.08892	0.00387	-0.00188	-0.00009	-0.00055
33.75	0.08790	0.00402	-0.00187	-0.00010	-0.00053
34.25	0.08686	0.00435	-0.00189	-0.00011	-0.00052
34.75	0.08625	0.00464	-0.00184	-0.00011	-0.00054
35.25	0.08554	0.00490	-0.00188	-0.00010	-0.00056
35.75	0.08477	0.00506	-0.00191	-0.00009	-0.00055

36.25	0.08439	0.00506	-0.00189	-0.00009	-0.00054
36.75	0.08413	0.00472	-0.00195	-0.00008	-0.00051
37.25	0.08386	0.00444	-0.00200	-0.00007	-0.00051
37.75	0.08387	0.00403	-0.00190	-0.00010	-0.00050
38.25	0.08366	0.00373	-0.00191	-0.00011	-0.00052
38.75	0.08341	0.00363	-0.00198	-0.00010	-0.00055
39.25	0.08280	0.00363	-0.00194	-0.00010	-0.00056
39.74	0.08207	0.00373	-0.00190	-0.00011	-0.00058
40.25	0.08110	0.00390	-0.00187	-0.00010	-0.00058
40.76	0.07998	0.00389	-0.00190	-0.00008	-0.00060
41.25	0.07930	0.00380	-0.00179	-0.00009	-0.00060
41.75	0.07887	0.00377	-0.00180	-0.00009	-0.00059
42.25	0.07843	0.00379	-0.00189	-0.00007	-0.00059
42.75	0.07828	0.00385	-0.00191	-0.00007	-0.00060
43.24	0.07796	0.00389	-0.00187	-0.00009	-0.00063
43.75	0.07731	0.00385	-0.00185	-0.00008	-0.00067
44.26	0.07682	0.00371	-0.00185	-0.00008	-0.00071
44.75	0.07576	0.00374	-0.00180	-0.00009	-0.00071
45.25	0.07495	0.00374	-0.00178	-0.00009	-0.00070
45.75	0.07404	0.00373	-0.00187	-0.00007	-0.00067
46.25	0.07374	0.00364	-0.00190	-0.00007	-0.00066
46.75	0.07376	0.00352	-0.00185	-0.00009	-0.00068
47.25	0.07378	0.00337	-0.00187	-0.00010	-0.00070
47.75	0.07389	0.00308	-0.00197	-0.00006	-0.00072
48.25	0.07354	0.00286	-0.00199	-0.00006	-0.00070
48.75	0.07251	0.00277	-0.00211	-0.00006	-0.00067
49.25	0.07165	0.00280	-0.00221	-0.00007	-0.00066
49.75	0.07033	0.00306	-0.00230	-0.00008	-0.00067
50.25	0.06914	0.00337	-0.00235	-0.00009	-0.00070
50.75	0.06826	0.00346	-0.00234	-0.00009	-0.00073
51.25	0.06752	0.00336	-0.00241	-0.00005	-0.00074
51.75	0.06662	0.00343	-0.00235	-0.00006	-0.00073
52.25	0.06632	0.00329	-0.00234	-0.00006	-0.00072
52.75	0.06585	0.00341	-0.00234	-0.00008	-0.00073
53.25	0.06542	0.00338	-0.00245	-0.00008	-0.00076
53.75	0.06518	0.00325	-0.00255	-0.00008	-0.00081
54.25	0.06457	0.00335	-0.00267	-0.00006	-0.00086

54.75	0.06412	0.00318	-0.00269	-0.00007	-0.00091
55.25	0.06362	0.00292	-0.00264	-0.00008	-0.00094
55.75	0.06339	0.00252	-0.00253	-0.00008	-0.00096
56.25	0.06289	0.00231	-0.00241	-0.00010	-0.00096
56.75	0.06222	0.00228	-0.00231	-0.00010	-0.00097
57.25	0.06118	0.00231	-0.00233	-0.00009	-0.00095
57.75	0.06012	0.00242	-0.00245	-0.00007	-0.00094
58.25	0.05932	0.00236	-0.00251	-0.00007	-0.00095
58.75	0.05881	0.00227	-0.00250	-0.00008	-0.00099
59.25	0.05806	0.00240	-0.00250	-0.00008	-0.00104
59.75	0.05726	0.00248	-0.00243	-0.00009	-0.00106
60.25	0.05640	0.00253	-0.00230	-0.00013	-0.00106
60.75	0.05542	0.00254	-0.00228	-0.00012	-0.00103
61.25	0.05449	0.00253	-0.00237	-0.00010	-0.00102
61.75	0.05362	0.00256	-0.00238	-0.00010	-0.00103
62.24	0.05255	0.00254	-0.00234	-0.00010	-0.00105
62.75	0.05212	0.00246	-0.00233	-0.00010	-0.00110
63.25	0.05116	0.00264	-0.00231	-0.00009	-0.00109
63.75	0.05038	0.00296	-0.00223	-0.00012	-0.00107
64.25	0.04921	0.00333	-0.00218	-0.00013	-0.00104
64.75	0.04837	0.00342	-0.00220	-0.00014	-0.00104
65.25	0.04749	0.00334	-0.00216	-0.00015	-0.00108
65.74	0.04668	0.00313	-0.00205	-0.00019	-0.00113
66.25	0.04582	0.00302	-0.00201	-0.00019	-0.00116
66.75	0.04508	0.00291	-0.00200	-0.00017	-0.00117
67.25	0.04440	0.00268	-0.00184	-0.00018	-0.00117
67.75	0.04424	0.00230	-0.00180	-0.00017	-0.00118
68.25	0.04399	0.00209	-0.00186	-0.00015	-0.00119
68.75	0.04308	0.00222	-0.00190	-0.00017	-0.00120
69.25	0.04204	0.00263	-0.00191	-0.00020	-0.00120
69.75	0.04139	0.00258	-0.00190	-0.00022	-0.00121
70.25	0.04053	0.00251	-0.00199	-0.00021	-0.00122
70.75	0.03938	0.00261	-0.00195	-0.00023	-0.00125
71.25	0.03806	0.00275	-0.00195	-0.00024	-0.00125
71.75	0.03723	0.00289	-0.00198	-0.00024	-0.00126
72.25	0.03653	0.00294	-0.00204	-0.00025	-0.00127
72.75	0.03605	0.00288	-0.00203	-0.00028	-0.00126

73.25	0.03614	0.00246	-0.00207	-0.00028	-0.00129
73.75	0.03525	0.00227	-0.00217	-0.00025	-0.00131
74.25	0.03371	0.00242	-0.00216	-0.00026	-0.00132
74.75	0.03223	0.00254	-0.00217	-0.00026	-0.00131
75.25	0.03077	0.00266	-0.00218	-0.00026	-0.00127
75.75	0.02977	0.00267	-0.00223	-0.00024	-0.00124
76.25	0.02869	0.00278	-0.00228	-0.00024	-0.00117
76.75	0.02816	0.00274	-0.00238	-0.00020	-0.00114
77.25	0.02703	0.00275	-0.00236	-0.00021	-0.00110
77.75	0.02593	0.00289	-0.00245	-0.00019	-0.00106
78.25	0.02404	0.00309	-0.00247	-0.00020	-0.00097
78.75	0.02183	0.00363	-0.00258	-0.00018	-0.00085
79.25	0.01966	0.00417	-0.00259	-0.00018	-0.00072
79.75	0.01785	0.00460	-0.00258	-0.00017	-0.00062
80.25	0.01658	0.00494	-0.00261	-0.00017	-0.00055
80.75	0.01583	0.00494	-0.00260	-0.00017	-0.00050
81.25	0.01531	0.00471	-0.00262	-0.00016	-0.00045
81.75	0.01497	0.00411	-0.00253	-0.00018	-0.00040
82.25	0.01419	0.00393	-0.00250	-0.00019	-0.00036
82.75	0.01320	0.00401	-0.00250	-0.00019	-0.00033
83.25	0.01223	0.00412	-0.00247	-0.00019	-0.00033
83.75	0.01149	0.00406	-0.00246	-0.00020	-0.00032
84.25	0.01012	0.00417	-0.00251	-0.00020	-0.00025
84.75	0.00863	0.00432	-0.00247	-0.00021	-0.00020
85.25	0.00719	0.00461	-0.00236	-0.00023	-0.00015
85.75	0.00668	0.00474	-0.00231	-0.00023	-0.00012
86.25	0.00620	0.00447	-0.00222	-0.00024	-0.00012
86.75	0.00518	0.00434	-0.00222	-0.00023	-0.00012
87.25	0.00273	0.00504	-0.00222	-0.00024	-0.00005
87.76	0.00192	0.00499	-0.00208	-0.00025	0.00004
88.26	0.00289	0.00480	-0.00207	-0.00027	0.00000
88.76	0.00164	0.00516	-0.00204	-0.00027	0.00006
89.27	0.00264	0.00422	-0.00192	-0.00026	0.00007
89.71	0.00134	0.00457	-0.00174	-0.00034	0.00017

Table 46. Aerodynamic Coefficients, $U_{\infty} = 10$ [in/sec], $Re = 2.15 \times 10^4$,
 $\alpha = 15^\circ$, $\dot{\phi} = 7^\circ/\text{sec}$

DYNAMIC ROLL $\phi = 0^\circ\text{-}90^\circ$					
$\phi (^\circ)$	C_N	C_M	C_S	C_{YM}	C_{RM}
0.22	0.11044	0.00665	-0.00292	0.00030	0.00029
0.73	0.10833	0.00684	-0.00253	0.00027	0.00026
1.24	0.10785	0.00670	-0.00219	0.00027	0.00017
1.74	0.10874	0.00636	-0.00211	0.00030	0.00003
2.25	0.10890	0.00650	-0.00201	0.00031	0.00001
2.74	0.10886	0.00697	-0.00204	0.00031	0.00001
3.25	0.10923	0.00696	-0.00217	0.00032	-0.00004
3.75	0.10934	0.00664	-0.00221	0.00034	-0.00009
4.25	0.10945	0.00631	-0.00218	0.00034	-0.00010
4.75	0.10897	0.00656	-0.00211	0.00033	-0.00013
5.25	0.10906	0.00674	-0.00211	0.00031	-0.00016
5.74	0.10948	0.00656	-0.00229	0.00032	-0.00015
6.25	0.10914	0.00655	-0.00244	0.00033	-0.00017
6.75	0.10901	0.00662	-0.00250	0.00034	-0.00021
7.25	0.10889	0.00643	-0.00249	0.00035	-0.00022
7.75	0.10911	0.00632	-0.00243	0.00034	-0.00022
8.25	0.10906	0.00644	-0.00239	0.00035	-0.00023
8.75	0.10924	0.00655	-0.00246	0.00036	-0.00023
9.25	0.10875	0.00674	-0.00255	0.00036	-0.00025
9.75	0.10876	0.00668	-0.00259	0.00035	-0.00028
10.25	0.10908	0.00639	-0.00260	0.00035	-0.00030
10.75	0.10904	0.00630	-0.00263	0.00035	-0.00034
11.25	0.10884	0.00629	-0.00265	0.00035	-0.00036
11.75	0.10886	0.00620	-0.00269	0.00037	-0.00039
12.25	0.10888	0.00612	-0.00273	0.00038	-0.00038
12.75	0.10847	0.00628	-0.00276	0.00037	-0.00034
13.25	0.10820	0.00639	-0.00280	0.00036	-0.00030
13.75	0.10761	0.00663	-0.00288	0.00036	-0.00028
14.25	0.10756	0.00651	-0.00299	0.00037	-0.00029
14.75	0.10780	0.00624	-0.00309	0.00038	-0.00031
15.25	0.10777	0.00600	-0.00319	0.00038	-0.00033
15.75	0.10735	0.00595	-0.00326	0.00038	-0.00032
16.26	0.10685	0.00626	-0.00332	0.00039	-0.00031
16.75	0.10613	0.00652	-0.00332	0.00038	-0.00032
17.25	0.10568	0.00652	-0.00329	0.00038	-0.00035

17.75	0.10574	0.00654	-0.00328	0.00039	-0.00036
18.25	0.10607	0.00638	-0.00329	0.00041	-0.00034
18.75	0.10623	0.00610	-0.00332	0.00041	-0.00029
19.25	0.10608	0.00588	-0.00335	0.00041	-0.00026
19.75	0.10547	0.00605	-0.00344	0.00040	-0.00024
20.25	0.10447	0.00637	-0.00355	0.00038	-0.00024
20.75	0.10322	0.00668	-0.00364	0.00038	-0.00027
21.25	0.10282	0.00654	-0.00372	0.00040	-0.00029
21.75	0.10287	0.00643	-0.00380	0.00041	-0.00027
22.25	0.10293	0.00624	-0.00381	0.00042	-0.00025
22.75	0.10275	0.00611	-0.00380	0.00042	-0.00026
23.25	0.10316	0.00582	-0.00381	0.00043	-0.00029
23.75	0.10299	0.00557	-0.00384	0.00045	-0.00029
24.25	0.10243	0.00567	-0.00393	0.00047	-0.00027
24.75	0.10208	0.00585	-0.00405	0.00048	-0.00026
25.25	0.10194	0.00607	-0.00417	0.00048	-0.00026
25.75	0.10130	0.00626	-0.00427	0.00047	-0.00027
26.25	0.10056	0.00649	-0.00434	0.00046	-0.00028
26.75	0.09984	0.00661	-0.00440	0.00047	-0.00028
27.25	0.09929	0.00635	-0.00443	0.00048	-0.00025
27.75	0.09903	0.00593	-0.00444	0.00049	-0.00021
28.25	0.09908	0.00591	-0.00442	0.00049	-0.00019
28.75	0.09969	0.00588	-0.00447	0.00050	-0.00022
29.25	0.09994	0.00605	-0.00458	0.00050	-0.00028
29.75	0.10005	0.00613	-0.00469	0.00051	-0.00032
30.25	0.09996	0.00612	-0.00476	0.00052	-0.00032
30.75	0.09941	0.00599	-0.00485	0.00054	-0.00030
31.25	0.09886	0.00578	-0.00488	0.00055	-0.00030
31.75	0.09833	0.00567	-0.00484	0.00055	-0.00029
32.25	0.09794	0.00559	-0.00482	0.00056	-0.00031
32.75	0.09757	0.00551	-0.00478	0.00057	-0.00032
33.25	0.09723	0.00559	-0.00475	0.00057	-0.00031
33.75	0.09725	0.00567	-0.00477	0.00058	-0.00030
34.25	0.09733	0.00557	-0.00485	0.00060	-0.00031
34.75	0.09753	0.00538	-0.00491	0.00061	-0.00034
35.25	0.09711	0.00562	-0.00501	0.00060	-0.00034
35.75	0.09687	0.00571	-0.00507	0.00060	-0.00036

36.25	0.09599	0.00587	-0.00509	0.00059	-0.00035
36.75	0.09494	0.00586	-0.00508	0.00060	-0.00035
37.25	0.09407	0.00554	-0.00500	0.00062	-0.00038
37.75	0.09298	0.00539	-0.00494	0.00064	-0.00038
38.25	0.09211	0.00535	-0.00491	0.00065	-0.00038
38.75	0.09113	0.00566	-0.00487	0.00065	-0.00038
39.25	0.09116	0.00567	-0.00486	0.00064	-0.00038
39.75	0.09154	0.00554	-0.00487	0.00063	-0.00039
40.25	0.09136	0.00544	-0.00493	0.00065	-0.00042
40.75	0.09163	0.00532	-0.00495	0.00066	-0.00048
41.25	0.09131	0.00546	-0.00494	0.00067	-0.00052
41.75	0.09045	0.00575	-0.00496	0.00069	-0.00051
42.25	0.08962	0.00576	-0.00493	0.00069	-0.00048
42.75	0.08854	0.00583	-0.00491	0.00070	-0.00044
43.25	0.08777	0.00576	-0.00487	0.00070	-0.00044
43.75	0.08756	0.00547	-0.00480	0.00070	-0.00048
44.25	0.08751	0.00527	-0.00475	0.00070	-0.00051
44.75	0.08743	0.00528	-0.00475	0.00070	-0.00053
45.24	0.08754	0.00537	-0.00482	0.00071	-0.00055
45.75	0.08744	0.00534	-0.00490	0.00072	-0.00054
46.25	0.08709	0.00533	-0.00501	0.00072	-0.00054
46.75	0.08674	0.00526	-0.00506	0.00073	-0.00056
47.25	0.08543	0.00535	-0.00507	0.00073	-0.00056
47.75	0.08412	0.00531	-0.00510	0.00073	-0.00055
48.25	0.08310	0.00517	-0.00510	0.00073	-0.00053
48.75	0.08263	0.00495	-0.00509	0.00072	-0.00050
49.25	0.08228	0.00478	-0.00514	0.00073	-0.00048
49.75	0.08210	0.00461	-0.00517	0.00073	-0.00051
50.25	0.08182	0.00456	-0.00527	0.00075	-0.00054
50.75	0.08124	0.00440	-0.00536	0.00077	-0.00058
51.25	0.08037	0.00419	-0.00540	0.00077	-0.00059
51.75	0.07930	0.00436	-0.00546	0.00076	-0.00060
52.25	0.07832	0.00439	-0.00550	0.00075	-0.00063
52.75	0.07762	0.00449	-0.00556	0.00075	-0.00069
53.25	0.07715	0.00441	-0.00554	0.00077	-0.00076
53.75	0.07660	0.00432	-0.00548	0.00079	-0.00079
54.25	0.07609	0.00417	-0.00539	0.00079	-0.00081

54.75	0.07567	0.00401	-0.00533	0.00078	-0.00079
55.25	0.07530	0.00395	-0.00533	0.00074	-0.00079
55.75	0.07464	0.00396	-0.00534	0.00072	-0.00081
56.25	0.07413	0.00390	-0.00537	0.00072	-0.00087
56.75	0.07334	0.00362	-0.00538	0.00074	-0.00090
57.25	0.07248	0.00336	-0.00541	0.00076	-0.00090
57.75	0.07145	0.00305	-0.00542	0.00078	-0.00089
58.25	0.07034	0.00304	-0.00539	0.00077	-0.00089
58.75	0.06929	0.00324	-0.00536	0.00076	-0.00091
59.25	0.06840	0.00329	-0.00528	0.00074	-0.00096
59.75	0.06785	0.00329	-0.00520	0.00073	-0.00101
60.25	0.06744	0.00324	-0.00517	0.00073	-0.00105
60.75	0.06652	0.00324	-0.00516	0.00074	-0.00106
61.25	0.06551	0.00338	-0.00522	0.00074	-0.00108
61.75	0.06418	0.00351	-0.00527	0.00074	-0.00107
62.25	0.06287	0.00367	-0.00528	0.00073	-0.00105
62.75	0.06163	0.00348	-0.00521	0.00073	-0.00100
63.25	0.06033	0.00337	-0.00512	0.00071	-0.00096
63.75	0.05953	0.00315	-0.00503	0.00070	-0.00094
64.25	0.05859	0.00307	-0.00496	0.00069	-0.00095
64.75	0.05804	0.00312	-0.00488	0.00068	-0.00101
65.25	0.05728	0.00326	-0.00477	0.00066	-0.00108
65.75	0.05682	0.00311	-0.00466	0.00066	-0.00115
66.25	0.05605	0.00288	-0.00457	0.00065	-0.00117
66.75	0.05513	0.00257	-0.00455	0.00065	-0.00116
67.25	0.05420	0.00228	-0.00457	0.00065	-0.00115
67.75	0.05270	0.00239	-0.00466	0.00065	-0.00113
68.25	0.05115	0.00250	-0.00474	0.00065	-0.00113
68.75	0.04965	0.00276	-0.00477	0.00063	-0.00114
69.25	0.04899	0.00280	-0.00477	0.00062	-0.00117
69.75	0.04875	0.00271	-0.00475	0.00061	-0.00123
70.25	0.04874	0.00273	-0.00476	0.00060	-0.00131
70.75	0.04898	0.00259	-0.00473	0.00058	-0.00140
71.25	0.04884	0.00246	-0.00476	0.00057	-0.00148
71.75	0.04804	0.00246	-0.00480	0.00056	-0.00151
72.25	0.04667	0.00248	-0.00486	0.00055	-0.00149
72.75	0.04485	0.00261	-0.00492	0.00056	-0.00145

73.25	0.04350	0.00238	-0.00496	0.00056	-0.00140
73.75	0.04280	0.00205	-0.00496	0.00057	-0.00139
74.25	0.04239	0.00167	-0.00493	0.00057	-0.00140
74.75	0.04205	0.00150	-0.00493	0.00057	-0.00143
75.25	0.04133	0.00165	-0.00494	0.00056	-0.00144
75.75	0.04065	0.00185	-0.00494	0.00054	-0.00144
76.25	0.03933	0.00204	-0.00490	0.00054	-0.00140
76.75	0.03813	0.00214	-0.00489	0.00053	-0.00138
77.25	0.03579	0.00258	-0.00493	0.00054	-0.00134
77.75	0.03366	0.00282	-0.00505	0.00056	-0.00129
78.25	0.03181	0.00281	-0.00515	0.00058	-0.00121
78.75	0.03116	0.00229	-0.00526	0.00060	-0.00111
79.25	0.03016	0.00211	-0.00532	0.00062	-0.00101
79.75	0.02891	0.00234	-0.00528	0.00061	-0.00093
80.25	0.02770	0.00257	-0.00516	0.00059	-0.00087
80.75	0.02637	0.00278	-0.00503	0.00057	-0.00080
81.25	0.02445	0.00302	-0.00499	0.00057	-0.00070
81.75	0.02170	0.00336	-0.00507	0.00059	-0.00057
82.25	0.01951	0.00340	-0.00522	0.00060	-0.00042
82.75	0.01755	0.00345	-0.00528	0.00060	-0.00031
83.25	0.01585	0.00367	-0.00520	0.00058	-0.00028
83.75	0.01451	0.00403	-0.00508	0.00056	-0.00027
84.25	0.01376	0.00416	-0.00502	0.00055	-0.00027
84.75	0.01282	0.00419	-0.00503	0.00055	-0.00028
85.25	0.01150	0.00426	-0.00505	0.00054	-0.00024
85.75	0.01010	0.00426	-0.00501	0.00053	-0.00016
86.25	0.00922	0.00401	-0.00487	0.00052	-0.00008
86.75	0.00846	0.00388	-0.00484	0.00052	-0.00003
87.25	0.00731	0.00401	-0.00488	0.00052	-0.00003
87.75	0.00569	0.00429	-0.00488	0.00051	0.00001
88.25	0.00462	0.00412	-0.00476	0.00050	0.00008
88.76	0.00422	0.00371	-0.00467	0.00050	0.00012
89.27	0.00271	0.00416	-0.00471	0.00050	0.00014
89.70	0.00225	0.00390	-0.00448	0.00048	0.00021

Table 47. Aerodynamic Coefficients, $U_{\infty} = 10$ [in/sec], $Re = 2.15 \times 10^4$,
 $\alpha = 20^\circ$, $\dot{\phi} = 7^\circ/\text{sec}$

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